

Government of Tamil Nadu
Tamil Nadu Urban Development Fund

City Corporate cum Business Plan

Pallavaram Municipality

FINAL REPORT

October 2007

Wilbur Smith Associates Private Limited

Currency Equivalent

Currency Unity	:	Indian Rupee/s (Re/Rs)
Re. 1.00	:	US\$ 0.022
US\$ 1.00	:	Rs. 45

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
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
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
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
O&M	:	Operation and Maintenance
OHT	:	Overhead Tanks
PAP	:	Project Affected People
PSP	:	Public Stand Post
PWD	:	Public Works Department
SEC	:	Sensitive Environmental Components
SFC	:	Second Finance Commission
SH	:	State Highway
SI	:	Sanitary Inspector
SJSRY	:	Swarna Jayanti Shahari 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
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

1. 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.

2. *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 8.5, 8.6, 8.7 and 8.8**).
- (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:

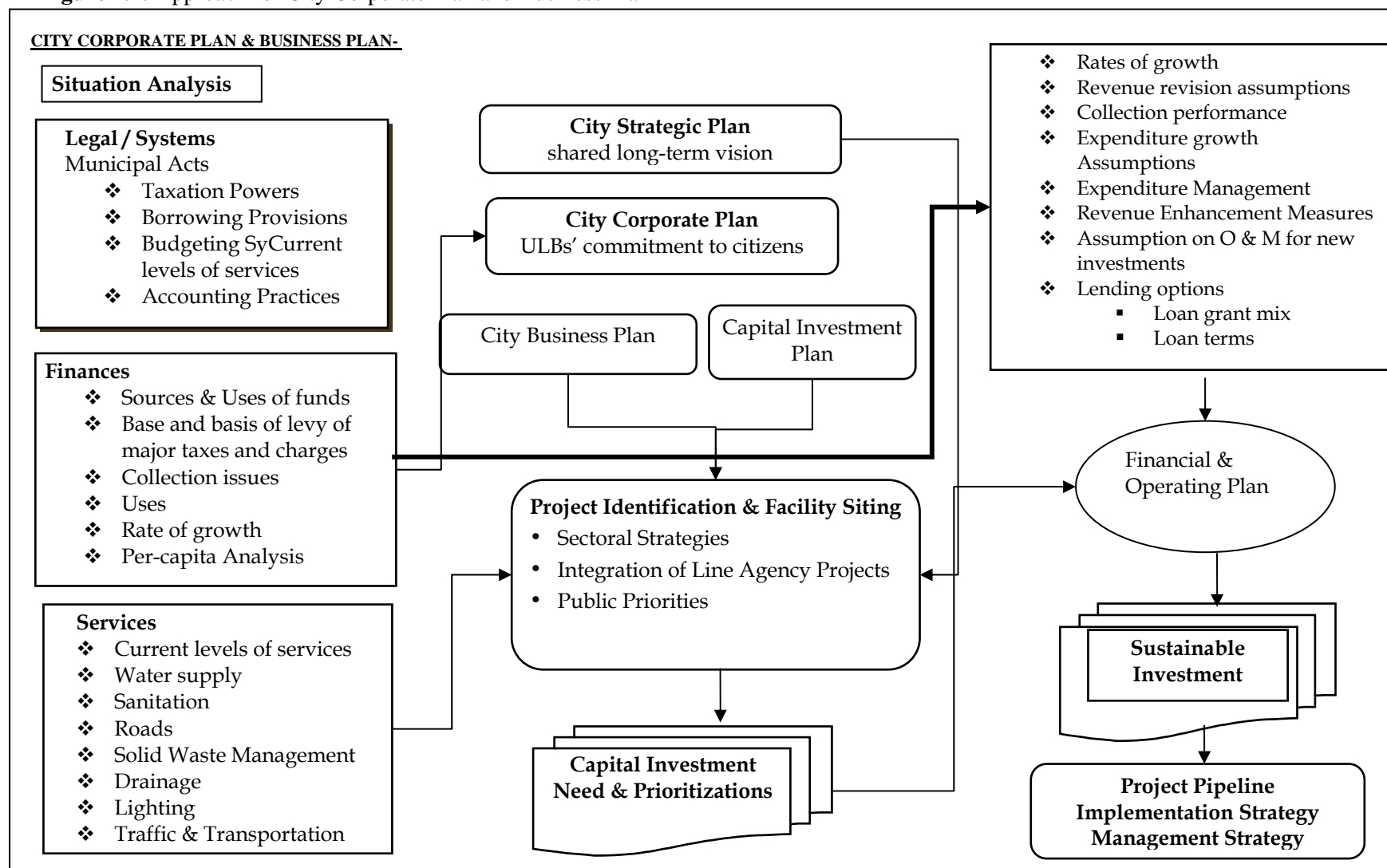
- (i) Infrastructure service delivery to keep pace with and sustain economic growth in the region, and
- (ii) High service levels in the three towns, enabling them to attract population and business to the region, was therefore identified.

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 draft final 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 Pallavaram municipality. The chapter identifies the physical and chemical characteristics of solid waste of both residential and

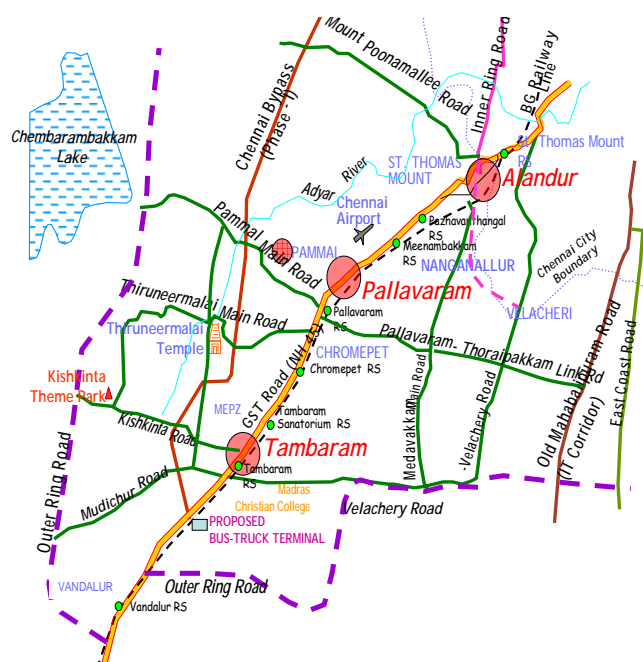
commercial, undertaken on the basis of field surveys.

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.

II. CITY DEMOGRAPHY

A. Geography and Climate

Figure 2.1: Regional Setting



41. Pallavaram is the Third largest urban center in Kancheepuram District. The town is situated at a distance of about 70 km from the district headquarters and 21 km from Chennai.
42. Pallavaram 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.
43. The town is an important part of 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.
44. *Topography.* The general topography of the town indicates a gentle fall from south to north and west to east. It is seen from the contour map of this area, the area in the eastern portion of the Railway track is sloping from west to east and from North to South, Northern part of the municipal area located in the west of Railway track, slopes from East to west and from north to south. Similarly, Southern part of the municipal area in the west of Railway line slopes from East to West.
45. The topography is such that level varies from 4.0 m in North-East to 27 m in North-West. Thus, the town drains largely into North-East. Since there is a gradient slope towards the north east and due to the scattered presence of water bodies, there are no complaints on major water stagnation in the town.
46. *Geology.* In most of the parts in Pallavaram, the top soil is found in the first 1 m followed by Silty clay for 3 m, weathered rock for 3-5 m, fractured rock for 10-25 m and rock below that strata in areas like Zamin Pallavaram, Issa Pallavaram and Keelakatalai area. Hastinapuram area has different strata comprising Lime stone bed below the clay bad unlike fractured rock in other areas.

47. *Climate and Rainfall.* Climate of the town, overall, is temperate and from March to June is generally hot. The district receives maximum rain fall from North-West monsoon and the annual rain fall is 1,124 mm. April to June are the hottest months and the lowest temperatures are recorded during the months of December and January. Temperatures start rising towards the end of February.

Map 2.1: Administrative Wards of Pallavaram

B. Population Trends and Urbanization

48. Pallavaram, being only 22 km from the Chennai City, has always had a significant population trend. Being so proximal to the Chennai City, Pallavaram has become one of the receiving points and has been growing in pace matching Chennai's growth trends. Pallavaram being an industrial center and educational centre has resulted in significant increase in the population every year. Its proximity to Chennai City also contributes in the increase of population the town serves as preferred residential destination for Chennai's population.
49. Present population of Pallavaram municipality is 1, 50,000 as reported in the solid waste management action plan. The growth trend is much higher when compared with the growth rate of Chennai Metropolitan Area (CMA), Chennai Urban Agglomeration (CUA) and the Chennai City, which can be read from the **Table 2.1**. However, due to sharp decline in the population growth rate of Chennai City has effected the CUA's growth rate. There is a sharp decline in the growth rate of Chennai City with 9.76 percent. 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.

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

Parameter	Unit	Year	CMA	Decadal Growth	Chennai City	Decadal Growth	CUA	Decadal Growth	Pallavaram	Decadal Growth
				%		%		%		%
Area	Sq. km		1,177.00		172.00		306.70		18.00	
Population	Lakh									
		1981	46.29		33.17		42.73		0.84	
		1991	59.17	27.82	38.41	15.82	53.41	24.99	1.12	33.33
		2001	75.22	27.13	42.16	9.76	64.25	20.28	1.45	29.28

Source: Census Reports

50. **Table 2.2** shows the population trend of Pallavaram municipality from 1951. The population of Pallavaram municipality has increased from 11,941 in 1951 to 1.5 lakh in 2005. The population of the town as per 2001 census is 1,44,623 with an average growth rate of 29.28 percent. The highest population growth rate of 216.09 percent has been in the year 1971, when the town limits expanded from 3.7 sq. km to 18.7 sq. km adding places like Essa Pallavaram, etc. From 1981, the area of the municipality has been 18.00 sq. km, with 32, 38 and 42 number of wards for the year 1981, 1991 and 2001 respectively. Wards along the railway line and G.S.T. Road have been bifurcated for administrative purposes.

Table 2.2: Population Growth

Year	Area	Population			Decadal Growth Rate
		Male	Female	Total	
	Sq. km	Nos	Nos	Nos	%
1951		6,093	5,848	11,941	
1961	3.7	8,545	7,708	16,253	36.11
1971	18.7	26,776	24,598	51,374	216.09
1981	18.0	43,176	40,725	83,901	63.31

Year	Area	Population			Decadal Growth Rate
		Male	Female	Total	
	Sq. km	Nos	Nos	Nos	%
1991	18.0	57,226	54,640	1,11,866	33.33
2001	18.0	73,385	71,238	1,44,623	29.28
2005				1,50,000*	3.60 [#]

Source: Census of India

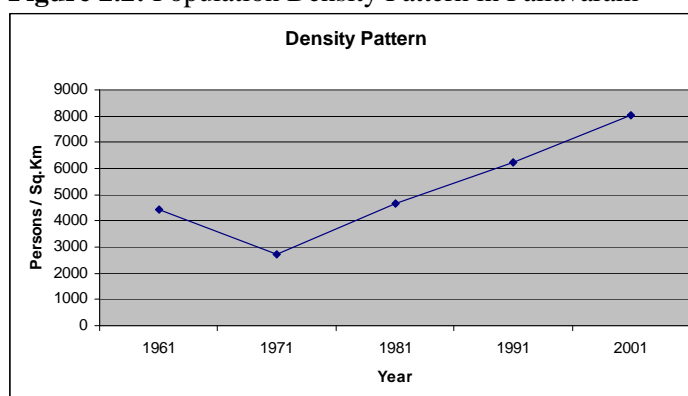
Note: * Population as indicated in the solid waste management report, [#] Growth rate for 4 years.

51. Discussions with the CMDA authorities explicated that, a growth rate of 2.5 percent is envisaged for the year 2026 for Pallavaram while the Chennai City's growth rate is only envisaged between 1.2 – 1.5 percent, clearly emphasizing the roaring growth of this town and its location advantage of being the residential hub of the Chennai City.

Density

52. The town has 42 wards within its administrative boundary with an extent of 18 sq. km. The density pattern of Pallavaram is given in the **Table 2.3**.

Figure 2.2: Population Density Pattern in Pallavaram



53. There has been a sharp decline in density in the year 1971 owing to the expansion in the municipal limits from 3.7 sq. km to 18.70 sq. km. However, the growth rate and density has been steady from 1971 and now works out to be 8,035 persons per sq. km as per 2001 census.

Table 2.3: Population Density

Year	Area	Population	Density
	sq. km	Nos	Persons / sq. km
1961	3.70	16,253	4,451
1971	18.70	51,374	2,746
1981	18.00	83,901	4,661
1991	18.00	111,866	6,215
2001	18.00	144,623	8,035

Source: Analysis

Ward wise Density Pattern

54. Density of wards varies based on its location, proximity to the transportation's modes and available infrastructure. The average density of the wards works out to be 12,222, the highest being 35,168 person per sq. km in Ward 2 and the lowest in ward 18 with 2003 person per sq. km. The ward wise density pattern is presented in **Annexure 2.1**.

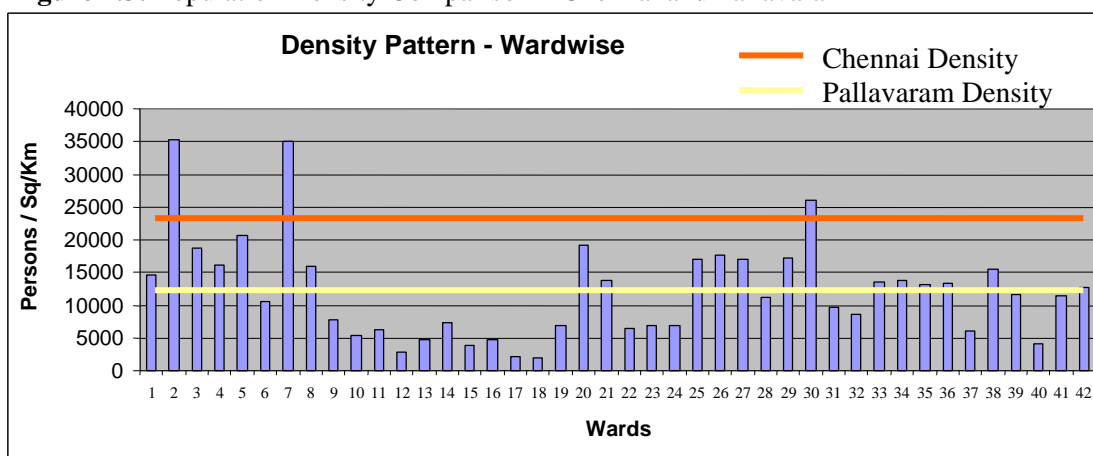
Table 2.4: Summary of Density Pattern

Range	Density Pattern	Wards
<i>Nos</i>		<i>Nos</i>
>20,001	Very High Density	2,5,7,30
15,001 – 20,000	High Density	3,4,8,20,25,26,27,29,38
10,001 – 15,000	Medium Density	1,6,21,28,33,34,35,36,39,41,42
5,001 – 10,000	Moderate Density	9,10,11,14,19,22,23,24,31,32,37
<5,000	Low Density	12,13,15,16,17,18,40

Source: Analysis

55. It has been noted that the density pattern of the city is guided mainly by the G.S.T. Road and the railway station indicating the pattern of a high dense corridor development.
56. The G.S.T. Road is a main access road from Chennai and it separates the municipality into two. Ward Nos 1, 2, 3, 4, 5, 6, 38, 39, 40, 41 and 42 falls on the right hand side of the road from Chennai and has an average density of 17,104 / sq. km. The other wards on the left hand side have an average density of 10,034 persons / sq. km. Wards 25 and 26 have mixed land use pattern and as a result of which these wards have high density. Industrial activity predominates in Ward 42, thus, has medium density. Ward 15 falls under the category of low density because of the predominance of commercial and industrial activities. New residential layouts are coming up in Wards 12 and 18, thus, the density is below 5,000 persons per sq. km. The presence of vacant lands in wards 18, 19 and 22 makes the wards low to moderately dense.

Map 2.2: Population Density Pattern in Pallavaram

Figure 2.3: Population Density Comparison – Chennai and Pallavaram

57. It can be noted from the graph and **Table 2.4** that the wards 2, 5, 7 and 30 have density more than 20,000 person per sq. km. Proximity to the G.S.T. Road or to the railway stations are attributed to the high density in these wards, which closely matches to the density to that of Chennai, which is around 25,000 persons/sq. km. More than 50 percent of the wards have density of more than 10,000 persons/sq. km. There are proposals of huge residential complexes coming up in these wards and it is imperative that, the density in these wards is going to shoot up in less than 5 year's time.
58. The average density of the wards is 12,178 person/sq. km. The wards 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 22, 23, 24, 37 and 40 have a density of around 5,246 person / sq. km. The low density is mainly attributed to the presence of water bodies or to its interior locations. These wards could be considered as potential wards for future development. The density map can be read from **Map 2.2**.

C. Economic Development

1. Economic Structure

59. 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.

60. The work force participation rate of Pallavaram is 34 percent as per the 2001 census, which has increased by 5 percent from 1991. Overall, the major workforce is concentrated in the tertiary sector, i.e., trade and commerce followed by secondary sector. This indicates that the concentration on agricultural practices is less and people are more engaged in transport, trade, and commerce activities. The trend in occupation pattern is presented in the **Table 2.6**.

Table 2.6: Occupational Structure in Pallavaram Town

Year	1971	1981	1991	2001
Population	51,374	83,901	111,866	144,623
Sector				
<i>Primary Sector</i>				
Cultivators & Agricultural Laborers	431	585	550	394
Livestock & Mining	79.00	-	348.00	-
Sub-Total- Primary	510	585	898	394
<i>Secondary Sector</i>				
Household & Industry	5,430	142	11,121	771
Construction	546	-	2,934	-

Year	1971	1981	1991	2001
Sub-Total- Secondary	5,976	142	14,055	771
<i>Tertiary Sector</i>				
Trade & Commerce	2,223	-	6,176	-
Transport & Communication	2,186	-	3,672	-
Other Services/ Other Main Workers	2,556	11,956	7,717	45,069
Sub-Total- Tertiary	6,965	11,956	17,565	45,069*
Marginal Workers	-	202	350	3,557
Total Workforce	13,451	12,885	32,868	49,791
Non- Workers	37,923	61,094	78,615	94,832
Work Force Participation Rate	26%	15%	29%	34%

Source: Census of India

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 2.7**.

Table 2.7: 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

61. **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



View of Ship at Chennai Port

provide such as packaging, landing, pilferage prevention and speedy 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.

62. *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

63. *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.



View of Chennai Airport

64. 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 purposes. 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*

65. *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



View of Manali Petrochemical

exports of the country. Tamil Nadu accounts for 70 percent of leather tanning companies in India and 38 percent of leather foot wear 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.

66. The metropolitan region comprises large automobile engineering, glass and ceramic industries, which are located at Marai Malai Nagar, Irungattukottai, Sriperumbudhur, 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.
67. 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.

68. *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



View of Tidal Park

with more than 90 percent of the exports from Chennai alone. In addition, the initiatives 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

69. Pallavaram has been famous for its tanneries, which is on a decline in the recent years. The other major industries are Leather goods manufacturing, Leather polishing, Pharma and garments. The other industries mainly comprise of automobile fabrication industries and printing industries. Good rail and road connectivity with Chennai and other districts has given a good locational advantage attracting a substantial working population.

4. Population Growth Trends and Projections

70. Population data for the Pallavaram area is available from 1901. However, the area considered for population between 1901-1971 was far less than the present area of 17.41 sq. km. It was only in 1971 that Pallavaram was assigned the status of a municipality. Therefore, population data between 1971-2001 has been selected for analysis and future projection.
71. A critical factor in the design of an underground sewerage system for a locality is the present population and its expected rate of growth. Conventional population projection method such as Arithmetic Increase, Incremental Increase and Geometric Increase are compared with Graphical methods such as Trend Line that adopts polynomial function. Using these methods, population is forecasted for the project horizon year 2036.

The various methods analyzed were

- (i) Arithmetical Increase Method
 - (ii) Geometric Increase Method
 - (iii) Incremental Increase Method
 - (iv) Line of Best-fit Method
 - (v) Semi Log Method
72. Population for 2001, was projected using above methods and the one which gave the nearest to the actual census figure was adopted. Population projection by Arithmetical Increase Method gave the nearest figure to the census figure of 2001. Thus, this method was adopted for population projection of Pallavaram Municipality. The population projection by Arithmetical Increase Method is given below.

Table 2.8: Population Projection Based on Arithmetic Increase Method

Year	Population (Per Census)	Decadal Growth	Projected Population	Percentage Increase
	Nos	Nos	Nos	%
1971	51,374	30,805		
1981	83,901	32,527		39
1991	111,866	27,965	1,14,333	25
2001	144,623	32,118	1,42,298	23

Year	Population (Per Census)	Decadal Growth	Projected Population	Percentage Increase
	<i>Nos</i>	<i>Nos</i>	<i>Nos</i>	<i>%</i>
2011			1,72,730	18
2021			2,03,163	15
2031			2,33,595	13
2036			2,48,812	6

Source: Final Report of Detailed Project Report for Underground Sewerage Scheme for Pallavaram Municipality, Tamil Nadu

D. Socio-Economic Profile

1. Land and Housing

73. As per Census 2001, there are 35,429 census houses, out of which 33,689 are occupied and the remaining 1,740 are vacant. The residences form the major occupied houses in the town with 89.16 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 6 percent of the total occupied census houses.

Table 2.9: Occupied Census Houses

Occupied Census Houses	Numbers	Distribution
	<i>Nos.</i>	<i>%</i>
Residence	30,038	89.16
Residence cum Other Use	333	0.99
Shop, Office	2,022	6.00
School, College, etc.	58	0.17
Hotel, Lodge, Guesthouse, etc.	39	0.12
Hospital, Dispensary, etc.	122	0.36
Factory, Workshop, Workshed, etc.	220	0.65
Place of Worship	115	0.34
Other Non-Residential Use	742	2.20
Total Number of Occupied Census Houses	33,689	100.00

Source: Census Reports

74. Census of Tamil Nadu has classified houses based on the type of roof material, which is detailed out in **Table 2.10**. Like any other towns or cities in India, concrete roof is the most preferred in Pallavaram also. The structures with concrete roof shares about 78 percent of the total census houses followed by roof made of grass, thatch, bamboo, etc., with 12 percent.

Table 2.10: Distribution of Census Houses by Type of Roof

Type of Roof	Numbers	Distribution
	<i>Nos.</i>	<i>%</i>
Grass, Thatch, Bamboo, Wood, Mud, etc	207	12.16
Plastic, Polythene	11	0.65
Tiles	129	7.58
Slate	0	-

Type of Roof	Numbers	Distribution
	Nos.	%
G.I., Metal, Asbestos Sheets	5	0.29
Brick	14	0.82
Stone	1	0.06
Concrete	1,332	78.26
Any Other Material	3	0.18
Total Census Houses	1,702	100.00

Source: Census Reports

75. Based on the type of floor in occupied census houses, the census classification is given in the **Table 2.11**. The use of concrete floor is most preferred with 60 percent of the total occupied census houses followed by the usage of mosaic and other tiles.

Table 2.11: Distribution of Census Houses by Type of Floor

Type of Floor	Number	Distribution
	Nos.	%
Mud	2,174	6.14
Wood, Bamboo	53	0.15
Brick	139	0.39
Stone	62	0.17
Cement	21,195	59.82
Mosaic, Floor Tiles	11,727	33.10
Any Other Material	79	0.22
Total	35,429	100.00

Source: Census Reports

76. Thus, Pallavaram can be considered to house working sector that has reasonably good income.

2. Social Capital

77. *Markets.* The local body is maintaining two daily markets along the station roads of Chrompet and Pallavaram, both of which house about 85 shops. The local body has collected Rs. 5,000 towards the deposit and earns a monthly rental income of Rs. 450 from each shop.
78. *Parks and Playgrounds.* Pallavaram municipality is maintaining 7 parks within its jurisdiction. However, the parks are in bad condition with inadequate seating without walking pavements and need immediate measures to be taken for maintaining a proper green belt and recreational facilities in the town.

3. Health

79. There are two Health Care Centres, one is situated in Zamin Pallavaram and the other one at Old Pallavaram. There are many Private Practitioners in the town having clinics and offering medical services. However, the non-availability of data in this respect has not resulted in any analysis.

4. *Education*

80. The literacy rate in the town is 79.4 percent. The literacy rate in Pallavaram 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. Pallavaram houses government education institutions along with aided and private institutions.
81. Pallavaram houses the prestigious Madras Institute of Technology and two colleges besides Polytechnic and schools. The local body is maintains 5 Elementary school, 3 High schools and 1 elementary Urdu school. In addition, the town has around 46 private schools and colleges.

III. URBAN MANAGEMENT

A. Institutions and Capacity

1. *Institutional Arrangements and Policy Context*

82. *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.

83. 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).
84. *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 Pallavaram.

2. *Service Delivery and Performance of ULB*

85. Pallavaram 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

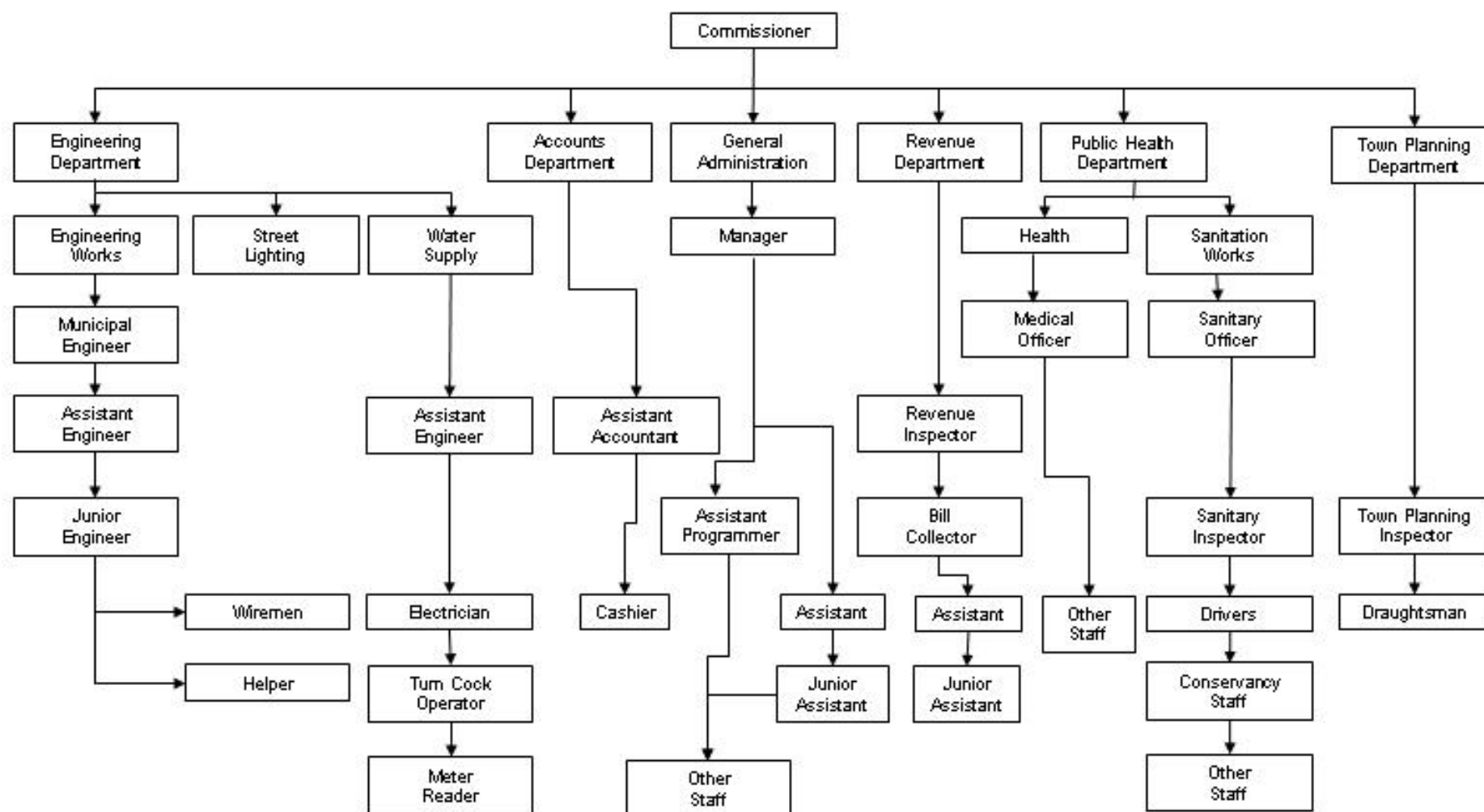
86. Pallavaram municipality is governed by the Tamil Nadu District Municipalities Act, 1920. The municipality is classified as a Selection Grade Municipality. The organizational setup of the municipality comprises of a Political Wing and an Executive Wing. The Political Wing is an elected body of Councilors 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

87. The Municipal Council, the political arm of the municipality consists of 42 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

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

Figure 3.1: Organizational Chart of Pallavaram Municipality

90. Pallavaram 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: Functional Departments

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

91. The following are the set of rules for different departments of the local body:
- The Tamil Nadu Municipal General Service Rules, 1970
 - The Tamil Nadu Municipal Engineering and Water Works Service Rules, 1970
 - The Tamil Nadu Municipal Engineering Service Rules, 1997
 - The Tamil Nadu Municipal Town Planning Service Rules, 1970.
 - The Tamil Nadu Municipal Medical Service Rules, 1970.

General Administration Department

92. 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:
- Public Relations and Redressal of Public Grievances,
 - Appointments and Transfers,
 - Council Subjects,
 - Correspondence,
 - Record Maintenance,
 - Maintenance of Accounts, etc.
93. The General Administration Department is further divided into three sections viz.
- Establishment Section
 - Dispatch/ Typing and Record Maintenance Section, and
 - Accounts Section

Establishment Section

94. An Assistant who reports to the Manager heads the Establishment Section. The responsibilities of this section include
- Appointments
 - Leave Sanctions and Records
 - Correspondence related to Establishment affairs

Despatch, Typing and Records Maintenance Section

95. 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

96. The Accounts section headed by the Chief Accountant carries out functions relating to finances, and accounts of all the Departments except Water Supply and Drainage. The Accounts Section also monitors the grants and State Government transfers and devolution, and manages Debt Servicing, Provident Fund Accounts, Pensions, Salaries, Advances, etc.
97. The Accountant is responsible for the Accounting function of the municipality- his function includes the recording of transactions, maintaining the accounts and compilation of accounts. Two Assistants and eight Junior Assistants assist him in this task. A major function of the Accountant is the preparation of the Annual Budget. The Manager oversees all the activities of this Section.
98. 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

99. The Engineering Department is responsible for all Public Works, and maintenance of civic facilities. This department is responsible for:
- (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)
100. 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.

101. The Municipal Engineer (of Executive Engineer Level) heads the engineering department, and is assisted by junior Engineers 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 and Water Supply, Street Lighting, and one Water Works junior engineer of Head Works.

Functions

102. A major function of the municipality is formulation and execution of Works- like construction and maintenance of roads, buildings and other infrastructure systems.
103. *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.
104. *Maintenance Works.* Maintenance and Repair of existing buildings and infrastructure systems, and construction of Minor Works. 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 who is assisted by four Sanitary Inspectors, 14 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. Four Sanitary Inspectors co-ordinate the entire conservancy works. 14 Sanitary Supervisors and 229 sanitary workers assist them. The sanitary workers sweep the roads and clean choked drains on a daily basis to weekly basis depending upon the prevailing activities. Private contracts were awarded for SWM in certain areas of the town. Markets areas and main roads are cleaned every day.
110. For the transportation of the garbage collected to the disposal point, the municipality employs own and hired trucks. The maintenance and upkeep of the trucks is also the responsibility of the Public Health department.
111. The major functions of the public health department are:
 - (i) Maintaining Vital Statistics
 - (ii) Sanitation and Conservancy
 - (iii) Maternity and Child Welfare,
 - (iv) Maintenance of Municipal Dispensaries
 - (v) Epidemic Control
 - (vi) Maintenance of Slaughter Houses
 - (vii) Maintenance of Burial Grounds

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 and consists of 3 Revenue Inspectors, and 9 revenue assistants.

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, and collect Development Charges and Encroachment Charges etc. The Department is headed by a Town Planning Officer and consists of 2 Town

Planning Inspectors.

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 Pallavaram is only 5 percent. The vacancy rate within departments shows that Engineering Department (Water supply section) has a high vacancy rate of 33 percent followed by Revenue Department with 8 percent. Water supply section is an area of concern, as the vacancy rate is very high and since, this section is responsible for providing one of the most important services (i.e., water supply), the staff in this section may be overloaded.

Table 3.2: Staff Details of Pallavaram Municipality

Item	Staff
Sanctioned Positions	442
Vacant Positions	20
Filled Positions	422
Vacancy Rate %	4.52

Source: Pallavaram Municipality

G. Municipal Financial Management

4. Municipal Fund

119. *Overview.* Pallavaram 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 Tamilnadu 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

123. Revenue income of Municipality has increased to Rs. 1,016.42 lakh in the FY 2003-04 from Rs. 678.62 lakh in FY 2000-01, at an annual growth of 14.41 percent.

Revenue expenditure

increased at an

average annual rate of 1.51 percent from Rs. 538.83 lakh to Rs. 563.64 lakh during the assessment period. The revenue account maintains surplus during the entire assessment period and maintained a maximum surplus of Rs. 452.78 lakh in 2003-04. This is attributed due to water supply and sanitation grants. The trends for the revenue fund are presented in **Table 3.3**.

Figure 3.1: Total Revenue Income and Expenditure Trend

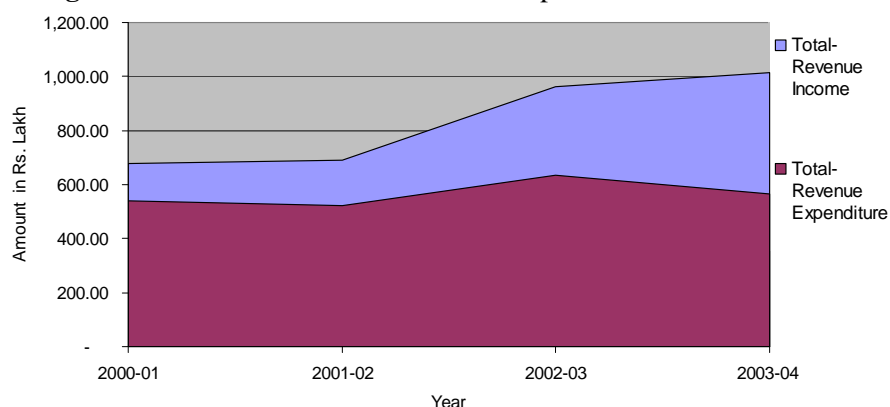


Table 3.3: Summary of Municipal Fund

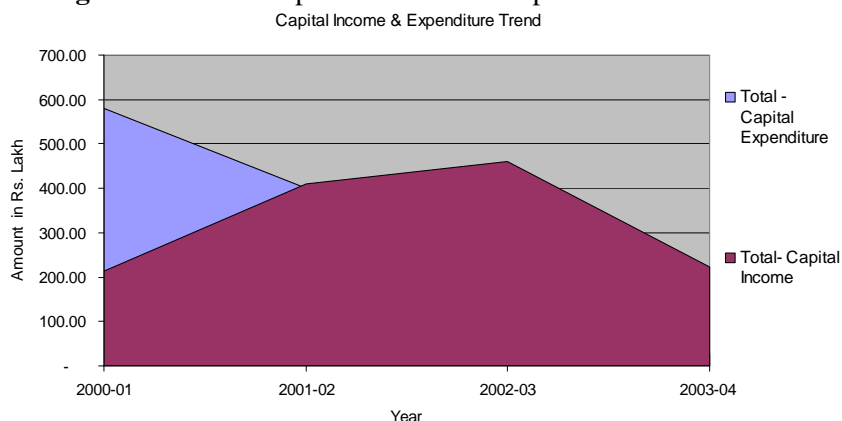
Item	2000-01	2001-02	2002-03	2003-04
	<i>Rs. lakh</i>			
Revenue Account				
Revenue Income	678.62	691.50	963.45	1,016.42
Revenue Expenditure	538.83	523.61	633.77	563.64
<i>Surplus/Deficit</i>	<i>139.79</i>	<i>167.89</i>	<i>329.68</i>	<i>452.78</i>
Capital Account				
Capital Income	212.93	410.21	459.42	223.89
Capital Expenditure	580.59	401.20	158.59	25.79
<i>Surplus/Deficit</i>	<i>(367.67)</i>	<i>9.00</i>	<i>300.83</i>	<i>198.11</i>
<i>Fiscal Status</i>	<i>(318.10)</i>	<i>19.57</i>	<i>472.50</i>	<i>559.66</i>
Advances & Deposits				
Extraordinary Income	141.43	132.40	144.79	132.83
Extraordinary Expenditure	5.22	4.96	6.13	4.56
<i>Surplus/Deficit</i>	<i>136.20</i>	<i>127.44</i>	<i>138.66</i>	<i>128.27</i>
<i>Overall Fiscal Status</i>	<i>(181.90)</i>	<i>147.00</i>	<i>611.16</i>	<i>687.93</i>

Source: Pallavaram Municipality & Analysis.

Note: Figures in parentheses indicate a deficit and above details exclude opening balance

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 loans. The capital account has witnessed surplus except during 2000-01.

Figure 3.2: Total Capital Income and Expenditure Trend

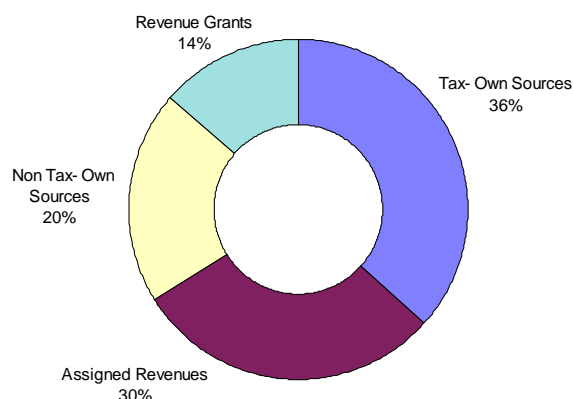


125. The following sections present a detailed review of revenue and capital accounts, primarily aimed at assessing the municipal fiscal status and providing a base for determining the ability of Municipality to sustain the planned investments.

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 3.3: 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 Pallavaram Municipality has increased from Rs. 483.26 lakh in 2000-01 to Rs. 769.82 lakh in 2003-04 – a Compound Annual Growth Rate (CAGR) of about 16.79 percent. The low growth attributed to inconsistent transfer of assigned revenue and state finance commission grants to ULB during the FY 03-04.

Table 3.4: Sources of Revenue Income

Item	2000-01	2001-02	2002-03	2003-04
	<i>Rs. Lakh</i>			
Own Sources				
Tax	180.85	230.41	217.11	283.71
Non Tax	114.52	150.01	121.00	79.90
Assigned Revenue	181.52	136.03	390.16	319.49
Grants	6.37	50.46	86.72	86.72
Total (excl. W&D a/c)	483.26	566.90	814.99	769.82

Source: Pallavaram 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 licences, 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 35.39 percent of the total revenue income during the review period and has increased at an average compounded annual growth rate of 16.19 percent. Tax sources contributed 35.39 percent of the revenue income and non-tax sources contribute 18.85 percent of the revenue income.

Table 3.5: Own Sources of Revenue Income

Item	2000-01	2001-02	2002-03	2003-04
	<i>Rs. Lakh</i>			
Taxes				
Property Tax (excl. W&D tax)	162.31	213.11	197.60	263.24
Profession Tax	18.54	17.31	19.51	20.47
Other Taxes	-	-	-	-
Non - Taxes				
Income from ULB's. properties	2.64	3.66	11.16	0.93
License Income (Trade, etc.)	22.14	22.59	26.44	26.43
Income from Fees and Fines	1.37	1.53	2.60	2.59
Miscellaneous Income	88.37	122.23	80.80	49.95
Total	295.37	380.42	338.11	363.61

Source: Pallavaram Municipality & Analysis.

- *Property Tax:* This is the most important category of own source income to the Municipality. Pallavaram Municipality levies a consolidated property tax of 23 percent of the Annual Rateable Value (ARV). Property tax current

demand has increased at a CAGR of about 3.21 percent during the assessment period.

Figure 3.4: Property Tax Collection Performance

The average collection performance of property tax for the review period is 53 percent and the same is presented in **Table 3.6**. The property tax levied is 23 percent of the Annual Rental Value (ARV) and includes the general tax (12 percent), water and drainage tax (6 percent) and education tax (5 percent). It is observed that the Municipality maintained a low arrear collection, averaging about 32 percent.

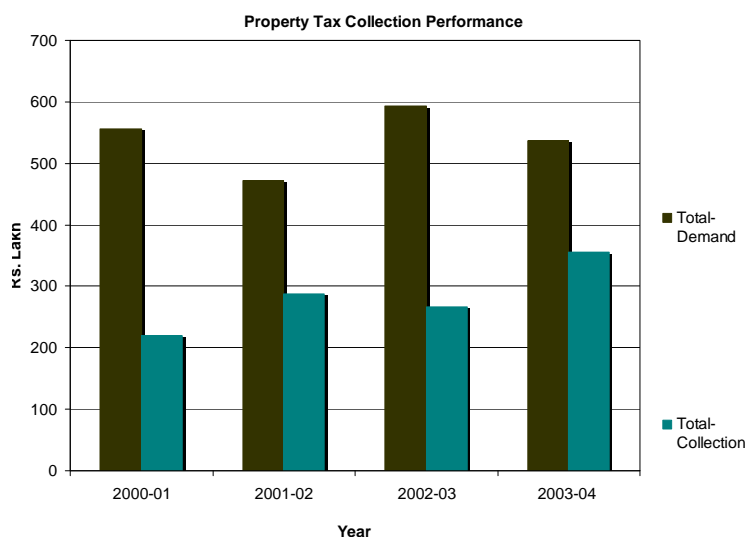


Table 3.6: Property Tax – Demand Collection and Balance Statement

Item	2000-01	2001-02	2002-03	2003-04	2004-05
Demand (Rs. Lakh)					
Arrear	302.30	241.97	269.23	267.76	180.19
Demand	253.98	230.30	324.82	268.58	288.20
<i>Total</i>	<i>556.28</i>	<i>472.27</i>	<i>594.05</i>	<i>536.34</i>	<i>468.39</i>
Collection (Rs. Lakh)					
Arrear	55.83	94.25	41.24	146.23	76.06
Demand	163.77	194.07	226.10	209.92	232.53
<i>Total</i>	<i>219.60</i>	<i>288.32</i>	<i>267.35</i>	<i>356.15</i>	<i>308.59</i>
Collection Performance (%)					
Arrear	18%	39%	15%	55%	42%
Demand	64%	84%	70%	78%	81%
<i>Total</i>	<i>39%</i>	<i>61%</i>	<i>45%</i>	<i>66%</i>	<i>66%</i>

Source: Pallavaram Municipality & Analysis.

The average property tax collection performance of the Municipality has increased significantly during the assessment period. The maximum arrear collection (55 percent) was achieved during the FY 03-04 and the same was as low as 15 percent during FY 03. There are a total of 32,200 assessed properties in the Municipality as of 2004-05. The average ARV per property during the FY 04 is Rs. 3,891 and the average tax per property is Rs. 895.

- **Professional Tax:** The municipality also collects professional tax from all registered organizations, companies or firms, public or private, individuals and State and Central Government departments. Currently, 6,350 assesseees are registered with the Municipality. Based on the demand, the average tax

per professional is about Rs. 470 per annum. Low average arrear collection of 9 percent observed during the review period and the average current collection is around 76 percent during the same period. 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	42.81	43.66	45.16	29.45	32.54
Demand	20.43	21.37	21.73	28.65	29.88
<i>Total</i>	<i>63.24</i>	<i>65.03</i>	<i>66.89</i>	<i>58.10</i>	<i>62.42</i>
Collection (Rs. Lakh)					
Arrear	4.63	3.42	4.79	2.01	4.51
Demand	13.91	15.60	17.31	23.55	27.45
<i>Total</i>	<i>18.54</i>	<i>19.02</i>	<i>22.09</i>	<i>25.56</i>	<i>31.96</i>
Collection Performance (%)					
Arrear	11%	8%	11%	7%	14%
Demand	68%	73%	80%	82%	92%
<i>Total</i>	<i>29%</i>	<i>29%</i>	<i>33%</i>	<i>44%</i>	<i>51%</i>

Source: Pallavaram 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 only 18.85 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 decreased over the assessment period at a CAGR of about 11.30 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 only 0.67 percent of the revenue income during the assessment period and registered a decrease in the CAGR of about 29.44 percent. The average revenue mobilized during the review period under this item head is only Rs. 4.60 lakh.
- (ii) 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>Rs. Lakh</i>			
Entertainment Tax	9.24	2.14	20.92	-
Surcharge on Stamp Duty	172.28	133.88	369.24	319.49
Other Transfers	-	-	-	-
Total	181.52	136.03	390.16	319.49
Share in total Revenue	37.56	23.99	47.87	34.18
Income (%)				
Growth (%)		(25.06)	186.83	(18.11)

Source: Pallavaram Municipality & Analysis.

Income through assigned revenues contributes around 37.73 percent of revenue income and it is growing at an average compounded annual growth rate of 20.74 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 5 cinema halls (with a total capacity of 3,438 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 1.21 percent of total revenue income.
- *Stamp Duty:* Surcharge on stamp duty is another assigned revenue source, accounting for 36.52 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.

- (ii) 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 Pallavaram Municipality, revenue grants and contributions constitute about 8.03 percent of the total revenue income and have registered an average annual growth rate of 138.75 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>Rs. Lakh</i>			
State Finance Commission Grant	4.00	43.36	86.72	86.72
Other Grants	2.37	7.10	-	-
Total	6.37	50.46	86.72	86.72
Share in total Revenue Income (%)	1.32	8.90	10.64	11.26
Growth (%)		691.85	71.87	-

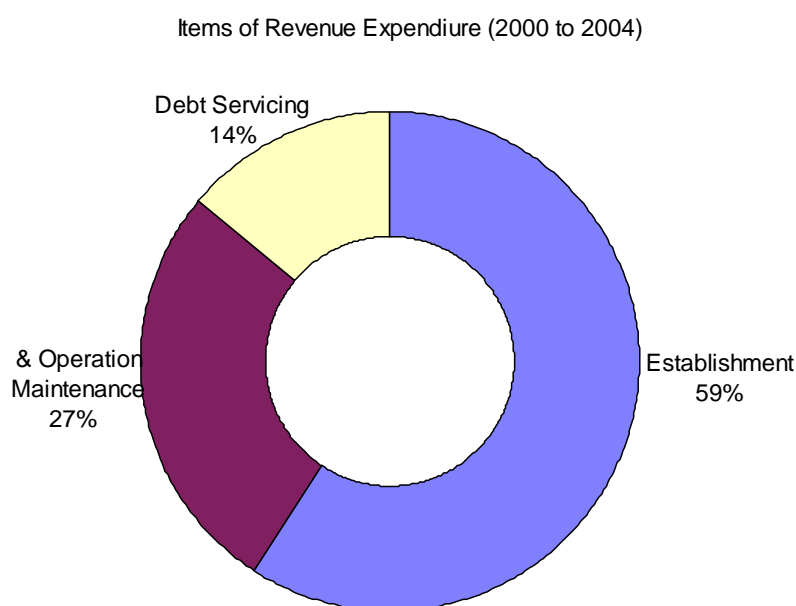
Source: Pallavaram Municipality & Analysis.

Figure 3.5: 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: Sector-wise Revenue Expenditure**

Item	2000-01	2001-02	2002-03	2003-04
	<i>Rs. Lakh</i>			
Establishment	340.20	325.53	368.27	238.01
Operation & Maintenance	59.99	47.68	106.30	66.71
Debt Servicing	49.82	48.36	45.22	170.09
Total (excl. W&D A/C)	450.01	421.57	519.79	474.81
Growth (%)		(6.32)	23.30	(8.65)

Source: Pallavaram Municipality & Analysis.

- (i) Establishment Expenditure. Establishment expenditure alone accounts for about 70 percent of revenue expenditure, excluding water supply and drainage account. About 49 percent of the total revenue income is utilized for payment of salaries excluding water supply and drainage staff salary and other related expenses. About 17 percent utilized for debt servicing undertaken from the general fund during the

review period.

For the assessment period, revenue expenditure grew at an average rate of 1.51 percent; while growth in revenue income was 14.41 percent during the same period. This indicates that revenue and education fund of the Municipality is in surplus position.

Further, while expenditure on establishment grew at annual average rate of 0.87 percent, expenditure on O&M reduced at an average rate of 11.23 percent per annum indicating that municipality has incurred less expenditure towards establishment and operation and maintenance during the assessment period.

Figure 3.6: Sector Wise Salary Composition (2000 to 2004)

The following table presents sector /department wise salary expenditure during the assessment period. Since, the department wise establishment expenditure is not furnished in the account statement (consolidated figures only available in the 2000 series), consultant used the third SFC questionnaires for working out the department wise salary.

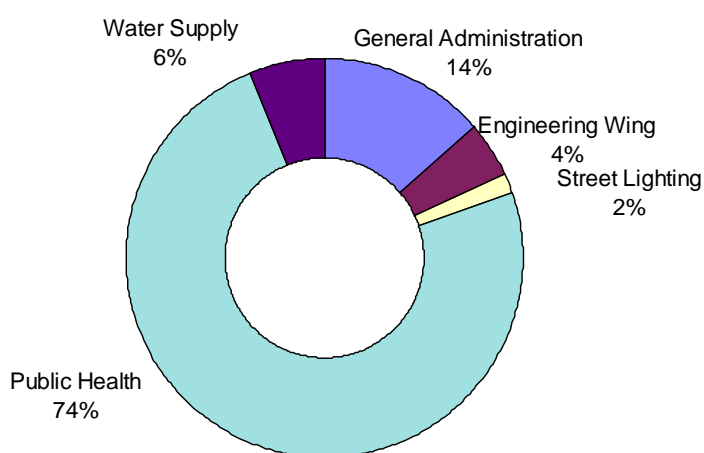


Table 3.11: Sector wise Salary

Item	2000-01	2001-02	2002-03	2003-04
<i>Rs. Lakh</i>				
General Administration	34.02	35.05	31.88	34.42
Engineering Wing	8.50	8.66	10.96	13.32
Street Lighting	3.59	3.69	3.61	4.09
Public Health	171.64	181.23	183.16	187.10
Water Supply	13.23	14.72	14.65	16.29
Total	230.98	243.35	244.26	255.22

Source: SFC Questionnaire Document

Establishment expenditure of all sections (excluding water & drainage account) accounts for an average of 68 percent of revenue expenditure. It is necessary that the Municipality go ahead with such privatization initiatives to improve upon and allocate more amounts for the O&M and debt servicing.

- (ii) Operations & Maintenance. Operation and maintenance expenditure of all sections together accounts for 14.79 percent of revenue expenditure.

Street lighting, public works and roads conservancy are the major expenditure items. A major portion of O&M expenses are towards power charges for street lighting, while that for the upkeep of roads has been very minimal. Privatization of

streetlights has already been initiated and energy conservation measures implemented to curtail the costs on repairs, replacements and power charges.

- (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. 4,133.79 lakh. **Table 3.12** details out the agency-wise outstanding loans.

Table 3.12: Outstanding Loan Statement

Item	Loan Amount	Outstanding
	<i>Amount in Rs. Lakh</i>	
Government of Tamil Nadu	852.67	718.00
TUFIDCO - Road Works - TUFIDCO	90.00	90.00
TUFIDCO	548.30	548.30
TUFIDCO	140.20	72.93
TUFIDCO	71.84	71.84
TUFIDCO	154.16	154.16
TUFIDCO	110.26	108.56
TNUIFSL - ongoing UGD Scheme	2,370.00	2,370.00
Total	4,337.43	4,133.79

Source: Pallavaram Municipality & Analysis.

The total amount of loans drawn by the Municipality till date is Rs. 4,337.43 lakh, majority of it from Government of Tamilnadu. It needs to be mentioned that the ratio of outstanding loans to current demand of property tax is about 1,434 percent. The ratio in terms of ARV (estimated at Rs. 1,253) is 3.30; thereby indicating that the Municipality is just capable of leveraging additional debt to finance its projects as this is below the threshold of 2 to 3 (generally considered by financial institutions).

Debt servicing accounted for around 17 percent of revenue expenditure (including all funds) during the review period and the DSR (as % of revenue income) is around 17 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*

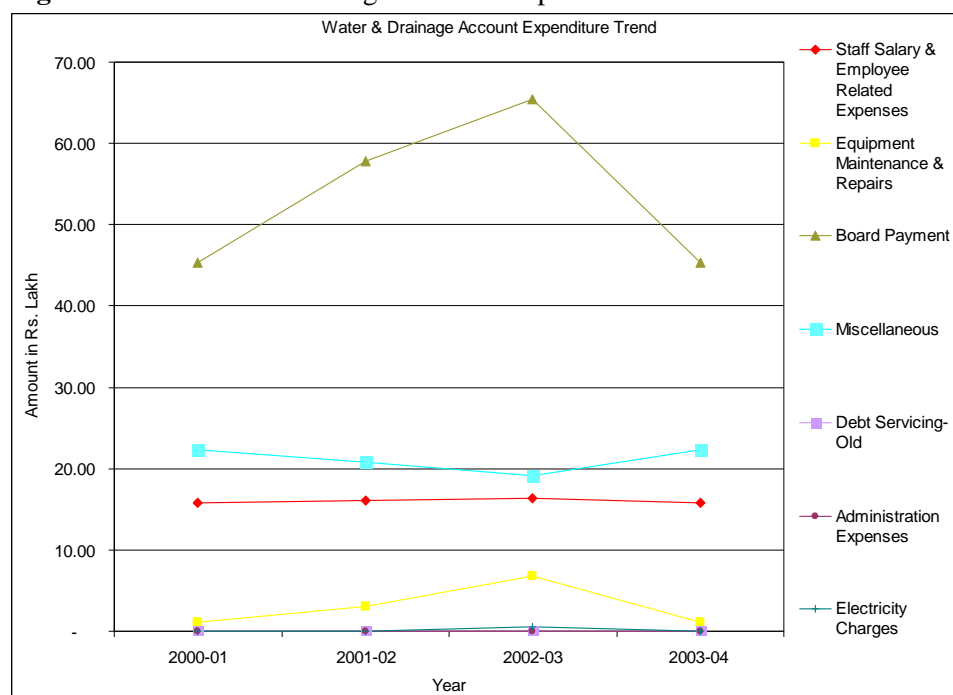
130. As mentioned earlier, local bodies in Tamilnadu maintain a separate water supply and drainage fund. Hence, to maintain the consistency and also to assess the cost recovery aspect, the consultants have analyzed the water fund separately. The details are provided in the following table and the water supply and drainage revenue fund expenditure trend is plotted on a graph.

Table 3.13: Revenue Account Status of Water Supply and Drainage Fund

Item	2000-01	2001-02	2002-03	2003-04
	<i>Rs. Lakh</i>			
Revenue Income				
Water & Drainage Tax	57.29	75.21	69.74	92.91
Water Charges	21.61	38.79	39.90	37.32
Water Supply & Sanitation Grant	116.37	-	-	116.37
Other Income	0.09	10.59	38.82	-
<i>Total</i>	<i>195.36</i>	<i>124.59</i>	<i>148.46</i>	<i>246.60</i>
Revenue Expenditure				
Establishments	15.81	16.12	16.37	15.81
Electricity Charges	-	-	0.56	-
Board Payment	45.38	57.86	65.44	45.38
Miscellaneous	27.64	28.05	31.62	27.64
Debt Servicing- Old	-	-	-	-
<i>Total</i>	<i>88.82</i>	<i>102.04</i>	<i>113.98</i>	<i>88.82</i>
Surplus/Deficit	106.54	22.56	34.48	157.77
Recovery (%) only w/s charges	24%	38%	35%	42%

Source: Pallavaram Municipality & Analysis.

131. 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 54.07 percent board payment for maintenance of scheme, 16.44 percent for establishment expenditure and miscellaneous expenditure accounts for 21.86 percent. No debt servicing was made during the assessment period from water and drainage account.

Figure 3.7: Water and Drainage Account Expenditure Trend

132. Cost recovery in case of only through water supply charges works out to only 35 percent of the revenue expenditure incurred in the water supply and drainage fund account. Major share of water supply income is derived by way of water and drainage taxes, which account for about 44 percent of water supply & drainage income.
133. There are a total of 9,745 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 3.14**.

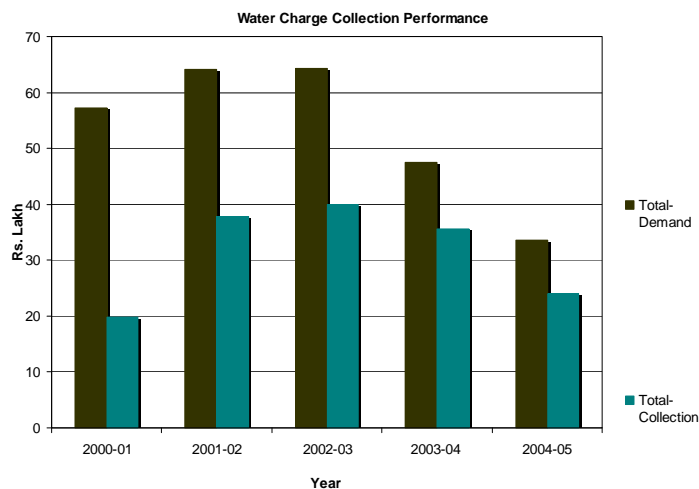
Table 3.14: Water Charges – Demand Collection and Balance Statement

Item	2000-01	2001-02	2002-03	2003-04	2004-05
Demand (Rs. Lakh)					
Arrear	30.21	37.19	37.29	27.09	12.60
Demand	26.95	26.94	26.95	20.34	20.95
<i>Total</i>	<i>57.17</i>	<i>64.13</i>	<i>64.24</i>	<i>47.43</i>	<i>33.55</i>
Collection (Rs. Lakh)					
Arrear	6.73	18.23	19.77	16.65	9.09
Demand	13.15	19.62	20.13	18.93	14.92
<i>Total</i>	<i>19.87</i>	<i>37.85</i>	<i>39.90</i>	<i>35.58</i>	<i>24.01</i>
Collection Performance (%)					
Arrear	22%	49%	53%	61%	72%
Demand	49%	73%	75%	93%	71%
<i>Total</i>	<i>35%</i>	<i>59%</i>	<i>62%</i>	<i>75%</i>	<i>72%</i>

Source: Pallavaram Municipality & Analysis.

Figure 3.8: Water Charge Collection Performance

134. The number of House Service Connections stands at 30 percent of the property tax assessments indicating the lesser numbers of unauthorized connections in the Municipality.



8. Capital Account

135. *Capital Income.* Capital income comprises of loans, grants and contributions. The detailed components of capital income are detailed in **Table 3.15**. An analysis of this account indicates that contributions from capital grants and balance amount in the form of loans is maximum under this account which constitutes about 43 percent of the total capital income followed by about 42 percent of the capital income from own sources. There is also no income realized by the Municipality in the form of sale proceeds.

Table 3.15: Status of Capital Account - General

Item	2000-01	2001-02	2002-03	2003-04
<i>Rs. Lakh</i>				
<i>Capital Income</i>				
Capital Loans	-	90.00	154.16	-
Capital Grants and Contribution	101.85	125.91	131.63	111.82
Own Sources	90.23	157.32	158.01	91.23
<i>Total (excl. W & D a/c)</i>	<i>192.08</i>	<i>373.23</i>	<i>443.79</i>	<i>203.05</i>
<i>Capital Expenditure</i>				
General	92.86	171.50	31.63	-
Public Works and Roads	315.50	175.83	43.09	-
Street Lighting	-	4.27	-	-
Public Health & Conservancy	7.52	-	6.65	-
Education	25.79	28.09	54.42	25.79
Others	-	-	11.91	-
<i>Total</i>	<i>441.67</i>	<i>379.70</i>	<i>135.79</i>	<i>25.79</i>
<i>Surplus/Deficits (excl. W & D a/c)</i>	<i>(249.59)</i>	<i>(6.47)</i>	<i>308.00</i>	<i>177.26</i>

Source: Pallavaram Municipality & Analysis.

136. *Capital Expenditure.* A major share of capital expenditure has been directed towards general purpose includes all item of works excluding water supply and drainage and roads over the past three years, this is due to fact TNUDF/TUFIDCO had funded most of the municipalities for roads during the assessment period. Hence, there is a sudden major jump in spending on roads.
137. Analysis of capital income and capital expenditure notes that the account was in surplus during the FY 02-03 and 03-04 indicating lesser utilization of allocated funds or just start of utilization of allocated funds.
138. Water supply and drainage capital account status is detailed in **Table 3.16** Capital income is mainly from drainage and water supply connection charges, other than that capital grants were also received during the assessment period. The capital account shows a surplus during the entire review period except FY 00-01 and 02-03.

Table 3.16: Status of Water Supply and Drainage Capital Account

Item	2000-01	2001-02	2002-03	2003-04
	<i>Rs. Lakh</i>			
Capital Income				
Capital Loans	-	-	-	-
Capital Grants and Contribution	-	10.66	14.17	-
Own Sources – Water Supply	20.85	26.32	1.45	20.85
Own Sources – Drainage	-	-	-	-
<i>Total</i>	<i>20.85</i>	<i>36.97</i>	<i>15.62</i>	<i>20.85</i>
Capital Expenditure				
Water supply	138.92	14.42	16.63	-
Drainage & Sanitation	-	7.08	6.18	-
<i>Total</i>	<i>138.92</i>	<i>21.50</i>	<i>22.80</i>	<i>-</i>
<i>Surplus/Deficits</i>	<i>(118.07)</i>	<i>15.47</i>	<i>(7.18)</i>	<i>20.85</i>

Source: Pallavaram Municipality & Analysis.

9. Assets and Liabilities

139. Current assets and liabilities of Pallavaram Municipality include monies due to the Municipality from debtors and monies due from the Municipality to creditors, respectively. **Table 3.17** presents a summary of the current assets and liabilities of Pallavaram Municipality.
140. 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. 698.34 lakh.
141. Current liabilities include the payment of power charges due to TNEB, salaries payable, PF and other contributions due, tax /cess payable to government, other payables and deposits. The net liability of Pallavaram Municipality is Rs. 552.11 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 Pallavaram Municipality the current ratio is 1.26, hence, the ULB has a comfortable current ratio.

Table 3.17: Summary of Current Assets and Liabilities Status

Description	Amount (Rs. Lakh)
A. Current Assets	
Property Tax Recoverable	159.80
Profession Tax Recoverable	30.46
Water Charges Recoverable	9.54
License/Lease/Rental/other Recoverable	-
Other Recoverable	48.65
Cash on Hand /Bank	449.88
<i>Total – Current Assets</i>	<i>698.34</i>
B. Current Liabilities	
Salaries Payable	-
PF and Other Contribution	48.40
TNEB	-
Library Cess Payable	64.29
Other Payables	296.36
Recoveries from Staff	64.44
Deposits	78.63
<i>Total – Current Liabilities</i>	<i>552.11</i>
Net Status	146.23

Source: Pallavaram Municipality & Analysis.

10. Key Financial Indicators and Issues

142. A set of key financial indicators has been derived using the financial data procured from the Municipality for the assessment period. **Table 3.18** present these indicators. These indicators are used to assess municipal performance with regard to resource mobilization, fund utilization, financial performance and collection efficiencies.

Table 3.18: Key Financial Indicators

	Indicators	Value	Unit
A	<u>Resource Mobilization</u>		
1	Per Capita Income	572	Rs. p.a
2	Sources of Funds		
a	Share of Own Sources in Total Revenue Income (RI)	56.82	%
b	Share of Property Tax in Total Revenue Income	34.21	%
c	Share of Revenue Grants & Subsidies in Total RI	13.59	%
3	Growth in Revenue Income	14.41	% p.a
4	Growth in Own Sources of Revenue Income	8.19	%
5	Per Capita Own Income	236	Rs. p.a
B	<u>Fund Application</u>		
1	Per Capita Expenditure	387	Rs. p.a
2	Uses of Funds		
a	Share of Establishment Expenditure in Total RE	59.26	%
b	Share of O&M Expenditure in Total Revenue	26.79	%

	Indicators	Value	Unit
	Expenditure		
	c Share of Establishment Expenditure to Total RI	39.88	%
3	Growth in Establishment Expenditure	(6.37)	%
4	Growth in O&M Expenditure	5.40	%
5	Growth in Total Revenue Expenditure	2.38	% p.a
C	Liability Management		
1	Per Capita Liability (2004-05 estimated)		
	a Outstanding Debt per Capita	2,709	Rs.
	b Outstanding Non-Debt Liability per Capita	105	Rs.
	c Total Outstanding Liability per Capita	2,814	Rs.
2	As a Proportion of Property Tax Current Demand (2003-04 estimated)		
	a Outstanding Debt as % of P.T Demand	1,539.13	%
	b Outstanding Non-Debt Liability as % of P.T Demand	59.37	%
	c Total Outstanding Liability as % of P.T Demand	1,598.50	%
3	As a Proportion of Property Tax Own Revenue Income (2003-04 estimated)		
	a Outstanding Debt as % of Own Revenue Sources	837.07	%
	b O/s Non-Debt Liability as % of Own Revenue Sources	32.29	%
	c Total O/s Liability as % of Own Revenue Sources	869.36	%
4	Non-Debt Liability as % of Total Liability	3.71	%
5	Debt Servicing Ratio (D.S/ Revenue Income)	8.94	%
D	Performance Indicators		
1	Operating Ratio	0.69	Ratio
2	Growth in Per Capita Own Income	5.25	% p.a
3	Growth in Per Capita Grant	134.48	% p.a
4	Growth in Per Capita Total Revenue Income	12.37	% p.a
5	Growth in Per Capita Establishment Expenditure	(12.27)	% p.a
6	Growth in Per Capita O&M Expenditure	(0.16)	% p.a
7	Growth in Per Capita Revenue Expenditure	(0.31)	% p.a
8	Capital Utilization Ratio	2.09	Ratio
E	Efficiency Indicators		
1	Tax Collection Performance		
	a Property Tax	53%	%
	b Water Charges	58%	%
	c Sewer Charges	NA	%
	d Profession Tax	34%	%
2	No. of P.T Assessments per Tax Collection Staff	3,578	Nos.
3	Property Tax Demand per Assessment	895	Rs. p.a
4	No. of Municipal Staff per 1000 Population	2.64	Nos.
5	Annual Revenue (Own Source) per Municipal Staff	9.02	Rs. Lakh p.a
6	Population per Residential P.T Assessment	5.24	Persons

Source: Analysis.

143. *Resource Mobilization Indicators.* These indicators summarize the performance of the Municipality with regards sources of funds. Pallavaram Municipality derives about 56.82 percent of its revenue income from own sources, which is average, while grants account for just about 13.59 percent of the revenue income.

144. *Fund Application Indicators.* These indicators are a measure of ascertaining the utilization from the municipal fund. Around 59.26 percent of the revenue expenditure is spent on establishment heads, only about 26.79 percent for O&M of municipal assets and services and only 13.95 percent utilized for debt servicing. Establishment expenditure accounts for about 39.88 percent of the total revenue generated by the Municipality.
145. *Liability Management Indicators.* These indicators are a measure of ascertaining utilization from the municipal fund for debt servicing. The ratio of debt servicing to revenue income is 8.94 percent during the assessment period. The per capita average outstanding debt works out to Rs. 2,709 and per capita non-debt liability is Rs. 105. Outstanding debt to property demand is around 1,539.13 percent and non-debt liability is 59.37 percent times the property tax demand for the current year.
146. *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 0.69. 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. Pallavaram Municipality has demonstrated 12.37 percent annual growth in per capita revenue income during the assessment period, while the per capita revenue expenditure has decreased at 0.31 percent during the same period.
147. *Efficiency Indicators.* These indicators are essentially a measure of municipal efficiency with regard to revenue base coverage and realization. Pallavaram Municipality has maintained an average collection performance, both with regard to property tax and water charges (53 percent and 58 percent respectively). The average population per residential assessment at 5.24 indicates that the property tax base has an average coverage.
148. 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 ULB and then transfers funds (SFC devolution). The ULB 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 ULB, 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:
 - High per capita revenue expenditure witnessed during FY 02-03,
 - Financial transaction trends 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 only 14 percent and 16 percent for expenditure on operation and maintenance of services and debt servicing respectively.

(iv) Efficiency. Key issues regarding collection efficiency comprise:

- Average property tax arrear collection is high (83 percent). Consequently, it leads to adequate fund to meet the operation and maintenance requirements for the town.

IV. PLANNING AND LAND USE MANAGEMENT

A. Planning Efforts in the Past

1. Master Plan Outline

149. 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

150. 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.,
151. 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;

B. Land Use Management

2. Land Use Pattern – Current and Future

152. Pallavaram planning area coincides with the Pallavaram municipal limits and extends to an area of 18 sq. km. Pallavaram town has been famous for leather industries and is popularly known as “Leather Town”. In addition, the town has Tanneries, leather finished goods, textile garment factories. The Railway line divides the town into North-West and North-East parts, the larger part of town being on North-Eastern side. A 200-foot Inner Ring Road originates east of the aforementioned railway line and runs east across Pallavaram and further to connect the G.S.T. Road (NH-49) with Old Mahabalipuram Road near Perungudi. The topography being such that level varies from 27 m in North-West to 4.0 m in North-East. Thus, the town drains largely into North-East and West.
153. The southern bound Villiapuram Railway line and G.S.T. Road transverse through this municipal area, dissecting to Eastern and Western parts. The Western part comprises of about 20 percent of the municipal area while the balance part is located in the eastern of the above said road/railway line. This municipal area includes Kelkattalai Eri, which is occupied by the habitats at the fringe. The unoccupied portion of the lake is to be taken over by CMWSSB as per the G.O. Ms. No. 417, dated 03-09-2003. A 200 ft link road originates from the aforementioned Railway line and runs east across the Kelkattalai Lake to join with the Chennai – Old Mahabalipuram Road near Thuraipakkam.
154. *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.
155. *Growth Direction.* It is evident that the major road corridors comprising National Highways, State Highways and other Major District Roads in the region have great potential for the growth and development.

156. The details of the present land use are not available with the municipality. This data is being cross-checked with CMDA and will be updated.

Table 4.2: Proposed Landuse (2011)

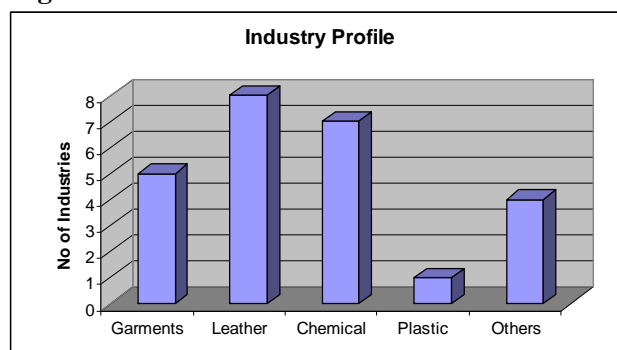
Land use	Area	Distribution
	<i>sq. km</i>	<i>%</i>
Primary Residential	12.51	69.5
Mixed Residential	1.44	8.0
Commercial	0.10	0.6
Institutional	0.29	1.6
Light Industrial	0.18	1.0
General Industry	0.85	4.7
Agricultural	0.77	4.3
Non-urban	0.03	0.1
Water bodies	1.21	6.7
Roads	0.62	3.4
Total	18.00	100.0

Source: CMDA Landuse Map (area extracted using AutoCAD)

157. *Residential.* The town is predominantly residential landuse, with residential areas scattered in all parts of the town constituting about 75 percent of the total area of the town. The new residential areas are developing along N.S.R Main Road, Hastinapuram Main Road, Raman Street, New Colony, Ganapathy Puram, Santhi Nagar, Naidu Shop Road, Garden Wood road, Dargha Road, Medavakkam Main Road, Sakthi Nagar, which would add up 1,500 households by 2006.
158. Residential population is dense along the G.S.T. Road and the railway line, moderate on the West side of G.S.T and towards Southern side and low on the South East due to presence of lakes.
159. *Commercial.* The commercial establishments of the town are classified as retail shops and whole sale trading centers which are mainly concentrated on both sides of G.S.T. Road, Pallavaram Station road (ward no: 6), Chrompet station road (ward no: 25), R.P. Road (ward no: 34,35,36), Radha Nagar road (ward no: 25,26,27), Medavakkam road (ward no: 14), Thiruneer Malai Road (ward no: 3,42). The town caters only to its commercial activities, while Tambaram, the proximal town acts as a commercial hub for the adjoining towns and villages. There are no organized markets in the town.

160. *Industrial.* Pallavaram has been famous for its tanneries, which have been on a decline in recent years. The other major industries are Leather goods manufacturing, Leather polishing, Pharma and garments. There are 8 leather based industries, 5 garment industries, 7 chemical based industries and 1 plastic industry. The other industries mainly

Figure 4.1: Distribution of Industries



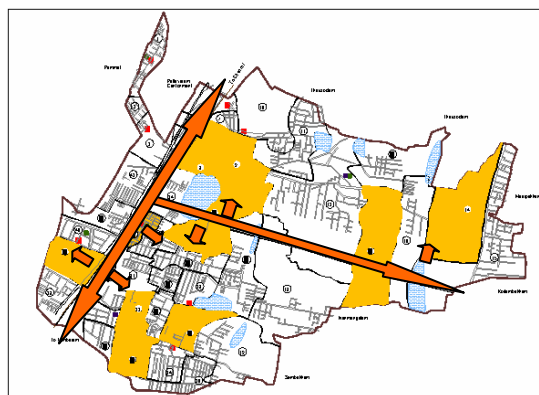
comprise automobile fabrication industries and printing industries.

161. LRC Pharma and TTK Pharma are the two major Pharma industries, having employee strength of more than 100. Leather polishing industries are largely located along the Thiruneer Malai road (ward 3,42), which also attracts a substantial floating population. A few industries are also located in wards 14 and 15.
162. *Institutions.* Pallavaram has always been a famous educational hub with the Madras Institute of Technology and two colleges, besides Polytechnic and schools. The local body maintains six elementary schools, three High schools and one elementary Urdu school. In addition, the town has around 46 private schools and colleges. Institutions occupy about 1.7 percent of the total area of Pallavaram municipality.
163. *Traffic and Transportation.* Roads, road margins, and bus stands and areas under uses related to transportation purposes constitute about 4 percent of the total area of the town.
164. *Water Bodies.* The town is surrounded by several water bodies, which are sources for recharging ground water in the town.
165. *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.
166. *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

Figure 4.2: Growth Direction



167. The growing population and demand for other basic services raises the need for development of the town. The proximity to Chennai and the strategic geographical location of being in the main cordon line of development of Chennai has resulted in potential development of the town. Pallavaram is becoming the preferred residential destination for the people in Chennai and the emergence of huge commercial complexes substantiates the fact.
168. Many new residential areas are developing along the wards 8, 9, 14, 21, 23, 25, 33, 35 and 39, which would add up about 1,500 households by 2006.
169. Growth is expected across the city and mainly concentrated along the G.S.T. Road and the Medavakkam high road, where most of the residential colonies are emerging. The figure above shows the location of the potential emerging wards and the growth pattern in the town.

C. Key Developmental Issues

- (i) Need for a Revised Master Plan for Pallavaram 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.
170. *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,
 - (ii) 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 on both directions.

- (iii) 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 ULBs. Improvement of these roads will provide better inter municipal connectivity between Tambaram and Pallavaram. 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 ends at Tambaram.
- (iv) Missing Links. Two major residential hubs of Pallavaram, namely, Chrompet and Old Pallavaram lack proper connectivity with arterials roads in the area. Hence, it is necessary to identify new links to Thoraipakkam link road from Chrompet and Old Pallavaram.
- (v) Absence of Grade Separated Pedestrian Crossing Facilities. Heavy pedestrian crossing is observed on G.S.T. Road near Pallavaram and Chrompet due to the presence of railway station, bus terminals, institutions and industries in the locality. As the G.S.T. Road carry heavy traffic throughout the day, safe pedestrian crossing facilities are needed at these places.
- (vi) 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

171. The municipality of Pallavaram meets its water supply requirements through surface and sub surface sources. The main source of water for Pallavaram is Palar River at a distance of 64 km from the town. The water is only chlorinated and no treatment facility is available at the source. The source is been maintained by the TWAD board under the Pallavaram - Tambaram combined water supply scheme. The subsurface sources are primarily bore wells.
172. The Pallavaram municipality maintains the distribution system. There are 15 nos of storage reservoirs of combined capacity 6.3 ML, located at various strategic locations within the municipal limits. Water is supplied for alternate days.

B. Source of Water Supply

173. 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.
174. *Surface Water Source.* The primary source of water supply to Pallavaram Municipality is the Palar River. A Combined Water Supply Scheme for Alandur and Pallavaram was designed and implemented to supply Pallavaram with a daily quantity of 5.45 ML. However, the supply is only 3.10 MLD during the normal season and 2.50 MLD during the summer months.
175. The present water supply system was designed in the year 1972 as commissioned in the year 1983 for a design population of 75,147 for 1986 and for an ultimate population of 143,984 at 2001. The beneficiaries are namely Alandur Municipality, Pallavaram Municipality, Pammal, Anakaputhur, Chitlapakkam town panchayat, I.A.F Tambaram Cantonment Board and Vandalur Zoo. This quantity is being tapped from river Palar at two sources viz,
 - (i) Palayaseevaram (11.82 MLD)
 - (ii) Vengudi (10.9 MLD).
176. The scheme is maintained by TWAD board maintenance division, Tambaram.

Map 5.1: Schematic Diagram of Combined Water Supply Scheme

177. The total quantity of water supplied by TWAD in the normal is 3.10 MLD and during summer, it is 2.5 MLD. The average gross per capita supply works out 21 lpd during normal season and 17 lpd during summers (April, May, June and July). The requirement is 27.7 MLD (5 MGD) for intermediate (1986) and 34.05 MLD (7.5 MGD) for the ultimate project year (2001). Due to the ground water potentiality, the quantity has been restricted to 22.72 MLD (5 MGD) for ultimate use also.
178. *Head Work Details.* In River Palar, Infiltration galleries have been provided for a length of 300 m at Palayaseevaram and water is being collected in collection well. A quantity of 4,290 lpm is being pumped by 60 HP turbine pumpsets and conveyed through 600 mm C.I. Main to Devariampakkam sump. In addition to the above, 7 nos of Infiltration wells have been sunk in the above area in Palar river and is collected in a 0.1 ML capacity sump and water is being pumped by 50 HP pumpset through 300 AC main upto Devariampakkam sump. The total quantity extracted from Palayaseevaram head works is 11.81 MLD (2.6 MGD)
179. At Vengudi head works 8 nos of infiltration wells are provided in the Palar River and 1.0 LL of water is collected in sump and pumped by 70 HP pumpset to Devariambakkam sump. The total quantity of water pumped at Vengudi is 10.91 MLD (2.1 MGD). **Table 5.1** gives abstract details of head works.

Table 5.1: Details of Head Works

Type	Unit	Nos.
Palayaseevaram Head Works		
Infiltration gallery	M	300
Manhole wells	Nos	5
Collection well cum Pump house (6 m Dai)	Nos	1
Turbine Pumpsets (60 HP x 4920 lpm x 35m)	Nos	2
Foot Bridge	M	125
Infiltration Wells	Nos	5
Common Sump	ML	0.1
Turbine Pumpset (50 HP x 3500 lpm x 32m)	Nos	2
Vengudi Head Works		
Infiltration wells	Nos	8
Common sump	ML	0.1
Pumpset (70 HP x 9090 lpm x 22m)	Nos	2

Source: Pallavaram Municipality

180. *Water Treatment Plant.* TWAD has not provided the water treatment facility. However, chlorination at source is done. The quantity of chlorine used for the 4.00 LL sump is 5 kg incurring about Rs. 1 lakh per annum. Samples of water are tested at source, storage sump and the distribution system and tested for the parameters once in 3 months at an approved laboratory – Kings Laboratory, Guindy.
181. In Nov 2002, samples from the distribution network within Pallavaram municipal limits were collected by the Department of Water and Sewage Examination, King Institute, Guindy. The laboratory results indicated that the water quality is satisfactory from hygienic point of view. The sample of bleaching powder in use contained only 28.2 percent of available chlorine as against a minimum requirement of 32 percent and hence,

recommended to store the powder in air-tight room or condition to stop its further deterioration.

182. *Other Sources.* There are 312 bore wells with hand pumps and 41 bore wells with power pumps in different parts of the town extracting around 1.47 MLD and 0.41 MLD of water respectively. The average ground water depth in Pallavaram is 9 – 18 m below the ground level and goes down much more during summer. It is estimated that around 1,500 liters of water may be extracted from a bore well in a day.

C. Distribution System

183. The distribution system comprises of storage reservoirs and distribution network. The municipality maintains the distribution system in Pallavaram.
184. *Storage Facilities.* The water is collected in the service reservoir through the feeder mains. Four new elevated service reservoirs (OHT - 1.9 ML Cap.) and four new ground level reservoirs (GLSR - 1.3 ML Cap.) were constructed through the aforementioned improvement scheme.
185. The transmitted water is stored in the newly constructed sumps and pumped to the ELSRs. The location of GLSR's and ELSR's and its respective capacity and levels is presented in the **Table 5.2** and **Table 5.4** respectively. The total capacity is 1.3 ML and 5.0 ML for GLSR and ELSR respectively.

Table 5.2: Storage Reservoir – GLSR's

Storage Reservoir	Year of Completion	Depth of Storage	Diameter	Capacity
	<i>Year</i>	<i>M</i>	<i>M</i>	<i>ML</i>
Sump				
New Colony	2001	3	13	0.40
Munuvar Avenue	2001	2.6	7	0.10
Shanthi Nagar	2001	3	15	0.50
Bharathi Nagar	2001	3	11.3	0.30
Total				1.30

Source: Pallavaram Municipality

186. The water from the source is stored in the sumps and pumped to the tanks as described in **Table 5.3**. It can be noted that, centrifugal pumps are used for pumping water from the sumps to the OHT's. There is also a standby arrangement available at Shanthi Nagar and Bharathi Nagar pumping stations.

Table 5.3: Details of Feeder Mains

Sump	Pump Description	Tanks Pumped
New Colony	Centrifugal type pump set duty 560 lpm x 25m head	Only to New Colony OHT
Munuvar Avenue	NA	Manuvar Avenue OHT
Shanthi Nagar	Centrifugal type pumpset of duty 2760 lpm x 20m head	Shanthi Nagar

Sump	Pump Description	Tanks Pumped
	Centrifugal type pumpset of duty 2500 lpm x 30m head	NGO Colony
	Centrifugal type pumpset of duty 1667 lpm x 20m head	Radha Nagar
	Centrifugal type pumpset of duty 2760 lpm x 30m head	(Standby)
Bharathi Nagar	Centrifugal type pumpset of duty 1400 lpm x 15m head	Bharathi Park
	Centrifugal type pumpset of duty 1500 lpm x 28m head	Chattier Malai (proposal)
	Centrifugal type pumpset of duty 1500 lpm, 28.00 m	(standby)

Source: Pallavaram Municipality

187. There are 11 nos of ESR's and the zoning of water supply is dependent on the location of the ESR.

Table 5.4: Storage Reservoirs – ESR's

Storage Reservoirs	Year of Completion	Average GL	Maximum Water Level	Lowest Water Level	Capacity
	<i>Year</i>	<i>m</i>	<i>m</i>	<i>m</i>	<i>ML</i>
Munvar Avenue		17	32.6	29	0.2
Kannabiran Koil Street					0.5
New Colony	1972	23	36.4	33.4	0.2
Radha Nagar	1972	23	33.4	30.4	0.6
Gayathri Nagar	1990	24.5	26	23	0.5
Shanthi Nagar		21	36.45	33	0.5
Bharathi Nagar	1982	29.5	40	37	0.5
Eswari Nagar	1990				0.3
Nehru Nagar	1982	33.25	42	39	0.5
N.G.O. Colony		16.5	34.95	31.5	0.5
Katcheri Malai	Not functioning	27.6	36.1	32.6	0.7
Total					5.0

Source: Pallavaram Municipality

188. Water is directly pumped from the source to Nehru Nagar, Gayathri Nagar, and Eswari Nagar, Kannapiran Koil Street ESR's.
189. *Distribution Arrangements.* The total length of the distribution network is 130 km, with PVC as the predominant material. It is noted that, almost about 61 km of distribution network was laid during the year 1991 – '06. The abstract of the distribution network is presented in the **Table 5.5**. The water supply distribution network can be read from **Map 5.2**.

Table 5.5: Distribution Network

Diameter	Material	Length	Percentage
mm		<i>M</i>	%
90	PVC	21,142	21.1
110	PVC	71,625	71.5
150	AC	2,695	2.7
250	AC	4,720	4.7
Total		100,182*	100.0

Source: Pallavaram Municipality

Note: * Details of 100.18 km of pipeline is only available in the municipality.

190. *Water Supply Zones.* The town is divided into 11 zones, based on the locations of the tanks across the municipality as seen in the **Map 5.4**. It is noted that about 13,000 people are served from a zone. Wards 14,15,16 are not served with piped water supply due to the damaged OHT at Katcheri Malai and proposal for new tank is under progress. The tanks and its respective service zones are presented in **Table 5.6**.

Table 5.6: Water Supply Zones

Sr. No	Name	Wards Served
		<i>Ward Nos</i>
1	Munuvar Avenue	1,2(part)
2	Kannabiran Koil Street	2 (part),3,4,5
3	New Colony	38,39,40,41,42
4	Radha Nagar	19,22,23,26,27,28,,31 (part)
5	Gayathri Nagar	20,21, 30,34,35
6	Shanthi Nagar	24,25,26,31
7	Bharathi Nagar	9,10,11,12,13,17
8	Eswari Nagar	6,7,8,9
9	Nehru Nagar	32,33,35,36,37
10	N.G.O Colony	21,29,28,22
11	Katcheri Malai	14,15,16,17 (not functioning)

Source: Pallavaram Municipality

191. *House Service Connections.* All the connections are unmetered. There are around 9,745 house serviced connections of which 9,522 (98 percent) are residential connections, 204 (2 percent) commercial connections and 19 industrial connection.

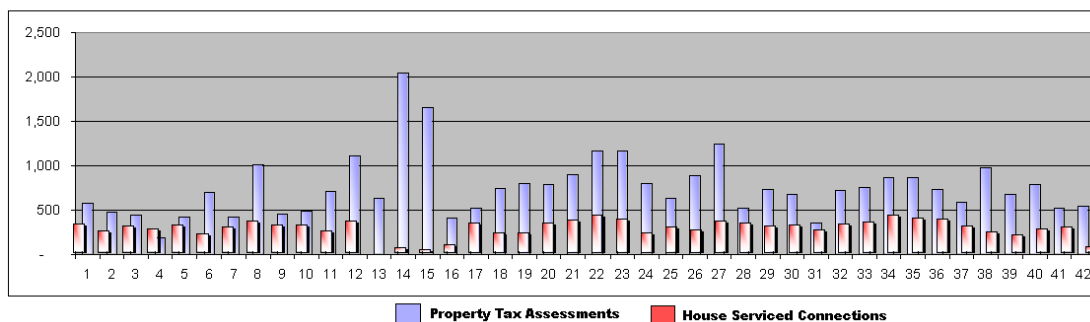
Table 5.7: House Service Connections

Type	No of Serviced Connection	Monthly Tariff	Connection Deposit
	<i>Nos</i>	<i>Rs.</i>	<i>Rs.</i>
Residential	9,522	50.50	5,000
Commercial	204	150.50	10,000
Industrial	19	150.50	10,000
Total	9,745		

Source: Pallavaram Municipality

192. It is noted that, of the total 31,647 property tax assessments, only 30 percent have a serviced connection. Others are either dependent on the public fountains or have their own source.
193. The details of ward wise house service connections and the length of the distribution main are presented in the **Annexure 5.1**. It can be noted that, ward nos 11, 12, 13, 14, 15, 16, 17, 18, 21 and 22 are inadequately covered and has a pipe length of 0 - 65 percent of the total road length. Ward no 15 is fully not equipped with piped water supply. All the other wards are almost fully covered with the piped water supply.
194. *Per Capita Supply*. The gross supply in the town is 3.5 MLD with respect to the total need of about 13 MLD, working with a norm of 90 lpcd. The water is supplied once in two days owing to the shortage in supply from the source. The main issue is that, water from the source is being shared by the way side villages and a leakage loss is also expected through the passage. Thus, the gross per capita supply is just about 21 lpcd during normal season and about 17 lpcd in summers, which is usually in the months of April and May.
195. *Coverage*. The system in place at present is catering to almost 83 percent of the total area of the town. The remaining 17 percent area is provided water by tankers. Against a total of 31,647 assessments and 33,759 households in the town, there are 9,745 Service connections (9,552 domestic connections). The service coverage is 30.18 percent with respect to P.T. Assessments and 28.29 percent with respect to households. This explains the actually low coverage of the service as the no of properties assessed stands at 94 percent of the households.

Figure 5.1: Comparison of Property Tax Assessments vs. Household Service Connections
Property Tax Assessments Vs House Serviced Connections



196. Discussions with the municipal authorities, it was reported that, more than 50 percent of the population and the emerging housing complexes have their own source of water either from the ground wells or the deep bore wells. However, wards 13,14,15,16 and 17 do not have inadequate pipeline coverage thus making them dependent on tanker lorries. The comparison of property tax assessments and house-serviced connection can be read from the **Figure 5.1**.
197. As a whole, the coverage of piped water supply in the town 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.

Map 5.2: Water Supply Connections

198. *Water Tariff.* A monthly tariff of Rs. 50.50 and Rs. 150.50 is laid on the residential and commercial connections respectively. Rs. 5,000 is charged as a new connection deposit for residential connections and Rs. 10,000 for commercial and industrial connections. The water tariff details and the deposit amount can also be read from **Table 5.7**.
199. *Public Fountain.* There are 131 public fountains distributed across the municipality at an average of three public fountains per ward.
200. *Areas Served by Tanker Supply.* Water is supplied through tankers in the unserved areas: viz., ward nos 13, 14, 15, 16 and 17, which have a population of 17,310, which is approximately 13 percent of the total population. Four municipal lorries and seven private tankers are used to cater to these unserved areas. 74 trips are taken up by the lorries, which have a capacity of 0.01 ML, thus, supplying about 0.74 MLD. The ULB spends about Rs. 358 per trip. The water for these tankers is extracted from private wells located at Nanmangalam and Vadakkupattu.

Map 5.3: Water Supply Distribution Network

Map 5.4: Water Supply Zones

Map 5.5: Areas Served by Tankers

D. Ongoing/Proposed Projects

201. There is a proposal for an additional source creation at Palar Basin near Cheyar, which is under progress. Three wells will be dug in the river basin. The municipal share of Rs. 154 lakh is already remitted to TWAD.
202. It is proposed to provide 6 nos of infiltration wells at River Cheyar near Pullampakkam village. These well locations were originally identified for Tambaram WSIS. Now these locations are suggested for Pallavaram and Tambaram improvement scheme by DHG. The sand depth of the proposed well is 10 m to 12 m. Expected yield from each well is 600 lpm. From these wells, 3,600 lpm will be collected in the proposed 2.5 LL capacity at Pullyampakkam. From the proposed sump, the water will be pumped (3,600 lpm) to Deverampakkam. Booster station sump of 3.0 LL capacity thought 350 mm PSC main or a length of 9.43 km and 350 mm CI main for a length of 0.87 km. In order to obtain 4.32 MLD, 20 hours of pumping should be adopted. The proposal envisages the following items of works, presented in **Table 5.8**.

Table 5.8: Proposal for Additional Source

Sr. No	Work	Unit	Value
1	Construction of Infiltration wells (4.5 m x 10 m)	Nos	5
	Construction of Infiltration wells (4.5 m x 8 m)	Nos	1
2	Construction of Sump with 1 hour detention time		
	Capacity	MLD	0.25
	Diameter	M	9.40
	Depth	M	3.65
	AV GL	M	52.125
	F V L	M	50.975
	M W L	M	54.625
3	Construction of Pump room of size 3.0 m x 2.5 m	Nos	3
4	Construction of Pump room of size 7.0 m x 4.0 m	Nos	1
5	Short Raising Main (from Infiltration wells to common sump at Pullampakkam)		
	125 mm C.I LA class (500+300+600+900)	M	2,300
	150 mm CI LA class (1200+1900)	M	3,100
6	Pumping Main		
	350 mm PSC pipes 6 ksc	M	9,430
	350 mm CI LA CL	M	87
7	Pumpsets		
	For infiltration wells (Submersible pumpset with standby) 7.5 HP x 600 lpm x 26m)	Nos	7
	For sump at Pullampakkam (Centrifugal pumpset with standby) 30 HP x 3600 lpm x 22m	Nos	2

Source: Proposal for developing third source at Palar basin, Pallavaram Municipality

203. The total cost for the scheme of works out to be Rs. 333 lakh for the creation of source and Rs. 25.20 lakh for annual maintenance. The cost of scheme is proposed to be met out from the beneficiaries. The annual maintenance cost will be included in the regular maintenance estimate. The scheme is also proposed to be maintained by the TWAD board.

204. There is also a proposal for buying 30 mini-water tanks for Rs. 45 lakh under the MP-LAD.
205. 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.
206. 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 5.9** and **Table 5.10**.

Map 5.6: Water Source Surface and Sub Surface for Chennai Metropolitan Region

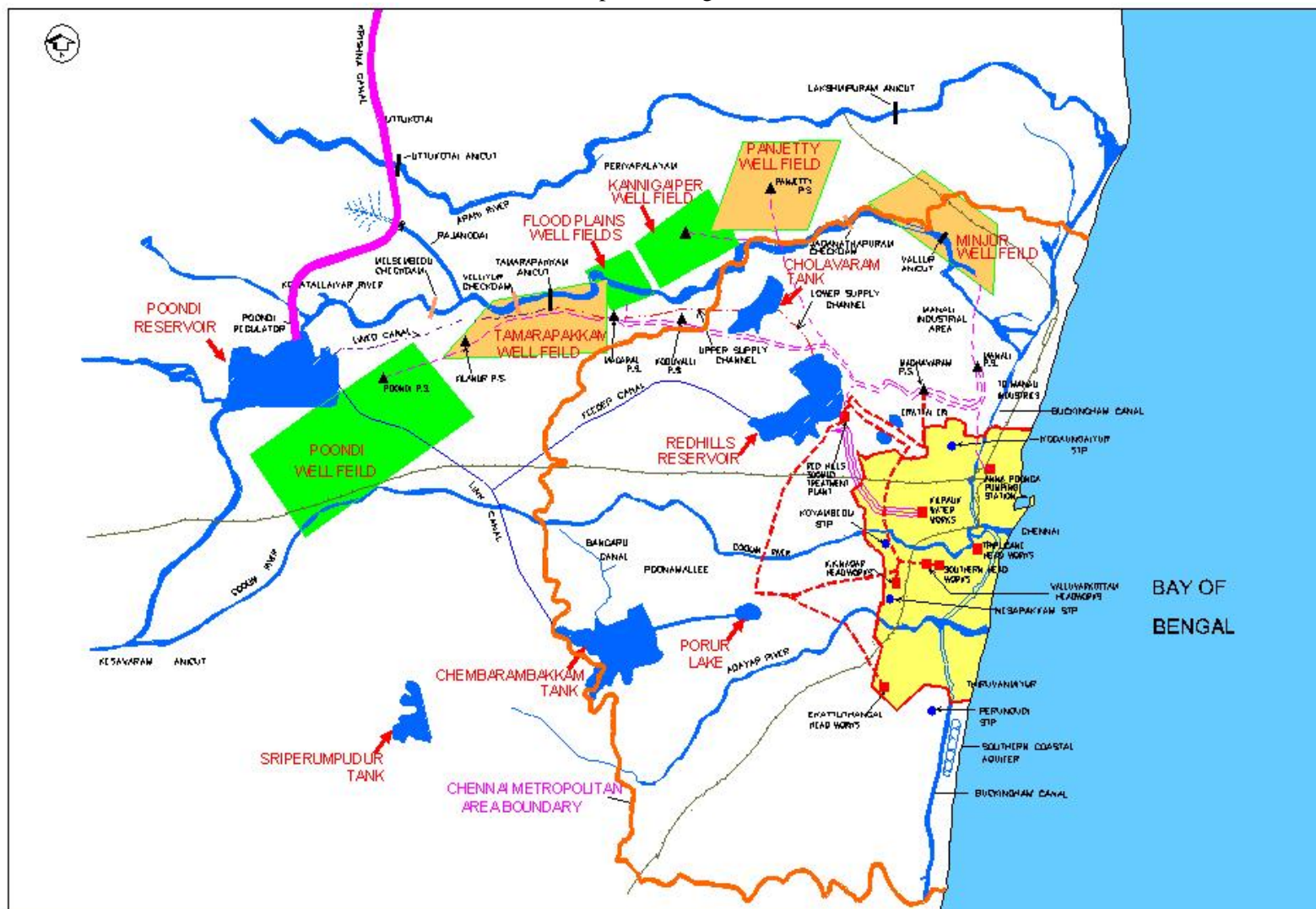


Table 5.9: Assumptions- Water Requirement

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 5.10: 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 Kandaleru, 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 5.11**.

Table 5.11: 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

Sr. No.	Name of Source	Safe Yield
		<i>MLD</i>
7	CWSAP-II (Proposed)	20
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.

E. Key Issues

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

Table 5.12: Performance Indicators

Indicator	Unit	Existing	Norm
Daily Per Capita Supply			
Summer Season	Lpcd	21	90
Normal Seasons	Lpcd	17	90
T & D Losses	%	24-30	<15
Storage Capacity	%	42	33
Supply Frequency	Days	Alternate Days	Daily
Property Tax Assesses / Water Supply Connections	%	30	70

Source: Analysis

- (i) System (Transmission & Distribution) Losses and Unaccounted for Water. About 25 percent to 30 percent transmission and distribution losses due to leakage and water theft in the way side villages and thus, the share of unaccounted for water is large. The gross average supply in the city is 3.5 MLD. This results in the reduction of supply levels and reliability of the service.
- (ii) Source Inadequacy. The static water level in Palayaseevaram head works and Vengudi head works has gone down drastically resulting in appreciable reduction in water drawn from the infiltration gallery and infiltration wells. The present water supply has gone down from 17 MLD to 11 MLD due to failure in monsoon. In Palayaseeveram head works, 11.8 MLD is water is supplied though seven nos of infiltration wells and 300 m length of infiltration gallery. During the month of

December to May, supply has been reduced to 11.8 MLD to 10.00 MLD. At Vengudi head works, 8 nos of infiltration wells are supplying 10.90 MLD. However, during December to May, the supply has been reduced from 10.90 MLD to 6.0 MLD.

- (iii) Conflicts in Operation and Maintenance of the System. Administrative conflicts between the Engineering Department of Pallavaram municipality and TWAD board
- (iv) Inadequate Water Supply. 21 lpcd is provided by the municipality to the population as against a norm of 90 liters per day
- (v) Inequitable Coverage. During the water scarcity period, about 13 percent of the town's population is supplied water through tankers due to the inadequate distribution network.

2. Sewerage and Sanitation

F. Overview

208. The proposed underground sewerage system for Pallavaram is under implementation and was commissioned on January 10, 2006.
209. The town has about 25,000 individual septic tanks as explicated from the Sanitary Officer, which serves as one of the major means of safe disposal of human waste. The septic tanks serve about 80 percent of town's population. In addition, the municipality has provided public conveniences and low cost sanitation units, which serve about 2 percent of town's population. Thus, about 87 percent of town's population has safe disposal facilities and about 7 percent opt for open defecation, which is an area of concern. **Table 5.13** provides details on sanitary facilities in the town.

Table 5.13: Sanitation Facilities

Description	Value
	Nos.
No. of Septic Tanks	25,000
No. of Low Cost Sanitation Units	3
No of Public Toilets	1
No. of Pay & Use Toilets	Nil

Source: Vision Plan of Pallavaram Municipality

210. Most of the houses are provided with aqua-privy along with septic tanks for treatment. Sewage generated flows into the septic tanks and its supernatant overflows causing odor nuisance. The sullage and sewerage water from the households in the town is presently led into drains, which ultimately accumulate as a stagnant pond in the low lying areas, leading to breeding of mosquitoes and unsanitary conditions.
211. A survey conducted in 2000 reveals the under-developed drainage and sewage disposal system prevalent in Pallavaram. **Table 5.14** outlines the system of drainage adopted by type of housing (denoting economic strata) within Pallavaram Municipality.

Table 5.14: Existing Sanitary Facilities and Conditions

Description	Percentage of Each Stratum			
	Hut	Tile Roofing	Concrete	All
Dry Latrine	6.5	52.6	7.2	10.4
Septic Tank w/o soak pit	25.8	26.3	76.2	69.7
Septic Tank with soak pit	-	2.6	14.0	12.5
Open defecation	67.7	18.5	2.6	7.4
Total	100%	100%	100%	100%

Source: Pallavaram Municipality

212. It may be noted from the above table that about 68 percent of the people in huts practice open defecation, however, municipality has taken measures to build low cost sanitation

facilities in hutment and slum areas to improve sanitation.

G. Issues

213. The key issues identified are:

- (i) Dearth of Safe Sanitation Facilities. About 80 percent of the property tax assessments are covered by safe sanitation facilities. With the 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.
- (iv) Mixing of Sewage with Storm water and Solid Waste. Absence of safe and adequate disposal systems has also led to the disposing of sullage and night soil into the storm water drains and other natural water bodies in the town. The town is not having a proper surface drainage system. Sullage sewage and effluent from septic tanks flow into open drains, although natural steep gradient is available, but at many places, drains meet obstructions causing stagnation.

214. As per the analysis of available data, the performance indicators for Pallavaram have been arrived.

Table 5.15: Performance Indicators

Indicator	Unit	Current Situation	Benchmark
% P.T. Assessment Covered with Septic Tanks	%	80	90.0
% P.T. Assessment Covered with LCS	%	7	10.0
% Safe Disposal Facilities	%	87	100.0

Source: Analysis

H. Proposed Underground Drainage System

215. The proposed underground sewerage system for Pallavaram designed by Wilbur Smith Associates Pvt. Ltd is under implementation and commissioned on January 10, 2006.

216. Pallavaram is divided into 13 sewerage sheds or zones, named P1 through P13, with major areas of the town located south west of the main railway line and the G.S.T. Road. Therefore, the proposed sewerage system shall drain the above specified areas (P1-P13) by gravity flow to the extent possible permitting sewers to be laid in accordance with the proposal as listed below:

- (i) Interceptor sewer along the Ring Road to Thuraipakkam.
 - (ii) Main (Trunk) Sewer along the Southwest boundary of the town
 - (iii) Both the above sewers terminate at the Main Sewage Pumping Station (MSPS)
 - (iv) Areas in the Northeast shall drain in two different directions and two Intermediate Sewage Pumping Stations (SPS) are designed for this area.
 - (v) Pumping main / trunk sewer shall cross the G.S.T. Road / NH-45 at three places and through proposed culverts to be constructed below the Chennai-Trichy Railway line
217. The proposed sewerage system was to be designed for the targeted population of about 2,48,812 in the year 2036 at an estimated cost of Rs. 36.73 crore. The total sewage estimated per day is 20 MLD. Public participation is sought in the proposal and an amount of Rs. 2.43 crores has been collected from the public as Rs. 5,000 per household. This project contemplates providing comprehensive sewerage systems to Pallavaram municipality and major components of the system are:
- (i) Providing collection system;
 - (ii) Construction of sub pumping stations SPS 1 and 2 at Ramaswamy Kuttai and Indra Nagar respectively. Construction of Lift Station LS 1 and 2 at Arul Murugan Nagar and Sarathi Street. Laying 150 mm diameter and 200 mm diameter pumping main;
 - (iii) Construction of Main Pumping main stations at Keelakattalai Eri and providing pumping main of 1,000 mm diameter. PSC main from Keelakattalai Eri to Perungudi STP.
- The above Item No. 1 is covered in Package I, II and III.
 - The above Item No. 2 is covered in Package IV.
 - The above Item No. 3 is covered in Package V.

Collection System (Package I, II & III)

218. The complete sewerage system has been divided into 3 packages.
- (i) Package I covers zones P1, P2, P3, P 7 & P12
 - (ii) Package II covers zones P4, P5 & P6
 - (iii) Package III covers zones P8, P9, P10 & P11

Package I

219. The work involves
- (i) Laying of SW and RCC pipes
 - (ii) Construction of manholes
 - (iii) Providing ventilating columns
 - (iv) House service connection.
220. The total length of sewer in this package is 50.2 km. The size of the sewer ranges from 200 mm to 600 mm. The depth of sewer is varies from 1.0 to 8.0 m. SW pipes of diameter 200 mm to 350 mm is proposed for depth up to 3.5m. The proposed length of the SW is

42.8 km. RCC, NP 3 class pipes are proposed diameter from 200 mm to 600 mm for a length of 7.4 km. Depth up to 2.5 m rectangular manholes of 1,360 nos is proposed and for depth, more than 2.5 m circular manholes 389 nos. is proposed.

Package II

221. The work involves

- (i) Laying of SW and RCC pipes
- (ii) Construction of manholes
- (iii) Providing ventilating columns
- (iv) House service connection

222. The total length of sewer in this package is about 89.9 km. The size of the sewer ranges from 200 mm to 800 mm. The depth of sewer is varies from 1.0 to 6.5 m. SW pipes of diameter 200 mm to 350 mm is proposed for depth up to 3.5 m. The proposed length of the SW is 76.0 km. RCC, NP 3 class pipes are proposed diameter from 200 mm to 600 mm for a length of 13.9 km. Depth up to 2.5m rectangular manholes of 2,515 nos. is proposed and for depth, more than 2.5 m circular manholes of 586 nos. is proposed.

Package III

223. The work involves

- (i) Laying of SW and RCC pipes
- (ii) Construction of manholes
- (iii) Providing ventilating columns
- (iv) House service connection

224. The total length of sewer in this package is about 45.7 km. The size of the sewer ranges from 200 mm to 800 mm. The depth of sewer is varies from 1.0 to 6.5 m. SW pipes of diameter 200 mm to 350 mm is proposed for depth up to 3.5 m. The proposed length of the SW is 35.4 km. RCC, NP 3 class pipes are proposed diameter from 200 mm to 600 mm for a length of 10.3 km. Depth up to 2.5 m rectangular manholes of 1,216 nos. is proposed and for depth, more than 2.5m circular manholes of 422 nos. is proposed.

Map 5.6: Proposed UGD System

*Package IV**Construction of Sub Pumping Stations, Lift Stations and Pumping Main*

- (i) *Construction of Sub Pumping Stations.* The work involves construction of screen well, grit well and suction well. Supplying and fixing pipes and specials for wells. Providing 200 mm dia. D.I pumping main. Supply, delivery, erection and commissioning of electrical, driven non-clog submersible sewage pumpsets with electrical works.
- (iii) *Construction of Lift Stations.* The work involves construction of screen cum suction well. Supplying and fixing pipes and specials for well. Providing 150 mm dia. D.I pumping main. Supply, delivery, erection and commissioning of electrical, driven non-clog submersible sewage pumpsets with electrical works.

*Package V**Construction of main pumping stations and providing 1,000 mm dia. pumping main to Perungudi STP*

- (i) The work involves construction of collection well, screen well, distribution chamber, grit well and suction well. Supplying and fixing pipes and specials for wells. Supply, delivery, erection and commissioning of electrical, driven non-clog submersible sewage pumpsets with electrical works.
- (ii) Providing 1,000 mm dia. PSC main with MS specials from Keelkattalai Eri to Perungudi STP

225. Cost estimate of the project is briefed in the **Table 5.16**.

Table 5.16: Cost Estimate of the Proposed Underground Drainage System

Sr. No	Description	Cost
		<i>Rs. Lakh</i>
Package I		
1	Sewage Collection System (for Zones P1, P2, P3, P7 & P12)	790.46
2	Rail way & NH crossing	100.00
I	Base Project Cost	890.46
	Centage (5%)	44.53
II	Project Cost including Centage	934.99
III	Road Restoration Charges	210.45
IV	Grand Total Cost	1145.44
Package II		
1	Sewage Collection System (for Zones P4, P5 & P6)	1331.31
I	Base Project Cost	1331.31
	Centage (5%)	66.57
II	Project Cost including Centage	1397.88
III	Road Restoration Charges	336.90

Sr. No	Description	Cost
		<i>Rs. Lakh</i>
IV	Grand Total Cost	1734.78
Package III		
1	Sewage Collection System (for Zones P8, P9, P10 & P11)	775.11
I	Base Project Cost	775.11
	Centage (5%)	38.76
II	Project Cost including Centage	813.87
III	Road Restoration Charges	348.48
IV	Grand Total Cost	1162.35
Package IV		
	Civil Cost	
1	Sewage Sub Pump Station -1 (SPS-1)	63.97
2	Sewage Sub Pump Station -2 (SPS-2)	47.71
3	Lift Station -1 (LS-1)	14.52
4	Lift Station -2 (LS-2)	21.25
	Electrical Cost	
1	Sewage Sub Pump Station -1 (SPS-1)	30.99
2	Sewage Sub Pump Station -2 (SPS-2)	28.26
3	Lift Station -1 (LS-1)	11.53
4	Lift Station -2 (LS-2)	12.31
I	Base Project Cost	230.54
	Centage (5%)	11.53
II	Project Cost including Centage	242.07
III	Road Restoration Charges	13.75
IV	TNEB deposit	2.62
IV	Grand Total Cost	258.44
Package V		
	Civil Cost	
1	Sewage Main Pump Station (MSPS)	194.24
2	Pumping Main	395.35
3	Electrical Cost	242.90
I	Base Project Cost	832.49
	Centage (5%)	41.63
II	Project Cost including Centage	874.12
III	Road Restoration Charges	68.40
IV	TNEB deposit	5.00
IV	Grand Total Cost	947.52

Source: Proposed UGD system at Pallavaram, Wilbur Smith Associates Pvt. Ltd

3. Storm Water Drainage and Rehabilitation of Water Bodies

I. Overview

226. Pallavaram is having effective network of storm water drains to the length of 130 km, which is 69 percent of total road network. **Table 5.17** provides further details regarding the type of storm water drains in the town.

Table 5.17: Storm Water Drains

Drain Type	Length	Distribution
	<i>Km</i>	<i>%</i>
Open Drains- Pucca	43.50	33.46
Open Drains- Kutcha	86.50	66.54
Closed Drains	-	-
Total	130.00	100.00

Source: Pallavaram Municipality

227. *Topography.* The general topography of the town indicates a gentle fall from south to north and west to east. It is seen from the contour map of this area, the area in the eastern portion of the railway track is sloping from west to east and from north to south, northern part of the municipal area located in the west of railway track, slopes from east to west and from north to south. Similarly, the southern part of the municipal area towards the west of railway line slopes from East to West. The topography being such that levels vary from 27 m in North-West to 4.0 m in North-East. Thus, the town drains largely into North-East. The contour of Pallavaram can be read from the **Map 5.7**. Since there is a gradient slope towards the north east and due to the scattered presence of water bodies, there are no complaints on major water stagnation in the town.
228. *Drainage System.* The wastewater flows through roadside open drains. As of now 43.5 km length of regular road side drains exist, though kutcha drains exist almost along all roads. There is no proper disposal of sullage/waste water as it accumulates in low-lying areas/depressions effectively draining due to steep natural gradients. The accumulated sullage acts as a breeding place for mosquitoes and flies creating health hazards an unhygienic environment.

Map 5.7: Contour Map of Pallavaram Municipality

Map 5.8: Flooded Areas in Pallavaram

229. *Water Bodies.* There are 11 water bodies in Pallavaram municipality of which six are owned by municipality (temple trusts), four by revenue department and one by PWD. The total area of the identified water bodies is approximately 38 Ha while the average depth of water bodies is about 0.85 m.
230. It is noted that, portions of most of the water bodies are encroached by hutments and buildings. It is stated that out of 37.95 Ha, about 23 Ha of land under Eris are encroached. Desilting and repairs are essential for most of the water bodies, which offer an excellent potential for ground water recharge. Thus, there is a need to initiate measures to improve the condition of the tanks and make them encroachment-free.
231. A site visit was conducted to understand the actual condition of water bodies. The observations are tabulated below in **Table 5.18**.

Figure 5.2: Photographs of Water Bodies





Table 5.18: Existing Status of Water Bodies

Name of Water Body	Source	Mixing of Sewage/Storm Water Drain	Inlet/Outlet		Supply to Agricultural Land	Surrounding Land use	Over Flow During Rainy Season	Availability of Water	Remarks
		Yes/No	Inlet	Outlet	Yes/No		Yes/No		
Thiruvengad amudayan Koil Tank	Rain water	No			No	Residential	No	6 Months	Water is not used for any purpose. During raining season sewage may be mixed
Chelliamman Koil Tank	Rain water	No			No	Residential	No	6 Months	Water is not used for any purpose. During raining season sewage may be mixed
Papathikuttai	Rain water	No			No	Residential	No	6 Months	Water is not used for any purpose. During raining season sewage may be mixed
Easwaran Koil Kulam	Rain water	No			No	Residential	No	6 Months	Water is not used for any purpose. During raining season sewage may be mixed
Beriamman Koil Kulam	Rain water	No			No	Residential	No	6 Months	Water is not used for any purpose.

Name of Water Body	Source	Mixing of Sewage/Storm Water Drain	Inlet/Outlet		Supply to Agricultural Land	Surrounding Land use	Over Flow During Rainy Season	Availability of Water	Remarks
		Yes/No	Inlet	Outlet	Yes/No		Yes/No		
									During raining season sewage may be mixed
Hasthinapuram	Rain water	No			No	Residential	Yes		No water because of full encroachments
Ramaswamy Kulam	Rain water	No			No	Residential	No	6 Months	Water is not used for any purpose. During raining season, sewage may get mixed. It is full of plants and the Thasildhar office is constructed along the encroachment. Solid waste of near by market is dumped in kulam
Periya Eri Keelakattalai Tank	Rain water	No	Storm water drain		No	Agricultural land with residential	No	12 Months	Water is used for washing and bathing purpose
Nemilicherry Tank	Rain water	Yes	Storm water	Hasthinapuram Eri	No	Agricultural land with	Yes	12 Months	Water is not used for any

Name of Water Body	Source	Mixing of Sewage/Storm Water Drain	Inlet/Outlet		Supply to Agricultural Land	Surrounding Land use	Over Flow During Rainy Season	Availability of Water	Remarks
		Yes/No	Inlet	Outlet	Yes/No		Yes/No		
			drain			residential			purpose. During raining season sewage may get mixed
Balacony Kulam	Rain water	Yes			No	Residential	No	12 Months	Water is used for washing and bathing purpose
Zamin Royapettai Tank	Rain water & Periya Eri Keelakattalai Tank	Yes	Storm water drain		No	Residential	Yes	12 Months	Water is not used for any purpose. During raining season, sewage may get mixed. Some portion is used for dumping solid waste

Note:* Discussions with local residents

Source: Field visit

232. *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 5.19**. The total available water storage capacity is estimated at 265.65 ML. As most of the water bodies are in dilapidated condition, they need to be rehabilitated and strengthened.

Table 5.19: Water Bodies in Pallavaram Municipality

Tank	Land Ownership	Extent	Storage Capacity	Actual Water Storage Capacity	Actual Water Storage Capacity
		<i>Ha</i>	<i>Mcum</i>	<i>Mcum</i>	<i>ML</i>
Thiruvengadamudayan Koil Tank	Municipality	1.37	0.03	0.01	9.59
Chelliamman Koil Tank	Municipality	1.03	0.02	0.01	7.21
Papathikuttai Kulam	Municipality	1.97	0.04	0.01	13.79
Easwaran Koil Kulam	Municipality	0.07	0.0014	0.0005	0.49
Beriamman Koil Kulam	Municipality	1.28	0.03	0.01	8.96
Hasthinapuram	Revenue Dept	5.06	0.10	0.04	35.42
Ramaswamy Kulam	Revenue Dept	2.90	0.06	0.02	20.30
Periya Eri Keelakattalai Tank	Revenue Dept	13.96	0.28	0.10	97.72
Nemilicherry Tank	Revenue Dept	4.41	0.09	0.03	30.87
Balacony Kulam	PWD	3.00	0.06	0.02	21.00
Zamin Royapettai Tank	Municipality	2.90	0.06	0.02	20.30
Total		37.95	0.76	0.27	265.65

Source: Pallavaram Municipality and Analysis

233. During the discussion with the officials of Pallavaram Municipality, it was noted that, garbage collected is hugely dumped near the water bodies, mainly in the Periya Eri.
234. 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.

235. *Quarries.* There are two abandoned quarries located within the municipal limits viz., Akimbai Malai at Survey No. 32 and Katcheri Malai at Survey No. 341. The details of the quarries are given in **Table 5.20**.

Table 5.20: Details of Quarries in Pallavaram

Quarry	Area	Depth	Storage Capacity
	<i>Acres</i>	<i>m</i>	<i>cum</i>
Akimbai Malai	6.50	24.00	631,305
Katcheri Malai	2.00	100.00	809,365
Total			1,440,670

Source: Pallavaram Municipality

236. These abandoned quarries may be used for storing water but certain precautionary measures are essential before they are considered for use for supply. The most important consideration would be water quality. As explosives are extensively used during the quarry process, there is a need to check the quality of water for residual content of heavy metals and other toxic chemicals before supply to the consumers. Hence, water must be treated before introduction into the distribution network. The cost of supplying this water may be on the higher side.

J. Key Issues

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

Table 5.21: Performance Indicators

Service Indicators	Units	Value	Benchmark
Roads Covered with Storm Water Drains	%	69	> 150
% Kutchra Drains	%	66.54	0.0
% Pucca Drains	%	33.46	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 and creating unhygienic conditions.
- (ii) Silting and Solid Waste Accumulation. Silting and uncontrolled solid wastes 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 69 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) Low Lying Areas. The recent rains have submerged the low-lying wards 8, 9, 14,

15, 16, 18, 19, 21, 22, 23, 24, 38, 39 (part) and 40. The water from the government hospital in ward 38 was pumped out using pumping facilities; however, the pumps were not in proper working condition, which led to its submergence.

4. Solid Waste Management

K. Overview

238. The collection, transportation and disposal of municipal solid waste is an obligatory function of the Pallavaram 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 seven sanitary divisions covering all the 42 municipal wards as represented in **Table 5.22** and mapped in **Map 5.9**. Sanitary divisions are bifurcated based in the population, density and area, which work out to be about 19,500 persons, 10,000 persons/Sq. Km and 2.5 sq. km respectively.

Table 5.22: Sanitary Divisions

Sanitary Divisions	Wards
Division A	38,39,40,41,42
Division B	1,2,3,4,5,6 (part)
Division C	6 (part),7,8,9,10,11
Division D	12,13,14,15,16,17
Division E	22,23,24,25,26,27,31
Division F	18,19,21,28,29,30
Division G	20,32,33,34,35,36,37

Source: Pallavaram Municipality

L. Solid Waste Generation

239. *Waste Generation.* As per the Solid Waste Action Plan prepared for Pallavaram municipality, the total quantity of waste generated in Pallavaram is to the tune of 75 MT per day. This works out to 518.6 per capita per day (2001) which is higher than the specified standards of 350 grams per capita for the town of similar size.

Map 5.9: Solid Waste Sanitary Divisions

Sources

240. The various sources of waste generation in Pallavaram is detailed out in the **Table 5.20**.
241. *Domestic Waste.* In Pallavaram, the major source of waste generation has been the households. The quantum of waste generated from households is around 40 tons per day, which are approximately 54 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.
242. *Commercial Waste.* Commercial establishments like hotels, restaurants, shops, trading units, small time street traders, etc., generate solid waste to a quantum of 8 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. The total commercial waste constitutes about 11 percent of the total waste generation.
243. *Market Waste and Kalayana Mandapam Waste.* Pallavaram does not have a regulated market. However, ward no 31 have an informal market and about 0.5 MT of waste is collected daily from that market. The market waste is composted for Manure in a small cow shed, which now acts as a compost yard. About 3 MT of waste is generated from the 31 Kalyana Mandapams in the municipality, of 2 MT is Bio Degradable waste.
244. *Industrial Waste.* Industrial waste generated is mainly from the industries in the town. Around 12 MT of waste is generated by these industries every day, which is 16 percent of the total waste, generated in the town.
245. *Hospital and Clinical Waste.* Pallavaram has 2 dispensaries and many private health centers. The biomedical waste generated from these institutions per day is 7.3 tons. The hospitals have engaged private operators for the disposal of the hospital waste.
246. *Waste from Other Sources.* In Pallavaram, the quantity of solid waste generated from street sweepings and drain desilting activities is significant. These activities generate about 3 tons of waste per day, which are about 4 percent of the total waste generation.

Table 5.23: Sources of Solid Waste Generation

Source	Quantity (MT/day)	Total Percent
Domestic	40	53.73
Commercial	8	10.75
Markets	0.5	0.67
Kalyana Mandapams	3	4.03
Industrial	12	16.12
Hospitals and Clinics	7.35	9.87
Government Offices	0.6	0.81
Night Sweeping	3	4.03
Total	74.45	100.00

Source: Pallavaram Municipality

247. It can be read from the **Table 5.24** that, all the divisions contribute equally to the total garbage collection. However, Divisions G and D have a highest collection of bio-degradable waste owing to the presence of markets and Kalyana Mandapams in those divisions.

Table 5.24: Solid Waste Collection in Sanitary Divisions and from Other Sources

Division	Total Garbage	Bio-D Waste	Non-Bio D waste
	<i>MT</i>	<i>MT</i>	<i>MT</i>
Division A	8.9	5.80	3.10
Division B	7.85	5.85	2.00
Division C	10.2	6.60	3.60
Division D	12	7.80	4.20
Division E	9	6.60	2.40
Division F	9.1	7.00	2.10
Division G	11.1	8.20	2.90
Kalyana Mandapam	3	2.00	1.00
Government Offices	0.6	0.45	0.15
Night Sweeping Moping	3	2.00	1.00
Total	74.75	52.3	22.45

Source: Solid Waste Action Plan for Pallavaram Municipality

248. *Composition of Waste.* To analyze the physico-chemical characteristics of solid waste, waste characterization study was conducted and the results are presented in **Table 5.25** and **Table 5.26**. The details of test results are presented in **Annexure 5.1**.

Table 5.25: Waste Characterization - Physical

Parameter	Unit	Average	
		Residential	Commercial
Organic			
Organic Matter	% w/w	29.36	31.37
Paper	% w/w	5.19	4.63
Garden Waste	% w/w	24.19	23.85
Inorganic			
Ash	% w/w	48.45	66.14
Bulk Density	Kg/cu.m	257.50	275.89
Ash & Fine Earth	% w/w	19.92	14.67
Glass & Ceramics	% w/w	1.63	0.06
Inorganic Matter	% w/w	7.60	8.14
Metal	% w/w	0.07	0.30
Other Inert Materials	Nil	-	-
Plastic	% w/w	10.57	10.82
Rubber & Leather	% w/w	1.48	6.16

Source: Waste Characterization Study, 2006

Table 5.26: Waste Characterization - Chemical

Parameter	Unit	Average	
		Residential	Commercial
Carbon	% w/w	15.91	9.21
Fixed Carbon	% w/w	7.31	5.13
Gross Calorific Value	Kcal/Kg	2,133.00	1,482.50
Nitrogen as N	% w/w	1.03	0.79
Phosphorous as P	% w/w	0.16	0.11
Volatile Matter	% w/w	40.47	25.99
Cadmium as Cd	mg/Kg	0.40	0.24
Lead as Pb	mg/Kg	39.66	29.30
Arsenic as As	BDL (DL: 0.10 mg/Kg)	0.48	0.55
Nickel as Ni	mg/Kg	5.69	6.25
Zinc as Zn	mg/kg	84.55	19.50
Copper as Cu	mg/Kg	190.35	17.90
Mercury as Hg	BDL (DL: 0.10 mg/Kg)	BDL	BDL
pH (@ 25 °C)	(10% Suspension)	6.38	8.25
Moisture	% w/w	78.91	74.88

Source: Waste Characterization Study, 2006

249. The summary of physicochemical characteristics indicates that, on an average, the organic waste (including garden waste and paper waste) content in residential and commercial wastes is 58.74 percent and 59.85 percent respectively. The average ash content in residential and commercial wastes is about 48 percent and 66 percent of respectively. The gross calorific value of the samples in residential waste was found to be around 2,133 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 1,482 kcal/kg, just below the advised value.

M. Solid Waste Collection

250. *Primary Collection.* Pallavaram Municipality has initiated the system of door-to-door collection to collect solid waste from the households and other establishments. The Pallavaram Municipality has sought private sector participation for 13 identified wards. The source segregation is not insisted and thus the mixed waste is collected though source segregation is practiced partially in some areas. The local body has provided 36 tri-cycles and 11 autos for door-to-door collection. The wards where door-to-door collection is done on a daily basis are Ward No: 1,2,3,4,5,7,9,14,15, 18 (part), 20 (part), 21,23,24,25,27,29,30,31,32,34,35, 38 (part), 39,40. In the absence of sufficient manpower with the municipality, door to door collection is not uniform. Solid waste in other wards is collected in alternate days or once in three days.
251. Since there is no designated secondary collection points in the municipality, waste is being dumped in the near by Eris (lakes). Door-to-Door collection is not carried out in slums of the municipality. Slum dwellers dump the waste on the roadside, which is cleaned up by the municipality.

252. As per details furnished by the Pallavaram municipality, the local body has provided only about 45 dustbins of different sizes based on the need and type of waste. It was noted that, all the dustbins were in a dilapidated state and provision of new bins are strongly felt. The average distance between dustbins works out to be 4,487 m which is much higher than the standard prescribed limits of 1,000 m. Due to insufficient number of dustbins, 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.
253. *Street Sweeping.* One of the major activities in the solid waste management is the street sweeping activity, 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 ends having metal blade are used for street sweeping while shovel and push carts are used for drain desilting activities. About 3.0 MT of waste is collected through street sweeping.
254. The local body has engaged 296 sanitary workers against the sanctioned posts of 511 to manage the solid waste in the town. Due to high vacancy rate of 42 percent, many of the streets are not swept regularly. However, arterial roads and roads with commercial establishments like G.S.T. Road (Division 1, 2), Medavakkam road (Division 4), R.P Road (Division 7), Radha Nagar Road, etc. are swept daily.
255. *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. Presently there are no allocated secondary collection points in the municipality. The existing collection bins are in a dilapidated condition and thus waste is directly dumped in the vehicles.
256. *Frequency of Collection.* Since there are no designated secondary collection points and owing to the bad condition of the dustbins, the waste collected is dumped in the disposal ground as and when the vehicle reaches its full carrying capacity.
257. *Transportation of Waste.* The local body has engaged 17 vehicles for the transportation of wastes to the disposal site. The total rated capacity of the available fleet of vehicles is 61.82 tons, which indicates a collection performance of 82.43 percent. The details of vehicles with their carrying capacities are given in **Table 5.24**. However, adopting the bulk density of 350 kg/cum¹ (after compaction), the actual vehicle carrying capacity increases to about 110.96 percent of the total waste generation, thus, indicating sufficient availability of fleet with the local body .

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

Table 5.27: Details of Transportation Vehicles

Description	Mfg. Year	Owner Ship	Number	Capacity	Trip / Day	Bulk Density	Rated Capacity
			<i>Nos.</i>	<i>Tons</i>	<i>Nos.</i>	<i>Tons/m³</i>	<i>Tons/day</i>
Lorry	1989,1990 1998,2002	ULB	5	2.5	2.4*	0.26	31.66
Mini Lorry	1997	ULB	5	1.5	3	0.26	16.02
Tractor with Trailer	1988, 1998	ULB	2	1.5	3	0.26	6.34
Autos	1998	ULB	5	0.8	4	0.26	7.80
Total			17				61.82

Note: * Two trucks sometimes make 3 trips per day, hence their average number of trips are considered

Source: Solid Waste Action Plan for Pallavaram Municipality/Analysis

N. Disposal of Solid Waste

258. Scientific method of disposal of waste is not followed in the town. Since there is no allotted load for disposal, the waste collected from the town is disposed into the adjoining lakes and parts of graveyard.
259. In order to make the solid waste disposal system safe and scientific, 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 32 km (16.67 acres) (Survey No. 16/3) from the town. The land is capable of handling 180 tones of waste per day from these municipalities. The ULB has paid it's contribution to the State Government amounting to Rs. 37,46,667 on August 28, 2004. 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. 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 5.28**.

Table 5.28: Salient Features of the Proposed Disposal Site – Venkata Mangalam

Description	Venkata Mangalam
Total Area	50 acres
Approach Road*	The site is situated along Kandigai road (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 also surrounded by the agricultural fields
Remarks	The site is in close proximity to the newly developing residential

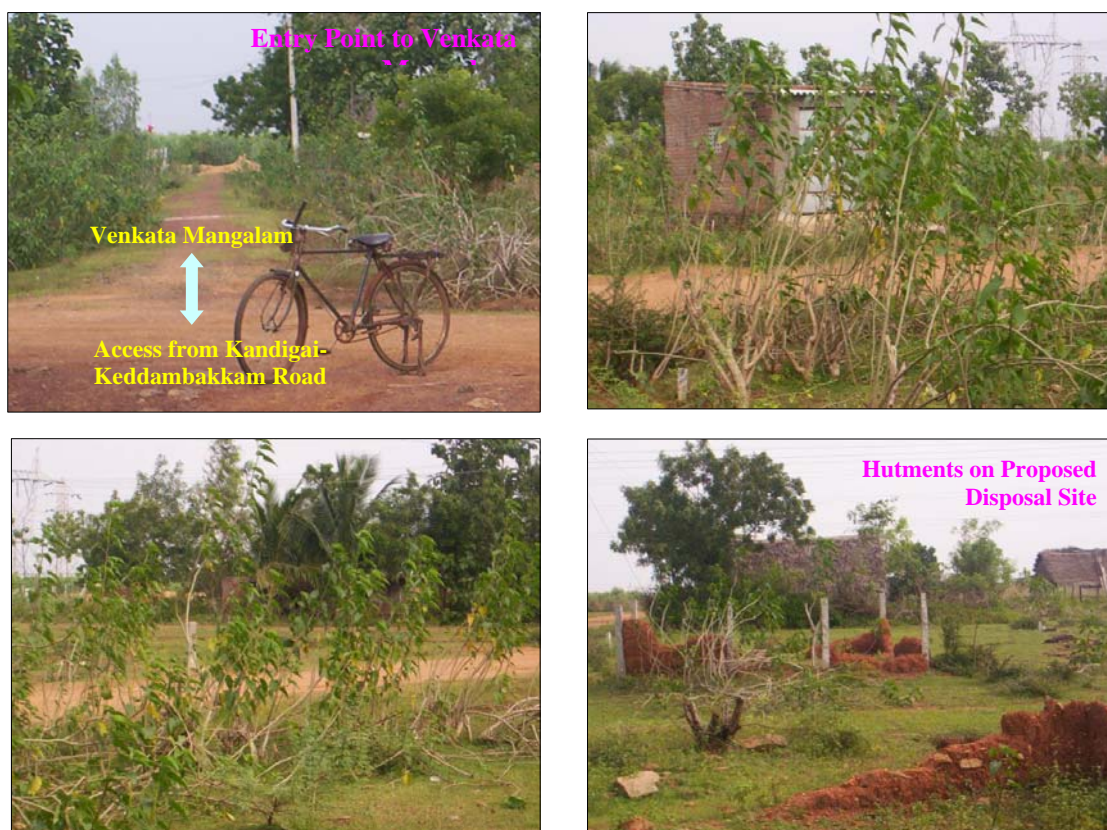
Description	Venkata Mangalam
	locality and surrounded by the social forest. Functioning of the disposal site may create problems like bad odor, filthy conditions, etc., thus, this is being objected to by the local residents. Birds are another major problem at the site as the Air Force Station is about 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 Venkata Mangalam Panchayat had issued the land holding rights to them during 1970s (as indicated during discussions). However, the ULB is still of the view that the land has been illegally encroached by them.

Source: Site Visit

Figure 5.3: Status of Proposed Disposal Site at Venkata Mangalam



Institutional Set-Up

260. As described earlier municipal solid waste management is an obligatory function of the urban local body. In Pallavaram, the health department is headed by Sanitary Officer who is supported by 7 Sanitary Inspectors. At present, around 15 sanitary supervisors are responsible for allotment of labor and vehicles for waste management and 511 sanitary

workers and 11 divers involved for the solid waste management. It is noted that, almost 41 percent of vacantly rate, which hinders the functions of solid waste management.

Table 5.29: Staff Details of Health Department

Description of Post	Sanctioned Post	Filled Post	Vacant Post	Vacancy Rate
	<i>Nos</i>	<i>Nos</i>	<i>Nos</i>	<i>%</i>
Sanitary Officer	1	1	Nil	-
Sanitary Inspector	7	4	3	43
Sanitary Supervisor	15	13	2	13
Driver	11	9	2	18
Sanitary Workers	511	296	215	42
Total	545	323	222	41

Source: Pallavaram Municipality

O. Key Issues

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

Table 5.30: Performance Indicators

Indicator	Unit	Current Situation	Benchmark
Per-Capita Generation	Grams	518.6	<350
Collection Performance (% Collected to Generated)	%	82.43	100.0
% Actual Capacity of the Vehicles to the Total Waste Generated	%	110.96	>= 100.0
Road Length per Conservancy Staff	m	607 m	< 1,000 m
Area Coverage per Collection Point	Sq. km	NA	0.16 Sq. km

Source: Analysis

- (i) Per Capita Waste Generation. High per capita waste generation of 518.6 gm per day is observed in Pallavaram against a prescribed level of 350 gm.
- (ii) Non Existence of Transfer Station. There is no transfer station exists in the town, the waste is directly carried to the disposal area.
- (iii) Poor Waste Collection Performance. The collection efficiency of waste is 82 percent, which is good, but lower than the recommended level of 100 percent.
- (iv) Transportation of Waste. The spillage of waste all along the route and odor from the waste is a common problem associated with open transportation of waste.
- (v) No separate vehicle for Secondary Collection: The surplus waste of about 31 MT is now being carried by the Agro Lorries.
- (vi) Compost Yard Alienated. The present compost yard at Venkata Mangalam about 25 km away from municipality which is also in litigation and still not operational.

- (vii) Inadequate Conservancy Staff and Dustbins. The average distance between two dustbins being 4,487 m, a large portion of the area remains unserved. Because of which many of the households, shops and commercial establishments throw the waste onto the streets, drains and open spaces creating unhealthy conditions and choking the drains. The road length per conservancy staff is also high, which not only reduces the efficiency of the staff to sweep but also the sweeping activity is not performed regularly in all the wards.
 - (viii) 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.
 - (ix) Lack of Scientific Waste Disposal. Scientific waste disposal of waste is not followed; the waste is being disposed through open dumping. Therefore, the waste finds its way onto the surrounding areas due to wind, making the surroundings unhygienic, posing problem to environment.
262. *Privatization*. It is proposed to privatize Zone 1, which has 19,440 households with an population of 71,618. The quantity of garbage that will be collected is 32.68 MT per day. It is proposed that, the private operator will furnish the vehicle requirements, transfer stations points and labor requirement, which is required for the process.

5. Roads and Traffic Management

Roads

263. Pallavaram 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.
264. The famous Grand Southern Trunk Road and railway route from Chennai Egmore to Kanyakumari divide the town into East and West Pallavaram. The distribution of roads in the town is given in the **Table 5.31**.

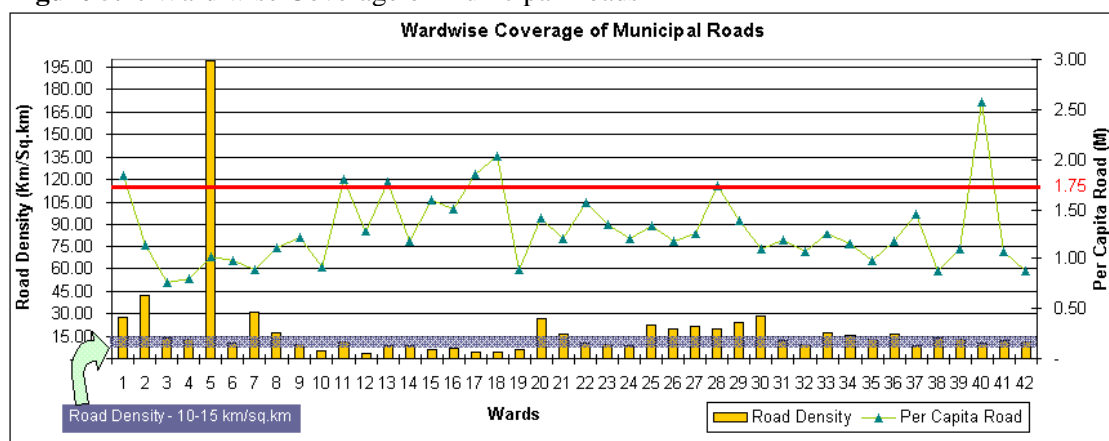
Table 5.31: Distribution of Roads in Pallavaram

Roads	Length Km	Distribution %
Municipal Roads		
<i>Surfaced Roads</i>		
Black Topped	155.30	86.52
Concrete	17.60	9.81
<i>Unsurfaced Roads</i>		
WBM	3.20	1.78
Earthen / Kutcha	3.40	1.89
Sub-Total	179.50	100.00
Other Departmental Roads		
Highways and Major District Roads	9.50	

Source: Vision Plan of Pallavaram Municipality

265. Roads in the interiors of the town are narrow and have a width ranging from 1.2 m to 14m. Of the 189 km of roads in Pallavaram, 179.5 are maintained by the local body while the remaining 9.5 km by the other departments. With regards to the surface condition of municipal roads, about 86.5 percent of the total road length have bitumen surface.

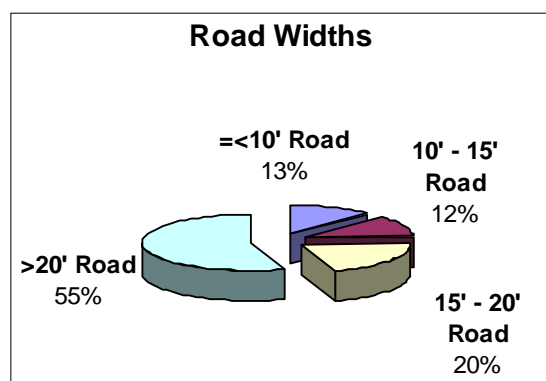
Figure 5.4: Ward wise Coverage of Municipal Roads



266. 1,316 number streets represent the total road length of 179.5 km. The density of roads in the town is 9.97 km/sq. km. The per-capita road length maintained by the local body is 1.24 m, which is less than the standard of 1.75 m. The average length of road in a ward is 4.27 km, with a minimum 1.04 km length of road in ward 37 and ward 15 having a road length of 8.97 km. The ward wise road classification is presented in the **Annexure 5.2**.
267. The ward wise coverage of municipal roads indicates that the road density in Ward 5 is very high due to less administrative area and availability of more roads within the ward. Wards 1-2, 5, 7-8, 20-21, 25-30, 33, 34 and 36 have densities more than 15 km /sq. km, the maximum being in Ward 5 with 199.12 km/sq. km while minimum in Ward 12 with 3.43 km/sq. km. The local body is maintaining the per capita road length more than prescribed standards of 1.75 m in 5 wards (Ward Nos. 1, 11, 17-18 and 40), the highest being in the Ward 1 with 27.12 m while minimum in the Ward 3 with 0.76 m.

Figure 5.5: Distribution of Roads w.r.t. Width

268. It is observed that, out of 179.5 km of municipal road, 55.1 percent have a width of more than 20 feet, 20.3 percent of the roads have width between 15 feet – 20 feet, 12.5 percent roads between 10 feet - 15 feet and 12 percent with less than 10 feet width.



269. The condition of major roads is maintained properly. However, minor roads and roads within individual residential colonies are in bad condition. Footpaths and parking facilities are lacking on the streets.

P. Key Issues

270. The key issues and conclusions are based on field visits and data analysis. Performance indicators presented in the **Table 5.32**.

Table 5.32: Essential Road Network Indicators

Indicator	Units	Current Situation	Benchmark
Road Density	km/sq. km	6.28	10.00 – 15.00
Per Capita Road Length (Municipal Roads)	M	0.81	1.75
Percent of Black Topped Roads to Total Road Length	%	86.5	70.00
Percent of Municipal Surfaced Roads	%	96.3	100.00

Source: Analysis

- (i) 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.

- (ii) 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.
- (iii) 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

- 271. Pallavaram situated towards the south of Chennai City are 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). Therefore, heavy movement of vehicular as well as pedestrian traffic has resulted in traffic congestions.
- 272. *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.
- 273. The presence of bus stand along the G.S.T. Road also adds to the problem of traffic congestion. There is a proposal to construct new flyovers in the G.S.T. Road, which the highway has taken up and due for completion.
- 274. *Road-Rail Crossings.* There are 7 manned railway crossing in the town. The railway crossings are located in the following areas:
 - (i) Near Easwari Nagar
 - (ii) Near P.V Street
 - (iii) Lakshmi Nagar main road
 - (iv) Radha Nagar main road
 - (v) Hastinapuram main road
- 275. This road carries heavy vehicular traffic mainly originating from the surrounding industries in the area. It has been observed that the traffic flow at this crossing has not been smooth due to frequent closure of the level crossing leading to time loss and traffic congestion.
- 276. *Parking.* Land-use and economic activity of the town drives the parking demand in the region. In Pallavaram, there is no proper parking regulation and control put to practice, therefore, 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 not provided the authorized parking lots on important roads like G.S.T. Road. Southern railway has provided parking lots within the station premises, which are operated by the private contractors nominated by the railways.

Map 5.10: Map Showing the Status of Proposals for Traffic and Transportation in Chennai Metropolitan Region

277. *Public Transportation System.* Metropolitan Transport Corporation (MTC) provides the public transportation system for Pallavaram. In addition, the autos, which form the Intermediate Public Transport (IPT) mode, are widely used.
278. *Bus Shelters.* There are two bus stands in the municipality, one at Kilkattalai and another at Hasthinapuram. Both these bus stands are maintained by Tamil Nadu Transport Corporation and a private agency and are not maintained by the municipality. There are total of 8 bus shelters along the bus route. The locations of the bus shelters are as follows, Kilkattalai, Old Pallavaram, Malanganandapuram, Chrompet, Chrompet railway station and M.I.T Gate. It is noted that most of the existing bus shelters are damaged and there is a clear dearth of waiting space for passengers.
279. *Projects under Implementation.* The various projects identified by different agencies that are being implemented or in the planning stage are given in **Table 5.33**.

Table 5.33: Projects under Implementation

Sr. No	Proposals	Status
	<i>Up Gradation of Road Rail Crossing</i>	
1	Hasthinapuram Main Road	Under Construction
2	Near Pallavaram Railway Station	Under Construction
3	Pallavaram – Thoraipakkam Link Road	Under Construction
	<i>Other Proposals</i>	
1	Pedestrian FoB on G.S.T. Road at Chrompet	Planning Stage
2	Improvements to MTC Bus Terminal at Pallavaram	Planning Stage
3	Pedestrian Subway at Pallavaram	Planning Stage
4	Fly-over on G.S.T. Road at Pallavaram	Under Construction

Source: Pallavaram Municipality.

Q. Key Issues

- (i) Lack of Proper Connectivity with NHs. G.S.T. Road, the NH passing through Pallavaram is the one of the most important road providing connectivity to Chennai City and other major places in South Tamil Nadu. One important road connected with G.S.T. Road in Pallavaram is the Pallavaram – Thoraipakkam Link Road that connects Pallavaram with the Proposed IT Corridor. The construction of this four-lane road is in the final stage. Other major roads originating from the municipality are the Pammal road connecting the town with Pammal and the famous temple township of Thirunneermalai. Another road passing through Pallavaram is the Medavakkam Main road that connects Medavakkam and Alandur. All these roads should be improved to provide better connectivity with G.S.T. Road.
- (ii) Lack of Proper Connectivity with SHs. Roads connecting various parts of the municipality to the arterial roads are Dhargha Road, Rajendra Prasad Road, Hasthinapuram Road. These roads should be improved to provide better link with the SHs.
- (iii) 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 on both directions.

- (iv) 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 ULBs. Improvement of these roads will provide better inter municipal connectivity between Tambaram and Pallavaram. 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 ends at Tambaram.
- (v) Missing Links. Two major residential hubs of Pallavaram, namely, Chrompet and Old Pallavaram lack proper connectivity with arterials roads in the area. Hence, it is necessary to identify new links to Thoraipakkam link road from Chrompet and Old Pallavaram.
- (vi) Level Crossings. The level crossing at LC No. 27 on Radha Nagar Main Road, LC No. 26 on Shanthi Nagar Road, and LC No. 25 on Dhargha Road are located on the Chennai – Kanyakumari main railway line and sub-urban line between Tambaram – Chennai Beach across the Radha Nagar main road. This busy railway line has nearly about 150 closures in a day because of the presence of educational institutions, industries and residential areas around this link. As per the railway records, the total Train Vehicular Unit (TVU) at these locations are more than 2,00,000. As per the railway manual an ROB is warranted if the TVU cross 1,00,000 TVU. Hence, all the three level crossings may be upgraded to RoBs/RuBs.
- (vii) Absence of Grade Separated Pedestrian Crossing Facilities. Heavy pedestrian crossing is observed on G.S.T. Road near Pallavaram and Chrompet due to the presence of railway station, bus terminals, institutions and industries in the locality. As the G.S.T. Road carries heavy traffic throughout the day, safe pedestrian crossing facilities are needed at these places.
- (viii) 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
- (ix) Damaged Bus Shelters. Most of the bus shelters are damaged and there is no facility for waiting passengers in some of the bus stops.

6. Street Lighting

R. Overview

280. The provision and maintenance of streetlights is an obligatory function of Pallavaram municipality. The Tamil Nadu Electricity Board (TNEB), a statutory body formed in 1957 under the Electricity Supply Act, 1948, supplies electricity to Pallavaram. 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.
281. There are about 6,246 streetlights in the town municipal limits. The average spacing of streetlight pole is 30.27 m, which is as per the preferred spacing of 30 m. **Table 5.34** summarizes the streetlight composition.

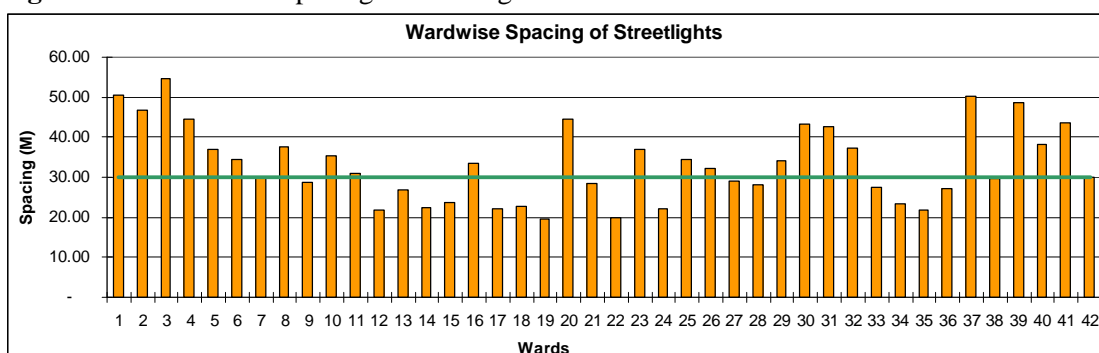
Table 5.34: Summary of Streetlights

Type of Fixtures	Numbers	Distribution
	Nos.	%
Tube Lights (40 W)	4,315	69.08
High Mast Lamps	3	0.05
Sodium Vapor Lamp	1,917	30.69
70W	750	
150W	200	
250W	967	
Halogen Lamps (250 W)	7	0.11
Mercury Vapor Lamp (250 W)	4	0.06
Total	6,246	100.00

Source: Pallavaram Municipality

282. Tube light constitutes about 69 percent of the total luminaries in the town followed by sodium vapor lamps with 31 percent while Halogen Lamps and Mercury Vapor Lamps constitute 0.11 percent of and 0.06 percent of the total luminaries respectively. Three high mast lamps at Kizkattalai, Radha Nagar and M.I.T. Gate are provided.
283. In spite of average spacing of 30 m between the street poles, it has been observed that the illumination especially in new extension areas and crowded places is poor.

Figure 5.6: Ward wise Spacing of Streetlights



284. The analysis of ward wise spacing of streetlights (refer **Annexure 5.3**) indicate that 24 wards have spacing more than preferred spacing of 30 m indicating that they are poorly lit while the remaining 18 wards are well lit. The spacing of street poles is wide apart in Ward 3 at about 55 m while the minimum spacing of about 20 m is observed in Ward 19.
285. *Operation and Maintenance.* As the municipality was incurring high expenses on the operation and maintenance of street lights, all the wards have been privatized in 2005. The maintenance charges fixed and is presented in **Table 5.35**.
286. The scope of work for private contractor is to follow a regular routine maintenance, breakdown maintenance and preventive maintenance aspects including repairs and replacement works, for all parts and accessories, etc.

Table 5.35: O&M Rates for Street Lights

Description	Rate per Fixture
	Rs / year
Poles with Tube Lights	
1 x 40 watts Tube Light	250
2 x 40 watts Tube Lights	250
Poles with Sodium Vapor Lamps	
250 watts S.V.L	880
150 watts S.V.L	741
70 Watts S.V.L	631
Poles with Mercury Vapor Lights	
250 watts M. V. L	950
150 watts M.V.L	950

Source: Contract Document, Pallavaram Municipality

287. However, the discussion with engineering department officials revealed that after privatizing the O&M of streetlights, the number of complaints from the public have reduced drastically. The contractor appears to be delivering a satisfactory performance.

S. Key Issues

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

Table 5.36: Performance Indicator

Indicator	Unit	Current Situation	Benchmark
Average Spacing between Lamp Posts (Town as a Whole)	M	30	< 30.0
% Tube Lights	%	69.11	70.0 – 80.0
% High Power Lamps	%	28.89	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*

289. *Primary Health.* There are two Health Care Centres, one is situated in Zamin Pallavaram and the other one at Old Pallavaram. There are many Private Practitioners in the town having clinics and offering medical services.
290. *Education.* Pallavaram houses the prestigious Madras Institute of Technology and two colleges besides Polytechnic and schools. The local body maintains 5 Elementary schools, 3 High schools and 1 elementary Urdu school. In addition, the town has around 46 private schools and colleges.
291. The literacy rate in the town is 79.4 percent. The literacy rate in Pallavaram 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. Pallavaram houses government education institutions as well as aided and private institutions.
292. *Burial Ground.* There are 9 burial grounds within the municipal jurisdiction, which require improvement.

VI. WASTE CHARACTERISATION

A. Introduction

293. Estimating the characteristics of solid waste generated in Pallavaram 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.
294. Considering the aspects, surveys were carried out in Pallavaram for assessing the exact characteristics of the solid waste generated in the town.
 - (i) Solid waste sampling for the analysis of physico-chemical characteristics.
295. 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

296. The physico-chemical characteristics of solid waste are analyzed in this section. For this purpose, sampling surveys were carried at the Zamin Royapettai Eri 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 Pallavaram 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.
297. 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.
298. 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

299. 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 neighbourhood (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 analysed for its characterization.



- (ii) Commercial Sources. For Commercial Sources, a group of solid waste trucks originating from a particular neighbourhood (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 analysed for its characterization.

D. Methodology of Sampling

300. 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 labelled 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 11:30 AM in the afternoon. The same procedure was followed for all the two days of sampling.



301. 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.

302. 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.

303. 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

304. 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.
305. As per the sample survey and analysis, the Organic matter and Garden waste are the major constituents of solid wastes in Pallavaram. The composition of Organic matter and Garden waste as presented in **Table 6.1** is around 29.36 percent and 24.19 percent respectively, the contribution of Ash and Fine Earth constitutes to a significant is 19.92 percent.

Table 6.1: Physical Characteristics of Solid Waste – Domestic Waste

Parameter	Units	Sample-I	Sample-2	Average
Bulk Density	Kg/Cu.m	126.00	389.00	257.50
Physical Characteristics (% of total weight) - wet weight basis				
Organic Matter	% w/w	18.3	40.42	29.36
Garden waste	% w/w	16.1	32.27	24.185
Plastic	% w/w	2.8	18.33	10.565
Paper	% w/w	2.23	8.15	5.19
Inorganic Matter	% w/w	15.2	0	7.6
Rubber & Leather	% w/w	2.21	0.74	1.475
Metal	% w/w	0.06	0.07	0.065
Glass & Ceramics	% w/w	3.25	0.00	1.63
Other Inert Materials	NIL	0	0	0
Ash & Fine Earth	% w/w	39.84	0	19.92

Source: Sample Analysis

306. The other significant constituents of solid waste in Pallavaram are plastic and inorganic matter. The contribution of these elements is around 10.57 percent and 7.60 percent. It is noted that in physical characteristics of solid waste the organic waste constitutes are more (58.74 percent) when compared to inorganic waste (41.25 percent). The organic content is high in the town because of the number of kalyanamandapams (30 nos) and hotels (12 nos). 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 Pallavaram and associated activities.

Figure 6.1 Composition of Solid Waste

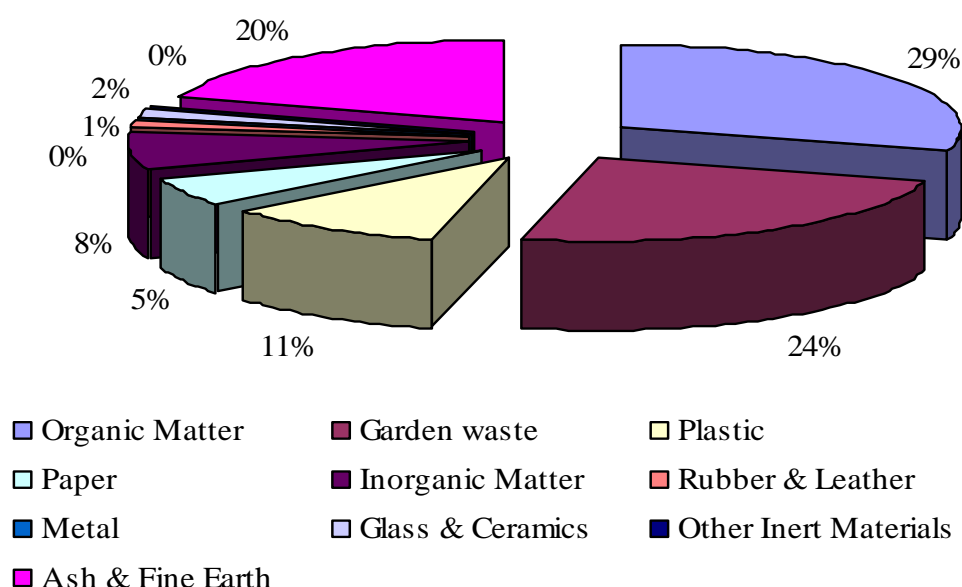


Table 6.2: Physical Characteristics of Solid Waste as Per CPHEEO – Domestic Waste

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

Source: CPHEEO Manual on Solid Waste Management

Note:

¹For towns of population 0.1 to 0.5 million

²For towns of population less than 0.2 million

307. Chemical Characteristics. As regards chemical composition, moisture content of solid waste was found to be around 78.91 percent (**Table 6.3**). Similarly, the calorific value of

the waste is around 2,133.00 Kcal / kg in Pallavaram. These values are higher than the advised Moisture content and Heating Calorific Value estimated by CPHEEO. The other significant constituents of solid waste in Pallavaram are ash content and volatile matter. The contribution of these elements is around 48.45 percent and 40.47 percent. The carbon content is found to be 15.91 percent, which is, higher than the advised carbon value anticipated by CPHEEO.

Table 6.3: Chemical Characteristics of Solid Waste – Domestic Waste

Parameter	Units	Sample-I	Sample-2	Average
pH		7.76	5	6.38
Moisture Content	% w/w	79	78.82	78.91
Calorific Value	Kcal/Kg	238	4028	2133
Volatile Matter	% w/w	9.77	71.17	40.47
Ash Content	% w/w	89.20	7.70	48.45
Carbon	% w/w	3.67	28.14	15.905
Fixed Carbon	% w/w	0.07	14.54	7.305
Nitrogen (N)	% w/w	0.2	1.85	1.025
Phosphorous (P)	% w/w	0.05	0.26	0.155
Metals				
Copper (Cu)	mg/Kg	0.48	BDL (DL:0.10mg/Kg)	0.48
Zinc (Zn)	mg/Kg	367.6	13.1	190.35
Lead (Pb)	mg/Kg	143	26.1	84.55
Cadmium (Cd)	mg/Kg	76.5	2.81	39.655
Copper (Cu)	mg/Kg	0.4	BDL (DL:0.10mg/Kg)	0.4
Mercury	mg/Kg	BDL (DL:0.10mg/Kg)	BDL (DL:0.10mg/Kg)	-
Nickel	mg/Kg	8	3.37	5.685

Source: Sample Analysis

308. Since there are 21 hospitals and 7 industries in Pallavaram, some toxic (metal) content was also found. Copper and Zinc are the major constituents of the solid wastes of Pallavaram. The composition of Copper and Zinc as presented in **Table 6.4** is around 190.35 mg/kg and 84.55 mg/kg respectively. The other significant constituents of solid waste in Pallavaram are lead and nickel. The contribution of these elements is around 39.66 mg/kg and 5.69 mg/kg.

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

Parameter	Units	Composition	
		As per CPHEEO ¹	As per MNES ²
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: ¹For towns of population 0.1 to 0.5 million

²For towns of population less than 0.2 million

Source: CPHEEO Manual on Solid Waste Management

2. Commercial Sources

309. Commercial waste comprises the solid waste that originates in offices, wholesale and retail stores, restaurants, hotels, markets, warehouses and other commercial establishments. Organic matter and Garden waste are the major constituents of the solid waste of Pallavaram. The composition of Organic matter and Garden waste as presented in **Table 6.5** is around 31.37 percent and 23.85 percent respectively, the contribution of ash & fine earth constitutes a significant proportion and is 14.67 percent.

Table 6.5: Physical Characteristics of Solid Waste - Commercial Waste

Parameter	Units	Sample-I	Sample-2	Average
Bulk Density	Kg/Cu.m	115.21	436.57	275.89
Physical Characteristics (% of total weight) – wet weight basis				
Organic Matter	% w/w	24.3	38.44	31.37
Garden waste	% w/w	22.5	25.2	23.85
Plastic	% w/w	5	16.63	10.815
Paper	% w/w	1.84	7.42	4.63
Inorganic Matter	% w/w	16.28	0	8.14
Rubber & Leather	% w/w	0	12.32	6.16
Metal	% w/w	0.6	0	0.3
Glass & Ceramics	% w/w	0.12	0.00	0.06
Other Inert Materials	NIL	0	0	0
Ash & Fine Earth	% w/w	29.33	0	14.665

Source: Sample Analysis

310. The other significant constituents of solid waste in Pallavaram are plastic and inorganic matter. The contribution of these elements is around 10.82 percent and 8.14 percent respectively. Since there are leather industries in the town the rubber and leather constituents of solid waste is around 6.16 percent. It is noted that in physical characteristics of solid waste the organic waste constitutes are more (59.85 percent) when compared to inorganic waste (40.14 percent). The organic waste is high because of the number of hotels (12) and kalyanamandabams (30). The contribution of plastic and paper is higher than the normal composition anticipated by CPHEEO in its manual on solid waste management. This may be attributed to growing urbanisation in Pallavaram and associated activities.

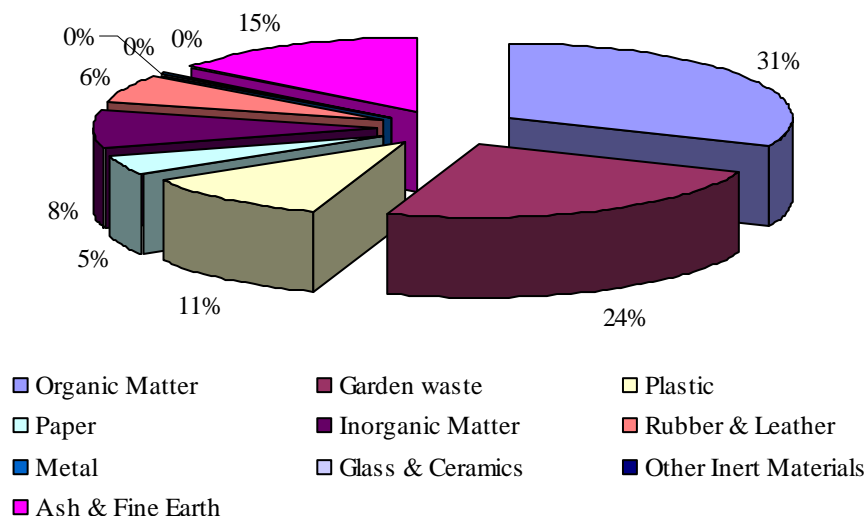
Table 6.6: Physical Characteristics of Solid Waste as Per CPHEEO- Commercial Waste

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

311. **Chemical Characteristics.** As regards the chemical composition, moisture content of solid waste was found to be around 74.88 percent (**Table 6.7**). Similarly, the calorific value of waste is around 1482.50 Kcal / kg in Pallavaram. 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 Pallavaram are ash content and volatile matter. The contribution of these elements is around 66.14 percent and 25.99 percent respectively. Chemical characteristics of solid waste are illustrated in **Table 6.7**.

Table 6.7: Chemical Characteristics of Solid Waste- Commercial Waste

Parameter	Units	Sample-I	Sample-2	Average
pH		9.94	6.55	8.245
Moisture Content	% w/w	73.2	76.56	74.88
Calorific Value	Kcal/Kg	321	2644	1482.5
Volatile Matter	% w/w	10.07	41.91	25.99
Ash Content	% w/w	87.06	45.21	66.14
Carbon	% w/w	3.92	14.5	9.21
Fixed Carbon	% w/w	1.37	8.89	5.13
Nitrogen as N	% w/w	0.23	1.34	0.785
Phosphorous as P	% w/w	0.02	0.2	0.11
Metals				
Arsenic	Mg/Kg	0.55	BDL (DL:0.10mg/Kg)	0.55
Copper as Cu	Mg/Kg	20.4	15.4	17.9
Zinc as Zn	Mg/Kg	BDL (DL:0.10mg/Kg)	19.5	19.5
Lead as Pb	Mg/Kg	44.4	14.2	29.3
Cadmium as Cd	Mg/Kg	BDL (DL:0.10mg/Kg)	0.24	0.24
Mercury	Mg/Kg	BDL (DL:0.10mg/Kg)	BDL (DL:0.10mg/Kg)	-
Nickel	Mg/Kg	8.1	4.4	6.25

Source: Sample Analysis

312. Since there are 21 hospitals and 7 industries in Pallavaram, some toxic (metal) content was also found. Lead and Zinc are the major constituents of the solid wastes of Pallavaram. The composition of Lead and Zinc as presented in **Table 6.7** is around 29.30 mg/kg and 19.50 mg/kg respectively. The other significant constituents of solid waste in Pallavaram are copper and nickel. The contribution of these elements is around 17.90 mg/kg and 6.25 mg/kg. Chemical Characteristics of Solid Waste as Per CPHEEO is tabulated in **Table 6.8**.

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 million

2 For towns of population less than 0.2 million

Source: CPHEEO Manual on Solid Waste Management

F. Key Issues

- (i) In the physical composition of solid waste, the organic waste of commercial establishments and domestic waste is found to be around 60 percent. This is due to more number of hotels and kalyanamandapams in the town.
- (ii) In the physical composition of solid waste, the inorganic waste of commercial establishments and domestic waste is found to be 40 percent. This factor is due to the plastic and ash & fine earth are generated more from sources.
- (iii) In the physical composition of solid waste, the rubber constituents of commercial establishment (6.16 percent) are more when compared to domestic waste (1.47 percent). This factor is due to the number of industries in the town.
- (iv) In the chemical composition of solid waste, the calorific value of commercial establishment (1,482.50 Kcal/kg) is less when compared to domestic waste (2,133.00 Kcal/kg). This factor is due to high proportion of plastic and paper content in waste.
- (v) In the chemical composition of solid waste, the ash content of commercial establishment (66.14 percent) is more when compared to domestic waste (48.45 percent). This factor is due to hotels, markets.
- (vi) In the chemical composition of solid waste, the carbon content of commercial establishments (9.21 percent) is less compared to domestic waste (15.91 percent). This is, higher than the advised carbon value anticipated by CPHEEO.

- (vii) In the chemical composition of solid waste, the toxic content of commercial establishments (73.74 mg/kg) is less compared to domestic waste (321.12 mg/kg).
- (viii) The significant constituents of solid waste in Pallavaram 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 urbanisation in the region and associated activities.
- (ix) The Moisture content and Calorific value of solid waste of Pallavaram 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

313. 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.
314. 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.
315. In Pallavaram, there are 39 slums. **Table 7.1** tabulate the total population residing in slums is about 37,509, which is 25.9 percent of the town's population.

Table 7.1: Slums in Pallavaram

Sr. No	Slums	Ward No	Population <i>Nos.</i>
1	Eswari Nagar	6	932
2	Arunthatipuram	4	1,466
3	Kannapiran Koil Street	3	520
4	P.P Amman Koil Street	3	520
5	CLC line	42	1,433
6	Gothendam Street	41	836
7	Sasthri Colony	41	891
8	Adaikalam Nagar	41	836
9	Kamarajar Nagar	3	1,000
10	Sathiya Nagar	1	636
11	Subramaniyar Koil Street	7	529
12	Kullathumedu	7	1,110
13	Dhulu Kanatham Koil Street	9	1,382
14	Malagananthapuram	10	1,400
15	Pachaiyappan Colony	11	1,469
16	Ambedkar Nagar	11	938
17	Villiyar Pakuthi	12	703
18	Chitherikarai	12	1,001
19	Duraikannu Colony	16	426
20	Thirupathiamman Koil Street	17	1,028
21	Mummoorthi Nagar	38	1,316
22	Indira Nagar	38	810
23	Periyar Nagar	28	393
24	New Colony	39	480
25	Bharathipuram	30	600
26	Rayapettai	22	1,006
27	Ganapathipuram	23	1,312
28	Gandhipuram	31	1,148

Sr. No	Slums	Ward No	Population
			Nos.
29	East Puduvali Nagar	24	800
30	Bangalow Malai	33	1,503
31	Haridossapuram	20	585
32	Anna Nagar	35	1,221
33	Hashtinapuram Nethaji Nagar	21	357
34	Nemilicherry	18	1,608
35	Thiruvalluvar Nagar	35	428
36	Vinobaji Nagar	20	1,300
37	Hashtinapuram	19	2,001
38	Sanjay Gandhi Nagar	24	1,026
39	Thirumalai Kullur	32	559
	Total		37,509

Source: Pallavaram Municipality

316. It can be noted that, wards 2, 5, 8, 13, 14, 15, 25, 26, 27, 29, 34, 36, 37 and 40 does not have any slum habitation. Wards 3 and 41 are noted to have three nos of slums and the other wards have one or 2 nos of slums.

B. Infrastructure Provision in Slums

317. Slums in Pallavaram 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.

Map 7.1: Location of Slums in Pallavaram

Table 7.2: Overview of Existing Infrastructure in Slums

Name of Slum	Water Taps/Han d pumps	No. of Seats in Public Toilet	No. of Dustbins	Total Roads	Surfaced Roads	Storm Water Drains	Street lights
	Nos.	Nos.	Nos.	km	km	km	Nos.
Eswari Nagar	3	-	1	0.75	0.75	0.38	30
Arunthatipuram	5	-	1	2.00	2.00	1.00	35
Kannapiran Koil Street	2	-	1	1.00	1.00	0.50	20
P.P Amman Koil Street	2	-	1	1.00	1.00	0.50	50
CLC Line	5	10	1	2.00	2.00	1.00	42
Gothendam Street	4	10	1	1.00	1.00	0.50	36
Sasthri Colony	2	-	1	1.00	1.00	0.50	30
Adaikalam Nagar	3	-	1	1.00	1.00	0.50	60
Kamarajar Nagar	5	-	1	2.00	2.00	1.00	25
Sathiya Nagar	3	-	1	0.63	0.63	0.32	60
Subramaniyar Koil Street	2	-	1	0.43	0.43	0.21	28
Kullathumedu	6	-	1	2.00	2.00	1.00	65
Dhulu Kanathamam Koil Street	6	-	1	2.00	2.00	1.00	63
Malagananthapuram	5	10	1	2.00	2.00	1.00	60
Pachaiyappan Colony	7	-	1	2.00	2.00	1.00	50
Ambedkar Nagar	3	10	1	1.00	1.00	0.50	35
Villiyar Pakuthi	2	-	1	1.00	1.00	0.50	33
Chitherikarai	3	-	1	2.00	2.00	1.00	36
Duraikannu Colony	1	-	1	0.65	0.65	0.33	32
Thirupathiamman Koil Street	4	-	1	2.00	2.00	1.00	22
Mummoorthi Nagar	6	-	1	2.00	2.00	1.00	25
Indira Nagar	3	-	1	1.00	1.00	0.50	30
Periyar Nagar	3	-	1	0.42	0.42	0.21	45
New Colony	2	-	1	0.53	0.53	0.27	42
Bharathipuram	2	-	1	1.00	1.00	0.50	39
Rayapettai	3	-	1	2.00	2.00	1.00	30
Ganapathipuram	4	10	1	2.00	2.00	1.00	27
Gandhipuram	5	-	1	2.00	2.00	1.00	25
East Pudurvai Nagar	3	10	1	1.00	1.00	0.50	15
Bangalow Malai	6	-	1	2.00	2.00	1.00	30
Haridossapuram	2	-	1	0.50	0.50	0.25	22
Anna Nagar	5	-	1	2.00	2.00	1.00	18
Hashtinapuram Nethaji Nagar	1	-	1	0.35	0.35	0.18	18
Nemilicherry	5	10	1	2.00	2.00	1.00	13
Thiruvalluvar Nagar	2	-	1	0.35	0.35	0.18	27
Vinobaji Nagar	6	-	1	2.00	2.00	1.00	20
Hashtinapuram	5	-	1	2.50	2.50	1.25	39
Sanjay Gandhi Nagar	3	-	1	2.00	2.00	1.00	45
Thirumalai Kullur	1	-	1	1.00	1.00	0.50	30
Total	140	70	39	54.11	54.11	27.05	1,352

Source: Pallavaram 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 only 140 units of hand pump and PSP covering all the slums. The slum at Pachaiyappan Colony has maximum number of water outlets with 7 numbers while other slums have in the range of 2 to 6. Dependency on hand pump or PSP is very high with about 268 persons per unit against the standard norm of 75 persons per hand pumps or PSPs. The water tankers also supplement the water supply requirement in the slums.
- (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 only in 7 slums viz., CLC Line, Gothendam Street, Malagananthapuram, Ambedkar Nagar, Ganapathipuram, East Puduvali Nagar and Nemilicherry. People living in slums without access to sanitation facilities either depend on nearby public toilets or resort to open defecation. Considering 7 slums, on an average, each seat serves about 119 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 the slum dwellers, it was stated that all the slums are provided with one dustbin. However, most of them are in bad condition. 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 54.11 km of surfaced roads in slums. The per capita road maintained by the ULB in slums works out to 1.44 m, which is higher than the total roads maintained by the ULB on town level at 1.24 m.
- (v) *Storm Water Drains.* The total drains provided in slums extend to a length of 27.05 km indicating coverage of about 50 percent of the surfaced roads, which is as per the prescribed limits. However, the demand for the proper connectivity of slum drains with the main drains is high.
- (vi) *Street Lights.* The ULB has provided 1,352 numbers of streetlights in slums with an average spacing of 40.02 m between the poles, which is above the standards spacing of 30 m. Overall, the streetlight spacing in Pallavaram is about 30.27 m. Thus, the slums are poorly lit. The slum at Kullathumedu is provided with maximum number of streetlights with 65 followed by 63 at Dhulu Kanatham Koil Street and 60 each at Adaikalam Nagar, Sathiya Nagar and Malagananthapuram.

C. Poverty Alleviation and Community Development

1. Policies, Targets and Programs

318. This section reviews programs that address service delivery to the poor in Pallavaram. 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. **Table 7.3** explicates the projects undertaken for infrastructure improvement in the slums under the NSDP scheme.

Table 7.3: Infrastructure Upgradation under NSDP

Component	Units	2000 – 01	2001 – 02	2002 – 03	2003-04	Cost (Rs. Lakh)
Basic Amenities						
Water taps / wells/ hand pumps	Nos	1	-	-	1	3.50
Street Lights	Nos	-	-	-	-	-
Community bath room	Nos	-	-	-	-	
Physical Infrastructure						
Road	Km	1	1	0.75	1	76.00
Sewerage	Km	-	-	0.50	-	14.50
Storm Water Drain	Km	-	-	-	-	-
Social Infrastructure		-	-	-	-	-

Source: Pallavaram Municipality

319. *VAMBAY Scheme.* 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.
320. 11-toilet block have been constructed across the slums under the VAMBAY scheme. 50 percent of the total project cost is obtained as grant under the scheme and the municipality mobilized 50 percent. **Table 7.4** explains the works undertaken and the corresponding cost.

Table 7.4: Project taken up under VAMBAY Scheme

Sr. No	Location	Cost <i>Rs. Lakh</i>
1	Ward no 9, Malanganandapuram	4.00
2	Ward no 22, Kuratthiamman Koil street	4.00
3	Ward no 23, Ganapathypuram	4.00
4	Ward no 42, Kothandaramar Nagar 8 th Street	4.00
5	Ward no 12, Balcony Kulam street	4.00
6	Ward no 13, Selvan Street	4.00
7	Ward no 18, Nemilicherry	4.00
8	Ward no 18, Kuppanaickan Pettai	4.00
9	Ward no 20, Thiru Vi Ka Nagar	4.00
10	Ward no 14, Keelkattalai	4.00

Source: Administrative report 2004-05, Pallavaram Municipality

321. *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.

322. 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, 26 groups have got benefited
323. *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/ 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.
324. *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.
325. 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. Many applications have been received to be benefited by the scheme

D. Key Issues

326. Poor infrastructure facilities in slums, is the main issue in Pallavaram slums.

VIII. INFRASTRUCTURE DEVELOPMENT AND SERVICE PROVISION

A. Rationale, Need and Demand

327. 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 17 lpcd for summer season and 21 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. 25,000 septic tanks and 3 low cost sanitation units serve about 82 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 82 percent; (iv) Surfaced roads within the ULB is approximately 96 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 69 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

328. 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.
329. *Design Supply.* The rate of water supply of 90 lpcd at consumer end is assumed for working out the water demand of Pallavaram town.
330. *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 %

331. *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.
332. *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

Description	Year 2005		Year 2011		Year 2026	
	Population	Demand	Population	Demand	Population	Demand
		MLD		MLD		MLD
Water Demand						
Consumer end (90 lpcd)	155,238	13.97	171,159	15.40	210,964	18.99
At service reservoirs (15% loss)		16.07		17.71		21.83
At WTP outlet (2% loss)		16.39		18.07		22.27
At WTP inlet (4% loss)		17.04		18.79		23.16
At source works (2% loss)		17.38		19.17		23.63
Capacity Requirement						
Service storage (1/3 rd of daily)		4.66		5.13		6.33

Description	Year 2005		Year 2011		Year 2026	
	Population	Demand	Population	Demand	Population	Demand
		MLD		MLD		MLD
demand) – ML						
Distribution network to cover population		155,238		171,159		210,964

333. *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: Demand, Supply & Required Augmentation of Water Supply System for 2026

Component	Unit	Supply	Demand					
			Year 2005		Year 2011		Year 2026	
			Demand	Surplus (Deficit)	Demand	Surplus (Deficit)	Demand	Surplus (Deficit)
Raw Water Pumping	MLD		17.38	(17.38)	19.17	(19.17)	23.63	(23.63)
Raw Water Transmission	MLD		17.04	(17.04)	18.79	(18.79)	23.16	(23.16)
Water Treatment Plant	MLD		16.39	(16.39)	18.07	(18.07)	22.27	(22.27)
Clear Water Pumping	MLD		16.07	(16.07)	17.71	(17.71)	21.83	(21.83)
Clear Water Transmission	MLD	3.10	13.97	(10.87)	15.40	(12.30)	18.99	(15.89)
Service Storage	ML	5.00	4.66	0.34	5.13	(0.13)	6.33	(1.33)
Distribution System	Km	130.00	155.24	(25.24)	171.16	(41.16)	210.96	(80.96)

Source: Analysis

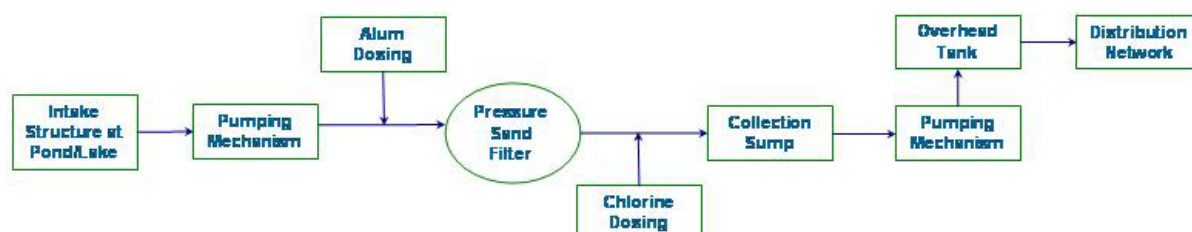
334. *Sector Approach.* Considering the above requirements, capital investments in water supply have to be planned to address issues focusing upon; (i) Augmentation of source to meet the per capita demand of water; (ii) Increase in the storage and distribution of existing facilities to meet the growing demand; (ii) Rehabilitation of existing facilities to avoid the higher costs of deferred maintenance.
335. 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

336. 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.
337. *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

338. 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.

339. *Option - I*. The capacity for water storage in the water bodies and potential for supply bodies 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>
Thiruvengadamudayan Koil Tank	9.59	Bharathi Nagar	17,162	0.11	6.21
Chelliamman Koil Tank	7.21	Bharathi Nagar	17,162	0.08	4.67
Papathikuttai Kulam	13.79	Bharathi Nagar	17,162	0.15	8.93
Easwaran Koil Kulam	0.49	Bharathi Nagar	17,162	0.01	0.32
Beriamman Koil Kulam	8.96	Radha Nagar	21,063	0.10	4.73
Hashtinapuram	35.42	Nehru Nagar	8,973	0.20	21.93
		Gayathri Nagar	21,012	0.20	9.37
Ramaswamy Kulam	20.30	Kannabiran Koil Street	8,714	0.11	12.94
		Munvar Avenue	5,550	0.11	20.32
Periya Eri Keelakattalai Tank	97.72	Katcheri Malai	14,218	1.09	71.83
Nemilicherry Tank	30.87	Shanthi Nagar	6,051	0.09	14.17
		N.G.O. Colony	3,123	0.09	27.46
		Radha Nagar	27,239	0.09	3.15
		Gayathri Nagar	21,012	0.09	4.08
Balacony Kulam	21.00	Eswari Nagar	9,410	0.23	18.84
Zamin Royapettai Tank	20.30	Radha Nagar	21,063	0.23	10.71

Note: * Actual Storage Capacity available for 90 days

Source: Analysis

340. *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	Supply to OHT	Actual Storage Capacity*	Design Population	Estimated Storage Capacity per Day	Potential Per Capita Supply Rate
		<i>ML</i>	<i>Nos</i>	<i>MLD</i>	<i>lpcd</i>
Thiruvengadamudayan Koil Tank	Bharathi Nagar	8.70	17,162	0.10	5.63
Chelliamman Koil Tank	Bharathi Nagar	7.21	17,162	0.08	4.67
Papathikuttai Kulam	Bharathi Nagar	12.17	17,162	0.14	7.88
Easwaran Koil Kulam	Bharathi Nagar	0.49	17,162	0.01	0.32
Beriamman Koil Kulam	Radha Nagar	8.96	21,063	0.10	4.73
Hasthinapuram	Nehru Nagar	-	8,973	-	-
	Gayathri Nagar		21,012	-	-
Ramaswamy Kulam	Kannabiran Koil Street	17.87	8,714	0.10	11.39
	Munvar Avenue		5,550	0.10	17.88
Periya Eri Keelakattalai Tank	Katcheri Malai	97.72	14,218	1.09	71.83
Nemilicherry Tank	Shanthi Nagar	24.56	6,051	0.07	11.27
	N.G.O. Colony		3,123	0.07	21.84
	Radha Nagar		27,239	0.07	2.50
	Gayathri Nagar		21,012	0.07	3.25
Balacony Kulam	Eswari Nagar	19.66	9,410	0.22	17.64
Zamin Royapettai Tank	Radha Nagar	17.34	21,063	0.19	9.15

Note: * Actual Storage Capacity available for 90 days

Source: Analysis

341. It can be noted that the designed population to be served (mentioned in the above tables) by the water bodies is more than the actual population of the town. It can be attributed due to more number of water bodies than the existing OHTs (or the water supply zones) in the town and the water supply zone is proposed to served by two or more water bodies. Thus, the water demand from a water body is calculated considering the respective zonal population.
342. Thus, the average gross per capita supply from the existing water bodies during 90 days of summer season would be around 24 lpcd for Option - I and 19 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.
343. *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).

344. *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.
345. *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.
346. *Performance Monitoring.* It is important to monitor certain key indicators to assess the performance of the system and also to ensure sustainability of operations.
347. *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

348. *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.
349. *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	155,238	13.97	171,159	15.40	210,964	18.99
Pumping Station		11.18		12.32		18.99
Sewage Treatment Plant		11.18		12.32		18.99

350. 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

351. The DPR for Underground Drainage System has been prepared for Pallavaram with the design year of 2036 to serve a population of 2.23 lakh (Design Flow – 20 MLD) at an estimated cost of Rs. 4,909.00 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 the **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.
352. *Comparison.* The following table compares the capacity of various components of the existing/proposed system with the projected demand.

Table 8.9: Comparison of Demand & 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	185.58*	97.80	87.78	107.83	77.75	132.91	52.67
Pumping Station	MLD	20.00*	11.18	8.82	12.32	7.68	18.99	1.01
Sewage Treatment Plant	MLD	20.00*	11.18	8.82	12.32	7.68	18.99	1.01

Note: * Proposed as per DPR

Source: Analysis

353. *Adequacy.* The proposed project under DPR can very well serve the town for the project year of 2026. As the UGD system is under implementation, thus, no projects are considered under this project.
354. *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).
355. *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 Pallavaram town in future.
356. *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.
357. *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*

358. *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.
359. The drain network demand for 2011, based on 150 percent road length is approximately 598 km (also includes the drains along the new formation of roads anticipated in future), as against a service level of 69 percent for 2005. As most of the water bodies are presently in a dilapidated condition, improvements would be necessary prior to proper usage.
360. *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 (if any), 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 becomes fully functional (including provision of desired level of HSCs) 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.
361. Areas along G.S.T. Road in Alandur, Pallavaram and Tambaram municipal areas (especially from Alandur municipal office to Tambaram hospital at Chrompet) usually get inundated during the rainy season.
362. Water bodies such as lakes, tanks, catchment areas and leading channels have been encroached and urbanized. During the normal rainy spell, rainwater is discharged directly into the now-encroached streams and water bodies, thus submerging portions of buildings (even upto the ceiling of the first floor) and other structures, especially in and around Alandur and Pallavaram areas. Hence, a proper disposal mechanism of floodwater is required.
363. Two options are considered to discharge rainwater:
- (i) Adambakkam Eri. The storage capacity of Adambakkam Eri has reduced from 96.71 ML to 19.17 ML due to encroachments. Construction of lead drains to discharge rainwater from Airport area to Adambakkam Eri requires sufficient land. This can be achieved either by removal of encroachments or acquisition of additional land. Additional care has to be taken to avoid flooding of wayside areas. This option may be considered as a long-term option and requires government action to remove encroachments or acquire additional land.

- (ii) Adyar River. The best option to avoid flooding of areas of Alandur and Pallavaram is to divert floodwater to Adyar River. This can be achieved by providing deep drains, which would involve deep cuttings, as there are reverse slopes. The link to be provided is around 1 km from NH-45 to Adyar River. In addition to these drains, horizontal and vertical drains with geo-fabric material should also be used at regular intervals to disperse the water to underground. This would help in recharging the ground water table. As there is a proposal by Public Works Department for constructing check dams along Adyar River, this diversion of floodwater would also contribute to recharge the ground water. The construction of vertical drains depends on the availability of sand at minimum 5 m depth. Hence, a geo-technical survey would be needed to ascertain the profile of soil stratum and accordingly, vertical drains can be laid.

The total investment (for option II) envisaged is estimated at Rs. 500 lakh.

The following funding/cost-sharing arrangement may be considered:

- Contribution from Highway Department = 40 %
- Contribution from Airport Authority = 20 %
- Contribution from Alandur ULB = 16.67 %
- Contribution from Pallavaram ULB = 16.67 %
- Contribution from Cantonment Board = 6.67 %

In case the rocky stratum along the NH-45 is at shallow depth, vertical drains can be constructed as per the availability of sandy layer at minimum depth of 5 m. The other option is to provide a leading drain from NH-45 to Adyar River, which would cost around Rs. 400 lakh.

364. *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*

365. *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.
366. 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.
367. **Table 8.10** shows the projected quantity of waste generated. As per the estimate, the total population in the year 2026 would be 210,964 while the quantity of waste generation would be around 106.05 tons per day.

Table 8.10: Projected Waste Generation

Year	Population	Waste Generation	
		Per Capita	Total Waste
	Nos.	Gms/Day	Tons/Day
2005	155,238	483.00	74.98
2011	171,159	487.85	83.50
2015	181,774	491.76	89.39
2021	197,696	497.69	98.39
2026	210,964	502.69	106.05

Source: Analysis

368. 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.
369. *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.
370. *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.
371. 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.
372. 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.
373. *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.
374. *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

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: 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

375. 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).
376. 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.

377. 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	1,414	859	803	754	703
Transportation	287	538	301	236	220
Disposal	-	733	754	776	433
Total	1,701	2,130	1,858	1,766	1,356

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	1,414	859	803	754	703
Transportation	287	538	301	236	220
Disposal	-	695	709	724	373
Total	1,701	2,093	1,813	1,713	1,296

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	1,414	859	803	754	703
Transportation	287	538	301	236	220
Disposal	-	733	754	776	433
Total	1,701	2,130	1,858	1,766	1,356

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	-	88	218	286	397
Transportation	-	-	-	-	-
Disposal	-	-	-	-	-
Total	-	88	218	286	397

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	1,414	770	585	468	306
Transportation	287	538	301	236	220
Disposal	-	733	754	776	433
Total	1,701	2,042	1,640	1,480	959

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	1,414	859	803	754	703
Transportation	287	538	301	236	220
Disposal	-	733	754	776	433
Total	1,701	2,130	1,858	1,766	1,356

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	-	88	218	286	397
Transportation	-	-	-	-	-
Disposal	-	38	45	53	60
Total	-	126	263	338	457

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	1,414	770	585	468	306
Transportation	287	538	301	236	220
Disposal	-	695	709	724	373
Total	1,701	2,004	1,595	1,428	899

Source: Analysis

378. 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.
379. *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.

380. *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.
381. *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

382. *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.
383. *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 10.50 km/sq. km only). Formation of new roads based on the future requirement of the town is also envisaged under this project.
384. *Strengthening and Widening of Major Roads.* Emphasize 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
385. *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.
386. *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 sign boards
 - (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
387. Improvements to major and minor junctions are also proposed in terms of geometry, traffic management, lighting and signages and construction of ROB/RUBs at level crossings, is also considered under this project.

6. *Street Lighting*

388. *Sector Approach.* The local body has provided sufficient number of street light fixtures within the municipal limits as the spacing between the poles is 24 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.
389. 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.
390. 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

391. *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 slums areas.
392. The detail of service levels for future is 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 1,000	m	0.25
Population below 1,000	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

393. *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.
394. In recent years, TNUISL has carried out a study on slums in Chennai Metropolitan Area and envisaged the capital investments needed for the upgradation of infrastructure 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.
395. Lack of basic infrastructure facilities in most of the slums is a key issue.

8. Other Municipal Projects

396. As per the Vision Plan, the local body has identified certain projects related to

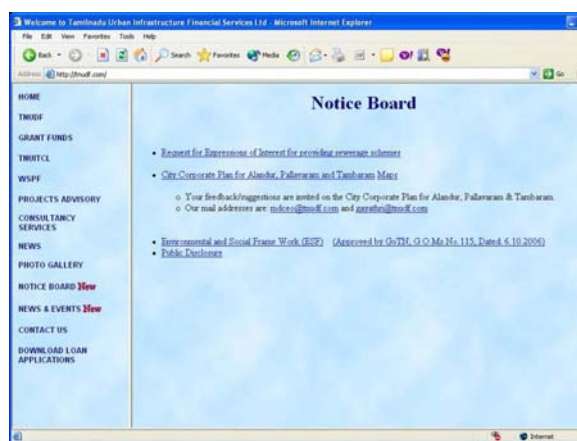
improvements to parks, tree plantation along the roadside and improvements to burial grounds for which the investment size has been estimated by the local body and the same has been considered for this project.

B. The Consultative Process

397. 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.
398. 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.
399. The consultation workshop for stakeholders of corporate planning process for Pallavaram was conducted on February 14, 2006. To prioritize the needs of the town effectively, the workshop was conducted for the ward councilors and other stakeholders, which included officials from various government offices, representatives from non-governmental organizations, local clubs and prominent citizens.
400. Mr. S. Swaminathan, Commissioner and Mr. Dhasnamurthy, Chairman of Pallavaram Municipality gave the introductory speeches and briefed the session about the importance of this project. The invitation for the presentation and the list of participants are given in **Annexure 8.1** and **8.2**. The minutes of consultation meetings/workshops held at various stages of the report submission are given in **Annexures 8.3, 8.4, 8.5** and **8.6**.
401. 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) Landuse 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

402. The focus of the discussions at the workshops and meetings was on the existing infrastructure situation and identified investments for Pallavaram 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.
403. The presentation made by the consultants was appreciated by all the stakeholders present for the workshop.
404. 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.



Project Summary uploaded in official web page of TNUIFSL

405. Hence, the feedback from various stakeholders has strengthened the visioning process and helped in prioritizing the projects.

1. Priorities and Suggestions

406. 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:
- Feasibility for use of quarries for storing water
 - Combined water supply system for Alandur, Pallavaram and Tambaram towns
 - Improvements to Link Road from CLC Work's Road to Tiruneeramalai Road
 - Construction of electric burial ground

- (v) Revision of tax every year, instead of once in five years
 - (vi) Privatization of tax collection
 - (vii) Street lights are not working and not maintained properly
 - (viii) Requirements of footpaths adequate street lighting
 - (ix) Encroachments along main roads
 - (x) Solution to prevent flooding of areas during rainy seasons
 - (xi) Construction of additional public toilets
 - (xii) Poor condition of roads – Needs resurfacing of roads
407. Discussions with stakeholders led to the formulation of regional and town-level vision as follows:

2. *Regional Level Vision*

408. 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*

409. 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.”
410. 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	Pallavaram 2005	Goal 2026
A. Water Supply			
1	Coverage of distribution network	69.00 %	100%
2	Per Capita Supply (Normal Season)	21.44 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			

Sr. No	Parameters	Pallavaram	Goal
		2005	2026
1	Storm Water Drain Coverage (% of road length)	69.00%	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	82%	100%
3	Scientific Disposal		100%
E. Traffic and Transportation			
1	Road Density	6.28 km/sq. km	15 km/sq. km
2	Percent of Municipal Surfaced Roads	96.3 %	100%
F. Street Lighting			
1	Initiatives in energy saving mechanisms	No	Yes
2	Average spacing of street poles	Avg 30 m (with variation between wards/pockets ranging from 19.6 m to 54.6)	30 m or less in all wards
G. Basic Services for Poor			
1	Dependency on public taps/standposts	268 persons per unit	75 persons per unit
2	Dependency on public conveniences	536 persons per unit	30 persons per unit
3	Provision of Dust-bins	1,387 m	300 m
4	Average spacing of street poles	40 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 15.89 MLD at the rate of 90 lpcd, is proposed. Under this component, rehabilitation of existing distribution network of 7.42 km, provision of additional distribution network for a length of 80.96 km with road overlay, construction of storage reservoirs of combined capacity of 13.30 LL and a water treatment plant of 22.27 MLD (2026), is proposed under this project.
- (ii) Cost Estimates. **Table 8.23** summaries the capital investment is estimated at Rs. 2,348.41 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	7.42	km	37.08
2	Leak Detection and Reduction Measures for Distribution Network	130	km	26.00
	Sub-Total (A)			63.08
B	New Infrastructure			
1	Augmentation of Headwork	15.89	MLD	1,270.94
2	Storage Reservoir	1.33	ML	73.09
3	Distribution Network	80.96	km	404.82
4	Road Overlay	80.96	km	202.41
5	Water Treatment Plant	22.27	MLD	334.07
	Sub-Total (B)			2,285.33
	Total (A+B)			2,348.41

Source: Analysis.

2. Sewerage and Sanitation

- (i) Sub-Project Components. As the UGD scheme for Pallavaram town is under implementation, thus no proposals are considered under this project.

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 21.75 km and diversion of floodwater from Airport area to Adyar River, is also proposed under this project.
- (ii) Cost Estimates - Drainage. **Table 8.24** illustrates the capital investment for the improvements and upgradation of storm water drains is estimated at Rs. 4,680.87 lakh.

Table 8.24: Projects Identified for Drains (2011)

Sr. No	Description	Value	Unit	Cost
				<i>Rs. Lakh</i>
A	Rehabilitation			
1	Rehabilitation of Existing Storm Water Drains	21.75	km	21.75
B	Upgradation of Kutcha to Pucca			
1	Kutcha to Pucca Open	84.99	km	1,019.86
2	Kutcha to Pucca Closed	1.51	km	25.69
3	Pucca Open to Pucca Closed	-	km	
C	Formation of New Drains			
1	New Pucca Open Drains	89.91	km	1,078.91
2	New Pucca Closed Drains	144.20	km	2,451.33
D	Diversion of Floodwater from			83.33

Sr. No	Description	Value	Unit	Cost
				<i>Rs. Lakh</i>
	<i>Airport to Adyar River</i>			
	Total			4,680.87

Source: Analysis.

- (iii) Sub-Project Components – Water Bodies. Under this component, it is proposed to improve the 10 existing water bodies viz., Thiruvengadamudayan Koil Tank, Chelliamman Koil Tank, Papathikuttai Kulam, Easwaran Koil Kulam, Beriamman Koil Kulam, Hasthinapuram, Ramaswamy Kulam, Periya Eri Keelakattalai Tank, Nemilicherry Tank and Balacony Kulam. 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. 185.15 lakh is furnished in **Table 8.25**.

Table 8.25: Estimated Cost for Improvements to Lakes

Sr. No.	Tank	Improvements to Lakes	Infrastructure for Supply to OHTs
		<i>Rs. Lakh</i>	<i>Rs. Lakh</i>
1	Thiruvengadamudayan Koil Tank	2.83	8.11
2	Chelliamman Koil Tank	2.12	8.56
3	Papathikuttai Kulam	4.06	7.05
4	Easwaran Koil Kulam	0.14	5.71
5	Beriamman Koil Kulam	2.64	10.71
6	Hasthinapuram	10.44	12.44
7	Ramaswamy Kulam	5.98	11.85
8	Periya Eri Keelakattalai Tank	28.79	11.11
9	Nemilicherry Tank	9.10	11.52
10	Balacony Kulam	6.19	10.70
11	Zamin Royapettai Tank	5.98	9.14
	Total	78.27	106.88

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 191 tricycles (with 6 bins each) and 315 pushcarts. The secondary collection and transportation system consists of 34 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 106.05 tons by the year 2026.

- (ii) Cost Estimates. The capital investment is estimated at Rs. 646.02 lakh is tabulated in **Table 8.26**.

Table 8.26: Projects Identified for Solid Waste Management (2026)

Sr. No	Item	Quantity	Unit	Cost
				<i>Rs. Lakh</i>
A	New Infrastructure			
I.	Waste Collection and Transportation Equipment			
1	Tri-cycles (with 6 Bins Each)	191	Nos	15.28
2	Push Carts	315	Nos	22.68
3	Dumper Bins (7 cum)	34	Nos	18.70
4	Dumper Placers	9	Nos	90.00
	Subtotal (I)			146.66
II.	Compost Plant Development and Sanitary Landfill Site Development			
1	Compost Yard	64.00	Tons	160.00
2	Landfill	42.42	Tons	339.36
	Subtotal (II)			499.36
	Total (I+II)			646.02

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. Improvements to the traffic and transportation related components are also considered under this project is illustrated in **Table 8.27** and **8.28**.

Table 8.27: 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	Thirunneermalai Road	1,600	Alternate to G.S.T. Road section between Pallavaram and Tambaram and also a bus route	7.0	Widening & Strengthening of existing two lane road to four lane carriageway with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder
2.	Medavakkam Main Road	2,000	State highway passing through Pallavaram and	7.0	Widening & Strengthening of existing two lane road to four lane carriageway with 50 mm BM and 25 mm

Sr. No	Road Name	Length	Importance of Road	Existing Width	Proposals
		<i>m</i>		<i>m</i>	
			connecting Alandur and Medavakkam		SDBC with 1.5 m gravel shoulder
3	Rajendra Prasad Road	2,000	Bus route, connecting Chrompet and Hasthinapuram	5.5	Widening and Strengthening of existing intermediate lane carriageway to two lane with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder
4	Dhargha Road	5,000	Bus route	5.5	Widening & Strengthening of existing road to two lane carriageway with 50 mm BM and 25 mm SDBC with 1.5m gravel shoulder
5.	Indhira Gandhi Street	400		5.5	
6	Radhanagar main Road	3,200		5.5	
7	Hasthinapuram Road	3,300		5.5	
8	New Link from Thoraipakkam Link road to Chrompet	3,000	To connect Chrompet and Thoraipakkam Link road	-	Two lane carriageway with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder
9	New Link from Thoraipakkam Link road to Dhargha road	800	To connect Old Pallavaram and Thoraipakkam Link road	-	Two lane carriageway with 50 mm BM and 25 mm SDBC with 1.5 m gravel shoulder
10	CLC Works Road Improvement and Extension	2,000	Link from Chrompet to Thirunermalai Road	5.5	Two lane carriageway with 50 mm BM and 25 mm SDBC with 1.5m gravel shoulder

Source: Analysis.

Table 8.28: Proposed Improvements to Major Junctions

Sr. No	Junction	Type of Junction	Roads Leads to	Existing Condition	Proposals
1	G.S.T. Road - Thirunneermalai road Junction	T - Junction	Tambaram on South side, Thirunneermalai on West side, Chennai on north side	No chanelising island No Lighting facility Unsignalised No traffic Signs and markings	Proper chanelization, provision of proper traffic signs and markings, proper lighting facility

Sr. No	Junction	Type of Junction	Roads Leads to	Existing Condition	Proposals
2.	G.S.T. Road – Pammal Road Junction	T - Junction	Pammal on West side, Chennai on North side, Tambaram on North side	No chanelising island No Lighting facility, Signalised No traffic Signs and markings	
3.	G.S.T. Road – Dhargha Road Junction	T – junction	Dhargha Rd on East side, Chennai on North side, Tambaram on South side	No chanelising island No Lighting facility Unsignalised No traffic Signs and markings	
4	Dhargha Road-Medavakkam Main Road	T – junction	Madipakkam on North side, Pallavaram on West side, Tambaram on South side	No chanelising island No Lighting facility Unsignalised No traffic Signs and markings	

Source: Analysis.

Proposals for on-street parking are proposed on the roads given in **Table 8.29**.

Table 8.29: On-Street Parking Proposals

Sr. No	Road	Stretch Between	Details of Parking	Proposals
1.	G.S.T. Road	Bus terminus – Lakshmi Theatre	Length of parking is 750 m. Mixed type of parking	Bay markings, signage
2.	Pammal Main Road	From Indhira Gandhi street - Mars hotel	Length of parking is 500 m. Mixed type of parking	
3.	Indhira Gandhi Street	From G.S.T. Road – Pammal main Road	Length of parking is 200 m. Mixed type of parking	
4.	Ranganathan Street	From G.S.T. Road – 250 m	Length of parking is 250 m. Mixed type of parking	

Two pedestrian sub-ways on G.S.T. Roads at Pallavaram and Chrompet are proposed. The following roads are proposed for footpaths:

- (i) G.S.T. Road
- (ii) Pammal Road
- (iii) Indhira Gandhi Street

(ii) **Cost Estimates.** The capital investment is estimated at Rs. 11,878.78 lakh.

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

Table 8.30: Projects Identified for Roads and Traffic & Transportation

Sr. No	Item	Value	Unit	Cost <i>Rs. Lakh</i>
I	Roads			
<i>A</i>	<i>Upgradation (Excludes the Bus Route and Major Links)</i>			
1	BT to Concrete	-	km.	-
2	WBM to Black Top	1.39	km.	20.84
3	Earthen to Black Top	3.40	km.	67.96
<i>B</i>	<i>New Formation (Excludes the Bus Route and Major Links)</i>			0
1	Concrete	5.00	km.	235.15
2	Black Top	48.09	km.	1,538.73
3	WBM	12.44	km.	174.16
<i>C</i>	<i>Widening/ Strengthening (Excludes the Bus Route and Major Links)</i>	88.48	km.	619.34
<i>D</i>	<i>Formation of New Bus Route Road (Maintained by Municipality)</i>	3.80	km.	570.00
<i>E</i>	<i>Radha Nagar Main Road</i>	1.0	Km	250.00
<i>F</i>	<i>Station Road</i>	0.75	km	200.00
				3,676.18
	<i>Highways and other department</i>			
	<i>Widening/ Strengthening of Bus Route and Major Links (Maintained by Highway Department)</i>	19.50	km.	2,062.50
	<i>ROBs (Maintained by Railways)</i>	3	Nos.	4,500.00
	Link road to Pallavaram – Thoraipakkam road			1,254.00
	From Dargah road to Ganapathipuram	1.2	km	
	Connectivity at Vels College (Vaidhyalingam Street to Radha nagar Main Road)	1.1	km	
	Connectivity from 5 th Cross street	1.4	Km	
	Sriramnagar main road to Marudhupandiar Street	2.0	Km	
	Rail lane near Vaishnav College – underpass	1.0	Km	
	Sub-Total (I)			7,816.5
II	Traffic and Transportation			
	Municipality			
<i>A</i>	<i>Junction Improvement</i>	4	Nos.	20.00
<i>B</i>	<i>Parking Facility</i>	1.70	Km.	4.25
<i>C</i>	<i>Footpath (1.5 m Wide)</i>	9.40	Km.	18.80
	Sub-Total (Municipality)			43.05
	Highway Department			
<i>A</i>	<i>Pedestrian Subways</i>	2	Nos.	300.00
	Sub-Total (Highway Department)			300.00
	Sub-Total (II)			343.05
	Total (I+II)			11,835.73*

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, 957 tube lights, 49 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, 1,749 tube lights, 436 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 roads.

- (ii) Cost Estimates. The capital investments estimated at Rs. 755.20 lakh are presented in **Table 8.31** and **Table 8.32**.

Table 8.31: 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	957	Nos.	43.07
2	High Power	49	Nos.	4.44
3	High Mast Lamps	5	Nos.	23.32
4	Power Saver Switches	5	Nos.	0.23
	<i>Sub-Total (A)</i>			71.06
B	<i>Distribution by Type (For New Formation of Roads)</i>			
1	Tube Light	1,749	Nos.	428.51
2	High Power	436	Nos.	126.44
3	High Mast Lamps	6	Nos.	28.32
4	Power Saver Switches	6	Nos.	0.28
	<i>Sub-Total (B)</i>			583.55
	Total (A+B)			654.59

Source: Analysis.

Table 8.32: Cost for Underground Multi-Utility Duct

Roads	Cost <i>Rs. Lakh</i>
Bus Route and Municipal Internal Roads	4500.00
Total	4500.00

Source: Analysis.

7. Urban Services for Poor

- (i) Sub-Project Components. There are 39 declared slums in Pallavaram having a population of 37,509, constituting roughly 26 percent of the total population. Declared slums in the town are considered for slum upgradation.
- (ii) Cost Estimates. The capital investment estimated at Rs. 902.18 lakh is presented in **Table 8.33**.

Table 8.33: Projects Identified for Upgradation of Slum Infrastructure

Sr. No	Component	Value	Unit	Cost
				<i>Rs. Lakh</i>
1	No. of Public Taps / Hand pumps	359	Nos.	125.65
2	No. of Public Toilet Seats	1,181	Nos.	590.50
3	No. of Public Urinals	752	Nos.	127.84
4	No. of Dustbins / Temporary Waste Storage Points	144	Nos.	5.47
5	Roads and Pavements	-	km	-
6	Storm Water Drains	-	km	-
7	Streetlights	659	Nos.	52.72
	Total			902.18

8. Other Municipal Projects

- (i) Sub-Project Components. As per the Vision Plan, the local body has identified projects related to 4 parks (Pallava Garden, Perumal Nagar Park, Vengatraman Nagar and A.G.S Colony), tree plantation along the road side and improvements to burial grounds.
- (ii) Cost Estimates. The capital investment for other municipal projects is estimated at Rs. 212.00 lakhs is pointed out in **Table 8.34**.

Table 8.34: Projects Identified by the ULB

Sr. No	Description	Value	Unit	Cost
				<i>Rs. Lakh</i>
1	Development of Pallava Garden, Perumal Nagar Park as Eco-Parks	2	Nos.	10.00
2	Sports Parks at Vengatraman Nagar & A.G.S Colony	2	Nos.	12.00
3	Tree Plantation	10	Nos.	10.00
4	Improvements to Burial Grounds	9	Nos.	180.00
	Total			212.00

Source: Analysis.

9. Total Investments for Identified Projects

411. To improve and meet the future demand for the town's infrastructural facilities, the total investment is estimated at Rs. 21,666.18 lakh is highlighted in **Table 8.35**.

Table 8.35: Total Investment Identified for Pallavaram Town

Sr. No	Component	Cost
		<i>Rs. Lakh</i>
1	Water Supply	2,348.41
2	Sewerage and Sanitation	0
3	Storm Water Drainage	4,680.87
4	Water Bodies	0
	Improvements to Water Bodies	78.27
	Supply Mechanism to OHTs	106.88
5	Solid Waste Management	646.02
6	Roads & Traffic and Transportation	0
	Municipality	3676.18
	Highway Department	3316.50
	Railways (ROBs)	4800.00
7	Street Lighting and Under Ground Service Duct	0
	Street Poles and Fixtures	654.59
	Under Ground Multi-Utility Duct	4500.00
8	Slums	902.18
9	Other Projects	212.00
	Total	25,921.9

Source: Analysis.

IX. ASSET MANAGEMENT

A. Overview

412. 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.
413. 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

414. 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
415. 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

416. *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.
417. As Pallavaram 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 5.1**. The distribution of water supply is met with 130 km of pipeline laid across the town. The municipality operates its water supply system through sluice valves. They

are around 48 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.

Table 9.1: Details of Valves

Diameter	Material	Number of Valves	Distribution
<i>Mm</i>		<i>Nos.</i>	<i>%</i>
80	C.I	18	37.50
100	C.I	29	60.42
200	C.I	1	2.08
Total		48	100.00

Source: Pallavaram Municipality

418. In addition, the ULB has 15 storage reservoirs, 312 bore wells with hand pumps, 41 borewells with power pumps and 131 public taps spread in all the wards of the town.
419. *Sewerage and Sanitation.* The underground drainage is under implementation, commissioned recently. The municipal owned assets for sanitation system consist of public toilets and pay-and-use toilets. The ULB has provided 3 low cost sanitation units and 1 public toilet.
420. *Land and Buildings.* The local body is maintaining both remunerative and non-remunerative assets. The ULB also possess vacant lands which could be given on lease and enhance their revenue income (elaborated in **Chapter IX**). The details of land availability with the municipality are given in **Table 9.2**. The municipal land has been categorized into Low Value, Medium Value and High Value based on the unit rate.

Table 9.2: Categorization of Land with respect to Unit Rate

Land Value	Criteria
Low Value	< 200
Medium Value	201-400
High Value	401 and Above

Source: Analysis

421. The ULB has 59 numbers of lands. The maximum number of land parcels with 45 nos. has unit value less than Rs. 200 per sq. m while only 2 have value more than Rs. 401 per sq. m.
422. There are 25 vacant lands with the ULB, valuing to about Rs. 22.74 lakh. The details of the vacant lands are given in the following **Table 9.3**.

Table 9.3: Details of Municipal Owned Land

Sr. No	Location	Ownership	Area	Unit Rate	Total Value	Status of Land	Remarks
			<i>Sq. m</i>	<i>Rs. / Sq. m</i>	<i>Rs.</i>		
1	G.S.T. Road Pallavapuram		1,500.00	590.00	885,000	Shops	
2	Big Street Keelakatalai		73,634.00	160.00	11,781,440	Shopping Complex Bus Stand Mpl. Primary School	Here ULB has some vacant land where the shopping complex can be constructed and the cost of construction would be about Rs. 700 to Rs. 1,000 sq. m. Monthly rental income could be around Rs. 2,000 to Rs. 3,000 with deposit of Rs. 30,000 to Rs. 40,000
3	Munwar Avenue Iss Pallavaram	Layout Land	6,000.00	350.00	2,100,000	Noon - Meal Centre	
4	Kannapiran koil street Issa Pallavaram		10,000.00	360.00	3,600,000	Ward Office Slaughter House Noon-meal Centre	
5	Vembuliamman Koil 7th street Kulathumedu, Pallavaram		2,400.00	170.00	408,000	Noon - Meal and Park	
6	Thirupura Sundari Colony Rajaji Nagar, Pallavaram		6,000.00	370.00	2,220,000	Ward Office	
7	Sarojini street Rajaji Nagar, Pallavaram		4,000.00	363.00	1,452,000	Municipal Hospital and Noon - Meal Centre	
8	Raja Joseph Colony Pallavaram		2,300.00	330.00	759,000	Noon - Meal Centre	
9	Bharathi Naar 2nd street Pallavaram		2,400.00	350.00	840,000	Noon - Meal Centre	
10	Pachaiamman Nagar		4,500.00	280.00	1,260,000	Vacant	

Sr. No	Location	Ownership	Area	Unit Rate	Total Value	Status of Land	Remarks
			<i>Sq. m</i>	<i>Rs. / Sq. m</i>	<i>Rs.</i>		
11	Pachiamman Nagar Pallavaram		3,000.00	280.00	840,000	Vacant	
12	P.V.Vaithiyalingam Road Old Pallavaram		9,600.00	310.00	2,976,000	Municipal Hospital	
13	P.V.Vaithiyalingam Road Old Pallavaram		2,400.00	310.00	744,000	Noon-Meal Centre	
14	Subham Nagar Phase I Zamin Pallavaram	Gift Deed	34,880.00	85.00	2,964,800	Vacant	
15	Subham Nagar Phase II Zamin Pallavaram	Gift Deed	22,675.00	76.00	1,723,300	Vacant	
16	Subham Nagar 3rd Phase Pallavarm	Gift Deed	27,805.00	70.00	1,946,350	Vacant	
17	Silver Jubilres Zamin Pallavaram	Gift Deed	11,335.00	120.00	1,360,200	Vacant	
18	Chelliamman Koil street Keelakatalai		6,000.00	140.00	840,000	Ward office and Noon - Meal Centre	
19	Arulmurugan Nagar Keelakatalai	Gift Deed	12,640.00	90.00	1,137,600	Plays Space	
20	Eswaran Nagar Keelakatalai	Layout	5,000.00	90.00	450,000	Vacant	
21	Thiruvengadamudaiyan street Pallavaram		1,500.00	120.00	180,000	Noon - Meal Centre	
22	Perumal Nagar Pallavaram	Layout	2,400.00	98.00	235,200	Vacant	
23	Perumal Nagar Pallavaram	Layout	6,500.00	98.00	637,000	Vacant	
24	Bajanai Koil Street Hasthinapuram (26000)		2,000.00	82.00	164,000	Noon - Meal Centre	
25	A.G.S. Colony Nemilichery	Gift Deed	2,834.00	60.00	170,040	Vacant	
26	Muthusamy Nagar Hasthinapuram	Gift Deed	9,150.00	82.00	750,300	Vacant	
27	Manikandan Nagar Hasthinapuram	Gift Deed	9,600.00	101.00	969,600	Vacant	
28	Haridossapuram Main Road Hasidossapuram		2,400.00	90.00	216,000	Noon - Meal Centre	

Sr. No	Location	Ownership	Area	Unit Rate	Total Value	Status of Land	Remarks
			<i>Sq. m</i>	<i>Rs. / Sq. m</i>	<i>Rs.</i>		
29	Venkataraman Nagar Hasthinapuram	Gift Deed	17,000.00	110.00	1,870,000	Vacant	
30	Balaji Nagar Hasthinapuram		2,400.00	110.00	264,000	Vacant	
31	N.G.O. Colony Hasthinapuram		6,500.00	120.00	780,000	Vacant	
32	Padmanaba Nagar Hasthinapuram		3,600.00	110.00	396,000	Vacant	
33	Kurinji Nagar Chromepet		3,925.00	88.00	345,400	Vacant	
34	Suguna Colony Chromepet		3,000.00	120.00	360,000	Noon-Meal Centre	
35	Lakshmi Nagar Chromepet		7,000.00	140.00	980,000	Play Ground	
36	Kannan Nagar Chromepet		2,400.00	120.00	288,000	Park	
37	Shanthi Nagar Chromepet		56,000.00	140.00	7,840,000	Vacant	
38	Shanthi Nagar Chromepet		2,400.00	140.00	336,000	Vacant	
39	Shanthi Nagar Chromepet		3,000.00	130.00	390,000	Vacant	
40	B.B.R. Nagar Chromepet		6,600.00	120.00	792,000	Vacant	
41	Raghava Nagar Chromepet		7,300.00	115.00	839,500	Vacant	
42	Natarajapuram Chromepet		2,400.00	95.00	228,000	Noon - Meal Centre	
43	Gandhi Nagar Chromepet		2,400.00	120.00	288,000	Noon - Meal Centre	
44	Bungalamalai Nehru Nagar		5,000.00	90.00	450,000	Water Tank & Ward Office	
45	Gajalakshmi Nagar	Giff Deed	13,950.00	110.00	1,534,500	Vacant	
46	Velmurugan Colony		9,000.00	75.00	675,000	Vacant	
47	Gayathiri Nagar Hasthinapuram		5,000.00	90.00	450,000	Water Tank	
48	Rajarajeswari Nagar Hasthinapuram	Giff Deed	3,200.00	75.00	240,000	Vacant	
49	Nallappa street Nehru Nagar		4,000.00	110.00	440,000	Noon - Meal Centre	
50	Nellaiappar 2nd Street Bharathipuram (4500)		3,900.00	90.00	351,000	Noon- Meal centre	
51	G.S.T. Road Chromepet		2,000.00	465.00	930,000	Noon - Meal Centre	
52	Chambers Colony Chromepet		2,400.00	120.00	288,000	Noon- Meal centre	
53	Kothandam Nagar Chromepet		2,400.00	90.00	216,000	Noon- Meal centre	
54	Old Pallavaram		15,260.00	120.00	1,831,200	Burial Ground	

Sr. No	Location	Ownership	Area	Unit Rate	Total Value	Status of Land	Remarks
			<i>Sq. m</i>	<i>Rs. / Sq. m</i>	<i>Rs.</i>		
55	Union Carbide Colony Old Pallavaram		78,000.00		-	Burial Ground	
56	Malanganandapuram Sudugadu Road		183,550.00		-	Burial Ground	
57	GST Road Chromepet Near Hindustan Lever Company		11,775.00		-	Burial Ground	
58	Kannan Nagar Chromepet		13,510.00		-	Burial Ground	
59	Peria Eri Ganapathipuam Chromepet		11,200.00		-	Burial Ground	
60	GST Road Chromepet Opp. to G.H		13,510.00		-	Burial Ground	
61	Thiru-Vi-Ka Nagar Hasthinapuram		13,510.00		-	Burial Ground	
62	Ponnamman koil street Hasthinapuram		53,190.00		-	Burial Ground	
63	Barathipursm Nagar IRT Nemilichery Village		55,000.00		-	Burial Ground	
64	Senthuran Road Keelkattalai		20,920.00		-	Burial Ground	
65	Anbu Nagar Keelkattalai		10,590.00		-	Burial Ground	
66	Nanmangalam Road Nemilichery		6,750.00		-	Burial Ground	
67	Pallavapuram Municipal Office (53580)		11,942.00	260.00	3,104,920	Municipal Office & Ward Office(Water Tank & Store Room)	
68	Panchayat Market Road Chromepet (30000)		880.00	115.00	101,200	Ward Office (Water Tank)	
69	Eswari Nagar Pallavapuram	5,000	880.00	200.00	176,000	Noon Meal Centre (Water Tank)	
70	Bangalamalai Nehru Nagar	2,400	200.00	395.00	79,000	Ward Office (Water Tank)	

Sr. No	Location	Ownership	Area	Unit Rate	Total Value	Status of Land	Remarks
			<i>Sq. m</i>	<i>Rs. / Sq. m</i>	<i>Rs.</i>		
71	Nemilichery High Road Zamin Royapettah	8,000	800.00	82.00	65,600	Noon Meal Centre	
	Total				70,539,150		

Source: Schedule Register, Pallavaram Municipality

423. 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, 2000 is given in the **Table 9.4**.
424. The shopping complexes (137 shops) constructed at four locations viz., Kizkattalai, Near Pallavaram Police Station, Station Road Pallavaram and Station Road Chrompet fetch good revenue income to the municipality.
425. The service-oriented assets maintained by the ULB include maternity centres or homes, noon meal centres, reading rooms, toilet blocks, parks, and playgrounds.
426. *Other Assets*. Other assets of the municipality include a fleet of 26 vehicles utilized by various departments of the ULB. It currently also owns 36 tricycles with bins, etc., for the primary collection.
427. The ULB also owns about 179.50 km of roads of which 86 percent is bitumen surface. Approximately 6,224 street light poles and the associated fixtures also form the assets of the municipality.
428. 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 Pallavaram 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.

Table 9.4: Details of Municipal Buildings

Name of Building	Location	Site Area	Plinth Area	Nature of Construction	Usage of Building	Year of Completion	Construction Cost	Depreciation	Net Value as on 31.03.2000
		<i>Sq. ft</i>	<i>Sq. m</i>				<i>Rs. Lakh</i>	<i>Rs. Lakh</i>	<i>Rs. Lakh</i>
Class I									
Municipal Office Building	New Colony 3rd Main Road Chromepet	11,643	1,082	R.C.C. Roof Building	Ex. Municipal Office	1992	30.00	10.10	19.90
Ward Office	New Colony 3rd Main Road Chromepet	299	28	R.C.C. Roof Building	Ward Office	1998	0.55	0.05	0.50
Ward Office	Kannabiran Koil Street Pallavaram	10,000	929	R.C.C. Roof Building	Ward Office	1972	0.59	0.45	0.14
Ward Office	Thiripurasundari Colony	2,400	223	R.C.C. Roof Building	Ward Office	1997	0.50	0.07	0.43
Ward Office	Bangalamalai Nehur Nagar Chrompet	200	19	R.C.C. Roof Building	Ward Office	1999	0.40	0.02	0.38
Hospital Building	P.V.Vaidyalngam Road Pallavaram	10,000	929	R.C.C. Roof Building	Hospital Building	1989	0.20	0.09	0.11
Hospital Building	Sarojini Street Pallavaram	4,000	372	R.C.C. Roof Building	Hospital Building	1988	5.00	2.30	2.70
Municipal High School	Ponnamman Koil Street Old			R.C.C. Roof Building	Municipal High School	1985	1.59	0.86	0.74
Sub-Total (I)							38.83	13.93	24.90
Class II									
Ward Office	Chelliamman Koil Street Keelkattalai	600.00	100.00	A.C. Sheet Roof	Ward Office	1998	0.30	0.10	0.20
Ward Office	Balaji Nagar Hasithinapuram	2400.00	880.00	A.C. Sheet Roof	Ward Office	1982	0.20	0.19	0.01
Ward Office	Panchayat Market Road Radha	21800.0	1500.0	A.C. Sheet Roof	Ward Office	1965	0.20	0.20	0.0002

Name of Building	Location	Site Area	Plinth Area	Nature of Construction	Usage of Building	Year of Completion	Construction Cost	Depreciation	Net Value as on 31.03.2000
		<i>Sq. ft</i>	<i>Sq. m</i>				<i>Rs. Lakh</i>	<i>Rs. Lakh</i>	<i>Rs. Lakh</i>
	Nagar Chromepet								
Noon Meal Centre	Kothandam Nagar Chrompet		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Chambers Colony Chrompet		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Kannabiran Koil Street Pallavaram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Eswari Nagar Pallavaram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Vembuliamman Koil 7th street		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Raja Joseph Colony Pallavaram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Sarojini street Pallavaram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Barathi Nagar 2nd Street Pallavaram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	P.V.Vaidyalingam Road Pallavaram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Duraikannu Salai Pallavaram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Chelliamman Koil Street Keelkattalai		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Bajanai Koil Street Hasthinapuram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Haridasspuram Main Road Haridasapuram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01

Name of Building	Location	Site Area	Plinth Area	Nature of Construction	Usage of Building	Year of Completion	Construction Cost	Depreciation	Net Value as on 31.03.2000
		<i>Sq. ft</i>	<i>Sq. m</i>				<i>Rs. Lakh</i>	<i>Rs. Lakh</i>	<i>Rs. Lakh</i>
Noon Meal Centre	Nemilichery High Road Chrompet		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Suguna Colony Ganapathipuram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Kannan Nagar		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Chidambaram Street Barathipuram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Gandhi Nagar Chrompet		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Gajalaksmi Nagar Chrompet		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	G.S.T. Road Pallavaram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Nemilichery Erikarai street		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Ramasamy street Natarajapuram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Raghava Nagar Hasthinapuram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	Nallappa street Hasthinapuram		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Noon Meal Centre	G.S.T. Road Chrompet		880.00	A.C. Sheet Roof	Noon Meal Centre	1982	0.20	0.19	0.01
Sub-Total (II)							5.70	5.35	0.35
Total (I+II)							44.53	19.28	25.25

Source: Schedule Register, Pallavaram Municipality

X. RESOURCE MOBILIZATION INITIATIVES

A. Scope in Savings and Revenue Generation

1. Infrastructure

429. 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

430. 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

431. *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.
432. 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.
433. 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.

434. 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.
435. 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*

436. 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
437. *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 Pallavaram to curtail energy consumption. As the municipality was incurring high expenses on the operation and maintenance of streetlights, entire town's operations and maintenance have been privatized since 2004. 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. 2.13 lakh per month. The per month unit rates charged by the contractor is Rs. 250 for tube light and Rs. 850 for sodium vapor lamp 250 W. The contractor is delivering a satisfactory performance.
438. Pallavaram Municipality has 6,244 light fixtures out of which around 69 percent fixtures are tube lights and 31 percent sodium vapor lamps. The total cost of energy utilized is Rs. 21.58 lakh for FY 05-06 and average maintenance expenses of street lighting is Rs. 25.61 lakh per annum is being paid to the private contractor. The average cost of energy consumption per fixture is Rs. 346 per annum. The average maintenance expenditure per light is works out to Rs. 410 per annum. There are two skilled wiremen and 5 helpers to operate and maintain the entire street lighting fixtures 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
	<i>Nos.</i>	<i>Rs./Year</i>
Privatized Lights		
High Mast Lamps	1	26,440.00
Tube lights	4,315	1,078,750.00
Sodium Vapor Lamps 70W	750	473,250.00
Sodium Vapor Lamps 150W	200	148,200.00
Sodium Vapor Lamps 250W	967	821,950.00
Halogen Lamps 250W	7	8,400.00
Mercury Vapor Lamps 250W	4	3,800.00
Total	6,244	728,812.00

Source: Pallavaram Municipality and Analysis.

3. Assets

439. Details of remunerative assets owned by Pallavaram municipality are presented in **Table 10.2**. 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 scope of revenue maximization through lease and rentals from remunerative assets of Pallavaram 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 to the tune of Rs. 2.01 Lakh per annum. The rentals and lease amounts have to be revised every 3 year once to a minimum of 15 percent from FY 2006-07. The collection performance of leases and rentals are inconsistent over the assessment period and hence collection efficiency needs improvement.

Table 10.2: Additional Revenue Estimation from Remunerative Assets

Name/Location of the Asset	No of Shops	Rental Value	Accruing Rentals	Market Rental	Additional Revenue
		<i>Rs./Month /shop</i>	<i>Rs./Year</i>	<i>Rs./Year</i>	<i>Rs./Year</i>
Keelkattalai	42	1,000	504,000	579,600	75,600
Pallavaram Station Road (Daily Market)	30	450	162,000	194,400	32,400
Chromepet Station Road (Daily Market)	54	200	129,600	155,520	25,920
G.S.T Road (Pallavaram)	11	1,700	224,400	291,720	67,320
Total			1,020,000	1,221,240	201,240

Source: Analysis.

C. Additional Resource Mobilization

1. Parking Fees

440. Land-use and economic activity drives the parking demand in Pallavaram. Town attracts two-wheeler and four-wheeler traffic, which puts up specific parking requirement. Private vehicles can be seen parked haphazardly along GST Road, Station Road, Gandhi Road. 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 10.3**.

Table 10.3: Estimated Parking Fee

Year	From bus terminus to Lakshmi theatre	From Indra Gandhi street to Mars hotel	From G.S.T. Road to pammal main road	GST Road	Total
Approx. No of veh./day	225	150	60	75	510
	<i>Rs. Lakh</i>				
2007	7.39	4.38	1.75	2.19	15.71
2008	7.61	4.51	1.80	2.26	16.18
2009	7.84	4.65	1.86	2.32	16.67
2010	8.08	4.79	1.91	2.39	17.17
2011	8.32	4.93	1.97	2.46	17.69
2012	8.57	5.08	2.03	2.54	18.22
2013	8.83	5.23	2.09	2.61	18.76
2014	9.09	5.39	2.15	2.69	19.33
2015	9.36	5.55	2.22	2.77	19.91
2016	9.64	5.71	2.29	2.86	20.50
2017	9.93	5.89	2.35	2.94	21.12
2018	10.23	6.06	2.43	3.03	21.75
2019	10.54	6.24	2.50	3.12	22.40
2020	10.85	6.43	2.57	3.22	23.08

Source: Analysis.

2. Advertisement Fee

441. 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 Pallavaram 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 10.4**) presents detailed estimation of advertisement fee for Pallavaram municipality. The total estimated advertisement fee is Rs. 12.50 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*

442. Conservancy establishment cost is work out to 74 percent of total establishment cost of Pallavaram 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, 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, starting 2006-07. **Table 10.5** presents estimated additional revenue mobilization through conservancy fee for Pallavaram municipality.

4. *Summary*

443. Summary of additional revenue mobilization through expenditure control measures and additional revenue generation is presented in **Table 10.6**.

Table 10.4: 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	Rs.	100.00	50.00	100.00	50.00
Total Length of Road	Km	189			
Length of Road	%	20%	50%	-	-
Total Length of Road	km	38	95	-	-
Spacing of Hoardings/Boards per km	Nos	5	5	-	-
Total no of Hoardings/Boards	Nos	190	475	50.00	3,125
Total Revenue per annum	Rs. lakh	7.60	2.88	1.00	1.56

Source: Analysis.

Table 10.5: Estimation of Conservancy Fee

Description	Coverage	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Domestic (No)	50%	14,925	15,372	15,834	16,309	16,798	17,218	17,649	18,090	18,542	19,005	19,481
Non Domestic (No)	100%	2,653	2,733	2,815	2,899	2,986	3,061	3,138	3,216	3,296	3,379	3,463
<i>Total Revenue (Rs. Lakh)</i>		<i>49.19</i>	<i>56.82</i>	<i>61.60</i>	<i>77.34</i>	<i>81.65</i>	<i>84.88</i>	<i>100.90</i>	<i>105.39</i>	<i>109.00</i>	<i>128.22</i>	<i>133.67</i>

Source: Analysis.

Table 10.6: Estimated Additional Revenue from Resource Mobilization

Table 16.3: Estimated Additional Revenue from Resource Mobilization												
	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
	Rs. Lakh											
Additional Resource Mobilization												
Leases/Rentals from Assets	2.01	2.01	2.01	2.31	2.31	2.31	2.66	2.66	2.66	3.06	3.06	3.06
Parking Fee	15.7	16.2	16.7	17.2	17.7	18.2	18.8	19.3	19.9	20.5	21.1	21.8
Advertisement Fee	12.5	12.8	13.0	13.3	13.6	13.8	14.1	14.4	14.7	15.0	15.3	15.6
Conservancy Fee	50.15	58.43	63.90	81.00	85.95	89.79	107.29	112.60	117.02	138.34	144.92	150.47
Total Revenue	80.36	89.44	95.61	113.81	119.56	124.10	142.85	148.96	154.28	176.90	184.38	190.93

Source: Analysis.

XI. FINANCIAL OPERATING PLAN

A. Financial Sustainability

1. Financial Sustainability

444. *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 Pallavaram Municipality evaluates the municipal fund status for the following scenarios:

- (i) Full Project Scenario. The Full Project Investment Scenario is based on investments identified for Pallavaram 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.
- (ii) 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

445. 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.
446. 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.
447. *Revenue Income.* The assumptions for forecasting revenue income comprise:
- 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 with 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 and 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)	3,891	3,891	3,891
Tax Rate (% of ARV)	23%	23%	23%
Periodic increase in ARV (%)			
2006-07	-	30%	30%
2011-12	-	30%	30%

Description	Current Level	Base Case Scenario	Investment Scenarios
2016-17	-	30%	30%
Collection Performance (% of Demand)			
Arrears	32%	50%	50%
Current	74%	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	30.26%	30.26%	80%
Monthly water charge per connection (Rs.)			
Domestic	50.00	50.00	50.00
Non Domestic	100.00	100.00	100.00
Industrial	150.00	150.00	150.00
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	46%	50%	50%
Current	72%	80%	80%
One time connection fee (Rs.)			
Domestic	5,000	5,000	5,000
Non Domestic	10,000	10,000	10,000
Industrial	10,000	10,000	10,000
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	-	-	150.00
Non Domestic	-	-	300.00
Industrial	-	-	300.00

Description	Current Level	Base Case Scenario	Investment Scenarios
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	-	-	50%
Current	-	-	80%
One time connection fee (Rs.)			
Domestic	-	-	6,000
Non Domestic	-	-	12,000
Industrial	-	-	12,000
Periodic revision of one time connection fee	-	-	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. Though the income from the license fees (like trade, etc.) trend is witnessed a negative growth trend, on a conservative side 20 percent has been adopted, by improving the collection efficiency this can be achieved.

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

Description	Current Level	Assumption
Profession Tax	3.35 %	5.00 %
Other taxes & Charges	--	--
Income from Municipal Properties and Markets	(29.44 %)	20.00 %
License Income (Trade, etc.)	6.09 %	6.00 %
Income from Special Services	(31.42 %)	5.00 %
Income from Sale Proceeds	--	--
Income from Fees and Fines	23.60 %	15.00 %
Income from Interest on Deposits	(52.37 %)	6.00 %
Income from Investments(Excl. Interest)	--	--
Miscellaneous Income	(15.38 %)	5.00 %

Source: Analysis.

- (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. Surcharge on stamp duty, a growth rate of 22.86 percent is witnessed during the review period. Considering trend of 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	(100.00 %)	5.00 %
Surcharge on Stamp Duty	22.86 %	15.00 %
Other Transfers	--	--
Total- Assigned Revenue	20.74 %	

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 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 & Contributions

Description	Current Level	Assumption
State Finance Commission Grant	178.87 %	15.00 %
Other Grants	(100.00) %	5.00 %
Total- Grants & Contribution	138.75 %	

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.

448. *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	11.29 %	8.00%
Allowances to Elected Representatives	(100.00 %)	5.00%
General Expenses	(26.97 %)	5.00%
Pensions and Gratuities	(5.55 %)	5.00%
Education - Staff Salary	--	--
Miscellaneous	2.07 %	5.00%
Total-General Admin. & Revenue Collection	(11.23 %)	
Municipal Services excl. W&D		
General Expenses	(12.66 %)	13.00%
Public Works and Roads	(10.98 %)	11.00%
Public Health and Conservancy	(38.25 %)	15.00%
Street Lighting (including Electricity Charges)	17.80 %	20.00%
Education	(100.00 %)	5.00%
Vehicle and Equipment Maintenance	52.75 %	15.00%
Miscellaneous	93.14 %	15.00%
Total- Municipal Services excl. W&D	3.60 %	

Source: Analysis.

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

Description	Current Level	Assumption
Staff Salary & Employee Related Expenses	-	8.00%
Administration Expenses	-	5.00%
Equipment Maintenance & Repairs	-	5.00%
Board Payment	-	5.00%
Electricity Charges	(100.00 %)	5.00%
Vehicle Maintenance & Repairs	-	5.00%
Miscellaneous	-	5.00%
Total- Water Supply & Drainage	-	

- (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 15-year period beginning 2006-07 to 2016-17 with the furnished interest rate adopted otherwise at a constant interest of 9.50 percent per annum was assumed. The ongoing sewerage scheme debt amount also considered to clear over next 20 years starting from 2007-08. Since the existing loan burden on the ULB is high and hence, it is planned to clear in different schedule to increase the borrowing capacity of the municipality in next ten years.
- (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	40	30	30	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	60	30	10	8.50
Others	80	10	10	8.50

449. *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.
450. *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 (%)									
	Rs. Lakh	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
Water Supply	2,348.41	20%	20%	20%	20%	20%	0%	0%	0%	0%	0%
Sewerage & Sanitation	0	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Roads	11,835.73	0%	0%	10%	20%	20%	20%	10%	10%	10%	0%
Storm Water Drains	4,866.02	0%	0%	15%	20%	15%	10%	10%	10%	10%	10%
Solid Waste Management	646.02	0%	10%	20%	20%	20%	10%	10%	10%	0%	0%
Street Lighting	855.82	0%	0%	10%	20%	20%	20%	20%	10%	0%	0%
Slum Upgradation	902.18	0%	0%	10%	10%	15%	15%	15%	15%	10%	10%
Others	212	0%	0%	0%	20%	20%	20%	20%	20%	0%	0%
Grand Total Investment	21,666.18										

Source: Analysis

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

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	2015-16
Water Supply	2,348.41	469.682	469.682	469.682	469.682	469.682	0	0	0	0	0
Sewerage & Sanitation	0.00	0	0	0	0	0	0	0	0	0	0
Roads	11,835.73	0	0	1183.573	2367.146	2367.146	2367.146	1183.573	1183.573	1183.573	0
Storm Water Drains	4,866.02	0	0	729.903	973.204	729.903	486.602	486.602	486.602	486.602	486.602
Solid Waste Management	646.02	0	64.602	129.204	129.204	129.204	64.602	64.602	64.602	0	0
Street Lighting	855.82	0	0	85.582	171.164	171.164	171.164	171.164	85.582	0	0
Slum Upgradation	902.18	0	0	90.218	90.218	135.327	135.327	135.327	135.327	90.218	90.218
Others	212.00	0	0	0	42.4	42.4	42.4	42.4	42.4	0	0
Grand Total Investment	21,666.18	469.682	534.284	2688.16	4243.02	4044.83	3267.24	2083.67	1998.09	1760.39	576.82

Source: Analysis

451. *Capital Income.* Capital income is forecast based on actual requirement to meet proposed capital expenditure.

Table 11.14: Financing Pattern for Proposed Projects

Table 12.1: Financing Pattern for Proposed Projects					
Sr. No	Sector	Government Grant	Financial Institution Loan	ULB Share	Other Department
		%			
	Municipal Infrastructure				
1	Water Supply	30	40	30	-
2	Sewerage & Sanitation	30	40	30	-
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	60	10	-
7	Slum Upgradation	30	60	10	-
8	Others	10	80	10	-
	Other Dept. Infrastructure				
9	Traffic & Transportation	-	-	-	100

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

Sr. No	Description	Water Supply	Sewerage
1	Domestic	6,000	6,000
2	Non Domestic	12,000	12,000
3	Industrial	12,000	12,000

452. 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; collection performance assumed at 50 percent against arrears demand and 80 percent against current demand.
- 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 FY 2011; 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.* Since the sewerage project is under implementation no new connections envisaged in the base case scenario. Regular sewer connections provided under the Project is accounted with project situation – it is assumed that 80 percent of the property tax assessments would have UGD connections by FY 2012. Monthly flat rate of Rs. 150, Rs. 300 and Rs. 300 per connection for domestic, non-domestic and industrial connections respectively. It is assumed that collection of sewerage charge starts from 2006-07, 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 15 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*

453. 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. Pallavaram municipality would accumulate a positive closing balance of Rs. 1,873 lakh by the end of 2019-20. The total net sustainable project cash flows due to sustainable

project when loaded onto the Base Case Scenario FOP indicate that Pallavaram municipality would end up with a positive closing balance of Rs. 19,742 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. 10,039.15 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.10,331.12 lakh (approximately 80 percent of the total identified investment) is expected.

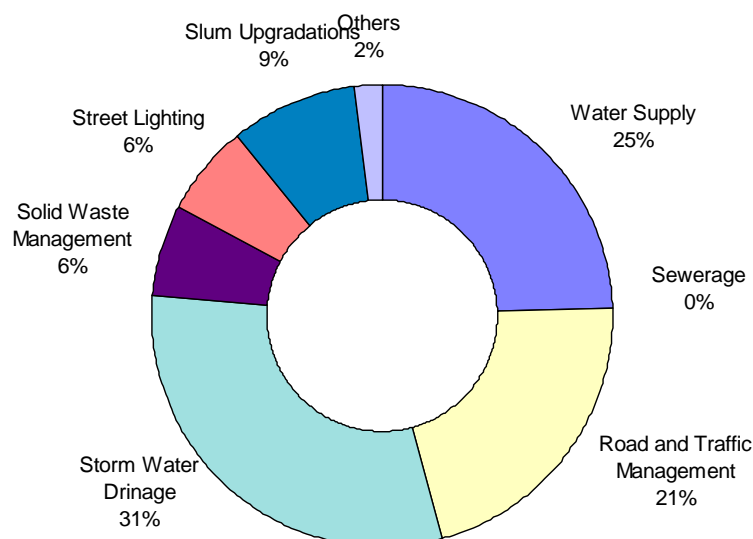


Table 11.16: Financial Operating Plan Results - Pallavaram Municipality

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	511	1,080	1,533	1,770	2,073	2,466	2,930	3,627	4,465	5,427	6,523	7,795	9,953	12,329	14,970
Revenue Income*	1,142	1,338	1,454	1,580	1,736	1,879	2,164	2,395	2,620	2,868	3,174	3,664	4,045	4,495	4,964
Additional Revenue Mobilization**	-	30	31	32	33	34	34	36	36	37	39	39	40	42	43
Total Revenue Income	1,142	1,368	1,485	1,611	1,769	1,913	2,198	2,430	2,657	2,906	3,213	3,703	4,085	4,537	5,007
Revenue Expenditure	572	915	1,248	1,309	1,375	1,450	1,500	1,592	1,695	1,810	1,940	1,545	1,710	1,896	2,107
Status	569	453	237	303	394	463	698	838	962	1,096	1,273	2,158	2,375	2,641	2,900
Closing Balance	1,080	1,533	1,770	2,073	2,466	2,930	3,627	4,465	5,427	6,523	7,795	9,953	12,329	14,970	17,869
Project Account - Full Project Scenario															
Total Net Project Cash Flow (after deducting ULB equity from cash flow)	-	269	279	73	(535)	(1,422)	(946)	(1,375)	(1,897)	(2,460)	(2,695)	(3,298)	(3,937)	(4,354)	(4,786)
Overall Closing Balance	1,080	1,802	2,049	2,145	1,932	1,508	2,681	3,090	3,530	4,063	5,100	6,655	8,392	10,615	13,083
Project Account - Sustainable Investment Scenario															
Total Net Project Cash Flows (after deducting ULB equity from project cash flow)	-	1,462	2,055	2,601	2,882	2,989	3,096	2,958	2,672	2,290	2,049	1,903	1,732	1,799	1,873
Overall Closing Balance	1,080	2,995	3,825	4,674	5,349	5,919	6,724	7,423	8,099	8,813	9,845	11,856	14,061	16,769	19,742
Financial Viability Ratios															
Sustainable Investment Scenario															
Debt Equity Ratio- New Projects	-	0.16	0.48	1.22	1.89	1.87	1.79	3.09	3.02	2.55	-	-	-	-	-
Debt Service Coverage Ratio (DSCR) – Min. 150%	0%	786%	246%	249%	212%	186%	176%	158%	150%	144%	159%	268%	278%	315%	
Operating Ratio (<1)	0.00	0.39	0.70	0.73	0.82	0.87	0.80	0.84	0.86	0.87	0.82	0.66	0.66	0.62	
DSR (Max. 30%)	0%	10%	27%	27%	30%	32%	33%	34%	35%	36%	33%	20%	19%	18%	
Full Project Investment Scenario															
Debt Equity Ratio- New Projects	-	0.43	0.81	2.08	2.90	2.82	0.86	1.75	1.69	1.42	-	-	-	-	-

Item Heads	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
	<i>Rs. Lakh</i>														
Debt Service Coverage Ratio (DSCR) – Min. 150 %		0%	362%	147%	142%	110%	88%	202%	133%	131%	130%	152%	195%	204%	232%
Operating Ratio (<1)		0.00	0.67	0.95	1.04	1.21	1.29	0.74	0.93	0.93	0.92	0.83	0.75	0.74	0.70
DSR (Max. 30%)		0%	10%	27%	27%	30%	32%	33%	34%	35%	36%	33%	20%	19%	18%

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 Full Project Cash Flow

	Description	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
		<i>Rs. Lakh</i>													
	Full Sub Project Cash Flow														
1	Water Supply	396.1	548.5	750.1	850.1	899.3	880.1	749.7	619.0	484.8	391.8	297.4	198.5	148.6	97.3
2	Sewerage *	230.8	553.1	964.9	1,506.5	2,329.6	3,232.6	4,136.9	5,086.8	6,074.5	7,243.6	8,465.9	9,734.1	11,229.9	12,792.9
3	Roads and Traffic Management	0.0	0.0	(21.9)	(103.0)	(261.3)	(555.3)	(939.4)	(1,413.9)	(1,994.8)	(2,623.8)	(3,307.1)	(4,025.1)	(4,779.7)	(5,573.3)
4	Storm Water Drainage	0.0	0.0	(46.1)	(175.6)	(383.6)	(651.2)	(976.1)	(1,381.9)	(1,880.9)	(2,472.7)	(3,107.2)	(3,768.7)	(4,458.9)	(5,179.6)
5	Solid Waste Management	50.2	104.5	147.7	181.4	190.8	177.2	159.8	122.8	69.2	26.2	(19.7)	(69.9)	(95.5)	(120.2)
6	Street Lighting	0.0	0.0	(5.1)	(30.7)	(89.4)	(184.2)	(318.7)	(492.1)	(689.9)	(900.5)	(1,124.5)	(1,362.7)	(1,613.3)	(1,873.9)
7	Slum Upgradations	0.0	0.0	(6.0)	(19.7)	(44.8)	(146.3)	(265.4)	(405.9)	(539.6)	(692.1)	(798.4)	(910.6)	(1,028.9)	(1,152.0)
8	Others	0.0	0.0	0.0	(4.0)	(13.4)	(28.8)	(50.5)	(78.9)	(103.8)	(130.7)	(160.0)	(191.7)	(226.0)	(260.7)
	Total Sub Project Cash Flow	677.1	1,206.1	1,783.6	2,205.0	2,627.2	2,724.2	2,496.2	2,055.9	1,419.5	841.7	246.5	(396.0)	(823.8)	(1,269.3)
	Total Full Project Cash Flow														
	<i>Opening Balance</i>		677	1206	1784	2205	2627	2724	2496	2056	1419	842	246	(396)	(824)
A	Sources of Fund														
1	Debt Drawdown	237	299	1,298	1,951	1,905	1,426	1,187	1,179	979	651	-	-	-	-
2	Equity Drawdown	178	196	372	488	490	235	195	194	163	109	-	-	-	-
3	Govt. Grant	178	212	716	1,028	1,008	630	505	496	439	272	-	-	-	-
4	User Charges	318	439	563	746	847	944	1,136	1,196	1,246	1,470	1,539	1,599	1,881	1,969
5	New Connection Fees	379	171	253	184	393	414	144	148	152	188	194	200	248	256
	Total- Inflow	1,289	1,317	3,202	4,397	4,644	3,650	3,167	3,212	2,980	2,690	1,733	1,798	2,129	2,225
B	Disposition of Funds														
1	Project Capex	592	707	2,386	3,467	3,403	2,355	1,955	1,939	1,632	1,085	-	-	-	-
2	Operation &	-	36	83	187	335	494	606	713	816	902	976	1,035	1,097	1,163

	Description	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
		<i>Rs. Lakh</i>													
	Maintenance														
3	Debt Servicing- Repayment	-	-	-	-	-	583	612	678	763	820	1,301	1,355	1,409	1,458
4	Interest During Construction	20	46	156	322	484	121	222	322	406	461	52	52	51	49
	Total- Outflow	612	788	2,625	3,976	4,221	3,553	3,395	3,653	3,616	3,267	2,329	2,441	2,557	2,670
	Net Cash Flow	677	529	577	421	422	97	(228)	(440)	(636)	(578)	(595)	(642)	(428)	(446)
	<i>Closing Balance</i>	677	1206	1784	2205	2627	2724	2496	2056	1419	842	246	(396)	(824)	(1269)

Source: Analysis.

Note: *Ongoing schemes additional connection deposits and tariff revenues has been considered in sub project cash flow

Table 11.18: Summary of Base Cost Sustainable Investment and Phasing Schedule

Sector	Total Investment	Investment Phasing (%)									
	<i>Rs. Lakh</i>	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
<u>Municipal Infrastructure</u>											
Water Supply	2,533.56	20%	20%	20%	20%	20%	0%	0%	0%	0%	0%
Sewerage & Sanitation	-	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Roads	2,206.74	0%	0%	10%	21%	21%	19%	10%	10%	10%	0%
Storm Water Drains	3,159.59	0%	0%	16%	21%	16%	10%	10%	10%	10%	10%
Solid Waste Mgmt	646.02	0%	10%	20%	20%	20%	10%	10%	10%	0%	0%
Street Lighting	671.03	0%	0%	10%	20%	20%	20%	20%	10%	0%	0%
Slum Upgradation	902.18	0%	0%	10%	10%	15%	15%	15%	15%	10%	10%
Others	212.00	0%	0%	0%	20%	20%	20%	20%	20%	0%	0%
Total – ULB Investment	10,331.12	5%	6%	15%	20%	18%	11%	9%	8%	6%	4%

Source: Analysis

Table 11.19: Summary of Sustainable Project Investment -Base Cost

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
<u>Municipal Infrastructure</u>											
Water Supply	2,533.56	506.71	506.71	506.71	506.71	506.71	-	-	-	-	-
Sewerage & Sanitation	-	-	-	-	-	-	-	-	-	-	-
Roads	2,206.74	-	-	228.85	457.69	457.69	425.00	212.50	212.50	212.50	-
Storm Water Drains	3,159.59	-	-	491.49	655.32	491.49	304.26	304.26	304.26	304.26	304.26
Solid Waste Mgmt	646.02	-	64.60	129.20	129.20	129.20	64.60	64.60	64.60	-	-
Street Lighting	671.03	-	-	67.10	134.21	134.21	134.21	134.21	67.10	-	-
Slum Upgradation	902.18	-	-	90.22	90.22	135.33	135.33	135.33	135.33	90.22	90.22
Others	212.00	-	-	-	42.40	42.40	42.40	42.40	42.40	-	-
Total – ULB Investment	10,331.12	506.71	571.31	1,513.58	2,015.76	1,897.03	1,105.79	893.29	826.19	606.98	394.47

Source: Analysis**Table 11.20:** Summary of Sustainable Investment Project Cash Flow

Table 11.20: Summary of Sustainable Investment Project Cash Flow															
Description		2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
		Rs. Lakh													
	Sustainable Sub Project Cash Flow														
1	Water Supply	396	548	750	850	899	880	750	619	485	392	297	199	149	97
2	Sewerage	1,193	1,776	2,468	3,226	4,049	4,952	5,856	6,806	7,794	8,963	10,185	11,453	12,949	14,512
3	Roads and Traffic Management	-	-	(15)	(72)	(183)	(383)	(643)	(962)	(1,351)	(1,773)	(2,230)	(2,710)	(3,214)	(3,744)
4	Storm Water Drainage	-	-	(33)	(125)	(273)	(462)	(689)	(971)	(1,316)	(1,724)	(2,160)	(2,614)	(3,088)	(3,582)
5	Solid Waste Management	50	105	148	181	191	177	160	123	69	26	(20)	(70)	(96)	(120)
6	Street Lighting	-	-	(4)	(27)	(79)	(164)	(283)	(437)	(613)	(800)	(999)	(1,211)	(1,433)	(1,665)
7	Slum Upgradation	-	-	(6)	(20)	(45)	(146)	(265)	(406)	(540)	(692)	(798)	(911)	(1,029)	(1,152)
8	Others	-	-	-	(4)	(13)	(29)	(50)	(79)	(104)	(131)	(160)	(192)	(226)	(261)

	Description	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020
		<i>Rs. Lakh</i>													
	Total Sub Project Cash Flow	1,639	2,429	3,307	4,009	4,545	4,825	4,834	4,693	4,424	4,261	4,115	3,944	4,011	4,085
		Total Sustainable Project Cash Flow													
	Opening Balance		1,639	2,429	3,307	4,009	4,545	4,825	4,834	4,693	4,424	4,261	4,115	3,944	4,011
A	Sources of Fund														
1	Debt Drawdown	237	299	1,059	1,553	1,541	1,050	902	885	678	467	-	-	-	-
2	Equity Drawdown	178	196	332	421	429	173	148	145	113	78	-	-	-	-
3	Govt. Grant	178	212	596	829	826	442	363	349	289	180	-	-	-	-
4	User Charges	318	439	563	746	847	944	1,136	1,196	1,246	1,470	1,539	1,599	1,881	1,969
5	New Connection Fees	1,341	432	533	400	393	414	144	148	152	188	194	200	248	256
	Total-Inflow	2,251	1,578	3,083	3,950	4,037	3,023	2,692	2,724	2,477	2,383	1,733	1,798	2,129	2,225
B	Disposition of Funds														
1	Project Capex	592	707	1,986	2,803	2,797	1,728	1,480	1,451	1,130	778	-	-	-	-
2	Operation & Maintenance	-	36	83	177	306	446	537	627	712	779	840	890	944	1,000
3	Debt Servicing-Repayment	-	-	-	-	-	480	499	546	606	650	1,040	1,079	1,118	1,151
	Total-Outflow	612	788	2,205	3,248	3,501	2,743	2,682	2,865	2,746	2,546	1,880	1,969	2,062	2,151
	Net Cash Flow	1639	790	878	702	536	280	10	(141)	(269)	(163)	(146)	(171)	67	74
	Closing Balance	1,639	2,429	3,307	4,009	4,545	4,825	4,834	4,693	4,424	4,261	4,115	3,944	4,011	4,085

454. The phasing/ scheduling of investments have been carried out through an iterative process and the principles of phasing have taken into account:
- Priority needs, with developed areas getting priority over future development areas,
 - Inter- and intra service linkages, viz. water supply investments shall be complemented by corresponding sewerage/ sanitation improvements,
 - Size and duration of the requirements, including preparation and implementation period,
 - Project linked revenue implications, such as installing house connections where supply and distribution capacities have been increased.
455. 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 11.21: Sustainable Project Funding Option- Base Cost (Rs. Lakh)

Sectors	Loan	Grant	ULB /Beneficiaries Contribution	Total
2006-11				
Water Supply	1,013.42	760.07	760.07	2,533.56
Sewerage & Sanitation	-	-	-	-
Road and Traffic Management	686.54	343.27	114.42	1,144.23
Storm Water Drainage	982.98	491.49	163.83	1,638.30
Solid Waste Management	271.33	135.66	45.22	452.21
Street Lighting	201.31	100.65	33.55	335.52
Slum Upgradation	189.46	94.73	31.58	315.76
Others	67.84	8.48	8.48	84.80
Total	3,412.88	1,934.36	1,157.15	6,504.39
2012-16				
Water Supply	-	-	-	-
Sewerage & Sanitation	-	-	-	-
Road and Traffic Management	637.50	318.75	106.25	1,062.50
Storm Water Drainage	912.77	456.38	152.13	1,521.28
Solid Waste Management	116.28	58.14	19.38	193.81
Street Lighting	201.31	100.65	33.55	335.52
Slum Upgradation	351.85	175.93	58.64	586.42
Others	101.76	12.72	12.72	127.20
Total	2,321.47	1,122.58	382.67	3,826.72
2006-16				
Water Supply	1,013.42	760.07	760.07	2,533.56
Sewerage & Sanitation	-	-	-	-
Road and Traffic Management	1,324.04	662.02	220.67	2,206.74
Storm Water Drainage	1,895.75	947.88	315.96	3,159.59
Solid Waste Management	387.61	193.81	64.60	646.02
Street Lighting	402.62	201.31	67.10	671.03
Slum Up gradations	541.31	270.65	90.22	902.18
Others	169.60	21.20	21.20	212.00
Total	5,734.36	3,056.93	1,539.82	10,331.12

Source: Analysis.

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

Table 11.22: 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	37.08	18.54	12.98	5.56		
Leak Detection	26.00	26.00				
New Infrastructure						
Augmentation of Headwork	1,270.94	241.48	228.77	228.77	248.92	323.01
Storage Reservoir	73.09	29.24	25.58	18.27		
Distribution Network with road over lay	607.23	191.46	121.45	121.45	91.08	81.79
Water Treatment Plant	334.07		117.93	83.52	132.62	
Improvements to Lakes	78.27			22.42	23.48	32.36
Water Supply to OHT (Required Infrastructure)	106.88			26.72	10.61	69.55
Total	2,533.56	506.71	506.71	506.71	506.71	506.71

Source: Analysis

Table 11.23: Phasing of Investment for Road and Traffic Management

Sector-Road and Traffic Management	Total Cost	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15
	<i>Rs. Lakh</i>							
Roads								
<i>Upgradation (Excludes the Bus Route and Major Links)</i>								
WBM to Black Top	20.84	10.42	10.42					
Earthen to Black Top	67.96	27.18	20.39	20.39				
<i>New Formation (Excludes the Bus Route and Major Links)</i>								
Concrete	135.15	27.03	21.62	21.62	21.62	21.62	21.62	-
Black Top	700.11		280.04	175.03	140.02	70.01	35.01	
WBM	174.16	17.42	34.83	52.25	43.54	26.12		
Widening/ Strengthening (Excludes the Bus Route and Major Links)	495.47	54.49	33.08	99.09	123.87	49.14	58.97	76.83
Formation of New Bus Route Road (Maintained by Municipality)	570.00	78.06	28.50	89.31	95.95	45.60	96.90	135.68
Traffic & Transportation								
Junction Improvements	20.00	10.00	10.00					
Parking facility	4.25	4.25						
Footpath	18.80		18.80					
Total	2,206.74	228.85	457.69	457.69	425.00	212.50	212.50	212.50

Source: Analysis

Table 11.24: Phasing of Investment for Storm Water Drainage

Sector-Storm Water Drainage	Total Cost	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
<i>Rs. Lakh</i>									
Rehabilitation									
Rehabilitation of Existing Storm Water Drains	21.75	21.75							
Upgradation of Kutcha to Pucca									
Kutcha to Pucca Open	815.89	203.97	244.77	203.97	122.38	40.79			
Kutcha to Pucca Closed	25.69		25.69						
Formation of New Drains									
New Pucca Open Drains	917.07	130.60	137.56	137.56	73.37	119.22	135.73	183.04	
New Pucca Closed Drains	1,295.86	51.83	247.30	149.96	108.51	144.24	168.53	121.22	304.26
Primary Drains									
Diversion of Floodwater from Airport to Adyar River	83.33	83.33							
Total	3,159.59	491.49	655.32	491.49	304.26	304.26	304.26	304.26	304.26

Source: Analysis**Table 11.25: Phasing of Investment for Solid Waste Management**

Sector-Solid Waste Management	Total Cost	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
<i>Rs. Lakh</i>								
Containerised Tricycles (6 bins)	15.28	7.64	7.64					
Push Carts	22.68	9.07	13.61					
Dumper Bins (7 Cum Capacity)	18.70		9.35	9.35				
Dumper Placer	90.00		36.00	36.00	18.00			
Land Fill Capacity Development	339.36	27.15	38.61	54.30	95.02	50.90	50.90	22.47
Compost Facility Development	160.00	20.74	24.00	29.55	16.18	13.70	13.70	42.13
Total	646.02	64.60	129.21	129.20	129.20	64.60	64.60	64.60

Source: Analysis**Table 11.26: Phasing of Investment for Street Lighting**

Sector-Street Lighting	Total Cost	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
<i>Rs. Lakh</i>							
Tube Light	471.58	46.25	70.74	62.87	90.42	134.21	67.10
High Power	130.88		47.83	39.26	43.79		
High Mast Lamps	51.62	20.65	15.49	15.49			

Sector-Street Lighting	Total Cost	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
	<i>Rs. Lakh</i>						
Power Saver Switches	0.51	0.20	0.15	0.15			
Providing Under Ground Multi-Utility Duct	16.44			16.44			
Total	671.03	67.10	134.21	134.21	134.21	134.21	67.10

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/ Taps/ Handpumps	125.65	50.26	37.70	37.70					
No. of Public Toilet Seats	590.50	39.96	39.35	59.81	90.19	96.58	112.20	71.04	81.38
No. of Public Urinals	127.84			19.18	31.96	25.57	23.13	19.18	8.83
No. of Dustbins/ Temporary Waste Storage Points	5.47			5.47					
Streetlights	52.72		13.18	13.18	13.18	13.18			
Total	902.18	90.22	90.22	135.33	135.33	135.33	135.33	90.22	90.21

Source: Analysis

Table 11.28: Phasing of Investment for Others

Sector-Others	Total Cost	2009-10	2010-11	2011-12	2012-13	2013-14
	<i>Rs. Lakh</i>					
Development of Parks	22.00	4.40	4.40	4.40	4.40	4.40
Tree Plantation	10.00	2.00	2.00	2.00	2.00	2.00
Improvements to Burial Grounds	180.00	36.00	36.00	36.00	36.00	36.00
Total	212.00	42.40	42.40	42.40	42.40	42.40

Source: Analysis

XII. INITIAL ENVIRONMENTAL AND SOCIAL SCREENING

A. Introduction

457. 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.
458. 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

459. 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**).
460. 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

461. 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.
462. 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/Stand	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

463. The details of Environmental Laws and Regulations applicable for TNUIFSL's Projects and their obligations are presented in **Annexure 12.1**.
464. 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**).
465. 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.
466. 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.
467. 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

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

B. Initial Environmental and Social Screening of Implementable Projects

469. The initial environmental and social screening of implementable projects under CCP for Pallavaram 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

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						Poor performance of the contractor may potentially exacerbate these impacts and therefore qualified contractors to be appointed. The contracted work includes the implementation of construction site management plan, which will address these issues	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
						Ensure usage low noise generating equipment; use standard equipment to comply with the	Contractor	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						noise levels of construction equipment laid out by the CPCB. High 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	Proper planning is required during the	ULB/ contractor	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					sensitive receptors along the water supply lines during construction	construction phase to avoid such situations		
					<i>Operation Phase</i>			
					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

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					<i>Construction Phase</i>			
					Land required for Pump house construction and Elevated storage reservoir	Compensation in the form of land (or) money as per the TNUISL ESF guidelines.	ULB	PMC / 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	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

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					Safety hazards to laborers and nearby resident population	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	ULB/ contractor	PMC / ULB
					<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

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					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 Assessment Report and Environmental Management Plan	ULB/Design consultant	ULB
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>			

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					<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 traffic diversion including prior intimation and by erecting proper sign boards	Contractor / ULB	PMC / ULB
					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	Contractor / ULB	PMC / ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						equipment laid out by the CPCB. High noise generating activities including material unloading shall be avoided during nights. The surrounding people shall be 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	Not Applicable		

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					future, thus, impact may be insignificant			
					Poor performance of the contractor may potentially exacerbate these impacts and therefore qualified contractors to be appointed. The contracted work includes the implementation of construction site management plan, which will address these issues	In consideration with the densely populated areas and arterial and sub-arterial roads, a construction site management plan, incorporating the above suggested mitigation measures, shall be implemented	Contractor / ULB	PMC / ULB
					<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	Adequate safety precautions such gloves, oxygen	ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					drains/pipes	masks, etc., should be provided to the labor		
					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 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

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					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 material should be covered	Contractor / ULB	ULB
						Sprinkling of water and removal of excess matter/construction debris from the site as soon as possible	Contractor / ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					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 provide 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 construction	Contractor / ULB	ULB
					Nuisance due to noise	Noise limits for construction equipments such as compactors, rollers shall not exceed 75 dB(A), as specified in the	Contractor / ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						Environment (Protection) Rules, 1986		
						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 Environmental Management Plan	ULB	ULB
	3	Widening/ Strengthening of Roads	E - 1	S - 2		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		
	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 material/waste and material transport vehicles and other equipment	Construction material shall be stockpiled to minimize traffic blockages	Contractor / ULB	PMC / ULB
					Nuisance due to noise			

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					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 due to improper design	Ensure proper design of section; design shall as per the CPHEEO Guidelines	ULB/Design consultant	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					<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>			

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					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
					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		

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
	2	Providing Under Ground Multi-Utility Duct	E - 2	S - 3				
					<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	Contractor / ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						out by the CPCB. High 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

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					<i>Operation Phase</i>			
					No major impact is anticipated			
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>			

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
					Nuisance due to location of waste collection containers. During the monsoon, the waste may mix with the runoff and may potentially create unhygienic conditions around the site.	Containers shall be located at appropriate location; place the containers on a slightly elevated plot 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	ULB/Design consultant	ULB
					<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	Contractor / ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						consistent with State Policy on Integrated Solid Waste Management and Schedule II of MSW Rules, 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 	Contractor / ULB	ULB

Sectors			Environmental Category	Social Category	Potential (Environmental) Negative Impact/Concern	Mitigation Measures	Responsible Agency for Mitigation	Monitoring Agency
						hazards. • Prepare a health risk mitigation plan incorporating health check up program		
	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

XIII. PROJECT IMPACTS AND POLICY INTERVENTIONS

A. Project Benefits and Impacts

1. Financial

470. 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.
471. 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

472. 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
473. 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.
474. 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*

- 475. 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.
- 476. 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.
- 477. 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.
- 478. 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*

- 479. 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.
- 480. 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

481. 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

482. 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 undertakes to issue a policy regarding liability management and encourage ULBs to commit themselves to prudent fiscal management.

3. Land Acquisition and Clearances

483. 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*

484. 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

485. 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

486. 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.
487. *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.
488. 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.
489. *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

490. *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.
491. 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.
492. 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.
493. *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.
494. *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.
495. *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.

496. *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.

497. *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

498. 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	Area	Population	Population Density
		<i>sq. km</i>	<i>Nos</i>	<i>Density</i>
1	Medium Density	0.20	2,943	14,691
2	Very High Density	0.07	2,607	35,168
3	High Density	0.23	4,225	18,729
4	High Density	0.16	2,532	16,209
5	Very High Density	0.01	1,957	20,604
6	Medium Density	0.22	2,320	10,644
7	Very High Density	0.08	2,810	35,146
8	High Density	0.27	4,280	15,880
9	Moderate Density	0.39	2,976	7,650
10	Moderate Density	0.64	3,387	5,292
11	Moderate Density	0.52	3,275	6,250
12	Low Density	1.86	5,021	2,695
13	Low Density	0.67	3,092	4,629
14	Moderate Density	0.92	6,730	7,337
15	Low Density	1.15	4,453	3,885
16	Low Density	0.63	3,035	4,795
17	Low Density	0.86	1,797	2,084
18	Low Density	1.27	2,536	2,003
19	Moderate Density	0.80	5,521	6,893
20	High Density	0.30	5,651	19,050
21	Medium Density	0.32	4,346	13,731
22	Moderate Density	0.68	4,366	6,380
23	Moderate Density	0.71	4,940	6,960
24	Moderate Density	0.53	3,683	6,968
25	High Density	0.14	2,368	16,921
26	High Density	0.18	3,080	17,539
27	High Density	0.26	4,425	17,022
28	Medium Density	0.21	2,331	11,139
29	High Density	0.18	3,123	17,271
30	Very High Density	0.13	3,358	26,052
31	Moderate Density	0.26	2,576	9,730
32	Moderate Density	0.26	2,207	8,547
33	Medium Density	0.22	3,021	13,628
34	Medium Density	0.26	3,592	13,858
35	Medium Density	0.31	4,065	13,208
36	Medium Density	0.16	2,190	13,409
37	Moderate Density	0.26	1,555	6,048
38	High Density	0.31	4,824	15,480
39	Medium Density	0.33	3,851	11,689
40	Low Density	0.27	1,112	4,070
41	Medium Density	0.27	3,033	11,303
42	Medium Density	0.43	5,429	12,741
Total		18.00	144,623	513,327

Source: Pallavaram municipality and Analysis.

Annexure 5.1: Tests Results of Waste Characterization Study

Parameters	Units	Residential			Commercial		
		Sample 1	Sample 2	Average	Sample 1	Sample 2	Average
Ash	%w/w	89.20	7.70	48.45	87.06	45.21	66.14
Bulk Density	Kg/cum	126.00	389.00	257.50	115.21	436.57	275.89
Carbon	%w/w	3.67	28.14	15.91	3.92	14.50	9.21
Fixed Carbon	%w/w	0.07	14.54	7.31	1.37	8.89	5.13
Gross Calorific Value	Kcal/Kg	238.00	4,028.00	2,133.00	321.00	2,644.00	1,482.50
Nitrogen as N	%w/w	0.20	1.85	1.03	0.23	1.34	0.79
Phosphorous as P	%w/w	0.05	0.26	0.16	0.02	0.20	0.11
Ash & Fine Earth	%w/w	39.84	-	19.92	29.33	-	14.67
Garden Waste	%w/w	16.10	32.27	24.19	22.50	25.20	23.85
Glass & Ceramics	%w/w	3.25	-	1.63	0.12	-	0.06
Inorganic Matter	%w/w	15.20	-	7.60	16.28	-	8.14
Metal	%w/w	0.06	0.07	0.07	0.60	-	0.30
Organic Matter	%w/w	18.30	40.42	29.36	24.30	38.44	31.37
Other Inert Materials	Nil	-	-	-	-	-	-
Paper	% w/w	2.23	8.15	5.19	1.84	7.42	4.63
Plastic	%w/w	2.80	18.33	10.57	5.00	16.63	10.82
Rubber & Leather	%w/w	2.21	0.74	1.48	-	12.32	6.16
Volatile matter	%w/w	9.77	71.17	40.47	10.07	41.91	25.99
Cadmium as Cd	mg/Kg	0.40	BDL (DL:0.10 mg/Kg)	0.40	BDL (DL:0.10 mg/Kg)	0.24	0.24
Lead as Pb	mg/Kg	76.50	2.81	39.66	44.40	14.20	29.30
Arsenic as As	BDL (DL:0.10m g/Kg)	0.48	BDL	0.48	0.55	BDL	0.55
Nickel as Ni	mg/Kg	8.00	3.37	5.69	8.10	4.40	6.25
Zinc as Zn	mg/kg	143.00	26.10	84.55	BDL (DL:0.10 mg/Kg)	19.50	19.50
Copper as Cu	mg/Kg	367.60	13.10	190.35	20.40	15.40	17.90
Mercury as Hg	BDL (DL:0.10m g/Kg)	BDL	BDL	BDL	BDL	BDL	BDL
pH (@25 ⁰ C)	(10% Suspension)	7.76	5.00	6.38	9.94	6.55	8.25
Moisture	%w/w	79.00	78.82	78.91	73.20	76.56	74.88

Source: Field Survey.

Annexure 5.2: Ward wise – Water Supply Details

Ward No	Population	House Service Connections			Public Fountain	Road Length	Distribution Line
		Domestic	Industrial	Commercial			
	<i>Nos</i>	<i>Nos</i>	<i>Nos</i>	<i>Nos</i>	<i>Nos</i>	<i>km</i>	<i>km</i>
Ward 1	2,943	272	-	-	2	3.31	3.31
Ward 2	2,607	200	-	5	4	1.96	1.96
Ward 3	4,225	245	4	5	4	2.02	2.02
Ward 4	2,532	205	5	15	3	1.19	1.19
Ward 5	1,957	252	-	14	4	1.14	1.14
Ward 6	2,320	156	5	15	3	1.7	1.7
Ward 7	2,810	247	-	-	4	2.1	2.1
Ward 8	4,280	303	-	2	3	4.5	4.5
Ward 9	2,976	257	-	2	4	4.22	4.22
Ward 10	3,387	262	-	-	4	4.68	4.68
Ward 11	3,275	203	-	3	3	4.68	2.86
Ward 12	5,021	302	-	-	4	6.4	2.4
Ward 13	3,092	3	-	-	3	6.16	2.16
Ward 14	6,730	50	-	-	3	6.85	1.88
Ward 15	4,453	32	-	-	-	8.97	-
Ward 16	3,035	70	-	1	3	5.57	1.57
Ward 17	1,797	281	-	-	3	4.86	1.81
Ward 18	2,536	189	-	-	3	4.00	2.00
Ward 19	5,521	185	-	-	3	6.59	4.59
Ward 20	5,651	285	-	-	3	6.71	6.71
Ward 21	4,346	310	-	-	3	6.69	6.69
Ward 22	4,366	355	-	-	4	9.51	5.51
Ward 23	4,940	310	-	5	3	5.81	3.81
Ward 24	3,683	180	-	5	3	6.61	4.61
Ward 25	2,368	243	-	-	3	2.78	2.78
Ward 26	3,080	210	-	10	3	1.06	1.06
Ward 27	4,425	285	-	15	3	8.31	5.31
Ward 28	2,331	270	-	8	4	3.66	3.66
Ward 29	3,123	250	-	-	3	3.48	3.48
Ward 30	3,358	265	-	-	3	2.83	2.83
Ward 31	2,576	208	-	10	3	1.45	1.45
Ward 32	2,207	272	-	5	3	1.35	1.35
Ward 33	3,021	270	-	18	3	8.44	5.44
Ward 34	3,592	346	-	15	3	5.04	5.04
Ward 35	4,065	320	-	10	3	4.86	4.86
Ward 36	2,190	315	-	9	3	1.95	1.98
Ward 37	1,555	245	-	9	3	1.04	1.04
Ward 38	4,824	190	-	5	3	2.92	2.92
Ward 39	3,851	165	-	5	3	1.86	1.86
Ward 40	1,112	220	-	5	3	4.79	4.79
Ward 41	3,033	240	2	5	3	2.12	2.12
Ward 42	5,429	54	3	3	3	5.12	5.12
Total	144,623	9,522	19	204	131	179.29	130.51

Source: Pallavaram Municipality & Analysis.

Annexure 5.3: Ward Wise Road Distribution

Ward	Streets	Length	=<10' Road		10 - 15' Road		15 - 20' Road		>20' Road		Per Capita	Road Density
			Length	Nos	Length	Nos	Length	Nos	Length	Nos		
	Nos	km	km	Nos	km	Nos	km	Nos	Km	Nos	m	Km/km ²
1	30	3.31	0.54	6	0.27	3	0.36	4	2.15	17	1.84	27.12
2	18	1.96	0.13	2	0.5	8	-	-	1.33	8	1.13	42.06
3	25	2.02	0.29	5	0.41	7	0.58	10	0.75	3	0.76	14.00
4	14	1.19	0.58	7	0.17	2	0.33	4	0.11	1	0.79	12.56
5	10	1.14	0.32	3	0.21	2	-	-	0.61	5	1.02	199.12
6	20	1.7	0.43	8	0.11	2	0.32	6	0.85	4	0.98	10.37
7	30	2.1	0.77	12	0.5	8	0.51	8	0.32	2	0.89	31.15
8	33	4.5	0.48	5	0.47	5	0.38	4	3.18	19	1.10	17.47
9	25	4.22	0.6	5	0.96	8	1.2	10	0.46	2	1.21	9.25
10	29	4.68	-	-	0.72	5	0.86	6	2.81	18	0.91	4.82
11	35	4.86	0.61	5	0.61	5	0.84	7	2.81	18	1.80	11.35
12	27	6.4	1.77	10	0.88	5	0.89	5	3.23	7	1.27	3.43
13	37	6.16	1.4	10	0.7	5	0.71	5	3.34	17	1.78	8.22
14	45	6.85	0.97	10	0.49	5	0.48	5	4.91	25	1.18	8.61
15	59	8.97	1.13	10	1.13	10	2.6	23	4.1	16	1.59	6.16
16	30	5.57	1.2	8	0.3	2	0.75	5	3.32	15	1.50	7.23
17	33	4.86	0.65	5	0.52	4	0.65	5	3.04	19	1.85	3.87
18	34	4	1.32	10	1	10	1.04	9	0.64	5	2.03	4.06
19	52	6.59	0.68	10	0.68	10	0.96	14	4.27	18	0.89	6.13
20	45	6.71	0.56	10	0.56	10	0.73	13	4.86	12	1.42	26.80
21	43	6.69	-	-	0.84	10	0.84	10	5.01	33	1.19	16.20
22	79	9.51	1.02	10	1	10	1.42	14	6.07	45	1.57	10.06
23	57	5.81	1.03	10	1.03	10	0.82	8	3	29	1.36	9.45
24	50	6.61	0.66	5	0.66	5	1.85	14	3.44	26	1.20	8.30
25	20	2.78	-	-	0.28	2	1.11	8	1.39	10	1.34	22.64
26	10	1.06	-	-	-	-	0.64	6	0.42	4	1.18	20.16
27	44	8.31	-	-	-	-	2.05	17	6.25	27	1.26	21.36
28	28	3.66	1.05	8	0.65	5	0.65	5	1.57	12	1.74	19.32

Ward	Streets	Length	=<10' Road		10 - 15' Road		15 - 20' Road		>20' Road		Per Capita	Road Density
			Length	Nos	Length	Nos	Length	Nos	Length	Nos		
	Nos	km	km	Nos	km	Nos	km	Nos	Km	Nos	m	Km/km ²
29	27	3.48	-	-	0.77	6	0.77	6	1.94	15	1.39	24.17
30	18	2.83	-	-	0.63	4	0.79	5	1.41	9	1.10	28.30
31	25	1.45	-	-	0.29	5	0.35	6	0.81	14	1.19	11.79
32	13	1.35	-	-			0.52	5	0.83	8	1.07	9.05
33	51	8.44	0.63	5	0.63	5	1.89	15	5.28	26	1.25	17.18
34	38	5.04	0.66	5	0.66	5	1.33	10	2.38	18	1.14	15.75
35	38	4.86	0.64	5	0.64	5	1.02	8	2.55	20	0.98	12.88
36	15	1.98	-	-			0.66	5	1.32	10	1.17	15.98
37	5	1.04	0.22	1			0.2	1	0.62	3	1.45	8.68
38	24	2.92	0.61	5	0.61	5	1.22	10	0.49	4	0.87	13.55
39	16	1.86	-	-	0.23	2	0.7	6	0.93	8	1.10	12.82
40	13	4.79	-	-	-	-	-	5	2.95	8	2.57	10.60
41	23	2.12	0.52	5	0.4	5	0.46	5	0.74	8	1.07	11.97
42	48	5.12	1.14	10	1	10	1.07	10	1.92	18	0.87	11.02
Total	1,316	179.5	22.61	210	21.51	210	36.39	322	98.41	586	1.24	9.97

Source: Pallavaram Municipality & Analysis.

Annexure 5.4: Ward wise Distribution of Streetlights

Ward No	Tube lights	Highmast Lamps	Sodium Vapor Lamp				Halogen Lamps	Mercury Vapor Lamp	Total	Spacing
	40W		70W	150W	250W	Total	250W	250W		
	Nos.	Nos.	Nos.	Nos.	Nos.	Nos.	Nos.	Nos.	Nos.	m
1	79	-	8	1	19	28	-	-	107	50.68
2	22	-	27	1	13	41	-	-	63	46.73
3	8	-	22	14	15	51	-	-	59	54.56
4	20	-	20	-	5	25	-	-	45	44.67
5	3	-	38	-	13	51	-	-	54	36.87
6	24	-	21	11	10	42	-	-	66	34.56
7	25	-	37	5	16	58	-	-	83	30.03
8	68	-	27	5	26	58	-	-	126	37.43
9	95	-	8	12	10	30	-	-	125	28.86
10	52	-	15	3	17	35	-	-	87	35.47
11	152	-	20	6	13	39	-	-	191	30.91
12	218	-	18	7	50	75	-	-	293	21.80
13	159	-	30	6	10	46	-	-	205	26.87
14	293	-	2	-	59	61	-	-	354	22.38
15	273	-	-	-	27	27	-	-	300	23.61
16	107	-	10	10	9	29	-	-	136	33.49
17	124	-	-	6	21	27	-	-	151	22.05
18	171	-	37	1	17	55	-	-	226	22.81
19	203	-	14	11	21	46	-	1	250	19.60
20	130	-	7	12	32	51	-	-	181	44.42
21	145	-	15	3	19	37	-	-	182	28.49
22	276	-	37	4	29	70	-	-	346	19.77
23	166	-	2	-	13	15	-	-	181	37.07
24	148	-	28	7	15	50	-	-	198	22.23
25	49	-	12	11	20	43	-	-	92	34.45
26	86	-	-	-	27	27	-	-	113	32.11
27	122	-	25	2	41	68	-	2	192	28.93
28	103	-	25	1	16	42	-	-	145	27.98

Ward No	Tube lights	Highmast Lamps	Sodium Vapor Lamp				Halogen Lamps	Mercury Vapor Lamp	Total	Spacing
	40W		70W	150W	250W	Total	250W	250W		
	Nos.	Nos.	Nos.	Nos.	Nos.	Nos.	Nos.	Nos.	Nos.	m
29	93	-	25	-	10	35	-	-	128	33.98
30	54	-	24	1	6	31	-	-	85	43.28
31	41	-	11	-	20	31	-	-	72	42.56
32	44	-	5	12	2	19	-	-	63	37.35
33	84	-	27	8	19	54	-	-	138	27.39
34	124	-	20	5	26	51	-	-	175	23.40
35	118	-	33	20	13	66	-	-	184	21.70
36	29	-	37	1	27	65	-	-	94	27.19
37	29	-	-	5	11	16	-	-	45	50.18
38	102	-	25	1	14	40	-	-	142	29.57
39	65	-	3	2	17	22	-	-	87	48.63
40	49	-	-	1	25	26	-	-	75	38.18
41	55	-	1	5	13	19	-	-	74	43.68
42	107	-	34	-	16	50	-	1	158	30.00
G.S.T Road Centre Median	-	-	-	-	165	165	-	-	165	
Pallavaram Bus Stand	-	-	-	-	-	-	4	-	4	
Kizkattalai	-	1	-	-	-	-	-	-	1	
Chrompet Bus Stand	-	-	-	-	-	-	3	-	3	
Total	4,315	1	750	200	967	1,917	7	4	6,244	

Source: Pallavaram Municipality.

Annexure 8.1: Invitation for Consultation Workshop

பல்லவபுரம் நகராட்சி,
குரோம்பேட்டை, சென்னை- 600 044

நாள் 13.02. 2006.

பல்லவபுரம் நகராட்சியில் நகரில் செய்யப்பட வேண்டிய வளர்ச்சிப் பணிகளையும், அடிப்படை வசதிகளையும் பற்றிய திட்ட வடிவம் கொடுப்பதற்காக (City Corporate Plan) நலச் சங்கத்துடன் கலந்துரையாடல் நிகழ்ச்சி 14.02.2006 மதியம் 1..30 மணிக்கு நகராட்சியில் நடைபெற உள்ளதால் , அதில் கலந்து கொண்டு தவறாது தங்களது கருத்துக்களை தெரிவிக்கும்படி கேட்டுக் கொள்ளப்படுகிறது.

(ஓம்) சோம.கவாமிநாதன்,
ஆணையர்,
பல்லவபுரம் நகராட்சி

பெறுநர்

Annexure 8.2: List of Participants in the Workshop

Name	Designation
Thiru S. Swaminathan	Commissioner, Pallavaram Municipality
Thiru Dhasnamurthy	Chairman, Pallavaram Municipality
Thiru V. Santhanam	President, New Colony
Thiru V. Purushothaman	Joint Secretary, New Colony
Thiru M. Shanmugam	Secretary, R.R. Nagar
Thiru C. Srinivasan	President, Raja Rajeswari Nagar
Thirumathi Patharunisa	Secretary, IHFD Nagar Welfare Association, Pallavaram
Thiru Rajamani	President, IHFD Nagar Welfare Association, Pallavaram
Thiru S.H. Subramanian	IHFD Nagar Welfare Association, Pallavaram
Thiru V. Srinivasan	Vice President, Purushothaman Nagar Welfare Association
Thiru K. Thyagarajan	Pathbanaba Nagar, Resident Welfare Association
Thiru M. Ramabadran	B'Men Association Civic Exnora
Thirumathi S. Uma Santhanam	MC – Ward 4
Thiru K. Visvanathan	MC – Ward 14
Thiru B. Ramadoss	MC – Ward 20
Thirumathi Seetha Thiagam	MC – Ward 21
Thiru J. Rathmolo	MC – Ward 25
Thiru M. Thambiran	MC – Ward 28
Thirumathi Uma Chandrasekar	MC – Ward 29
Thirumathi D. Rama	MC – Ward 32
Thiru P. Venkatraman	MC – Ward 33
Thirumathi A. Rosimaliga	MC – Ward 37
Thiru M. Madurai	MC – Ward 38
Thirumathi R. Parimala Devi	MC
Thiru C. Murugayan	Secretary, AGS Colony
Thiru M.C. Balaraman	Secretary, BBR Nagar Welfare Association
Thiru S. Chandrasekaran	President, Federation of Civic Association, Pallavaram
Thiru H. Elangovan	Secretary, Vinobai Nagar Veettermalai Urimaialar Podunala Sanngam, Hasthinapuram
Thiru K. Sakrabani	Tresser, Vinobai Nagar Veettermalai Urimaialar Podunala Sanngam, Hasthinapuram
Thiru K. Rama Subramanian	SARA Trust Welfare Association, Manickam Nagar

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 landuse 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 wastewater 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) Privatization 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 landuse 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	Inditution / 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. Professor, 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
12	Mr. Santhanam	The Chromepet New Colony Resident's	President	22388612, 9444254850

Sr. No	Name	Indititution / Departments	Designation	Contact
		Welfare Society and Peoples Awareness Centre, 3/20, 16th Cross Street, Newcolony, Chromepet, Chennai - 44		
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-moterable.

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

499. *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.
500. 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 predominantly 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.
501. 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, ROBs.

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 11.1: Abstract of Accounts and Project Cash Flows

Annexure 12.1: Environmental Laws and Regulations Applicable for TNUIFSL'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/Stands	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*
<100 buses	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

Project	Applicable Legislations	Obligations*	Responsibility*
V. Non Comm./Community Amenities			
<i>A. Parks</i>	None		
<i>B. Playgrounds</i>	None		
<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. <p style="text-align: center;">Or</p> 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). <p style="text-align: center;">Or</p> 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

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
	b) Encroacher	1) Right to salvage material.	
	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	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) 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>	Govt/ Sponsor

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
<p>2) Loss of Income / Sources of livelihood</p> <p>a) Shops and Businesses</p>	<p>a) Title holder</p>	<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>	<p>Govt/ Sponsor</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) 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.)	

Type of Issue/Impact	Entitlement Beneficiary	Entitlement Options	Responsibility
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
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)