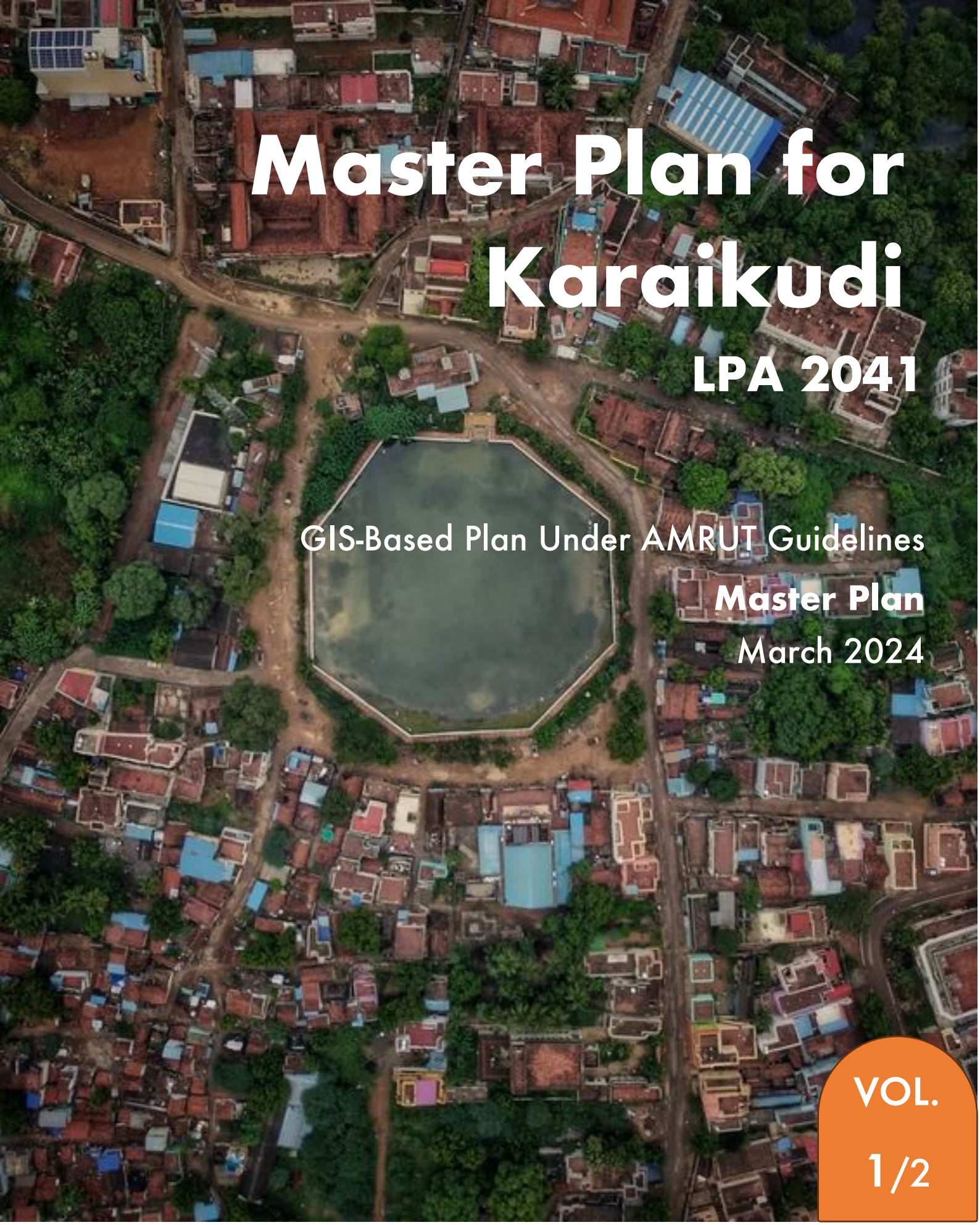

Master Plan for Karaikudi

LPA 2041

GIS-Based Plan Under AMRUT Guidelines

Master Plan

March 2024

VOL. 1/2

Directorate of Town & Country Planning
Government of Tamil Nadu

GIS – Based Master Plan

Karaikudi LPA - 2041

Draft Master Plan

Directorate of Town and Country Planning

March 2024

Master Plan for Karaikudi
Composite Local Planning Area – 2041

LPA Reference No:
Sivagangai District Office : Roc No: 8948/2018Sima-4

DTCP Reference No.

Master Plan for : Karaikudi Composite Local Planning Area

Karaikudi Local Planning Area

22/2/24

Assistant Director (FAC)
Karaikudi Local Planning Authority
Sivagangai District.

23/4/24

Assistant Director
Directorate of Town & Country Planning
Chennai

23/4/24

Deputy Director
Directorate of Town & Country Planning
Chennai

23/4/24

Joint Director
Directorate of Town and Country Planning
Chennai

Director
Directorate of Town and Country Planning
Chennai

for **Principal Secretary to The Government**
Housing and Urban Development Department
Government of Tamil Nadu

PROFORMA

Name of the Office	Directorate Town and Country Planning Office Sivagangai District
Name of the LPA	Karaikudi Local Planning Authority

I. PROPOSAL :

1.	Letter No and date of DTCP in which Proposals submitted to Government	

II. NOTIFICATION

2.	The G.O details which confirmation Was ordered under section 10(1)	G.O (Ms) No: 2051 R.D & LA Dept dt:20.09.1973
3.	The G.O details which confirmation Was ordered under section 10(4)	G.O (Ms) No: 2340 R.D & LA Dept dt : 31.10.1974
4.	The G.O details which confirmation Was ordered under section 10(1)(b)	G.O (Ms) No: 307 H & U.D [UD4 (2)] Dept dt: 31.12.2013
5.	The G.O details which confirmation Was ordered under section 10(1)(4)	G.O (Ms) No: & U.D [UD4 (2)] Dept dt: 27.10.2022

III. CONSTITUTION

6.	The G.O details in which confirmation Karaikudi appointment of members	

IV. CONSENT

7.	The G.O details in which the Government Accorded consent Under section 24(2)	

V. PUBLICATION :

8.	Notification in the form No.1 in the TamilNadu Government Gazette Under Section 26	

9. Notification in the form No.1 in the District Gazette Under Section 26 (1)

10. Letter no: and date in which Director of Town and Country Planning has given advice on O & S under section 26 (2)

11. Resolution no. and date in which the Karaikudi approved the Draft Master plan

VI. APPROVAL :

12. Submission of Master plan to Government for final approval Under Section 28

13. The G.O details in which Government accorded its approval Under section 28

VII. PER PUBLICATION OF APPROVAL IN

14. The Tamil Nadu Government gazette under Section 30

15. The notice Board of the Local Body

16. One more leading daily newspaper circulation in the Karaikudi Local Planning.

22/2/24

Assistant Director (FAC)
Karaikudi Local Planning Authority
Sivagangai District.

Karaikudi Composite Local Planning Area
Master Plan – 2041

CERTIFICATE

It is certified that,

- All the procedures prescribed in the Master Plan are prepared, published, and sanctioned.
- The boundary of Karaikudi Composite Local Planning Area is reframed.
- Reports with the Master Plan are annexed and authenticated.
- The categorization in the zoning map and the categorization in zoning regulation are tallied and found correct.
- The numbers found missing are duly acknowledged and verified by the concerned department.

22/12/24

Assistant Director (FAC)
Karaikudi Local Planning Authority
Sivagangai District.

Master Plan for Karaikudi LPA 2041

GIS-Based Plan Under AMRUT Guidelines

Master Plan

Volume 1 of 2

March 2024

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1 INTRODUCTION

01

1.1 Background of the study

The GIS-based Master Plan is prepared under AMRUT (Atal Mission for Rejuvenation and Urban Transformation) Program. The aim of AMRUT is to transform cities in to efficient living spaces. The mission targets at transforming 500 cities and towns in India into efficient urban living spaces, with special focus on i. water supply, ii. sewerage, iii. storm water drains, iv. green spaces and parks. The Mission mandates a set of 11 Reforms which have to be implemented by all the States and 500 Mission cities within 4 years. One such reform under Urban Planning and City Development Plans is Preparation and implementation of Master Plan using GIS within a period of 48 months. The GIS is a system that creates, manages, and analyze all types of spatial & geographical data. Its significant feature is to integrate the spatial and attribute data. It has revolutionized the process of map making and plan preparation. The system is capable of storing, updating, retrieving, analyzing and displaying. It's a cost effective, and accomplishes the plan preparation with speed.

In the above context, the Department of Town and Country Planning, Government of Tamil Nadu with the assistant of the local authority have prepared this GIS based Master Plan (MP). The Master Plan for Karaikudi will be prepared for a period of 20 years considering the various demand for the projected population. This report begins with collection and review of data available, study the demand, supply and identifying the gap in the service delivered, assessment of the environmental conditions, study the traffic situations, prepare existing land use and identify existing issues.

Going forward Karaikudi municipality and its surrounding area make as environmentally sustainable, economically vibrant, congestion free, provide sufficient amenities and services, enhancing heritage value and develop knowledge town.

Also, Special care is given considering the special aspect of Heritage and Cultural tourism, in preparing this master plan. In the following sections Growth Pattern analysis, SWOT analysis carried out for best understanding of CLPA. Also, each chapter sector wise issues and potentials are discussed in detailed and

end of the chapter formulated sector wise proposals, it included Land use proposals for the Draft Karaikudi CLPA master plan 2041.

1.2 Profile of Karaikudi Local Planning Area

Karaikudi Municipal area was notified as local planning under the Town and Country Planning Act 1971 In G.O.Ms.No.2051 RD&LA, dated 20.09.1973 and subsequently confirmed in G.O.Ms.No.2340 RD&LA, dated 31.10.1974. The total extent of the local planning area is 13.51 sq.km in the year 1973. Karaikudi Local Planning Area consists of the following villages.

1. Kalanivasal (Part)
2. Karaikudi (Part)
3. Ariyakkudi (Part)
4. Sekkalaikottai (Part))
5. Illuppaikudi (Part)
6. Senjai (Part)
7. Amaravathi (Part)

The Local Planning Authority for the Karaikudi Local Planning Area was constituted by Government in G.O.Ms.No.650 RD&LA dated 08.06.1976. As per the G.O. the municipal council of Karaikudi in the Local Planning Authority for the area. A Master Plan for Karaikudi Local Planning Area was prepared by the Regional Directorate of Town and Country Planning. Sivagangai in the year 1973. The draft master plan was submitted Government in year 1977 in G.O.Ms.No. 1863 RD&LA, dated 16.11.1977. The final approval of the Government for the Master Plan was given in G.O.Ms.No.1131 H&UD dated 27.12.1984 under section 28 of Town and Country Planning Act 1971. This approved master plan is in force till date. The profile of Karaikudi Town & Karaikudi CLPA is described in **(Table 1.1 & 1.2)**

1	Name of the Town	Karaikudi
2	Civic Status	Municipality (1928)
		Second Grade Municipality (1973)
5	Municipality Area	13.75 sq.km
7	Name of the Taluk	Karaikudi
8	Name of the District	Sivagangai
9	State	Tamil Nadu

Table 1.1 Profile of Karaikudi Town

The Local Planning Authority for the Karaikudi Composite Local Planning Area was notified by the Government in G.O.Ms.No.307 H&UD dated 31.12.2013 and subsequently confirmed in G.O.Ms.No.190 H&UD [UD4(2)] dated 27.10.2022 the municipal council of Karaikudi in the Composite Local Planning Authority for the area. The total extent of the Composite local planning area is 115.78 sq.km.

1	Constituents of the LPA (1976)	Karaikudi Municipality
2	Civic Status	Municipality (1928)
3	Extent of the LPA	13.75 sq.km
4	Inclusion of Additional Area in the LPA	
	Date of Notification for inclusion of additional areas	31.12.2013
	Extent of the LPA including additional areas	102.03 sq.km
	Constituents of the CLPA (27.10.2022)	Karaikudi Municipality Selection Grade Municipality, Kottaiyur Town Panchayat, & 10 Revenue villages
5	**Total area of the CLPA**	**115.78 sq.km**

Table 1.2 Profile of Karaikudi CLPA

S. No	Urban Area	Extent in Hectare
1	Karaikudi Municipality	1375.00
2	Kottaiyur Town Panchayat	2003.58
	Rural Area	
1	Thiruvelangudi Village (T.Soorakudi Village)	781.54
2	Kalanivasal Village (Part)	1060.00
3	Karaikudi Village (Part)	650.20
4	Ariyakkudi Village (Part)	744.73
5	Sekkalaikottai Village (Part)	522.50
6	Illuppaikudi Village (Part)	920.22
7	Senjai Village (Part)	763.00
8	Amaravathi Village (Part)	903.28
9	Managiri Village	1325.20
10	Kovilur Village	525.03
	Total in Hectare	**11,577.28**

Table 1.3 Karaikudi Composite Local Planning Area consists of the following local bodies

1.2.1 History of Development

Karaikudi the settlement must have existed from Early 19th century as Sri Koppudaiya Nayagi Amman Temple. The oldest structure in the town tracks its history from 1800 A.D. It is part of the area commonly referred to as "Chettinad" and has been declared a heritage town by the Government of Tamil Nadu and UNESCO on account of the palatial houses built with limestone called karai veedu. The importance of the town is identified with its significant development in trade and commerce, education and transport aspects. It has gained more importance in education by virtue of the location of the Alagappa University

besides the development of trade and commerce and transportation activities. The dairy development is also significant in this town.

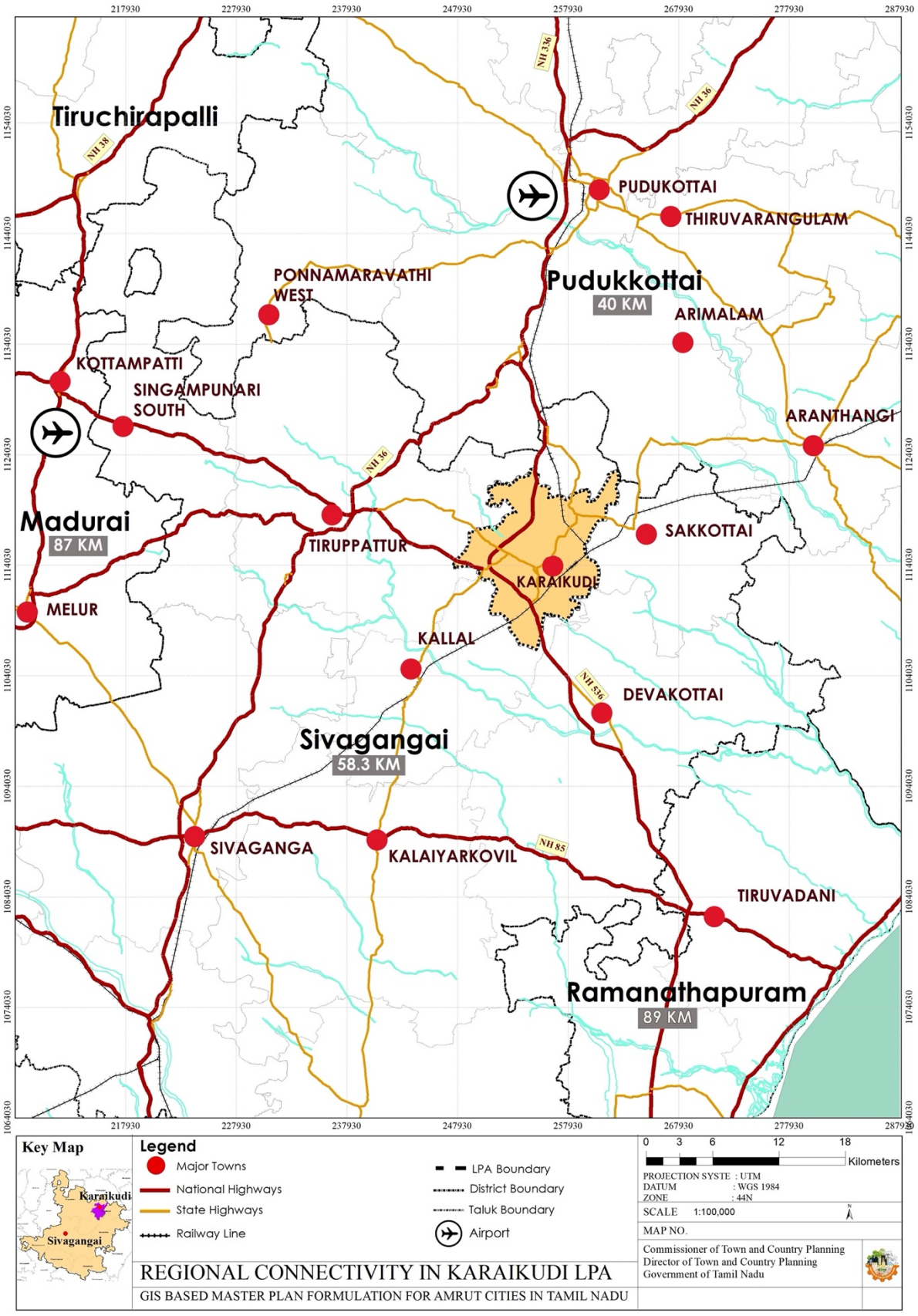
1.2.2 Regional Context

Karaikudi is the most populous and busy town in Sivagangai District, it is situated in the North-eastern as part of the district. It is the headquarters town of the taluk by its name. It is an important junction of the Broad Gauge Railway line from Chennai to Rameswaram beyond Trichy. It is well connected by all other district roads with Madurai, Pudukkottai, Trichy and Ramanathapuram. Madurai. Tiruchirappalli and Ramanathapuram are situated at equidistant (about 90 km) From Karaikudi by road on the western, Northern and South eastern directions respectively.

Class I Towns with their distance from Karaikudi		
Tiruchirapalli (86.9 Km)	Sivagangai (58.3)	Madurai (86.6 Km)
Pudukkottai (39.6 Km)	Thanjavur (104.5)	Viruthunagar (69.9 Km)

Table 1.4 Class I Towns with a distance of 100 Kms from Karaikudi with their distance

Table 1.4 shows the Class I towns with their distance from Karaikudi town shows, it has a vast hinterland serving as a potential market and service areas. The neigghbouring urban centres are Pudukkottai on the North at about 45 km. Aranthangi on the east at 45 km. Devakottai and the south east at 18 km. Tiruppathur on the west at 21 km and Sivagangai head quarter town of the district of the south west at 55 kms.



Maps 1.1 Regional Connectivity of Karaikudi CLPA Area

1.2.3 Geographical Location

In the geographical map the location of the town is defined at 10° 7'45" north Latitude and 78° 46' 30" east longitude. The town is situated on the plan and is an important growth pole and selection grade municipal town in the Sivagangai District.

1.2.4 Administrative Setup of CLPA

Karaikudi CLPA consist of Karaikudi Municipality, Kottaiyur Town Panchayat and 10 villages, namely Thiruvelangudi Village (T. Soorakudi Village), Kalanivasal Village (Part), Karaikudi Village (Part), Ariyakkudi Village (Part), Sekkalaikottai Village (Part), Illuppaikudi Village (Part), Senjai Village (Part), Amaravathi Village (Part), Managiri Village and Kovilur Village. Karaikudi Municipality was constituted on 09-05-1928 and subsequently upgraded as Selection Grade Municipality from 14-12-1988. Now the Karaikudi municipality is upgraded as special grade municipality as per G.O.Ms.No. 74 (MAWS) dated 28.5.2013. The **Map 1.2** showing the Karaikudi Municipality, Kottaiyur Town Panchayat (two are statutory towns) and the surrounding villages within the planning area

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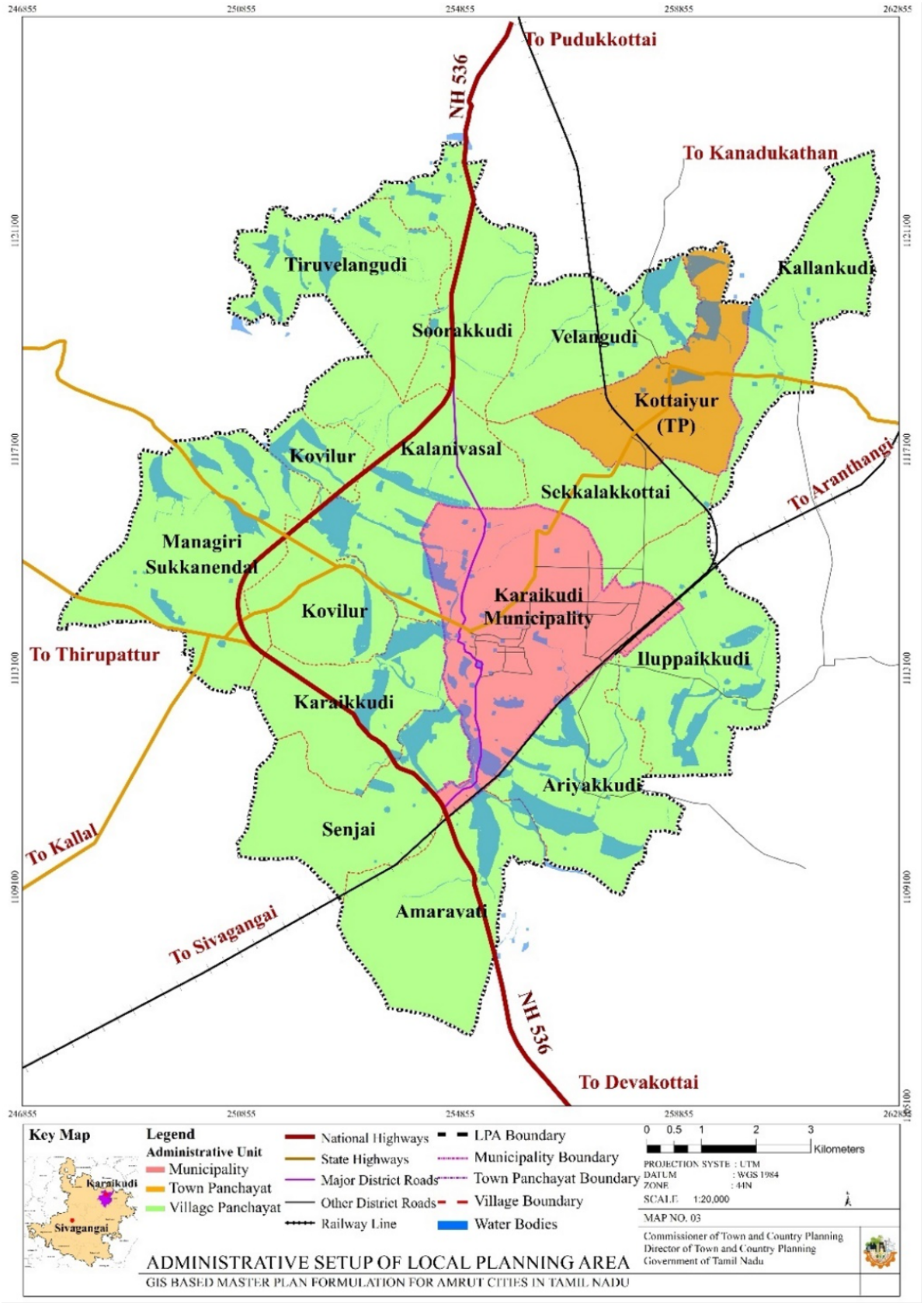


Maps 1.2 Administrative Setup of the Local Planning Area

1.3 Physical Charactertistics

1.3.1 Topography and Soil

The physiological formation has given rise to various land forms, viz., structural hills, residual hills and pediment terrains in the district. Eastern part of the district the Karaikudi classified as flood plain. The major soil types in the district are red soil, lateritic soil, alluvial soil and black cotton soil. lateritic soil is found in Karaikudi and Devakottai taluks. Alluvial soil is found along the river courses and black soil in Ilayangudi.

1.3.2 Climate and Rainfall

Karaikudi has experiences a very dry and hot climate with low degree of humidity with the summer season from April to July and December to January marks the winter season.

Normally, the temperature varies from 22 °C to 39 °C. During the winter season (December to January) the temperature is below normal. (Census 2011)

Summer rains are sparse and the first monsoon, the South-West monsoon, sets in June and continues till September. North-East monsoon sets in October and continues till January. The rainfall during the South-West monsoon period is much lower than that of the North-East monsoon. The North-East monsoon contributes 60% of the total annual rainfall. The average rainfall in Karaikudi is 872.8 mm per annum. Table 1.5 give details about the year wise rainfall received in Karaikudi.

2013	2014	2015	2016	2017	2018	Normal Rain fall in mm
724.8	964	1116.2	710.9	967.5	932.6	872.8

Source: **TWAD Board website**

Table 1.5 Average Rainfall in Sivagangai - Actual rainfall in mm

1.4 Transport Network

The main roads radiating from the Karaikudi town are leading to Madurai (Tirupathur) on the west, (Trichirappalli) (Pudukkottai) on the north and

Ramanathapuram (Devakottai) on the east. The other roads are interlinking important settlements within and surrounding the town. This town is an important Junction of the broadgauge railway line from Trichy Manamadurai (Madras to Rameswaram) line on the long range.

1.4.1 Road Connectivity

National High Way, Karaikudi is connected by a National Highway, NH 536 connects to Tiruchirappalli via Pudukkottai, Madurai via Thirupattur and Ramanthapuram via Devakkottai. State Highway, 28 connects Karaikudi and Pudukkottai. SH 29 connects Aranthangi on the north eastern side via Sakkottai and Thiruppathur in west. Also, SH 29 connects Manamadurai via Sivangangai district headquarters on the south western side. SH35 connects Kalayarkovil on the south via Kallal.

1.4.2 Rail Connectivity

Karaikudi has one main railway station namely, Karaikudi junction which connects railway line from Trichy Manamadurai (Madras to Rameswaram) line on the long range.The railway station is eastern outskirts of the town Madras-Rameswaran railway line. The quantum of goods transported through railway is also considerably large.

1.4.3 Air Connectivity

No airport in Karaikudi. The nearest airports are Tiruchirappalli and Madurai International Airports, These Airports are located in the distance of 86.9 Km and 96.6 Km from Karaikudi Municipality.

1.5 Summary

Karaikudi settlement must have existed from Early 19th century as Sri Koppudaiya Nayagi Amman Temple. The oldest structure in the town tracks its history from 1800. The importance of the town is identified with its significant development in trade and commerce, education and transport aspects. It has gained more importance in education by virtue of the location of the

Alagappa University besides the development of trade and commerce and transportation activities. The dairy development is also significant in this town, Food processing industries and Engineering and Auto mobile services. The proposals will focus on developing Karaikudi with a robust economy by utilizing its, trade and commerce, tourism, agriculture and Education and industrial development in peripheral area. Also, physical and social infrastructure and recreational space for improve better quality of life. The planning area of Karaikudi CLPA, 2021 is extended from 13.75 sq. km to 102.3 sq. km. The planning area is heterogenous which includes Karaikudi Municipality, Kottaiyur Town panchayat, and 10 villages.

2 URBANISATION AND GROWTH TRENDS

02

The planning area is heterogeneous in nature. The development experienced beyond the town and it experience huge shortfall in the resource allocation and services. The continues growth the town faced many issues like, unauthorised construction, informal settlements along the waterbodies and water channels, water pollution. traffic congestion, no proper intersections, parking issues, increased demand for amenities, gardens, open spaces, social infrastructures and much more. In the recent development heritage value of the town slowly diminishing.

The Government of India has launched the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) with the aim of providing basic civic amenities like water supply, sewerage, urban transport, parks as to improve the quality of life for all especially the poor and the disadvantaged. It essential to study the urbanisation factors such as spatial expansion, population growth and economic development in the city. The trend of population growth and density determines the required infrastructure demand of the planning area. The population projections help us to estimate the housing demand, water demand, the allocation of solid waste disposal sites etc. This demography factors forms the basis for projections for various utilities need to be created, spatial expansion demands where to be placed and economic factor determines the viability in the Local Planning Authority Area. Hence, it is imperative to analyze, understand and appreciate the Spatial growth, demography and economic factor of the planning area of Karaikudi Composite Local Plan Authority.

Master plan 2041 emphasis that overall comprehensive plan to take care its present and future requirements with respect to its population, Sustainable economic development, Heritage conservation, ecologically sustain, and the optimum use of the land available. The absence of the above would lead to haphazard development, unhealthy living and numerous other connected problems.

2.1 Population and its Growth

The Karaikudi Municipality had a moderate population of 11,801 in 1901 and it has experienced a natural growth since then. According to the 2011 census, the population of Karaikudi Municipality is 1,06,714. The population projection for 2021 is 1,34,148. **(Table 2.1)** reveals that the maximum decadal growth rate was witnessed during 1921 to 1931. The population of the town has exponential

increased more than 1000% from 11,810 to 1,34,148 during the 100-year period 1901 to 2021. It is evident from Table 2.1 that the decadal growth rate was high during the year 1971 which is mainly due to the expansion of the town limits. There is an abrupt fall in the growth rate of the total population after 1971. The reason may be the control over the birth rate because awareness campaign and educational development. However, there is an increase in the growth rate in Karaikudi CLPA from the year 2001 to 2021. The following **(Map 2.1)** presents the growth rate of Karaikudi Municipality from the year 1901-2021.

S. No.	Year	Population	Inter - Decennial Growth
1	1901	11,801	
2	1911	14,648	24.13
3	1921	15,350	4.79
4	1931	21,672	41.19
5	1941	28,908	33.39
6	1951	38,453	33.02
7	1961	43,698	13.64
8	1971	55,449	26.89
9	1981	66,993	20.82
10	1991	71,965	7.42
11	2001	86,596	20.33
12	2011	1,06,714	23.23
13	2021	1,34,148	25.71

Source: **Census of India**

Table 2.1 Growth Rate of Karaikudi Municipality from 1901-2021

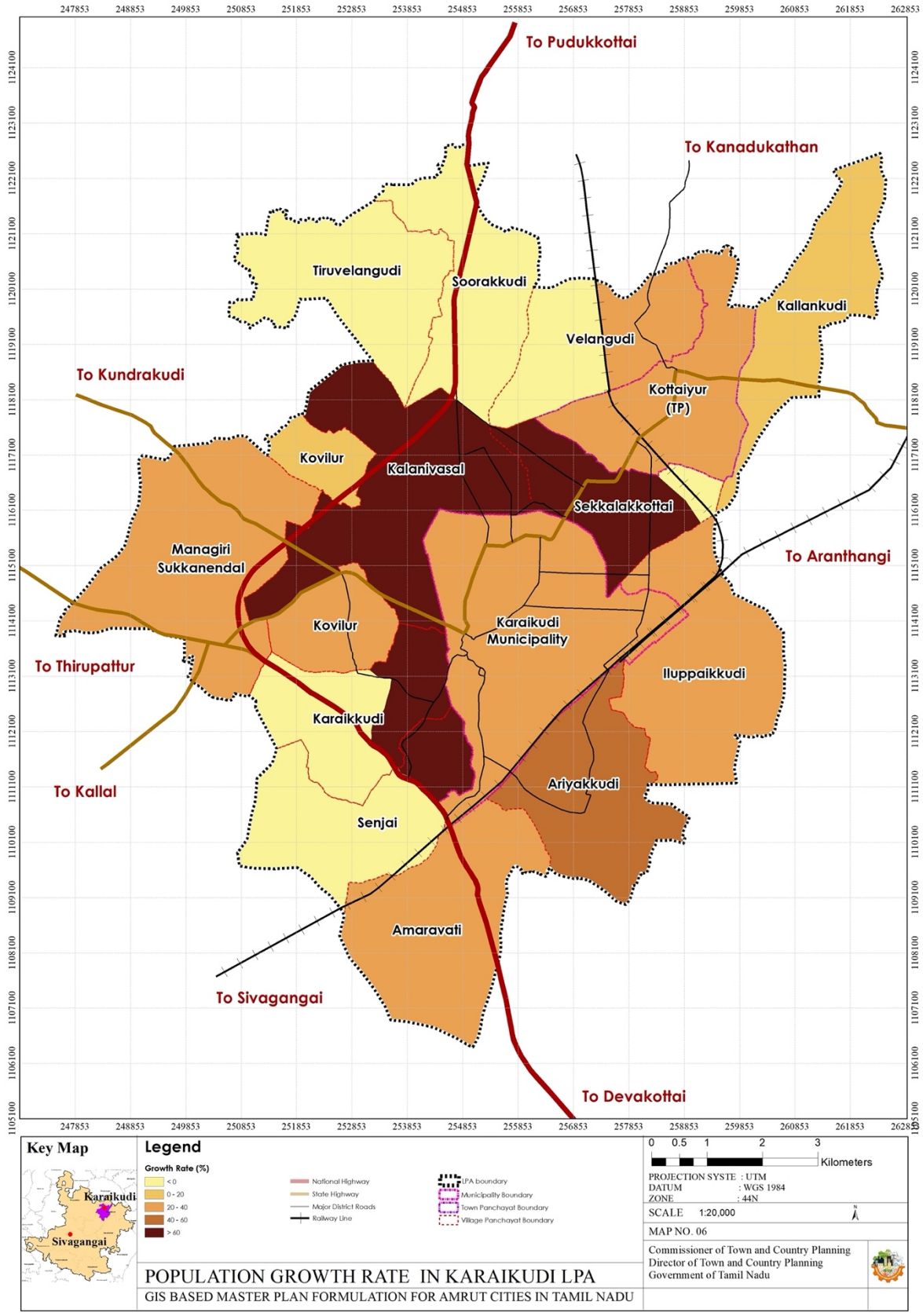
The population of Karaikudi Composite Local Planning Area for the year 2021 is 2,37,334. **(Table 2.2)** showed Villages/Town wise population growth rate of Karaikudi CLPA from the year 1991-2021. The population growth rate is higher in the major villages Karaikudi Composite Local Planning Area for the year 2021 is such as

Sankarapuram CT (Kalanivasal, Sekkalakottai, and Sankarapuram villages), Amaravathi, Illuppaikkudi and Managiri.. Less growth rate is observed in the Thiruvelangudi village which is situated for away from the core development area. The major cause of it is the lack of further employment opportunities in Agriculture.

S. No	Description	Name of Villages/Towns	Population			Decadal Growth rate %			
			1991	2001	2011	2021	1991-2001	2001-2011	2001-2021
1	Urban	Karaikudi	71,965	86,596	1,06,714	1,34,148	20.33	23.23	25.71
2		Kottaiyur	8,318	10,633	14,766	20,057	27.83	38.87	35.83
3	Rural	Amaravathi	1,672	1,881	2,529	3,799	12.50	34.45	50.23
4		Ariyakkudi	3,353	3,660	5,538	9,685	9.16	51.31	74.87
5		Illuppaikkudi	3,004	3,989	5,327	8,777	32.79	33.54	64.77
6		Kovilur	2,917	3,640	4,938	6,430	24.79	35.66	30.22
7		Managiri	1,233	2,594	3,486	6,009	110.38	34.39	72.38
8		Sankarapuram CT (In the Census 2011 data, It includes population of Kalanivasal, Karaikudi, Senjai, Sekkalaokotai)	5,854	13,911	26,923	43,964	137.63	93.54	63.29
9		Thiruvelangudi (T.Soorakudi)	1,645	2,154	3,197	4,466	30.94	48.43	39.69
10		**CLPA Total**	**99,961**	**1,29,058**	**1,73,418**	**2,37,334**	**29.11**	**34.37**	**36.86**
		Urban in CLPA	**80,283**	**97,229**	**1,21,480**	**1,54,204**	**21.11**	**24.94**	**26.94**
		Villages in CLPA	**19,678**	**31,829**	**51,938**	**83,130**	**61.75**	**63.18**	**60.06**

Source: **Census of India**

Table 2.2 Village/Town-wise Growth Trend of the CLPA



Maps 2.1 Population Growth Rate in Karaikudi CLPA Area

2.1.1 Comparison of Population Growth Rate

The State, District and Karaikudi CLPA comparative growth rate has been shown in **(figure 2.1).** According to the census 2011, the Karaikudi CLPA has a growth rate of 33.20 % which is higher than district 15.90%.

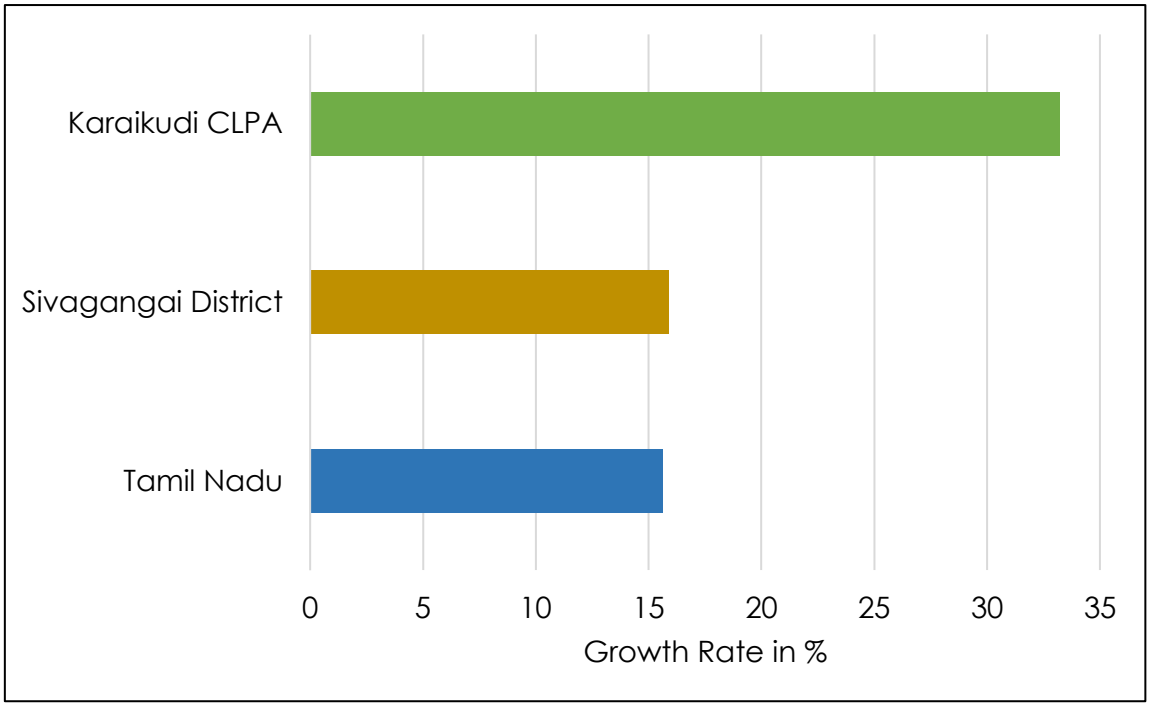


Figure 2.1 Comparative Population Growth Rate

2.1.2 Population under 6-10 age group

The percentage of population under 0-6 age group shows the health status, infant mortality and wellbeing of households in the CLPA. As per Census 2011, Sivagangai District, with a population of 13,39,101, has 10.25 % (1,37,235) of its population in the age group 0-6 years. Karaikudi CLPA has 9.96 % of its population in the age group of 0-6 years 2011. The population in the age group 0 to 6 in Karaikudi CLPA has increased by 9.52 % from the year 2001 to 2011. In 2011 the urban area average child population reported 9.47 % and for rural areas 10.25 % thesev **(Table 2.2)** have influence on deciding educational facilities in the local plan authority.

S. No.	Name of Villages/Town	Population		Child Population		% of variation	% of Child Population 2011
		2001	2011	2001	2011		
1	Karaikudi	86,596	1,06,714	9,696	10,619	9.52	9.95
2	Kottaiyur	10,633	14,766	1,054	1,327	25.90	8.99
3	Villages in CLPA	31,829	51,938	3,317	5,323	60.48	10.25
	Total CLPA	**1,29,058**	**1,73,418**	**14,067**	**17,269**	**22.76**	**9.96**

Source: **Census of India**

Table 2.3 Village/Town wise Total Population & Child Population (0-6 years) from 2001-2011

The gender-wise population distribution among the population under 0-6 reveals that the composition of the male and female population in 0-6 age group varies from that of the total male and female population. 48.78% of the child population is female which is lower than that of the overall proportion of females in Karaikudi CLPA. The variation in between genders below 0-6 shows the preference to have more male babies than female child. However, this is only a marginal variation.

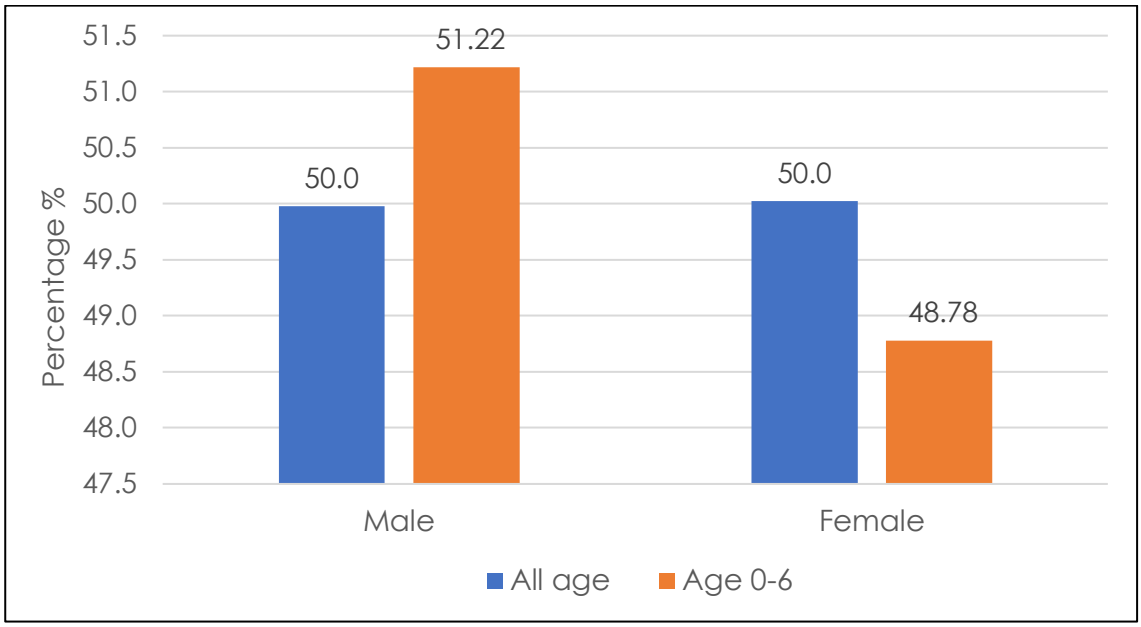


Figure 2.2 Population Distribution by Sex in Karaikudi CLPA – 2011

2.1.3 SC & ST Population

The SC & ST population constituted 9.98 percent and 0.07 percent of the total Karaikudi CLPA population in the year 2011. **(Table 2.4)** reveals that SC & ST Population has been increased 64.26% within two decades from 2001 to 2011. The Karaikudi Municipality has the highest SC & ST population followed villages, particularly Kalanivasal (Sankarapuram CT) village during the year 2011. It is observed. there is a significant increase in the population of SC & ST in Kalanivasal village during the last decade it because of the adjoining village data merge to Sankarapuram CT in Census 2011.

S. No	Name of Villages/Town	SC Population			ST Population		
		1991	2001	2011	1991	2001	2011
1	Karaikudi	3,130	4,935	7,667	453	283	94
2	Kottaiyur	931	958	1,551	2	-	5
3	Villages in CLPA	3,573	5,013	8,084	15	42	77
	Total CLPA	**7,634**	**10,906**	**17,302**	**470**	**325**	**176**

Source: **Census of India**

Table 2.4 Village/ Town wise Total SC & ST Population for 1991, 2001 and 2011

The Village/Town Wise proportion of SC & ST population in Karaikudi CLPA is revealed in **(Table 2.5).** The villages have the largest proportion of SC and ST populations, at 15.56% and 0.15 percent, respectively. In the CLPA, Kovilur village has the highest percentage of its people (46.54%) classified as SC. Similarly, a higher percentage of SC people live in villages in Karaikudi CLPA like as Managiri, Illuppaikkudi, Amaravathi, and Ariyakkudi.

S. No.	Name of Villages/Town	Population 2011	SC Pop	ST Pop	% SC	% ST
1	Karaikudi	1,06,714	7,667	45	7.18	0.04
2	Kottaiyur	14,766	1,551	3	10.50	0.02
3	Villages in CLPA	51,938	8,084	77	15.56	0.15
	Total CLPA	**1,73,418**	**17,302**	**125**	**9.98**	**0.07**

Table 2.5 Village/Town wise Total Proportion of SC & ST Karaikudi CLPA

2.1.4 Sex Ratio

Sex Ratio is denoted by the number of females per 1000 males. The sex ratio of the Karaikudi CLPA is 1001 females per 1000 males which is almost similar to that of the district (1003) and higher than the State (996) in 2011. Overall, the sex ratio in Karaikudi CLPA is showing an increasing trend. **Figure 2.3** shows the comparison of sex ratio in Country, State District and Karaikudi LPA. It may also be associated with men's in the family who settled in another country and female members who stay here for completion children's school education. This may be attributed to two reasons; First, the women in Karaikudi CLPA receive proper education and health care, so their survival chances are good as those of men. Secondly, the town has a matriarchal society in which the women hold the power to pull string and doesn't allow discrimination between a daughter and son. **(Table 2.6)** presents the Village/Town wise sex ratio of Karaikudi CLPA for the year 2011. The villages in Karaikudi CLPA Amaravathi and Thiruvelngudi villages have highest Sex ratio 1136 and 1025 respectively. Kottaiyur, Illuppaikudi, Kovilur, Managiri and Sankarapuram CT has less sex ratio. This associated with high rental housing in these villages.

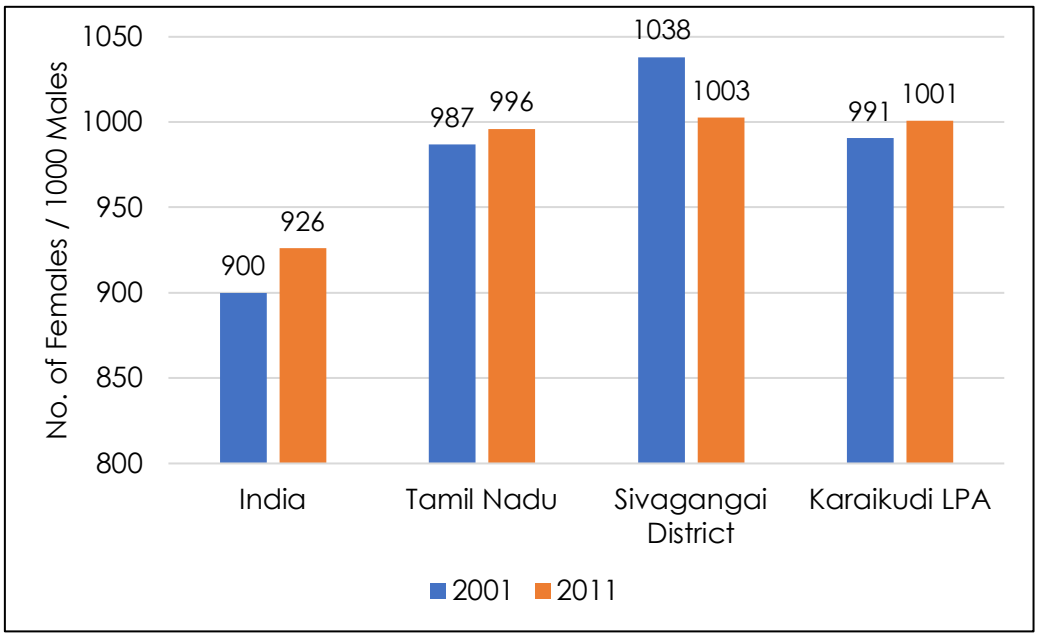


Figure 2.3 Comparison of Sex Ratio

S. No	Name of Villages/Town	Total Population 2011	Population in 2011		
			Male	Female	Sex Ratio
1	Karaikudi (M)	1,06,714	53,348	53,366	1000
2	Kottaiyur (TP)	14,766	7,402	7,364	995
3	Amaravathi	2,529	1,184	1,345	1136
4	Ariyakkudi	5,538	2,768	2,770	1001
5	Illuppaikkudi	5,327	2,675	2,652	991
6	Kovilur	4,938	2,482	2,455	989
7	Managiri	3,486	1,762	1,724	978
8	Sankarapuram CT (In the Census 2011 data, It includes population of Kalanivasal, Karaikudi, Senjai, Sekkalai Kottail)	26,923	13,489	13,434	996
9	Thiruvelangudi	3,197	1,579	1,618	1025
10	**CLPA Total**	**1,73,418**	**86,689**	**86,728**	**1001**
11	**Urban in CLPA**	**1,21,480**	**60,750**	**60,730**	**1000**
12	**Villages in CLPA**	**51,938**	**25,939**	**25,998**	**1002**

Source: **Census of India**

Table 2.6 Village/Town-wise Total Sex Ratio of Karaikudi CLPA (2011)

2.2 Population Density

Population Density is defined as the number of persons per Sq. Km. The Karaikudi CLPA spreads over an area of about 115.78 Sq. Km. **Figure 2.4** shows the comparison of the population density of Karaikudi Municipality with other similar Municipalities in Tamil Nadu. In Karaikudi CLPA, Karaikudi Municipality has the moderate population density of about 7161 persons per Sq.Km followed by Kottaiyur Town Panchayat. The density of population is very high where urban agglomeration is taking place. This is mainly associated with the availability of better employment opportunities in the urban areas and immediate surroundings.

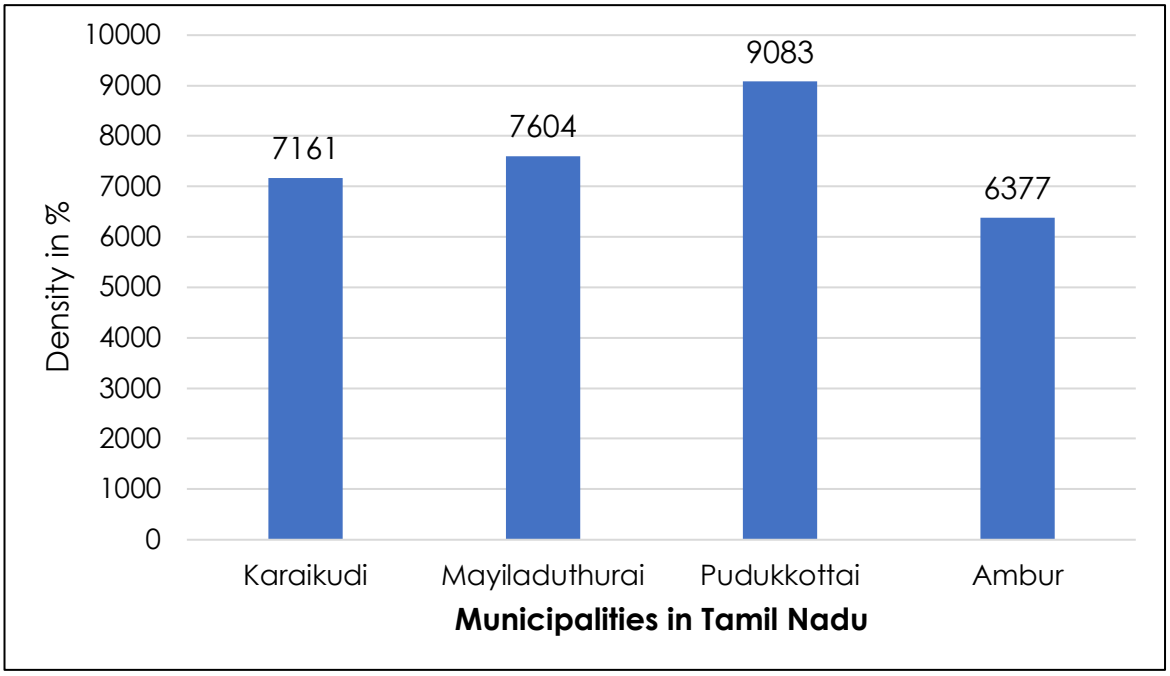
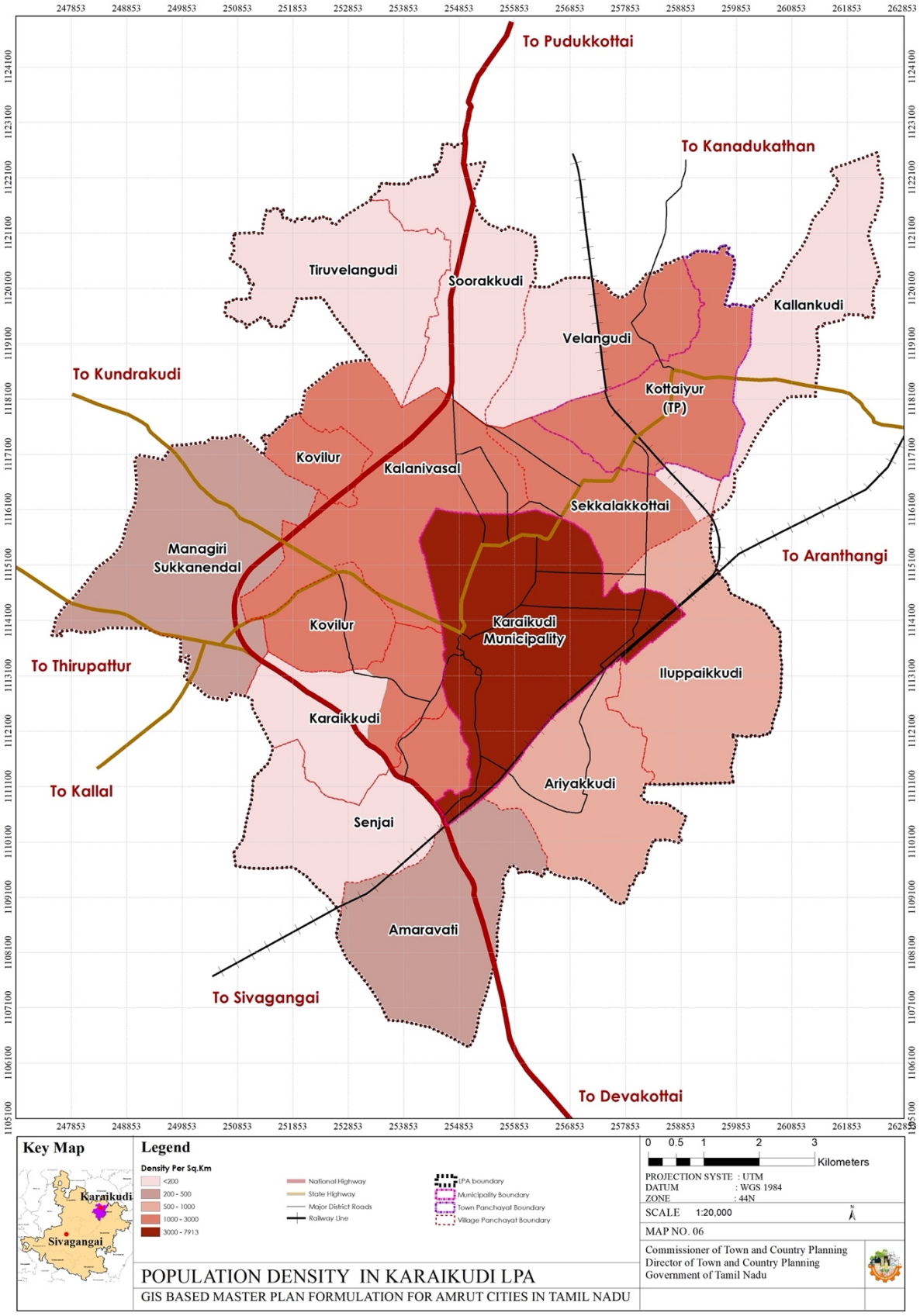


Figure 2.4 Comparative Population Density



Maps 2.2 Population Density in Karaikudi CLPA

S. No.	Projection Methods	Population					
		1991	2001	2011	2021	2031	2041
1	Arithmetic Increase Method	71,965	86,596	1,06,714	1,24,089	1,41,463	1,58,838
2	Geometric Increase Method	71,965	86,596	1,06,714	1,29,958	1,58,264	1,92,736
3	Exponential Method	71,965	86,596	1,06,714	1,49,027	1,96,665	2,62,291
4	**Incremental Increase Method**	**71,965**	**86,596**	**1,06,714**	**1,34,148**	**1,64,020**	**1,94,501**

Table 2.7 Various Methods of Population Projection - Karaikudi Municipality

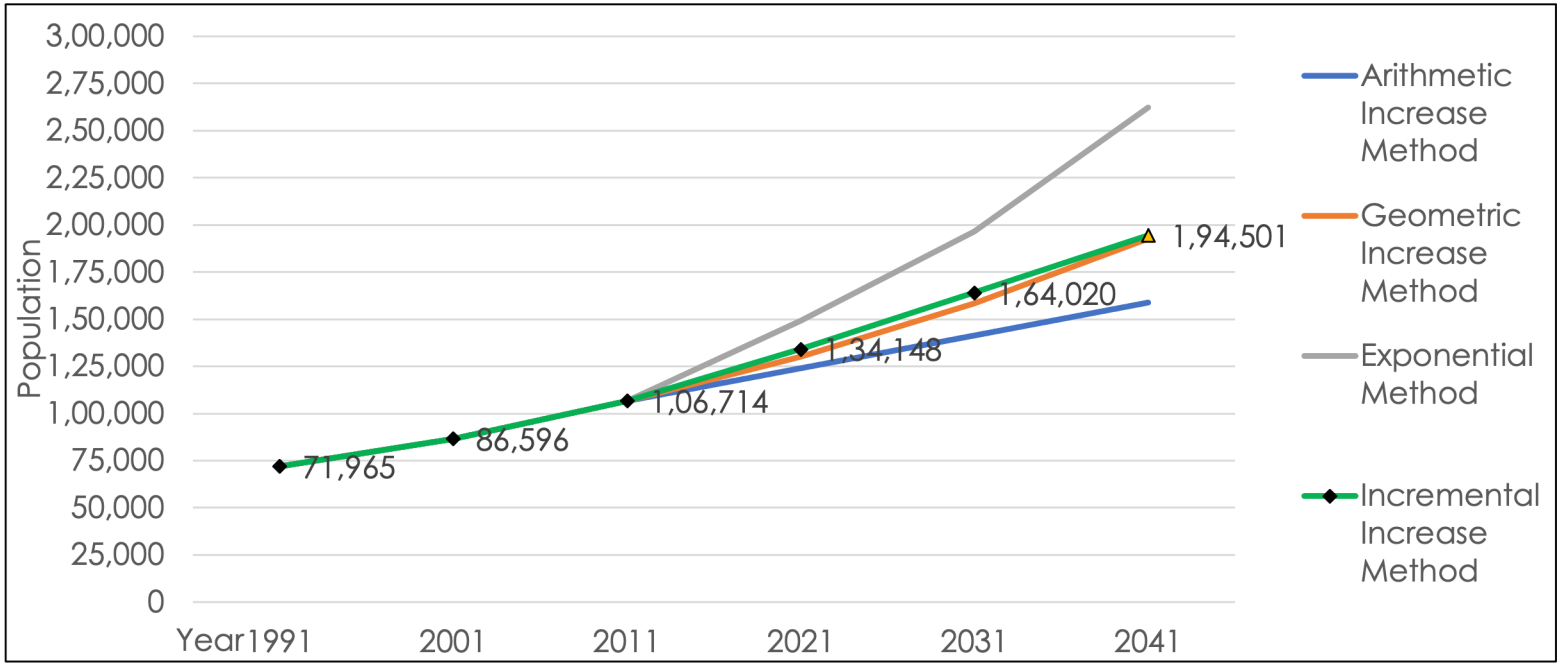


Figure 2.5 Population Projection of Karaikudi Municipality

A careful study of population projection is essential to estimate the basic demand for water, sewage, solid waste, Housing and labour force demand. For a master plan it is important to identify the required lands portion for the future. Hence, an attempt has been made to project the population under the five methods and tabulated below. The following analysis consists of the population projections under two heads viz a. Urban and Rural. The urban area consists of 1. Karaikudi Municipality and Kottaiyur Town Panchayat and 10 villages are surrounding the Local plan authority has been considered under the Rural. Population projections considered to find the increase of population for year 2021, 2031 and 2041. The purpose of Population projection Karaikudi CLPA is classified into 3 types 1. Karaikudi Municipality, 2. Kottaiyur Town Panchayat and 10 Villages (These 10 villages individually considered for projection of population). The past four decades 1991, 2001, 2011 and 2021 population data has been taken for population projection for 2021, 2031 and 2041. Population projections used various methods such as Arithmetic Progression, Geometric Progression, Exponential growth, Incremental Increase. Census and local bodies population data coincides with the Population projected by Incremental Increase Method (Karaikudi, Kottaiyur and Sankarapuram (CT). Geometric Progression (Kovilur, Managiri and Thiruvelangudi, Exponential Growth Method (Ariyakkudi & Illuppaikkudi (Growth Potential) and Amaravathi (SIDCO Industrial Development). Therefore, the population arrived by Incremental Increase Method, Geometric Progression and Exponential Growth Method are used for future population projection. Hence, the results obtained in the above methods have been used to calculate the demand for various utilities in the study area. **(Table 2.7 to 2.15)** and **(Figure 2.5 to 2.13)** discloses the Local Body wise population projection information

S. No.	Projection Methods	Population					
		1991	2001	2011	2021	2031	2041
1	Arithmetic Increase Method	8,318	10,633	14,766	17,990	21,214	24,438
2	Geometric Increase Method	8,318	10,633	14,766	19,691	26,257	35,014
3	Exponential Method	8,318	10,633	14,766	25,033	39,420	63,978
4	**Incremental Increase Method**	**8,318**	**10,633**	**14,766**	**20,057**	**25,733**	**31,506**

Table 2.8 Various Method of Population Projection - Kottaiyur Town Panchayat

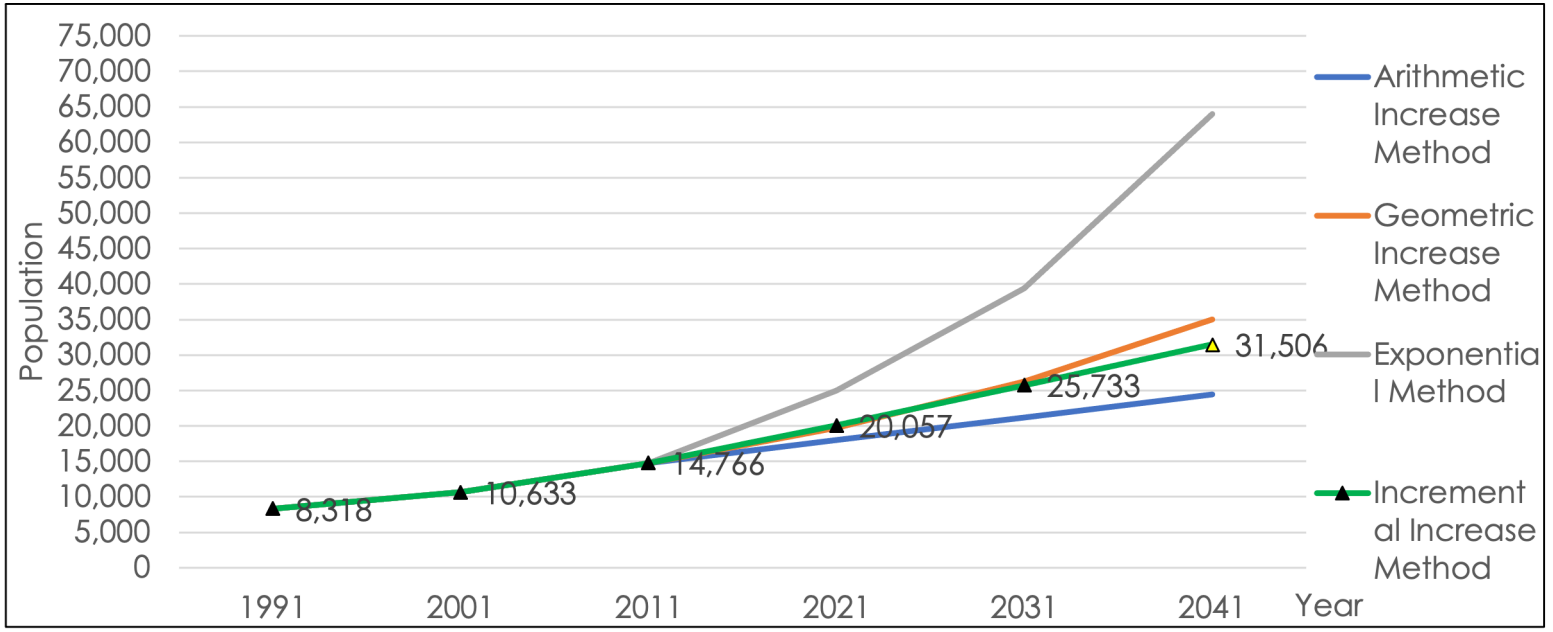


Figure 2.6 Population Projection of Kottaiyur Town Panchayat

S. No.	Projection Methods	Population					
		1991	2001	2011	2021	2031	2041
1	Arithmetic Increase Method	1,672	1,881	2,529	2,958	3,386	3,815
2	Geometric Increase Method	1,672	1,881	2,529	3,123	3,856	4,761
3	**Exponential Method**	**1,672**	**1,881**	**2,529**	**3,799**	**5,253**	**7,369**
4	Incremental Increase Method	1,672	1,881	2,529	3,282	10,255	13,216

Table 2.9 Various Methods of Population Projections - Amaravathi Village in Karaikudi CLPA

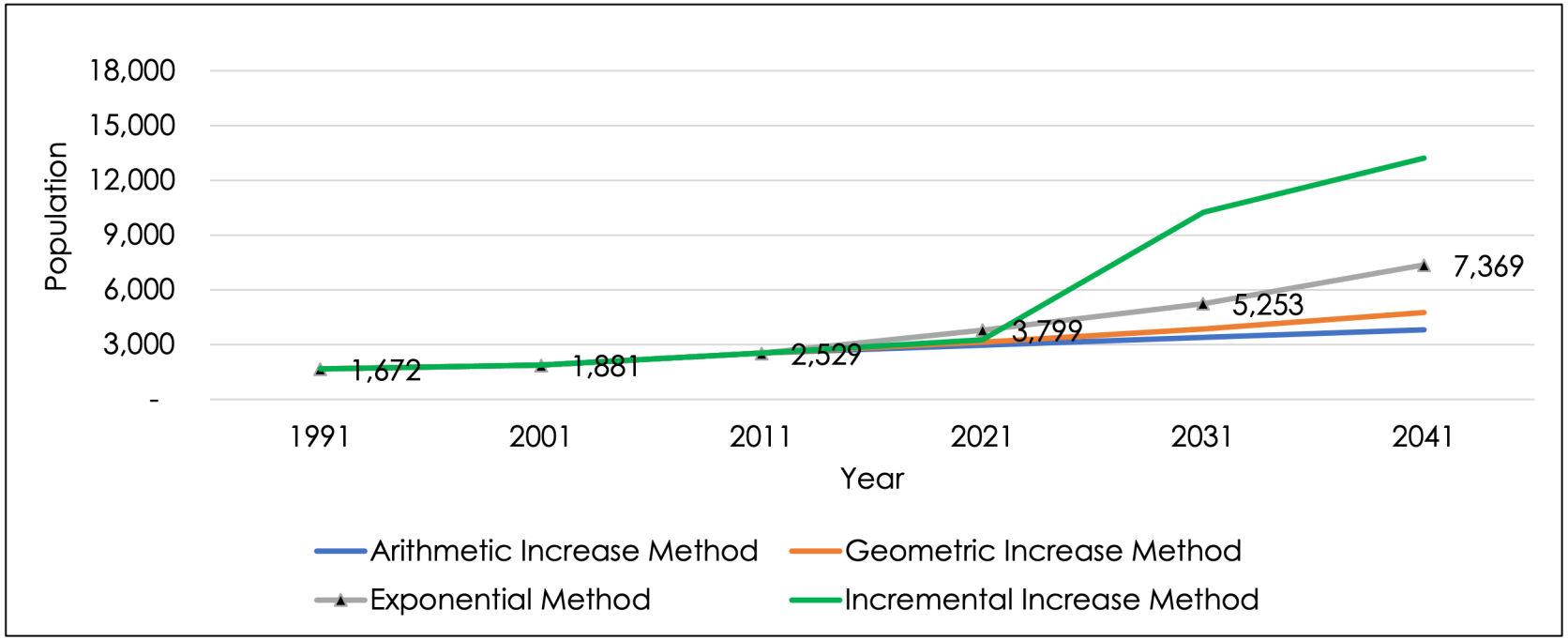


Figure 2.7 Population Projection of Amaravathi Village in Karaikudi CLPA

S. No.	Projection Methods	Population					
		1991	2001	2011	2021	2031	2041
1	Arithmetic Increase Method	3,353	3,660	5,538	6,631	7,723	8,816
2	Geometric Increase Method	3,353	3,660	5,538	7,212	9,393	12,233
3	**Exponential Method**	**3,353**	**3,660**	**5,538**	**9,685**	**15,206**	**24,595**
4	Incremental Increase Method	3,353	3,660	5,538	7,570	9,652	11,748

Table 2.10 Various Methods of Population Projection - Ariyakkudi Village in Karaikudi CLPA

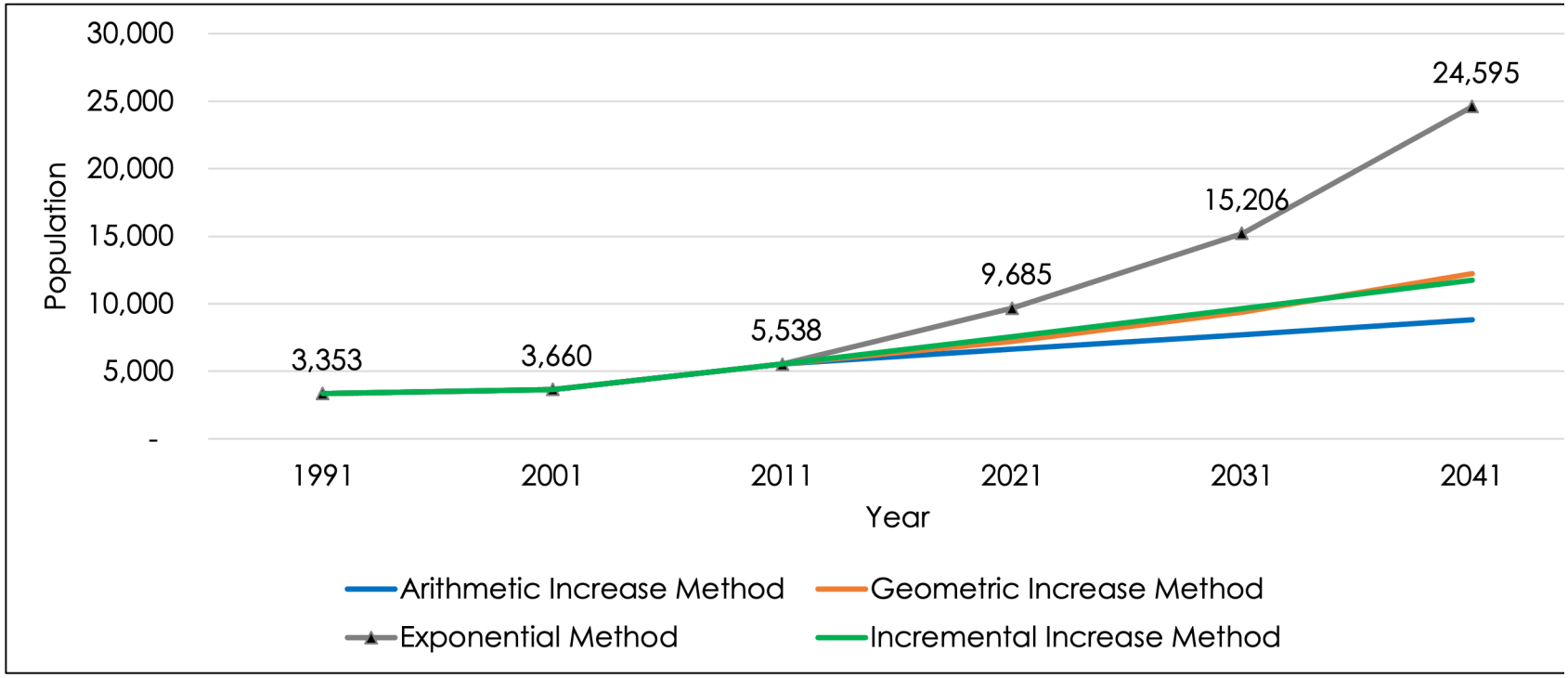


Figure 2.8 Population Projection of Ariyakkudi Village in Karaikudi CLPA

S. No.	Projection Methods	Population					
		1991	2001	2011	2021	2031	2041
1	Arithmetic Increase Method	3,353	3,660	5,538	6,631	7,723	8,816
2	Geometric Increase Method	3,353	3,660	5,538	7,212	9,393	12,233
3	**Exponential Method**	**3,353**	**3,660**	**5,538**	**9,685**	**15,206**	**24,595**
4	Incremental Increase Method	3,353	3,660	5,538	7,570	9,652	11,748

Table 2.11 Various Methods of Population Projection - Ariyakkudi Village in Karaikudi CLPA

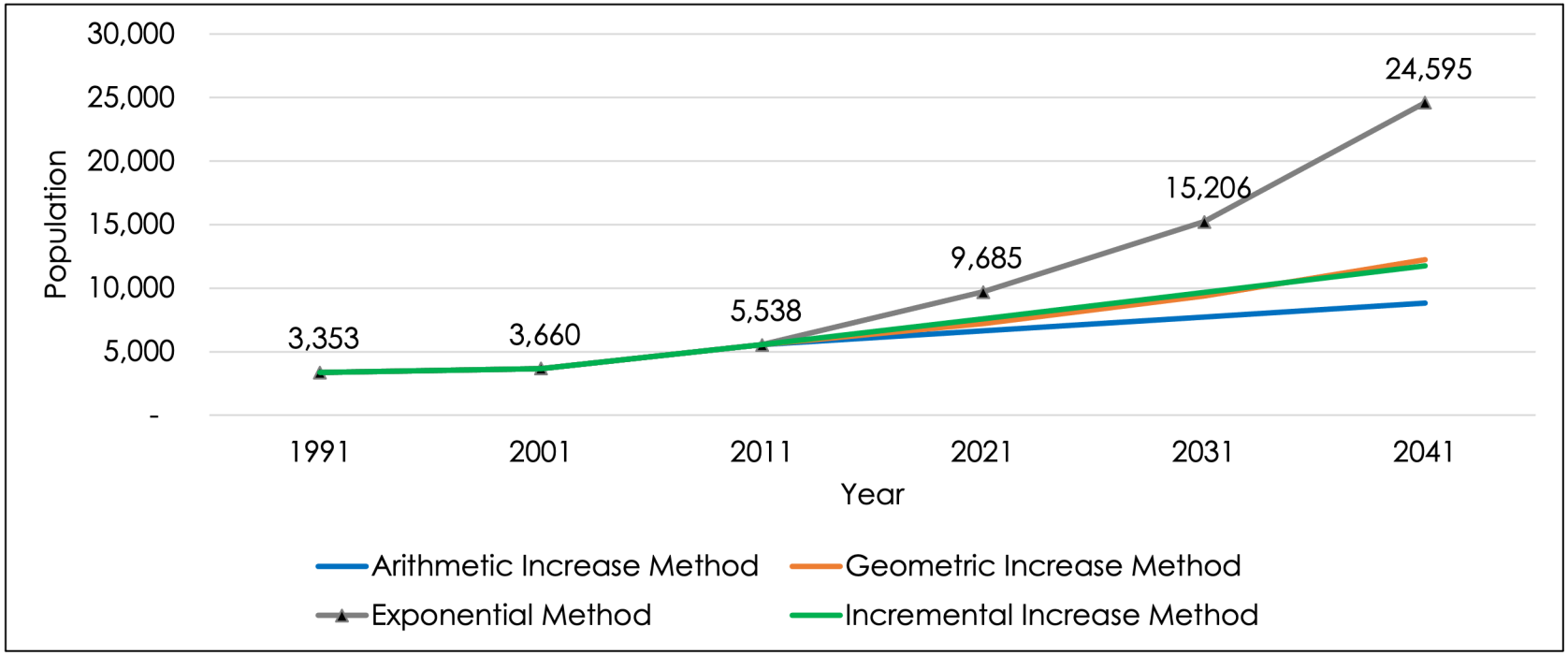


Figure 2.9 Population Projection of Ariyakkudi Village in Karaikudi CLPA

S. No.	Projection Methods	Population					
		1991	2001	2011	2021	2031	2041
1	Arithmetic Increase Method	3,004	3,989	5,327	6,489	7,650	8,812
2	Geometric Increase Method	3,004	3,989	5,327	7,094	9,446	12,579
3	**Exponential Method**	**3,004**	**3,989**	**5,327**	**8,777**	**13,588**	**21,627**
4	Incremental Increase Method	3,004	3,989	5,327	7,158	9,152	11,188

Table 2.12 Various Methods of Population Projection - Illuppaikkudi Village in Karaikudi CLPA

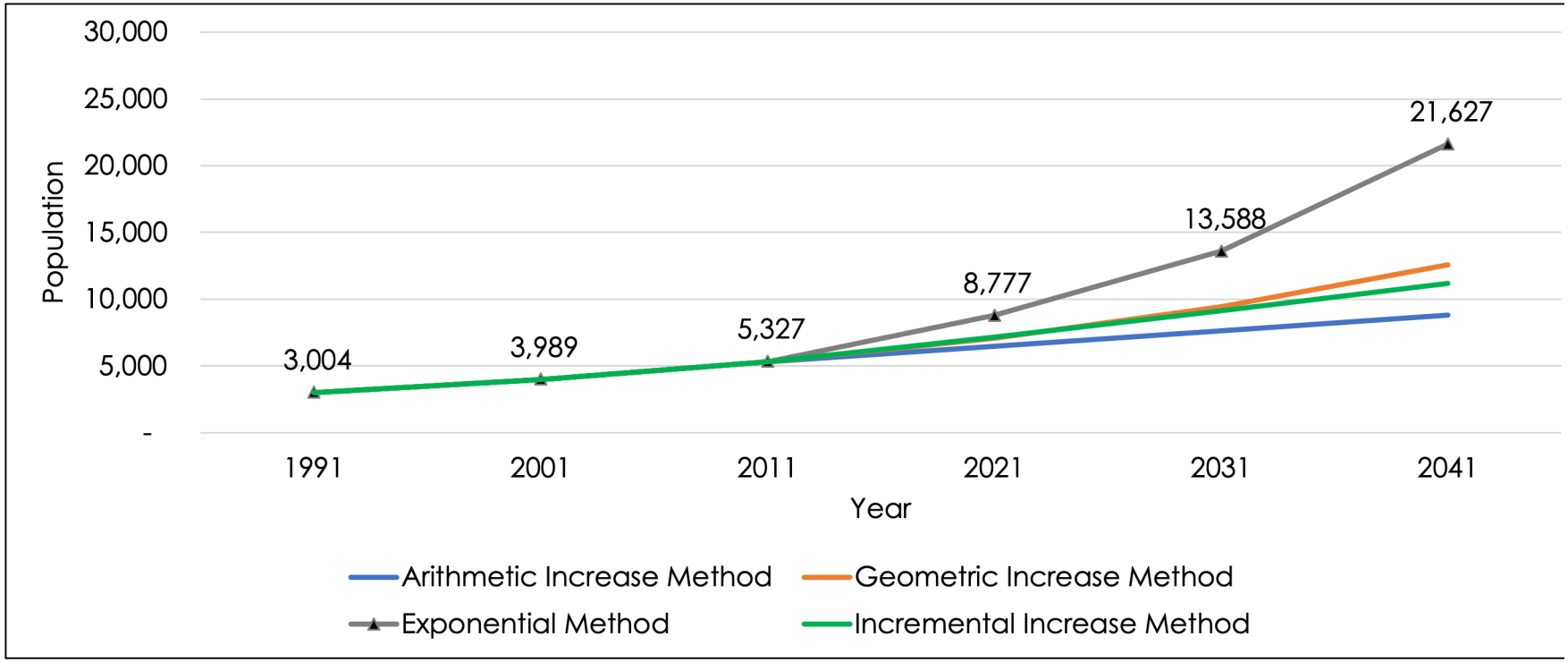


Figure 2.10 Population Projection of Illuppaikkudi Village in Karaikudi CLPA

S. No.	Projection Methods	Population					
		1991	2001	2011	2021	2031	2041
1	Arithmetic Increase Method	2,917	3,640	4,938	5,949	6,959	7,970
2	**Geometric Increase Method**	**2,917**	**3,640**	**4,938**	**6,430**	**8,374**	**10,905**
3	Exponential Method	2,917	3,640	4,938	7,984	11,996	18,459
4	Incremental Increase Method	2,917	3,640	4,938	6,598	8,378	10,188

Table 2.13 Various Methods of Population Projection - Kovilur Village in Karaikudi CLPA

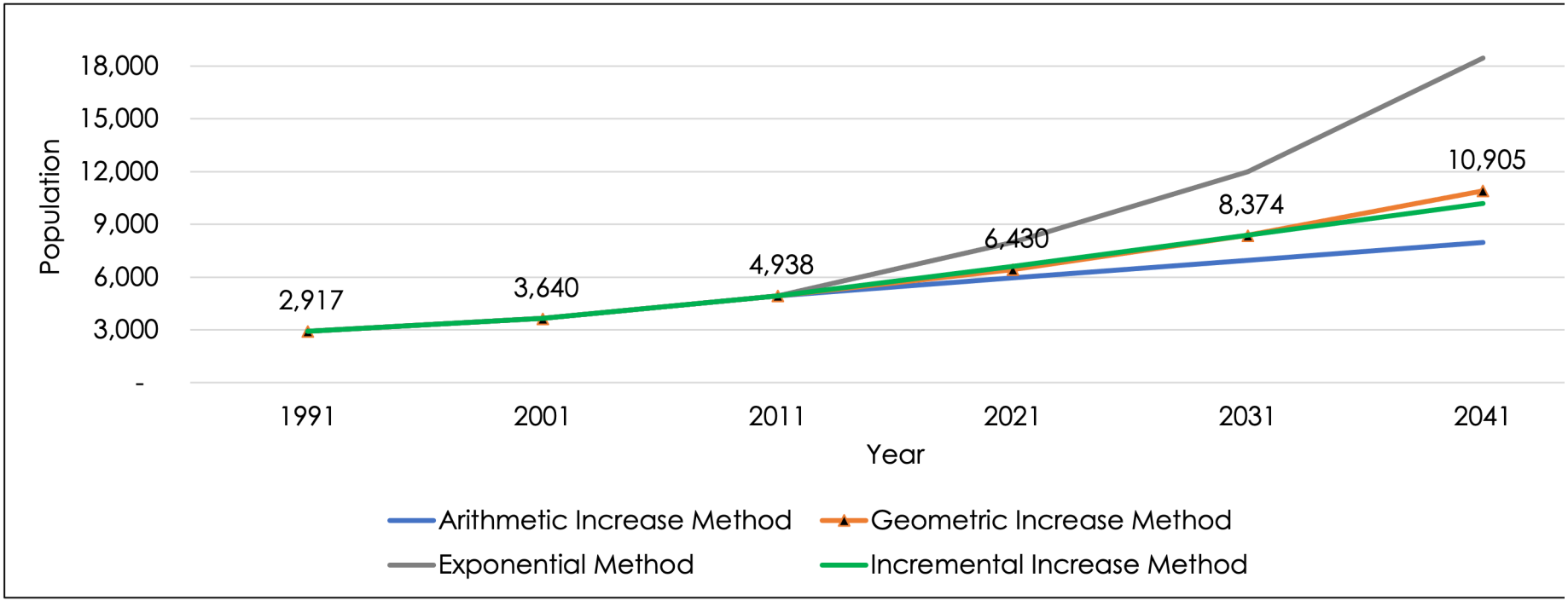


Figure 2.11 Population Projection of Kovilur Village in Karaikudi CLPA

S. No.	Projection Methods	Population					
		1991	2001	2011	2021	2031	2041
1	Arithmetic Increase Method	1,233	2,594	3,486	4,613	5,739	6,866
2	**Geometric Increase Method**	**1,233**	**2,594**	**3,486**	**6,009**	**10,359**	**17,857**
3	Exponential Method	1,233	2,594	3,486	8,538	22,425	69,479
4	Incremental Increase Method	1,233	2,594	3,486	5,059	6,858	8,714

Table 2.14 Various Methods of Population Projection - Managiri Village in Karaikudi CLPA

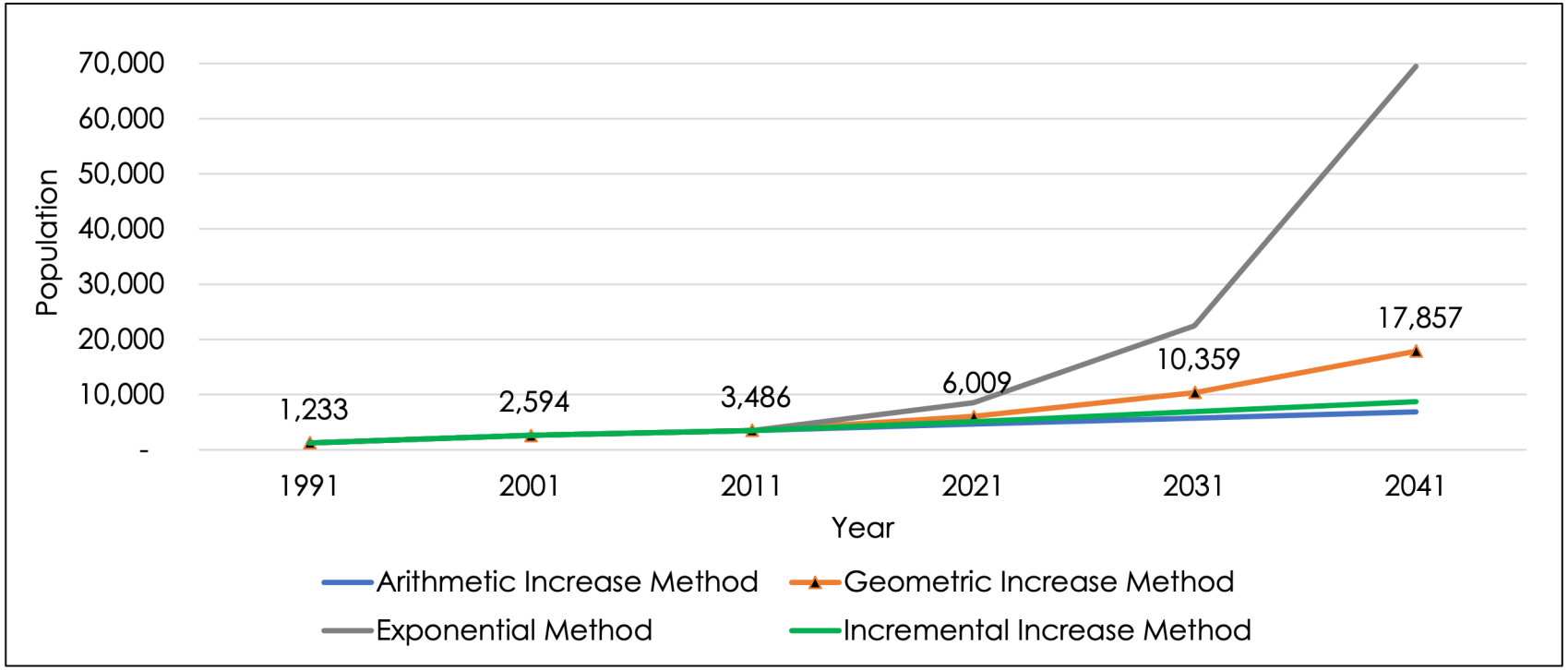


Figure 2.12 Population Projection of Managiri Village in Karaikudi CLPA

S. No.	Projection Methods	Population					
		1991	2001	2011	2021	2031	2041
1	Arithmetic Increase Method	5,854	13,911	26,923	37,458	47,992	58,527
2	Geometric Increase Method	5,854	13,911	26,923	58,042	1,25,130	2,69,761
3	Exponential Method	5,854	13,911	26,923	53,476	1,21,964	3,04,739
4	**Incremental Increase Method**	**5,854**	**13,911**	**26,923**	**43,964**	**62,347**	**81,066**

Table 2.15 Various Methods of Population Projection - Sankarapuram CT in Karaikudi CLPA

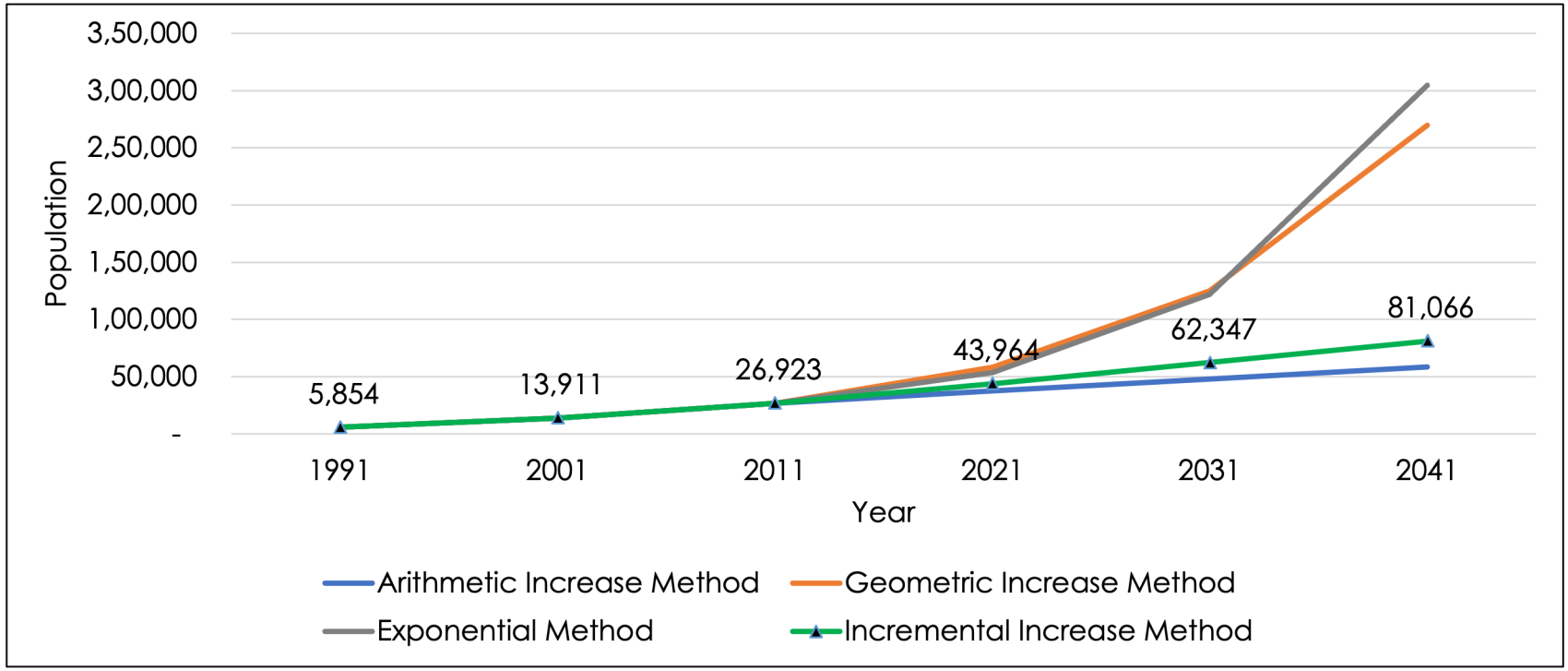


Figure 2.13 Population Projection of Sankarapuram CT in Karaikudi CLPA

S. No.	Projection Methods	Population					
		1991	2001	2011	2021	2031	2041
1	Arithmetic Increase Method	1,645	2,154	3,197	3,973	4,749	5,526
2	**Geometric Increase Method**	**1,645**	**2,154**	**3,197**	**4,466**	**6,239**	**8,715**
3	Exponential Method	1,645	2,154	3,197	6,058	10,635	19,592
4	Incremental Increase Method	1,645	2,154	3,197	4,495	5,878	7,281

Table 2.16 Various Methods of Population Projection - Thiruvelangudi Village in Karaikudi CLPA

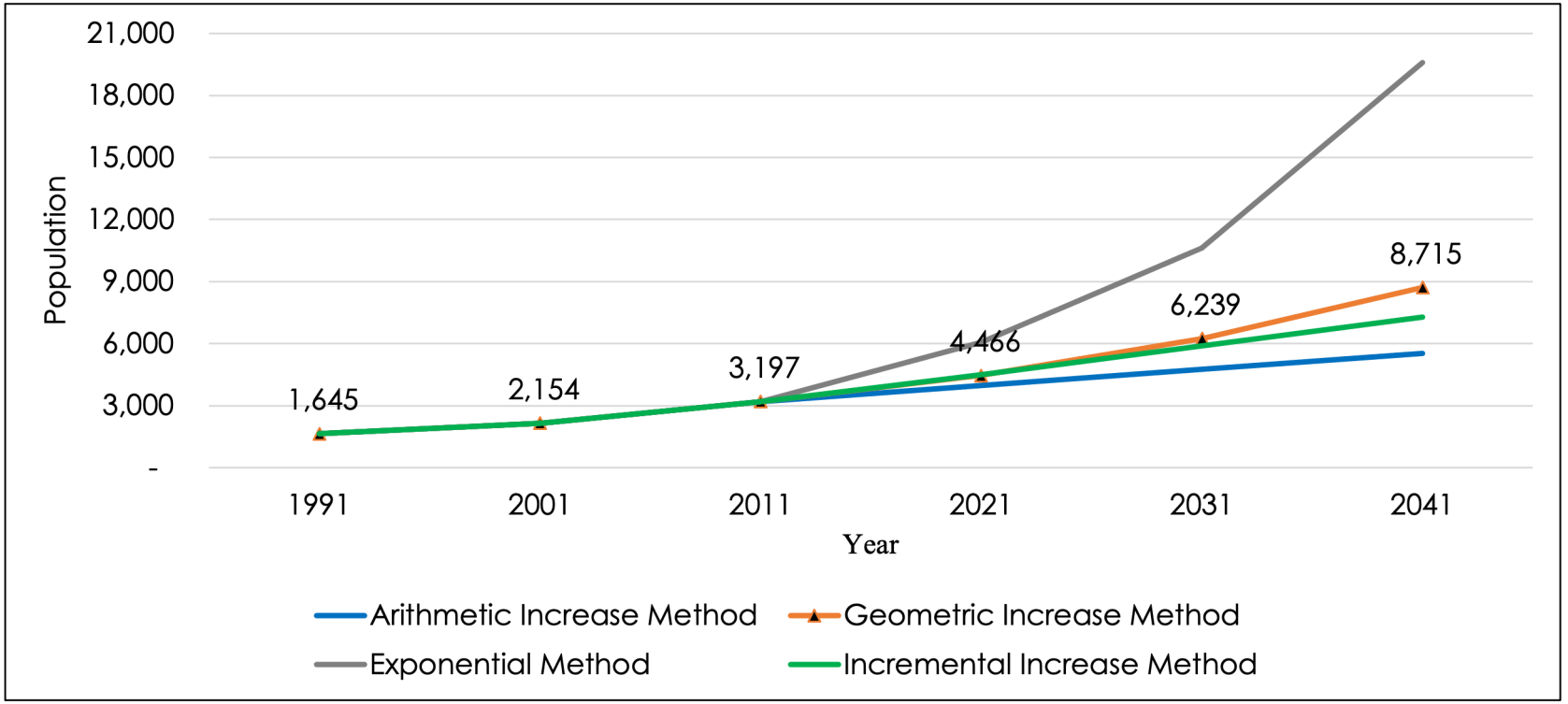


Figure 2.14 Population projection of Thiruvelanaudi Village in Karaikudi CLPA

As per Census data and conventional projection method, the **(Table 2.16)** shows decadal growth in Karaikudi CLPA area between 1991 to 2001 about 29.11%, 2001 to 2011 about 34.37 % and 2011 to 2021 about 36.86 % Karaikudi CLPA population will increase in up to 3,11,117 is about 31,09% from 2021 to 2031 and 3,98,140 is about 27.97% from 2031 to 2041. The method of population.

Description	Census Population			Projected Population		
	1991	2001	2011	2021	2031	2041
Karaikudi Municipality	71,965	86,596	1,06,714	1,34,148	1,64,020	1,94,501
Kottaiyur Town Panchayat	8,318	10,633	14,766	20,057	25,733	31,506
Villages in CLPA	19,678	31,829	51,938	83,130	1,21,364	1,72,134
Karaikudi CLPA	**99,961**	**1,29,058**	**1,73,418**	**2,37,334**	**3,11,117**	**3,98,140**
% of Growth rate		**29.11**	**34.37**	**36.86**	**31.09**	**27.97**

Table 2.17 Population Projection of Karaikudi CLPA

2.4 Growth Pattern and Trends

To conceptualize the proposals of the Draft Karaikudi CLPA master plan 2041. The following growth trend have been studied and analysed.

1. Spatial Growth Trends
2. Population Growth Trends
3. Population Density Trends
4. Economic Growth Trends

2.4.1 Spatial Growth Trend

The growth of the town is observed to be faster on eastern and northern direction. To know the chronological growth of Karaikudi CLPA, the temporal satellite imageries (1985, 2002, 2012 and 2021) have been used for mapping the built-up area. In 1985 Karaikudi CLPA built up areas was 8.30 Sq. km, after a decade, in the year 2002 built up area grew to 21.24 Sq. km Further, in the 2012 built up area grew to 21.24 Sq. km. In the recent year 2021 built up area has grown to 29.96 Sq.km. Karaikudi CLPA has experienced rapid growth in the towns and immediate

surrounding villages. Spatial growth of Karaikudi is mainly governed by DDP for 10.3 Sq.km. Typically, outward growth is fuelled by corridors, connectivity and availability of land in northeast direction without any physical barrier. However, such developments have also caused a significant amount of low-density sprawl and loss of farmlands.

The growth of the town is observed to be faster on eastern and northern direction. Developments along southern and western direction are also notable but with lesser intensity. To know the chronological growth of Karaikudi CLPA, the temporal satellite imageries (1985, 2002, 2012 and 2021) have been used for mapping the built-up area. In 1985 Karaikudi CLPA built up areas was 8.30 Sq. Km, with a population range from 70,000 to 99,000 in the year between 1981 and 1991. After a decade, in the year 2002 built up area grew to 21.24 Sq.km with a population range from 1,00000 to 1,29,000. Further, in the 2012 built up area grew to 29.96 Sq.km with a population range from 1,29, 000 to 1,72,000. In the recent 2021 built up area has grown to 29.96 Sq.km with a population range from 1,29, 000 to 1,72,000. Last two decades from 1991 to 2021, Karaikudi CLPA has experienced rapid growth in the towns and immediate surrounding villages. **The figure 2.14** showing the are chronical growth of Karaikudi CLPA.

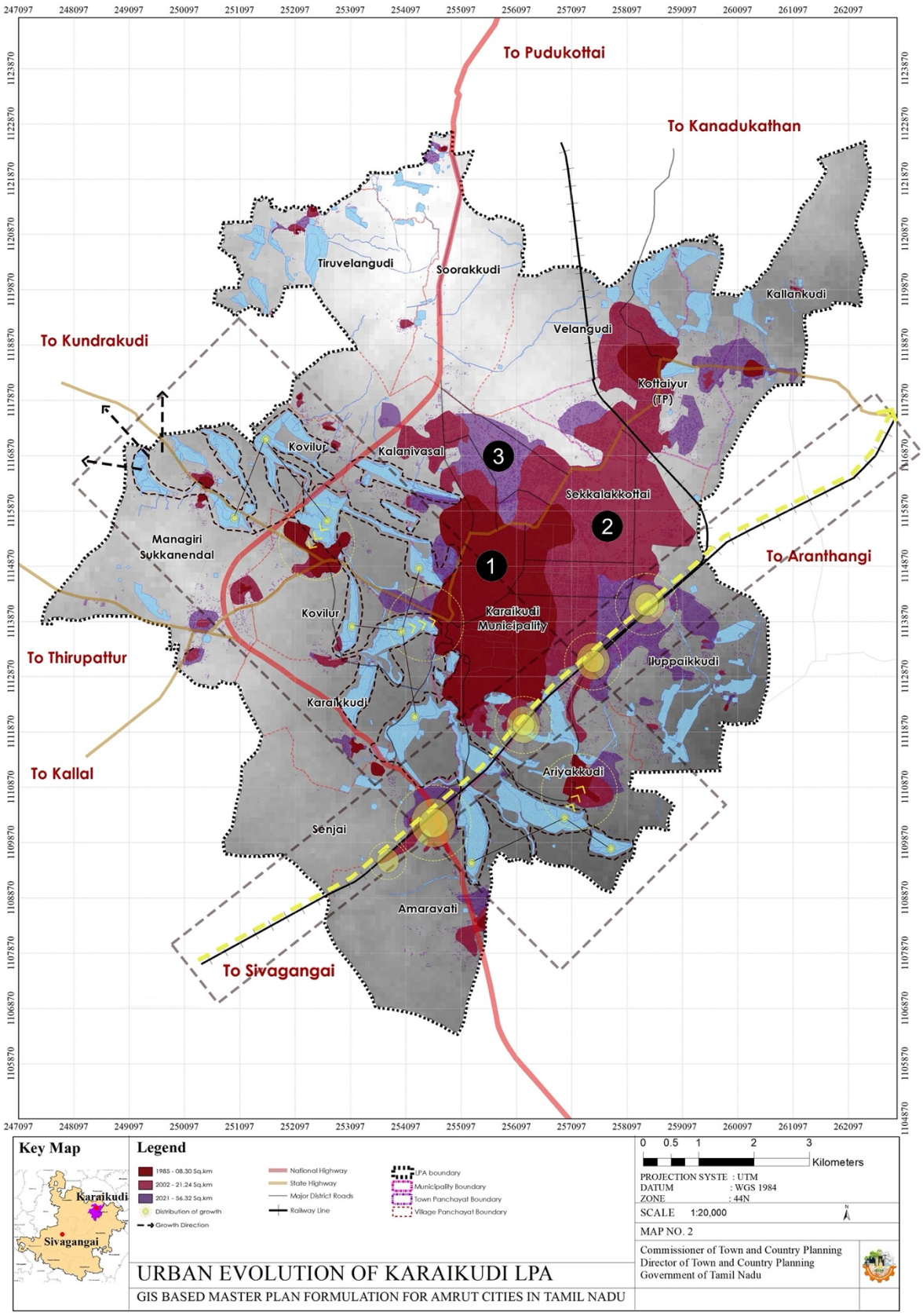


Figure 2.15 Spatial Growth Trend of Karaikudi CLPA

Developments along southern and western direction are also notable but with lesser intensity. The growth of the town is affected by the railway line in the south, linear waterbodies and forest area in the west. However, road crossings providing opportunities for development in southside. Also, Kovilur road (Madurai Road), provides opportunity for development in northwest direction. However, immediate surrounding of northwest direction has potential drinking waterbody and its catchment area.

With the growth of the town the planning boundary were expanded. In the year 2001 Karaikudi planning area was 13.75 sq.km which is increased to 115.78 sq.km in the 2021 about 102.03 sq.km area increased.

2.4.2 Population Growth Trend (Projection)

A careful analysis of population growth trends over the time is essential to cater the objectives of AMRUT mission. The population of Karaikudi Composite Local Planning Area for the year 2021 is 2,37,334 of which male and female were 1,18,646 (49.99%) and 1,18,688 (50.01%) respectively. As per Census 2011, the Karaikudi CLPA has a growth rate of 34.37 % which is higher than district 15.90% and state growth rate 15.61%. **(Figure 2.15)** reveals that the trend of the population growth of Karaikudi Municipality generally increasing which is mainly due to employment opportunities within the town and immediate surroundings. The population of Karaikudi is rising considerably given the progress in the district.

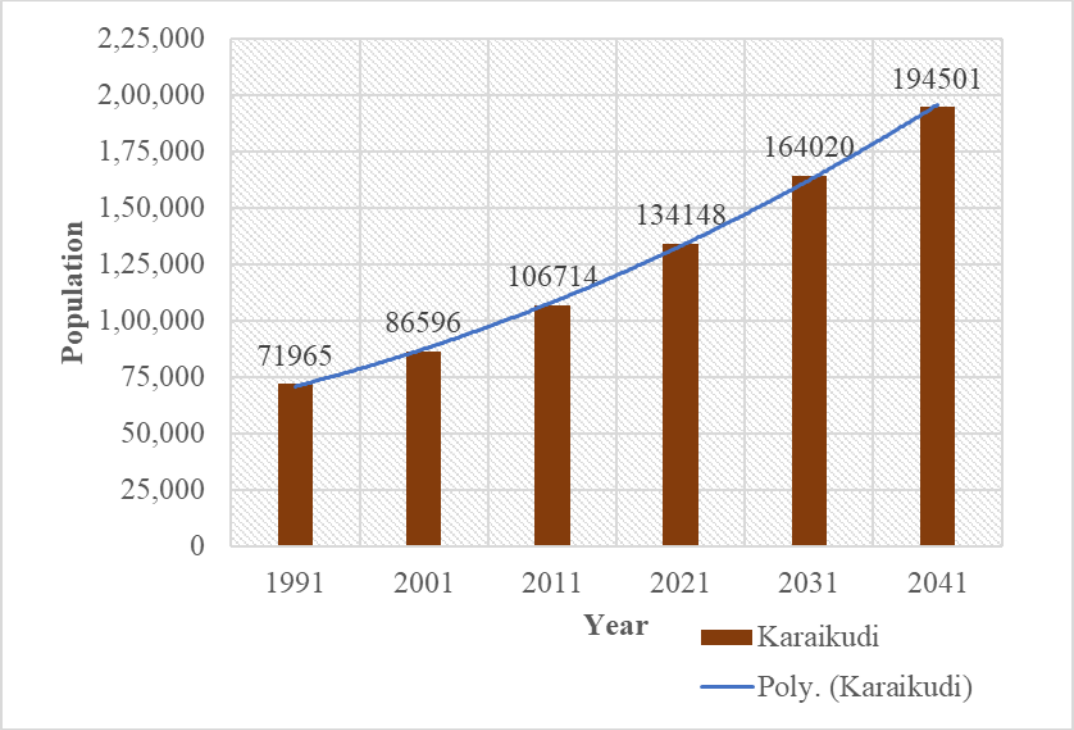


Figure 2.16 Population Growth Trend in Karaikudi Municipality

As per population projection, the increase in the decadal growth rate, that is 25.71% between 2011 and 2021. The population growth rate is higher in the suburban areas surrounding the core city. The growth of population in villages like consist of major village Sankarapuram CT (Kalanivasal, Sekkalakottai, and Sankarapuram villages) have increased exorbitantly. The reasons may be due to its proximity to the urban area, availability of residential space at a cheaper cost, and the connectivity to main town and major roads. **Refer Table 2.17** for urban and rural wise Population Growth Rate of the CLPA.

S. No	Year	Urban		Rural		Total Population	Growth Rate % of CLPA
		Population	Growth Rate %	Population	Growth Rate %		
1	1991	80,283		19,678		99,961	
2	2001	97,229	21.11	31,829	61.75	1,29,058	29.11
3	2011	1,21,480	24.94	51,938	63.18	1,73,418	34.37
4	**2021**	**1,54,204**	**26.94**	**83,130**	**60.06**	**2,37,334**	**36.86**
5	2031	1,89,752	23.05	1,21,364	45.99	3,11,117	31.09
6	**2041**	**2,26,007**	**19.11**	**1,72,134**	**41.83**	**3,98,140**	**27.97**

Source: **Census of India**

Table 2.18 Population Growth Trend in Urban & Rural Area of Karaikudi CLPA (1991-2041)

At present in 2021, out of the total population of Karaikudi CLPA, 65% reside in urban areas and 35% in rural areas. Population growth rate clearly indicates that the growth is high in the adjoining villages compared to ULBs. The CLPA has enormous potential for development, the policy of state government on economical corridor development influences area, educational and health development, is prospective to attract more population. If the current growth trends continue, the total population in the planning area is expected to go up to 3.11 lakh by 2031 and 3.98 lakh by the year 2041**(refer table 2.17).**

2.4.3 Population Density Trend

The trend of population growth and density determines the required infrastructure demand of the planning area. As per census, the population density of Karaikudi municipality was 78 persons/ha in 2011 and it is increased to 98 person /ha in 2021. The Population density in Kottaiyur town panchayat was 7 person /ha and it is increased to 10 person /ha. In villages it was 6 person /ha and it increased 10 person /ha. As per URDPFI guide lines Medium Town should have density of 100 to 150 person /ha. The proposed density in the municipality will be 141 person/ha in 2041. Kottaiyur town panchayat will be 16 person /ha in 2041. Also, villages will have

higher density that is 21 person /ha in 2041. In the Villages, Ariyakkudi, Illuppaikkudi and Sankarapuram CT alone will have highest density of 33, 24 and 27 person / ha in 2041 respectively. The density of population is very high where urban agglomeration is taking place. It is witnessed that the immediate surroundings of the municipality within the CLPA is experiencing high densification. This is indication for creation additional urban amenities like affordable housing, transportation infrastructure, water supply, sanitation, solid waste management and other facilities. **(Table 2.18)** shows the present and projected population density for the town and villages of Karaikudi CLPA.

S. No.	Name of Villages/Towns	Area in Ha	Population				Density in Ha			
			2011	2021	2031	2041	2011	2021	2031	2041
1	**Karaikudi (M)**	1375	1,06,714	1,34,148	1,64,020	1,94,501	78	98	119	141
2	**Kottaiyur (TP)**	2003.58	14,766	20,057	25,733	31,506	7	10	13	16
3	Amaravathi	903.28	2,529	3,799	5,253	7,369	3	4	6	8
4	Ariyakkudi	744.73	5,538	9,685	15,206	24,595	7	13	20	33
5	Illuppaikkudi	920.22	5,327	8,777	13,588	21,627	6	10	15	24
6	Kovilur	525.03	4,938	6,430	8,374	10,905	9	12	16	21
7	Managiri	1325.2	3,486	6,009	10,359	17,857	3	5	8	13
8	Sankarapuram CT (In the Census 2011 data, It includes population of Kalanivasal, Karaikudi, Senjai, Sekkalaikottai)	2995.7	26,923	43,964	62,347	81,066	9	15	21	27
9	Thiruvelangudi (T.Soorakudi)	781.54	3,197	4,466	6,239	8,715	4	6	8	11
10	**CLPA Total**	**11,574**	**1,73,418**	**2,37,334**	**3,11,117**	**3,98,140**	**15**	**21**	**27**	**34**
11	**Urban in CLPA**	**3,379**	**1,21,480**	**1,54,204**	**1,89,752**	**2,26,007**	**36**	**46**	**56**	**67**
12	**Villages in CLPA**	**8,196**	**51,938**	**83,130**	**1,21,364**	**1,72,134**	**6**	**10**	**15**	**21**

Source: **Census of India**

Table 2.19 Village/Town wise Projection Density of Karaikudi CLPA (2021-2041)

2.4.4 Economic Growth Trends

Karaikudi has three major economic base trade and commerce, industrial and tourism. Apart from these three agricultural and household-based industries have significant contribution in the economic development. The workforce participation rate of Karaikudi CLPA (37.46% of workforce rate) is low when compared with the State workforce rate (45.6%). However, Karaikudi has potential for growing economy, it reflects in Census 2011 data decadal proposition of workers had increased by 2.77% when compared to 2001.

In the recent decades Karaikudi major economy has drifted from primary activities to secondary and tertiary sectors. Development of manufacturing industries and service sector industries in the rural premises. It is evident that total workers participation rate 2.84% has increased in rural area that was reflected 2.77% of decrease in workers participation in agriculture. **(Table 2.19)** shows the Village/Town wise workers participation rate of Karaikudi CLPA for the year 2001 & 2011.

S.No.	Name of Villages/Town	Population		Total Workers		% of workers	
		2001	2011	2001	2011	2001	2011
1	Karaikudi	86,596	1,06,714	28,786	40,069	33.24	37.55
2	Kottaiyur	10,633	14,766	3,522	5,368	33.12	36.35
3	Villages in CLPA	31,829	51,938	11,082	19,511	34.82	37.56
4	**Total CLPA**	**1,29,509**	**1,73,418**	**43,529**	**64,948**	**33.61**	**37.46**

Source**: Census of India**

Table 2.20 Village/Town wise Population Rate of Karaikudi CLPA

Since, development of technical education institution in the CLPA has created lot of potential to develop industrial sector and tertiary sector such as Trade and Commerce (sales & services).

2.5 SWOT Analysis

SWOT analysis carried out based on stakeholders' discussion and data analysis. It helps to develop a growth strategic plan that identifies the strength of CLPA. At the same time maximize its strength, reduces its weaknesses, brough up its opportunities and limits its threats. **(Table 2.20)** demonstrates the SWOT of Karaikudi CLPA.

Strength	Weakness
1. Karaikudi is Taluk headquarters and highly urbanized taluk in the predominant rural district. 2. Reputable higher educational institutions Karaikudi serves as an educational hub, for the surrounding area. 3. UNESCO declared Chettinad region as Heritage site, Traditional planned settlement and Unique architecture. 4. Karaikudi is focal centre for tourism destination and development of tourism allied infrastructure brings local and international tourist. 5. Planned Grid iron pattern road network, traditionally recognised land use and urban planning. 6. Good transportation network, well known National Highway, State highway and Railway connectivity. 7. Chettinad community are foremost in trade and commerce, it reveals agglomeration of commercial activity in city.	1. Development took place in one direction due to railway track and chain of water bodies forest area in other side. 2. Modern development planning did not consider tradition value of settlements 3. Core area old city congested and roads are very narrow. 4. Inadequate green, open space in the old part of town and also challenging to carry down urban renewal. 5. Considerable number of old traditional houses completely demolished because of this diminishing of heritage value of the town 6. In the heritage building owner do not live in the place permanent basis they often need to be maintained, government has less control on them because private owned property also lacks of financial means or joint

8. Industrial development providing employment opportunities in the region, such as SIDCO industrial estate, TCP, Food production industries and TNSTC body buildings and Engineering works, Metal works, auto services industries. 9. Positive growth in the workforce participation 10. Presence of traditional unique handloom sarees and art and handicrafts small scale industries. 11. Karaikudi is greater municipality in the Sivagangai District and well-established public, Semipublic and public utilities. 12. Presence of potable groundwater source 'Sambai Ootru' 13. Thenar river and connecting flowing channels of waterbodies.	ownership dismantling purpose of sale and damaging structure. 7. All the water bodies and the tanks in the town had connecting flowing channels which have either got encroached upon or choked over the years of negligence and no maintenance.

Table 2.21 SWOT Analysis for Karaikudi CLPA

Threats	Opportunity
1. Environmentally safe guarding fragile zones, no clear demarcation of environmental assets such as water bodies and forest area. Therefore, there is threat of encroachments. 2. Urban poor settlement encroachment of water bodies and low-lying area 3. The drain carries the waste water from the households directly discharge into (Oorani's/Kanmoi's) thus polluting the water bodies making them unsafe of potential use. 4. The main source of water supply is 'Sambai Ootru', it has threat of contamination due to current development in the proximity. 5. Inappropriate or seepage from TCP industries polluting the Periya Kanmoi and it overflows during the rainy season and feeds other Kanmoi's in downstream. 6. Emission from the TCP pollutes the air thus threat of health issues for nearby settlements. 7. Demolition of heritage settlements could totally wipe out the living evidence of a traditional way of life. 8. The small-scale industries handloom and art & handicrafts declining due to low wages.	1. Availability of land along the National Highway for industrial development. 2. The recent development of Industrial sector has created opportunity for skilled labours. Promoting manufacturing and service sector industries will balances the higher education institutions employment needs. 3. Karaikudi falls under influenced area, Industrial development corridor of CKIC and has strong base of petro-chemical industries, metal and food products, auto service industries. 4. Strong potential to emerge as vibrant tourist destination through heritage conservation plan and Opportunity of developing a helipad at Kanadukathan. 5. Safeguarding environmental assets by following ways. a. Biodiversity mapping and development Eco mobility corridor along water body – North to South within CLPA area b. Development of good quality infrastructure will be key economic driver in near future. 6. The proposal of resettlement of slum dwellers in the city, provides opportunity for waterfront

9. House ownership, various problems associated with large number of rental housings in many parts of the CLPA. 10. A major shift of agriculture workers to another sector for the high wages thus reflected 2.77% decrease in decadal workforce participation in agricultural. 11. Major traffic and transportation issues are: a. Ineffective intersection (poorly designed) b. Encroachment of informal activities on major corridor such as informal shops and illegal parking. c. No good surface road and Some bus routes are narrow roads due to lots of one way. d. Absence of pedestrian walkways and pedestrian crossing. e. Railway tracks intercepting smooth flow of traffic. 1. Less green cover in the urban residential area. 12. Inadequate recreational facilities and open spaces.	development and open & recreation space. 7. The recent development of UGSS and also stoppage of effluent will reduce the pollution level in Kanmoi's 8. Promoting separate commercial space for unique traditional handloom and art & handicraft products will boost economy and livelihood of local manufactures. 8. The provision of railway over bridge, redesigning of certain intersection, railway under bridge, pedestrian walk ways and widening existing roads will improve the smooth traffic flow.

2.6 Summary

The importance of the town is identified with its significant development in trade and commerce, education and transport aspects. It has gained more importance in education by virtue of the location of the Alagappa University besides the development of trade and commerce and transportation activities. The dairy development is also significant in this town, Food processing industries and Engineering and Auto mobile services. The proposals will focus on developing Karaikudi with a robust economy by utilizing its, trade and commerce, tourism, agriculture and Education and industrial development in peripheral area. Also, physical and social infrastructure and recreational space for improve better quality of life.

As per the URDPFI guideline classification of urban settlements, based on population the Karaikudi town falls under the Medium Town category (50,000 to 5 lakh) with a population of about 1,34,148 in 2021 and expected to go up to1,94,501. Though the town is characterized as a medium town, the population density of the town attained the desired range of mentioned in URDPFI guidelines for the medium-sized town. Being a heritage town with several tourism destinations and educational hub and recent industrial development, the Karaikudi CLPA has many opportunities for education, employment and better facilities attracts large migration of people to Karaikudi. This is associated with high population density. Furthermore, the exponential increase of population in rural areas particularly has an impact on wide spread distribution of population resulting in increase in demand on the provision of services in the rural areas. Effective planning strategy, employment opportunities, and provision of other facilities will enhance the quality of life in Karaikudi CLPA for the present and future population.

3 DEVELOPMENT AREA

03

3.1 Vision of Master Plan

Vision is to make Karaikudi CLPA a prime tourism hot spot, trade and commerce centre, industrial development corridor, educational hub and eco-friendly and biodiversity location which will become more liveable, economically vibrant, environmentally sustainable and with better assets for the future generations.

3.2 Goals and Objectives

The objective of Master Plan Preparation for Karaikudi CLPA is to improve socioeconomic standard of the residents. To provide better quality of infrastructure for residents and floating population. To preserve the inheritance of heritage value of area, and to enhance educational significant of the area. To generate employment opportunities by increasing Trade and Commerce, Tourism and Industrial development. To enhance the quality of life of residents and floating population by providing social facilities, basic amenities, transport infrastructure and better services, and by to study existing land use pattern and to propose the future land use pattern for a plan period up to 2041.

3.3 Development Growth Guiding Strategy

3.3.1 Issues and Guiding Strategies

A number of Karaikudi development issues and Guiding Strategies:

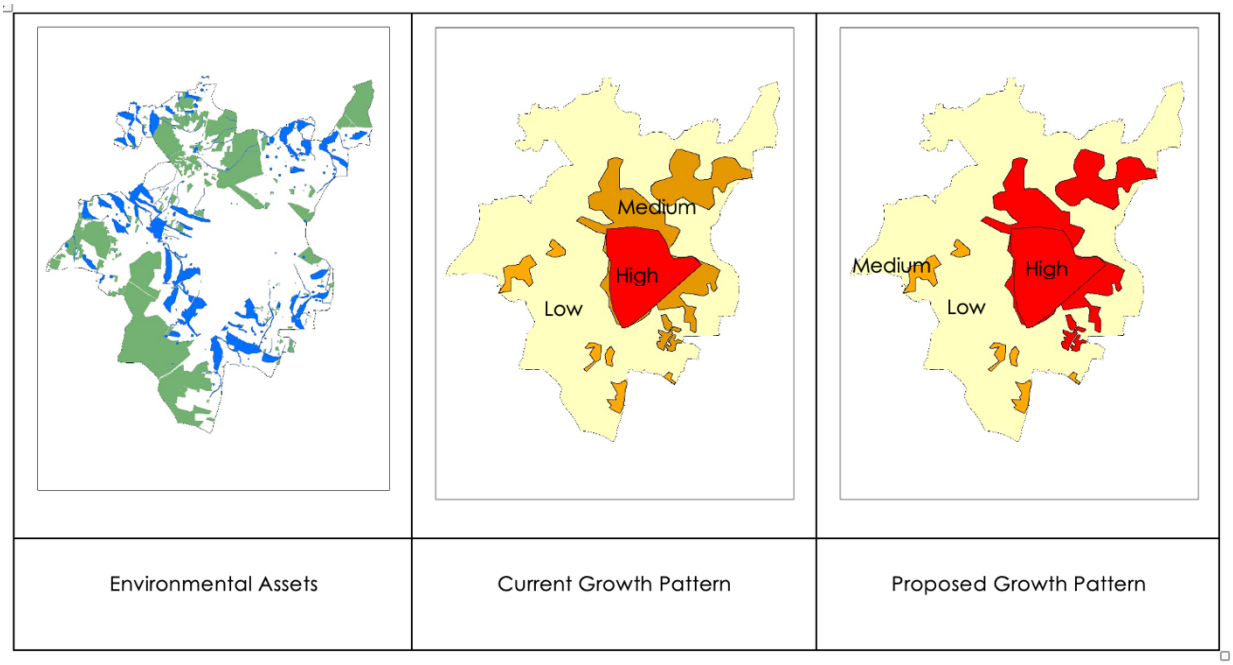
1. The Karaikudi must move beyond the ad hoc development pattern, development that is growth to date thus causes low-density sprawl. It has to be replaced with comprehensive approach.
2. Planning and development must consider the environment assets as base layer for sustainable social and economic development.
3. Two approaches to planning and development: Optimisation of existing land and strategically identified expansion; and increase integrated infrastructure in built- up areas.

3.3.2 Growth Management Framework

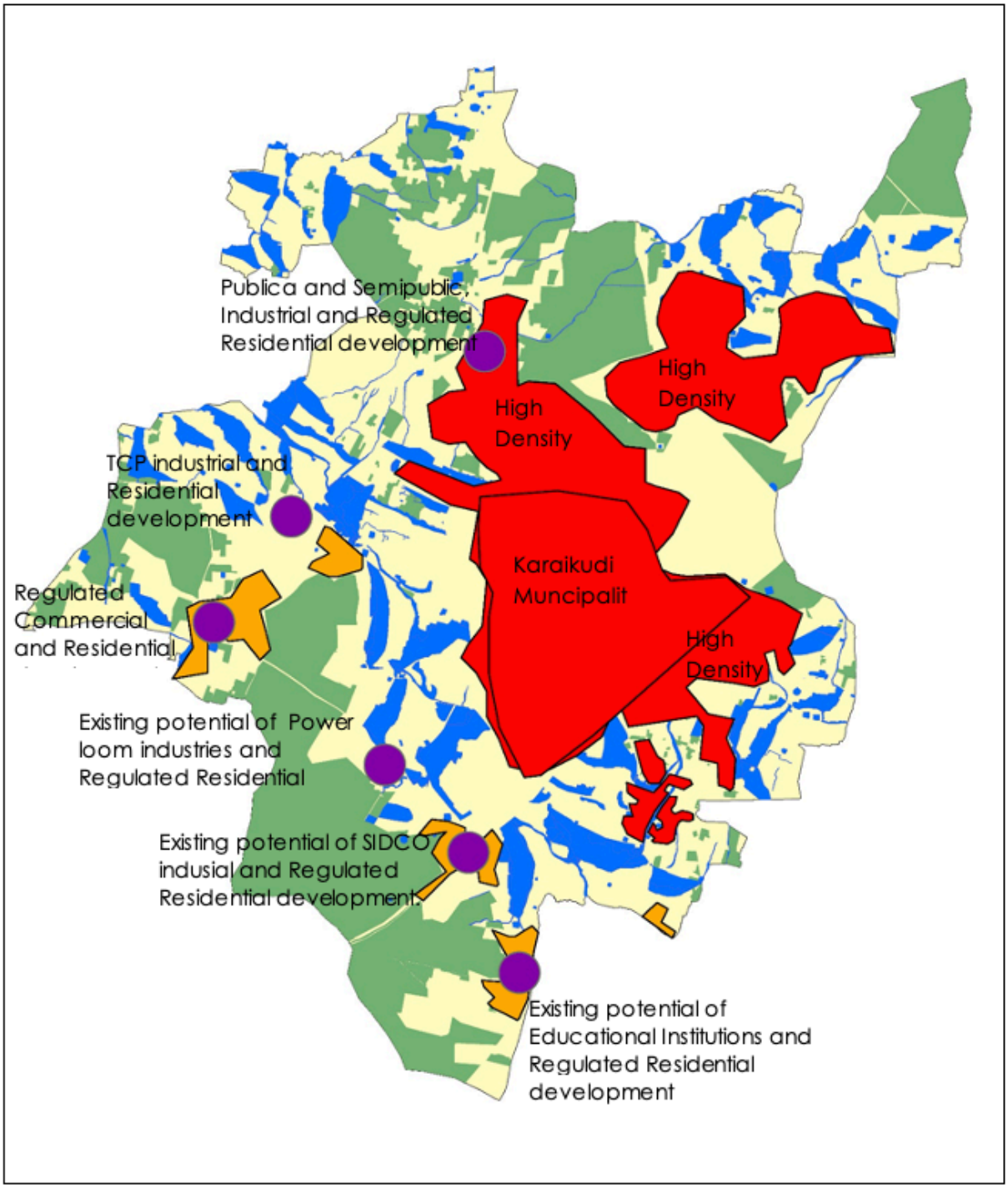
Growth Management Framework is needed as the starting point accommodation for different land use and integrated infrastructure provision. The master plan proposed the key strategies and principles including:

1. Demarcation and protection of environmentally and ecologically sensitive areas;
2. Focused growth in Municipality, Kottaiyur and Sankarapuram CT and selected growth points such as Ariyakkudi, Illuppaikkudi, Amaravathi and Managiri, T.Soorakudi;
3. A series of integrated developments along the National Highway 365; based on existing land use pattern and development potentials.
4. Specific urban renewal projects for upgrading quality of life.

The Master plan 2041 consolidates and elaborates these key features and presents them in graphic form to illustrate a Development Planning Framework and how it addresses the critical existing situation of low-density sprawls.



Maps 3.1 Growth Management



Maps 3.2 Proposed Growth Management Strategy

Agricultural land such as high yield cropping land and plantation need to be protected. Green Area encroachment and land use conversions situation needs

to be avoided, Forest and Tree Glad need to be conserved and protected from urban development to maintain an ecological balance. Safe guarding or increasing green space reduce negative impact of climate (urban heat island effect in town).

As there is constrain for bringing additional land for residential development within the Karaikudi municipality. To achieve the density of the medium town FSI has to be increased eastern part of Karaikudi Municipality, Kottaiyur TP and Sankarapuram CT.

It is absorbed that the development is taking place in the surrounding villages in Sankarapuram CT (Kalanivasal, Sekkalakottai) Kovilur and Kottaiyur town panchayat therefore the future development will be in these villages so the major activities such as commercial and public semi public need to be decentralised and existing development needs to be strengthened. As the future development are accumulated in various nodes as defined in development concept plan figure.

3.4 Development Issues and Potentials

Continues chain of water bodies in the western side of the planning area and railway track in the south are the constrain factor of the equal wide spread development. Because of these natural and manmade barriers development took place in the one direction. Railway track cut across north eastern direction as well participating the municipality and town panchayat. Kottaiyur town panchayat developed because of its historical value and Chettinadu houses. However, growth rate comparatively lesser than the village in the surrounding of municipality

It is observed that due to land constrain in the Karaikudi municipality, Kalanaivasal, Sekkalakottai, Sankarapuram villages has witnessed highest growth rate. It is huge burden for village administration for providing basic amenities and services.

3.5 Summary

Balance in development and distributed facilities are the planning principals. It is observed that there is an over dependence of Karaikudi municipality this itself challenge in terms establishing the desired quality of services & amenities. However, Karaikudi has good network of roads connecting the surrounding villages. Thus, the large number of average daily migration to municipality and it cause of inadequacy of the physical infrastructure facilities. Therefore, it necessary that to identify certain settlements to provide the intermediate level of services. Also, to be strengthened what is available at the village level and the tehsil headquarters of Karaikudi.

4 ENVIRONMENT

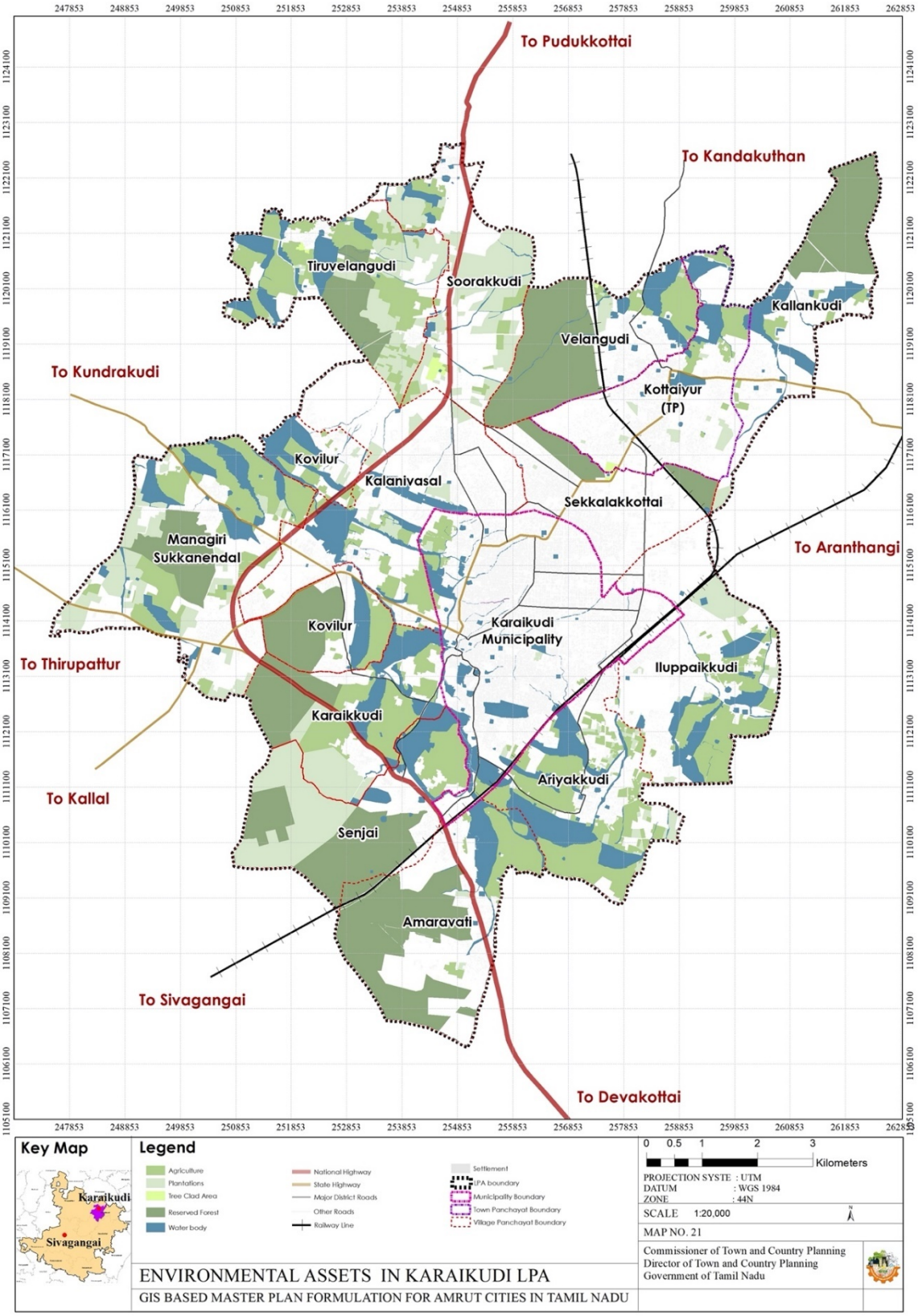
04

Karaikudi is situated in a plain terrain with a gentle slope towards the south and southeast. Karaikudi CLPA has two micro level watersheds dividing CLPA in two parts east and west. Eastern side watershed in Karaikudi CLPA has highest number of water bodies. These water bodies recharging temple tanks in Karaikudi its visually gives feel perennial tanks. The town has no history of built-up developed along is water. In spatial planning environmental factors should be taken into account. Air and water quality, green cover, agriculture lands, water bodies, surface temperature, environmentally sensitive areas, and natural hazards should be considered and protected in spatial planning to improve the quality of life and enhance sustainable development. To ensure safety and adequate conditions of life of the population, to limit the negative impact of economic and other activities on the environment, and to ensure the protection and rational use of natural resources for the benefit of present and future generations, in spatial planning environmental factors should be taken into account.

4.1 Environment Assets

Karaikudi CLPA one of the unique areas which has huge number of green cover areas, waterbodies and agriculture lands **(Refer Map 4.1)**. Karaikudi CLPA has an extent of 19.20 sq. km under green area which is 16.58 % of the overall CLPA area. Green area use includes Reserved Forest and Tree Glad area. Karaikudi CLPA has an extent of 14.18 sq. km under Water Bodies which is 12.25 % of the overall CLPA area. Karaikudi CLPA has about 22.90 Sq.km of agriculture use which is 19.78% of total area of the CLPA. Villages have a higher concentration of agriculture use. Managiri Sukkenendal has 4.56 Sq.km, Ariyakkudi Village has 3.31 Sq.km, T. Soorakudi has 3.26 Sq.km and Karaikudi village 2.72 Sq.km.

Karaikudi CLPA has more green cover which indicates that the quality of the environment is fairly good. To ensure food security and enhance the source of livelihood, conversion of well productive agricultural land (cropped land) for urban development need to be prevented. As the cities expand in the area with more population growth the land use gets changed with the hitherto non-urban areas like agricultural lands, other vegetative areas, water bodies etc., getting replaced by concrete structures and black-topped roads. This situation needs to be avoided, water bodies need to be conserved and protected from urban development to maintain an ecological balance.



Maps 4.1 Environmental Assets of Karaikudi CLPA

As Karaikudi CLPA is rich in green cover (Green cover and agriculture land) at the same time Urbanisation is high. It creates concrete jungle feel in the middle and towards North and North east direction. Due to this the land surface temperature is comparatively high. The maximum surface Temperature in May about 38 oC which shows that the town has a very hot temperature.

4.2 Environmental Issues and Potential

4.2.1 Water Pollution

Karaikudi CLPA one of the Unique areas which has Thenar river which is connected with multiple waterbodies, when surplus water flows during rainy period upper stream waterbody feeds water to downstream water body, because of these interlinked waterbodies and low- lying area the structure of Thenar river is unknown and it is challenge to draw a boundary. Karaikudi has green cover area which consist of Reserved Forest, Plantation (tree glad area), Agriculture. Karaikudi is situated in a plain terrain with a gentle slope towards the south and southeast. Karaikudi CLPA has two micro level watersheds dividing CLPA in two parts east and west. Eastern side watershed in Karaikudi CLPA has highest number of water bodies.

Karaikudi is very sensitive interims of water pollution and air pollution. Noise pollution found only in the high traffic area and market area it is not found to be major issue. It is suggested tree plantation along the 40 feet and above roads to reduce the noise and air pollution. In terms of air pollution, it found only in around Tamil Nadu Petrochemical Industry at near Kovilur village. CPCB has given a few recommendations to M/s Tamil Nadu Chemical Products Ltd in 2015 via NGT. TNPCB has to ensure that the recommendations adhered by TCP. As mentioned above the water pollution is major issue in this area. The main causes of water pollution are natural drains (Odai's) and constructed drains carrying the wastewater in addition with storm water to waterbodies and thus polluting the water bodies making them unsafe for potential use.

The following issues identified by CPCB in 2015. TCP direct discharge of effluent or due to seepages from earthen ponds/solar ponds which were used for storage of untreated/treated effluent. seepages from TCP Compound walls and slight flow from their out let pipes which was meant for discharge of storm water from the premises. This was carrying the contaminated water to Periaya Kanmoi which is located at the back side of TCP. Periya Kanmoi overflows during the rainy season and feeds overflowed water to other waterbodies (Athalai Kanmoi) in downstream. The results of water test are pH, TDS, BOD, COD, alkalinity and sulphate contents were high in Periya Kanmoi It was observed that Athalai kanmoi receives discharge of domestic sewage (part of) from Karaikudi town through drain. Similar, the Karaikudi Kanmoi and Shekarathi Kanmoi was also experienced same as well.

The analysis results of Sambai Ootru confirms the slight contamination due to existence of storm water drain carrying domestic effluent from commercial activities and joining this Ootru in other side. The potable water extracted from this Sambai Ootru by borewell is being supplied to Karaikudi town found within the permissible limit except TDS concentration. There are lot of developments took along Kovilur road within 500m of Sambai Ootru. The Developments including commercial establishments, automobile sales and service centres belong to some branded companies and other small scale four wheelers & two wheelers service centres (includes water wash, painting and tinkering units) and lathe works. The service centres let effluent either into septic tank or on land for open percolation. This will ultimately pollute the ground water. The spillage of oil and grease from automobile service unit, there is chance of polluting ground water during the rainy season.

Water bodies in the CLPA account for almost 12.25 % of the overall CLPA area, which is 14.18 sq. kms. In the Karaikudi town waterbodies account for 10.11 % and it has total 13 water tanks in which temple tanks (Uranis) are protected with side walls.

As per the observations of CPCB Team, Periya Kanmoi and other Kanmois were found totally covered with water weeds and silt, no proper maintenance in place. This issues still exist in all Kanmois, including potable drinking water source Kanmois. Since water is drawn from ground water source, an artesian spring, which has recorded negligible pollutants, pre-chlorination is the only type of treatment done before water is pumped into the elevated storage reservoirs. However, with increasing urbanization, there has been an increasing threat felt by the citizens of Karaikudi to this only source of water in the form of seeping of sewerage and sullage contaminating the shallow ground water aquifer of Sambai Oothu running below the town. So, considering the seepage of wastewater in to the ground water it is essential to have treatment plant.

Sewerage and sullage water generally flow into the storm water drains and finally into the Uranis. The poor and slum dwellers lack adequate safe sanitation facilities and hence are prone to health-related diseases.

Sewage water treatment system, NGT has ordered Municipality shall not allow at any cost mixing of any other effluent into the STP pipeline either by breaking of pipelines on the way by any persons or by any other means of tampering. The State Board shall keep a close watch not only on the functioning of STP in accordance with the environmental norms but also throughout the passage where the pipeline runs from the households leading to the STP site. As and when such pilferage is found and any complaint is received, municipality as well as the TWAD Board shall take immediate step to rectify. EIA report suggested that Environmental Monitoring Cell (EMC) regular monitoring of the proposed pollution control system and conduct yearly audit of the environmental performance of the system. This EIA report suggested the both construction and operation monitoring. Following parameters are monitored, Air quality both ambient air and stack emission, Water quality monitoring such as surface water and ground water and sewage inlet & outlet, Noise monitoring, Soil Quality monitoring both site and disposal area, sludge monitoring and collection system monitoring. Sludge handling is most important factor should be considered that is the dewatered sludge. The sludge quantity generated will be around 0.96 tons/ day and it will be used as manure for raising

fodder crops and balance quantity if any will be disposed off from the STP site to the nearby municipal compost yard.

4.2.2 Air Pollution

The major cause of air pollution is industrial and vehicular emission. The emission from TCP may have high possibility affecting the air pollution. As observed, odour prevailing around TCP industries. There are few poor settlements next to the TCP, may have higher risk of health issues. NGT also suggested to upgrade the existing air pollution devices to meet prescribed standards of TNPCB, also suggested install online monitoring system to monitor source emission and disseminate data to public. Apart from above very few industries and vehicular emissions the air quality of Karaikudi CLPA is very good and free from pollution. Air quality at junction of Amaravathi rastha to NH 536 Devekottai road, near SIDCO and Near NH 536 Karaikudi Dumping Yard has to be monitored as it is located South west part of Karaikudi municipality during the south west monsoon. At northeast direction SIDCO and Residential development taking place, these residential areas air quality closely to be monitored.

The concentrations of ambient parameters in the Karaikudi CLPA, Fine particulate PM 2.5 and very small particle PM10 matter is slightly low, however its fairly performing, if it goes beyond permissible limit, it causes eye and throat irritation, coughing or difficulty breathing, and aggravated asthma.

As Proposed UGSS project, baseline data were collected in November 2016 within 10 Km radius from the proposed site. The ambient air quality status of the study area within 10 km radial distance from the proposed STP Site. The locations were selected based on the wind direction. In all the locations the observed values of PM10, PM2.5, CO, SO2, & NOX are within the prescribed limits of CPCB. Over all Ambient air quality within the CLPA is within the permissible level **(Table 4.1).**

S. No.	Pollutant	National ambient air quality standards for Good AQI (in µg/m3)	AQI in Karaikudi (in µg/m3)
1	NO2	0-40	9
2	O3	0-50	12
3	PM2.5	0-30	26
4	SO2	0-40	05
5	PM10	0-50	28

Source: **www.accuweather.com**

Table 4.1 Air Quality Index of Karaikudi CLPA

4.2.3 Noise Pollution

Noise pollution is not a major issue in Karaikudi. CPCB standard in the commercial area is 75 db in the day and 55db in the night. For Industrial area standard is 75 db in the day and 55db in the night. Karaikudi area Noise levels were monitored at eight locations under UGSS project. Around STP along Devkottai Rastha road commercial area is 62 db day and in night 52 db. Amaravathi industrial area has recorded as high as 72db in the day and 60 db in the night. SIDCO industrial estate noise level during night exceeded prescribed standard.

Master plan intent to propose buffer areas around SIDCO industrial complex to prevent adjoining residential areas from noise pollution. Along the commercial road corridors, the tree plantation (buffer) is necessary to prevent air, noise pollution and also reduce urban heat island effect in the Karaikudi CLPA.

4.2.4 Flood Prone Areas

Most of the flood prone areas are those near the water bodies in the low-lying areas towards south. Some of the areas that face regular flooding problems are Vadakku Urani and Idaichi Urani areas of ward 1, Sekkalai water tank and near Ambedkar statue, Pillayar Kovil Urani of ward 7, Senjai Urani, Nattar Kanmoi areas of ward 35.

TCP - earthen ponds/solar ponds – Seepage of untreated/treated effluent to Periaya Kanmoi. Encroachment of Kanmoi

TCP – Smoke emission, Air pollution, observed, odour prevailing around industries

Sewerage and sullage water flow and Silting, disposal of construction waste, solid waste dumping

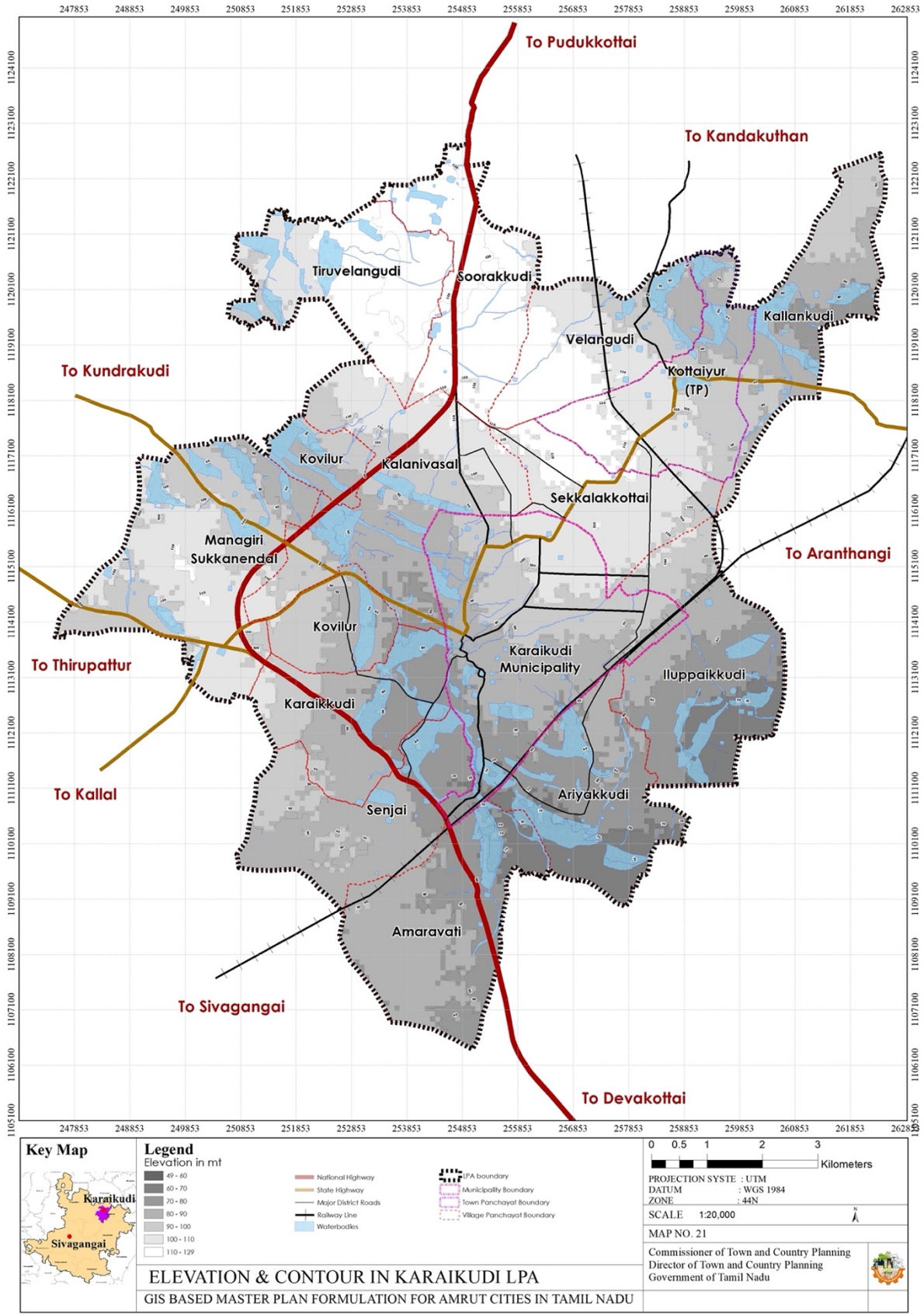
Current development proximity to Sambai Ootru

5 SURFACE WATER PROTECTION AND GROUNDWATER RECHARGE

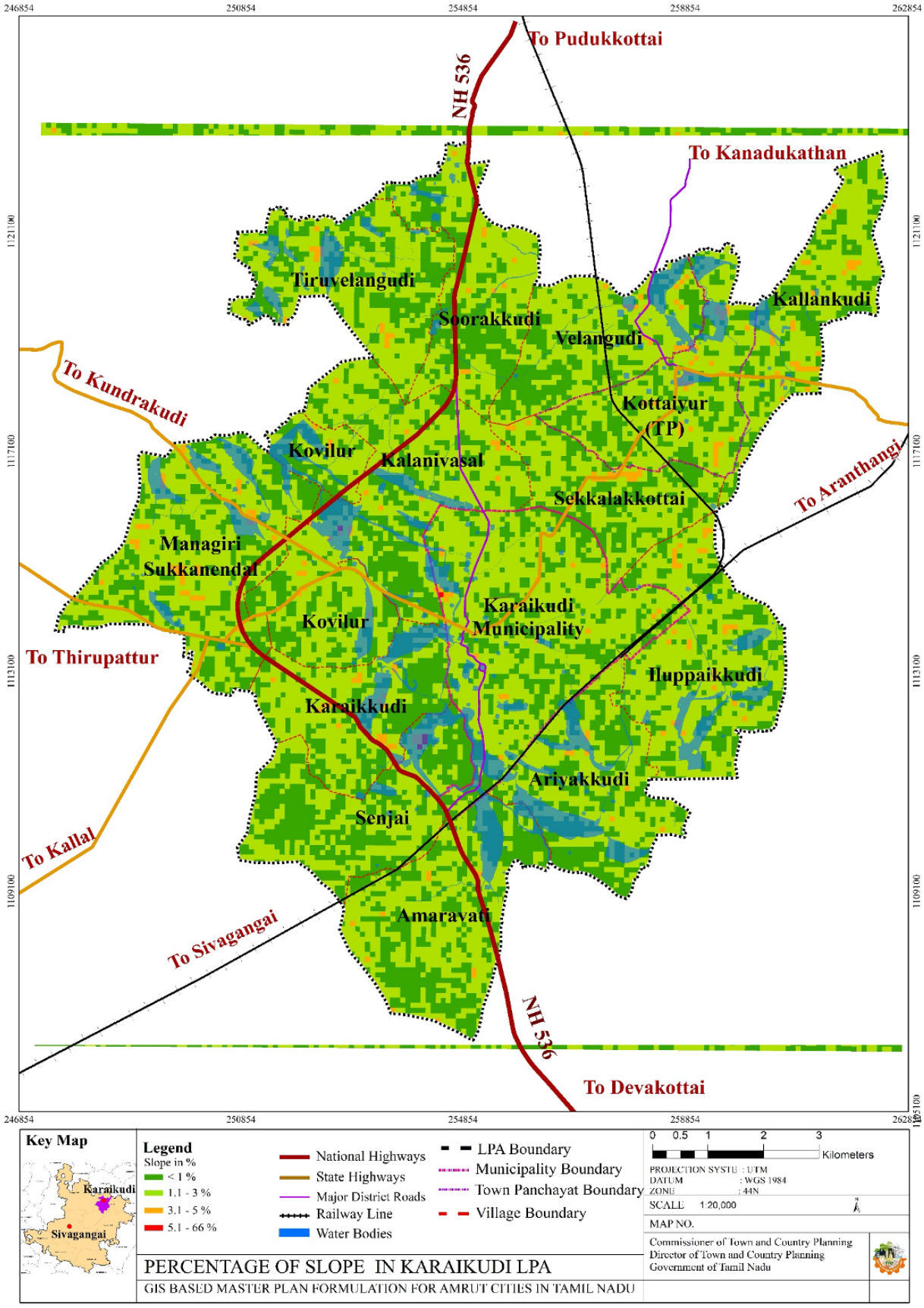
05

5.1 Topography

Karaikudi CLPA lies between in the northeast 78°41'44.516"E 10°8'57.193"N and South west 78°50'10.355"E 10°0'5.188"N The entire Karaikudi CLPA is a plain terrain with a slope less than 3.1o. The topographical slope is towards the south and southeast. The elevation of Karaikudi CLPA varies between 65 to 120 m. The highest point is at T. Soorakudi village of 120m elevation, and the lowest point is at Ariyakkudi south most part 65m elevation. The topology of Karaikudi is flat. Gentle slopes are forming low lying area at the south side of CLPA. Digital Elevation Model (DEM) map and Slope map of the planning area have been generated to study topography. One of the critical factors is connectivity of present water bodies reveals that from north to south there is large quantity of waters flows from thenar river filling each catchment of water bodies. The following map showing the elevation, contour and Slope of the Karaikudi CLPA. **(Refer Maps: 5.1 and 5.2).**



Maps 5.1 Elevation and Contour of Karaikudi CLPA



Maps 5.2 Percentage of Slope of Karaikudi CLPA

5.2 Climate and Rainfall

Karaikudi has experiences a very dry and hot climate with low degree of humidity with the summer season from April to July and December to January marks the winter season. Normally, the temperature varies from 22°C to 39°C. During the winter season (December to January) the temperature is below normal (Census 2011). The Average monthly temperature Maximum is 34.47°C.

Hydro Meteorological values are essential for Water Resources Analysis. The basic factors which influence water resource for drinking water supply and irrigation are Climatological features such as Rain fall, Temperature, Humidity Wind Speed, Sunshine, and Evaporation **(Refer table 1.2).** Rainfall is received during the two monsoons called South West and North East Monsoon. The Southwest monsoon sets in June and continues till September. North-East monsoon sets in October and continues till January. The rainfall during the South- West monsoon period is much lower than that of the North-East monsoon. The North-East monsoon contributes 60% of the total annual rainfall. Summer and winter season receives around 17% of the total rainfall. The average rainfall in Karaikudi is 872.8 mm per annum which is lesser than the mean rainfall of Tamil Nadu. **(Table 5.1)** give details about the year wise rainfall received in Karaikudi.

Year	Sivagangai District		Tamil Nadu	
	Actual Rainfall (in mm)	Normal Rainfall (in mm)	Actual Rainfall (in mm)	Normal Rainfall (in mm)
2015	1116.2	872.8	780.0	981.6
2016	710.9		920.8	
2017	967.5		1210.0	
2018	932.6		578.0	

Source: **TWAD Board Website**

Table 5.1 Average Rainfall in Sivagangai and Tamil Nadu

The climatological values of Kundrakudi receiving station are given in **(Table 5.2)** Kundrakudi is in 10 km distance from main town of Karaikudi.

S. No.	Climatological Parameter	Kundrakudi
1	Average monthly temperature Maximum. in. 0 Celsius	34.47
2	Average monthly temperature Minimum. in. 0 Celsius	20.83
3	Average mean temperature in 0 Celsius	27.65
4	Average relative humidity in %	70.86
5	Average wind velocity in km/hour	3.21
6	Average Sunshine hours / day	6.18
7	Pan Evaporation in mm	197.53

Source: **National Water Mission – Pambar basin report**

Table 5.2 Climatological Parameters

The rainfall is the main source for both surface and sub surface water. The rainfall quantity is depending on monsoon period, it changes every year. However, the extraction of surface and sub surface water is increasing year by year. It. It makes the demand for the quantification of available water and also its quality for various purposes like agriculture, industries, drinking and domestic purposes. The State Environmental Report 2005 predicted that the domestic use (urban and rural) is projected to go up from 4 per cent to 6 per cent in 2050 due to increase in population and due to urbanisation. The domestic requirement would increase by 55.72 percent.

5.3 Pambar River Basin

Pambar originates at the surplus of Thamarai kanmoi tank in Thirumayam taluk. Thamarai Kanmoi group is a group of 137 tanks. The last tank, the Thamarai Kanmoi, of the group is situated in Thirumayam taluk and the surplus course of this tank is the origin of the Pambar River. Kottakudiyar, Thenar and Manimuthar are three major tributaries which joins with the Pambar. The total length of Pambar River from its origin to confluence is 71 kms. The Karaikudi CLPA area is part of the Pambar river sub basin, it located in northwest part of the sub basin. Pambar river spread over 6 Districts a major 50% of the area covered by Sivagangai District. Nearly 6% of the area occupied by the Sakkottai Block in Karaikudi Taluk, where indigenous thenar river minor basin situated. The tributary of Thenar river flows

within Karaikudi CLPA from north to south direction. At 1 Km southeast of Iluppakkudi, at the 55th Km point of Pambar, its tributary, Thenar joins with it.

5.4 Thenar Minor Basin

The area of this minor basin starts from Keelasevalpatti & Pillamangalam Village in Thirumayam Taluk of Pudukkottai District. It forms as a river from the Surplus of Senjai Nattar Tank in Karaikudi Taluk of Sivagangai District. It travers at a distance of 31.7 Km and joins with Pambar near Ruthiranpatti Village in Ramnad District. There are 3 Anicuts and 19 Open off-takes across this river having 63 Nos. of Tanks feeding 3639.85 Ha in Sivagangai & Pudukottai District. The area (Ayacut) of this Minor Basin is 306.35 Sq.Km. In the Karaikudi CLPA area it has 3.74 Sq.Km area of Ayacut (Tank area). The cultivated area under the Basin is being served with the Surface Irrigation through Ayacuts, Tanks, sub surface Irrigation through wells and the remaining as Rainfed. The following **(Table 5.3)** presents the Thenar river number of tanks and area coverage, **(Table 5.4)** presents Thenar river major Ayacuts in Karaikudi CLPA.

S. No.	Name of Minor Basin	Name of District	Non System Tanks	Ayacut in Ha.	Rain fed Tanks	Ayacut in Ha.	Total Basin	
							Tanks	Ayacut Ha.
1	Thenar	Sivagangai	34	1968.870	26	1477.990	60	3446.860
		Pudukkottai			3	192.990	3	192.990

Source: **IAMWARM – Thenar Report**

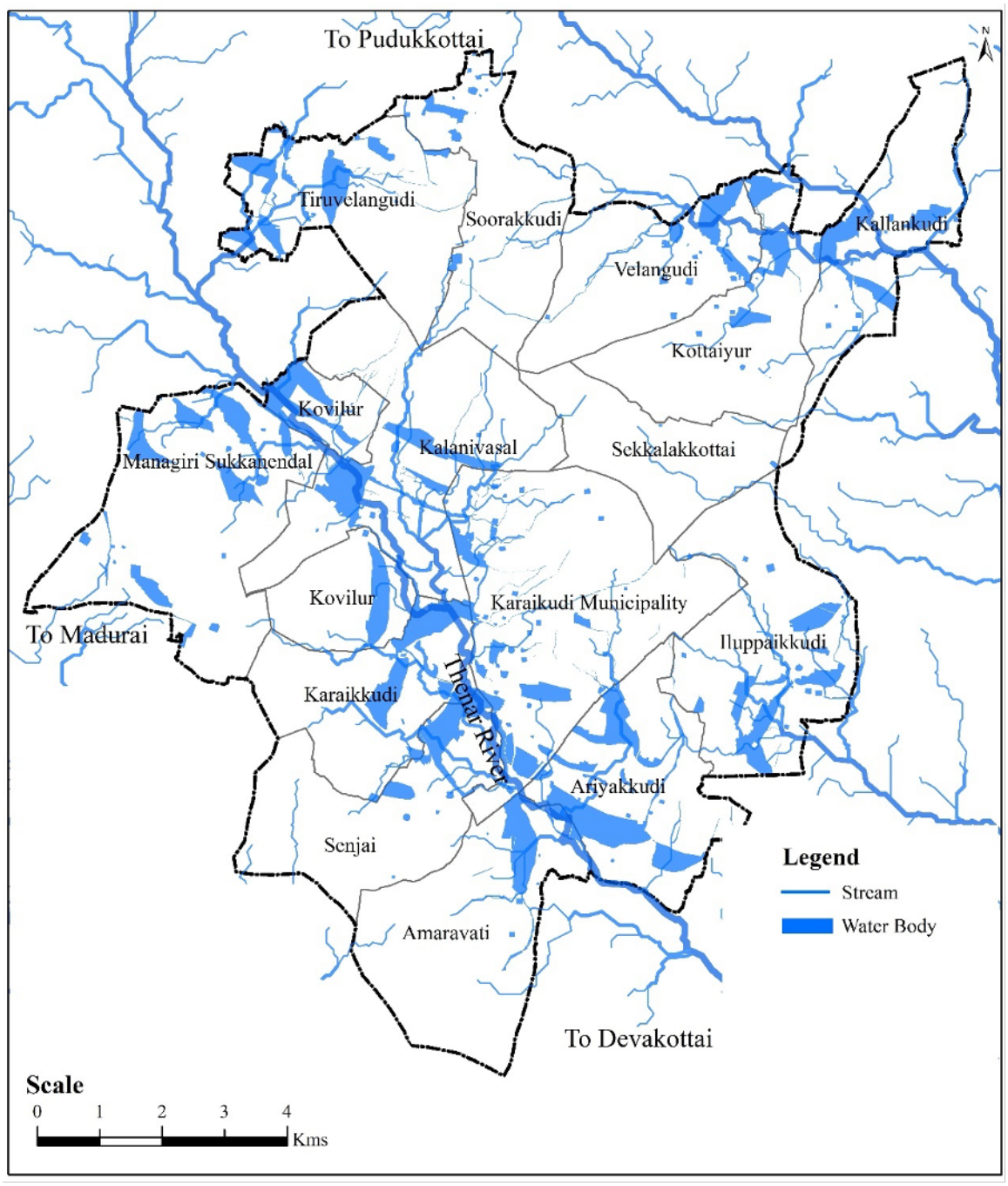
Table 5.3 Thenar River - Ayacut Abstract

Karaikudi CLPA has 4 Non System Tanks and 9 Rainfed tanks (total 13 tanks). The rainfed tanks begins in the north direction from Thriuvelangudi Kanmai in Thiruvelangdudi and flows through Patharakudi Periya Kanmoi in Manakri Sukkanendal and flows further south towards Amaravathi and Araiyakkudi.

S. No.	Details	Name of Tank	Name of village	Name of Block	Ayacut Ha.
1	Thenar Non-System Tanks	Ariyakkudi Kanmoi	Ariyakkudi	Sakkottai	58.680
2	Thenar Non-System Tanks	Idayan Kanmoi	Ariyakkudi	Sakkottai	48.810
3	Thenar Non-System Tanks	Amaravathi Kanmoi	Amaravathi	Sakkottai	87.640
4	Thenar Non-System Tanks	Illuppakudi Kanmoi	Illuppakudi	Sakkottai	12.360
5	Thenar Rainfed Tanks	Thiruvelangudi Kanmoi	Thiruvelangudi	Kallal	41.020
6	Thenar Rainfed Tanks	Patharakudi Periya Kanmoi	Managri Sukkanendal	Kallal	42.760
7	Thenar Rainfed Tanks	Senjai Kanmoi	Senjai	Sakkottai	82.650
8	Thenar Rainfed Tanks	Athalai Kanmoi	Kalanivasal	Sakkottai	51.070
9	Thenar Rainfed Tanks	Sekarathi Kanmoi	Kovilur	Kallal	42.740
10	Thenar Rainfed Tanks	Karaikudi Kanmoi	Karaikudi	Sakkottai	55.080
11	Thenar Rainfed Tanks	Sankarapuram Kanmoi	Sankarapuram	Sakkottai	64.250
12	Thenar Rainfed Tanks	Illuppakudi Kanmoi	Illuppakudi	Sakkottai	48.780
13	Thenar Rainfed Tanks	Koneri Kanmoi	Kalanivasal	Sakkotai	101.050

Source: **IAMWARM – Thenar Report**

Table 5.4 Thenar River Major Ayacuts in Karaikudi CLPA



Source: **Ground Survey and Cartosat – 1 DEM**

Maps 5.3 Surface Water Map

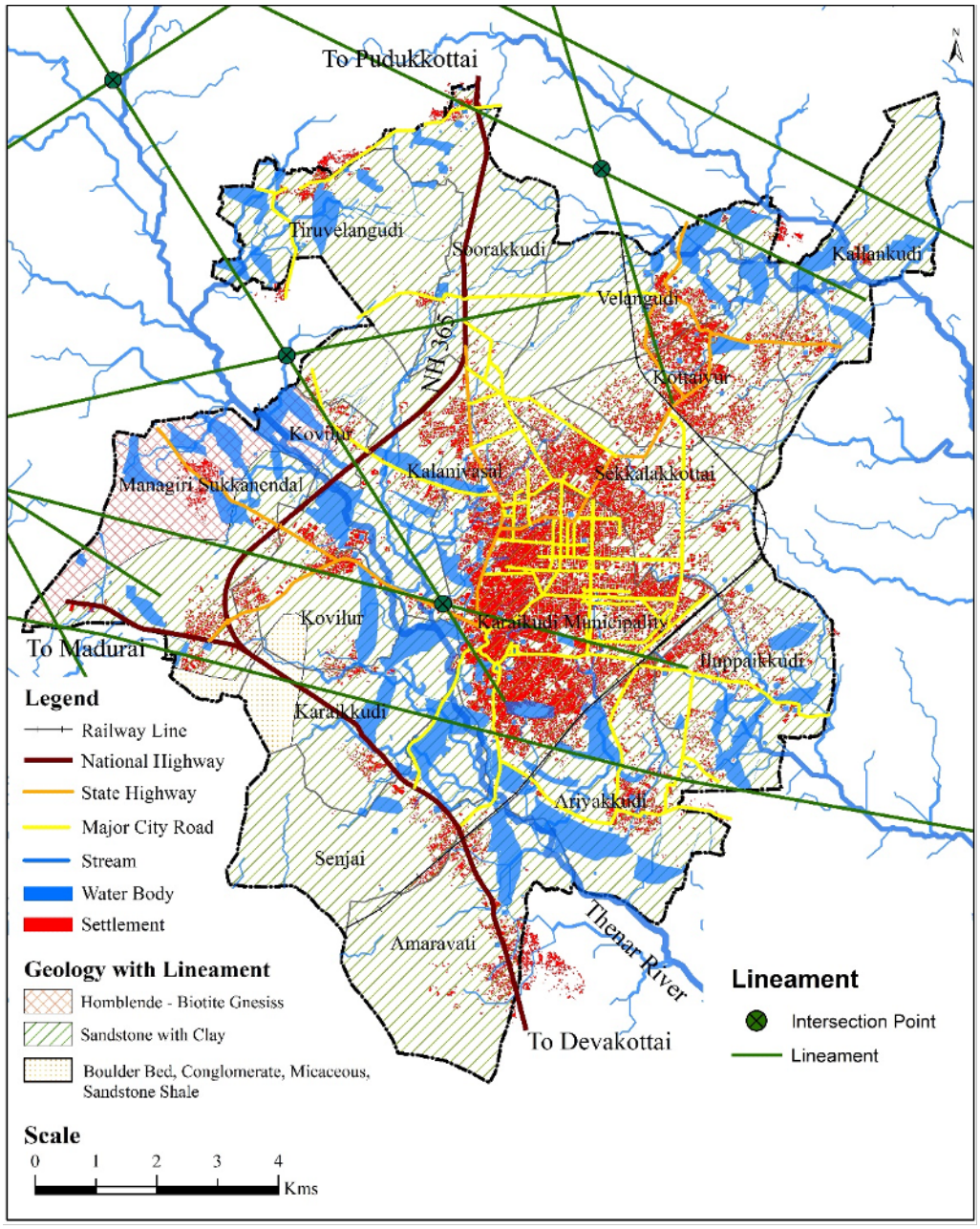
5.5 Geology

Karaikudi CLPA, falls within the Thenar river minor sub-basin, trending SE-NW between Devakottai in SE and Thirumayam in NW. Tertiary and Recent to sub recent formations on the east. Recent to sub recent formations are represented

by Alluvium, Laterite and soils. Laterite occurs in parts of sivaganga, Thirupathur, Karaikudi & Devakottai areas. The formations are capped by thick laterite at places. However, The study of well section around Managiri, Koviloor and Talakavoor villages shows red yellow and purple shells which are generally fine grained and fossils showing horizontal bedding (Source: District Groundwater Resource by National Water Mission (NWM)).

The lower as well as upper cretaceous formations do not crop out anywhere in the district and are encountered in the bore holes only. The formations suggestive of lower cretaceous are encountered in the bore holes drilled by ONGC near Karaikudi below 128m below ground level, comprises alternate layers of clay and shale with sandstone. The clay and shale are grey to black in colour. The sandstone is medium to coarse grained greenish and admixes with clay (Source:NWM). Exposures of tertiary (Mio-pliocene age) formations are seen around Karaikudi, Sengarai, Sakkottai, Kottaiyur, Kalayarkoil and Manamadurai. The alluvial formation brought down by the river draining the district are found in major part of Karaikudi. It consists of clay, sandy clay, silky clays, sand and gravel with thickness ranging between 6m and 40m. The terrain of Karaikudi is predominantly flat.

The geology of the area was prepared by digitizing the geology with a lineament map of the Pambar and Kottakaraiyar basin prepared by the Tamil Nadu Water Resource Department, PWD. Karaikudi CLPA area has 92.74% Stand stone with clay of the total CLPA area, 5.53% of the area is hornblende – Biotite Gneiss found in the northwest part of CLPA area, north of Managiri and Kovilur villages, and 1.73% of Bolder bed, Conglomerate, Miacaceous, and Sandstone shale found in the western side of CLPA area in Kovilur and Karaikudi village. **(Refer Maps 5.4)** The principal crop of Karaikudi is paddy. The other crops that are grown are millets, cereals, pulses, sugar cane and groundnut. The local varieties of paddy Nutipathu and Kuliparichan are drought tolerant (Source: TWAD UGGS EIA Report).



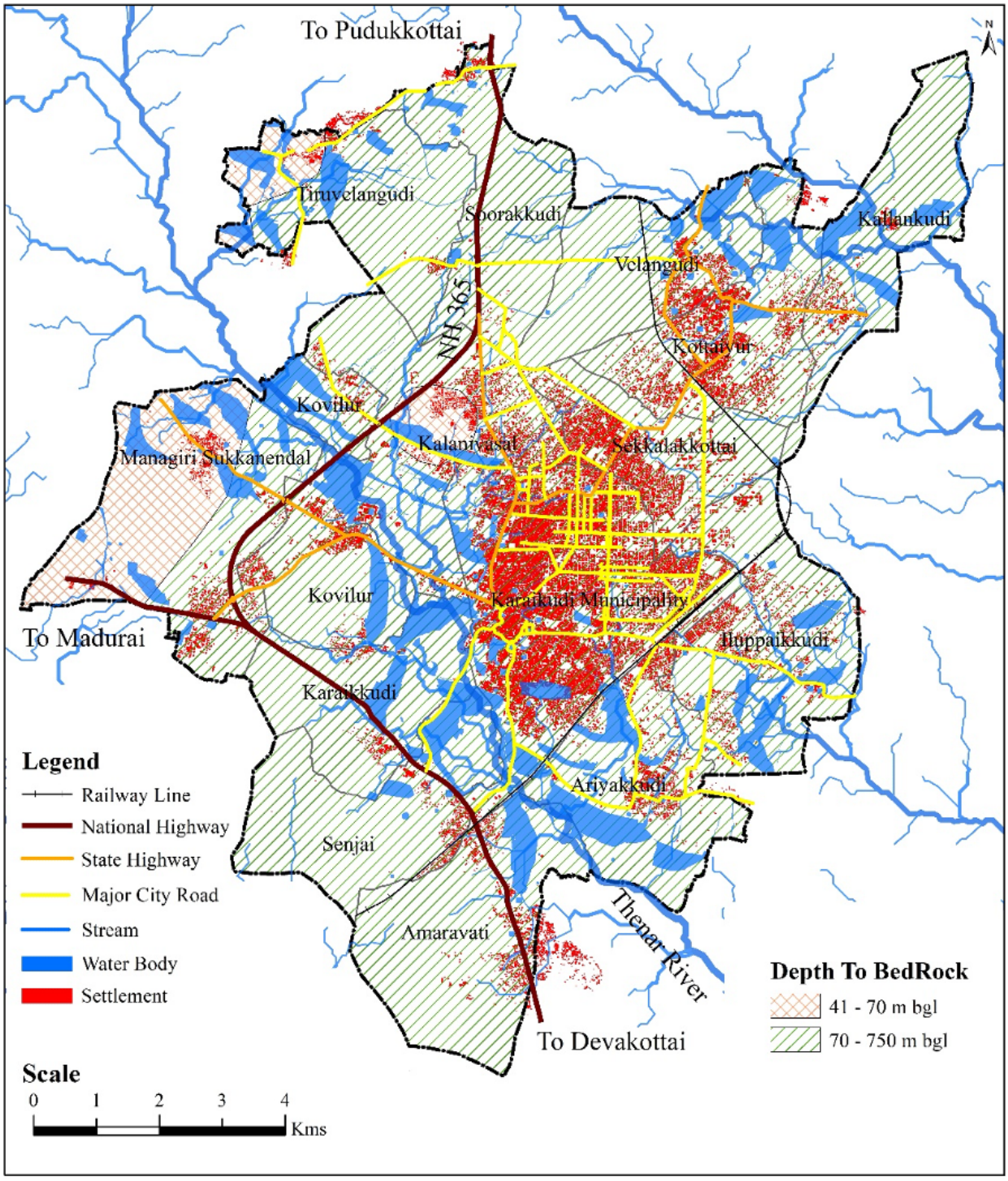
Maps 5.4 Geology with Lineament Map

Lineament may be defined as a natural process representing deep faults, dykes, cracks, or fractures. It controls the movement and storage of the groundwater. The lineament intersection areas will have increased porosity, and permeability, and topographically low elevated grounds are good groundwater potential targeting zones. The two major lineament density of the area is found in the middle part nearer to the Thenar River and North Easter part of the CLPA area

(North of Kottaiyur). Major lineament's trend towards a northwest to southeast direction and are located near the mainstream. The lineament intersection points have been identified at Thenar river beside Karaikudi Old Bus stand and northeast of Managiri and T.Soorakudi.

5.5.1 Depth to Bed Rock

Karaikudi CLPA, the depth to bedrock is grouped into two general categories viz. 1. depth to bedrock at intermediate depth (41-70 m bgl) and 3. at deeper depth (70-750 m bgl) with the increase of depth from northwest to southeast comprising of weathered fractured rock aquifer in the northwest and sedimentary region is the Southeast. Karaikudi CLPA predominantly, Bedrocks found in 70 – 750 m bgl that is 91.68% of the total area and 8.32% area in northwest of Managiri, and Thiruvelangudi villages, Central part in Kalanivasal (beside Aavin Dairy) village. Generally, the depth to bottom of aquifer (depth to bedrock) of this basin extends to deeper depth, however, augmenting groundwater is possible in the region where dewatering or over-exploitation is not a concern. The depth to bedrock map of Karaikudi CLPA is shown in **(Maps 5.5).**

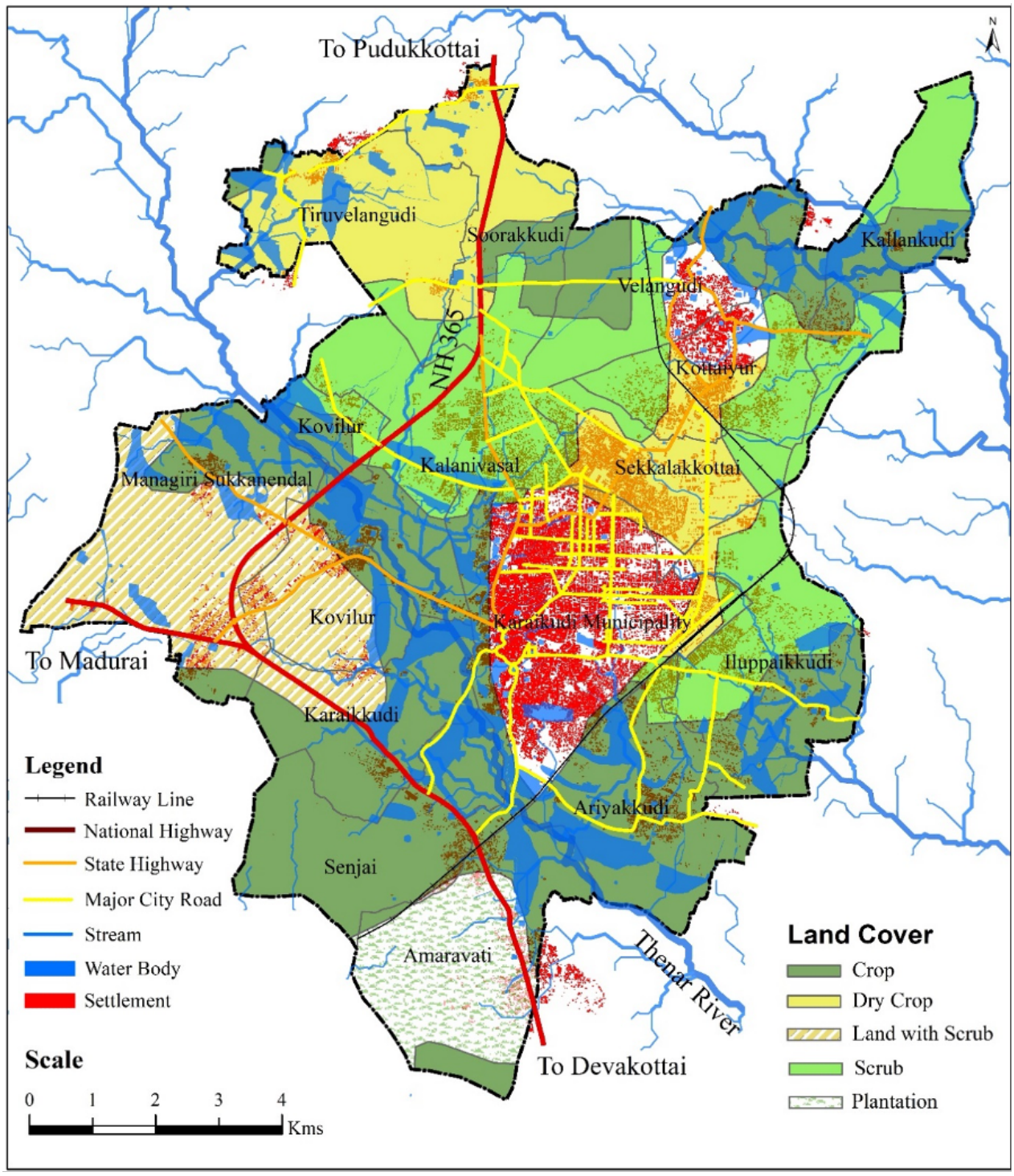


Source: **TN Water Resource Organisation, PWD**

Maps 5.5 Depth to Bed Rock Map

5.6 Land Use and Land Cover

Tamil Nadu Water Resource Department, PWD. Karaikudi CLPA cropped area covers around 40% of the Total CLPA area. Pambar river tributaries of the Thenar river and its rainfed ponds or tanks are the major sources of irrigation for these fertile lands. Therefore, during land use planning safeguarding or minimal use of these lands are imperative for agriculture and groundwater recharge. The Scrub and Land with Scrub are the next level land use category, it occupies around 30% of the Total CLPA area. The dry crops have seen in T.Soorakudi, and Thiruvelangudi cover about 15% of the Total CLPA area. The Scrubs, Land with Scrub, and Dry crop areas are the potential area for expansion of development. Plantation land use categories are concentrated in Amaravathi village, about 5.5% of the total CLPA area, and the remaining are settlement areas. The land use and cover map of Karaikudi CLPA is given in **Maps 5.6** and the land use and the land cover category is given in **(Table 5.5).**



Source: **TN Water Resource Organisation, PWD**

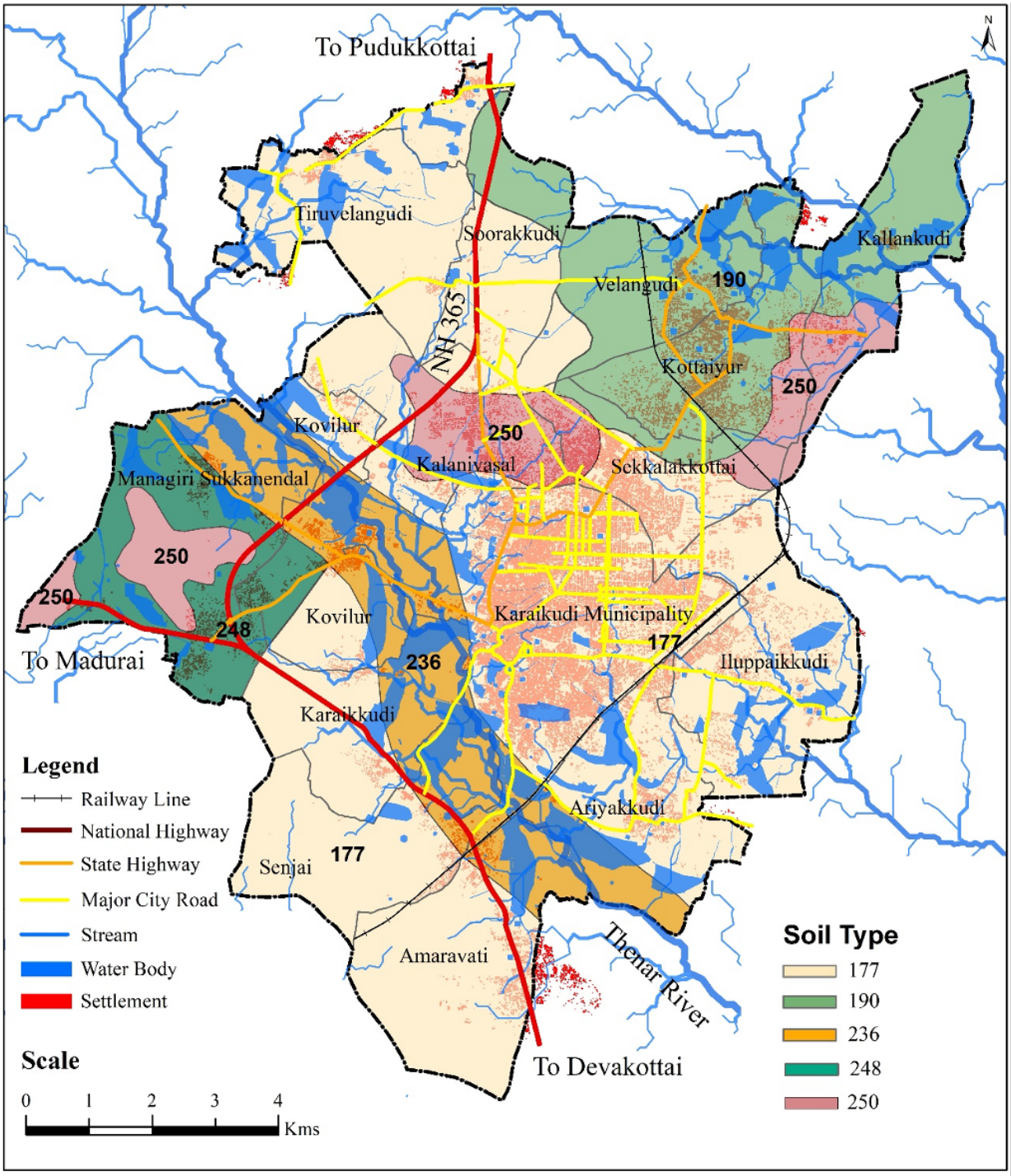
Maps 5.6 Land Use and Land Cover Map

S. No.	Land Use / Land Cover	Area in Sq.km	Percentage (%)
1	Crop	45.71	39.48
2	Dry Crop	17.07	14.74
3	Land with Scrub	13.66	11.79
4	Plantation	6.40	5.52
5	Scrub	20.43	17.65
6	Settlement	12.52	10.81
	Total	**115.78**	**100.00**

Source: **TN Water Resource Organisation, PWD**

Table 5.5 Aerial Extent of Various Land use Categories

The Predominant Soil type and area is Karaikudi Alfisols Red or Brown coarse, Gravelly Clay, loamy to fine loamy, clay loam to clay. The loamy, gravelly clay soils are weathered soils, which consist of minor particles of weathered rock. It is well drained to somewhat extensively drained, water percolation is good, better for agriculture, and crops get water and space for growth. The major crops cultivated in these soils are rice and sugarcane. Proximity to the Thenar river predominantly clay soil, it has excellent water storage qualities. The clay soil makes it hard for moisture, air to penetrate it and does not drain well or provide space for plant roots to flourish. Further, a little away from the Thenar river loamy soils situated, it provides fertile agriculture environments in this area. Part of the Kalanivasal, Managiri, and Kottaiyur has very gently sloping laterite lands, somewhat extensively drained, severely eroded, and gravelly clay soil. In these area's generally scrub is visibly seen. The Soil Type map of Karaikudi CLPA is given in **(Maps 5.7)** and the Soil Type category is given in **(Table 5.6).**



Source: **TN Water Resource Organisation, PWD**

Maps 5.7 Soil Type Map

Soil Code / Type	Description
177	Deep, well drained, gravelly clay soils on very gently sloping lands, severely eroded; associated with, shallow, somewhat excessively drained, loamy soils.
190	Moderately shallow, somewhat excessively drained, gravelly clay soils on gently sloping lands, moderately eroded; associated with; moderately deep, well drained, loamy soils on very gently sloping lands.
236	Deep, well drained, clayey soils of nearly level valleys, slightly eroded; associated with; moderately deep, moderately well drained, stratified, loamy soils.
248	Moderately deep, somewhat 'excessively drained, gravelly clay soils on very gently sloping lands, moderately eroded; associated with, deep, well drained, gravelly clay soils on nearly level lands with slight erosion.
250	Moderately shallow, somewhat excessively drained, gravelly clay soils on very gently sloping laterite land, severely eroded; associated with shallow, well drained, gravelly clay soils.

Table 5.6 Soil Type Category

5.7 Ground Cover

In Sivagangai District, 196 observation wells and 42 piezometers, totally 238 wells are monitoring on Monthly basis. In Sivagangai District, during the pre-monsoon, the water level generally in declining trend ranges from G.L. to 15m. The depth of well below Ground Level 12.0m are become dry during hot season like May, June, July. In the post monsoon, the water level generally in upward trend due to rainfall and it may reach the Ground Level also. The long-term fluctuations of water levels range from G.L. to 14.0m in many parts of the Sivagangai District. The analysis reveals that the water level has gone down in the north, west and central parts of the Sivagangai District.

CGWB has 3 observation wells within the distance of 6 km from Karaikudi Municipality and these sites namely Karaikudi, Chettinadu, and Puduvayal. In Karaikudi site observation wells during pre-monsoon periods from 2015 to 2019, the water level generally declines trend ranging from 4.87 meters to 8.67 meters. In Chettinadu site observation wells during pre- monsoon the water level

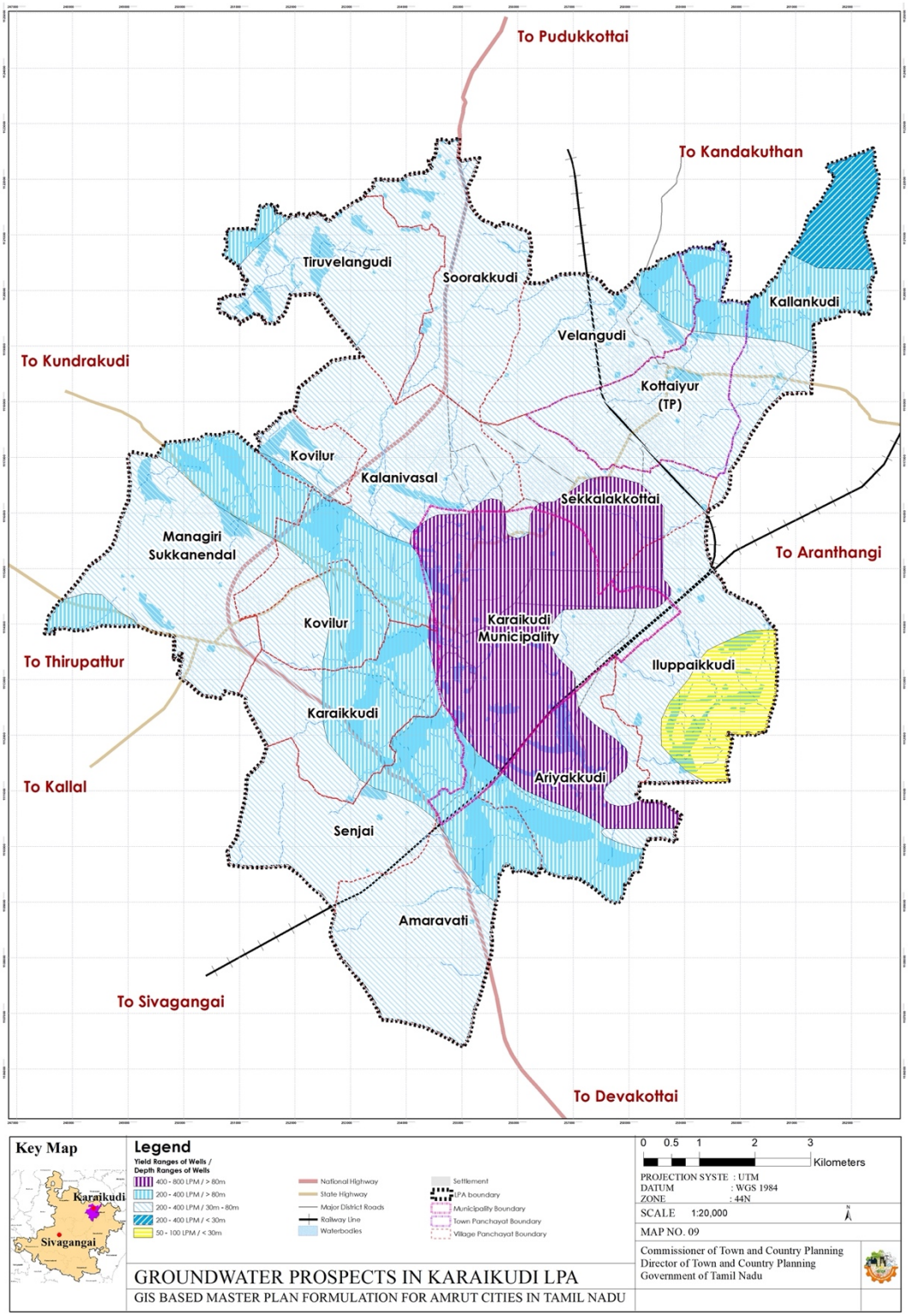
generally declines trend ranging from 2.76 meters to 4.78 meters. During the post-monsoon season from 2015 to 2019, the Karaikudi, Chettinadu site groundwater level is generally in an upward trend due to rainfall, and it may reach the Ground Level also which is 0.18m to 0.95m respectively. The Puduvayal site observation well nearest to Kottaiyur TP reported that pre-monsoon period between 2015 to 2019 groundwater level drastically declines trend ranging from 7.37m to 13.07m. The inference taken from the annual fluctuation is due to lack of rainfall which in turn affects the groundwater levels in phreatic aquifer. Also, post-monsoon season Puduvayal observation well reported generally declined trend 5.0m to 10.75m. The seasonal fluctuation study reveals that due to necessity for development of ground water for different sectored needs and due to failure of monsoons, the water level has gone down. Also, in these region Paddy, sugarcane, groundnut, and chillies cultivation would continue to be major agriculture activities so large quantity of water extracted for irrigation purposes.

The long-term Decadal Water Level Fluctuation, CGWB has analysed 2 observation wells in Karaikudi Block mean post-monsoon (1995 to 2004) and 2005 shows that 2-4 meter category 100% raise of groundwater that was minimum raise is 2.57 meter, maximum raise is 3.17 meter and decadal mean value was 6.79 meter. It indicates major parts of the Karaikudi CLPA area has potential for groundwater storage through natural rainfed tanks, non rainfed tanks and artificial recharge.

5.7.1 Groundwater Potential

Groundwater potential map prepared by NRSC with State Government support under the Rajiv Gandhi National Drinking Water Mission Project. Karaikudi CLPA wells yelled range from 50 to 800 LPM, and the well's depth range varies from shallow less than 30m to deep 80m. A predominant area of Karaikudi municipality and Ariayakudi has a high yield range of 400 – 800 LPM at the depth of wells above 80m. A low yield range of 50 – 100 LPM is sited in the Illuppaikkudi village however, the depth of the well is shallow below 30m. The remaining predominant CLPA area falls in the average yield range of 200 – 400 LPM, and the depth of the well varies from 30m – 80m, some locations like along the Thenar riverbed, part of Kottaiyur TP

depth range is above 80m and Kallankudi reported as belove 30m. The Groundwater Potential of Karaikudi CLPA is given in **(Maps 5.8).**



Source: **NRSC, Bhuva**

Maps 5.8 Groundwater Prospects Map

The ground water prospects map is used mainly for two purposes, namely i) to identify groundwater prospect area for locating ground water source within the prospect area, close to a habitation. to be supplied with drinking water and ii) to locate the site for constructing a ground water recharge. Structure (NRSC, Bhuvan Manual). The groundwater prospect map has some limitation, the scale of 1:50,000 and spatial resolution is 100m. Groundwater prospects considering both static parameters such as lithology, geomorphology and geological structure as well as dynamic parameters such as rainfall, streams/ rivers, water bodies, canals and well data. The dynamic parameters are likely to change over a period of time. Hence, update of the information is required.

5.7.2 Category of Groundwater Assessment

The groundwater potential assessment is dynamic, not static. So careful study is required from time to time. Groundwater Resources Assessments are jointly carried out by CGWB & respective State Agencies using the Groundwater Estimation Committee methodology, as a standard method to assess groundwater resources. The latest assessment of dynamic groundwater resources is GWRA-2017, using the GEC-2015 methodology. In these assessments, the assessing unit is Micro Level Basis Firka (Unit of Taluk) and categorized as Over-Exploited, Critical, Semi-Critical, Safe, and Saline Firkas. The area is characterized by depth to-water level of more than 4 m during the post-monsoon period (Jan 2019) coupled with a declining decadal long-term trend of pre and post monsoon water levels (Jan 2010 – Jan 2019) and stage of groundwater development or Groundwater extraction **(Refer Table 5.7).**

S. No.	Stage of Groundwater development	Significant long term decline		Categorization
		Pre-monsoon	Post-monsoon	
1	< = 70 %	No	No	Safe
2	>70% to < 90%	No	No	Safe
		Yes/No	No/yes	Semi-Critical
3	>90% to <= 100%	Yes/No	No/Yes	Semi-Critical
		Yes	Yes	Critical
4	> 100 %	Yes/No	No/Yes	Over-exploited
		Yes	Yes	Over-exploited

Table 5.7 Groundwater Assessment Categorization

Sivagangai District has 38 (2020) total assessment units. In the re-estimation of groundwater resources in the State in 2011, 2013, 2017, 2019, and 2020, all firkas are categorized as safe to over-exploited, in that the Karaikudi falls as safe categorization in all assessment years. However, the surface water resources are fully utilized by various stake holders. The demand of water is increasing day by day. So, groundwater resources play a vital role for additional demand by farmers and Industries and domestic usage leads to rapid development of groundwater. About 63% of available groundwater resources are now being used in India. In Karaikudi CLPA all local bodies extract groundwater for drinking water supply within their administrative limit. The quantity of water being used is dealt with in detail in Physical Infrastructure Chapter under the water supply section.

5.7.3 Groundwater Quality Issues and Challenges

According to National Water Mission, Ground Water Resource report for Sivgangai District, In Sivagangai District, the quality of Ground Water generally ranges from moderate to good quality both in the shallow dug well and bore wells except in & around the Kazhuveli tank, where the water quality is poor due to seawater intrusion in the lagoons during high tide seasons, the production of salt and Aquaculture farming. The value of Total Dissolved Solids (TDS) has been considered for demarcation of good / bad quality areas. For this purpose, the TDS value of less than or equal to 2000 mg/l have been considered as good quality and the value more than 2000 mg/l have been considered as bad quality areas.

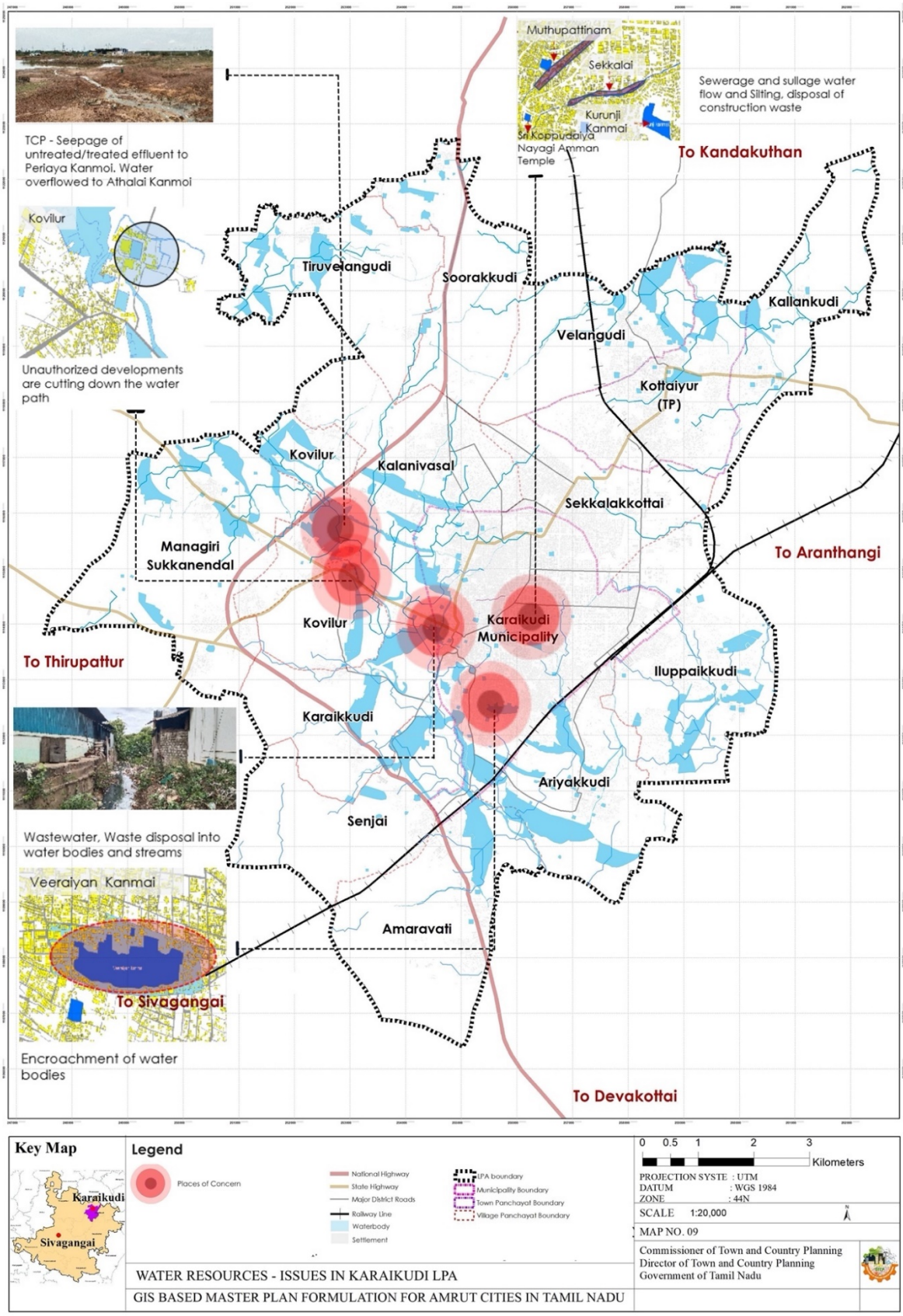
Problem posed by the nature, rainfall may more within the short period of duration. In urban and its surrounding due to this recharge is less and runoff will be more. Deforestation and poor land use practices in the catchment area, changes in the vegetation cover and topsoil decreased infiltration rates, increased runoff, sediment transport and deposition in rivers and storage reservoirs.

The availability of groundwater is less due to over extraction than recharge. Indiscriminate ground water extraction, intensive surface water irrigation, intensive mining activities, growing urban complexes and industrial establishments has threatening sustainability of groundwater resource. Recharge for catering to

drinking water needs in adverse situations, augmentation of water supply to projects of strategic importance falls under the highest priority. The artificial recharge can be advocated to increase the water quality in case of anthropogenic contamination in the urban area.

In Karaikudi CLPA, increase anthropogenic activities cause eutrophication and lead to aquatic pollution. Juliflora has invaded the water bodies' ie.tanks, channels and rivers. Also, some other plants like water hyacinths like Aagaya Thamarai, Elephant Grasses, Amanakku (Castor bean plant) these plants need to be eliminated totally for the conserving precious water resources.

The water pollution due to discharge of untreated/partially treated industrial and municipal wastewater into water sources depletes dissolved oxygen and affects aquatic life and both surface and ground water quality. The details regarding water pollution are delt in details in Environmental Chapter.



Maps 5.9 Water Resources issues in Karaikudi LPA

6 HERITAGE, CULTURE AND PUBLIC WORKS

06

Karaikudi have few tourist sports within municipality, However, surrounding areas within 15 km distance (average travel time 30 minutes) have numerous sites with cultural, religious and heritage significance. Karaikudi Municipality act as core centre for visiting surrounding tourist sites. One of the ways to improve the economy in Karaikudi CLPA is to foster the Tourism Industry. Therefore, tourism has to be promoted in the Master Plan to improve the economy and the livelihood of the people.

6.1 Tourism and Place of Interest

The tourism industry is one of the important industries in India which provides direct and indirect employment opportunities to the people. Tourism contributes 7% to the national GDP and it is also a major contributor to the state GDP. It is estimated that in 2028 tourism industry will contribute up to 9.9% to the national GDP. It acts as an important tool for employment generation, poverty alleviation, and sustainable human development. The economic multiplier effect is induced by the tourism sector through which other industries such as transportation, telecommunication, hotels, and allied industries are stimulated. Place of interest within CLPA are, Aayiram Jannal Veedu, Kaviarasu Kannadhasan Manimandapam, Sri Koppudaiya Nayagi Amman Temple, Venkatamudayan Perumal temple (also called as Then Tirupati) in Ariyakkudi and Sri Kotravaleeswarar temple in Kovilur. Other places in surrounding areas are Sri Sanmuga Nathar Temple in Kundrakudi, Kanadukathan Palace, Athankudi Handmade Tiles, Karpaga Vinayagar Temple in Pillayarpatti, Viravan Patti Temple and Sorna Moortheeswarar Temple in Kanda Devi nearest to Devakottai. The following section each tourist interested locations delt in details.

6.2 Places of Interest in Karaikudi CLPA

6.2.1 Aayiram Jannal Veedu

Aayiram Jannal Veedu is a famous landmark in the town of Karaikudi. The literal translation of the name of the place means the house with a thousand windows. The house is Built in 1941 with area of 20,000 square feet. It is very famous among the tourists.

6.2.2 Kaviarasu Kannadhasan Manimandapam Villundi Theertham

Kaviarasu Kannadhasan Manimandapam is a small Structure that has been built in In Karaikudi 100 Feet Road junction the memory of famous Tamil poet Kavi Arasar Kannadhasan who was born in Siru Koodalpatti. He was a man who is believed to have changed the face of Tamil literature. He contributed not only to Tamil literature but also to the Tamil film Industry by writing songs that became very popular.

6.2.3 Koppudaiamman Temple

Sri Koppudaiya Nayagi Amman Temple has the Oldest Structure in the town tracks its history from 1800 A.D. It is the only source to identify historic of settlement which is existed from the early 19th century. Koppudaiamman temple is an important temple in which annual festival is held for 10 days in Tamil month of VAIGASI.

6.2.4 Venkatamudayan Perumal Temple (Then Thirupathi)

Venkatamudayan Perumal temple (also called as Then Tirupati) is dedicated to Hindu God Vishnu located at Ariyakkudi. Venkatamudayan Perumal Temple (Also called as Then Tirupati) Then Tirupati is 500 years old and is considered to be a distinct change from traditional temples. Garuda, the eagle vehicle of Lord Vishnu, is shown with two lions on each side. This temple is especially associated with Garuda. The day in the month of Aadi (July-August) called Maha Swathi is considered the birthday of Garuda.A special pooja is performed on this day.

This is the biggest Vishnu Temple in the Chettinad Region with the 7 Tier Raja Gopuram measuring 80ft. It is located about 4 kms South East of Karaikudi Railway Station on a huge 3 1⁄2 acre land.

6.2.5 Sri Kotravaleeswar Temple

Sri Kotravaleeswarar temple located in Kovilur, it is 500 years old temple. It has uniqueness of the statue of Adalvallan is located in the Mahamandapam. Sri Nellaiamman is a female goddess of the temple.

6.3 Places of Interest Close to Karaikudi CLPA

6.3.1 Sri Sanmuga Nathar Temple - Kundrakudi

Kundram means hillock and Kudi means village. Hence this village is called Kundrakudi. This Shanmuganathar Temple is an abode of Lord Murugan called "Shanmuga" with six faces and 12 hands. Kundrakudi is 10 km distance from Karaikudi. On the western side of the hill are three excavated shrines at the ground level. Later structures have been added to these shrines. All these caves are dedicated to lord Shiva. There are a number of old inscriptions in this region which attracts research minded historians.

6.3.2 Kanadukathan Palace

The chettinad houses in Karaikudi, Pallathur, Athangudi and Kothamangalam are the most lavish and expuisite examples of architectural beauty. Located at 10 km distance from Karaikudi, Chettinad Palace is a beautiful edifice situated in the Chettinad region, in Sivaganga district. It is one of the most glorious examples of chettinad's widely famed palatial mansions. The Chettinad Palace was designed and constructed by Dr.Annamalai Chettiyar, founder of Indian Bank and the Annamalai University in Chidambaram. An outstanding example of the Chettinad architecture, the Chettinad Palace of Sivaganga dates back to the year 1912. It took about two years to complete this palace. It reflects the traditional style of architecture, which is characteristic of the region. Many antiques used by the Raja are preserved in the palace now also. The palace stands tall covering about 1900 sq.ft including 9 car sheds and a lift.

6.3.3 Athankudi Handmade Tiles

Athangudi village is located in Sivaganga district of Tamil Nadu and is 13.5 km distance from Karaikudi. The village itself comes within the Chettinad area and is very famous all over the country for the hand-made terracotta tiles that are made only here. The tiles are built using cement, sand, synthetic oxides and belly jelly. The terracotta tiles are first shaped and then sun-dried after which they are adorned with artistically made patterns. It is the pattern that gives the tiles their unique texture. The pattern can be decorated with various colours to make the tiles look

attractive. People also get customised tiles made for their houses and lawns. The most popular design on tiles for lawns is the one depicting flora and fauna.

6.3.4 Karpaga Vinayagar Temple – Pillayarpatti

Karpaga Vinayagar Temple is one of the oldest Cave Temples (Rock Cut) of Tamilnadu and situated at Pillayarpatti, which is between Pudukkottai and Karaikudi. Pillayarpatti is situated 12 km from Karaikudi on Thirupathur – Karaikudi State Highway. The village gets its name from the temple. Here Lord Vinayaga appears with 2 hands unlike in other places where he is seen with 4 hands. The six feet presiding deity is called as Karpaga Vinayagar [valampuri posture]. Over 15 inscriptions are found within the temple, that help establish the age of the temple. Vinayagar Chathurthi festival during August-September is the main festival of the temple. It is celebrated for 10 days in a grand manner. Sankata Hara Chathurthy every month is also celebrated with a festival look. Unlike other places the three Lingams Thiruveesar, Marudhesar and Senchadeswarar and the three Goddess Sivagami amman, Vadamalar Mangaiamman and Soundara Nayagiamman all appear together at the same place and bless the devotees. Cottages maintained by the trust are also available which can be booked in advance.

6.3.5 Viravan Patti Temple

Virvan Patti Temple is famous temple dedicated to Lord Kala Bhiraver located 2 km distance from Pillayarpatti and 14 km distance from Karaikudi. It is one among nine temples held in high esteem by the Nagarthar Chettyar community in Tamil Nadu.

6.3.6 Sorna Moortheeswarar Temple – Kanda Devi nearest to Devakottai

The Village Kandadevi is situated 3 kms away from Devakottai Town. Here the temple is dedicated to Lord Shiva and called as Arulmigu Swarna Moortheeswarar alias Siragilinathar. The Amman is called as Periya Nayaki Amman. This is a 350 years old temple. The temple is maintained by Sivaganga Raja. Lord Rama installed a sivalinga and named "Siragilinathar" meaning the lord without feathers. It is here that Hanuman said "Kanden Deviyai" to Rama, after finding Seetha at Sri Lanka and hence this place is called as Kandadevi. Bihnd the temple, there is a big tank

called the Jatayu Theertham. The tank is so huge and covers a large area. It is said that the temple tank has never dried up even during drought or intense summer seasons. The Aani Urchavam is very famous festival for this temple, which is celebrated every year, during the month of June by the people of 75 Villages. Karaikudi Railway Station is located at a distance of 12 km.

S. No.	Tourist Attraction	Type (Natural, adventure, pilgrimage, heritage etc.,)	Season
1	Aayiram Jannal Veedu	Heritage	All the year
2	Kaviarasu Kannadhasan Manimandapam	Heritage	All the year
5	Koppudaiamman temple	Pilgrimage	May - June/ Every Friday
6	Venkatamudayan Perumal Temple (then tirupati)	Pilgrimage	July-August
7	Sri Kotravaleeswar Temple – Kovilur	Pilgrimage	June
8	Sri Sanmuga Nathar Temple - Kundrakudi	Pilgrimage	All the year
9	Kanadukathan Palace	Heritage	All the year
10	Athankudi Handmade Tiles	Pilgrimage	All the year
11	Karpaga Vinayagar Temple – Pillayarpatti	Pilgrimage	August-September
12	Viravan Patti Temple (Nearest to Thiruppatur)	Pilgrimage	August-September
13	Sorna Moortheeswarar Temple – Kanda Devi nearest to Devakottai	Pilgrimage	June

Source: **District Tourist Office, Karaikudi**

Table 6.1 Tourist Destination in Karaikudi CLPA

6.4 Tourist Footfall

Karaikudi CLPA has two major pilgrims that attracts larger tourist, Venkatamudayan Perumal Temple in Ariyakkudi village and Sri Kotravaleeswar temple in Kovilur. Among all tourist spot Sri Sanmuga Nathar Temple - Kundrakudi and Karpaga Vinayagar Temple, Pillayarpatti arrives an enormous pilgrim during the festival season. The average annual tourist visit has been shown in the chart below.

S. No	Name of the Tourist Attraction	No. of Footfalls				
		2017	2018	2019	2020	2021 (Till Aug)
1	Venkatamudayan Perumal Temple (then tirupati)	707463	697910	562906	95762	133869
2	Sri Kotravaleeswar Temple – Kovilur	452194	559372	442187	90352	91724
Nearby Tourist destination Less than 15 Kms outside CLPA (30 minutes travel from Karaikudi town)						
3	Sri Sanmuga Nathar Temple - Kundrakudi	1398207	1093543	1213852	563319	583715
4	Kanadukathan Palace	7019	9437	10546	521	314
5	Athankudi Handmade Tiles	228454	357326	376146	13452	10427
6	Karpaga Vinayagar Temple – Pillayarpatti	1382458	1027324	1268646	525678	658236
7	Viravan Patti Temple (Nearest to Thiruppatur)	479635	551937	528194	81476	84453
8	Sorna Moortheeswarar Temple – Kanda Devi nearest to Devakottai	314842	420195	448905	87342	89439

Source: **District Tourist Office Karaikudi**

Table 6.2 Year-wise Tourist Footfall of Karaikudi and Surroundings

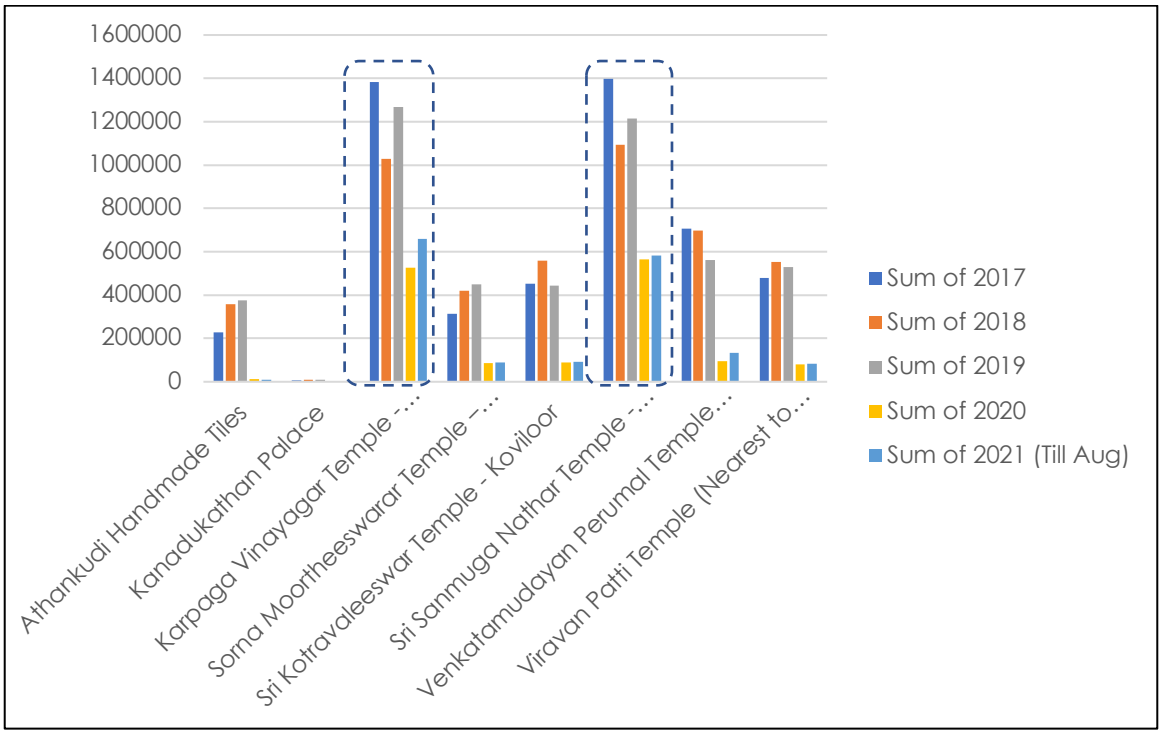


Figure 6.1 Tourist Population in and around Karaikudi CLPA

It is observed from above chart that tourist arrival in Sri Sanmuga Nathar Temple - Kundrakudi and Karpaga Vinayagar Temple, Pillayarpatti highest visitors in the year 2017 that is 13.9 lakhs. 2019 onwards tourist arrival decreased due to pandemic. The tourist population in and around Karaikudi CLPA are shown in **(Figure 6.1).**

6.5 Karaikudi Heritage and Culture

UNESCO identified three village clusters in Karaikudi area and it is known as Chettinad. The worldwide foreign tourists known by this name only. India proposes UNESCO Karaikudi area as Chettinad, Village Clusters of the Tamil Merchants. Chettinad comprises of a network of 73 villages and 2 towns forming clusters spread over a territory of 1,550 km2 in the Districts of Sivagangai and Pudukkottai in the State of Tamil Nadu. These forms based on unique architectural characteristics and art deco interior designs. The houses are constructed using the limestone that is called "Karai veedu" in local language.

Chettinad comprises series of 3 clusters of total 9 villages and 2 towns. The first cluster comprises of 3 villages and 1 town, Kanadukathan, Pallathur, Kothamangalam and Kottaiyur town in the District of Sivagangai. Kottaiyur town is situated in Karaikudi CLPA this has been selected as its traditional settlement is exposed to urban development from its neighbour Karaikudi municipality, the economic centre of the region. The second series of cluster, South of the first series, covers the 3 villages and 1 town, the rural villages of Kandanur, Athangudi, Chokalingampudur, and Karaikudi Municipality in the District of Sivagangai. The third series of cluster is situated North of the first series in the District of Pudukkottai with the very significant villages of Rayavaram, Kadiapatti and Arimalam.

As per UNESCO record only Karaikudi municipality and Kottaiyur town panchayat are part of Chettinad cluster and no other villages in CLPA is part of this cluster. The unique urban traditional buildings contributing to the city identity, these heritage buildings need to be preserved.

6.6 Key Issues Heritage

These Economic growth in the fragile context and diversity of cultural expression in the age of globalisation is diminishing the heritage value. The majority of heritage buildings are private owned; therefore, Government has less control on them. According to ArcHe-S, there are three different is issues prevail in the Chettinad region. The owners do not live in the palaces on a permanent basis, they often need to be maintained them. The palaces are used for large, important occasions or gatherings. A considerable number of houses have been completely demolished and dismantling of houses has led to a lucrative antiques business. Family lack of financial means or joint ownership, dismantling for purposes of sale, and damage to the structure. This could totally wipe out the living evidence of a way of life.

6.7 Existing Tourism Infrastructure

Karaikudi is not famous tourist designation with compared to other pilgrims Rameswaram and Nagapattinam. It is not required full day stay to visit the surrounding tourist sports. However, Karaikudi act as core place, it required the

basic infrastructure facilities for existing tourist population. Apart from TNSTC there are 8 travel operators are present in Karaikudi. From the study, it is observed that the accommodation, basic amenities, and transportation facilities are it mostly fulfils the accommodation needs of tourist and traders. In the forthcoming years visitors may increase and this will lead to an increase in demand for additional accommodation facilities. Karaikudi Municipality are given in **(Table 6.3)**

List of Hotels			
S. No	**Hotels without lodging facilities**	**S. No**	**Hotel with lodging facilities**
1	President Hotel	1	Hotel Malar
2	Annapoorna Hotel	2	Hotel Subhalakshmi Palace
3	Amsavalli Hotel	3	Hotel Sathguru
4	Ganga Hotel	4	Sugam International
5	Jegan Hotel	5	Golden Singer
6	Friends Hotel	6	The Bangla
7	Udhayam Hotel		

Source: **Statistical Handbook 2020-2021**

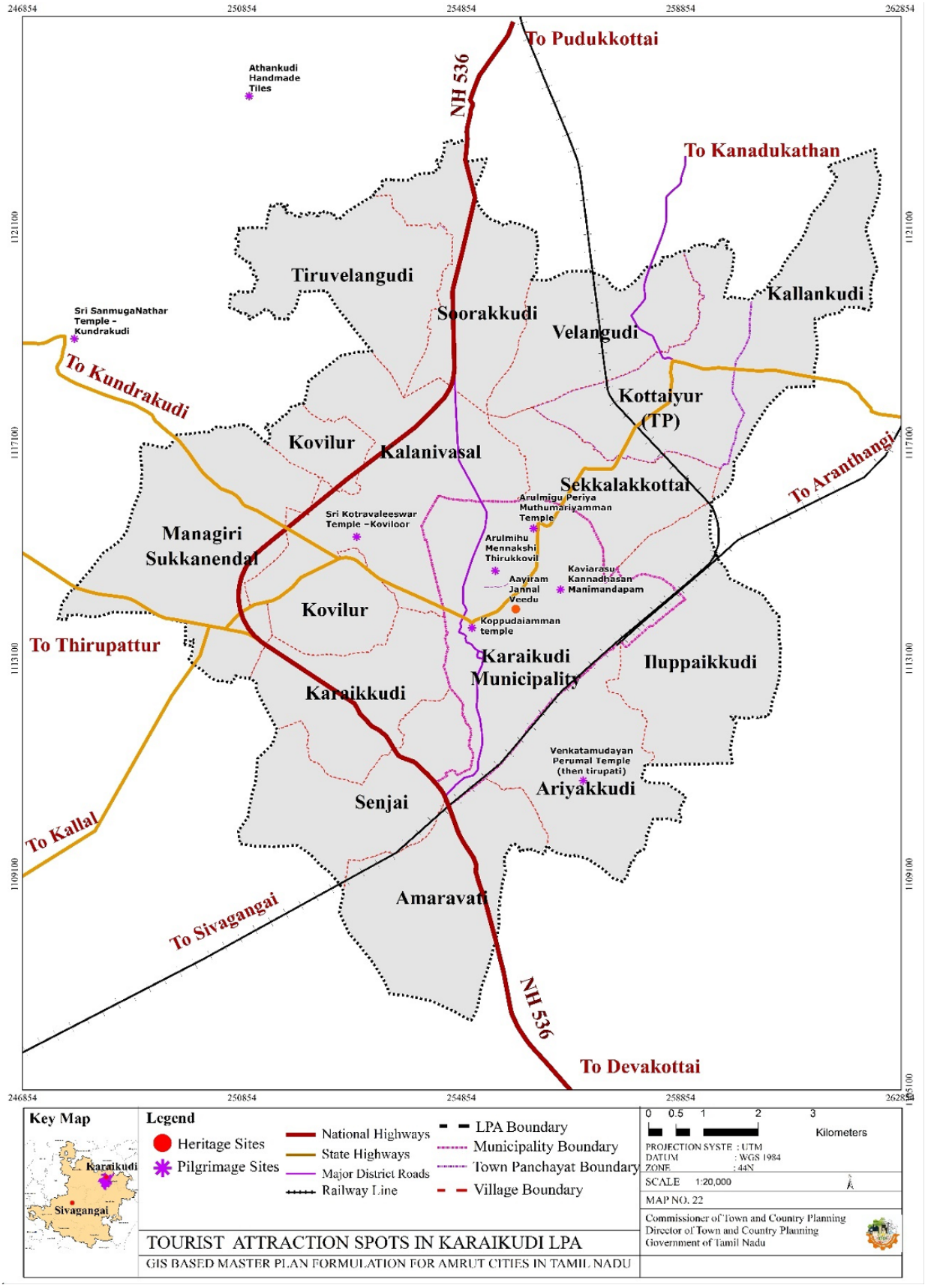
Table 6.3 Hotels and Accommodation facilities in Karaikudi Municipality

6.8 Summary

Tourism is recognized as one of the important sectors of development for Karaikudi and a major source of income and job creation. The major tourist attraction spots within and outside Karaikudi CLPA are Karpaga Vinayagar Temple – Pillayarpatti, Sri Sanmuga Nathar Temple – Kundrakudi and Venkatamudayan Perumal Temple (then tirupati). As Venkatamudayan Perumal Temple (then tirupati) Ariyakkudi and Kotraleeswar temple During the year 2017 within Karaikudi CLPA witnessed approximately 12 lakhs of tourist population, both domestic and foreign. Outside CLPA around 15 km tourist spots tourist put gather in same year around 50 lakhs. Such a huge crowd visits Karaikudi annually indicating that the place has immense potential for development through

tourism. The accommodation facilities available at Karaikudi municipality are satisfactory for the current population.

Since Karaikudi is heritage town, Karaikudi is being called as "CHETTINADU" by nick name all over the world and it is declared as ancient town by the UNESCO. More foreigners were coming here as tourists to see the artful houses and ancient temples. To conserve heritage settlements, master plan intent to promote heritage walk at Karaikudi and Kottaiyur thus study required for delineate the heritage zones. Apart from South Indian Cinema, North Indian cinema's also find Karaikudi as shooting sites, they were coming here often for film shooting. Therefore, provisions for accommodating the future tourist inflow must be taken into consideration. Measure such as ensuring access to and within the destination, developing the necessary infrastructure, and upgrading the existing accommodation facilities, will magnify the industry to a greater extent. Proper planning for tourism infrastructure can be a positive force, bringing numerous benefits to Karaikudi.



Maps 6.1 Tourist Attraction Spots in Karaikudi CLPA

7 ECONOMY

07

In Karaikudi CLPA, vibrant economic activities are Trade & Commerce, Manufacturing & Service industries, Construction, and Tourism. Trade and commerce are major areas where a large workforce contributes to the local economy. The Chettinad community is the foremost and well known for trade commerce activities in Tamil Nadu. A larger proportion of workforce is involved in manufacturing and service-oriented industries. The industries in Karaikudi CLPA are Petrochemical, Engineering, and Lathe work, Auto works, Woodworks and Furniture, Food products, Power Loom, and Metalworks. The construction works contribute to major employment opportunities in the CLPA. Tourism and allied activities create direct and indirect employments for Karaikudi CLPA. Another major contributor to the economy is agriculture. It is witnessed that service sector also growing at faster rate.

7.1 Workforce Participation Rate

The workforce participation rate of India was 39.79 percent and Tamil Nadu was 45.6 percent in 2011. The participation rate of Karaikudi CLPA is low when compared with the State workforce rate **(Refer Figure 7.1).** The proportion of total workers to the population of Karaikudi CLPA was 33.61% in 2001 and 37.46% in 2011. The figure had increased by 2.77% which is a reflection of the growing economic opportunities in the area. The Karaikudi municipality and Kottaiyur town panchayat participation rate (33.12 % and 36.35 %) is lower than that of the rural participation rate (37.60%) in the planning area. Because of increase in employment opportunities these adjoin villages thus indicates major shift from agriculture to manufacture and service sector.

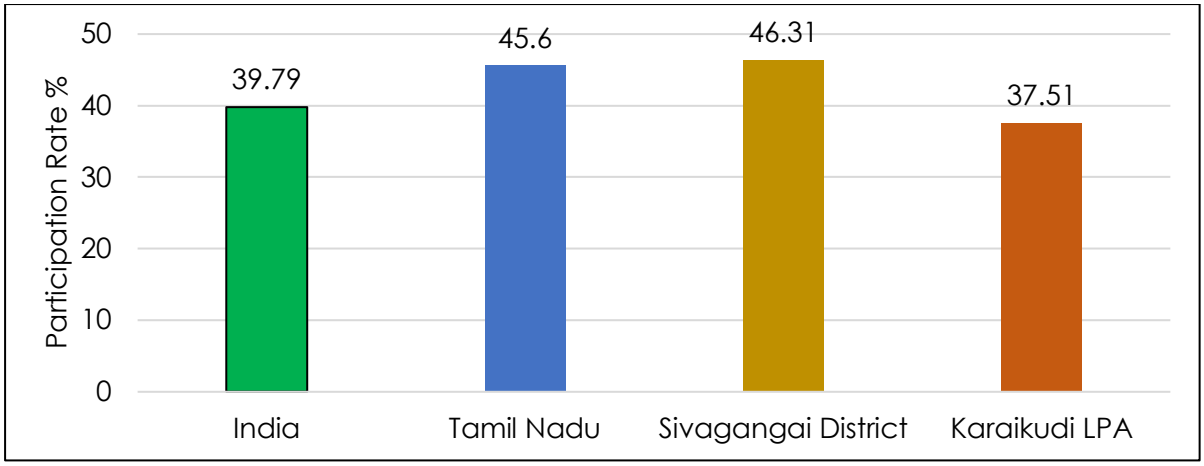
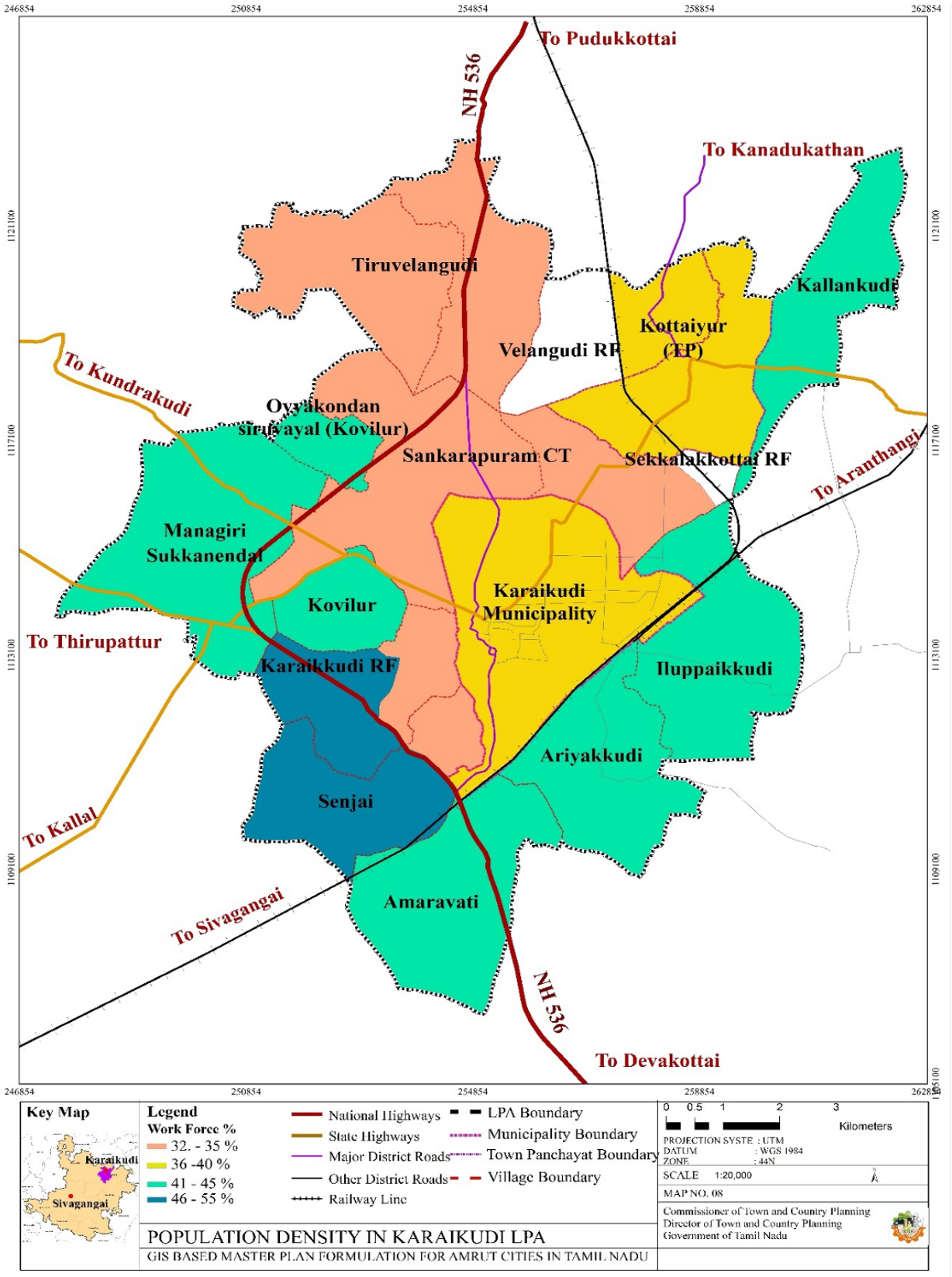


Figure 7.1 Workforce Participation Rate



Maps 7.1 Workforce Participation Rate in Karaikudi CLPA

7.2 Occupation Structure

The comprehensive profile of employment in Karaikudi CLPA has been made based on the data available in Census. The participation rate i.e., proportion of total workers to the population of Karaikudi CLPA was 37.51% in 2011 and 40.46% in 2021. The corresponding figure for the Karaikudi CLPA has main workers 30.26 percent, marginal workers 0.15 percent in 2011 which is lesser than State (38.8 % and 6.8 %) and District (34.43 % and 11.88 %). The villages in Karaikudi CLPA an average of 3.43 percent of agriculture workforce decreased from 2001 to 2011. The occupational structure of Karaikudi CLPA is shown in **(Table 7.1).**

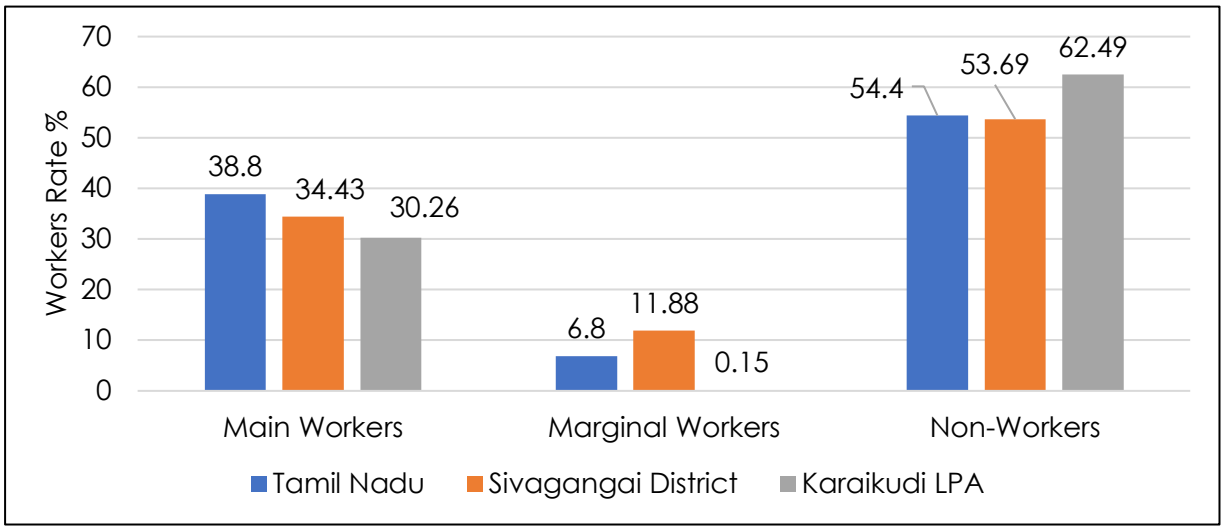


Figure 7.2 Comparison of Occupational Structure

S. No.	Name of Villages/Town	Growth Rate in %							
		Cultivators		Agricultural Labours		Household Industrial Workers		Other Workers	
		2001	2011	2001	2011	2001	2011	2001	2011
1	Karaikudi	0.44	0.47	0.51	1.24	2.7	2.52	61.46	57.03
2	Kottaiyur	0.16	0.44	0.46	0.08	0.25	0.12	7.1	7.56
3	Villages in CLPA	4.14	1.88	4.18	3.01	0.73	0.72	16.32	23.68
4	**Total LPA**	**4.74**	**2.79**	**5.15**	**4.33**	**3.68**	**3.36**	**84.88**	**88.27**

Source: **Census of India**

Table 7.1 Sectoral Composition of Workers in Karaikudi CLPA during 2001 & 2011

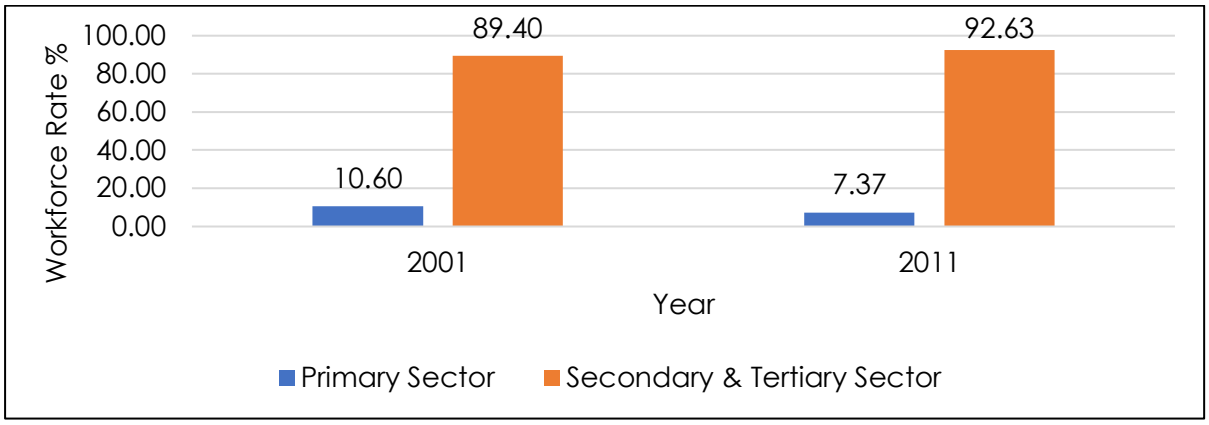


Figure 7.3 Trend of Occupational Structure in Karaikudi CLPA

Further, the occupational structure of Karaikudi CLPA has been analysed, the **(Table 7.2)** demonstrates the sectoral wise proposition of workers involved in various occupations. The growing economic opportunities in the area of large scale, medium scale and small-scale (it includes household industries) manufacturing industries, trade & commerce and construction industries. Also, agriculture sector contributes significant economic growth of CLPA.

S. No	Type of Occupational	Number of Workers in Karaikudi Municipality	Number of Workers in Kottaiyur Town Panchayat	Number of Workers-Village in Karaikudi CLPA	Total Number of Workers in CLPA	% Of Workers
1	Agriculture	1,512	553	7,760	9,825	9.84
2	Industries	6,935	171	8,243	15,349	15.37
3	Trade and commerce (Whole sale and retails shops)	11,028	277	8,475	19,780	19.81
4	Construction	5,802	171	9,730	15,703	15.73
5	Education / Health/Social Work	4,047	966	2,104	7,117	7.13
6	Administrative Service and Public Administration	2,132	650	392	3,174	3.18
7	Household industries	2,233	1121	1,516	4,870	4.88
8	Mining and Quarrying	51	-	-	51	0.05
9	Other service sectors	20,533	2059	1,390	23,982	24.02
10	**Total Workers**	**54,273**	**5,968**	**39,610**	**99,851**	**100.00**

Source: **Municipality (Census 2011- Projected) and Town Panchayat and Village Panchayat**

Table 7.2 Occupational Structure in Karaikudi CLPA in 2021

7.3 Agriculture

Agriculture is considered an important means of livelihood in many villages in Karaikudi CLPA. Since the area has several networks of irrigation natural streams and waterbodies, the place is known for paddy, pulses, oilseeds and sugarcane cultivation. In Karaikudi CLPA, the percentage of agriculture workers is 10.25% of the total work force. The share of agriculture workers in Karaikudi Municipality is about 2.79 %. The village in Karaikudi CLPA, The Nine-fold classification data collected from Kallal Block. According to Kallal Block record, Agricultural cultivable land area is high in Illappaikkudi, though net cropped area is less. The reason may be workforce participation involved in agriculture is less. It is strongly associated with proximity of the town, the Illappaikkudi village is located adjoining to Karaikudi municipality and the employment opportunity is comparably high in another sector. And also, the similar trend follows in other villages, villages namely Kalanivasal, Karaikudi village, Ariyakkudi, Sekkalaikottai, Senjai, Amaravathi. Whereas, Thiruvelangudi located away from Karaikudi municipality, which has highest net cropped area, area is about 299.75 ha, that is 56.6% of total area. So, this indicates agriculture workforce is high in Thiruvelangudi compared to other villages. The Illuppakudi has the highest cultivable land area, which is 1004.67 hectares. The village has 81.7 % of the percentage of cultivable land. However, the net cropped area is only 12.5%. Thiruvelangudi has a large area under cultivable land of 834.98 ha, the cultivable land is about 56.6 %. It has a reasonable percentage of net cropped area that is 35.9 percent. Table 7.3 reveals that the accountable number of people involved in agriculture is high in Thiruvelangudi village compared to the other villages in Karaikudi CLPA. Managiri and Kovilur village data is not available.

S. No	Land Type of Classification	Kazhanivasal	Karaikudi	Ariyakkudi	Sekkalaikottai	Illuppakudi	Senjai	Amaravathi	Kallangudi	Velangudi	Kottaiyur	Thiruvelangudi
1	Forest	14.86	318.06	-	69.95	70.24	225.77	222.20	89.52	343.81	74.25	91.79
2	Barren and Uncultivated Land	638.51	-	102.91	-	-	-	-	123.31	187.96	-	-
3	Land put to Non-Agriculture Use	12.32	150.35	233.48	314.99	97.56	0.10	147.82	-	25.50	291.42	130.68
4	Cultivable Waste	-	-	10.87	0.34	57.28	39.67	148.24	212.82	-	1.91	44.47
5	Permanent Pastures and other grazing lands	-	-	-	-	-	-	-	0.16	-	-	-
6	Area under Misc. Tree Crops	2.78	97.64	-	66.64	-	143.37	-	7.17	14.76	13.12	372.94
7	Current Fallow	481.09	207.56	416.05	0.00	103.86	337.18	316.18	10.31	69.72	6.37	397.06
8	Other Fallow Land	0.00	129.57	0.00	70.01	775.63	0.00	0.00	370.03	0.00	306.24	138.17
9	Net Cropped Area	56.74	30.22	66.34	0.57	125.19	92.30	71.87	38.67	9.97	11.71	299.75
	Total	1206.30	933.38	829.64	522.48	1229.74	838.38	906.30	851.97	651.71	705.01	1474.84
	Total Cultivable land Area (7+8+9) in Ha	**537.84**	**367.34**	**482.39**	**70.57**	**1004.67**	**429.48**	**388.05**	**419.00**	**79.68**	**324.32**	**834.98**
	% of Cultivable land to the total area	**44.6**	**39.4**	**58.1**	**13.5**	**81.7**	**51.2**	**42.8**	**49.2**	**12.2**	**46.0**	**56.6**
	% of net cropped area to Cultivable land area	**10.5**	**8.2**	**13.8**	**0.8**	**12.5**	**21.5**	**18.5**	**9.2**	**12.5**	**3.6**	**35.9**

Table 7.3 Nine Fold Classification of Land Usage From 2010-11 To 2019-20 (Units in Hectares)

7.4 Industries

Major industries in Karaikudi town are Engineering and Auto works, Wood works and Furniture in the large and medium scale. The small-scale cottage industries are food products, metal works and tailoring, paper binding and allow fibre rope. It is spread west side of the town near all major commercial area. In Karaikudi CLPA, out of the total work force, 15.53 % of workers are directly involved in Manufacturing Industries and Household indusries 4.92 %, this total is 20.45 %.

Apart from above major manufacturing industries in Karaikudi CLPA has SIDCO industrial estate of 180 acres area is situated along the National highway 536 Karaikudi Devakottai Rastha within Amaravathi village. In and around the SIDCO, Engineering and Auto works, Metal roofing manufacturing units are located. Tamil Nadu Petro Chemical Industries are located in Kalanivasal Village along Kovilur road. The Company set up its plant for the manufacture of "Sodium Hydrosulphite" (SHS) and manufacture of "Liquid Sulphur Dioxide" introduced for the first time in India. Currently the installed capacity of production is 14800 Metric Tonnes. (TCP website). Along NH 536 in Sankarapuram area power loom industry also located. Agro based food processing industries Aavin Dairy located in Transport Nagar in Kalanivasal. Another roof sheet manufacturing industry coming up in T. Soorakudi along NH 536 Karaikudi to Thirumayam road. Agro-based industries, Engineering and Auto service, Also the product of TCP industrial products widely used in Textiles, Paper, Pharmaceuticals, Ceramics and in the production of jaggery this can properly utilised by local industrial development.

7.5 Trade and Commerce

Karaikudi, is a noted centre for trade and commerce in Sivagangai Districs. There are wholesale traders bronze lamp, bronze bell, bronze sculpture (miniatures - Elephant, Horse), Temple Pooja products such as Kalasam, Thiruvatchi and sword (manufacturing at Ariyakkudi), groceries, paddy, pulses, oilseeds from surrounding villages. In CLPA majority of cultivable land is available in Thiruvalngudi net cropped area is 299.75 hectares, Sugarcane from Kallankudi area (Sugarcane cultivated in 2 hectares out of total net cropped area 38.67 hectares), building materials (Particularly Handmade tiles from Athankudi), home

appliances (2nd beet junction), automobiles etc. The town acts as marketing centre for the surrounding towns villages and there are one weekly market beside other wholesale and retail shops catering to the daily needs of the people. Nattukottai Chettiars are foremost in this place to Trade and commerce. They have business in Malaysia, Indonesia. Colombo etc. The weekly market is held on Monday. Well known for wholesale business transacted here. After the improvements of roads and bus traffic, the traders go to villages and purchase commodities directly from the producers. In Karaikudi Municipality, out of the total work force, 19.79% of workers are directly involved Wholesale and Retail Trade activities.

7.6 Tourism

Tourism is an important source of income for the resident in Karaikudi. It is part of the Chettinad region. The Karaikudi town is a cultural and heritage hub, towns of Karaikudi and Kottaiyur have been notified as heritage towns by UNESCO. The town well-known to the world tourism mainly the style of houses that is unique to the place called Chetinad house. The houses in this town are constructed using the limestone that is called "karai veedu" in local language. The important tourist places are Koppudai Amman Temple, Meenakshi Sundareswarar Temple, Aaiyram Kannudayanayagi Temple and Chettinad Palace.

7.7 Economy Development Issues and Potential

Karaikudi CLPA has lot of potential for industrial development in the regions as large number of skilled labours produced by the education institution. The majority of skilled labours are migrating to larger cities for employment. Government of Tamil Nadu has plan for developing the industrial corridor Chennai to Kanniyakumari called Chennai Kanniyakumari Industrial Corridor (CKIC). The CKIC project will focus on balanced regional growth and development of the southern districts one of the key objects is strengthen traditionally strong sector (Auto and auto components quantum, textiles, machinery, petro- chemical industries, metal and mineral and food products). Karaikudi has a strong base for these industries in the Sivagangai District.

Households industrial in the Karaikudi LPA is the unique in nature two major products

1. Chettinadu handloom Kanchivaram sarees
2. Ariyakkudi brass, bronze and copper vessels.

The small-scale weaving units in the town has declined and has almost come to a standstill due to the large-scale mechanization of the textile industry in the neighbouring region of Madurai. There is a predominance of small-scale industries with an average of four members employed per industry. It is observed field visit that in Nessavalar Colony in Kalainvasal village 20 household-based handloom industries and 12 Art and Handicraft household industries in Arriyakkudi are producing unique handmade products. As discussed, these unique products have growing business. However, wages are less due to this lower contribution from the younger generation. These traditional handmade products are slowly disappearing, this needs to be strengthened priority to be given for development.

Major Commercial activities are concentrated in the old town and towards main transport corridors. Anna daily market and weekly market are also situated at core area of the town. Major commercial activities like wholesale and retail business of textiles, handlooms, furniture shops automobile spares, repair shops etc. is located along the main roads. It is noticed that concentration of commercial activities in the Karaikudi Municipality along the major road conflicts with commuters and merchant's Certain junction are overcrowded indulging congestion in those areas. Faster growing towns experience commercial development along the major road it is challenge to control the conversion of the land use.

7.8 Employement Projection

The main economic development goal for any town is the generation of adequate employment opportunities. Employment growth leads to the improvement of livelihood, in addition, enhances the quality of life for the locals. In Karaikudi CLPA, the percentage of workers according to the 2011 Census was

37.46%, which had increased from 33.62% in 2001. This increase in workforce participation is directly linked to the availability of employment opportunities, particularly in adjoining villages, and indicates a major shift from agriculture to the manufacturing and service sectors. On average, there was a 3.43% decrease in the agricultural workforce. However, the workforce rate of Karaikudi CLPA is still less than that of the state and district rate. The male workforce is 57.09% and female workers are 17.87% of the total male and female population respectively. The participation of Female in the workforce has increased by 4.34% from 2001 to 2011. However, it is still lower than the national average of 25% and the state average of 31%. **(Table 7.4)** displays the participation rates of male and female workers in Karaikudi CLPA from 1991 to 2011.

Year	Total Population	Male Workers	% to Male Population	Female Workers	% to Female Population	Total Workers	% to Total Workers
1991	**99,961**	26235	51.89	5416	10.96	31651	**31.66**
2001	**1,29,058**	34733	53.54	8658	13.49	43390	**33.62**
2011	**1,73,418**	49,490	57.09	15,458	17.82	64948	**37.46**

Source: **Census of India**

Table 7.4 Male and Female Workforce in Karaikudi CLPA (1991-2011)

The employment projection for 2041 has been determined based on workforce participation rate of both male and female workers. Also, by considering the following factors namely eligible working population, population willing to work. The total workforce participation rate estimated for Karaikudi CLPA in 2041 will be 46.50%. Among the eligible workforce population, male is projected to comprise approximately 64.88% of workers while female is projected to be 28.11% of workers. The projection of the workforce participation rate for Karaikudi CLPA up to 2041 is presented in **(Table 7.5).**

S. No.	Description	2011	2021	2031	2041
1	Total Population	1,73,418	2,37,334	3,11,117	3,98,140
2	Eligible Workers (67%)	1,16,190	1,59,014	2,08,448	2,66,754
3	Male Population (49.99%)	86,689	1,18,645	1,55,529	1,55,588
4	Female Population (50.01%)	86,729	1,18,689	1,55,588	1,99,108
5	Male Willing to Work (% of Male Workers to Total Eligible Workers)	42.59	45.73	46.47	48.41
6	Male Willing to Work	49,490	72,721	96,873	1,29,142
7	Female Willing to Work (% of Female Workers to Total Eligible Workers)	13.30	17.06	18.42	20.98
8	Female Willing to Work	15,458	27,130	38,404	55,976
9	Toal Workers	64,948	99,851	1,35,278	1,85,118
10	% to Total eligible workers	55.90	62.79	64.90	69.40
11	Workforce Participation Rate	37.46	42.07	43.48	46.50
12	Additional Jobs to br created			**35,427**	**85,267**

Table 7.5 Employment Projection of Karaikudi CLPA

To accommodate the projected workforce in Karaikudi CLPA, additional jobs amounting to 35,427 for 2031 and 85,267 for 2041 will need to be created. The

expansion of the job market will not only increase employment opportunities but also promote future growth in the area. the promotion of manufacturing industries such as oil, food products, metalworks, woodworks, furniture works, auto works, power loom and textiles, paper, and ceramics can generate more job opportunities can be created. Furthermore, by developing the tourism and service sector, can produce additional employment opportunities.

7.9 Summary

The workforce participation rate for Karaikudi CLPA was 40.28 % in 2011 which has increased from 37.51 % in 2001. Karaikudi, is a well-known center for trade and commerce. The economy is based on agriculture and allied activities in addition to growing manufacturing sector also. The service sector is rapidly growing interms offering employment opportunities and trading is also taking place on large scale. Karaikudi act a market for the surrounding villages. The teritary activities of trade and commerce most valued by the people of Karaikudi workforce in wholesale and retail trade alone 20.32%. Followed by trade and commerce town has industrial based economy, workforce in industrial sector is 12.78% of workers are directly involved Manufacturing Industries and Household indusries 4.11%, this total is 16.88 %. As the place also has tourism potential in the regional context, developing tourism drives economic growth, creates jobs, and improves social development. As per census, growth rate of cultivators and agricultural labour showing decreasing trend, despite the larger concentration of agricultural areas. Therefore, strengthening the agricultural sector is vital to enhance the food security of the place by well productive agricultural land (cropped land) for urban development need to be prevented.

The employment projection, the workforce participation rate of Karaikudi CLPA in 2041 is estimated as 46.50% and to achieve this workforce participation rate 85,267 additional jobs need to be created. These additional jobs can be created by proposing new projects based on the potential of the planning area.

8 TRANSPORT AND MOBILITY

08

Transport infrastructure is the backbone of physical development of city. It is important factor to be consider for economic development of town. The new residential and industrial development will create intangible impact on the transportation system. In sufficient transportation infrastructure and no proper traffic planning will deterioration of quality of urban area. Improper planning leads congestion in the core city. Therefore, transportation has to be carefully planned to meet the demand for the increasing population. The objectives of studying transport sector are to understand and analyses the present scenario of the city and to understand existing potentials and scope of development.

8.1 Existing Road Condition

Karaikudi Municipality has road length of 159.73 Km. in that 146.91 Km is maintained by local body. Around 12.819 Km belongs to SH. The existing roads are classified based material used, three are five types of surfaces laid by in the Municipality, which are Bituminous, Cement Concreted, Water Bound Macadam, Earthen Road and Cut stone Slabs.

Surfaced roads constitute 99.98 percent of the total network with earthen roads constituting only 0.02 percent. Of the surfaced roads 7.54 percent of the roads are concrete paved roads, 1.82 percent is WBM (water bound macadam) and the rest 90.0 percent are BT (bituminous) roads. **(Refer table 8.1)**

S. No	Roads	Length (km)	Percentage
Surfaced Roads			
1	Black topped	130.94	81.98
2	Cement Concrete	12.05	7.54
3	Water Bound Macadam	2.90	1.82
5	Other Roads (Paver Block)	0.99	0.62
4	Earthen	0.03	0.02
	Sub Total	**146.91**	**91.97**
Un-surfaced Roads			
6	SH Roads	12.82	8.03
	Total length	**159.73**	**100.00**

Source: **Municipal Records, Karaikudi**

Table 8.1 Existing Road Network

Nearly one km of road belongs to paver block mostly this type of road surface can find in old city roads. The total road covered in Karaikudi Municipality is around 14.95 percent of the total area of Municipality.

Kottaiyur Town Panchayat has road length of 97.95 Km. in that 93.36 Km is maintained by local body. Around 4.59 Km belongs to SH. The existing roads are classified based material used, three are five types of surfaces laid by in the Town Panchayat, which are Bituminous, Cement Concreted, Water Bound Macadam, Earthen Road and Cut stone Slabs.

Surfaced roads constitute 85.04 percent of the total network with earthen roads constituting only 14.96 percent. Of the surfaced roads 2.24 percent of the roads are concrete paved roads, at present there are no WBM (water bound macadam) roads and the rest 81.08 percent are BT (bituminous) roads. Nearly two km of road belongs to paver block mostly this type of road surface can find in slums. **(Refer table 8.2)**

S. No	Roads	Length (km)	Percentage
Surfaced Roads			
1	Black topped	74.83	76.39
2	Cement Concrete	2.19	2.24
3	Water Bound Macadam	0	0.
4	Other Roads (Paver Block)	1.69	1.72
	Sub Total	78.71	80.35
5	Earthen	14.66	14.96
	Sub Total	**93.36**	**95.31**
Un-surfaced Roads			
6	SH Roads	4.59	4.69
	Total length	**97.95**	**100.00**

Source: **Town Panchayat Record, Kottaiyur**

Table 8.2 Existing Road Network in Kottaiyur Town Panchayat

The total road covered in Kottaiyur town panchayat is around 4.97 percent of the total area of town panchayat

The Villages in Karaikudi CLPA, the existing roads are classified based material used, three are four types of surfaces laid by in the Village Panchayat. which are Bituminous, Cement Concreted, Water Bound Macadam, Earthen Road. Sankarapuram CT has the highest Bituminous Road length of 56 Km which is 56% of the total road length.

Thiruvalngudi has highest earthen road length 30.5 km which is 50.0 % of the total road length. Followed by Amaravathi 24.5 km road length which is 54.3 % of the total road length. Ariyakkudi has 21.8 km road length which is 49.6 %. Illuppaikkudi has 19.7 km road length which is 40.2 % of total length and similarly Managiri has 10.0 km length which is 40.0 % of the total road length. **(Refer table 8.3)**

S.No	Name of the Village in CLPA	Bituminous Road in Km	Concrete Road in Km	Water Bound Macadam Road in Km	Earthen Road in Km	Total Road length in Km	% of unsurfaced road	NH Road in Km
1	Amaravathi	9.8	3.4	7.4	24.5	45.1	**54.3**	3.0
2	Ariyakkudi	3.2	10.6	8.4	21.8	44.1	**49.6**	0.0
3	Illuppaikkudi	15.9	10.6	2.7	19.7	48.9	**40.2**	0.0
4	Kovilur	5.0	6.0	4.0	10.0	25.0	**40.0**	3.0
5	Managiri	8.0	3.0	1.0	6.0	18.0	33.3	6.0
6	Sankarapuram CT - (Kalanivasal, Karaikudi, Senjai, Sekkalaokotai)	56.0	22.0	9.0	13.0	100.0	13.0	6.0
7	Thiruvelangudi (T.Soorakudi)	18.3	12.2	-	30.5	61.0	**50.0**	7.0

Source: **Village Panchayats**

Table 8.3 Existing Road Network in Villages in Karaikudi CLPA

Except Sankarapuram CT, Other villages have been taken assessment of existing road condition. Surfaced roads constitute 53.52 percent of the total network. Earthen roads constituting 46.48 percent of the total road network. The share of surfaced roads as follows,18.94 percent of the roads are concrete paved roads,

9.73 percent WBM (water bound macadam) roads and the rest 24.84 percent are BT (bituminous) roads.

8.2 Public Transport Service

Currently Karaikudi has two system of public transport namely Bus service and Railways. Buses are providing frequent, comfortable and affordable mode of transit within the city and surrounding villages. Karaikudi municipality, has 2 bus stands, old bus stand called Rajaji bus stand located in north west of municipality near Muthupattinam Junction with 2 large bays. A new bus stand of 2.67 acres B Grade bus stand has 5 Bays located along 100 Feet Road eastern side of municipality. New bus stand constructed under the Tamil Nadu Urban Development Program. Stairway facilities have been made at the bus stand for 33 buses. From the new TNSTC bus operated to Coimbatore, Tirupur, Erode, Salam, Tiruchirappalli, Pudukkottai, Tiruvannamalai, Madurai, Ramanathapuram, Tirunelveli and Tirupathi in Andhra Pradesh. As trade and commerce and educational and heritage tourism hub, required transport connectivity all over Tamil Nadu, so this new bus stand caters the demand. Also, 8 Private bus operates connecting to Bangalore, Hosur, Tirupur, Coimbatore and Chennai.

TNSTC intra city buses and private service operators through mini-buses between various localities in and around the town. There are about 10 to 15 such mini buses plying within the municipal limits. Para transit Auto plays important roll cater the local transport needs. Pedestrian mode of transport is also significant in the town.

Karaikudi is the vibrant junction in the south Tamil Nadu, A Grade junction. It has vehicle parking facilities. It connects Tiruchirapplli in north via Pudukkottai, Madurai in the west and Ramnathapuram in the south via Sivagangai and Manamadurai. Karaikudi railway line well connected to Chennai most of the train comes from Rameswaram, Kanniyakumari via Manamadurai stops here. Passing trains have average 5 minutes stoppage time. The Broad- gauge single Railway track connects to Manamadurai 61.5 Kms. The Broad-gauge single Railway line connects to Tiruchirappalli 89.7 Kms. The passenger train total 30 trains pass through Karaikudi junction. Also, 4 trains Origin from here and 4 trains Terminate

here. Passenger's trains such as Rameswaram Express, Chennai Express are pass through all days in a week. Pallavan express origin and ends here. The quantum of goods transported through railway is also considerably large.

Next important junction is Kottaiyur town panchayat is about 6.2 kms from the Karaikudi junction around 7 minutes travel time. This railway connectivity boost the development in the Kottaiyur which is act as sub urban of Karaikudi municipality.

Stations	No. of Platforms	Type of track	No. of Train Arrivals/ Departures
Karaikudi	5	Single Line Electrification	30 passing through / 4 origin and ends

Source: **Karaikudi Railway Station**

Table 8.4 Train Arrival and Departure

8.3 Existing Pedestrian and Bicycle Network

Walk remains to be the most neglected mode of travel in majority of the transportation studies carried out in India. It is because of the sheer nonexistence of basic minimum pedestrian facilities that most of the victims of urban road accidents turn out to be pedestrians. For the Karaikudi urban area, critical pedestrian locations have been identified.

The following Road and junctions are to be considered high movement of pedestrian:

1. Kovilur road (Old Bus stand to first beet junction, 2nd beat junction)
2. 2nd beat junction to Kallukatti road junction
3. Around Sri Koppudainayaki Amman Temple
4. Amman Sannathi theru
5. Puthu Santhai Patti
6. Sekkali road (2nd beet to Periyar statue junction),
7. Periyar statute junction to Pasumpon Thevar Junction
8. Periyar statute junction to College Road
9. Near New Bus Stand

10. Mudiyarasan Road (Pasumpon Thevar Junction to College Road Junction
11. Sekkalai Road (Near Kalanivasal Santhai)

Comprehensive pedestrian network plan to be prepared, and based on that pedestrian facilities need to be recommended at major locations.

In addition to these, provision of footpath along the primary network should be made mandatory. All signalized intersections should have pedestrian guardrails around along with zebra crossing to define pedestrian flow while negotiating any of the arms of an intersection. At the mid blocks, if pedestrian cross-flow is significant zebra crossing with blinkers is recommended to be installed.

8.4 Existing Road Transportation Network

The National Highway and State Highway radiating from the Karaikudi town are leading Major million plus cities in Tamil Nadu. NH 536 runs across the Karaikudi CLPA north and south. NH 536 connects Madurai on the west via Tirupathur. NH 536 connects Tiruchirappalli via Pudukkottai on the north and SH 28 connects Karraikudi and Pudukkottai in the North. SH 29 connects Aranthangi on the north eastern side via Sakkottai and Thiruppathur in west. NH 536 connects Ramanathapuram on the southeast via Devakottai. Also, SH 29 connects Manamadurai via Sivangangai district headquarters on the south western side. The SH 35 connects Kalayarkovil on the south via Kallal. SH The other roads are interlinking important settlements within and surrounding the town villages.

The area under Transportation use in Karaikudi CLPA is about 2.54 Sq.km which is 18.79% of total area of the CLPA and roads cover an area of about 5.4 sq. km. Karaikudi CLPA is a growth pole of Karaikudi CLPA, it geographical location in the middle it connects all places with easy access via SH road, its spread across north, east and west. The old parts of the town grown around Koppudaiamman temple in radial pattern important commercial centres boomed from here across the main corridor of the town. And adjacent to that well planned grid-iron pattern where the New bus stand located in 100 feet road. The road density in the town is about 11.27 km / sq. km. The average width of the road is 5.5 m with carriage way 3.1 meter.

Indicator	Current situation	Benchmark
Road Density	11.67 Km/ Sq km	10.0-15.0 Km Sq.km
Per capita Road Length	1.78 mt	1.75 mt
% CC Road to Total Road Length	2.24%	5.0%
%Municipal Surfaced Roads	99.98%	100.0%

Source: **Municipal Records , Karaikudi**

Table 8.5 Performance Indicator

8.4.1 Road Classifications

Based on the function and capacity, the roads in Karaikudi CLPA four categories of roads identified based on the functional hierarchy are:

1. Arterials,
2. Sub-arterials,
3. Collector and
4. Loca-lStreets

A. Arterial Roads:

The primary roads which facilitate traffic movement to the external area are the Arterial roads, Karaikudi CLPA has one National highways 536 runs across north to south and dividing towards west near Managiri. North towards Tiruchirappalli, West towards Madura and South towards Ramanathapuram.

B. Sub Arterial Roads:

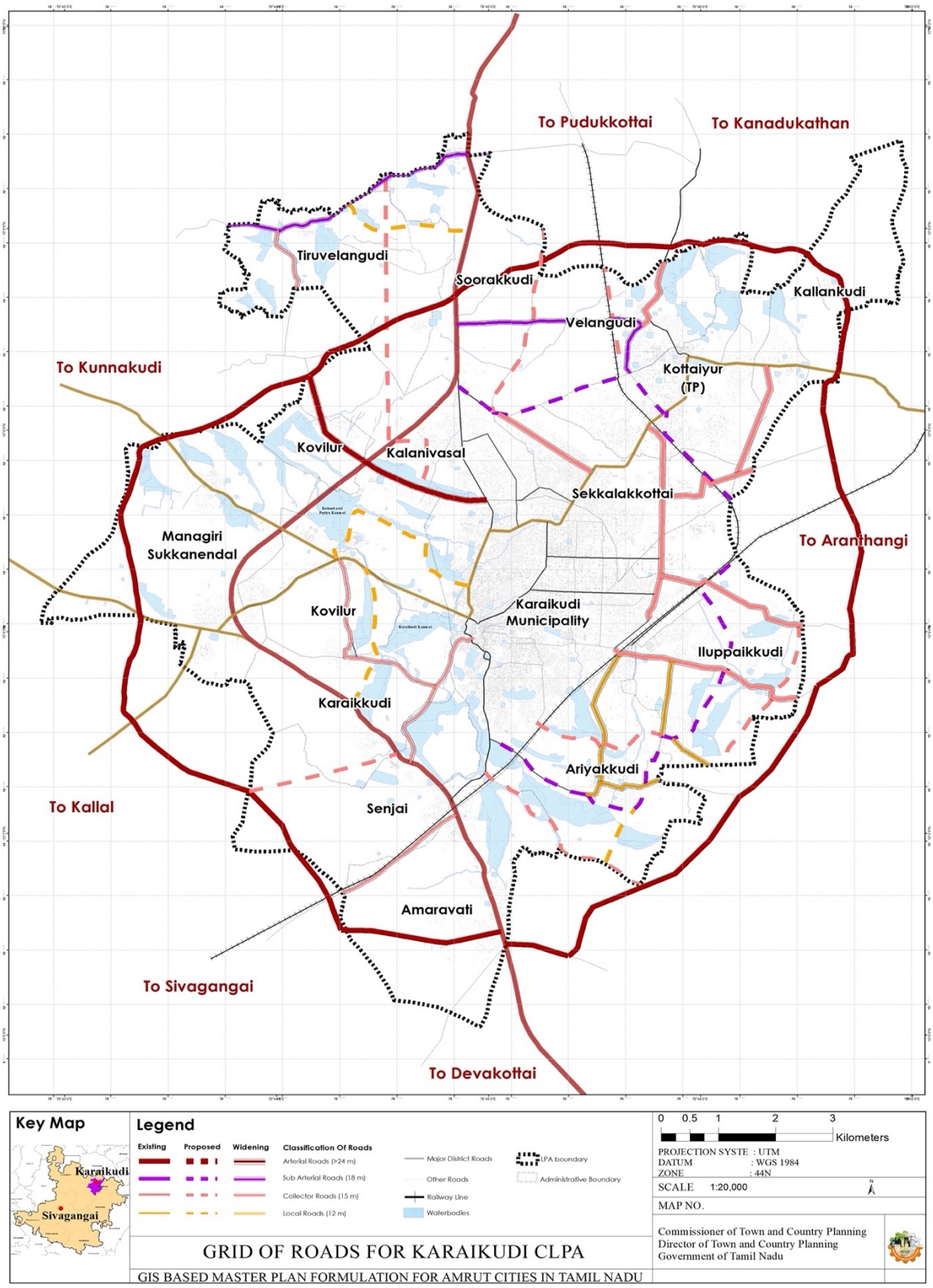
The major roads that carry a large volume of traffic to important urban nodes within the planning area, SH 29 and SH 35 runs across in east to west. In the east connecting to NH 536 and goes beyond towards Thiruppathur via Kovilpatti and the west connect Aranthangi via Kottaiyur and Sakkottai and in the North Kanadukathan, Via T. Soorakudi.

C. Collector Roads:

Collector roads are found in municipality and immediate surroundings, The major collector roads which channel traffic from the local roads to the arterial roads are. The same SH roads within the Municipality identified as collector road which are major road system within the town. this comprises of the following. The major roads are starts from important junction points those are Periyar statue intersection, Sri Koppudaiya Nayagi Amman Temple intersections, Junction of Kovilur road and VOC road (First beat junction), Pasupon Thevar Statue Junction of 100 Feet Road and Mudiyarasan Salai Road, Junction of 100 Feet Road and Railway Station Road, Junction of college road and Arunachalam Chettiar Road. (Pudukkottai road) Periyar road Intersection forms based on the following 5 roads 100 Feet Road in the east and Sakkalai road in the north east to south west and Annamalai Chettiar Road in north and Greens Road in the west these five-road junction is called Periyar statue road intersection. Sri Koppudaiya Nayagi Amman Temple Intersections form two intersections, that are 1. Junction of Sekkalai road and Kallukatti north road across Kovilur road. 2. Junction of Amman Sannathi Street and Kallukatti east road.

1. Periyar statue intersection to Kanadukathan Road
2. Hussain Arch to Hospital Road
3. College campus Road
4. College campus Road- Railway station road
5. First beat Junction of VOC road to Kalanivasal road (Kovilur road)
6. Sekkalai to Kalanivasal road
7. Periyar statue intersection to Siruvayal road
8. Kallukatti East and North Road
9. Keela Urani alround road
10. Chairman Meyyapa Chettiar street

D. Local Roads - The local roads that provide direct access to the properties in Karaikudi CLPA are in a grid pattern due to this high per capita road length is high.



Maps 8.1 Grids of Roads for Karaikudi CLPA

8.4.2 Traffic Flow

Traffic flow is determined by the Land use and Road network pattern in the town. Higher traffic flow between residential use and commercial or industrial use areas. In Karaikudi CLPA. Karaikudi Municipality is the major agglomerations of commercial and trading centers. This concentration of commercial centers and grid iron pattern increases the traffic flow. The above identified junctions have huge number of commercial and trade centers. In certain junctions' forms radial road pattern example Periyar Statue intersection it creates large number of trips. And Similar junctions near Sri Koppudai Nayagi Amman Temple, Sekkalai Road and Kallukatti North Road junction and 1st beat junction of VOC road to Kovilur road.

Kallukatti area has weekly market near the Sri Koppudaiya Nayagi Amman Temple and Puthu Chanthai Patti has a daily market and Periyar statue junction trade and commerce. This location act as centripetal and centrifugal of daily traffic flow. Apart from SH, present road pattern also makes a lot traffic pass through the town. All the regional traffic pass through the center because SH29 Which connects east region with western region traffic through Karaikudi central commercial area. The large lengthy water bodies in the western sides puts pressure on land availability and creates dense road pattern within town. Also, this waterbody and Railway track as barrier for development in western, Southern side it is challenging to plan ring roads / bye-pass roads.

The complexity of traffic in the town slow-moving and fast-moving vehicle puts pressure on current road capacity. The major roads traffic flow characteristics given in the **(Table 8.6)**

S. No	Name of the road	Length	Width of Carriage Way	Capacity	Peak hour	Volume/capacity ratio
		Km	M	PCUs	PCUs	
1	Kovilur Road	0.6	7	1,200	1,091	0.91
2	Sekkalai Road	1.74	6.2	1,063	1,021	0.96
3	V.O.C Road	2.22	6.2	1,063	786	0.74
4	Mela Oorani Road	0.48	3.6	617	382	0.62
5	Kallukatti North Road	0.12	10	1,714	753	0.44

Source: **CCBP Report 2007 and Karaikudi Municipality**

Table 8.6 Characteristics of Municipal Roads

The V/C ratio is found minimum on Kallukatti North Road at 0.44 while the maximum value of 0.96 was on Sekkalai road. The width of these major roads varies from 3.6m to 10m. The peak hour volume ranges from 382 PCUs Melur Oorani road to 1091 PCUs on Kovilur road. In current scenario volume of vehicle multiplied but the minimal improvement in the road capacity that has been detailed in following traffic analysis section.

8.4.3 Traffic Flow Analysis

The traffic volume survey is a pivotal tool for determining the amount of traffic moving on a road at a particular section during a specific time. The State Highway Department has conducted a volume count survey from 01.05.2017 to 18.05.2017 at various major intersections on SH 29, SH 35, SH191A, and Major District Roads (MDR), such as Kundrakudi to T.Soorakudi Road, T.Soorakudi to Karaikudi 1st beat junction, and College road.

According to a survey conducted by the State Highway Department, the following modal shares were identified in the Karaikudi CLPA. The modal share indicates the proportion of trips made using each mode of transportation. Private motorized vehicles such as cars, vans, jeeps and two-wheelers have a high modal share of 47.0%, indicating a strong preference for personal mobility. The share of freight vehicles is also quite significant at 22.8%, suggesting a thriving economic activity in

the town with freight movement between the town and its surroundings. This implies a need for free flow services and strengthening of road infrastructure. The relatively high percentage for cycles (15%) shows a positive trend towards sustainable and eco-friendly modes of transportation. It indicates that the Karaikudi CLPA is focused on promoting cycling for health and environmental benefits. The lower percentage of 6% for buses indicates a potential challenge in public transportation utilization. The modal shares of the CLPA area are given in the following **(Figure 8.1).**

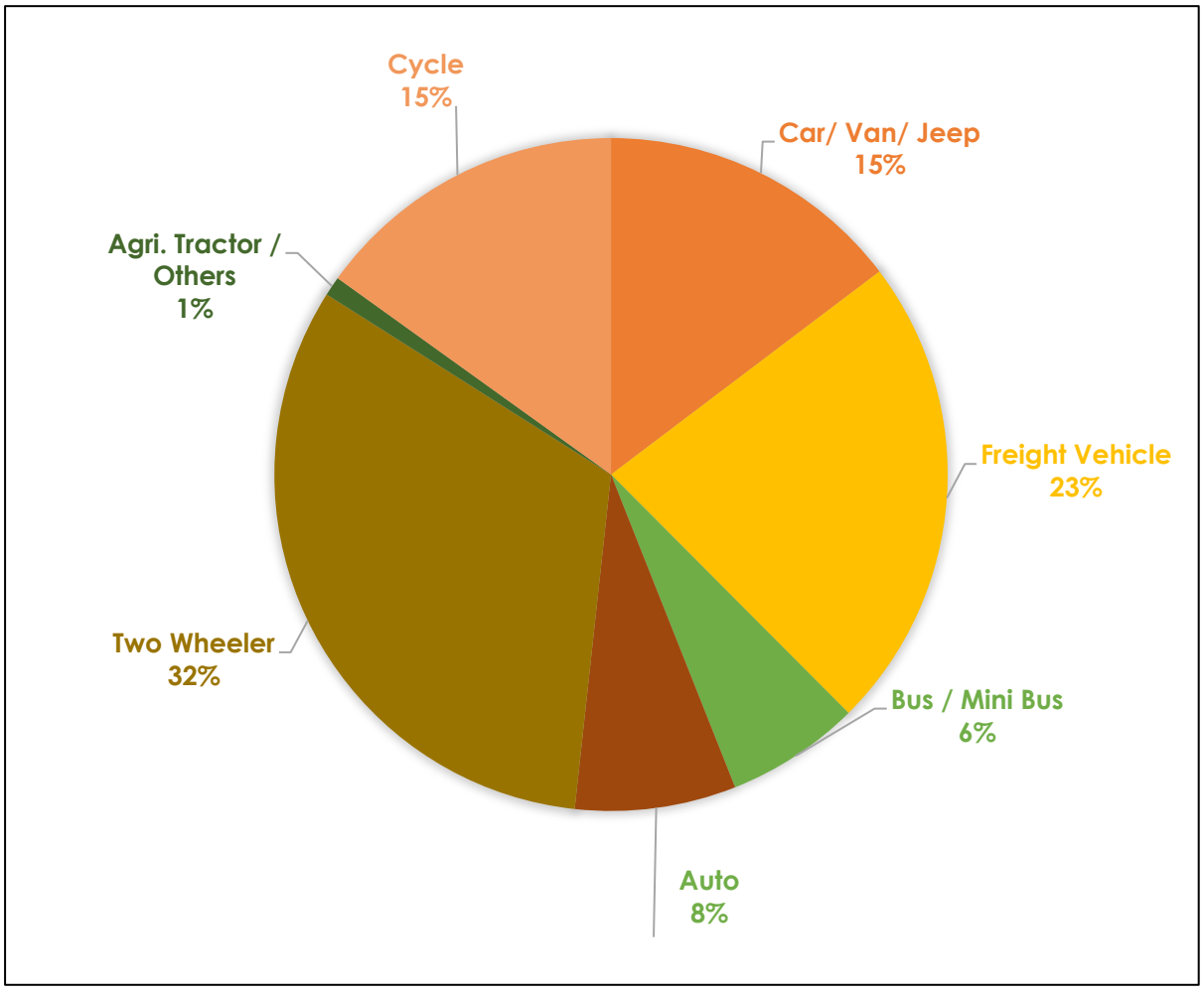


Figure 8.1 Transportation Mode Share Karaikudi CLPA - 2011

In the Karaikudi CLPA, the municipality area is only 13.75 sq. km, which represents approximately 11.88% of the total area of the CLPA. The majority of roads in Karaikudi CLPA are SH and MDR, which fall under the rural highways category. Therefore, the rural highway Road Capacity, Design Service Volume, Volume

capacity ratio (V/C ratio), and Level of Service (LOS) have been analyzed. According to IRC: 64-1990 and draft IRC: 73- 2020, the Capacity & Design Service Volume represents the maximum volume that can be accommodated on the road, and it depends on the vehicle operating speed or design speed and traffic density on the road. Additionally, the capacity of a road is also influenced by other factors, such as:

- carriageway width
- Pavement shoulder width and condition (Paved/unpaved)
- Directional split
- Road geometry (curvature and gradient)
- Pavement condition (roughness)

The CLPA Major SH roads in Karaikudi consist of a two-lane roadway with paved shoulders, plain terrain, and a low degree of curvature. The provision of hard shoulders enables slow-moving traffic to travel on the shoulder, thereby reducing interference to fast traffic on the main carriageway. This results in a 15% increase in capacity from the present Design Service Volume in a two-lane road of 15000 PCU/day and a four-lane road 35,000 PCU/day. The accompanying table shows the increased Design Service Volume in PCU/day and the V/C ratio of the Major roads in Karaikudi CLPA.

S.No	Type of Road	Location From	Location To	Weekly Average PCU per day	Design Service Volume per day	V/C ratio
1	SH29	Kanadukathan	Kottaiyur	17795	17250	1.03
2	SH29	Kottaiyur	Devakkottai Rastha via 2nd beat (Sekkalai Road)	17437	17250	1.01
3	SH U and NH365 part	Devakkottai Rastha	Amaravathi outwards LPA	17281	40000	0.43
4	SH29	From Outside Kandanur	Kottaiyur	8864	17250	0.51
5	SH29	Karaikudi	Managiri	14279	17250	0.83
6	SH29	Managiri	Managiri outwards	9179	17250	0.53
7	SH35	Kummangudi	Devakkottai Rastha	9890	17250	0.57
8	SH191A	Kundrakudi	Kovillur	10419	17250	0.60
9	MDR	Kundrakudi	T.Soorakudi	11354	17250	0.66
10	MDR	T.Soorkudi	Karaikudi 1st beat	34753	17250	2.01
11	MDR - four-lane dual roads	College Road Sekkalai Road Junction	College Road - Alagappa Chettiyar Statue	20654	40000	0.52

Table 8.7 Traffic Flow Analysis in Karaikudi CLPA 2021

8.4.4 Level of Service

The use of a highway is often measured by the Level of Service (LOS), which expresses the perceived quality of traffic flow by road users. LOS is defined across six levels, ranging from A to F, with A denoting the highest performance, indicating free flow, and F representing the worst performance, indicating forced or breakdown flow, where demand exceeds the capacity. It is not advisable to design the width of road pavement for a traffic volume equal to its capacity, which is available at LOS E, to ensure smooth traffic flow. Rural highways' design at present

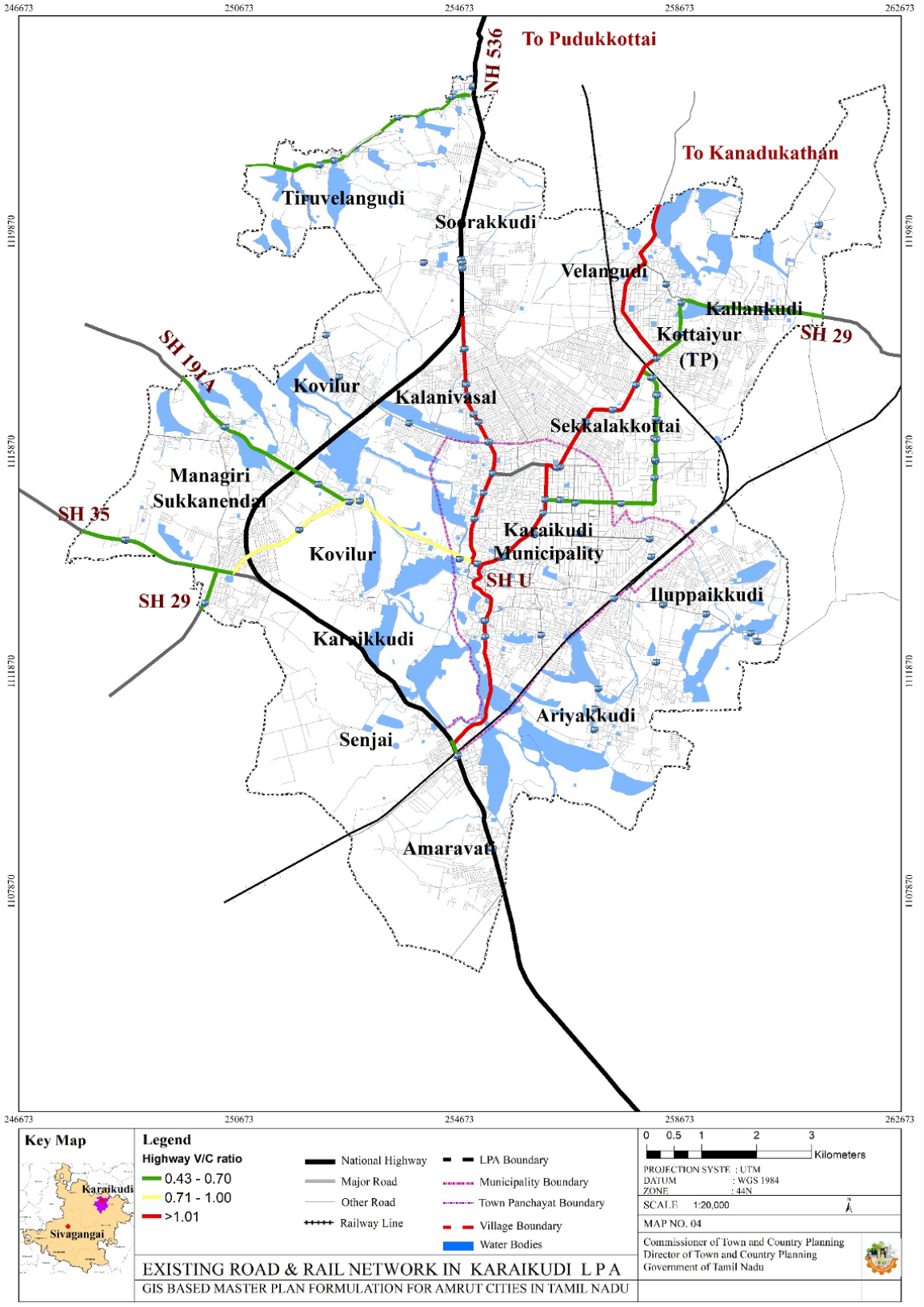
is considered adequate at LOS B when the Volume/Capacity (V/C) ratio is at 0.5, while up to LOS D is acceptable when the V/C ratio is 0.85. A V/C ratio less than 0.85 generally implies that sufficient capacity is available, and vehicles are not expected to encounter significant queues or delays. As the V/C ratio approaches 1.0, traffic flow may become unstable, and delay and queuing conditions may arise. Once the demand exceeds capacity (V/C ratio greater than 1.0), traffic flow is unstable, and excessive delay and queuing are expected.

An analysis of eleven roads reveals that eight of them have a V/C ratio indicating that traffic flow is without delay or disruption. The Kovilur road, extending from Karaikudi to Managiri, is about to reach the threshold level of V/C ratio 0.85, Operating conditions at or close to the capacity level, Operations at this level are usually unstable and small increases in flow or minor disturbances within the traffic stream will cause breakdowns. The other three major roads include the VOC road from Karaikudi 1st beat to T. Soorakudi, Sekkalai road, and Devakkottai Rastha road from Kottaiyur to Rastha railway junction via Karaikudi 2nd beat, Mela Oorani and Kallukatti road, and the Kanadukathan road from Kottaiyur to Kanadukathan. In these three roads traffic flow Forced/ breakdown, Amount of traffic approaching a point exceeds the amount that can pass it, Queue formation at such bottlenecks and substantial traffic delays leading to traffic jam condition. Karaikudi CLPA major roads traffic flow analysis, volume capacity ratio map, is presented in **(Map 8.1).**

Enhancing traffic flow and mitigating congestion in a town constrained by limited road widening possibilities in above mentioned roads. However, it necessitates careful planning and optimizing existing infrastructure. Transportation proposals are currently exploring various solutions to improve traffic dynamics. Key infrastructure enhancements include upgrading intersections, incorporating roundabouts at critical junctions, enhancing pedestrian and cyclist facilities, improving level crossings, and implementing efficient parking management.

To further alleviate congestion, the proposals suggest enhancing road network connectivity in peripheral areas. This involves fortifying existing roads and

introducing new ones to disperse traffic efficiently and reduce the strain on the



Maps 8.2 Karaikudi CLPA Major Road Traffic Flow

central town roads. These comprehensive measures aim to address traffic challenges within the town while maximizing the utility of the available infrastructure.

8.5 Traffic and Transportation Issues and Potentials

The population growth in most of the Indian cities is influenced by transportation network. In the case of Karaikudi, the location of strategically important National Highways, State Highway and Railway Station, have been important in the city's development. Key issues in traffic and transportation management are summarized below. The following issues are identified in the CCMBP report, and field observation delt in detailed and these problems are still persisted in the town.

1. Traffic and Transport management is more of a management issue
2. Encroachments and informal activities on major corridors of the town create congestion, especially in the old town area. The margins of the road and the footpaths are encroached in several sections by small time street vendors, illegal parking and other informal activities.
3. The main issue is good surfaced roads, major bus routes have paver blocks surface at considerable lengths and it affects the smooth flow of traffic.
4. Inefficient intersections, limiting the capability of any road network to serve traffic demand. Intersections in the city are not properly designed; a majority of them are skewed junctions, and higher grades of approaching links cause discomfort to drivers.
5. Heavy traffic movements and frequent congestion is seen on Kovilur road, Sekkalai road and Kallukatti East Road.
6. Railway tracts are intercepting the traffic flow at various places. Railway over- bridges will be required to cope with increasing traffic, and enable smooth connectivity between the surrounding town and villages.
7. Absence of raised footpaths and pedestrian crossing facilities on busy routes.
8. Haphazard on street parking of vehicles on Kovilur road from old bus stand to second beat junction and second beat junction up to Sri Koppudaiya Nayagi Amman Temple.
9. Most of the roads in Karaikudi town are functioning as one-way streets.

10. During night time the visibility is poor on most of the roads and at several junctions.
11. Lack of segregated roads creates absolute confusion and hazardous traffic movements.
12. Widening of carriage way of major roads which have more vehicular traffic and bus routes is to be carried out.
13. The public transportation facilities need to be improved considerably, in quantity and quality, so that it is attractive for a shift from private modes.
14. Traffic islands may be provided at important road Junctions and signals may be posted wherever necessary.

Congestion in Core Areas

The important road junctions are as follows :

1. Periyar statue intersection
2. Sri Koppudaiya Nayagi Amman Temple intersections forms two major junctions.
    a. Junction of Sekkalai road and Kallukatti north road (across Kovilur road)
    b. Junction of Amman Sannathi street and Kallukatti east road
3. Junction of Kovilur road and VOC road (First beat junction)
4. Junction of college road and Arunachalam Chettiar Road. (Pudukkottai road)
5. Pasupon Thevar Statue Junction of 100 Feet Road and Mudiyarasan Salai Road
6. Junction of 100 Feet Road and Railway Station Road

The above mention first 1 to 4 road junctions need improvements.

Periayar Statue junction is a 5 roads intersection can say a 5 corner junction. Other three junctions are four road intersections. Periyar junction, has traffic island all other junction does have proper traffic island facility. Except Junction of Amman Sannathi street and Kallukatti east road all other junctions have some improved facilities such as dividers at Periyar statute junction, Junction of Sekkalai road and

Kallukatti north road, Junction of Kovilur road and VOC road. However, that is not enough to flow the traffic smoothly.

Periayar Statue Island junction has alignment issue, meandering alignment has made the junction a bottleneck for the smooth flow. The construction beyond the culvert at Sekkalai road and Kallukatti north road, is a severe bottleneck to traffic flow. At the first beat intersection Junction of Kovilur road and VOC road of encroachments have lessened the width of the roads. In case of Amman Sannathi Street and Kallukatti east road, the road geometrics need to be revised to improve visibility.

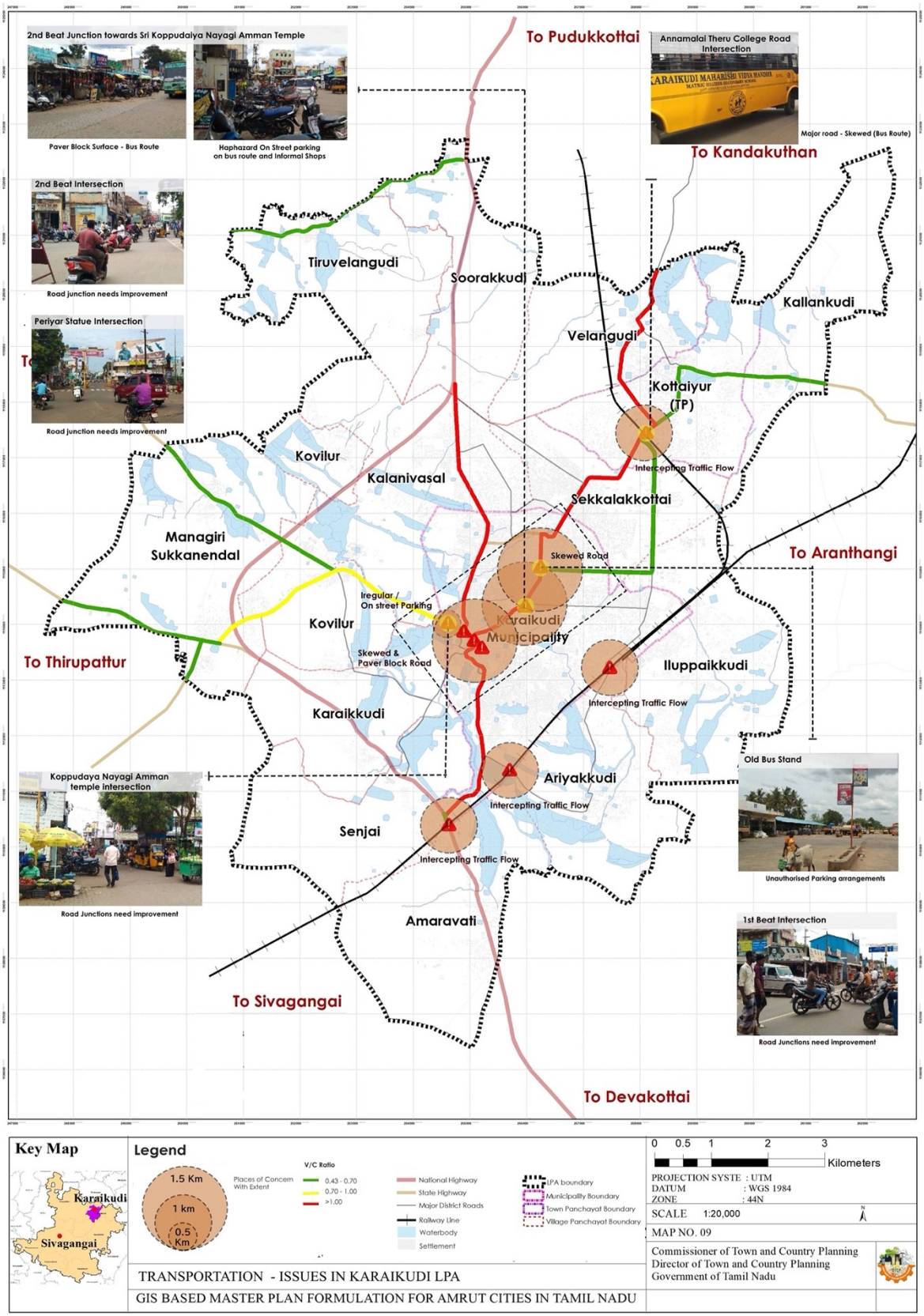
8.5.1 Issues in Parking Facilities

The city was not properly planned for parking facilities. This has been further aggravated by the development of commercial areas without the provision of sufficient parking facilities. The resulting on-street parking is, in turn, increasing congestion on roads. Many on street parking in major roads reduce the carriage width. Major bottlenecks created in the beside the junctions due to large number of auto rickshaw and taxi parking and merchants parking. Regularised parking facilities to be provided in the town. Parking regularisation to be done Kovilur road, First beat junction and old bus stand area. Area needs to be identified for multi storied parking facilities near main commercial centers

Road Junctions need improvements - 1st Beat Intersection

Road Junctions need improvements - 2nd Beat Intersection

<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>Road Junctions need improvements - Sri Koppudaiya Nayagi Amman Temple intersection</td><td>Road Junctions need improvements - Periyar Statue Intersection</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>Paver blocks surface – Bus Route – 2nd beat jucntion towards Sri Koppudaiya Nayagi Amman Temple</td><td>Haphazard on street parking on bus route and informal shops - 2nd beat jucntion towards Sri Koppudaiya Nayagi Amman Temple</td></tr>
<tr><td>  </td><td> 
</td></tr>
<tr><td>Old Bus Stand – unorganised Parking arrangements</td><td>Major road – Skewed Road (Bus route) at Annamalai theru in college road intersection</td></tr>
</table>



Maps 8.3 Transportation issues in Karaikudi LPA

8.6 Grid Of Roads

In Karaikudi CLPA road transportation has gradually increased over the years with improvement in connectivity between towns and villages. Karaikudi CLPA between towns and villages road network is a back born for passengers and freight transportation. As per IRC norms, an urban road network has been standardised as Arterial, Sub arterial, Collector Road, and Local Road. The roads are classified based on Road width and minimum distances. According to IRC norms, the Grid of Roads is formulated for Karaikudi CLPA to address the existing issues such as improper hierarchical road network, poor connectivity in the villages of Arterial and Sub arterial roads, and traffic congestion on major roads. To confront the above problems Grid of Roads is prepared for Karaikudi CLPA to improve road connectivity, and strengthen the supply between higher-order and lower-order roads which enhances the usage of road networks.

The IRC recommends that the arterial roads are spaced at 8km or more in the sparsely developed urban areas and the sub-arterial roads in the similar area spaced between 3 to 5 km. Similarly, the collector roads are spaced between 2 km. This would enable easy access to any arterials within a 4 km distance and sub arterials within a 2 km distance and Collector roads in a 1 km distance **(Refer Figure 8.2).**

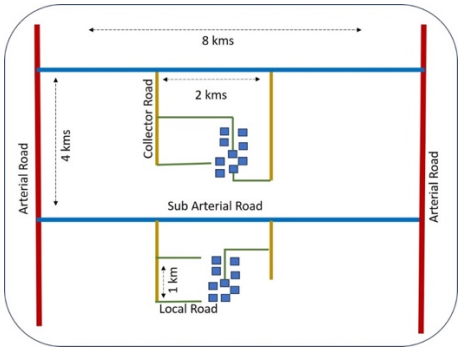


Figure 8.2 Presents the Conceptual Grid of Road Network

The Karaikudi CLPA roads are classified based on IRC standards according to present road connectivity and function, irrespective of the right of way width, carriageway width, or volume of traffic. **(Figure 8.2)** shows the existing road network pattern in Karaikudi CLPA.

8.6.1 Grid of Roads Network Plan

The grid of road network plan is prepared for Karaikudi CLPA to establish strong connectivity between the different functions of roads and which provides smooth traffic flows. The new road proposals are increasing the accessibility to villages with major roads and urban neighbourhoods which are expected to enhance the functioning road network. The new road developments are identified in peripheral areas where future development is expected and major connectivity is required for a long-term development perspective. The proposal for road widening is considered based on their functioning where major traffic flow is expected in the future, reducing the present traffic congestion and length/width of the road which is imperative for the hierarchy of roads to promote the Grid of Road Network. The connectivity issues are mostly spotted in villages like Ariyakkudi, Illupppaikkudi, and Sangamthidal in Kovilur. The absence of proper approach roads to the arterial and sub-arterial roads, and the inadequate width of public bus transportation roads are the common problems observed at the town level. To expand and enhance the present road network, new road proposals and widening of roads were identified, the development of Arterial Road, Sub Arterial Road under the State Highway Department, the development of Collector Road, and Local Road under local bodies.

8.7 Street Lighting

8.7.1 Existing Situation and Improvements

Street lights in the city total to 4,492 and are spaced at an average distance of 40 m. making the city 93.47% of the total street lights in the town are CFL / FTL of total street lights. The Tube lights and CFL lights contributes 89.41% which is less energy saving as compared to LED lights. High Mast Lamp has been placed at the strategic location like the Bus Stand, Periyar Statue Junction, Pasumpon Devar Junction, College Road and Railway Road intersection, And other important junctions. As per URDPFI guideline street lights has to be kept in 30m interval. So present street light systems need improvement.

Total No. of Lights	Nos	% of Lights
HHL (400 W)	72	1.60
Sodium Vapour Lamps (250 W)	200	4.45
LED lights (120 W)	96	2.14
Sodium Vapour Lamps (125W)	72	1.60
LED lights (80 W)	36	0.80
Tube Lights (40 W)	2,536	56.46
CFL Light (28 W)	1,166	25.96
4X24 CFL Light	314	6.99
Sub Total	**4,492**	**100**
High Mast Lamps	9	
Total	4,501	

Source: **Municipal Website Karaikudi**

Table 8.8 Street Lights in Karaikudi Municipality

Kottaiyur town panchayat has fairly good coverage of street light. However, the Tube total lights and CFL lights contributes 75.38% of total street lights and this is cost intensive compared to LED light and Solar lamp. So, present street light systems need improvement.

Total No. of Lights	Nos	% of Lights
Solar Lamps	15	1.15
LED lights (80 W)	80	6.15
CFL Light (28 W)	225	17.31
Tube lights (40 W)	980	75.38
Sub Total	**1300**	100
High Mast Lamps	4	
Total	**1304**	

Table 8.9 Street Lights in Kottaiyur Town Panchayat

In Karaikudi CLPA villages, the existing street lights system details are given in the following **(Table 8.9).**

S. No	Name of the Village in CLPA	Sodium Vapour Lamps (250 W)	High Mast Lamps	CFL	Tube Lights (40 W)	LED
1	Amaravathi	-	-	-		559
2	Ariyakkudi	1	-	-		692
3	Illuppaikkudi	1	1	372		418
4	Kovilur	-	1	26		242
5	Managiri	-	2	150		579
6	Sankarapuram CT - (Kalanivasal, Karaikudi, Senjai, Sekkalaikottai)	-	5	1361	759	2340
7	Thiruvelangudi (T.Soorakudi)	-	2	-		365

Table 8.10 Village wise Existing Street Lights in Karaikudi CLPA

8.8 Summary

Karaikudi city is well connected through all modes of transportation. To improve the inter region connectivity road carriage has been increased existing link road of Karaikudi to Melur via Tirupattur under CKIC project. This further demand for safe and viable public transport, increased road density and road network with designed section. It is observed that slow and speed moving traffic in the unmanned intersections further draws attention for need for traffic management. To avoid through traffic in the city and improve linkage with major highways the city road network is integrated with NH 536.

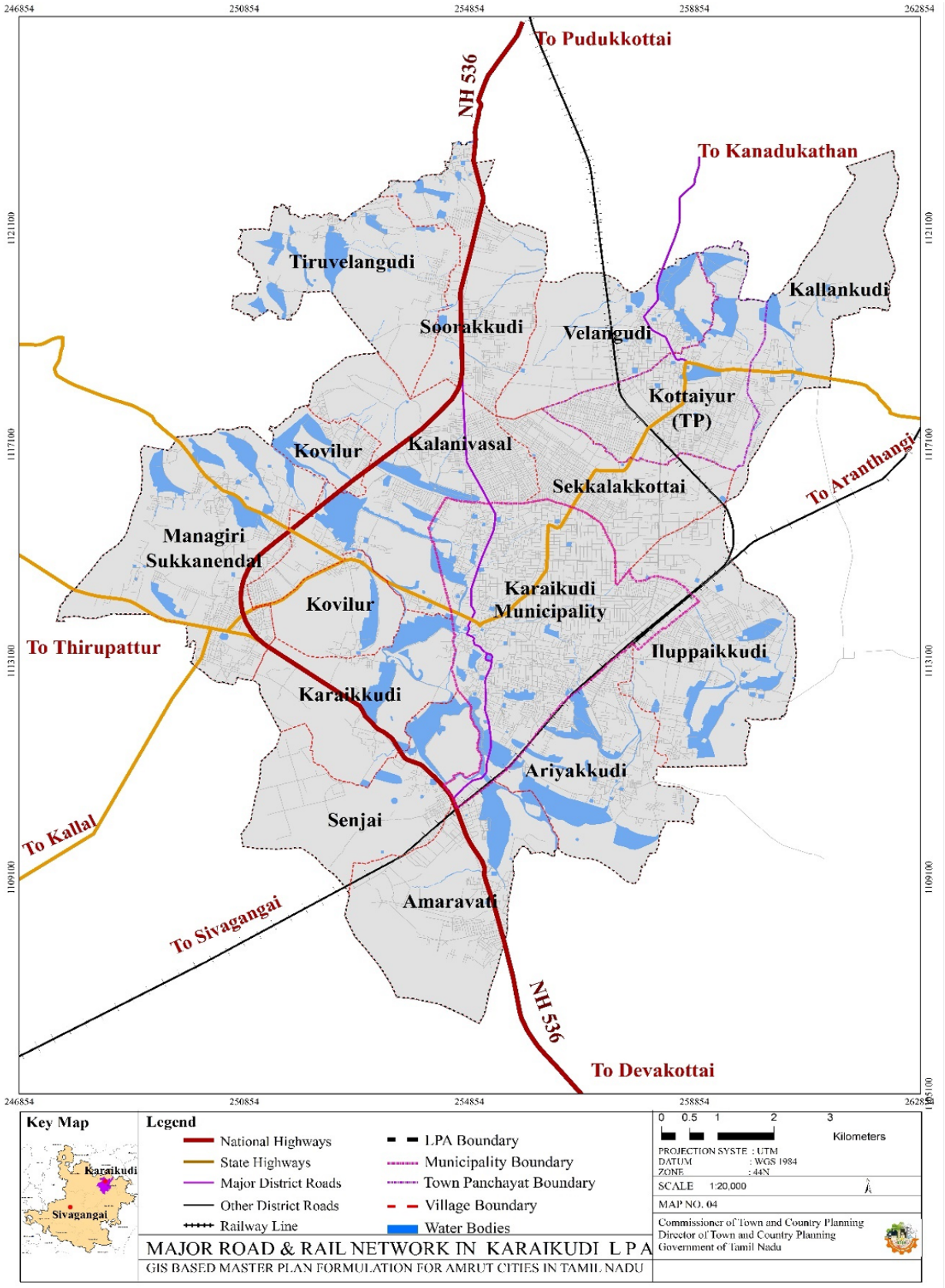
It is imperative physical redevelopment programs for existing links. In some cases, based on additional traffic demand in the future, the cross-section of existing links can be improved through marginal land acquisition. On many streets widening for wider right-of-way would result in significant land acquisition costs and delays due to intense abutting development. Thus, redevelopment of existing roads is proposed to be confined to alignments where improvements

within the existing right-of-way are possible, or where additional right-of-way is available. The 20 new roads are required for providing additional roadway capacity. Also, 13 roads upgrading existing links are proposed based on their envisaged hierarchy in the entire network system. It is observed that the development along the transit corridor has a major impact on the activity and economic patterns of the area.

In the Old City area indicate limited scope for capacity augmentation without land acquisition. However, ample scope exists for capacity enhancement of the network in the new Karaikudi area. In the present scenario, it is seen that in the old city road width affects the height and scale permissible for development within any given plot. By considering future population growth and optimisation of land resources it suggested to increase the FSI of eastern side planned area.

Transportation network is the major guiding factor for driving development. Commercial development is now oriented along the transport corridor. To reduce the congestion and parking problems more emphasis should be given on use of public transport. To enhance public transportation, it is required to integrate land use activities with mobility plan.

The connectivity of Arterial or Sub Arterial Road issues are mostly spotted in Villages like Ariyakkudi and Illuppaikkudi and Senganthidal in Kovilur. The absence of proper approach roads to the arterial and sub-arterial roads, and inadequate width of internal roads are the common problems observed at the city level. The grid of road network plan is formulated for Karaikudi CLPA to develop a strong hierarchical order of roads which ensures a smooth flow of traffic. The road development proposals identified as part of this study are the development of new roads & widening of the existing roads under Local bodies. The proposed new roads (83.0 km) cover Villages. There are 20 roads identified in Karaikudi CLPA for road widening and the total length of these roads is 79.19 km. The major roads widening which required accusations of settlements in Karaikudi Municipality are Illuppaikkudi Road connecting Kallukatti to Thottakadu, Devakkottai Rashtaha connecting Kallukatti to Devakottai Rastha Junction.



Maps 8.4 Transportation Network in Karaikudi CLPA

9 HOUSING

09

Housing is a key input for economic, social, and civic development. The main objective of master plan to identify and estimate the housing demand for the town also. Hence, a close study housing facilities available, type of housing needs to be analysed. Provision of appropriate residential areas concerning workplace, industrial area, and access to various facilities is also a key to a successful city development strategy for any urban area. The main purpose of the housing sector is to assist all people especially the houseless, economically weaker sections of the society, and to expand the supply of developed land for housing possibly through land use planning.

In the housing sector, various aspects such as housing type, housing condition, period of residence and ownership, housing stock, and housing requirements for present and future are discussed.

9.1 Household Size

Household size indicates number of persons living in a family. The Thiruvelangudi (T.Soorakudi) have the highest household size that is 4.31. In Karaikudi LPA, Karaikudi, Kottaiyur, Kalanivasal, Kovilur and Managiri has less population size. In this Karaikudi region, many residents settled in other countries like Dubai, Malaysia, and Singapore. They built a house here and gives it for lease or rent. This associated with rental accommodations are more in this area. This might be proximity of Higher Educational Facilities such as Alagappa University near Karaikudi and Nachiappa Swamigal Group of colleges in Kovilur. In Managiri have notable employment opportunity in Appolo Hospital, Water industry, Tiles Company, Mahendra car showroom, and also educational facility like Chettinadu School. Overall Karaikudi CLPA area has average family size of 3.93. **(Refer table 9.1)**

S. No.	Name of Villages/Town	Population in 2021	No. of households in 2021	Household Size in 2021
1	Karaikudi	1,34,148	34,575	3.88
2	Kottaiyur	20,057	5,166	3.88
3	Amaravathi	3,799	922	4.12
4	Ariyakkudi	9,685	2,406	4.02
5	Illuppaikkudi	8,777	2,198	3.99
6	Kovilur	6,430	1,687	3.81
7	Managiri	6,009	1,546	3.89
8	Sankarapuram CT (In the Census 2011 data, It includes population of Kalanivasal, Karaikudi, Senjai, Sekkalaikottai)	43,964	11,349	3.87
9	Thiruvelangudi (Thiruvelangudi)	4,466	1,035	4.31
10	**CLPA Total**	**2,37,334**	**60,884**	**3.90**
11	**Urban in CLPA**	**1,54,204**	**39,740**	**3.88**
12	**Villages in CLPA**	**83,130**	**21,144**	**3.93**

Source: **Local Bodies**

Table 9.1 Household Size in Karaikudi CLPA 2021

9.2 Growth in Households

As per household projection for 2021, Karaikudi CLPA accommodates 60,884 households spread in the shape of various housing typologies, such as individual housing, plotted development, slums, and squatter resettlements in the city and village settlements. The household growth rate of Karaikudi CLPA from 2011-2021 is about 36.77%. After 2001 Kalanivasal, Karaikudi, Senjai, Sekkalaikottai villages had been merged with Sankarapuram Census Town (CT) which leads to an increase in household population. Faster growth of Trade & commerce

and industrial development in the Karaikudi and its immediate surroundings the nearby villages migrating to the CLPA. **(Refer Table 9.2)**

S. No.	Town/ Villages	Households in 2001	Households in 2011	Households in 2021	Growth rate (%) 2001-2011	Growth rate (%) 2011-2021
1	Karaikudi (M)	19,924	27,504	34,575	38.04	25.71
2	Kottaiyur (TP	2,626	3,803	5,166	44.82	35.83
3	Amaravathi	400	614	922	53.50	50.23
4	Ariyakkudi	845	1,376	2,406	62.84	74.87
5	Illuppaikkudi	885	1,334	2,198	50.73	64.77
6	Kovilur	854	1,295	1,687	51.69	30.22
7	Managiri	610	897	1,546	47.05	72.38
8	Sankarapuram CT (In the Census 2011 data, It includes population of Kalanivasal, Karaikudi, Senjai, Sekkalaikottai)	2,990	6,950	11,349	132.44	63.29
9	Thiruvelangudi (T.Soorakudi)	441	741	1,035	68.03	39.69
10	**CLPA Total**	**29,575**	**44,514**	**60,884**	**50.51**	**36.77**

Source: **Census of India**

Table 9.2 No. of Households in Karaikudi CLPA 2001-2021

The household growth rate of the urban area in the CLPA is compared with the rural area. **(Table 9.3)** shows that the household growth rate of the urban area in CLPA Karaikudi municipality is 25.71% and Kottaiyur town panchayat 35.83% which is lower than the growth rate in the rural area 60.09 %. There is wide spread of horizontal development going beyond the municipal area and this associated with availability of low-priced land for development in the

surrounding villages in CLPA. This may be linked to social prestige of Chettiars who built the larger houses.

Description	Households in 2001	Households in 2011	Households in 2021	Household growth rate (in %) 2001-2011	Household growth rate (in %) 2011-2021
Karaikudi Municipality	19,924	27,504	34,575	38.04	25.71
Kottaiyur Town Panchayat	2,626	3,803	5,166	44.82	35.83
Villages in CLPA	7,025	12,847	21,144	88.01	60.09
CLPA Total	**29,575**	**44,154**	**60,884**	**50.51**	**36.77**

Source: **Census of India**

Table 9.3 Household Growth rate in Urban and Rural areas of the CLPA

9.3 Housing Typology

S. No.	Town/ Villages	No of households 2011	Pucca	% of share	Semi Pucca	% of share	Kutcha	% of share
1	Karaikudi	27,504	22,938	83.40	3,603	13.10	962	3.50
2	Kottaiyur	3,803	3,343	87.90	354	9.31	106	2.79
3	Amaravathi	614	577	93.97	28	4.56	9	1.47
4	Ariyakkudi	1,376	1,077	78.27	254	18.46	45	3.27
5	Illuppaikkudi	1,334	1,187	88.98	107	8.02	40	3.00
6	Kovilur	1295	983	75.91	234	18.07	78	6.02
7	Managiri	897	714	79.60	135	15.05	49	5.46
8	Sankarapuram CT (In the Census 2011 data, It includes population of Kalanivasal, Karaikudi, Senjai, Sekkalaikottai)	6,950	6,331	91.09	363	5.22	256	3.68
9	Thiruvelangudi (T.Soorakudi)	741	403	54.33	301	40.68	37	4.99
10	**Karaikudi CLPA**	**44,514**	**37,553**	**84.36**	**5,379**	**12.08**	**1,574**	**3.54**

Source: **Census of India**

Table 9.4 Housing Condition - Karaikudi CLPA – 2011

Karaikudi is known for its own design of architecture and it is tourist attraction too. Housing Condition has been analysed under 3 categories as Pucca, Semi Pucca, and Kutcha based on the material used for construction. The condition of houses in Karaikudi CLPA is predominantly Pucca which is about 84.36 % and had 12.08 % of Semi Pucca houses and 3.54 % of Kutcha houses **(Refer Table 9.4).** Though it has a lesser amount of Kutcha houses they are vulnerable to natural disasters. Kovilur, Managiri and Thiruvelangudi Villages have the highest number of Kutcha houses because these villages have a larger agricultural labours population. The large number of Kutcha houses are directly proportionate to Economically Weaker Section (EWS) and Low-Income Group (LIG) settlements in these villages. In these villages the share of EWS and LIG houses are 44.46 % to the total area of the CLPA.

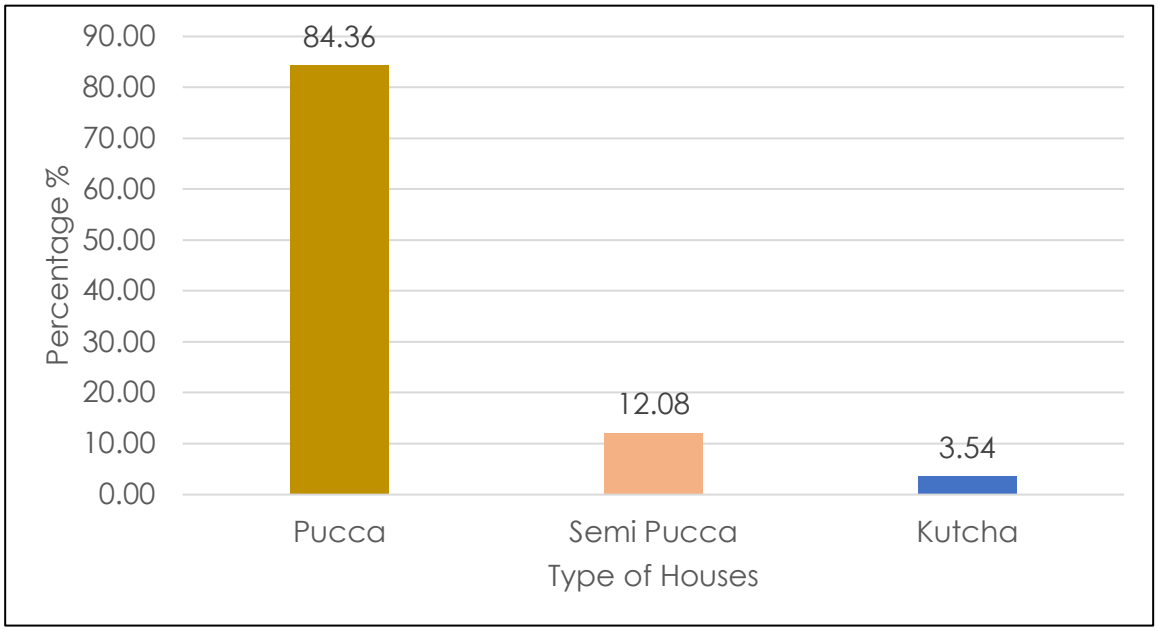


Figure 9.1 Housing Condition in Karaikudi CLPA – 2021

9.4 Housing Ownership

Housing tenure in Karaikudi CLPA is partially owned (57.33%) partially rental (41.10%), There is no much variation in the ownership. Other categories include leased houses (1.61%). The share of rental ownership is high in urban areas and immediate surroundings which shows that for education and employment

opportunities people migrated to the urban area and lived in rental housing. **(Refer Table 9.5)**

S. No.	Name of Villages/Town	No of households	Own	% of share	Rental	% of share	Others	% of share
1	Karaikudi	27,504	14,055	51.10	13,009	47.30	440	1.60
2	Kottaiyur	3,803	2,419	63.61	1,361	35.79	23	0.60
3	Villages in CLPA	13,207	9,048	68.51	3,926	29.73	253	1.92
4	**CLPA Total**	**44,514**	**25,522**	**57.33**	**18,296**	**41.10**	**716**	**1.61**

Source: **Census of India**

Table 9.5 Housing Tenure - Karaikudi CLPA – 2011

9.5 Housing Stock

The housing stock is analysed by classifying the houses into 4 categories based on the area. In Census 2011 the houses are classified based on the number of rooms in a house. Based on that house having no exclusive room is taken as EWS as it falls within 40.sq.m and one room is considered as LIG, two rooms and three rooms as MIG and four and above rooms as HIG. They are as follows,

- EWS- less than 40 Sq.m
- LIG- 40 to 60 Sq.m
- MIG- 60 to 90 Sq.m
- HIG- more than 90 Sq.m

The share of MIG houses (46.78%) is higher in Karaikudi CLPA followed by LIG (33.89%), EWS (10.57%), and HIG (8.76%). In terms of EWS and LIG houses, the concentration was more in Kovilur, Ariyakkudi and Amaravathi villages the reason for this can be a higher concentration of agriculture and other labours in the above villages. **(Refer Table 9.6)**

S. No.	Town/ Villages	Total Households 2011	EWS	% of share	LIG	% of share	MIG	% of share	HIG	% of share
1	Karaikudi	27,504	2,695	9.80	10,039	36.50	12,432	45.20	2,338	8.50
2	Kottaiyur	3,803	338	8.89	1,289	33.89	1,894	49.80	281	7.39
3	Amaravathi	614	98	15.96	175	28.50	300	48.86	41	6.68
4	Ariyakkudi	1,376	270	19.62	417	30.31	591	42.95	98	7.12
5	Illuppaikkudi	1,334	144	10.79	414	31.03	583	43.70	193	14.47
6	Kovilur	1,295	315	24.32	585	45.16	359	27.71	37	2.86
7	Managiri	897	62	6.91	404	45.04	399	44.48	32	3.57
8	Sankarapuram CT (In the Census 2011 data, it includes population of Kalanivasal, Karaikudi, Senjai, Sekkalakottai)	6,950	672	9.67	1,543	22.20	3,934	56.60	802	11.54
9	Thiruvelangudi (T.Soorakudi)	741	111	14.96	220	29.66	333	44.88	77.80	10.50
10	**Karaikudi CLPA**	**44,514**	**4,705**	**10.57**	**15,086**	**33.89**	**20,825**	**46.78**	**3,900**	**8.76**

Source: **Census of India**

Table 9.6 Housing Stock - Karaikudi CLPA – 2011

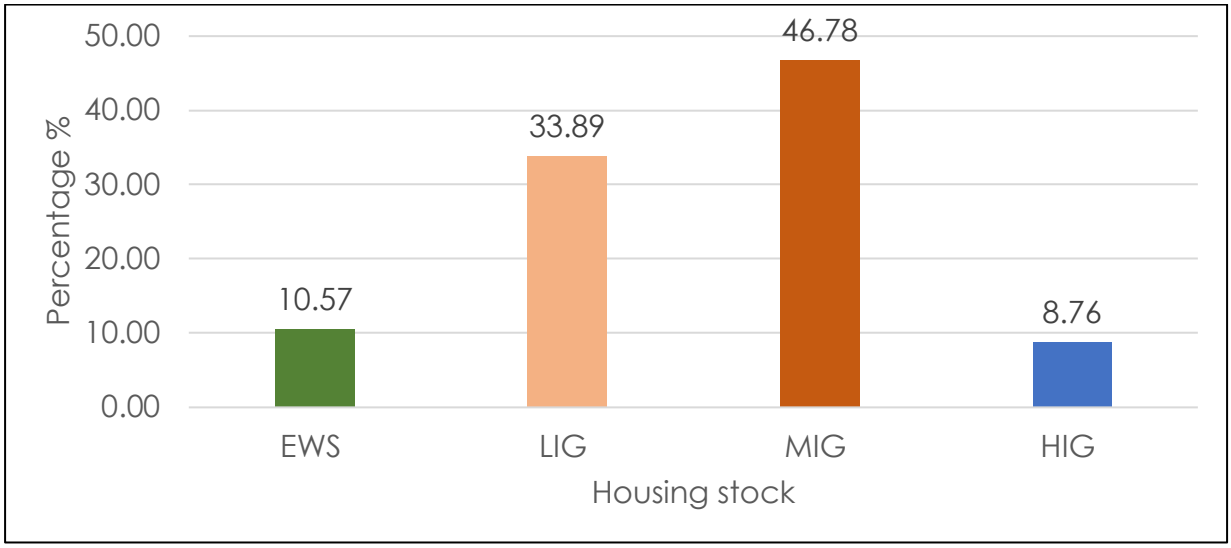


Figure 9.2 Existing Housing Stock in Karaikudi CLPA – 2021

9.6 Urban Slums

Slums are defined based on the condition of the area and the buildings. An area, which is described as a source of danger to the health and safety of the people living in the area and its neighbourhood and buildings, which are considered as unfit for human habitation.

The term squatter describes a wide range of low-income settlements or poor living conditions. Slum at its simplest definition is a heavily populated area characterized by substandard housing and squatter. In the last decade, slum upgradations are executed under schemes and policies like JNNURM, and PMAY.

The Urban Slum Population of Karaikudi CLPA decreased during 2001-2011. Karaikudi CLPA had 28,082 urban slums population in 2001 and in 2011 is about 25,663. The share of the slum population in Karaikudi municipality was about 30.04 % in 2001 whereas in 2011 it is decreased to 20.24 %. In Kottaiyur it was about 19.0 % in 2001 whereas in 2011 it is increased to 27.54 % **(Refer Table 9.7).** Karaikudi municipality has 17 slums in western side. These slums classified into two types notified and non-notified and the share of slums are 13 and 4 respectively. In the urban area of Karaikudi CLPA marginal reduction in the slum population during the interdecennial period may be due to the improvement or redevelopment of slums.

S.No	Name of Slum	Notified	Households 2011	Population (Approx) 2011
1	Annanagar	Yes	825	3,357
2	Avvaiyar Street	Yes	117	457
3	Ganesapuram	Yes	155	585
4	Jeeva Nagar	Yes	355	1,491
5	Kalanivasal	Yes	814	3,160
6	Kalavaippottal	No	607	2,345
7	Kilaoorani	Yes	197	802
8	Kurichikanmaai	No	107	408
9	Maruthupandiyar Nagar	Yes	142	522
10	Meenachipuram	Yes	135	563
11	Pannanthoppu	Yes	511	2,037
12	Pappa Oorani	Yes	181	760
13	Ramakrishna Street	No	191	1,166
14	Sathya Nagar	Yes	125	525
15	Servar Oorani	Yes	155	644
16	Vaithiyalingapuram	No	339	1,311
17	Veerayyan Kanmaai	Yes	350	1,464
	Total	**13 + 4**	**5,306**	**21,597**

Source: **Census of India 2011**

Table 9.7 Urban Slum Population and share of Slum Households - Karaikudi Municipality 2011

As per Karaikudi municipality record, the current slum population is 21,674, and Households is 5,406 which is slightly increased from 2011 to 2021. The Share of slum population is 17.85 % of the total population of Karaikudi municipality.

Kottaiyur town panchayat has 5 slums. **(Table 9.8)** has slum details, all 5 slums are notified. In the urban area of Kottaiyur town panchayat increase in the slum population during the interdecennial period. It indicates the rehabilitation and resettlements scheme not implemented properly.

S.No	Name of Slum	Notified	Households 2011	Population (Approx) 2011
1	Gandhi Nagar	Yes	400	1,656
2	Kallangudi Arisan Colony	Yes	63	252
3	Sokkanathapuram	Yes	326	1,011
4	Karumaravar street	Yes	120	372
5	Muthirai Kudiyiruppu	Yes	250	775
	Total	**5**	**1,159**	**4,066**

Table 9.8 Urban Slum Population and share of Slum Households - Kottaiyur Town Panchayat 2011

S. No.	Description	Karaikudi		Kottaiyur		Karaikudi CLPA Total
		2001	2011	2001	2011	2011
1	Total Population	86,596	1,06,714	10,633	14,766	1,21,480
2	Total Households	19,924	27,504	2,626	3,803	31,307
3	Number of Slums	17	16	05	05	21
5	Total Slum Population	**26,013**	**21,597**	**2,069**	**4,066**	**25,663**
4	%Share of Slum Population	30.04	20.24	19.00	27.54	21.13
6	Total slum household	**6,883**	**5,306**	**443**	**1,159**	**6,465**
	%Share of Slum households	34.55	19.29	16.87	30.48	20.65

Source: **Census of India and Analysed**

Table 9.9 Urban Slum Population and share of Slum Households - Karaikudi CLPA 2001 & 2021

Tamil Nadu Urban Habitat Development Board has proposal for resettlement around 900 tenements. Tender finalised at Board, construction yet to be started in Kalanivasal.

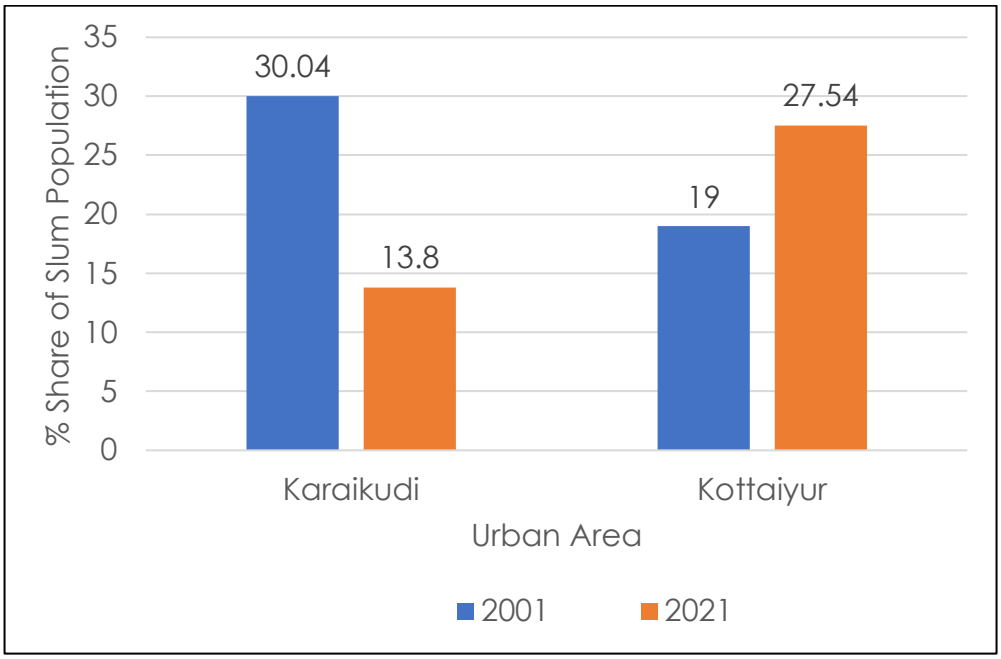


Figure 9.3 Share of Slum Population in Urban Area Karaikudi CLPA – 2021

Pradhan Mantri Awas Yojana Scheme addresses urban housing requirement among the EWS/LIG and MIG categories including the slum dwellers by ensuring a Pucca house to all eligible urban households by the year 2021. 297 dwelling units have constructed under PMAY scheme in Karaikudi urban CLPA. **(Table 9.10)** shows the number of houses developed under the PMAY (Urban) Scheme in Karaikudi CLPA.

Name of the Urban area	Houses Sanctioned	Houses Grounded	Houses Completed	Total number of Beneficiaries
Karaikudi	1,470	441	238	5,880
Kottaiyur	46	46	26	184
Villages in CLPA	216	68	33	864
CLPA total	1,732	555	297	6,928

Source: **Ministry of Housing and Urban Affairs, GOI and Village Panchayat**

Table 9.10 House Proposed Under PMAY (Urban) in Karaikudi CLPA

In the rural area 32 dwelling units have constructed under PMAY scheme in Karaikudi rural CLPA. **(Table 9.11)** shows the number of houses developed under the PMAY (Rural) Scheme in Karaikudi CLPA.

S. No.	Name of the Urban area	Houses Sanctioned	Houses Grounded	Houses Completed
1	Amaravathi	7	7	-
2	Ariyakkudi	12	12	2
3	Illuppaikkudi	7	7	-
4	Kovilur	81	8	7
5	Managiri	57	25	22
6	Sankarapuram CT - (Kalanivasal, Karaikudi, Senjai, Sekkalaikottai)	45	2	2
7	Thiruvelangudi (T.Soorakudi)	7	7	-
8	**Total villages in CLPA**	**216**	**68**	**33**

Source: **Village Panchayat Office**

Table 9.11 Houses Proposed under PMAY (Rural) in Karaikudi CLPA

9.7 Houseless Population

A total Houseless population sourced from Census 2011; However, a total houseless population number may be higher. Census 2011 Houseless population defines that person or family do not live in a 'census house,' which refers to a 'structure with roof.' The share of houseless Population of Urban areas in Karaikudi CLPA is very negligible (0.01%) of the total population So while providing housing for the future Population only the additional Population and slum population should be given more priority. **(Refer Table 9.12)**

Name of the Town	Total Population 2001	Houseless Population	Number of Households	% Share of Houseless population
Karaikudi	1,06,714	7	3	0.01
Kottaiyur	14,766	0	0	0.00

Source: **Census of India**

Table 9.12 Share of Houseless Population in Karaikudi Urban Area – 2011

9.8 Housing Issue and Potential

Karaikudi CLPA has 3.56% of houses are Kutcha houses they are vulnerable to natural disasters. Kovilur, Managiri and Thiruvelangudi villages have the highest number of Kutcha houses because these villages have a larger agricultural labours population. The large number of Kutcha houses are directly proportionate to Economically Weaker Section (EWS) and Low-Income Group (LIG) settlements in these villages. In these villages the share of EWS and LIG houses are 55.36 % to the total area of the CLPA. There is a potential for converting kutcha houses into pucca houses in the rural area under PMAY rural central government scheme. At present above mentioned 3 villages 145 houses sanctioned under this scheme and over all 1732 houses sanctioned in CLPA.

Slum settlements are major issues in the Karaikudi and Kottaiyur. It is noticed that Karaikudi has implementing Slum Rehabilitation and Resettlement Scheme rigorously. Karaikudi municipality has proposed for resettlement slum located in objectionable land such as waterbodies 10 slums were proposed relocated to Kalanivasal village near Aavin dairy. The list of lakes, three Kanmais in ward 1 Kaneri Kanmai, Athalai Kanmai and Manakkattu Kanmai, One Kanmai in ward 3 Kurichi Kanmai, One Kanmai in ward 9 Karaikudi Kanmai, Two Kanmais in ward 16 Veeriyan Kanmai, Kudikattanethal Kanmai, One Kanmai in ward 10 Aadithiravidar Kanmai and Two Kanmais in ward 17 Nattar Kanmai, Kudikattanethal Kanmai. Also, observed that Kottaiyur town panchayat not rigorously implemented slum rehabilitation and resettlements scheme. Census data revealed that increase of slum population in Kottaiyur. There is potential for housing development under Central Government PMAY urban scheme and TN Govt. R&R scheme-based resettlement and rehabilitation policy.

Rental ownership is another major issue, as per Census 2011, rental housing and leased houses are high as 42.81% (41.20 % and 1.61% respectively). The details of rental ownership delt in detailed in the Rental Housing Requirement section.

9.9 Housing Requirements

The housing requirement is analysed both in qualitative and quantitative aspects. In qualitative aspects condition of houses is taken into consideration and in quantitative aspects houseless population. As per census 2011, Karaikudi CLPA has 1,574 Kuccha Houses which is less than the Slum Houses of 6,565. So, the total slum houses have been considered for housing requirement in Karaikudi CLPA. The existing housing requirement in Karaikudi CLPA is about 4,463. **(Table 9.13 and 9.14)** shows the existing housing demand and future requirement in Karaikudi CLPA.

Description	Total houses 2011
Slum houses	6,565
PMAY Scheme sanctioned	1516
TUHDB proposal at Kalanivasal 2021	900
Slum houses 2021	**4,149**
As per census 2011 Dilapidated Houses	311
As per census 2011 Houseless Population households	3
Total requirement	**4,463**

Table 9.13 Existing Housing Demand

Description	Residential Area Requirement
Total Population 2021	2,37,334
Households in 2021	60,884
Projected Population 2041	3,98,140
Additional Population	1,60,806
Additional Households in 2041 (Avg. 3.9 HHs size)	41,232
Present housing requirement – 2021	4,463
TNHB proposed households	129
Total housing requirement – 2041	**45,566**

Table 9.14 Area required for Residential Development

Tamil Nadu Housing Board has constructed 813 households in Kalanivasal before 2021 for specific requirements such as police housing, SMT scheme, and houses acquired for NH, ABS, and LBS schemes. Also, 129 houses were proposed in Kalanivasal (HIG 32 nos, MIG 43, and EWS 51 nos).

Town/Villages	Existing Density	Existing residential area	Projected density 2041	Projected Residential area 2041	Residential area required 2041
	(Person/Sq.km)	(in Sq.km)	(Person/ Sq.km)	(in Sq.km)	(in Sq.km)
Karaikudi Municipality	9,756	6.13	14,146	8.88	2.76
Kottaiyur TP	1,001	4.64	1,572	7.30	2.65
Villages in CLPA	1,014	8.98	2,100	18.59	9.61
Total area required for residential use					**15.02**

Table 9.15 Area required for Residential Use

If present low-density pattern continues land area required for proposed residential use is 15.02 sq.km. This low-density sprawl has to be minimised by adopting growth management strategy in proposed land use.

9.10 Rental Housing Requiremnt

The share of rental ownership is high in urban areas, Karaikudi Municipality 48.9% and Kottaiyur 35.32% and immediate surroundings Sankarapuram CT (Kalanivasal) 40.65% which shows that for education and employment opportunities people migrated to the urban area and lived in rental housing. It was reflected in average family size of Karaikudi 3.88, Kottaiyur 3.88 and Kovilur 3.81, Sankarapuram CT 3.87 and Managiri 3.89 has less household size. Kottaiyur, Illuppaikkudi, Kovilur, Managiri and Sankarapuram CT has less sex ratio. It may also be associated with men's in the family who settled in another country and female members who stay here for completion children's school education.

The reason for high rental housing associated with proximity to the Higher Educational Facilities such as Alagappa University in Illuppaikkudi and Nachiappa Swamigal Group of colleges, Sri Kotravaleeswar Temple in Kovilur. In Managiri have notable employment opportunity in Apollo Hospital, Water industry, Tiles Company, Mahendra car showroom, and also educational facility like Chettinadu School.

The need of housing demand is catered by private house owners. The local body can tap this opportunity by providing rental accommodations. Also, promote rental apartments in the Karaikudi municipality and immediate surroundings.

9.11 Summary

Rapid urbanization combined with economic disparities has led to the increasing problem of housing, overcrowding in small houses, the steady growth of slums and unplanned settlements, and severe deleterious effect on civic services in urban areas. Villages having proximity to urban areas and major transport corridors have higher Household growth rates. The quality of houses in the overall CLPA is predominantly Pucca (84.58%). The share of Kuchha houses in the Villages which are prone to natural disasters is very little. The slum population in Karaikudi municipality has been decreased. Whereas, Kottaiyur town panchayat slum population is increased, So, proper implementation of the PMAY Scheme is required, in this regard strengthening of town panchayat through capacity building is necessary. The houseless population, Kuchha households, and dilapidated houses are taken into Consideration and the existing housing demand found to be nearly 4,463 houses.

10 PHYSICAL INFRASTRUCTURE

The main objective of AMRUT mission is create essential physical infrastructure. Quality of life in any urban area is very much conditioned by the level of availability, accessibility, quality of physical and social infrastructure. Physical Infrastructure is one of the most important driving forces for economic development. Efficient water supply systems, sewerage systems, solid waste collection, and disposal systems are essential for good urban health and for leading productive lifestyles. The rapid growth of the population generates a need for the augmentation of physical infrastructure. An overview of the existing scenario in Karaikudi CLPA is presented below followed by a future demand assessment

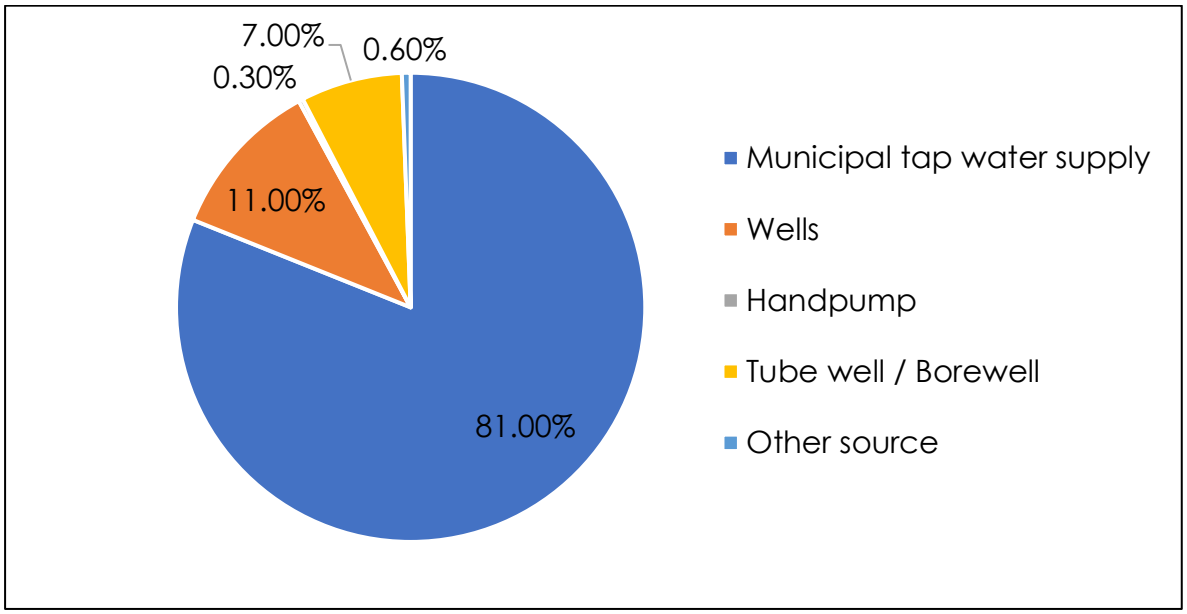
10.1 Water Supply

10.1.1 Source and Quantity

The existing quantity of water supply is collected from respected Local Bodies. The existing quantity of water supply for Karaikudi municipality is 12.03 MLD, as per TWAD Board Norms, the existing quantity of water supply is inadequate so to increase the supply existing source need to be augmented in the municipal area. In terms of Kottaiyur, the total quantity of water source available is 1.147 MLD. As per TWAD Board Norms, the existing quantity of water supply is inadequate for the existing population in Kottaiyur. In village total quantity of water supply is 4.20 MLD. As per TWAD norms the existing water supply quantity is adequate for Ariyakkudi and Thiruvelangudi villages. Whereas, other villages in Karaikudi CLPA are inadequate for present population.

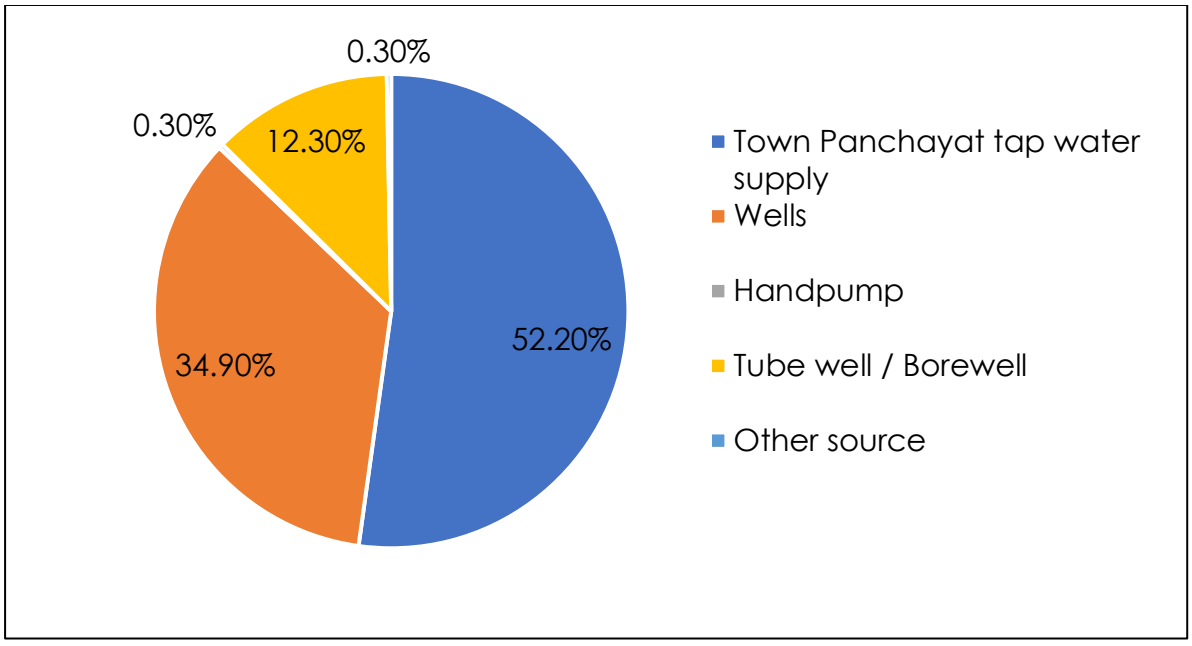
10.1.2 Mode of Supply

Karaikudi CLPA has different modes of water supply. In Karaikudi municipality (81%) and Kottaiyur Town Panchayat (52%) and villages (53%), the majority of the households receive water supply through Municipal tap water supply. Kottaiyur TP and Villages have approximately 50% Local Body tap water supply. **(Refer Figure 10.1-10.3).**



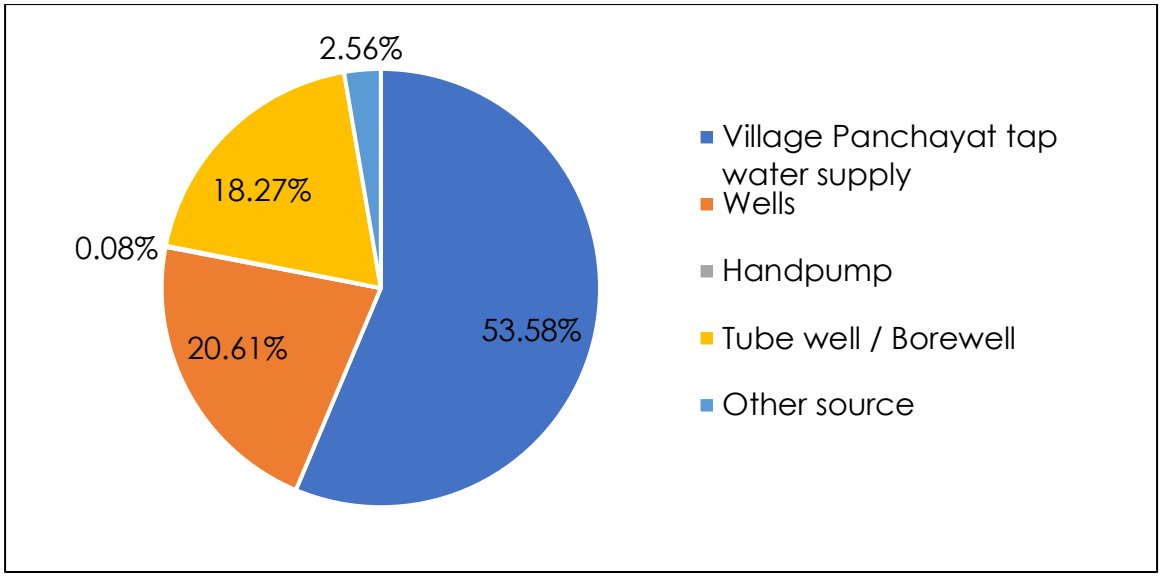
Source: **Census of India**

Figure 10.1 Mode of water supply in Karaikudi Municipality



Source: **Census of India**

Figure 10.2 Mode of water supply in Kottaiyur Town Panchayat



Source: **Census of India**

Figure 10.3 Mode of water supply in Villages in Karaikudi CLPA

10.1.3 Infrastructure for Water Supply

There are 3 locations where drinking water is extracted and distributed to Karaikudi municipality. Sambai Oorani is the major source of drinking water which is situated at 0.55 Km away from Old Bus Stand along Kovilur road. There is total 13 tube wells erected in Sambai Oorani. Other drinking water source are 2 borewells in Devakottai Rastha near Karpaga Vinayagar temple and 26 borewell within the city in 'O' Siruvayal road. There are 10 KLD capacity sump constructed along with Pumping Station at Devakottai Rastha. There are 10 Over Head Tank (OHT) located in various part of town to distribute drinking supply to Karaikudi municipality. As per municipal record distribution of water supply to households every day 2 hours in the morning from 6 am to 8 am. There are 14,575 individual household service connection and 353 public pipes were used to supply potable water. The total quantity of water supply is 12.03 MLD per day which is 113 LPCD for Population of 1,06,714. Whereas current population of 1,34,148 is 90 LPCD.

In Kottaiyur town panchayat has per capita water supply 70 LPCD with individual domestic connections 877, 8 Commercial connections and 875 public tap to serve the population of 20,057.

The village in Karaikudi CLPA, the existing per capita supply is 55 LPCD in Ariyakkudi and Thiruvelngudi, 45 LPCD in Amaravathi, Illuppaikkudi and Kovilur,

40 LPCD in Managiri and Sankarapuram CT. In the villages total quantity of 4.20 MLD per day drinking water extracted from borewell which is 43 LPCD for total CLPA village population of 96,700. There are 9,175 household service connections and 1400 public pipes and 40 hand pumps were used to supply potable water. The village wise water supply details given in the **table 10.1.**

10.1.4 Existing gap in water supply

The Tamil Nadu Drainage and Water Supply Board recommend a per capita water supply of 135 liters per capita per day for municipalities with an underground sewerage system, 90 liters per capita per day for Town Panchayat with an underground sewerage system, and 55 liters per capita per day for Villages.

S. No.	Description	Karaikudi Municipality	Karaikudi Town Panchayat	Villages in CLPA
1	Population (2021)	1,34,148	20,057	83,130
2	Floating Population	6,500	-	-
3	Coverage of water Supply connection	14,575	877	9'175
4	Per capita Supply (TWAD Board Norms)	135	90	55
5	Total quantity required (in MLD)	18.11	1.81	4.57
6	Existing Per capita supply (in lpcd)	90	57	51
7	Total quantity supplied (in MLD)	12.03	1.147	4.20
8	Existing demand (in MLD)	6.08	0.66	0.37
9	Water requirement for floating Population (40 lpcd)	0.26	-	-

Source: **Karaikudi Municipality, Kottaiyur Town Panchayat and TWAD Board**

Table 10.1 Existing gap in water supply-Karaikudi CLPA

10.1.5 Water Supply Issues And Potentials

In the physical infrastructure first and primary infrastructure is water supply. Karaikudi Municipality Kottaiyur town panchayat and surrounding villages are highly depending on ground water source. At present per capita water supply is inadequate. Karaikudi CLPA has different modes of water supply. In Karaikudi municipality 81% of the households receive water supply through Municipal tap water supply. Kottaiyur TP and Villages have approximately 50% Local Body tap water supply.

The municipal main source of Sambai Ootru has thread of contamination. Current development proximity to Sambai Ootru may affect the water quality because of inappropriate wastewater disposal. In the current administration set has less control and monitor the development. The Sambai Ootru and issues of contamination delt in detailed in the environmental chapter. The existing water sources needs to be augmented and water bodies need to rejuvenate, improved rainwater water harvesting system to developed and new sources must be identified to fulfil the existing demand and future need in water supply.

10.1.6 Water supply present demand and future need

The town and village wise water supply and existing demand and future need has been shown in the **table 10.2**.

S. No	Name of Villages/Towns	No of Public Water Supply taps	No of Hand Pump	Existing Per capita supply (in lpcd)	Total quantity required for 2021 (in MLD)	Total quantity required for 2031 (in MLD)	Total quantity required for 2041 (in MLD)	Total quantity supplied (in MLD)	Existing demand (in MLD)	CWSS projected quantity - 2031 Estimated from (Inter period 2036)	Additional requirement (in MLD) for 2031	CWSS projected quantity - 2041 Estimated from (Inter period 2051)	Additional requirement (in MLD) for 2041
1	**Karaikudi (M)**	14575		90	18.11	22.14	26.26	12.03	**-6.08**	2.88	**-7.23**	3.61	**-10.62**
2	**Kottaiyur (TP)**	877		57	1.81	2.32	2.84	1.15	**-0.66**	1.15	**-0.02**	1.79	**0.10**
3	Amaravathi	238	1	44	0.21	0.29	0.41	0.17	**-0.04**	0.15	**0.03**	0.25	**0.02**
4	Ariyakkudi	264	2	49	0.53	0.84	1.35	0.47	**-0.06**	0.29	**-0.08**	0.51	**-0.38**
5	Illuppaikkudi	368	5	50	0.48	0.75	1.19	0.44	**-0.04**	0.23	**-0.08**	0.39	**-0.36**
6	Kovilur	56	0	39	0.35	0.46	0.60	0.25	**-0.10**	0.23	**0.02**	0.39	**0.04**
7	Managiri	15	14	43	0.33	0.57	0.98	0.26	**-0.07**	0.08	**-0.23**	0.13	**-0.60**
8	Sankarapuram CT (In the Census 2011 data, It includes population of Kalanivasal, Karaikudi, Senjai, Sekkalaikottai)	124	5	49	2.42	3.43	4.46	2.14	-0.28	1.71	**0.42**	2.79	**0.47**
9	Thiruvelangudi (T.Soorakudi)	335	13	55	0.25	0.34	0.48	0.25	**0.00**	0.13	**0.03**	0.21	**-0.02**

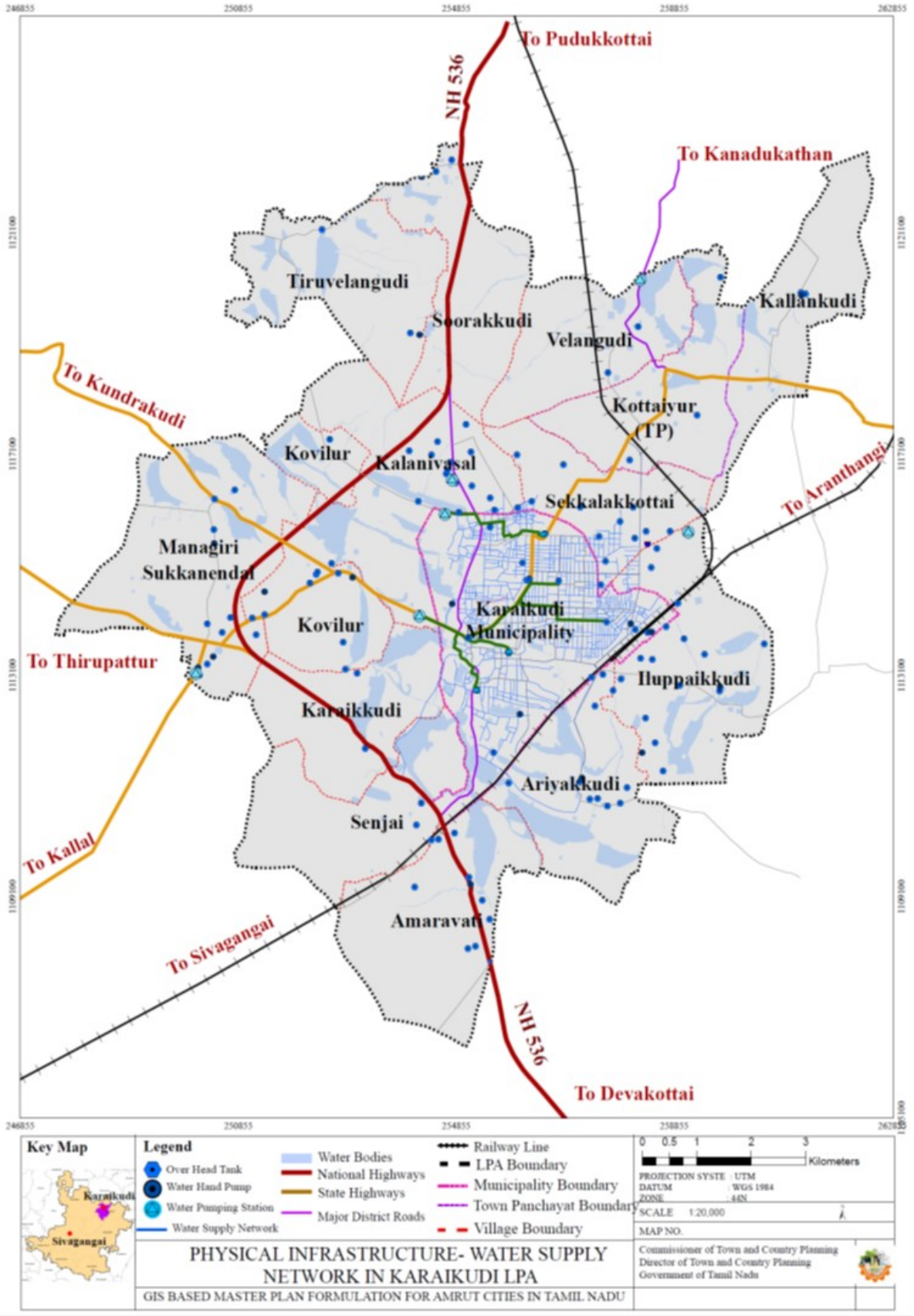
Table 10.2 Town and village-wise existing water supply demands for 2021 and requirements for 2041

As per the TWAD norms the per capita supply for Municipality, Town Panchayat and Villages are 135 lpcd, 90 lpcd and 55 lpcd. As per this norm the existing gap in water required quantity for Karaikudi municipality is found to be 6.34 MLD, Kottaiyur town panchayat water required quantity is 0.66 MLD and Villages water required quantity is 0.37 MLD. The existing water sources needs to be augmented and water bodies need to be rejuvenated or new sources have to be identified to fulfil the existing demand and future need in water supply.

S. No.	Description	Population 2021	Population 2031	Population 2041	Present Supply 2021 in MLD	Present Gap in MLD	Future demand for 2031 in MLD	Future demand for 2041 in MLD
1	Karaikudi Municipality	1,34,148	1,64,020	1,94,501	12.03	6.08	10.11	14.23
2	Karaikudi Town Panchayat	20,057	25,733	31,506	1.147	0.66	1.17	1.69
3	Villages in CLPA	83,130	1,21,364	1,72,134	4.20	0.37	2.48	5.27
	CLPA Total	**2,37,334**	**3,11,117**	**3,98,140**	**17.38**	**7.11**	**13.76**	**21.18**

Table 10.3 Existing water supply demands for 2021 and requirement for 2041 in Karaikudi CLPA

In Karaikudi Municipality, projected quantity additional requirement for 2041 population is 14.23 MLD and for 10,000 floating population is 0.40 MLD, the total 14.63 MLD is required, 1.69 MLD for Kottaiyur town panchayat, for villages is 5.27 MLD and Karaikudi CLPA total additional required quantity is 21.18 MLD.



Maps 10.1 Water Supply Network in Karaikudi CLPA

10.2 Sewerage And Sanitation

An Underground sewerage scheme was formulated for Karaikudi municipality.

10.2.1 Sewage generation and Treatment

In Karaikudi municipality Under Ground Sewerage Schemes is in under progress from 18.05.2017, TWAD board is the implementing agency. UGSS work yet complete. The total sewage generated from Karaikudi municipality, Kottaiyur Town panchayat, and Villages within Karaikudi CLPA are presently estimated 9.62 MLD, 0.92 MLD, and 3.36 MLD. Karaikudi Municipal area will have Sewage Treatment Plants with a total capacity of 16 MLD and about 90% of the municipal area planned to be covered with sewer network. The work progress is divided in two categories collection system and treatment system, construction of collection system 98% completed and 75% of STP construction completed. No of Household targeted to connect is 31,725 and presently household connection given for 17,438 which is 55.0%. The sewer line targeted is 144.653 km of road length and achieved is 144.618 which is 99.0%. Once STP construction is completed and become operational the targeted households' connections will be provided. Kottaiyur Town Panchayat and Villages have no sewage treatment facilities.

10.2.2 Access to Sanitation facilities

As per Census 2011, 81.4% of total households in Karaikudi CLPA had latrine facilities within their premises while 18.60% of the total households do not have latrine facilities within the premises. It may be observed that there is a direct correlation CLPA have pucca houses and access to the sewage system. In Karaikudi municipality, 12.20% of total households are living in slums and 13.70% of the total households had no access to latrine facilities.

S. No.	Name of the Town/Village	Total households in 2011	Households having latrine facility within the premises	% Share	Households not having latrine facility within the premises	% Share
1	Karaikudi	27,504	28,906	86.30	4,589	13.70
2	Kottaiyur	3,803	3,794	74.81	1,277	25.19
3	Villages in CLPA	12,974	14,591	73.98	5,131	26.02
4	**CLPA Total**	**44,281**	**47,291**	**81.70**	**10,997**	**18.30**

Source: **Census of India**

Table 10.4 Household sanitary facilities 2011-Karaikudi CLPA

As per Census 2011, The concentration of EWS and LIG groups in villages such as Kovilur, Thiruvelangudi, Managiri are higher which can be related to a greater number of households in the above villages does not have latrine facilities within their premises. Households which did not have latrine facility have been covered by SBM Individual Household Latrine (IHHL) and SBM Community Toilet and Public Toilet provisions. Karaikudi municipality and Kottaiyur town panchayat declared ODF on 17.10.2017 and as well as villages in Karaikudi CLPA. Karaikudi municipality has constructed 107 seats under CT/PT which serves 384 households (who do not have space for construction IHHL within premisses). All other households have IHHL within premisses. The Kottaiyur Town Panchayat and village wise IHHL and CT & PT coverage shown in the following tables 10.5 and 9.6. Kottaiyur Town Panchayat has individual latrine application 319 – 319 completed 47 has no space for construction.

In the village Panchayats Sankarapuram CT and Managiri have reported highest number of households not having individual latrine facilities. Sankarapuram CT reported 400 households has no space for construction of IHHL., in this area SBM community toilet has been constructed and served around 300 individuals. However, it is insufficient for required population.

S. No	Name of the Village in CLPA	Total Households not having latrine facility within the premises	Total Households Can't Provide Individual Household latrine (No Space)	Total Individual Household Latrine Application	Total Individual Household Latrine Sanctioned	Total Individual Household Latrine Completed
1	Kottaiyur (TP)	237	47	319	319	319

Source: **Kottaiyur Town Panchayat**

Table 10.5 Status of SBM for Household sanitary facilities 2021-Kottaiyur Town Panchayat

S. No	Name of the Village in CLPA	Total Households having latrine facilities within premises	Total Households not having latrine facility within the premise	Total Households Can't Provide Individual Household latrine (No Space)	Total Individual Household Latrine Application	Total Individual Household Latrine Sanctioned	Total Individual Household Latrine Completed
1	Amaravathi	1,979	19	19	-	-	-
2	Ariyakkudi	2,450	6	6	-	-	-
3	Illuppaikkudi	2,915	15	15	-	-	-
4	Kovilur	1,746	295	50	245	163	82
5	Managiri	1,426	985	85	900	900	900
6	Sankarapuram CT - (Kalanivasal, Karaikudi, Senjai, Sekkalaikottai)	15,026	1,276	400	876	876	241
7	Thiruvelangudi (T.Soorakudi)	1,455	10	10	-	-	-

Source: **Village Panchayats**

Table 10.6 Status of SBM for Household sanitary facilities 2021-Villages in Karaikudi CLPA

S.No	Name of the Village in CLPA	Total number Public toilet	Total number of Community toilet	Total Number of seats in Public toilet	Total Number of seats in Community toilet	Served Population by Public toilet	Served Population by Community Toilet
1	Kottaiyur (TP)	3	1	18	6	250	150

Source**: Kottaiyur Town Panchayat**

Table 10.7 Status of SBM for CT/PT Implementation status 2021- Kottaiyur Town Panchayat

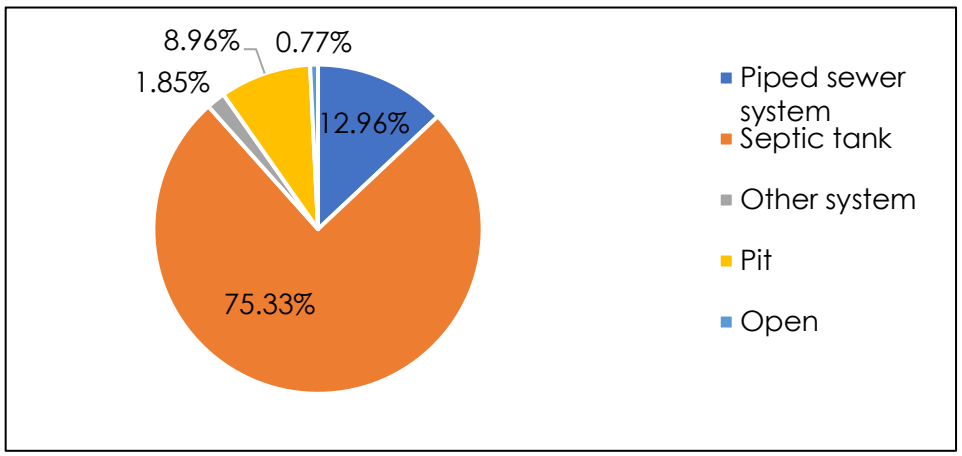
S.No	Name of the Village in CLPA	Total number Public toilet	Total number of Community toilet	Total Number of seats in Public toilet	Total Number of seats in Community toilet	Served Population by Public toilet	Served Population by Community Toilet
1	Amaravathi	1		6		26	-
2	Ariyakkudi	2	1	11	11	82	196
3	Illuppaikkudi	1	-	11	-	188	-
4	Kovilur	-	1 (IWSC)	-	6	-	50
5	Managiri	2	-	20	-	85	-
6	Sankarapuram CT - (Kalanivasal, Karaikudi, Senjai, Sekkalaikottai)	-	1	-	13	-	300
7	Thiruvelangudi (T.Soorakudi)	2	-	11	-	65	-

Source: **Village Panchayats**

Table 10.8 Status of SBM for CT/PT implementation status 2021-Villages in Karaikudi CLPA

10.2.3 Sewage Disposal System

The households having latrine facilities within the premises have different types of disposal systems such as Piped sewer system, Septic tanks, Pits, open-drain, etc. The majority of households in Karaikudi CLPA use septic tanks, followed by piped water systems in the Municipal area and Kottaiyur. Villages also use Pits for disposal of sewage.



Source: **Census of India**

Figure 10.4 Type of Latrine Facility within the Premises in Karaikudi CLPA

10.2.4 Existing gap in Sewage Treatment

Presently, Karaikudi municipality generates an estimated 9.62 MLD sewage (using population figures and estimated at 80 percent of water supply) and has an STP of the capacity of 16 MLD which indicates that the planned STP is sufficient for treating the total sewage generated in the municipal area. Kottaiyur town Panchayat generates an estimated 0.92 MLD sewage (using population figures and estimated at 80 percent of water supply) and Villages generate about 3.36 MLD of Sewage.

Description	Existing Water Supply (MLD)	Existing Sewage Generated (MLD)	Present Installed Capacity of STPs (MLD)	Present Gap (MLD)
Karaikudi Municipality	12.03	9.62	16 MLD (Construction progress)	Nil
Kottaiyur	1.147	0.92	-	0.92 MLD
Villages in CLPA	3.59	3.36	-	3.36 MLD

Source: **Karaikudi Municipality, Kottaiyur and Village Panchayats**

Table 10.9 Existing gap in Sewage treatment in Karaikudi CLPA

10.2.5 Sewage and Sanitation issues and potentials

Sewerage disposal is the major issue in the Karaikudi LPA, waste water disposed into nearby water channels. In Karaikudi municipality majority of HHs have individual septic tanks. The direct discharge of raw sewage into roadside drains or natural drains, in place where low income or economically weaker section lives. These road side drain and natural drains are connected with waterbodies, resulting in large scale pollution of existing natural water courses and waterbodies posing serious hazard. Currently, Karaikudi municipality has UGSS scheme is under implementation. Karaikudi Municipal area will have Extended Activated Sludge Process Technology (EASP) with a total capacity of 16 MLD and about 90% of the municipal area planned to be covered with sewer network. The entire scheme is designed by gravity. No lift station or pumping station is proposed for the collection system. The main pumping station proposed within the STP site that will be collecting entire municipality sewage and pump to the STP for treatment. Presently, household connection given for 17,438 which is 55.0% of targeted HHs of 31,725. Network. The sewer line targeted is 144.653 km of road length and achieved is 144.618 which is 99.0. However, along the water channel until arrest all insanitary toilets from HHs and establishment, this problem exists.

Kottaiyur town panchayat and villages does not have treatment system. Individual septic tanks are in use for collecting the night soil from toilets. However, the sullage water from kitchens, bathrooms, wash basins, cloth washing etc. is

directly discharged into existing road side open drains or an open land. Hence, decentralised treatment facilities to be proposed. Sankarapuram CT has reported lack of sanitation facilities. The community driven public sanitation system and individual centralised treatment facility to be established at Kalanivasal in Sankarapuram CT.

10.2.6 Sewage Treatment facility present demand and future need

The Villages / Town wise Sewage treatment facilities existing demand and future need has been shown in the **table 10.10.**

Description	Per capita supply TWAD board norm	Water Supply required (MLD) 2021	Estimated Sewage Generation (MLD) 2021	Water Supply required (MLD) 2031	Estimated Sewage Generation (MLD) 2031	Water Supply required (MLD) 2041	Estimated Sewage Generation (MLD) 2041
Karaikudi Municipality	135	18.37	14.70	22.46	17.97	26.26	21.01
Kottaiyur	90	1.81	1.44	2.32	1.85	2.84	2.27
Villages in CLPA	55	4.57	3.66	6.68	5.34	9.47	7.57
CLPA Total		**24.75**	**19.80**	**31.45**	**25.16**	**38.56**	**30.85**

Source: **Karaikudi Municipality, Kottaiyur and Village Panchayat**

Table 10.10 Estimated Sewage treatment capacity in Karaikudi CLPA

Description	Per capita supply TWAD board norm	Estimated Sewage Generation (MLD) 2041	STP - Present installing capacity in MLD	Additional capacity required in MLD
Karaikudi Municipality	135	21.01	16.0	5.01
Kottaiyur	90	2.27	-	2.27
Villages in CLPA	55	7.57	-	7.57
CLPA Total		**31.17**	**16.0**	**15.17**

Table 10.11 Projected requirement of Sewage Treatment Plant

Projected additional requirement for 2041 is 5.01 MLD in Karaikudi Municipality to be created as additional facility (Refer Table 10.11). As per TWAD board reports in Karaikudi Municipality, The STP is originally designed and sanctioned for ultimate requirement of 20.24 MLD in the original estimate. The present demand of 16 MLD has been satisfied for current demand. However, 0.77 MLD sewage treatment facility needs to be added additionally for future.

Kottaiyur town panchayat is 2.27 MLD and 7.57 MLD in villages and Karaikudi CLPA total is 15.17 MLD. At the Town Panchayat and Village level, there are no treatment facilities so Decentralized Wastewater Treatment Systems can be proposed Eg: DEWATS and FSTP with cluster town and villages. **(Refer Table 10.11)**

10.3 SOLID WASTE MANAGEMENT

Solid Waste management is an essential service that relates directly to public health and the environment. ULB is responsible for creating, operating, and maintaining infrastructure for the collection, storage, segregation, transportation, processing, and disposal of municipal solid wastes. Poor solid waste management has direct implications on the environmental health of the region and has a significant bearing on the quality of life of citizens. The concerned local body is responsible for waste management in their respective jurisdictions.

10.3.1 Solid Waste Generation, Collection and Transportation

Karaikudi CLPA generates about 89.01 TPD of Solid waste as per NEERI standards. Currently, the quantity of waste collected per day in the Municipal Area is 48.0 MT per day. It is estimated 395 gram per person per day. However, as per NEERI Standards it is calculated 500 gram per person per day, estimated quantity of waste generated per day in the municipal area is 68.37 MT per day. In Kottaiyur TP 3.20 MT per day collected and estimated quantity of waste generated per day is 4.01 MT. In Villages only 7.73 MT per day collected and estimated quantity of waste generated per day is 16.63 MT. 1.3 TPD from floating population. Composition of Municipal Solid Waste are 58% Biodegradable waste and 31% Dry waste, 11% silt. The large quantum of it is Biodegradable waste.

Source: **Karaikudi Municipality**

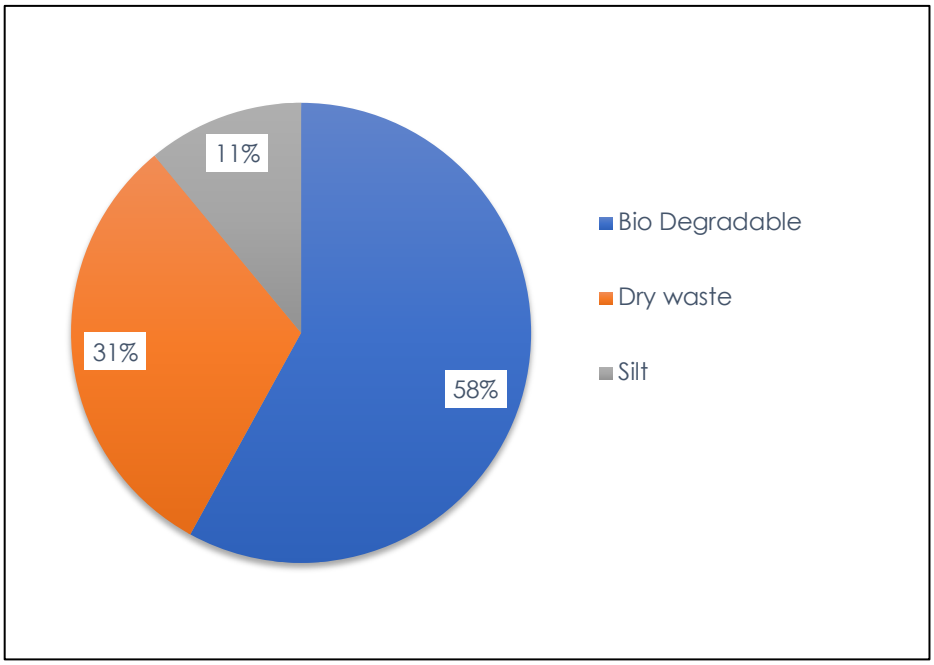


Figure 10.5 Solid Waste Generation

The door-to-door collection has been ensured for all 36 wards which are 100% of the households in the municipal area. The Source segregation is happening at the collection itself. The garbage segregation awareness has been done by Municipality through various media. And also, training given for Sanitary workers.

The garbage from street sweeping and door-to-door collection is kept in a nearby Municipal bin. Segregated waste from the 36 wards and the market waste was collected separately. The municipality has 5 sanitary inspectors, 11 sanitary supervisors, and field assistants under the supervision of the Municipal Health Officer to monitor the solid waste management system in the town. There are 130 municipal sanitation workers and 240 private sanitation workers involved in solid waste management work. About 81% source segregation is achieved. MSW is stored in the compost yard. For transporting the MSW to the compost yard following vehicles are used.

1. Truck 2 Nos
2. Auto tipper 8 nos
3. Compactor vehicle 2 nos
4. Compactor Bins 60 nos

Dump placer vehicles and bins are used to collect waste from private institutes. From March 2013 onwards for 13 wards and important streets waste collection and segregations are privatised. As single usage plastic waste was banned by the Tamil Nadu Government, Municipality took serious action and reduced the usage.

A total of 91 Bulk waste generators have been identified by the municipality. There are 2,479 commercial shops and 26,745 residentials were covered by door-to-door collections. The total waste collected is 48.00 MT per day. Quantity of solid waste is classified into two types Wet waste and Dry waste, 28 tonnes and 20 respectively.

Biomedical wastes are collected by private vendor Medicare Enviro System. These medical wastes are collected from all hospitals in the municipality and transported to a secured site and wastes are burned through incinerator.

In Kottaiyur town panchayat all 15 wards are covered by door-to-door collection which are 100% of the households in the town panchayat area. The Source segregation is happening at the collection itself. The SWM works have been carried out by 9 field assistants and 50 SHG members. Kottaiyur town

panchayat has 27 primary collection vehicles and 1 tractor, 1 tipper lorry one mini truck used for secondary collection. The total quantity waste collected is 3.20 MLD, in that Bio degradable waste is 2.091 MT, 0.76 MT is non bio degradable, 0.01 MT is plastic and 0.20 MT is silt.

The villages panchayats in Karaikudi CLPA, have door to door collection system. However, only partly coverage. The Government appointed sanitation workers (Called Thooimai Kavalargal) and private Self Help Group women are involved in the solid waste management. The total quantity waste collected is 7.73 MLD. The share of Sankarapuram CT is 6 MT of the total waste collected from villages in Karaikudi CLPA. The rest 1.73 MT collected from other 6 villages. The share of bio solids quantity is 2.24 MT which is 29.0%. Sankarapuram CT reported that only 750 kg of bio waste collected. This clearly indicates that door to door collection and source segregation is not done properly. The village level existing solid waste collection details shown in the **(Table 10.12).** The collection bins kept in the street at strategic location where waste littered by households. This waste collected through primary collection vehicles and transported to landfill sites and Bio solids composting unit. In village panchayats Solid Waste Management implemented under different schemes (under MGNREGS, SBM(G) and SWM Schemes). The work has been monitored through Village Poverty Reduction Committee (VPRC) and reported through online on daily basis.

S. No	Name of Villages	Domestic Waste Generation Per Day	Bio Solids	Non-Bio Degradable	Plastic	Silt	Others
1	Amaravathi	240 Kg	200 Kg	40 Kg	-	-	-
2	Ariyakkudi	320 Kg	300 Kg	20 Kg	-	-	-
3	Illuppaikkudi	450 Kg	350 Kg	20 Kg	-	50 Kg	
4	Kovilur	300 Kg	290 Kg	10 Kg	-	-	-
5	Managiri	210 Kg	200 Kg	50 Kg	10 Kg	-	-
6	Sankarapuram CT (In the Census 2011 data, It includes population of Kalanivasal, Karaikudi, Senjai, Sekkalaikottai)	6 MT	750 Kg	5.25 MT	5 MT	250 Kg	0.25 MT
7	Thiruvelangudi (T.Soorakudi)	210 Kg	150 Kg	50 Kg	10 Kg	-	-

Source **Village Panchayat**

Table 10.12 The village level solid waste collection

10.3.2 Treatment facilities

Karaikudi municipality treating solid waste by composting and has recycling. Karaikudi municipality has total 5 MCC's (1 under construction) each MCC has 5 tonne handling capacity. The quantity of wet waste processed through MCC's is 20 Tonne per day. Karaikudi municipality has 22 OCCs which are located across the municipality. These OCCs are handling 4 tonnes per day. Balance 4 tonne has been processed through home composite & fixtures. Total 28 tonne of wet waste is processed. Balance 20 tonne dry waste has 5.5 tonne plastic waste, the plastic waste disposes through vendor to cement factory. Other 12.5 tonne wastes are Glasses, Rubbers, Metals, Cloths dumped in landfill site. Another 2 tonne silt dumped in low lying area. Apart from the above Construction and demolition (C&D) waste of 6.5 tonne dumped in low lying area within Senjai Burial

Ground. Karaikudi Municipal area has a landfill site located Devekottai Rastha about total 13.7 acres municipality owned land.

Kottaiyur town Panchayat has a RRP of 1 acre and it is situated in near Aranthangi road to Pudukkottai Road interchange total 2.092 MT bio solids composting (100%), 0.03 MT manures produced every day.

In villages in Karaikudi CLPA have 1.78 MT bio solids composting units, 0.1 MT produced every day. In that, the share of Sakarapuram CT is 1 MT (1 MCC with 1 MT capacity). The villages panchayats in Karaikudi CLPA, has resource recovery park 16 acres. These sites are located within village boundary. The village level existing composting details given in the **Table 10.13.**

S. No	Name of Villages	Bio solids composting unit	Manure Produced in Kg	Landfill site / Composting Location name	Area Available in acre
1	Amaravathi	80 Kg	10 Kg	Pudhur	0.5
2	Ariyakkudi	120 Kg	20 Kg	Velan Nagar	5.0
3	Illuppaikkudi	180 Kg	30 Kg	Melasandiruppu	4.0
4	Kovilur	100 Kg	10 Kg-	Kovilur	0.5
5	Managiri	150 Kg	10 Kg	Thalakavur	0.5
6	Sankarapuram CT (In the Census 2011 data, It includes population of Kalanivasal, Karaikudi, Senjai, Sekkalaikottai)	1 MCC with 1 tonne capacity	Under construction	Rajiv Gandhi Nagar	5.0
7	Thiruvelangudi (T.Soorakudi)	150.0	20.0	V. Soorakudi	0.5

Source: **Village Panchayat**

Table 10.13 The village level existing composting details

10.3.3 Solid waste management issues and potentials

The solid waste management is a major concern for any local body. Karaikudi municipality is the largest producer in the CLPA. Municipality and Town Panchayat have arrangements for collection, segregation and treatment for bio solids and plastic wastes. Whereas, glasses, rubbers, metals and cloths dumped in to landfill sites without any treatment arrangements. Similar C&D waste also dumped in the unutilised area in the Senjai burial ground. In the development of current technology, there is potential for recycling the waste various ULBs demonstrated recycling of all type of non bio-degradable waste materials. in this regards Karaikudi has prospects for recycling and reusing non bio degradable wastes, including C&D wastes.

10.3.4 Solid waste treatment facility present demand and future need

As per municipal record the present existing land fill site and composting facilities in the municipal area is adequate to cater the existing population. For all the Villages Community waste disposal system should be proposed. Recycle and reuse concept needs to be implemented to minimize the waste generation.

Years	Population of Municipality	Domestic Waste Generation (In MT)	Area Requirement in acre	Area Available in acre	Existing Gap and Future Need in acre
2021	1,34,148	67.07	13.41	13.7	Nil
2031	1,64,020	82.01	16.40		2.70
2041	1,94,501	97.25	19.45		5.75

Table 10.14 Projected requirement of Treatment facilities in Karaikudi Municipality

Years	Population of Town Panchayat	Domestic Waste Generation (In MT)	Area Requirement in acre	Area Available in acre	Existing Gap and Future Need in acre
2021	20,057	4.01	2.01	1	1.01
2031	25,733	5.15	2.57		1.57
2041	31,506	6.30	3.15		2.15

Table 10.15 Projected requirement of Treatment facilities in Kottaiyur Town Panchayat

Years	Population of Villages in CLPA	Domestic Waste Generation (In MT)	Area Requirement in acre	Area Available in acre	Existing Gap and Future Need in acre
2021	83,130	16.63	8.31	16	Nil
2031	1,21,364	24.27	12.14		Nil
2041	1,72,134	34.43	17.21		1.21

Table 10.16 Projected requirement of Treatment facilities in Villages in Karaikudi CLPA

Projected solid waste management area requirement in 2041 is 5.75 acres in Karaikudi Municipality (it includes Avg. 10,000 population), Kottaiyur town panchayat is 2.15 acres. Kalanivasal and Managiri villages are required addition land area for solid waste management in 2041, that is 3.11 acres and 1.29 acre respectively. Arriyakkudi and Illuppaikkudi villages have excessive land area of 3.48 acres and 2.54 acres respectively. The village wise land area availability and requirements are given in the **table 10.17.**

S.No	Parameters	Amaravathi	Ariyakkudi	Illuppaikkudi	Kovilur	Managiri	Sankarapuram CT (In the Census 2011 data, It includes population of Kalanivasal, Karaikudi, Senjai, Sekkalai Kottail)	Thiruvelangudi (T.Soorakudi)
1	Population - 2021	3,799	9,685	8,777	6,430	6,009	43,964	4,466
2	Population - 2031	5,253	15,206	13,588	8,374	10,359	62,347	6,239
3	Population - 2041	7,369	24,595	21,627	10,905	17,857	81,066	8,715
4	Domestic Waste Generation (In MT) - 2021	0.76	1.94	1.76	1.29	1.20	8.79	0.89
5	Domestic Waste Generation (In MT) - 2031	1.05	3.04	2.72	1.67	2.07	12.47	1.25
6	Domestic Waste Generation (In MT) - 2041	1.47	4.92	4.33	2.18	3.57	16.21	1.74
7	Area Requirement in acre (2021)	0.38	0.97	0.88	0.64	0.60	4.40	0.45
8	Area Requirement in acre (2031)	0.53	1.52	1.36	0.84	1.04	6.23	0.62
9	Area Requirement in acre (2041)	0.74	2.46	2.16	1.09	1.79	8.11	0.87
10	Area Available in acre	0.5	5.0	4.0	0.5	0.5	5.0	0.5
11	Existing Gap in acre for 2021	Excess 0.12 acre	Excess 4.03 acres	Excess 3.12 acres	0.14	0.10	Excess 0.60 acre	Excess 0.05 acre
12	Existing Gap in acre for 2031	0.03	Excess 3.48 acres	Excess 2.64 acres	0.34	0.54	1.23	0.12
13	Future requirement in acr for 2041	0.24	Excess 2.54 acres	Excess 1.84 acres	0.59	1.29	3.11	0.37

Source: **Village Panchayat**

Table 10.17 Village wise projected requirement of Treatment facilities

10.4 Storm Water Drainage

At present not complete municipalities covered with constructed drainage facility. The city roads have pucca lined drainage facility only 54.27 % which is 101.24 Km. Remaining road length is 85.31 Km has either kutcha drains or no drain. Karaikudi Municipality The core area 13 wards had drain closed facilities 12 km. Drainage water outlets located Samuthiram Eri. City need proper drainage facilities. In Kottaiyur has 3 Km pucca storm water drainage. According to Town Panchayat immediate requirement of storm water drainage length is 5 km. The surfaced road in Kottaiyur is 78.71 Km. The surfaced road indicates development of an area. The estimate length of Storm Water Drainage requirement is 85.295 Km in Karaikudi municipality. In Kottaiyur 75.71 Km Road length required drainage facility.

10.4.1 Storm water drainage issues and potentials

Storm Water Drain (SWD) infrastructure needs to be augmented and strengthened. It is observed that mixing of sullage water from households directly connected with SWD. The existing natural drains (Odai's) are between potable water bodies in and around the town. Most of the road network in the town has storm water drains on either side of the roads pucca drain length is 101.24 Km and 85.31 Km has of kutcha drains or no drains. The Kutcha drain carrying the household waste water and there is possibility of polluting the ground water. These pucca and kutcha drains discharge storm water into the lakes (Urani's/ Kanmoi's) in the low-lying areas. The drains carry the wastewater in addition to the storm water generated during the monsoon, thus polluting the water bodies making them unsafe for potential use.

1. In addition, the storm water drains and natural drainage channels are susceptible to uncontrolled garbage dumping resulting in blockage and stagnation.
2. Silting, disposal of construction waste, solid waste dumping and encroachments on the banks of Odai and Urani's are interrupting the smooth flow of storm water.

3. All the water bodies and the tanks in the town had connecting flowing channels which have either got encroached upon or choked over the years of negligence and no maintenance.

In the Karaikudi Municipality, the following areas require strengthening of Primary drains viz., North Urani Street, Pillayar Coodam Street, Alagappan Street, Pugazhendhi Street, Marudhuapandiar Street, Sekkalai Thiyagarajan Chettiyar street, Arunachalam Chettiyar street, Pillayar Koil Street, Swaminathan Achari Street, Srinivasan Street, North lane 1,2,3, Middle lane, South lane etc. The town has converted most of the Kutcha drains into pucca drains still there is prospects for converting kutcha drain into pucca drain through various infrastructure development scheme.

10.5 Electricity

All settlements in Karaikudi CLPA have Electric city connections. Based on the estimated requirements of power supply as per the National Electricity Policy published in 2005, the recommended consumption is 2.74 kWh per capita per day demand which included domestic, commercial, industrial, and other requirements. The existing scenario of Karaikudi CLPA has been served by 6 Substations, 4 substations located within the CLPA and 2 substations situated outside the CLPA area. The following are the substation within CLPA, One of the substations 110 KV / 22KV capacity located within the municipal area name called Karaikudi substation, second one 110 KV / 22KV capacity located in Kalanivasal village, it called Kalanivasal substation, third one 220 KV / 22KV substation located in Kovilur village and fourth one 110 KV / 22KV located in Amaravathi village. And other two substations Kanadukathan substation and Sakavayal substation located outside CLPA are having 110 KV / 22KV each. The existing Substation can serve approximately 7,03000 population, these substations serve both within and outside CLPA area. The served area of the substations are given in the table 10.18 and 10.19. It is adequate for the present population and future population in 2041.

S. No.	Location of the substations	Capacity	Locations served within CLPA
1	Karaikudi	110 KV /22 KV	Karaikudi municipality, Sekkalakottai part, Kalanivasal part
2	Kalanivasal	110 KV /22 KV	Karaikudi municipality part, Sekkalakottai part, Kalanivasal part, Kottaiyur part, Velangudi part, Senjai part
3	Kovilur	230 KV /22 KV	Kovilur2 and Managiri
4	Amaravathi	110 KV /22 KV	Amaravathi, Senjai part, SIDCO industrial area, Sankarapuram, Ariyakkudi and Illuppaikudi part
5	Kanadukathan	110 KV /22 KV	Kottaiyur part, Thiruvelngudi, T. Soorakkudi, Kovilur1 and Velangudi part
6	Sakavayal	110 KV /22 KV	Illuppaikudi

Source: **TANGEDCO, Karaikudi**

Table 10.18 Substations served areas in Karaikudi CLPA

10.5.1 Electricity issues and potentials

In terms of electricity and energy, current sub stations capacity is sufficient to cater the future demand. The renewable energy such as solar and wind receiving attention of the Government. It is time for shifting the non-renewable energy to renewable energy. Karaikudi municipality is taluk headquarters and highest urbanised town and also largest consumer in the Sivagangai district.

S. No.	Parameters	Data
1	Population 2021	2,37,334
2	No. of substations existing	6 (4 within CLPA / 2 Outside)
3	Existing capacity of substation	5 - 110 KV / 22KV and 1 - 220 KV / 22KV
4	As per URDPFI guidelines	11 KV/15000 Population
5	Existing substation coverage	Existing substation can serve for 7,03000 population.
6	Existing gap / demand	Adequate
7	For Projected Population 2041 Karaikudi CLPA	3,98,140
8	Projected Demand	No additional requirement

Source: **TANGEDCO, Karaikudi**

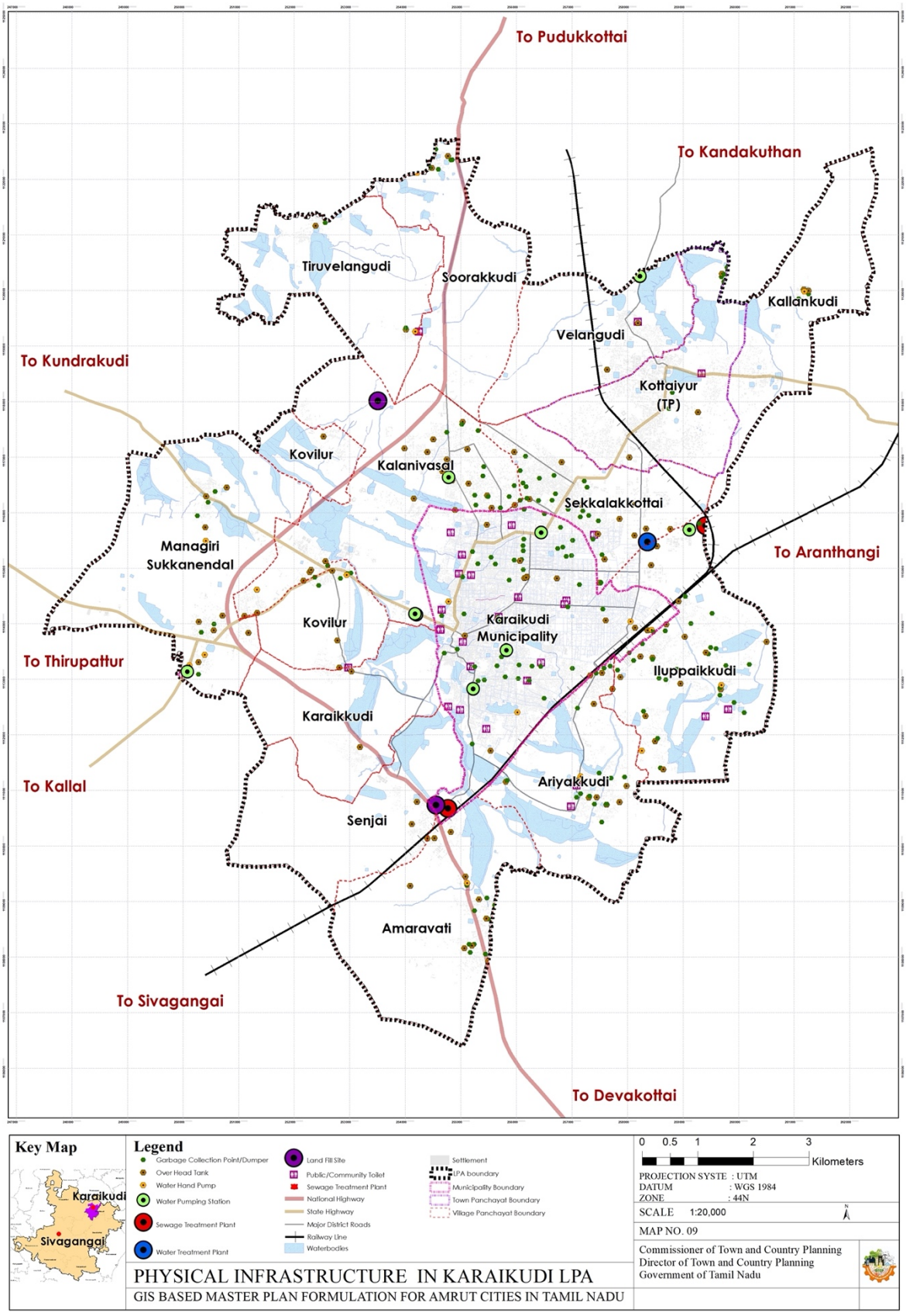
Table 10.19 Substation Gap Analysis Karaikudi CLPA

Master plan intent to identify appropriate land for implementing renewable energy project is prerequisite.

10.6 Summary

Physical infrastructure deals with Water Supply, Electricity, Sewage, Solid waste management, and Stormwater management. Access to basic amenities like drinking water, electricity, septic tank, or flush and toilet facilities are the major determinants of the quality of urbanization. In terms of Water Supply, the major source of Water supply for Sambai Oothu in Karaikudi As per TWAD Board norms, the existing gap in water supply for Karaikudi CLPA is found to be 7.11 MLD. Water supply present gap Karaikudi Municipality 6.08 MLD, Kottaiyur town panchayat 0.66 MLD and Villages 0.37 MLD. Karaikudi CLPA, the total additional water supply requirement is 21.18 MLD. Sambai Ootru and its catchments has to be protected from encroachment and contamination. The Capacity of STP in the municipal area is about 16 MLD. The existing STP is adequate to treat the existing Sewage

generated in Karaikudi municipality. Present gap in sewage treatment Kottaiyur and villages are 0.92 MLD and 3.36 MLD respectively. The existing landfill site in the municipal area is adequate to cater to the existing population whereas in Kottaiyur an additional dump yard 1.01 acre needs to be identified to fulfil the gap in solid waste generation and dumping facilities. **(Table 10.12)** reveals that Kalanivasal has no proper solid waste collection and segregation at the source is adopted. For all the Villages Community waste disposal system should be proposed. Recycle and reuse concept needs to be implemented to minimize waste generation. The Stormwater drain coverage of the road network needs to be extended. The existing water bodies need to be desilted to increase their capacity. Rain water harvesting to be done to meet the water demand for the existing and future population. Rain water harvesting and groundwater recharge are delt in detailed in the separate chapter. The capacity Power distribution for Karaikudi CLPA is found to be adequate and there is no additional capacity required for future 2041 population.



Maps 10.2 Physical Infrastructure in Karaikudi CLPA

11 SOCIAL INFRASTRUCTURE

Development of any community is closely linked with the provision of the basic facilities required for the healthy and proper development of the area contribute towards a good quality of life. It includes health provision, education, community facilities, youth, recreation, sports, faith, and emergency facilities. As the city grows rapidly, the need to amplify the number of social infrastructures is essential to develop strong and inclusive communities. Hence a rational distribution of social infrastructure has to be ensured in preparing a master plan for a town.

11.1 Educational Facilities

Development of any community is closely linked with the level of educational attainment. Hence, the provision of education facilities determinise the quality of living. Among the basic facilities, educational institutions play a vital role. Hence a rational distribution of educational institution has to be ensured in preparing a master plan for a town. The literacy rate of the Karaikudi CLPA is 80.53 in 2011. Karaikudi CLPA is slightly high compared with the State and District **(Refer fig 11.1**). The **tables 11.1** shows the literacy rate of Karaikudi CLPA.

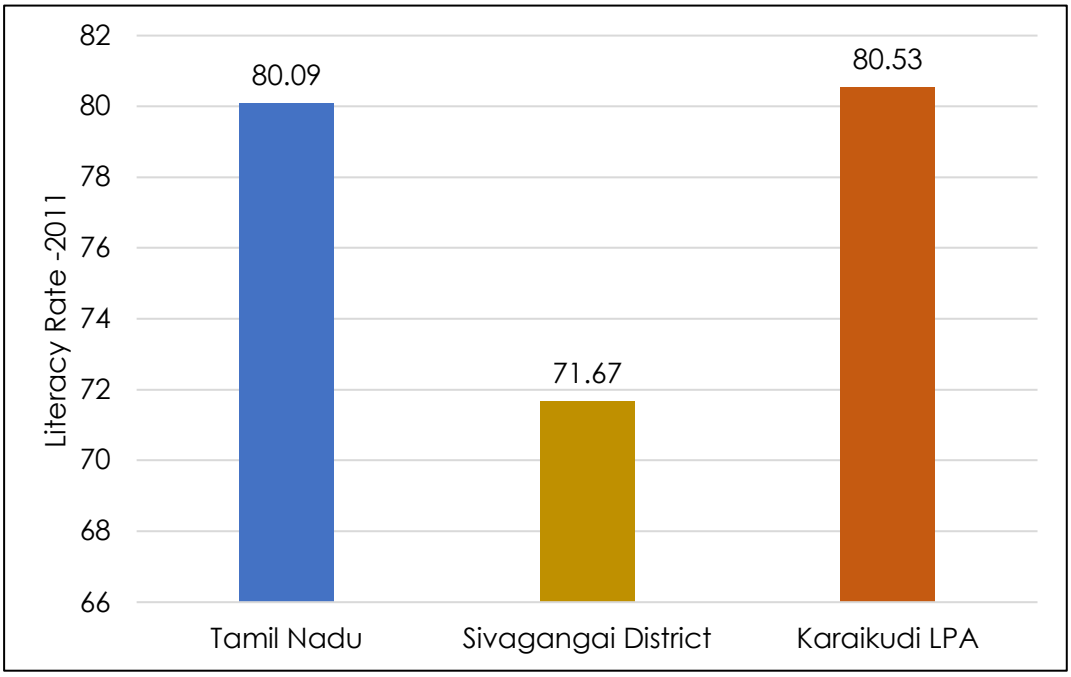


Figure 11.1 Comparative Literacy Rate

S. No.	Name of Villages/Town	Total Population 2001	Total Population 2011	Literacy Population		Literacy Rate %		Changes in Literacy %
				2001	2011	2001	2011	
1	Karaikudi	86,596	1,06,714	67,189	86,955	77.59	81.48	29.65
2	Kottaiyur	10,633	14,766	7,932	12,017	74.60	81.38	46.80
3	Villages in CLPA	31,829	51,932	23,283	39,930	72.13	78.36	79.46
4	**Total CLPA**	**1,29,058**	**1,73,318**	**98,404**	**1,38,902**	**75.98**	**80.55**	**45.45**

Source: **Census of India**

Table 11.1 Literacy Rate of Karaikudi CLPA from 2001 to 2011

The literacy rate in Karaikudi CLPA has increased by 6.20 % from 2001 to 2011. According to the Census 2011, the literacy rate in the region (80.53%) is higher than that of India (74.04 %) and higher than the State average (80.09 %). The literacy rate is high due to several public & private educational intuitions located in Karaikudi and it serves as an educational hub for the surrounding area. However, the literacy rate is low, when compared with other municipalities in Sivagangai District like Sivagangai (92.77%) and Devakottai (89.99%). In overall terms, Karaikudi CLPA has a fairly good network of educational infrastructure in comparison to the rest of the municipalities.

11.1.1 Schools

Karaikudi CLPA has approximately 112 numbers of schools managed by Government Education Department, Local Bodies and Private. There are 65 primary schools (I to V), 16 middle schools (I to VIII), 11 high schools (VI to X is 4 and I to X is 7), and 29 higher secondary schools (VI to XII is 12 and I to XII is 18). And also 1 for differently abled children's and 1 for special care child or Psycho-Social rehabilitation centre**. (Refer Tables 11.2 and 11.3)**

S. No	Name of Villages/Town	Primary School	Middle School	High School	Higher Secondary
1	Karaikudi	34	5	2	14
2	Kottaiyur	9	1		2
3	Amaravathi		1		
4	Ariyakkudi	1		2	2
5	Illuppaikkudi	7		2	
6	Kallankudi	1			
7	Karaikudi Village	2			
8	Kovilur	1	1	1	1
9	Managiri	1	4	1	1
10	Kalanivasal	5	1	1	3
11	Sekkalaikottai	3	2		3
12	Senjai				
13	T.Soorakudi		1	1	1
14	Thiruvelangudi	1			
15	Velangudi			1	2
	CLPA Total	**65**	**16**	**11**	**29**

Source: **Primary Survey & School Report Card**

Table 11.2 No. of Schools Available in Karaikudi CLPA

S. No.	Name of the School	Level of Courses Offered	Students			Teachers	
			Boys	Girls	Total	Male	Female
1	R.H. Physically Handicapped High School, Karaikudi	6th – 12th	27	3	30	2	3
2	St. Giuseppe Moscati Psycho-Social Rehabilitation Centre, Meenavayal Village, Ariyakkudi	-	43	0	43	9	3

Table 11.3 School for Differently abled Children's

The URDPFI norms for educational facilities suggest for a provision of one primary school for 5000 population and one senior secondary school (VI to XII) for 7500 population and Integrated school without hostel facility (I-XII) for 1,00,000. The existing number of schools in Karaikudi CLPA is satisfactory for the present population.

According to Tamil Nadu School Education Department, any place with a population of 300 and above must have schools located at a distance as mentioned in **Table 11.4.**

S. No.	Type of Institution	Distance
1	Primary Schools	1 Km
2	High Schools	5 Km
3	Higher Secondary School	8 Km

Source: **Tamil Nadu School Education**

Table 11.4 Tamil Nadu School Education Norms for Schools

According to RTE Act 2009, a primary school must be accessed within 1 km radius and a middle school within 3 km radius. Presently, all the areas in Karaikudi CLPA are adequately covered by school facilities based on the above-mentioned norms. Improving the existing facilities will enhance the quality of education in Karaikudi CLPA. Spatial distribution of schools as per the standards must be ensured in the future.

11.1.2 Higher Education

The Karaikudi CLPA has 16 colleges of which there are 3 Engineering colleges, 6 Arts & Science colleges, 4 B.ED colleges and 1 Polytechnic colleges 2 ITI colleges. Council of Scientific and Industrial Research (CSIR), India, established in 1942, is an autonomous Society with the Prime Minister of India as its President. The URDPFI norms for Higher Educational facilities suggest for a provision of one Art & Science College for 1,25000, Engineering College population and one senior secondary school (VI to XII) for 7500 population and Integrated school without hostel facility (I-XII) for 1,00,000.

CSIR Central Electrochemical Research Institute (CSIR-CECRI) was found at Karaikudi on July 25, 1948. The institute took roots in the patriotic fervor of RM. Alagappa Chettiar, Pandit Jawarharlal Nehru and Dr. Shanthi Swarup Bhatnagar. On January 14, 1953, the institution became a reality when Dr.S. Radhakrishnan dedicated CSIR – CECRI, the 12th national laboratory under the Council of Scientific and Industrial Research (CSIR), to the nation. Laying the foundation stone of the institute, Pandit Nehru CSIR – CECRI has extension centres in Chennai, Mandapam and Tuticorin. Focusing on Fuel cells, Marine Corrosion and Offshore corrosion testing. As part of its human resource development programme, CSIR – CECRI runs a unique B.Tech. course in Chemical and Electrochemical Engineering supported by the Anna University with the help of independent.

Alagappa University well known renowned education institution for entire south Tamil Nadu. Alagappa College campus are available adjacent to the town limit on the north eastern direction. However, Karaikudi being a medium sized town,

the distribution of school and college does not pass any problem of easy accessibility and movement. Alagappa University was brought into existence by a Special Act of the Government of Tamil Nadu in May 1985 with the objective of fostering research, development and dissemination of knowledge in various branches of learning. Alagappa University is recognized by the University Grants Commission (UGC) of India. The University has 44 Departments, 9 Centres and 2 Constituent Colleges on its campus. 46 Affiliated Colleges located in the districts of Sivagangai and Ramanathapuram are part of the University (University Website).

The University offers education through Regular, Week-end, Distance and Collaborative modes. Through all modes of education, the University caters to the needs of the student community of around 1.12 lakhs.

And there is one Government Industrial Training Institute at Amravathi in Karaikudi that provides technical skills to develop the industrial sector in the region. A substantial amount of skilled manpower is generated every year from the Govt. ITI & polytechnic colleges, and they can be utilized properly through developing industrial sectors in this region. This can prevent out-migration of the inhabitants in search of better employment opportunities and also help to boost the economy.

The educational institutions in Karaikudi CLPA meet the planning norms for higher education mentioned in URDPFI guidelines and there is no need for the provision of additional facilities for the present population. **Table 11.5, 11.6 and 11.7** gives the list of various colleges located in Karaikudi CLPA.

S. No.	Name of Institution	Students			No. of Facilities		
		Boys	Girls	Total	Male	Female	Total
1	Alagappa Govt.Arts. College, Karaikudi	1,190	2,777	3,967	64	25	89
2	Dr. Umayal Ramanathan College for Women, Karaikudi	0	1,770	1,770	0	43	43
3	Ramasamy Tamil College, Karaikudi	19	99	117	5	2	7
4	Vidhyaa Giri College of Arts and Science, Puduvayal, Karaikudi	479	478	957	10	14	24
5	Nachiappa Swamigal Arts and Science College – Kovilur			680			65
6	Sri Sarada Niketan College for Women – Amaravathi			294			45

Source: **Primary Survey**

Table 11.5 Colleges of Arts and Science Student and Faculties

S. No.	Name of the Institutions	Students			No. of Teaching Staff		
		Boys	Girls	Total	Boys	Girls	Total
1	CSIR-Central Electrochemical Research Institute, Karaikudi	106	43	49	10	2	12
2	Alagappa Chettiar Govt. College of Eng. and Tech., Karaikudi	1,314	608	1,922	53	30	83
3	Sri Raaja Raajan College of Engineering and Technology – Amaravathi						
4	Nachiappa Swamigal Polytechnic College – Kovilur						
5	Vallambar I.T.I Kottaiyur	16	0	16	2	1	3
6	Govt. I.T.I Amaravathi, Karaikudi	235	15	250	19	Nil	19

Table 11.6 College of Professional Engineering Education Students and Faculties Source: Primary

S. No.	Name of the Institute	No. of Courses Offered	Students			Faculties	
			Boys	Girls	Total	Male	Female
1	Kavi B.Ed College, Karaikudi	1	182	18	200	12	7
2	Annai Teresa College of Education				100		
3	Sri. Raaja Raajan College of Education for women, Karaikudi	1	0	150	150	4	19
4	St. Joseph College of Education, Karaikudi	1	16	184	200	11	6

Source: **Primary Survey**

Table 11.7 College of Professional Education Student and Faculties

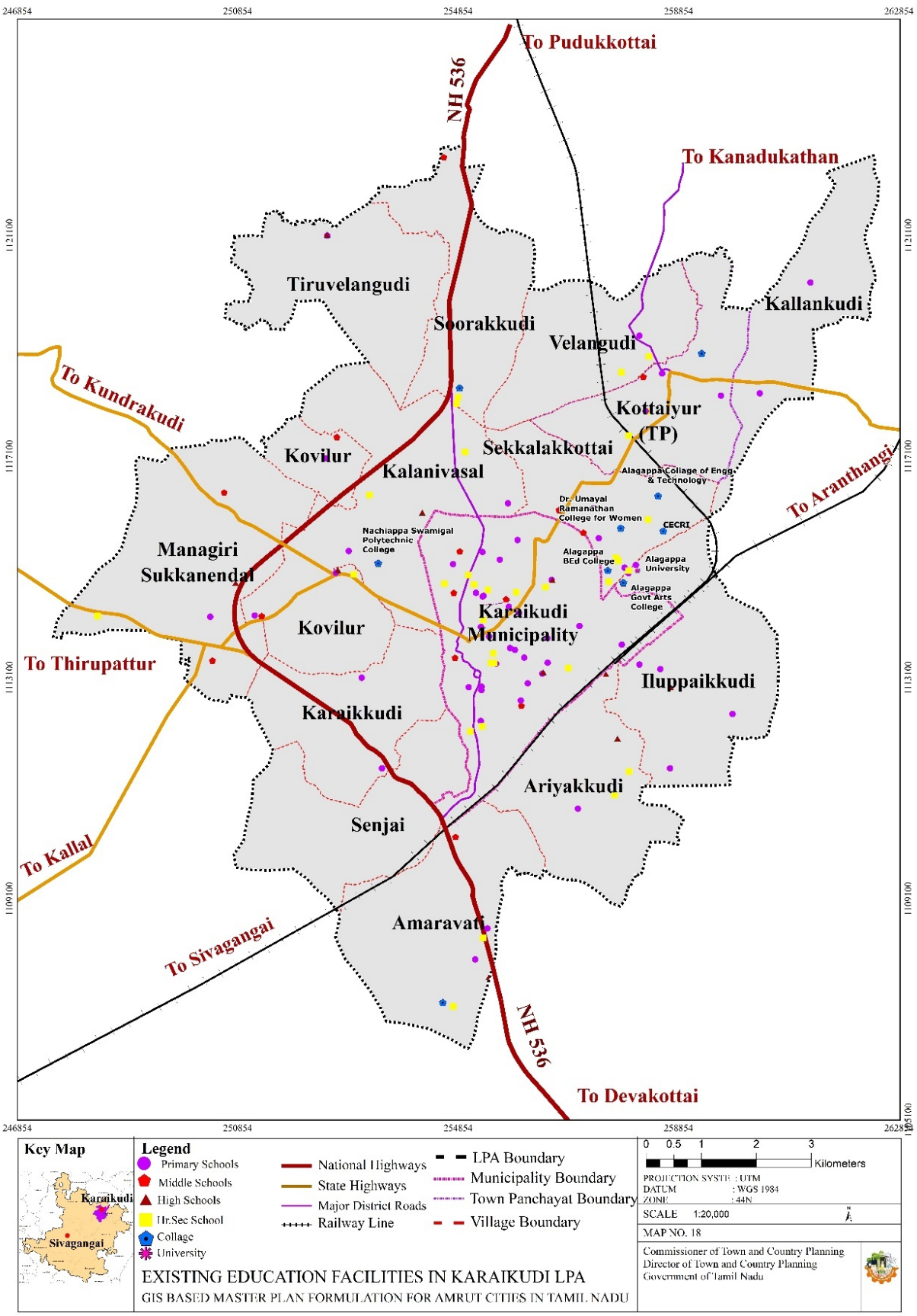
Alagappa University

CSIR- Central Electrochemical Research Institute

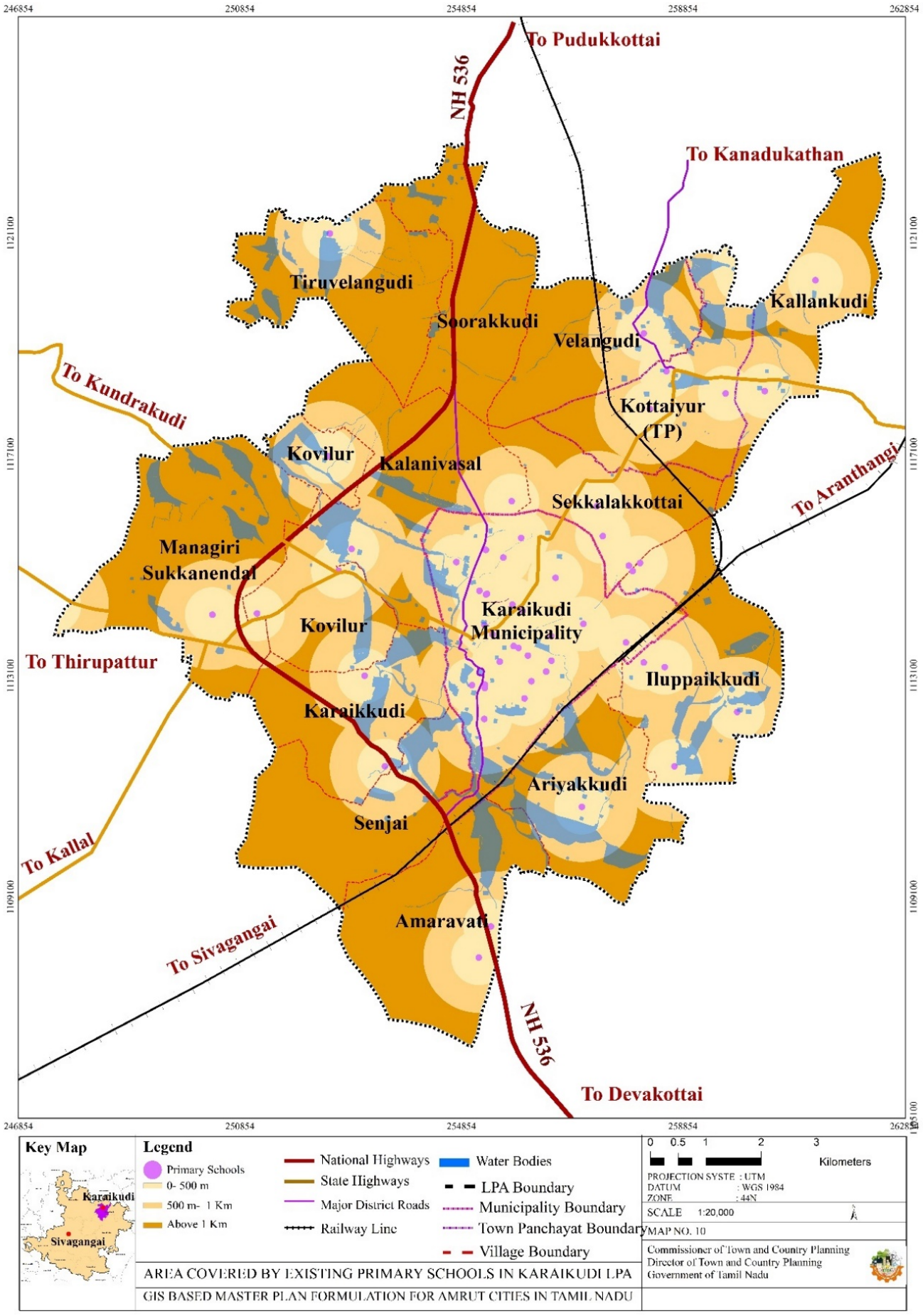
Nachiappa Swamigal Group of colleges – Polytechnic College

Alagappa Chettiyar Govt. College of Engineering and Tech.

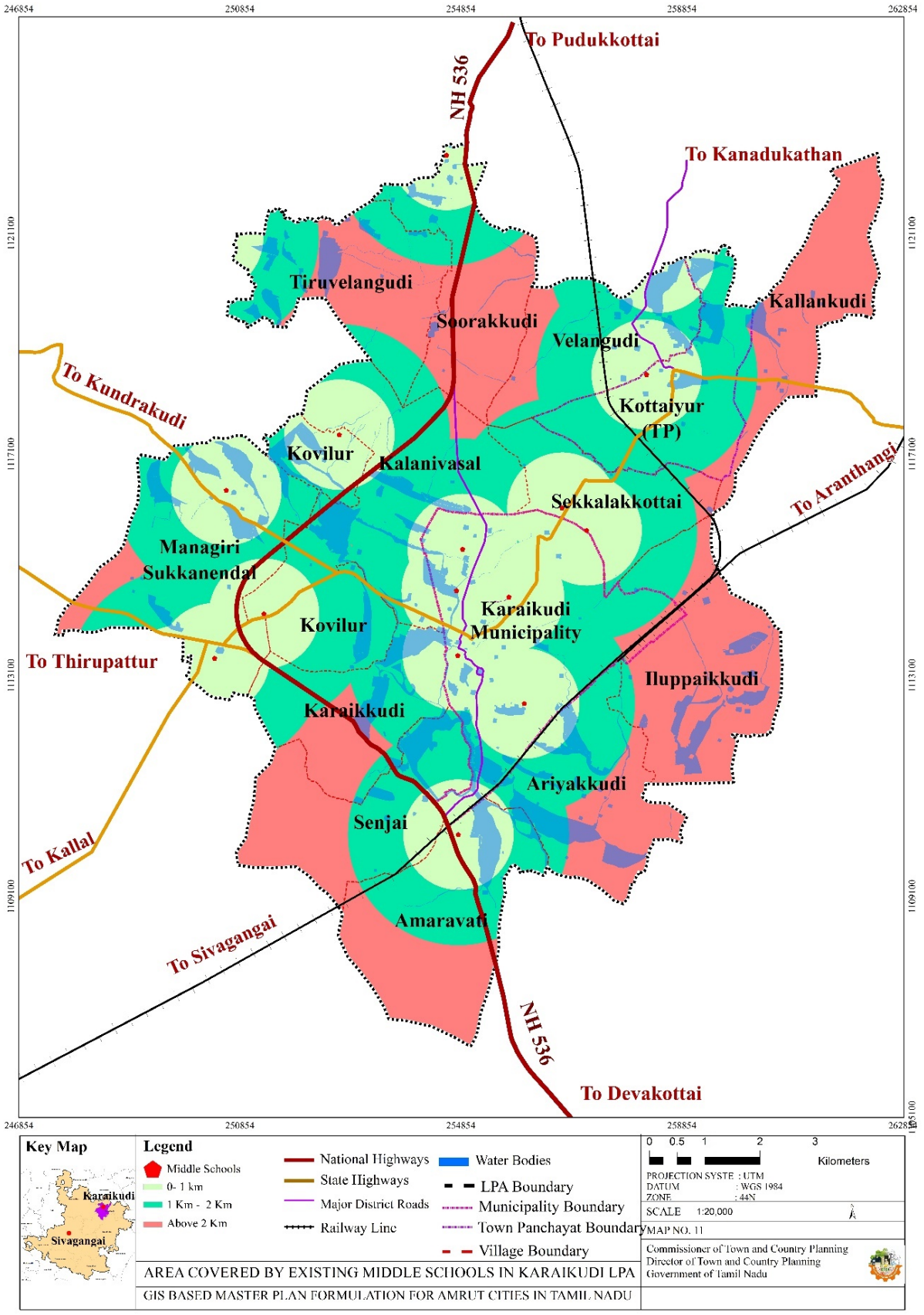
Figure 11.2 Karaikudi University Colleges



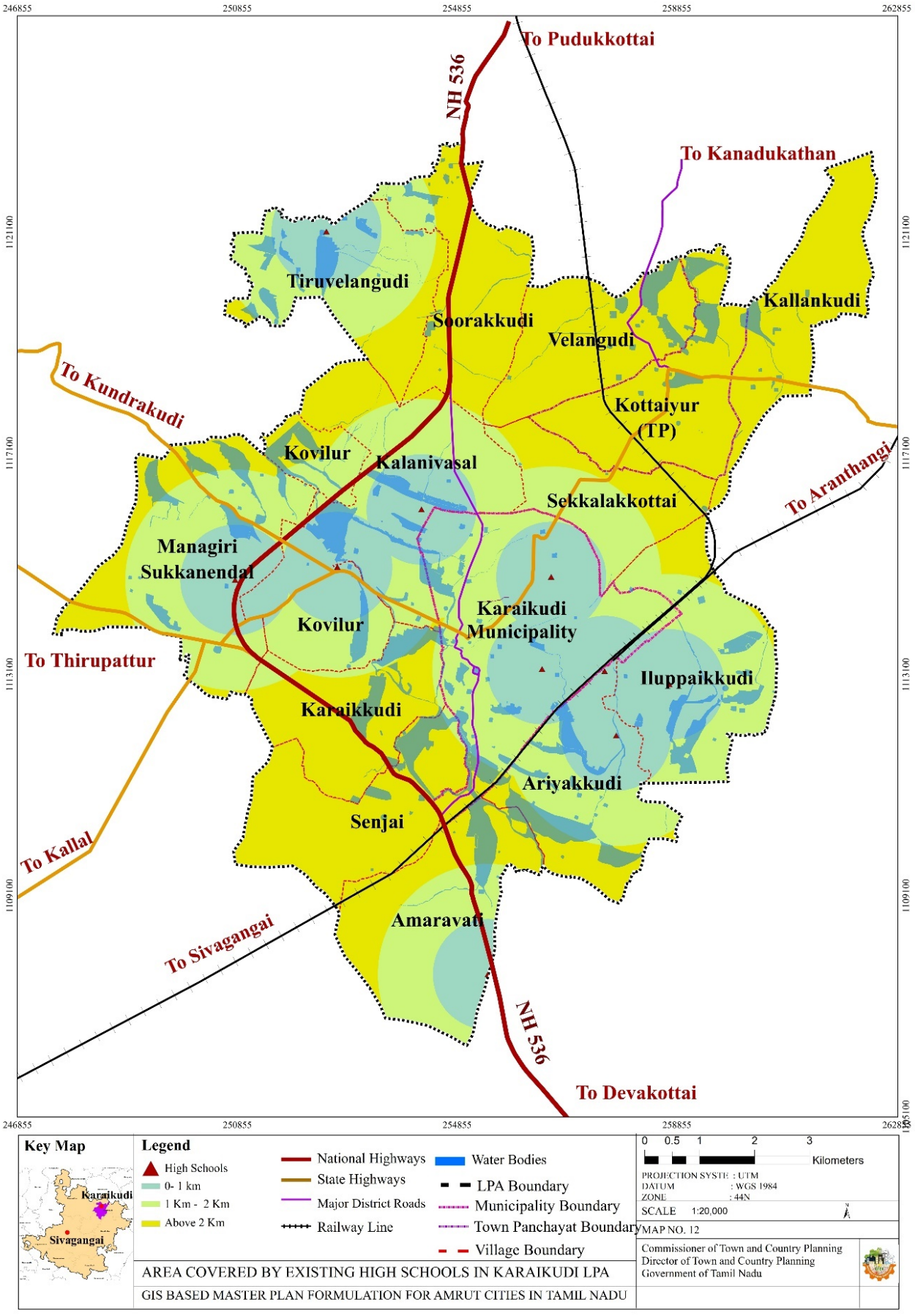
Maps 11.1 Educational Facilities in Karaikudi CLPA

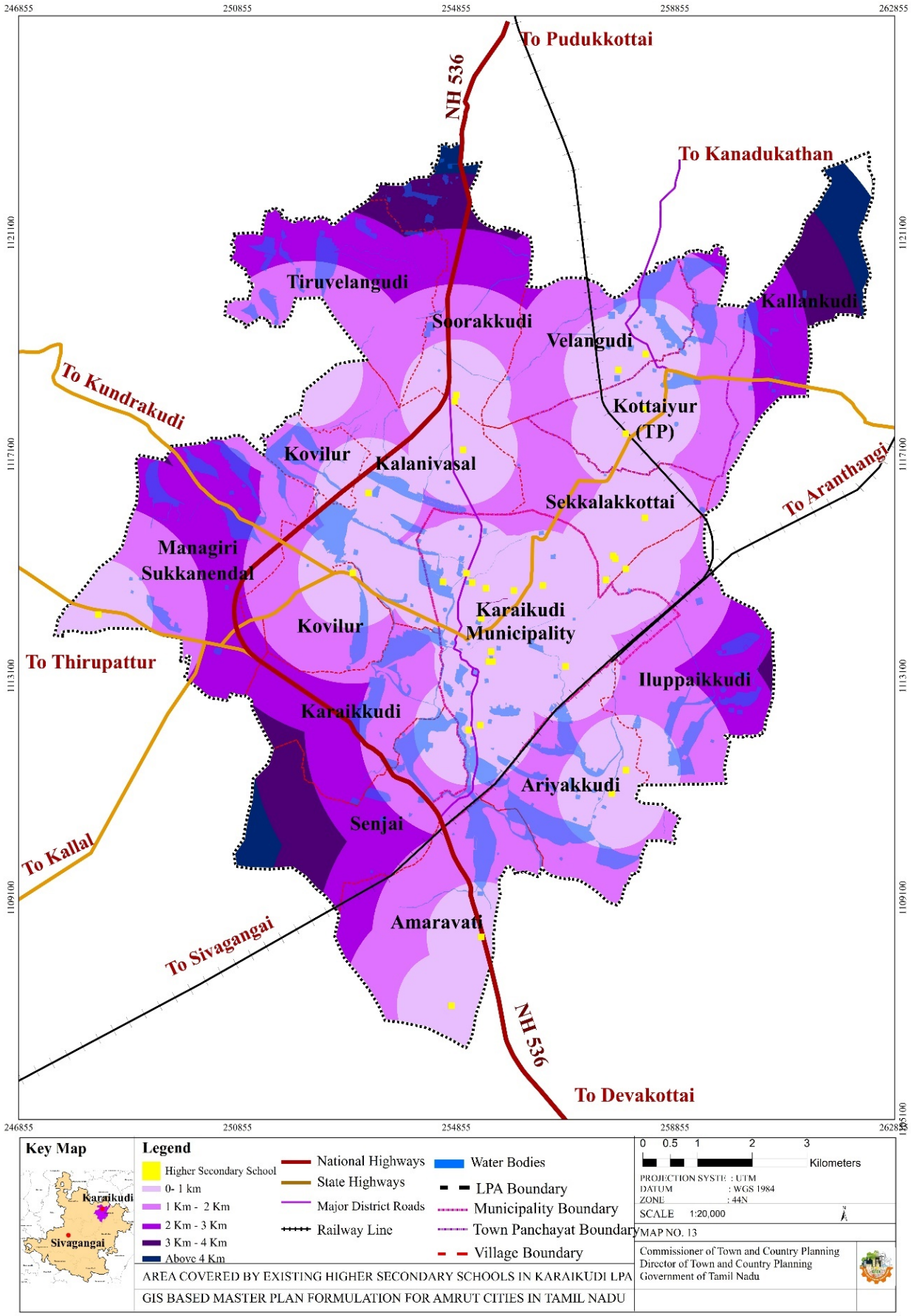


Maps 11.2 Area Covered by Existing Primary



Maps 11.3 Area Covered by Existing Middle Schools


246855
250855
254855
258855
262855
1121100
1117100
1113100
1109100
To Pudukkottai
NH 536
To Kanadukathan
Tiruvelangudi
Soorakkudi
Velangudi
Kallankudi
To Kundrakudi
Kottaiyur (TP)
Kovilur
Kalanivasal
Sekkalakkottai
To Aranthangi
Managiri Sukkanendal
Kovilur
Karaikudi Municipality
To Thirupattur
Iluppaikkudi
Karaikkudi
Ariyakkudi
Senjai
To Kallal
Amaravati
To Sivagangai
NH 536
To Devakottai
Key Map
Karaikudi
Sivagangai
Legend
High Schools
0- 1 km
1 Km - 2 Km
Above 2 Km
National Highways
State Highways
Major District Roads
Railway Line
Water Bodies
LPA Boundary
Municipality Boundary
Town Panchayat Boundary
Village Boundary
0 0.5 1 2 3
Kilometers
PROJECTION SYSTE : UTM
DATUM : WGS 1984
ZONE : 44N
SCALE 1:20,000
MAP NO. 12
Commissioner of Town and Country Planning
Director of Town and Country Planning
Government of Tamil Nadu
AREA COVERED BY EXISTING HIGH SCHOOLS IN KARAIKUDI LPA
GIS BASED MASTER PLAN FORMULATION FOR AMRUT CITIES IN TAMIL NADU



Maps 11.5 Area Covered by Existing Higher Secondary Schools

11.1.3 Projected Requirement of Schools Education and Higher Education

Karaikudi CLPA has fairly good network of Eductional Infrastructure. The existing school eduction and higher education institutions are sufficient for present and future population. However, Pre-primary school has insufficient number to cater the present population , there are 59 schools required to fill the gap. In future for 2041, additional 89 pre- primary schools are required for 3,98,140 population (Refer table 11.8). As per Tamil Nadu School Education Distance Criteria Norms for schools, Primary school has to be provided at T.Soorakudi settlement which is part of Thiruvelangudi village.

11.2 Healthcare Facilities

Access to proper healthcare facilities is crucial for well-being of the inhabitants. The Karaikudi CLPA has two government hospitals; a Government District Headquarters Hospital located in T. Soorakudi Village and Old one in Karaikudi municipality with a total number of 222 beds. In addition to this, there are 4 Primary Health Centers, 3 Other Govt. Hospitals & child welfare centers, Total 99 Private Hospitals/Clinics have 901 beds and 32 Dispensaries. Most of the Private hospital are located in Karaikudi municipality. The details of healthcare facilities available in Karaikudi CLPA are given in **Table 11.9.**

S. No	Facilities	Existing Availability	Per unit population	Requirements			Gap			Total Required	Area required (In ha)	Total Area required (In ha)
				2021	2031	2041	2021	2031	2041			
1	Pre-primary School	35	2,500	94	124	159	59	89	124	89	0.08	7.12
2	Primary school (I-V)	65	5,000	47	62	79	-18	-3	14	-3	0.4	-1.20
3	Middle School (VI -VIII) & Secondary school (I- X) and Senior secondary Schools (VI-XII)	16+11+12 (Total 37)	7,500	31	41	53	-6	4	16	4	1.8	7.20
4	Integrated school without hostel facility (I-XII)	18	1,00,000	2	3	3	-16	-15	-15	-15	3.5	-52.50
5	School of physically challenged	1	45,000	5	6	8	4	5	7	5	0.7	3.50
6	College	6	1,25,000	1	2	3	-5	-4	-3	-4	5	-20.00
7	University Campus	1	5,00,000	0	0	0	-1	-1	-1	-1	60	-60.00
8	Engineering College	3	10,00,000	0	0	0	-3	-3	-3	-3	6	-18.00
9	Technical Education Center ITI	2	10,00,000	0	0	0	-2	-2	-2	-2	1.6	-3.20
10	Technical Education Center Polytechnic	1	10,00,000	0	0	0	-1	-1	-1	-1	2.4	-2.40
11	Technical Education Centre	1	10,00,000	0	0	0	-1	-1	-1	-1	4	-4.00

Source: **Department of Education**

Table 11.8 Projected requirements of school Education and Higher Education

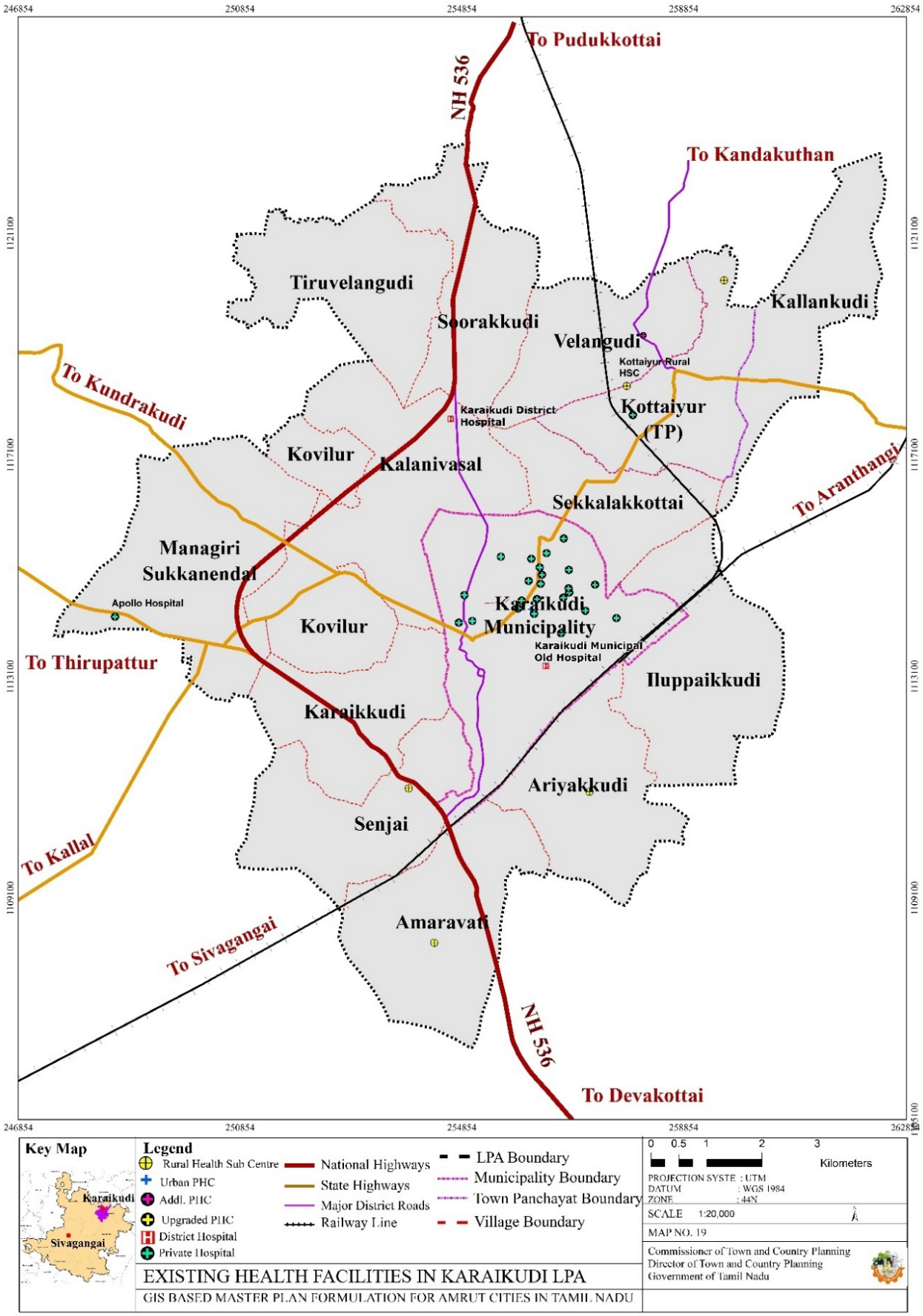
S. No.	Description	NOS	Beds	No Doctors	Other Staffs
1	Government Hospital	2	222	23	115
2	TB Sanitorium, in Amaravathi	1	50	2	13
3	Health Sub Centres	8			
4	Other small Government hospitals	3			
2	Primary Health Centre	4	-		
4	Private Hospitals / Clinic	99	901		
5	Dispensary/ Nursing homes	32	-		

Source: **Primary Survey and JD of Health service**

Table 11.9 : Healthcare Facilities in Karaikudi CLPA

The norms for provision of various healthcare facilities based on the population are given in the Tamil Nadu Health Policy. It recommends one Health Sub Centre for a population of 5000, one primary Health Centre for 30,000 population and one Community Health Centre for a population of one lakh. Based on these standards, Illuppaikkudi and T.Soorakudi villages are deprived of any health care facilities, but they avail it from the surrounding villages at proximity. Government hospital at Karaikudi and Kalanivasal satisfy the need for healthcare in Karaikudi CLPA as well as surrounding areas. URDPFI guidelines suggests 500 beds for a population of 2.5 lakh, at present 1,173 beds available in Government Hospital and Private hospitals, this is sufficient for present population 2,37,334 in 2021. 800 Beds are required for 2041 Population 3,98,140 so the existing health facility is sufficient for the future.There are no additional beds are required for 2041. Improving the existing health facilities is essential to enhance the quality of health services in Karaikudi CLPA.

	
Primary Health Center, Kottaiyur	New Government District Headquarters Hospital, Soorakudi
	
Old Government District Headquarters Hospital, Karaikudi	Apollo Hospital, Managiri



Maps 11.6 Health Facilities in Karaikudi CLPA

11.3 Recreational Spaces

Recreational facilities include parks, playgrounds, open spaces, and cinema theaters. Parks and open spaces create a high quality of life and promote inner-city revitalization. Open space boosts local economies by attracting tourists and supporting outdoor recreation. Recreation is one of the essential leisure time activities of people, by means of which they get relief and relaxation out of their day long tire some work. In Karaikudi CLPA, there are 27 parks & 15 playgrounds and it is spread over an area of about 0.31 Sq. Km. Most of these Recreational facilities are mostly concentrated in the Karaikudi municipality and few available in Kottiyur, Kalanivasal, Amaravathi and Kovilur. The vicinity areas are deprived of recreational facilities**. Table 11.10** gives the details of various recreational facilities available in Karaikudi CLPA.

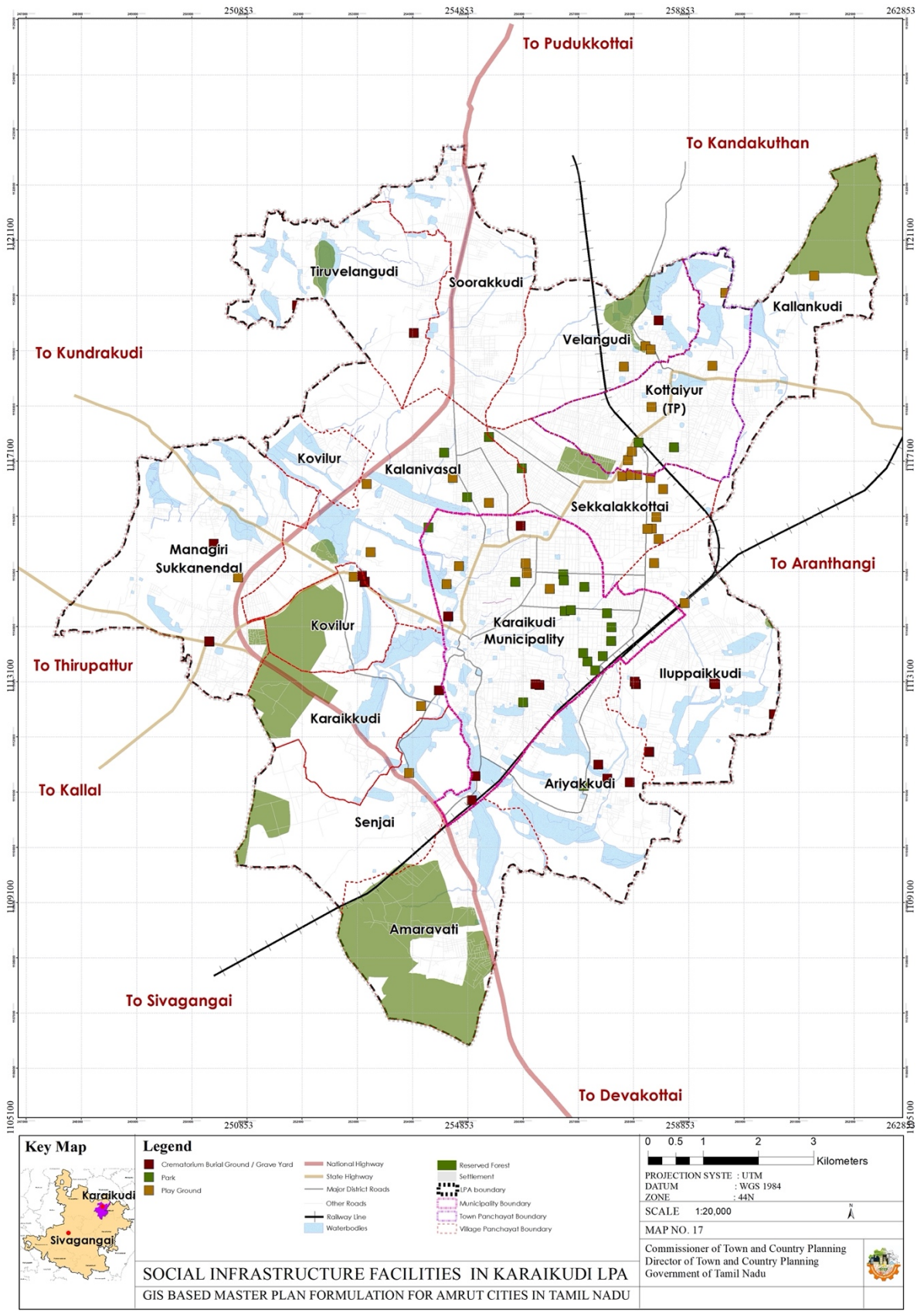
S. No.	Facilities	NOS
1	Parks	27
2	Playground	15
3	Football Stadium	1
4	Movie Theatres	6
5	Town Club	1

Source**: Primary Survey**

Table 11.10 Recreational Facilities in Karaikudi CLPA

Karaikudi town has got 6 permanent cinema theatres with a total seating capacity of 4534. In fact, this is the effective medium of recreation availed by most of the town dwellers

There is one town club for indoor games of the public. Considerably the religious importance of the town there are many temples and Koppudai Koppudaiya Nayagi Amman Kovil. Nagarathar Sivan Kovil, Perumal Kovil, Krishnan kovil, Kalanivasal Perumal Kovil and Muthalamman kovil are the other temple. There are two churches and one mosque in this town. Those are delt in details in tourism chapter.



Maps 11.7 Location of parks, play ground and burial ground

11.4 Miscellaneous Facilities

11.4.1 Burial Ground

Karaikudi CLPA consists of 27 burial grounds. **Table 11.11** gives details about the existing burial grounds in Karaikudi CLPA. An electric crematorium is available in Periyar Nagar in Karaikudi Municipality. Other locations to be upgraded the infrastructure facility.

S. No.	Description	Numbers
1	Karaikudi Municipality	5
2	Kottaiyur Town Panchayat	1
3	Villages in CLPA	21

Table 11.11 Existing Burial Grounds in Karaikudi CLPA

Source: **Primary Survey**

Maps 11.8 Location of Buriel Ground in Karaikudi CLPA

11.4.2 Fire Station

There are 2 fire stations in Karaikudi CLPA, one in Karaikudi Municipality located along Kil Korattiyar Road and another in Kalanivasal Village along National Highway 536 towards Thirumaiyam road. **Refer to Maps 11.10** for the location of fire stations in Karaikudi.

11.4.3 Police Force

There are 4 Police stations in Karaikudi CLPA, 2 civil police station in Karaikudi Municipality located one for North jurisdiction and one for south Jurisdiction. 3 other police stion also available in Karaikudi one for crime, one for traffic and another one act as city police control room. **Refer to Maps 11.10** for the location of police stations in Karaikudi

S No.	Name of the Station	Police Station & Other Units	Local Strength
1	Karaikudi South	Police Station	36
2	Karaikudi North	Police Station	45
3	Karaikudi Crime	Police Station	5
4	Karaikudi Traffic	Police Station	13
5	Karaikudi Control	Police Station	14
6	PEW, Sivagangai & Karaikudi	Unit	17
7	AWPS, Karaikudi	Unit	11
8	Highway Patrol-Karaikudi	Unit	10

Table 11.12 No of Police station and other units

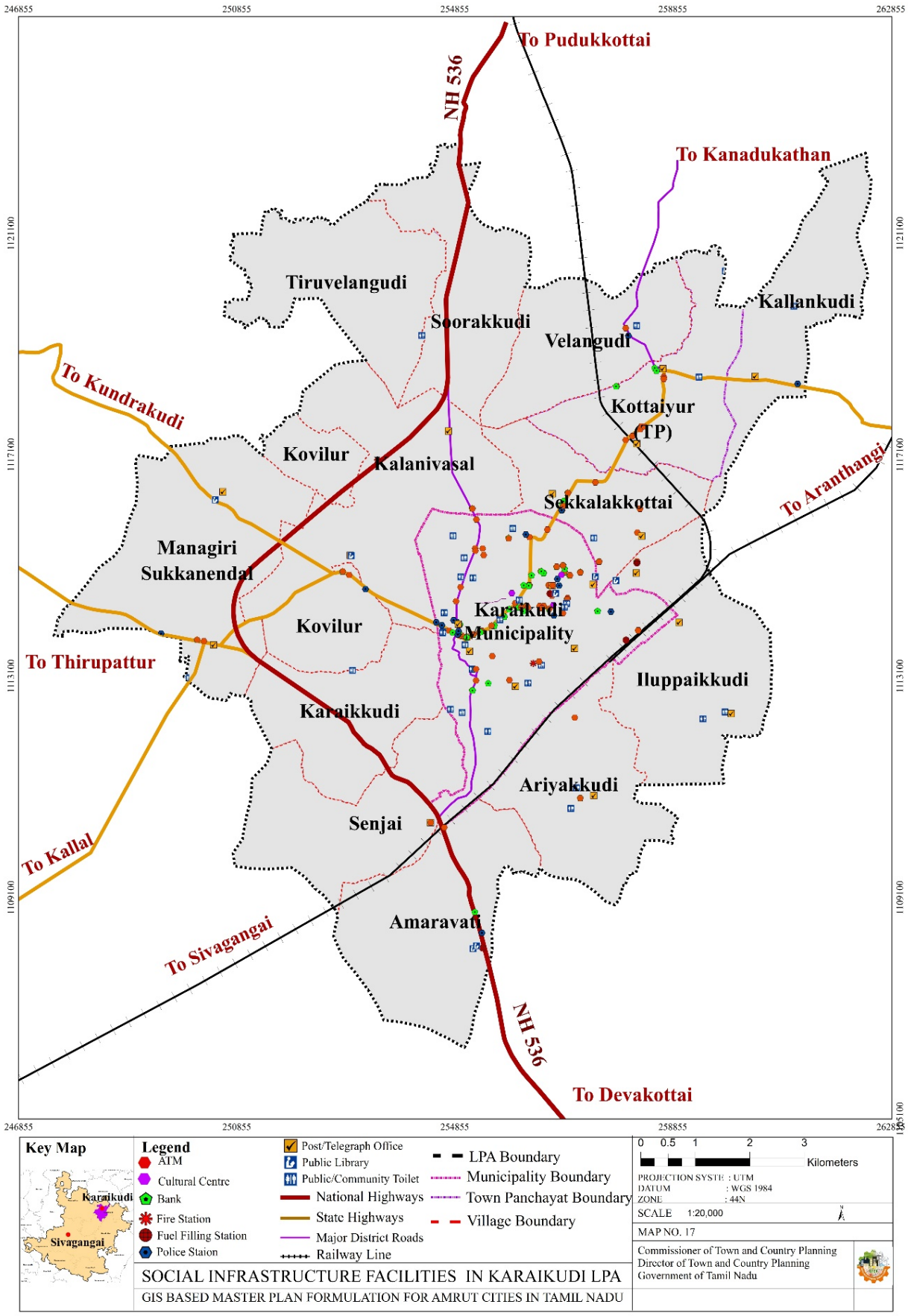
Source: **Statistical hand book 2020 -2021**

11.4.4 Judicial Division and Original Jurisdiction

S No.	Name of the Court	No. of Advocate practicing
1	The Principal District Munsif cum Judicial Magistrate, Karaikudi	150
2	The Additional District Munsif, Karaikudi	
3	The Judicial Magistrate, Fast Track Court (Magisterial Level, Karaikudi	

Source: **Statistical hand book 2020 -2021**

Table 11.13 No of Advocate Practicing in Courts



Maps 11.9 Other Social Infrastructure Facilities in Karaikudi CLPA

11.5 Social Infrastructure Issues, Potentials And Projected Requirement

Karaikudi in general consist of heterogeneous society mixture of culture religious and social values. The people indicate a high level of literary rate of 83.53% (male 52.53%, female 47.47%) in the LPA similarly good health condition observed the changes in the sex ratio has improved from 991 2001 to 1001 2011 in the Karaikudi LPA.

11.5.1 Education

In the social infrastructure education institution receives priority development of the society depends on large human resource Karaikudi is well known for education hub. Educational facilities schools and college are adequate for the present and future population student and staff ratio also satisfactory. In terms of proximity except T.Soorakudi all other locations have access to primary schools.

11.5.2 Healthcare facilities

Health and family welfare as the second factor of the social sphere to receive adequate attention. Karaikudi CLPA has well establish healthcare facilities and sufficient for present and future population. In terms of accessibility, It is observed that T.Soorakudi and Illuppaikkudi villages are deprives of any healthcare facilities. It is proposed to have sub-health centres in these villages. In the recent pandemic period number of beds have increased in the certain hospitals. One of them is TB Sanitorium hospital in the Amaravathi. Amaravathi is growing faster it is necessary to have additional general healthcare facility. Hence, TB sanitorium hospital space can be utilised for current and future needs.

11.5.3 Recreational facilities

Parks and playgrounds are the third factor which is most significant for public health and well-being. Parks and playgrounds are concentrated in Karaikudi municipality and Kottiyur town Panchayat, other parts of CLPA have less recreational facilities. Old town deprive of open spaces and parks.

According to NBC rules, 3 Sq. m/person is the minimum norm for open space in a built-up area. This rule demands an area of 0.712 Sq.km as open space for the

present population of 2,37,334. According to norm open space available for present population is insufficient. additional 0.402 sq.km area required. In future for 2041 0.884 Sq.km area required for 3,98,140 population.

11.5.4 Burial Ground

Karaikudi CLPA consists of 27 burial grounds. The existing burial grounds in Karaikudi CLPA are located in Karaikudi Municipality (5), Kottaiyur TP (1) and villages (21). An electric crematorium is available in Periyar Nagar in Karaikudi Municipality. As per requirement number of burial ground and area is sufficient. However, Infrastructure facilities is insufficient.

11.5.5 Fire Station

As per URDPFI safety standards, one fire station is required for every 2-lakh population with a 5 -7 km radius. The existing safety facilities in Karaikudi are sufficient for the present and future projected population 2041.

11.5.6 Police Force and Judicial Division

As per URDPFI safety standards, one police station is required for every 90,000 population, Traffic and police control is as per requirement. The existing police station facilities in Karaikudi are sufficient for the present population. However, 1 more civil police station required in future 2041 population.

Karaikudi has 3 Judicial magistrate units, Principal District Munisif, Additional District Munisif and Fast track court. There are 150 advocates practicing in these three courts. The existing Judicial facilities are sufficient for present and future population.

11.6 Summary

Social infrastructure plays an important role in development the society's quality of life as well as the economic development of a place. It enhances social wellbeing by providing basic services and facilities like health, education, recreation, and other social facilities. In terms of educational facilities, Karaikudi CLPA has 121 schools and 16 colleges. The place has a Highly good network of education facilities and even the literacy. Karaikudi is an educational hub particularly the development of Alagappa University. Karaikudi literacy rate is quite high when

compared with the State's and District's literacy rate. Regarding health facilities, Karaikudi CLPA is served with 222 beds in Government hospitals in Karaikudi and Soorakkudi, 50 beds in TB Sanitorium, Sonthapuram in Amaravathi. Accountable number of private hospitals which are more than enough for the present population. Karaikudi CLPA must increase its open space extent as mentioned in the norms to enhance the quality of life and promote active living. School grounds are major open space for west side municipalities proper public parks and open place to be provided. There is less potential for leisure recreational facilities in the town. The few ways to improve quality of wellbeing are promoting cycling bay by connecting all the chine of water bodies and pedestrian walking and parks and children's playground and differently abled walking & playing facilities. Water front development can be proposed through Area development plan.