

Government of Tamil Nadu
Tamil Nadu Urban Development Fund

City Corporate cum Business Plan

Tambaram Municipality

FINAL REPORT

October 2007

Wilbur Smith Associates Private Limited

Abbreviations and Acronyms

BOT	:	Build, Operate and Transfer
BPL	:	Below Poverty Line
BT	:	Black Top
CAA	:	Constitution Amendment Act
CAGR	:	Compounded Annual Growth Rate
CC	:	Cement Concrete
CCP	:	City Corporate Plan
CMA	:	Chennai Metropolitan Area
CMDA	:	Chennai Metropolitan Development Authority
CMWSSB	:	Chennai Metropolitan Water Supply and Sewerage Board
CPHEEO	:	Central Public Health Environmental Engineering Organization
CSC	:	Community Structure Component
CUA	:	Chennai Urban Agglomeration
DIC	:	District Industries Centre
DPR	:	Detailed Project Report
DWCUA	:	Development of Women and Children in Urban Areas
EAR	:	Environmental Assessment Reports
ECR	:	East Coast Road
ELSR	:	Elevated Storage Reservoir
ESF	:	Environmental and Social Framework
ESR	:	Environmental and Social Report
FOP	:	Financial and Operating Plan
FY	:	Financial Year
G.S.T. Road	:	Grand South Trunk Road
gm	:	Grams
GoI	:	Government of India
GoTN	:	Government of Tamil Nadu
gpcd	:	Grams per Capita per Day
GLSR	:	Ground Level Storage Reservoir
ISP	:	Integrated Sanitation Program
IT	:	Information Technology
Ha	:	Hectares
HH	:	Households
HSC	:	House Service Connection
IPT	:	Intermediate Public Transport
ISP	:	Integrated Sanitation Program
kg	:	Kilograms
LCS	:	Low Cost Sanitation
Lit	:	Liters
LL	:	Lakh Liters
LPA	:	Local Planning Area
lpcd	:	Liters Per Capita Per Day
m	:	Metres
MEPZ	:	Madras Export Processing Zone
ML	:	Million Liters
MLD	:	Million Liters per Day
MSW	:	Municipal Solid Waste
MT	:	Metric Ton
MTC	:	Metropolitan Transport Corporation
NGO	:	Non-Governmental Organizations
NH	:	National Highway

Nos	:	Numbers
NSDP	:	National Slum Development Program
OHM	:	Operation and Maintenance
OMAR	:	Old Mahabalipuram Road
OHT	:	Overhead Tanks
PAP	:	Project Affected People
PSP	:	Public Stand Post
PWD	:	Public Works Department
SEC	:	Sensitive Environmental Components
SEZ	:	Special Economic Zone
SFC	:	Second Finance Commission
SH	:	State Highway
SI	:	Sanitary Inspector
SIPCOT	:	State Industrial Promotion Corporation of Tamil Nadu
SJSRY	:	Swarna Jayanti Shehri Rozgaar Yojna
SMP	:	Social Management Plan
SO	:	Sanitary Officer
Sq. km	:	Square Kilometers
STP	:	Sewage Treatment Plant
SWM	:	Solid Waste Management
TCS	:	Thrift & Credit Societies
TNEB	:	Tamil Nadu Electricity Board
TNRDC	:	Tamil Nadu Road Development Corporation
TNSCB	:	Tamil Nadu Slum Clearance Board
TNUDP	:	Tamil Nadu Urban Development Project
TNUIFSL	:	Tamil Nadu Urban Infrastructure Financial Services Limited
tpd	:	Tons per Day
TWAD	:	Tamil Nadu Water Supply and Drainage Board
UGD	:	Underground Drainage
ULB	:	Urban Local Body
USEP	:	Urban Self Employment Program
UST	:	Urban Skill Training
UWEP	:	Urban Wage Employment Program
VAMBAY	:	Valmiki Ambedkar Awas Yojana
W	:	Watts
WBM	:	Water Bound Macadam

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I. BACKGROUND

A. Introduction

1. The 74th Constitution Amendment Act, 1992 has imparted constitutional status on the Urban Local Bodies and assigned appropriate functions to them. A constitutional backing is given to the relationship of the Urban Local Bodies (ULBs) with the State Government with respect to their functions and powers, ensuring of timely and regular elections, arrangements for revenue sharing etc. Urban Local Bodies are given additional powers including preparation of local development plans, programs for ensuring social justice, environmental management making them responsive to the local needs. This is facilitated by Section 243 (W) of the Constitutional Amendment (74th) Act, 1992. The list of programs included under this section is

- (i) Urban planning including town planning
- (ii) Regulation of land-use and construction of buildings
- (iii) Planning for economic and social development
- (iv) Roads and bridges
- (v) Water supply for domestic, industrial and commercial purposes
- (vi) Public health, sanitation conservancy and solid waste management
- (vii) Fire services
- (viii) Urban forestry, protection of the environment and promotion of ecological aspects
- (ix) Safeguarding the interests of weaker sections of society, including the handicapped and mentally retarded
- (x) Slum improvement and up gradation
- (xi) Urban poverty alleviation
- (xii) Provision for urban amenities and facilities such as parks, gardens and playgrounds
- (xiii) Promotion of cultural, educational and aesthetic aspects
- (xiv) Burials and burial grounds; cremations, cremation grounds and electric crematoriums
- (xv) Cattle pounds; prevention of cruelty to animals
- (xvi) Vital statistics including registration of births and deaths
- (xvii) Public amenities including street lighting, parking lots, bus stops and public conveniences
- (xviii) Regulation of slaughterhouses and tanneries

Functions and Powers

2. In conformity with the 74th CAA, the Tamil Nadu District Municipalities Act, 1920 was amended and the ULBs are entrusted with the functions listed in the Twelfth Schedule of the constitution or Section 243 (W) of the Constitutional Amendment (74th) Act, 1992.

Finances and Taxes

3. The 74th CAA also provides for the constitution of a State Finance Commission to review the financial position of the municipalities and make recommendation. The Second State Finance Commission of Tamil Nadu has already submitted its recommendations to improve the financial position of the municipalities.
4. Tamil Nadu District Municipalities Act authorizes a municipality to levy, collect and appropriate such taxes, duties, tolls and fees in accordance with the procedures subject to limits as specified by the legislature. Besides these, the ULBs are also empowered with certain other financial powers.
5. The urban reforms resulting from the 74th Constitution Amendment Act lays larger responsibility on the Municipal Bodies, in terms of development planning, service provision and fiscal affairs. The policy framework of the state and central government has provided the necessary impetus to the urban sector to play a pro-active role in the development process. In the changed scenario, it is imperative for the ULBs to set their priorities and strategies right, designed to achieve a clear vision.

B. City Corporate and Business Plans

6. The State of Tamil Nadu is in the forefront of devolving functions to ULBs as envisaged by 74th CAA and is further strengthening the Urban Governance through a series of initiatives under the Tamil Nadu Urban Development Project-II. A key initiative of TNUDP-II (1999-2004) was to prepare “City Corporate Plans”, an implementable plan providing a strategic vision for the development of the town, in consultation with key stakeholders, including the public, through a robust public information and consultation exercise. Expanding the concept of CCP, TNUDF has initiated a process to formulate Business Plans along with CCP’s outlining the innovative resource mobilization measures, investment options based on sustaining capacity, clear implementation plan and technical assistance measures to improve service delivery and efficiency.
7. While ensuring the above, the CCP would focus on issues of priority regional and local concerns for livability, and the implied requirements in terms of
 - (i) Enhancing City Productivity
 - (ii) Reducing Poverty
 - (iii) Improving Management
 - (iv) Enhancing Financial Sustainability
8. It would involve assisting the Urban Local Bodies in setting up of development goals and objectives, establishing a structured revenue management and investment strategy, designed to achieve the towns’ Vision.
9. Wilbur Smith Associates Private Limited is assisting the Alandur, Pallavaram and Tambaram municipalities to prepare City Corporate Plan cum Business Plans through a customized public consultation and information exercise.

10. The objective of this assignment is to assist the municipalities in preparation of their City Corporate Plan and Business Plan, guided by a shared vision for the region and the city's development. It include assisting the ULBs in strategizing developmental goals and objectives, establishing and phasing of a structured Capital Investment Program and a Financial and Operating Plan outlining the revenue management and investment strategy to realize the set goals. The business plan outlines the measured for expenditure management and enhancing the revenue flows through non-traditional means to enhance the credit-worthiness of the municipality. The approach to CCP and BP is presented in **Figure 1.1.**

C. Vision

11. Alandur, Pallavaram and Tambaram present a case that warrants a regional perspective and vision, reinforced by a local one. The towns' proximity to Chennai, location within the Chennai Metropolitan Area along a major corridor (Grand South Trunk Road), and the existing and proposed investments in industries (IT/ITES/BPO industries, TIDEL Park, Biotech Park, MEPZ, Cyber City, Mahindra Industrial Park, BMW plant etc.), indicate the tremendous development potential of the region. This, coupled with the congestion in Chennai and the increasing need for residential land at locations proximal to new developments/employment opportunities, provides a strong rationale for investment in infrastructure in the region / towns. In order to sustain the pace of regional economic growth, availability of critical infrastructure, particularly in the three project towns that are potential engines of regional growth, would be critical.
12. It is thus imperative to consider strategies to tackle ongoing developmental pressures in a regional context, while safeguarding the interests and development vision of individual project towns. GoTN has rightly identified the need to prioritize investments in urban infrastructure, with a view to boost the local economy and enhance the livability/quality of life offered by these towns.
13. Based on discussions with eminent citizens / retired, senior government officials, the broad consensus vision that appears to be emerging is that the entire CMA may be expected to function as one city in 20 years' time, which has the potential to be an important economic centre not only in Southern India but in the country as a whole. Identification of infrastructure needs to provide an enabling environment for the 'city region' to develop is therefore the need of the day.
14. Case studies worldwide highlight the need to strengthen regional level transport infrastructure as one of the first pre-requisites to regional economic development. Proposed investments in transportation infrastructure (e.g. improvement of NH 45, Outer Ring Road and airport upgradation) in the region are expected to provide a tremendous boost to economic development in the region. Projects/proposals that can lead to mutual benefits and cost sharing related to transportation, water supply, sewerage and solid waste management are discussed in subsequent sections of this study.
15. A participatory approach was adopted for the visioning exercise for CCP and Business Plan preparation. The idea was to arrive at a shared vision, owned by local stakeholders at

both regional and town levels. The process of consultation undertaken for the visioning exercise as an integral part of CCP and Business Plan preparation is outlined below:

- (i) Identification of stakeholders at regional and town level – these included agencies like TNUIFSL, CMWSSB, TWAD, TNPCB, regulatory authorities for water bodies, etc. at regional level and Commissioners and Chairpersons of municipalities, elected representatives, municipal officials, NGOs, members of Resident Welfare Associations, academicians and citizens at town level;
- (ii) Consultation with identified stakeholders, wherein the project was announced and the purpose, process and expected outcomes of the CCP shared. The existing situation in the town vis-à-vis infrastructure status was presented. Stakeholders were invited to speak / define their vision for the town / region and identify infrastructure needs and priorities. Inputs received from various stakeholders were distilled to formulate the regional and town level vision. (refer List of Participants in town level consultations in **Annexure 8.1**) Apart from interaction through formal consultations, a series of meetings were held with stakeholders and officials in each town, which helped firm up the vision and arrive at quantifiable indicators on service provision.
- (iii) Technical inputs from a team of experts for project preparation / identification and appropriate strategic framework for implementation, incorporating stakeholder concerns and priorities wherever feasible. Sharing of infrastructure needs and priorities and vision at common fora at different stages of CCP preparation (Inception Report, Assessment Report and Rapid Urban Assessment Report) with key stakeholders. (Refer minutes of meeting in **Annexure 8.3, 8.4, 8.5 and 8.6**).
- (iv) Broad consensus with stakeholders is sought on the regional and town level vision and infrastructure priorities, proposals, projects and strategies, on submission of Draft Final Report. The Draft Final version of the City Corporate Plan (CCP) and Business Plan and the vision for the region and individual towns presented in this report is the result of a collective effort of all planning partners and key stakeholders. The CCP is a 20 year program defining development objectives at the regional and town level, program of institutional and policy priorities, environmental, social and economic infrastructure goals, identified high priority investments, capital investment plan and revenue enhancement and expenditure management plans, designed to achieve the towns' vision. Apart from the consultative exercise of visioning and prioritization of infrastructure needs, best practice case studies were referred prior to project identification/preparation. Further comments and concerns of stakeholders, if any shall be incorporated in the Final Report.

Regional Level Vision

16. To sum up, stakeholder consultations yielded the following consensus on a vision for the region:

Chennai Metropolitan Area is likely to function as a single entity in 20 years' time, and has the potential to be an important economic centre in Southern India and the country as a whole. The need for:

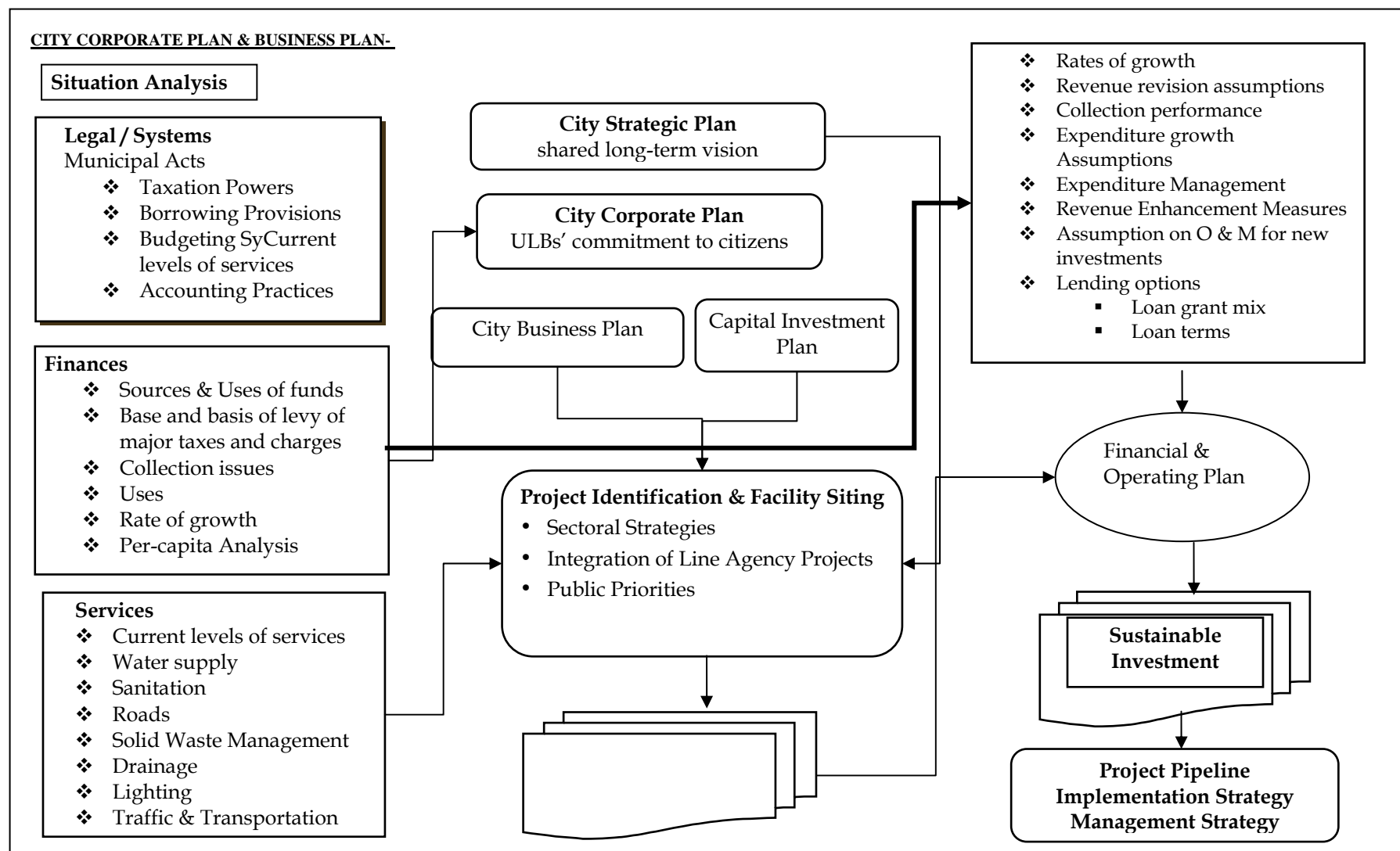
- (i) Infrastructure service delivery to keep pace with and sustain economic growth in the region, and
- (ii) High service levels in the three towns, enabling them to attract population and business to the region, was therefore identified.

Town Level Vision

17. Consultations with citizens of all the project towns upheld the vision, “To make the towns dynamic, vibrant, self-reliant and sustainable with all basic amenities, offering a better quality of life to residents.”
18. The vision will be achieved by each ULB through continued consultation with the community in an integrated and cohesive manner and by defining its presence through dedication to achieve excellence in provision of civic amenities and a Responsive, Modern, Simple, Accountable and Transparent Administration. The vision is stated to be achieved through various the proposals and strategies set under each sector of the Corporate Plan. Indicators to monitor CCP implementation and achievements are given in the section on stakeholder consultation (**Chapter VIII**).

D. Scope of Work

19. The CCP originated with and is wholly owned by the local stakeholders. It primarily:
 - (i) Looks at the demand for the projects specified by the ULBs, and reveals the gap in services;
 - (ii) Defines the growth directions and service upgradation in relation to the activity mix / growth;
 - (iii) Broadly outlines the infrastructure needs;
 - (iv) Defines specific rehabilitation and capital improvement needs with regard to priority city infrastructure in both slums and other areas;
 - (v) Defines revenue enhancement and revenue management improvements required to sustain the rehabilitation proposed;
 - (vi) Reforms required in local administration and service delivery;
 - (vii) Management changes required at the local level to improve O&M of assets; and
 - (viii) Carries out a study on waste characterization.
20. The scope of services for preparing City Corporate Plan cum Business Plan for the three towns for broadly covers the following areas:
 - (i) Assess Levels of Service;
 - (ii) Financial Assessment of ULBs. An assessment of municipal finances for the past five years;

Figure 1.1: Approach for City Corporate Plan and Business Plan

- (iii) Outline issues in revenue realizations, quality of existing assets in relation to service levels and coverage, and institutional constraints. Develop quick indicators of performance;
 - (iv) Financial and Operating Plan (FOP)
21. Prepare a draft Memorandum of Understanding between Urban Local Body and TNUIFSL for effective implementation and monitoring of the City Corporate and Business Plans.
 22. Initiate consultations with council and local stakeholders on the priorities.
 23. Finalize Business Action Plan for the town, with a resolution from the council on the priorities and commitment to implement revenue and management improvement measures.
 24. Identify the obligations on the part of the ULB/TNUIFSL/TNUDF/Government for successful implementation of the City Corporate Plan and Business Plan.

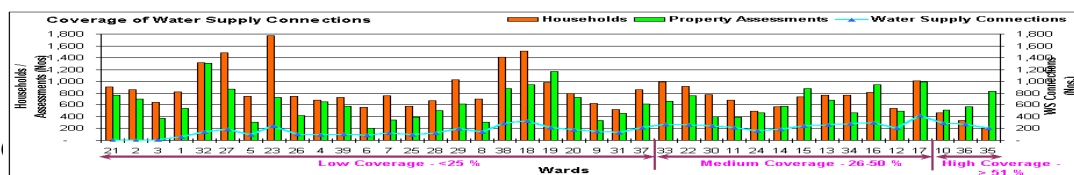
E. Report Structure

25. The present report is the rapid urban assessment report containing the following chapters.
26. Chapter 1 is an introduction to the City Corporate Planning Process and presents in brief the methodology and the background of the project in context of 74th Constitutional Amendment Act and the new powers assigned to Urban Local Bodies.
27. Chapter 2 gives the profile of the town in terms of demographic characteristics, past trends and growth, population projections and future trends. It also describes the regional setting and economic development focusing on the economic base, road and rail linkages and the impact of economic activities in the development of the town. The chapter also includes the population projections for the town, which would be used for analyzing the future demand for infrastructure.
28. Chapter 3 provides a review of the urban governance aspects of the municipality with a focus on the organizational responsibilities and emerging initiatives. The chapter also provides the existing financial situation of the municipality in terms of sources and uses of funds, the outstanding dues, operating ratios etc.
29. Chapter 4 describes the land use and spatial growth of the town, concentration of economic activities, review of the master plan and the future growth of the town, spatially.
30. Chapters 5 focuses on the urban infrastructure including water supply, sanitation, solid waste management, roads, storm water drainage and street lighting. The chapter presents the existing situation in terms of coverage, deficiencies and key issues in delivery, provision of urban services and analyses of the projects identified by the municipality.
31. Chapter 6 focuses on the waste characterization of Tambaram municipality. The chapter identifies the physical and chemical characteristics of solid waste of both residential and

commercial, undertaken on the basis of field surveys.

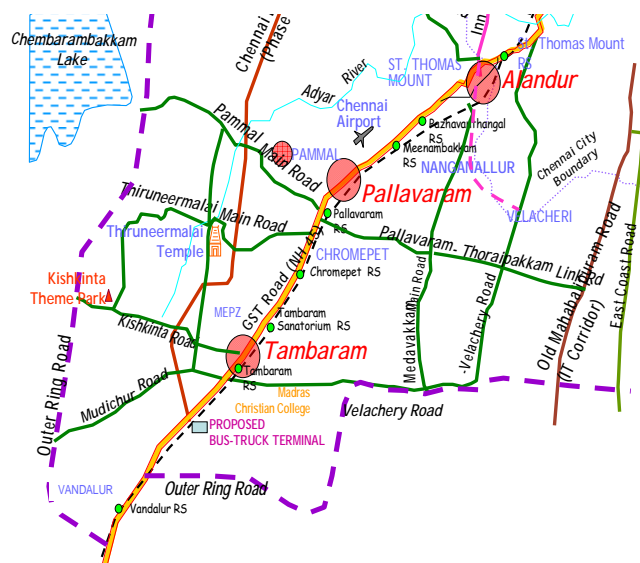
32. Chapter 7 addresses the infrastructure needs of the urban poor through an examination of slum population and growth of slums, socio-economic aspects, access to basic urban services, improvement/development programs, institutional aspects, etc.
33. Chapter 8 discusses the design criteria adopted to study the future demand for infrastructure development and service provision. This chapter also identifies the projects required to be implemented to meet the future demand.
34. Chapter 9 presents the asset management for the remunerative and non-remunerative municipal assets.
35. Chapter 10 focuses on the initiatives to be taken up by the local body to enhance their revenue income through the non-traditional sources with minimal investments. In addition, it also discusses the scope for controlling the expenditures on various sectors.
36. Chapter 11 presents the Financial and Operating Plan for the municipality.
37. Chapter 12 presents the initial screening of social and environmental impacts for the implementable projects with mitigation measures.
38. Chapter 13 summarizes the impacts and benefits accruing from project implementation – social, environment and economic benefits. It also summarizes policy interventions and steps to be undertaken by GoTN for proceeding with the detailed design phase.
39. Chapter 14 outlines the various best practices and good urban governance. The strategies are also presented in this chapter.
40. Chapter 15 summaries the potential risks and assumptions of various sub projects proposed for the ULB.

A.



41.

distance of about 65 km from the district headquarters and 30 km from Chennai. Tambaram, a satellite town for Chennai City is well connected by good network of roads and railway line, located on South Chennai Grand Southern Trunk Road (National Highway 45) and along the Chennai-Tambaram railway line. This town is also known as Gateway to Chennai City.



42. The town is an important part in Chennai Metropolitan Area (CMA) which includes Chennai Municipal Corporation, 8 Municipal Towns – Thiruvottiyur, Alandur, Tambaram, Pallavaram, Ambattur, Kathivakkam, Madhavaram, Avadi and township of Thiruverkadu; 27 Town Panchayats and 211 villages comprised in 10 Panchayat Unions.

43. The Villiapuram Railway Line and Tambaram-Beach Suburban Line divide Tambaram into two zones – West Tambaram and East Tambaram.

44. *Topography.* It is located at 13°20' North latitude and 80°10' East longitude, situated in relatively steep terrain with a gradual slope towards the East, draining towards a water body called Tiruvandipuram Lake, which is draining towards CTO Colony. The topography is relatively flat, with a maximum elevation of 34 m in the West.

45. *Geology.* The soil profile of Tambaram falls under the category of Clayey Loam with Laterite sub-sol. The predominant soil type is Clayey Loam, which extends to a depth of 0.30 m to 1.0 m. The groundwater table varies from 3 to 4 m. The groundwater table varies from 3 to 4 m in the dry seasons while in rainy seasons; the depth of groundwater table improves and extends to 4.5 m to 5.0 m.

46. *Climate and Rainfall.* The climate of the town is temperate as a whole except during the months of March to June, during which the climate would be hot with temperatures



varying from 35°C - 40°C. The mean annual average temperature is about 30°C while the relative humidity reaches upto 90 percent during monsoons. The district receives maximum rainfall from Northeast Monsoon from October to December and the Southwest Monsoon between July to August brings some rains. The annual rainfall is about 1,124 mm.

B. Population Trends and Urbanization

47. The comparison of population of Tambaram with Chennai Metropolitan Area (CMA), Chennai Urban Agglomeration (CUA) and Chennai City indicates that the growth rate of Tambaram is increasing and has surpassed the growth rate of CMA of 27.13 percent. However, the sharp decline in the population growth rate of Chennai City with 9.76 percent has effected the CUA's growth rate. This indicates that the city's saturation level has already reached and the developments now would take place towards the outer peripheries of the City. Thus, Tambaram has growth potential for its development. The comparison with CMA, CUA and Chennai City are presented in **Table 2.1**. As per the discussions with CMDA officials, 2.5 percent growth rate is foreseen for the towns in near to Chennai City.

Table 2.1: Comparison of Tambaram Population with CMA, CUA and Chennai City

Parameter	Unit	Year	CMA	Decadal Growth (%)	Chennai City	Decadal Growth (%)	CUA	Decadal Growth (%)	Tambaram	Decadal Growth (%)
Area	Sq. km		1,177.00		172.00		306.70		20.72	
Population	Lakh									
		1981	46.29		33.17		42.73		0.87	
		1991	59.17	27.82	38.41	15.82	53.41	24.99	1.07	22.99
		2001	75.22	27.13	42.16	9.76	64.25	20.28	1.38	28.97

Source: Census 1981, 1991, and 2001

48. *Population.* Tambaram being located on the periphery of Chennai City is witnessing a significant growth in the urban population every decade especially during 1961 and 1971. The population has increased from 1,07,187 in 1991 to 1,37,933 in 2001 indicating a decadal growth rate of 28.68 percent (**Table 2.3**). The highest and lowest population growth rates recorded were 87.06 percent during 1951-1961 and 23.31 percent during 1981-91. However, the decadal growth rate has increased to 28.68 percent during 1991-01. The details of decadal population growth are given in the **Table 2.2**.

Figure 2.2: Population Growth - Tambaram

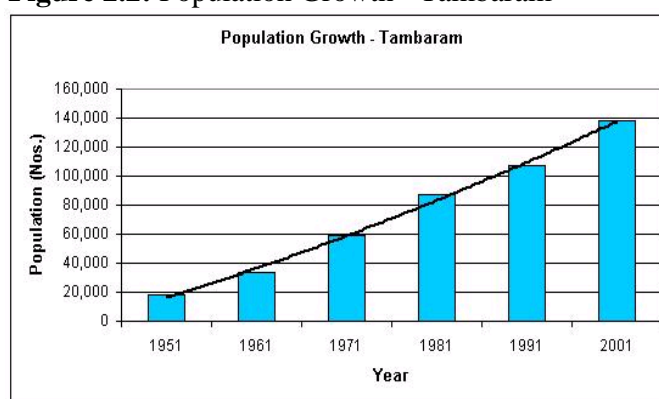


Table 2.2: Population Growth in Tambaram

Year	Population			Decadal Growth Rate	Compounded Annual Growth Rate
	Male	Female	Total		
	Nos.	Nos.	Nos.	%	%
1951	10,011	7,898	17,909	-	-
1961	17,496	16,004	33,500	87.06	6.46
1971	31,751	27,054	58,805	75.54	5.79
1981	46,848	40,075	86,923	47.82	3.99
1991	56,568	50,619	107,187	23.31	2.12
2001	70,419	67,514	137,933	28.68	2.55

Source: Census Reports

49. The compounded annual growth rate (CAGR) has drastically dropped from 6.46 percent during 1951-61 to 2.12 percent during 1981-91. However, the CAGR has increased to 2.55 percent during 1991-01. The increase in the growth rate can be attributed to the development of economic activities in the region and the municipality being a receiving zone for working class employed in the city.
50. *Population Density.* The population density for Tambaram is showing an increasing trend every decade. The density has increased from 52 persons per Ha during 1981-91 to 67 persons per Ha (a growth of 28.68 percent) during 1991-01. The area under municipal limits remained same with 2,072 Ha (20.72 sq. km) since 1971 and increase in population has consequently increased the population density in the town. The trend in population density is presented in **Table 2.3**.

Table 2.3: Population Density in Tambaram

Year	Population	Area	Population Density
	Nos.	Ha	Persons per Ha
1951	17,909	1,342	13
1961	33,500	565	59
1971	58,805	2,210	27
1981	86,923	2,072	42
1991	107,187	2,072	52
2001	137,933	2,072	67

Source: Census Reports

Map 2.1: Administrative Wards of Tambaram

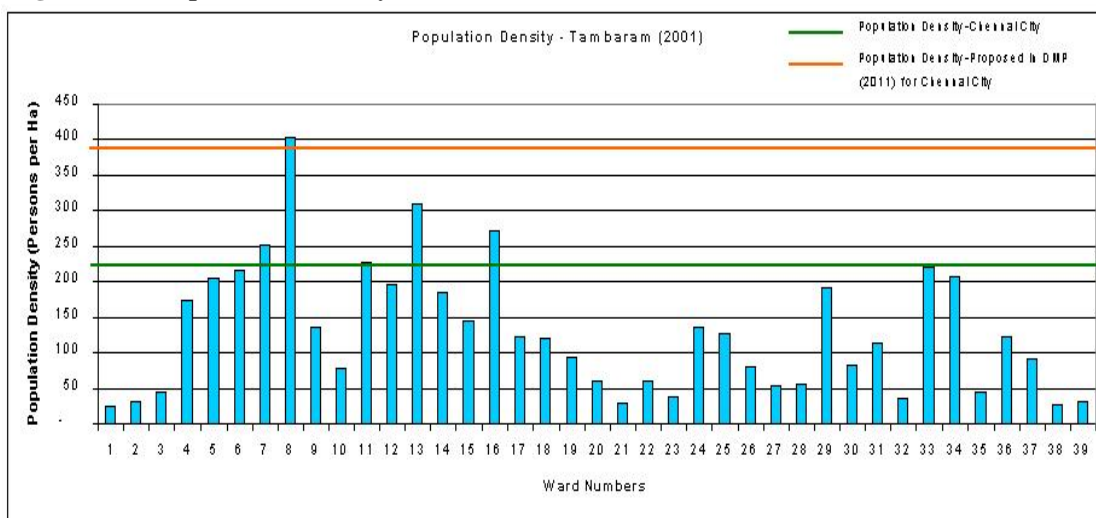
Table 2.4: Summary of Density Pattern

Range	Density Pattern	Number of Wards
<i>(Persons per Ha)</i>		<i>Nos.</i>
201 & Above	Very High Density	9
151-200	High Density	4
101-150	Medium Density	8
51-100	Moderately Less Dense	9
>=50	Low Density	9

Source: Analysis

51. Most of the wards having very high density are occupied by the BPL families. In West Tamparam, wards 4, 5, 6 and 7 are predominantly occupied by Economically Weaker Section (EWS). All these wards are highly congested and are characterized by very high-density wards. Wards 1, 2, 3 and 38 are dominantly forest areas; thus, the population density in these wards is less. The density of ward 23 is low as it houses world-renowned Christian College indicating no major scope of increase in population density in this ward, while the ward is a Air Force Base, thus, the ward is less dense. The new extension layouts are popping up in Ward 35. Wards 10 and 39 are commercially active zones and wards 26 and 27 are resided by Below Poverty Line (BPL) families, thus, they are moderately less dense.
52. The average population density in Chennai City is 244 persons per Ha. The comparison of city's population density and the ward wise density indicates that four wards are having population density more than Chennai city while remaining 35 wards are below (refer **Annexure 2.1**). As Chennai City is already congested, there is a great potential for Tamparam for its development. If proper infrastructure facilities are provided, there is no doubt that, in future, Tamparam would become one of the major preferred locations for all activities, which include residential developments, commercial establishments, IT offices, etc.

Map 2.2: Population Density Pattern in Tambaram

Figure 2.3: Population Density

53. The Draft Master Plan for Madras Metropolitan area proposes the average density for the Chennai City as 399 persons per Ha. This indicates that Ward No. 8 has already reached the saturation levels and thus, the population growth rate for future would come down in this ward. Ward Nos. 5, 6, 7, 11, 13, 16, 33 and 34 would be reaching the saturation levels in future, as they have densities already reached more than 200 persons per Ha. The high population growth rate can be expected in the remaining wards unless restrained by any physical features.

C. Economic Development

1. Economic Structure

54. Chennai Metropolitan Area (CMA) comprises of Chennai City and areas to an extent of 376.58 sq. km. in Kancheepuram District and 639.39 sq. km. in Thiruvallur District. According to the 2001 Census, 38.6 percent of the population of Kancheepuram District and 57.5 percent of the population in Thiruvallur District live within CMA. The economic base of the Chennai City had shifted from trade and commerce to administration and services by the early part of the 20th Century. In the post-independence period, manufacturing became an important sector and CMA continues to be the most important industrial center in the State. Recent trends show that the economic structure of the city is largely tertiary with growing contribution by Information Technology/Information Technology Enabling Services/Business Process Outsourcing Industries.

- (i) **Occupational Structure.** The comprehensive profile of employment in CMA indicates that the workforce participation rate i.e. proportion of main workers to the population of CMA was 30.74 percent in 1991 and 30.96 percent in 2001. The corresponding figures for Chennai city were 30.50 percent in 1991 and 31.79 percent in 2001. The number of marginal workers both in the Chennai City and in CMA is negligible. **Table 2.5** presents the occupational structure of City and CMA in 2001.

Table 2.5: Occupational Structure in CMA -2001

Sr. No	Component	Chennai City	CMA
1	Total Workers	14,88,364	25,19,278
2	Main Workers	13,80,757	22,84,457
	Main Cultivators	15,149	33,170
	Main Agriculture	5,849	33,390
	Main House Hold	25,836	43,394
	Main Others	13,33,923	21,74,503
3	Marginal Workers	1,07,607	2,34,821
	Marginal Cultivators	2,026	5,728
	Marginal Agricultural	1,233	22,681
	Marginal House Hold	5,156	10,511
	Marginal Others	99,192	1,95,901
4	Non-Workers	28,55,281	4,85,9201

Source: Census of India

The workers in primary activity constitute 6.52 percent in CMA and 1.05 percent in City 1991. In 2001, it was 2.91 percent and 1.52 percent respectively in CMA and Chennai city indicating that the primary activities are on the decline in the peripheral areas due to the emergence of manufacturing and new economy industry. The workers in primary activity are dwindling and it is negligible compared to total, both in Chennai city and in CMA with more than 90 percent of the people engaged in the tertiary sector. The percentage of non- workers was 65.73 percent in city and 69.14 percent in CMA during 2001. As Census 2001 has clubbed town level figures of tertiary sector with primary and secondary, analysis of sectoral shift over time is not possible.

55. As per Census, 2001, the workforce participation rate in Tambaram is 34 percent, an increase of 31 percent from the previous decade. The tertiary sector, i.e., trade and commerce is again predominant, followed by the secondary sector. This indicates that the concentration on agricultural practices is less and people are largely engaged in transport, trade, and commerce activities. The trend in occupation pattern is presented in **Table 2.5**. There is an increase in the population of marginal and non-workers in 2001, which is an area of concern as this would add to the unemployment.

Table 2.5: Occupational Structure in Tambaram Town

Sr. No	Year	1971	1981	1991	2001
	Population	58,805	86,923	107,187	137,933
	Sector				
	<i>Primary Sector</i>				
1	Cultivators & Agricultural Laborers	984	796	785	357
2	Livestock & Mining	93	-	149	-
	Sub-Total- Primary	1,077	796	934	357
	<i>Secondary Sector</i>				
3	Household & Industry	3,239	186	6,979	499
4	Construction	908	-	2,123	-
	Sub-Total- Secondary	4,147	186	9,102	499
	<i>Tertiary Sector</i>				

Sr. No	Year	1971	1981	1991	2001
5	Trade & Commerce	3,097	-	6,939	-
6	Transport & Communication	2,223	-	3,299	-
7	Other Services/ Other Main Workers	6,616	5,672	13,192	43,110
	Sub-Total- Tertiary	11,936	5,672*	23,430	43,110*
8	Marginal Workers	-	295	227	2,764
	Total Workforce	17,160	6,949	33,693	46,730
9	Non- Workers	41,845	59,974	73,494	91,203
10	Work Force Participation Rate	29%	8%	31%	34%

Source: Census Reports

Note: * Includes the figures of Livestock & Mining, HH & Industry and the tertiary sector.

- (ii) Income Estimates for CMA. The following are the Income estimates for the Districts falling under CMA. The income estimates for districts in CMA is presented in **Table 2.6**.

Table 2.6: Income Estimates – NDDP at Current Prices

Sr. No	District	At Current Prices 1999-2000
		<i>Rs. Lakh</i>
1	Chennai	12,48,833
2	Kancheepuram	8,24,702
3	Thiruvallur	4,96,671
4	Tamil Nadu State	1,14,30,943

Source: Department of Economics and Statistics

Chennai City alone accounts for 10.94 percent of the State Income. Estimating the income in the areas of Kancheepuram and Thiruvallur District, which fall within CMA, based on proportion of population, it works out to 2.8 percent and 2.5 percent respectively. These show that CMA accounts for 16.21 percent of the State income from all sectors.

2. *Economic Gateways to Chennai*

56. **Chennai Port.** Chennai Port is one of the largest ports of India and comprises of well equipped shipping facilities (23 berths including 4 exclusive berths for containers), marine services and other associated facilities like warehouses and storages. The Port has full-fledged container terminals with road and rail connections, which offer all the advantages that containerization could provide such as packaging, landing, pilferage prevention and speedy



View of Ship at Chennai Port

transportation of cargo. The Port measures a water-spread area of 170 Ha and a land extent of 238 Ha. The principal items of Imports are Petroleum, Oil, Lubricants, Fertilizers, Food Grains and Fibers. The main items of export are Ores (mainly iron ores) granite stones, quartz, Barites, hides and skins, chemical and cotton goods. Chennai Port handles 60 percent of the total cargo handled by the State. The total number of containers handled during 2003 - 2004 was 5,39,265 showing an increase of 67 percent in the last 5 years. The passenger traffic shows an increase of 22 percent in the last five years.

57. *Ennore Port.* The Port of Ennore is the first corporatised port in the country and handles bulk cargo. The Port measures a water-spread area of 220 Ha. and a land extent of 1336 Ha. Currently, Ennore Port comprises only two berths and is planning to expand its shipping facilities to handle large volumes of bulk cargo. A port specific Special Economic Zone (SEZ) is being planned to enhance the economic opportunities of the port as well as the region.



Approach to Ennore Port

58. *International Airport.* The Chennai Airport is one of the largest airports of the country. It handled about 20.54 lakhs international passengers and 25.01 lakh domestic passengers during 2003-04. In addition, the airport handled cargo of about 1.50 lakh tons including 1.35 lakh tons of international cargo and has a significant share in total passengers as well as cargo handled in the four major Airports. The international passengers handled by Chennai Air Port have increased 4 fold from 1991 to 2004 where as the domestic passengers have increased 2 fold in the same year.



59. In addition, the existing airport is planned for a major expansion to make it a world-class airport and accordingly, GoTN has provided for 1,500 acres of land for its expansion. The expansion and modernization of Airport would impact the economic competitiveness and will have a major impact on the economy of the CMA/the State.

3. *Economic Drivers*

60. *Manufacturing Sector.* The manufacturing sector of Chennai comprises large industries such as petrochemicals and chemical industry, electrical and automobile and related ancillary industries. Chennai is the automobile capital of India with the presence of international car manufactures. Some of the largest industrial estates such as Ambattur and

Manali are located in CMA and house multi-product industries. Small industrial estates at Guindy, Thirumazhisai and Thirumudivakkam house medium and small-scale industries. Chennai has a large base of leather industry and accounts for 50 percent of the total exports of the country. Tamil Nadu accounts for 70 percent of leather tanning companies in



India and 38 percent of leather footwear and components; most of the footwear industries are located within CMA. A cluster of chemical industries is located at Manali in CMA. An export processing zone (MEPZ) spreading over an area of 261 acres is located at Tambaram for apparel and other exports.

61. The metropolitan region comprises large automobile engineering, glass and ceramic industries, which are located at Marai Malai Nagar, Irungattukottai, Sriperumbudur, Thiruvallore and Gummudipoondi. Tamil Nadu accounts for about 21 percent of passenger cars, 33 percent of commercial vehicles and 35 percent of automobile components produced in India. Chennai, the 'Detroit of India' is emerging as a major export hub for cars in South East Asia.
62. International car manufactures such as Ford, Hyundai, and General Motors etc. have established their manufacturing bases to cater to domestic and international markets. Some of the major industrial developments having an impact on the economic development of CMA include:
 - (i) Saint Gobain Glass factory at Sriperumbudur.
 - (ii) Mahindra Industrial Park developed over an area of 1,300 acres.
 - (iii) New testing and homologation centre for automobile sector with an investment of Rs. 1,000 Crores.

63. *New Economy Industries.* Chennai is a preferred destination for IT/ITES and houses all the top 10 IT Indian multi national Companies. The Tidal Park, with a combined area of 2.5 million sq.ft. is an established self-contained IT park housing all the major players in the IT sector. In addition, an exclusive IT Park is being developed at Siruseri to promote IT investments in the region and a Knowledge Industrial Township is being planned in Sholinganallur along the IT Corridor to meet the growing demands of the sector. Tamil Nadu is the second largest software exporter in the country next to Karnataka with more than 90 percent of the exports from Chennai alone. In addition, the initiatives



View of Tidal Park

that are planned/on-going that are likely to make Chennai the most preferred destination for new technology industries including:

- (i) Development of Bio-technology Park or TICEL
- (ii) Development of IT Corridor

4. *Industrial Development*

64. Industries, trade and commerce are the main driving factors for the economy in the town. In Tambaram, MEPZ Special Economic Zone (SEZ) was established in 1984 with the objective of promoting foreign direct investment, enhancing foreign exchange earnings, and creating greater employment opportunities. The Zone was converted into a Special Economic Zone on January 1, 2003. The added objective of the SEZ is to facilitate exports through reduction of transaction costs. To this effect, the Ministry of Commerce and Industries has introduced special features that include Offshore Banking Units and Container Freight Stations to be set up within the Zone, besides liberalized Customs procedures. It is expected that the cost, time and effort saved would translate to higher exports from the Zone.
65. MEPZ SEZ is a multi-product Zone housing 101 functional units and another 8 units are under various stages of implementation. The export turnover for the year 2004-2005 was Rs. 1,376 crores. Garments, software and engineering products contributed more than 50 percent of export value. Recent growth has been in engineering sector with special reference to automobile ancillaries.
66. Due to good connectivity by roads and railway line with other parts of the region, it has become a focal point for trade and commerce too.

5. *Population Growth Trends and Projection*

67. In order to carry out the demand analysis of infrastructure facilities in the town, the town's population has been projected. Different methods of population projection were analyzed and the one, which gave the best fit to the trend with minimal variance, is adopted.
68. For updating the detailed project report for Underground Sewerage Scheme for Tambaram Municipality, the consultants projected the population of Tambaram Municipality using Arithmetic Projection Method, estimated to be 2.23 lakh in 2034.

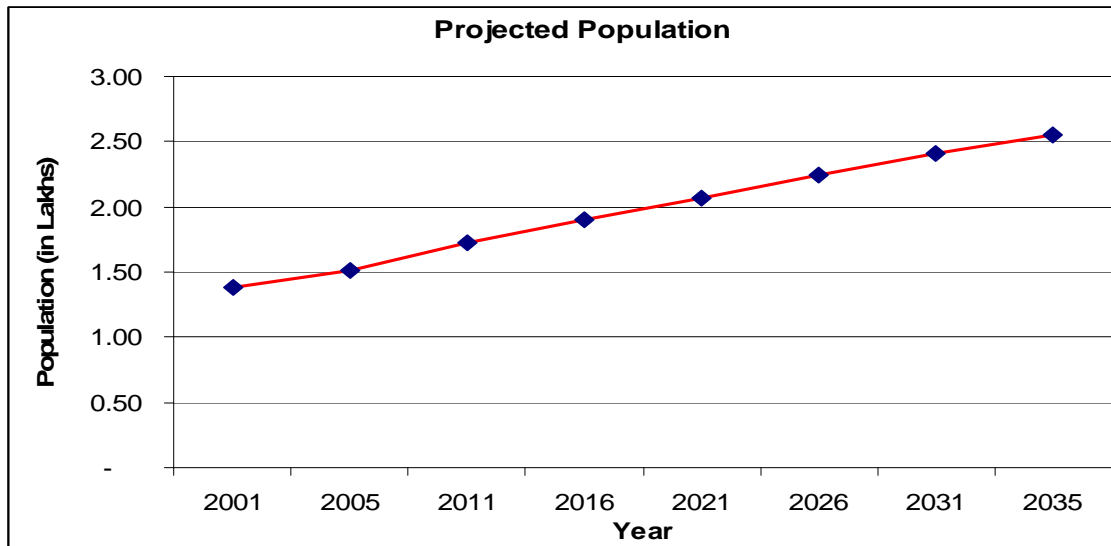
Table 2.6: Population Projected for UGD System

Year	Projected Population	Percentage Increase
	<i>Nos.</i>	<i>%</i>
2001	1,31,473	22.66
2004	1,45,355	5.54
2019	1,84,085	26.25
2034	2,22,815	20.79

Source: Final Report of Updating the Detailed Project Report for Underground Sewerage Scheme for Tambaram Municipality, Tamil Nadu

69. Considering the future potentiality of the town, a CAGR of 2.5 percent is assumed and projected, the population is estimated to be 1.72 lakh in 2011, 2.24 lakh in 2026 and 2.55 lakh in 2035.

Figure 2.4: Population Projection for Tambaram Town



70. According to the above projection method, the decadal growth rate between 2001 and 2011 is 25.00 percent and the CAGR is 2.26 percent. In comparison, the decadal growth between 1991 and 2001 is 28.68 percent and the CAGR is 2.55 percent.

Table 2.7: Population Projection

Year	Projected Population	CAGR
	Nos.	%
2001	137,933	2.55
2005	151,726	2.41
2011	172,416	2.20
2016	189,658	1.92
2021	206,900	1.76
2026	224,141	1.61
2031	241,383	1.49
2035	255,176	1.40

Source: Analysis

D. Socio-Economic Profile

1. Land and Housing

71. As per Census 2001, there are 35,359 census houses, out of which 33,602 are occupied and the remaining 1,757 are vacant. The residences form the major occupied houses in the town with 83.52 percent of total occupied census houses. This indicates the town is mainly a residential zone. The commercial and public institutions like shops and offices account for about 11 percent of the total occupied census houses.

Table 2.8: Occupied Census Houses

Occupied Census Houses	Numbers	Distribution
	<i>Nos.</i>	<i>%</i>
Residence	28,065	83.52
Residence cum Other Use	271	0.81
Shop, Office	3,751	11.16
School, College, etc.	72	0.21
Hotel, Lodge, Guesthouse, etc.	76	0.23
Hospital, Dispensary, etc.	124	0.37
Factory, Workshop, Work shed, etc.	282	0.84
Place of Worship	137	0.41
Other Non-Residential Use	824	2.45
Total Number of Occupied Census Houses	33,602	100.00

Source: Census Reports

72. Census of Tamil Nadu has classified houses based on the type of roof material, which is detailed out in **Table 2.9**. Like any other towns or cities in India, concrete roof is the most preferred in Tambaram also. The structures with concrete roof shares about 66 percent of the total census houses followed by roof made of grass, thatch, bamboo, etc., with 15 percent.

Table 2.9: Distribution of Census Houses by Type of Roof

Type of Roof	Numbers	Distribution
	<i>Nos.</i>	<i>%</i>
Grass, Thatch, Bamboo, Wood, Mud, etc	5,359	15.16
Plastic, Polythene	74	0.21
Tiles	4,107	11.62
Slate	109	0.31
G.I., Metal, Asbestos Sheets	1,932	5.46
Brick	322	0.91
Stone	140	0.40
Concrete	23,287	65.86
Any Other Material	29	0.08
Total Census Houses	35,359	100.00

Source: Census Reports

73. Based on the type of floor in occupied census houses, the census classification is given in the **Table 2.10**. The use of concrete floor is most preferred with 65 percent of the total occupied census houses followed by the usage of mosaic and other tiles.

Table 2.10: Distribution of Census Houses by Type of Floor

Type of Floor	Number	Distribution
	<i>Nos.</i>	<i>%</i>
Mud	2,743	7.76
Wood, Bamboo	26	0.07
Brick	140	0.40
Stone	98	0.28
Cement	22,990	65.02

Type of Floor	Number	Distribution
	Nos.	%
Mosaic, Floor Tiles	9,328	26.38
Any Other Material	34	0.10
Total	35,359	100.00

Source: Census Reports

74. Thus, Tambaram can be considered to house working sector that has reasonably good income.

2. Social Capital

75. *Markets.* The municipality maintains Periyar market in West Tambaram and New Market in East Tambaram. Periyar market houses more number of vegetable and fruit shops than the new market. They are also maintaining one fish market in the town.
76. *Park and Playground.* Tambaram municipality is maintaining eight parks within its jurisdiction. However, the parks are in bad condition and need immediate measures to be taken for maintaining a proper green belt and recreational facilities in the town.

3. Health

77. There are two government hospitals, one each at West and East (20 bedded) Tambaram. The municipality is also maintaining a health dispensary. Apart from these health facilities, the town houses 26 private hospitals and clinics and 2 dispensaries. No definite trend is observed in case of births. However, the trend line for deaths is increasing till 2003 and dropped in the following year of 2004 with 775 deaths registered.

Table 2.11: Number of Births and Deaths

Year	Births	Deaths
	Nos.	Nos.
2000	2,920	615
2001	2,928	821
2002	2,832	851
2003	2,887	859
2004	2,774	775

Source: Tambaram Municipality

4. Education

78. Tambaram houses government education institutions along with aided and private institutions. It is also known for the existence of world-renowned Madras Christian College and Indian Air Force Training Center.
79. In 2001, the literacy rate in the town was 77.45 percent. The literacy rate in Tambaram is higher than the Chennai City and the state urban average figures of 76.82 percent and 73.47 percent respectively. The main reason for high literacy can be attributed to its proximity to Chennai City, which houses wide range of educational facilities.

80. The local body is maintaining seven municipal schools within the area of its jurisdiction. In addition, the town has around 46 private schools and colleges.

III. URBAN MANAGEMENT

A. Institutions and Capacity

1. *Institutional Arrangements and Policy Context*

81. *Institutional Arrangements.* The State Government's line departments continue to play a crucial role in urban basic service delivery. Sectors and agency involvement include:
- (i) Water Supply & Sewerage. The Tamil Nadu Water Supply and Drainage Board (TWAD) and Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB), are the responsible agencies for creation of water and sewerage infrastructure. CMWSSB was formed in 1978 and as per the Act, it is responsible for the entire metropolitan area but has confined its operations to the Chennai Corporation limits. TWAD Board was established as a statutory body for planning and executing the water supply and sewerage schemes all over the state. The ULBs maintain the system – the ULBs, however, continue to face a shortage in quality staff to maintain the system.
 - (ii) Master Plan/Comprehensive Development Plan. Chennai Metropolitan Development Authority (CMDA) constituted under the Tamil Nadu Town and Country Planning Act, 1971, was set up as a planning and development agency for the controlled growth of Chennai Metropolitan Area (CMA). Presently, its activities are limited to the preparation and implementation of spatial and physical plans viz., Master Plan or Comprehensive Development Plans for spatial development of CMA through public consultations.
 - (iii) Roads and Highways. The Public Works Department (PWD) maintains National and State Highways that pass through the town/city. The ULB creates and maintains the municipal roads.
 - (iv) Environmental Protection. The Tamil Nadu Pollution Control Board (TNPCB) established in 1982 is responsible for environmental protection and enforcement of rulings related to the same, passed by competent authorities. The important ruling by the Supreme Court, regarding municipal solid waste, is yet to achieve its objective.
 - (v) Slum Upgradation. The Tamil Nadu Slum Clearance Board (TNSCB) was set up under the Tamil Nadu Slum Clearance Act 1971. The board develops slum improvement and rehabilitation schemes for notified/regularized slum settlements in the city/town. Infrastructure provision is financed partly through loans from the Housing and Urban Development Corporation (HUDCo) and partly through grants from GoTN and GoI.
82. In addition to involvement of various institutions in the development of regional and local-level infrastructure, the Urban Development Department controls local-level governance

through the Commissioner of Municipal Administration (CMA).

83. *Regulatory Framework.* The Tamil Nadu District Municipalities Act (1920) governs the management of Urban Local Bodies of Tamil Nadu and the same is applicable to Tambaram.

2. *Service Delivery and Performance of ULB*

84. Tambaram Municipality is governed by the Tamil Nadu District Municipalities Act (1920). The municipality is responsible for the provision of services and basic amenity to the citizens, which include:

- (i) Distribution of potable water;
- (ii) Operation and maintenance of drainage and sewerage systems;
- (iii) Public lighting;
- (iv) Sanitation and public hygiene;
- (v) Construction and maintenance of bus terminals, roads, culverts, and bridges;
- (vi) Maintenance of public parks and gardens;
- (vii) Ensuring systematic urban growth;
- (viii) Regulation of building construction; and
- (ix) Licensing of commercial activities, etc.

B. Organization Structure of Urban Local Body

85. Prior to 1964, Tambaram was a small Panchayat. In 1964, it was constituted as Grade III Municipality comprising the Village Panchayats of Pulikoradu, Irumbliyur, and Selaiyur. Due to rapid growth and development of the town residentially as well as commercially, the Municipality is upgraded to Selection Grade Municipality in 1998. The municipality is governed by the Tamil Nadu District Municipalities Act, 1920. The organizational setup of the municipality comprises of a Political Wing and an Executive Wing. The Political Wing is an elected body of Councilors from different wards in the town, headed by the Chairperson. The Executive Wing, headed by the Commissioner looks after the day-to-day functioning of the municipality and supports the Political Wing in the decision-making process.

Political Wing

86. The Municipal Council, the political arm of the Municipality consists of 39 elected Councilors, each representing a ward. The Chairperson (elected from among the Councilors) heads the Municipal Council, which performs its duties as per the provisions of the District Municipalities Act. The political wing provides an overall direction to the Municipality and performs its functions through a set of committees constituted for different purposes.

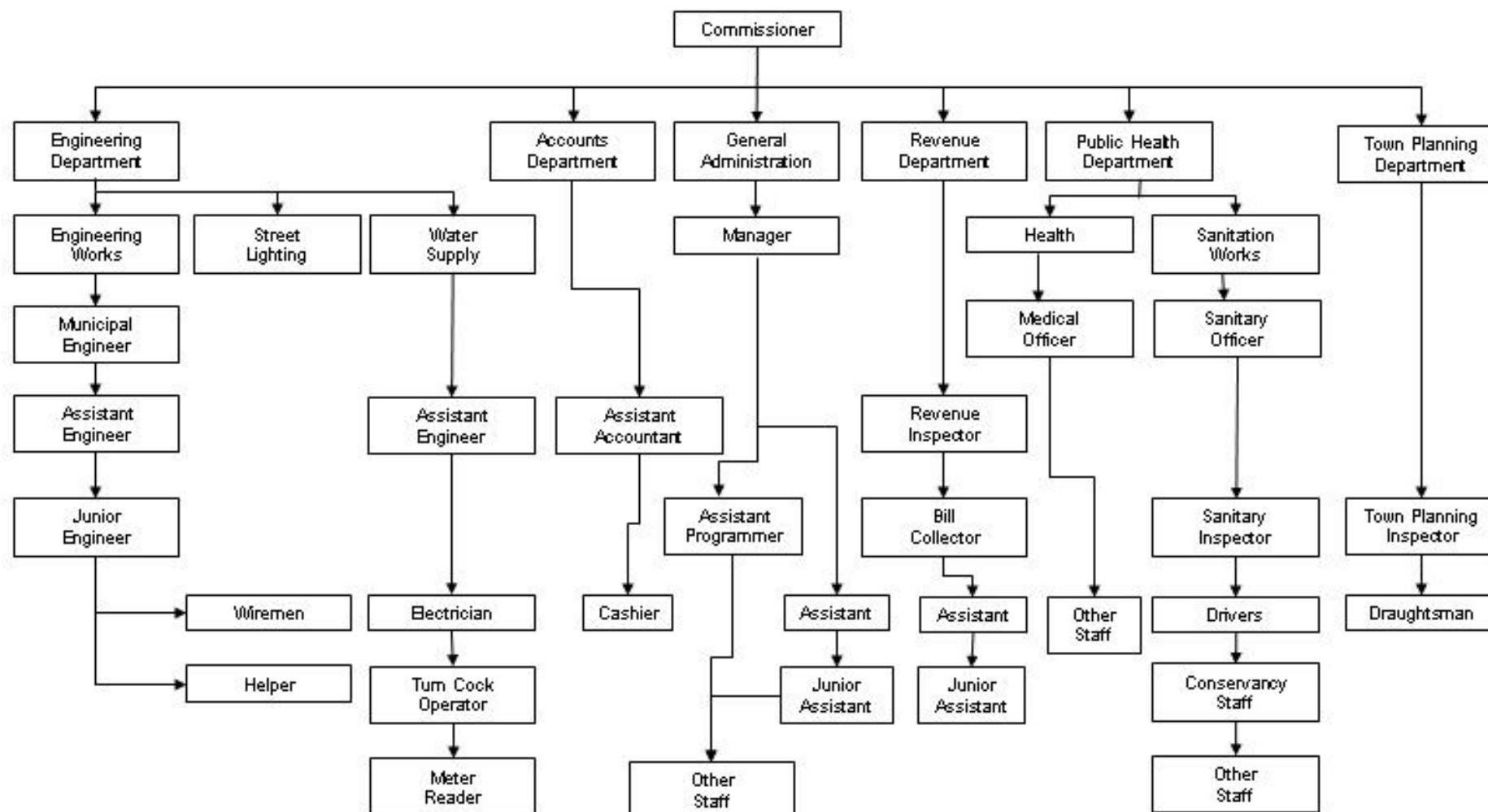
Executive Wing

87. The Executive Wing is responsible for day-to-day operations of the Municipality, and is

headed by the Municipal Commissioner. The Commissioner is the administrative head of the Municipality and is supported by different departments in the operations. The organizational structure of the Municipality comprises of five functional Departments.

88. The organization chart of Tambaram municipality has been shown in the following **Figure 3.1**.

Figure 3.1: Organization Chart of Tamparam Municipality



89. Tamparam Municipality consists of five functional Departments (refer **Table 3.1**). Each departmental head reports to the Commissioner and functions as per the responsibilities prescribed in the Act and as delegated by the Municipal Commissioner.

Table 3.1: Municipal Departments and Functions

Department	Functions
General Administration	Establishment, Records, Accounts, Correspondence, Treasury
Engineering	Works, Water Supply and Operation and Maintenance
Public Health	Preventive Health Care, Conservancy, Vital Statistics
Revenue	Billing and Collection of Taxes, Charges and Fees
Town Planning	Administration of Master Plan

90. The following are the set of rules for different departments of the local body:
- (i) The Tamil Nadu Municipal General Service Rules, 1970
 - (ii) The Tamil Nadu Municipal Engineering and Water Works Service Rules, 1970
 - (iii) The Tamil Nadu Municipal Engineering Service Rules, 1997
 - (iv) The Tamil Nadu Municipal Town Planning Service Rules, 1970.
 - (v) The Tamil Nadu Municipal Medical Service Rules, 1970.

General Administration Department

91. The General Administration Department, headed by the Manager oversees the administrative functions of the Municipality including the accounts and budgeting. The other functions of the Department include:
- (i) Public Relations and Redressal of Public Grievances,
 - (ii) Appointments and Transfers,
 - (iii) Council Subjects,
 - (iv) Correspondence,
 - (v) Record Maintenance,
 - (vi) Maintenance of Accounts, etc.
92. The General Administration Department is further divided into three sections viz.
- (i) Establishment Section
 - (ii) Dispatch/ Typing and Record Maintenance Section, and
 - (iii) Accounts Section

Establishment Section

93. An Assistant who reports to the Manager heads the Establishment Section. The responsibilities of this section include

- (i) Appointments
- (ii) Leave Sanctions and Records
- (iii) Correspondence related to Establishment affairs

Dispatch, Typing and Records Maintenance Section

94. A Junior Assistant is responsible for the Numbering and Delivery of all inward correspondence. He handles and maintains all records of all Departments. He is assisted by an attender to dispatch correspondence to all Departments.

Accounts Section

95. The Accounts section headed by the Accountant who carries out functions relating to finances, and accounts of all the Departments except Water Supply and Drainage. In Tambaram municipality, the post is vacant and Assistant Accountant is in charge for the operations. The Accounts Section also monitors the grants and State Government transfers and devolution, and manages Debt Servicing, Provident Fund Accounts, Pensions, Salaries, Advances, etc.
96. The Assistant Accountant (in case of Tambaram) is responsible for the accounting function of the municipality- his function includes the recording of transactions, maintaining the accounts and compilation of accounts. One Assistant assists him in this task. A major function of the Assistant Accountant is the preparation of the Annual Budget. The Manager oversees all the activities of this Section.
97. The specific functions of the Accounts Section include:
- (i) Receipt of Cash and Cheques,
 - (ii) Scrutiny of Bills,
 - (iii) Maintenance of Records/ Registers and Account Books, Payments, etc.

C. Engineering Department

98. The Engineering Department is responsible for all Public Works, and maintenance of civic facilities. This Department is responsible for the following works:
- (i) Public Works (Construction and maintenance of roads and storm water drains,
 - (ii) Maintenance of school buildings,
 - (iii) Construction and Maintenance of Public Conveniences,
 - (iv) Maintenance of other facilities viz., Bus stand, Markets, etc.
 - (v) Street Lighting (Maintenance of Street Lights)
 - (vi) Water Supply and Sewerage (Provision and operation and maintenance of water supply and sewerage system)
 - (vii) Parks and Gardens (Maintenance of parks and gardens)
99. The Engineering Department co-ordinates with Tamil Nadu Water Supply & Drainage Board (TWAD) and other state government agencies to implement water supply and other

developmental works. The Department is responsible for ensuring the quality of works and their timely completion.

100. The Municipal Engineer (of Executive Engineer Level) heads the engineering department, and is assisted by Assistant Engineer, Junior Engineer and other staff. As regards fieldwork, Scheme works are delegated to one Junior Engineer who also looks after regular works, related to Public Works, Drains, Street Lighting. The Assistant Engineer looks after the water supply and is assisted by electrician, operators and other staff.

Functions

101. A major function of the Municipality is formulation and execution of Works- like construction and maintenance of roads, buildings and other infrastructure systems.
102. *Capital Works.* Capital Works under specific schemes or Master Plan Proposals includes new construction whether entirely of new works or of major additions/ modifications to existing assets like buildings, roads, infrastructure network, etc.

Maintenance Works

103. Maintenance and repair of existing buildings and infrastructure systems, and construction of minor works.
104. These works involve the co-ordination of various functional departments within a local body, including the Engineering, Administration and Accounts Departments, Council, etc.
105. Based on the functions, the department has four Sections viz.
 - (i) Public Works
 - (ii) Street Lighting
 - (iii) Water Supply
 - (iv) Parks and Gardens

D. Public Health Department

106. The Department is headed by a Sanitary Officer (this post is vacant) who is assisted by two Sanitary Inspectors, ten Supervisors and several other staff in carrying out the Departmental functions.

Functions

107. The Public Health Department is vested with the responsibility of ensuring safe sanitation and cleanliness of a town. The Department is also responsible for the maintenance of Municipal Dispensaries, Burial Grounds and Slaughter Houses.

Maintenance of Sanitation

108. One of the most crucial services of a municipality is maintenance of sanitation and cleanliness in the town. This involves mainly conservancy works involving sweeping of roads, garbage collection and disposal, cleaning of drains, and disinfecting of drains.
109. Two Sanitary Inspectors co-ordinate the entire conservancy works. Ten Sanitary Supervisors and 180 sanitary workers assist them. The sanitary workers sweep the roads and clean choked drains on a daily basis depending upon the prevailing activities. Private contract was awarded for SWM in certain areas of the town. Market areas and main roads are cleaned every day.
110. For the transportation of the garbage collected to the disposal point, the municipality employs own as well as hired vehicles. The maintenance and upkeep of the vehicles is also the responsibility of the Public Health Department. The garbage is transported to a dumping yard situated about 7 km from the town.
111. The municipality has privatized 11 wards for the solid waste management while the remaining wards are handled by the local body. The municipality has proposed to convert the existing compost yard into a transfer station and the identified 16.67 acres of land at Venkata Mangalam for proper land filling and composting of waste.

E. Revenue Department

112. The main function of the Revenue Department is the collection of taxes and charges as levied by the Municipality. The Department serves Demand Notices to the tax payers and charge sheet in the case of default.
113. The Revenue Department is headed by a Revenue Officer (in Tambaram municipality, the post is vacant) and consists of one Revenue Inspector, eight Bill Collectors, one Assistant and three Junior Assistants in carrying out its functions.

Functions

114. This department is solely responsible for the revenue management functions of the Municipality. The function of the department is two-fold:
 - (i) Levy, Assessment and Collection of Taxes, Fees and Charges; and
 - (ii) Accounting of Collections
115. The various revenue sources of the Municipality include Taxes, Fees, Charges, and Rents.

F. Town Planning Department

116. The Town-Planning Department's main function is to implement the Master Plan proposals, ensure orderly growth in the town and avoid unauthorized constructions and to

formulate projects. The Department is vested with the powers to issue Building Licenses, grant Planning Permissions, collect Development Charges and Encroachment Charges etc. The Department is headed by a Town Planning Officer (this post is vacant in Tambaram municipality) and consists of three Town Planning Inspectors, and one draughtsman.

Functions

117. With regard to day-to-day operations, the Town Planning Department is responsible for issue of building permissions and licenses.

3. Institutional Strengthening and Capacity Building

118. The vacancy rate of municipal staff in Tambaram is about 16 percent, which is high. The vacancy rates within departments shows that Accounts Department has a high vacancy rate of 50 percent followed by Public Health and Engineering (Water Supply) Departments with 20 percent and 18 percent respectively. This is an area of concern as the above-mentioned departments play a major role in providing and maintaining services in the town.

Table 3.2: Staff details of Tambaram Municipality

Item	Staff
Sanctioned Positions	361
Vacant Positions	57
Filled Positions	304
Vacancy Rate %	15.79

Source: Tambaram Municipality

G. Municipal Financial Management

4. Municipal Fund

119. *Overview.* Tambaram Municipality maintains a municipal fund for managing the finances of the Municipality. The accounts of the municipal fund were maintained on a cash based single entry system till the FY 1999-2000. The financial status of the municipality has been reviewed for the past four years, commencing from the financial year 2000-01. This section contains a description of the municipal finances, the sources and uses of funds, and an assessment of municipal finances based on important financial indicators. Currently, the urban local bodies of Tamil Nadu maintain three separate funds, namely General Fund (Revenue Fund), Water & Drainage Fund and Education Fund. For the purpose of this analysis, Education fund has been clubbed into General fund. For further analysis, the items of each fund are categorized under three major heads – Revenue Account, Capital Account and Deposits and Advances.
120. *Revenue Account.* All recurring items of income and expenditure are included under this head. These include taxes, charges, salaries, maintenance expenditure, debt servicing etc.
121. *Capital Account.* Income and expenditure items under this account are primarily non-

recurring in nature. Income items include loans, contributions by GoTN, other agencies and capital grants under various State and Central Government programs, revenue account transfer for capital works and income from sale of assets. Expenditure items include expenses booked under developmental works and purchase of capital assets.

122. *Deposits and Advances.* Under the municipal accounting system, certain items are compiled under advances and deposits. These items are temporary in nature and are essentially adjustments for the purpose of recoveries and payments. Items under this head include library cess, income tax deductions, pension payments, provident fund, payment and recoveries of advances to employees and contractors, etc.

5. Financial Status

Figure 3.2: Total Revenue Income and Expenditure Trend

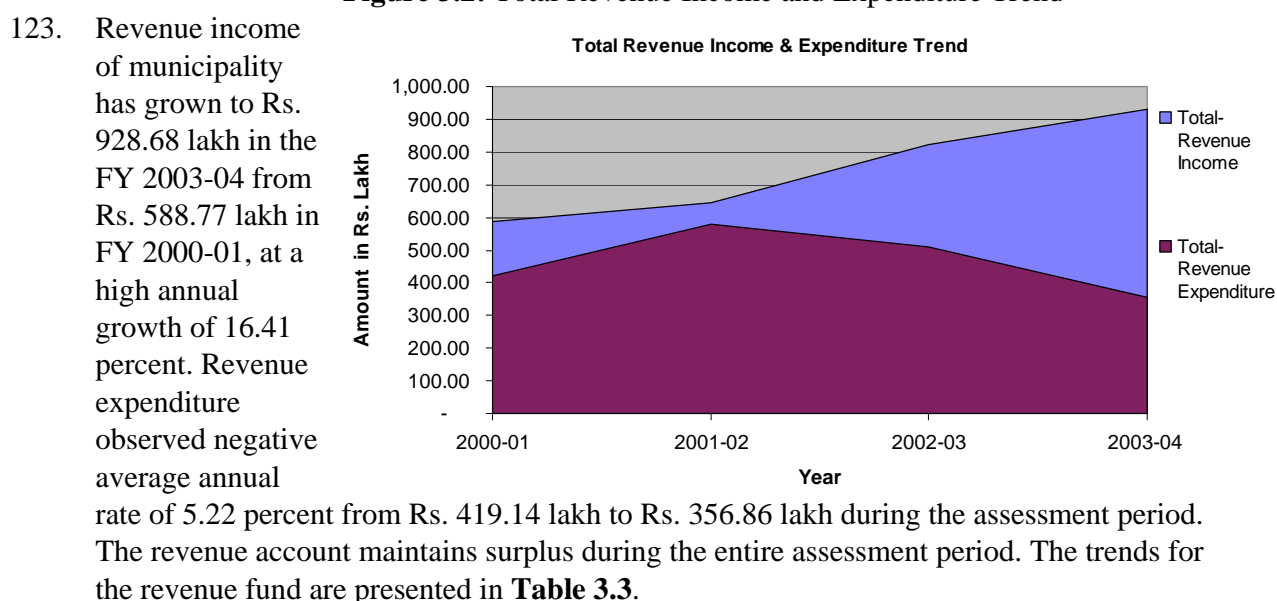


Table 3.3: Summary of Municipal Fund

Item	2000-01	2001-02	2002-03	2003-04
<i>Amount in Rs. Lakh</i>				
Revenue Account				
Revenue Income	588.77	645.19	821.11	928.68
Revenue Expenditure	419.14	577.25	509.49	356.86
<i>Surplus/Deficit</i>	<i>169.63</i>	<i>67.94</i>	<i>311.62</i>	<i>571.82</i>
Capital Account				
Capital Income	131.98	191.32	302.59	100.37
Capital Expenditure	369.82	287.46	437.68	52.80
<i>Surplus/Deficit</i>	<i>(237.84)</i>	<i>(96.14)</i>	<i>(135.08)</i>	<i>47.57</i>
<i>Fiscal Status</i>	<i>(68.21)</i>	<i>(99.34)</i>	<i>74.26</i>	<i>639.00</i>
Advances & Deposits				
Extraordinary Income	162.36	160.35	272.46	564.82
Extraordinary Expenditure	16.14	53.91	110.29	94.98
<i>Surplus/Deficit</i>	<i>146.22</i>	<i>106.44</i>	<i>162.17</i>	<i>469.83</i>
<i>Overall Fiscal Status</i>	<i>78.01</i>	<i>75.31</i>	<i>335.77</i>	<i>1,034.58</i>

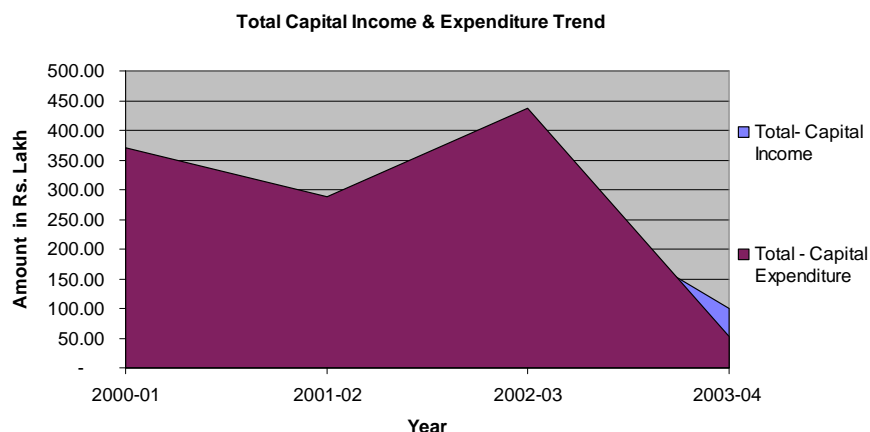
Source: Tambaram Municipality & Analysis.

Note: Figures in parentheses indicate a deficit. Capital Income includes Revenue account

transfer for capital works.

Figure 3.3: Total Capital Income and Expenditure Trend

124. Capital income comprises of loans, grants and contribution in the form of initial deposit for water supply connections, revenue account transfer for capital works and sale proceeds of assets.



Majority of the capital income is in the form of grants. The capital account has witnessed deficit in all the financial years except for 2003-04, implying revenue account was being used for asset creation. Fiscal status of revenue account and capital account status witnessed surplus during assessment period except in 2000-01 and 2001-02. Major share of capital expenditure were incurred during the assessment period was public works and roads asset creation.

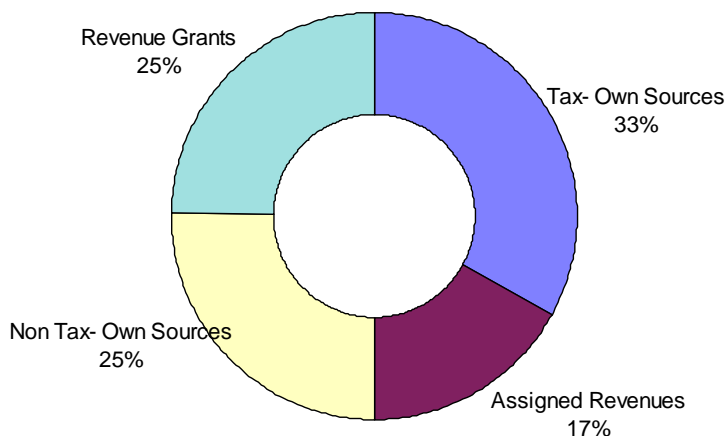
125. The following sections present a detailed review of revenue and capital accounts, primarily aimed at assessing the municipal fiscal status and providing a base for determining the ability of municipality to sustain the planned investments.

6. Revenue Account

126. The revenue account comprises of two components, revenue income and revenue expenditure. Revenue income comprises of internal resources in the form of tax and non-tax items and external resources in the form of shared taxes/ transfers and revenue grants from the State Government. Revenue expenditure comprises of expenditure incurred on establishments, operation and maintenance and debt servicing.

Figure 3.4: Source of Income (2000 to 2004)

127. *Revenue Income.* The revenue sources of Municipality can be broadly categorized as own sources, assigned revenues and grants. The source-wise income generated during the review period is presented in **Table 3.4**. The base and basis of each income source has been further elaborated in the following section. The revenue income of Tambaram Municipality has increased from Rs. 538.09 lakh in 2000-01 to Rs. 862.39 lakh in 2003-04 – a high Compound



Annual Growth Rate (CAGR) of about 17.03 percent. During the financial year 2003-04, Tambaram Municipality has received maximum surcharge on stamp duty and State Finance Commission Grant (inconsistent transfer of ULB share), which attribute to high revenue income during the same period.

Table 3.4: Sources of Revenue Income

Item	2000-01	2001-02	2002-03	2003-04
	<i>Amount in Rs. Lakh</i>			
Own Sources				
Tax	192.16	271.87	228.82	241.80
Non Tax	159.63	161.98	153.58	157.61
Assigned Revenue	96.48	56.68	164.98	186.73
Grants	89.82	120.66	220.64	276.25
Total (excl. W&D A/C)	538.09	611.18	768.03	862.39

Source: Tambaram Municipality & Analysis.

128. Own-source income includes income from resource mobilization activities of Municipality in the form of taxes, income from municipal properties and markets, building permit fee, trade licenses, income from fees and fines, etc. Own revenue sources are further classified as tax revenue and non-tax sources that are generated by various sections of the municipality. The salient features of revenue head is detailed below:

- (i) Own Sources/Tax. This item head comprises income sourced primarily from property tax (General purpose tax, Lighting tax, Scavenging tax and Education tax excluding Water and Drainage tax), professional tax and other taxes. The property tax is the largest revenue-generating item. Own sources of tax income are presented in **Table 3.5**. Average income from own sources constituted 34.51 percent of the total revenue income during the review period and has increased at an average compounded annual growth rate of 7.96 percent. Tax sources contributed 34.51 percent of the revenue income and non-tax sources contribute 23.61 percent of the revenue income.

Table 3.5: Own Sources of Revenue Income

Item	2000-01	2001-02	2002-03	2003-04
	<i>Amount in Rs. Lakh</i>			
Taxes				
Property Tax (excl. W&D Tax)	148.96	218.88	166.44	176.32
Profession Tax	43.20	52.99	62.38	65.48
Other Taxes	-	-	-	-
Non - Taxes				
Income from ULB's Properties	40.93	52.05	50.05	59.49
License Income (Trade, etc.)	27.17	28.39	32.33	31.41
Income from Fees and Fines	12.29	15.43	18.59	41.13
Miscellaneous Income	79.24	66.11	52.62	25.58
Total (excl. W&D A/C)	351.79	433.85	382.40	399.41

Source: Tambaram Municipality & Analysis.

- *Property Tax*. This is the most important category of own source income to the

municipality. Tambaram Municipality levies a consolidated property tax of 25 percent of the Annual Ratable Value (ARV).

Figure 3.5: Property Tax Collection Performance

The average collection performance of Property Tax for the review period is 37 percent and the same is presented in **Table 3.6**. The property tax levied is 25 percent of the Annual Rental Value (ARV) and includes the general tax (14 percent), water and drainage tax (6 percent) and education tax (5 percent). It is observed that the municipality maintained a poor arrear collection, averaging about 14 percent.

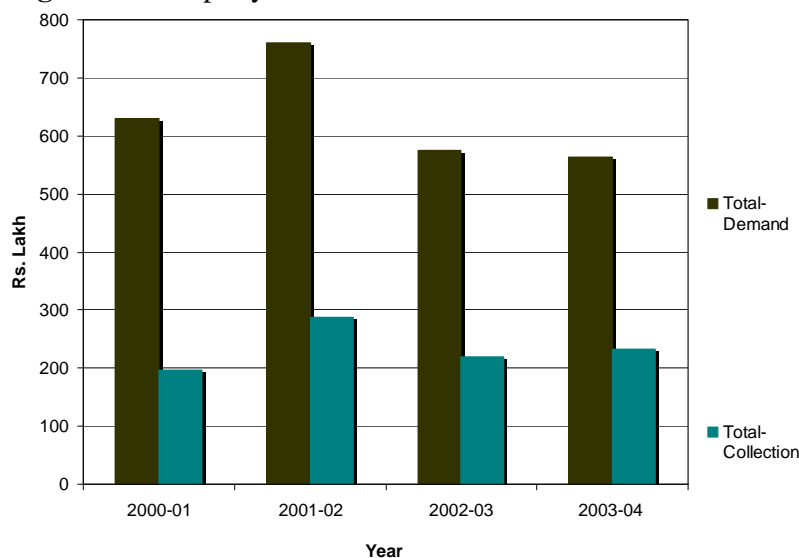


Table 3.6: Property Tax – Demand Collection and Balance Statement

Item	2000-01	2001-02	2002-03	2003-04	2004-05
Demand (Rs. Lakh)					
Arrear	360.00	488.00	290.00	276.00	264.00
Demand	269.00	272.00	284.00	288.00	297.00
<i>Total</i>	<i>629.00</i>	<i>760.00</i>	<i>574.00</i>	<i>564.00</i>	<i>561.00</i>
Collection (Rs. Lakh)					
Arrear	54.00	101.00	26.00	34.00	39.00
Demand	142.00	187.00	193.00	198.00	203.00
<i>Total</i>	<i>196.00</i>	<i>288.00</i>	<i>219.00</i>	<i>232.00</i>	<i>242.00</i>
Collection Performance (%)					
Arrear	15%	21%	9%	12%	15%
Demand	53%	69%	68%	69%	68%
<i>Total</i>	<i>31%</i>	<i>38%</i>	<i>38%</i>	<i>41%</i>	<i>43%</i>

Source: Tambaram Municipality & Analysis.

The total collection performance of the municipality has witnessed an increasing trend from 31 percent to 43 percent during the assessment period. The maximum arrear collection was achieved during the FY 01-02 and the same was as low as 9 percent during FY 02-03. There are a total of 24,323 assessed properties in the Municipality. The average ARV per property during the FY 04 is Rs. 4,884 and the average tax per property is Rs. 1,221.

- **Professional Tax.** Professional tax is also collected by the municipality from all registered organizations, companies or firms, public or private, individuals and

State and Central Government departments. Currently, 17,416 assessee are registered with the Municipality. Based on the demand, the average tax per professional is about Rs. 328 per annum. Low arrear collection of 5 percent was observed during 2000-01, while the maximum arrear collection performance of 20 percent was registered during 2002-03. The overall collection performance for the FY 2004-05 is 60. The details of Demand Collection and Balance statement are provided in **Table 3.7**.

Table 3.7: Profession Tax – Demand Collection and Balance Statement

Item	2000-01	2001-02	2002-03	2003-04	2004-05
Demand (Rs. Lakh)					
Arrear	61.67	73.62	71.03	56.52	50.49
Demand	48.37	50.39	47.87	59.45	65.66
<i>Total</i>	<i>110.04</i>	<i>124.01</i>	<i>118.90</i>	<i>115.97</i>	<i>116.15</i>
Collection (Rs. Lakh)					
Arrear	3.28	8.54	14.51	6.03	4.28
Demand	39.92	44.45	47.87	59.45	65.66
<i>Total</i>	<i>43.20</i>	<i>52.99</i>	<i>62.38</i>	<i>65.48</i>	<i>69.94</i>
Collection Performance (%)					
Arrear	5%	12%	20%	11%	8%
Demand	83%	88%	100%	100%	100%
<i>Total</i>	<i>39%</i>	<i>43%</i>	<i>52%</i>	<i>56%</i>	<i>60%</i>

Source: Tambaram Municipality & Analysis.

- (ii) **Own Sources/Non-Tax.** This item head comprises income from municipal properties, fees on municipal services (building permission, etc.), income from interest on investment and miscellaneous services. On an average, through the assessment period, own source/non-tax income constitutes 23.61 percent of the total revenue income. Income from remunerative enterprises, income from fees and fines constitute the major revenue sources under this item head. Income through non-tax own sources of the municipality has registered negative growth during the assessment period at a CAGR of about 0.42 percent.
- *Remunerative Enterprises.* Income from remunerative enterprises is the non-tax income in the form of rentals from assets like shopping complexes, market fee, parking fee and income from other real assets owned by the municipality. Income from the remunerative assets of the municipality contributed 7.38 percent of the revenue income during the assessment period and registered a high CAGR of about 13.28 percent. The average revenue mobilized during the review period under this item head is Rs. 50.63 lakh.
- (iii) **Assigned Revenues.** This item head comprises income from Government of Tamil Nadu (GoTN)/State transfers of Municipal income collected by the state line department. Transfers are in the form of the municipality's share of taxes levied and collected by GoTN from establishments/operations within the municipal limits. Surcharge on transfer of immovable properties and entertainment tax are the major items from which the municipality realizes these revenues.

Table 3.8: Income from Assigned Revenue

Item	2000-01	2001-02	2002-03	2003-04
	<i>Amount in Rs. Lakh</i>			
Entertainment Tax	36.25	12.06	30.74	22.11
Surcharge on Stamp Duty	54.06	44.55	134.24	164.62
Other Transfers	6.17	0.06	-	-
<i>Total</i>	<i>96.48</i>	<i>56.68</i>	<i>164.98</i>	<i>186.73</i>
Share in Total Revenue Income (%)	17.93	9.27	21.48	21.65
<i>Growth (%)</i>		<i>(41.26)</i>	<i>191.09</i>	<i>13.18</i>

Source: Tambaram Municipality & Analysis.

The average income through assigned revenues contributes around 17.58 percent of revenue income and it is growing at an average compounded annual growth rate of 24.62 percent during the review period. It is observed (**Table 3.8**) that the inflow from this account head has been inconsistent due to delays in transfers and deductions at source towards municipality debt repayment commitments and/ or other dues payable to GoTN.

- *Entertainment Tax.* The Commercial Tax (CT) Department collects entertainment tax from three cinema halls (with a total capacity of 2,053 seats) functioning within Municipal limit. The CT Department transfers 90 percent of the total tax collection to Municipality, and retains 10 percent towards management charges. Entertainment tax accounts for around 3.82 percent of total revenue income.
 - *Stamp Duty.* Surcharge on stamp duty is another assigned revenue source, accounting for 13.48 percent of revenue income during the assessment period. It is levied in the form of a surcharge on stamp duty applicable on all properties registered or transferred within municipality limits. The Registration Department collects this and 90 percent of the collections are transferred to municipality.
- (iv) Revenue Grants and Contribution. This item mainly comprises revenue grants and compensations from the State Government under various heads. The regular grants include the SFC grants and the others include aid grants, grants for services like roads, buildings, maternity and child welfare, public health, contributions for elementary and secondary schools etc. Grants, which are for specific purposes, are ad-hoc in nature. In case of Tambaram Municipality, revenue grants have contributed about 24.30 percent of the total revenue income and have registered a high annual growth rate of 45.43 percent. SFC Devolution is a major item of grants, which is transferred as per SFC recommendation. Twelve percent of state revenue under pool B is transferred to each local body based on a formula recommended by SFC. The fluctuation in SFC grant is due to delay and deduction at source.

Table 3.9: Income from Revenue Grants

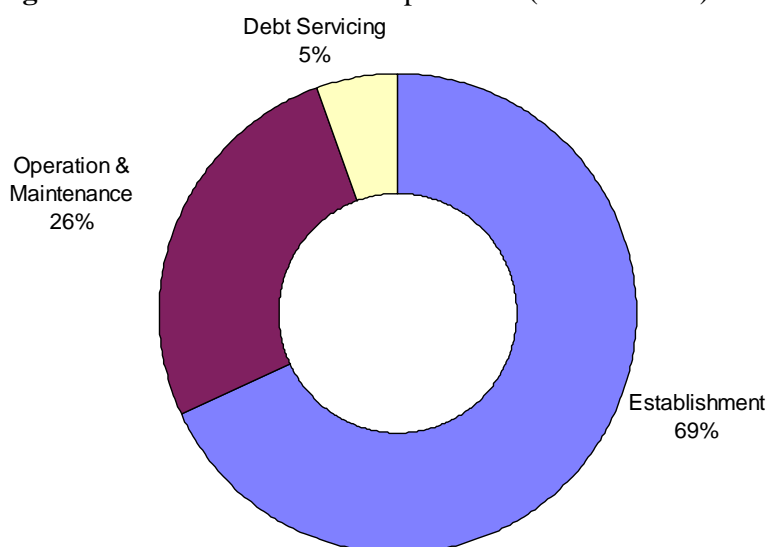
Item	2000-01	2001-02	2002-03	2003-04
<i>Amount in Rs. Lakh</i>				
State Finance Commission Grant	89.82	102.09	202.10	276.25
Other Grants	-	18.57	18.54	-
<i>Total</i>	89.82	120.66	220.64	276.25
Share in total Revenue Income (%)	16.69	19.74	28.73	32.03
<i>Growth (%)</i>		34.33	82.87	25.20

Source: Tambaram Municipality & Analysis

Figure 3.6: Items of Revenue Expenditure (2000 to 2004)

129. *Revenue Expenditure.* Revenue expenditure of the Municipality has been analyzed based on expenditure heads broadly classified under the following departments- General Administration and Tax collection, Public Works and Roads, Street Lighting, Public Health and Conservancy, Town Planning and Miscellaneous Items.

Water supply and drainage revenue expenditure is analyzed separately and the same is presented in the following section. Revenue expenditure is further classified under Establishment, Operation and Maintenance and Debt Servicing.

**Table 3.10: Sectorwise Revenue Expenditure**

Item	2000-01	2001-02	2002-03	2003-04
<i>Amount in Rs. Lakh</i>				
Establishment	305.16	424.67	275.34	214.91
Operation & Maintenance	84.08	81.48	127.49	63.88
Debt Servicing	-	18.13	25.52	43.13
<i>Total (excl. W&D A/C)</i>	389.24	524.29	428.34	321.92
<i>Growth (%)</i>		34.69	(18.30)	(24.84)

Source: Tambaram Municipality & Analysis.

- (i) Establishment Expenditure. Establishment expenditure alone accounts for about 72.6 percent of revenue expenditure, excluding water supply and drainage account. About 45 percent of the total revenue income is utilized for payment of salaries excluding water supply and drainage staff salary and other related expenses. Debt servicing of the Municipality accounts for a meager 5.70 percent of the revenue expenditure, undertaken from the general fund during the review period.

For the assessment period, revenue expenditure observed negative CAGR of 5.22

percent; while growth in revenue income was 16.41 percent during the same period. This indicates that revenue and education fund of the Municipality is in surplus.

Further, while expenditure on establishment grew at a negative annual average rate of 11.03 percent, expenditure on O&M declined at an average rate of 8.75 percent per annum indicating that the operation and maintenance expenditure allocation was declining during the assessment period.

- (ii) Operations & Maintenance. Operation and maintenance expenditure of all sections together accounts for 21.69 percent of revenue expenditure and had decreased at an average rate of 8.75 percent per annum. General administration, public health and conservancy and street lighting are the major expenditure items. A major portion of O&M expenses towards power charges for street lighting and for general administration; while that for the upkeep of roads has been minimal. Privatization of street lighting sector has already been initiated and energy conservation measures implemented to curtail the costs on repairs.
- (iii) Debt Servicing. A review of the outstanding loan statement of municipality, as on March 31, 2005, i.e., at the start of the FY 2004-05 reveals that the net outstanding debt liabilities of municipality are at Rs. 442.97 lakh. **Table 3.11** details out the agency-wise outstanding loans.

Table 3.11: Outstanding Loan Statement

Item	Loan Amount	Outstanding
	<i>Amount in Rs. Lakh</i>	
TNUDF -Mega City	14.10	11.71
TUFIDCO - Mega City Project	411.16	298.96
TUFIDCO - Own Fund	161.65	132.30
Total	586.91	442.97

Source: Tambaram Municipality & Analysis.

- 130. The total amount of loans drawn by the municipality till date is Rs. 586.91 lakh, majority of it from Mega City project loan. It needs to be mentioned that the ratio of outstanding loans to current demand of property tax is about 154 percent. The ratio in terms of ARV (estimated at Rs. 4,884) is 2.68; thereby indicating that the municipality is capable of leveraging additional debt to finance its projects as this is between the threshold of 2 to 3 (generally considered by Financial institutions).
- 131. Debt servicing accounted for around 5.70 percent of revenue expenditure during the review period and the DSR (as % of revenue income) is around 2.91 percent, which is well below the threshold level of 25 percent, as considered by financial institutions. The Municipality has to start to focus upon sustainable debt servicing after having cut down establishment costs to improve its credit rating and capability towards leveraging additional debts.

7. Water Supply and Drainage Account

- 132. As mentioned earlier, local bodies in Tamil Nadu maintain a separate water supply and drainage fund. Hence, to maintain the consistency and to assess the cost recovery aspect,

the consultants have analyzed the water fund separately. The details are provided in the following table and the water supply and drainage revenue fund expenditure trend is plotted on a graph.

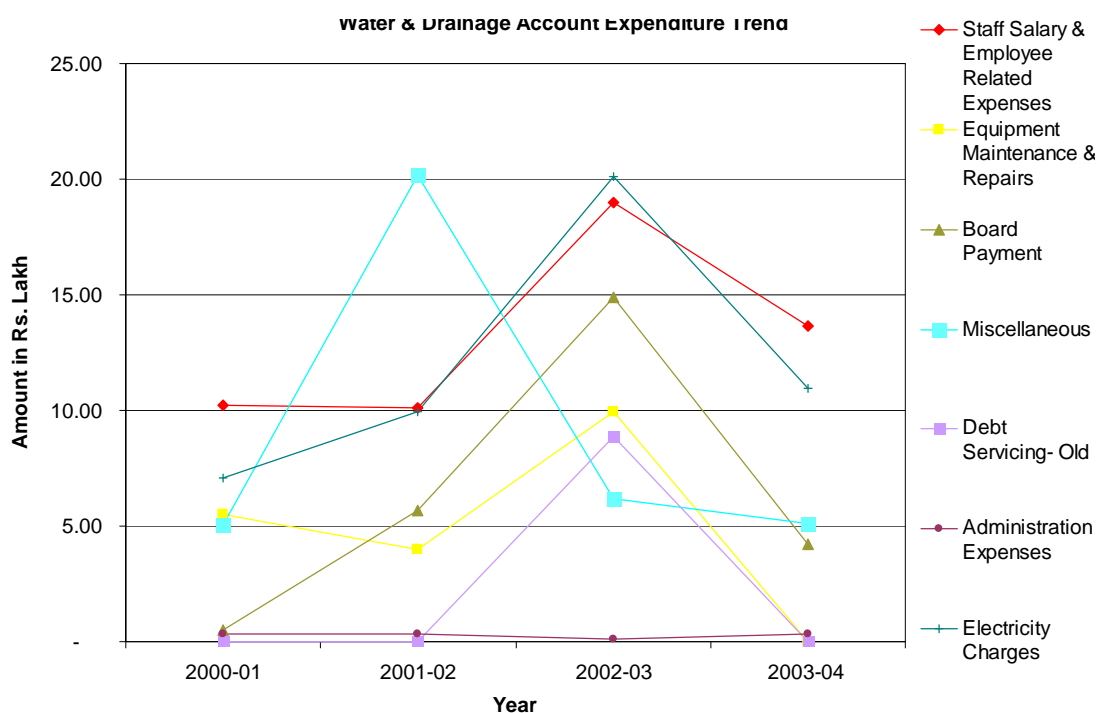
Table 3.12: Revenue Account Status of Water Supply and Drainage Fund

Item	2000-01	2001-02	2002-03	2003-04
<i>Amount in Rs. Lakh</i>				
Revenue Income				
Water & Drainage Tax	10.37	12.72	14.97	15.72
Water Charges	17.78	17.88	37.95	50.58
Water Supply & Sanitation Grant	22.46	-	-	-
Other Income	0.06	3.42	0.17	-
<i>Total</i>	<i>50.68</i>	<i>34.01</i>	<i>53.09</i>	<i>66.30</i>
Revenue Expenditure				
Establishments	10.58	10.44	19.11	14.02
Electricity Charges	7.09	9.97	20.09	10.93
Board Payment	0.49	5.68	14.91	4.22
Miscellaneous	11.73	26.88	18.16	5.76
Debt Servicing- Old	-	-	8.87	-
<i>Total</i>	<i>29.89</i>	<i>52.97</i>	<i>81.14</i>	<i>34.94</i>
Surplus/Deficit	20.78	(18.95)	(28.06)	31.36
Recovery (%) excl. tax	59%	34%	47%	145%

Source: Tambaram Municipality & Analysis.

133. Salaries of staff directly working in the water supply department are booked under this head, while salaries of other engineering staff performing administrative functions related to water supply are booked under the engineering section of general fund. Expenditures incurred under this account comprised 25 percent power charges, other operation and maintenance expense accounts 12.93 percent and establishment costs 28.95 percent. The balance 30.74 percent is spent on wages and other expenditures and around 2.73 percent utilized towards debt servicing.

Figure 3.7: Water and Drainage Account Expenditure Trend



134. Cost recovery in case of water supply charge works out to only 45 percent of the revenue expenditure incurred in the water supply and drainage fund account, excluding FY 03-04. Major share of water supply income is derived by way of water charges, which account for about 59 percent of water supply and drainage income.

Figure 3.8: Water Charge Collection Performance

135. There are a total of 7,040 water supply house service connections as of 2004-05 provided by the Municipality in the town. The average collection performance of water charges for the review period indicated in **Table 3.13** is 59 percent, however, the cost recovery in the sector is only 45 percent excluding water and drainage taxes, indicating low coverage and very less number of legal service connections against the service provided.

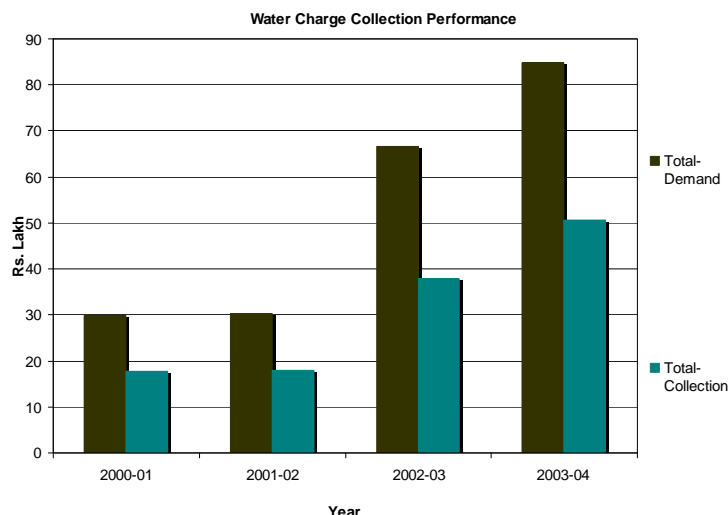


Table 3.13: Water Charges – Demand Collection and Balance Statement

Item	2000-01	2001-02	2002-03	2003-04	2004-05
Demand (Rs. Lakh)					
Arrear	13.61	12.17	11.65	28.68	34.27
Demand	16.34	18.15	54.97	56.17	57.10
Total	29.95	30.32	66.62	84.85	91.37
Collection (Rs. Lakh)					
Arrear	5.49	3.58	1.66	9.38	13.30
Demand	12.29	14.29	36.28	41.20	43.38
Total	17.78	17.87	37.94	50.58	56.68
Collection Performance (%)					
Arrear	40%	29%	14%	33%	39%
Demand	75%	79%	66%	73%	76%
Total	59%	59%	57%	60%	62%

Source: Tambaram Municipality & Analysis.

136. The number of House Service Connections stands at just 29 percent of the property tax assessments indicating large number of unauthorized connections in the Municipality. The unauthorized connections and unassessed properties need to be brought under the user charges and municipal tax gambit to effect cost recovery on the investments.

8. Capital Account

137. *Capital Income.* Capital income comprises of loans, grants and own contributions. The detailed components of capital income are detailed in **Table 3.14**. An analysis of this account indicates that grants and contributions have contributed the maximum share of

income under this account. On an average 15.57 percent of the capital income is from own sources and 84.43 percent is from grants and contributions like XIIth Finance Commission grants. No new loan was taken during the assessment period.

Table 3.14: Status of Capital Account - General

Item	2000-01	2001-02	2002-03	2003-04
	<i>Amount in Rs. Lakh</i>			
Capital Income				
Capital Loans	-	-	-	-
Capital Grants and Contribution	119.64	69.68	100.30	44.26
Own Sources	-	2.94	3.09	54.65
<i>Total (excl. W & D a/c)</i>	<i>119.64</i>	<i>72.62</i>	<i>103.39</i>	<i>98.90</i>
Capital Expenditure				
General	0.001	2.52	10.92	0.13
Public Works and Roads	245.96	271.37	183.23	52.61
Street Lighting	3.44	-	-	0.06
Public Health & Conservancy	61.53	-	-	-
Education	58.88	6.38	24.71	-
<i>Total</i>	<i>369.82</i>	<i>280.27</i>	<i>218.85</i>	<i>52.80</i>
<i>Surplus/Deficits (excl. W & D a/c)</i>	<i>(250.18)</i>	<i>(207.65)</i>	<i>(115.46)</i>	<i>46.10</i>

Source: Tambaram Municipality & Analysis.

138. *Capital Expenditure.* A major share of capital expenditure has been directed towards public works and roads over the past four years.
139. Analysis of capital income and capital expenditure notes that the account was deficit except during 2003-04, indicating higher revenue account for asset creation.
140. Water supply and drainage capital account status is detailed in **Table 3.15**. Capital income is mainly from water supply connection charges and capital grants received during the assessment period. The capital account shows a surplus during the entire assessment period.

Table 3.15: Status of Water Supply and Drainage Capital Account

Item	2000-01	2001-02	2002-03	2003-04
	<i>Amount in Rs. Lakh</i>			
Capital Income				
Capital Loans	-	-	-	-
Capital Grants and Contribution	6.09	66.40	-	-
Own Sources	6.25	52.30	199.20	1.47
<i>Total</i>	<i>12.34</i>	<i>124.80</i>	<i>271.69</i>	<i>7.47</i>
Capital Expenditure				
Water Supply	-	6.80	218.82	-
Drainage & Sanitation	-	0.39	-	-
<i>Total</i>	<i>-</i>	<i>7.19</i>	<i>218.82</i>	<i>-</i>
<i>Surplus/Deficits</i>	<i>12.34</i>	<i>117.61</i>	<i>52.87</i>	<i>7.47</i>

Source: Tambaram Municipality & Analysis.

9. Assets and Liabilities

141. Current assets and liabilities of Tambaram Municipality include monies due to the municipality from debtors and monies due from the Municipality to creditors, respectively. **Table 3.16** presents a summary of the current assets and liabilities of Tambaram Municipality.
142. The current assets include outstanding arrears in property tax, water charges and profession tax and lease rental (non-tax items) dues. The total current assets due to the municipality are Rs. 1,328.61 lakh.
143. Current liabilities include power charges due to TNEB, salaries payable, PF and other contribution due, tax /cess payable to government, other payables and deposits. The net liability of Tambaram Municipality is Rs. 211.74 lakh. The current ratio is the ratio of total current assets to total current liabilities, which is used to measure short-term liquidity of a ULB. The idea behind measuring this ratio is to assess whether the ULB has enough liquid assets to pay off its current obligations when they fall due. This ratio should ideally be over 1. In case of Tambaram municipality, the current ratio is 6.27, hence, ULB has a comfortable current ratio.

Table 3.16: Summary of Current Assets and Liabilities status

Description	Amount (Rs. Lakh)
A. Current Assets	
Property Tax Recoverable	319.00
Profession Tax Recoverable	46.21
Water Charges Recoverable	34.69
License/Lease/Rental/other Recoverable	-
Other Recoverable	378.74
Cash on Hand /Bank	549.98
<i>Total – Current Assets</i>	1,328.61
B. Current Liabilities	
Salaries Payable	-
PF and Other Contribution	7.99
TNEB	-
Library Cess Payable	29.54
Other Payables	15.22
Recoveries from Staff	11.42
Deposits	147.57
<i>Total – Current Liabilities</i>	211.74
Net Status	1,116.87

Source: Tambaram Municipality & Analysis.

10. Key Financial Indicators and Issues

144. A set of key financial indicators has been derived using the financial data procured from the Municipality for the assessment period. **Table 3.17** presents these indicators. These indicators are used to assess municipal performance with regard to resource mobilization, fund utilization, financial performance and collection efficiencies.

Table 3.17: Key Financial Indicators

	Indicators	Value	Unit
A	<u>Resource Mobilization</u>		
1	Per Capita Income	532	Rs. p.a
2	Sources of Funds		
a	Share of Own Sources in Total Revenue Income (RI)	60.06	%
b	Share of Property Tax in Total Revenue Income	26.43	%
c	Share of Revenue Grants & Subsidies in Total RI	23.60	%
3	Growth in Revenue Income	16.41	% p.a
4	Growth in Own Sources of Revenue Income	5.78	%
5	Per Capita Own Income	281	Rs. p.a
B	<u>Fund Application</u>		
1	Per Capita Expenditure	335	Rs. p.a
2	Uses of Funds		
a	Share of Establishment Expenditure in Total RE	68.16	%
b	Share of O&M Expenditure in Total Revenue Expenditure	26.34	%
c	Share of Establishment Expenditure to Total RI	42.71	%
3	Growth in Establishment Expenditure	(4.19)	%
4	Growth in O&M Expenditure	3.14	%
5	Growth in Total Revenue Expenditure	(1.32)	% p.a
C	<u>Liability Management</u>		
1	Per Capita Liability (2004-05 estimated)		
a	Outstanding Debt per Capita	300	Rs.
b	Outstanding Non-Debt Liability per Capita	8	Rs.
c	Total Outstanding Liability per Capita	309	Rs.
2	As a Proportion of Property Tax Current Demand (2003-04 estimated)		
a	Outstanding Debt as % of P.T Demand	153.81	%
b	Outstanding Non-Debt Liability as % of P.T Demand	4.23	%
c	Total Outstanding Liability as % of P.T Demand	158.05	%
3	As a Proportion of Property Tax Own Revenue Income (2003-04 estimated)		
a	Outstanding Debt as % of Own Revenue Sources	95.12	%
b	O/s Non-Debt Liability as % of Own Revenue Sources	2.62	%
c	Total O/s Liability as % of Own Revenue Sources	97.74	%
4	Non-Debt Liability as % of Total Liability	2.68	%
5	Debt Servicing Ratio (D.S/ Revenue Income)	2.91	%
D	<u>Performance Indicators</u>		
1	Operating Ratio	0.65	Ratio
2	Growth in Per Capita Own Income	1.79	% p.a
3	Growth in Per Capita Grant	41.89	% p.a
4	Growth in Per Capita Total Revenue Income	13.58	% p.a
5	Growth in Per Capita Establishment Expenditure	(12.35)	% p.a
6	Growth in Per Capita O&M Expenditure	(8.67)	% p.a
7	Growth in Per Capita Revenue Expenditure	(7.52)	% p.a
8	Capital Utilization Ratio	3.19	Ratio
E	<u>Efficiency Indicators</u>		
1	Tax Collection Performance		
a	Property Tax	37	%

	Indicators	Value	Unit
	b Water Charges	59	%
	c Sewer Charges	NA	%
	d Profession Tax	48	%
2	No. of P.T Assessments per Tax Collection Staff	3,040	Nos.
3	Property Tax Demand per Assessment	4,884	Rs. p.a
4	No. of Municipal Staff per 1000 Population	2.08	Nos.
5	Annual Revenue (Own Source) per Municipal Staff	13.01	Rs. Lakh p.a
6	Population per Residential P.T Assessment	6.14	Persons

Source: Tambaram Municipality & Analysis.

145. *Resource Mobilization Indicators.* These indicators summarize the performance of the Municipality with regards sources of funds. Tambaram Municipality derives about 60.06 percent of its revenue income from own sources, while grants account for just about 23.60 percent of the revenue income.
146. *Fund Application Indicators.* These indicators are a measure to ascertain the utilization from the municipal fund. Around 68 percent of the revenue expenditure is spent on establishment heads, only about 26 percent for O&M of municipal assets and services and only around 6 percent utilized for debt servicing.
147. *Liability Management Indicators.* These indicators are a measure of ascertaining the utilization from the municipal fund for debt servicing. The ratio of debt servicing to revenue income is only 2.91 percent during the assessment period. The per capita average outstanding debt works out to Rs. 309 and per capita outstanding debt to property demand is around 154 percent of the property tax demand for the current year.
148. *Overall Financial Performance Indicators.* These indicators are a measure of the overall financial performance of the Municipality with regard to operational performance and effective growth in revenue income and expenditure. The average operating ratio during the assessment period was a healthy 0.65 and the capital utilization ratio was high at 3.19 indicating higher utilization of revenue surpluses in asset creation. The indicators of growth in per capita income and expenditure item heads indicate the effective growth, giving a performance measure relative to the growing population. Tambaram Municipality has demonstrated only 13.58 percent annual growth in per capita revenue income during the assessment period, while the per capita revenue expenditure has grown at a negative CAGR of 7.52 percent during the corresponding period.
149. *Efficiency Indicators.* These indicators are essentially a measure of municipal efficiency with regard to revenue base coverage and realization. Tambaram Municipality has maintained a low collection performance, both with regard to property tax and water charges (37 percent and 59 percent respectively). The average population per residential assessment at 6.14 indicates that the property tax base has a low coverage.
150. Key issues and conclusions are based on the review and assessment of municipal finances and discussions with relevant municipal officials.
 - (i) Maintenance and Reporting of Accounts. The State Government deducts debt due by the Urban Local Body and then transfers funds (SFC devolution). The Urban Local Body records do not capture such apportionment. ULB's do not maintain

department/sector-wise salary expenditure as mentioned in the ULB Accounting Manual.

- (ii) Revenue Realization. Taxes and charges are major own sources of revenue income. Being more dynamic in nature and within the control of the Urban Local Body, these revenue incomes have the potential to contribute more to the municipal fund. Besides low tax rates and charges levied, the actual demand itself is not established. Key issues regarding the above comprise:
- Low water supply coverage witnessed there are chances of illegal or unauthorized connections in the town,
 - Financial transaction trends are not commensurate with population growth trends, resulting in reduction in per capita expenditure levels.
- (iii) Fund Application. Key issues regarding application from the municipal fund comprise:
- About 68 percent of the total expenditure is on establishment-related heads, leaving relatively lower amounts for expenditure on operation and maintenance of services.

IV. PLANNING AND LAND USE MANAGEMENT

A. Planning Efforts in the Past

1. Master Plan Outline

151. Chennai Metropolitan Development Authority (CMDA) prepared the first Master Plan for Chennai Metropolitan Area (CMA) in 1975. In order to ensure orderly development of CMA, CMDA formulated the Master Plan, in sequel to the first Master Plan, with a horizon year of 2011 for a projected population of 95.05 lakh. The distribution of the land use pattern for the CMA for 2011 is given in the following **Table 4.1**.

Table 4.1: Distribution of Land Use for CMA for 2011

Land use	Chennai Metropolitan Area			Distribution
	Inside City	Outside City	Total	
	Ha	Ha	Ha	
Residential	7,464.36	11,813.29	19,277.65	19.41
Commercial	2,201.17	7,505.11	9,706.28	9.77
Industrial	906.17	6,575.33	7,481.50	7.53
Transportation	4,456.82	2,086.85	6,543.67	6.59
Open /Recreational Spaces	1,015.71	11,012.68	12,028.39	12.11
Urbanizable Land	89.58	28,009.57	28,099.15	28.29
Non-Urbanizable Land	98.10	16,102.75	16,200.85	16.31
Total	16,231.91	83,105.58	99,337.49	100.00

152. The highlights of broad recommendations proposed in Master Plan are:
- Developing specialized industrial estates for the manufacture of export oriented industries around Pammal, Pallavaram MEPZ, and the Electronic City at Sholinganallur;
 - Setting up of a financial trade centre to house the new city level junction at Taramani;
 - Setting up of decentralized business districts for CMA;
 - Strengthening of informal sector;
 - Introduction of alternative transport systems like Aerometros-improved versions of trams, electrically operated buses etc;
 - Setting up procedures for drawl of water from the three main sources, viz., Poondi, Red Hills and Tamaraipakkam Panjetty
 - Activating the additional sources viz., tapping of Palar aquifer, storing of additional run off, recycling of waste water for industrial purposes, etc.,
153. Some of the facts about the Master Plan are:
- To reduce the pressure of population on Chennai City, there is a need to develop areas outside the city with proper infrastructure facilities;

- (ii) The present planning system is based solely on physical planning and lacks an integrated approach between the economic activities and the infrastructural facilities;
- (iii) Scarce urban land is being used up inefficiently and most of the housing plots are blocked for deferred use, leaving little room for immediately needed developments;
- (iv) At present, public sectors contribution to housing is still small compared to the total need, private sector is not contributing to the needs of the lower income groups;
- (v) Under the pressure of developments, ecologically sensitive areas, which require conservation, are getting urbanized. Pollution of water bodies is a threat to human health;
- (vi) Intense pressure is building up on the road system particularly with respect to commute traffic;
- (vii) Present levels of resource mobilization are far below the level required for meeting the investment and maintenance needs of infrastructure.

B. Land Use Management

2. Land Use Pattern – Current and Future

154. The Tambaram LPA extends upto the local body's area of jurisdiction i.e., upto 2,072 Ha (20.72 sq. km).

Figure 4.1: Distribution of Existing Land use - 1991

155. *Existing Land use.* As per the Draft Master Plan, the existing land use for 1991 has total developed area of 2,714.26 Ha while the total non-urbanized area constitutes for 1,254.08 Ha, which is 31.60 percent of total planning area. The distribution of land use for 1991 is given in **Table 4.2**.

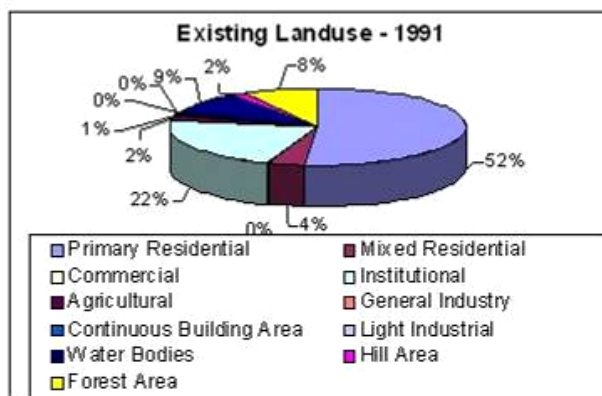


Table 4.2: Existing Land use 1991

Land use	Area Ha	Distribution %
Primary Residential	1,477.46	37.23
Mixed Residential	158.50	3.99
Commercial	80.29	2.02
Institutional	840.06	21.17
Industry	157.95	3.98
Water Bodies	288.07	7.26
Agricultural	522.77	13.17
Vacant Land	308.68	7.78
Non-Urbanized Area	134.56	3.39
Total	3,968.34	100.00

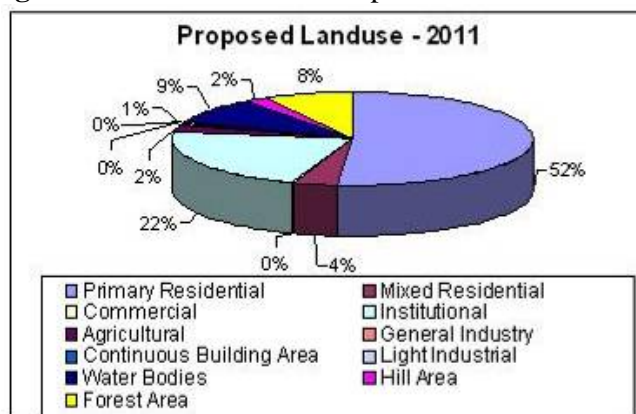
Source: Draft Master Plan for Madras Metropolitan Area - 2011

156. *Proposed Land use.* The CMDA has proposed the land use for 2011.
157. Due to unavailability of land use break-up, the figures are worked out with the proposed land use map using AutoCAD. Care has been taken to minimize the errors. This data is being cross-checked with CMDA and will be updated. The distribution of proposed land use is given in the following **Table 4.3**.

Table 4.3: Proposed Land use (2011)

Land use	Area	Distribution
	Ha	%
Primary Residential	1,136.33	51.33
Mixed Residential	87.43	3.95
Commercial	7.54	0.34
Institutional	486.91	21.99
Agricultural	46.46	2.10
General Industry	19.64	0.89
Continuous Building Area	2.01	0.09
Light Industrial	6.95	0.31
Water Bodies	198.74	8.98
Hill Area	43.86	1.98
Forest Area	178.01	8.04
Total	2,213.89	100.00

Source: Master Plan

Figure 4.2: Distribution of Proposed Land use - 2011

158. The Villiapuram Railway Line and Tambaram-Beach Sub-Urban Line divide the town into two parts – West Tambaram and East Tambaram.
159. *Residential Use.* Tambaram is largely residential with residential land use comprising 51.33 percent of the LPA area. Predominantly residential use can be witnessed in West Tambaram. One of the main reasons for this is the presence of important roads like G.S.T Road, Mudichur road that connects Tambaram with many important places of South India. New extension areas are also coming up slowly in East Tambaram due to the presence of educational institutions like Madras Christian College and commercial establishments.
160. *Mixed Residential Use.* In West Tambaram, the mixed land use can be witnessed along NH 45, while in East Tambaram, the mixed land use is found near the institutions and the water body (Periya Eri).
161. *Commercial Use.* The major concentration of commercial establishments is along the G.S.T Road. However, the commercial establishments and shops are also coming up along Velachery Road.

162. *Institutional Use.* Tambaram has the world known institution –Madras Christian College, situated south of Tambaram.
163. *Industries.* The town does not have major industries. However, it houses Madras Export Processing Zone in West Tambaram, which has export processing units, finished leather goods, textile garment factories and factories of electrical goods and ancillary items. The products are exported to many parts of the world. Light industrial units are also found along NH 45 and in East Tambaram.
164. *Water Bodies.* In Tambaram, water bodies are spread across the town, occupying about 9 percent of the total developed area. Most of the water bodies present in the town are used for draining out the storm water, thus posing pollution problems.
165. Providing NH by-pass connecting Tambaram with Puzhal, alternative truck terminal to by pass airport, construction of grade separator towards the south of the railway station, subway on G.S.T Road near the railway station, conversion of meter gauge to broad gauge, recycling of sewage for the industrial and other usage, implementation of water distribution plan, in stages, for large CUA , construction of flyover connecting Velachery main road and G.S.T. Road, are some of the master plan proposals.
166. *Zoning Regulations.* Zoning regulations are prepared to promote public health, safety, general moral and social welfare of the community. These regulations ensure that the most appropriate, economical and healthy development of the town takes place in accordance with the proposed land use plan.
167. *Municipality and CMDA.* Chennai Metropolitan Development Authority (CMDA) is the agency responsible for the preparation and implementation of the master plan. CMDA, through its regional network and Local Planning Authorities prepares the plan, receives objections, notifies the plan elements, and after approval, implements the plan with the assistance of the municipality. The municipality is the regulating body of the developments taking place in the town limits in consultation with various departments. The Development Plans and development control regulations form the basis of regulation. Accordingly, the role of the municipality in plan implementation includes:
 - (i) Sanctioning building plans and construction supervision;
 - (ii) Issuing completion certificates;
 - (iii) Sanctioning colony layout plans; and
 - (iv) Regularizing unauthorized developments.

Map 4.1: Proposed Land use Map (2011)

3. *Development Patterns – Growth Areas and Direction*

168. *Regional Setting.* The three Municipalities, namely Alandur, Pallavaram and Tambaram located within CMA along NH 45 known as G.S.T. Road. Other major roads comprising the regional road network include NH bypass, Velachery road, Medavakkam Main Rd, Pallavaram-Thoraipakkam link Rd, IT Corridor and the proposed Outer Ring Road and the extension of Inner Ring road from St. Thomas Mount to Velachery. The suburban railway line between Beach and Chengalpet runs almost parallel to G.S.T. Road. It is also proposed to extend the MRTS line from Velachery to St. Thomas Mount.
169. *Activity Zones.* The major activity zones present in the region include the international airport at Meenambakkam, the industrial estates at Guindy, Pallavaram and Pammal and the Entertainment Park at Kishkinta. The proposed developments in the region include the development of IT Corridor, proposed Peerankaranai bus and truck terminal and the proposed Thairuneermalai Satellite town.
170. *Growth Direction.* It is evident that the major road corridors comprising National Highways, State Highways and other Major District Roads in the region offer great potential for the growth and development of the region and the project town.
171. *Overview.* Tambaram, known as the satellite town of Chennai City, has a great potential for the growth and development. It is a gateway to Chennai City for all cities and towns of southern part of India.
172. *West Tambaram.* The growth of the town is taking place mainly in the south-west direction along Grand Southern Trunk Road (National Highway 45) (Ward 28 is growing towards this direction). The growth can also be witnessed along Mudichur Road (Wards 31 and 32 are growing in this direction) towards south-west of the town. There is a moderate development along Kiskinta Road towards north-west of the town (Ward 38 is growing in this direction). The growth of the town towards north is restricted due to the presence of small hillocks and forests.
173. The growing wards of West Tambaram are low to moderately dense parts of the town. Thus, these wards would be the future potential areas in the town and become one of the preferred areas to reside.
174. *East Tambaram.* The growth in East Tambaram is low compared to West Tambaram. However, small growth can be witnessed along Velachery Road towards east of the town.
175. The Tamil Nadu Government has been taking a number of initiatives to attract Information Technology (IT) sector. The setting up of the TIDEL Park and a Biotechnology Park near Taramani in Chennai are good examples of such initiatives. To provide further developments to the IT sector, the State Government through State Industrial Promotion Corporation of Tamil Nadu (SIPCOT) proposes to develop a Cyber City at Siruseri Village, about 17 km from TIDEL Park. The Tamil Nadu Road Development Corporation (TNRDC) is developing the Old Mahabalipuram Road (OMR) from Madhya Kailash to Siruseri as IT Corridor, including improvement of 2.1 km long East Coast Road (ECR) link, which connects OMR. The Taramani road passes through Velachery and finally

connects to East Tambaram. Thus, the area along Taramani or Velachery roads has great potential for the growth and development.

176. Indian Air Force Station is located in the south of East Tambaram, which is a restricted area for the common public. Hence, the growth of the town is not much towards down south. However, the development of Mahindra Industrial Park Limited (MIPL) at Maramalai Nagar in Chengalpet would also influence the Tambaram's growth towards south (along G.S.T. Road). The German car major BMW is putting up a premium car assembly plant at an investment of about Rs. 180 crore in MIPL.
177. As described in the previous chapter that the wards with low density have greater scope for the future expansion and development while the overcrowded wards are needed to be decongest.

Map 4.2: Growth Direction of Tambaram Town

C. Key Developmental Issues

- (i) Need for a Revised Master Plan for Tamparam LPA, addressing the growth pull-and-push factors, economic spurt and growth potential;
 - (ii) Need for a specific regional approach for development of towns along the G.S.T. belt, which is the main receiving hub of Chennai City;
 - (iii) To exploit potential benefits of proximity to IT Corridor - need for rezoning, new development guidelines and demarcation of Special Development Areas;
 - (iv) Multiplicity and conflict of institutions dealing with land use management.
178. *Transportation Related Problems.* The major problems in the comprehensive transportation network of the region constituting the National Highways, State Highways and other roads could be summarized as
- (i) Lack of Connectivity with NHs and SHs. Since the NHs and SHs are the major traffic corridors in the region, better links to these regional corridors need to be developed for better accessibility,
 - (iii) Lack of Proper Connectivity to Activity Zones. The road connecting to Kishkinta major entertainment park is the Kishkinta road starting from Tamparam. In addition, the Thirunneermalai road to the proposed Thirunneermalai township needs to be improved.
 - (iv) Narrow Bus Routes. It is observed that certain bus routes have carriageway width less than a two-lane width (7 m) and hence, and suggest to have minimum 7 m width to cater to safe movement of the vehicles in both directions.
 - (vi) Better Inter Municipal Connectivity. Thirunneermalai road and the link from Hasthinapuram main road to Velachery road are the two roads passing through both Tamparam and Pallavaram Municipalities. Improvement of these roads will provide better inter municipal connectivity between the two ULBs. In addition, Thirunneermalai road can act as a bypass link to the congested G.S.T. Road section between Tamparam and Pallavaram as it starts from Pallavaram and terminates at Tamparam.
 - (vii) Absence of traffic infrastructure facilities for better traffic management such as
 - Organized on-street parking facilities
 - Junction improvement
 - Pedestrian facilities such as foot path, safe pedestrian crossing

V. INFRASTRUCTURE SERVICES

A. Physical Infrastructure

1. Water Supply

179. Tambaram municipality meets its water supply requirements through surface and sub-surface sources. The local body initiated first organized water supply to the town in 1967 with ground water as a source from Villiambakkam Headwork in Palar River. The scheme has been designed to supply 4.90 MLD of water. About 25 percent – 30 percent of water is also supplied to six wayside villages. Tambaram municipality receives about 2.40 MLD during summer season and about 4.00 MLD during normal seasons from this source. In 1983, TWAD has executed a combined water supply scheme for Alandur and Pallavaram. In 2002, Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) has commissioned a new water supply scheme for Alandur, thus, TWAD Board is supplying the combined water supply to Tambaram and Pallavaram. The main source of water supply for the above scheme being Palar River is situated at a distance of about 40 km from the town. The total quantity of water supplied from this source during summer is 0.50 MLD and during normal season is 2.0 MLD. The water is only chlorinated and no treatment facility is available at the source.
180. In addition, the town has 280 bore wells and 52 open wells in use. The yield from bore wells is about 0.56 MLD. Thus, the town receives about 3.46 MLD and 6.56 MLD during summers and the normal seasons respectively.
181. The water supply requirement during summers is also met with four tankers of capacity 9,500 liters each and each makes 6-7 trips per day.

B. Source of Water Supply

182. The town is served by both ground and surface sources of water. Due to the insufficient availability of water from the main source, the Palar River, tapping of ground water through bore wells, hand pumps and open wells is practiced to augment the current supplies. Water is also supplied in tanker lorries to the unserved areas. Four tankers are engaged for this purpose, out of which the municipality owns two while the other two belongs to the private contractor. The capacity of each tanker is 9,500 liters and each makes 6-7 trips per day. The source for the municipal tankers is bore wells at Gayathri Nagar while for the private maintained tankers, the source is Perungalathur well.

Old Water Supply from Villiambakkam Headwork (Ground Water Supply)

183. This is the first water supply scheme for Tambaram with ground water as the source. This scheme was commissioned in 1967 with 3.60 MLD installed capacity at an estimated cost of Rs. 47.27 lakh. The designed capacity of this scheme is 4.90 MLD. At present

(summer) about 2.40 MLD of water is supplied from this source to Tambaram. However, during normal/other seasons, about 4.00 MLD is received. This water is also supplied to five-enroute villages viz., Singaperumal Kovil, Venkatpuram, Sasthirampakkam, Villiambakkam and Sivanandha Gurukulam. The local body is operating and maintaining the scheme.

184. *Headworks.* The Villiambakkam headwork includes infiltration well, collection well, pumps, generators and other allied support facilities. There are five infiltration wells in Palar River for supplying water to Tambaram municipality but due to bad condition, three wells are not used. Thus, two infiltration wells are used to supply water to Tambaram. The two infiltration wells of diameter 3 m each are provided with 10 HP and 15 HP pumps which pumps water to the collection well of diameter 6 m. As the yield in the original scheme is poor, one ring well has been erected on the southern side of Palar River Bank, which is 750 m away from the collection well. The water from this well is also pumped to the collection well situated at 750 m away. The water is pumped for 24 hours from collection well with the help of 50 HP pump (+50 HP standby) and two generators (75 KVA and 125 KVA) and conveyed through a pumping main of 450 mm diameter (C.I. Pipe) of length 16.0 km upto Maraimalai Nagar. From there, the water is transmitted through gravity main of 375 mm diameter (A.C. Pipe) of length 24.0 km to Tambaram.

Combined Water Supply Scheme for Tambaram and Pallavaram

185. The other source of water supply to Tambaram Municipality is through a Combined Water Supply Scheme for Tambaram and Pallavaram. The scheme was originally catering to the municipalities of Alandur and Pallavaram along with wayside villages. As Alandur being supplied by CMWSSB, it is detached from this scheme and Tambaram is provided the allocation. It was commissioned in 1983 at an estimated cost of Rs. 950.00 lakh, with a design capacity of 22.60 MLD serving about 2,00,000 persons. The scheme has been proposed to supply 18.00 MLD in normal season while during summers; the scheme would supply 16.00 MLD. This system is also proposed for supplying water to the enroute towns and villages. The quantity of water supplied to these villages is presented in **Table 5.1**. Due to decrease in the yield of Palar River, Tambaram is receiving only 0.50 MLD.

Table 5.1: Water Supply from TWAD Scheme

Sr. No	Name	Designed Supply	Normal Supply	Present Supply	Remarks
		MLD	MLD	MLD	
1	Tambaram Municipality	-	2.00	0.50	
2	Pallavaram Municipality	5.40	4.60	2.00	
3	Alandur Municipality	9.00	-	1.20	Delinked from this scheme September 2002
4	Pammal Town Panchayat	0.90	1.80	0.80	
5	Anakaputhur Town Panchayat	1.00	0.90	0.20	
6	Chitlapkkam Town Panchayat	0.90	1.00	0.50	
7	Cantonment Board	1.80	1.00	0.40	Presently (summer), Supply being given

Sr. No	Name	Designed Supply	Normal Supply	Present Supply	Remarks
		MLD	MLD	MLD	
					to Pallavaram only
8	Indian Air Force, Tambaram	1.80	1.80	1.00	
9	Vandaloor Zoo	1.80	0.60	0.20	
10	Taj Flight Kitchen	-	0.30	0.20	
	Total	22.60	14.00	7.00	

Source: TWAD Division Office, Alandur

Palayaseevaram Headworks at Palar River and Cheyyar

186. *Old Headworks.* The old headwork at Palayaseevaram includes infiltration gallery, manhole wells and pump sets. There are five manholes of 3.50 m diameter each. The water is collected from these wells in a common sump from where it is pumped with the help of 3 Turbine pump sets of capacity of 60 HP each (one standby) (Discharge - 4,920 lpm and Head - 35 m) to the booster station at Devarambakkam through 300 mm AC pipe of Class 10.
187. *New Headworks.* The new headwork at Palayaseevaram includes eight infiltration wells of 3.50 m diameter each. The water from the infiltration wells is collected at a common sump of capacity 0.10 ML. The water from the sump is pumped with the help of 9 submersible pump sets with the capacities varying from 3 HP to 12.5 HP, (Discharge - 500 lpm to 1,000 lpm and Head - 22 m to 40 m) and two centrifugal pump sets (one is standby) of 50 HP each (Discharge - 4,000 lpm and Head - 22 m) to booster station at Devarambakkam through 600 mm C.I. pipe of length 7.20 km.

Vengudi Headworks at Palar River

188. The Vengudi headwork at River Palar includes nine infiltration wells of 4.50 m diameter each. The water from these wells is collected in a common GLSR of capacity 0.10 ML. The water is pumped to booster station at Devarambakkam with the help of 13 submersible pump sets of power varying from 3 HP to 12.5 HP (Discharge - 500 lpm to 2,000 lpm) with a constant head of 18 m. in addition, three centrifugal pump sets of 70 HP capacity each (Discharge – 9,090 lpm and Head – 22 m) (one is standby) also pumps water to the booster station. The water is conveyed to booster station through 500 mm diameter C.I. pipe of Class L.A of length 8.23 km.
189. The schematic diagram for the combined water supply scheme is given in **Map 5.1**.
190. *Booster Stations.* There are four booster stations at Devarambakkam, Krishna Nagar, Kadaperi and Mannivakkam, with ground level sumps and pump sets. The booster station at Krishna Nagar has two ground level sumps of capacities 0.10 ML and 0.50 ML from where the water is pumped to Tambaram.

Other Source of Supply

191. There are 280 bore wells in different parts of the town extracting ground water at the rate of about 0.56 MLD. The ground water table varies from 9 m to 18 m as maximum during summers and improves to 4.5 m to 5.0 m during rainy seasons.
192. The municipality has requested CMWSSB, to provide 20 MLD of water supply to Tambaram. However, CMWSSB could not supply water due to scarcity.

Map 5.1: Schematic Diagram of Combined Water Supply Scheme

C. Water Treatment Plant

193. TWAD Board has not provided the water treatment facility, as the source is ground water. However, the chlorination at source, overhead tanks and sumps, is done. On an average, 2 kg of chlorine is used daily.

D. Distribution System

194. The distribution system comprises of storage reservoirs and distribution network. The municipality maintains the distribution system in Tambaram.
195. *Storage Reservoirs.* The town has been divided into water supply zones – West Tambaram and East Tambaram. West Tambaram has been divided into 14 water supply zones while East Tambaram is divided into 12 zones. The zone wise distribution of wards is given in the following **Table 5.2**. Most of the parts of Ward 39 are supplied through open well located at Krishna Nagar of capacity 0.30 ML while the other wards have access through service reservoirs.

Table 5.2: Water Supply Zones in Tambaram

Zones	Wards
<i>West Tambaram</i>	
1	35-33, 34, 37
1A	35 (Part), 28, 29
1B	28 (Part), 29 (Part)
2	30
2A	33
3	30 (Part)
3A	28 (Part), 29 (Part)
3B	29 (Part), 34, 35
4	8, 9, 10, 36, 37
4A	7, 8 (Part), 9 (Part), 10 (Part), 36
5	6, 7, 8, 9, 10, 36
6	33
7	5, 10
8	10
8A	10 (Part)
9	3, 4
10	31, 32
10A	32
11	8, 9, 39
11A	1, 8, 39
<i>East Tambaram</i>	
1	11, 12, 14, 15
1A	12, 13
2	14, 16, 17
2A	13, 18
3	16, 17
3A	16, 17

Zones	Wards
4	24, 26, 27
5	24, 25
6	20, 23
7	22, 23
8	18, 20
9	15, 16, 17, 18
10	15, 16, 17, 18, 19, 22

Source: Tamparam Municipality

196. There are 10 storage reservoirs with total capacity of 2.71 ML capacity, which distribute water to the town. The zone wise details of storage reservoirs are given in the following **Table 5.3.**

Table 5.3: Storage Reservoirs in Tamparam

Sr. No	Location	Numbers			Capacity			Wards Served
		GLSR	OHT	Total	GLSR	OHT	Total	
		<i>Nos</i>	<i>Nos</i>	<i>Nos</i>	<i>ML</i>	<i>ML</i>	<i>ML</i>	
	West Tamparam							
1	Muthurangam Park		1	1		0.36	0.36	4-10, 28-29, 33 (Part)-37
2	Muthurangam Park	1		1	0.40		0.40	
3	Kone Krishna Park		1	1		0.30	0.30	30-33 (Part)
4	Thiruneermalai Road		1	1		0.30	0.30	1-3, 8, 9, 39 (Part)
5	Ramesh Nagar		1	1		0.06	0.06	38 (Part), 39 (Part)
	Sub-Total	1	4	5	0.40	1.02	1.42	
	East Tamparam							
1	Gandhi Park		1	1		0.36	0.36	11-20, 22-27
2	Gandhi Park	1		1	0.40		0.40	21
3	Bharati Park, Selaiyur		1	1		0.30	0.30	
4	Old G.S.T. Road		1	1		0.20	0.20	
5	Old G.S.T. Road	1		1	0.03		0.03	
	Sub-Total	2	3	5	0.43	0.86	1.29	
	Total	3	7	10	0.83	1.88	2.71	

Source: Tamparam Municipality

Map 5.2: Location of Storage Reservoirs in Tambaram

197. *Distribution Network.* The distribution network was laid in 1966. The length of distribution networks provided in West and East Tambaram are 31.0 km and 22.0 km respectively, thus, totaling to 53.0 km. The total road length within the municipal limits is 132.63 km, which indicates that only 39.96 percent of roads are covered with distribution network. This indicates that the coverage is very low in Tambaram. The ward wise coverage of distribution network with respect to roads indicates that the maximum coverage is in Ward 34 (almost all the roads are covered with distribution network in this ward) and the minimum distribution network is laid in Ward 2 with only 4.83 percent of roads are covered. However, ward 21 lacks distribution network.
198. *Coverage and Per Capita Supply.* The supply from own source is supplied to East Tambaram covering 17 wards viz., from ward no. 11 to ward no. 27. Thus, this source is supplied at the rate of 36.65 lpcd (considering the population of 17 wards served by this source) during summers. The supply rate increases to 61.08 lpcd during normal seasons.
199. The water from Palar River is supplied to West Tambaram covering 22 wards (ward no. 1 to ward no. 10, ward no. 28 to ward no. 39). The total quantity of water supplied by TWAD in normal season is 2.0 MLD and during summers, the supply is 0.50 MLD, indicating average gross per capita supply of 27.61 lpd and 6.90 lpd (considering the population of 22 wards served by this source) in respective seasons.
200. The water to Tambaram is supplied once in three days for three hours.
201. Thus, overall, Tambaram is supplied at the rate of 25.08 lpcd (Summer season) and 47.56 lpcd (Normal season). In both the cases, the supply rates are very low compared to the prescribed standards of 90 lpcd by TWAD Board. CPHEEO (Central Public Health and Environmental Engineering Organization) guidelines prescribe 70 lpcd for a town provided with piped water supply but without the sewerage system. Still 90 lpcd is an ideal rate for design considerations. Looking at the pace of growth in Tambaram's population, there is an immediate need to augment more supply to the town.
202. *Supply to Consumers.* All the connections are unmetered. The municipality has given 7,040 water supply connections. Out of which, 6,837 connections are given to domestic while the remaining 203 connections to non-domestic. Domestic connections accounts for 97.12 percent while non-domestic connections accounts for 2.88 percent. No industrial connection has been given in the town. As per Census 2001, Tambaram has 31,772 households. Thus, only 21.52 percent of households are provided with House Service Connections (HSC) which is very low (refer **Annexure 5.1**).
203. The following **Table 5.4** shows the range considered for the ward wise coverage of waster supply connections with respect to households.

Table 5.4: Criteria for Coverage of HSCs

Coverage	Criteria
Low Coverage	> 25%
Medium Coverage	25%-50%
High Coverage	<50%

Source: Analysis

Figure 5.1: Coverage of Water Supply Connections

204. The ward wise analysis of coverage of HSCs w.r.t households indicates that 24 wards are poorly covered, 12 wards have medium coverage and only 3 wards (10, 35, and 36) have coverage more than 50 percent of households. The high coverage wards are in West Tambaram along the G.S.T. Road (Wards 11-17, 22 and 24). Wards 30, 33-36 located along G.S.T. Road towards Civil Lines, in West Tambaram, have good coverage by service connections. West Tambaram is poorly covered with connections mainly because of geographical constraints like hills, quarries, etc.
205. In comparison with residential assessments of 24,031 done by the municipality, the coverage of HSCs is about 29 percent. As a whole, the coverage of piped water supply in Tambaram is very low which either indicates that the municipality has not been able to cover the other areas due to engineering difficulties or that there is a good number of unauthorized connections, which need to be regularized. No secondary data on unauthorized connections / unaccounted for water is available.
206. *Connection Charges.* The municipality collects the connection charges from the residents. Water supply charges (deposit and monthly tariff) in **Table 5.5**. These charges are in force from April 1, 2002.

Table 5.5: Water Supply Connection Charges

Type of Connection	Monthly Tariff	Connection Deposit
	Rs.	Rs.
Residential	65	2,000
Commercial	100	5,000

Source: Tambaram Municipality

207. *Public Stand Posts/Public Fountains.* There are about 216 public stand posts in Tambaram. The municipality has provided about 134 stand posts in West Tambaram and 82 in East Tambaram. Thus, on an average 5 to 6 public stand posts per ward are provided.

Map 5.3: Ward wise Coverage with HSCs in Tambaram

208. *Water Supply with Tankers.* Supply through tanker facilities is a common phenomenon during summers. However, the tankers are also used for covering the uncovered areas by piped water supply system. Some of the locations served by tankers in Tambaram are presented in **Table 5.6**. Overall, the parts of town served by tankers are Wards 1, 2, 3, 4 (Part), 19, 20 (Part)-21, 28, 32, 36, 38 and 39 (Part).

Table 5.6: Locations Supplied through Tankers

Sr. No	Locations
A	<i>West Tambaram</i>
1	Blue Jacker
2	P.F. Office
3	Bus Stand and Jeva Complex
B	<i>East Tambaram</i>
1	Rajeswarhi Nagar Extension
2	Indira Nagar
3	Karpagam Nagar I Street
4	Karpagam Nagar II Street
5	Ranganathan Nagar
6	Sakthi Garden
7	Eswari Nagar
8	Mullai Nagar
9	Jagajevan Ram Nagar
10	MES Road

Source: Tambaram Municipality

209. Four tankers are engaged for this purpose, out of which the municipality owns two while the other two belong to a private contractor. The capacity of each tanker is 9,500 liters and each makes 6-7 trips per day. The source for the municipal tankers is bore wells at Gayathri Nagar while for the private maintained tankers; the source is Perungalathur well.

E. Ongoing/Proposed Projects

210. Chennai Metropolitan Water Supply and Sewerage Board (CMWSSB) formed in 1978 as a statutory body, is vested with the responsibility of planning, construction, operation and maintenance of water supply and sewerage system in Chennai Metropolitan Area (CMA) and the same is planned to be done progressively as and when adequate source of water supply is available. The implementation of the Master Plan for Water Supply and Sewerage drawn in the year 1978, revised in 1991 and updated in 1997, is being taken up by CMWSSB in stages, with funding from the World Bank, HUDCO, TUFIDCO and other financial institutions. Primarily the proposals envisaged construction additional water treatment plants, transmission mains and distribution system.
211. CMWSSB has worked out the requirements of water supply for CMA for the year 2026, which is around 2,248 MLD. This includes 1,606 MLD for domestic purposes and the remaining for commercial and industrial purposes. The assumptions related to per capita water supply and demand for water supply for CMA are presented in **Tables 5.7** and **Table 5.8**.

Map 5.4: Water Source Surface and Sub Surface for Chennai Metropolitan Region

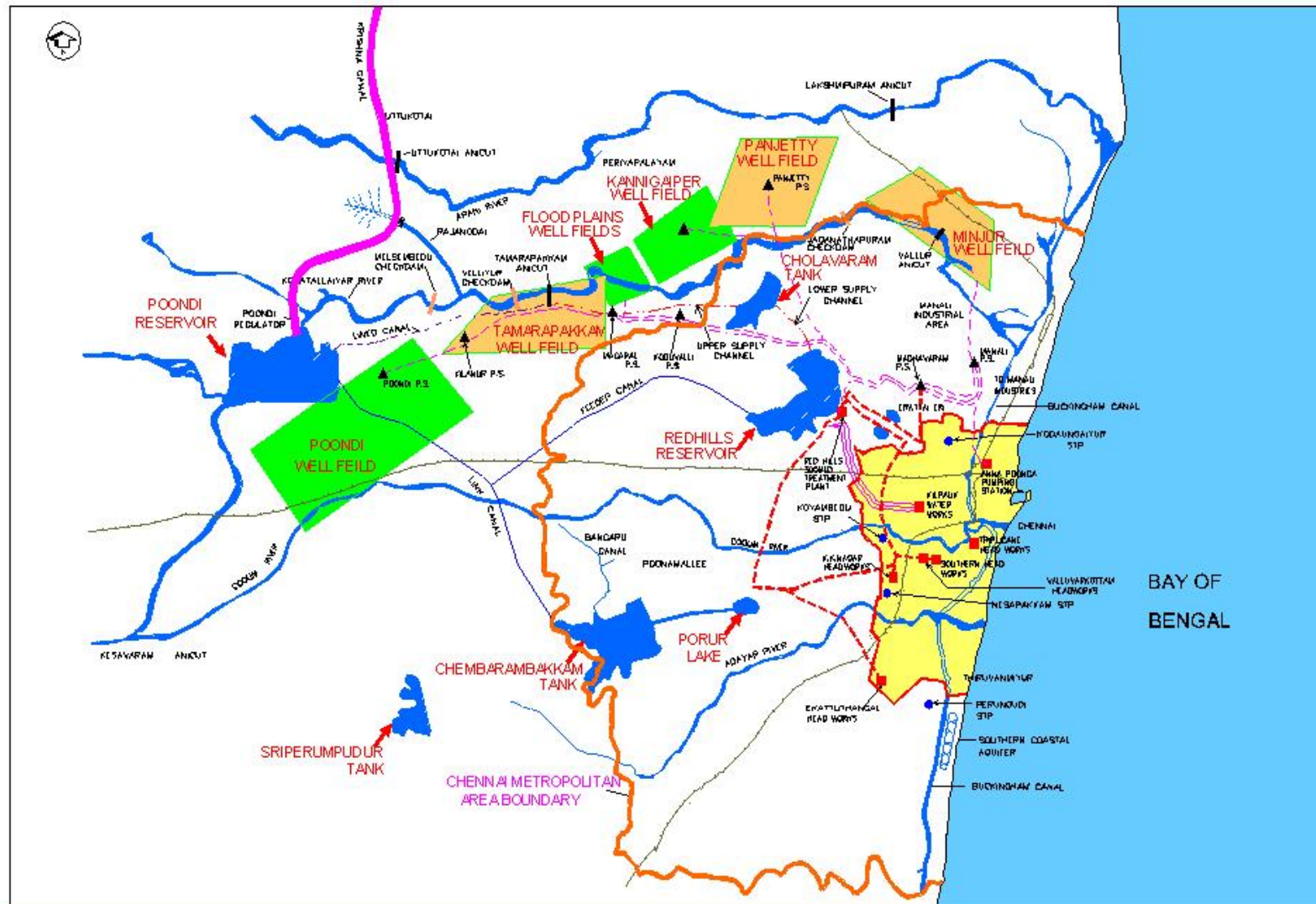


Table 5.7: Assumptions- Water Requirement

Component	Details
Residential Use	
Chennai City	150 lpcd
Municipalities	125 lpcd
Special Village Panchayats	100 lpcd
Village Panchayats	80 lpcd
Commercial uses	30% of resident population requirements
Industrial use	10% of resident population requirements

Source: CMWSSB**Table 5.8:** Total Water Requirement for CMA

Sr. No	Name of Category	Year			
		2011	2016	2021	2026
		<i>MLD</i>			
1	Water requirement for the resident population	1,165	1,284	1,431	1,606
2	Water requirement for office, commercial, industrial premises and other places of employment, education etc.	349	385	429	482
3	For industrial use	116	128	143	160
	Total Water requirement	1,630	1,797	2,003	2,248

Source: CMWSSB

- (i) Source Development. The CMWSSB has completed the scheme to augment the source of water supply by implementing Chennai Water Supply Augmentation Project-I to supply 180 MLD in CMA area. A project to construct a 100 MLD Reverse Osmosis based seawater desalination plant under DBOOT basis has also been taken up for implementation. Further, the CWSAP II project at an estimated cost of Rs. 124 crore is also under implementation to firm up source sustainability, in addition to augmenting the source. In addition, improvement works to enhance the storage capacity of Kandaluru, Somasila reservoirs and the lining of Telugu Ganga Project canal to improve the flow efficiency are in progress to enable supply of 12 TMC (930 MLD) of water to Chennai city. The sources and availability of water from each source is presented in **Table 5.9**.

Table 5.9: Sources and Availability of Water to Meet Demand

Sr. No.	Name of Source	Safe Yield
		<i>MLD</i>
1	Poondi-Cholavaram – Red Hills Lake system (including diversion of flood flow from Araniar to Korataiyar	200
2	Ground Water from Northern Well Field	100
3	Southern Coastal Aquifer	5
	Sub Total (A)	305
4	Krishna Water I Stage	400
5	Krishna Water II Stage	530
6	New Veeranam (CWSAP-I)	180
7	CWSAP-II (Proposed)	20

Sr. No.	Name of Source	Safe Yield
		<i>MLD</i>
8	Sea Water Desalination (Proposed)	100
	Sub Total (B)	1,230
	Grand Total (A) + (B)	1,535

Source: CMWSSB

The projections indicate that the overall water demand for the year 2026 is of the order of 2,248 MLD as against the full potential of the existing and presently ongoing source works totaling to 1,535 MLD, thus leaving a deficit of 713 MLD. Due to frequent and recurrent deficit monsoon in Chennai and in AP, there is uncertainty on the availability of water during such periods. Hence, it is pertinent to create additional reliable sources of water supply and accordingly the use of recycled wastewater and desalination of seawater are being considered.

The reuse of wastewater, though desirable from the environmental point of view, is fraught with limitations, until acceptability for use is established. Until then, the utilization of recycled wastewater can be limited to industrial purposes only.

Considering the above, desalination is one of the options being considered for reliable source of water supply. Accordingly 700 MLD is proposed in two phases, phase I comprising of 300 MLD and phase II of 400 MLD. The land required for establishing the additional desalination plants have already been identified, one at Kattupally near Minjur and the other near Thiruporur and Kelambakkam.

- (ii) Transmission Main and Distribution Network. Based on the Master Plan already prepared by the CMWSSB action has been taken to integrate the requirements of the adjacent and distant Local Bodies and the network of transmission mains has been created with this objective in mind. Therefore, it would be possible for CMWSSB to cover the Adjacent Municipalities and Special Village Panchayats by drawing from the transmission main network system and creating appropriate separate distribution for these areas. Under the Phase I program, extension of trunk mains from the CMWSSB system already available can be implemented with additional trunk mains to be established from the proposed desalination plants.
- (iii) Improvements to Water Distribution System. All the source development interventions would result in increased water availability and hence warrants systemic improvement projects in water distribution system in the City. Consequent to the systemic improvements undertaken, strengthening of the water distribution system was also undertaken in 11 zones. It is proposed to take up the strengthening of the water distribution system in the remaining 5 zones viz. Anna Poonga, Kilpauk, Triplicane, Southern Head works and K.K. Nagar also and providing valves in all the 16 zones towards isolation of zones, so that the entire service area would be benefited in supply eliminating defective streets of piped water supply. The pipelines will be laid to a total length of about 307 km. The existing distribution stations also needs strengthening to handle the water requirement of 2026 population. The total estimated cost of these works is Rs. 338.36 crore.
- (iv) Unaccounted for Water in Left Out Areas. Initial study by the NEERI in the 1970s revealed that leakage losses in the existing system were in the order of 35 percent to

40 percent. Hence, to increase the terminal pressure and to avoid leakage losses, it was decided to take up the leak detection program in phases with the objective of saving water. Out of the 3.40 lakh HSCs in Chennai City, so far, renewal and leak detection tests in 2.24 lakh HSCs has been completed. It is proposed to take up further 30,000 HSCs under this project including renewal of corresponding water mains of about 100 km, which are aged and choked. Further works are to be taken up in the coming years to minimize unaccounted for water.

- (v) Rehabilitation of Existing Raw Water Conduits. Three existing masonry conduits, used to draw raw water from Redhills constructed in the years 1914, 1955 and 1986 are brick masonry arched conduits, which need complete rehabilitation. The study carried out by international consultants M/s. Compagnie Generale des Eaux has examined the condition of these conduits in an extensive way and have recommended reconstruction of conduits I and III and repairs and rehabilitation of Conduit-II to transfer 359 MLD of water to Kilpauk Water Treatment Plant. The proposals envisage construction of 1,300 mm x 1,300 mm RCC conduit within the existing Conduit-I and Construction of 1,700 mm x 1,400 mm RCC conduit within the existing conduit in Conduit-III at an estimated cost of Rs. 44.00 crores.

F. Key Issues

212. Based on the available data, discussions with the officials, and field survey, the following the key issues and performance indicators are arrived.

Table 5.7: Performance Indicators

Service Indicators	Units	Value
Daily Per Capita Supply		
Summer Season	Liters	25.08
Normal Seasons	Liters	47.56
Roads Covered with Distribution Network	%	39.96
Total Storage Capacity with respect to Supply		
Summer Season	%	78.32
Normal Seasons	%	41.31
Assessment Covered by House Service Connections	%	29.30

Source: Analysis

- (i) Scarcity during Summer. As the yield from Palar River gradually decreases and worsens during summer season, the water supply requirement is met with tankers and ground water.
- (ii) Low Gross Per Capita Supply. The gross per capita supply to Tamparam is only 25.08 lpd during summers and 47.56 lpcd during normal seasons, which are very low compared to the standards of 90 lpcd (As per TWAD Board). To meet the standards, additional supply of 5.85 MLD of water is required.
- (iii) Duration of Supply. The municipality is supplying the water once in three days.
- (iv) Inadequate Storage Facilities. Additional 1.43 ML is required ($1/3^{\text{rd}}$ of total daily

demand) to serve the uncovered areas.

- (v) Inadequate Coverage/Unauthorized Connections. The distribution systems covers only 40 percent of the total road length while HSCs with respect to residential assessments is low as 29 percent. Apparently, there may be unauthorized/illegal connections in the town.
- (vi) The A.C. pipe connecting the ring well with the collection well at headworks is posing problems especially during summer and rainy seasons.
- (vii) Frequent Power Failures. Frequent power failures increase system losses. Existing power supply ranges from 330 volts to 400 volts as against 440 volts.

2. Sewerage and Sanitation

G. Overview

213. In the absence of UGD system, septic tanks and public conveniences serve as the major source for the safe disposal of human waste.
214. The sewage generated flows into septic tanks and its supernatant overflows causes odor nuisance. The sullage and sewerage water from the households in the town is presently led into drains, which ultimately accumulate as stagnant ponds in low-lying areas, leading to breeding of mosquitoes and unsanitary conditions.
215. The town has 9,600 individual septic tanks, which serves as one of the major means of safe disposal of human waste. The septic tanks serve about 30 percent of town's population. In addition, the municipality has provided about 1,360 low cost sanitation units, which serves about 4 percent of the total population. The Self Welfare Groups (SWGs) in Tambaram has constructed four toilets under Integrated Sanitation Program (ISP), which are used by about 1,200 households. They are located at Vinoba Nagar, Pudu Nagar, Bharat Nagar and Arputa Nagar. The users of ISP toilets are charged by the SWGs, which is based on the household size. Households having more than five members are charged Rs. 60 per month while those having less than five members are charged Rs. 30 per month. In addition to this, the town has nine community toilets constructed under VAMBAY Scheme and 12 community latrines.
216. Overall, about 38.27 percent of town's population has safe disposal facilities and the remaining either opt for community toilets or have no option other than open defecation, which is an area of major concern, as the coverage of safe disposal facilities is very low. **Table 5.8** provides details on sanitary facilities in the town.

Table 5.8: Sanitation Facilities

Description	Value	Population Covered
	<i>Nos.</i>	<i>Nos.</i>
No. of Septic Tanks	9,600	41,677
No. of Low Cost Sanitation Units	1,360	5,904
No of Toilets Constructed in Integrated Sanitation Program (ISP)	4	5,210
No. of Toilets		
Community Toilets constructed under VAMBAY Scheme	9	
Community Latrines	12	

Source: Tambaram Municipality

217. The sewage generated flows into septic tanks and its supernatant overflows causes odor nuisance. The sullage and sewerage water from the households in the town is presently led into drains, which ultimately accumulate as stagnant ponds in low-lying areas, leading to breeding of mosquitoes and unsanitary conditions.

Map 5.5: Location of Sanitation Facilities

H. Key Issues

218. Based on the available data, discussions with the officials, and field survey, the following key issues and the performance indicators are arrived.

Table 5.9: Performance Indicators

Indicator	Unit	Current Situation	Benchmark
% P.T. Assessment Covered with Septic Tanks	%	39.95	90.00
% P.T. Assessment Covered with LCS	%	5.66	10.00
% P.T. Assessment Covered with Safe Disposal Facility	%	45.61	100.00

Source: Analysis

- (i) Dearth of Safe Sanitation Facilities. Only 38.27 percent of total households and 39.98 percent of property assessments are served with safe sanitation facilities. With rapid population growth, it is important that the town be provided with a sewerage system.
- (ii) Absence of Safe Disposal System. In addition to the dearth in sanitary units, sullage and night soil is disposed into roadside/storm water drains. The problem needs immediate attention as it pollutes the watercourses (storm water drains lead sullage/wastewater to the natural drain/stream).
- (iii) Inadequate and Ill-maintained Public Sanitation. There is a high dependency by slum population on public conveniences, the seat per person is limited and most slum dwellers resort to open defecation; public awareness regarding safe sanitation is very poor.

I. Proposed Under Ground Sewerage System for Tambaram

219. The Detailed Project Report (DPR) for the Underground Drainage System for Tambaram Municipality was partly completed in 1999 by M/s Water and Power Consultancy Services (India) Pvt. Ltd. (WAPCOS). To update the DPR, Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL) entrusted the work to DHV Consultants in association with MDP Consultants Pvt. Ltd. and The Community Group International (TCGI). The final report was submitted in March 2005.
220. The sewerage system has been designed for the ultimate population of 2.23 lakh for 2034 (keeping 2004 as a base year) (refer **Map 5.6**). Due to contour variation, separate pumping stations are proposed for West and East Tambaram. The entire area has been divided into 7 sewer zones with 6 pumping stations, 3 each at West and East Tambaram. The sewage generated in each zone would be taken to six pumping stations located one at each zone. However, the waste from zone 4 and zone 7 shall be taken to a common pumping station through gravity (separately). The main pumping station located at zone 2 in East Tambaram is proposed to pump the entire wastewater to a common pumping station for

Tambaram and Pallavaram in Kilkattalai Eri located at Pallavaram. Sewage would be pumped from here to the common sewage treatment plant at Perungudi through a common pumping main for a length of 8.55 km.

221. About 4,408 manholes and 382 drop manholes are proposed for a sewer length of 137.99 km. The zone wise sewer details are given in **Table 5.10**. The cost abstract for the project is given in **Table 5.11**.
222. Waste Stabilization Pond has been considered the best for the treatment of waste. The ultimate sewage flow for 2034 is projected at about 20 MLD.
223. The proposed service connections for domestic and non-domestic are 17,500 and 2,500 respectively, thus, totaling to 20,000.

Map 5.6: Proposed Underground Drainage System for Tambaram Town

Table 5.10: Summary of Proposed Sewer Network

Pipe Material	Stoneware Pipes			RCC							Total
Diameter	200	250	300	200	250	300	350	400	450	500	
Zones	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm	m
1	11,804	569	71	501	408	319	30	-	-	-	13,702
2	26,734	432	1,424	934	470	411	-	1,354	694	609	33,062
3	10,119	68	267	116	240	1,404	-	-	-	-	12,214
4	33,169	477	2,480	2,188	-	1,065	217	93	555	732	40,976
5	11,152	800	1,434	520	-	48	-	1,100	309	-	15,363
6	2,789	-	-	646	-	-	-	-	-	-	3,435
7	14,990	-	1,325	1,169	-	208	-	1,545	-	-	19,237
Total	110,757	2,346	7,001	6,074	1,118	3,455	247	4,092	1,558	1,341	137,989

Source: Final Report of Updating the Detailed Project Report for Underground Sewerage Scheme for Tamaram Municipality, Tamil Nadu.

Table 5.11: Cost Abstract for Proposed UGD System in Tamaram

Sr. No	Particulars	Cost
		<i>Rs. Lakh</i>
1	Sewer System	2,036.28
2	Pumping Stations	197.85
3	Pumping Mains	605.16
4	Electrical and Mechanical Works	188.73
5	Proportionate Cost for Common Pumping Station	196.85
6	Proportionate Cost for Common STP	227.40
	Sub-Total (Base Cost)	3,452.27
	(a) Physical Contingencies @ 2.5 %	86.31
	Sub-Total (a)	3,538.58
	(b) Price Contingencies @ 2.5 % on sub-total (a)	88.46
	Sub-Total (b)	3,627.04
	(c) Supervision Charges @ 5 % on sub-total (b)	181.35
	Sub-Total (c)	3,808.39
7	Miscellaneous Cost	587.45
	Total Project Cost	4,395.84

Source: Final Report of Updating the Detailed Project Report for Underground Sewerage Scheme for Tamaram Municipality, Tamil Nadu.

3. Storm Water Drainage and Rehabilitation of Water Bodies

J. Overview

224. Tambaram has an effective network of storm water drains to the length of 112.40 km, which is 86.38 percent of the total road network. The town lacks closed drain system. Chunambu nallah (Length - 3 km), which is a natural nallah, passing through the outskirts of the town. It carries the wastewater as well as storm water from the entire town to the outskirts and finally discharges into Adyar Coouam River. The following **Table 5.12** provides further details regarding the type of storm water drains in the town.

Table 5.12: Storm Water Drains

Drain Type	Length	Distribution
	<i>Km</i>	<i>%</i>
Open Drains- Pucca	107.00	95.20
Open Drains- Kutcha	5.40	4.80
Closed Drains	-	-
Total	112.40	100.00

Source: Tambaram Municipality

Drainage System

225. *Topography.* Tambaram is located at 13⁰20' North latitude and 18⁰30' East longitude. The town is situated in relatively steep terrain with a gradual slope on the eastern side of the town draining towards a water body called Tiruvancheri Eri and western side of the town draining towards CTO Colony. The topography varies from 30 m to 20 m in the East and 34 m in the West.
226. *Rainfall.* The region receives maximum rainfall from Northeast monsoon i.e., from October to December and very little rains due to Southwest monsoon between July and August. The annual rainfall is about 1,124 mm.
227. *Primary Drain.* As such, there are no primary nallahs flowing within the municipal limits. However, some portion of Chunambu nallah, a natural nallah belonging to Perungalathur village flows within the Tambaram municipal limits. The local panchayat of Perungalathur village has upgraded the natural nallah with Cement Concrete (CC) till Chinamaya School. Most of the storm water from West Tambaram is drained out into this nallah. However, the local panchayat of Perungalathur village has raised an objection for the use.
228. In West Tambaram, the municipality has constructed a Cement Concrete roadside drain along Mudichur road, which stretches to a length of 3.0 km from Kalyani Nagar, Pillai Street to the outskirts of the town. The storm water from the entire area of West Tambaram is collected at Kalyani Nagar and from there; the storm water ultimately reaches the Chunambu nallah. However, some quantity of water is diverted to Kulakarraikulumb (Pond), which belongs to Iswaran Temple. The pond is spread on about 2 acres of land.

229. Chunambu nallah meets a rainwater channel, which flows about 3 km away from the town on Kiskinta road. This water channel ultimately gets discharged into Adyar Koovam River.
230. *Road Side Drains.* The municipality has provided 112.40 km of roadside built-up drains in the town, out of which about 95 percent are pucca drains while the remaining are kutcha in nature. The municipality has provided one side as well as both side drains along the roads in the town.
231. *Disposal.* In West Tamparam, most of the storm water is drained out of the municipal limits through Chunambu nallah. However, the other parts are drained into nearby Eris. In East Tamparam, the storm water is drained out into Periya Eri, Chitlapkkam Eri and Thiruvancheri Eri. The approximate areas drained out into these Eris are given in the following **Table 5.13**.

Table 5.13: Drainage Pattern in Tamparam

Eri	Wards Served
<i>West Tamparam</i>	
Periya Eri	28, 30, 31, 34, 35, 36
Vannan Eri	33, 37
Pudu Tungal	38
<i>East Tamparam</i>	
Periya Eri	15, 16, 17, 21, 22, 23
Chitlapakkam Eri	11, 12, 13, 14, 18, 19
Thiruvancheri Eri	Adjoining areas only

Source: Tamparam Municipality

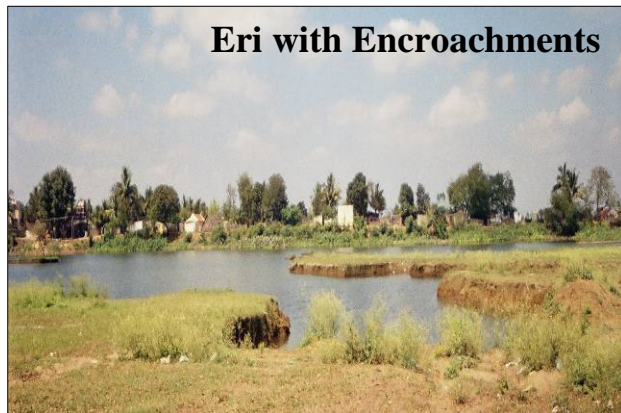
232. *Water Bodies.* Tamparam has 15 tanks within the municipal limits mostly maintained by the revenue department. The details of the tanks with the present status are briefed in **Table 5.14**. Most of the tanks are encroached and residing for more than 10-20 years. Periya Eri, located at Kadaperi (S. No. 154), spread on about 29 Ha of land is encroached by about 544 houses out of which 216 are RCC made structures. The only tank - Irumbuliyur Eri (S. No. 176), is owned by PWD Department. This tank is spread on about 39 Ha of land is encroached by about 515 houses. Five tanks are without any encroachments. Thus, there is a need to initiate measures to improve the condition of the tanks and make them encroachment-free.
233. A site visit was conducted to understand the actual condition of water bodies. The observations are tabulated below in **Table 5.15**.

Table 5.14: Water Bodies in Tamparam

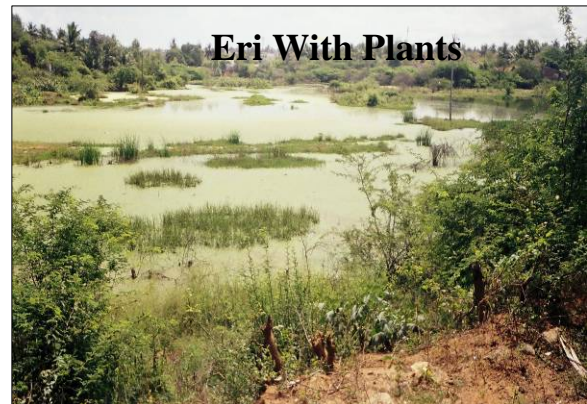
Sr. No.	Tank	Land Ownership	Extent	Present Condition	Details of Encroachment				Remarks
					Type of Encroachments				
					RCC	Tiles	Huts	Others	
			Ha		Nos.	Nos.	Nos.	Nos.	
1	Pudu Thangal Eri, Mullai Nagar, Tamparam (S. No. 256)	Revenue Dept.	10.42	Vacant with Encroachment	-	17	23	4	Encroachers living for past 20 years
2	Vannan Eri, Bajanai Koil Street (near), Tamparam (S. No. 298)	Revenue Dept.	4.60	Vacant with Encroachment	-	7	16	2	Encroachers living for past 20 years
3	Periya Eri, West Tamparam (S. No. 348)	Revenue Dept.	17.58	Vacant with Encroachment	37	116	168	16	Encroachers living for past 20 years
4	Etti Thangal Eri, Tamparam (S. No. 276)	Revenue Dept.	2.50	Vacant with Encroachment	-	11	17	-	Encroachers living for past 20 years
5	Mudichur Road Kulam (S. No. 295)	Revenue Dept.	1.80	Vacant	-	-	-	-	
6	Kulam Avenue III (near), Tamparam (S. No. 140)	Revenue Dept.	0.56	Vacant	-	-	-	-	
7	Kulam, Tamparam (S. No. 14)	Revenue Dept.	0.69	Vacant	-	-	-	-	
8	Idumban Eri, Pillikoradu (S.No.100)	Revenue Dept.	2.55	Vacant	-	-	-	-	
9	Periya Eri, Kadaperi (S.No.154)	Revenue Dept.	29.14	Vacant with Encroachment	216	124	182	22	
10	Kulam	Revenue Dept.	1.50	Vacant with Encroachment	2	2	9	-	Encroachers living for past 10 years
11	Irumbuliyur Eri (S. No. 176)	PWD Dept.	39.06	Vacant with Encroachment	186	162	148	19	Encroachers living for past 20 years
12	Kulam, Tamil Poonga Street (S. No. 26 & 28)	Revenue Dept.	0.91	Vacant with Encroachment	35	28	22	9	Encroachers living for past 20 years
13	Selaiyur Eri, (S. No. 145)	Revenue Dept.	71.10	Vacant with Encroachment	130	85	75	48	Encroachers living for past 20 years
14	Thiruvanchari Eri (S. No. 300)	Revenue Dept.	6.94	Vacant	-	-	-	-	
15	Kuttai (S. No. 80)	Revenue Dept.	0.78	Vacant with Encroachment	26	30	18	6	Encroachers living for past 20 years

Figure 5.2: Photographs of Water Bodies

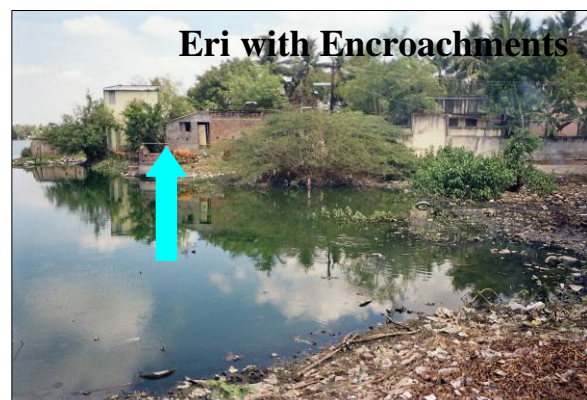
Pudu Thangal Eri, Mullai Nagar, Tambaram



Vannan Eri, Bajanai koil Street (near), Tambaram



Periya Eri, West Tambaram



Kulam Avenue III (near), Tamparam



Kulam near by residential



Drainage along Kulam



Drainage from Residential



Encroachments in Eri



Drainage to Eri



Bathing Purpose

Kulam, Tambaram Idumban Eri, Pillikoradu

Encroachment in Eri



Kulam with Plants



Encroachment in Eri



Eri without Water

Bathing Purpose



Eri Serves Irrigation



Encroachment in Eri



Kuttai without Encroachment

Table 5.15: Existing Status of Water Bodies

Name of Water Body	Source	Mixing of Sewage/Storm Water Drain			Supply to Agricultural Land		Surrounding Land use	Over Flow During Rainy Season	Availability of Water*	Remarks
		Yes/No	Inlet	Outlet	Yes/No	Quantity/Day		Yes/No		
Pudu Thangal Eri, Mullai Nagar, Tambaram (S.No. 256)	Rain Water, Vannan Eri & Etti Thangal Eri	Yes			No		Residential	Yes	12 Months	ULB has constructed well and from where water is pumped to OHT and supplied for drinking purpose
Vannan Eri, Bajanai Koil Street (near), Tambaram (S.No.298)	Rain Water	Yes		Pudu Thangal Eri	No		Residential	Yes	12 Months	Water is not used for any purpose
Periya Eri, West Tambaram (S.No.348)	Rain Water	Yes			No		Residential	Yes	12 Months	Water is not used for any purpose
Etti Tahangal Eri, Tambaram (S.No.276)	Rain Water & Vannan Eri	Yes		Pudu Thangal Eri	No		Residential	Yes	12 Months	Water is not used for any purpose
Mudichur Road Kulam (S.No.295)	Rain Water	No			No		Residential	Yes	12 Months	Water is not used for any purpose
Kulam Avenue III (near), Tambaram (S.No.140)	Rain Water	Yes			No		Residential	Yes	12 Months	Water is not used for any purpose

Name of Water Body	Source	Mixing of Sewage/Storm Water Drain			Supply to Agricultural Land		Surrounding Land use	Over Flow During Rainy Season	Availability of Water*	Remarks
		Yes/No	Inlet	Outlet	Yes/No	Quantity/Day		Yes/No		
Kulam, Tamparam (S.No.14)	Rain Water	Yes			No		Residential	Yes	12 Months	Water is not used for any purpose
Idumban Eri, Pillikoradu (S.No.100)	Rain Water	Yes			Yes	NA	Agricultural Land with Residential	Yes	12 Months	Water is supplied to irrigaton. It is found there is encroachment in eri during our field visit.
Periya Eri, Kadaperi (S.No.154)	Rain Water	Yes			No		Residential	Yes	12 Months	Water is not used for any purpose
Kulam	Rain Water	No			No		Residential	Yes	12 Months	Water is used for washing and bathing purpose
Irumbuliyur Eri (S.No.176)	Rain Water	Yes			No		Residential	Yes	12 Months	Water is used for washing and bathing purpose
Kulam, Tamil Poonga Street (S.No.26 & 28)	Rain Water	Yes			No		Residential	Yes	12 Months	Water is not used for any purpose
Selaiyur Eri (S.No.145)	Rain Water	Yes			Yes	NA	Residential	Yes	12 Months	Water is supplied to irrigaton
Thiruvanchari Eri	Rain Water	Yes			Yes	NA	Agricultural	Yes	12 Months	Since there is

Name of Water Body	Source	Mixing of Sewage/Storm Water Drain			Supply to Agricultural Land		Surrounding Land use	Over Flow During Rainy Season	Availability of Water*	Remarks
		Yes/No	Inlet	Outlet	Yes/No	Quantity/Day		Yes/No		
(S.No.300)							Land with Residential			breakage in lake at present there is no water. It is found there is encroachment in Eri during our field visit
Kuttai (S.No.80)	Rain Water	No			No		Residential	Yes	12 Months	Water is not used for any purpose. It is found there is no encroachment in kuttai during our field visit

Note:* Discussions with local residents

Source: Field visit

234. *Water Holding Capacity.* The water bodies offer a potential for ground water recharge and as localized sources for water supply. However, prior to use as water supply sources, detailed studies would be required on the water quality, extent of rehabilitation and regular maintenance required to ensure adequate storage and water quality, and the related treatment and pumping facilities and cost-effectiveness of supply from water bodies. The estimated water holding capacity for the existing tanks is given in **Table 5.16**. The total available water storage capacity is estimated at 1,330.91 ML. As most of the water bodies are in dilapidated condition, they need to be rehabilitated and strengthened.

Table 5.16: Water Holding Capacities of Eris

Tank	Storage Capacity	Actual Water Storage Capacity	Actual Water Storage Capacity
	<i>Mcum</i>	<i>Mcum</i>	<i>ML</i>
Pudu Thangal Eri, Mullai Nagar, Tambaram (S. No. 256)	0.21	0.07	72.94
Vannan Eri, Bajanai Koil Street (near), Tambaram (S. No. 298)	0.09	0.03	32.20
Periya Eri, West Tambaram (S. No. 348)	0.35	0.12	123.06
Etti Tahangal Eri, Tambaram (S. No. 276)	0.05	0.02	17.50
Mudichur Road Kulam (S. No. 295)	0.04	0.01	12.60
Kulam Avenue III (near), Tambaram (S. No. 140)	0.01	0.004	3.92
Kulam, Tambaram (S. No. 14)	0.01	0.005	4.83
Idumban Eri, Pillikoradu (S.No.100)	0.05	0.02	17.85
Periya Eri, Kadaperi (S.No.154)	0.58	0.20	203.98
Kulam	0.03	0.01	10.50
Irumbuliyur Eri (S. No. 176)	0.78	0.27	273.42
Kulam, Tamil Poonga Street (S. No. 26 & 28)	0.02	0.01	6.37
Selaiyur Eri, (S.No.145)	1.42	0.50	497.70
Thiruvanchari Eri (S. No. 300)	0.14	0.05	48.58
Kuttai (S. No. 80)	0.02	0.01	5.46
Total	3.80	1.33	1,330.91

Source: Analysis

235. Once the UGD system becomes fully functional (including provision of desired level of HSCs) and a proper networking of storm water drains is undertaken, the disposal of waste into the existing water bodies can be minimized / prevented. The water bodies can be improved to make them suitable for storing rainwater. Provision of proper treatment facilities and formulation and strict adherence to guidelines to keep them pollution free would be required prior to supply to consumers. Thus, the water bodies offer a potential local source that can supplement the regular water supply during summer. Improvement of water bodies would also lead to better environmental conditions and groundwater recharge.

K. Key Issues

236. Based on the available data, discussions with officials, and field survey, the following the key issues and the performance indicators are arrived at:

Table 5.17: Performance Indicators

Service Indicators	Units	Value	Benchmark
Roads Covered with Storm Water Drains	%	86.38	> 150
% Kutchra Drains	%	4.80	0.0
% Pucca Drains	%	95.20	100.00

Source: Analysis

- (i) Disposal of Domestic Sewage. In the absence of a sewerage system and inadequate sanitation facilities, a large amount of the domestic sewage is let into storm water drains resulting in overflow of the drains creating unhygienic conditions.
- (ii) Silting and Solid Waste Accumulation. Silting and uncontrolled solid waste dumping cause blockage and stagnation of storm water/wastewater runoff. Consequently, storm water drains choke and overflow into neighboring areas.
- (iii) Storm Water Drain Inadequacy. About 85 percent of the total road length in the town is covered by storm water drains. It is recommended that at least 150 percent of the town roads are covered by drains – the problem becomes more prominent when the storm water drains acts as medium for wastewater/sullage.
- (iv) Blockage in Earthen Nallah from Chinmaya School to Rain Water Channel. As this stretch is not strengthened with CC, the flow within this stretch becomes very less due to choking by trees, bushes, solid waste, etc., leading to blockage and over-flooding the surrounding areas.
- (v) Low Lying Areas/Flooding Areas. The topography of Tambaram has resulted in many low-lying areas like ward no. 3, 5, 6, 7, 20, 21, 22, 25-27, 32 and 38, facing the problem of water logging during rainy season. The recent rains have particularly affected and submerged Wards 25, 27, 32 and 38. Water stagnation problem can be observed in wards 17 (Satyasai Nagar), 18 and 28 as well. One of the reasons to which the problem may be attributed is the encroachment of Eris by huts and loss of natural drainage channels due to urbanization.

Map 5.7: Drainage Pattern in Tambaram

4. Solid Waste Management

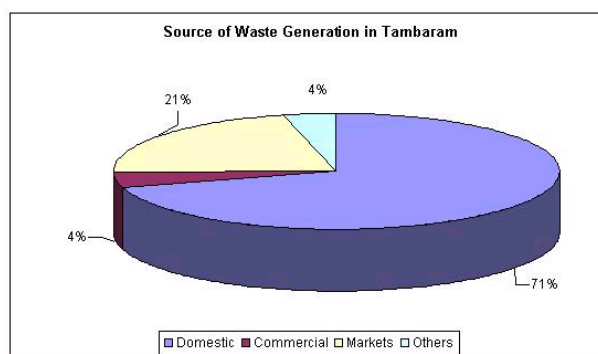
L. Overview

237. The collection, transportation and disposal of municipal solid waste, is an obligatory function of the Tambaram municipality. The municipal solid waste mainly comprises waste from households, markets, commercial establishments, hotels, hospitals and industries in the town. The health department of the municipality, headed by Sanitary Officer (SO), is responsible for the solid waste management of the town. For the efficient administration and for day-to-day operational purposes, the town is divided into five sanitary zones covering all the 39 municipal wards.

Solid Waste Generation

238. *Quantity of Generation.* As per the Solid Waste Action Plan prepared for Tambaram municipality, the total quantity of waste generated in Tambaram is to the tune of 75 tons per day. This works out to 534.39 gm per capita per day (2004), which is higher than the specified standards of 350 grams per capita for the town of similar size.

Figure 5.3: Sources of Waste Generation



239. *Sources.* The various sources of waste generation in Tambaram are detailed out in the **Table 5.18**.

Table 5.18: Sources of Solid Waste Generation

Source	Quantity	Total
	<i>Tons/day</i>	<i>Percent</i>
Domestic	53.00	70.67
Commercial	3.00	4.00
Markets	16.00	21.33
Industrial	-	-
Hospitals and Clinics	-	-
Others	3.00	4.00
Total	75.00	100.00

Source: Tambaram Municipality

240. *Domestic Waste.* In Tambaram, the major source of waste generation has been the households. The quantum of waste generated from households is around 53.0 tons per day, which is 70.67 percent of the total waste generation of the town. The household waste mainly consists of organic waste such as vegetable waste, food, etc., which can be easily disposed.

241. *Commercial Waste.* Commercial establishments like hotels, restaurants, shops, trading units, small time street traders, etc., account to about 1,500 in West as well as East Tambaram, which generates solid waste to a quantum of 3.0 tons per day. It mainly comprises of paper, plastics and other in-organic waste, which are finding their way to the disposal yard along with the domestic waste. In West Tambaram, the commercial shops are located along market, Mettu Ramalingam Street, Shanmukha Road, Gandhi Road, Rajaji Road, G.S.T. Road and Mudichur Road. While in East Tambaram, only Velachery Road houses commercial shops. The total commercial waste constitutes about 4.0 percent of the total waste generation.
242. *Market Waste.* Tambaram has two daily vegetable markets maintained by the municipality, one each in West (Periyar Market) and East Tambaram (New Market). The total waste generated from these markets is about 16.0 tons per day (Periyar Market – 13 tons per day, New Market – 3 tons per day) constituting 21.33 percent of the total waste, which constitutes one of the major sources of waste generation. Due to good connectivity with nearby districts like Chengalpatt and other villages, Tambaram has become the focal point for the sale of agricultural produce. As a result of which, the waste generation from the market in the town is more.
243. *Industrial Waste.* As there are no major industries in the town, the waste from the existing units is not mixed with the municipal waste.
244. *Hospital and Clinical Waste.* Tambaram has 28 hospitals/health clinics and 3 dispensaries. The medical association in Tambaram has employed a private contractor to collect and dispose the bio-medical waste outside the town limits. The waste is then incinerated. Thus, the hospital waste is not mixed with the municipal waste.
245. *Waste from Other Sources.* The municipality also collects waste generated from street sweeping, drain desilting and construction. The quantity of solid waste generated from the above sources is of the order of 3.0 tons per day, which is about 4.0 percent of the total waste generation.
246. *Composition of Waste.* To analyze the physico-chemical characteristics of solid waste, waste characterization study was conducted and the results are presented in **Table 5.19** and **Table 5.20**. The details of test results are presented in **Annexure 5.1**.

Table 5.19: Waste Characterization - Physical

Parameter	Unit	Average	
		Residential	Commercial
Organic			
Organic Matter	% w/w	15.53	40.88
Paper	% w/w	7.87	6.09
Garden Waste	% w/w	7.07	33.10
Inorganic			
Ash	% w/w	54.58	66.91
Bulk Density	Kg/cu.m	237.00	291.25
Ash & Fine Earth	% w/w	41.06	8.77
Glass & Ceramics	% w/w	5.70	-

Parameter	Unit	Average	
		Residential	Commercial
Inorganic Matter	% w/w	2.27	2.50
Metal	% w/w	0.40	0.95
Other Inert Materials	Nil	-	-
Plastic	% w/w	14.80	6.38
Rubber & Leather	% w/w	5.33	1.30

Source: Waste Characterization Study, 2006

Table 5.20: Waste Characterization - Chemical

Parameter	Unit	Average	
		Residential	Commercial
Carbon	% w/w	12.75	8.13
Fixed Carbon	% w/w	7.75	5.48
Gross Calorific Value	Kcal/Kg	2,520.00	1,376.00
Nitrogen as N	% w/w	1.05	0.92
Phosphorous as P	% w/w	0.11	0.13
Volatile Matter	% w/w	33.99	24.77
Cadmium as Cd	mg/Kg	0.41	0.18
Lead as Pb	mg/Kg	26.95	79.00
Arsenic as As	BDL (DL: 0.10 mg/Kg)	0.71	0.52
Nickel as Ni	mg/Kg	15.65	5.30
Zinc as Zn	mg/kg	126.40	11.10
Copper as Cu	mg/Kg	43.55	26.05
Mercury as Hg	BDL (DL: 0.10 mg/Kg)	BDL	BDL
pH (@ 25 °C)	(10% Suspension)	7.33	7.51
Moisture	% w/w	77.00	73.50

Source: Waste Characterization Study, 2006

247. The summary of physico-chemical characteristics indicates that, on an average, the organic waste (including garden waste and paper waste) content in residential and commercial wastes is 30.46 percent and 80.06 percent respectively. The average ash content in residential and commercial wastes is about 55 percent and 67 percent of respectively. The gross calorific value of the samples in residential waste was found to be around 2,520 kcal/kg, much higher than the advised calorific value of 1,500 kcal/kg for self-sustaining reaction for combustion. However, in commercial wastes the gross calorific value is 1,376 kcal/kg, below the advised value.

Solid Waste Collection

248. *Primary Collection.* In 2004, Tambaram municipality has initiated the concept of “Private Sector Participation” by handing over 17 wards (Ward Nos. 11-27) to a private contractor for solid waste management while the local body itself maintains remaining wards. The municipality is paying Rs. 340 per ton of waste collected to the contractor. **Table 5.21** details out the wards covered by the local body and the contractor. The Tambaram municipality has initiated the system of door-to-door system of collection in all the wards.

249. Tambaram is divided into two major divisions – West Tambaram and East Tambaram. These divisions are further sub-divided into five sub-divisions, which are supervised by ten Sanitary Supervisors (SS). The details of sanitation divisions are given in **Table 5.21**.

Table 5.21: Solid Waste Management in Tambaram

Sanitary Divisions	Sanitary Sub-Divisions	Wards Maintained by		Households Covered
		Local Body	Private Contractor	
West Tambaram	I	1,2,3,4,5,6,7,8,9		6,391
	II	10,33,34,35,36		2,766
	III	28,29,30,31,32,37,38,39		7,319
East Tambaram	IV		19,20,21,22,23,24,25,26,27	8,681
	V		11,12,13,14,15,16,17,18	6,615

Source: Tambaram Municipality

250. The local body and the private contractor have provided 28 and 30 tri-cycles respectively for door-to-door collection. The waste segregation is done at household level itself. For door-to-door system, no monthly charges are collected from the households. The waste collected is transported to the secondary collection points. The municipality has identified ward wise secondary collection points from where the waste is carried to the compost yard. The collection is done based on the priority and importance. The prioritized locations / streets are markets, G.S.T. Road, Velacheri Main Road, Gandhi Road, Rajaji Road, Mudichur Road, Kalkan Street, Mettu Ramalingam Street, etc.
251. The door-to-door waste is collected from 6.00 a.m. to 11.00 a.m. in the morning and from 2.00 p.m. to 5.00 p.m. in the afternoon throughout the year.
252. As per Solid Waste Management Rules of 2000, door-to-door collection is necessary because of which the municipality has not provided any dustbins for the primary collection.

Map 5.8: Sanitary Divisions and Sub-Divisions for Solid Waste Management

Map 5.9: Wards Maintained by Municipality and Private Contractor

253. However, there are about 723 dustbins provided by various NGOs and Social Welfare Groups in various wards. As per municipal officials, about 15 NGOs are involved in solid waste management activities in particular wards. For instance, in ward 11, the municipality is providing only the manpower to collect the door-to-door waste while the NGO has provided the tricycles. In Ward 12 and 32, the ward councilors perform works like cleaning the bushes and streets, desilting the drains, etc., and they charge Rs. 25 per month per household. The local body provides the vehicles. In ward 15, the NGO has provided 12 dustbins of 1 ton capacity each at a cost of Rs. 1.50 lakh.
254. In spite of door-to-door collection, it is observed that many of the households throw the waste onto the streets, drains and open spaces within the locality creating unhealthy conditions. Further, the waste thrown into the open drains leads to its choking causing the overflow of the wastewater on the streets.
255. *Street Sweeping.* One of the major activities in solid waste management is street sweeping, which is time consuming and labor intensive. In addition to street sweeping, due to the open drain system of sewage collection, drain desilting is also essential. The local body and the private contractor carry out street sweeping and drain desilting in their respective wards. Hand brooms and brooms with metal blade end are used for street sweeping while shovel and tricycles are used for drain desilting activities. Due to shortage of manpower, these activities are carried out for once in two days in each sanitary division.
256. The local body has engaged 180 sanitary workers (Permanent – 163, Temporary – 17) against the sanctioned posts of 222 to manage the solid waste in the town. Due to high vacancy rate of 20 percent, many of the streets are not swept regularly. The private contractor employs about 60 to 70 workers to manage 28 wards. Thus, per conservancy worker about 737 m of road length is being maintained, which is well within the prescribed limits of 1,000 m. The local body feels the shortfall of workforce; this is mainly due to following an unplanned/unorganized way of managing the solid waste.
257. *Secondary Waste Collection.* The secondary collection refers to collection of waste from community dustbins and intermediate collection points or transit points to the disposal site. In Tambaram, the municipality has identified 105 collection points. Each ward is facilitated with collection points. The ward wise collection points are given in the following **Table 5.22**.

Table 5.22: Ward wise Secondary Collection Points

Wards	Secondary Collection Points	Wards	Secondary Collection Points	Wards	Secondary Collection Points	Wards	Secondary Collection Points
	Nos.		Nos.		Nos.		Nos.
1	3	11	2	21	4	31	2
2	2	12	2	22	3	32	3
3	1	13	3	23	4	33	2
4	2	14	2	24	4	34	2
5	1	15	1	25	4	35	8
6	2	16	2	26	2	36	5
7	2	17	3	27	3	37	2
8	2	18	2	28	2	38	3
9	3	19	3	29	2	39	3

Wards	Secondary Collection Points	Wards	Secondary Collection Points	Wards	Secondary Collection Points	Wards	Secondary Collection Points
	Nos.		Nos.		Nos.		Nos.
10	5	20	2	30	2	Total	105

Source: Tambaram Municipality

258. *Frequency of Collection.* The frequency of waste collection from the households and secondary collection points are daily.

Transportation of Waste

259. Tambaram local body and the private contractor have engaged ten and seven vehicles respectively for the transportation of waste from secondary collection site to the disposal site. The municipality hired a tractor for Rs. 900 (which includes the wages of the driver and fuel requirement) from Agricultural Department for six months. The local body has discontinued this service. The total rated capacity of the available fleet of vehicles (with bulk density of 0.29 tons/cum) with the municipality and the private contractor is 65.49 tons, which indicates a collection performance of 85.98 percent. The details of vehicles with their carrying capacities are given in **Table 5.23**. However, adopting the bulk density of 350 kg/cum¹, the actual vehicle carrying capacity increases to 105.59 percent of the total waste generation, indicating availability of sufficient fleet for the solid waste collection and disposal.

Table 5.23: Details of Transportation Vehicles

Description	Mfg. Year	Owner Ship	Nos.	Capacity	Trips / Day	Bulk Density	Rated Capacity
				Tons	Nos.	Tons/m ³	Tons/day
<i>Municipality</i>							
Mazda	1989 (1 No.), 1997 (3 Nos.), 2006 (1 No.)	ULB	5	2.50	3	0.29	17.56
Ashok Leyland	1990	ULB	1	3.00	2	0.29	5.78
Cargo 709	1997	ULB	1	3.00	4	0.29	5.85
Tata 407	2003	ULB	3	2.50	3	0.29	8.66
Sub-Total			10				37.85
<i>Private Contractor</i>							
Benz	NA	Pvt.	1	2.50	2	0.29	4.63
Tractor	NA	Pvt.	5	1.50	3	0.29	17.37
Furgo	NA	Pvt.	1	2.50	2	0.29	4.63
Sub-Total			7				26.64
Total			17				64.49

Source: Tambaram Municipality

¹The Solid Waste Management studies conducted in several towns of Tamil Nadu (Palani, Mamallapuram, Kodaikanal, Rameswaram, Erode etc have put the density factor for compacted is observed to be in the range of 0.35 -0.4.

Disposal of Solid Waste

260. Scientific method of disposal of waste is not followed in the town. The waste collected from the town is disposed off into a compost yard at Kannadapalayam, which is around 7 km from heart of the town. The compost yard is spread on 4.2 acres of land and is in use for the last 40 years. A site visit was conducted to the existing disposal site at Kannadapalayam and the salient features observed are tabulated in **Table 5.24**.

Table 5.24: Salient Features of the Existing Disposal Site – Kannadapalayam

Description	Kannadapalayam
Approach Road*	The site is located on the Tambaram-Kishkinta road (BT Surface) and is in close proximal to Chennai - Maduravoyal Bypass road
Year of Usage*	40 Years
Fencing and Equipment at the Site	Compound wall exists
Waste Disposal Method	Open dumping
Adjoining Conditions of the Existing Site*	<ul style="list-style-type: none"> i. The site is located near to the newly developing residential locality. Due to odor and filthy conditions at the site, the local residents are uncomfortable and raised objections for its use. Very often, the lighter waste particles find their way into nearby streets, schools, temples, etc ii. The site is on the way to the burial ground. As the waste is dumped just beside this approach road, the road is always covered with waste and the commuters find difficult to access the road iii. Mullai Nagar Eri is located at 0.5 km from the site. iv. The compost yard extends to a height of about 8 to 10 feet from the ground level and is almost used to its capacity, thus, there is no scope for further expansion of this site in future v. The waste is also dumped along the Kishkinta road. The vacant land belongs to private persons
Ground Water Condition*	The depth of ground water at the existing site is about 30 feet. Though there is on data available on the ground water quality, the risk of groundwater contamination can not be ruled out due to open dumping
Remarks*	Municipality has employed five notified rack pickers to segregate the waste at the disposal site

Note: * Discussions with ULB officials and local residents

Source: Field Visit

Figure 5.4: Status of Existing Disposal Site at Kannadapalayam



261. The waste is also dumped illegally along Tambaram-Kishkinta Road (especially during evening) on a private land.

Figure 5.5: Illegal Dumping of Waste along Tambaram-Kishkinta Road



262. In order to make the solid waste disposal system safe and scientific, the local body has proposed to convert the existing compost yard at Kannadapalayam into a transfer station with proper infrastructure facilities which includes construction of shed with washing yard, pit stages, segregation shed for rag-pickers, providing watchman shed, water and lighting facilities, fencing and procurement of palm loader and front end loader. The estimated cost for above said facilities is Rs. 56 lakh. An integrated modern compost yard for the three municipalities viz., Alandur, Pallavaram and Tambaram at an estimated cost of Rs. 2.10 crores has been identified at Venkata Mangalam (near Vendalur), which is 30 km (16.67 acres) (Survey No. 16/4), from the town. The land is capable of handling 180 tones of waste per day from these municipalities.
263. The ULB has paid its contribution to the State Government amounting to Rs. 37,46,667. However, the work on 50 acres of land was started in June 2005, but soon came to a halt following the protests from residents in the vicinity over the land acquisition and also from the Indian Air Force Base who voiced concerns on safety to their flights on the ground that the compost yard once completed might attract birds. The ULB has also identified two lands for the solid waste disposal. The sites are situated at Nallur (50 acres) and Othivakkam (25 acres) at the distance of 13 km and 25 km from the town respectively. The proposal is submitted to the collector office for approval. A visit was conducted to capture the existing situation of the proposed disposal site at Venkata Mangalam. The salient features of the proposed site are presented in the following **Table 5.25**.

Table 5.25: Salient Features of the Proposed Disposal Site – Venkata Mangalam

Description	Venkata Mangalam
Total Area	50 acres
Approach Road*	The site is situated along Kandigai (from Vandalur to Kallambakkam Salai)
Fencing and equipments at the site	No Facilities
Adjoining conditions of the proposed site*	The site is enclosed by three Eris located in three different directions - Rathanamangalam Eri (Area – 50 acres, 0.5 km from the proposed site), Akaram Eri (Area – 150 acres, 0.10 km from the proposed site) and Madurapakkam Eri (Area – 100 acres, 2.00 km from the proposed site). The proposed disposal site is

Description	Venkata Mangalam
	also surrounded by the agricultural fields
Remarks	The site is in close proximity to the newly developing residential locality and surrounded by the social forest. Functioning of the disposal site may create problems like bad odor, filthy conditions, etc., thus, this is being objected to by the local residents. Birds are another major problem at the site as the Air Force Station is about 3 km from site, which may create problems to the flights. Presently, there are 60-65 families residing at the proposed site location. With the help of Venkata Mangalam Panchayat and Air Force officials, these people have raised objections to the disposal. All three Eri's (mentioned above) join together and ultimately meet Venkata Mangalam Eri which serves as a drinking water source for 7 villages

Note: * Discussions with ULB officials and residents

Residents residing at the proposed site location, claim that the Venakata Mangalam Panchayat had issued the land holding rights to them during 1970s (as indicated during discussions). However, the Tambaram ULB is still of the view that the land has been illegally encroached by them.

Source: Site Visit

Figure 5.6: Status of Proposed Disposal Site at Venkata Mangalam



Institutional Set-Up

264. As described earlier municipal solid waste management is an obligatory function of the urban local body. In Tambaram, Sanitary Officer who is supported by two Sanitary Inspectors heads the health department. Ten sanitary supervisors reporting to Sanitary Inspectors, supervise five sanitary divisions in Tambaram.

Table 5.26: Staff Details of Health Department

Description of Post	Sanctioned Post	Filled Post	Vacant Post	Vacancy Rate
	Nos.	Nos.	Nos.	%
Sanitary Officer	1	-	1	100%
Sanitary Inspector	5	2	3	60%
Sanitary Supervisor	10	10	-	-
Driver	13	10	3	23%
Sanitary Workers	225	180	45	20%
Others	1	1	-	-
Total	255	203	52	20%

Source: Tambaram Municipality

265. The total sanctioned posts in the health department is 252, out of which only 203 posts are filled indicating a very high vacancy ratio of 20 percent.

M. Key Issues

266. As per the available data and field visits, the following performance indicators are derived.

Table 5.27: Performance Indicators

Indicator	Current Situation	Benchmark
Per-Capita Generation	534.39 gm	< 350 gm
Collection Performance (% Collected to Generated)	85.98 %	100.0 %
% Actual Capacity of Vehicles to Total Waste Generation	105.59 %	>= 100.0 %
Road Length per Conservancy Staff	737 m	< 1,000 m

Source: Analysis

- (i) Per Capita Waste Generation. High per capita waste generation of 534.39 gm per day is observed in Tambaram against a prescribed level of 350 gm.
- (ii) Poor Waste Collection Performance. The collection efficiency of waste is 86 percent, which is good, but lower than the recommended level of 100 percent.
- (iii) Transportation of Waste. At present, the waste is being transported in open vehicles to the compost yard. The spillage of waste all along the route and odor from the waste is a common problem associated with open transportation of waste.

- (iv) Occupation Health Hazards. The waste collection, loading and unloading operations are manually dealt. The sanitary workers have not been provided with any protective equipment, which poses health hazards.
- (v) Lack of Scientific Waste Disposal. As the scientific disposal of waste is not followed, the waste is being disposed through open dumping. As a result, the waste finds its way onto the surrounding areas due to wind, making the surroundings unhygienic, and posing problem to environment.
- (vi) Improper Practice of Solid Waste Management. Even though the coverage by each sanitary worker is less than the prescribed standards of 1,000 m, still 42 posts of sanitary workers are vacant. In spite of less coverage by each sanitary worker, the local body feels the shortage of man-power. This is attributed mainly to the improper and unorganized practice of solid waste management system in the town.

5. Roads and Traffic Management

Roads

267. Tambaram municipality's role regarding roads comprises construction of major roads and maintenance of all roads in its jurisdiction, except roads belonging to PWD and Highway Department. In the new extension areas within municipal limits too, the internal roads are developed and maintained by the local body. It is also responsible for implementing proposals from master plan with regards new major roads and road widening activities.
268. The famous Grand Southern Trunk Road (G.S.T. Road) and railway route from Chennai Egmore to Kanyakumari divide the town into East and West Tambaram. The other important roads in the town are National Highway by-pass from Irumbuliyur to Maduravoyal, Velachery road, Tambaram to Kishkinta and Tambaram to Mudichur. The distribution of roads in the town is given in the following **Table 5.28**.

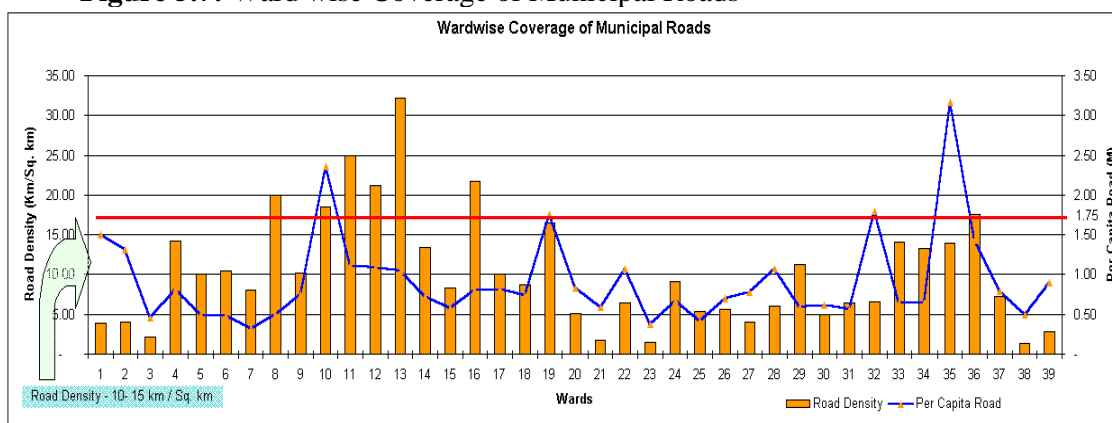
Table 5.28: Distribution of Roads in Tambaram

Roads	Length	Distribution
	<i>Km</i>	<i>%</i>
Municipal Roads		
<i>Surfaced Roads</i>		
Black Topped	62.73	53.33
Cement Concrete	23.55	20.02
<i>Unsurfaced Roads</i>		
WBM	17.33	14.73
Earthen/Kutchra	14.02	11.92
Sub-Total	117.63	100.00
Other Departmental Roads		
Highways and Major District Roads	15.00	
Sub-Total	15.00	
Total	132.63	

Source: Road Ledger of Tambaram Municipality

269. Roads in the interiors of the town are narrow and have a width ranging from 4 m to 6 m. Of the 132.63 km of roads in Tambaram, 117.63 km is maintained by the local body while the remaining 15.00 km by the other departments. With regards to the surface condition of municipal roads, about 73 percent of the total road length has bitumen surface.
270. The ward wise coverage of municipal roads is given in **Annexure 5.3**. Wards 8, 10-13, 16, 19 and 36 have densities more than 15 km /sq. km, the maximum being in Ward 13 with 32.22 km/sq. km (due to less administrative area and availability of more roads within the ward) while minimum in Ward 38 with 1.27 km/sq. km. The local body is maintaining the per capita road length more than prescribed standards of 1.75 m in 4 wards (Ward Nos. 10, 19, 32 and 35), the highest being in the Ward 35 with 3.16 m while minimum in the Ward 7 with 0.32 m.

Map 5.10: Road Network in Tambaram

Figure 5.7: Ward wise Coverage of Municipal Roads

271. The density of roads in the town is 6.40 km/sq. km. The per-capita road length maintained by the local body is 0.85 m, which is less than the standard of 1.75 m.
272. The condition of major roads is average. However, minor roads and roads within individual residential colonies are in bad condition. Footpaths and parking facilities are lacking on the streets.

N. Key Issues

273. The key issues and conclusions are based on field visits and data analysis. Performance indicators for Tambaram town is presented in the **Table 5.29**.

Table 5.29: Essential Road Network Indicators

Indicator	Units	Current Situation	Benchmark
Road Density	km/sq. km	6.40	10.00 – 15.00
Per Capita Road Length (Municipal Roads)	M	0.85	1.75
Percent of Black Topped Roads to Total Road Length	%	59.24	70.00
Percent of Municipal Surfaced Roads	%	81.28	100.00

Source: Analysis

- High Density and Congested Lanes.** Central areas of the town are narrow and surrounded by heavily built-up areas. These roads also carry large volumes of traffic that cater to commercial trading in the area. These factors make the lanes highly susceptible to air pollution and delayed travel times.
- Encroachment.** The margins of roads are encroached upon in several sections of major roads of the town by small-time street vendors, illegal parking and other informal activities. With no margins left on the roads, the effective carriageway of the road is reduced drastically leading to congestion.
- Absence of Street Furniture/Signages.** The roads lack signals, signages, and footpaths. Improper road sweeping results in most roads being covered with silty

soil, which reduces the driving safety.

Traffic and Transportation

274. Tambaram situated towards the south of Chennai city is one of the major urban areas in the metropolitan area. The excellent road connectivity and rail linkages have helped in its rapid development. The commercial activity is mainly concentrated near the railway station and the bus terminal on the G.S.T. Road (NH 45). As a result, heavy movement of vehicular as well as pedestrian traffic has resulted in traffic congestion.
275. *Travel Pattern.* The travel pattern in the town is guided by the road network and land use pattern in the town. The road pattern also makes a lot of thorough traffic to pass through the town. All the regional traffic too has to pass through the centre of the town owing to the presence of the G.S.T. Road, which is the gateway to Chennai City.
276. *Parking.* Land-use and economic activity of the town drives the parking demand in the region. In Tambaram, there is no proper parking regulation and control put to practice, as a result, abrupt and indiscriminate roadside parking is done. This has led to reduction in the effective carriageway of the roads leading to congested travel and accidents. The municipality has also not provided authorized parking lots on important roads like G.S.T. Road.
277. In 1993-94, a study on parking facilities in Chennai and its surrounding areas was conducted. The on-street parking surveys conducted along the stretches of G. S. T. Road indicated that the maximum parking demand was found as 201 PCE. Two-wheelers form the major share of parked vehicles (73 percent) followed by cars (13 percent) and auto rickshaws (11 percent). Average duration of parking is found to be 0.7 hour. Duration of parking for 92 percent of the total vehicles is more than 3 hours. On-street parking has reduced the capacity of roads by 27 percent to 43 percent. Turn-over of parking varies between 5.5 and 11.2. High parking turn over is observed on Mudichur Road. Mudichur Road and G.S.T. Road stretching between Mudichur road and Shanmugham Street have high parking demand.
278. Out of all the intra-city bus terminals (23 in No.), only Thirumanglam bus terminal had parking space provided by MTC. As per the above mentioned study, there is a felt need to provide parking facilities at Tambaram Terminal to serve passengers from Tambaram, Selaiyur, Madambakkam, Sembakkam, etc. and at Velachery Terminal to serve passengers from Velachery, Madipakkam, Puzhuthivakkam, Pallikaranai, etc.
279. Southern railway has provided parking lots within the station premises, which are operated by the private contractors nominated by the railways.
280. *Public Transportation System.* Metropolitan Transport Corporation (MTC) provides the public transportation system for Tambaram. In addition, autos, which form the Intermediate Public Transport (IPT) mode, are widely used.
281. *Projects under Implementation.* The various projects identified by different agencies that are being implemented or in the planning stage are given in **Table 5.30**.

Map 5.11: Map Showing the Status of Proposals for Traffic and Transportation in Chennai Metropolitan Region

Table 5.30: Projects under Implementation

Sr. No	Proposals	Status
	<i>Up Gradation of Road Rail crossing</i>	
1	Velachery Road	DPR in Progress
	<i>Other Proposals</i>	
1	Improvements to MTC Bus Terminal at Tambaram	Planning Stage

O. Key Issues

- (i) Lack of Proper Connectivity with NHs. G.S.T. Road, the NH passing through Tambaram, is the most important road providing connectivity to Chennai City and other major places in South Tamil Nadu. The important roads- State Highways- connected with G.S.T. Road in Tambaram are Mudichur Road and Velachery Road. Mudichur Road cross the proposed Outer Ring Road also, outside the limit of Tambaram Municipality. Hence, this road should be improved to provide better connectivity with G.S.T. Road. Velachery Road is a four-lane road, but need to be strengthened.
- (ii) Lack of Proper Connectivity with SHs. Other roads connecting to Mudichur road and Velachery road, both are the State Highways passing through Tambaram Municipality, such as Thirunneermalai road, Agaram road, MES road, etc., should be improved to provide better link with the SHs.
- (iii) Lack of Proper Connectivity to Activity Zones. The road connecting to Kishkinta major entertainment park is the Kishkinta road starting from Tambaram. In addition, the Thirunneermalai road to the proposed Thirunneermalai township needs to be improved.
- (iv) Narrow Bus Routes. It is observed that certain bus routes have carriageway width less than a two-lane width (7 m) and hence, and suggest to have minimum 7 m width to cater to safe movement of the vehicles in both directions.
- (v) The presence of a mufossil bus stand, parallel to Tambaram's bus terminal affects free traffic movement.
- (vi) Better Inter Municipal Connectivity. Thirunneermalai road and the link from Hasthinapuram main road to Velachery road are the two roads passing through both Tambaram and Pallavaram Municipalities. Improvement of these roads will provide better inter municipal connectivity between the two ULBs. In addition, Thirunneermalai road can act as a bypass link to the congested G.S.T. Road section between Tambaram and Pallavaram as it starts from Pallavaram and terminates at Tambaram.
- (vii) Absence of traffic infrastructure facilities for better traffic management such as
 - Organized on-street parking facilities
 - Junction improvement

- Pedestrian facilities such as foot path, safe pedestrian crossing

P. Proposals from Comprehensive Traffic and Transport Study (CTTS)

282. The Comprehensive Traffic and Transport Study (CTTS) carried out by the Madras Area Transport Study Unit (MATSU) in late 60's, provided the directional plan for transport investments and also formed an integral part of the first Master Plan for the CMA (1971-91). Updations of CTTS was done in 2004 and forecasted the travel demand for 2009 and 2014 which would be used for the feasibility studies and design the individual transport investments.
283. To update CTTS, the CMA was delineated into 121 zones and conducted household surveys with 2 percent as the sample size. Pallavaram was one of the zones selected and as the town characteristics are similar to Tambaram, the results of the survey can be taken as an indicative value for Tambaram as well. The results of surveyed households in Pallavaram are briefed in the following **Table 5.31**.

Table 5.31: Outcomes of Survey Data

Description	Year	Unit	Value
Traffic Zone Number			281
Household Surveyed		Nos.	295
Household Size	1992		4.47
	2004		4.31
Trip Rate	1992		1.19
	2004		1.36
Household Income	1992	Rs.	1,945.00
	2004	Rs.	5,292.98
Per Capita Income	1992	Rs.	435.00
	2004	Rs.	1,228.30

Source: Final Report of Updating the CTTS Carried Out in 1992-95

284. The above table indicates that there is a tremendous increase in the household income in the town. The trip rate has also increased from 1.19 in 1992 to 1.36 in 2004 indicating that there is a demand for mobility and hence, vehicles.
285. The main proposal pertaining to Tambaram is to widen and strengthen Tambaram-Somangalam Road (2.4 km, carriageway width – 6 m). Construction of ROB in lieu of Level Crossing 32, 33 in between Tambaram-Vandalur (Near Standard Motors).

6. Street Lighting

Q. Overview

286. The provision and maintenance of streetlights is an obligatory function of Tambaram municipality. The Tamil Nadu Electricity Board (TNEB), a statutory body formed in 1957 under the Electricity Supply Act, 1948, supplies electricity to Tambaram. TNEB is responsible for installing new streetlight poles and drawing electric cables to light them.

The municipality bears the expenses incurred. Temporary lighting arrangements are also extended by the local body in case of fairs and festivals organized in the town.

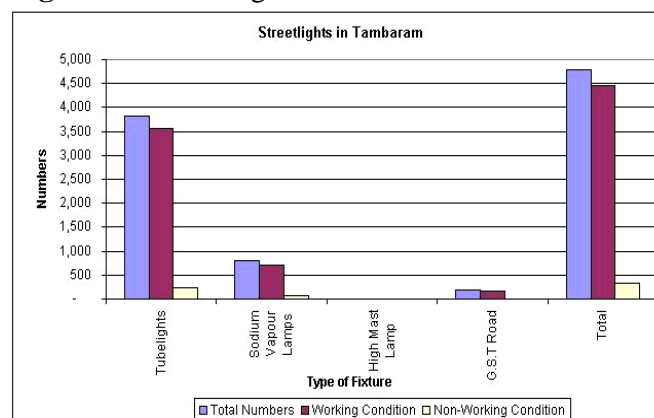
287. There are about 4,785 streetlights in the town limits. The average spacing of streetlight pole is 28 m, which is better than the preferred spacing of 30 m. **Table 5.32** summarizes the streetlight composition.

Table 5.32: Summary of Streetlights in Tambaram

Streetlights	Total Numbers	Working Condition	Non-Working Condition	Distribution of Total Streetlights	Distribution of Working Streetlights
	Nos.	Nos.	Nos.	%	%
Tube lights	3,813	3,568	245	79.69	93.57
Sodium Vapor Lamps	791	713	78	16.53	90.14
High Mast Lamp	1	1	-	0.02	100.00
G.S.T Road	180	174	6	3.76	96.67
Total	4,785	4,456	329	100	93

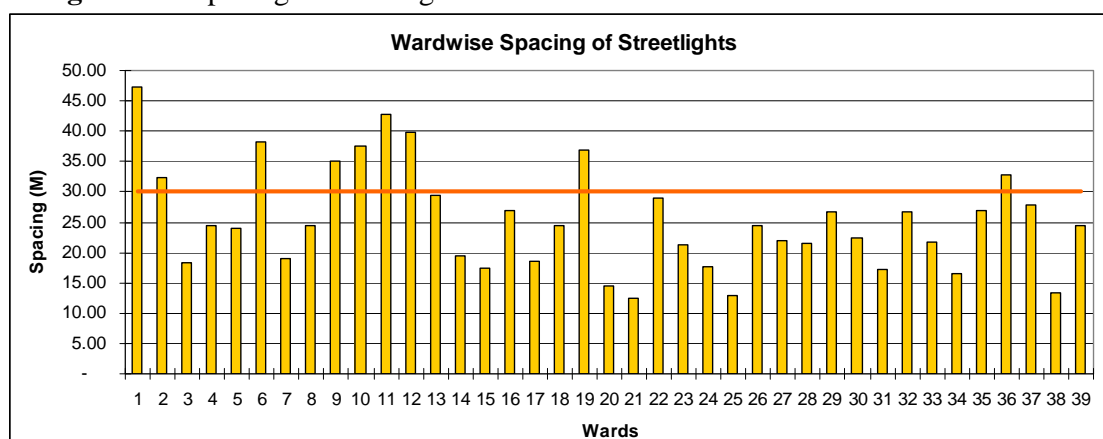
Source: Tambaram Municipality

Figure 5.8: Streetlights in Tambaram



288. Tube light constitutes about 80 percent of the total luminaries in the town followed by sodium vapor lamps with 17 percent. Only one high mast lamp has been provided at Camp Road Junction in East Tambaram.
289. In spite of average spacing of 28 m between the street poles, it has been observed that the illumination especially in new extension areas and crowded places is poor.
290. The ward wise spacing of streetlights indicates that 9 wards have streetlight spacing more than the prescribed spacing of 30 m with maximum spacing persisting in Ward No. 1 with 47.38 m, resulting in poor illumination. However, 30 wards have spacing less than 30 m, thus, are well lit. The minimum spacing with 12.36 m in Ward 22 is well illuminated.
291. Out of 4,785 fixtures, about 7 percent are in damaged condition. The problem persists maximum in Ward No. 38 with 42 fixtures are in non-working condition. The ward wise distribution of streetlights is detailed out in **Annexure 5.4**.

Map 5.12: Poorly lit Wards in Tambaram Town

Figure 5.9: Spacing of Streetlights

292. *Operation and Maintenance.* As the municipality was incurring high expenses on the operation and maintenance of streetlights, 10 wards (with G.S.T Road and Velachery Road) have been privatized in October 2004. The wards considered for the privatization are 10, 28, 29, 30, 31, 32, 33, 34, 35, 36 and G.S.T. Road. The work has been entrusted for three years to M/s Akash Associates, Tirunelveli.
293. The scope of work for the private contractor includes switching on and off the streetlights, maintenance of fixtures based on unit rate and attending to streetlight complaints. The municipality pays a net amount of Rs. 59,345 per month (Gross Payable Amount – Rs. 60,705, Tax Deductions – Rs. 13,601). The per month unit rates charged by the contractor is Rs. 250 for tube light and Rs. 880 for sodium vapor lamp.
294. As per the contract document, the contractor is required to use only ISI Certified products. If the contractor fails to attend the complaints within the stipulated time of 24 hours, he is liable to a fine of 5 percent per post, which would be deducted once in a year.
295. However, the discussion with engineering department officials revealed that after privatizing the O&M of streetlights for 11 wards, the number of complaints from the public have reduced drastically. The contractor appears to be delivering a satisfactory performance.

R. Key Issues

296. Poor illumination at new extension areas and congested places and damaged poles are the key issues with respect to street lighting in Tambaram. The performance indicators are given below.

Table 5.33: Performance Indicator

Indicator	Unit	Current Situation	Benchmark
Average Spacing between Lamp Posts (Town as a Whole)	M	27.72	< 30.0
% Tube Lights	%	79.69	70.0 – 80.0

Indicator	Unit	Current Situation	Benchmark
% High Power Lamps	%	16.55	20.0 – 30.0

Source: Analysis

Note: The average for the town given in the table above cloaks the discrepancies between wards. While the average for the town is within / above prescribed limits, certain wards fall below the standard, with wider spacing.

7. Social Infrastructure

297. *Primary Health.* There are two government hospitals, one each at West and East (20 bedded) Tambaram. The municipality also maintains a health dispensary. Apart from these health facilities, the town houses 26 private hospitals and clinics and 2 dispensaries.
298. *Education.* Tambaram houses government education institutions and aided and private institutions. It is also known for the existence of the world-renowned Madras Christian College and Indian Air Force Training Center.
299. In 2001, the literacy rate in the town was 77.45 percent. The literacy rate in Tambaram is higher than that in Chennai City and the state urban average figures of 76.82 percent and 73.47 percent respectively. The main reason for high literacy can be attributed to its proximity to Chennai City, which houses wide range of educational facilities.
300. The local body maintains seven municipal schools within its area of its jurisdiction. In addition, the town has around 46 private schools and colleges.
301. *Burial Ground.* There are six burial grounds within the municipal jurisdiction located at Selaiyur, Kannadapalayam, Thiruneermalai, Arputha Nagar, Moulana Nagar, and Selaiyur (Dr. Ambedkar Nagar). All the above-mentioned burial grounds require improvement.

VI. WASTE CHARACTERIZATION

A. Introduction

302. Estimating the characteristics of solid waste generated in Tambaram is one of the primary tasks of the present study. These characteristics are strongly influenced by, climatic and seasonal variation, the economy of the region, the physical characteristics of the city and social and religious customs of the society.
303. Considering the aspects, surveys were carried out in Tambaram for assessing the exact characteristics of the solid waste generated in the town.
- (i) Solid waste sampling for the analysis of physico-chemical characteristics
304. Details of these surveys and the results of the same are discussed in the subsequent sections of this chapter.

B. Physico-Chemical Characteristics of Solid Waste

305. The physico-chemical characteristics of solid waste are analyzed in this section. For this purpose, sampling surveys were carried at the Kanadapalayam disposal site of the town. As per the project scope of work, at least one sample was required to be analyzed at the transfer stations. However, there are no formal transfers stations functioning in Tambaram town and the characteristics of waste at the collection points (if considered as the temporary transfer stations) was found to be not the true representative of the solid waste produced by town.
306. Considering these aspects, all the samples were collected from the disposal site for two consecutive days (13 Feb 2006 and 15 Feb 2006). The sampling program comprised collecting one residential and one commercial waste sample on two different days of the week (Monday and Wednesday) and performing on site characterization and lab analysis of the same. The Monday samples will represent the holiday waste and the Wednesday sample will represent the weekend waste.
307. In order to represent the waste characteristics from different parts of the town, the two samples were collected from different parts of the disposal site. The sample analysis comprised
- (i) Onsite characterization by way of segregation and weighing the percentage of each constituent in terms of paper, plastic, rags, organic and inorganic components on the site; and
- (ii) Chemical analysis of representative sample in the lab for various chemical parameters as listed in the CPHEEO manual

C. Selection of Samples

308. Selection of samples for characteristics survey is done based on the various sources of waste generation presented in the earlier section.

- (i) Domestic Sources. For Domestic Sources a group of solid waste trucks originating from a particular neighborhood (Residential Area) is unloaded and mixed thoroughly by the coning and quartering method and a sample of 5 kg is collected from one quarter, that represent the sample waste and then analyzed for its characterization.



- (ii) Commercial Sources. For Commercial Sources, a group of solid waste trucks originating from a particular neighborhood (Commercial Area) is unloaded and mixed thoroughly by the coning and quartering method and a sample of 5 kg is collected from one quarter that represent the sample waste and then analyzed for its characterization.

D. Methodology of Sampling

309. For the purpose of survey, a day before the sampling survey, each Municipality Sanitary worker was briefed about the purpose of the study, and modalities of waste collection. On the day of sampling, Municipality Sanitary workers were given a duly labeled sampling bag and were requested to place all the accumulated waste in the bag for collection. In addition, the survey team collected the waste in a vehicle from each of the identified samples around 12:30 PM in the afternoon. The same procedure was followed for all the two days of sampling.



310. The collected samples were then collated at a common place (Lab) and weighed for the total waste generated. During weighing the basic characters of the sample such as condition and broad constituents in the sample, etc. were recorded.

311. At the waste sampling locations on-site segregation was undertaken to establish the broad categorization of various constituents of waste such as:

- (i) Organic matter (food and vegetable matter)
- (ii) Garden waste
- (iii) Paper
- (iv) Plastic
- (v) Rubber and leather

- (vi) Metal
- (vii) Glass and ceramics
- (viii) Inorganic and
- (ix) Other inert materials, etc.

and percentage composition in the sample estimated.

312. The physico-chemical characteristics was then analyzed in the laboratory as per BIS guidelines and the characters in terms of

- (i) pH
- (ii) Moisture content
- (iii) Carbon
- (iv) Nitrogen
- (v) Phosphorous
- (vi) Volatile matter
- (vii) Ash
- (viii) Calorific value
- (ix) Heavy metals such as Arsenic, Zinc, Lead, Cadmium, Copper, Mercury and Nickel.

E. On Site Physical Analysis of Solid Waste

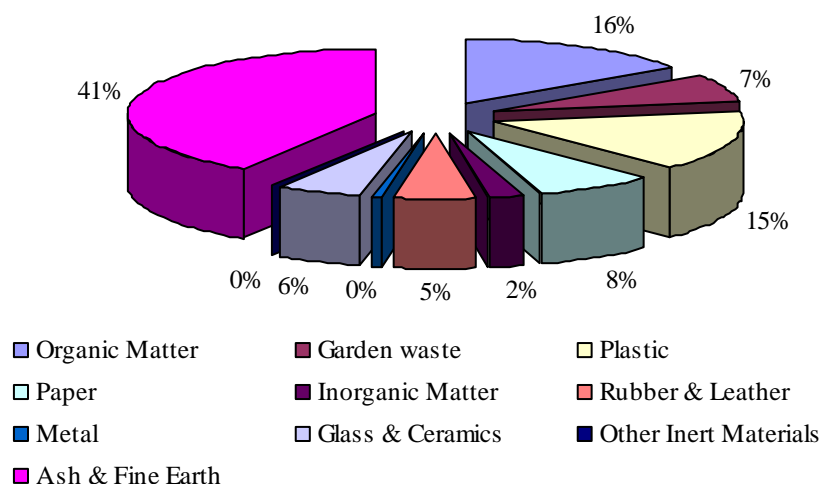
1. Domestic Sources

313. Domestic waste comprises the solid wastes that originate from single and multi-family household units. These wastes are generated as a consequence of household activities such as cooking, cleaning, repairs, packing, clothing, old books, and old furnishings.
314. As per the sample survey and analysis, Ash and Fine Earth are the major constituents of the solid wastes of Tambaram. The composition of Ash and Fine Earth as presented in **Table 6.1** is around 41.06 percent, the contribution of Organic matter and Plastic constitutes a significant proportion and is 15.53 and 14.80 percent respectively.
315. The other significant constituents of solid waste in Tambaram are papers and garden wastes. The contribution of these elements is around 7.87 percent and 7.07 percent. It is noted that in physical characteristics of solid waste the inorganic waste constituents are more (69.56 percent) when compared to organic waste (30.47 percent). The inorganic content is high in the town because of market waste like plastic, ash and fine earth, etc. Similarly, the contribution of plastic and paper is higher than the normal composition estimated by CPHEEO in its manual on solid waste management for towns of this size class. This can be attributed to the growing urbanisation in the region and around the project town of Tambaram and associated activities. The physical characteristic of solid waste as per CPHEEO is tabulated in **Table 6.2** and composition of solid waste is shown in **Figure 6.1**

Table 6.1: Physical Characteristics of Solid Waste – Domestic Waste

Parameter	Units	Sample-I	Sample-2	Average
Bulk Density	Kg/Cu.m	105.00	369.00	237.00
Physical Characteristics (% of total weight) - wet weight basis				
Organic Matter	% w/w	2.9	28.15	15.53
Garden waste	% w/w	1.86	12.27	7.07
Plastic	% w/w	0	29.6	14.80
Paper	% w/w	1.03	14.7	7.87
Inorganic Matter	% w/w	4.54	0	2.27
Rubber & Leather	% w/w	10.65	0	5.33
Metal	% w/w	0.13	0.66	0.40
Glass & Ceramics	% w/w	1.42	9.97	5.70
Other Inert Materials	NIL	0	0	0
Ash & Fine Earth	% w/w	77.5	4.62	41.06

Source: Sample Analysis

Figure 6.1: Composition of Solid Waste**Table 6.2:** Physical Characteristics of Solid Waste as Per CPHEEO – Domestic Waste

Parameter	Units	Composition	
		As per CPHEEO ¹	As per MNES ²
Paper	% w/w	2.91	3.09
Plastic	% w/w	-	0.57
Rubber & Leather	% w/w	0.78	-
Glass & Ceramics	% w/w	0.56	0.29
Metal	% w/w	0.33	0.51
Inorganic Matter	% w/w	43.59	33.41
Other Inert Materials	% w/w	44.57	46.06

Note:

¹ For towns of population 0.1 to 0.5 million

² For towns of population less than 0.2 million

Source: CPHEEO Manual on Solid Waste Management

316. *Chemical Characteristics.* As regards chemical composition, moisture content of solid waste was found to be around 77 percent (**Table 6.3**). Similarly, the calorific value of the waste is around 2,520.00 Kcal / kg in Tambaram. These values are higher than the advised

Moisture content and Heating Calorific Value estimated by CPHEEO. The other significant constituents of solid waste in Tambaram are ash content and volatile matter. The contribution of these elements is around 54.58 percent and 33.99 percent.

Table 6.3: Chemical Characteristics of Solid Waste – Domestic Waste

Parameter	Units	Sample-I	Sample-2	Average
pH		8.14	6.52	7.33
Moisture Content	% w/w	75	79	77.00
Calorific Value	Kcal/Kg	653	4,387	2,520
Volatile Matter	% w/w	12.4	55.57	33.99
Ash Content	% w/w	83.75	25.41	54.58
Carbon	% w/w	5.9	19.6	12.75
Fixed Carbon	% w/w	2.19	13.31	7.75
Nitrogen (N)	% w/w	0.37	1.72	1.05
Phosphorous (P)	% w/w	0.02	0.2	0.11
<i>Metals</i>				
Arsenic	Mg/Kg	0.71	BDL (DL:0.10mg/Kg)	0.71
Copper (Cu)	Mg/Kg	67.7	19.4	43.55
Zinc (Zn)	Mg/Kg	224.5	28.3	126.40
Lead (Pb)	Mg/Kg	47.5	6.4	26.95
Cadmium (Cd)	Mg/Kg	0.56	0.26	0.41
Mercury	Mg/Kg	BDL	BDL	BDL
Nickel	Mg/Kg	18	13.3	15.65

Source: Sample Analysis

317. Since there are 28 hospitals and 3 dispensaries in Tambaram, some toxic (metal) content was also found. Zinc and Copper are the major constituents of the solid wastes of Tambaram. The composition of Zinc and Copper as presented in **Table 6.4** is around 126.40 mg/Kg and 43.55 mg/kg respectively. The other significant constituents of solid waste in Tambaram are Lead and Nickel. The contribution of these elements is around 26.95 mg/kg and 15.65 mg/kg.

Table 6.4: Chemical Characteristics of Solid Waste as Per CPHEEO – Domestic Waste

Parameter	Units	Composition	
		<i>As per CPHEEO¹</i>	<i>As per MNES²</i>
Moisture Content	% w/w	25.81	22.21
Carbon	% w/w	-	12.56
Nitrogen	% w/w	0.71	0.60
Phosphorus	% w/w	0.63	0.70
Potassium	% w/w	0.83	0.70
Heating Calorific Value	Kcal/Kg	1009.89	800.00

Note:

¹ For towns of population 0.1 to 0.5 million

² For towns of population less than 0.2 million

Source: CPHEEO Manual on Solid Waste Management

2. Commercial Sources

318. Commercial waste comprises the solid waste that originates in offices, wholesale and retail stores, restaurants, hotels, markets, warehouses and other commercial establishments.
319. Organic matter and Garden waste are the major constituents of the solid waste of Tamaram. The composition of Organic matter and Garden waste as presented in **Table 6.5** is around 40.88 percent and 33.10 percent respectively, the contribution of ash and fine earth constitutes a significant proportion and is 8.77 percent.

Table 6.5: Physical Characteristics of Solid Waste – Commercial Waste

Parameter	Units	Sample-I	Sample-2	Average
Bulk Density	Kg/Cu.m	119.0	463.5	291.25
Physical Characteristics (% of total weight) – wet weight basis				
Organic Matter	% w/w	40.6	41.15	40.88
Garden waste	% w/w	34.74	31.45	33.10
Plastic	% w/w	3.2	9.55	6.38
Paper	% w/w	5.86	6.31	6.09
Inorganic Matter	% w/w	5	0	2.50
Rubber & Leather	% w/w	0	2.6	1.30
Metal	% w/w	1.5	0.4	0.95
Glass & Ceramics	% w/w	0	0	0.00
Other Inert Materials	NIL	0	0	0.00
Ash & Fine Earth	% w/w	9	8.53	8.77

Source: Sample Analysis

320. The other significant constituents of solid waste in Tamaram are plastic and paper. The contribution of these elements is around 6.38 percent and 6.09 percent, which is higher than the normal composition anticipated by CPHEEO in its manual on solid waste management. This may be attributed to growing urbanization in Tamaram and associated activities. It is noted that in physical characteristics of solid waste, the inorganic waste constitutes are less (19.9 percent) when compare to organic waste (80.07 percent). The organic waste is high because of more number of hotels (26) and *kalyanamandabams* (16) in the town.

Table 6.6: Physical Characteristics of Solid Waste as Per CPHEEO – Commercial Waste

Parameter	Units	Composition	
		As per CPHEEO ¹	As per MNES ²
Paper	% w/w	2.91	3.09
Plastic	% w/w	-	0.57
Rubber & Leather	% w/w	0.78	-
Glass & Ceramics	% w/w	0.56	0.29
Metal	% w/w	0.33	0.51
Inorganic Matter	% w/w	43.59	33.41
Other Inert Materials	% w/w	44.57	46.06

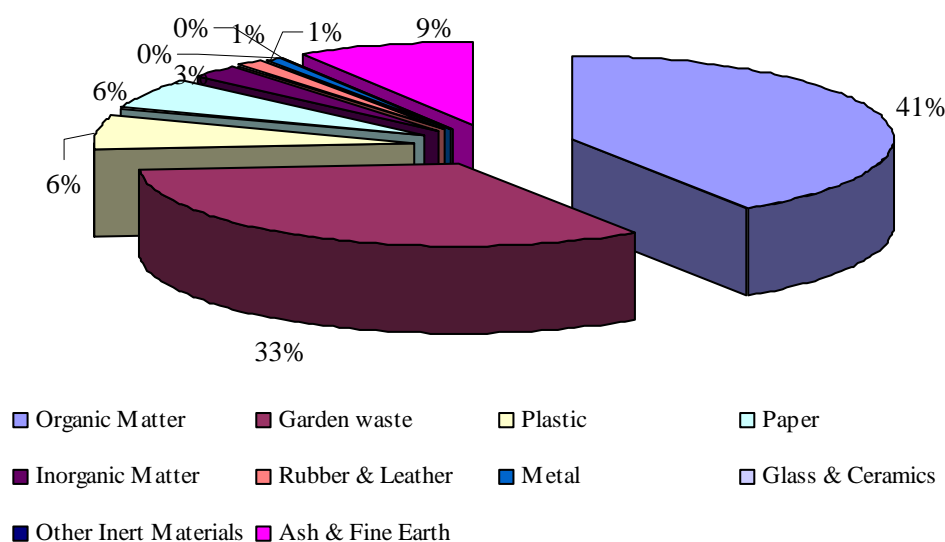
Note:

¹ For towns of population 0.1 to 0.5 million

² For towns of population less than 0.2 million

Source: CPHEEO Manual on Solid Waste Management

Figure 6.2: Composition of Solid Waste



321. **Chemical Characteristics.** As regards the chemical composition, moisture content of solid waste was found to be around 73.50 percent (**Table 6.7**). Similarly, the calorific value of waste is around 1,376.00 Kcal / kg in Tambaram. These values are higher than the Moisture content and Heating Calorific Value estimated by CPHEEO for town of similar size class. The other significant constituents of solid waste in Tambaram are ash content and volatile matter. The contribution of these elements is around 54.58 percent and 33.99 percent. Chemical Composition is illustrated in **Table 6.7** and **6.8**.

Table 6.7: Chemical Characteristics of Solid Waste – Commercial Waste

Parameter	Units	Sample-I	Sample-2	Average
pH		8.5	6.51	7.51
Moisture Content	% w/w	70	77	73.50
Calorific Value	Kcal/Kg	470	2,282	1,376.00
Volatile Matter	% w/w	11.65	37.89	24.77
Ash Content	% w/w	85.1	48.72	66.91
Carbon	% w/w	4.26	12	8.13
Fixed Carbon	% w/w	1.7	9.26	5.48
Nitrogen as N	% w/w	0.36	1.47	0.92
Phosphorous as P	% w/w	0.002	0.25	0.13
Metals				
Arsenic	mg/Kg	0.52	BDL	0.52
Copper as Cu	mg/Kg	28.7	23.4	26.05
Zinc as Zn	mg/Kg	5.9	16.3	11.10
Lead as Pb	mg/Kg	152.7	5.3	79.00
Cadmium as Cd	mg/Kg	0.18	BDL	0.18
Mercury	mg/Kg	BDL	BDL	BDL
Nickel	mg/Kg	9	1.6	5.30

Note:* BDL – Below Detection Limit

Source: Sample Analysis

Table 6.8: Chemical Characteristics of Solid Waste as Per CPHEEO – Commercial Waste

Parameter	Units	Composition	
		<i>As per CPHEEO¹</i>	<i>As per MNES²</i>
Moisture Content	% w/w	25.81	22.21
Carbon	% w/w	-	12.56
Nitrogen	% w/w	0.71	0.60
Phosphorus	% w/w	0.63	0.70
Potassium	% w/w	0.83	0.70
Heating Calorific Value	Kcal/Kg	1009.89	800.00

Note:¹ For towns of population 0.1 to 0.5 million² For towns of population less than 0.2 million**Source:** CPHEEO Manual on Solid Waste Management

322. Since there are 28 hospitals and 3 dispensaries in Tambaram, some toxic (metal) content was also found. Lead and Copper are the major constituents of the solid wastes of Tambaram. The composition of Lead and Copper as presented in **Table 6.7** is around 79.00 mg/kg and 26.05 mg/kg respectively. The other significant constituents of solid waste in Tambaram are zinc and nickel. The contribution of these elements is around 11.10 mg/kg and 5.30 mg/kg.

F. Key Issues

- (i) In the physical composition of solid waste, the organic waste of commercial establishments (80.07 percent) is more when compared to domestic waste (30.47 percent). The organic waste from commercial establishments is high because of the waste from hotels and kalyanamandapams.
- (ii) In the physical composition of solid waste, the inorganic waste of commercial establishment (19.9 percent) is less when compared to domestic waste (69.56 percent). This is due to the fact that street waste, market waste and ash & fine earth are generated more from domestic sources.
- (iii) In the chemical composition of solid waste, the calorific value of commercial establishment (1,376 Kcal/kg) is less when compared to domestic waste (2,520 Kcal/kg). This factor is due to high proportion of plastic and paper content in domestic waste.
- (iv) In the chemical composition of solid waste, the ash content of commercial establishments (66.91 percent) is more compared to domestic waste (54.58 percent). This factor is due to hotels, markets.
- (v) In the chemical composition of solid waste, the carbon content of commercial establishments (8.13 percent) is less when compared to domestic waste (12.75 percent).
- (vi) In the chemical composition of solid waste, the toxic content of commercial

establishments (122.15 mg/kg) is less when compared to domestic waste (213.67 mg/kg).

- (vii) The significant constituents of solid waste in Tambaram are plastic and paper, which is higher than the normal composition estimated by CPHEEO in its manual on solid waste management. This can be attributed to the growing urbanization in the region and associated activities.
- (viii) The moisture content and calorific value of solid waste of Tambaram was found to be higher than the Moisture content and Heating Calorific Value as per CPHEEO standards.

VII. URBAN BASIC SERVICES FOR POOR

A. Overview

323. Slums and squatter settlements are essentially products of urban poverty. Almost by definition, the population living in slums lack access to basic infrastructure services such as safe water, sanitation, solid waste collection and disposal, drainage, access roads, streetlights, neighborhood amenities (e.g., safe play areas for children and community facilities), and electricity.
324. The Tamil Nadu Slum Clearance Board (TNSCB) is the responsible authority for notifying and upgrading the slums, and providing clearances and basic services to the urban poor residing in slums and within municipal limits.
325. In Tambaram, there are 17 declared and 7 undeclared slums. The total population residing in slums is about 38,770, which is 28.11 percent of the town's population. About 22 percent are residing in the declared slums while remaining (about 6 percent) in the undeclared slums. Slums are located at a proximity to a water body, work sites (Industrial Areas), available patches of land, near reserve forest and along the road and railway margins. Slum population of Tambaram is illustrated in **Table 7.1** and **Figure 7.1**.

Figure 7.1: Slum Population in Tambaram

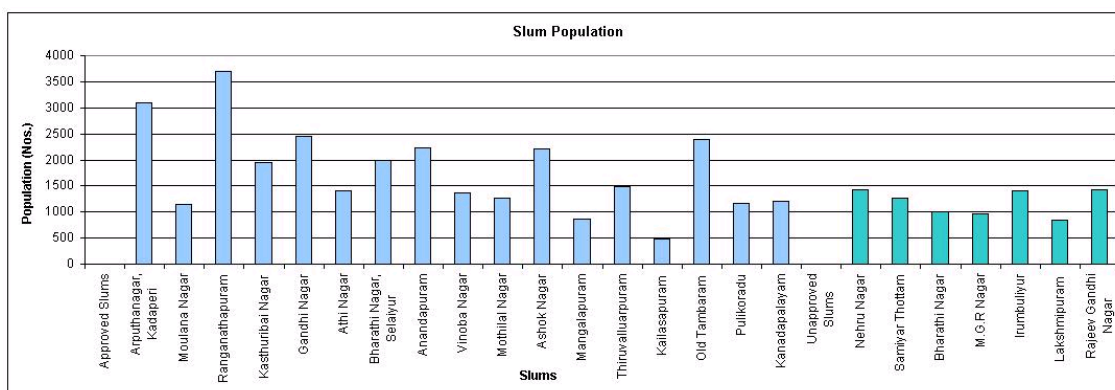


Table 7.1: Slums in Tambaram

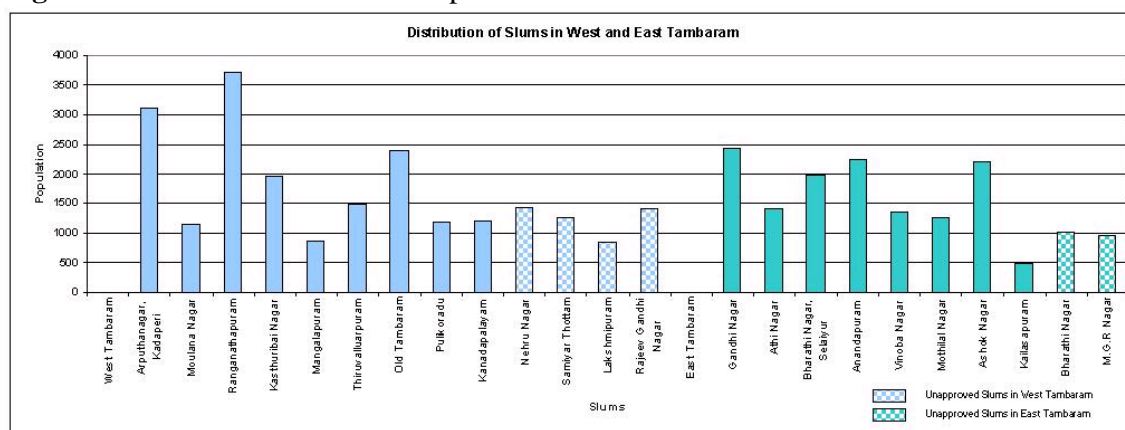
Name of Slum	Ward Numbers	Households	Population
		Nos.	Nos.
<i>Declared Slums</i>			
Arputhanagar, Kadaperi	1	620	3,100
Moulana Nagar	2	228	1,140
Ranganathapuram	5,6,7	741	3,705
Kasthuribai Nagar	9	390	1,950
Gandhi Nagar	11,16	489	2,445
Athi Nagar	18,22	282	1,410
Bharath Nagar, Selaiyur	20	396	1,980
Anandapuram	22	448	2,240

Name of Slum	Ward Numbers	Households	Population
		Nos.	Nos.
Vinoba Nagar	23	273	1,365
Mothilal Nagar	25	252	1,260
Ashok Nagar	26,24	443	2,215
Mangalapuram	29	172	860
Thiruvalluarpuram	29	298	1,490
Kailasapuram	33	98	490
Old Tambaram	33,37	477	2,385
Pulikoradu	38	235	1,175
Kanadapalayam	38	242	1,210
Sub-Total		6,084	30,420
<i>Undeclared Slums</i>			
Nehru Nagar	3	286	1,430
Samiyar Thottam	8	252	1,260
Bharathi Nagar	21	203	1,015
M.G.R. Nagar	21	194	970
Irumbuliyur	27,28	282	1,410
Lakshmipuram	37	168	840
Rajeev Gandhi Nagar	39	285	1,425
Sub-Total		1,670	8,350
Total		7,754	38,770

Source: Tambaram Municipality

326. **Figure 7.2** does not include Irumbuliyur as it is spread in West as well as in East Tambaram. The distribution of slums in West and East Tambaram is almost the same with 13 slums in West Tambaram and 10 slums in East Tambaram while slum at Irumbuliyur is spread in both. There are four unapproved slums in West Tambaram while East Tambaram has only two unapproved slums.

Figure 7.2: Distribution of Slum Population in West and East Tambaram



327. Slum located at Ranganathapuram houses maximum number of population with 3,705, which is spreaded across Ward Nos. 5, 6, and 7. Slum at Arputhanagar, Kadaperi in Ward No. 1 has about 3,100 persons forming second largest population residing in the slums. Slum at Kailasapuram has the minimum number of slum settlements with 490 persons residing. This slum is located in Ward No. 33.

B. Infrastructure Provision in Slums

328. Slums in Tambaram lack proper infrastructure facilities, like slums anywhere in the country. An overview of the existing infrastructure in slums is presented in the **Table 7.2** – this is based on secondary data provided by the respective municipality and discussions with officials. To improve the condition of slums and to make slum dwellers self-dependent, government is initiating various programs, which has been described in the following section.

Table 7.2: Overview of Existing Infrastructure in Slums

Name of Slum	WT/ HP	No. of Seats in Public Toilet	No. of Dustbins	Total Roads	Surfaced Roads	Storm Water Drains	Street lights
	<i>Nos.</i>	<i>Nos.</i>	<i>Nos.</i>	<i>km</i>	<i>km</i>	<i>km</i>	<i>Nos.</i>
Arputhanagar, Kadaperi	7	10	1	0.45	0.45	0.45	14
Moulana Nagar	6	2	1	1.15	1.15	1.50	26
Ranganathapuram	35	-	3	2.50	2.50	2.50	129
Kasthuribai Nagar	5	-	1	0.45	0.45	0.25	59
Gandhi Nagar	2	-	-	1.06	0.81	0.21	26
Athi Nagar	3	-	-	0.30	0.30	0.30	83
Bharath Nagar, Selaiyur	5	4	-	0.45	0.45	0.45	95
Anandapuram	7	-	-	0.75	0.60	0.60	7
Vinoba Nagar	8	10	-	0.45	0.45	0.30	3
Mothilal Nagar	7	-	-	0.65	0.55	0.55	3
Ashok Nagar	9	5	-	0.53	0.53	0.53	-
Mangalapuram	4	-	1	0.36	0.36	0.30	19
Thiruvalluarpuram	3	-	1	0.48	0.48	0.30	12
Kailasapuram	8	-	1	0.40	0.40	0.40	14
Old Tambaram	6	-	1	0.65	0.65	0.65	113
Pulikoradu	3	-	1	1.45	1.25	0.20	13
Kanadapalayam	9	-	1	3.75	3.05	0.30	40
Nehru Nagar	-	-	1	0.90	0.90	0.30	22
Samiyar Thottam	8	-	-	0.80	0.45	0.45	38
Bharathi Nagar	4	-	-	0.45	0.45	0.25	36
M.G.R Nagar	4	10	1	0.50	0.50	0.35	20
Irumbuliyur	4	4	1	0.55	0.15	-	11
Lakshmipuram	5	-	1	0.75	0.75	0.30	10
Rajeev Gandhi Nagar	-	-	-	-	-	0.15	13
Total	152	45	16	19.78	17.63	11.59	806

Source: Tambaram Municipality

- (i) Water Supply. The main sources of water supply in slums are hand pumps and public stand posts (PSPs). The local body has provided 152 units of hand pump and PSP covering all the slums. The slum at Ranganathapuram has maximum number of water outlets with 35 numbers serving about 3,700 persons while the slums at Nehru

Nagar and Rajeev Gandhi Nagar are solely dependent on tankers and nearby water outlets. Dependency on hand pump or PSP is very high with about 255 persons per unit against the standard norm of 75 persons per hand pump or PSP.

- (ii) Sewerage and Sanitation. UGD facility is not present. The safe sanitation facilities comprise of public conveniences and toilets provided under ISP. Public toilets are provided in seven slums viz., Arputhanagar, Kadaperi, Moulana Nagar, Bharath Nagar, Selaiyur, Vinoba Nagar, Ashok Nagar, M.G.R Nagar and Irumbuliyur. People living in slums without access to sanitation facilities either depend on nearby public toilets or resort to open defecation. Considering seven slums, on an average, each seat serves about 270 persons, which is very high compared to the prescribed limits of 30 to 50 persons per seat.
- (iii) Solid Waste Management. As per the discussions with slum dwellers, it was stated that about 16 bins are provided in 14 slums. Slum at Ranganathapuram has maximum bins with 3 numbers. The total road length in the slums is about 19.78 km. Thus, the spacing of bins works out to 1,24 m, which is more than the prescribed standard spacing of 350 m in slums. As a result, in most of the slums, the waste is disposed in nearby vacant areas creating unhygienic conditions.
- (iv) Roads. The ULB has provided about 19.78 km of roads out of which 17.63 are surfaced roads while the remaining 2.15 km stretch is unsurfaced. The per capita road maintained by the ULB in slums works out to be 0.51 m that is less than the total roads maintained by the ULB on town level and prescribed standards of 0.78 m and 1.75 m.
- (v) Storm Water Drains. The total drains provided in slums extend to a length of 11.59 km indicating coverage of about 66 percent of the surfaced roads, which is within the prescribed limits of 50 percent of surfaced roads. However, the demand for the proper connectivity of slum drains with the main drains is high.
- (vi) Street Lights. The ULB has provided 806 numbers of streetlights in slums with an average spacing of 24.54 m between the poles, which is well within the standards spacing of 30 m. Overall, the streetlight spacing in Tambaram is about 28 m. Thus, the slums are well lit. The slum at Ranganathapuram is provided with maximum number of streetlights with 129 followed by 113 at Old Tambaram Slum. The Ashok Nagar slum lacks the facility of street lighting.

Map 7.1: Location of Slums in Tambaram

C. Poverty Alleviation and Community Development

1. Policies, Targets and Programs

329. This section reviews programs that address service delivery to the poor in Tambaram. A review of Slum Improvement Programs indicates that by improving basic infrastructure and access to municipal services, there is a significant impact on the quality of life of slum residents. To alleviate the problems of slum dwellers and to reduce urban poverty, a number of programs initiated and has been implemented by the local body with assistance from state and central government.
330. Two major slum improvement programs are being implemented in Tambaram and include viz., Swarna Jayanti Shehary Rojgar Yojna (SJSRY) and National Slum Development Program (NSDP).

Swarna Jayanti Shehary Rojgar Yojna (SJSRY)

331. Swarna Jayanti Shahari Rojgar Yojana (SJSRY) is central and state government sponsored scheme started in 1997-98 in Tambaram. The main programs in this scheme are:
- (i) Development of Women and Children in Urban Areas (DWCUA). This scheme is distinguished by the special incentive extended to urban poor women who decide to set up self-employment ventures as a group as opposed to individual effort. Groups of poor women shall take up an economic activity suited to their skill, training, aptitude and local conditions. Besides generations of income, their group shall strive to empower the urban poor women by making them independent as also providing a facilitation atmosphere for self-employment.

Under this program, groups of women devise a project plan. A successful plan will receive a subsidy from the government and a loan from an area bank branch. To be eligible for subsidy under this scheme, the DWCUA group should consist of at least 10 urban poor women. The loan is 45 percent of the project cost (maximum), the subsidy is 50 percent (maximum), and the remaining 5 percent are borne by the group. The maximum project size supported is Rs. 2,50,000.

Under this program, as of 2004-05, 40 groups were benefited covering 256 Below Poverty Line (BPL) families. The total amount released is Rs. 4.51 lakh, out of which Rs. 3.78 lakh has been utilized under this component while the remaining Rs. 0.73 lakh has been diverted to Thrift & Credit Societies (2004-05). Fund release and expenditure of DWCUA is tabulated in **Table 7.3**.

Table 7.3: Details of Fund Release and Expenditure - DWCUA

Year	Amount Utilized	Balance Amount	Amount Diverted to TCS
	Rs.	Rs.	Rs.
1999-2000	166,582	Nil	Nil
2000-2001	65,211	Nil	Nil
2001-2002	Nil	Nil	Nil
2002-2003	144,098	Nil	Nil
2003-2004	2,035	Nil	Nil
2004-2005	73,000	73,000	73,000
Total	450,926	73,000	73,000

Source: Tambaram Municipality

- (ii) Thrift & Credit Societies. This program brings together 10-20 women from Below Poverty Line families to carry out saving and lending activities. The government gives a lump sum grant to the group after it has been functioning for one full year. The grant is determined at the rate of Rs. 1,000 per member and is to be used as a revolving fund.

In Tambaram, 267 TCS groups have been formed, out of which 135 groups are financially assisted, benefiting about 4,900 families. The total amount utilized under this scheme is Rs. 2.96 lakh. **Table 7.4** present the details of fund release and expenditure of TCS.

Table 7.4: Details of Fund Release and Expenditure - TCS

Year	Amount Utilized	Balance Amount
	Rs.	Rs.
1999-2000	83,175	Nil
2000-2001	Nil	Nil
2001-2002	Nil	Nil
2002-2003	86,373	Nil
2003-2004	41,830	Nil
2004-2005	84,700	Nil
Total	296,078	Nil

Source: Tambaram Municipality

- (iii) Urban Skill Training. This component sponsors skill development in a variety of service and manufacturing trades as well as in local skills and local crafts. After being trained, beneficiaries should be able to set up self-employment ventures or secure salaried employment with enhanced remuneration. Training institutions such as ITIs/ Polytechnics/ Shramik Vidyapeeths/ Engineering Colleges and other suitable training institution run by Government, private, or voluntary organizations may be utilized and provided support for this purpose (but they must be registered with the concerned government department). Training includes computer skills, beautician skills, car driving, screen printing, doll making, tailoring, TV & radio repair, electrical equipment repair, candle-making, detergent and soap-making and book binding. Training is limited to an expense of Rs. 2,000 per student, including a Rs. 300 stipend. For trainees successfully completing their courses, the scheme can

provide up to Rs. 600 for a toolkit. Some institutes place candidates in jobs.

For providing training, as of now, the municipality has utilized Rs. 4.41 lakh, out of which Rs. 10,000 has been diverted to TCS during 2004-05. While for providing the infrastructure facilities, about Rs. 1.69 lakh has been incurred, out of which Rs. 30,000 is transferred to TCS during 2000-01. **Table 7.5** represents the fund release and expenditure of UST and infrastructure.

Table 7.5: Details of Fund Release and Expenditure - UST

Year	Amount Utilized	Balance Amount	Amount Diverted to TCS
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
1999-2000	46,409	Nil	Nil
2000-2001	16,291	Nil	Nil
2001-2002	Nil	Nil	Nil
2002-2003	138,198	Nil	Nil
2003-2004	104,619	Nil	Nil
2004-2005	135,523	10,000	10,000
Total	441,040	10,000	10,000

Source: Tambaram Municipality

Table 7.6: Details of Fund Release and Expenditure - Infrastructure

Year	Amount Utilized	Balance Amount	Amount Diverted to TCS
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
1999-2000	92,845	Nil	Nil
2000-2001	32,606	30,000	30,000
2001-2002	Nil	Nil	Nil
2002-2003	17,271	Nil	Nil
2003-2004	9,382	Nil	Nil
2004-2005	16,938	Nil	Nil
Total	1,69,042	30,000	30,000

Source: Tambaram Municipality

- (iv) Urban Wage Employment Program (UWEP). This program seeks to provide wage employment to beneficiaries living below the poverty line within the jurisdiction of urban local bodies by utilizing their labor for construction of socially and economically useful public assets. Under this program, there is no restriction on educational qualification. The material labor ratio for works under this program is to be maintained at 60:40. The prevailing minimum wage rate, as notified from time to time for each area, has to be paid to beneficiaries under this program.

About Rs. 7.17 lakh is allotted for this scheme. Twenty-six works have been taken up, are still in progress. The total expenditure incurred is about Rs. 4.41 lakh. **Table 7.7** tabulates the fund release and expenditure - UWEP

Table 7.7: Details of Fund Release and Expenditure - UWEP

Year	Amount Allotted	Amount Utilized	Balance Amount	Amount Diverted to TCS
	Rs.	Rs.	Rs.	Rs.
1999-2000	Nil		Nil	Nil
2000-2001	299,730		260,000	260,000
2001-2002	72,421		Nil	Nil
2002-2003	101,610		Nil	Nil
2003-2004	98,074		Nil	Nil
2004-2005	145,109		Nil	Nil
Total	716,944	440,944	260,000	260,000

Source: Tambaram Municipality

- (v) Urban Self-Employment Program (USEP). Under this program, individuals (men or women) devise an income generation project plan and apply for a loan. A successful plan will receive a subsidy from the government and a loan from an area bank branch. The loan is 80 percent of the project cost (maximum), the subsidy is 15 percent (maximum), and the remaining 5 percent are borne by the individual. The maximum project size supported is Rs. 50,000 per individual. Details of Fund Release and Expenditure – USEP is furnished in **Table 7.8**.

As of now, 387 applications have been submitted in the bank and out of which 266 were financed and benefited with the scheme and the remaining applications were rejected due to insufficient and improperly filled application forms. The total loan amount received for this scheme is Rs. 54.87 lakh with a subsidy of Rs. 9.68 lakh.

Table 7.8: Details of Fund Release and Expenditure - USEP

Year	Amount Utilized (Subsidy)	Balance Amount
	Rs.	Rs.
1999-2000	487,000	Nil
2000-2001	179,313	Nil
2001-2002	204,371	Nil
2002-2003	64,553	Nil
2003-2004	1,017	Nil
2004-2005	32,000	Nil
Total	9,68,254	Nil

Source: Tambaram Municipality

- (vi) Community Structure Component (CSC). This component provides a budget for working with other government agencies and departments to address needs of the eligible population beyond jobs and income. The details of amount utilized under this component are given in the following **Table 7.9**.

Table 7.9: Details of Fund Release and Expenditure - CSC

Year	Amount Utilized	Balance Amount	Amount Diverted to TCS
	<i>Rs.</i>	<i>Rs.</i>	<i>Rs.</i>
1999-2000	238,459	Nil	Nil
2000-2001	164,169	Nil	Nil
2001-2002	183,141	Nil	Nil
2002-2003	72,214	Nil	Nil
2003-2004	60,562	Nil	Nil
2004-2005	Nil	Nil	Nil
Total	718,545	Nil	Nil

Source: Tambaram Municipality

National Slum Development Program (NSDP)

332. Under this program, the central and state government provide a total of 50 percent of the project cost while the local body has to bear the remaining 50 percent. The works are finalised by the decision of the council. They are inspected by the RDMA through the Regional Engineer. Special priority is given to the following:

- (i) Improvement of Drinking Water Supply System
- (ii) Laying/Relaying of Roads
- (iii) Provision of Street Lights
- (iv) Drainage Facilities
- (v) Improvement and New Public Conveniences with Water Supply
- (vi) Welfare (education, etc.); and
- (vii) Shelter Upgradation (Individual Water Connections)

Valmiki Ambedkar Awas Yojana Scheme (VAMBAY)

333. Valmiki Ambedkar Awas Yojana Scheme is centrally sponsored scheme with 50 percent central and 50 percent state share to construct houses for slum dwellers. As per the guidelines issued by Ministry of Urban Development and Poverty Alleviation, the target group has been identified based on the yearly income of the slum dwellers. The objective of this scheme is to provide housing in urban slums in a march towards the goal of slum less cities with a healthy and enabling urban environment. The selection of slums has based on the declared status of slums.
334. It was proposed to construct nine housing units at an estimated cost of Rs. 46.0 lakh, out of which seven units have been constructed and allotted. The expenditure incurred, as of now is Rs. 28.0 lakh.

D. Key Issues

335. Poor infrastructure facilities in slums, is the main issue in Tambaram slums.

VIII. INFRASTRUCTURE DEVELOPMENT AND SERVICE PROVISION

A. Rationale, Need and Demand

336. Infrastructure assessment of the town indicates inadequate service levels for the present scenario, which will further escalate given the future growth; (i) Per capita supply is low at 25 lpcd for summer season and 48 lpcd for normal seasons. Water is supplied in the municipality only once in two days; Coverage of water supply connections with respect to property tax assessments is as low as 30 percent; (ii) There is no sewerage system. 9,600 septic tanks and 1,360 low cost sanitation units serve about 45.61 percent of total population as safe sanitation disposal facilities; (iii) ULB lacks scientific municipal solid waste treatment and disposal system catering to the waste collected; waste collection efficiency of the local body based on rated capacity of the vehicle is a low 86 percent; (iv) Surfaced roads within the ULB is approximately 90 percent; missing links, network deficiency and lack of traffic management systems causes congestion within the ULB area and reduces the carrying capacity of the roads; (v) Drainage network of the town covers only 77 percent of the total road length; which has been indicated as one of the major causes of flooding and water logging. The abysmal levels of service therefore provide a strong basis and need for the project.

- (i) Approach and Design Criteria. The ULB should increase the level of coverage of all facilities, to meet the service norms based on State Norms, CPHEEO Norms, UDPFI Norms or other applicable criteria. Based on this, considering the current deficits and the future requirements for the ULB, strategies and action plan are suggested.
- (ii) Component Selection Criteria. The total investment in the ULB depends on several parameters like the level of current basic needs, the town's affordability, and the assessed implementation capacity of the town or its agencies. Overall, project component selection is majorly influenced by affordability and implementation capacity. In the interest of integrated town development, another criterion considered in project component selection has been to ensure inter-sector linkages and optimization. For instance, water supply, sanitation and sewerage have been seen as a composite sector and not in isolation from each other.
- (iii) Least Cost Solutions and Component Selection. In formulating project components, the preferred option was developed based on least cost options, taking into account service delivery targets and whole-life costs, including considerations on achievable operation and maintenance arrangements, given available resources in terms of skills and facilities. Based on the considerations and screening referred to in the preceding section, priority components were selected and scrutinized and their financial, social and environmental impacts assessed to verify acceptability.

1. Water Supply

337. Considering the current deficits and the future requirements for water supply, strategies and action plan are suggested. For the provision of water supply the ULB should facilitate creation of capital assets to meet the future requirements.
338. *Design Supply.* The rate of water supply of 90 lpcd at consumer end is assumed for working out the water demand of Tambaram town.
339. *System Losses.* The following system losses are considered to determine the capacity of the system.

Table 8.1: Losses in Water Supply System

Losses	Value
Loss of water in the distribution system	15 %
Loss of water in the clear water transmission	2 %
Loss of water in the water treatment process	4 %
Loss of water in the raw water transmission	2 %

340. *Service Storage.* Service reservoir provides a buffer between inflow from the source at fixed *pumping* rate and outflow to the distribution network of varying rate, depending on the drawl by the consumers during the supply hours. Assuming that the supply to the consumers will be in two shifts (four hours in the morning and four hours in the evening) per day, the service storage required will be equal to one third of the daily demand.
341. *Water Demand.* Water demand is calculated for the present population and population projected for 2026 as shown in **Table 8.2**. The demand of service storage and distribution system is also projected.

Table 8.2: Projected Water Demand and Distribution System Requirement for 2026.

Description	Year 2005		Year 2011		Year 2026	
	Population	Demand	Population	Demand	Population	Demand
		MLD		MLD		MLD
Water Demand						
Consumer end (90 lpcd)	151,726	13.66	172,416	15.52	224,141	20.17
At service reservoirs (15% loss)		15.70		17.85		23.20
At WTP outlet (2% loss)		16.02		18.20		23.66
At WTP inlet (4% loss)		16.66		18.93		24.61
At source works (2% loss)		16.99		19.31		25.10
Capacity Requirement						
Service storage (1/3 rd of daily demand) - ML		4.55		5.17		6.72

Description	Year 2005		Year 2011		Year 2026	
	Population	Demand	Population	Demand	Population	Demand
		MLD		MLD		MLD
Distribution network to cover population		151,726		172,416		224,141

Source: Analysis

342. *Comparison.* The projected demand for 2026 is compared with the optimum supply available from the existing system, to verify the adequacy of the existing system and need to augment the capacity of certain components. **Table 8.3** tabulates demand, supply and required augmentation of water supply system.

Table 8.3: Demand, Supply and Required Augmentation of Water Supply System.

Component	Unit	Supply	Demand					
			Year 2005		Year 2011		Year 2026	
			Demand	Surplus (Deficit)	Demand	Surplus (Deficit)	Demand	Surplus (Deficit)
Raw Water Pumping	MLD		16.99	(16.99)	19.31	(19.31)	25.10	(25.10)
Raw Water Transmission	MLD		16.66	(16.66)	18.93	(18.93)	24.61	(24.61)
Water Treatment Plant	MLD	-	16.02	(16.02)	18.20	(18.20)	23.66	(23.66)
Clear Water Pumping	MLD		15.70	(15.70)	17.85	(17.85)	23.20	(23.20)
Clear Water Transmission	MLD	6.00	13.66	(7.66)	15.52	(9.52)	20.17	(14.17)
Service Storage	ML	1.88	4.55	(2.67)	5.17	(3.29)	6.72	(4.84)
Distribution System	Km	53.00	151.73	(98.73)	172.42	(119.42)	224.14	(171.14)

Source: Analysis

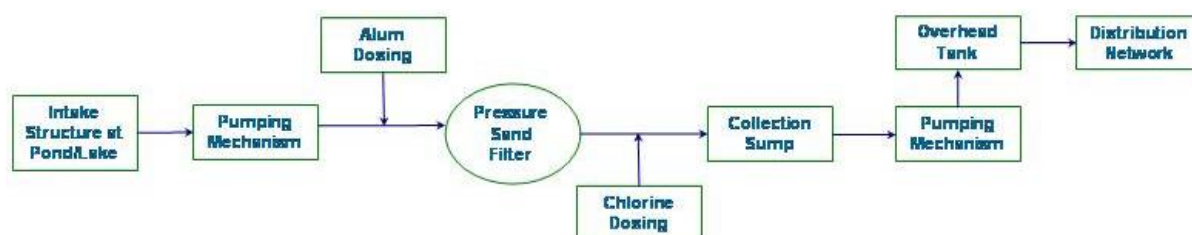
343. *Sector Approach.* Considering the above requirements, capital investments in water supply have to be planned to address issues focusing upon; (i) Augmentation of source to meet the per capita demand of water.(ii) Increase in the storage and distribution of existing facilities to meet the growing demand; (ii) Rehabilitation of existing facilities to avoid the higher costs of deferred maintenance;
344. There are two options for source augmentation to meet the desired supply rates in these three towns. Option I considers the proposals prepared by CMWSSB (as mentioned in Section D of Chapter V) and Option II is to construct a combined desalination plant for Alandur, Pallavaram and Tambaram municipalities. To meet the supply rate of 90 lpcd for the requirements of 2026, the cost requirements for common desalination plant is given in **Table 8.4**. The cost for treating 1 MLD of water is estimated at Rs. 409.07 lakh with annual operation and maintenance cost of Rs. 45.80 lakh (per MLD).

Table 8.4: Cost Estimation for Common Desalination Plant for 3 Towns

Parameters	Units	Alandur	Pallavaram	Tambaram	Total
Water Supply	MLD	13.05	15.89	14.17	43.11
Cost	Rs. Lakh	5,336.85	6,498.80	5,797.63	17,633.27
Annual O&M Cost	Rs. Lakh	597.58	727.68	649.17	1,974.42
Cost of Water Production	Rs./KL	12.55	12.55	12.55	37.65

Source: Analysis

345. The option of having a common desalination plant would ensure regular supply with 90 lpcd supply rate. However, it is a high-energy consuming process and would incur high capital and O&M costs. It requires trained operator. The membrane used in the reverse osmosis process has to be changed once in 3 years. Consequently, Option I supersedes Option II.
346. *Local Source Development.* The existing water bodies could serve as recharge zones for ground water. Improvement/rejuvenation of water bodies and keeping them encroachment-free would also serve to enhance their storage capacity. These may be considered as a supplementary source for the water supply, especially during the summer season (i.e., 90 days), provided studies on water quality, extent of rehabilitation and regular maintenance required to ensure adequate storage and water quality, and the related treatment and pumping facilities and cost-effectiveness of supply from water bodies are undertaken and reveal the feasibility of the exercise. Provision of proper treatment facilities and formulation and strict adherence to guidelines to keep them pollution free would be a pre-requisite, prior to supply to consumers. While water supply from each water body may not be feasible or cost-effective (the same may be ascertained only after a detailed feasibility study is conducted), the study examines the potential of water bodies as potential groundwater recharge zones/supplementary local sources. Partnerships with the private sector for maintenance of water bodies and development of parks / other potential revenue generating options around the same may be considered. The spin-offs are likely to be in terms of environmental improvement and enhanced land values around the area. The water stored in the water body may be pumped to the localized treatment plant (Pressure Sand Filter). Alum shall be mixed with the water before it reaches the treatment plant. The treated water shall be given chlorination treatment and collected in a collection sump. The chlorinated water shall be pumped to the nearest service reservoir. The schematic diagram of water supply from water body (Pond/Lake) to the overhead tank is given in **Figure 8.1**.

Figure 8.1: Schematic Diagram of Water Supply from a Water Body to Service Reservoir

347. As most of the water bodies are encroached, two options are worked out for calculating the

actual storage capacity of the water bodies:

- (i) Option - I. Calculation of actual storage capacity assuming all the encroachments are removed.
- (ii) Option - II. Calculation of actual storage capacity assuming the encroachments are not removed. Thus, the net area available after deducting the area under encroachments from the gross area is used for calculating the actual storage capacity of the water body.

348. *Option - I*. The capacity for water storage in the water bodies and potential for supply is worked out (assuming that encroachments are removed) and presented in **Table 8.5**.

Table 8.5: Water Supply from Water Bodies – Option - I

Name	Actual Storage Capacity*	Supply to OHT	Design Population	Estimated Storage Capacity per Day	Potential Per Capita Supply Rate
	<i>ML</i>		<i>Nos</i>	<i>MLD</i>	<i>lpcd</i>
Pudu Thangal Eri, Mullai Nagar, Tambaram (S. No. 256)	72.94	Thiruneermalai Road	20,676	0.81	39.20
Vannan Eri, Bajanai Koil Street (near), Tambaram (S. No. 298)	32.20	Thiruneermalai Road	20,676	0.36	17.30
Periya Eri, West Tambaram (S. No. 348)	123.06	Muthurangam Park	39,295	1.37	34.80
Etti Tahangal Eri, Tambaram (S. No. 276)	17.50	Kone Krishna Park	13,620	0.19	14.28
Mudichur Road Kulam (S. No. 295)	12.60	Kone Krishna Park	13,620	0.14	10.28
Kulam Avenue III (near), Tambaram (S. No. 140)	3.92	Kone Krishna Park	13,620	0.04	3.20
Kulam, Tambaram (S. No. 14)	4.83	Thiruneermalai Road	20,676	0.05	2.60
Idumban Eri, Pillikoradu (S.No.100)	17.85	Thiruneermalai Road	20,676	0.20	9.59
Periya Eri, Kadaperi (S.No.154)	203.98	Ramesh Nagar	4,679	0.76	161.46
		Gandhi Park	61,560	0.76	12.27
		Kone Krishna Park	13,620	0.76	55.47
Kulam	10.50	Ramesh Nagar	4,679	0.12	24.93
Irumbuliyur Eri (S. No. 176)	273.42	Muthurangam Park	39,295	3.04	77.31
Kulam, Tamil Poonga Street (S. No. 26 & 28)	6.37	Gandhi Park	61,560	0.07	1.15
Selaiyur Eri (S. No. 145)	497.70	Gandhi Park	61,560	3.87	62.88
		Bharati Park, Selaiyur	3,933	0.55	140.61
		Ramesh Nagar	4,679	0.55	118.19

Name	Actual Storage Capacity*	Supply to OHT	Design Population	Estimated Storage Capacity per Day	Potential Per Capita Supply Rate
	<i>ML</i>		<i>Nos</i>	<i>MLD</i>	<i>lpcd</i>
		Muthurangam Park	39,295	0.55	14.07
Thiruvanchari Eri (S. No. 300)	48.58	Bharati Park, Selaiyur	3,933	0.54	137.24
Kuttai (S. No. 80)	5.46	Bharati Park, Selaiyur	3,933	0.06	15.43

Note: * Actual Storage Capacity available for 90 days

Source: Analysis

349. *Option - II.* The capacity for water storage in the water bodies is worked out (assuming that encroachments are not removed) and presented in **Table 8.6**.

Table 8.6: Water Supply from Water Bodies – Option - II

Name	Actual Storage Capacity*	Supply to OHT	Design Population	Estimated Storage Capacity per Day	Potential Per Capita Supply Rate
	<i>ML</i>		<i>Nos</i>	<i>MLD</i>	<i>lpcd</i>
Pudu Thangal Eri, Mullai Nagar, Tambaram (S. No. 256)	63.40	Thiruneermalai Road	20,676	0.70	34.07
Vannan Eri, Bajanaik Koil Street (near), Tambaram (S. No. 298)	29.12	Thiruneermalai Road	20,676	0.32	15.65
Periya Eri, West Tambaram (S. No. 348)	104.52	Muthurangam Park	39,295	1.16	29.55
Etti Tahangal Eri, Tambaram (S. No. 276)	16.19	Kone Krishna Park	13,620	0.18	13.21
Mudichur Road Kulam (S. No. 295)	12.60	Kone Krishna Park	13,620	0.14	10.28
Kulam Avenue III (near), Tambaram (S. No. 140)	3.92	Kone Krishna Park	13,620	0.04	3.20
Kulam, Tambaram (S. No. 14)	4.83	Thiruneermalai Road	20,676	0.05	2.60
Idumban Eri, Pillikoradu (S.No.100)	17.21	Thiruneermalai Road	20,676	0.19	9.25
Periya Eri, Kadaperi (S.No.154)	188.89	Ramesh Nagar	4,679	0.70	149.52
		Gandhi Park	61,560	0.70	11.36
		Kone Krishna Park	13,620	0.70	51.36
Kulam	10.50	Ramesh Nagar	4,679	0.12	24.93
Irumbuliyur Eri (S. No. 176)	241.95	Muthurangam Park	39,295	2.69	68.41

Name	Actual Storage Capacity*	Supply to OHT	Design Population	Estimated Storage Capacity per Day	Potential Per Capita Supply Rate
	<i>ML</i>		<i>Nos</i>	<i>MLD</i>	<i>lpcd</i>
Kulam, Tamil Poonga Street (S. No. 26 & 28)	6.37	Gandhi Park	61,560	0.07	1.15
Selaiyur Eri (S. No. 145)	245.65	Gandhi Park	61,560	1.91	31.04
		Bharati Park, Selaiyur	3,933	0.27	69.40
		Ramesh Nagar	4,679	0.27	58.33
		Muthurangam Park	39,295	0.27	6.95
Thiruvanchari Eri (S. No. 300)	47.46	Bharati Park, Selaiyur	3,933	0.53	134.09
Kuttai (S. No. 80)	5.46	Bharati Park, Selaiyur	3,933	0.06	15.43

Note: * Actual Storage Capacity available for 90 days

Source: Analysis.

350. The water demand from a water body is calculated, considering the respective zonal population. The OHTs availability in each water supply zone is less when compared to the larger numbers of available water bodies. Hence, it is assumed that each water body may serve many water supply zones. Due to this, it may be noted that the design population to be served (**Table 8.6**) by the water bodies is more than the actual population of the town.
351. Thus, the average gross per capita supply from the existing water bodies during 90 days of summer season would be around 159 lpcd for Option - I and 123 lpcd for Option - II. If system losses are considered, the per capita supply rate would decrease. It must be noted that the figures mentioned in the above tables are indicative and are arrived at on the basis of certain assumptions. As mentioned earlier, the feasibility of supplying water from the water bodies to the OHTs must be studied in detail, which would give a fair idea of the adequacy as supplementary source, quality, cost-effectiveness and possible supply rate during peak seasons.
352. *Operation & Maintenance Plan.* Adoption of an O&M Plan and Schedule, including options of using the private sector for O&M (e.g. management contract).
353. *Water Management Plan.* Adoption of a comprehensive strategy for Water Management, through leak detection, checking of unaccounted-for-water and strategy for use of recycled water for non-potable use, based on a study for the ULB.
354. *Tariff Revision.* Future capital investments on system up-gradation being imminent, the tariff structure shall be revised from time to time to enable cost recovery and to service the additional debt from the capital investments.
355. *Performance Monitoring.* It is important to monitor certain key indicators to assess the performance of the system and to ensure sustainability of operations.

356. *Institutional Strengthening and Capacity Building.* Recruitment of trained engineering personnel for management of waterworks is an important issue confronting the ULB. Of greater importance is the issue of keeping them technically updated. It is necessary that periodic training be imparted to the operations staff of the ULB. Such training facilities are available along with training manuals at TWAD Board and CMWSSB office.

2. Sewerage and Sanitation

357. *Design Criteria.* Water demand of the town has been projected at the rate of 90 lpcd (considering all losses). Hence, the sewer network is also designed for a sewage flow of 90 lpcd. The treatment plant however, can be developed in phases. Initially, the STP for the town may be provided at 80 percent of 90 lpcd i.e. 72 lpcd and may be augmented subsequently to treat 90 lpcd. Hence, the demand for sewerage system is worked out at following rates of sewage flow:

- (a) 90 lpcd for sewer network, and
- (b) 72 lpcd for sewage pumping and treatment plant, upto year 2011 and 90 lpcd beyond year 2011.

358. *Demand of Sewerage System.* The capacity of sewerage system required for the town is worked out in the **Table 8.7**.

Table 8.7: Demand of Sewerage System

Component	Year 2005		Year 2011		Year 2026	
	Population	Demand	Population	Demand	Population	Demand
		MLD		MLD		MLD
Sewer Network	151,726	13.66	172,416	15.52	224,141	20.17
Pumping Station		10.92		12.41		20.17
Sewage Treatment Plant		10.92		12.41		20.17

359. There are various technologies available to treat wastewater. A comparison of their efficiencies with respect to cost is explained in the **Table 8.8**.

Table 8.8: Comparison of Various Sewage Treatment Technologies

Parameter	Units	TF	ASP	AL+MP	OD	Single Cell WSP	Multiple Cell WSP	UASP+MP
Detention Time		1 Day	4 to 6 hr	3 to 5 hr	1 Day	20 to 30 Days	6 to 10 Days	2 to 4 Days
Land Required	Ha/MLD	0.3	0.25	0.5	0.3	2 to 3	1 to 2	0.6 to 1
Method of Oxygen Supply		Atmospheric	Mechanical	Mechanical	Mechanical	Biological (Algae)	Biological (Algae)	Not Required
Power Required	Kw/MLD	180	250	300	400	Nil	Nil	120
Ease of Operation		Simple	Difficult	Simple	Simple	Very Simple	Very Simple	Simple
Skill for O&M		High	High	Moderate	Moderate	Low	Low	Moderate
Capital Cost	Rs. Lakh/MLD	30.0	35.0	20.0	20.0	6.0	8.0	20.0
Annual O&M Cost		Medium	High	High	Medium	Very Low	Very Low	Low
Reliability		Good	Least	Good	Good	Very Good	Very Good	Good
FC Removal	%	90-96%	90-96%	95-98%	95-98%	98-99%	98-99%	95-99%

Note: TF – Trickling Filter, ASP – Activated Sludge Process, AL – Aerated Lagoon, OD – Oxidation Ditch, WSP – Waste Stabilization Pond, UASP – Up flow Anaerobic Sludge Blanket, MP – Maturation Pond, FC – Faecal Coliform

360. The DPR for Underground Drainage System has been prepared for Tambaram with the design year of 2034 to serve a population of 2.23 lakh (Design Flow – 20 MLD) at an estimated cost of Rs. 4,395.84 lakh. A check on its adequacy to meet the future requirement due to influence of Chennai City and other factors is carried out and the adequacy of system components is presented in **Table 8.9**. The proposed project in DPR can very well serve the future requirements of the town even if there is a tremendous growth in the population due to various influencing factors.
361. *Comparison.* The following **Table 8.9** compares the capacity of various components of the existing/proposed system with the projected demand.

Table 8.9: Comparison of Demand and Anticipated Supply of Sewerage Facilities for 2026

Component	Unit	Status	Year 2005		Year 2011		Year 2026	
			Demand	Surplus /Deficit	Demand	Surplus /Deficit	Demand	Surplus /Deficit
Sewer Network	Km	137.99*	95.59	42.40	108.62	29.37	141.21	(3.22)
Pumping Station	MLD	21.61*	10.92	10.69	12.41	9.20	20.17	1.44
Sewage Treatment Plant	MLD	20.00*	10.92	9.08	12.41	7.59	20.17	(0.17)

Note: * Proposed as per DPR

Source: Analysis

362. *Adequacy.* The proposed project under DPR can very well serve the town for the project year of 2026. However, there would be a small additional requirement of sewer network of 3.22 km to serve the population in 2026. Thus, the total cost estimated for the UGD system in the DPR has been considered along with the cost for the additional requirement of sewer network (3.22 km).
363. *Operation & Maintenance Plan.* Adoption of an O&M Plan and Schedule, including options of using the private sector for O&M (e.g. management contract).
364. *Asset Management Plan.* To address the condition assessment and the performance of sewerage assets, it is recommended that an asset management plan, which would require a fairly detailed study, be prepared for the management of UGD assets in Tambaram town in future.
365. *Tariff Revision.* The tariff structure shall be revised from time to time to enable cost recovery and to service the additional debt from the capital investments.
366. *Institutional Strengthening and Capacity Building.* Recruitment of trained engineering personnel for management of sewer works is an important issue confronting the ULB. The present system is being implemented by CMWSSB and shall be transferred to the ULB for maintenance of assets. It will therefore be important to keep them technically updated. It is necessary that periodic training be imparted to the operations staff of the ULB. Such training facilities are available along with training manuals at the TWAD Board and

CMWSSB office.

3. *Storm Water Drainage and Rehabilitation of Water Bodies*

367. *Design Criteria.* The ULB should increase service levels in terms of coverage, to achieve coverage of 150 percent of road length, through built drains. It is recommended that the ULB adopt a strategy for rejuvenation of lakes and ponds, to be used as sources for groundwater re-charge and as summer storage. Networking of water bodies may also be considered.
368. The drain network demand for 2011, based on 150 percent road length is approximately 600 km (also includes the drains along the new formation of roads anticipated in future), as against a service level of 77 percent for 2005. As most of the water bodies are presently in a dilapidated condition, improvements would be necessary prior to proper usage.
369. *Sector Approach.* Considering the requirements, capital investments in drainage have to be planned to address issues focusing upon; (i) Improvement works and construction of storm water drains.(ii) Drainage improvement works for low lying areas, through improvement of networking of secondary and tertiary drains to primary drains; (iii) Improvement and rehabilitation of primary drain (Chunambu Nallah), through widening, deepening, construction of side-walls and cross-drainage works; (iv) Rehabilitation works for water bodies, through de-silting, bunding works and Intersection and Diversion of Sewage wherever required. Once the UGD system is put in place and a proper storm water drain networking is done, the disposal of waste into the existing water bodies can be minimized and prevented. The water bodies can be improved to make them suitable for storing rainwater with provision of proper treatment facilities to make it potable for the consumers. Thus, the local source i.e., water bodies may supplement regular water supply during summer.
370. *Operation & Maintenance Schedule.* Adoption of an O&M schedule for works varying from drain cleaning to desilting, including options of using the private sector for O&M (e.g. management contract).

4. *Solid Waste Management*

371. *Design Criteria.* The ULB should increase the service levels to meet the norms recommended by Solid Waste Handling Rules, 2000 and The State Finance Commission Norms. The ULB should achieve 100 percent coverage, through door-to-door collection and segregation of waste at source.
372. The future trend of waste generation has been estimated based on the projected population and per capita waste generation. The per capita growth rate for the solid waste has been assumed to be 0.2 percent every year.
373. **Table 8.10** shows the projected quantity of waste generated. As per the estimate, the total population in the year 2026 would be 224,141 while the quantity of waste generation would be around 118.51 tons per day.

Table 8.10: Projected Waste Generation

Year	Population	Waste Generation	
		Per Capita	Total Waste
	Nos.	Gms/Day	Tons/Day
2005	151,726	508.00	77.08
2011	172,416	513.10	88.47
2015	186,210	517.22	96.31
2021	206,900	523.46	108.30
2026	224,141	528.71	118.51

Source: Analysis

374. As the town lacks a proper mechanism for the solid waste management, there is a need for the ULB to take initiatives to improve the solid waste management of the town.
375. *Implementation Strategy.* The Solid Waste Action Plan, 2004, prepared by the ULB need to be updated and implemented on an immediate basis. Highest priority has to be accorded for segregation and storage at source irrespective of the area of generation to facilitate an organized and environmentally acceptable waste collection, processing and disposal. Source segregation of recyclables and biodegradable organic waste will not only provide an efficient way for resource recovery, but will also substantially reduce the pressure and pollution in landfill sites.
376. *Approach for Waste Collection and Transportation.* The following measures have been recommended for improving the primary collection practices of the ULB; (i) Implementation of 'Door-to-Door collection' through 100 percent privatization or through SHGs; (ii) Street sweeping on daily basis; (iii) Source segregation and collection of commercial waste, through privatization; (iv) Source segregation and collection of hotel and market waste; (v) Introduction of bin system at household and establishment level for storage and segregation of waste at source; (vi) Enforcement of by-laws and waste collection and handling rules.
377. It is envisaged that 100 percent area of the ULB be brought under door-to-door collection and hence, no additional dustbins are proposed, except for slums and other areas. In this scenario, the ULB shall be responsible for the collection. Based on these assumptions, the equipments for primary collection are estimated, to meet the future waste generation.
378. To improve the waste collection performance and transportation efficiency of the ULB, dumper placers with bins would be ideal, as their introduction would reduce the multiple handling of solid waste as recommended by Solid Waste Handling Rules, 2000.
379. *Approach for Disposal of Waste.* The existing practice of dumping the solid waste collected is on open land and does not comply with Solid Waste Management Regulations. Hence, it is recommended to develop a scientific landfill site for safe disposal. Considering that more than 50 percent of the waste generated constitutes organic waste, composting is the one of the feasible option of solid waste processing.
380. *Composting and it's Various Technologies.* Composting can be undertaken either by controlled or uncontrolled aerobic composting. Even in aerobic composting, there are

many types, depending on the method of aeration adopted. However, the following are the broad categories of composting that are most commonly used:

- (i) Wind Row Composting,
- (ii) Aerated Static Pile Composting,
- (iii) In-Vessel Composting, and
- (iv) Vermi Composting

381. Anaerobic technologies that produce methane rich gas are just emerging from development stage and the commercial viability and their long-term operational aspects are not clearly known. Thus, for small towns, Aerobic form of Wind Row Type Composting is the most appropriate option as this kind of composting would require no major mechanization and the compost plant would be manually operated. **Table 8.11** illustrates the comparison of composting technologies.

Table 8.11: Comparison of Composting Technologies

Category	Composting Process		
	Wind Row	Aerated Static Pile	In-Vessel
Capital Cost	Generally Low	Low in small system High in large system	Generally High
Operating Cost	Generally Low	High in sludge systems where bulking agents are used	Generally Low
Land Requirement	High	High	Low, Increases, if drying or curing is required
Air Control	Limited	Complete	Complete
Operational Control	Turning Frequency Amendment or Compost Recycle addition	Air Flow Rate	Air Flow Rate, Dynamic Agitation Amendment or Compost Recycle Addition
Sensitivity to Cold or Wet Weather	Highly Sensitive	Demonstrated in Cold and Wet Climate	Demonstrated in Cold and Wet Climate
Control of Odor	Depends on feedstock, Potential large area source	May be large area source, but can be controlled	Potentially Good
Potential Operating Problems	Susceptible to adverse weather	Air supply control is critical, potential for channeling or short circuiting of air supply	Potential for Channeling or short circuiting of air supply (plug flow), system may be mechanically complex

382. The disposal strategies for the ULB will do with, (i) Composting the organic fraction of the waste; (ii) Sanitary land filling of inorganic fraction of waste and the compost rejects; (iii) Educating the community on 4R strategy (Reduce, Reuse, Recycle and Recover).

383. The major municipal expenditure on solid waste management in the town goes into the salaries or wages of the sanitary workers and O&M (which also includes the cost of fuel) of the vehicles. To understand the expenditure pattern on solid waste, an attempt has been made, by assuming a common disposal site for the three municipalities (Alandur, Pallavaram and Tambaram) and the implementation of solid waste proposals identified under CCP in a phased manner. Three options are worked out based on the following assumptions:

- (i) Introducing door-to-door collection charge of Rs. 10 from each household until the year 2015. The collection charge shall be increased by 6 percent until 2020 and thereafter, every five years, an increase by 2 percent is assumed.
- (ii) If the compost plant is handled by the private contractor, then he would charge Tipping Fees from the ULB to compost the solid waste. It is assumed that the contractor shall charge Rs. 300 per ton of waste until the year 2015 and thereafter, the fees shall be increased by 7 percent after every five years.
- (iii) The compost shall be sold at the rate of Rs. 2.50 per kg.
- (iv) The contract document for the private contractor shall be prepared in such a way that there shall be a profit sharing between the ULB and the private contractor over the sale of compost. Here, it is assumed that until the year 2015, the profit share for the ULB shall be 10 percent of the total income from the sale of the compost while the remaining 90 percent shall be for the private contractor. Thereafter, an increase of 2 percent in the ULB share is assumed after every five years.

384. The following three options are worked out:

- (i) Option – I. **Table 8.12, 8.13 and 8.14** tabulates Option – I. It is worked out assuming that the projects identified under CCP are implemented, the private contractor charges a Tipping Fee and the contractor agrees to a contract of profit sharing with the ULB from the sale of compost. The following tables detail out the indicative figures on the reduction in expenditure (Rs. per Ton) for the ULB towards solid waste handling.

Table 8.12: Option – I – Summary of Projected Expenditure towards Solid Waste Handling

Solid Waste Handling	2005	2010	2015	2020	2026
	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>
Collection	945	495	453	418	382
Transportation	401	559	440	227	191
Disposal	-	726	747	769	426
Total	1,346	1,780	1,640	1,414	1,000

Source: Analysis

Table 8.13: Option – I – Summary of Projected Income towards Solid Waste Handling

Solid Waste Handling	2005	2010	2015	2020	2026
	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>
Collection	-	-	-	-	-
Transportation	-	-	-	-	-
Disposal	-	38	45	53	60
Total	-	38	45	53	60

Source: Analysis**Table 8.14: Option – I – Summary of Reduction of Projected Expenditure towards Solid Waste Handling**

Solid Waste Handling	2005	2010	2015	2020	2026
	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>
Collection	945	495	453	418	382
Transportation	401	559	440	227	191
Disposal	-	688	702	717	366
Total	1,346	1,742	1,595	1,362	940

Source: Analysis

- (ii) Option – II. **Table 8.15, 8.16 and 8.17** tabulate Option – II. It is worked out assuming that the projects identified under CCP are implemented, introducing the user charges for door-to-door collection from each household and the private contractor charges a Tipping Fee. The following tables detail out the indicative figures on the reduction in expenditure (Rs. per Ton) for the ULB towards solid waste handling.

Table 8.15: Option – II – Summary of Projected Expenditure towards Solid Waste Handling

Solid Waste Handling	2005	2010	2015	2020	2026
	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>
Collection	945	495	453	418	382
Transportation	401	559	440	227	191
Disposal	-	726	747	769	426
Total	1,346	1,780	1,640	1,414	1,000

Source: Analysis**Table 8.16: Option – II – Summary of Projected Income towards Solid Waste Handling**

Solid Waste Handling	2005	2010	2015	2020	2026
	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>
Collection	-	71	176	231	323
Transportation	-	-	-	-	-
Disposal	-	-	-	-	-
Total	-	71	176	231	323

Source: Analysis

Table 8.17: Option – II – Summary of Reduction of Projected Expenditure towards Solid Waste Handling

Solid Waste Handling	2005	2010	2015	2020	2026
	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>
Collection	945	424	277	186	60
Transportation	401	559	440	227	191
Disposal	-	726	747	769	426
Total	1,346	1,709	1,464	1,183	677

Source: Analysis

- (iii) Option – III. **Table 8.18, 8.19 and 8.20** shows Option – III. It is worked out assuming that the projects identified under CCP are implemented, introducing the user charges for door-to-door collection from each household, the private contractor charges a Tipping Fee and the contractor agrees to a contract of profit sharing with the ULB from the sale of compost. The following tables detail out the indicative figures on reduction in expenditure (Rs. per Ton) for the ULB towards solid waste handling.

Table 8.18: Option – III – Summary of Projected Expenditure towards Solid Waste Handling

Solid Waste Handling	2005	2010	2015	2020	2026
	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>
Collection	945	495	453	418	382
Transportation	401	559	440	227	191
Disposal	-	726	747	769	426
Total	1,346	1,780	1,640	1,414	1,000

Source: Analysis**Table 8.19:** Option – III – Summary of Projected Income towards Solid Waste Handling

Solid Waste Handling	2005	2010	2015	2020	2026
	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>
Collection	-	71	176	231	323
Transportation	-	-	-	-	-
Disposal	-	38	45	53	60
Total	-	109	221	284	383

Source: Analysis**Table 8.20:** Option – III – Summary of Reduction of Projected Expenditure towards Solid Waste Handling

Solid Waste Handling	2005	2010	2015	2020	2026
	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>	<i>Rs. / Ton</i>
Collection	945	424	277	186	60
Transportation	401	559	440	227	191
Disposal	-	688	702	717	366
Total	1,346	1,671	1,419	1,130	617

Source: Analysis

385. Although the above options are based on assumptions, the indicative value arrived at

indicates that once the identified projects are implemented, the expenditure on solid waste handling by the ULB would come down.

386. *Operation and Management Schedule.* Adoption of an O&M Schedule, including options of using the private sector for O&M (e.g. management contract). In view of the criticality of the information on vehicle movement in assessing the collection and disposal efficiency of the local body, it is recommended that a standard register at the disposal site and transfer station be maintained. The register should contain information on each of the vehicle trips at both the locations and the origin of waste collection. The Schedule can be used for periodic maintenance of vehicles to differ costs. A summary of this information shall be prepared at the end of the day, to be verified by the head of the Health Department.
387. *Approach for Optimal Manpower Utilization.* Since the entire area of ULB is proposed for privatization, it is considered that there would not be any further requirement to induct conservancy workers. The existing street sweeping operations in the ULB are satisfactory and to ensure operational efficiency of the system, the following measures are suggested, (i) Markets and other areas of the town shall be swept at least twice a day and sweeping should be done on Sundays and holidays in core areas and denser areas. (ii) Sweepings shall be collected separately as degradable and non-biodegradable waste and deposited in containers kept at various locations and de-silting of larger drains may be done by a separate crew equipped with appropriate implements.
388. *Institutional Strengthening and Capacity Building.* Recruitment of trained engineering personnel for solid waste management is an important issue confronting the ULB. It will be equally important to keep them technically updated. It is necessary that periodic training be imparted to the operations staff of the ULB.

5. Roads and Traffic Management

389. *Objectives.* The strategic objectives of road network improvements are (a) To improve the connectivity and accessibility within the town, (b) To improve the efficiency of road space, and (c) To reduce delays at the junctions and remove bottlenecks if any.
390. *Design Criteria.* Strategy shall focus on 100 percent coverage of surfaced roads including up-gradation of roads. Out of 100 percent of surfaced roads, 85 percent would have bitumen surface, 5 percent of cement concrete and the remaining 10 percent would be WBM. The deficiencies in the ULB area with respect to the road infrastructure pertain mainly to the condition of the surface, width and density of the roads (presently, the roads density is 6.40 km/sq. km only). Formation of new roads based on the future requirement of the town is also envisaged under this project.
391. *Strengthening and Widening of Major Roads.* Emphasis on strengthening and widening of bus route roads (provision of minimum 7.0 m carriageway for bus routes less than 7.0 m carriageway and widening of major bus routes to 4 lane width) and other important arterial roads of the town, formation of link roads to the highways and other important roads, to address the issues of congestion and incomplete network. With due consideration to the growing traffic intensity, it has been proposed to upgrade the major links and bus routes. The components of improvement proposals include:

- (i) Strengthening of existing two lane carriageway and widening to four lane with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder
 - (ii) Strengthening of existing two lane carriageway with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder
392. *Asset Rehabilitation.* Upgrading shall be undertaken to extend, refurbish and enhance the roads. Plans would be phased to optimize cost and surface condition and shall include upgrading earthen roads to bituminous-topped roads. This phased up-gradation would considerably reduce the costs on new formations.
393. *Traffic Management Plan.* These shall focus on junction improvements, traffic management within core areas of the town, regional level proposals, parking and pedestrian facilities. It has been observed that, in most of the major roads in the town, pedestrians are forced to use the carriageway due to the absence or poor maintenance of footpaths. Footpaths of 1.5 m width are proposed along the major roads where heavy pedestrian movements are observed. For traffic safety and convenience, appropriate signs, markings, lighting, guideposts are required to be provided on curves, intersections, public utility places, etc. Proposals for road furniture are made considering the importance of the road, safety and aesthetic. The design of the road furniture and quality proposed are of international standards. It is proposed to provide the following road furniture for the roadway:
- (i) Kilometer stones on the major roads
 - (ii) 200 m Furlong stones
 - (iii) Road painting using reflectorised thermoplastic road paint
 - (iv) High intensity grade informatory, regulatory and cautionary signboards
 - (v) Street lights on all major roads within the municipal limits, which have been considered for improvement
 - (vi) High mast lighting at all major junctions
 - (vii) Stop signs
 - (viii) Place identification signs
394. Improvements to major and minor junctions are also proposed in terms of geometry, traffic management, lighting and signages.

6. *Street Lighting*

395. *Sector Approach.* The local body has provided sufficient number of street light fixtures within the municipal limits as the spacing between the poles is 28 m, which is well within the prescribed spacing of 30 m. However, the extension areas and the crowded places are poorly lit. Given the high density of population within the ULB area, and limited area for development, it is proposed to emphasize on high power fixtures and tube lights. The assumed distribution based on the type of fixture is 80 percent for tube lights and 20 percent for high-powered fixtures. Important junctions will be provided with High Mast Lamp with power saver switches.
396. The strategic intervention in this sector is increasing the number of lampposts in the

identified wards to reduce the average spacing between lampposts to 30 m. Further, measures are also to minimize the percentage of high power lamps and finally the power consumption charges. These measures are expected to pay back in the form of reduced and sustained O&M costs.

397. Further, to improve upon the O&M of the street lighting it is recommended to mechanize the system and involve private sector in the same. The mechanization would be towards introducing dimming systems during non-peak hours of operation to reduce the power consumption.

7. Urban Basic Services for Poor

398. *Design Criteria.* The ULB should increase the coverage of services in Low Income Areas and Slum Areas, through implementation of government schemes and other innovative programs with public participation. Given the high share of slum population, within the limited area for development, it is proposed to emphasize on provision of basic services, like water, sanitation and waste management, and improvement of quality of life through relocation and rehabilitation of slum areas.
399. The details of service levels for future are presented in **Table 8.21**.

Table 8.21: Design Criteria and Target Service Level for Urban Slums

Description	Unit	Based on Design Norms
Water Supply Demand	Lpcd	90
Distribution Network Demand	Percent of Road Length	100
Sewer Network Demand	Percent of Road Length	100
Persons per Public Water Stand Post/Taps	Persons	75
Persons per Public Toilet Seat	Persons	30
Persons per Public Urinal	Persons	50
Daily Per Capita Waste Generation	Gms per Day	350
Size of each Dustbin/Container	cu. m	0.30
Spacing of Temporary Waste Storage Points	m	300
Per Capita Road Demand		
Population above 1000	m	0.25
Population below 1000	m	0.51
Percentage of Surfaced Roads in Municipalities	Percent	70
Percentage of Surfaced Roads to be provided with Storm Water Drains	Percent	50

Source: Norms

400. *Sector Approach.* As a policy, notified/declared slums are considered for slum upgradation. The implementation of National Slum Development Program (NSDP) is in progress. The following types of infrastructure are provided: (a) roads and culverts, including concrete pavements for certain stretches; (b) surface/storm water drains; (c) water supply, with house service connections; (d) sewerage system with household latrines; and (e) external electrification.
401. In recent years, TNUIFSL has carried out a study on slums in Chennai Metropolitan Area

and envisaged the capital investments needed for the upgradation of infrastructural facilities in slums. The study has been taken into consideration and updated as per the existing details for approved slums only. The infrastructure components considered under this project are the same as in NSDP.

402. Lack of basic infrastructure facilities in most of the slums is a key issue.

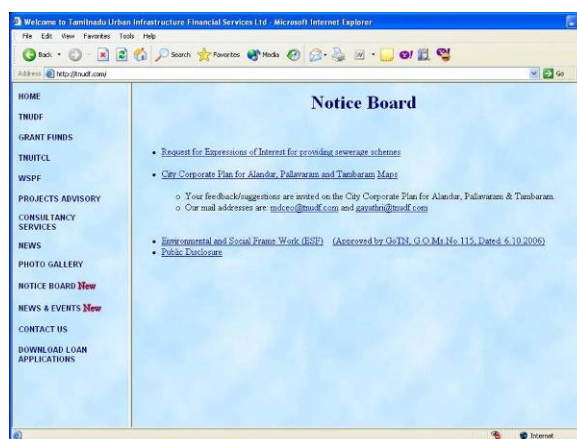
8. *Other Municipal Projects*

403. As per the Vision Plan, the local body has identified certain projects related to improvements to parks, tree plantation along roadside and improvements to burial grounds for which the investment size has been estimated by the local body and the same has been considered for this project.

B. The Consultative Process

404. The entire exercise revolved around stakeholder participation at various stages to formulate a shared vision for each of the municipalities outlining:
- (i) Development objectives and long term environmental, social, economic infrastructure, cultural and health goals, and
 - (ii) Program of institutional and policy priorities and a definition of sectoral and inter sectoral goals and development strategies.
405. The process followed was: (i) stakeholder identification, (ii) consultation/meetings with identified stakeholders to firm up vision and arrive at goals/quantifiable indicators, (iii) technical inputs from experts and firming up of vision and goals, and (iv) seeking broad consensus on regional and town-level vision and identified infrastructure priorities/projects. A series of meetings were conducted to define the vision and identify and prioritize the projects, which would help in improving the service levels in towns, and in turn, improve the pace of regional growth and development.
406. The consultation workshop for stakeholders of corporate planning process for Tambaram was conducted on January 28, 2006 at Hotel Henkala. To prioritize the needs of the town effectively, the workshop was conducted in two sessions. The morning session was attended by the ward councilors while the afternoon session was meant for the other stakeholders, which included officials from various government offices, representatives from non-governmental organizations, local clubs and prominent citizens.
407. In both the sessions, Mr. Ahmed Papa, Commissioner and Mr. S.R. Raja, Chairman of Tambaram Municipality gave the introductory speeches and briefed the sessions about the importance of this project. The list of participants is given in **Annexure 8.1**. The minutes of consultation meetings/workshops held at various stages of the report submission is given in **Annexure 8.3, 8.4, 8.5 and 8.6**.
- Consultation Workshop - Tambaram**
408. The consultant addressed the gathering and presented status of town and service delivery by the Municipality in various aspects:

- (i) Regional setting
 - (ii) Demographic analysis
 - (iii) Economy of the town
 - (iv) Land use and growth management
 - (v) Urban poverty
 - (vi) Urban environmental service
 - (vii) Infrastructure services
 - (viii) Traffic and transportation
 - (ix) Municipal assets
 - (x) Privatization and other initiatives
 - (xi) Sector wise projects and investments
 - (xii) Financial Analysis
409. The focus of the discussions at the workshops and meetings was on the existing infrastructure situation and identified investments for Tambaram to meet the future requirement. It included the existing situation review, demand-gap analysis, key issues under each sector and municipal fiscal status. The consultation workshops were also meant to create awareness among the stakeholders on the present situation with respect to various service sectors in the town. The consultations yielded specific suggestions from the stakeholders on the vision, approach and short term and long-term requirements of the town.
410. The presentation made by the consultants was appreciated by all the stakeholders present for the workshop and a brief about the project was published in “The Hindu” on January 31, 2006 (**Annexure 8.2**).
411. In addition to the consultation workshops, the Consultants identified key stakeholders who included government and non-governmental agencies/ institutions involved in service delivery, educational institutions, representatives of trade and industry, and social welfare groups. **Annexure 8.7** presents the list of Stakeholders met. The Consultants familiarized stakeholders with the purpose and process and expected outcomes of the City Corporate Plan (CCP), and built enthusiasm, understanding and commitment to the CCP process among all the stakeholders. Inputs from Stakeholders have been an intrinsic part of CCP cum BP preparation. Issues raised /suggestions given by Stakeholders are presented in **Annexure 8.8**. To receive further comments from different section of people, on September 09, 2006, TNUIFSL uploaded the summary of the report in their web site (www.tnuidf.com) for further suggestions and comments.
412. Hence, the feedback from various stakeholders has strengthened the visioning process and helped in prioritizing the projects.



Project Summary uploaded in official web page of TNUIFSL

1. *Priorities and Suggestions*

413. A participatory approach was adopted to arrive at a shared vision and infrastructure needs identification/prioritization exercise for CCP and Business Plan preparation. Stakeholders discussed and gave suggestions on various issues and problems faced by the region and the town. The overall outcomes of the consultations are given below:

- (i) Identification of additional source of water supply
- (ii) Daily supply of water
- (iii) Improvements to existing water bodies and removal of encroachments
- (iv) Provision of additional public toilets in East Tambaram
- (v) Implementation of UGD Scheme in Tambaram
- (vi) Improvements to Link Road from Camp Road to Chittlapakam
- (vii) Provision of more dustbins in the markets
- (viii) Issue of scavengers not attending regularly to duties
- (ix) Construction of New Link Road from East Tambaram to ROB at LC-29
- (x) Provision of parking facilities
- (xi) Improvements to markets and kalayana mandapam
- (xii) Enhancement of revenue income of the ULB by constructing remunerative assets like shopping complexes, kalyana mandapams
- (xiii) Improvements to water bodies
- (xiv) Measures to improve slum infrastructure
- (xv) Construction of electric burial ground
- (xvi) Flooding of areas during rainy seasons

414. Discussions with stakeholders led to the formulation of regional and town-level vision as follows:

2. *Regional Level Vision*

415. To sum up, stakeholder consultations yielded the following consensus on a vision for the region:

Chennai Metropolitan Area is likely to function as a single entity in 20 years' time, and has the potential to be an important economic centre in Southern India and the country as a whole. The need for:

- (i) Infrastructure service delivery to keep pace with and sustain economic growth in the region, and
- (ii) High service levels in the three towns, enabling them to attract population and business to the region, was therefore identified.

3. *Town Level Vision*

416. Consultations with citizens of the project town upheld the vision, "To make the town

dynamic, vibrant, self-reliant and sustainable with all basic amenities, offering a better quality of life to residents.”

417. Based on discussions with stakeholders, an attempt was made to arrive at quantifiable or measurable indicators that would facilitate monitoring of CCP implementation in the project town, as presented in **Table 8.22** below:

Table 8.22: Goals and Service Outcomes

Sr. No	Parameters	Tambaram 2005	Goal 2026
A. Water Supply			
1	Coverage of distribution network	39.96 %	100%
2	Per Capita Supply (Normal Season)	47.56 lpcd	90 lpcd
3	Quality of Water	Safe & in conformance with standards	Safe & in conformance with standards
B. Sewerage			
1	Coverage of Sewer Network	0%	100%
C. Storm Water Drain and Water Bodies			
1	Storm Water Drain Coverage (% of road length)	86.38%	150%
2	Rehabilitation of Existing Nallahs and Water Bodies		100%
D. Solid Waste Management			
1	Door to Door Collection		100%
2	Collection Performance for Handling of Waste	86%	100%
3	Scientific Disposal		100%
E. Traffic and Transportation			
1	Road Density	6.4 km/sq. km	15 km/sq. km
2	Percent of Municipal Surfaced Roads	81.28 %	100%
F. Street Lighting			
1	Initiatives in energy saving mechanisms	No	Yes
2	Average spacing of street poles	Avg 28 m (with variation between wards/pockets ranging from 12.4 to 47.4)	30 m or less in all wards
G. Basic Services for Poor			
1	Dependency on public taps/standposts	255 persons per unit	75 persons per unit
2	Dependency on public conveniences	862 persons per unit	30 persons per unit
3	Provision of Dust-bins	1,319 m	300 m
4	Average spacing of street poles	25 m (with variation between slums ranging from 19.4 m to 216.7 m)	30 m

C. Project Identification for Service Delivery

1. Water Supply

- (i) Sub-Project Components. To meet the water supply requirements for 2026, augmentation of additional headwork to meet the demand gap of 14.17 MLD at the rate of 90 lpcd, is proposed. Under this component, rehabilitation of existing distribution network of 13.34 km, provision of additional distribution network for a length of 171.14 km with road overlay of 119.80 km, construction of storage reservoirs of combined capacity of 48.40 LL and a water treatment plant of 23.66 MLD (2026), is proposed under this project.
- (ii) Cost Estimates. **Table 8.23** illustrate the capital investment is estimated at Rs. 2,987.70 lakh.

Table 8.23: Projects Identified for Water Supply (2026)

Sr. No	Item	Quantity	Unit	Cost
				<i>Rs. Lakh</i>
A	System Rehabilitation			
1	Distribution Network	13.34	km	66.71
2	Leak Detection and Reduction Measures for Distribution Network	53.00	km	10.60
	<i>Sub-Total (A)</i>			<i>77.31</i>
B	New Infrastructure			
1	Augmentation of Headwork	14.17	MLD	1,133.82
2	Storage Reservoir	4.84	ML	266.43
3	Distribution Network	171.14	km	855.71
4	Road Overlay	119.80	km	299.50
5	Water Treatment Plant	23.66	MLD	354.94
	<i>Sub-Total (B)</i>			<i>2,910.39</i>
	Total (A+B)			2,987.70

Source: Analysis.

2. Sewerage and Sanitation

- (i) Sub-Project Components. The proposals identified in the DPR of UGD System for Tambaram town has been considered under this project. Additional requirement of 3.22 km of sewer network is also considered.
- (ii) Cost Estimates. **Table 8.24** illustrate the capital investment is estimated at Rs. 4,097.93 lakh.

Table 8.24: Projects Identified as per Detailed Project Report

Sr. No	Item	Quantity	Unit	Cost
				<i>Rs. Lakh</i>
A	System Rehabilitation			
1				-
	<i>Sub-Total (A)</i>			-
B	New Infrastructure			

Sr. No	Item	Quantity	Unit	Cost
				<i>Rs. Lakh</i>
1	Road Length Covered (2034)	141.21	km.	2,083.78
2	Road Overlay Cost (2034)	141.21	km.	463.17
3	Pumping Station (6 Nos.) (2019)	21.61	MLD	197.84
4	Electrical and Mechanical Works	6	Nos.	188.73
5	Pumping Main	24.30	Km.	605.16
6	Proportionate Cost for Common Pumping Station at Kilkattalai Eri		MLD	196.85
7	Proportionate Cost for Common Pumping Main	8.55	Km.	227.40
8	Miscellaneous Works			135.00
	<i>Sub-Total (B)</i>			<i>4,097.93</i>
	Total (A+B)			4,097.93

Source: Analysis.

3. Storm Water Drainage and Rehabilitation of Water Bodies

- (i) Sub-Project Components - Drainage. Under this component, it is proposed to provide pucca drains with proper connectivity. Rehabilitation of existing drains for a length of 53.50 km and desilting and strengthening of primary nallah (3.0 km), is also proposed under this project.
- (ii) Cost Estimates - Drainage. **Table 8.25** furnishes the capital investment for the improvements and upgradation of storm water drains is estimated at Rs. 3,795.40 lakh.

Table 8.25: Projects Identified for Drains (2011)

Sr. No	Description	Value	Unit	Cost
				<i>Rs. Lakh</i>
A	<i>Rehabilitation</i>			
1	Rehabilitation of Existing Storm Water Drains	53.50	km	53.50
B	<i>Upgradation of Kutcha to Pucca</i>			
1	Kutcha to Pucca Open	5.40	km	64.80
2	Kutcha to Pucca Closed	-	km	-
3	Pucca Open to Pucca Closed	2.64	km	13.19
C	<i>Formation of New Drains</i>			
1	New Pucca Open Drains	105.97	km	1,271.67
2	New Pucca Closed Drains	139.40	km	2,369.74
D	<i>Primary Drains</i>			
1	Desilting & Strengthening of Primary Drains	3.00	km	22.50
	Total			3,795.40

Source: Analysis.

- (iii) Sub-Project Components – Water Bodies. Under this component, it is proposed to improve the 15 existing water bodies viz., Pudu Thangal Eri, Mullai Nagar, Tambaram, Vannan Eri, Eri near Bajanai Koil Street, Tambaram, Periya Eri, West Tambaram, Etti Tahangal Eri, Tambaram (S.No. 276), Mudichur Road Kulam, Eri

near Kulam Avenue III, Tamparam (S.No. 140), Kulam, Tamparam (S.No. 14), Idumban Eri, Pillikoradu, Periya Eri, Kadaperi, Kulam, Irumbuliyur Eri, Kulam, Tamil Poonga Street, Selaiyur Eri, Thiruvanchari Eri and Kuttai. The improvements include the desilting, strengthening and beautification of the water bodies.

- (iv) **Cost Estimates - Water Bodies.** The capital investment for the improvements of existing water bodies and supply to the water supply zones (which includes the conveying main, collection sump, pumping machinery, treatment facilities, etc.) is estimated at Rs. 547.12 lakh is tabulated in **Table 8.26**.

Table 8.26: Estimated Cost for Improvements to Lakes and Supply to OHTs

S. No.	Tank	Improvements to Lakes	Infrastructure for Supply to OHTs
		<i>Rs. Lakh</i>	<i>Rs. Lakh</i>
1	Pudu Thangal Eri, Mullai Nagar, Tamparam (S. No. 256)	21.49	10.13
2	Vannan Eri, Bajanai Koil Street (near), Tamparam (S.No. 298)	9.49	6.18
3	Periya Eri, West Tamparam (S.No. 348)	36.26	8.90
4	Etti Tahangal Eri, Tamparam (S.No. 276)	5.16	7.75
5	Mudichur Road Kulam (S.No. 295)	3.71	5.88
6	Kulam Avenue III (near), Tamparam (S.No. 140)	1.16	8.38
7	Kulam, Tamparam (S.No. 14)	1.42	7.79
8	Idumban Eri, Pillikoradu (S.No.100)	5.26	7.66
9	Periya Eri, Kadaperi (S.No.154)	60.10	20.83
10	Kulam	3.09	6.11
11	Irumbuliyur Eri (S.No. 176)	80.56	9.36
12	Kulam, Tamil Poonga Street (S.No. 26 & 28)	1.88	13.74
13	Selaiyur Eri, (S.No.145)	146.64	23.53
14	Thiruvanchari Eri (S.No. 300)	14.31	11.10
15	Kuttai (S.No. 80)	1.61	7.65
	Total	392.14	154.98

Source: Analysis.

4. Solid Waste Management

- (i) **Sub-Project Components.** Under this component, it is proposed to develop a comprehensive solid waste management system for the town. House-to-house waste collection is proposed. The primary collection comprises of tricycles and pushcarts. The total requirement for primary collection including street sweeping and drain desilting has been estimated as 205 tricycles (with 6 bins each) and 221 pushcarts. The secondary collection and transportation system consists of 35 dumper bins of 7.0 cum capacity each and 9 dumper placers. The primary, secondary collection and transportation equipment is estimated to cater the needs till 2026. To treat and dispose the waste safely, it is proposed to develop an integrated compost and landfill facility for the town. The integrated plant has been designed to treat and dispose ultimate waste generation of about 118.51 tons by the year 2026.

- (ii) Cost Estimates. The capital investment is estimated at Rs. 698.28 lakh is pointed out in **Table 8.27.**

Table 8.27: Projects Identified for Solid Waste Management (2026)

Sr. No	Item	Quantity	Unit	Cost
				<i>Rs. Lakh</i>
A	<i>New Infrastructure</i>			
I.	Waste Collection and Transportation Equipment			
1	Tri-cycles (with 6 Bins Each)	205	Nos	16.40
2	Push Carts	221	Nos	15.91
3	Dumper Bins (7 cum)	35	Nos	19.25
4	Dumper Placers	9	Nos	90.00
	<i>Subtotal (I)</i>			<i>141.56</i>
II.	Compost Plant Development and Sanitary Landfill Site Development			
1	Compost Yard	71.00	Tons	177.50
2	Landfill	47.40	Tons	379.22
	<i>Subtotal (II)</i>			<i>556.72</i>
	Total (I+II)			698.28

Source: Analysis.

5. Roads and Traffic Management

- (i) Sub-Project Components. Under this component, it is proposed to upgrade the existing roads to cement concrete and a bitumen surface, formation of new roads based on the future growth (2011) of the town, widening, and strengthening of the existing internal roads, bus routes and the major links, is proposed in **Table 8.28.** Improvements to the traffic and transportation related components considered under this project are tabulated in **Table 8.29.**

Table 8.28: Proposed Improvements to Bus Routes and Major Links

Sr. No	Road Name	Length	Importance of Road	Existing Width	Proposals
		<i>M</i>		<i>m</i>	
1.	Mudichur Road				
1.1	From G.S.T. Road to Municipal limit	2,800	This is the State Highway Connecting Tambaram Town with Mudichur and connect Tambaram with the proposed outer ring road	5.5	Widening and Strengthening of existing intermediate lane carriageway to four lane with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder
1.2	From municipal limit to the proposed outer ring road	3,000		5.5	
2.	Velachery Road	3,000	State highway connecting Tambaram with Chennai City,	14.0	Strengthening of existing four lane carriageway

Sr. No	Road Name	Length	Importance of Road	Existing Width	Proposals
		<i>M</i>		<i>m</i>	
			via Velachery and act as a bypass to G.S.T. road.		with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder
3	Kishkinta Road	2,700	This is another major Road connecting Tambaram with Kishkinta, the famous theme park	5.5	Widening and Strengthening of existing intermediate lane carriageway to four lane with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder
4	Thirunneermalai Road	1,500	Major road connecting Tambaram with the famous Thirunneermalai temple and the proposed Thirunneermalai township	5.5	Widening and Strengthening of existing intermediate lane carriageway to four lane with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder
5.	Agaram Road	1,000	Bus route	5.5	Widening & Strengthening of existing road to two lane carriageway with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder
6	Old G.S.T. Road	700			
7	MES Road	1,000			
8	Sudhanandha Bharathi Street	1,500			
9	Bharathamatha Street	2,000			
10	Muthu Ranga Street	400			
11	Gandhi Road	1,500			
12	Rajaji Street	200			
13	Kamarajar St-Bharathidasan St-Chitlapakam 3rd Main Rd	2,000	Link from Velachery Road to Chitilapakkam	5.5	Widening & Strengthening of existing road to two lane carriageway with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder

Sr. No	Road Name	Length	Importance of Road	Existing Width	Proposals
		<i>M</i>		<i>m</i>	
14	New Link	1,500	Link to RoB at LC 29 from East Tamparam	-	New two lane carriageway with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder

Source: Analysis.

Table 8.29: Proposed Improvements to Major Junctions

Sr. No	Junction	Type of Junction	Roads Leads to	Existing Condition	Proposals
1	G.S.T. Road – Mudichur Road	T - Junction	Chenglepattu on North side, Mudichur on East side, Chennai on South side	No channelising island No Lighting facility Unsignalised No traffic Signs and markings	Proper channelization, Provision of proper Traffic signs and markings Proper lighting facility
2.	G.S.T. Road - Gandhi Road Junction	T - Junction	Chenglepattu on North side, Kishkinta on East side, Chennai on South side	No channelising island No Lighting facility Unsignalised No traffic Signs and markings	
3.	Thirunneermalai Road – Kishkinta Road Junction	T – Junction	Kishkinta on East side, Thiruneermalai on South side, Tambaram on West side	No channelising island No Lighting facility Unsignalised No traffic Signs and markings	
4.	Velachery Road – Agaram Road Junction	T – Junction	Medavakkam on West side, Agaram on North side, G.S.T. Road on West side	No channelising island Unsignalised No traffic Signs and markings No Turning Radius	
5.	Velachery Road – Bharathamatha Street Junction	T - Junction	Chitlapakkam on South side, G.S.T. Road on West side, Medavakkam on East side	No channelising island Unsignalised No traffic Signs and markings No Turning Radius	

Source: Analysis.

The minor junctions identified for the improvements are:

- (i) Gandhi road- Kishkinta road
- (ii) Gandhi road- Thirunneermalai road
- (iii) Gandhi road- Mudichur road
- (iv) Gandhi road- Kakkan Street
- (v) Mudichur road- Kakkan Street

Proposals for on-street parking are proposed on the roads given in **Table 8.30**.

Table 8.30: On-Street Parking Proposals

Sr. No	Location	Name of the Stretch	Parking Details	Proposals
1.	G.S.T. Road	From Mudichur Road Junction – Shanmugam Street	Length of Parking is 250 m Parallel parking	Bay markings, signage
2.	Mudichur Road	From G.S.T. Road – 300 m	Length of parking is 300 m Mixed Parking	
3.	Velachery Road	From MTC Bus stand – MCC	Length of parking is 300 m Mixed Parking	
4.	Kakkan Street	From Mudichur Rd – Gandhi Rd	Length of parking is 500 m Mixed parking	
5.	Rajaji Street	From G.S.T. Road – 400 m	Length of parking is 400 m Mixed Parking	
6.	Bharathamadha Street	From G.S.T. Road -100 m	Length of Parking is 100 m Mixed Parking	

Source: Analysis

The following roads are proposed for footpaths:

- (i) G.S.T. Road (3 km)
- (ii) Velachery Road (1.5 km)
- (iii) Mudichur Road (1 km)
- (iv) Gandhi Road (1.5 km)

Map 8.1: Proposed Improvements of Roads (Bus Routes) and Traffic Management

- (ii) Cost Estimates. **Table 8.32** present the capital investment is estimated at Rs. 62,512.33 lakh.

Table 8.32: Projects Identified for Roads and Traffic & Transportation

Sr. No	Improvement Proposals	Value	Unit	Cost
				<i>Rs. Lakh</i>
I	Roads			
<i>Roads Maintained by Municipality</i>				
<i>A</i>	<i>Upgradation (Excludes the Bus Route and Major Links)</i>			
1	BT to Concrete	-	km.	-
2	WBM to Black Top	8.52	km.	127.81
3	Earthen to Black Top	14.02	km.	280.43
<i>B</i>	<i>New Formation (Excludes the Bus Route and Major Links)</i>			0
1	Concrete	0.35	km.	16.37
2	Black Top	115.04	km.	3,681.32
3	WBM	6.29	km.	88.07
<i>C</i>	<i>Widening/ Strengthening (Excludes the Bus Route and Major Links)</i>	22.96	km.	160.70
<i>D</i>	Kamarajar Street	0.8	km	200.00
<i>E</i>	Camp Road	1.2	km	300.00
	<i>Sub-Total</i>			<i>4,854.70</i>
<i>Roads Maintained by Highway Department</i>				
1	Strengthening of existing intermediate lane carriageway and widening to four lane with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder	10.00	km	3,000.00
2	Strengthening of existing four lane carriageway with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder	3.00	km	120.00
3	Widening & Strengthening of existing road to two lane carriageway with 50 mm BM and 25 mm SDBC with 1.5m gravel shoulder	10.30	km	772.50
4	New two lane carriageway with 50 mm BM and 25 mm SDBC with 1.5m gravel shoulder	1.50	km	300.0
5	Connectivity from Tamparam to NH – 4 (Sunguvarchatram)			53404.00
6	Walajabadh Road – Srperambudur Link Road – 4 line			
7	Mudichur Road to Darkas Road			
8	Velachery OMR Link Road – 4 lane			
9	Velachery – Kelambakkam Link Road – 4 lane			
10	Connectivity from Darkas Road to Mudchur Road via TNHB Colony			
11	Improvements to Old GST road from perungalathur to Erambuliyur Road			

Sr. No	Improvement Proposals	Value	Unit	Cost
				<i>Rs. Lakh</i>
12	Linkage to ROB from Bharatmatha Street			
13	Tambaram Sanatorium to ORR – 4 lane			
	<i>Sub-Total</i>			57,596.50
	<i>Sub-Total (I)</i>			62,451.20
II	Traffic and Transportation			
1	Junction Improvements (Major)	6	Nos.	30.00
2	Junction Improvements (Minor)	5	Nos.	12.50
3	Provision of 1.5 m Wide Footpath	7.00	km	14.00
4	Provision of On-Street Parking (Bay Markings & Signs)	1.85	km	4.63
	<i>Sub-Total (II)</i>			61.13
	Total (I+II)			62,512.33*

Note: *The cost excludes land acquisition cost

6. Street Lighting

- (i) Sub-Project Components. Under this component, it is proposed to provide proper lighting facilities with an average spacing of 30 m between the poles. For existing roads, 193 tube lights, 176 high power lamps and 5 high mast lamps with power saver switches at important junctions are proposed. To meet the future demand of new roads for 2011, 3,245 tube lights, 811 high power lamps and 6 high mast lamps with power saver switches are proposed. Multi-utility underground duct is also proposed for the major bus route road is tabulate in **Table 8.34**.
- (ii) Cost Estimates. The capital investments estimated at Rs. 1,212.58 lakh are presented in **Table 8.33** and **Table 8.34**.

Table 8.33: Projects Identified for Streetlights (2011)

Sr. No	Fixture	Value	Unit	Cost
				<i>Rs. Lakh</i>
A	<i>Distribution by Type (For Existing Roads)</i>			
1	Tube Light	193	Nos.	8.69
2	High Power	176	Nos.	15.84
3	High Mast Lamps	5	Nos.	22.63
4	Power Saver Switches	5	Nos.	0.23
	<i>Sub-Total (A)</i>			47.38
B	<i>Distribution by Type (For New Formation of Roads)</i>			
1	Tube Light	3,245	Nos.	795.03
2	High Power	811	Nos.	235.19
3	High Mast Lamps	6	Nos.	27.63
4	Power Saver Switches	6	Nos.	0.28
	<i>Sub-Total (B)</i>			1,058.12
	Total (A+B)			1,105.49

Source: Analysis.

Table 8.34: Cost for Underground Multi-Utility Duct

Roads	Cost
	<i>Rs. Lakh</i>
Bus Route and Major Links (Maintained by Highway Department)	2600.00
Total	2600.00

Source: Analysis.

7. Urban Services for Poor

- (i) Sub-Project Components. There are 17 declared slums and 7 undeclared slums in Tambaram having a population of 38,770, constituting roughly 28 percent of the total population. Declared slums in the town are considered for slum upgradation.
- (ii) Cost Estimates. The capital investment estimated at Rs. 736.96 lakh is presented in **Table 8.35**.

Table 8.35: Projects Identified for Upgradation of Slum Infrastructure

Sr. No	Component	Value	Unit	Cost
				<i>Rs. Lakh</i>
1	No. of Public Taps / Hand pumps	280	Nos.	98.00
2	No. of Public Toilet Seats	985	Nos.	492.50
3	No. of Public Urinals	575	Nos.	97.75
4	No. of Dustbins / Temporary Waste Storage Points	105	Nos.	3.99
5	Roads and Pavements	-	km	-
6	Storm Water Drains	1.85	km	27.68
7	Streetlights	213	Nos.	17.04
	Total			736.96

Source: Analysis.

8. Other Municipal Projects

- (i) Sub-Project Components. As per the Vision Plan, the local body has identified projects related to parks (Gandhi park, Muthurangam park, Bharathi park, Tamil Poonga, Anandapuram park, Chandran Devanesan park, Thiruppur Kumaran park & Raja Iyer pond, Karpagam Nagar park and road side parks) and tree plantation along the road side. Improvements to 6 burial grounds (Selaiyur, Kannadapalayam, Thiruneermalai, Arputha Nagar, Moulana Nagar, and Selaiyur (Dr. Ambedkar Nagar) is also considered under this project.
- (ii) Cost Estimates. **Table 8.36** illustrates the capital investment for other municipal project is estimated at Rs. 110.00 lakh.

Table 8.36: Projects Identified by the ULB

Sr. No	Description	Value	Unit	Cost
				<i>Rs. Lakh</i>
1	Development of Parks	9	Nos.	50.00
2	Tree Plantation		Nos.	10.00
3	Improvements to Burial Grounds	6	Nos.	50.00
	Total			110.00

Source: Analysis.

9. *Total Investments for Identified Projects*

418. To improve and meet the future demand for the town's infrastructural facilities, the total investment is estimated at Rs. 76,794.30 lakh is furnished in **Table 8.37**.

Table 8.37: Total Investment Identified for Tambaram Town

Sr. No	Component	Cost
		<i>Rs. Lakh</i>
1	Water Supply	2,987.70
2	Sewerage and Sanitation	4,097.93
3	Storm Water Drainage	3,795.40
4	Water Bodies	0
	Improvements to Water Bodies	392.14
	Supply Mechanism to OHTs	154.98
5	Solid Waste Management	698.28
6	Roads	0
	Municipal Roads	4,854.70
	Highway Department Roads	57,596.50
7	Traffic Management	61.13
8	Street Lighting	1,105.49
	Under Ground Multi-Utility Duct	2600.00
9	Urban Services for Poor - Slums	736.96
10	Others	110.00
	Total	79,191.21

Source: Analysis.

IX. ASSET MANAGEMENT

A. Overview

419. The basic objective of asset management is to define and describe the key elements, and principles of an Asset Management System. This chapter will deal with the elements that are essential in an asset management program for movable and immovable infrastructure, more specifically road networks, sidewalks, water supply networks, pumping, storage, treatment facilities, and storm water drains.
420. While the need for Asset Management is clearly felt, it is equally important to have appropriate management information on asset condition, infrastructure costs and performance, and the consolidated requirements for repairs and maintenance, as well as appropriate maintenance standards.

1. Asset Inventory

421. The first stage of implementation of an asset management program for municipal infrastructure relies on the essential element of inventory. For each element in each category of infrastructure it is fundamental to know about all as mentioned below:
- (i) Available Assets
 - (ii) Location of Asset
 - (iii) Age of Asset
 - (iv) Quantity of Asset
 - (v) Physical Characteristics of Asset
422. Infrastructure Assets will include all movable and immovable equipment, properties including but not restricted to sectors like water supply drainage, sewerage, solid waste management, roads, street lighting etc. Unlike other assets of the municipality, these assets undergo constant use, wear and tear, addition, repair, etc. This correspondingly changes their values and hence, a constant value updating is necessary.

2 Information of Municipal Assets

423. *Water Supply.* The water supply assets basically comprise of all the assets from the headworks, treatment plant, sump, transmission mains, pumping mains, feeder mains, distribution mains and sub mains, including all valves, connections, meters and all related facilities for the efficient delivery service of water.
424. As Tambaram Municipality is responsible for the distribution of water supply only, the assets related to the headwork and transmission does not fall under the list of ULB assets. The details of municipal maintained water supply distribution network are detailed out in **Annexure 9.1**. The distribution of water supply is met with 53 km of pipeline laid across the town. The municipality operates its water supply system through sluice valves. They

are around 70 in number. The age of the valves correspond to the age of the distribution network. However, it is the reliability over the age of these valves that is more important. The fact that most of the valves in the town are operational and functional through minimal repairs makes the reliability high. The details of valves are shown in **Table 9.1**.

Table 9.1: Details of Valves

Diameter	Material	Number of Valves	Distribution
<i>mm</i>		<i>Nos.</i>	<i>%</i>
80	C.I	2	2.86
100	C.I	54	77.14
125	C.I	-	-
150	C.I	8	11.43
200	C.I	6	8.57
Total		70	100.00

Source: Tambaram Municipality

425. In addition, the ULB has 10 storage reservoirs, 280 bore wells and 216 public taps spread in all the wards of the town.
426. *Sewerage and Sanitation.* The town does not have a sewerage system. The municipal owned assets for sanitation system consist of public toilets and pay-and-use toilets. The ULB has provided four public toilets constructed under ISP, 9 toilets constructed under VAMBAY and 12 are community latrines.
427. *Land and Buildings.* The local bodies maintain both remunerative and non-remunerative assets. The ULB own buildings some of which are as old as 20 years. These buildings attract monthly rental incomes and deposits to the local body. The construction cost and the building value as on March 31, 1999 is given in the following. The details of municipal buildings are presented in **Table 9.2**.

Table 9.2: Details of Municipal Buildings

Name of Building	Site Area	Plinth Area	Construction Cost	Year of Construction	Building Value as on 31/03/99
	<i>Sq. m</i>	<i>Sq. m</i>	<i>Rs. Lakh</i>		<i>Rs. Lakh</i>
Municipal Office	684.80	684.80	200,000	1970	140,000
IPP-V Hospital		346.85	1,700,000	1990	1,522,000
Bus Stand Buildings		484.00	1,200,000	1993	1,104,000
Jeeva Complex	247.18	247.18	439,000	1996	421,000
Shanmugam Road Shops		529.92	1,200,000	1980	972,000
		421.20	450,000		365,000
		56.94	50,000		33,000
Service Road Shops			500,000	1990	456,790
Poondi Bazaar Shops			500,000	1992	466,035
Ambedkar Kalyanamandapam		1,961.12	1,567,000	1996	1,520,460
Bharathinagar - Selaiyur		39.22	150,000	1998	148,500
Pulikkoradu		31.64	150,000	1994	142,648
Kailasapuram		19.20	100,000	1992	93,207

Name of Building	Site Area	Plinth Area	Construction Cost	Year of Construction	Building Value as on 31/03/99
	<i>Sq. m</i>	<i>Sq. m</i>	<i>Rs. Lakh</i>		<i>Rs. Lakh</i>
Thiruvalluvar Nagar		23.04	75,000	1997	73,507
Bharatha Madha St.		23.04	200,000	1996	194,060
Abdul Razak St.			243,000	1994	231,091
Amedkar (T.N. Malai Rd.)		35.62	50,000	1994	47,550
Tamil Poonga St.		14.73	50,000	1996	48,515
Gandhi park library		70.56	75,000	1997	72,766
Kailasapuram		22.75	50,000	1995	48,030
Bharathy Park Library		63.14	75,000	1998	73,875
Anandapuram Park Library		22.68	75,000	1998	73,875
Thiruppur Kumaran Park		54.72	75,000	1998	73,875
Thiruneermalai Road NMC		83.36	150,000	1996	145,545
Mariamman Koil (NMC) T.N.Malai Road		83.42	150,000	1997	147,015
Kone Krishna Park NMC		84.42	150,000	1992	139,810
Bajanai Koil St. NMC		45.00	150,000	1997	147,015
Sweeper Qtrs West NMC		85.39	150,000	1998	145,545
Old Tambaram SCH NMC		85.76	150,000	1994	142,648
Tamil Poonga St. NMC		81.84	150,000	1998	145,545
Vinoba Nagar Mun. School NMC		83.08	150,000	1998	145,545
Bharathi Park NMC		82.50	150,000	1999	150,000
Anandapuram Park NMC		81.84	150,000	1999	150,000
Thiruppur Kumaran Park		82.41	150,000	1999	150,000
Erikkarai St. NMC			150,000		145,570
Adhinagar NMC			186,005		177,151
Vedan St. (Balaraman St.) NMC			150,000		145,570
Ashok Nagar (Mothilal)			150,000		145,570
Kulakkarai St. (Old GST Road)			150,000		145,570
Kalangal St. NMC			150,000		145,570
Thiruvalluvar Nagar NMC			150,000		150,000
Watchman Room (Comp)		12.78	50,000	1995	48,030
Sweeper Qtrs East		247.55	250,000	1996	238,892
Sweeper Qtrs West		173.39	175,000	1996	167,225
		97.08	70,000		66,890
Beemeswaran St. Karumathi mandapam		11.13	50,000	1996	48,515
Erikkarai St. (W.No.11) Karumathi Mandapam		11.13	150,000	1999	150,000

Source: Schedule Register, Tambaram Municipality

428. The annual revenue incomes from the remunerative assets are mainly from kalyana

mandapams and shopping complexes, which fetch good revenue income to the municipality.

429. Remunerative assets have been used to estimate the additional resource that could be mobilized and is presented in the **Chapter X**.
430. Non-remunerative assets mainly include land, which are vacant or are being used as social capital for parks, playground, temples, water tanks or open areas. Some of the land is also being put to remunerative use through leasing, or through rentals from the buildings, etc.

Table 9.7: Details of Municipal Owned Land

Sr. No	Location	Ownership	Area	Status of Land	Remark
			<i>Sq. m</i>		
1	Amar Nagar	Gifted	12,199	Open - Presently used as park	
2	Noon meal centre, MES Road	Govt. Natham	1,109	Noon meal centre	
3	Kamatchi Nagar	Gifted	735	Park	
4	Noon meal centre, Gandhi Road	Govt. Natham	417	Noon meal centre	
5	Noon meal centre Renganathapuram 5th St & Gandhi Road Junction	Govt. Natham	592	Noon meal centre, Well & Pump Room	
6	Andal St.	Municipal land	1,180	Open Space - Presently used as park	
7	Thiruvallur St. Extn.	Municipal land	223	Open	
8	Ganapathi Colony Selayiur	Municipal land	714	Open Space & Temple	
9	Gandhi Park	Alienated	14,881	Park, O.H.T, Library & Aavin Booth	
10	Mpl. Hospital Kamber St. East Tambaram	Alienated	1,338	Hospital	
11	Burial Ground Selayiur	Municipal land	7,736	Burial Ground	
12	Indira Nagar Selayiur	Municipal land	1,200	Temple	
13	Ganesh Nagar	Municipal land	3,990	Well, Open Space & Play Ground	
14	Srinivasa Nagar Selayiur	Municipal land	1,262	Open Space	
15	Avvai Nagar Selayiur	Municipal land	450	Open Space	
16	Bharathi Poonga	Owned by Council	3,041	O.H.T, Library & Noon Meal Centre	
17	Agaram Road	Alienated	6,082	Burial Ground	
18	Sri Balaji Nagar	Municipal land	493	Open Space	
19	Sri Balaji Nagar	Municipal land	190	Open Space	
20	Jagajivanram	Municipal land	1,008	Open Space	
21	Jagajivanram	Municipal land	506	Open Space	
22	Karpagam Nagar	Gifted	884	Vacant - Presently used as park	
23	Indian Bank Colony	Municipal land	293	Open Space	

Sr. No	Location	Ownership	Area	Status of Land	Remark
			<i>Sq. m</i>		
24	Thiruppur Kumaran Poonga	Owned by Council	2,027	Park & Library	
25	Varadharaja Nagar	Municipal land	290	Open Space	
26	Nataraj Nagar	Municipal land	521	Open Space	
27	M.G.R. Nagar	Municipal land (Slum Clearance Board)	734	Open Space	
28	Subbarayan park, Vinobha Nagar	Gifted	14,880	Park, Library & Noon Meal Centre	
29	Balaji Nagar	Municipal land	472	Open Space	
30	Nithiyananda Nagar	Not Handed Over	823	Open Space	
31	Tamil Poonga Park	Tank Peromboke	2,027	Park & Noon Meal Centre	
32	Koon Krishna Park	Govt. Natham	1,095	Park & O.H.T - At present OHT and Municipal cash collection counter is available	Surrounding land use is residential, located on Mudichur Road. Cost of construction - Rs.800/sq.m, and can fetch monthly rentals of about Rs. 2,500
33	Haritha Enclave	Gifted	2,959	Open Space	
34	Dr. Chandra Devanasan Park	Alienated	2,027	Park & Temple	
35	Municipal Durai Samy Market	Alienated	20,396	Site Handed Over with Encroachments	
36	Town Hall Muthulinga Street	Alienated	3,160	Kalyanamandapam	
37	Jeeva Rathinam Park GST Road	Alienated	203	Shopping Complex	
38	Municipal Office	Alienated	3,649	Office Complex	
39	Bus Stand	Alienated	2,715	Bus Stand	
40	Bajanai Koil Street	Government	57	Community Hall	

Sr. No	Location	Ownership	Area	Status of Land	Remark
			<i>Sq. m</i>		
		Land			
41	Scavanger's Colony	Owned	3,640	Scavanger's Quarters	
42	Composed Yard	Government Land	24,329	Composed Yard (Alienation Proposals Pending)	
43	Amal Nagar	Gifted	971	Park	
44	Burial Ground west	Forest Land	32,438	Burial Ground	
45	Arul Nagar Irumbuliyur	Municipal land	10,661	Park	
46	New State Bank Colony	Municipal land	1,105	Open Layout	Surrounding land use is residential, located on Kakkan Street. Cost of construction is Rs.800/ sq.m and can fetch monthly rental of about Rs. 2,500
47	Muthurangam Park	Municipal land	15,111	Park, OHT & Temple	Surrounding land use is commercial, located - Shanmumuga Road. Cost of construction is Rs.800/ sq.m and can fetch monthly rental of about Rs. 2,500

Source: Schedule Register, Tambaram Municipality

431. The municipality also owns school buildings (21 nos.) and one office building. The service-oriented assets maintained by the ULB include maternity centres or homes, noon meal centres, reading rooms, toilet blocks, parks, and playgrounds.
432. *Other Assets.* Other assets of the municipality include its solid waste management facilities of disposal site at Kannadapalayam (4.2 acres) and a fleet of 38 vehicles utilized by various departments of the ULB. It currently also owns 28 tricycles with bins, etc., for the primary collection.
433. The ULB also owns about 117.63 km of roads of which 53 percent is bitumen surface. Approximately 4,785 street light poles and the associated fixtures also form the assets of the municipality.
434. The municipality needs to take a policy decision on the product-mix they wish to have with respect to its assets, both remunerative and non-remunerative. The vacant municipal lands in Tambaram are allocated specific uses under the Master Plan, which precludes any change in use. The option of leasing of such lands to the private sector for commercial development though considered by the consultants, had to be ruled out on these grounds. Hence, it is recommended that such lands be retained as open areas / lung spaces of the town. The possibility of private sector participation in the development and management of the larger parks/water bodies/lung spaces needs to be considered as a potential revenue generating option. This may be achieved through the development of theme parks on such lands, open-air exhibition spaces, drive-in theatre, etc. – options that would not require the areas to be fully ‘built-up’. The implications / modalities of such change need to be further discussed with stakeholders. The revenue earning potential of options that are likely to be considered could then be worked out. For social infrastructure like school buildings, tie-ups with NGOs may be considered. Asset management plans would have to be prepared to ensure maximization of returns from remunerative assets and maintenance and management of non-remunerative assets.

X. RESOURCE MOBILIZATION INITIATIVES

A. Scope in Savings and Revenue Generation

1. Infrastructure

435. The main objective of the Business plan is to generate revenue through the non-traditional sources with minimum investments. There is enormous scope to control expenditure in water supply, solid waste management and street lighting sector etc. The analysis will find the options for the replacement of inefficient existing pumps in terms of energy efficiency through Cost Benefit Analysis. Regarding street lighting, the analysis will be towards introducing technology of street lighting with the help of private participation.

2. Assets

436. The major assets for the ULB's are the immovable assets. This is one potential area to develop the asset values and increase the municipal revenue. The analysis includes find out the various options to make use of vacant lands on BOT basis and revising of rents for the remunerative assets up to market values.

B. Sector Wise Savings

1. Water supply

437. *Energy Saving.* A significant number of municipalities in Tamil Nadu rely on motive power for conveying water, either through significantly long distances (typically source to distribution point) or to meet contour gradient requirements within the distribution system. Pump Stations or Booster Stations achieve this objective by providing the necessary motive power to increasing the energy of the fluid to ensure water supply and distribution at required pressure and quantity.
438. Smooth functioning of the pump stations is highly critical, since they operate more than 12 hours and virtually form the heart of a system. Such pump stations consume a significant amount of electricity and result in high O & M costs for the Municipality that owns and operates such pumping system. It is common that over time, pumps and motors undergo severe wear and tear resulting in reduced operating efficiencies. This directly translates into higher power consumption for the same amount of output or even reduced output, which further results in a tangible increase in spending.
439. Energy Audit is an effective management tool to combat and control spiraling O & M and energy costs and to enable the municipality effectively use the system at the optimum cost possible. There is scope to control expenditure with effective energy management, leak detection and unauthorized tap connections. Since the TWAD Board operate and maintain the bulk water supply for the town and hence no energy savings are envisaged.

440. Unaccounted for water (UFW) is the difference between the volume of water delivered into the distribution system and the water sold/ billed or accounted for by legitimate consumption. UFW includes losses, physical losses and non-physical or commercial losses.
441. Waste is that water which having been obtained from a source and put into a supply and distribution system and into consumers' installation leaks or is allowed to escape or is taken there for no useful purpose. Leakage is that part of waste that leaks or escapes other than by deliberate or controllable action. Leakage from reservoir, mains, communication pipes and consumers' supply pipes are of major concern for water managers. The above waste results in the reduction in the revenue to the urban local body. Thus, the UFW is also referred to as non-revenue water. If there is any unauthorized /illegal connections in the town that needs to be regularized, this would generate significant revenue for the Municipality. However, this cannot be quantified accurately in the absence of data on the number of illegal connections in the town and hence municipality should take necessary action towards legalizing the illegal connections in the town.

2. *Street lighting*

442. In street lighting sector, there is large scope to minimize the expenditure towards power consumption and operation and maintenance. Related to street lighting the data has been collected as follows:
- (i) Number and types of street lighting and its operation and maintenance
 - (ii) Expenditure towards salaries and Power charges
443. *Energy Savings.* This section reviews the current level of energy consumption, maintenance and establishment charges incurred in street light maintenance. Municipality has already initiated private sector participation in street lighting maintenance in Tamparam to curtail energy consumption. As the municipality was incurring high expenses on the operation and maintenance of streetlights, 10 wards (with G.S.T Road and Velachery Road) have been privatized in October 2004.
444. The wards considered for the privatization are 10, 28, 29, 30, 31, 32, 33, 34, 35, 36 and G.S.T. Road. The scope of work for the private contractor includes switching on and off of the streetlights, maintenance of fixtures based on unit rate and attending to streetlight complaints. The municipality is paying a net amount of Rs. 59,345 per month. The per month unit rates charged by the contractor is Rs. 250 for tube light and Rs. 880 for sodium vapor lamp. Discussion with officials in municipality revealed that after privatizing the O&M of streetlights for 11 wards, the complaints from the public have come down drastically. The contractor is delivering a satisfactory performance. Hence, street lighting privatization can be extending to the remaining areas in the town.
445. Tamparam Municipality has 4,785 light fixtures out of which around 80 percent fixtures are tube lights, about 17 percent sodium vapor lamps. The total cost of energy utilized is Rs. 43.74 lakh for FY 04-05 and average maintenance expenses of street lighting are Rs. 5.40 lakh per annum. The average cost of energy consumption per fixture is Rs. 9,145 per annum. The average maintenance expenditure per light is works out to Rs. 113 per annum.

There are six skilled wiremen and six helpers to operate and maintain the street lighting in the town and all of them are permanent employee of the Municipality. The following **Table 10.1** presents the number of streetlights that have been privatized and the maintenance charges being paid to the contractor by the municipality.

Table 10.1: Maintenance Charge of Street Lighting Payable to Private Contractors

Type of Fixture	Numbers	Maintenance Charges	Energy Consumption
	<i>Nos.</i>	<i>Rs/Year</i>	<i>KW/Yr</i>
Privatized Lights			
High Mast Lamps	1	41,272.00	0.00
Tube lights	1,050	262,500.00	181,440.00
Sodium Vapor Lamps 250W	483	425,040.00	521,640.00
Total	1,534	728,812.00	703,080.00

Source: Tambaram Municipality and Analysis.

446. Energy savings in street lighting could be achieved through replacement of existing conventional tube lights with energy efficient retrofit tube lights, installing power saver devices and privatizing the operation and maintenance of street lighting. There are 3,813 florescent tube light fixtures installed in Tambaram town out of which 2763 tube lights are being maintained by the municipality. The 40 Watt fluorescent tube lights with ballasts will consume an additional 10-13 watts. To reduce the energy consumption, 28 Watt T-5 retrofit tube lights have to be introduced in place of existing conventional tube lights.
447. Based on the best practices followed in other parts of the country, retrofit tube lights are proposed in Tambaram. The new tube-lights have a higher luminary rating, longer life span, lower failure rate and perform better under the highly fluctuating voltage that plagues the town's electricity supply. The salient features of retrofit tube lights are presented in the **Table 10.2**.

Table 10.2: Salient Features of Retro Fit Tube Lights

Description	Value
Tube type	E+28 W
Power consumption	28 W
Power Factor	0.95
Rated life of tube (burning hours)	18,000
Rated life of electronics (burning hours)	50,000
Stroking Voltage	Less than 120 volts

Source: Analysis.

448. The following **Table 10.3** presents the comparison of present conventional florescent tube lights with proposed Retrofit tube lights.

Table 10.3: Comparison of Conventional Tube Lights with Retrofit Lights

Description	40 Watts Tube Light	Retrofit light
Connecting load* (W)	52.5	30
Light output (Lm)	2,450	2,900
Annual energy consumption ** (KWH)	211	120
Energy charges @Rs. 3.50/-	738	422

Description	40 Watts Tube Light	Retrofit light
Life of lamp (Hours)	4,000	18,000

Source: Analysis.

Note: * Including ballast loss of 12.5 W for conventional 40 Watts tube lights.

** Calculated for 11 hrs daily burning.

449. The present street lighting system in Tamparam is challenged with poor lighting levels, inappropriate operation timings, poor quality of power and inefficient lighting devices.
- Operator switching streetlights require 1 to 1.5 hrs to operate all the switches in an area, resulting in some places lights are switched on/off almost 1 to 1.5 hrs prior and after the required time;
 - Lighting levels are higher than required standards;
 - During off peak hours (after 11 pm in night) lighting levels increase further due to increase in voltage;
 - Lighting devices are not mounted properly, thus unnecessarily distributing light to surrounding areas and providing less light on roads and pathways; and
 - Selection and mounting of lamps is not done in a scientific manner, considering parameters like land use, type of road and illumination required as per Indian Standard Codes.
450. In order to address some of the above issues in the town, power saver devices have to be installed. The power saver devices save energy, by regulating voltage after peak hours. The built in timer automatically reduces voltage from 240 V to 180 V after 10 pm. It also can reduce voltage stepwise up to 110 V in different time slots. This action optimizes the illumination level after peak hours. The programmable timer switch also controls street lighting operating hours as per desired timings. These power savers also act as protection devices, which increase the life of lamps and luminaries.
451. The replacement of existing tube lights, which are maintained by the municipality is proposed to replace in a phased manner for next two years (2006 and 2007). Separate cash flow for street lighting was prepared to ascertain the savings due to the replacement of new energy efficient lights and installing power saver devices. The cash flows have been worked out considering privatization of streetlights.
452. The basis for preparing cash flows are as follows, no increase in fixtures, annual increment in energy cost at 3 percent, rate of interest at 8.5 percent and net energy savings share (profit share) between contractor and Urban Local Body with a mutually agreed percentage basis. In this case, it was assumed that the cost of savings in energy utilization was distributed between contractor and Urban Local Body at 80 percent and 20 percent respectively. Through street lighting energy consumption Urban Local Body can save a minimum of Rs. 7.17 Lakh in 2008, out of which Rs. 1.43 Lakh is transferred to municipality as per the above mentioned profit sharing arrangement, rest with private contractor. Further details are presented in the following table. Existing municipal skilled staffs shall be retained for overseeing the private contractors operation and maintenance work and hence no savings are envisaged from staff reduction or redeployment. Assumption for calculating energy savings are presented in **Table 10.4** and energy savings is tabulated in **Table 10.5**. The Internal Rate of Return (IRR) for 2012 is more than the discounted rate of 10 percent making the initiative viable. This savings in energy

consumption from street lighting are includes existing privatized streetlights and proposed streetlights in the town.

Table 10.4: Assumption for Calculating Energy Savings

Description	Unit	Value
No. of Street Lights in the ULB	Nos.	4,785
Total Annual Energy Cost for Street Lighting	Rs. lakh	43.74
Energy Cost per Street light/annum	INR	914
Standard Cost as per Case Studies	INR	640
Annual Increment in Energy Cost	%	3
Transfer of Savings to ULB	%	20
Rate of Interest	%	8.50

Source: Tamparam Municipality and Analysis.

Table 10.5: Energy Savings in Street Lighting

Year	Capital Cost	No. of Lights	Actual Energy Cost	Normative Energy Cost	Net Savings	Transfer of Savings to ULB	Net Cash flow
	<i>Rs. lakh</i>	<i>Nos.</i>	<i>Rs. lakh</i>				
2006	11.19	4,785	45.06	31.54		0.00	-11.19
2007	11.86	4,785	46.41	32.48		0.00	-11.86
2008		4,785	47.80	33.46	7.17	1.43	7.17
2009		4,785	49.23	34.46	14.77	2.95	14.77
2010		4,785	50.71	35.50	15.21	3.04	15.21
2011	29.95	4,785	52.23	36.56	15.67	3.13	-14.28
2012		4,785	53.80	37.66	16.14	3.23	16.14
2013		4,785	55.41	38.79	16.62	3.32	16.62
2014		4,785	57.07	39.95	17.12	3.42	17.12
2015		4,785	58.79	41.15	17.64	3.53	17.64
2016	40.08	4,785	60.55	42.39	18.17	3.63	-21.91
2017		4,785	62.37	43.66	18.71	3.74	18.71
2018		4,785	64.24	44.97	19.27	3.85	19.27
2019		4,785	66.16	46.32	19.85	3.97	19.85
2020		4,785	68.15	47.70	20.44	4.09	20.44
						Total	123.70
						IRR 12	19%
						IRR 15	33%
						IRR 20	34%

Source: Analysis.

3. Assets

453. Details of remunerative assets owned by Tambaram Municipality are presented in **Table 10.6**. Current year demands of remunerative assets were collected from municipality and the same were compared with the market rental value. From the following table it is apparent that the municipal remunerative assets are under valued. There is a wide scope of revenue maximization through lease and rentals from remunerative assets of Tambaram Municipality. The ULB should follow the market value as minimum for lease and rentals of remunerative assets. Through this process municipality can fetch additional revenue of Rs. 9.26 lakh per annum. The rentals and lease amounts have to be revised every 3 year once minimum of 15 percent from FY 2006-07. The collection performance of leases and rentals are inconsistent over the assessment period. Annual account statement reveals very low collection performance, which needs to be attended immediately by municipality.

Table 10.6: Additional Revenue Estimation from Remunerative Assets

Name of Asset	No of Shops	Annual Income	Market value	Additional Revenue
		<i>Rs./Annum</i>	<i>Rs./Annum</i>	<i>Rs./Year</i>
Durai Swamy Market	26	327,600	376,740	49,140
Durai Swamy Market - 10 Burma Shops	10	61,440	70,656	9,216
Bharathamatha Street	8	51,840	57,024	5,184
Muthulingam Street	5	72,960	80,256	7,296
Shanmuga Street	17	408,000	469,200	61,200
Shanmuga Road	11	232,320	267,168	34,848
Geeve Vaniga Valagam	26	561,600	617,760	56,160
Bus Stand Shops	3	78,588	86,447	7,859
Vasantham Hotel	1	779,520	935,424	155,904
Shanmuga Road	22	1,333,200	1,533,180	199,980
Telephone Booth	6	10,800	11,880	1,080
Abdul Prasad Road - Bunks	7	15,372	16,909	1,537
Durai Swamy Market - Chicken Shops	15	990,000	1,138,500	148,500
Pay and Use Toilets		140,700	161,805	21,105
Durai Swamy Daily Market		225,000	258,750	33,750
Durai Swamy Market – Mobile Vendors		165,000	181,500	16,500
Bus Stand Toilets - Front Side		350,465	385,512	35,047
Bus Stand Toilets - Back Side		450,000	495,000	45,000
Fish Markets		220,000	242,000	22,000
Septic Tank East		164,000	172,200	8,200
Septic Tank East		127,000	133,350	6,350
Total		6,765,405	7,691,261	925,856

Source: Analysis.

C. Additional Resource Mobilization

1. Parking Fees

454. Land-use and economic activity drives the parking demand in Tambaram. Town attracts two-wheeler and four-wheeler traffic, which puts up specific parking requirement. Private vehicles can be seen parked haphazardly along GST Road, Velachery Road, Mudichur Road and Bharathamadha street. Based on the field visit four locations were identified for on street parking of four wheelers. For estimating the parking fee, it was assumed that 40 percent of the total vehicle will be parked less than or equal to one hour and 60 percent of the total vehicle will be parked more than one hour. Vehicles that are parked more than an hour can be charged ten rupees per vehicle and for other vehicles, five rupees can be charged. An annual vehicle increment of three percent has been assumed to calculate the future revenue generation. The estimated parking fee is presented in **Table 10.7**.

Table 10.7: Estimated Parking Fee

Year	G.S.T Road	Mudichur Road	Velachery Road	Kakkan Street	Rajaji Street	Bharath-amadha Street	Total
Approx. No of veh./day	75	100	100	150	120	50	595
	<i>Rs. Lakh</i>						
2007	2.46	3.29	3.29	4.93	3.94	1.64	19.55
2008	2.54	3.38	3.38	5.08	4.06	1.69	20.13
2009	2.61	3.49	3.49	5.23	4.18	1.74	20.74
2010	2.69	3.59	3.59	5.38	4.31	1.79	21.36
2011	2.77	3.70	3.70	5.55	4.44	1.85	22.00
2012	2.86	3.81	3.81	5.71	4.57	1.90	22.66
2013	2.94	3.92	3.92	5.88	4.71	1.96	23.34
2014	3.03	4.04	4.04	6.06	4.85	2.02	24.04
2015	3.12	4.16	4.16	6.24	4.99	2.08	24.76
2016	3.21	4.29	4.29	6.43	5.14	2.14	25.50
2017	3.31	4.41	4.41	6.62	5.30	2.21	26.27
2018	3.41	4.55	4.55	6.82	5.46	2.27	27.06
2019	3.51	4.68	4.68	7.03	5.62	2.34	27.87
2020	3.62	4.82	4.82	7.24	5.79	2.41	28.70

Source: Analysis.

2. Advertisement Fee

455. Lease amount fixed by the council for advertising on lamp posts and hoardings erected within the Municipal limit are accounted in advertisement fee. In case of Tambaram Municipality, average revenue generated through the advertisement fee is low. Hence, there is a scope to increase the advertisement fee by extending the coverage net. The following table (**Table 10.8**) presents detailed estimation of advertisement fee for Tambaram municipality. The total estimated advertisement fee is Rs. 9.85 lakh per annum with an annual increment of 2 percent on total advertisement fee adopted to forecast the

future revenue. This minimum increase is assumed to accommodate increase in the number of advertisement hoardings/ boards that are likely to come in future.

3. *Conservancy Fee*

456. Conservancy establishment cost is maximum share in the total establishment cost of Tambaram municipality. To meet at least a part of solid waste collection expenses conservancy fee is introduced. It is proposed to cover at least 50 percent of the residential properties and 100 percent of non-domestic properties like hotels, lodges and commercial establishments, etc, in the town. It is proposed that for residential properties, a fee of Rs. 20 per month and for non-domestic properties, a fee of Rs. 75 per month may be charged with an upward revision of 15 percent every 3 years, starting 2006-07. **Table 10.9** presents estimated additional revenue mobilization through conservancy fee for Tambaram municipality.

4. *Summary*

457. Summary of additional revenue mobilization through expenditure control measures and additional revenue generation is presented in **Table 10.10**.

Table 10.8: Estimation of Advertisement Fee

Description	Unit	Major Arterial Roads	Other Roads	Markets/ Bus stands	Street Light poles
Average Size of Hoardings	Sq.m	20.00	5.00	10.00	
Average Rate/sq.m/half yearly	Rupees	100.00	50.00	100.00	50.00
Total Length of Road	Km	133			
Length of Road	%	20%	50%	-	-
Total Length of Road	Km	30	66	-	-
Spacing of Hoardings/Boards per km	Nos	5	5	-	-
Total no of Hoardings/Boards	Nos	150	330	50.00	2,393
Total Revenue per annum	Rs. Lakh	6.00	1.65	1.00	1.20

Source: Analysis.

Table 10.9: Estimation of Conservancy Fee

Description	Coverage	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Domestic (No)	50%	11,839	12,312	12,804	13,316	13,849	14,265	14,693	15,134	15,588	16,055	16,457
Non Domestic (No)	100%	2,105	2,189	2,276	2,367	2,462	2,536	2,612	2,690	2,771	2,854	2,926
<i>Total Revenue (Rs. Lakh)</i>		<i>37.88</i>	<i>44.13</i>	<i>48.27</i>	<i>61.18</i>	<i>65.45</i>	<i>68.43</i>	<i>81.80</i>	<i>85.86</i>	<i>89.24</i>	<i>105.51</i>	<i>110.08</i>

Source: Analysis.

Table 10.10: Estimated Additional Revenue from Expenditure Control and Resource Mobilization

Table 10.16: Estimated Additional Revenue from Expenditure Control and Resource Mobilization												
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Rs. Lakh											
Expenditure Control Measures												
Energy Saving – Street lights	-	1.43	2.95	3.04	3.13	3.23	3.32	3.42	3.53	3.63	3.74	3.85
Additional Resource Mobilization												
Leases/Rentals from Assets	9.26	9.26	9.26	10.65	10.65	10.65	12.24	12.24	12.24	14.08	14.08	14.08
Parking Fee	19.5	20.1	20.7	21.4	22.0	22.7	23.3	24.0	24.8	25.5	26.3	27.1
Advertisement Fee	9.85	10.04	10.24	10.45	10.66	10.87	11.09	11.31	11.54	11.77	12.00	12.24
Conservancy Fee	37.88	44.13	48.27	61.18	65.45	68.43	81.80	85.86	89.24	105.51	110.08	113.80
Total Revenue	73.18	84.96	91.42	106.72	111.89	115.88	131.75	136.83	141.35	160.49	166.20	171.07

Source: Analysis.

XI. FINANCIAL OPERATING PLAN

A. Financial Sustainability

1. Financial Sustainability

458. *Sustainability Analysis.* The sustainability analysis is based on the assumption that the municipality will carry out reforms indicated as the basis for financial projections. A Financial and Operating Plan (FOP) prepared for Tambaram Municipality evaluates the municipal fund status for the following scenarios:

- (i) Base Case Scenario. In the Base Case Scenario, the finances of the ULB are forecast in a “do nothing” or “without project” scenario. Additional resources mobilized through various initiatives like expenditure control through energy savings, privatization etc. and further resources mobilized through introduction of conservancy fee, parking fee, remunerative assets lease/ rental value appreciation and extending advertisement fee coverage are loaded on to the FOP. The revenue surplus thus generated indicates the ULB’s capacity to service capital expenditure.
- (ii) Full Project Scenario. The Full Project Investment Scenario is based on investments identified for Tambaram municipality and the requirement for upgrading the town’s infrastructure is estimated and phased based on the construction activity and investment priority. Implications of this investment in terms of external borrowings required, resultant debt service commitment, and additional operation and maintenance expenditure are worked out to ascertain sub-project cash flows. Revenue surpluses from the Base Case Scenario are applied to sub-project cash flows emerging from full project investments – the municipal fund net surpluses indicate the ULB’s ability to sustain full investments. FY 2020 is assumed as the reference year to determine the net surpluses and whether the Municipality maintains a debt/revenue surplus ratio as an indication of the ULB’s ability to sustain investments.
- (iii) Sustainable Investment Scenario. The sustainable investment scenario is worked out when the full project investment scenario indicates inability of the municipality to sustain the total identified investment. In this case, the identified investment is sized down to immediate felt need for the municipality such that it is sustainable. Implications of this investment in terms of external borrowings required, resultant debt service commitment and additional operation and maintenance expenditure are worked out to ascertain sub-project cash flows. Revenue surpluses from the Base Case Scenario are applied to sub-project cash flows emerging from sustainable investments – the municipal fund net surpluses indicates the ULB’s ability to sustain the investments. FY 2020 is assumed as the reference year to determine the net surpluses and whether the Municipality maintains a debt/revenue surplus ratio as an indication of the ULB’s ability to sustain investments. The outcome of this scenario will give an indication of the actual level of investment sustainable by the municipality without any additional external support.

2. *Basic Assumptions for Projection*

459. The FOP is based on a whole range of assumptions related to income and expenditure. These are critical to ascertain the investment sustenance and would also provide a tool to test certain specific policy decisions regarding revenue and expenditure drivers on the overall municipal fiscal situation. This section elucidates the key assumption adopted for the three FOP scenarios.
460. The FOP is a cash flow stream of the ULB based on the regular municipal revenues, expenditures, and applicability of surplus funds to support project sustainability. The FOP horizon is determined to assess the impact of full debt servicing liability resulting from the borrowings to meet the identified interventions. The proposed capital investments are phased over ten years investment from FY 2006-07 to 2015-16 implying that the last loan draw down would occur in FY 2020-21. Considering a five-year moratorium period, the debt servicing commitment will commence in the FY 2011-12 for the first phase (first five years) and 2016-17 for the second phase (second five years) of investment.
461. *Revenue Income.* The assumptions for forecasting revenue income comprise:
- (i) Taxes and Charges. In cases like property related taxes, water charges and sewerage charges, where the base and basis of revenue realization are known and predictable, the likely revenue is forecast based on certain assumptions regarding growth in number of assessments, revision in ARV (in case of property-related taxes), revision in charges/tariffs and improvement in collection efficiencies. The assumptions with regard to basis for forecasting revenue income of taxes and charges are the same for base case and investment scenarios (full project as well as sustainable project scenarios). However, the tax base (number of connections) varies for the base, full project and sustainable investment scenarios, assuming that the new investments in water supply and sewerage schemes will result in increased coverage of the infrastructure systems. In the sustainable investment scenario, the increase in tax base is scaled down pro rata with the scaled down (sustainable) investment. **Table 11.1, Table 11.2, Table 11.3 & Table 11.4** list the assumptions adopted with regard to forecasting income from property tax, water charges, drainage charges and conservancy fee respectively under the three FOP scenarios. The investment scenarios include both full project and sustainable investment scenarios.

Table 11.1: Key Assumptions for Forecasting Income from Property Tax

Description	Current Level	Base Case Scenario	Investment Scenarios
Annual growth in number of assessments (%)	4%	4%	4%
Average ARV per Property (Rs. Per Annum)	4,884	4,884	4,884
Tax Rate (% of ARV)	25%	25%	25%
Periodic increase in ARV (%)			
2006-07	-	30%	30%
2011-12	-	30%	30%
2016-17	-	30%	30%
Collection Performance (% of Demand)			
Arrears	14%	50%	50%
Current	65%	80%	80%

Source: Analysis.**Table 11.2: Key Assumptions for Forecasting Income from Water Charges**

Description	Current Level	Base Case Scenario	Investment Scenarios
% water connections to property tax assessments	28.94%	28.94%	80%
Monthly water charge per connection (Rs.)			
Domestic	65.00	65.00	65.00
Non Domestic	100.00	100.00	100.00
Industrial	200.00	200.00	200.00
Periodic revision in water charges			
2006-07	-	15%	15%
2009-10	-	15%	15%
2011-12	-	15%	15%
2015-16	-	15%	15%
2018-19	-	15%	15%
Collection Performance (% of Demand)			
Arrears	29%	50%	50%
Current	73%	80%	80%
One time connection fee (Rs.)			
Domestic	2,000	2,000	2,000
Non Domestic	5,000	5,000	5,000
Industrial	5,000	5,000	5,000
Periodic revision of one time connection fee	-	20%-once in 3 years	20%-once in 3 years

Source: Analysis.

Table 11.3: Key Assumptions for Forecasting Income from Sewerage Charges

Description	Current Level	Base Case Scenario	Investment Scenarios
% Sewerage connections to PT assessments	-	-	80%
Monthly sewerage charge per connection (Rs.)			
Domestic	-	-	100.00
Non Domestic	-	-	400.00
Industrial	-	-	400.00
Periodic revision in sewerage charges			
2006-07	-	15%	15%
2009-10	-	15%	15%
2011-12	-	15%	15%
2015-16	-	15%	15%
2018-19			
Collection Performance (% of Demand)			
Arrears	0%	0%	50%
Current	0%	0%	80%
One time connection fee (Rs.)			
Domestic	-	-	5,000
Non Domestic	-	-	10,000
Industrial	-	-	10,000
Periodic revision of one time connection fee	-	20%-once in 3 years	20%-once in 3 years

Source: Analysis.**Table 11.4: Key assumptions for forecasting income from Solid Waste Conservancy Fee**

Description	Current Level	Base Case Scenario	Investment Scenarios
% Coverage to PT assessments			
Domestic	-	-	50.00
Non Domestic	-	-	100.00
Monthly conservancy fee per PT assessment (Rs.)			
Domestic	-	-	20.00
Non Domestic	-	-	75.00
Periodic revision in conservancy fee			
2006-07	-	-	15.00
2009-10	-	-	15.00
2011-12	-	-	15.00
2015-16	-	-	15.00
2018-19	-	-	15.00
Collection Performance (% of Demand)			
Arrears	-	-	50.00
Current	-	-	80.00

Source: Analysis.

- (ii) Other Revenue Income from Own Sources. All revenue income from own sources other than property-related taxes and water and sewerage charges, where the base and basis is not clearly defined, are forecast, based on the observed trend during the assessment period (2000-01 to 2003-04), subject to minimum and maximum annual growth rates of 5 percent and 20 percent, respectively. However, the income from the municipal properties trend is witnessed at 13.28 percent growth rate during the review period. Growth rate of 20 percent has been assumed for the future projections - this can be achieved through periodic revision of lease and rental improving the collection performance.

Table 11.5: Key Growth Rate Assumptions for Income from Other Own Sources

Description	Current Level	Assumption
Profession Tax	14.87 %	15.00 %
Other Taxes & Charges	--	5.00 %
Income from Municipal Properties and Markets	13.28 %	20.00 %
License Income (Trade, etc.)	4.95 %	5.00 %
Income from Special Services	(100.00 %)	5.00 %
Income from Sale Proceeds	(100.00 %)	5.00 %
Income from Fees and Fines	49.57 %	5.00 %
Income from Interest on Deposits	(94.00 %)	6.00 %
Income from Investments(Excl. Interest)	-	5.00 %
Miscellaneous Income	(28.00 %)	5.00 %

- (iii) Assigned Revenue. Items of assigned revenue such as surcharge on stamp duty, entertainment tax share, etc. are forecast based on the observed trend during the assessment period (2001 to 2003-04), subject to minimum and maximum annual growth rates of 5 percent and 15 percent, respectively. The observed trend in Entertainment Tax during the assessment period was a negative growth rate, which is attributed to inconsistent transfer of ULB share during the review period. Hence, a nominal growth rate of 5 percent is assumed to forecast the revenue. In case of surcharge on stamp duty, a high growth rate of 44.94 percent is witnessed during the review period, which is very high. This high growth trend attributed to uneven transfers of stamp duty to municipality. Considering high property value appreciation in the town, a maximum of 15 percent has been adopted to forecast the revenue.

Table 11.6: Key Growth Rate Assumptions for Income from Assigned Sources

Description	Current Level	Assumption
Entertainment Tax	(15.20 %)	5.00 %
Surcharge on Stamp Duty	44.94 %	15.00 %
Other Transfers	(100.00 %)	5.00 %
Total- Assigned Revenue	24.62 %	

Source: Analysis.

- (iv) Grants and Contributions. Revenue income in the form of grants and contributions are also forecast based on the observed trend during the review period (2000-01 to 2003-04), subject to minimum and maximum annual growth rates of 5 percent and 15 percent respectively. The trend in SFC devolution is rendered a very high growth

rate, owing to inconsistent transfer of grant to ULB. Considering the states' tax revenue growth trend forecast, population growth trend and reforms measures initiated by the municipality will fetch more devolution fund. In this perspective, a maximum of 15 percent growth per annum was adopted.

Table 11.7: Key Growth Rate Assumptions for Income from Grants and Contributions

Description	Current Level	Assumption
State Finance Commission Grant	45.43 %	15.00 %
Other Grants	(100.00 %)	5.00 %
Total- Grants & Contribution	45.43 %	

Source: Analysis.

- (v) Additional Revenue Income due to Sub-Projects. The sub-projects – in case of water and sewerage projects – are expected to fetch additional revenue by way of increase in number of assessments and levy of user charges (in cases where a new sewerage system is proposed). The sewerage charge is adopted as per Table 11.3 starting 2007-08 and a revision of 15 percent is proposed every three years, beginning 2007-08. The additional revenue income due to water supply and sewerage sub-projects is computed based on the proposed number of new connections, proposed tariffs and assumed collection performance. In addition, solid waste conservancy fee is also planned to be levied on property assessments.

462. *Revenue Expenditure*. Key assumptions for forecasting revenue expenditure comprise:

- (i) Expenditure on Municipal Services. Expenditure on municipal services including general administration, revenue collection and service delivery are forecast based on the observed trend during the assessment period (2000-01 to 2003-04), subject to minimum and maximum annual growth rates of 5 percent and 20 percent, respectively.

Table 11.8: Key Growth Rate Assumptions for Forecasting Revenue Expenditure

Description	Current Level	Assumption
General Administration & Revenue Collection		
Staff Salary and Employee Related Expenses	(14.04)	8.00%
Allowances to Elected Representatives	(5.56)	5.00%
General Expenses	(15.67)	5.00%
Pensions and Gratuities	35.96	5.00%
Education - Staff Salary	--	5.00%
Miscellaneous	(9.97)	5.00%
Total-General Admin. & Revenue Collection	(11.03)	
Municipal Services excl. W&D		
General Expenses	(8.49 %)	15.00%
Public Works and Roads	(2.16 %)	20.00%
Public Health and Conservancy	(3.27 %)	20.00%
Street Lighting (including Electricity Charges)	(18.40 %)	10.00%
Education	(100.00 %)	5.00%
Vehicle and Equipment Maintenance	7.35 %	5.00%
Miscellaneous	84.60 %	5.00%
Total- Municipal Services excl. W&D	(8.75 %)	

Source: Analysis.

Table 11.9: Key Growth Rate Assumptions for Forecasting Water Supply Revenue Expenditure

Description	Current Level	Assumption
Staff Salary & Employee Related Expenses	10.10 %	8.00%
Administration Expenses	1.94 %	5.00%
Equipment Maintenance & Repairs	(100.00 %)	5.00%
Board Payment	104.63 %	10.00%
Electricity Charges	15.51 %	10.00%
Vehicle Maintenance & Repairs	(18.72 %)	5.00%
Miscellaneous	0.56 %	5.00%
Total- Water Supply & Drainage	5.33 %	

Source: Analysis.

- (ii) Outstanding Non-debt Liabilities. The outstanding non-debt liabilities like payments due to employees, TNEB, TWAD, State Government cess, etc. are assumed to be cleared in equal installments over a 5-year period from 2006-07 to 2010-11. Wherever data was provided by the ULB, it was considered for preparing the FOP.
- (iii) Outstanding Debt Liabilities. The outstanding debt liabilities are proposed for clearance over a 10-year period beginning 2006-07 to 2016-17 with the furnished interest rate adopted at a constant interest of 9.50 percent per annum.
- (iv) Additional O&M Expenditure due to Sub-Projects. While each sector identifies the O&M costs applicable for asset maintenance (manpower, consumables, power charges, etc.), a proportion of the capital cost was derived for projections. **Table 11.10** presents the assumptions regarding O&M expenditure on new assets.

Table 11.10: Assumptions for O&M Expenditure

Sector	As % of Capital Cost
Water Supply	6.00
Sewerage & Sanitation	4.00
Roads and Traffic Management	3.00
Storm Water Drainage	2.00
Solid Waste Management	10.00
Street Lighting	10.00
Others	2.00

Source: Analysis.

- (v) Additional Debt Servicing Expenditure due to Sustainable Investment. The loans for the sustainable investments are assumed to spread over 20 years, carrying an interest burden as indicated in **Table 11.11**, with a five-year moratorium on interest and principal repayment – interest during the moratorium period being capitalized. Considering a five-year loan draw down schedule (2006-07 to 2010-11) and a 20-year tenor, debt servicing will commence from 2011-12 for a period of 15 years. According to the project implementation schedule, the loan drawn and repayment schedule will differ.

Table 11.11: Proposed Financing Pattern

Infrastructure Type	Loan	Grant	ULB + Consumer	Interest Rate
	%			
Water Supply	40	30	30	8.50
Sewerage & Sanitation	50	30	20	8.50
Roads and Traffic Management	60	30	10	8.50
Storm Water Drainage	60	30	10	8.50
Solid Waste Management	60	30	10	8.50
Street Lighting	50	30	20	8.50
Slum Upgradation	60	30	10	8.50
Others	50	10	40	8.50

Source: Analysis.

463. *Capital Account.* In case of capital account, only regular capital grant expected during the forecast period based on past trend are considered in the base case scenario, as this scenario is aimed at ascertaining the ULB's capacity to generate internal resources that would be leveraged to undertake identified sub-projects. In the identified investment and sustainable investment scenarios, sub-project cash flows are loaded onto the FOP and their impact on municipal finances in corresponding scenarios are tested. Key assumptions regarding capital account are investment phasing and project financing/funding structures.
464. *Capital Expenditure.* The estimated expenditure for implementing sub-projects is phased over a five-year period beginning 2006-07. Based on the above phasing, the actual investment requirement over the ten-year period is ascertained adopting a physical contingency of seven percent and a price contingency of six percent per annum. The following tables present the base full project cost and implementation schedule.

Table 11.12: Summary of Estimated Investment Requirement and Phasing Schedule

Sector	Total Investment	Investment Phasing (%)									
		2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
	<i>Rs. Lakh</i>										
Water Supply	2,987.70	15%	25%	25%	15%	20%	0%	0%	0%	0%	0%
Sewerage & Sanitation	4,097.93	15%	15%	25%	25%	20%	0%	0%	0%	0%	0%
Roads	62,512.33	0%	10%	10%	10%	10%	10%	10%	15%	15%	10%
Storm Water Drains	4,342.52	0%	5%	10%	15%	15%	15%	10%	10%	10%	10%
Solid Waste Management	698.28	10%	10%	20%	30%	30%	0%	0%	0%	0%	0%
Street Lighting	1,319.67	0%	10%	10%	10%	20%	20%	20%	10%	0%	0%
Slum Upgradation	736.96	0%	0%	15%	15%	15%	15%	10%	10%	10%	10%
Others	110	0%	0%	10%	20%	20%	20%	20%	10%	0%	0%
Grand Total Investment	76,805.39										

Source: Analysis

Table 11.13: Summary of Phased Investment in Full Project Investment Scenario

Sector	Total Investment	Investment Phasing – Rs. Lakh at Current Price									
		2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
	<i>Rs. Lakh</i>										
Water Supply	2,987.70	448.16	746.93	746.93	448.16	597.54	0.00	0.00	0.00	0.00	0.00
Sewerage & Sanitation	4,097.93	614.69	614.69	1,024.48	1,024.48	819.59	0.00	0.00	0.00	0.00	0.00
Roads	62,512.33	0.00	6,251.23	6,251.23	6,251.23	6,251.23	6,251.23	6,251.23	9,376.85	9,376.85	6,251.23
Storm Water Drains	4,342.52	0.00	217.13	434.25	651.38	651.38	651.38	434.25	434.25	434.25	434.25
Solid Waste Management	698.28	69.83	69.83	139.66	209.48	209.48	0.00	0.00	0.00	0.00	0.00
Street Lighting	1,319.67	0.00	131.97	131.97	131.97	263.93	263.93	263.93	131.97	0.00	0.00
Slum Upgradation	736.96	0.00	0.00	110.54	110.54	110.54	110.54	73.70	73.70	73.70	73.70
Others	110.00	0.00	0.00	11.00	22.00	22.00	22.00	22.00	11.00	0.00	0.00
Grand Total Investment	76,805.39	1,132.67	8,031.77	8,850.06	8,849.24	8,925.70	7,299.09	7,045.12	10,027.76	9,884.80	6,759.18

Source: Analysis

465. *Capital Income.* Forecast of capital income is based on actual requirement to meet proposed capital expenditure.

Table 11.14: Financing Pattern for Proposed Projects

Sr. No	Sector	Government Grant	Financial Institution Loan	ULB Share	Other Department
<i>Percentage Share</i>					
Municipal Infrastructure					
1	Water Supply	30	40	30	-
2	Sewerage & Sanitation	30	50	20	-
3	Roads and Traffic Management	30	60	10	-
4	Storm Water Drainage	30	60	10	-
5	Solid Waste Management	30	60	10	-
6	Street Lighting	30	50	20	-
7	Slum Upgradation	30	60	10	-
8	Others	10	50	40	-
Other Dept. Infrastructure					
9	Traffic & Transportation	-	-	-	100

Source: Analysis.

Table 11.15: One-Time Charges for Water & Sewerage Connections

Sr. No	Description	Water Supply	Sewerage
1	Domestic	2,500	5,000
2	Non Domestic	6,000	10,000
3	Industrial	6,000	10,000

Source: Analysis.

466. In summary, the following key assumptions were made while preparing the cash flows:

(i) Revenue Income:

- a. *Property Tax.* Projected based on ARV per property and the following assumptions: number of assessments to grow at a nominal 4 percent per annum; ARV for all properties revised once in 5 years beginning 2006-07 at 30 percent; and collection performance assumed at 50 percent against arrears demand and 80 percent against current demand. A reasonable increase in the collection performance is proposed every year so that the municipality achieves the target of collecting 50 percent of arrear demand and 80 percent of current demand over a period of time.
- b. *Water Charges.* Assumed at a nominal growth rate of 4 percent per annum (proportionate to property tax assessment growth rate); regular connections are envisaged in the base case scenario and increase in water connections is a result of the availability of additional water for distribution. It is assumed that 80 percent of the property tax assessments would have water

connections by 2013; the current rate of water charge is maintained till 2005-06, and from 2006-07, a 15 percent increase is assumed every 3 years; collection performance is assumed at 50 percent against arrears demand and 80 percent against current demand; and new (one-time) connection charges are collected as per the current rate till 2005-06. From 2006-07, a 20 percent increase every 3 years is assumed.

- c. *Sewerage Charges.* No new connections are envisaged in the base case scenario. Regular sewer connections provided under the Project, it is assumed that 80 percent of the property tax assessments would have UGD connections by FY 2013. Monthly flat rate of Rs. 100, Rs. 400 and Rs. 400 per connection for domestic, non domestic and industrial connections respectively. It is assumed the collection of sewerage charge starts from 2007-08, and from then, a 15 percent increase is assumed every 3 years. Collection performance is assumed at 50 percent against arrears demand and 80 percent against current demand, and new (one-time) connection charges are adopted as per **Table 11.3**.
- d. *Conservancy Fee.* In base case scenario and investment scenarios, it is assumed that 50 percent of the residential property tax assessments and 100 percent of non-domestic property assessments would have to be brought under the conservancy fee coverage net. Monthly conservancy fee of Rs. 20 and Rs. 75 per property assessment has been proposed for residential and non-domestic properties respectively. It is assumed that conservancy fee collection starts from 2006-07, and then onwards, a 15 percent increase is assumed every 3 years. Collection performance is assumed at 50 percent against arrears demand and 80 percent against current demand.
- e. *All Other Revenue Income Items* (including municipal own sources, grants and assigned revenues). The past trend is adopted, subject to minimum and maximum ceilings of 5 and 20 percent per annum, respectively.

(ii) Revenue Expenditure.

- a. The past trend is adopted, subject to minimum and maximum ceilings of 5 and 20 percent per annum, respectively.
- b. Additional O&M expenditure is estimated based on ascertained percentages of capital costs.
- c. All outstanding non-debt liabilities are to be cleared off in the next 5 years.
- d. All outstanding debt liabilities are to be cleared off in the next 10 years at an interest rate provided by the ULB.
- e. New loans are to be serviced over a 20-year tenor (including a five-year principal plus interest moratorium) at interest rates indicated in **Table 11.11**.

(iii) Capital Expenditure.

- a. Capital expenditure is forecast based on the identified investments.
- b. The base costs estimated are at 2005-06 prices, which are then indexed by 7 percent for physical contingencies, and 6 percent for price contingencies.

(iv) Capital Income.

- a. Based on the past trend, regular capital grants are estimated.
- b. Capital income is ascertained based on assumed project financing patterns as detailed in **Table 11.11**.

3. *Project Cash Flows and FOP Results*

467. The impemetable investment scenario is worked out considering only the revenue account transactions to assess the municipal capacity to generate revenue surpluses that could be leveraged to undertake capital investments. Detailed cash flows are worked out for each of the sub-projects based on the assumptions with regard to investment phasing, financing pattern, additional O&M expenditure and additional income due to proposed capital investments, for the Sustainable Investment Scenario. The net project cash flows are then loaded onto the base case scenario to test their impact on the overall municipal fiscal situation.

Figure 11.1: Sector-wise Sustainable Investment -Base Cost(i) Implementable Investment. Table

11.16 presents a summary of project cash flows due to the sustainable project scenario. Tamaram municipality would accumulate a negative closing balance of Rs. 18,678 lakh by the end of 2019-20 due exclusively to the sustainable project investment. The total net sustainable project cash flows

due to sustainable project when loaded onto the Base Case Scenario FOP indicate that Tamaram municipality would end up with a positive closing balance of Rs. 9,403 lakh by the FOP horizon year 2019-20, which represents the extent of sustainability and Debt Servicing Ratio is maintained below 30 percent. The above graph represents sector-wise distribution of sustainable investment. Without additional resource mobilization initiatives, the municipality can sustain investments to the tune of Rs. 15,490.45 lakh. With resources mobilization initiatives like energy savings in street lighting, introduction of conservancy fee, privatization/ redeployment of conservancy staffs, levy of parking fee and increasing the remunerative assets rental/lease values to the market level, sustainability increase to the tune of Rs.15,889.38 lakh (approximately 86 percent of the total identified investment) is expected.

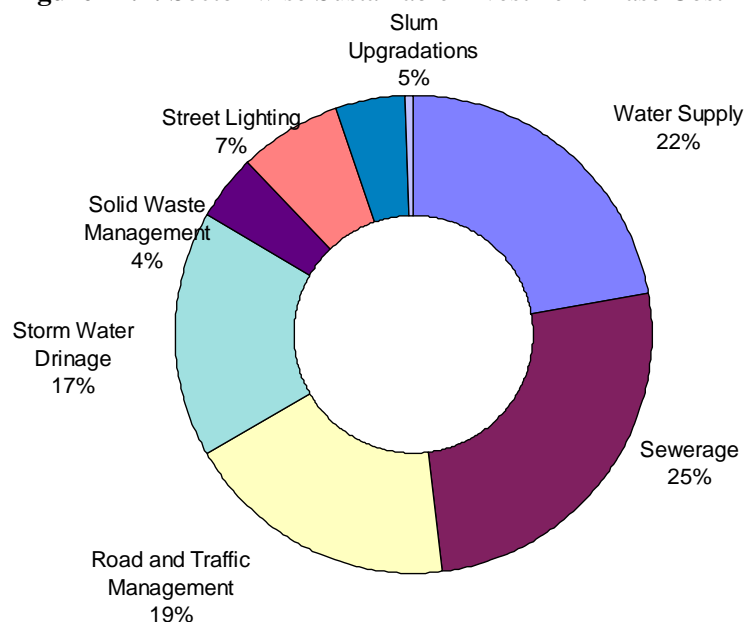


Table 11.16: Financial Operating Plan Results - Tambaram Municipality

Item Heads	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	Rs. Lakh														
Base Case - Municipal Fund															
Opening Balance	472	1,069	1,792	2,594	3,504	4,543	5,691	7,094	8,689	10,510	12,509	14,754	17,517	20,619	24,130
Revenue Income*	1,117	1,323	1,448	1,608	1,795	1,968	2,292	2,562	2,877	3,152	3,506	4,074	4,551	5,111	5,724
Additional Revenue Mobilization**	-	39	41	43	45	46	47	50	51	52	55	56	57	61	62
Total Revenue Income	1,117	1,362	1,489	1,651	1,841	2,014	2,339	2,612	2,928	3,204	3,561	4,130	4,608	5,171	5,785
Revenue Expenditure	520	638	687	741	801	867	937	1,017	1,106	1,205	1,316	1,368	1,506	1,661	1,835
Status	597	724	802	910	1,040	1,148	1,402	1,595	1,822	1,998	2,245	2,762	3,102	3,511	3,951
Closing Balance	1,069	1,792	2,594	3,504	4,543	5,691	7,094	8,689	10,510	12,509	14,754	17,517	20,619	24,130	28,080
Project Account - Full Project Scenario															
Total Net Project Cash Flow (after deducting ULB equity from cash flow)	-	(526)	(1,485)	(1,942)	(3,288)	(5,188)	(7,167)	(8,847)	(11,129)	(13,764)	(16,552)	(19,293)	(22,161)	(25,012)	(28,001)
Overall Closing Balance	1,069	1,267	1,109	1,562	1,256	503	(74)	(159)	(619)	(1,255)	(1,797)	(1,776)	(1,542)	(882)	80
Project Account - Sustainable Investment Scenario															
Total Net Project Cash Flows (after deducting ULB equity from project cash flow)	-	(346)	(1,052)	(1,312)	(2,287)	(3,750)	(4,999)	(6,165)	(7,755)	(9,524)	(11,344)	(13,134)	(15,001)	(16,802)	(18,678)
Overall Closing Balance	1,069	1,446	1,542	2,191	2,256	1,941	2,094	2,524	2,755	2,984	3,411	4,383	5,618	7,328	9,403
Financial Viability Ratios															
Sustainable Investment Scenario															
Debt Equity Ratio- New Projects	1.90	2.11	1.26	2.10	2.21	1.95	1.36	3.09	3.35	-	-	-	-	-	1.90
Debt Service Coverage Ratio (DSCR) – Min. 150%	582%	336%	415%	211%	148%	125%	145%	122%	116%	126%	155%	171%	200%	221%	582%
Operating Ratio (<1)	0.79	1.01	0.80	1.02	1.17	0.98	0.91	0.97	0.97	0.93	0.84	0.81	0.76	0.73	0.79
DSR (Max. 30%)	10%	16%	16%	25%	31%	33%	31%	34%	35%	34%	29%	27%	24%	22%	10%
Full Project Investment Scenario															
Debt Equity Ratio- New Projects	1.40	1.85	1.11	1.79	1.99	11.26	2.26	4.36	4.26	-	-	-	-	-	1.40
Debt Service Coverage	555%	301%	405%	191%	127%	63%	100%	78%	71%	76%	93%	103%	122%	134%	555%

Item Heads	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	<i>Rs. Lakh</i>														
Ratio (DSCR) – Min. 150 %															
Operating Ratio (<1)	0.93	1.17	0.88	1.16	1.32	1.24	1.05	1.15	1.19	1.15	1.03	0.99	0.93	0.89	0.93
DSR (Max. 30%)	10%	16%	16%	25%	31%	33%	31%	34%	35%	34%	29%	27%	24%	22%	10%

Source: Analysis.

Note: * Including projected regular capital grant and with out project scenario regular connection deposit fee.

** Excluding conservancy fee, since it is loaded on to the SWM sub project cash flow.

Table 11.17: Summary of Base Cost Sustainable Investment and Phasing Schedule

Sector	Total Investment	Investment Phasing (%)									
		Rs. Lakh	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
Municipal Infrastructure											
Water Supply	3,534.82	15%	25%	25%	15%	20%	0%	0%	0%	0%	0%
Sewerage & Sanitation	4,097.93	15%	15%	25%	25%	20%	0%	0%	0%	0%	0%
Roads	2,958.61	0%	15%	15%	15%	15%	7%	7%	10%	10%	7%
Storm Water Drains	2,647.29	0%	7%	14%	22%	22%	10%	6%	6%	6%	6%
Solid Waste Mgmt	698.28	10%	10%	20%	30%	30%	0%	0%	0%	0%	0%
Street Lighting	1,105.49	0%	10%	10%	10%	20%	20%	20%	10%	0%	0%
Slum Upgradation	736.96	0%	0%	15%	15%	15%	15%	10%	10%	10%	10%
Others	110.00	0%	0%	10%	20%	20%	20%	20%	10%	0%	0%
Total – ULB Investment	15,889.38	8%	15%	20%	19%	20%	5%	4%	4%	3%	3%

Source: Analysis

Table 11.18: Summary of Sustainable Project Investment -Base Cost

Sector	Total Investment	Investment Phasing – Rs. Lakh at Current Price									
		Rs. Lakh	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
<u>Municipal Infrastructure</u>											
Water Supply	3,534.82	530.22	883.71	883.71	530.22	706.96	-	-	-	-	-
Sewerage & Sanitation	4,097.93	614.69	614.69	1,024.48	1,024.48	819.59	-	-	-	-	-
Roads	2,958.61	-	441.58	441.58	441.58	441.58	198.71	198.71	298.07	298.07	198.71

Sector	Total Investment	Investment Phasing – Rs. Lakh at Current Price									
	<i>Rs. Lakh</i>	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Storm Water Drains	2,647.29	-	189.77	379.54	569.31	569.31	256.19	170.79	170.79	170.79	170.79
Solid Waste Mgmt	698.28	69.83	69.83	139.66	209.48	209.48	-	-	-	-	-
Street Lighting	1,105.49	-	110.55	110.55	110.55	221.10	221.10	221.10	110.55	-	-
Slum Upgradation	736.96	-	-	110.54	110.54	110.54	110.54	73.70	73.70	73.70	73.70
Others	110.00	-	-	11.00	22.00	22.00	22.00	22.00	11.00	-	-
Total – ULB Investment	15,889.38	1,214.74	2,310.12	3,101.06	3,018.18	3,100.57	808.54	686.30	664.11	542.56	443.20

Source: Analysis

Table 11.19: Summary of Sustainable Investment Project Cash Flow

	Description	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
		<i>Rs. Lakh</i>													
	Sustainable Sub Project Cash Flow														
1	Water Supply	(12)	(13)	(45)	(145)	(290)	(598)	(935)	(1,279)	(1,635)	(1,964)	(2,310)	(2,670)	(3,004)	(3,352)
2	Sewerage	(31)	(122)	577	728	728	691	892	850	788	794	796	800	897	1,004
3	Roads and Traffic Management	-	(28)	(102)	(225)	(402)	(634)	(925)	(1,297)	(1,761)	(2,303)	(2,879)	(3,480)	(4,114)	(4,784)
4	Storm Water Drainage	-	(12)	(54)	(147)	(299)	(490)	(712)	(969)	(1,269)	(1,616)	(1,983)	(2,363)	(2,755)	(3,162)
5	Solid Waste Management	34	61	74	66	15	(70)	(149)	(235)	(331)	(424)	(520)	(621)	(705)	(792)
6	Street Lighting	-	(6)	(31)	(79)	(157)	(286)	(472)	(713)	(985)	(1,275)	(1,584)	(1,912)	(2,258)	(2,618)
7	Slum Upgradation	-	-	(7)	(24)	(51)	(140)	(222)	(318)	(428)	(553)	(641)	(732)	(826)	(925)
8	Others	-	-	(1)	(3)	(7)	(13)	(22)	(33)	(42)	(52)	(63)	(75)	(87)	(100)
	Total Sub Project Cash Flow	(9)	(120)	412	171	(463)	(1,541)	(2,545)	(3,994)	(5,662)	(7,394)	(9,184)	(11,052)	(12,852)	(14,728)
	Total Sustainable Project Cash Flow														
	<i>Opening Balance</i>		(9)	(120)	412	171	(463)	(1,541)	(2,545)	(3,994)	(5,662)	(7,394)	(9,184)	(11,052)	(12,852)

	Description	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
		<i>Rs. Lakh</i>													
A	Sources of Fund														
1	Debt Drawdown	655	1,407	2,059	2,210	2,377	720	642	678	606	525	-	-	-	-
2	Equity Drawdown	337	594	792	734	829	171	161	142	101	87	-	-	-	-
3	Govt. Grant	426	858	1,218	1,253	1,365	320	297	307	262	219	-	-	-	-
4	User Charges	40	67	254	394	481	548	706	750	784	935	977	1,011	1,181	1,230
5	New Connection Fees	7	71	846	319	248	198	310	78	80	99	85	87	107	110
	Total-Inflow	1,466	2,997	5,169	4,912	5,301	1,957	2,116	1,955	1,833	1,864	1,061	1,097	1,288	1,340
B	Disposition of Funds														
1	Project Capex	1,418	2,859	4,069	4,198	4,571	1,263	1,137	1,166	1,010	874	-	-	-	-
2	Operation & Maintenance	-	74	218	416	623	874	981	1,093	1,201	1,298	1,395	1,479	1,568	1,662
3	Debt Servicing-Repayment	-	-	-	-	-	836	888	971	1,065	1,155	1,456	1,486	1,521	1,554
	Total-Outflow	56	175	350	538	740	61	116	173	225	270	-	-	-	-
	Net Cash Flow	(9)	(111)	531	(241)	(634)	(1,078)	(1,004)	(1,448)	(1,668)	(1,732)	(1,790)	(1,868)	(1,801)	(1,876)
	Closing Balance	(9)	(120)	412	171	(463)	(1,541)	(2,545)	(3,994)	(5,662)	(7,394)	(9,184)	(11,052)	(12,852)	(14,728)

Source: Analysis.

Note: *Ongoing schemes addition connection deposit and tariff revenue has been considered in sub project cash flow

468. The phasing/ scheduling of investments have been carried out through an iterative process and the principles of phasing have taken into account:

- (i) Priority needs, with developed areas getting priority over future development areas,
- (ii) Inter- and intra service linkages, viz. water supply investments shall be complemented by corresponding sewerage/ sanitation improvements,
- (iii) Size and duration of the requirements, including preparation and implementation period,
- (iv) Project linked revenue implications, such as installing house connections where supply and distribution capacities have been increased.

469. The Capital Improvement Program involved the identification of public capital facilities to cater to the demand of the town population by the year 2026.

Table 11.20: Sustainable Project Funding Option- Base Cost (Rs. Lakh)

Sectors	Loan	Grant	ULB /Beneficiaries Contribution	Total
2006-11				
Water Supply	1,413.93	1,060.45	1,060.45	3,534.82
Sewerage & Sanitation	2,048.97	1,229.38	819.59	4,097.93
Road and Traffic Management	1,059.80	529.90	176.63	1,766.33
Storm Water Drainage	1,024.76	512.38	170.79	1,707.93
Solid Waste Management	418.97	209.48	69.83	698.28
Street Lighting	276.37	165.82	110.55	552.75
Slum Upgradation	198.98	99.49	33.16	331.63
Others	27.50	5.50	22.00	55.00
Total	6,469.27	3,812.40	2,463.00	12,744.67
2012-16				
Water Supply	-	-	-	-
Sewerage & Sanitation	-	-	-	-
Road and Traffic Management	715.36	357.68	119.23	1,192.27
Storm Water Drainage	563.62	281.81	93.94	939.36
Solid Waste Management	-	-	-	-
Street Lighting	276.37	165.82	110.55	552.75
Slum Upgradation	243.20	121.60	40.53	405.33
Others	27.50	5.50	22.00	55.00
Total	1,826.05	932.41	386.25	3,144.71
2006-16				
Water Supply	1,413.93	1,060.45	1,060.45	3,534.82
Sewerage & Sanitation	2,048.97	1,229.38	819.59	4,097.93
Road and Traffic Management	1,775.16	887.58	295.86	2,958.61
Storm Water Drainage	1,588.38	794.19	264.73	2,647.29
Solid Waste Management	418.97	209.48	69.83	698.28
Street Lighting	552.75	331.65	221.10	1,105.49
Slum Up gradations	442.17	221.09	73.70	736.96
Others	55.00	11.00	44.00	110.00
Total	8,295.32	4,744.81	2,849.24	15,889.38

Source: Analysis.

470. The phasing of investments for components of all sectors are presented in the following tables.

Table 11.21: Phasing of Investment for Water Supply Sector

Sector-Water Supply	Total Cost	2006-07	2007-08	2008-09	2009-10	2010-11
	<i>Rs. Lakh</i>					
System Rehabilitation						
Distribution Network	66.71	20.01	36.69	10.01		
Leak Detection	10.60	10.60				
New Infrastructure						
Augmentation of Headwork	1,133.82			453.53	226.76	453.53
Storage Reservoir	266.43	74.03	95.91	66.61	29.88	
Distribution Network with road over lay	1,155.21	288.80	519.84	181.78	110.92	53.86
Water Treatment Plant	354.94			70.99	88.74	195.22
Improvements to Lakes	392.14	98.04	161.06	74.51	58.54	
Water Supply to OHT (Required Infrastructure)	154.98	38.75	70.20	26.29	15.39	4.36
Total	3,534.83	530.22	883.71	883.71	530.22	706.96

Source: Analysis

Table 11.22: Phasing of Investment for Sewerage and Sanitation Sector

Sector-Sewerage and Sanitation	Total Cost	2006-07	2007-08	2008-09	2009-10	2010-11
	<i>Rs. Lakh</i>					
Road Length Covered (year 2034)	2,083.78	416.76	238.01	458.85	479.27	490.90
Road Overlay Cost (2034)	463.17	92.63	52.90	101.99	106.53	109.12
Pumping Station (6 Nos.) (2019)	197.84	59.35		79.14		59.35
Electrical and Mechanical Works	188.73	45.95	56.62	86.16		
Pumping Main	605.16		181.55	219.61	204.01	
Proportionate Cost for Common Pumping Station	196.85			78.74	76.22	41.89
Proportionate Cost for Common Pumping Main	227.40		85.62		90.96	50.82
Miscellaneous Works	135.00				67.50	67.50
Total	4,097.93	614.69	614.69	1,024.48	1,024.48	819.59

Source: Analysis

Table 11.23: Phasing of Investment for Road and Traffic Management

Sector-Road and Traffic Management	Total Cost	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
	<i>Rs. Lakh</i>									
Roads										
Upgradation (Excludes the Bus										

Sector-Road and Traffic Management	Total Cost	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
<i>Rs. Lakh</i>										
<i>Route and Major Links)</i>										
Black Top to Concrete	-									
WBM to Black Top	127.81	25.56	25.56	25.56	25.56		25.56			
Earthen to Black Top	280.43		70.11	70.11		70.11			70.11	
<i>New Formation (Excludes the Bus Route and Major Links)</i>										
Concrete	16.37			8.19		8.19				
Black Top	2,224.10	368.13	324.66	307.66	331.41	104.35	125.26	245.22	227.96	189.45
WBM	88.07				26.42		31.82	20.56		9.26
Widening/ Strengthening (Excludes the Bus Route and Major Links)	160.70	22.01		16.07	58.19	16.07	16.07	32.29		
<u>Traffic & Transportation</u>										
Junction Improvements	42.50	21.25	21.25							
Parking facility	4.63	4.63								
Footpath	14.00			14.00						
Total	2,958.61	441.58	441.58	441.58	441.58	198.71	198.71	298.07	298.07	198.71

Source: Analysis

Table 11.24: Phasing of Investment for Storm Water Drainage

Sector-Storm Water Drainage	Total Cost	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
<i>Rs. Lakh</i>										
<u>Rehabilitation</u>										
Rehabilitation of Existing Storm Water Drains	53.50	26.75	26.75							
Upgradation of Kutchha to Pucca										
Kutchha to Pucca Open	64.80	16.20	16.20	16.20	16.20					
Kutchha to Pucca Closed	-									
Pucca Open to Pucca Closed	13.19	13.19								
<u>Formation of New Drains</u>										
New Pucca Open Drains	826.59	111.13	148.79	132.25	123.99	115.72	107.46	87.25		

Sector-Storm Water Drainage	Total Cost	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
	<i>Rs. Lakh</i>									
New Pucca Closed Drains	1,666.72		187.81	420.85	429.13	140.47	63.34	83.54	170.79	170.79
Primary Drains										
Desilting & Strengthening of Primary Drains	22.50	22.50								
Total	2,647.29	189.77	379.54	569.31	569.31	256.19	170.79	170.79	170.79	170.79

Source: Analysis

Table 11.25: Phasing of Investment for Solid Waste Management

Sector-Solid Waste Management	Total Cost	2006-07	2007-08	2008-09	2009-10	2010-11
	<i>Rs. Lakh</i>					
Containerised Tricycles (6 bins)	16.40	7.79	8.61			
Push Carts	15.91	6.36	9.55			
Dumper Bins (7 Cum Capacity)	19.25		9.63	9.63		
Dumper Placer	90.00		42.05	27.00	20.95	
Land Fill Capacity Development	379.22	37.92		62.21	135.28	143.80
Compost Facility Development	177.50	17.75		40.83	53.25	65.68
Total	698.28	69.83	69.83	139.66	209.48	209.48

Source: Analysis

Table 11.26: Phasing of Investment for Street Lighting

Sector-Street Lighting	Total Cost	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
	<i>Rs. Lakh</i>							
Tube Light	803.72	88.41	80.37	72.33	120.56	184.86	184.86	72.33
High Power	251.03		25.10	30.12	85.09	36.25	36.25	38.22
High Mast Lamps	50.26	22.01	4.95	7.97	15.33			
Power Saver Switches	0.51	0.13	0.13	0.13	0.13			
Providing Under Ground Multi-Utility Duct								
Total	1,105.52	110.55	110.55	110.55	221.10	221.10	221.10	110.55

Source: Analysis

Table 11.27: Phasing of Investment for Slum Upgradation

Sector-Slum Upgradation	Total Cost	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
	<i>Rs. Lakh</i>								
No. of Public Water Tanks/	98.00	29.40	21.54	20.31	26.75				

Sector-Slum Upgradation	Total Cost	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
<i>Rs. Lakh</i>									
Taps/ Handpumps									
No. of Public Toilet Seats	492.50	73.88	73.88	49.25	69.13	59.04	63.92	63.92	39.49
No. of Public Urinals	97.75			14.66	14.66	14.66	9.78	9.78	34.21
No. of Dustbins/ Temporary Waste Storage Points	3.99			3.99					
Roads and Pavements	-								
Storm Water Drains	27.68	7.27	8.30	12.11					
Streetlights	17.04		6.82	10.22					
Total	736.96	110.54	110.54	110.54	110.54	73.70	73.70	73.70	73.70

Source: Analysis

Table 11.28: Phasing of Investment for Other Projects

Sector-Others	Total Cost	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
<i>Rs. Lakh</i>							
Development of Parks	50.00	10.00	10.00	10.00	10.00	10.00	-
Tree Plantation	10.00	1.00	2.00	2.00	2.00	2.00	1.00
Improvements to Burial Grounds	50.00		10.00	10.00	10.00	10.00	10.00
Total	110.00	11.00	22.00	22.00	22.00	22.00	11.00

Source: Analysis

XII. INITIAL ENVIRONMENTAL AND SOCIAL SCREENING

A. Introduction

471. Recognizing the environmental and social issues that can arise in urban infrastructure projects, TNUIFSL has evolved an Environmental and Social Framework (ESF-originally named as Environmental and Social Report (ESR)). The ESF provides an overall framework to identify, assess and manage the environmental and social concerns at the sub project level. The ESF outlines the policies, assessments and procedures that will enable TNUIFSL to ensure that a sub-project that it funds is developed in accordance with ESF and is adequately protected from associated risks.
472. Based on the magnitude and implications of environmental issues that can arise in the projects an indicative categorization of various types of urban infrastructure projects has been prepared based on their environmental sensitivity. This indicative categorization has been developed to serve as a guidance tool. It is expected that adequate judgment will be applied to determine the category while preparing the DPRs and undertaking EAs, Guidance has also been provided for categorization for those projects, which are not categorized upfront.

Categorization of Urban Infrastructure Projects

473. TNUIFSL has categorized urban infrastructure projects into three categories viz. E-1, E-2 and E-3 (guidelines for categorization presented in **Table 12.2**).
474. E-1 projects are those wherein TNUIFSL foresees major environmental impacts thus necessitating Environmental Assessment Reports (EAR). A proposed project is classified as E1 if it is likely to affect sensitive environmental components (SEC) such as those mentioned in **Table 12.1**. Those projects/activities, which require environmental clearance as per the EIA notification published by Ministry of Environment and Forest will also be categorized as E1.

Table 12.1: List of Sensitive Environmental Components

Sr. No	Sensitive Environmental Component
1	Religious, heritage historic sites and cultural properties
2	Archaeological monuments/sites
3	Scenic areas
4	Hill resorts/mountains/ hills
5	Beach resorts
6	Health resorts
7	Coastal areas rich in corals, mangroves, breeding grounds of specific species
8	Estuaries rich in mangroves, breeding ground of specific species
9	Gulf areas
10	Biosphere reserves
11	National park and wildlife sanctuaries and reserves
12	Natural lakes, swamps Seismic zones tribal Settlements

Sr. No	Sensitive Environmental Component
13	Areas of scientific and geological interests
14	Defense installations, specially those of security importance and sensitive to pollution
15	Border areas (international)
16	Airport (for solid waste management projects)
17	Tiger reserves/elephant reserve/turtle nestling grounds
18	Habitat for migratory birds
19	Lakes, reservoirs, dams
20	Streams/rivers/estuary/seas

475. E-2 projects are expected to have only moderate environmental issues. A project is categorized as E2 if its potential adverse environmental impacts are less adverse than those of E1 projects. These impacts are mostly generic impacts in nature and in most cases; mitigation can be designed more readily than for E1 projects. Although the scope of assessment for an E2 project is project specific and examines the project's potential negative and positive environmental impacts, it recommends measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.
476. No environmental issues are expected in E-3 projects and can be termed 'environmentally benign'. Hence, no environmental assessment is required for an E3 project beyond screening.

Table 12.2: Guidelines for Environmental Categorization of Projects

Sr. No	Project	Environmental Category
I	Water Supply and Sewage	
a	Water Supply	
i	Water Supply Augmentation	E-2 ²
ii	Water Supply Distribution Lines	E-2
iii	Water Tankers	E-3
iv	Overhead Tanks	E-3
v	Water Treatment Plants	E-1
vi	Upgradation of Existing Headworks	E-3
vii	Generators	E-3
viii	River Intake Works	E-1
b	Storm Water Drainage	
i	Open drains	E-2
ii	Closed / Underground Drains	E-2
c	Sewerage / Sanitation	
i	Only Sewer Network	E-2 ³
ii	Sewerage Network and Pumping Stations	E-2 ³
iii	Sewerage Network, Pumping Station and Treatment Plant	E-1
iv	Public Conveniences	E-2
v	Pay & Use Latrines	E-2

² In case of development of a new sources, head works, intake works/channels, the project will be categorized as E-1

³ Projects without adequate treatment and disposal facilities (meeting the requirements of TNPCB or other applicable laws) to cater to the sewage collected due to the extension of sewerage system or network shall be categorised as E1.

Sr. No	Project	Environmental Category
vi	Septic Tanks	E-2
II	<i>Solid Waste Management</i>	
a	Landfill Sites	E-1
b	Compost Yard	E-1
c	Solid Waste Mgmt, including Collection & Transportation Vehicles	E-2
III	<i>Transportation</i>	
a	Roads	
i	New Roads	E-1
ii	Widening of Roads Outside ROW	E-1
iii	Widening of Roads Within ROW Affecting Environmental Sensitive Components	E-1
iv	Widening of Roads Within ROW Without Affecting Environmental Sensitive Components	E-2
v	Improvement of Surface	E-2
vi	Traffic Islands	E-3
vii	Road Divider	E-3
viii	Other Traffic and Transport Management measures	E-3
ix	Footpaths	E-3
b	Street Furniture	
i	Traffic Signals	E-3
ii	Streetlights	E-3
iii	Sign Boards	E-3
c	Road Structures	
i	Subways	
	- Pedestrian	E-2
	- Cycle Lanes	E-2
	- Fast Moving	E-2
ii	ROBs/RUBs	E-1
iii	Culverts	E-2
iv	Small Bridges	E-2
d	Terminals / Shelter ⁴	
i	Bus Shelters	E-2
ii	Bus Terminals/Stands	E-2
iii	Truck Terminals	E-2
iv	Workshops	E-2
v	Parking Complexes	E-2
e	Fleet Expansion >100 buses	E-2
	<100 buses	E-3
f	Construction & Maintenance Equipment	E-3
g	Inland Water Ways / Lakes / Water Bodies	E-1
IV	<i>Commercial Complexes</i>	
a	Shopping /Office Complexes (for < 1000 persons or with a sewage discharge < 50,000 litres per day)	E-2
b	Shopping /Office Complexes (for > 1000 persons or with a sewage discharge > 50,000 litres per day)	E-1
c	Vegetable/Fish Markets	E-2
d	Slaughter Houses	E-1
e	Marriage Halls	E-2

⁴ In case of construction of new bus/truck terminals, the project will be categorized as E1

Sr. No	Project	Environmental Category
f	Lodge / Dormitory	E-3
g	Municipal Community Complexes (for < 1,000 persons or with a sewage discharge < 50,000 litres per day)	E-2
h	Municipal Community Complexes (for > 1000 persons or with a sewage discharge .> 50,000 litres per day)	E-1
V	<i>Non Comm./Community Amenities</i>	
a	Parks	E-3
b	Playgrounds	E-3
c	Maternity and Child Centers	E-2
d	Educational Institution/Reading Room	E-3
e	Burial Grounds	E-2
f	Electric Crematorium	E-2
VI	<i>Integrated Area Development</i>	
a	Housing (Sites & Services)	E-1
b	Guided Urban Development	E-1
c	TRAMP	E-1
VII	<i>General</i>	
a	Computer Facilities	E-3
b	Weigh Bridge	E-3

477. The details of Environmental Laws and Regulations applicable for TNUIFSL's Projects and their obligations are presented in **Annexure 12.1**.
478. Based on the number of PAPs who may be affected by the project and magnitude of social impact, TNUIFSL has categorized projects as either S-1, S-2 or S-3 projects (Refer **Table 12.3**).
479. S-1 projects are those that will affect 200 PAPs or more or if PAPs are physically displaced and will require a detailed Social Assessment Report (SAR) that would include a resettlement plan.
480. S-2 projects are those in which no PAP is physically displaced and less than 10 percent of their productive assets are lost (or) less than 200 PAPs are affected. In this case, the borrower can submit a Social Management Plan (SMP) that would include an abbreviated resettlement plan.
481. S-3 projects, on the other hand will not have any households affected at all i.e. they can be classified as 'socially benign'. However, the borrower will have to submit a Social Status Report (SSR).

Table 12.3: Categorization of Projects Based on Social Sensitivity

Category	Description		Type of Project
	Level of Issues	Management Measures	
S-1	Serious social issues expected	Project specific SAR along with a RP essential	200 PAPs are involved
S-2	Moderate social issues expected	Adopt generic design guidelines and norms in ESF along with a project specific abbreviated plan essential	< 200 PAPs are involved
S-3	No social issues expected hence socially benign	No social mitigation measures required, need to submit SSR	No PAPs are involved

482. The details of Social Safeguard and Entitlement Framework are presented in **Annexure 12.2**.

B. Initial Environmental and Social Screening of Implementable Projects

483. The initial environmental and social screening of implementable projects under CCP for Tambaram municipality is given in **Table 12.4**.

Table 12.4: Initial Environmental and Social Screening

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
A	Water Supply							
	1	Augmentation of Headworks	E - 1	S - 3	Over Exploitation of water sources, issues relating to conflicting water users.	To prepare Environmental Assessment Report and Environmental Management Plan	ULB/Design consultant	ULB
	2	Distribution Network	E - 2	S - 3				
					<i>Development and Design Phase</i>			
					Since the location of rehabilitation work will be at existing facilities, and the existing environment is a built environment, no design-specific impacts are envisaged	Not Applicable	ULB/Design consultant	ULB
					However, improper design of distribution network may lead to pressure problems, overflow and leakages	Ensure proper design as per CPHEEO guidelines	ULB/Design consultant	ULB
					<i>Construction Phase</i>			

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					Soil erosion / silt run off from construction operations	Silt traps are suggested to avoid silt run off and soil erosion	ULB/ contractor	ULB
					Road blocking due to laying of water supply network and increased traffic flow due to vehicle movement for construction activities; inconvenience to the local community	Construction material shall be stockpiled to minimize traffic blockages	ULB/ contractor	ULB
					Most of the proposed network will be laid in fringe and extension areas, which are at present unserved. As these areas are not densely populated areas the impacts due to construction activities may not be significant	Construction material shall be stockpiled to minimize traffic blockages	ULB/ contractor	ULB
						Poor performance of the contractor may potentially exacerbate these	ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						impacts and therefore qualified contractors to be appointed. The contracted work includes the implementation of construction site management plan, which will address these issues		
					Dust and noise from construction activities. Due to the climatic condition the dust generation may be considerable	The practices such as spraying of water to arrest dust shall be employed	Contractor	ULB
						Ensure usage low noise generating equipment; use standard equipment to comply with the noise levels of construction equipment laid out by the CPCB. High	Contractor	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						noise generating activities including material unloading shall be avoided during nights		
					Health and safety concerns of workers while laying the pipelines	Adequate safety precautions such helmets, safety shoes, gloves, etc., should be provided to the labor and provide appropriate signage near the construction activities to sensitize the community and minimize accidents	Contractor	ULB
					Impact on public/private properties and other sensitive receptors along the water supply lines during construction	Proper planning is required during the construction phase to avoid such situations	ULB/ contractor	ULB
					<i>Operation Phase</i>			

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					Recurrence of blockage and leakage problems	The leak detection and restoration time shall be minimized. The water audit and leak detection surveys are proposed under the present project to improve the system efficiency	ULB	ULB
	3	Elevated Storage Reservoir	E - 3	S - 3				
					<i>Development and Design Phase</i>			
					Failure of reservoir structure and flooding of nearby areas	Proper design of the structure taking into consideration terrain and other physical characteristics	ULB/ Design consultant	ULB
					<i>Construction Phase</i>			
					Land required for Pump house construction and Elevated storage	Compensation in the form of land (or) money as per the	ULB	PMC / ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					reservoir	TNUIFSL ESF guidelines.		
					Noise, vibration and dust from construction activities	Use of less noise generating equipment for all activities; provision for personal protective equipment, ear muffs, etc. during construction; and avoiding construction activities during nights	ULB/ contractor	PMC / ULB
						Sprinkling of water and removal of excess matter/construction debris from the site as soon as possible	ULB/ contractor	PMC / ULB
					Safety hazards to laborers and nearby resident population	Adequate safety precautions such as helmets, safety shoes, gloves, etc., should be provided to the	ULB/ contractor	PMC / ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						labor and provide appropriate signage near the construction activities to sensitize the community and minimize accidents		
					<i>Operation Phase</i>			
					Excessive algae growth in storage reservoirs	Flow in the reservoir should be continuous to prevent stagnant of water, which lead to algal growth	Engg from water supply section of ULB	ULB
					Possibilities for insect breeding in case of the cracks (or) not properly sealed	Make sure its well ventilated and properly covered	Engg from water supply section of ULB	ULB
					Chances of mishappenings like mixing water with chemical substances	To avoid mishappenings, it should be prohibited from local (or) unauthorized reach	Engg from water supply section of ULB	ULB
	4	Water Treatment Plant	E - 1	S - 3		To prepare Environmental	ULB/Design consultant	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						Assessment Report and Environmental Management Plan		
B	Water bodies							
	1	Lake improvements	E - 1	S - 3		To prepare Environmental Assessment Report and Environmental Management Plan	ULB/Design consultant	ULB
C	Sewerage and Sanitation							
	1	Additional New Sewer Network	E - 2	S - 3				
					<i>Development and Design Phase</i>			
					<i>Construction Phase</i>			
					Nuisance due to dust and noise; road blocking due to laying of sewer network; and, increased traffic flow due to vehicle movement for construction activities	Construction material shall be stockpiled to minimize traffic blockages. In case of excavations for sewer lines in busy streets, adequate arrangements for	Contractor / ULB	PMC / ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						traffic diversion including prior intimation and by erecting proper sign boards		
					Dust generation may be significant during day time	Construction activities include significant quantities of earthwork. Dust generation must be arrested by water spraying. Use standard equipment to comply with the noise levels of construction equipment laid out by the CPCB. High noise generating activities including material unloading shall be avoided during nights. The surrounding people shall be	Contractor / ULB	PMC / ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						informed, especially in densely populated area, of nature and schedule of the high noise generating activities, if any		
					Disposal of excavated soil during construction	Excavated soil can be used for filling low lying area (or) landscaping	Contractor / ULB	PMC / ULB
					Proposed laying of additional sewers is very minimal and would cover extension areas in future, thus, impact may be insignificant	Not Applicable		
					Poor performance of the contractor may potentially exacerbate these impacts and therefore qualified contractors to be appointed. The contracted work includes the implementation of	In consideration with the densely populated areas and arterial and sub-arterial roads, a construction site management plan, incorporating the	Contractor / ULB	PMC / ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					construction site management plan, which will address these issues	above suggested mitigation measures, shall be implemented		
					<i>Operation Phase</i>			
					Surface runoff during the rainy seasons leads to blockage of sewage and overflow problems	Sewers should be frequently checked for the blockage	ULB / Contractor	ULB
					Surface and groundwater contamination due to leakages	Frequent testing of groundwater quality	ULB	ULB
					Health and safety concerns while working in closed drains/pipes	Adequate safety precautions such as gloves, oxygen masks, etc., should be provided to the labor	ULB	ULB
					Disposal of sludge and sewer silt during operation and maintenance	Sludge and the sewer silt can be disposed at sanitary landfill	ULB	ULB
D	Roads & Storm Water Drains							
	1	Upgradation (Excludes the Bus Route and Major Links)	E - 2	S - 3				
					<i>Development and</i>			

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					<i>Design Phase</i>			
					<i>Construction Phase</i>			
					Emission of air pollutants from construction vehicles and machinery	All vehicles, equipment and machinery used for construction shall be regularly maintained to ensure that the pollution emission levels are as per norms of SPCB	Contractor / ULB	ULB
					Noise, vibration and dust from construction activities	Use of less noise generating equipment for all activities; provision for personal protective equipment, ear muffs, etc. during construction; and avoiding construction activities during nights. • Vehicles delivering	Contractor / ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						material should be covered		
						Sprinkling of water and removal of excess matter/construction debris from the site as soon as possible	Contractor / ULB	ULB
					Safety hazards to laborers and nearby resident population	Adequate safety precautions such as helmets, safety shoes, gloves, etc., should be provided to the labor and appropriate signage near the construction activities to sensitize the community and minimize accidents	Contractor / ULB	ULB
					Road block and increase in traffic on the alternative routes and traffic congestion	Alternate routes are suggested to control the traffic load during	Contractor / ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						construction		
					Nuisance due to noise	Noise limits for construction equipments such as compactors, rollers shall not exceed 75 dB(A), as specified in the Environment (Protection) Rules, 1986	Contractor / ULB	ULB
						High noise generating activities, if any, shall not be carried out during the nights	Contractor / ULB	ULB
					<i>Operation Phase</i>			
					Contamination from spills due to traffic and accidents	Cleaning of the spills at the accidental site and the left over spill may be scrapped to a small nearby pit within ROW	ULB	ULB
	2	New Formation (Excludes the Bus Route and Major Links)	E - 1	S - 1		To prepare Environmental Assessment Report and	ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						Environmental Management Plan		
	3	Widening/ Strengthening of Roads	E - 1	S - 2		To prepare Environmental Assessment Report and Environmental Management Plan	ULB	ULB
	4	Desilting & Strengthening of Primary Drains	E - 2	S - 3				
					<i>Development and Design Phase</i>			
					Improper design may lead to overflowing or siltation	Ensure proper design of section; design shall as per the CPHEEO Guidelines	ULB/Design consultant	ULB
					<i>Construction Phase</i>			
					Exposure of workers to contaminated soil during desilting and exactions	The personal protection equipment such as gloves, boots shall be provided	Contractor / ULB	PMC / ULB
					Disturbance to traffic due to storage of construction	Construction material shall be stockpiled to	Contractor / ULB	PMC / ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					material/waste and material transport vehicles and other equipment	minimize traffic blockages		
					Nuisance due to noise			
					Dust generation during construction activity may be significant	Dust suppression activities such as water sprinkling shall be employed	Contractor / ULB	PMC / ULB
					Impacts due to disposal of organic contaminated silt	It can be used as manure	Contractor / ULB	PMC / ULB
					<i>Operation Phase</i>			
					Silting and pollution of water bodies due to non-clearance of construction work site	Ensure clearing of debris/waste and material from the drainage bed and from the banks before pressing into operation	Contractor / ULB	ULB
	5	Storm Water Drains	E - 2	S - 3				
					<i>Development and Design Phase</i>			
					Regularization of drain sections may lead to overflowing or silting of section	Ensure proper design of section; design shall as per the	ULB/Design consultant	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					due to improper design	CPHEEO Guidelines		
					<i>Construction Phase</i>			
					Exposure of workers to contaminated soil during desilting and exactions	The personal protection equipment such as gloves, boots shall be provided	Contractor / ULB	ULB
					Disturbance to traffic due to storage of construction material/waste and material transport vehicles and other equipment	Construction material shall be stockpiled to minimize traffic blockages	Contractor / ULB	ULB
					Nuisance due to noise			
					Dust generation during construction activity may be significant	Dust suppression activities such as water sprinkling shall be employed	Contractor / ULB	ULB
					Impacts due to disposal of contaminated silt			
					Pollution and silt loading of water bodies			
					Public and worker safety			
					<i>Operation Phase</i>			
					Silting and pollution	Ensure clearing	Contractor /	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					of water bodies due to non-clearance of construction work site	of debris/waste and material from the drainage bed and from the banks before pressing into operation	ULB	
					Health and safety concerns while working in closed drains/pipes	Adequate safety precautions such gloves, oxygen masks, etc., should be provided to the labor	Contractor / ULB	ULB
E	Street Lighting							
	1	Provision of New Lamp Posts	E - 3	S - 3				
					<i>Development and Design Phase</i>			
					No major impact is anticipated	Not Applicable		
					<i>Construction Phase</i>			
					No major impact is anticipated	Not Applicable		
					<i>Operation Phase</i>			
					No major impact is anticipated	Not Applicable		
	2	Providing Under Ground	E - 2	S - 3				

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
		Multi-Utility Duct						
					<i>Construction Phase</i>			
					Road blocking due to laying of water supply network and increased traffic flow due to vehicle movement for construction activities; inconvenience to the local community	Construction material shall be stockpiled to minimize traffic blockages	Contractor / ULB	ULB
					Dust and noise from construction activities. Due to the climatic condition the dust generation may be considerable	The practices such as spraying of water to arrest dust shall be employed	Contractor / ULB	ULB
						Ensure usage low noise generating equipment; use standard equipment to comply with the noise levels of construction equipment laid out by the CPCB. High	Contractor / ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						noise generating activities including material unloading shall be avoided during nights		
					Health and safety concerns of workers while laying the pipelines	Adequate safety precautions such helmets, safety shoes, gloves, etc., should be provided to the labor and provide appropriate signage near the construction activities to sensitize the community and minimize accidents	Contractor / ULB	ULB
					Impact on public/private properties and other sensitive receptors along the supply lines during construction	Proper planning is required during the construction phase to avoid such situations	Contractor / ULB	ULB
					<i>Operation Phase</i>			
					No major impact is			

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern anticipated	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
F	Traffic & Transportation							
	1	Junction Improvement, Parking Facilities & Footpath	E - 3	S - 3				
					<i>Development and Design Phase</i>			
					No major impact is anticipated			
					<i>Construction Phase</i>			
					No major impact is anticipated			
					<i>Operation Phase</i>			
					No major impact is anticipated			
G	Solid Waste Management							
	1	Collection and Transportation Vehicles	E - 2	S - 3				
					<i>Development and Design Phase</i>			
					Nuisance due to location of waste collection containers. During the monsoon, the waste may mix with the runoff and may potentially	Containers shall be located at appropriate location; place the containers on a slightly elevated plot	ULB/Design consultant	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					create unhygienic conditions around the site.	form. Waste shall be regularly collected and no overflowing must be allowed. The collection, storage and transportation of solid waste shall confirm to Schedule II of MSWM Rules, 2000		
					<i>Operation Phase</i>			
					Change in surface and ground water quality due to leachate	Segregation of waste		
					Nuisance due to waste collection residue and waste spillage during transportation	The waste collection, storage and transportation system shall in consistent with State Policy on Integrated Solid Waste Management and Schedule II of MSW Rules,	Contractor / ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						2000		
					Health and safety hazards to workers during waste collection, transportation and at compost and disposal site	Occupational safety plan shall be prepared. This includes: <ul style="list-style-type: none"> • Provision of appropriate personal protection equipment (PPE) such as gloves, boots, etc. • Manual handling of waste shall be avoided as far as possible. • Training of workers on safe handling of waste and potential dangers such as safety and health hazards. • Prepare a health risk mitigation plan incorporating health check up program 	Contractor / ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
	2	Disposal Site						
	i	Land Fill Area	E - 1	S - 3		To prepare Environmental Assessment Report and Environmental Management Plan	ULB/Design consultant	ULB
	ii	Compost Facility Area	E - 1	S - 3		To prepare Environmental Assessment Report and Environmental Management Plan	ULB/Design consultant	ULB

Source: Analysis.

XIII. PROJECT IMPACTS AND POLICY INTERVENTIONS

A. Project Benefits and Impacts

1. Financial

484. A financial analysis was undertaken for direct revenue-generating components, i.e. water supply, sewerage and SWM. Sewerage projects are proposed in the view of environmental improvement and currently no scheme in place and hence, in view of the plausible tariff applicable – initial connection and monthly rent – water supply and sewerage projects indicate either negative cash flows or low FIRR. A similar scenario is experienced in case of solid waste management project, where there is no history of tariffs. Hence, all sub-projects identified have a strong economic rationale but indicate poor financial returns. On a stand-alone basis, none of the projects other sewerage project is financially viable but at the municipal/local-level, the municipal fund bears the financial burden of sub-project cash flows. However, municipal funds are not robust enough to bear the entire investment identified, hence, implementable projects have been identified.
485. Outstanding liabilities – debt and non-debt – of ULBs play a critical role in the long-term sustainability of sub-projects and determining the ULB's ability to manage resources. Electricity charges, staff pensions and debt towards water and sewerage sub-project components constitute liabilities, which are often borne by the State (through SFC devolution). This approach of State subsidy frees the ULB of the responsibility of performing its role of mobilizing local resources to deliver basic services.

2. Economic

486. The economic rationale is based on three key principles: (i) basic human requirements for urban services, both for social development and for economic activity; (ii) *the contribution of efficient and integrated urban services to sustainable economic development and poverty reduction*; and (iii) prioritization of need and cost effective (least cost) solutions
487. All sub-projects have a strong economic rationale since they provide minimum acceptable standards for basic living conditions and assist in removing existing constraints on social development and economic growth. Similarly, all sub-projects were designed along sound principles of priority need; consultation and targeting; demand management and rehabilitation before new investment.
488. Alternatives considered in sub-project design included types of wastewater treatment process, sites and location and design of sewer network; and sites and type of solid waste disposal process. In all cases, the most appropriate technical and least cost solution was preferred. Reduction of UFW and ground water recharge are key recommendations for water augmentation. Without the sewerage/sanitation, solid waste and drainage components, the prevailing unhygienic and unacceptable living conditions will continue.

3. *Social*

489. The Project is designed to maximize the number of poor beneficiaries, aimed specifically at improving conditions in under-served areas. The project should benefit 100 percent of the notified slum population. It will extend or improve the service delivery to previously unserved or under-served areas, particularly for poor settlements. The combination of project components will lead to sustained poverty reduction through demonstrable health, livelihood benefits.
490. Institutional components of the project should empower and lead to demonstrable improvement in “Quality of Life” of women. Awareness of affected population in particular the poor will be increased and improved through dedicated education programs, thereby increasing the quality of dialogue and informed participation between communities and local government.
491. Indirect benefits will be available to residents of the project ULBs through improved living conditions, a healthier living environment and the prospect of improved health status of the population. This and the prospect of accelerated economic development should increase employment and raise living standards. The capacity-building initiatives should lead to a more efficient, effective and responsive state and local government, better able to understand and respond to the needs of the population, especially the poor.
492. Negative impacts will be minimized in requiring minimum resettlement or loss of productive or non-productive assets. A social impact assessment was carried out for identified sub-projects and translated as a risk mitigation matrix. The sub-project minimizes other negative impacts on poor men and women such as an increased cost for services (time and money), unemployment, and health risks.

4. *Environmental Screening*

493. The proposed Project is fundamentally aimed at environmental improvement in the urban areas, and as such, the overall impact should be beneficial to the urban population and their environment. The Project will thus contribute significantly to achieving one of its overall objectives, which is to improve the living conditions and thus well-being of the urban poor. The urban population will run less risk of incurring infectious diseases through exposure to waste and contaminated water.
494. Based on an initial evaluation, the proposed Project is unlikely to result in any direct adverse environmental impacts. Adverse impacts relate almost entirely to the construction phase, and particular attention will need to be paid to ensuring that contractors comply with good engineering practice and avoid creating unnecessary inconvenience to the public during construction. Thus, on the assumption that the construction process is well managed, the short-term negative impacts of the project will be far outweighed by the major positive impacts of a more sanitary urban environment. The study identifies environmental categories for sub-project components and has developed Environmental Safeguard Frameworks for sub-projects proposed; EIA/EMP/IEE will need to be done accordingly, during the detailed design phase. An Environmental Monitoring Plan captures

the prospective environmental risks and the associated mitigation measures along with institutional roles and responsibilities.

B. Policy Interventions

1. Institutional Arrangements

495. Institutions at the State-level and local-level play an important role in project implementation. At the State-level, the TNUFSL and CMA would manage infrastructure investments and institutional development. At the local-level, the Project ULB would undertake reforms (tax rationalization, expenditure control and resource base enhancement), TWAD/Metro Water Board would construct water and sewerage systems on behalf of ULB, TNPCB would provide environmental clearances (focused on EIA/EMP for municipal waste processing and disposal, and sewage treatment plants), and TNSCB would approve slum upgradation programs and identify target beneficiaries. While the above arrangements define roles of each institution, the mechanism to coordinate the responsibilities is critical for project success.

2. Resource Mobilization and Expenditure Control

496. Analyses indicate that sub-project viability is dependent on equity contributions (ULB and customer) and debt servicing capabilities of ULB. Since the cash flow at the municipal fund level determines investment sustenance, it is imperative that adequate resources are mobilized to meet sub-project sustenance. Hence, prior to project implementation, it is pertinent that ULBs undertake resource mobilization drives including but not limited to enhancing the tax base, raising tariffs and taxes, enhancing the water connection database (detecting illegal/unauthorized connections), and planning for accurate management information systems to capture the demand for revenue. Water charge enhancement and revisions are proposed on a nominal and pragmatic basis, with due consideration to the prevailing political environment; a similar approach was adopted while recommending sewerage charges and connection fees. Expenditure controls on establishment, staff salary and pensions, and energy savings in street lighting, maintenance and repairs are key to long-term sustainability of sub-projects – lack of data on non-debt outstanding liabilities hampered analyses but it is recommended that the State undertake to issue a policy regarding liability management and encourage ULBs to commit themselves to prudent fiscal management.

3. Land Acquisition and Clearances

497. Typical problems in project construction are land availability and approvals/clearances from State and Central Government agencies. While this study identifies risk mitigation measures, site conditions may vary during technical investigations and surveys, e.g., soil conditions affecting foundations of proposed structures. The ULB would require confirming site conditions and the Implementing Agency along with the CMA would procure approvals and clearances in addition to initiating land acquisition processes.

4. *Asset Maintenance and Debt Service*

498. Considering that the project assets would be created through good operating practices, it is recommended that the State initiate a system of performance benchmarking and internal controls regarding asset maintenance and continued resource mobilization. While the ULB would continue to report sub-project O&M performance through the tenure of the loan and sub-project life, as system of checks require institutionalization in order to regulate ULB's commitment to asset maintenance and debt servicing.

XIV. URBAN GOVERNANCE

A. Urban Governance

499. This chapter outlines the various best practices world over regarding good urban governance. The strategies presented in this chapter, are an integrated whole and none of them can be seen or understood in an isolated section. Commitment of the municipality to civic, secure and transparent administration will realize the dream of any city/town where the citizens will be those who govern and the municipality as an institution is one who facilitates and provides the service.

1. Current Initiatives

500. The other initiatives that are being adopted by the municipality to enhance its performance and capacity building are computerization of its activities and involving private sector in the delivery of civic services.
501. *Computerization.* GoTN has initiated steps to computerize municipal administration in the state. The entire process consists of four modules: Revenue and Taxation, Record Maintenance, Personnel Management System, Financial Management System.
502. As a start up, data relating to property tax has been computerized and the assessments are now handled by using computers. The billing and collection system of the property taxes is also computerized in the town. However, the computerization efforts are slow owing to the absence of technical capabilities with the municipality.
503. *Private Sector Participation.* The municipality has initiated the involvement of private sector in service delivery through part privatization of the solid waste collection system. The initiative has received good response from the citizens of the town and further privatization of certain other components of services is in active consideration of the municipality.

2. Strategies

504. *Decentralization.* In conformity to the 74th CAA, the Government of Tamil Nadu has made necessary legislative changes to devolve functional domains of the 18 listed items in the 12th schedule of the constitution. However only seven functions are made obligatory functions of urban local bodies and important functions like urban planning including town planning, regulation of land use and construction of buildings, slum improvement, urban poverty alleviation remain discretionary functions with rather little say for ULB. Consequently, the funds and concerned staff continue to remain under the control of the State Government. Financial powers as envisaged in the 12th Schedule of the Constitution also need to be immediately devolved to urban local bodies.
505. The local bodies should have control over the land in their jurisdiction and other

infrastructure including roads in their area. They should have power to remove encroachment from public land, construct and maintain roads within their respective municipal areas.

506. The municipality shall divide the area into zones/ divisions for better service delivery and management control. Such a mechanism is already being implemented in water supply and public health sectors.
507. *Urban Environmental Management.* The costs of maintaining a healthy urban environment needs to be recovered through various municipal taxes and user charges following the “Polluter Pays” principle. For this, the functional role of the ULB as envisaged in Item 8, 12th Schedule of the Constitution have to be resolved keeping in view the role of Tamil Nadu Pollution Control Board and the organizational and fiscal strength of the ULB.
508. *Access of Urban Services to Poor.* Since “Ability-to-Pay” for the full cost of environmental infrastructure services’ provision is the important criterion, cross-subsidization of tariffs, innovative project structuring and user/ community participation are the means towards ensuring access of these services to the poor. Again, the functional and financial role of ULB with respect to the items 10 and 11 of 12th Schedule against those of central and state government agencies need to be resolved.
509. *Streamlining and Strengthening of Revenue Base of Local Bodies.*
 - (i) The recommendations of the State Finance Commissions must be made mandatory and should be implemented as a matter of course. Law enforcement powers should be given to local bodies to compel payments of taxes and other charges levied by them.
 - (ii) Property Tax base should be de-linked from rental value method and should be linked to Unit Area or Capital value method.
 - (iii) Fiscal powers of municipal bodies to fix tax rates, fee structure and user charges should be strengthened through specific guidelines and notifications. Prepare model guidelines for the town to allow greater flexibility in levying taxes, fees and user charges, borrowing funds and incurring expenditures.
 - (iv) The annual report of the municipality shall devote a section highlighting the amounts of subsidy given to a particular service, how was the subsidy funded and who were its beneficiaries.
 - (v) Adopting Zero-based budgeting shall be carried out supported by the already computerised accounting system for continual monitoring of budgets and cash flow management.
 - (vi) Implementation of MIS to provide relevant information on accounts, commercial and operating systems for better decision making and information dissemination to citizens.
 - (vii) Auditing of Accounts should be carried out effectively and regularly to promote transparency and accountability.
 - (viii) Application of e-governance is equally important for municipal finance. Adequate software in the financial management is required at different levels.

510. *Transparency and Civic Engagement in Municipal Management.*

- (i) Laws/ rules/ regulations specific to town/ local issues should be tried to facilitate effective implementation. These should be lucid and easily understood.
- (ii) Participatory mechanisms should be so structured that they have legal entity and administrative power. Local bodies should be responsive and innovative and involve community participation in civic engagement.
- (iii) Specific code of conduct for municipal executives and elected representatives.
- (iv) Public education, resource mobilisation, good leadership and transparent processes apply in municipal finance and development work.
- (v) Closer networking with media and their engagement in creating public awareness and creating demand for good governance. Cautious engagement of private sector with continuous monitoring is necessary.
- (vi) Setting in place an active and online public Grievances' Redressal System, with automated department wise complaint loading and monitoring system.
- (vii) Instruments to improve the efficiency of local bodies through enhanced technical, administrative, and financial capacities.
- (viii) Credit Enhancement options other than state guarantees need to be adopted.
- (ix) Preparation of annual Environmental Status Reports through a multi-stakeholder consultation process.

511. *Capacity Building of Local Bodies.*

- (i) The municipality shall maintain data to generate indicators as suggested in this document for evaluating their performance.
- (ii) Prepare and conduct capacity building programs for elected representatives, especially women representatives with a view to enable them to focus on gender based issues.
- (iii) Promote the creation of interactive platforms for sharing municipal innovations, experiences among municipal managers.
- (iv) Better Human Resource Management through assessment of the training needs of personnel involved in urban administration to enhance the management and organizational capabilities.
- (v) Assessment of fund requirement and resource persons to tackle the training needs of all the personnel.
- (vi) Development of Training Material in the local language and Impact and Evaluation Studies of the Training Programs.
- (vii) Capacity building to position the ULB in a better place to employ highly qualified staff and seek superior quality of out-sourced services.

XV. PROJECT RISKS AND ASSUMPTIONS

A. Overview

512. Every project has its risks, and these can be much greater and numerous with a multi-city, multi-sector project involving a multitude of stakeholders and responsible authorities. However, early acknowledgement of the potential risks will help in mitigating or even eliminating the problems that they may cause during project implementation and beyond. The potential risks and assumptions come in a number of different categories and are classified below for better appreciation.

B. Physical Component Risks

- Land transfers and affected person (AP) compensation agreed and completed before scheduled construction;
- Temporary relocation of street vendor and hawkers likely during civil works construction; adequate provision for compensation to be allocated in the Project;
- Different sector contract conflicts to be avoided through careful contract management and supervision. Tender and contract documents to clearly specify contractor responsibilities;
- Environmental clearances completed before scheduled construction;
- Environmental pollution and nuisance to the public to be minimized during construction through diligent site supervision and monitoring. Tender and contract documents to clearly specify contractor responsibilities;
- Contractors perform competently, to time and budget; and
- ULB may not have the resources or skills to manage the operation of the new facilities (mainly STP and sanitary landfill sites) in an environmentally sound way.

C. Policy Risks

- State and local governments' commitment to necessary decentralization reforms in urban management to provide improved services;
- GoTN continues to provide adequate guidance and capacity building to support the devolution process of decision making and financial independence of the urban local bodies; and
- Political acceptance of required changes in tariffs, taxes, and rates.

D. Institutional Risks

- GoTN, through the CMA, TNUIFSL, and ULBs to ensure that the ULB are fully staffed and capable of undertaking duties prior to and during Project implementation;
- Delays will occur unless there is timely recruitment and satisfactory performance of Project Consultants;

- Project ownership will suffer unless there is effective consultation with stakeholders and others government agencies;
- Public awareness and community mobilization programs must be effective for getting the participation of local stakeholders into implementation;
- Adequate training opportunities for elected officials and municipal staff must be available;
- Implementing agencies must be amenable to capacity building; and
- There should be no legal obstacles to slum infrastructure upgrading.

E. Social Risks

- Adequate training facilities and technical support system must be available to help the agency in implementing poverty alleviation activities;
- The ULB Council must actively support the initiatives under the poverty alleviation component;
- Poor communities must be willing and able to participate in project planning activities;
- Investment provided by the Project should be converged with other programs to target the urban poor more effectively and for maximum benefit;
- Improved services will only benefit the urban poor and vulnerable groups if included in the physical design and if any financial cost recovery is affordable; and
- Project funds must not be diverted from the social programs to pay for loan charges.

F. Financial Risks

- Financial Improvement Action Plan not implemented to scale or schedule necessary for sustained operation and maintenance;
- Willingness of beneficiaries to pay for proper management, maintenance and operation of infrastructure facilities;
- Tariffs for services not set at appropriate levels or collected efficiently; and
- Un-timely provision of counterpart funds.

G. Economic Risks

- Overrun of project construction costs due to delays;
- Indirect economic costs are significant, e.g., negative environmental impacts on agricultural production, net loss of income due to shutdown of street vendors/hawkers;
- Underachievement of Project outputs, i.e., population coverage of improved services is below target or infrastructure improvements not as effective as planned;
- Effective demand for the services provided by the improved infrastructure is less than projected due to lack of consumer affordability or willingness to accept change; and
- Operation and maintenance of the infrastructure and equipment provided by the Project are not funded and/or carried out at levels sufficient to sustain Project benefits.

Annexure**Annexure 2.1: Ward wise Density Pattern**

Ward No.	Density Pattern	Comparison with Chennai City's Density	Area	Population	Population Density
			<i>Ha</i>	<i>Nos</i>	<i>Persons per Ha</i>
1	Low Density	Below	153.09	3,917	26
2	Low Density	Below	115.83	3,552	31
3	Low Density	Below	59.12	2,698	46
4	High Density	Below	15.85	2,765	174
5	Very High Density	Below	15.53	3,184	205
6	Very High Density	Below	11.72	2,544	217
7	Very High Density	Above	12.66	3,185	252
8	Very High Density	Above	7.45	3,008	404
9	Medium Density	Below	20.83	2,822	135
10	Moderately Less Dense	Below	27.21	2,141	79
11	Very High Density	Below	13.00	2,941	226
12	High Density	Below	10.89	2,144	197
13	Very High Density	Above	10.03	3,106	310
14	High Density	Below	12.15	2,243	185
15	Medium Density	Below	20.31	2,927	144
16	Very High Density	Above	12.42	3,373	272
17	Medium Density	Below	33.40	4,087	122
18	Medium Density	Below	54.02	6,447	119
19	Moderately Less Dense	Below	44.56	4,151	93
20	Moderately Less Dense	Below	57.88	3,504	61
21	Low Density	Below	130.89	3,933	30
22	Moderately Less Dense	Below	65.01	3,953	61
23	Low Density	Below	218.09	8,351	38
24	Medium Density	Below	15.64	2,131	136
25	Medium Density	Below	20.32	2,580	127
26	Moderately Less Dense	Below	39.62	3,210	81
27	Moderately Less Dense	Below	122.14	6,412	52
28	Moderately Less Dense	Below	51.55	2,924	57
29	High Density	Below	23.59	4,520	192
30	Moderately Less Dense	Below	40.21	3,287	82
31	Medium Density	Below	20.03	2,270	113
32	Low Density	Below	162.16	5,831	36
33	Very High Density	Below	20.30	4,464	220
34	Very High Density	Below	16.47	3,419	208
35	Low Density	Below	20.36	896	44
36	Medium Density	Below	13.63	1,673	123
37	Moderately Less Dense	Below	43.17	3,982	92
38	Low Density	Below	241.04	6,226	26
39	Low Density	Below	99.84	3,132	31
	Total		2,072.00	137,933	67

Annexure 5.1: Ward wise Coverage of Water Supply HSCs w.r.t. Households

Ward No	Coverage	Households	Water Supply Connections	Coverage
		<i>Nos.</i>	<i>Nos.</i>	<i>%</i>
1	Low Coverage	829	57	7
2	Low Coverage	867	4	0.5
3	Low Coverage	642	9	1
4	Low Coverage	677	96	14
5	Low Coverage	738	96	13
6	Low Coverage	560	85	15
7	Low Coverage	763	116	15
8	Low Coverage	694	135	19
9	Low Coverage	621	151	24
10	High Coverage	463	290	63
11	Medium Coverage	673	209	31
12	Medium Coverage	542	205	38
13	Medium Coverage	768	259	34
14	Medium Coverage	562	181	32
15	Medium Coverage	732	239	33
16	Medium Coverage	815	295	36
17	Medium Coverage	1,007	417	41
18	Low Coverage	1,516	329	22
19	Low Coverage	983	217	22
20	Low Coverage	794	177	22
21	Low Coverage	909	3	0.3
22	Medium Coverage	920	258	28
23	Low Coverage	1,776	241	14
24	Medium Coverage	491	154	31
25	Low Coverage	578	92	16
26	Low Coverage	745	104	14
27	Low Coverage	1,485	183	12
28	Low Coverage	669	119	18
29	Low Coverage	1,034	197	19
30	Medium Coverage	781	237	30
31	Low Coverage	517	126	24
32	Low Coverage	1,316	141	11
33	Medium Coverage	995	267	27
34	Medium Coverage	772	274	35
35	High Coverage	205	201	98
36	High Coverage	331	267	81
37	Low Coverage	867	216	25
38	Low Coverage	1,407	288	20
39	Low Coverage	728	105	14
Total	Low Coverage	31,772	7,040	22

Annexure 5.2: Coverage of Distribution Network w.r.t. Municipal Roads

Wards	Distribution Network	Roads	Percentage
	<i>km</i>	<i>km</i>	<i>%</i>
1	1.10	5.88	18.79
2	0.23	4.65	4.83
3	0.49	1.23	39.97
4	0.38	2.25	16.93
5	0.56	1.57	35.85
6	0.64	1.22	52.23
7	0.53	1.01	52.47
8	0.51	1.49	34.05
9	1.88	2.11	89.37
10	2.06	5.06	40.58
11	1.35	3.25	41.46
12	1.06	2.31	45.65
13	1.33	3.23	41.05
14	1.17	1.62	71.90
15	2.59	1.69	152.79
16	1.39	2.70	51.47
17	1.73	3.33	51.83
18	1.98	4.70	42.05
19	1.02	7.33	13.87
20	2.83	2.90	97.62
21	-	2.32	-
22	1.49	4.20	35.49
23	2.17	3.07	70.52
24	1.04	1.42	73.36
25	0.77	1.08	71.49
26	1.83	2.22	82.43
27	1.36	4.93	27.66
28	1.01	3.13	32.26
29	1.40	2.65	52.68
30	0.94	2.00	47.06
31	0.88	1.28	68.71
32	0.76	10.52	7.23
33	1.80	2.85	63.09
34	3.94	2.19	180.07
35	2.11	2.84	74.50
36	1.52	2.40	63.13
37	1.84	3.14	58.76
38	2.70	3.07	88.00
39	0.63	2.78	22.75
Total	53.00	117.63	45.05

Annexure 5.3: Coverage of Municipal Roads

Ward	Bitumen	WBM	CC	Earthen	Length	Percentage to Total Municipal Roads	Per Capita Roads
	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>m</i>	%	<i>m</i>
1	4,056.20	654.50	872.00	293.00	5,875.70	5.00	1.50
2	1,990.80	937.00	1,278.70	448.00	4,654.50	3.96	1.31
3	733.00	360.00	138.00	-	1,231.00	1.05	0.46
4	1,169.00	784.00	297.00	-	2,250.00	1.91	0.81
5	495.00	345.00	590.00	135.00	1,565.00	1.33	0.49
6	465.00	422.00	263.00	71.50	1,221.50	1.04	0.48
7	87.00	315.00	480.00	130.00	1,012.00	0.86	0.32
8	632.00	89.00	768.00	-	1,489.00	1.27	0.50
9	845.00	-	913.00	350.00	2,108.00	1.79	0.75
10	4,954.00	-	110.00	-	5,064.00	4.30	2.37
11	2,125.00	-	716.00	408.00	3,249.00	2.76	1.10
12	1,894.00	-	419.00	-	2,313.00	1.97	1.08
13	-	2,541.00	689.00	-	3,230.00	2.75	1.04
14	1,425.00	198.00	-	-	1,623.00	1.38	0.72
15	1,294.50	199.00	201.00	-	1,694.50	1.44	0.58
16	2,171.60	-	527.10	-	2,698.70	2.29	0.80
17	2,802.00	242.00	284.50	-	3,328.50	2.83	0.81
18	2,180.00	972.00	611.00	939.00	4,702.00	4.00	0.73
19	2,540.90	2,680.00	598.00	1,515.00	7,333.90	6.23	1.77
20	1,256.00	1,032.00	613.00	-	2,901.00	2.47	0.83
21	1,599.20	443.00	220.00	61.00	2,323.20	1.97	0.59
22	3,034.00	-	753.00	414.00	4,201.00	3.57	1.06
23	1,192.00	473.00	798.00	610.00	3,073.00	2.61	0.37
24	473.00	-	951.30	-	1,424.30	1.21	0.67
25	-	148.50	396.00	537.00	1,081.50	0.92	0.42
26	-	-	2,223.20	-	2,223.20	1.89	0.69
27	2,043.00	1,115.00	642.00	1,131.00	4,931.00	4.19	0.77
28	937.00	215.00	754.00	1,220.00	3,126.00	2.66	1.07
29	1,570.00	-	1,003.00	80.00	2,653.00	2.26	0.59
30	1,475.00	-	525.00	-	2,000.00	1.70	0.61
31	1,003.00	-	137.00	136.00	1,276.00	1.08	0.56
32	4,707.50	713.00	1,233.00	3,863.00	10,516.50	8.94	1.80
33	1,693.00	150.00	1,008.00	-	2,851.00	2.42	0.64
34	1,645.00	160.00	268.00	115.00	2,188.00	1.86	0.64
35	1,599.00	350.00	886.00	-	2,835.00	2.41	3.16
36	2,321.00	79.00	-	-	2,400.00	2.04	1.43
37	2,142.00	-	813.00	180.00	3,135.00	2.67	0.79
38	988.00	910.00	393.00	775.00	3,066.00	2.61	0.49
39	1,194.00	805.00	174.00	610.00	2,783.00	2.37	0.89
Total	62,731.70	17,332.00	23,545.80	14,021.50	117,631.0	100.00	0.85

Annexure 5.4: Ward wise Distribution of Streetlights

Ward	Total Streetlights				Working Condition				Non-Working Condition			
	Tube light	SVL	Others	Total	Tube light	SVL	Others	Total	Tube light	SVL	Others	Total
1	105	19	-	124	98	16	-	114	7	3	-	10
2	114	30	-	144	107	26	-	133	7	4	-	11
3	40	27	-	67	34	25	-	59	6	2	-	8
4	59	33	-	92	49	31	-	80	10	2	-	12
5	35	30	-	65	34	27	-	61	1	3	-	4
6	26	6	-	32	22	5	-	27	4	1	-	5
7	46	7	-	53	44	6	-	50	2	1	-	3
8	56	5	-	61	52	4	-	56	4	1	-	5
9	58	2	-	60	54	1	-	55	4	1	-	5
10	77	58	-	135	76	56	-	132	1	2	-	3
11	56	20	-	76	50	17	-	67	6	3	-	9
12	56	2	-	58	49	1	-	50	7	1	-	8
13	103	7	-	110	97	6	-	103	6	1	-	7
14	66	17	-	83	63	15	-	78	3	2	-	5
15	55	42	-	97	52	36	-	88	3	6	-	9
16	88	12	-	100	83	11	-	94	5	1	-	6
17	155	25	-	180	145	20	-	165	10	5	-	15
18	167	25	-	192	155	23	-	178	12	2	-	14
19	170	28	1	199	150	25	1	176	20	3	-	23
20	159	41	-	200	144	38	-	182	15	3	-	18
21	147	41	-	188	132	36	-	168	15	5	-	20
22	142	3	-	145	139	3	-	142	3	-	-	3
23	121	23	-	144	115	20	-	135	6	3	-	9
24	51	30	-	81	48	28	-	76	3	2	-	5
25	69	15	-	84	65	14	-	79	4	1	-	5
26	49	42	-	91	45	37	-	82	4	5	-	9
27	189	36	-	225	181	32	-	213	8	4	-	12
28	117	28	-	145	117	28	-	145	-	-	-	-
29	75	24	-	99	75	23	-	98	-	1	-	1

Ward	Total Streetlights				Working Condition				Non-Working Condition			
	Tube light	SVL	Others	Total	Tube light	SVL	Others	Total	Tube light	SVL	Others	Total
30	70	19	-	89	69	19	-	88	1	-	-	1
31	48	26	-	74	47	25	-	72	1	1	-	2
32	364	30	-	394	360	30	-	390	4	-	-	4
33	117	14	-	131	115	14	-	129	2	-	-	2
34	96	36	-	132	94	35	-	129	2	1	-	3
35	30	75	-	105	28	74	-	102	2	1	-	3
36	56	17	-	73	56	17	-	73	-	-	-	-
37	86	27	-	113	71	24	-	95	15	3	-	18
38	205	25	-	230	169	19	-	188	36	6	-	42
39	90	24	-	114	84	20	-	104	6	4	-	10
Total	3,813	971	1	4,785	3,568	887	1	4,456	245	84	-	329

Annexure 6.1: Tests Results of Waste Characterization Study

Parameters	Units	Residential			Commercial		
		Sample 1	Sample 2	Average	Sample 1	Sample 2	Average
Ash	% w/w	83.75	25.41	54.58	85.10	48.72	66.91
Bulk Density	Kg/cum	105.00	369.00	237.00	119.00	463.50	291.25
Carbon	% w/w	5.90	19.60	12.75	4.26	12.00	8.13
Fixed Carbon	% w/w	2.19	13.31	7.75	1.70	9.26	5.48
Gross Calorific Value	Kcal/Kg	653.00	4,387.00	2,520.00	470.00	2,282.00	1,376.00
Nitrogen as N	% w/w	0.37	1.72	1.05	0.36	1.47	0.92
Phosphorous as P	% w/w	0.02	0.20	0.11	0.00	0.25	0.13
Ash & Fine Earth	% w/w	77.50	4.62	41.06	9.00	8.53	8.77
Garden Waste	% w/w	1.86	12.27	7.07	34.74	31.45	33.10
Glass & Ceramics	% w/w	1.42	9.97	5.70	-	-	-
Inorganic Matter	% w/w	4.54	-	2.27	5.00	-	2.50
Metal	% w/w	0.13	0.66	0.40	1.50	0.40	0.95
Organic Matter	% w/w	2.90	28.15	15.53	40.60	41.15	40.88
Other Inert Materials	Nil	-	-	-	-	-	-
Paper	% w/w	1.03	14.70	7.87	5.86	6.31	6.09
Plastic	% w/w	-	29.60	14.80	3.20	9.55	6.38
Rubber & Leather	% w/w	10.65	-	5.33	-	2.60	1.30
Volatile matter	% w/w	12.40	55.57	33.99	11.65	37.89	24.77
Cadmium as Cd	mg/Kg	0.56	0.26	0.41	0.18	BDL (DL:0.10 mg/Kg)	0.18
Lead as Pb	mg/Kg	47.50	6.40	26.95	152.70	5.30	79.00
Arsenic as As	BDL (DL:0.10mg/Kg)	0.71	BDL	0.71	0.52	BDL	0.52
Nickel as Ni	mg/Kg	18.00	13.30	15.65	9.00	1.60	5.30
Zinc as Zn	mg/kg	224.50	28.30	126.40	5.90	16.30	11.10
Copper as Cu	mg/Kg	67.70	19.40	43.55	28.70	23.40	26.05
Mercury as Hg	BDL (DL:0.10mg/Kg)	BDL	BDL	BDL	BDL	BDL	BDL
pH (@25 ⁰ C)	(10% Suspension)	8.14	6.52	7.33	8.50	6.51	7.51
Moisture	% w/w	75.00	79.00	77.00	70.00	77.00	73.50

Annexure 8.1: List of Participants in the Workshop

Sr. No	Name	Department/Designation
	First Session - Morning	
1	Ms. Gayathri	Assistant Vice President – TNUIFSL
2	Mr. Mukundan	Senior Vice President – IL&FS
3	Thiru S.R. Raja	Chairman Tambaram Municipality
4	Thiru B. Chanakyrman	Vice – Chairman
5	Thiru Ahmed Papa	Commissioner
6	Thiru Balasubramanian	Municipal Engineer
7	Thiru K. Prabakaran	Municipal Councilor
8	Thiru L. Loganathan	Municipal Councilor
9	Thiru E. G. Sekar	Municipal Councilor
10	Thiru N. Munusamy	Municipal Councilor
11	Thiru D. V. Rama Murthy	Municipal Councilor
12	Thiru R. Purushothaman	Municipal Councilor – Ward 13
13	Thiru V. R. Sivaraman	Municipal Councilor
14	Thiru S. Suresh	Municipal Councilor
15	Thirumathi B. Bharathi	Municipal Councilor
16	Thiru M. Kumar	Municipal Councilor
17	Thiru Nathar Kani	Municipal Councilor
18	Thirumathi M. Velli	Municipal Councilor – Ward 3
19	Thiru P. Jothi Kumar	Municipal Councilor
20	Thiru K. Rajendran	Municipal Councilor
21	Thiru Dharmaraj	Municipal Councilor
22	Thiru N. Krishnamurthy	Municipal Councilor
23	Thirumathi S. Thilakavathi	Municipal Councilor – Ward 26
24	Thiru Parthi Nagappan	Municipal Councilor – Ward 22
25	Thirumathi Ramani Arunachalam	Municipal Councilor – Ward 29
26	Thirumathi Bhakyalakshmi	Municipal Councilor – Ward 15
27	Thirumathi L. Begam	Municipal Councilor – Ward 17
28	Thiru Rajendran	Municipal Councilor – Ward 23
29	Thirumathi G. Vaidehi	Municipal Councilor – Ward 12
30	Thiru J. Rajini	Municipal Councilor – Ward 8
31	Thirumathi M.Mary	Municipal Councilor – Ward 2
32	Thirumathi R.Muthulakshmi	Municipal Councilor – Ward 21
33	Thirumathi Alamelu Prusthoman	Municipal Councilor – Ward 6
34	Thirumathi Ramani Athimulam	Municipal Councilor – Ward 39
35	Thirumathi M. Usha	Municipal Councilor – Ward 42
36	Thiru T. R. Gopi	Municipal Councilor – Ward 31
37	Thiru Rajendran	Municipal Councilor – Ward 35
	Second Session - Afternoon	
1	Mr. I. Rajkumar	Manager, TNUIFSL
2	Dr. T. Nagasundaram	JE, Director of Municipal Administration (Retd)
3	Thiru S. Vrinda Kumar	President, Sri Subramanya Rai Nalasangam, Kadapperi
4	Thiru K. C. Sampath Kumar	Secretary, Sri Subramanya Rai Nalasangam, Kadapperi
5	Thiru M. S. Venkateswaran	
6	K. Kannabiran	Ward 32, Ramani Nagar Residence Association
7	R. Rajamani	Ward 12, Resident Welfare

Sr. No	Name	Department/Designation
		Association
8	M.V. Natrajan	Joint Secretary, Ward 12, Resident Welfare Association
9	S. Ramesh	Joint Secretary, Ward 12
10	S. Muthusankar	President, Ward 11
11	D. Ramu	Secretary, Old Tamparam Village Welfare Association
12	T.M.G. Mary Anand	CPI
13	M. Munusamy	
14	P .S. Chellappan	
15	Krishnamurthy	Ex. Municipal Councilor (Ward 18), President Selaiyur Welfare Association
16	E. Balaji	CPI, Ward 18
17	S. S Madhavan	CPI
18	G. Venkatesan	President, Ward 27, Welfare Association
19	G. Balaraman	Secretary, Ward 27, Welfare Association
20	C. P. Ramachandran	12 Ward, Resident Welfare Association
21	M. Govindasamy	Join Secretary, Dr. Ambedkar Association
22	M. K. Jeeva	
23	Meelan	Daily Thanthi
24	Rama Krishnan	Tamilmurusu
25	K. Manikandan	The Hindu
26	D. Vijayakumar	T.B.M
27	Dinakaran	Tamilmurusu
28	James Kumar	Reporter
29	Muralitharan	Reporter
30	Arumugam	Reporter
31	Sai Balu	Ward 15
32	Pressana Kumar	Ward 15
33	D. Manohar	Ward 15
34	R. Thulasingham	Ward 14
35	P. Krishnasamy	
36	Sundari Ramachandran	Ex Municipal Councilor, President, Mahila Dakshata Sanithi
37	Ramachandran	Secretary, Welfare Association
38	Mrs. Savithri	Sathya Sai Nagar, Irumbuliyur
39	Rajendaran	CPI
40	Vasan	PMK
41	K. Saragan	PMK
42	M. Suresh	Ward 2, Resident Welfare Association
43	K. Santhanam	President, Annai Teresa Nagar Welfare Association
44	Ratna Kumar	Secretary, Periyar Nagar Residence Welfare Association
45	P. Kiramani	Vetri Nagar Welfare Association
	Tamparam Municipal Officials	
1	M. Ramasamy	Town Planning Officer
2	A. Raja	Manager

Sr. No	Name	Department/Designation
3	M. Nagarajan	Sanitary Inspector
4	B. Ramakrishnan	Sanitary Inspector
5	E. Esaki	Health Inspector
6	K.R.S. Uanuppiah	Assistant Engineer
7	V. Tamilarasu	Technical Assistant
8	R. Elimalai	Junior Assistant
9	Millai Radha	Junior Assistant
10	P. Manimaran	Assistant Programmer

20/10/16	பெயர்	தொழில்நுட்பம்
17	க. கிருஷ்ணன் கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
18	E. மகாதேவன் தொழில்நுட்பம் - 18	செய்
19	செ. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
20	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
21	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
22	C. P. R. machandran தொழில்நுட்பம் - 18	செய்
23	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
24	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்

20/10/16	பெயர்	தொழில்நுட்பம்
25	செ. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
26	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
27	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
28	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
29	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
30	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
31	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
32	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
33	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
34	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
35	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
36	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
37	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
38	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
39	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்

20/10/16	பெயர்	தொழில்நுட்பம்
32	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
33	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
34	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
35	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்
36	சி. கிருஷ்ணன் தொழில்நுட்பம் - 18	செய்

MUNICIPAL OFFICIALS:		
Sl	Name & Designation	Signature
1.	M. Nagaraj Sanitary Inspector	Signature
2.	M. RAMASAMY TOWN PLANNING OFFICER	Signature
3.	B. RAMA KRISHNAN SANITARY INSPECTOR	Signature
4.	B. K. S. RAMAN H. Officer	Signature
5.	K. S. K. RAMAN A. E.	Signature
6.	V. Tamilarasu Technical Tambaram Municipality	Signature
7.	R. Elumalai Tambaram Municipality	Signature
8.	A. Raja Madrassar, Tambaram Municipality	Signature
9.	M. Raja Tambaram Municipality	Signature
10.	P. Manikumar Tambaram Municipality	Signature

Annexure 8.2: Stakeholder's Consultation Workshop (The Hindu, January 31, 2006)

Project "Improve Tambaram" under way

Private firm outlines projected growth of municipality

Staff Reporter

TAMBARAM: Tambaram, the southern gateway to Chennai, can expect an overall improvement in all spheres in about a decade from now. Elected representatives, officials and residents on Saturday had a glimpse of the improvements being planned.

Workshop

During a consultation workshop on "City corporate-cum business plan for Tambaram municipality," representatives from Wilbur Smith Associates gave an outline of the growth of Tambaram in the past five decades and its projected path in the near future. The private firm was engaged by the Tamil Nadu Urban Infrastructure Financial Services Limited (TNUIFSL) to draw up a plan for Tambaram's overall development.

The TNUIFSL has engaged companies to draw up similar plans in 31 municipalities in the

- TNUIFSL has engaged companies to draw up similar plans in 31 municipalities in the State
- State Government likely to sanction Rs. 220 crores to the Tambaram municipality through grants and loans
- Residents take part in workshop to air grievances about planning and lack of amenities

State and Wilbur Smith has drawn up plans for 12, including Tambaram, Pallavaram and Alandur. According to representatives from the firm and those from Tambaram municipality, the State Government was expected to sanction Rs. 220 crores to the local body through grants and loans to put in place various schemes.

While the officials and elected representatives witnessed the presentation in the morning, about 50 residents from different areas of Tambaram took part in the workshop. The presentation was done essentially to get

the residents' views and ensure their participation in the town's development, officials said. The private company had spent six months collecting records from various government agencies to draw the plan.

Core issues

The core issues raised at the presentation were the lack of a scientific garbage disposal methods, the unorganised and improper management of manpower, the drastic erosion of natural resources, particularly water bodies, the state of public utilities and traffic problems.

The residents did not lose the chance to point out the mistakes in town planning in the past few decades. The absence of a proper bus stand, parking lots, market areas and shopping complexes were a pointer to the manner in which the authorities and elected representatives had "steered this town to neglect." Further, connectivity between East and West Tambaram areas were not given the due attention that it deserved though it was the main reason for the traffic woes.

Residents' suggestions

Officials said the suggestion made by the residents would be incorporated in the presentation before a final plan was drawn up. The TNUIFSL planned to start implementing the schemes for 10 years starting from the financial year 2006-2007 onwards. An estimated Rs. 220 crores will be invested in the town, they said. Similar presentations would be held in Pallavaram and Alandur soon.

Annexure 8.3: Minutes of Consultation Meeting for Inception Report

Minutes of Meeting on Inception report submitted by Wilber Smith Associates Pvt. Ltd for preparation of CCCBP for Alandur, Pallavaram and Tambaram held at TNUIFSL on November 18, 2005.

List of Participants:

- (i) Mr. Shashi Shekar, MD&CEO, TNUIFSL
- (ii) Mr. Mukundan, SVP, IL&FS
- (iii) Dr. M.S. Srinivasan, Advisor, TNUIFSL
- (iv) Mr. Ravikumar, Head TNUIF – Southern Region, IL&FS
- (v) Mr. S. R. Raja, Chairman, Tambaram
- (vi) Mr. A.B. Dhyalamoorthy, M. Commissioner, Alandur Municipality
- (vii) Mr. G. Sivakumar, Town Planning Officer, Alandur Municipality
- (viii) Mr. N. M. Krishnamurthy, Asst Engineer, Alandur Municipality
- (ix) Mr. L. A. Papa, M. Commissioner, Tambaram Municipality
- (x) Mr. J. Balasubramanian, M. Engineer, Tambaram Municipality
- (xi) Mr. M.G. Gnaneswaran, Urban Planner, WSAPL
- (xii) Mr. Nidhish Nair, Senior Planner, WSAPL
- (xiii) Mr. Anbuezhayan, Senior Planner, WSAPL
- (xiv) Mr. Dinesh, WSAPL
- (xv) Ms. R. Gayathri, AVP, TNUIFSL
- (xvi) Mr. Rajendiran, DPE, TNUIFSL
- (xvii) Mr. K. Balaji, Manager, TNUIFSL
- (xviii) Mr. I. Rajkumar, Manager, TNUIFSL

The following are the salient points discussed.

- (i) Commonalities between Alandur, Pallavaram and Tambaram to be addressed.
- (ii) The Common projects to be identified for these three towns.
- (iii) Integration of services needs to be identified for these 3 towns like integrated landfill, integrated STP etc.
- (iv) Economic growth of these towns has to be plotted
- (v) Growth towards suburbs needs to be addressed for both domestic as well as commercial purpose.
- (vi) Possibility of reclamation of existing dump site for scientific landfill
- (vii) Road links between the major roads and municipality roads to be addressed
- (viii) Necessity on energy efficiency needs to be addressed
- (ix) Detailed sector wise income expenditure statement to be produced, which would help in identifying sectors of huge expenditure and sectors where income can be raised.
- (x) Collection efficiency on all receipts to be evaluated
- (xi) Possibilities of privatization across sectors may be looked up and cost benefit analysis of the same to be carried out

Annexure 8.4: Minutes of Consultation Meeting for Assessment Report

Minutes of Meeting on the Assessment Report submitted by Wilbur Smith Associates Pvt Ltd for preparation of CCC& BP for Alandur, Pallavaram and Tambaram held at TNUIFSL on December 7, 2005.

List of Participants:

- (i) Mr. Shashi Shekar, MD&CEO, TNUIFSL
- (ii) Mr. Makwana, JCMA
- (iii) Mr. Mukundan, SVP, IL&FS
- (iv) Mr. S. R. Raja, Chairman, Tambaram
- (v) Mr. Bharathi, Chairman, Alandur
- (vi) Mr. Chairman, Pallavaram
- (vii) Mr. A.B. Dhyalamoorthy, M. Commissioner, Alandur Municipality
- (viii) Mr. G. Sivakumar, Town Planning Officer, Alandur Municipality
- (ix) Mr. N. M. Krishnamurthy, Asst Engineer, Alandur Municipality
- (x) Mr. L. A. Papa, M. Commissioner, Tambaram Municipality
- (xi) Mr. J. Balasubramanian, M. Engineer, Tambaram Municipality
- (xii) Mr. S. Ravindra, Vice President, WSAPL
- (xiii) Mr. G. Dinesh, Senior Manager, WSAPL
- (xiv) Mr. V.N.K. Satyasai Tata, Senior Planner, WSAPL
- (xv) Ms. Jeena, Transportation Planner, WSAPL
- (xvi) Ms. R. Gayathri, AVP, TNUIFSL
- (xvii) Mr. K. Balaji, Manager, TNUIFSL
- (xviii) Mr. I. Rajkumar, Manager, TNUIFSL

The following are the salient points discussed.

- (i) Population projection should be revised considering the proposed and planned economic activities in nearby areas, particularly in the case of Tambaram
- (ii) Growth management strategy to focus on existing land use characteristics and developmental activities
- (iii) As the capacity of Palar Water Supply System at the source cannot be augmented, alternate sources such as Eris, Tanks and quarries have to be identified for their feasibility in supplying potable water
- (iv) Possibility of common treatment plant with recycling of waste water should be considered
- (v) Waste Characterization studies to be initiated immediately after the rains
- (vi) Evaluation of disposal technologies/options to be considered including common disposal facility
- (vii) Privatisation of collection, transportation and disposal options to be explored
- (viii) Mapping of existing eris/tanks to be carried out with the help of satellite imageries from CMDA. The same can be used to assess the land use characteristics of the municipalities
- (ix) A comprehensive traffic and transportation plan should be proposed considering the connectivity to NH, SH and other major arterial corridors in CMA. In addition, other transport infrastructure facilities, intra-municipal connectivity and missing links to be addressed

Annexure 8.5: Minutes of Consultation Meeting for Rapid Urban Assessment Report

Minutes of Meeting on Rapid Urban Assessment submitted by Wilbur Smith Associates Pvt Ltd for preparation of CCCBP for Alandur, Pallavaram and Tambaram held at TNUIFSL on March 7, 2006.

List of Participants:

- (i) Mr. Shashi Shekar, MD&CEO, TNUIFSL
- (ii) Mr. Chairman, Alandur Municipality
- (iii) Mr. Chairman, Pallavaram Municipality
- (iv) Mr. Commissioner, Pallavaram Municipality
- (v) Mr. Municipal Engineer, Pallavaram Municipality
- (vi) Mr. Municipal Engineer, Alandur Municipality
- (vii) Mr. Assistant Engineer, Alandur Municipality
- (viii) Mr. Ramamurthy, Pallavaram Municipality
- (ix) Mr. S. Ravindra, Vice President, WSAPL
- (x) Mr. G. Dinesh, Senior Manager, WSAPL
- (xi) Mr. V.N.K. Satyasai Tata, Senior Planner, WSAPL
- (xii) Mr. Anbuezhayan, Senior Planner, WSAPL
- (xiii) Ms. R. Gayathri, AVP, TNUIFSL
- (xiv) Mr. I. Rajkumar, Manager, TNUIFSL
- (xv) Mr. K. Balaji, Manager, TNUIFSL

The following are the salient points discussed during the Rapid Urban Assessment presentation on CCPBP study for Alandur, Pallavaram and Tambaram.

- (i) The consultants have presented that most of the water bodies in these municipalities were owned by the revenue department and PWD, and all the water bodies were encroached.
It was discussed that a pre-feasible study to be conducted for using those water bodies with the following two alternatives
Alternative 1: Using the water body by removing encroachment
Alternative 2: Using the water body with out removing the encroachment
- (ii) The water bodies available in the mine areas have to be tested for potable and/or non-potable purpose. The consultants have to conduct a pre-feasibility study for considering this as an additional source of supply during the drought period
- (iii) Leak deduction study for water supply distribution system can be suggested for rehabilitation in the near future
- (iv) The consultants can suggest an integrated approach to rehabilitate the existing water supply network along with the ongoing under ground drainage works to reduce the road restoration charges
- (v) While developing a comprehensive plan for these municipalities the consultant have to consider the facilities in the cantonment area
- (vi) It was discussed that all the existing RUB's were become unusable during the rainy season. Hence, in order to avoid this problem ROB's can be suggested for the areas where ever it is required. In Alandur municipality possibility of constructing a flyover along the proposed MRTS lines can be studied

- (vii) The consultants have to conduct a pre-feasibility study for laying underground cables for streetlights and various funding arrangements can be explored
- (viii) The consultants have to give a pre-feasibility report for solid waste management project
- (xi) The consultants have to suggest cost reduction measures in all the areas

Annexure 8.6: Minutes of Consultation Meeting for Draft Final Report

Minutes of the meeting on Draft Final Report presentation of the City Corporate Plan for Alandur, Pallavaram and Tambaram held in TNUIFSL on 8th June 2006

List of Participants:

- (i) Mr. Vikram Kapur, CEO, TNUIFSL
- (ii) Mr. K. Mukundan, Sr. Vice President, IL & FS (Special Invitee)
- (iii) Dr. M.S. Srinivasan, Advisor, TNUIFSL
- (iv) Mr. A. Jayaraman, VP & CS, TNUIFSL
- (v) Mr. A. Janakiraman, Chairman i/c, Tambaram Municipality
- (vi) Mr. L.A. Papa, Commissioner, Tambaram Municipality
- (vii) Mr. G. Sivakumar, Town Planning Officer, Alandur Municipality
- (viii) Mr. S.V. Maran, Town Planning Inspector, Alandur Municipality
- (ix) Mr. R. Krishnamoorthy, Director, Traffic & Transportaiton, WSAPL
- (x) Mr. V.S. Ganesan, Head, Tamilnadu Operations, WSAPL
- (xi) Mr. V.N.K. Satyasai Tata, Group Sr. Manager, WSAPL
- (xii) Mr. A. Hariprasad, Principal Planner, WSAPL
- (xiii) Ms. Saswati Belliappa, Sr. Vice President, WSAPL
- (xiv) Mr. P. Thankamony, AEE (Designs), TNUIDP III, CMA
- (xv) Ms. R. Gayathri, TNUIFSL

The following are the salient points discussed during the Draft Final Report presentation on CCPBP study for Alandur, Pallavaram and Tambaram.

- (i) Basically the consultants need to foresee a vision on how the three municipalities would be after 20 years, taking into consideration the future growth, like looking into the possibilities of these towns growing into a Corporation, as urban nodes of Chennai, etc.
- (ii) The consultants presented their plan for Alandur, Pallavaram and Tambaram Municipalities independently. The Committee felt that the consultant while identifying projects specifically for each of them, it is also important to look into common problems (like representative of Alandur Municipality opined that because of unprecedented floods last year, Palavanthangal subway got flooded and also suggested that the storm water drains could be let out in Adyar river) and prospects of these three towns in macro level and come with solutions / projects which can have mutual benefits and cost sharing. A comprehensive plan may be prepared for the three adjacent municipalities under the study
- (iii) The Committee also suggested that consultants while preparing plan will have to come with project proposal, which can earn revenue to Municipality / reduce expenses / possible private sector participation and including proposals to regulate bus / truck terminals.
- (iv) The consultants may deepen their consultations not restricting themselves with the council and the residents' associations, as they may restrict their ideas to their immediate requirements and not generate new ideas or a vision for the city, and which is already available in the report. While preparing strategy plan for these three neighborhood municipalities, emphasis is required to develop plans based on

consultative process among stakeholders, exchange of thought process through press and media, discussion with thoughtful planners and visionary. This is essentially required to facilitate focus on area development in a comprehensive manner, not merely for immediate needs but for future too. It is also opined that the integrated strategy may be given on a project mode (meaning the common projects can be given a lead to take up implementation), which will facilitate immediate attention of the Government and early take off is possible.

- (v) Once the common strategy is in place, TNUIFSL proposes to pose it in their website, in order to invite more suggestions and views for a period of 2 weeks. The report will be finalized after incorporating these views.
- (vi) The consultants are requested to give a note on their understanding of the report at the earliest and also do one more report and a presentation in the above lines in the next 15 days (by 28th of June 2006). In view of the integrated study envisaged, it is opined that in addition to 3 separate reports which provides the requirements of the towns individually, and one common report covering the commonalities would be more meaningful.

Annexure 8.7: List of Stakeholders Met

Sr. No	Name	Institution / Departments	Designation	Contact
1	Mr. Merlin Isac	Tamparam MCC (Madras Christian College)	Lecturer, Department of Economics	9841118468
2	Mr. Remchy Koshy	Tamparam MCC (Madras Christian College)	HOD, Department of Social Work	22790035
3	Mr. C. Senthil Kumar	Department of Aerospace Engineering, MITE, Anna University, Chromepet, Chennai - 44	Lecturer, Department of Aerospace Engineering	22237276-221, 9444123628
4	Mr. Elangovan	Department of Aerospace Engineering, MITE, Anna University, Chromepet, Chennai - 44	Asst. Proffosser, Department of Aerospace Engineering	22237038
5	Mr. N. Elangovan	Chennai Director of Industries & Commerce, O/o. Director of Industries & Commerce, Department of Industries and Commerce, Chepauk, Chennai - 05	Deputy Director (Technical)	28548173
6	Mr. Ramakrishnan	Chennai Metropolitan Development Authority	Senior Planner	28414855-402
7	Dr. V. M. Marudachalam	SAP, Department of Planning, Anna University	Head of Department, Department of Planning	22203707
8	Mr. K. Perumal	Officers Colony Civic Exnora, No. 22, 3rd Main Road, Officers Colony, Adambakkam, Chennai-88	President	22457011, 9841057011
9	Mr. V. Kuppan	Exnora Innovators Club of Adambakkam, Polt No. 27, 2nd Main Road, Jeevan Nagar, Adambakkam, Chennai-88	Secretary	9381028497
10	Mr. V. Parthasarathy	No. 34, State Bank Colony Welfare Association, State Bank colony, Adambakkam, Chennai - 88	President	22452243
11	Mr. Muthukrishna Rao	No. 34, State Bank Colony Welfare Association, State Bank colony, Adambakkam, Chennai - 88	Secretary	22454790

Sr. No	Name	Institution / Departments	Designation	Contact
12	Mr. Santhanam	The Chromepet New Colony Resident's Welfare Society and Peoples Awareness Centre, 3/20, 16th Cross Street, Newcolony, Chromepet, Chennai - 44	President	22388612, 9444254850
13	Mr. Chandrasekaran	Balaji Nagar Welfare Association, Plot No. 5, Balaji Nagar, Chromepet, Chennai -45	President	9444074440
14	Mr. R.Rathinakumar	Periyar Nagar Welfare Association, No. 8, 4th Street, Periyar Nagar, Irrumbuliyur, West Tambaram, Chennai - 46	President	9841166896
15	Mr. Balasubramanian	State Bank (Old) Colony, Welfare Association, 4-Old S.B.I. Colony, Tambaram West	President	65196596 / 223632850
16	Mr. Sunil Kumar	Traffic Police Department	Joint Commissioner of Police, Chennai	25612625
17	Mr. K. S. Balasunder	Traffic Police Department	Assistant Commissioner of Police (Traffic Investigation)	9840971110

Annexure 8.8: Comments/Suggestions Received from Identified Key Stakeholders**A. Government Departments and Educational Institutions****Department:** Chennai Metropolitan Development Authority (CMDA)**Person:** Mr. Ramakrishnan, Senior Planner, CMDA**Date:** 28/09/2006**Time:** 11.00 AM**Contact No:** 28414855-402

- (i) Road. Pallavaram-Thorapakkam road is an important link to G.S.T. Road but lacks proper connectivity. The road stretch linking Pallavaram-Thorapakkam ends at Ponds along G.S.T. Road and no link is provided between Thorapakkam Road to Chrompet

Suggestion from Stakeholder. Link should be provided from Ponds road along G.S.T. Road to Chrompet so that people have an easy access from airport to Old Mahaballipuram and Seruseri Roads.

- (ii) Road. NH-Bypass and Outer-ring road in Tambaram do not have proper connectivity.

Suggestion from Stakeholder. NH-Bypass and Outer Ring Road to Maduravoyal at Tambaram can be inter connected or any other option can be worked to reduce the traffic problem.

- (iii) Road. Road from Tambaram Old State Bank Colony to Kishkinta road is in poor condition. In addition, no proper approach road is available.

Suggestion from Stakeholder. Kishkinta theme park is located along the above stretch and if a proper connectivity is done then these areas can be developed.

- (iv) Traffic and Transportation. No proper bus bay and bus stand is provided near Velachery MRTS Station.

Suggestion from Stakeholder. Proper bus bay and bus stand should be arranged at MRTS near the proposed Inner Ring Road between G.S.T. Road and Taramani.

Department: Department of Industries and Commerce**Person:** Er. N. Elangovan, Deputy Director (Technical), Department of Industries and Commerce**Date:** 27/09/2006**Time:** 4.40 PM**Contact No.:** 9444114223

- (i) Industries. Industries lack basic infrastructure facilities like water supply, roads and power, etc.

Suggestion from Stakeholder. Once the new industries are setup, the basic infrastructure facilities like water supply, roads & power should be provided for better development.

- (ii) Solid Waste Management. Present disposal of solid waste especially e-waste is not done properly.

Suggestion from Stakeholder. E-waste concept should be introduced in all IT industries as more IT industries coming up in the project region.

- (iii) Solid Waste Management. No proper mechanism of industrial waste disposal is done. Reuse and recycling of waste is not done.

Suggestion from Stakeholder. Re-use of wastewater should be introduced in all industries and reusable materials like coir, fly-ash brick, etc. should be recycled.

- (iv) Industries. Lack of self-sustained industrial parks/estate.

Suggestion from Stakeholder. Location for industrial park should be identified in such a manner that all processing activities should be done at on place/industrial park. Industrial park should be self-sustained with infrastructure facilities without any dependence on others.

Place: Tambaram MCC (Madras Christian College)

Person: Lecturer Merlin Isac, Department of Economics

Date: 26/09/2006

Time: 10.35 AM

Contact No.: 9841118468

- (i) Storm Water Drains. No proper storm water drains exist in Tambaram as a result most of the areas get flooded during rainy seasons. Many of the drains are encroached and are poorly maintained.

Suggestion from Stakeholder. Construction of proper drains from Tambaram to St. Thomas Mount to avoid flood problem during rainy season is an important measure to avoid flooding.

- (ii) Under Ground Drainage. At present, there is no UGD facility in Tambaram Municipality and there is a delay in implementing the scheme.

Suggestion from Stakeholder. Municipality should implement the UGD scheme as early as possible.

- (iii) Traffic and Transportation. As there is no proper traffic regulation and road arrangement, traffic congestions are more prevalent near Madras Christian College (MCC). The road lacks level crossing.

Suggestion from Stakeholder. Fly-over should be constructed from Hindu Mission Hospital to Tambaram railway station to regulate traffic. A proper arrangement of level crossing near MCC should be provided and a ROB to connect West and East Tambaram to reduce traffic related problems.

- (iv) Solid Waste Management. Present collection and disposal of solid waste is poor in the three towns.

Suggestion from Stakeholder. More number of persons should be involved in solid waste management. A proper waste management should be followed.

Place: Tambaram MCC (Madras Christian College)

Person: Remchy Koshy, HOD, Department of Social Work

Date: 26/09/2006

Time: 11.05 AM

Contact No.: 22790035

- (i) Roads. Major roads passing through towns lack approach roads and also the margins of the roads are reduced due to encroachments.

Suggestion from Stakeholder. Encroachments should be removed and the roads should be widened wherever required.

- (ii) Parks and Playgrounds. Parks and playgrounds are in bad condition and not maintained properly. Few of them are also encroached.

Suggestion from Stakeholder. Encroachments should be removed and the municipality should maintain green spaces properly.

Place: Madras Institute of Technology, Anna University, Chrompet, Chennai -44

Person: C. Senthil Kumar, Lecturer, Department of Aerospace Engineering

Date: 26/09/2006

Time: 12.10 PM

Contact No.: 9444123628

- (i) Traffic and Transportation. The vehicular traffic is more on Chrompet-MIT Bridge as people commuting to Tambaram also uses the bridge. There are no proper traffic regulations.

Suggestion from Stakeholder. Vehicular traffic near MIT should be regulated with proper traffic management arrangements. People commuting to Tambaram should be diverted to G.S.T. Road, which would help in reducing load on the bridge. Task Mark shop near MIT should be removed, construction of Tambaram-Sanitorium Bridge should be completed soon and it should be constructed from Hindu Mission Hospital to Tambaram Railway Station. Proper arrangement of level crossing at MCC-Tambaram should be made.

- (ii) Roads. The width of the road linking Chitlapakkam-Velachery main road with G.S.T. Road near Chrompet-MIT Bridge is less due to encroachments and needs to be widened. The road is not constructed as per the design and lacks proper maintenance.

Suggestion from Stakeholder. Encroachments should be removed and the road should be maintained properly. The existing 40 ft road should be laid as per the suggested design width of 100 ft with proper pedestrian facilities.

- (iii) Roads. Generally, the roads are poorly maintained. Roads are dig many times by departments like highway authorities, electricity board and telephone department, and are not relayed after the completion of the work, which makes the road non-motable.

Suggestion from Stakeholder. An integrated approach by various departments should be followed during formation of the new road. This would minimize frequent digging of roads. Roads, which are dig, should be re-laid properly by the respective departments after the completion of the work.

- (iv) Solid Waste Management. The solid waste collection and disposal is poor. Many of the streets are not swept regularly. The waste is disposed without any treatment.

Suggestion from Stakeholder. A proper waste disposal site should be identified with provision of treatment facilities. The waste should not be dumped on open lands. Street dogs should be given treatment and taken care by municipality so that accidents can be avoided. Self Help Groups can be involved for door-to-door collection and reuse & recycling of waste should be done.

- (v) Electricity. Frequent power cut/failure in Gomathi Nagar and Vasavi Nagar.

Suggestion from Stakeholder. Frequent power cut/failure should be reduced in Gomathi Nagar and Vasavi Nagar.

- (vi) Parks. Parks maintained by promoters and other agencies restrict the entry of lower class people even though parks are meant for people belonging to all sections of the society.

Suggestion from Stakeholder. Municipality should be responsible for the maintenance of parks and open spaces.

- (vii) Traffic and Transportation. Presently, the parking fee collected for parking a vehicle is Rs. 6 per day but receipt/voucher is given for only Rs. 2.50. This results in the loss of revenue to the government.

Suggestion from Stakeholder. Parking fee should be regularized and the receipt/voucher should be given for the amount paid by vehicle owner as per the parking rules.

Place: Madras Institute of Technology, Anna University, Chrompet, Chennai -44

Person: Mr. Elangovan, Asst. Professor, Department of Aerospace Engineering

Date: 26/9/06

Time: 12.40 PM

Contact No.: 22237038

- (i) Roads. Major arterial roads lack approach roads and most of these roads are encroached by street vendors.

Suggestion from Stakeholder. Encroachments should be removed and as far as possible, the roads should be widened.

- (ii) Traffic and Transportation. The three towns lack proper traffic management.

Suggestion from Stakeholder. A comprehensive traffic management plan should be prepared in consultation with various government departments. Strict enforcement of traffic laws and regulations is necessary.

- (iii) Under Ground Drainage. During laying of sewers, roads are dig and damaged and are not relayed properly.

Suggestion from Stakeholder. The roads should be re-laid properly once the work is over.

Place: Department of Planning, SAP, Anna University, Chennai

Person: Dr. V. M. Marudachalam, HOD, Department of Planning, SAP, Anna University, Chennai

Date: 29/09/2006

Time: 10.30 AM

Contact No.: 22203707

- (i) Alandur, Pallavaram and Tambaram are situated very close to Chennai City and come under Chennai Metropolitan Area. The Project towns predominantly act as residential zones especially for people working in Chennai but these three towns lack basic infrastructure facilities.

Suggestion from Stakeholder. Adequate infrastructure facilities should be provided in the Project towns. The facilities should be capable of taking additional load due to increase in migration of people from Chennai City to these towns.

- (ii) Solid Waste Management. The present system of collection and disposal of solid waste is poor. There is no proper designated site for the waste disposal site with treatment facilities.

Suggestion from Stakeholder. Vermin-composting system can be introduced initially in few wards and later on, the entire town can be covered. Social welfare groups should be involved in solid waste management, awareness should be created among people about solid waste management and the concept of reuse and recycle of waste should be brought in. Organic cultivation should be introduced, as there is a good

demand for organic products in the market.

- (iii) Roads. Major roads in the Project towns lack approach roads. Poorly maintained roads in the towns is causing problem in the smooth movement of vehicular traffic.

Suggestion from Stakeholder. Generally, the roads in project towns are in poor condition for example Nanganallur-Minambakkam road in Alandur.

- (iv) Industries. IT industries lack basic infrastructure facilities like water supply, solid waste management, etc. Development of IT corridor would pressurize these three towns in case of infrastructure facilities.

Suggestion from Stakeholder. Provision of infrastructure facilities in these towns should be adequate to hold the pressure from developmental impacts due to the development of IT corridor. Proper institutional and administration arrangements should also be made in providing infrastructure facilities.

- (v) Parks and Playgrounds. Project towns have very limited parks and playgrounds. The existing parks and open spaces are poorly maintained due to lack of funds and manpower.

Suggestion from Stakeholder. Parks can be maintained by banks, NGOs, welfare associations and industries. Due to lack of funds with ULBs, the above-mentioned groups can take up the responsibility to maintain parks and open spaces, for example, construction of a compound wall can be entrusted with one association and another association can be responsible for the provision of infrastructure facilities.

- (vi) The local economy in these three towns is poor and needs exploration. Industries are not set-up based on locally available resources but are more dependent on other places for the manufacture. This hampers or suppresses the potential for the growth of local economic.

Suggestion from Stakeholder. Potential economy of each town should be identified and based on that industries should set up to increase the local economy, for example Bodinayakam is famous for Cardamom and is called as capital city of Cardamom, which is the main economy of the town. The villages from neighboring villages also bring their products to sell in Bodinayakam, which helps to improve the local economy of the town.

Place: Traffic Police Department, Chennai

Person: Mr. K. S. Balasunder, ACP (Traffic Investigation)

Date: 12/12/2006

Time: 10.30 AM

Contact No.: 9840971110

- (i) Anna Salai – M.K.N. Road junction in Alandur needs a pedestrian subway.
- (ii) Halda junction, which has more traffic problem due to all the traffic coming from Guindy Bridge, needs a flyover to be constructed.
- (iii) In Velachery main road near Pallikaranai the encroachment should be removed on

- the bazaar road and the road widening and automatic signals should be provided.
- (iv) Incomplete work in Pallavaram-Thorapakkam Road (100 ft road) at Pallavaram, which links to G.S.T. Road, should be completed as early as possible and the streetlights should be provided on both side of the road.
 - (v) Tiruneermalai road should be widened and it should be connected with Tambaram-Maduravoyal by-pass road.
 - (vi) Tambaram bus stand should be replaced to some open place; this would also help to reducing traffic congestion.
 - (vii) Street lights should be provided at Meenambakkam to avoid accidents
 - (viii) Velachery main road, which links Selaiyur – velachery, should be widened
 - (ix) In Medavakkam main road (Medavakkam to St. Thomas Mount and Alandur Subway) the encroachments should be removed for providing footpaths and two-way traffic should be provided with center median
 - (x) M.K.N. Road should be widened by removing encroachments
 - (xi) Pammal main road should be widened upto Kundrathur
 - (xii) Automatic traffic signal should be provided at English Electrical company, Meenambakkam old airport entrance and in Velachery main road at Kamatchi Amman Koil, Medavakkam bazaar road, Quaide-Milleth College and Sellaiyur near camp road
 - (xiii) The level crossing at Vaishnava College in G.S.T. Road should be removed and the vehicle movement subway should be provided
 - (xiv) Pedestrian subway needs to be provided opposite to Chromepet railway station and automatic signals should be provided along CLC workers road in G.S.T. Road
 - (xv) Signals should be provided along TB hospital, Siddha hospital, Mudichur Road junction, Peerakangranai Police Station opposite to Perungaluthur railway station
 - (xvi) Tambaram-Maduravayal by-pass road compulsorily to be provided with street lights and parking - bay
 - (xvii) Cantonment area from St. Thomas Mount to Pallavaram should be improved in all aspects

B. Voluntary Organizations

513. *The Exnora Club*. The consultants met Mr. K. Perumal (President, Officers Colony Civic Exnora, Adambakkam, Chennai -88), Mr. V. Kuppan (Secretary, Exnora Innovators Club of Adambakkam, Adambakkam, Chennai -88), and Mr. Mathan Mohan (Environmental Engineer) and explained them the need and necessity of their contributions to the project. Based upon our discussion a brief note was prepared by them on different issues related to various sectors like water supply, sewage and sanitation, storm water drains, solid waste management, roads, traffic & transportation, etc., and the same is given below.
514. Report regarding City Corporate Plan for Alandur Municipality sponsored by Tamilnadu Urban Infrastructure Financial Services Ltd. (TNUIFSL), Chennai – 17. We are submitting here with our proposals under various heads to make Alandur Municipality area into a clean green livable condition. For more than a decade, we have been associated with the people and civic conditions of this area. We are involved in community awareness program, etc.
- (i) Water Supply. Since the water supply position has improved Municipality should arrange 24 hours domestic supply by providing additional sump on Adambakkam

side, some more overhead tanks wherever required. Municipal authorities should check the water quality periodically and report to be published for public notice.

- (ii) Sewage and Sanitation. UGD scheme implemented by Alandur Municipality seems to have inadequate. The pumping station at Nilamangai Nagar is not functioning during monsoon. It should be rectified immediately. Still about 25 percent households not given connection, they should be given connections. Public should be strictly warned not to let the bathroom water out side. All storm water drainage should be desilted and cleared. When no sewage, bathroom water are into the storm water drains sufficient rain water harvesting structures can be provided in the storm water drains. Pay and use toilets should be provided sufficiently in the slum area and other public places. Serious mosquito eradication program should be under taken.
- (iii) Solid Waste Management. Supreme Court has already given ultimatum to municipalities to adopt scientific methods for solid waste management. It is obvious that 90 percent of garbage in urban areas is only throwaway plastic carry bags. So once we ban the manufacture of plastic carry bags and insisting the people to use cloth bags. More than 50 percent of solid waste management will be achieved, so that Govt. may be advised to ban the plastic carry bags.

Our Exnoras zero garbage scheme will solve the rest of the problems. Source segregation of biodegradable and non-degradable waste and home composting the biodegradable waste are to be advocated among the public. Even this may be made compulsory by Govt. orders. Govt. encourage self-help group also in this endour. The above two steps are most essential and should be adopted through out the state and country.

- (iv) Roads. The following roads are to be improved in the Alandur Municipal area,
- MKN road – it is a very important link connecting Guindy and Meenambakkam, bypassing congested Kathipara junction. It should be widened to four-lane width.
 - St. Thomas Mount – Medavakkam High Road – it should be widened to four – lane with drain cum footpath on either side
 - The road stretch linking Mount sub-way and Medavakkam High Road via, S. P. Hospital should be widened
 - Long pending inner ring road link from G.S.T. road (Meenambakkam to Velachery) should be formed
 - Pazhavanthangal side approach road (Vembali Amman Koil Street) of Pazhavanthangal sub-way should be widened
 - Meenambakkam sub-way work should be restarted and completed early
 - A link road extending Adambakkam New Colony main road to connect Velachery by-pass (100 ft road) to widened and improved
 - The road stretch linking Thilaiganga Nagar (100 ft Road) and Medavakkam road which connects to G.S.T. road should be restarted and completed early
 - ROB between St. Thomas Mount Station and Guindy (Near Chakrapandi Street) should be restarted and completed early to reduce the traffic problem and the problem due to buffalos which roam at roads should be rectified to reduce the traffic problem.

- (v) Traffic and Transportation. Existing bus terminus near St. Thomas Mount railway station should be shifted to more spacious along the Adambakkam lake bund where encroachments were cleared long back. Roadside parking should be prohibited.
 - (vi) Water Bodies. There are number of water bodies in Alandur area such as Mankulam, Adambakkam, Sivan Koil Kulam, Naganallur Eswarwn Koil Kulam and more prodominantly Adambakkam and Velacheri lakes. All these water bodies should be widened, deepened and restored to their original position. The storage at Thirusooalm during monsoon can be improved can improved by constructing checkdam and this can be treated and used for drinking purposes. The tank located at Sivan temple opposite to St. Thomas Mount railway station has been encroached, so the encroachments should be removed or at least the remaining part should be preserved with rainwater harvesting to avoid the flood problem during rainy season.
 - (vii) Parks and Playground. The encroachments in large area along the Adambakkam lake bund have been removed. This area should be taken over by revenue department and a beautiful park and playground should be developed. More parks should be developed. Massive tree planting should be done in all the street in the Municipal area.
 - (viii) Street Lights. Over-head cables should be changed to under ground cables for all the streetlights in Alandur Municipality area. A separate sub-station for Adambakkam area and more transformer units are to be provided for giving quality power supply.
 - (ix) Burial Grounds. Gasified crematory system in burial grounds have to be provided and burial ground area should be kept clean and green with more trees and flowering plants. The unused burial grounds should be converted as public parks. Municipality should provided sufficient vans for last journey of deceased.
515. Our views and proposals may be considered and suitable reports may be prepared and sent to government for implementation.

Place: State Bank (Old) Colony, Welfare Association, 4-Old S.B.I. Colony, Tambaram West

Person: Mr. Balasubramanian, President, Welfare Association, 4-Old S.B.I. Colony, Tambaram West

Date: 28/09/06

Time: 2.30 PM

Contact No.: 65196596/223632850

- (i) Solid Waste Management. Present disposal of solid waste is not done properly. There is no proper segregation of waste in source; waste disposal is open type, diseases due to mosquitoes, no sufficient dustbins.

Suggestion from Stakeholder. Segregation of waste should be done and it should be reused, nets should be used while the garbage is transferred to the disposal site, sufficient number of dustbins should be provided, Exnora can be introduced in SWM

- (ii) Street Lights. Present maintenance of streetlights is not done properly. No proper maintenance of lampposts, lights, etc.

Suggestion from Stakeholder. Solar energy can be introduced and the proper maintenance should be done by municipality by replacing the damaged lampposts, lights, etc.

- (iii) Parks and Playground. Lack of infrastructure facilities to parks and playground. Poor maintenance of parks and playground.

Suggestion from Stakeholder. Compound wall should be constructed in all parks to avoid the dogs, pigs and other animals and more anti-social activities and infrastructure facilities like water supply, electricity, etc., should be provided.

- (iv) Traffic and Transportation. Shanmuga Road – it is a very important road in Tambaram with more congestion. Very often there will be traffic problem due to Political and other meeting in the main road.

Suggestion from Stakeholder. This problem has to be rectified by avoiding meeting on the main road.

- (v) No proper road network between Tambaram (State Bank Colony) – Kishkinta road. Poor maintenance of roads, pedestrians.

Suggestion from Stakeholder. As the Kishkinta theme park is located and if the proper connectivity is done then these areas can developed as more places are available in these areas, pedestrians should be provided, lorries should diverted from these roads because the width of the road is small and due to this lorries have broken many compound wall of near by areas and it is the most shortest route for Sriprembadur

- (vi) No Proper Maintenance of Water Bodies. Encroachments and sewage are mixed in water bodies.

Suggestion from Stakeholder. Encroachments should be removed and mixing of drainage water in lakes should be stopped, if possible it can be used as source for water supply

- (vii) Storm Water Drains. No proper maintenance of storm water drains. Mixing of sewage water in SWD and closing the drains by dumping the waste in drains, no proper maintenance by municipality.

Suggestion from Stakeholder. Mixing of sewage water in SWD should be stopped; proper maintenance by municipality should be done.

- (viii) General - Markets, Share Autos. Cows roams in market area as they wish which cause problems to the public, high fare of autos for inner areas.

Suggestion from Stakeholder. Entry of Cows in markets should be avoided so that sellers may not beat the cows and there are no bus facilities for inner areas in West Tambaram and auto fare is high, share auto concept can be introduced.

Place: No. 8, 4th Street, Periyar Nagar, Irrumbuliyur, West Tambaram, Chennai - 45

Person: Mr. R. Rathinakumar, President

Date: 30/09/06

Time: 11.30 AM

Contact No.: 22265134 / 9841166895

- (i) Water Supply. No proper water supply facilities in Tambaram. No adequate source, low pressure.

Suggestion from Stakeholder. Desilting of lakes should be done, encroachments should be removed, water saved by rain water harvesting in buildings should be made to flow in lakes, while laying the cement road the proper arrangement should be made for rain water harvesting in road also, same pressure level should be maintained in all areas while laying the distribution network.

- (ii) Storm Water Drains. Present disposal of storm water drain is not done properly. No proper arrangement for storm water drains, mixing of sewage, dumping the waste.

Suggestion from Stakeholder. There should be proper arrangement to divert the rainwater to the water bodies, the mixing of sewage should be avoided, open type drains should be constructed in such a manner that it should be used to flow for both sewage and rain water i.e., one layer for sewage and another for rain water

- (iii) Traffic and Transportation. No proper road network, traffic regulation and transportation. No proper links, maintenance of roads.

Suggestion from Stakeholder. The roads should be laid as per the design because while laying the roads the contractors are not laying the roads according to their specifications so the contractors should put the specifications on the board and keep it in the work site so the public will have awareness about that and see to that work is carried in same manner so that quality of road will be good, heavy vehicles should not allow to pass through residential areas as it would damage the roads

- (iv) Solid Waste Management. Present disposal of solid waste is not done properly. No proper garbage collections in the project towns and no disposal site to dump the waste.

Suggestion from Stakeholder. Awareness should be created among people about SWM by reusing and recycling waste to prepare manure, energy, etc., within 5 sq. ft / 2 to 3 wards combine.

- (v) Parks and Playground. Non-availability of lands for parks & playground and lack of infrastructure facilities. Poor maintenance of Parks, no lands are available.

Suggestion from Stakeholder. As there is no lands available, lands should be

identified by municipality for parks and playground, and it should be maintained with the local support and contribution to provide infrastructure facilities.

- (vi) Streetlights. Present maintenance of streetlights is not done properly. Power shutdown, low voltage.

Suggestion from Stakeholder. Voltage should be maintained by the norms, solar system could be introduced to save energy, automatic power switches can put for on / off of street light.

Place: New Colony Welfare Association, 20-3, 16th Cross Street, New Colony, Chrompet, Chennai -44

Person: Mr. Santhanam, President, New Colony Welfare Association

Date: 28/09/06

Time: 3.30 PM

Contact No.: 9444254850

- (i) Water Supply. Lack of water supply facilities and poor maintenance of water bodies. There is no proper source for water supply and mixing of sewage into water bodies.

Suggestion from Stakeholder. Lakes can be used as source by desilting and protecting from mixing of sewage to water bodies, rainwater harvesting should be given more importance to raise the ground water level. While constructing bridges in lakes proper plan should be done so that during rainy seasons the near by areas should not get affected.

- (ii) Newly developing areas. No proper layouts.

Suggestion from Stakeholder. CMDA should prepare proper layouts with all infrastructure facilities, building rules should be regularized, devolution of power should be with in the local bodies.

- (iii) Electricity. Present maintenance of electricity is not done properly. No sufficient number of transformers and EB bills.

Suggestion from Stakeholder. As the width of roads are very small sufficient number of transformers cannot be provided so widening of roads should be done, EB bills paid by local bodies should taken by Government itself because local bodies are unable to the amount.

- (iv) Markets/Commercial Complexes. No separate markets.

Suggestion from Stakeholder. Multi-Complex should be constructed, separate markets for vegetables and fruits, slaughter houses and fish markets, daily markets in separate places

- (v) Parks, Play Grounds and Burial Ground. Poor maintenance of Parks, play grounds and burial ground.

Suggestion from Stakeholder. Parks, play grounds should be improved and electric crematorium should be provided for all places

- (vi) Solid Waste Management. Present maintenance of solid waste is not done properly. No proper garbage collections in the town and no disposal site to dump the waste.

Suggestion from Stakeholder. Burial grounds and water bodies should not used for dumping the waste separate disposal site should be identified, segregation of waste should be done, waste collection should done daily, society can handled the SWM, awareness should be created among people about SWM by reusing and recycling waste to prepare manure, energy, etc.

- (vii) Storm Water Drains. Present maintenance of storm water drains is not done properly. Mixing of sewage water in SWD and closing the drains by dumping the waste in drains, no proper maintenance by municipality.

Suggestion from Stakeholder. Mixing of sewage water in SWD should be stopped, proper maintenance by municipality should be done.

- (viii) No proper link roads, traffic regulations and transportation. No proper maintenance of roads, signals, bus shelter.

Suggestion from Stakeholder. Internal service roads should be improved, proper signals should be provided (Near MIT bridge), provision of bus shelters at all bus terminals.

- (ix) General. No proper system of Revenue collection by municipality, Community hall. No proper revenue collection system by municipality.

Suggestion from Stakeholder. Tax should be collected at regular intervals and kalyanamandams by government itself and community hall for public meetings

Place: No. 5, Balaji Nagar, Chrompet
Person: Mr. Chandrasekaran, President
Date: 29/09/06
Time: 4.00 PM
Contact No.: 9444074439

- (i) Water Supply. Inadequate water supply facility. No adequate source, 90 lpcd is not provided.

Suggestion from Stakeholder. 90 lpcd should be provided, rainwater harvesting should be given more importance to increase the GL, lakes should be improved to use it as source for water supply, public wells should be maintained properly, lake near Royapetta (Chrompet) is fully mixed with sullage it should be rectified, there should be proper flow arrangement between the lakes so flood can be avoided during rainy season, encroachment should be removed, sufficient OHT should be constructed

- (ii) Under Ground Drainage. Lack of awareness among people about UGD. Only few connections are taken by residences, mosquitoes due to open system of drainage

Suggestion from Stakeholder. All houses should get UGD connections because the people who are not getting connections they allow the sewage to flow into SWD, which will be mixed in, water bodies.

- (iii) Roads, Traffic and Transportation. No proper links, maintenance of roads, bus terminals, ROB's.

Suggestion from Stakeholder. Roads should be strengthen, to avoid traffic ROB or subway can be constructed near Vaishnava College and Radha Nagar (Chrompet) so the that train speed can be increased by closing the level crossing, bus facility to local areas because auto fares are more, on both side of Chrompet railway station autos and car stand can be arranged because it will be easy for the people coming from out station and escalators can be introduced in railway station to help the handicraft peoples.

- (iv) Storm Water Drains. Present maintenance of storm water drain is not done properly. No proper arrangement for storm water drains, mixing of sewage, dumping the waste.

Suggestion from Stakeholder. There should be proper arrangement to divert the rainwater to the water bodies; the mixing of sewage should be avoided.

- (v) Parks and Playground. Poor maintenance of parks, no lands are available.

Suggestion from Stakeholder. As there is no lands are available, lands should be identified by municipality for parks & playground, if possible stadium can be setup, tree plantation along roads to provide green belt through out the city.

- (vii) Streetlight. Present maintenance of streetlight is not done properly. Power shutdown, low voltage.

Suggestion from Stakeholder. Low voltage problem should be given more attention because due to this more fluctuation problems occur which damage more electronics items like computer, TV, etc.

- (viii) Health & Education. No sufficient facilities.

Suggestion from Stakeholder. 2 or more government schools should setup because in private schools fees are more, Tambaram govt. hospital should be upgraded and the ground floor in should be made as parking facility for hospital because during rainy this floor gets flooded, small dispensaries by municipality for first aid because the private hospital charges are more and community hall for public meetings.

Place: 34, State Bank Colony, Adambakkam

Person: Mr. V. Parthasarathy (President) & Mr. P. Muthukrishna Rao (Secretary), State Bank Colony Welfare Association, Adambakkam, Chennai

Date: 29/09/06

Time: 1.00 PM

Contact No.: 22452243/22454790

- (i) Water Supply. Since the water supply position has improved, municipality should arrange 24 hours domestic supply by providing additional sump and more overhead tanks wherever required. No adequate source.

Suggestion from Stakeholder. There is no problem with the system of water supplied by Alandur municipality, hope the alternative days supply is made to daily supply then there will be no problem at all.

- (ii) Under Ground Drainage. Pumping station at Nilamangai Nagar. 70 percent of the area in and around Alandur municipality (Alandur, Adambakkam, Keelkatalai, Madipakkam) is flooded during rainy season because the pumping station designed is not in proper manner

Suggestion from Stakeholder. The design of pumping station should be reworked and some kind of arrangement should be made to avoid the flood during rainy season, the capacity of well should be increased, the pumps setup for pumping the should be capable, there should be right protection in pumping station because during the rainy season water enters into the pumping station and toilet facilities for the workers in pumping station.

- (iii) Roads, Traffic and Transportation. No proper links (Velachery-Adambakkam, Vandikarran Street, Chakarapandi Street, Gnash Nagar- Vandikarran Street & City Link road), maintenance of roads, bus terminals, ROB between St. Thomas Mount and Guindy.

Suggestion from Stakeholder. While digging the road for laying any cable connection it should be properly laid once the work is completed, there should be separate arrangement for each connections for example SWD, UGD, water supply, etc., because if all the connection are laid in same place the mixing of storm water with sewage will take place, bus terminal at NGO colony should be improved because the terminal is not used by government buses it is mainly occupied by the private vehicles and most of the part is used for garbage dumping, and the above mentioned roads need immediate attention for proper linkage, ROB between St. Thomas Mount and Guindy should be restarted and completed earlier.

- (iv) Storm Water Drain. No proper arrangement for storm water drains, mixing of sewage, dumping the waste.

Suggestion from Stakeholder. There should be proper arrangement to divert the water from Kathipara junction at Guindy to Velachery lake, in same manner Alandur subway water should be diverted to the Temple tank opposite to SB hospital, the mixing of sewage should be avoided by creating awareness to people to take UGD connection at all houses

- (v) Parks. Poor maintenance of parks, no lands are available.

Suggestion from Stakeholder. As there is no lands are available, lands should be identified and the private owners should come front to provide lands for park development.

- (vi) General – Taskmark and Hospital. Taskmark is located near temple and school.

Suggestion from Stakeholder. Taskmark should be removed because it is located near the temple and school, government hospital should be constructed at the Eastern part of Adambakkam.

Annexure 9.1: Ward wise Water Supply Assets – Distribution Network

Wards	Year of Construction	Length	Present Market Rate	Depreciated Value
		<i>m</i>	<i>Rs.</i>	<i>Rs.</i>
1	1966, 1996	924	100,151	30,592
2	1966, 1996	135	13,350	219
3	1966, 1996	402	59,653	13,199
4	1996	291	19,814	7,676
5	1966, 1996	471	60,511	17,423
6	1966, 1996	468	50,571	15,579
7	1966, 1996	441	49,656	13,583
8	1996	417	41,237	15,976
9	1966, 1996	1,794	454,451	57,121
10	1966, 1996	1,965	385,164	37,185
11	1966, 1996	1,257	183,648	40,894
12	1966, 1996	966	74,483	23,931
13	1966, 1996	1,236	145,280	30,563
14	1966, 1996	1,077	205,390	24,850
15	1966, 1996	2,499	415,565	127,203
16	1966, 1996	1,299	246,073	38,475
17	1966, 1996	1,635	214,865	79,230
18	1966, 1996	1,887	396,857	93,381
19	1966, 1996	927	149,824	30,682
20	1966, 1996	2,742	309,467	87,199
21	1966, 1996	1,304	128,557	49,806
22	1966, 1996	1,401	133,225	44,317
23	1966, 1996	2,077	230,068	53,744
24	1966, 1996	955	211,554	38,006
25	1996	683	67,562	26,175
26	1966, 1996	1,743	195,921	61,091
27	1966, 1996	1,274	140,634	40,239
28	1966, 1996	918	114,302	25,254
29	1966, 1996	1,308	186,438	26,504
30	1966, 1996	851	112,936	16,853
31	1966, 1996	787	95,463	20,469
32	1996	670	66,256	25,669
33	1966, 1996	1,709	198,929	45,948
34	1966, 1996	6,138	644,706	219,438
35	1966, 1996	2,022	391,426	86,567
36	1966, 1996	1,425	301,648	18,446
37	1966, 1996	1,752	426,412	41,455
38	1966, 1996	2,608	258,103	99,994
39	1966, 1996	543	70,275	11,720
Total		53,000	7,550,423	1,736,660

Annexure 11.1: Abstract of Accounts and Project Cash Flows

Annexure 12.1: Environmental Laws and Regulations Applicable for TNUISL's Projects and their Obligations

Project	Applicable Legislations	Obligations*	Responsibility*
I) Water Supply & Sewage			
<i>A. Water Supply</i>			
1. Water Supply Augmentation	None		
2. Water Supply Distribution Lines	None		
3. Water Tankers	None		
4. Overhead Tanks	None		
5. Water Treatment Plants	Water Act, 1974 Hazardous Chemicals Rules, 1989 Hazardous Waste Mgt. Rules 1999	Secure the following from TNPCB <ul style="list-style-type: none"> • Consent to Establish • Consent to Operate 	ULB / Project Implementing Agency ULB / Operating Agency
6. Upgradation of Head Works	Groundwater Regulation Act 2002	Ensure that the water of the Tanks / water bodies is as per the act and augment ground water level	ULB / Project Implementing Agency
7. Generators	Air Act, 1981 & Noise Rules as per EP Act, 1986	Secure the following from TNPCB <ul style="list-style-type: none"> • Consent to Establish • Consent to Operate 	ULB / Project Implementing Agency ULB / Operating Agency
8. River Intake Works	None		
<i>B. Storm water Drainage</i>			
1. Open drains	None		
2. Closed / Underground drains	None		
<i>C. Sewerage / Sanitation</i>			
1. Only Sewer Net Work	None		
2. Sewerage Network and Pumping Stations	Air Act, 1981& Noise Rules as per EP Act, 1986	Ensure Air and Noise quality is within the stipulated limits of TNPCB	Contractor during construction and ULB / operating agency during operation

Project	Applicable Legislations	Obligations*	Responsibility*
3. Sewerage Network, Pumping Station and Treatment Plant	Water Act, 1974 Hazardous waste Management Rules 1999	Secure the following from TNPCB for treatment plant Consent to Establish Consent to Operate, and Ensure Air and Noise quality is within the stipulated limits of TNPCB	ULB / Project Implementing Agency ULB / Operating Agency Contractor during construction and ULB / operating agency during operation
4. Public Conveniences	None		
5. Pay & Use Latrines	None		
6. Septic Tanks	None		
II) Solid Waste Management			
<i>A. Landfill Sites</i>	MSW Rules, 2000 Air Act, Water Act and EPA	Secure the following from TNPCB • Consent to Establish • Consent to Operate	ULB / Project Implementing Agency ULB / Operating Agency
<i>B. Compost Yard</i>	MSW Rules, 2000 Air Act, Water Act and EPA	Secure the following from TNPCB • Consent to Establish • Consent to Operate	ULB / Project Implementing Agency ULB / Operating Agency
<i>C. Vehicles (More than 5 nos.)</i>	None		
III) Transportation			
<i>A. Roads</i>			
1. Widening of Roads	EIA Notification, 1994 Tamil Nadu Timber Transit Rules, 1968 Air Act, Forest Act, CRZ Notification and EPA	Clearances, consents and Reporting Obtain Permit wherever cutting of trees is involved to transport timber under Rule, 4	ULB / Project Implementing Agency
2. Improvement of Surface			
3. New Roads			
4. Traffic Islands			
5. Road Divider			
6. Foot Paths			
<i>B. Street Furniture</i>	None		
1. Traffic Signals	None		
2. Street Lights	None		
3. Sign Boards	None		

Project	Applicable Legislations	Obligations*	Responsibility*
<i>C. Road Structures</i>			
1. Subways			
- Pedestrian	None		
- Cycle	None		
- Fast Moving	None		
2. ROBs	Air Act, Noise Rules		
3. Culverts	None		
4. Small Bridges	None		
<i>D. Terminals / Shelter</i>			
1. Bus Shelters	None		
2. Bus Terminals/Stand	Water Act, 1974 Air Act, 1981& Noise Rules as per EP Act, 1986	Ensure water, air and Noise quality is within the stipulated limits of TNPCB	Contractor during construction and ULB / operating agency during operation
3. Truck Terminals	Water Act, 1974 Air Act, 1981& Noise Rules as per EP Act, 1986	Ensure water, air and Noise quality is within the stipulated limits of TNPCB	Contractor during construction and ULB / operating agency during operation
4. Workshops	Water Act, 1974 Air Act, 1981& Noise Rules as per EP Act, 1986	Ensure water, air and Noise quality is within the stipulated limits of TNPCB	Contractor during construction and ULB / operating agency during operation
5. Parking Complexes	Air Act, 1981& Noise Rules as per EP Act, 1986	Ensure air and Noise quality is within the stipulated limits of TNPCB	Contractor during construction and ULB / operating agency during operation
<i>E. Fleet Expansion >100 buses</i>	Water Act, 1974 Air Act, 1981& Noise Rules as per EP Act, 1986	Ensure water, air and Noise quality is within the stipulated limits of TNPCB	Contractor during construction and ULB / operating agency during operation

Project	Applicable Legislations	Obligations*	Responsibility*
<i><100 buses</i>	Water Act, 1974 Air Act, 1981& Noise Rules as per EP Act, 1986	Ensure water, air and Noise quality is within the stipulated limits of TNPCB	Contractor during construction and ULB / operating agency during operation
<i>F. Construction & Maintenance Equipment</i>	None		
<i>G. Inland Water Ways / Lakes / Water Bodies</i>	Water Act, 1974 & EP Act, 1986	Ensure water, air and Noise quality is within the stipulated limits of TNPCB	Contractor during construction and ULB / operating agency during operation
IV. Commercial Complexes			
<i>A. Shopping /Office complexes (for < 1,000 persons or with a Sewage Discharge < 50,000 litres per day)</i>	None		
<i>B. Shopping /Office complexes (for > 1,000 persons or with a Sewage Discharge > 50,000 litres per day)</i>	Water Act, 1974	Secure No Objection Certificate from TNPCB	ULB or Project Implementing Agency
<i>C. Vegetable/Fish Markets</i>	Water Act, 1974	Secure No Objection Certificate from TNPCB	ULB or Project Implementing Agency
<i>D. Slaughter Houses</i>	Water Act, 1974	Secure No Objection Certificate from TNPCB	ULB or Project Implementing Agency
<i>E. Marriage Halls</i>	Water Act, 1974	Secure No Objection Certificate from TNPCB	ULB or Project Implementing Agency
<i>F. Lodge / Dormitory</i>	Water Act., 1974	Secure No Objection Certificate from TNPCB	ULB or Project Implementing Agency
<i>G. Municipal Community Complexes (for < 1,000 persons or with a Sewage Discharge < 50,000 liters per day)</i>	None	Secure No Objection Certificate from TNPCB	ULB or Project Implementing Agency
<i>H. Municipal Community Complexes (for > 1,000 persons or with a Sewage Discharge > 50,000 liters per day)</i>	Water Act, 1974	Secure No Objection Certificate from TNPCB	ULB or Project Implementing Agency
V. Non Comm./Community Amenities			
<i>A. Parks</i>	None		
<i>B. Playgrounds</i>	None		

Project	Applicable Legislations	Obligations*	Responsibility*
<i>C. Maternity and Child Centers</i>	None		
<i>D. Educational institution/Reading Room</i>	None		
<i>E. Burial Grounds</i>	None		
<i>F. Electric Crematorium</i>	Air Act, 1981		
VI. Integrated Area Development			
<i>A. Housing (Sites & Services)</i>	Water Act, 1974 & EP Act 1986	Secure No Objection Certificate from TNPCB	ULB or Project Implementing Agency
<i>B. Guided Urban Development</i>	Water Act, 1974 & EP Act 1986	Secure No Objection Certificate from TNPCB	ULB or Project Implementing Agency
<i>C. TRAMP</i>	EP Act, 1986	Secure No Objection Certificate from TNPCB	ULB or Project Implementing Agency
VII. General			
<i>A. Computer Facilities</i>	None		
<i>B. Weigh Bridge</i>	None		
Note: *For Category E 1 or E 2 projects, the obligations and responsibilities as identified in the EAR or generic EMP shall be adhered to, by the respective agencies			

Annexure 12.2: Social Safeguard and Entitlement Framework

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
I – Rural PAPs 1. Loss of Homestead	a) Title holder	1) For the land, the PAP will have two options a) Land for land of equivalent extent, if possible, will be provided and the purchase price will be negotiated between a willing seller and the willing PAP. The project will bear registration charges in addition to paying for land. Or b) Replacement cost in cash for the extent lost as per the guideline value. 2) For the building, the PAP will have two options a) An alternate built house in the resettlement site (resettlement site will be developed provided not less than 20 families opt to move into a particular resettlement site) as per Government norms (as per Indira Awaas Yojana (IAY) norms i.e. Rs. 25,000/- in plain area and Rs. 27,200/- in hilly terrain and difficult places and plinth area not less than 20 sq. m). Or b) Replacement cost for the affected dwelling unit, in cash, calculated based on the scheduled rates of the PWD without depreciation. 3) One time shifting allowance of Rs. 5000/- (as prescribed in NPRR 2003) and 4) Right to salvage material.	Govt/ Sponsor
	b) Encroacher	1) Right to salvage material.	

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
	c) Squatter	<p>1) For the building, the PAP will have two options</p> <p>a) An alternate built house in the resettlement site (resettlement site will be developed provided not less than 20 families opt to move into a particular resettlement site) as per Government norms (as per Indira Awaas Yojana (IAY) norms i.e. Rs. 25,000/- in plain area and Rs. 27,200/- in hilly terrain and difficult places and plinth area not less than 20 sq. m).</p> <p style="text-align: center;">Or</p> <p>b) Replacement cost for the affected dwelling unit, in cash, calculated based on the scheduled rates of the PWD without depreciation.</p> <p>2) One time shifting allowance of Rs. 5000/- (as prescribed in NPRR 2003) and</p> <p>3) Right to salvage material.</p>	
	d) Tenant and lease holder	<p>1) Six month rental allowance to re-establish residence.</p>	

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
2. Loss of Income / Sources of livelihood a) Agricultural	a) Title holder b) Tenant / lease holder / sharecropper	<p>1) The PAP will have two options</p> <p>a) Land for land on the basis of replacement of land on equal basis (1 Ha of dry land for 1 Ha of dry land or ½ Ha of wet land for 1 Ha of dry land), upto a maximum of 3.00.00 Ha of dry land or 1.50.00 Ha of wet land. The purchase price will be negotiated between a willing seller and the willing PAP. The project will bear registration charges in addition to paying for land.</p> <p style="text-align: center;">Or</p> <p>b) A rehabilitation grant (adjusted for inflation every year by the TNUDP) of Rs. 24,661/-* per Ha of dry land lost or Rs. 41,420/- per Ha of wet land lost, upto a maximum of 3.00.00 Ha of dry land or 1.50.00 Ha of wet land.</p> <p>2) In addition, all project affected families will be paid a maintenance allowance of Rs. 1,000/- per month. Payment would start from the date the project takes over the land for construction, when the landowner loses his right to cultivate on the land, and ends with either the possession of replacement land or one year after the payment of rehabilitation grant.</p>	Govt/ Sponsor
	e) Agricultural laborers	1) One time livelihood assistance equivalent to 625 days of minimum wages (as prescribed in NPRR 2003) (minimum wages are fixed by the respective District Collector in accordance with Minimum wages fixed by Ministry of Labor under Minimum Wages Act, 1948. Rates will be revised by TNUDP every year.)	

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
b) Shops and Businesses	a) Title holder	<p>1) For the land, the PAP will have two options</p> <p>a) Land for land of equivalent extent, if possible, will be provided and the purchase price will be negotiated between a willing seller and the willing PAP. The project will bear registration charges in addition to paying for the land.</p> <p style="text-align: center;">Or</p> <p>b) Replacement cost in cash for the extent lost as per the guideline value.</p> <p>2) For the building, the PAP will have two options</p> <p>a) An alternate built shop in the resettlement site (resettlement site will be developed provided not less than 20 families opt to move into a particular resettlement site) of plinth area of 9 sq. m.</p> <p style="text-align: center;">Or</p> <p>b) Replacement cost for the affected shop, in cash, calculated based on the scheduled rates of the PWD without depreciation</p> <p>3) Livelihood assistance</p> <p>a) if income is declared and records of Income Tax returns are available, then a cash grant equivalent to one year income calculated as an average of past three years income</p> <p style="text-align: center;">Or</p> <p>b) if income details are not available, then cash grant equivalent to 750 days (as prescribed in NPRR 2003) of minimum wages (minimum wages are fixed by the respective District Collector in accordance with Minimum wages fixed by Ministry of Labor under Minimum Wages Act, 1948. Rates will be revised by TNUDP every year)</p> <p>4) One time shifting allowance of Rs. 5000/- and</p> <p>5) Right to salvage material</p>	<p>Govt/ Sponsor</p> <p style="text-align: right;">315</p>

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
	b) Encroacher	1) Right to salvage material.	
	c) Squatter d) Tenant / Lease holder	<p>1) For the building, the PAP will have two options</p> <p>a) An alternate built shop in the resettlement site (resettlement site will be developed provided not less than 20 families opt to move into a particular resettlement site) of plinth area of 9 sq. m.</p> <p style="text-align: center;">Or</p> <p>b) Replacement cost for the affected shop, in cash, calculated based on the scheduled rates of the PWD without depreciation</p> <p>2) Livelihood assistance</p> <p>a) if income is declared and records of Income Tax returns are available, then a cash grant equivalent to one year income calculated as an average of past three years income</p> <p style="text-align: center;">Or</p> <p>b) if income details are not available, then cash grant equivalent to 750 days (as prescribed in NPRR 2003) of minimum wages (minimum wages are fixed by the respective District Collector in accordance with Minimum wages fixed by Ministry of Labor under Minimum Wages Act, 1948. Rates will be revised by TNUDP every year)</p> <p>3) One time shifting allowance of Rs. 5000/- and</p> <p>4) Right to salvage material</p>	

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
	e) Employee and Hawker	1) One time livelihood assistance equivalent to 625 days of minimum wages (as prescribed in NPRR 2003) (minimum wages are fixed by the respective District Collector in accordance with Minimum wages fixed by Ministry of Labor under Minimum Wages Act, 1948. Rates will be revised by TNUDP every year.)	
II – Urban PAPs** 1) Loss of Homestead	a) Title holder	<p>1) For the land, the PAP will have two options</p> <p>a) Land for land of equivalent extent, if possible, will be provided. The Government will identify the land and the purchase price will be negotiated between a willing seller and the willing PAP. The project will bear registration charges.</p> <p style="text-align: center;">Or</p> <p>b) Replacement cost in cash for the extent lost as per the guideline value.</p> <p>2) Replacement cost for the affected dwelling unit, in cash, calculated based on the scheduled rates of the PWD without depreciation.</p> <p>3) One time shifting allowance of Rs. 5000/- (as prescribed in NPRR 2003) and</p> <p>4) Right to salvage material.</p>	Govt/ Sponsor
	b) Encroacher	1) Right to salvage material.	

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
	c) Squatter	<p>1) For the building, the PAP will have two options</p> <p>a) Replacement cost for the affected dwelling unit, in cash, calculated based on the scheduled rates of the PWD without depreciation</p> <p style="text-align: center;">Or</p> <p>b) an alternate built house in the resettlement site which will be developed provided not less than 20 families opt to move into a particular resettlement site) as per Government norms (as per Indira Awaas Yojana (IAY) norms i.e. Rs.25,000/- in plain area and Rs. 27,200/- in hilly terrain and difficult places and plinth area not less than 20 sq. m)</p> <p>2) One time shifting allowance of Rs. 5000/- (as prescribed in NPRR 2003) and</p> <p>3) Right to salvage material.</p>	
	d) Tenant and lease holder	1) Six month rental allowance to re-establish residence.	

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
2) Loss of Income / Sources of livelihood a) Shops and Businesses	a) Title holder	<p>1) For the land, the PAP will have two options</p> <p>a) Land for land of equivalent extent, if possible, will be provided. The Government will identify the land and the purchase price will be negotiated between a willing seller and the willing PAP. The project will bear registration charges.</p> <p>or</p> <p>b) Replacement cost in cash for the extent lost as per the guideline value.</p> <p>2) Replacement cost for the affected shop, in cash, calculated based on the scheduled rates of the PWD without depreciation</p> <p>3) Livelihood assistance</p> <p>a) if income is declared and records of Income Tax returns are available, then a cash grant equivalent to one year income calculated as an average of past three years income</p> <p>or</p> <p>b) if income details are not available, then cash grant equivalent to 750 days (as prescribed in NPRR 2003) of minimum wages (minimum wages are fixed by the respective District Collector in accordance with Minimum wages fixed by Ministry of Labor under Minimum Wages Act, 1948. Rates will be revised by TNUDP every year)</p> <p>4) One time shifting allowance of Rs. 5000/- and</p> <p>5) Right to salvage material</p>	Govt/ Sponsor
	b) Encroacher	1) Right to salvage material.	

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
	c) Squatter d) Tenant / Lease holder	<p>1) Replacement cost for the affected shop, in cash, calculated based on the scheduled rates of the PWD without depreciation</p> <p>2) Livelihood assistance</p> <p>a) if income is declared and records of Income Tax returns are available, then a cash grant equivalent to one year income calculated as an average of past three years income</p> <p>or</p> <p>b) if income details are not available, then cash grant equivalent to 750 days (as prescribed in NPRR 2003) of minimum wages (minimum wages are fixed by the respective District Collector in accordance with Minimum wages fixed by Ministry of Labor under Minimum Wages Act, 1948. Rates will be revised by TNUDP every year)</p> <p>3) One time shifting allowance of Rs. 5,000/- and</p> <p>4) Right to salvage material</p>	
	e) Employee and Hawker	1) One time livelihood assistance equivalent to 625 days of minimum wages (as prescribed in NPRR 2003) (minimum wages are fixed by the respective District Collector in accordance with Minimum wages fixed by Ministry of Labor under Minimum Wages Act, 1948. Rates will be revised by TNUDP every year.)	
III. Rural and Urban			
1) Other land	a) Title holder	1) Replacement cost in cash for the extent lost as per the guideline value.	Govt/ Sponsor

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
2) Loss of access to common resources and facilities			
a) Common resources	Unit	1) The affected common resources will be provided / created afresh	Govt/ Sponsor
b) Social and Cultural property	Unit	1) Wherever possible, the property will be relocated in consultation with the community 2) When relocation of the property is not feasible, will be provided afresh	
3) Losses to Host communities			
a) Amenities/Services	(i) Amenities / services	1) Will be entitled to restoration of losses as a result of additional consumption due to resettlement 2) Will be provided amenities/services equivalent to those provided to PAPs	Govt/ Sponsor

Note: * Based on consumer price index for agricultural laborers for Tamil Nadu - September 2003 Index 362.

** If any agricultural land is affected in Urban area, the entitlements prescribed for Rural area will be applicable.

Annexure 13.1: Draft Memorandum of Agreement**DRAFT MEMORANDUM OF AGREEMENT BETWEEN URBAN LOCAL BODY AND
TAMILNADU URBAN INFRASTRUCTURE FINANCIAL SERVICES LIMITED**

Dated _____

THIS AGREEMENT is made on this _____ day of
_____, 2006 _____ between the Tamilnadu Urban
Infrastructure Financial Services Ltd., and Urban Local Body.

WHEREAS the projects identified in the City Corporate Cum Business Plan seeks financial assistance from the TNUIFSL under the World Bank AID.

WHEREAS the projects identified in the City Corporate Cum Business Plan, in pursuance of the requirements for Comprehensive City Development, fully detailed in the City Corporate Cum Business Plan:

AND WHEREAS the comprehensive infrastructure projects identified in the City Corporate Cum Business Plan has to prepare feasibility and detailed project reports:

AND WHEREAS municipality has to implement the reform agenda, as per the timeline indicated in the reform agenda.

AND WHEREAS the projects identified in the City Corporate Cum Business Plan has considered the City Corporate cum Business Plan Report and found them consistent with the goals and objectives of CCP-BP:

NOW THE PARTIES WITNESSED as follows:

1. That the sustainable prioritize infrastructure projects identified in the City Corporate cum Business Plan report will be taken up as given in the Memorandum of Agreement.

(a) _____

(b) _____

(c) _____

2. The TNUIFSL and the Local Body should engage Third party quality control agency to check quality and audit.

3. Local Body is the responsible agency to see the progress of the projects, progress of the ongoing projects and also the implementation of reforms agenda.

4. That the parties to the agreement further covenant that in case of a dispute between the parties the matter will be resolved to arbitration within the provisions of the arbitration and conciliation Act, 1996 and the rules framed there under and amended from time to time. The matter in dispute shall be referred to _____ (Insert a name of an arbitrator) as arbitrator, however, in case such person refuses to act as arbitrator, or is rendered, unable because of sickness or otherwise, or dies, _____ (name of the second person for arbitrator) shall act as arbitrator between the parties and the dispute shall be referred to such person and still in case this second person is not available for any reason to act as arbitrator between the parties, both parties shall name one person of their choice as arbitrator and decision such arbitration shall be final and binding on the parties.

IN WITNESS HEREOF all the parties have put their hands on these presents of Memorandum of Agreement in the presence of witnesses.

WITTNESSES:

1. _____ TNUIFSL

2. _____ Or

Urban Local Body

(Government of Tamilnadu)