**Service Provision Governance in the Peri-urban Interface of Metropolitan Areas Research Project**

# AN OVERVIEW OF THE WATER SUPPLY AND SANITATION SYSTEM AT METROPOLITAN AND PERI-URBAN LEVEL: THE CASE OF CHENNAI

**DRAFT FOR DISCUSSION**

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## ACRONYMS

| | |
|---|---|
| AUA | Adjacent Urban Area |
| BOT | Build, Operate and Transfer |
| CDI | City Development Index |
| cm | Centimetre |
| CMA | Chennai Metropolitan Area |
| CMDA | Chennai Metropolitan Development Authority |
| CMWSSB | Chennai Metropolitan Water Supply and Sewerage Board |
| CUA | Chennai Urban Agglomeration |
| DUA | Distant Urban Area |
| ECR | East Coast Road |
| EXNORA | NGO |
| FIRE | Financial Institutions and Reform and Expansion Project |
| GUO | Global Urban Observatory |
| Ha | Hectare |
| HUDCO | Housing and Urban Development Corporation |
| IL&FS | Infrastructure Leasing and Financial Services Ltd. |
| INR | Indian Rupees (currently about Rs. 50 per U.S. Dollar) |
| IT | Information Technology |
| IVRS | Inter Active Voice Response Service |
| Lpcd/lcd | Litres Per Capita Per Day |
| M/m | Meters |
| MC | Municipal Corporation |
| MCU/mcu | Million Cubic Meters |
| METROWATER | Chennai Metropolitan Water Supply and Sewerage Board |
| mg/l | Milligrams Per Litre |
| MIDOS | Minimally Directed Organic Development Strategy |
| MLD/mld | Million Litres Per Day |
| mm | Millimetre |
| MR | Mixed Residential |
| MRTS | Mass Rapid Rail Transit System |
| MUDF | Municipal Urban Development Fund |
| NGO | Non-governmental Organisation |
| NTADCL | New Tirupur Area Development Corporation |
| NU | Non-Urban |
| O&M | Operation and Maintenance |
| O&R | Open Space and Recreation |
| PPM | Parts Per Million |
| PR | Primary Residential |
| PTC | Chennai Metropolitan Bus Transport |
| PWD | Public Works Department |
| SC/ST | Scheduled Caste / Scheduled Tribes (Socially and Economically Disadvantaged Communities in the Population ) |
| SIDCO | Small Industries Development Corporation |
| SIPCOT | Small Industries Promotion Corporation of Tamil Nadu |
| TACID | Tamil Nadu Corporation for Industrial Infrastructure Development |

| | |
|---|---|
| TDS | Total Dissolved Solids |
| TEA | Tirupur Exporters Association |
| TIDCO | Tamil Nadu Industrial Development Corporation |
| TMC | Thousand Million Cubic Feet |
| TN | Tamil Nadu |
| TNHB | Tamil Nadu Housing Board |
| TNPCB | Tamil Nadu Pollution Control Board |
| TNSCB | Tamil Nadu Slum Clearance Board |
| TNUDF | Tamil Nadu Urban Development Fund |
| TNUDP | Tamil Nadu Urban Development Project |
| TWAD | Tamil Nadu Water and Drainage Board |
| WSS | Water Supply and Sanitation |

## Local Names Used in the Report

| | |
|---|---|
| Dharna | Organised Protest by the Public |
| Panchayat | Village or Peri-Urban Local Body |

# AN OVERVIEW OF THE WATER SUPPLY AND SANITATION SYSTEM AT METROPOLITAN AND PERI-URBAN LEVEL: THE CASE OF CHENNAI

## INTRODUCTION

Chennai is often described as a rural metropolis because of its open development and its growth through annexation of villages. Also because of its reputation as a city with urban amenities and rural charm. This reputation has however been eroded in recent times with unplanned peripheral urbanization coupled with heavy backlogs in the provision and maintenance of basic urban infrastructure in the whole of the metropolitan area. Being a metropolis created by successive migrants predominantly from rural areas the skill level for urban employment as well as attitude towards the use of urban infrastructure of a significant sector of the population has not been helpful in developing an economically strong quality of life. The quality of governance particularly at the local level has not been adequate to meet the current and growing needs of the metropolis. The result is that Chennai is moving towards becoming an unsound urban environment – a liability in terms of its own well-being as well as nation's progress. The City in spite of being the capital of State of Tamil Nadu has not been able to develop the required improvements in infrastructure within the City area even with a local government in the highest tier. The peri-urban settlements of Chennai which as of today cover twice the extent of the City area have dispersed and weak local government structure. ***The infrastructure situation and quality of life in the peri-urban areas can therefore be well imagined.***

The peri-urban areas of Chennai are under tremendous physical pressure to provide for the growing population and economy of the metropolis because of the establishment of a number of industrial, IT related institutions as well as a number of higher educational technical colleges in the west, south-west and south. This makes it absolutely necessary to improve the WSS in these areas on a sustained basis.

This study on the service provision governance in the peri-urban areas of Chennai as a part of a comparative study of four other metros in other parts of the world is expected to throw up several important issues especially in the provision and delivery of water and sanitation services which are basic to making these cities healthy and liveable. The study is expected to contribute to the formulation of right policies in the physical, economic, environmental and governance spheres to benefit other metros round the world with similar problems in their peri-urban settlements besides directly benefiting the case study cities in question.

This paper first gives an overview of the metropolitan area and identifies the peri-urban case study localities before discussing demographic and socio-economic characteristics and trends of WSS. By exploring the trends of WSS the focus is evidently on the city, as the peri-urban areas still do not have any structured water supply and sanitation systems.

In this paper CMA stands for Chennai Metropolitan Area, CUA for Chennai Urban Agglomeration, the 'City' implies the area under the Chennai Municipal Corporation and AUA stands for Adjacent Urban Areas.

# 1. OVERVIEW OF THE METROPOLITAN AREA

## 1.1. Location

Chennai till recently known as Madras is the fourth largest metropolis of India next to Mumbai (Bombay), Kolkota (Calcutta) and Delhi. It is located on the East Coast of India facing the Bay of Bengal at latitude 13o 4' N and longitude 80o 17' E and is one of the largest and busiest sea ports. It is also the capital of the State of Tamil Nadu one of the premier states in the south of India. Starting as an administrative and trading centre of the British East India Company in the 17th century it has transformed itself since 1947 into a prime centre of industry, commerce, transport and communication, and recently as a health and education centre of excellence. It is divided into three districts: Chennai, Tiruvallur and Kancheepuram. A broad profile of the State of Tamil Nadu may be seen in **Annex 1**.

## 1.2. Population and Area

Chennai Metropolitan Area (CMA) extends over 1177 sq. km with an estimated population of about 7 million in 2001. Besides the City of Madras – a Municipal Corporation there are 8 Municipal Towns, 27 Town Panchayats and 18 Census Towns and one cantonment area, also a rural area with a population of about 40,000. **Table 1** presents the area and population in the constituent units of Chennai Urban Agglomeration. **Map 1** presents the City with its peri-urban settlements in relation to the CMA. The growth of Chennai in terms of geographic area and population since 1961 is presented in **Table 2.**

**Table 1 – Chennai Urban Agglomeration – Population 2001**

| Urban Category | Area in Sq. Km. | Population in '000 | Density persons/sq. km |
|---|---|---|---|
| Municipal Corporation | 172.0 | 4,216 | 24511 |
| Municipalities | 148.9 | 1,241 | 8328 |
| Town Panchayats | 256.8 | 606 | 2350 |
| Census Towns | 55.6 | 320 | 5755 |
| Cantonment Board | 11.2 | 42 | 3750 |
| **Urban Agglomeration** | **644.5** | **6,425** | **10035** |

*Source: Census of India 2001*

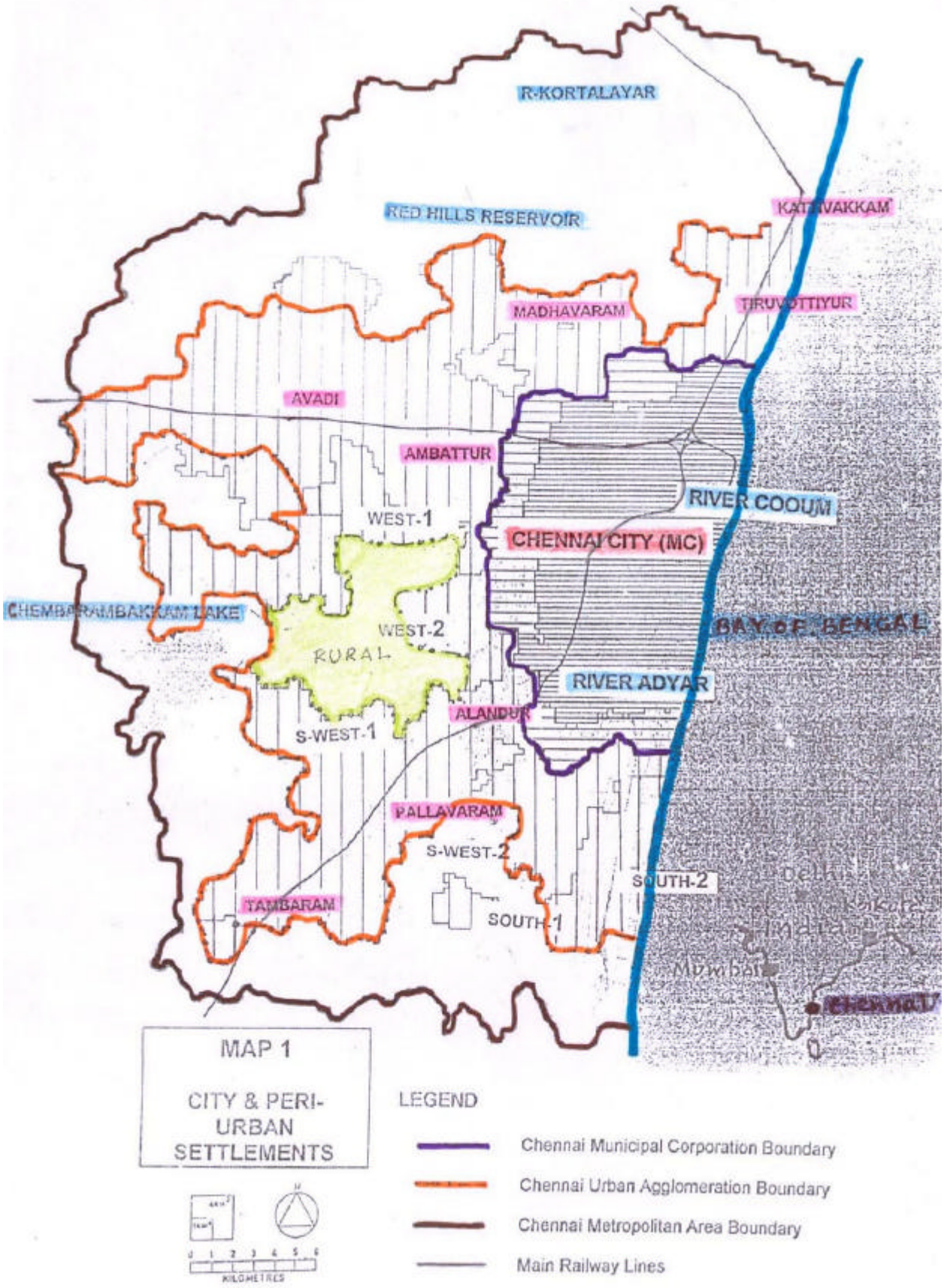
**Table 2 – CUA – Population Growth 1961-2001**

*Area in Sq. Km.*
*Population in '000*

| | 1961 | | 1981 | | 2001 | |
|---|---|---|---|---|---|---|
| | Area | Population | Area | Population | Area | Population |
| Chennai UA | 226 | 1945 | 572 | 4289 | 645 | 6425 |
| Chennai MC | 135 | 1750 | 172 | 3277 | 172 | 4216 |
| Peri-Urban | 91 | 195 | 400 | 1012 | 473 | 2209 |

*Source: Census of India 1981-2001*

## MAP 1 – CITY AND PERI-URBAN SETTLEMENTS



## 1.3. Economy

Chennai has a base of commerce and large industries including shipping, insurance and banking. Administration continues to be an important sector due to expansion in government and public sector activities.

The participation rate in the labour market in CMA (2001) is 33.95% of 28.10% are male and 5.85% female. For the City it is 34.18%, 28.29% and 5.89% respectively. The male participation rate in relation to the male population for the City and the CMA are respectively 55.18% and 54.80%. For females the corresponding figures are 12.09% and 12.02%. It may be observed that there is little difference in the participation rate for the metropolis as a whole and the City. **Tables 3 and 4** present the worker classification by industrial categories for the year 1981 and 1991.

Workers Classification with male and female participation for 1991 and 2001 for Chennai are given in **Annex 2.**

**Table 3 – Worker Classification 1981**

***Figures %***

| Classification | City | | | CUA | | |
|---|---|---|---|---|---|---|
| | **Males** | **Females** | **Total** | **Males** | **Females** | **Total** |
| **Primary** Cultivator, Agri labour, Livestock, Mining | 1.44 | 0.54 | 1.34 | 3.63 | 7.78 | 4.11 |
| **Manufacturing** Household and other than household | 31.34 | 19.33 | 30.0 | 33.73 | 20.36 | 32.19 |
| **Trade and Commerce** | 26.81 | 17.14 | 25.73 | 24.20 | 15.22 | 23.17 |
| **Construction** | 5.93 | 3.44 | 5.65 | 5.55 | 3.34 | 5.29 |
| **Transport** | 12.53 | 4.06 | 11.58 | 12.01 | 3.89 | 11.07 |
| **Services** | 21.95 | 55.37 | 25.70 | 20.87 | 49.4 | 24.17 |
| **Total** | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 | 100.00 |

*Source: Master Plan for CMA – 2011 – July 1995*

**Table 4 – Worker Classification 1991**

***Figures in %***

| Classification | Total | |
|---|---|---|
| | City | CUA |
| **Primary** Cultivator, Agri labour, Livestock, Mining | 1.05 | 3.06 |
| **Manufacturing** Household and other than household | 24.20 | 27.00 |
| **Trade and Commerce** | 25.70 | 22.96 |
| **Construction** | 6.39 | 6.60 |
| **Transport** | 10.74 | 10.24 |
| **Services** | 31.92 | 30.14 |
| **Total** | 100.00 | 100.00 |

*Source: Census of India 1991*

Activities in the **primary sector** in CMA are higher than in the City mainly because the rural areas still have significant farming operations and there is a significant amount of coastal fishing. Chennai accounts for over 10-15,000 tonnes of marine fisheries annually. **Industrial activities** are located both within as well as outside the City. In fact, most industrial activities after 1950 were located outside the City at Manali in the North, Avadi and Ambattur in the West and towards Tambaram in the South-West and beyond Tiruvanmiyur in the South. The industries include the manufacture of automobiles and automobile parts, a large range of machineries, petroleum refining, fertilizers and chemicals and IT related industries. Leather processing and the cinema industry are also important contributors to Chennai's economy. **Trade and commerce** include both wholesale and retail trade of manufactured goods and serves a large hinterland that covers the northern parts of Tamil Nadu. **Transportation** includes port activities as well as railways – Chennai being the headquarters of the Southern Railway - and Air Transport as Chennai is both a domestic as well as international airport of great importance. **Services** include both formal and informal activities and the most important formal activities relate to employment in state and central government offices, the City being an important regional headquarter for central government. In recent times there has been a significant expansion in education and health services and Chennai is emerging as a health centre of world class quality. The informal sector employment in Chennai is significantly high. An earlier estimate puts it at 30% of all employment.

There has been a significant shift of occupations from 1981. Agriculture and other primary activities have dwindled and according to the 2001 census they constitute only 0.11% for the City and 0.59% for CUA as against 1.05% and 3.06% in 1991 respectively.

Workers in construction and services have significantly increased at the cost of manufacturing. This appears to be a trend which will continue making the metropolis more and more service oriented. However both for the City as well as CUA the work participation rate is more or less stationary at 34% with males dominating at 86-87% with low female participation (13-14%).

After the opening up of the economy to the outside world several new industries have come up in the vicinity of the metropolitan area – Hyundai Motors and Ford Motors, Saint Gobain Glass, Dupont Chemicals to identify a few important ones. Many banking and financial institutions operating nationally and internationally have set up their offices in Chennai. The World Bank itself has set up its accounting back office here. There has been a spurt in IT related software exporting activities. It may be said that the economy of Chennai as a whole is forward looking. The positive trends in the economy however have not had a significant impact on low wage employment. Chennai has all along been one of the poor metropolises with a high percentage of poor people living in slums. As per the 2001 census the population living in slums is of the order of 25% both within the City and in the peri-urban settlements. According to an earlier survey about 31% of the slum population are workers and 56.5% of them are in the low paying informal sector. Another 27% are self-employed in petty industries. **Table 5** presents the distribution of slums within the City and in the peri-urban municipal towns.

**Table 5 – CUA – Slum Population in City and Municipal Towns 2001**

*Population Figures in '000*

| | Slum Population | | | % to Total Population | Sex Ratio F/1000 M |
|---|---|---|---|---|---|
| | Persons | Male | Female | | |
| Chennai MC | 1079 | 548 | 531 | 25.6 | 968 |
| Tiruvottiyur M | 81 | 42 | 39 | 38.4 | 943 |
| Avadi M | 57 | 29 | 28 | 24.8 | 964 |
| Ambattur M | 36 | 19 | 17 | 11.9 | 938 |
| Alandur M | 4.5 | 2.3 | 2.2 | 3.1 | 985 |
| Tambaram | 56 | 28 | 28 | 40.8 | 986 |
| Pallavaram M | 48 | 24 | 24 | 33.5 | 977 |

*Source: Census of India 2001*

## 1.4. Infrastructure

### *1.4.1. Transport*

Infrastructure provision in Chennai has not kept up with the expansion of the economy. Although some progress has been made in modernizing the port, construction of a new port at Ennore and advances in the telecommunication infrastructure through private participation, there have been no significant improvements in the road, water and sanitation sectors. The slow construction of the Beach – Velachery Mass Rapid Rail Transit System (MRTS) has failed to relieve the heavy burden on bus based public transport which still accounts for more than 80% of mass transportation trips made. In addition, the expansion in the ownership of cars and two-wheelers have congested the roads and added to woes of both passenger and goods movement.

### *1.4.2. Water*

The largest backlog has been in the water supply and sanitation sector notwithstanding heavy investments in source development and the distribution system for water and the restructuring and extension of the sewage system for drainage. Since 1978 when the Chennai Metrowater Water Supply and Sewage Board (METROWATER) was established major schemes have been taken up and investments are continuing to be made. However, the Krishna and Veeranam projects undertaken to obtain over 1,500 million litres per day (mld) for the metropolitan area have still not become operational and only 275 mld of water is available to Chennai at the best

of times. Most of the present supply of water to the CMA is generated within the catchment area through monsoon surface water storage and pumping from underground water sources. Failure of monsoon has resulted in acute water scarcity in Chennai City. ***The peri-urban settlements depending on local sources bore-wells and non-perennial rivers are worse off***. The supply of drinking water is mainly through water tankers. The per capita public supply per day in many outlying peri-urban areas has gone down to single digits. The difficult summer in Chennai is burning a hole in the pocket of residents as they depend more on packaged water and private tanker services. Almost all major corporate houses, hospitals and hotels obtain their water requirements from private tanker operators currently estimated at 900 tankers each undertaking five trips a day. The estimated quantum supplied by tankers is nearly 54 million litres as against Metrowater's alternate days supply of 275 mld. The middle income families are reported to be spending on average up to INR 600[1] a month for their water needs. Metrowater is reported to be making 2500 trips across the City to provide supply to regions where piped supply is not adequate, particularly to the poor.

Even the poor have to pay for water supplied to them through metro tankers at 50 paise to one rupee a pot unofficially. When a water tanker from Metrowater or the local body arrives at a place there is a large number of people waiting to be served. Although this public supply is free invariably distribution is regulated by the driver himself some times and in some cases a person from the locality takes up this regulation. For every pot (about 18 – 20 litres) supplied 50 paise to one rupee is collected and passed on to the driver of the tanker. The poor also pay for water (though unofficially) at a high rate.

#### *1.4.3. Sanitation*

Although the City is fully covered by an underground drainage system, nearly 25% of the population living in slums do not have access to this system. The treatment facilities are also inadequate. So much so the sullage flows into rivers and drains heavily polluting the waterways.

In the matter of solid waste collection and disposal these services have been privatized in some parts of the City but disposal continues in the form of dumping on vacant – designated and undesignated lands – creating health hazards for the residents of the peri-urban areas. ***In the peri-urban settlements the efficiency of solid waste collection is low.***

These deficiencies impose severe socio-economic costs on the residents particularly the poor who constitute a sizable sector of the population. Within the poor women are especially effected because they have to spend a lot of time in collecting water and there is little time for livelihood and social activities. Inadequate quality and quantity of water and inadequate sanitation and accumulation of solid waste impinge directly on the health of women and children.

## 1.5. Environmental Profile

Chennai has a tropical climate with high day time temperatures and gets its rainfall when depressions are formed in the Bay of Bengal. During this time cyclonic storms are common and occur mainly during October-December, the north-east monsoon season. The mean maximum temperature of 36.5oC occurs in June. The mean minimum temperature in June is 27.2oC. The mean maximum and minimum temperatures in January are 28.3oC and 20.8oC respectively. The humidity is high throughout the year. Mean relative humidity is high throughout the year and varies from 65% in May-July to 80o in October-December. A unique feature is that relative humidity generally increases by 20-30% with the onset of sea breeze in late afternoons. **Table 6 and Table 7** present the basic information on the temperatures and rainfall pattern in Chennai.

[1] 1GBP (United Kingdom Pounds) is equivalent to approximately 84 INR (Indian Rupees).

**Table 6 – Chennai – Temperatures Recorded at Nungambakkam**

| Month | Mean Maximum | Mean Minimum | Mean |
|---|---|---|---|
| | (In degree centigrade) | | |
| January | 28.3 | 20.8 | 24.6 |
| February | 29.7 | 20.8 | 25.3 |
| March | 31.7 | 22.9 | 27.3 |
| April | 33.3 | 25.8 | 29.6 |
| May | 25.6 | 27.4 | 31.5 |
| June | 36.5 | 27.2 | 31.9 |
| July | 34.4 | 25.2 | 29.8 |
| August | 33.9 | 25.4 | 29.7 |
| September | 33.5 | 25.2 | 29.4 |
| October | 31.5 | 24.4 | 28.0 |
| November | 29.2 | 22.7 | 26.0 |
| December | 28.2 | 21.4 | 24.8 |

*Source: Tamil Nadu Statistics Department*

**Table 7 – Chennai – Rainfall Recorded at Nungambakkam (in 'mm')**

| | Nungambakkam |
|---|---|
| Post Monsoon Period | |
| January | 45.5 |
| February | 12.5 |
| Hot Weather Period | |
| March | 13.2 |
| April | 17.5 |
| May | 37.9 |
| South-west Monsoon Period | |
| June | 44.7 |
| July | 86.6 |
| August | 113.0 |
| September | 119.4 |
| North-east Monsoon Period | |
| October | 305.8 |
| November | 350.3 |
| December | 139.2 |
| **Annual Total** | **1,285.6** |

*Source: Tamil Nadu Statistics Department*

Chennai is exposed to cyclonic storms during the north-east monsoons that are some times very severe with wind speeds of 80-140 km per hour. The cyclonic storms are accompanied by heavy rainfall and there are instances of a rainfall of 20 cm in one day. The average annual rainfall is 129 cm of which 80 cm are precipitated during the north-east monsoon season.

The physical and environmental characteristics of Chennai are depicted in **Map 2**. Chennai lies in flat plain just above sea level with low hills in the south-west at St. Thomas Mount and Pallavaram. The metropolitan area is traversed by three short non-perennial languid streams of Kortallaiyar in the north, Cooum in the middle and Adyar in the south. These streams do not carry any water except during the rainy season. In the last decade both Cooum and Adyar have become polluted, the former virtually turning itself in its lower reaches as a sewage carrier. These rivers are stagnant for most parts of the year as they are closed by sand bars.

## MAP 2 – PHYSICAL AND ENVIRONMENTAL CHARACTERISTICS

The CMA has a coastline of nearly 50 km from Ennore creek to Uthandi and is flanked in the north by the Ramsar recognized wetlands of Pulicat and in the south by the Pallikaranai wetlands. Further down south are the UNESCO recognized world heritage monuments of Mamallapuram. These two places namely Pulicat Lake and Mamallapuram are linked by the manmade Buckingham Canal, a narrow dead level sea water canal, originally used for navigation in this stretch by small country boats. Parts of this canal outside the City have recently been cleaned up.

The sea along the Chennai coast has two principal currents one from the north and the another from the south parallel to the coast. The northern current is active during October-February and the southern one from August-October. As a result of the construction of the harbour an accretion of sand has taken place south of the harbour and coastal erosion on the northern side of the harbour. While Chennai City has been gifted by a wide beach, the Marina, because of the accretion the land on the north has been eaten away so much that a dock and fishing harbour were built in the eroded part. The erosion is continuing to cause damage to habitations and the main access road to the industrial areas of Manali and Ennore.

The Chennai plain is dotted with a number of manmade lakes called tanks or eris which fill up with water during the rainy season. They were until recently widely used for irrigation. Five of them are used as drinking water supply lakes of which Red Hills, Sholavaram, Chembarambakkam and Porur are important. The largest of them is the Poondi reservoir just outside CMA. The total area covered by these reservoirs and eris is of the order of 150 sq. km with a capacity of about 1000 mcft (million cubic feet). The Chennai catchment area receives an annual precipitation of about 125 cm and if most of this water is collected and managed properly a substantial amount of drinking water supply for Chennai can be met. Besides there are 36 temple tanks within the City but unfortunately most of them are in a disused condition. Because of heavy rainfall during the northeast monsoon Chennai suffers regular damage from annual floods. The wetlands, the Adyar estuary and the tanks around Chennai used to be home to a variety of fauna and flora and bird life but these are diminishing with population encroachments.

## 1.6. Institutional Profile

The Chennai Metropolitan Development Authority (CMDA) was established as a statutory planning authority for holistic planning and development of CMA under the Tamil Nadu Town & Country Planning Act 1971. It has planning jurisdiction over all the eight municipal towns and other urban areas and all the rural settlements included in 1177 sq. km. The CMDA published the First Master Plan in 1975 and implemented a series of integrated urban plans for housing development in the form of sites and services and slum upgrading, roads and development of other infrastructure with loan assistance from the World Bank to the tune of US $750 million during the period 1977-1995. The Tamil Nadu Urban Development Project-II, which is a follow up from the earlier projects, has now established an urban development fund to finance infrastructure requirements of urban areas of the state. The CMDA published its second Master Plan in 1995 for the period up to 2011 and this is currently waiting to be approved. The other parastatal (statutory) organizations operating in the area are:

- Tamil Nadu Housing Board (TNHB), Tamil Nadu Slum Clearance Board (TNSCB) for housing and housing improvement
- Tamil Nadu Industrial Development Corporation (TIDCO), Small Industries Development Corporation (SIDCO) and Small Industries Promotion Corporation of Tamil Nadu (SIPCOT) for industrial development and
- Metrowater and Tamil Nadu Water and Drainage Board (TWAD) for water supply and sanitation.

Although these institutions were set up to meet the large development needs of the metropolis, over a period of time, the multitude of agencies with overlapping functions and responsibilities have not been able to put together a plan of action for the promotion of systematic development in CMA. The 73rd and 74th constitutional amendments providing for decentralized planning and development of rural and urban areas sought to transfer many of the functions of these bodies to various levels of local authorities. ***Tamil Nadu also enacted a comprehensive and uniform local bodies act to give effect to these changes from municipal corporation to town panchayats, but this act is not yet operational.***

In the matter of provision of water and sanitation services within CMA the two parastatal institutions involved are Metrowater and TWAD. Statutorily the Metrowater has jurisdiction over the entire CMA but due to operational limitations it was functioning only within the Municipal Corporation area. TWAD was the planning and construction agency for the rest of the peri-urban areas although assets created by it are to be maintained by the concerned local body. Recently the jurisdiction of Metrowater has been extended to a few other adjacent urban areas in CMA and there has been overlap of responsibility between the two water and sanitation providers in some of the peri-urban areas.

***With all local authorities now governed by elected representatives the relationship between the elected bodies and the non-representative parastatal bodies have become strained and this is hampering effective governance and provision of services within the City as well as the peri-urban areas.***

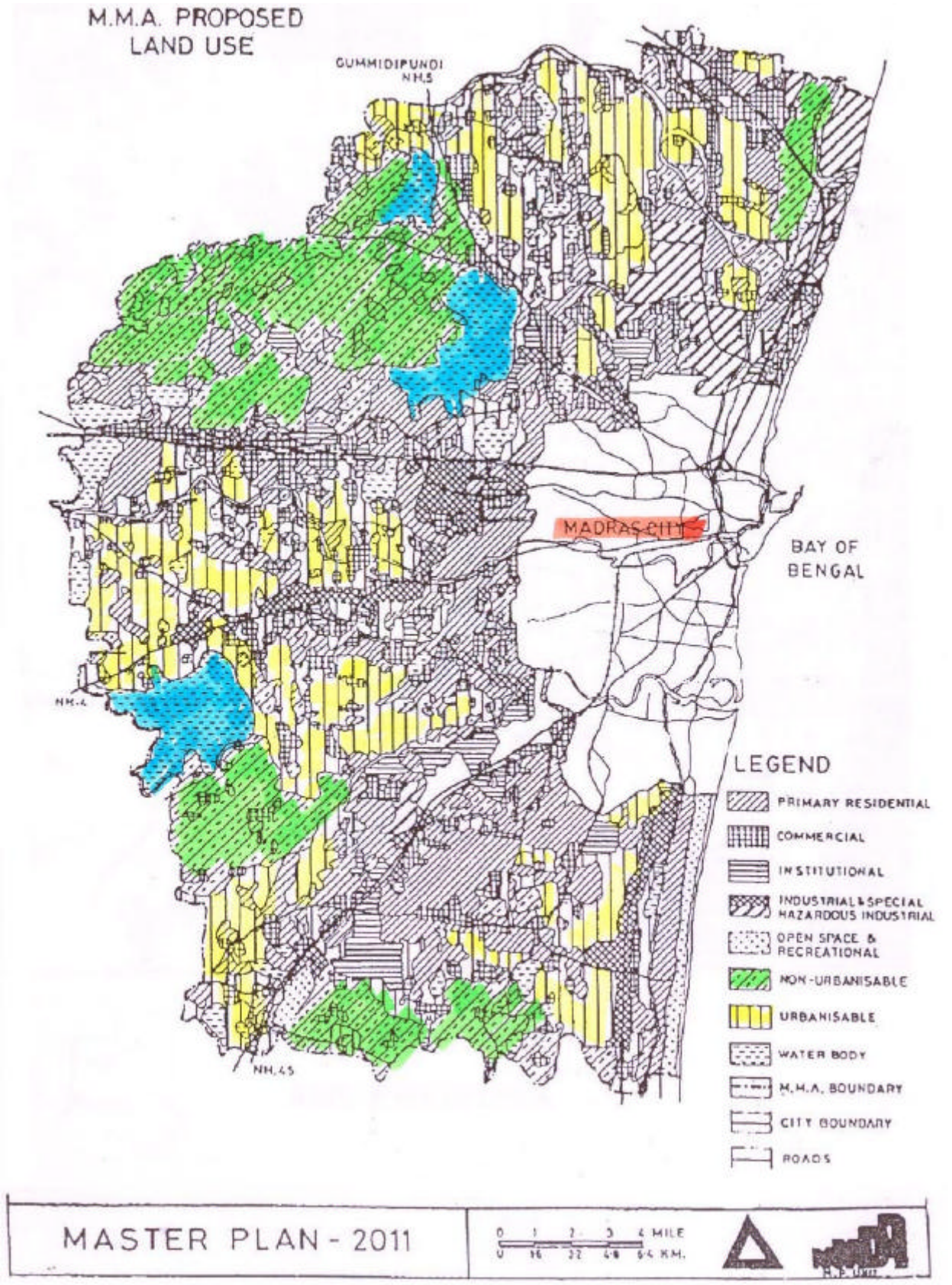
Selected urban indicators for Chennai published by GUO 1993-1998 are presented in **Table 8.** This table brings out the socio-economic profile within the urban agglomeration as a whole. The GUO study includes several cities in various parts of the world in order to provide an idea of the living quality in comparison to other cities. The City Development Index (CDI) is used rank cities and to evaluate the levels of development. The CDI has been calculated for 162 cities worldwide. It ranges from a high of 94.7 (Seoul, Korea) and Singapore (94.5), cities with good records of infrastructure and environmental management to 21.7 (Niamey, Niger). Among the Asian cities the CDI of Chittangong and Dhaka in Bangladesh and Bangalore in India are 39.3, 47.1 and 58.0 respectively. Chennai being similar to Bangalore may be assessed to have a CDI between 55 and 58.

For Chennai to improve its CDI greater efforts are needed in the provision of housing and basic amenities to slum households (living in informal settlements) and substantial improvements in the provision of water supply and sanitation including solid waste management.

## 1.7. Key Development Trends

The physical development of Chennai is guided by a liberal land use strategy **(Annex 3). Map 3** presents the proposed land use – 2011 for CMA. All the vacant lands outside the present developments have been classified as ‘urbanisable’ and ‘non-urbanisable’. The following areas have been designated as non-urbanisable – the catchment area of Red Hills reservoir and around the well fields near Kortalaiyar and the good agricultural lands south of Chembarambakkam lake and certain ecologically conservable areas. The new urbanisable lands have been designated on the west between the Avadi-Chennai Central Station rail line and the Adyar River. The proposed land use structure is shown in **Table 9. Tables 10 and 11** present the existing land use in CUA (1991) whereas **Table 12** indicates the land use structure proposed for 2011.

**MAP 3 – CMA PROPOSED LANDUSE – 2011**



## TABLE 8 - CHENNAI – SELECTED URBAN INDICATORS (1993-98)

**Shelter**

| | |
|---|---|
| No. of Households evicted | 1320 |
| Evicted from squatters | 100% |
| House price to income | 7.7 |
| Rent to Income Ratio % | 14.6 |
| Households with access to water within 200 m (%) | 94 |
| Land price to income ratios developed land | 357 |
| Raw land | 166 |
| Land price to income ratio | |
| Developed land | 1.850 |
| Raw land | 0.860 |

***Household connections (%)***

| | |
|---|---|
| Water | 51.30 |
| Sewage | 55.50 |
| Telephones | 60.40 |
| Water-informal settlements | 35.00 |

***Under five mortality (%)***

| | |
|---|---|
| Female | 6.40 |
| Male | 2.75 |
| Total | 3.72 |
| Households below poverty line | 20.50 |
| Women households below Poverty line | 4.90 |

**Literacy rate**

| | |
|---|---|
| Female | 69% |
| Male | 72% |

***Life Expectancy at Birth (years)***

| | |
|---|---|
| Female | 68.5 |
| Male | 65 |

**POPULATION (000)**
**Municipal Corporation**

| | |
|---|---|
| Male | 2220.29 |
| Female | 2073.42 |
| Total / Annual growth rate | 4293.71 |

**Urban agglomeration**

| | |
|---|---|
| Male | 3302.72 |
| Female | 3085.73 |
| Total | 6388.45 |

***Water consumption as litres/ Person/day***

| | |
|---|---|
| All settlements | 70 |
| Informal settlements (Slum Settlements) | 45 |
| Median water price US$/$m^3$ | 0.08 |
| Wastewater treated % | 70 |

**Solid waste disposal %**

| | |
|---|---|
| Open dump | 100 |

**Travel trip**

| | |
|---|---|
| Per work trip (min) | 23 |

Transport modes to work (%)

| | |
|---|---|
| Private motorized | 42 |
| Train | 11 |
| Bus | 25 |
| Walking/cycle/other | 22 |
| Informal employment (%) | |
| Total | 64.80 |
| City product US$/per capita | 547 |

***Note:*** The GUO has not worked out the CDI and city product for Chennai. The CDI and city product for Bangalore, a city generally ranked higher to Chennai has been worked out at 58.0 and 51.1 respectively.

***Source: Global Urban Indicators Database – Version 2. GUO – UN Human Settlements Programme (UN-HABITAT)***

**Table 9 – CMA – Proposed Land Use Structure 1991 – First Master Plan**

| | Chennai City | | CMA (Excluding Chennai City) | |
|---|---|---|---|---|
| | **Extent in hec.** | **% to total extent** | **Extent in hec.** | **% to total extent** |
| Residential | 8,081.98 | 48.57 | 32,255.78 | 30.98 |
| Commercial | 973.28 | 5.85 | 895.42 | 0.86 |
| Industrial | 1,107.51 | 6.66 | 6,361.62 | 6.11 |
| Institutional | 2,746.43 | 16.51 | 4,935.20 | 4.74 |
| Open space & Recreational | 3,254.11 | 19.55 | 7,767.21 | 7.46 |
| Agricultural | - | - | 50,924.14 | 48.91 |
| Non-Urban | 476.11 | 2.86 | 978.71 | 0.94 |
| | **16,639.42** | **100.00** | **1,04,118.08** | **100.00** |

*Note: The above analysis excludes the Cantonment area (1118 hec) and the Chembarambakkam Tank in Kattirambakkam village (197.32 hec.) with regard to the Metropolitan areas*

*Source: First Master Plan for CMA.*

**Table 10 – CMA – Abstract of land use analysis (Except Chennai City) – 1991**
**(In Hectares)**

| Spatial Entity | Total | P.R. | M.R. | Commercial | Institutional | Industrial | O&R | Agri. | N.U. | Vacant |
|---|---|---|---|---|---|---|---|---|---|---|
| Municipalities | 10251.92 | 3601.97 | 558.52 | 190.03 | 1279.97 | 1563.96 | 878.02 | 850.53 | 168.07 | 11 |
| Township | 10512.43 | 1953.39 | 679.90 | 56.05 | 886.03 | 1554.74 | 1434.98 | 3180.12 | 124.58 | 6 |
| Town Panchayats | 19150.36 | 4116.85 | 1090.17 | 74.62 | 1167.38 | 1032.89 | 3108.07 | 5832.59 | 336.26 | 2391.53 |
| Panchayat Unions | 59423.26 | 5422.08 | 3324.89 | 107.94 | 1728.94 | 553.10 | 7561.85 | 31127.97 | 2475.32 | 7121.17 |
| Total | 99337.97 | 15094.29 | 5653.48 | 428.64 | 5062.32 | 4704.69 | 12982.92 | 40991.21 | 3104.23 | 11316.19 |

**Table 11 – CMA – Existing land use structure - 1991**

| | Chennai City | | CMA (Excluding Chennai City) | |
|---|---|---|---|---|
| | **Extent** | **% to total** | **Extent** | **% to total** |
| Primary Residential | 8138.40 | 47.74 | 15094.29 | 15.20 |
| Mixed Residential | - | - | 5653.48 | 5.69 |
| Commercial | 1183.91 | 6.94 | 428.64 | 0.45 |
| Institutional | 4769.60 | 27.98 | 5062.32 | 5.08 |
| Industrial | 918.14 | 5.39 | 4704.69 | 4.75 |
| Open space & Recreational | 1080.29 | 6.34 | 12982.92 | 13.07 |
| Agricultural | 248.38 | 1.46 | 40991.21 | 41.25 |
| Non-Urban | 104.82 | 0.62 | 3104.23 | 3.12 |
| Vacant | 603.85 | 3.54 | 11316.19 | 11.39 |
| | **17047.39** | **100.00** | **99337.97** | **100.00** |

*Note: The above analysis exclude the cantonment areas (1118 ha.) and the Kattirambakkam Tank*
*Source: Madras Metropolitan Development Authority, Master Plan for CMA – 2011 – Draft*

**Table 12 – CMA – Proposed Land Use Structure – 2011**

| | Extent (in hec.) | |
|---|---|---|
| Land Use | **Chennai City** | **CMA** |
| Residential | **7,461.36** (45.97%) | **19,227.65** (19.40%) |
| Commercial | **2,201.65** (13.57%) | **9,706.76** (9.77%) |
| Industrial (includes Spl. & Hazardous industries) | **906.17** (5.58%) | **7,481.50** (7.53%) |
| Institutional (Includes roads & railways) | **4,456.82** (27.46%) | **6,543.67** (6.59%) |
| Open space & Recreational | **567.50** (3.50%) | **332.06** (0.33%) |
| Water Bodies | **448.21** (2.76%) | **11,696.33** (11.77%) |
| Urbanisable | **89.58** (0.55%) | **28,099.15** (28.29%) |
| Non-Urbanisable | **98.10** (0.61%) | **16,200.85** (16.33%) |
| **TOTAL** | **16,229.39** | **99,337.97** |

*Note: Land use structure for City excludes George Town and Harbour planning divisions and hence the total extent of city is 16,229.39 hec.*

*Source: Madras Metropolitan Development Authority, Master Plan for CMA – 2011 – Draft*

Urban growth of Chennai is taking place both through densification and extension to new areas. Densification is taking place mostly within the City area where multi-family apartments in high-rise as well as two to four-storey buildings are replacing single-family dwellings. Extension of the urban area is taking place primarily in three directions west, southwest and south. The southern stretch is most under pressure because of its designation as the information technology corridor and the location of several private technical institutions of higher education. The absence of any significant agricultural activity has helped this growth trend. In all three directions the developments are both in terms of plotted sites varying from 100 sq. m to 300 sq. m upwards and in medium-rise apartments.

The new trends of development are widening the existing development gap– pace and structure – as between the northern and southern parts of CMA. The south is the most preferred location for improvements while the north remains neglected.

Metrowater has assessed the 2021 population of settlements in Chennai Metropolitan Area for purposes of water supply as follows:

- **City**: 6,981,000
- **Adjacent Urban Areas:** 1,870,000 comprising of the Northern group (778,000), the Western group (599,000) and the Southern group (493,000)
- **Distant Urban Areas:** 1,437,000 comprising of the Northern group (84,000), the Western group (553,000) and the Southern group (800,000).

Thus with a peri-urban population of 3.3 million the total population in CMA for water supply is of the order of 10.3 million.

## 1.8. Characterisation of Peri-urban (PU) Settlements

As seen earlier the agricultural activity in CUA has dwindled to such an extent that the peri-urban areas do not have significant agricultural occupations. The work composition in peri-urban areas is “urban” but the infrastructure particularly water and sanitation are nowhere near urban standards.

The peri-urban localities generally fall in one of the three categories viz.

- Settlements with Municipal Status – urban in character
- Settlements with Town Panchayat status –urban areas in transition
- Census Towns – Village Panchayat Status

The first category consists of urban areas with a population of over 30,000 and an annual income not less than INR 5 million. These towns have a very high percentage of workers in urban activities and low employment in agriculture or other primary activities. They have a higher level of urban infrastructure than in the other two categories mentioned below. The area of agricultural land in these towns is minimal.

The next two categories are considered urban only because of their level of secondary and tertiary employment accounting for more than 75%. They have still some areas, which are used for agriculture or more recently converted as housing plots. Many of these subdivisions remain unbuilt for a long time. The settlements with a population between 20,000 to 30,000 with an annual income of not less than INR 3 million have been classified by the government as Town Panchayats.

The Census Towns continue to be rural or Village Panchayats but are given urban status by the Census of India which defines Census Towns as follows - a place with a population in excess of 5000 where 75% of the male working population is in non- agricultural occupations and the population density is at least 400 persons per sq. km. The level of infrastructure and environmental management is usually non-existent in Census Towns, low in Town Panchayats and somewhat better in municipalities.

Of the three categories, settlements included under the latter two fit the key features of PUI most. From an environmental perspective they are located in natural ecosystems, which are under pressure physically and economically from the adjoining urban extensions. ***Productive agricultural land here is giving way at a rapid pace to urban use.***

From the socio-economic point of view most of the residents here are relocating from the City to escape high rents in the City and fulfil their desire of building their own homes. And also in the hope of having their own private water supply in the shape of wells to beat the water shortage in the City. They mostly belong to low and medium income groups either employed or small entrepreneurs. They are employed in the City, the employment centres of the adjoining area, local enterprises or metro level institutions situated in the area. Typically they depend on on-site wells and street taps for water supply and septic tanks or open drains for sewage and drainage. The environmental conditions are invariably poor with stagnating water, unpaved roads and vacant lands and roadsides littered with solid waste and debris.

Institutionally these areas are at the bottom of the local authority hierarchy with little capacity in human resources and management and inadequate financial resources. They are also new to the democratic set up ushered in through 73rd and 74th constitutional amendments. These represent serious hurdles in the service provision particularly for water supply and sanitation including solid waste management.

Within the localities falling in this category six groups have been identified which show rapid growth in terms of population. **Table 13** presents these groups with the constituent localities and their population in 2001 and 1991. These are on the west, south-west and south.

**Table 13 – CUA – Peri-Urban Area Groups**

| | Population 2001 | Population 1991 | Growth Rate (%) |
|---|---|---|---|
| West 1 | 83671 | 58237 | 43.7 |
| West 2 | 103879 | 57000 | 82.1 |
| South-west 1 | 96806 | 60000 | 61.3 |
| South-west 2 | 44026 | 38000 | 57.2 |
| South 1 | 87464 | 30000* | 191.0 |
| South 2 | 54025 | Less than 30000 | +45% |

* *Estimate*

West 1 – Maduravoyal and Environs; West 2 – Valasaravakkam and Environs; South-west 1 – Anakaputhur and Environs; South-west 2 – Ullagaram and Environs; South 1 – Pallikkaranai and Environs South 2 – Kottivakkam and Environs

*Source: Compiled from Census of India Data*

The southern group consisting of developments from Perungudi, Pallikkaranai to Sholinganallur exhibit a very high growth rate. Part of this growth is due to large-scale resettlements of urban slums from the City. The land here is of average quality for agriculture and the wetlands are under government ownership. This has speeded up their conversion to urban use. This area is in the southern extremity of CMA and depends for its water supply on the local coastal aquifer.

The next rapidly growing settlements are in the west where the growth rate is 82.1%. These settlements are expanding on high quality agricultural land. Water supply for these localities is being developed by the metropolitan water system. Porur which is part of this set of settlements is a nodal point in the metropolitan water supply distribution system.

# 2. PROFILE OF PERI URBAN LOCALITY – VALASARAVAKKAM AND KOTTIVAKKAM

## 2.1 Introduction and Justification

Based on this appraisal two peri-urban localities with distinctive characteristics have been selected. Town Panchayats of Valasarawakkam and Porur and the adjacent Census Towns of Ramapuram, Karambakkam and Manapakkam have been identified as the **Case Study Area-1** for Service Provision Governance in the Peri-urban Interface of Chennai Metropolitan Area.

Another area, which has special features covering the coastal stretch to the south of the City, has been selected as **Case Study Area-2** consisting of the Census Towns of Kottivakkam, Palavakkam, Neelankarai and Injambakkam. The southern aquifer from which Metrowater draws some water is part of the coastal stretch.Both case study areas are shown in **Map 4**.

**Case Study Area-1** **Valasaravakkam and Environs**

**Case Study Area-2** **Kottivakkam and Environs**

## 2.2. Valasaravakkam and Environs

Case Study Area 1 comprises Valasaravakkam Town Panchayat along with Porur Town Panchayat and the Census Towns (CT) of Ramapuram, Karambakkam and Manapakkam.

| Locality | Area in Sq. km | Population 2001 |
|---|---|---|
| Valasaravakkam Town Panchayat | 2.97 | 30265 |
| Porur Town Panchayat | 3.72 | 28782 |
| Ramapuram Census Town | 2.69 | 30251 |
| Karambakkam Census Town | 1.07 | 14591 |
| Manappakkam Census Town | 4.58 | 8590 |
| **Peri-urban Case Study Area** | **15.03** | **112479** |

*Source: Census of India 2001*

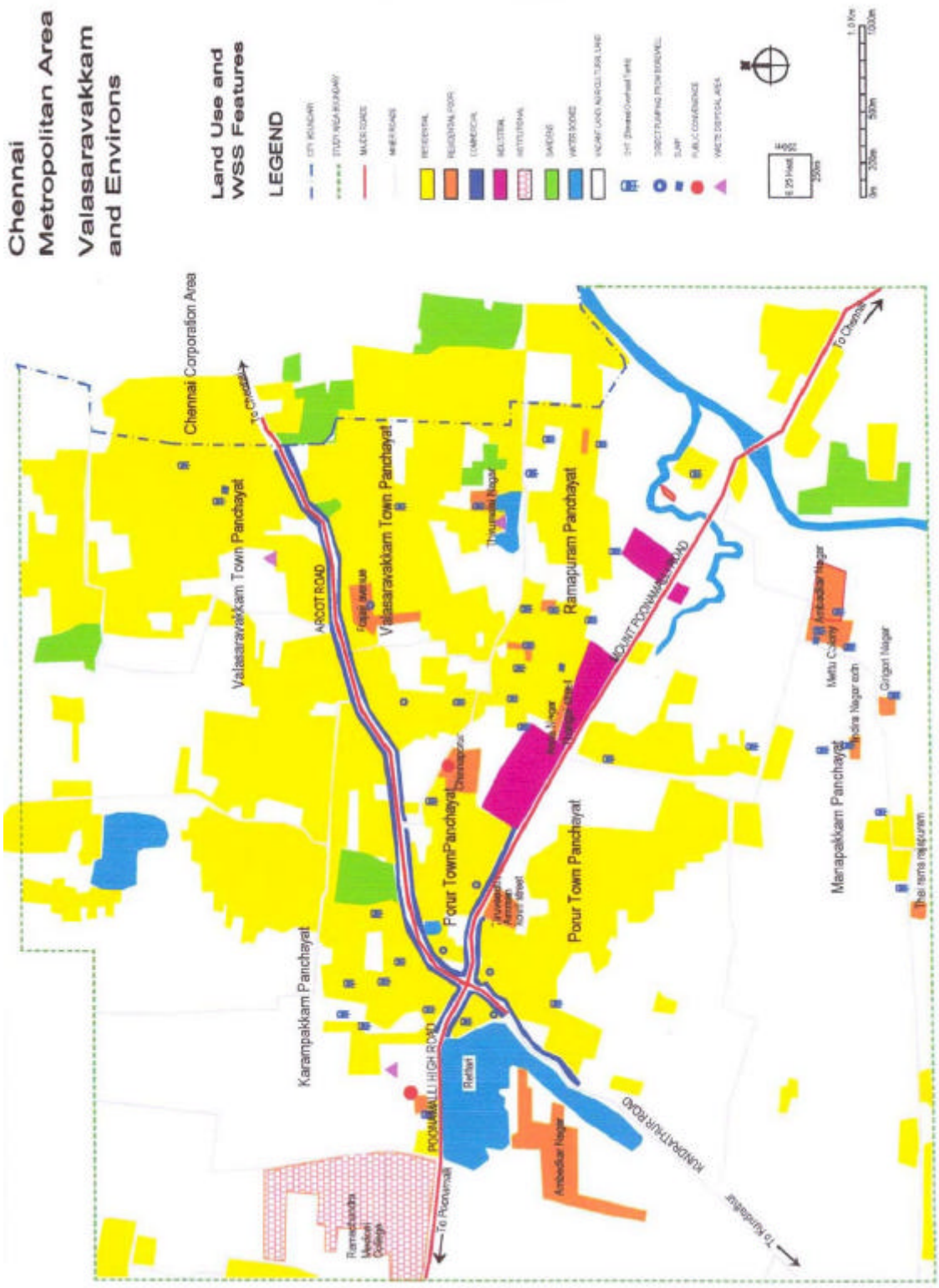
The study area adjoins the western boundary of Chennai City Corporation on Arcot Road, one of the important roads joining the National Highway to Bangalore. The area covers both sides of Arcot Road and Mount Poonamallee Road from the City boundary to Porur lake or tank.

Hierarchically it is developing as a metropolitan sub centre being at the junction of two important roads. This road junction has evolved into a commercial center serving the larger area around it. While Valasaravakkam area is mainly residential in character, Ramapuram and Porur have several industrial institutions and large health facilities serving the needs of the City. The developments remain scattered with intervening vacant lands.

This area lies on the most productive agricultural land of CMA with several large and small eris/tanks. It was formerly covered with orchards and gardens. Areas north of Arcot road drains into the River Cooum and areas South of the road drain into the River Adyar. Agricultural activities are rapidly decreasing and there is a rise in both formal and informal urban activities both commercial and service. The residents are mostly in the medium to low-income groups and there is a significant share of the economically weaker sections.

## MAP 4 – LOCATION OF CASE STUDY AREAS

## MAP 5 - VALASARAVAKKAM AND ENVIRONS – LAND USE 2001 AND WSS FEATURES



Institutionally the Town Panchayats are the lowest hierarchy in urban governance and the Census Towns are Village Panchayats or administered by rural local government. Their capacity in terms of manpower and finances is weak. The planning and implementation responsibility for water supply and drainage systems have been taken over by Metrowater recently.

The chosen locality forms part of the adjacent urban area of the City for which systems are being developed by Metrowater as a part of the distribution of water imported from Krishna Interstate River and Cauvery. The latter is also an interstate river but sourced from within the state itself. Water from Krishna comes from the north and that of the Cauvery from the south. The main transmission lines of Metrowater connect Red Hills Lake with Porur and the western part of the City and Porur acts as an important intermediate point in the metro water supply distribution system.

Considering that these localities were situated on farm and orchards providing good income to local farmers and still have about 30% of land under agriculture, the current developments are scattered, there is a mix of land uses and income groups including a significant size of poor groups, the localities are governed by weak local governments, the present level of services are environmentally poor, the localities chosen provide the best opportunity for useful research in the field of service governance in metro areas. However, there is potential for improving the environmental situation through local government–resident initiatives.

#### *2.2.1. Demographic Trends*

The total population of **Case Study Area-1** as of 2001 is 112,479. Information on Population and decadal growth as compared to Chennai UA and Chennai MC as well as population growth trends in the case study area is presented below.

**Case Study Area-1 – Population and Decadal Growth Rate**

| City/Town | Population | | | Percentage Decadal Growth (91-2001) |
|---|---|---|---|---|
| | Persons | Male | Female | |
| 1. Chennai UA | 6,424,624 | 3,294,328 | 3,130,296 | 20.28 |
| 2. Chennai MC | 4,216,268 | 2,161,605 | 2,054,663 | 9.76 |
| **3. Valasaravakkam** | **112,479** | **56,754** | **55,725** | **124.66** |

*Source: Compiled from Census of India Data*

**Case Study Area-1 Population Growth Trends**

| City/Town | Population | | |
|---|---|---|---|
| | 2001 | 1981 | 1961 |
| Valasaravakkam | 112,479 | 26,057 | 9,242 |

*Source: Compiled from Census of India Data*

The decadal growth of the study area 1991-2001 may be seen very high compared to MC and high compared to CMA. This clearly establishes the fact that peri-urban growth is taking place because of congestion and problems inside the City. The higher growth rate as compared to UA shows that there is a large flow of people into this area. ***The case study area has grown from***

***a small rural population in 1961 to a large urban population equivalent to a class-I town in 2001. Most of the population growth here has been due to a shift from the City to suburbs.*** It is further expected to grow to 250,000 inhabitants by 2011.

The demand on water resources has risen basically from the fact that needs of a urbanizing area (100 to 120 lpcd[2]) are several times more than rural drinking water standards (10-20 lpcd). Initially individual wells were able to supply water both for construction and domestic purposes but as the population has increased groundwater resources have become scarce and hence there is a demand for supply through the metropolitan system.

#### *2.2.2. Socio-economic Trends*

The sex ratio in the case study area is generally lower than in the City as well as the UA as a whole and literacy rate particularly for the males is higher. This perhaps reflects that migrants to the area are from the City's educated groups belonging to upper low and middle income groups.

The poverty situation in the area at this point can only be inferred from quality of housing, existence of hutted areas occupied by the poor and levels of employment in agriculture and household activities. From these it appears that 25-35% of the population are poor. This aspect can be confirmed only after detailed census data for housing and economic status become available. Sex Ratio and literacy rates for the study area are presented below:

**Study Area-1 Sex Ratio and Literacy**

| City/Town | Sex Ratios Females/1000 Males | Literacy Rate | | |
|---|---|---|---|---|
| | | Persons | Male | Female |
| Chennai UA | 950 | 81.99 | 86.79 | 76.94 |
| Chennai MC | 951 | 80.14 | 84.71 | 75.32 |
| **Valasaravakkam** | **935** | **96.60** | **97.95** | **95.15** |
| Porur | 939 | 87.64 | 91.22 | 83.81 |
| Ramapuram | 1126 | 79.25 | 92.21 | 67.87 |
| Karambakkam | 928 | 82.13 | 87.64 | 76.18 |
| Manappakkam | 923 | 81.99 | 86.29 | 77.32 |

*Source: Compiled from Census of India Data*

#### *2.2.3. Livelihood Patterns*

Patterns of livelihood are changing from predominantly agricultural occupations to trade/ service oriented occupations as can be expected in a low to medium income suburban setting. This change requires further study before the livelihood patterns of the poor become clear. Personal observation suggests that livelihood opportunities for the poor are lower than in municipal towns. As a result the environmental situation is worse than in the municipal towns.

[2] Lpcd = litre per capita per day

### *2.2.4. Environmental Characteristics*

Until recently the area was a highly productive in agricultural terms with cultivation of paddy, orchards and gardens. This was made possible by the availability of wells and tanks.

The area is bounded by the streams of Cooum and Adyar and surrounded with small and medium lakes or tanks constructed by putting small earthen dams. The main lakes include the Porur tank within the area itself and Chembarambakkam on the west, Maduravoyal on the north, Mangadu and Kunrathur tanks also on the west. Besides these were a number of small tanks and wells, which helped irrigation. altogether the tanks had a capacity of about 240 mcft and irrigated around 2800 ha. Once the irrigated area began to be converted to urban use, the tanks not only lost their importance but they have also become receivers of domestic and industrial pollution. The banks of Adyar provided a good resource for brick making but these being local resources were exhausted quickly resulting in the degradation of the environment.

The Porur tank had a capacity of 57.15 mcft and irrigated nearly 320 ha. The Chembarambakkam Lake on the west had a capacity of 88.36 mcft and provided irrigation facilities for more than 2000 ha. The other tanks nearby although small provided irrigation facilities for the small farmers. All these tanks helped recharge groundwater and the energized wells providing the needed irrigation facilities improved the livelihood patterns of farmers.

The present land use comprises mainly land for residential, commercial and industrial uses; other uses such as public open space and local amenities and utilities and even the street system has been incidental. The first to arrive on the scheme were industrial uses on the Mount-Poonamallee road followed by residential extensions on Arcot Road and finally the shopping and commercial activity at the meeting point of the two roads. The commercial activity includes provision of items of daily necessities, building construction materials and hardware as well as consumer items and households equipment. It has also become a mini-transport centre for all types of goods. One significant impact of the ongoing urbanization trends are that many agricultural lands are prematurely converted into residential layouts. **Map 5** indicates the present land use. The land use structure as estimated for the case study area is presented below:

**Case Study area – Land use structure**

| Use | % of Total Area |
|---|---|
| Residential | 30 |
| Industrial | 5 |
| Commercial | 1 |
| Institutional | 7 |
| Water Bodies & Non-urban | 10 |
| Vacant | 15 |
| Agriculture | 32 |

*Source: Compiled from CMA Landuse Map*

Ownership of land is changing from small farmer households to real estate operators ultimately to be transferred to individual homebuyers. In the process the farmers have not only become landless but have to resort to economically poorer occupations once the money from the sale is spent.

The changes taking place are producing more environmental problems than opportunities. Sullage flow and solid waste dumping by individuals aggregate to the creation of large

environmental problems. No significant livelihood opportunities in the environmental sector have come up even for the poor.

#### *2.2.5. Land Ownership*

Most of the land whether under built status or agricultural status is privately owned. Only the water bodies, public roads and drains are classified as government owned land.

#### *2.2.6. Financial Status*

The case study area consists of local bodies with the status of Town Panchayats and Census Towns. Their financial strength is very poor. The annual income and expenditure of the local bodies of Valasaravakkam and Porur in the case study area is given below along with a few other parameters.

| **Valasaravakkam T.P.** | | **Porur T.P.** |
|---|---|---|
| 1.91 | Annual Income (in million) | 14.3 |
| 1.87 | Annual Expenditure (in million) | 12.5 |
| - | Property Tax (in million) | 4.60 |
| - | Professional Tax (in million) | 0.60 |

Valasaravakkam Town Panchayat has contemplated the development of water supply and underground sewerage with assistance from TUFIDCO, a state governmental financial agency. Such schemes can be taken up provided they have enough financial capacities to return the loans and there is financial participation by the beneficiaries. TUFIDCO provides part of the project cost as grant.

## 2.3. Kottivakkam and Environs

This coastal peri-urban interface extends to a length of 5 km along the Bay of Bengal and about 2.5 km inland and is immediately to the south of the Chennai Corporation boundary. It is bisected by the Chennai-Mamallapuram coastal road. Located as it is on the coast with good beaches and on the way to Mamallapuram, a World Heritage site and a major tourist attraction, it houses uses ranging from residential buildings, farmhouses of the rich, tourist resorts and several institutions. There are a number of fishermen settlements close to the coastline and the fishermen here are engaged in the traditional way of catching fish using catamarans. Thus the area accommodates not only heterogeneous land uses but also extremes of income groups from the affluent section in the farmhouses to medium income City commuters to ordinary low-wage earners in fishing and non-farm occupation. This area is presently not served by the metropolitan water system but it has been a source of underground water not only for Metrowater but also for a number of private water suppliers whose clients are in the City such as hotels, hospitals and other institutions. The fishing villages here are islands in an increasingly changing peri-urban scenario and hence have qualified to be taken up as the second case study area.

With the upgrading of the bisecting East Coast Highway several restaurants, amusement parks and recreation centres serving the city population are coming up. These provide new opportunities for waged employment in the service sector for the residents.

### *2.3.1. Demographic Trends*

The Kottivakkam peri-urban case study area consists of the Census Towns of Kottivakkam, Palavakkam, Neelankarai and Injambakkam with an area of 12.4 sq. km and a population of 54,055 in 2001.

**Case Study Area-2 – Population and Decadal Growth Rate**

| City/Town | Population | | | Percentage Decadal Growth (91-2001) |
|---|---|---|---|---|
| | Persons | Male | Female | |
| 1. Chennai UA | 6424624 | 3294328 | 3130296 | 20.28 |
| 2. Chennai MC | 4216268 | 2161605 | 2054663 | 9.76 |
| **3. Kottivakkam** | **54055** | **27963** | **26092** | **+45** |

*Source: Compiled from Census of India Data*

**Case Study Area-2 – Population Growth Trends**

| City/Town | Population | | |
|---|---|---|---|
| | 2001 | 1981 | 1971 |
| Kottivakkam | 54055 | 11986 | 5970 |

*Source: Compiled from Census of India Data*

### *2.3.2. Socio-economic Trends*

The four Census Towns comprising of Kottivakkam, Palavakkam, Neelangarai and Injambakkam were primarily fishing villages and their settlements Kuppams are compact habitations close to the seacoast. They are separated by distances varying from 0.5 km to 2 km according to the traditionally established rights of fishing zone in the sea. These groups and the new arrivals in the service and construction sectors who inhabit the margins of the Buckingham Canal on the west (a canal earlier used by small boats to carry fuel, salt, etc. which is now rehabilitated and likely to be used for tourism purposes) are socially and economically disadvantaged and form nearly 30% of the population. The other important social group is the urban middle class from Chennai who have shifted from the city to these areas to be away from the bustle of the City and to enjoy a coastal location and a better quality of groundwater available here earlier. Most of these residents commute to the City for work. The total working population in the area is 19,081, which is about 35% of the population; over 95% are in non-farm occupations. Neelangarai one of the constituents of the area has a significantly high proportion of female workers in the household industry. Sex ratio and literacy rates for the study area are presented below:

**Study Area - 2 Sex Ratio and Literacy**

| City/Town | Sex Ratios Females/1000 Males | Literacy Rate | | |
|---|---|---|---|---|
| | | Persons | Male | Female |
| Chennai UA | 950 | 81.99 | 86.79 | 76.94 |
| Chennai MC | 951 | 80.14 | 84.71 | 75.32 |
| **Kottivakkam** | **940** | **79.31** | **86.93** | **71.26** |
| Palavakkam | 949 | 83.19 | 88.95 | 77.16 |
| Neelankarai | 924 | 79.28 | 85.94 | 71.91 |
| Injambakkam | 912 | 86.02 | 91.88 | 79.64 |

*Source: Compiled from Census of India Data*

#### *2.3.3. Livelihood Patterns*

Livelihood patterns are changing very rapidly because of the change in land uses. While fisheries continue to be the main occupation in the fishing villages employment in tourism related activities, plant nurseries and household work provide new opportunities for the population.

#### *2.3.4. Environmental Characteristics*

The coastal strip is a fragile ecosystem where the soil strata are sandy at the top and sand alluvial at a depth of 6 metres. The water table is 1.5 meters high in rainy seasons and about 6 meters in summer. There is freshwater storage in the top aquifer, which is being tapped both by public authorities and private water suppliers. Over the years the quality of water has deteriorated.

**Table 14 – TDS and Chloride Levels in Groundwater (PPM)**

| | 1996-1997 | | 1998-1999 | | 2002-2003 | |
|---|---|---|---|---|---|---|
| | TDS | Chloride | TDS | Chloride | TDS | Chloride |
| Tiruvanmiyur | 501 | 88 | 673 | 115 | 1439 | 589 |
| Palavakkam | 1047 | 209 | 1292 | 252 | 1301 | 302 |
| Neelangarai | 547 | 103 | 586 | 88 | 828 | 180 |
| Injambakkam | 668 | 139 | 558 | 100 | 989 | 231 |

*Source: CPR Centre Study*

The Coastal Zone Regulations have not been able to prevent developments close to the coast. Ribbon developments along the ECR are posing serious problems for traffic as well as for solid waste management. There are a number of industries in the coastal belt covering the new Mamallapuram Road as well as the Old Mamallapuram Road through which runs the Buckingham Canal. On the west of the canal there are a number of industries, which can be categorized as hazardous industries such as chemical industries. Although these industries are not in the case study area the environmental impacts of these industries both due to pollution of air and water have to be taken note of. Here water is not only a need for human consumption but also a need for tourism industries and plant nurseries and fuel plantations, which are finding a favourable location here and all along the coast. The land use structure as estimated for the case study Area-2 is presented below. About 60% of the area is either low-grade floodable land along the canal or low-grade agricultural land abutting the coastline.

**Case Study Area - 2 – Land use structure**

| Use | % of Total Area |
|---|---|
| Residential | 29 |
| Industrial | Negligible |
| Commercial | 2 |
| Institutional | 8 |
| Non-urban | 3 |
| Vacant | 40 |
| Nurseries and Casuarina Plantation and farms | 18 |

*Source: Compiled from CMA Landuse Map*

The changes taking place, while producing environmental problems by degrading water and creating problems in solid waste accumulation have also had a beneficial effect in that nearly 20% of the barren sandy land of a few years ago has been converted into planted green areas with economic potential. In this respect this area differs from Case Study Area-1 in terms of land use and social structure but has similar problems in relation to water and sanitation services.

#### *2.3.5. Land Ownership*

This area consists of a higher share of publicly owned land; with a strip of land varying from 50 – 100 m abutting the coast being beach land under government ownership. Similarly land on which the Buckingham canal runs as also land adjoining it is publicly owned. Most land between the beach mentioned earlier and the East Coast Road is under private ownership and developed as residential areas and farmhouses. Property under private ownership abutting the landside of East Coast road varies in width and there are small-dispersed extents of mud flats under government ownership. The fishing community lives close to the beach on *natham* or village land, which is considered as common land.

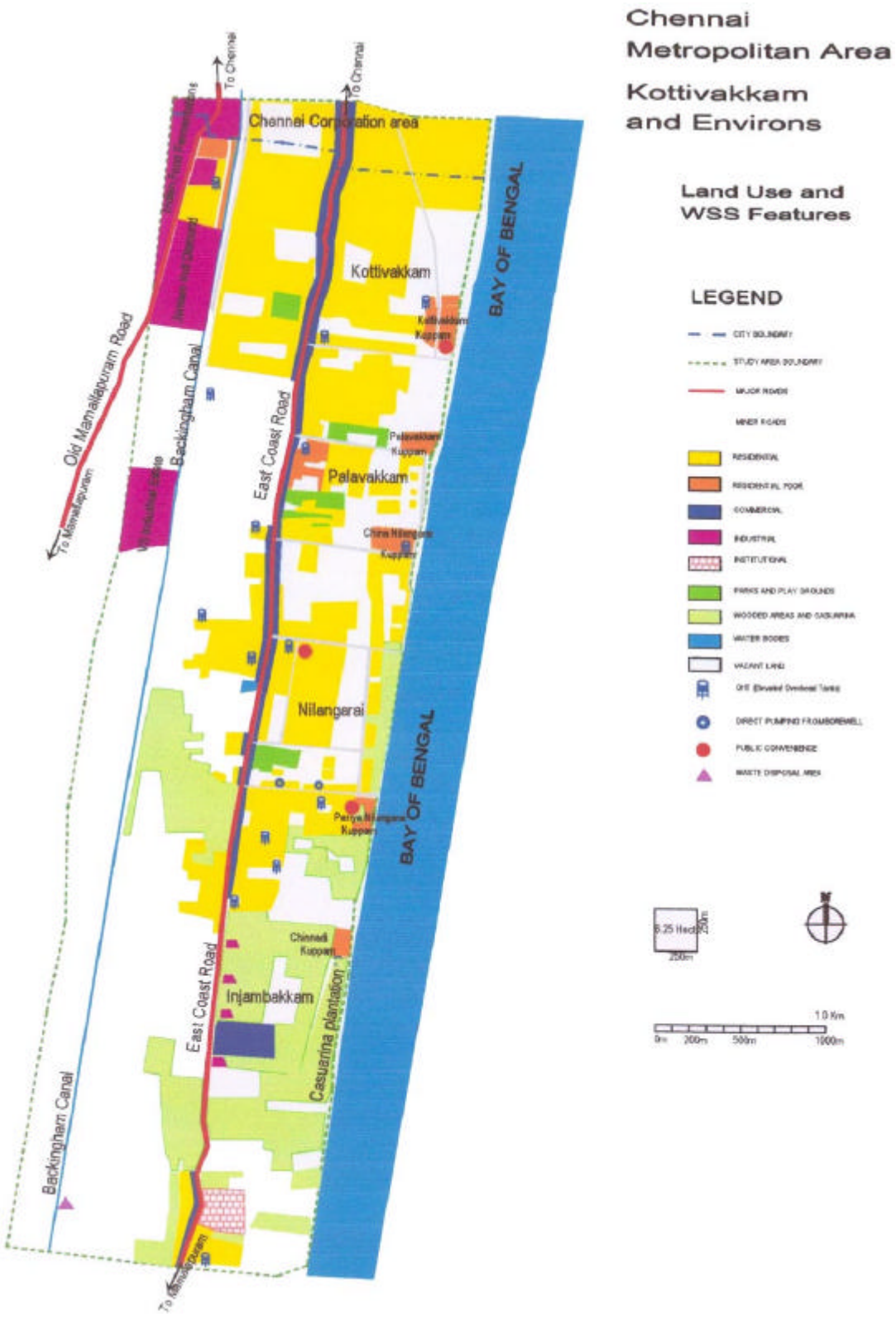
#### *2.3.6. Financial Status*

The localities within the case study area are all Village Panchayats hence their financial status is very poor. They have to depend upon general grants from the state government for development works. These grants being minimal local bodies are not able to invest in the improvement of infrastructure including water supply and sanitation without outside help.

## 2.4. Water related health hazards

The chief water related diseases prevalent in peri-urban areas in general are Diarrhoea, Cholera, Typhoid, Jaundice and Malaria. At present data is available only at the district level and no clear correlation can be established between the water supply situation and water related diseases. Diarrhoea and Malaria are the principal diseases followed by Typhoid and Jaundice.

## MAP 6 - KOTTIVAKKAM AND ENVIRONS – LAND USE 2001 AND WSS FEATURES



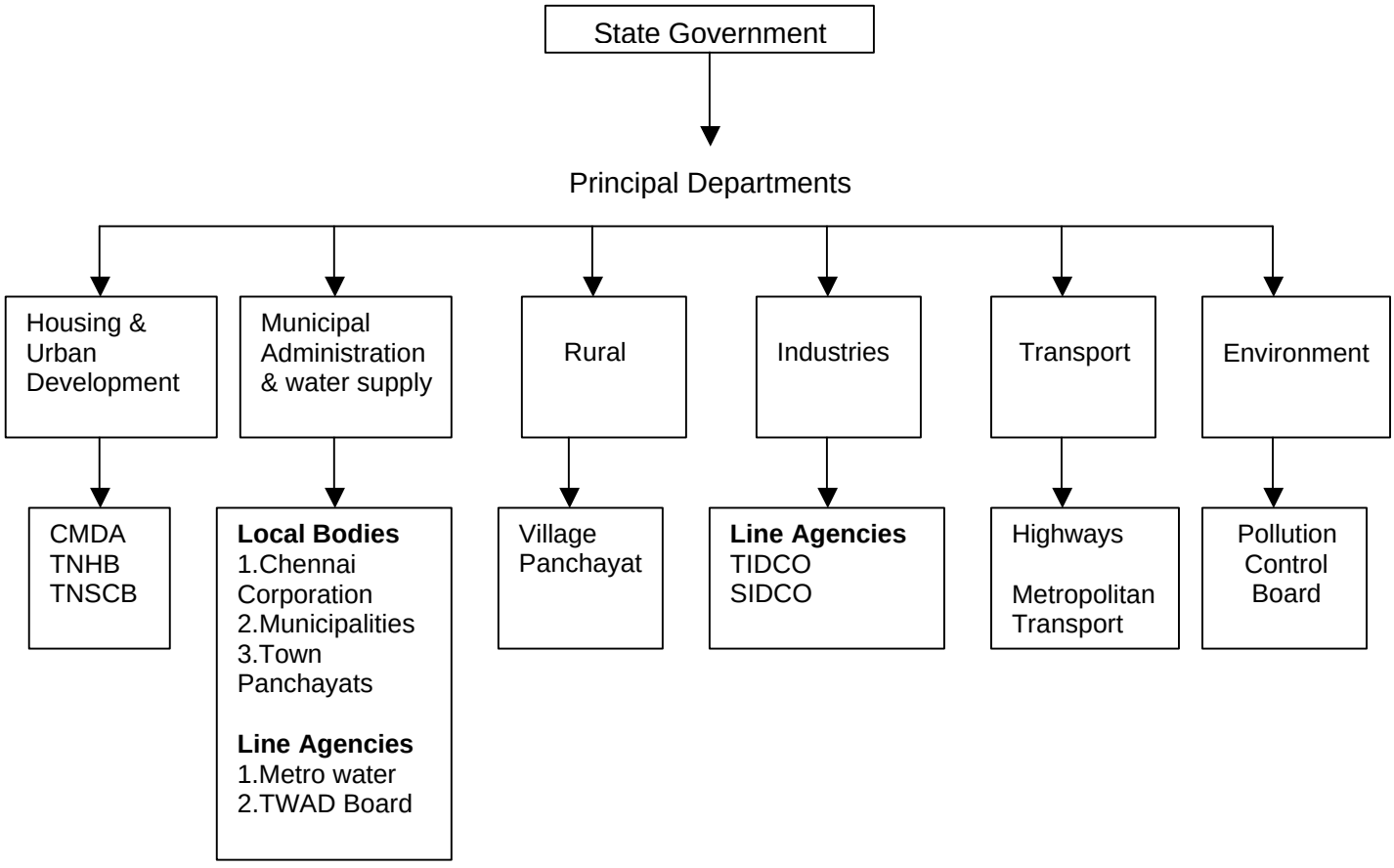
## 2.5. Legal and Institutional Framework

### *2.5.1. Institutional Framework*

Chennai being the capital of Tamil Nadu state and also a growing metropolis, the state itself carries out large investments in housing, industrial promotion, highways and other infrastructure. Considering the problems of Chennai, the state government in the last few years has setup several parastatal agencies for implementation of development projects.

In order to plan the metropolis, the CMDA was setup under the Town Planning Act. Prior to this the government had setup agencies such as Tamil Nadu Housing Board for developing housing neighbourhoods, Tamil Nadu Clearance Board for improvement, clearance and rehabilitation of slums and Tamil Nadu Industrial Development Corporation and Small Industries Development Corporation for development of industries.

Metrowater was setup on the advise of the World Bank to plan for water supply and sanitation in the metropolitan area. Except CMDA and Metrowater which have only metropolitan jurisdiction the other agencies have a state-wide jurisdiction but have substantial programmes for development in the metropolitan areas. The chart given below summarise the broad governance institutions in the metropolitan area.



The governmental and institutional support or lack of it varies within the study aresa depending upon the hierarchy and financial capacity of local bodies. The vicinity of the local body to the City has been a consideration for priority action. Thus in Chennai the AUAs are preferred for development of WSS against Distant Urban Areas (DUA).

From this point of view, the two main constituent areas of study area 1 viz. Valasaravakkam and Porur are included for financing WSS. At the same time the three other settlements, which are still Village Panchayats get a lower priority. This creates problems in different ways to the two categories of towns where the residents of favoured towns have to pay heavily for services while the residents next door in the adjoining village have no possibility of a better supply. For example in some of the schemes under implementation in AUA towns the water charge was estimated to be INR 7 per KL but it is doubtful whether the quantity of water proposed to be supplied will ever be met.

With the start of the World Bank financed projects in the state, direct assistance - state or central - has been completely eliminated and today funds are routed for schemes through the Tamil Nadu Urban Development Fund either directly to local government or indirectly through the parastatal organizations.

#### *2.5.2. Profiles of Institutions*

**Chennai Metropolitan Development Authority (CMDA)** was established as a statutory planning authority for holistic planning and development of CMA under the Tamil Nadu Town & Country Planning Act 1971. CMDA is responsible for formulating the Master Plan for the entire area including the case study areas. Development control and issuing the planning permission within the metropolitan area is directly under the control of CMDA.

**Tamil Nadu Housing Board** is a statutory authority for development of housing activities all over the state. It acquires lands on the outskirts of cities to develop residential neighbourhoods. It also acquires smaller areas within the city to build apartments. These developments are carried out generally on a no loss, no profit basis.

**Tamil Nadu Slum Clearance Board** is a statutory authority specially setup for improvement, clearance and rehabilitation of slums all over the state. The tenements constructed under rehabilitation schemes are highly subsidised by the government.

**Tamil Nadu Water Supply & Drainage Board (TWAD)** was set up in 1971 as a statutory authority for planning and execution of water supply and drainage schemes all over the state. In its operation, it acts as the executing agency for the local bodies who have to pay for the capital works. The maintenance of the system, once installed is the responsibility of the local body, but in several instances, TWAD is also acting as the maintenance and operating agency.

Even after the setting up of Metrowater, with its metropolitan jurisdiction, TWAD continues to be the executing agency for water supply and drainage projects in some parts of the urban and rural areas of CMA outside the City. It has executed water supply schemes o the municipal towns of Tambaram, Alandur, Pallavapuram and several other small towns besides a partial sewerage system for Tiruvottiyur.

**Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB)** known popularly as **Metrowater** is a statutory body under the Government of Tamil Nadu set up under the Chennai Metropolitan Water Supply and Sewerage Act 1978. Its jurisdiction extends over the entire Metropolitan Area as defined under the Town and Country Planning Act (1971) which includes the City, the urban areas outside the City comprised in the Chennai Urban Agglomeration and the villages forming part of the Chennai Metropolitan Area. Thus it is responsible for provision of water supply and sewerage facilities to all the peri-urban localities within the Chennai Metropolitan Area. But presently its jurisdiction has been extended only to the City of Chennai administered by the Municipal Corporation of Chennai (172 sq.km. – 4.2 m Population) and a few outlying urban and peri-urban localities designated as Adjacent Urban Areas (AUA) extending to approximately 235 sq. km with a population reaching about 2 million.

The following localities identified within the case study areas are included in the Adjacent Urban Areas (AUA) where Metrowater will in future extend its services both in water supply and sewerage.

| | | |
|---|---|---|
| Valasaravakkam & Environs | : | Valasaravakkam Town Panchayat<br>Porur Town Panchayat<br>Ramapuram Census Town |
| Kottivakkam & Environs | : | Kottivakkam Census Town |

The objective of setting up Metrowater was to provide “for exclusively attending to the growing needs of and for planned development and appropriate regulations of water supply and sewerage services in the Chennai Metropolitan Area with particular reference to the protection of public health and for matters connected therewith”.

The Authority has a Board consisting of directors both official and non-official with the State Minister in Charge of the department dealing with the subject ‘water supply’. The official directors consist of a Managing Director, a Finance Director, an Engineering Director and a Technical Director.

Apart from having power to acquire, hold and dispose of property, enter into contracts and agreements, preparing annual accounts & budgets and conducting research & experiments the Board has the following functions in or for the Chennai Metropolitan Area:

- To take over all existing responsibilities, power, control, facilities, services and administration relating to water supply and sewerage
- To enlarge, improve or develop existing facilities and to construct and operate new facilities for water supply and sewerage
- To prepare schemes for water supply and sewerage (including abstraction of water from any natural source and the disposal of waste and polluted water)
- To regulate the construction, maintenance and repair of wells, tanks and ponds and the drilling of tube-wells, whether public or private

- To control extraction, conservation and use of underground water
- To prevent pollution of any water including any water source, water course or channel utilized for the purpose of the Chennai Metropolitan area
- To prescribe the manner of treatment of trade effluents before discharging thereof and to regulate the discharge thereof into any sewer canal, river or other water channel utilized for the purpose of the Chennai Metropolitan Area.
- To determine, levy and collect taxes, rates, fees, charges, surcharges, rent and costs and expenses authorized under this Act
- To collect infrastructure development charges from the applicant builder or developer of such multistoreyed building or special building as may be prescribed for the provision of adequate water supply or sewerage
- To borrow money, issue debentures and manage its funds, including the power to mortgage, hypothecate, or pledge any of its assets
- To incur expenditure and to grant loans and advances as it may deem necessary and to recover the principal and interest thereon on such terms and conditions as it may specify

It has implemented two World Bank projects and in continuation of the Second Chennai Project which is in the final stage of implementation a Third Chennai Project at an estimated cost of INR 6,000 million is being posed to the World Bank. Under this project it is proposed to augment supply from all local surface and groundwater sources and extend water supply to the Adjacent Urban Areas of the City. Three other initiatives relate to extending sewer connections to households in Chennai who are below poverty line at a subsidized cost and making Rainwater Harvesting a genuine and participatory peoples movement, strictly enforcing Groundwater Regulation Act to regulate groundwater extraction. It is presently implementing the improvements to water and sewerage systems in the CMA to bring 15 TMC of water from the river Krishna. It is also bringing in significant reforms in the water sector to achieve a better level of services for the Metropolitan population.

**Tamil Nadu Urban Development Fund (TNUDF)** was established in 1996 as a trust for development of urban infrastructure in the state. This was a sequel to the successful track record of MUDF set up as a part of the TNUDP financed by the International Development Agency (IDA). It is the first public-private partnership providing long term debt for civic infrastructure on a non-guarantee mode.

The objectives of TNUDF are:

- Fund Urban Infrastructure Projects, which improve the living standards of the urban population
- Facilitate private sector participation in infrastructure through joint venture and public-private partnership.
- Improve the financial management of urban local bodies enabling them access debt finance from markets.

The Fund has so far approved (2001-2002) 179 projects at a total cost of INR 6750 million. The projects appraised by TNUDF primarily include core civic amenities including water supply, sewerage and sanitation, solid waste management and revenue generating projects totaling 30% of its outgoes of INR 2850 million. It has funded the first Municipal BOT waste water project in India with Vatech-Wabag. It is also financing schemes in Valasaravakkam and Porur which are in the case study area.

**Local Bodies in CMA** includes all tiers from Municipal Corporation to Village Panchayats some of which have been classified as Census Towns. All the tiers of the local body system of Tamil Nadu are present in CMA. They are City Corporation, Municipal Towns, Town Panchayats and Village Panchayats. Besides, there is St. Thomas Mount-Pallavaram Cantonment under the Central Government Cantonment Board Act.

A uniform act for the Governance of the urban local bodies – City Corporation, Municipalities and Town Panchayats, called the **Tamil Nadu Urban Local Bodies Act 1998** was enacted to consolidate the laws relating to Municipalities and Municipal Corporations. The object of bringing this Act was to remove redundant provisions from the age-old acts and to be in consonance with the Constitution (74$^{th}$ Amendment) Act 1992, which paves the way for greater participation of people and for more effective implementation of urban development programmes. The Act classifies urban local bodies into three categories as indicated below:

- Municipal Corporation – Not less than 500,000 population and annual income not less than INR 300 million

- Municipality – Not less than 30,000 population and annual income not less than 5 million

- Town Panchayats – Not less than 20,000 population and annual income not less than 3 million.

Every one of these authorities will consist of a council of elected councilors and an elected chairperson and a commissioner appointed by Government. It will have a standing committee and ward committees.

This Act, which is presently kept in abeyance, is likely to be applied to all local bodies sooner than later. Government is also having a proposal to do away with the classification of Town Panchayats and merge them with Municipalities or revert them as Village Panchayats depending upon their urban/rural characteristics. At present the different tiers of local bodies continue to be administered under the separate enactments applicable for the City Corporation, Municipalities and Town Panchayats.

Apart from above there are constituted for all villages, village panchayats which are the lowest level of governance. The elections to there are on non party lines and the President of the local body is elected directly. Some of these that have urban characteristics are classified by Census of India as Census Towns (CT).

#### *2.5.3. Institutions in Case Study Areas*

The parastatal agencies that have some activity in the area are CMDA, Metro Water and TWAD Board. As mentioned earlier CMDA's role is mainly to regulate the development. Till recently Metro water did not have direct responsibility for provision of water supply and drainage out side the core city and so these areas were outside metro water jurisdiction. However lately some part of the case study areas namely Valasaravakkam, Porur and Ramapuram in case study area 1 and Kottivakkam panchayat alone in case study area 2 have been included as Adjacent urban areas for service by Metro water. Where metro water has not extended its jurisdiction the planning and implementation of water supply schemes rests with TWAD Board.

# 3. CHARACTERISTICS AND TRENDS OF WATER SUPPLY AND SANITATION SYSTEM

## 3.1. Water Resources and Environmental Conditions

Chennai has the distinction of having the first protected water supply system in Tamil Nadu, which was instituted in 1782, when Government purchased from a private party 10 wells to supply water to the Residents within the Fort of the British East India Company. However the first elements of the present water supply system were developed in 1872. This system consisted of surface water collection from Kortalayar and the catchment of Cholavaram and Red hills to the north west of Chennai. The water was conveyed to the City through a masonry conduit. A slow sand filter was added in 1914-1918 at Kilpauk the water receiving station.

Additional resources of water was obtained in 1944 by the construction of a reservoir at Poondi farther west of Red hills and a supply channel was built to convey the water. The characteristics of these reservoirs are indicated in table.

**Table 15 – Characteristics of Reservoirs**

| | **Reservoirs** | | |
|---|---|---|---|
| | **Cholavaram** | **Red hills** | **Poondi** |
| Maximum water elevation (m) | 14.69 | 19.66 | 42.07 |
| Draw off elevation (m) | 8.89 | 14.24 | 33.56 |
| Maximum usable volume (million Cu M) | 22.50 | 71.00 | 76.70 |
| Full Surface Area (million sq.m.) | 7.00 | 20.60 | 34.30 |
| Catchment Area (sq.km.) | 487.00 | 76.00 | 2950.00 |

The total catchment area was 3513 sq.km with an average annual rainfall of 1280 mm. The temperatures range from +40$^{o}$C in summer to 21$^{o}$ (Mean). The total usable volume was 170 cum. As the supply of this water did not meet the requirements, augmentation through ground water resources was considered and an extensive hydro geological study was taken up in the North and North west of the City as part of an UNDP aided project in 1963.

The studies identified a buried channel in the basin, which was the course of Palar River in ancient times. In this river course a water bearing aquifer to a length of 50 km was identified for extraction of groundwater. **Table 16** summarises the number of wells and safe yield from these wells, which were sunk between 1965 and 1987.

**Table 16 – Number of Wells and Safe Yield**

| Well field | No. of Wells | Safe Yield (mld) |
|---|---|---|
| Minjur | 12 | 25 |
| Tamaraipakkam | 22 | 32 |
| Panjetty | 12 | 36 |
| Flood plains | 6 | 13 |
| Kannigaiper | 9 | 15 |
| Poondi | 15 | 27 |
| **Total** | **76** | **148** |

In 1983 a shallow aquifer in the Southern Coastal belt was identified with a total potential of about 10.0 mld. This aquifer is defined by the Shallow Stretch between Tiruvanmiyur and Muttukadu, a distance of 18 km (passing through the Kottivakkam case study area). This aquifer is being exploited through a series of shallow and tube wells. The total groundwater yield from the sources at present at 178 mld do not permit any further expansion because of the indication of sea water intrusion. Other smaller sources were exploited to provide 32 mld from the Palar subsurface flows and local wells in the outskirts of the City. The total availability from these sources is about 400 mld in years of normal rainfall.

Because of the expansion of settlements near to Red Hills and Cholavaram from which the City water supply is drawn there is a fear of greater pollution. Unfortunately there are no effective mechanisms to either monitor or prevent such pollution. As regards groundwater the threats to the source are through over extraction which induces saline intrusion and pollution by agricultural practices in the north and settlement expansion elsewhere. However these are being monitored and steps are being taken not only to restrict extraction but also recharge the aquifers through construction of check dams and other structures in the aquifer basin.

The actual, maximum and minimum supply by Metrowater for some significant years are indicated in **Table 17**. As of 1996 the safe yield from all local sources was estimated at 433 mld as exhibited in **Table 18.**

**Table 17 – Maximum and Minimum Supply (1985-2000)**

***(in million litres per day)***

| Year | Average | Maximum Supply – Month | Minimum Supply – Month |
|---|---|---|---|
| 1985 | 239 | 250 – February | 230 – June-July |
| 1987 | 141 | 225 – January | 102 – September |
| 1990 | 151 | 228 – December | 132 – January |
| 1993 | 105 | 146 – December | 81 – November |
| 1995 | 300 | 335 – September | 274 – February |
| 1997 | 348 | 434 – January | 250 – October |
| 1999 | 408 | 457 – June | 232 – December |
| 2000 | 204 | 218 – October-Decem | 184 – August |

*Source: Managing Water in Chennai, Centre for Science and Environment*

The main water source for the metropolis leaving out the interstate river is the Poondi-Red Hills system dependent on monsoon rains. The catchment area is approximately 2500 sq.km. with an annual rainfall of 1280 mm. The temperatures range from 36.5$^{o}$C to 20.8$^{o}$C (mean). The maximum temperature in summer can go upto 41$^{o}$C.

Projects for import of water from Krishna are underway for over a decade but so far there has not been significant relief from water scarcity for Chennai. The first phase of the project commissioned in 1996 was expected to bring 400 million litres per day from this source to Poondi. Chennai started receiving these waters from 1996. Due to seepages in the open channels it was estimated that 5-tmc releases would only bring in about 1.5 tmc in the Chennai reservoirs. Necessary correction works are in progress.

Chennai City area is fully covered by water supply and underground drainage systems but 30% of the populations including the slum population do not have full access to piped supply and little access to underground drainage. As mentioned earlier piped supply for the whole of City has dwindled to 275 mld on alternate days and the per capita supply from public sources in the peri-urban areas is abysmally low. The total availability of water here is less than 15 mld.

The water availability and allocation to different parts of CMA can be seen in **Table 18,** which was computed in the mid-90's assuming full drawal from the Krishna and Veeranam sources.

**Table 18 – CUA – Water Resources and Allocation**

***1. Water Availability***

| | Local Sources (mld) | All Sources (mld) |
|---|---|---|
| Poondi – Red hills | 227 | 227 |
| Well fields and Aquifer | 178 | 178 |
| Krishna I | - | 400 |
| Veeranam | - | 180 |
| Krishna II | - | 530 |
| Local Sources | 32 | 32 |
| Total | **437** | **1547** |

***2. Water Allocation***

| | **Mld** |
|---|---|
| Chennai City | 848 |
| Adjacent Urban Area | 304 |
| Distant Urban Areas | 95 |
| Special Industries | 300 |
| Total | **1547** |

*Source : Metrowater*

***3. Standards of Water Use***

The Master Plan for Water and Sewerage made in 1978 had projected water requirements in Chennai for 2002 at 1,294 mld. This had been arrived at on the basis of the following standards providing for leakages at 12%.

**Table 19 - Unit Water Requirements and Estimated Water Quantities**

| **Consumer Class** | **Standard** | **Water Requirement (mld)** |
|---|---|---|
| Prime Residential | 145 lpcd | 731 |
| Mixed Residential | 114 lpcd | 123 |
| Slum Population | 60 lpcd | 72 |
| Commercial | 114 lpcd | 32 |
| Industrial | 20000 lphd | 127 |
| Special Industrial | 70000 lphd | 90 |
| Institutional | 20000 lphd | 119 |
| **Total** | | **1294** |

*Source: Master Plan for Water and Sewerage, Part D Engineering Report 1978*

## 3.2. Characterisation and Trends of Water Supply and Sanitation

Supply from public sources viz., Metrowater and local bodies is regulated in the sense that they are meant to be used for drinking purposes only. The hours of supply are also regulated by the public body. The requirements for washing, flushing toilets are to be met from local underground facilities such as wells and tube wells within the users property or secured from private providers.

Overall consumption pattern varies depending upon the economic status of the households.

As a part of a doctoral thesis completed in 2003 at Indian Institute of Technology, Chennai (Assessing and Forecasting Sustainability of Human Settlements – An Integrated Model of an Urban Residential Community's Water Usage and Sanitation Practices, Mr. Monto Mani) community water usage and sanitation practices in Velachery a suburb of Chennai (still with some peri-urban features) covering about 3100 families from high, middle, low and poor income groups it was found that drinking water consumption vary from 9 to 16 litres per capita per day and other water consumption for hygiene varied from 32 to 225 lcd. The following table shows the water usage for typical economic groups. Surprisingly this survey showed that drinking water consumption was higher in the low and poor income groups than in high and middle

income groups. The use of water for hygiene purposes was naturally higher as the income increased and was about 32 to 45 lcd for low income groups.

**Table 20 – Water Consumption Pattern – Velachery Community**

| Economic Groups | No. of Families | Drinking Water | Water for Hygiene | Total |
|---|---|---|---|---|
| High Income Group | 120 | 9.2 | 225 | 234.20 |
| Middle Income Group | 71 | 8.10 | 175 | 183.10 |
| Low Income Group | 380 | 14 | 120 | 134.00 |
| Poor Income-I | 200 | 14.91 | 45.08 | 59.99 |
| Poor Income-II | 1250 | 14.60 | 32 | 46.60 |

*Note: The source for drinking water was mainly Metrowater mains and a Reverse Osmosis plant maintained by Metrowater. For other purposes it was predominantly shallow or deep tubewells although Metrowater was used in some communities.*

Valasaravakkam, Porur and Kottivakkam being part of AUA, water supply schemes based on the import of water from Krishna and Veeranam will be implemented. A few of the towns like Alandur and St. Thomas Mount get their water from Palar river and Ambattur and Avadi get from the Red hills lake. The other towns depend upon local groundwater resources through local borewells, shallow wells and hand pumps. Some of the hardest hit areas particularly the slum population has to depend upon occasional supply of water through tankers.

**Table 21 – Water Supply Service Levels in the Adjacent Urban Areas (AUA)**

| Local Body | Present Rate of Supply in LPCD | Present Water Supply in MLD | Remarks |
|---|---|---|---|
| Municipalities | **Maximum 33** – Alandur<br>**Minimum 5** – Avadi | 11.69 | |
| Town Panchayats | **Maximum 17 – Porur**, Manali, Chinnasekkadu<br>**Minimum 4** – Ullagaram | 1.46 | Porur belongs to Case study area 1 |
| Census Towns | **Maximum 20 – Ramapuram**<br>**Minimum 5 – Kottivakkam** | 0.63 | Ramapuram belongs to case study area 1 and Kottivakkam in case study area 2 |
| Cantonment Board | **27** | 1.07 | |

Presently a water supply scheme at a cost of INR 60 million for construction of overhead tanks and distribution on network are under implementation in Valasaravakkam. There are projects in Porur and Ramapuram also being implemented at a cost of INR 40 million and INR 13 million respectively.

Metrowater has an extensive network of sewers, pumping stations and treatment plants. At present there are four treatment plants capable of treating 267 mld, which is being improved and expanded to handle 532 mld.

Due to inadequacies of sewerage system and treatment plants the non-perennial streams in Chennai viz., Cooum, Adyar, Buckingham Canal and other minor drainage courses carry severely polluted water and have become virtually open sewers.

These drainage courses are owned by PWD or Chennai Corporation and the responsibility for cleaning up these water and drainage courses has been entrusted to several agencies including Metrowater under the National River Conservation Project funded jointly by Government of India and Government of Tamil Nadu as detailed below:

**Table 22 – Chennai River Conservation Project**

| Component | Implementing Agency | Cost INR in million |
|---|---|---|
| Macro Drainage | PWD | 2,369 |
| Micro Drainage | Corporation of Chennai | 1,093 |
| Intercepting Sewage | Metro Board | 7,201* |
| Relocation of Slums | Slum Clearance Board | 6,135 |
| Project monitoring | CMDA | 202 |
| **Total** | | **17,000** |

***GOI Grant INR 4,916 million; Metro Resources INR 2,285 million**

The effluent waters of unsewered areas mostly in the outside urban areas and peri-urban settlements are mostly let into the ground either having passed through individual or institutional plants – mostly traditional septic tanks or via the road side storm drains. There is no monitoring of the quality of effluent and consequently the ground water is liable to contamination.

The larger industrial units who are mostly located outside the city have their own effluent treatment plants and their treated effluents also ultimately end up below the ground directly or through drainage channels. TNPCB is responsible to monitor the quality of these treated effluents.

The salient points of the mapping are summarized in the Matrix.

## 3.3 Techno Infrastructural Development

#### *3.3.1. Water Infrastructure*

The water from Red hills is transmitted through closed conduits to the Kilpauk treatment plant and pump house from where the City distribution begins. The distribution system is more than 100 years old and 40% have served their life span of 50 years. The METROWATER has drawn a plan for radical improvements to the distribution system. To cater to the requirements of slums and tail end areas METROWATER operates a mobile transport system. Proposals for improving water supply systems in Chennai have been an ongoing process and heavy investments are being made both in improving distribution networks.

In the water supply distribution sector additional pipelines have been laid for about 300 km bringing the total length to over 2200 km. There has been an increase in the number of house connections by about 53,000 bringing the total number of connections to nearly 300,000. The total cost of improvements has been of the order of 6600 million between 1996 and 2000. Ongoing works include laying of 226 km of new pipelines, detection and rectification of leakages in over 90,000 connections, construction of overhead and underground tanks in several parts of the city, renewal of 100 km of over aged pipes, establishment of a new treatment plant for treating 530 mld of water at total cost of 3500 million.

Pumping from three open wells provides water supply to Valasaravakkam. About 0.1 mld of water is pumped and distributed through 11 km. pipelines to 356 house service connections and 132 public fountains. Besides 13 open wells and 7 deep bore-wells are also provided. Water supply to Porur is provided by pumping from 4 deep bore-wells. Water is pumped and distributed through 110 public fountains. Besides 9 open wells and 8 deep bore-wells with hand pumps are also provided. The census towns are also dependent on local sources only. Water needs for bathing and other domestic uses as well industries extract water from UG resources individually and there is no data available of total water extracted in this way.

In Kottivakkam water supply is provided by pumping from two wells and 20 bore wells. Water is distributed through three overhead tanks (OHTs) to 2100 house service connections and 100 public taps. Water supply to Palavakkam is provided by pumping from 9 wells and 11 bore wells. Water is pumped and distributed through 1566 house connections and 219 public taps. Water supply to Injambakkam is provided by 6 wells and 3 bore wells and distributed through 2500 house connections and 220 public taps. Water supply is provided only two to three hours either morning or evening in the Kotivakkam areas.

As regards the water supply system in the AUA water will be drawn by tapping water from the Metrowater system from appropriate transmission points and leading them on to a number of sumps. The water from each sump will be pumped to the service reservoirs in various locations. The pumping mains may range from a diameter of 700 mm to 400 mm and branch mains from 450 mm to 125 mm. The pump capacities vary from 275 HP to 465 HP. Available infrastructure consisting of service reservoirs and distribution system will be used with due modification.

#### *3.3.2. Alternative Water Resources*

Several alternative routes are being explored by Metrowater to improve water availability. Among them are:

- **Water conservation by evaporation control** – Analysis of inflow, outflow and residual storage in lakes has indicated that evaporation losses are as high as 43%. Experiments in covering the water spread by artificial films have shown that it is possible to reduce evaporation in a cost effective manner and thus increase availability of water.

- **Reclamation of wastewater** – Two major industries – The Madras Refineries and the Madras Fertilisers have been taking treated sewage water to an extent of 17 mgd for further treatment and use in their processes. This is expected to save at least 10 mgd of groundwater.

- **Storm Run off in Catchment** – A considerable quantity estimated to be of the order of 3000 m cu (nearly 18 times the capacity of the lakes) have overflowed and gone to sea over 20 years. It is assessed that increasing the holding capacity of lakes could add upto 90 mld. But there are constraints in the shape of submergence of land and cost.

- **Urban Storm water** – Direct collection of storm run off from City has not been found to be practical. Harvesting of Rainwater from individual and public properties is therefore being encouraged. It has now been made mandatory throughout the state under the Local Bodies Act.

- **Groundwater Regulation** – The State Government has introduced legislation on extraction of groundwater as well as transporting of such water.

- **Desalination** is another initiative that is being explored more seriously because of the decrease in gap between the cost of resourced water from a distance and cost of desalination through improved technologies.

#### *3.3.3. Sewerage*

The City sewerage system consists of a network of gravity mains, force mains and pumping stations serving different drainage areas of the City. This has been modified to a zonalised system made up of several microsystems covered in five macro systems each with its own treatment plant. Installed in early 1891, the sewerage network of Chennai City at present has a total length of about 2,300 km. Chennai City with a coverage of about 96% of the area. For operational purposes, the Chennai City sewerage network has been divided into five wastewater drainage zones each having its own interception, collection, diversion and treatment systems. This network is being operated through 134 pumping stations, which ultimately convey the collected sewage to the following six treatment plants:

**Table 23 – CMA – Sewage Treatment Plants**

| Location | Capacity (MLD) | Land (ha) |
|---|---|---|
| Kodungaiyur I & II | 160 | 198 |
| Koyambedu | 34 | 42 |
| Nesapakkam | 23 | 8 |
| Perungudi – Primary Treatment | 45 | 28 |
| Villivakkam | 5 | - |
| **Total** | **267** | **276** |

*Note: The capacity of the four sewage plants is being raised to 532 mld at a cost of INR 1170 million.*
*Source: Madras Institute of Development Studies, Madras Database 1996*

The present deficiencies in the system can be summarized as follows:

- Inadequate capacity of sewers and pumping stations even to handle the present sewage generated and consequent overflows into the waterways.

- Incomplete treatment at treatment plants, which again contribute to pollution of waterways.
- Entry of storm water into the system during rains which overloads both the carrying and the pumping systems.
- Entry of cattle waste and chemical effluents, grease, silt etc. which result in clogging of sewers.
- Non-service of slum areas particularly those that are low lying and the newly extended areas.

In order to rectify the above defects several works have been taken up by Metrowater, which include construction of interception, diversion and treatment of sewage at a cost of INR7200 millions under the Chennai City River Conservation Project jointly funded by Government of India Environment Ministry and State Government. The capacity of the four sewage plants will also be raised to 532 mld.

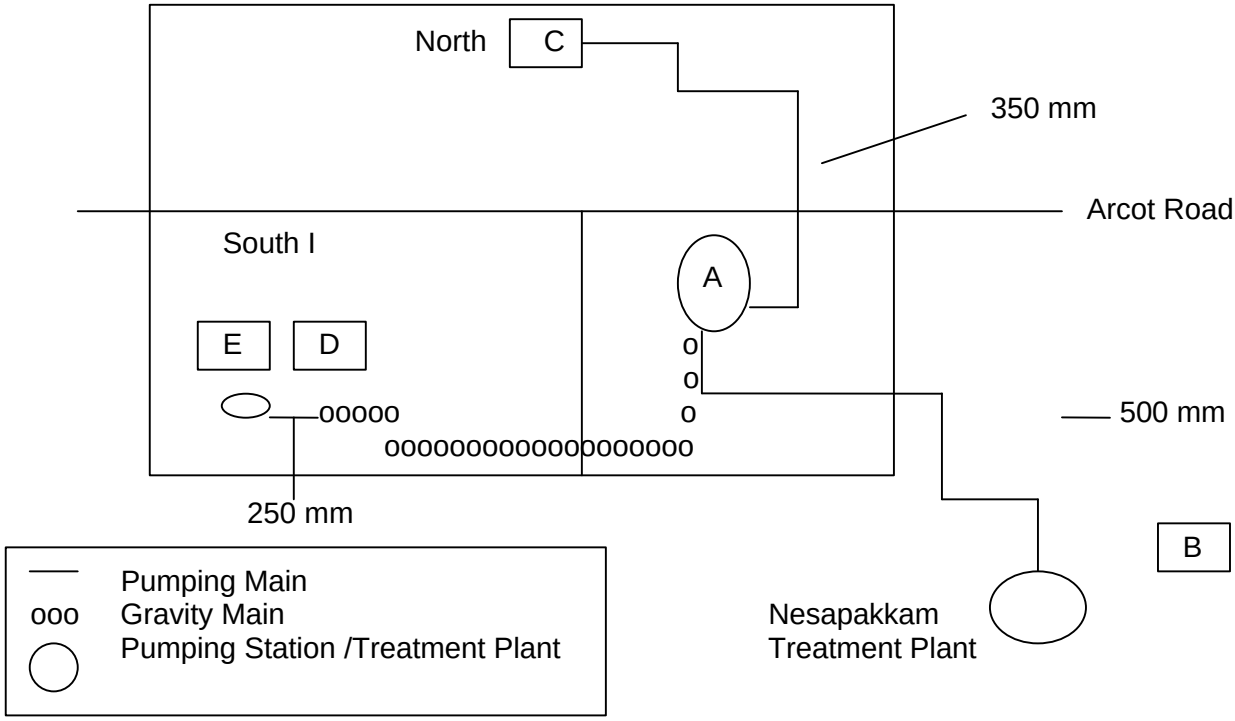
The raw sewage generated in Chennai is highly concentrated and has the following characteristics. This makes treatment more complex.

| | |
|---|---|
| pH | 6.5-7.0 |
| COD | 1000 mg/l |
| BOD | 450 mg/l |
| Suspended solids | 500 mg/l |
| Total Dissolved Solids | 850 mg/l |
| Total Kjeldahl Nitrogen | 30 mg/l |

***Valasaravakkam Underground Drainage Scheme***

In the case of Valasaravakkam Underground Drainage Scheme two sectors have been proposed – North sector and South sector on either side of Arcot Road. South sector has two sub-sectors. The Intercepting sewers will divert the sewage to pumping stations one in the north sector and one in the south sector I and will be brought to the pumping station in south sector II and pumped to the Nesapakkam Treatment Plant, one of the four treatment locations in the Chennai drainage disposal system. A schematic layout of the pumping mains may be seen in the accompanying figure for Valasaravakkam Project.

**Schematic Layout of Underground Drainage System - Valasaravakkam**




### *3.3.4 WSS in the context of Case Study Areas*

**Valasarvakkam**

At present water supply to these areas is generated locally through open and tube wells and they do not have links to the over all metro system of reservoirs. It is the same with collection and disposal of sullage and sewage in most of the area. The under ground sewage system that is proposed for a part of the area in Valasaravakkam is however to be linked to the treatment plant of the Metro water system.

**Kottivakkam**

In this case study area also water supply is fully localized and has no links to the City's Metro system. On the contrary the underground water is exploited by both Metro water and private water suppliers (Tanker supply) as source of supply for some parts within the core city. The disposal of sullage and sewage from the housing and other developments is through on-site septic tanks. There is no under ground drainage system specific to the locality or linked to the City's Metro system. The poor class areas particularly the fishing settlements are not served by any drainage facilities. They also lack toilet facilities and more often the beach side is used for open-air defecation.

## 3.4. Economic and Financial Aspects

Metrowater was created with the specific purpose of accessing funds from funding agencies national as well as international. It has obtained World Bank funding for many of its water supply and drainage improvement projects. It also raises loans from the Housing and Urban Development Corporation (HUDCO) which provides fund for infrastructure.

The financing of construction, operation and maintenance are the responsibility of Metrowater. Metrowater has financed such infrastructure from World Bank, HUDCO and other international and national infrastructure funding agencies. Some of the functions like O&M of pumping stations have been let as contract to private enterprises.

Improvements to the financial system have been taken up through a tariff policy, reduction of cross-subsidisation, privatizing some financial services and improved billing and collection.

Unlike the TWAD Board, Metrowater is fully responsible for all capital investments, maintenance and management of water and sewerage services within its jurisdiction. During the period 1996-2000 capital works have been carried out with heavy investments of INR 9840 million – 6590 million in the water sector and INR 3250 million in the sewerage sector. There are besides the massive investments being made by Government to source the required water from River Krishna in Andhra Pradesh and River Kaveri – an interstate river from the State itself. In spite of these efforts the Metrowater is finding it difficult to meet its commitments.

#### *3.4.1. Policy Environment*

Metrowater evisages private sector participation as a part of its market oriented financing systems – package and also as alternative systems of management towards securing increased efficiency and cost effectiveness.

Besides continuing with the private sector partnership in the management of some of the smaller and isolated engineering functions and operations, the Metrowater Board is opening up accounting and several financial management functions also to the private sector. The experiences of working together with the private sector have benefited Metrowater Board in not only obtaining increased efficiency but also substantial cost-savings.

#### *3.4.2. Tariff for Water Supply*

The Metrowater has two sets of regulations – Water Tax & Sewerage tax and Water Supply & Sewerage Service Charges

***Water Tax and Sewerage Tax***

The rates of taxes prescribed are as follows. The annual levy will be collected in two equal half yearly demands.

Water Tax : **1.5%** of assessed annual value of the property.
Sewerage Tax: **5.5%** of assessed annual value

***Water Supply and Sewerage Service Charges***

The regulations provide tariffs both for metered and unmetered connections. Because of the poor supply and low pressures in the distribution system metering is not very much in practice. The scale of tariff for unmetered consumers is as follows:

**Table 24 – Tariff for Unmetered Consumers**

| Category | Water charges/month (including sewerage charge) | Sewerage Charges/month | Frequency of Billing |
|---|---|---|---|
| A. Domestic | INR 50/- | - | Half-yearly |
| B. Commercial | INR 200/- (Water non-intensive) | - | Half-yearly |
| | INR 400/- (water intensive) | - | Half-yearly |
| C. Partly Commercial | INR 150/- | - | Half-yearly |
| D. Institutional | INR 200/- | - | Half-yearly |
| E. Public supply tube well pumps or mark pumps | INR 40/- | INR 10/- | Half-yearly |
| **Sewerage Service Charges (where there is no water supply connection)** | | | |
| A. Domestic | INR 25/- | - | Half-yearly |
| B. Commercial | INR 75/- | - | Half-yearly |
| C. Partly Commercial | INR 75/- | - | Half-yearly |

*Note: Water intensive means premises used fully or partly as Theatres, Hotels, Boarding Houses, Lodges, Private Hospitals, Private Hostels, Kalyanamandapams, Clinic with impatient facility, Swimming Baths, Places for keeping animals, Vehicle Service Stations, Nurseries.*

Apart from the above the following tariff applies for casual water supply. The following table indicates the tariff for such casual supply. In the context of scarcity of piped water a large number of users avail of this services.

**Table 25 – Tariff for Casual Water Supply**

| | |
|---|---|
| Mobile water supply to Customers | 1. INR 300/- for every load up to 6000 litres |
| | 2. INR 450/- for every load up to 9000 litres |
| | 3. INR 600/- for every load up to 12000 litres |
| Water supply at the Metrowater filling stations | INR 30/- per 1000 litres |
| For the employees of Metrowater | Actual cost price |
| Hire charges for tanks hired out | INR 250/- for two days and<br>INR 50/- for every additional day |
| Mobile water supply for slums | INR 4/- per thousand litres for the entire quantity supplied |

**Table 26 – Tariff for Metered Consumers**

| Category | Quantity of Water | Rate/Kilo Litre | Minimum rate chargeable (including sewerage charges (INR) | Frequency of Billing |
|---|---|---|---|---|
| A. Domestic | Up to 10 Kilo Litre | 2.50 | | |
| | 10 to 15 Kilo Litre | 10.00 | | |
| | 15 to 25 Kilo Litre | 15.00 | | |
| | Above 25 Kilo Litre | 25.00 | 50.00 | Monthly |
| B. Commercial | Where monthly consumption does not exceed 500 K.L. | 25.00 | 200.00 (Non-water Intensive) | Monthly |
| | Where monthly consumption exceeds (for entire quantity) | 40.00 | 400.01 (water intensive) | Monthly |
| C. Partly Commercial | Up to 10 Kilo Litre | 5.00 | 150.00 | Monthly |
| | Up to 10 to 15 Kilo Litre | 15.00 | | |
| | Above 15 Kilo Litre | 25.00 | | |
| D. Institutional | Entire Consumption | 20.00 | 200.00 | Monthly |
| E. Municipal Bulk Supply | Entire Consumption | 15.00 | - | Monthly |
| | Entire Consumption | 5.00* | | |
| *Wherever Local Bodies met the cost of infrastructure | | | | |
| Sewerage charges 25% on water supply charges wherever sewer connections are provided | | | | |

In times when the catchments of water reservoirs receive normal rainfall protected water supply system is in operation metro water supplies to the cities water through the piped system. But in the last few years due to failure of monsoon and scarcity of water in the reservoirs it has resorted to supply by the tankers to the various localities particularly the poor localities. This supply is only to the city areas with in the Chennai Municipal Corporation Limits. But in the case study areas the local bodies only provide supply of water through tankers or small capacity plastic tanks filled through tankers.

#### *3.4.3. Own Users*

Industrial establishments, institutions (Educational Institutions, Hospital, Hotels, etc.) and individual households when they construct wells for drawing groundwater use their own finances for construction, operation and maintenance of shallow wells or tube wells.

In the case of Apartment Complexes the ground water extraction and construction of infrastructure is carried out by the **Builder/Promoter** and the cost is passed on to the buyers of apartments.

In most cases particularly small complexes of 4 to 16 apartments the operation and maintenance is taken up by the **Residents Association** of the apartment block.

In some case when the apartment complexes are large the **builder/promoter** or a **service provider** operates and maintains the facility recovering the cost as maintenance charges from apartment residents.

#### *3.4.4. Packaged Water*

Apart from the above providers a recent addition to the water market is the packaged water in cans, bottles and sachets. The doubtful quality of water received through the public systems and non-potability of Ground water in many outlying areas has created a lucrative market for packaged water.

According to the South India Packaged Drinking Water Manufacturers Association the market is for 3.7 billion litres of water/month estimated to net INR 500 million/month. This includes tanker supply by private suppliers mentioned earlier of 1.2 mld valued at INR 8 million/day.

#### *3.4.5. Water Supply Project*

In order to illustrate the scale of investments for water supply in the peri-urban areas the cost abstract for the Ambattur Water Supply Project that was to be completed by TWAD by 1995 is given below. The current costs of investments will be much higher.

| | **INR In Million** |
|---|---|
| **Capital Costs** | |
| 1. Head works | 76.769 |
| 2. Service Reservoirs | 46.775 |
| 3. Distribution System | 72.281 |
| 4. Soil Testing | 0.300 |
| 5. Transmission Main Proportionate Cost | 3.288 |
| **Total** | **199.413** |
| 6. Physical Contingencies 10% Works 5% Mat | 13.387 |
| | **212.800** |
| 7. Price contingency 60% two years | 26.302 |
| 8. Engineering Cost at 22 ½ % | 53.786 |
| | **292.900** |
| 9. Investigation Charges | 0.700 |
| **Total** | **293.600** |
| **Annual Maintenance** | |
| 1. Establishment | 2.356 |
| 2. Electrical Energy | 3.981 |
| 3. Chemicals, Lubricants, Repairs & Renewals | 1.628 |
| | **7.965** |

| | **Mld*** | **Per capita cost** | **Cost/1000** | **Population** |
|---|---|---|---|---|
| Present Stage | 25.85 | 1363 | 4.60 | 215424 |
| Ultimate Stage | 72.12 | 587 | 2.00 | 500000 |

** Rate of Supply 120 lpcd*

*Source: Tamil Nadu Water and Drainage Board (TWAD)*

#### *3.4.6. Drainage Project*

A recent innovation has been to implement drainage schemes through public-local body-beneficiaries participation in Alandur as already mentioned. The Underground system for Valasaravakkam is also proposed under the system. The capital and operating costs for an

underground drainage project is illustrated to provide an overview of investments required in peri-urban areas. The financing pattern proposed generally, is local government 80%, beneficiaries 20%, the local government component can be shared by the private sector to reduce pressure on local government resources.

The abstract of cost for the Valasaravakkam drainage project is illustrated below as an example of a decentralized design of drainage for peri urban areas. As in water supply the current costs to completion will be much higher.

| | **INR in Million** |
|---|---|
| **Capital Costs** | |
| 1. Collection system | 92.0 |
| 2. Pumping main | 9.6 |
| 3. Pumping machinery | 12.5 |
| 4. Pumping Station | 14.5 |
| **Total** | **128.6** |
| 5. Contingencies 5% | 6.6 |
| | **135.2** |
| 6. Supervision 5% | 6.6 |
| | **141.8** |
| 7. Road cut | 2.0 |
| 8. Price contingency | 16.7 |
| **Total** | **160.5** |
| **Operation & Maintenance** | |
| 1. Establishment | 2.00 |
| 2. Power | 0.31 |
| 3. Cleaning Equipment | 0.50 |
| 4. Repairs | 0.55 |
| 5. Proportion cost of Treatment | 2.31 |
| **Total** | **5.67** |

| | **Population** | **Percapita/cap** | **Percapita / O & M** |
|---|---|---|---|
| Present | 21950 | 7312 | 25.87 |
| Interim | 92100 | 1740 | 6.16 |
| Ultimate | 162300 | 985.8 | 3.45 |

*Source: Tamil Nadu Water and Drainage Board (TWAD)*

## 3.5. Policy Institutional Environment

### *3.5.1. Legal Environment*

The existing framework is a complex mosaic of laws, agencies and functions. Their main features are:

- Multiplicity of agencies to implement central and state legislations
- Many of the municipal functions given to parastatal agencies which do not consist of elected representatives
- Pollution control functions are carried out by central and state governments

The legal framework in respect of water resources is summarized in the following table:

**Legal Framework for Urban Environment Sectors**

**Water Resources**

| Sector | Objective(s) | Legislation | Institution(s) |
|---|---|---|---|
| 1. Drinking Water | Supply of potable water | Chennai Metropolitan Water Supply and Sewerage Act, 1978<br><br>Tamil Nadu Water Supply and Drainage Board Act, 1971<br><br>Tamil Nadu District Municipalities Act, 1920 | METROWATER<br><br>Tamil Nadu Water Supply and Drainage Board (TWAD)<br><br>Municipalities/ Town Panchayats |
| 2. Water Bodies and Water Census | Management of Rivers, Tanks, & Resources in CMA | Indian Easement Act, 1882<br><br>TN Irrigation Tanks Improvement Act, 1949<br><br>TN Water Policy, 1994 | Public Works Dept. – Water Resources Organisation |
| 3. Groundwater | Regulation of Extraction in CMA<br><br>Monitoring of Water table | Chennai Metropolitan Ground Water Regulation Act, 1987<br><br>TN Water Policy, 1994 | METROWATER<br><br>PWD – Groundwater Dept./Central Ground Water Board |
| 4. Domestic Wastewater | Collection, treatment, and disposal of Sewage and Sullage | Chennai Metropolitan Water Supply and Sewerage Act, 1978<br><br>Tamil Nadu Water Supply and Drainage Act, 1971<br><br>Tamil Nadu District Municipalities Act, 1920 | METROWATER<br><br>TWAD Board<br><br>Municipalities/ Town Panchayats |
| 5. Industrial Wastewater | Prevention and Control of Pollution<br><br>Collection of Cess | Water (Prevention and Control of Pollution) Act, 1974; Amendments 1988 Environment (Projection) Act, 1986<br><br>Factories Act Amendments 1987<br><br>Water Cess Act, 1977 | Tamil Nadu Pollution Control Board (TNPCB)<br><br>Inspector of Factories<br><br>TNPCB |

| | | | |
|---|---|---|---|
| 6. Storm-water | Collection & Disposal of Storm-water | Chennai City Municipal Act, 1919 | Chennai Corporation |
| 7. Marine Pollution | Prevention and control of sea disposal<br><br>Disposal of oil in Port areas | Water Act, 1974, Env. Protection Act, 1986<br><br>Coastal Regulation Zone Notification, 1991<br><br>Indian Ports Act, 1908 | Tamil Nadu Pollution Control Board<br><br>Conservation of Ports |
| **Planning And Housing** | | | |
| 8.Urban Planning | Ensuring orderly development | Town & Country Planning Act, 1971 | CMDA |
| 9.Housing | Addition to Housing stock | Tamil Nadu Housing Board Act | TNHB |
| 10.Housing for the Urban Poor | Upgrading slums & informal settlements | Tamil Nadu Slum Clearance and Improvement Act | TNSCB |

*Source: Madras Institute of Development Studies – Madras Environmental Profile & Planning and Housing Acts.*

This table shows the responsibilities of parastatal agencies and departments of Government in the matter of dealing with the subjects mentioned under the heading of sectors. Thus in the case of water supply and sanitation in the metropolitan area the institutions and acts applicable are Metro water under the Chennai Metropolitan water supply and sewerage Act,1978 and TWAD Board under the Tamil Nadu Water Supply and Drainage Board Act, 1971.

The government of Tamil Nadu have recently enacted a Groundwater Regulation Act in order to control extraction, use and transport of groundwater. Besides making installation of rain water harvesting mandatory restrictions on the depth of bore-wells have also been brought in. There is yet no private sector participation in water supply for Chennai but an important project in the industrial Town of Tiruppur in the west of Tamil Nadu has been taken up for implementation in the public-private sector which may lead the way for such partnerships in CMA.

#### *3.5.2. Regulatory Environment*

Water and Drainage services either in the Metropolitan area or in the State are through public sector and there is no private sector as such.

A brief note on the Tiruppur scheme mentioned earlier is included because it is one of the first projects in which a State Government has allowed a public limited company to draw water from a river for sale it to domestic and industrial uses. It is also the first index based user charges and direct cost recovery for urban environmental services.

New Tirupur Area Development Corporation (NTADCL), a public limited company was established in 1995 to supply water to the industries of the Tirupur town and other domestic users. This project has many participants: the Tamil Nadu Government, Tirupur Exporters' Association (TEA), Tirupur Municipality, Infrastructure Leasing and Financial Services, Ltd.

(IL&FS), the Tamil Nadu Corporation for Industrial Infrastructure Development, Ltd. (TACID), New Tirupur Area Development Corporation (NTADCL) and Indo-US Financial Institutions Reform and Expansion (FIRE) Project. It aims to supply 185 million litres of water per day (drawn from the Cauvery) to supply water to the dyeing and bleaching units located in the area and the 1.6 million people in the Tirupur municipality and the adjacent panchayats (at 60 lpcd). The project components are:

- A treated piped water supply of 60 mld to Tirupur Municipality and 21 adjoining towns and village panchayats.
- A treated water supply of 100 mld to over 700 dyeing and bleaching industries within the Tirupur Planning area.
- A sewerage system for Tirupur
- On-site sanitation facilities for 88 designated slum areas within Tirupur Municipality

The NTADCL will be responsible for transmission, treatment of water supply, distribution of water outside municipal limits where most of the industry is located, treatment of the collected sewage and maintenance of the sewage treatment plants.

“The NTADCL will contract out the construction and maintenance of the systems to a BOT consortium, which is the Mahindra Consortium. USAID has provided 30 year loan guarantee for $25 million with IL&FS to help finance this project”.

The project’s total estimated cost is INR 12 billion contributed by the Union Government, IL&FS, the TACID, the TEA and the private sector Mahindra -led consortium. Implementation of the project has just commenced and is expected to be fully in operation in six years.

However, greater privatization in utilities such as water is still being debated hotly both at the national as well as at local levels. NGOs are the most vociferous in opposing it. Even in privatization of solid waste collection in the City area where Onyx is the contractor has run into difficulties both from the NGOs and the Municipal Corporation itself.

Tamil Nadu State Pollution Control Board has the mandate to check water pollution. Since water supply and sanitation is still operated by Government/parastatal organizations, monitoring of water quality and quality of effluents into water bodies is yet to be effectively carried out.

#### *3.5.3. Organisational Environment*

The Metrowater is the public company, which is in charge of water supply and sanitation in the City and the adjacent urban areas. In other areas the municipality or the local body is the authority for water supply and sanitation. There are no organized neighbourhood or community organizations for water supply except to the extent of facilitating tanker supply from Metrowater or local authorities to the residents. There are a few such organizations. A substantial segment of the population of the City as well as peri urban settlements depend on their own on-site wells – open as well deep bore-well and usually they are used for non-drinking uses. The institutional mapping of the water cycle is detailed in a subsequent section.

## 3.6. Socio-political Aspects

### *3.6.1. Water Governance*

Water and environmental Governance is the State's responsibility. At present WSS is fully in the public sector and there is no private sector in WSS as such except as indicated in para 3.5.2. Metro water Board which is the main agency in the WSS sector it is headed by Chairman who is political appointee. Bureaucracy consists of civil servants under whom there is a financial director and large body of well-qualified Engineers under a Technical Director who is an Engineer.

The activities in the water sector are heavily technically oriented and only in recent times the socio economic aspects are being considered.

### *3.6.2. Socio-economic Values*

Water is still considered as a free good not only by the people but also by the political segments although the political view when in Government is to acknowledge that water is to be priced. Even when water is priced there is always an imperative to cross subsidise poorer segments. Only with the wide introduction in the market of bottled water or water in sachets for drinking water that water as a saleable item has been recognized.

The decision making process in WSS mainly rests with the State department of Municipal Administration and Water Supply which oversees Metro Board and TWAD activities. While Civil Servants man the state department, the Boards have well-trained and skilled technocrats who work under a civil servant.

Civil Society organizations like EXNORA and Residents association are involving themselves in water supply and sanitation matters but this is more to represent citizens grievances to the water providers. The Metro Board facilitates this process through having regular interface meetings. NGOs are also invited for discussions in several studies being undertaken to institute sectoral reforms in water and sanitation.

In this respect Metroboard is taking a number of initiatives including hosting of a website, setting up of an Inter-active Voice Response Service (IVRS), grievance handling system, review of citizens charter and communication with stakeholders.

## 3.7. Social and Political Conflicts

The conflicts in this sector have only started to arise in the last few years. There have been street processions and demonstrations by citizens and local groups complain against erratic supply, supply of bad quality etc. These are mostly localized. The type of political opposition that was witnessed when a neighbouring state declined to let water for irrigation in the state has not happened in the drinking water sector so far but the extent of scarcity may trigger such widespread protests in future. Often politicians see the work of residents associations and NGOs in civic services as a threat and regular conflicts arise between the citizens and local authority. Also they arise between the local authority and parastatal/government organizations. Report of such conflicts is regularly reported in the media.

# 4. INSTITUTIONAL MAPPING IN THE PHASES OF THE METROPOLITAN WATER CYCLE

The main sources of drinking water for the metropolitan area can be categorized as:

- Surface Water
- Groundwater

Surface waters can be further categorized as water from local sources and water from distant sources from other basins. Similarly Groundwater can be categorized into those drawn from organized well fields and those drawn from wells all over the metropolitan area.

In India provision of drinking water supply has been the responsibility of local bodies. When it was found that local bodies could not effectively resource or distribute water, the Government set up Statutory Boards. In Tamil Nadu two such Boards are operation. The TWAD Board was set up to assist local bodies in the design of water sourcing and distribution systems. The Metro Board was established to provide for the growing needs of Chennai metropolis for water and sewerage and it took over this existing responsibility from the Chennai Corporation. Today although Metrowater has its jurisdiction over the entire metropolitan area of 1147 sq. m, it operates in the City (172 sq. km) and is now responsible to operate in the Adjacent Urban Areas (AUA) – totalling 235 sq. km and covering a population of approximately 2 million (1991).

In spite of the poor performance of the public sector in providing water supply, Chennai has been coping with the problem thanks to extraction from purely local sources by individuals and water suppliers. This source has provided nearly320 mld both for drinking and for other uses.

The institutional mapping of the water cycle is discussed below:

## 4.1. Actors in the Water Cycle

The different actors in the water cycle are:

***Public Bodies***

- Metro Board
- TWAD Board
- Local Bodies

***Private***

- Industrial Establishments
- Institutions
- Apartment Complexes
- Individuals
- Private Water Suppliers (Tankers)
- Private Water Suppliers (Bottled or Canned)

## 4.2. Extraction

***Regulation***

The ownership of the rivers, lakes and tanks in the state are vested in the Government and the Public Works Department acts as its agency. It is charged with the responsibility of maintaining, improving these sources and regulating their use.

The Metrowater regulates the use of ground water by individuals, groups of persons, industrial establishments and institutions within the CMA.

#### *4.2.1. Metrowater*

The Metrowater draws water from the Poondi-Red hills system as well as well fields in the Araniar Kortalayar Basin and the Southern aquifer. The Krishna water when available is also drawn through the Poondi-Red hills system.

The State Government finances infrastructure development of **Distant Sources** and Public Works Department is entrusted with the construction, improvements, operation and maintenance of the infrastructure Financing, construction, improvements, operation and maintenance of the local infrastructure are the responsibility of Metrowater.

#### *4.2.2. Tamil Nadu Water and Drainage Board (TWAD)*

This Board is responsible for designing and implementation of water supply schemes to local bodies and is permitted to extract the water from groundwater resources and subsurface water. The construction, improvements, operation and maintenance of **head works and treatment plant** vest with TWAD. It is to be noted that the financing, maintenance and operation of the system are the responsibility of the beneficiary **Local Body**.

#### *4.2.3. Local Bodies*

There are a large number of local bodies outside the Chennai Corporation – Municipalities – Town Panchayats and Village Panchayats including a Cantonment Board who are extracting water in their own area from ground resources through shallow or tube wells for community supply.

The financing of construction, construction, operation and maintenance are the responsibility of the concerned **Local Body.** The local bodies in the two case study areas and its status are given below.

| **Case Study Area 1** | **Status of Local Body** | **Case Study Area 2** | **Status of Local Body** |
|---|---|---|---|
| Valasaravakkam | Town Panchayat | Kottivakkam | Village Panchayat |
| Porur | Town Panchayat | Pallavakkam | Village Panchayat |
| Ramapuram | First grade Village panchayat | Neelangarai | Village Panchayat |
| Karambakkam | First grade Village panchayat | Injambakkam | Village Panchayat |
| Manappakkam | First grade Village panchayat | | |

*Note: All village panchayats in the case study area are recognized as Census Towns (as per 2001 census)*

#### *4.2.4. Water Suppliers*

These are **mostly small-scale individual Entrepreneurs/Contractors** owning couple of water tankers who have steppe d in recently into the water market to bridge the gap of supply from public agencies. They serve the needs of institutions, apartment complexes as well as individuals. Normally they lease private wells or lands to extract ground water and transport them through water tankers 10 to 12 thousand litres capacity for sale to clients.

The financing of the infrastructure, improvements to wells, operation and maintenance are their responsibility of the **entrepreneur/contractor** as the case may be.

## 4.3. Treatment and Storage

Only the Metrowater has large treatment and storage facilities. The surface waters drawn from the Poondi-Red hills system are treated to drinking water standards at their two plants one at Kilpauk – a long standing one and another new facility at Red hills before supplying through their extensive distribution network. The financing, construction, operation and maintenance of these facilities rest with Metrowater.

In the case of other providers there is no extensive treatment or storage. The decentralized units are constructed, financed and operated by these providers themselves. Some of the recently constructed apartments complexes provide Reverse Osmosis plants to treat the low quality ground water from the sites.

## 4.4. Distribution

The Distribution follows the same pattern of extraction and treatment and storage. Only in the case of facilities constructed by TWAD for the local bodies the distribution system financing, operation and maintenance is that of the **Local Body.**

The public bodies regulate the house services connections and the construction, operation and maintenance of these service connections are the responsibility of **property owners.**

For the last several years, Metrowater distributes drinking water in the poor class areas as well as other deficient areas through tankers. It is estimated that the population served is of the order of 700,000, which goes up and down depending upon the extent of piped water supply.

## 4.6. Disposal

Most of the water that enters the water supply system comes out as polluted effluent to different degrees. It is estimated that the return as sullage and sewage is to the extent of 75% of the water supply.

Both the Metrowater and the TWAD Board are responsible for removal of wastewaters also. While Metrowater is responsible for total construction and maintenance of sewerage systems TWAD follows the same system as for provision of water supply infrastructure to local bodies,

i.e., capital works are executed and maintained by TWAD Board. The local body concerned finances the cost.

The regulation as far as the disposal system is concerned the responsibility of the Tamil Nadu Pollution Control Board (TNPCB) who have set standards for effluent disposal. Different standards are applicable depending upon the receiving source viz., public sewers, on-land irrigation, surface water and Marine coastal. These are applicable to both public as well as private bodies particularly industries.

## CONCLUSION

Chennai is a growing metropolis and its population is expected to cross 10 million in the next two decades. The growth within the City has slowed down but it has increased in its periphery. The metropolitan area is growing fast in the westerly and southern directions both with planned and organic growth. The case study area on the west is seeing rapid population growth but it consists of a number of small extent localities, which are emerging as potential high-density urban accretions in the Chennai Metropolitan Area.

Water supply in Chennai has been a problem area even in the early seventies and the setting up of the Metrowater in 1978 was a step towards solving these problems. Several studies and plans have been prepared and continually updated and several long term as well as short-term projects has been taken up. In spite of these plans and technical skill available in the parastatal organizations effective satisfaction in the provision of water and sanitation services is not being reached. On the other hand residents of Chennai both within the City as well as in the peri-urban areas are facing a serious problems in obtaining potable water in adequate quantities and of good quality. During summer months, piped water system reaches its lowest ebb and supply by tankers becomes the only option.

Importing of water from outside the basin – from the Krishna and Cauvery, the two interstate rivers is becoming more complex and are likely to pose problems in fulfilling the requirements of Chennai. Other options are being explored including setting up of desalination plants. Rainwater harvesting at citizen level is being officially encouraged as a part of water management policy.

The performance of the drainage sector has also gone down in the last 2 decades. In spite of extensions to the sewage system, the pollution of waterways is posing great health hazards to the residents of the City. The extent of pollution of groundwater in the peri-urban areas due to lack of proper night soil and sullage disposal facilities has not been assessed but doubtless they are posing serious threat not only to the water resources but all natural resources of the area – the agricultural lands, tanks, wetlands and the coastal ecosystem and the health of the citizens.

The question upper most in the minds of planners is how to find and sustain a durable solution for the twin problems of water supply and sewage disposal. It is in this respect that this study will be important. It will trigger ideas for improving the mechanisms for planning, implementing, operating and delivering the services equitably and at affordable cost to all sections of people in the metropolis. These mechanisms, must, in the final analysis, sub serve the goal of providing better services and upgrade the quality of life of the poor and improve environmental management of the urban areas.

It is important that the solutions in the Indian context have to be found within the framework of 73 and 74$^{th}$ constitutional amendments which empower local bodies even at the lowest tiers to be responsible for water supply and public health.

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## ANNEX 1

***TAMIL NADU – A PROFILE***

1. **Area** 130,058 sq.km.

2. **Population**

| | Persons | Male | Female |
|---|---|---|---|
| **Total** | 62,110,839 | 31,268,854 | 30,842,185 |
| **Rural** | 34,869,286 | 17,508,985 | 17,360,301 |
| **Urban** | 27,241,553 | 13,759,669 | 13,481,884 |

| | | | | |
|---|---|---|---|---|
| 3. | **No. of Towns** | **1981** | **1991** | **2001** |
| | | 434 | 469 | 832 |
| 4. | **Urban Population % total** | 32.95 | 34.20 | 43.86 |
| 5. | **Decennial Growth** | **Total** | **Urban** | |
| | **1981-1991** | 15.39 | 19.59 | |
| | **1991-2001** | 11.19 | 42.79 | |
| 6. | **Sex Ratio** | **1981** | **1991** | **2001** |
| | Rural | 987 | 983 | 992 |
| | Urban | 956 | 951 | 980 |
| 7. | **Literates** | **Total** | Persons | 73.47 |
| | | | Male | 82.33 |
| | | | Female | 64.55 |
| | | **Urban** | Persons | 82.07 |
| | | | Male | 88.40 |
| | | | Female | 75.64 |

*Source: Compiled from Census of India Data*

# ANNEX 2

## WORKERS CLASSIFICATION

### *Workers Classification 1991 – Chennai and Case Study Area-1*

| UA / City / Town | Industrial category of main workers | | | | | |
|---|---|---|---|---|---|---|
| | Cultivators | | | Agricultural labourers | | |
| | Persons | Male | Female | Persons | Male | Female |
| Madras UA | 9264 | 8381 | 883 | 23259 | 16574 | 6685 |
| Madras MC | 883 | 852 | 31 | 199 | 176 | 23 |
| Porur TP | 111 | 104 | 7 | 30 | 26 | 4 |
| Valasaravakkam TP | 53 | 53 | - | 16 | 15 | 1 |
| Karambakkam CT | 48 | 46 | 2 | 317 | 257 | 60 |
| Ramapuram CT | 45 | 45 | - | 28 | 26 | 2 |
| Manapakkam CT | 39 | 33 | 6 | 302 | 205 | 97 |

| UA / City / Town | Industrial category of main workers | | | | | |
|---|---|---|---|---|---|---|
| | Livestock, Forestry, Fishing, Hunting and Plantations, Orchards & allied activities | | | Mining and Quarrying | | |
| | Persons | Male | Female | Persons | Male | Female |
| Madras UA | 15972 | 15630 | 342 | 1961 | 1793 | 168 |
| Madras MC | 9982 | 9868 | 114 | 1245 | 1175 | 70 |
| Porur TP | 8 | 6 | 2 | 4 | 4 | - |
| Valasaravakkam TP | 16 | 15 | 1 | 15 | 13 | 2 |
| Karambakkam CT | 5 | 4 | 1 | 2 | 1 | 1 |
| Ramapuram CT | 7 | 7 | - | - | - | - |
| Manapakkam CT | 3 | 3 | - | - | - | - |

| UA / City / Town | Industrial category of main workers | | | | | |
|---|---|---|---|---|---|---|
| | Manufacturing, Processing, Servicing & Repairs in household industry | | | Manufacturing, Processing, Servicing & Repairs in other than household industry | | |
| | Persons | Male | Female | Persons | Male | Female |
| Madras UA | 18332 | 11959 | 6373 | 427123 | 386603 | 40520 |
| Madras MC | 7683 | 4646 | 3037 | 275916 | 250971 | 24945 |
| Porur TP | 28 | 14 | 14 | 1920 | 1721 | 199 |
| Valasaravakkam TP | 16 | 12 | 4 | 1620 | 1485 | 135 |
| Karambakkam CT | 43 | 33 | 10 | 991 | 881 | 110 |
| Ramapuram CT | 9 | 8 | 1 | 1148 | 1009 | 139 |
| Manapakkam CT | - | - | - | 387 | 347 | 40 |

## Workers Classification 1991 (Contd.)

| UA / City / Town | Industrial category of main workers | | | | | |
|---|---|---|---|---|---|---|
| | Construction | | | Trade and Commerce | | |
| | Persons | Male | Female | Persons | Male | Female |
| Madras UA | 108317 | 100084 | 8233 | 378950 | 345215 | 33735 |
| Madras MC | 74856 | 69238 | 5618 | 300928 | 274519 | 26409 |
| Porur TP | 435 | 419 | 16 | 1212 | 1105 | 107 |
| Valasaravakkam TP | 491 | 461 | 30 | 1557 | 1371 | 186 |
| Karambakkam CT | 211 | 205 | 6 | 721 | 681 | 40 |
| Ramapuram CT | 428 | 405 | 23 | 442 | 405 | 37 |
| Manapakkam CT | 145 | 133 | 12 | 118 | 105 | 13 |

| UA / City / Town | Industrial category of main workers | | | | | |
|---|---|---|---|---|---|---|
| | Transport, Storage & Communications | | | Other services | | |
| | Persons | Male | Female | Persons | Male | Female |
| Madras UA | 168912 | 159831 | 9081 | 497287 | 382088 | 115199 |
| Madras MC | 125853 | 119226 | 6627 | 374194 | 285033 | 89161 |
| Porur TP | 472 | 461 | 11 | 1743 | 1330 | 413 |
| Valasaravakkam TP | 574 | 510 | 64 | 2418 | 1750 | 668 |
| Karambakkam CT | 274 | 271 | 3 | 657 | 509 | 148 |
| Ramapuram CT | 254 | 248 | 6 | 829 | 716 | 113 |
| Manapakkam CT | 111 | 107 | 4 | 229 | 195 | 34 |

| UA / City / Town | Industrial category of main workers | | | | | |
|---|---|---|---|---|---|---|
| | Marginal workers | | | Non - workers | | |
| | Persons | Male | Female | Persons | Male | Female |
| Madras UA | 4741 | 2303 | 2438 | 3767867 | 1375105 | 2392762 |
| Madras MC | 1323 | 822 | 501 | 2668334 | 969752 | 1698582 |
| Porur TP | 1 | 1 | - | 13543 | 4783 | 8760 |
| Valasaravakkam TP | 5 | 5 | - | 15172 | 5612 | 9560 |
| Karambakkam CT | - | - | - | 7198 | 2631 | 4567 |
| Ramapuram CT | 1 | 1 | - | 7519 | 2694 | 4825 |
| Manapakkam CT | - | - | - | 2856 | 1094 | 1762 |

## Workers Classification 2001

| LOCALITY | Workers – 2001 (%) | | | | | Non-Workers | Population |
|---|---|---|---|---|---|---|---|
| | Total Workers Main + Marginal | Cultivator | Agri Labour | Household | Total | | |
| CHENNAI UA | TOTAL | 0.26 | 0.33 | 1.66 | 2.25 | 4,242,814 | 6,424,624 |
| | MALE | 0.19 | 0.27 | 1.18 | 1.64 | 1,488,995 | 3,294,328 |
| | FEMALE | 0.61 | 0.63 | 3.95 | 5.19 | 2,753,819 | 3,130,296 |
| CHENNAI MC | TOTAL | 0.06 | 0.05 | 1.53 | 1.64 | 2,774,886 | 4,216,268 |
| | MALE | 0.04 | 0.03 | 1.08 | 1.15 | 968,681 | 2,161,605 |
| | FEMALE | 0.15 | 0.12 | 3.7 | 3.97 | 1,806,205 | 2,054,663 |
| VALASARAVAKKAM | TOTAL | 0.64 | 0.01 | 3.78 | 4.43 | 19,644 | 30,265 |
| | MALE | 0.73 | 0.01 | 0.19 | 0.93 | 7,679 | 15,642 |
| | FEMALE | 0.38 | - | 14.56 | 14.94 | 11,965 | 14,623 |
| RAMAPURAM | TOTAL | 0.22 | 0.49 | 0.72 | 1.43 | 21,685 | 30,251 |
| | MALE | 0.21 | 0.49 | 0.73 | 1.43 | 7,252 | 14,232 |
| | FEMALE | 0.25 | 0.51 | 0.69 | 2.21 | 14,433 | 16,019 |
| PORUR | TOTAL | 0.13 | 0.07 | 1.00 | 1.20 | 20,273 | 28,782 |
| | MALE | 0.13 | 0.07 | 0.67 | 0.87 | 7,838 | 14,845 |
| | FEMALE | 0.13 | 0.07 | 2.53 | 2.73 | 12,435 | 13,937 |
| KARAMBAKKAM | TOTAL | 1.93 | 4.23 | 6.15 | 12.31 | 9,244 | 14,591 |
| | MALE | 1.83 | 3.77 | 2.69 | 8.29 | 3,373 | 7,569 |
| | FEMALE | 2.26 | 5.91 | 18.76 | 26.93 | 5,871 | 7,022 |
| MANAPAKKAM | TOTAL | 0.27 | 0.61 | 1.42 | 2.30 | 5,283 | 8,590 |
| | MALE | 0.31 | 0.54 | 1.46 | 2.31 | 1,873 | 4,466 |
| | FEMALE | 0.14 | 0.84 | 1.26 | 2.24 | 3,410 | 4,124 |

## Chennai City – Migration Trends

| Year | Total Population (in million) | % of Total Migrants | | |
|---|---|---|---|---|
| | | From Tamil Nadu | Outside Tamil Nadu | Total |
| 1961 | 1.73 | 25.86 | 11.38 | 37.24 |
| 1971 | 2.47 | 22.30 | 9.29 | 31.59 |
| 1981 | 3.28 | 21.94 | 8.75 | 30.69 |

*Source: Madras Institute of Development Studies, Madras Database 1996*

# ANNEX 3

## Minimally Directed Organic Strategy (MIDOS)

1. The planning strategy now proposed, which may be termed as the Minimally Directed Organic Development Strategy (MIDOS) seeks to consider all the foregoing factors and seeks up rectify these shortcomings and provide for development and to implement the dictem planning is a process. The MIDOS is in tune with the liberalized economic and industrial policies of Government of India and Government of Tamil Nadu which have been announced subsequent to the urban development strategy. The major objectives of the strategy may be stated as follows:

- Initiate a process to bring about an enabling environment, wherein land supply can be augmented so that increase in land values can be dampened to keep housing affordable for low income groups.

- Provide wider scope for employment generating activities

- Conserve on land resource and protecting historical and cultural heritage and ecologically sensitive areas

- Reduce the need for “Policing” to the minimum, in implementing the plan.

2. The following constitute the basic premise for the new strategy:

(i) Chennai will continue to grow at the current rate and that the increase in population cannot be altogether hated. At best the growth rate could fail, if the policies of areas outside the city succeed.

(ii) The growth within the boundaries of Chennai City could be accommodated in the low density areas through suitably designated policies.

(iii) That the suburban rail system has the potential to take a substantial share of commuter traffic and thus reduce congestion on roads and heavy pressure on the bus system.

(iv) Future developments particularly housing development have to be at relatively higher densities of 75 to 150 dwelling units/hec. as against the present private sector subdivision densities of around 25 dwelling units/hec. to conserve scarce urban land.

(v) That substantial addition to housing stock can be effected only through involvement of private sector and rejuvenation of the co-operative housing sector.

(vi) Through the satellite towns proposed did not take off as desired in the First Master Plan development of three towns would not be given up as these are expected to function as filters to the migrant population.

(vii) That the Urban Nodes identified in the First Master Plan would continue to attract priority in future investment initiatives. In addition to the already identified Urban Nodes in the first Master Plan, new Urban Nodes such as Kundrathur, Thirunindravur, Porur and Kathivakkam as New Town are being identified in the second Master Plan.

**Elements of Development Strategy**

The strategy therefore relies on the following elements

***(a) Broad Based Zoning***

3. The zoning system enunciated in the First Master Plan has been observed to be rather rigid. Any desired changes had to go through the time causing reclassification procedures. It is normally being looked upon as an obstacle which stands in the way of an individual to develop his land as he desire and to derive the full benefits of development.

4. Further, the allocation of a particular use to a particular piece of land is arrived as a result of various projections and approximations with respect to future population, its possible trend and intensity of expansion. But in several cases, these approximations and projections have been observed to fail leading to large scale reclassification of land uses. These reclassifications have been fragmentary in nature making it different for development to take place in an integrated manner.

5. To get over these shortcomings it is proposed to adopt a broad based zoning system which will be flexible, minimize reclassifications and facilitate industrial activities, keeping in line with the new liberalized policy of the Government of India and the State. Accordingly the following are the land use zones suggested in the Master Plan:

1. Residential
2. Mixed Residential (Village settlements and properties abutting and gaining Access from roads of width 12 m and above but less than 18 m)
3. Commercial (Areas zoned for commercial use zone and properties abutting and gaining access from roads of width of 18m and above)
4. Industrial
5. Special & Hazardous Industrial
6. Institutional
7. Open Space & Recreational
8. Urbanisable

9. Non-urbanisable

6. Among the above zones, in the Institutional and Open Space & Recreational Use Zones, no additional areas would be zoned for these activities as these would be permitted in other zones, viz., Commercial, Urbanisable etc.

7. The concept of urbanisable zone is introduced here in this Master Plan with the intention of opening up large areas of development. The urbanisable zone would in essence, serve as a General and flexible Development Zone in which all urban uses excepting hazardous industrial uses would be permitted. However, Industries will also be permitted in urbanisable Zone on either side of the alignment of the proposed Outer Ring Road. Regulations will be limited to ensuring that the location of an activity does not adversely affect the environmental quality of that area.

8. Non Urbanisable zone would comprise of all lands and areas that have to be preserved or conserved for ecological reasons, or for their agricultural value. Demarcation of areas in this category would include.

- A compact block of valuable agricultural lands being irrigated from Chembarambakkam Tank
- Catchment areas of Red Hills-Sholavaram lakes and Chembarambakkam & Porur Tanks
- Well fields of Panjetty-Tamarapakkam, Minjur and other potential ground-water sources
- Beach-Aquifer zone along Mahabalipuram road, between the coast line and Buckingham Canal south of Kottivakkam and the areas designated as CRZ as per the Environmental Protection Act notification by the GOI.

9. The Urbanisable zone would include such of those areas that have been notified for development through public intervention and would include housing neighbourhoods, industrial estates and other committed projects. Such areas would include all lands that are proposed to be acquired and developed within the next 20 years.

***(b) Efficiency in land utilization***

10. Housing is the major consumer of urban land. In order to achieve optimum utilization of the available land resources, the existing DCRs are being streamlined to encouraged generation of smaller dwelling units, now housing, group housing & apartment. As it was pointed out in the shelter chapter, a recent study of CMDA has estimated that more than 75% of the households in CMA cannot afford more than 40 sqm. of built accommodation at current land and construction costs. The minimum extent of land required for sub-division has been proposed to be revised from 150 sq.m. to 90 sq.m. with a minimum frontage of 6m in the proposal sent to the Government.

### *(c) Intensifying Development on the Rail Corridors*

11. Intensive development along rail corridors for optimum utilization of rail facility is proposed to be promoted. The on-going MRTS and its extension upto Taramani is envisaged to meet the expected increase traffic in the north south eastern corridor, and that extent relieve congestion in that sector on the bus system. The bus system is expected to act as a feeder to the rail corridor for which purpose action is to be initiated to execute the necessary number of intermodal transfer stations/points.

12. In order to effectively utilize the arterial rail corridors, the Inner Circular Corridor (Rail) proposed in the First Master Plan is to be preserved with. This connects to arterial rail routes and runs more or less parallel to the Inner Ring Road. The ICC (Rail) and ORR is expected to open up large areas for development in its influence region. It is also proposed to integrate the plans of the Railway, the Central and the State Government and the PTC and dovetail their programmes to achieve the single goal of restructuring the travel pattern to exploit the potentials of the rail system.

13. In pursuance of the strategy to decongest the city core, railways proposed to shift a part of the existing rail terminal at central station to a location in the city fringe at Tambaram and Egmore. The facility would be utilized for terminating the long distance trains along the western Railway line.

### *(d) Limiting Application of Urban Land Ceiling Act only to City Area*

14. It is suggested that the application of the ULC Act may be limited to city area to obtain land for low income housing within the city. Release of other lands from application of ULC and simultaneous reforms to land sub-division regulations would increase the land supply for low income housing outside the city.

### *(e) FSI as a Tool for Guiding Development*

15. It is proposed to introduce variable Floor Space Index based on activity norms and road width for developments throughout the Metropolitan area with a view to encourage developments outside the city and to discourage developments within the city. The relocation of the Koyambedu market would necessarily shift the center of business activity from the present George Town area to the periphery and the adoption of variable FSI based on activity norms and road width would aid development in the peripheral areas. However higher FSI would be permitted in certain specific areas viz, areas where projects are to be implemented on the Build-Operate-Transfer basis, like the Outer Ring Road. Urban Renewal and conservation areas to make good for the deemed loss in development value.

### *(f) Vacant Land Tax to Discourage Speculation*

16. To ensure quick occupation of urbanized land it is suggested that all vacant plots (both approved & unapproved) may be subjected to a levy of urban vacant land tax. This would discourage holding of plots for speculation or deferred used. It has been estimated that about 750 hec. of legally subdivided lands have not been built upon. These lands by levying a vacant land tax, are proposed to be brought into use immediately.

***(g) Providing for the needs of informal Sector***

17. In order to cater to the needs of the informal sector, a stipulated extent of land by way of land banking, atleast 5% of the development area is to be set apart in all proposed projects to accommodated the manufacturing and other service activities.

***(h) Use of Government land as Initial Land Bank***

18. There is a considerable extent of land owned by government both state & central and other public sector organizations, both within the city limits as well as outside, not counting the lands that would become available under ULC.

19. These lands are not put to optimum use and not protected systematically, and get encroaching upon. These lands, particularly on the GST Road need to be reserved by Govt. and developed.

***(i) Instituting a Metropolitan Investment Inventory***

20. In order to institutionalize a system for effective co-ordination of investment decisions of development agencies within CMA, a Metropolitan Investment Inventory covering investments and revenues in infrastructure.

(j) Instituting a co-ordination Mechanism with CMDA as Nodal Agency

21. In order to evolve a continuous basis for co-operation, a permanent framework for co-ordination shall be institutionalized with CMDA playing an active role, in the sectors of Metropolitan Economy, Transport Co-ordination, Historical and Architectural conservation and Metropolitan Investment Inventory.

**Agenda for Action**

22. The new strategy will rely on minimal regulation of land use, but seeks to provide adequate opportunities for more effective planned development. The strategy requires suggests a number of policy measures which have to be translated into administrative, financial and investment institutional management terms over the next twenty years as follows:

a) Extending the operations of CMWSSB to cover the entire metropolitan area and making it responsible for delivery and maintenance of water and sanitation services according to the spatial policy of CMA.

b) Setting up a high level co-ordinating committee of PTC, Railways and CMDA to lay down policies, programmes and projects for optimum utilization of the railway system and to pursue other transport projects.

c) Consolidating local governments outside Chennai City into a few functionally and financially viable units for delivery and maintenance of civic services.

d) Establishing clearly the functioning of specialist agencies vis-à-vis the local bodies to achieve an integrated functioning and avoiding duplication.

e) Providing the requisite legal powers and operational instruments for prevention of environmental pollution, conservation of environmental, historical, and architectural heritage areas and development and adoption of good urban design principles in all developments.

f) Formulating a Metropolitan Capital Investment Inventory identifying the allocations and investments of all the development agencies and establish a system for programming, review and monitoring the investment portfolio and for programming development of central, state and local resources for the development projects.

g) Instituting a Metropolitan Information System to collect, compile and make available information related to economic activities, infrastructure provisions, social and economic profile of population, housing and land supply, finances collected by local bodies and all such information which may be of relevance to planning process.

*Source: Madras Metropolitan Development Authority, Master Plan for CMA – 2011 – Draft*

## ANNEX 4 – MATRIX FOR INSTITUTIONAL MAPPING IN THE PHASES OF THE METROPOLITAN WATER CYCLE

| Actors / Phases | Public Metrowater | Public TWAD/Local Body | Private | Community Formal | Community Informal |
|---|---|---|---|---|---|
| **1) Extraction** | | | | There are no actors in the community sector formal or informal<br><br>For individuals & Institutions (See Section 4 – Institutional Mapping) | |
| - regulation | PWD | PWD | PWD/Metrowater | | |
| - finance | | Local Body | | | |
| - construction | ***Metrowater*** | TWAD | Water Supply Enterprises | | |
| - maintenance | | Local Body | | | |
| - operation | | Local Body | | | |
| **2) Treatment&Storage** | | | | | |
| - regulation | | Local Body | Groundwater supplied without Treatment | | |
| - finance | | Local Body | | | |
| - construction | Metrowater | TWAD | | | |
| - maintenance | | Local Body | | | |
| - operation | | Local Body | | | |
| **3) Distribution** | | | | | |
| - regulation | | Local Body | **BY** Water Tankers | | |
| - finance | Piped Water & Tanker Water | ***TWAD*** | | | |
| - construction | | ***Local Body*** | | | |
| - maintenance | ***Metrowater*** | Local Body | | | |
| - operation | | Local Body | | | |
| **4) Consumption** | | | | | |
| - regulation | Metrowater | Local Body | | | |
| - finance | | | | | |
| - construction | Property Owners | Property Owners | — | | |
| - maintenance | | | | | |
| - operation | | | | | |
| - billing | Metrowater | Local Body | | | |
| **5) Disposal** | | | | | |
| - regulation | TNPCB | TNPCB | | | |
| - finance | | Local Body | | | |
| - construction | ***Metrowater*** | TWAD | — | | |
| - maintenance | | Local Body | | | |
| - operation | | Local Body | | | |
| **6) Remarks** | Chennai City & AUA | Rest of Metro Area | Private Water Suppliers | | |