COMPREHENSIVE DEVELOPMENT PLAN FOR PUDUCHERRY PLANNING AREA - 2036

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FINAL REPORT

PUDUCHERRY PLANNING AUTHORITY

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1 INTRODUCTION

1.1 INTRODUCTION

Puducherry, formerly known as Pondicherry is the largest region in the Union Territory of Puducherry having an area of 294.23 sq. kms and accommodates the population of 9.5 lac, as per census, 2011. Puducherry is famous for its cross-cultural heritage, which is derived from the European influence consequent to French Rule from the way back of 280 years.

Puducherry houses many important historical buildings manifesting the French era in its history timeline. It is also a destination for spiritual seekers due to the presence of Aurobindo Ashram and proximity to Auroville. The place is blessed with a number of natural scenic sites. The role that the city has to play in providing higher order services and facilities are also kept in view while preparing the plan for this planning area.

Once the "French window of India", this beautiful town is heading towards utter chaos due to unplanned growth which has taken place in the past few decades. The problems of Puducherry town and its environs are becoming more and more critical due to increased pressure on infrastructure services and haphazard growth. The problems are assuming serious propositions in all aspects of urban life. The major focus is on sectors like basic municipal services, social and physical infrastructure, traffic and transportation, housing, conservation of natural and historical heritage, which require immediate attention of planners & engineers.

The government constituted the Puducherry Planning Authority under Pondicherry Town & Country Planning Act, 1969. Preparation of Master Plan for a city is a long-drawn exercise. The Scenario of growth and development trends for the past and present has to be thoroughly analysed, in order to understand the most influencing factors in the system which would pave the way to forecast the future scenario to arrive a perspective plan. Compact development in the interest of optimum utilization of infrastructure is another approach for city planning.

1.1.1 HISTORY OF THE CITY

Puducherry, formerly known as Pondicherry, gained its significance as "The French Riviera of the East" after the advent of the French colonialization in India. Puducherry is the Tamil interpretation of "new town" and mainly arrived from "Poduke", the name of the marketplace as the "Port town" for Roman trading, way back in 1st century as mentioned in the 'The Periplus of the Erythraean Sea'. The settlement was once an abode of many learned scholars as evidently versed in the Vedas, hence also known as Vedapuri.

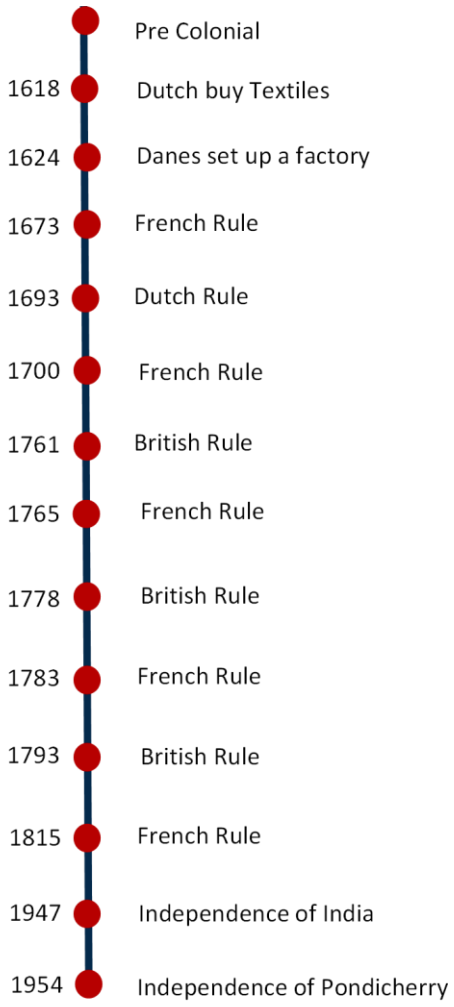


Figure 1.1 Timeline Colonial to Independence

The history of Puducherry can broadly be classified in two periods- Pre-Colonial period and Colonial Period. The Pre-Colonial period started with the reign of the Pallavas who continued to rule the empire from 325 A.D. – 900 A.D., then came the Chola dynasty for the time period from 900 A.D. – 1279 A.D., continued by Pandya Dynasty from 1279 A.D. - 1370 A.D. During 14th Century, it was under the rule of the Naikship of Gingee denoting the Vijayanagar Empire from 1370 A.D. – 1614 A.D which was conquered by the Sultan of Bijapur and he continued for the phase from 1614 A.D. - 1638 A.D. It was during the period of the Sultan when the Portuguese and Danish merchants used the place as the trading center.

The colonial period started with Portuguese as they were the first Europeans to trade in textile in 1521 and subsequently with the Dutch and the Danes in the 17th century.

The prospering trade of Puducherry attracted the French and the predominant feature of the town was laid by the French pioneer Francois Martin in the form of a French settlement in 1674 A.D. In 1693, Puducherry was captured by the Dutch but restored in 1699 A.D. subsequently with the Treaty of Ryswick.

The French acquired Mahe in 1720, Yanam in 1731, and Karaikal in 1738. The British captured the city from the French but returned it following the Treaty of Paris in 1763. This Anglo- French war continued until 1814 A.D., when finally, France had the control over the settlements of Puducherry, Mahe, Yanam, Karaikal and Chandernagar even during the British period until 1954. It was a reign of one hundred and thirty-eight years under French and finally on 31st October, 1954, they left the Indian shores following De Facto transfer of power.

1.1.2 REGIONAL SETTING

The Union Territory of Puducherry which is one of the seven Union Territories of India, comprises of four erstwhile French Settlements of Puducherry, Karaikal, Mahe and Yanam. The geographical location of Puducherry region lies between 11° 45′ and 12° N latitude and 79° 48' and 79° 50′E longitude and the location of four regions are presented in the figure 1.2. These four regions are non-contiguous and are enclaves of different states. Puducherry and Karaikal are the enclaves of Tamilnadu while Mahe and Yanam are the enclaves of Kerala and Andhra Pradesh respectively. The four regions have a coastline of about 45 kms. Puducherry town, in addition to being the capital of Puducherry Union Territory, is an administrative headquarters and as an important urban center.

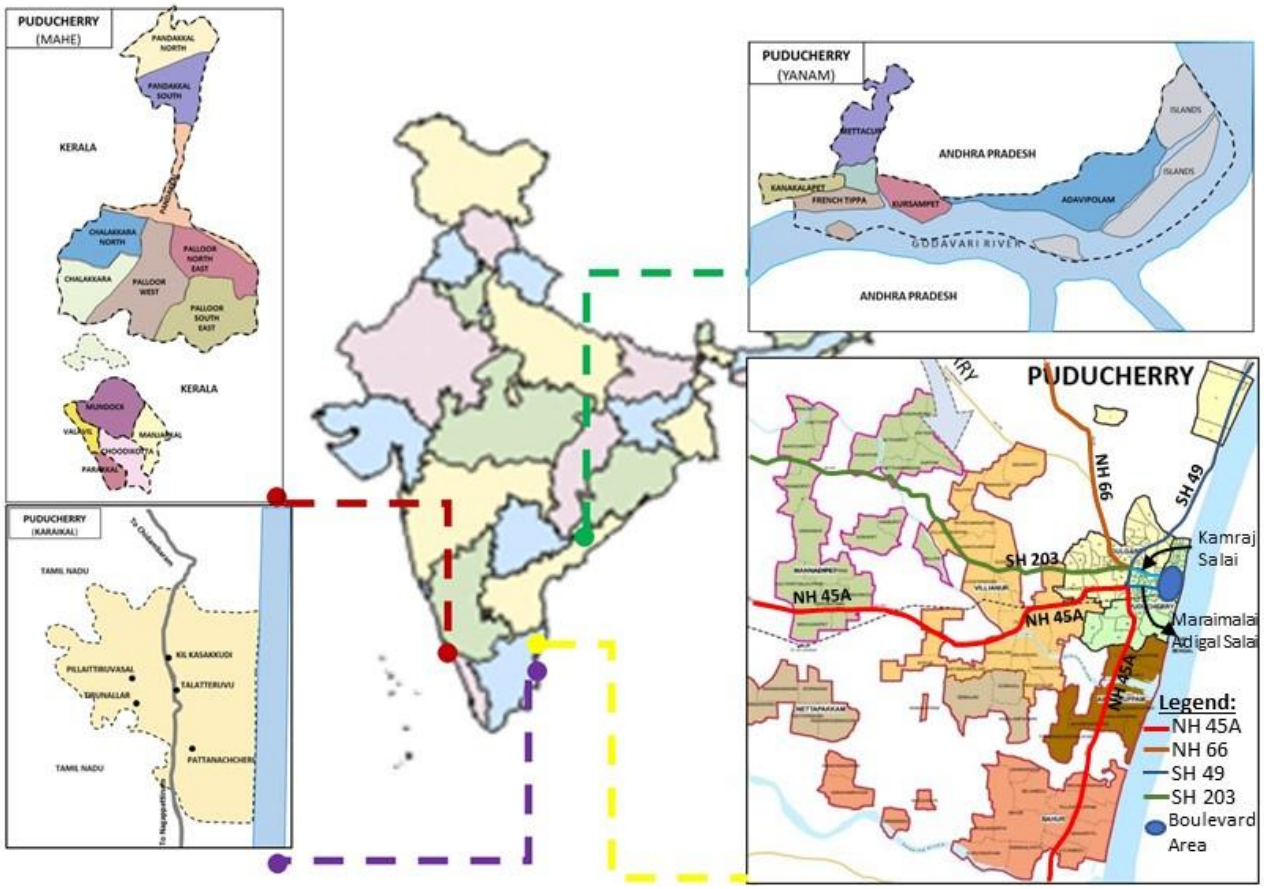


Figure 1.2 Geographical location of four districts in Union Territory of Puducherry

Puducherry region is situated on the Coromandel Coast towards south of Chennai at an approximate distance of 162 km by road and 204 km by rail. Puducherry region is limited on the east by the Bay of Bengal and on the other three sides by the South Arcot districts (Villupuram and Cuddalore) of Tamilnadu State. It is not a contiguous area and is interspersed with bits of territory of Tamilnadu State. Even though the planning area for the preparation of Comprehensive Development Plan is only for the Puducherry region or Puducherry Planning Authority Area, it is also important to understand the correlation of all the regions and the impacts of socio-economic development with its influence over the hinterlands and surrounding areas.

1.1.3 REGIONAL CONNECTIVITY

1.1.3.1 ROADWAYS

Puducherry is well connected through roads to major cities/towns towards northern, southern and western side. The major metropolitan area adjacent to the planning area is Chennai and is easily reachable by roadways through NH-45A and East Coast Road (ECR). The SH 49 road also connects to Chennai Via Marakanam. Tindivanam connects through NH 66, Northwestern side of Puducherry region. It is the municipality in the district of Villupuram in the state of Tamilnadu with an area of around 22 sq kms and population of 72,796 as per Census of India, 2011. Villupuram connects through NH - 45A in Western side and Cuddalore through NH - 45A in Southern side of Puducherry region.

Villupuram is also a municipality and the administrative headquarter for the district of Villupuram with an area of 32 sq km and population of 1,21,198 as per Census of India, 2011. Cuddalore is the other major industrial town is located in the southern side of Puducherry region. Cuddalore is a municipality and a district head quarter of Cuddalore district with an area of 27 sq km and has 1,73,676 population. The SH 203 also called as Vazhudhavur road connects to Thirukannur and other surrounding major hinterlands of Puducherry region. The other major city next to Chennai is Bangalore which is also called "Silicon Valley of India" or "IT capital of India". It is easily reachable by roadways NH 66 via Thiruvannamalai.

The Boulevard area i.e. existing CBD of Puducherry is connected to NH 45A, NH 66, SH 49 and SH 203 through Maraimalai Adigal Salai and Kamaraj Salai. This is shown in the figure 1.2.

1.1.3.2 RAILWAYS

Puducherry region is well linked with other states of India through railway network. Puducherry region has one major railway station connected to Chennai metropolitan region on daily basis. Bangalore is also other important IT city of India reachable by railways from Puducherry via salem and Hosur. The other railway station within the Puducherry Planning area is Villianur railway station situated along the NH45A.

Villupuram Junction is a prominent and nearby railway Junction, situated at a distance of 39 km from Puducherry region, serves as the distribution point of rail traffic towards the other parts of the state. Puducherry railway station have various trains operating to and from major cities in India, which provides easy access to the tourist visiting the city and the local population. The regional linkages of important Metros and other Cities around Puducherry region through roadways and railways are represented in figure 1.3.

1.1.3.3 AIRWAYS

The Puducherry region currently has an airport facility, which is yet to be brought under major civil aviation network. As of now flight services are operated to Bangalore and Hyderabad. The nearest major functional domestic and international airport is in Chennai which is almost 135 km proximity from Pondicherry region. The Bangalore is also easily reachable through airways from Chennai airport.

Puducherry airport was operational for short duration in 2013-14 when Spice Jet operated flights to Bangalore and in 2015 Alliance air started operating to Bangalore for six months' period, which was stopped due to financial issues. Due to low passenger turning up on domestic routes, these attempts to revive the airport wasn't successful, the feasibility of operating international flights should be accessed due to the fact that Puducherry attracts a lot of foreign tourist and this have to be explored in detail.

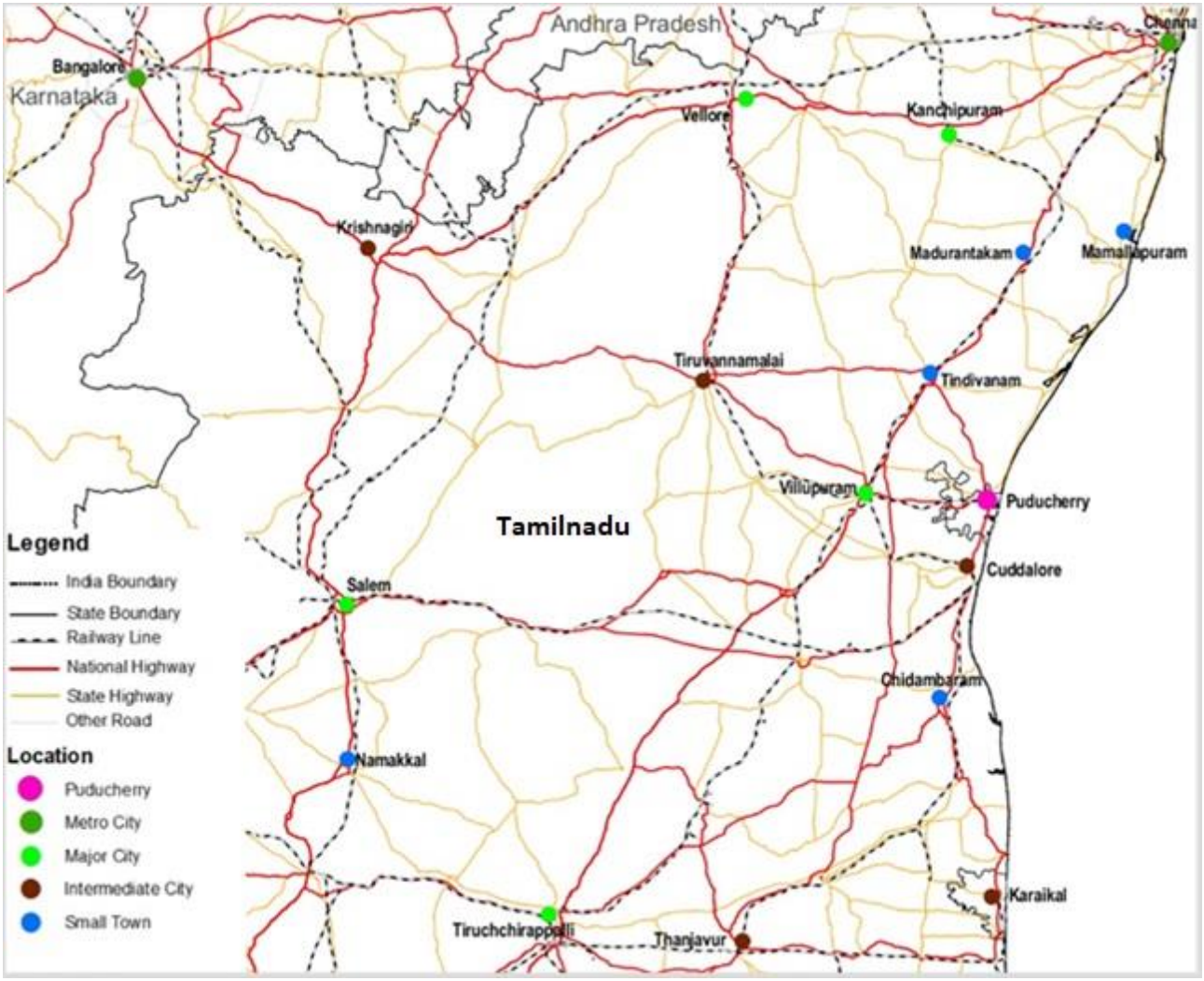


Figure 1.3 Regional Linkages of important Metros and other Cities around Puducherry region

1.1.3.4 PORT

The Puducherry Port is situated in the East Coast between two major ports viz., Chennai and Tuticorin. Puducherry Port is at about 150 Km south of Chennai Port. The other nearest Port is Cuddalore port and karaikal Port situated at a distance of about 28 km and 140 Km respectively. There is a proposal to start passenger ferry service between the ports of Chennai and Karaikal through Pondicherry Port (Port department, Puducherry). The National waterways act 2008 provides for the declaration of the Kakinada-Puducherry stretch of canals comprising of Kakinada canal, Eluru canal, Commamur canal, Buckingham canal and the Kaluvelly tank, Bhadrachalam-Rajahmundry stretch of river Godavari and Wazirabad - Vijayawada stretch of river Krishna in the States of Andhra Pradesh and Tamilnadu and the Union territory of Puducherry declared to be a national waterway (Ministry of shipping).

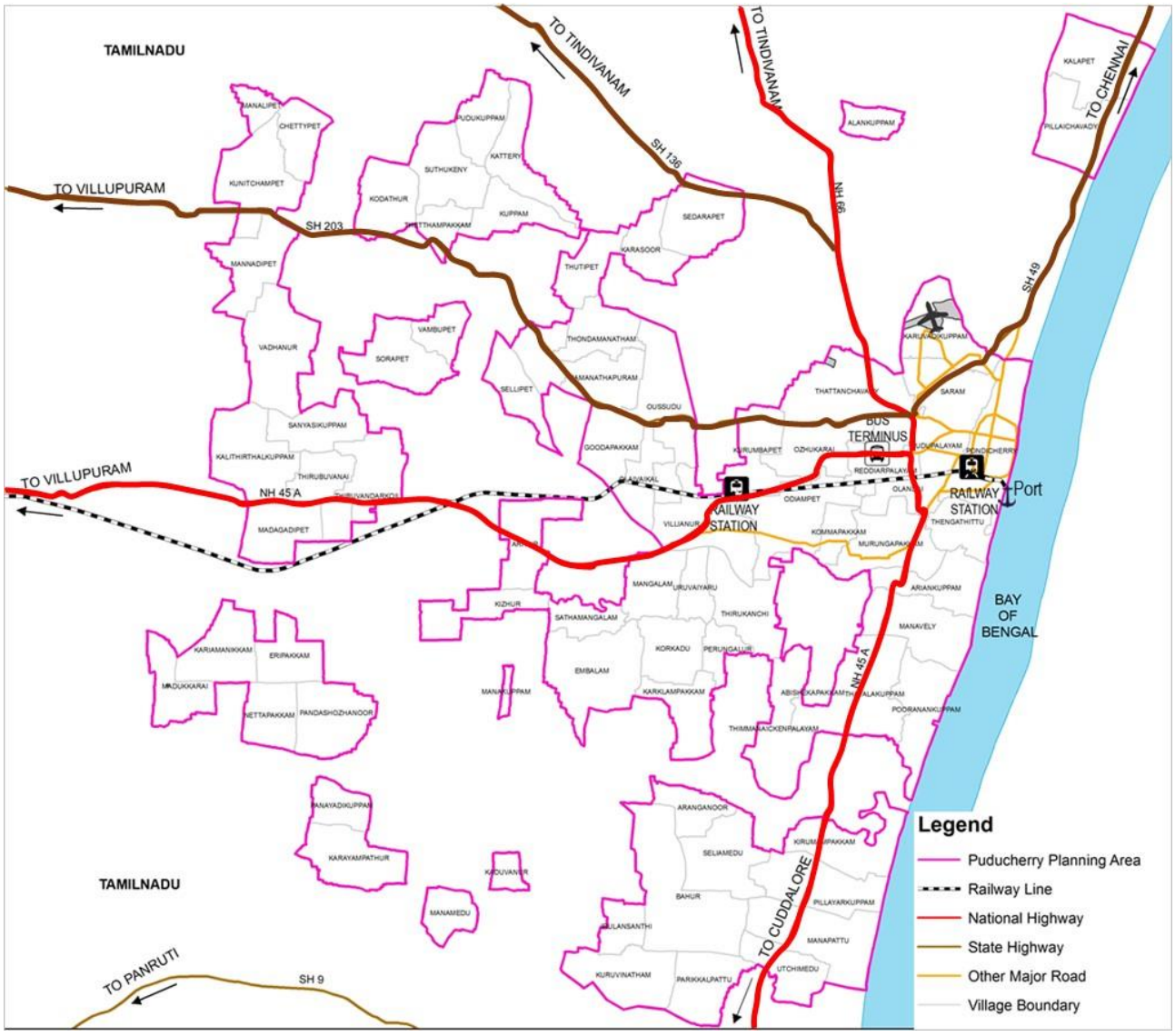


Figure 1.4 Connectivity of Nearby cities and towns around Puducherry region

1.1.4 TOPOGRAPHY

The Puducherry region is located on a flat plain with an average elevation of 15 m from Mean Sea Level (MSL) and a number of sea inlets, referred to as "backwaters" can be found. The region is intersected by the deltaic channels of River Gingee and the Pennaiyar and other streams forming the two main drainage basins interspersed with lagoons, lakes and tanks. The presence of shallow lagoon along the east coast give rise to the present continuity of land of Puducherry region.

1.1.5 CLIMATE

The prominent climatic conditions prevailing in Puducherry region is tropical wet and dry climate similar to that of coastal Tamilnadu. The region enjoys a hot and tropical climate characterised by little variation of temperature and humid weather. The Planning Commission of India identifies different Agro Climate Zones and further sub regionalised based on the agro ecological parameters. The Puducherry region comes under the North Coastal Tamilnadu which is highlighted in the table. Hence multiple cropping and a high cropping intensity is possible in Pondicherry region due to favorable soil and climatic conditions which effect the food production of Puducherry region.

Table 1-1 Agro climatic features of the Sub Regions

S. No	Sub Region	Soil	Climate
1	North Orissa Coast	Deltaic alluvial, coastal alluvial, laterite, red loamy	Moist sub-humid
2	South Coastal Andhra	Deltaic alluvium, deep black, red, sandy, red & black	Semi-arid
3	North Coastal Tamilnadu	Red loamy, red sandy, coastal alluvium	Semi-arid
4	North Coastal Andhra	Red loamy, laterite medium black, red, sandy, coastal alluvial	Dry sub-humid
5	Tanjavur	Deltaic alluvium, red loamy	Semi-arid to dry sub-humid
6	South Coastal Tamilnadu	Mixed Red & Black, coastal alluvium	Semi-arid (drier half)

Source: Final Report of the working group on Agro-Climatic Zonal Planning including agricultural development in North-Eastern India for XI Five Year Plan, 2007-2012

1.1.5.1 RAINFALL

The region receives the rain under the influence of both southwest and northeast monsoons. The northeast monsoon sets in during the middle of October and Puducherry region gets the greater part of its annual rainfall during the period of October to December. The annual average rainfall is 1,240 mm (49 inches). Fifty percent of the annual normal is received during northeast monsoon season (Rainfall Statistics of India 2015 report by IMD). The rainfall data for 8 years from 2010-2017 for Puducherry region is furnished in the table 1-2. The highest 24 hr rainfall occurred so far in Puducherry is 303.60 mm on 01 December 2015. Due to heavy rainfall intensity, many parts of Puducherry region were severely affected as there was inundation in the city.

Table 1-2 Rainfall Data for Puducherry Region

S. No	YEAR	RAINFALL											
		JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEPT	OCT	NOV	DEC
1	2010	46.7	0	0	0	114.7	237.3	32.7	158.8	182.7	243.1	498.4	203.4
2	2011	23.3	11.1	0	153.8	4.2	28.5	87.4	243.3	241.4	366	333.7	299
3	2012	11.6	0	0.9	9	0.3	35.8	99.4	90.9	115.8	505.3	71.1	49.2
4	2013	0	3.5	16.2	1.1	1.5	85.1	45.1	378.7	144.1	64	237.8	141.8
5	2014	0.5	27.5	0	0	150.8	138.9	48.4	105.3	183.4	383.8	219.3	63.6
6	2015	16.2	0.1	0	96.1	133.4	32.1	41.4	122.1	73.9	76.4	785.7	603.3
7	2016	0.7	0	0.4	0	125.3	45.9	20.7	155.7	115	39.2	54.6	98.1
8	2017	132.2	0	71.3	0	7.9	57.3	95.3	147	90.2	257.2	521.1	202.9

Source: Rainfall statistic of India, India Metrological Department.

1.1.5.2 TEMPERATURE

The Puducherry region experiences a hot and humid tropical climate. The summer season, which is very oppressive, is from March to May. January to the end of February is comparatively cool. Winds are moderately strong throughout the year except during the months of July to October. During May to September winds are mainly southwesternly in the mornings. May and early part of June constitute the hottest period of the year, with the mean daily maximum temperature at about 37°C and the mean daily minimum temperature at about 27°C. On individual days, the maximum temperature may even reach 43°C.

Table 1-3 Temperature data for Puducherry Region - 2015

No.	Month	Avg. Temp	Maximum Temp.	Minimum Temp
1	January	24.6°C	28.8°C	20.4°C
2	February	26.2°C	30.7°C	21.6°C
3	March	28.4°C	33.2°C	23.5°C
4	April	30.9°C	35.6°C	26.2°C
5	May	32.9°C	38.0°C	27.7°C
6	June	32.4°C	37.4°C	27.4°C
7	July	30.7°C	35.3°C	26.0°C
8	August	30.1°C	34.5°C	25.6°C
9	September	29.7°C	34.0°C	25.3°C
10	October	28.2°C	31.9°C	24.4°C
11	November	26.1°C	29.5°C	22.7°C
12	December	25.0°C	28.4°C	21.5°C

Source: Indian Metrological Department

1.1.5.3 HUMIDITY

The humidity plays the vital role for the comfortable living environment and one of the most important deciding factors for micro climatic condition of particular region. The relative humidity range of the region is generally high around 70% during August to April and a minimum of 60% during June and July. The higher relative humidity can be attributed due to the fact that the region's proximity to the sea.

1.1.5.4 SPECIAL WEATHER PHENOMENA

Due to the proximity of the Puducherry region to the Ocean, the weather tends to be unpredictable during certain period of the year. During North-East monsoon season, depressions and storm originates from the south Bay of Bengal and move across or in the surrounding region causing heavy rain, thunderstorms, gusty winds and at sometimes cyclones. These causes high tidal waves across the coastal region and flooding of low lying coastal areas. Thunderstorms generally occur from April to November being comparatively more frequent in September and October in the study region.

1.1.5.5 GEOLOGY

The geomorphology of the Puducherry region & Tamilnadu are a mixture of Alluvial Plains, Cheniers, Paleolagoonal plain, coastal sand dunes, beaches, beach ridge and ridge plain. The sedimentary formations dominate the general geology of the Puducherry region. Three major physiographic units are generally observed, viz., (i) Coastal plain, (ii) Alluvial plain and (iii) Uplands. The coastal plain extends as a narrow stretch for about 22 km and of four to six hundred meters' width on the eastern part of the region along the Bay of Bengal. Other physiographic units, which are characteristics of the coastal plains such as spit bars, mud flats, lagoons and tidal inlets also occur. The alluvial plain, formed due to two major rivers are namely Gingee and Pennaiyar. Besides the rivers and major canals, there are depressions acting as storage tanks, which are spreaded all over the terrain, to serve as surface water reservoirs. The high grounds are known as Uplands or the "Red Hills of Puducherry" are intersected by number of gullies and deep ravines.

1.1.5.6 SURFACE DRAINAGE SYSTEM

Puducherry region lays scattered as islands surrounded by the state of Tamilnadu, poses challenges in drainage system. There are two major rivers passing through the region. One is Gingee river, which traverses the region diagonally from north-west to south-east and the other is Pennaiyar river, which forms the southern border of the region. About 140 small and two big tanks are present in the region. These tanks are interlinked and act as water storage for agricultural purposes as well as to recharge the groundwater.

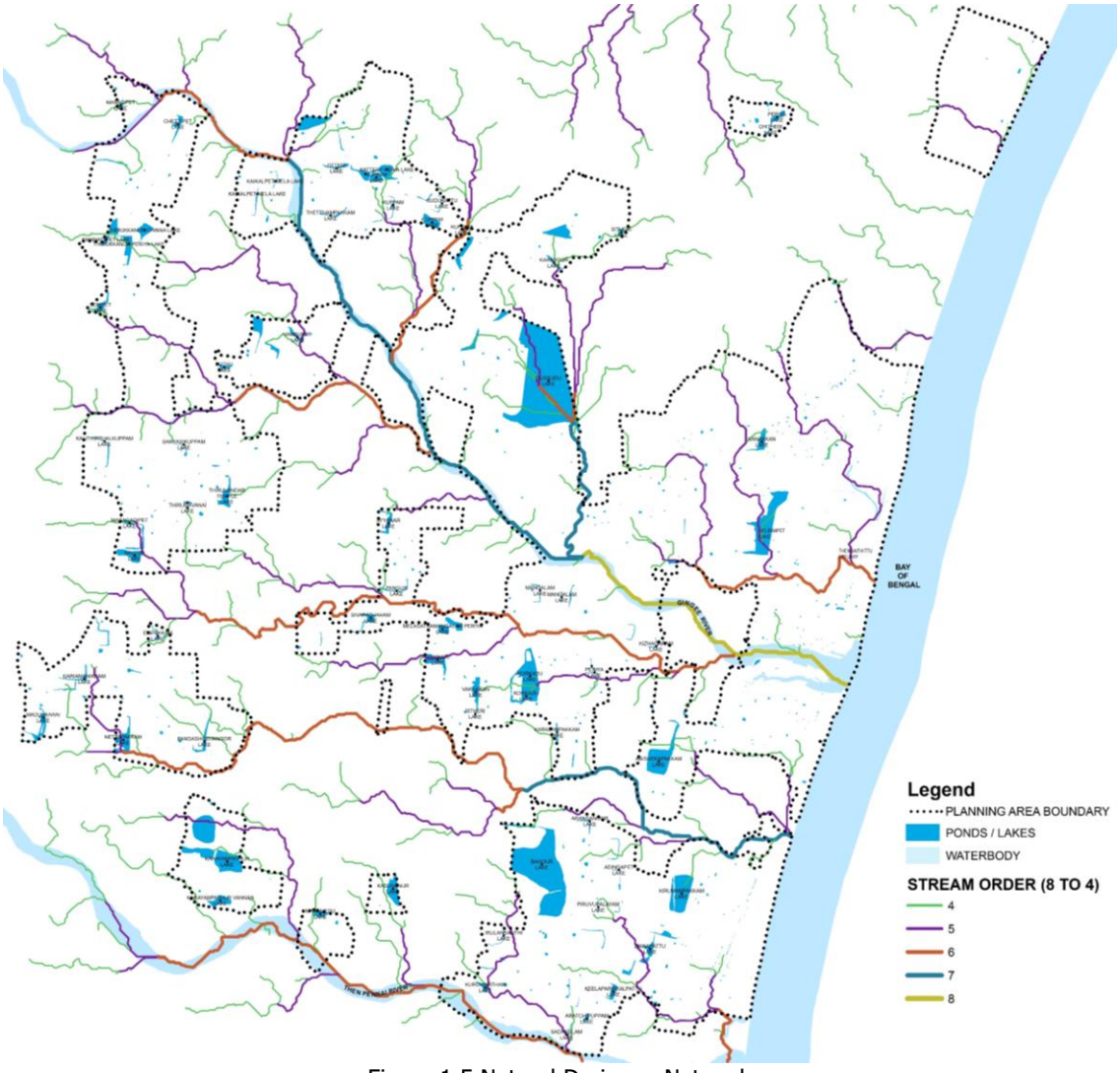


Figure 1.5 Natural Drainage Network

The Natural Drainage Network Map is prepared for Pondicherry Planning Area using Geospatial tools and Technique. Earth observation satellite of Cartosat-1 Data Product is used which is of CartoDEM 30m for watershed analysis and Drainage delineation analysis. This analysis has been carried out with the help of ArcGIS using spatial analysis with Hydrology model. DEM (Digital Elevation Model) is used to identify the surface drainage pattern. Once pre-processed, the DEM and its derivatives can be used for efficient watershed delineation and stream network generation.

1.1.5.7 SOIL

The soil of Puducherry region has developed from various parent materials like sandstone, limestone and alluvium. Pondicherry soil are coarse loamy whereas, Sanyasikuppam soils are fine loamy. Mannadipet soils are influenced by alluvium of river Penniar and also by old alluvium resulting in heavy soil texture. The entire region falls under East Coast Plains & Hills Region agro climatic zone with Red soil, Black soil, Alluvial soil and Colluvial soil. The major crops by area under cultivation are paddy, pulses, groundnut, millet and sugarcane.

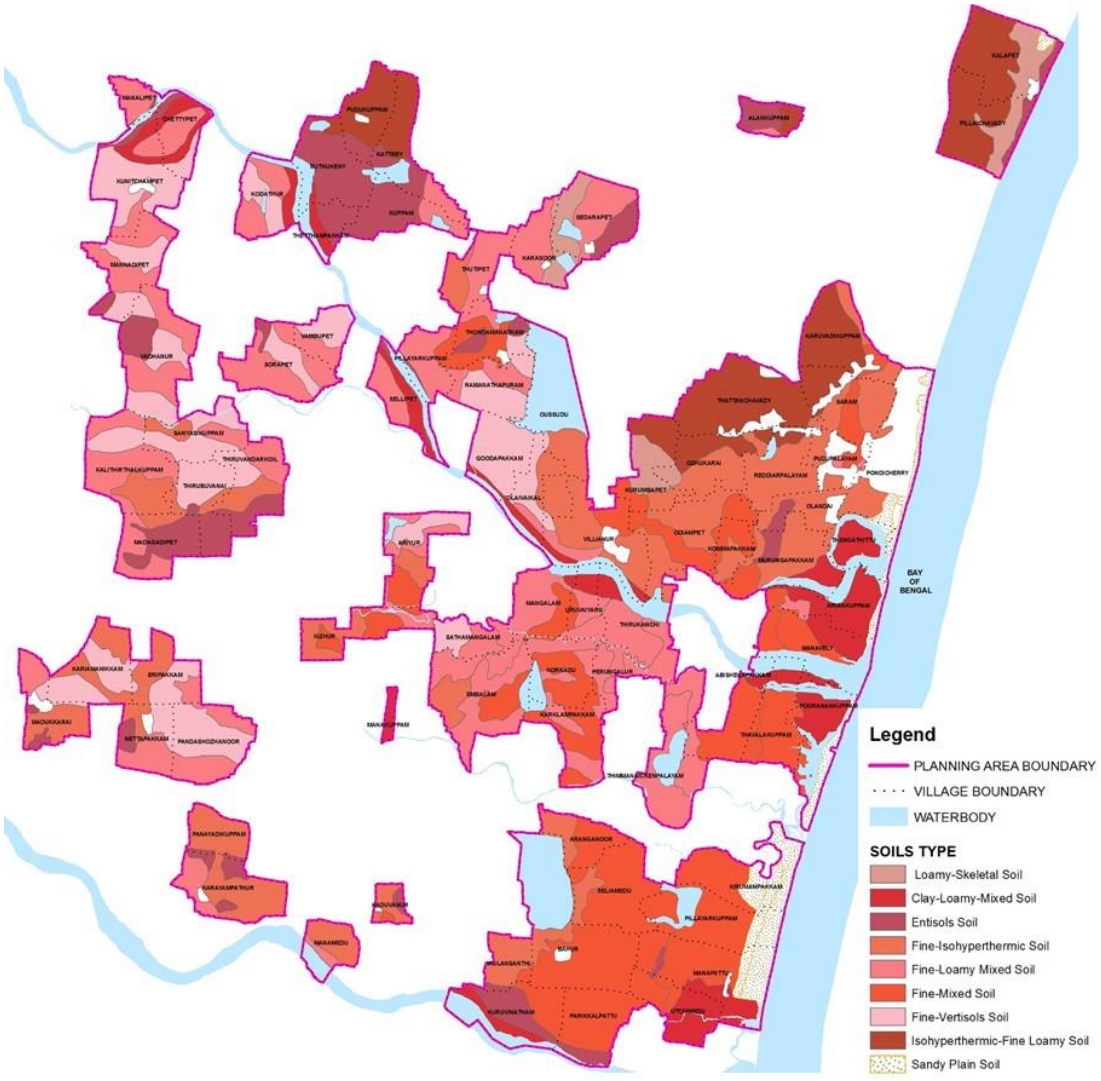


Figure 1.6 Soil Map of Puducherry Planning Area

1.1.5.8 NATURAL VEGETATION

There is no forest cover in Puducherry region, however the natural vegetation available is diverse throughout the region. The natural vegetation of the region consists of vegetation of tropical dry evergreen forest, tropical dry evergreen scrub, scrub savanna and thorn forest. Mangrove vegetation is also present in the estuaries along the Ariyankuppam and Thengaithittu village.

1.2 STUDY REGION AT A GLANCE

The Puducherry Planning Area is non-contiguous and scattered in 12 enclaves within Tamilnadu. This unique administrative boundary makes it crucial to understand the dynamics within the Planning Area, its relationship and influence of socio-economic character with the Tamilnadu Region.

Puducherry has left a unique town form and development based on French planning principles and concepts. The physical transformation of the town during the period has gone through 3 specific phases and has reflected in the urban form, based on the functions the town performed during the particular periods. They are:

(a) Trade (1674-1740),
(b) Expansion Stage with Political Motives (1741-1859)
(c) The colonial power (1860-1954).

Major transformation of the Puducherry town has taken place during expansionalist stage which has seen a series of wars with the British, resultant destruction and rebuilding of the town. Till 1954, the year in which the settlements got integrated with the Indian Union, developments were mainly confined within Boulevard. After independence, due to fast pace of developmental activities, the Government of Puducherry declared the whole Puducherry region in the Union territory of Puducherry as Puducherry Planning area in the year 1989. The details of Puducherry planning area are furnished in the table 1-4.

Table 1-4 Details of Puducherry Planning Area

S. No.	Name	Area (Sq.km)
A	**Municipalities**	
1	Puducherry Municipality	19.54
2	Ozhukarai Municipality	34.55
B	**Commune Panchayats**	
1	Ariyankuppam	24.39
2	Villianur	65.99
3	Mannadipet	64.33
4	Bahour	54.81
5	Nettapakkam	30.62
	Puducherry Planning Area	**294.23**

Source – Department of Survey and Land Records, Puducherry

1.2.1 ROADS

The study region is discussed as Boulevard area or Puducherry town (The old fortified city) and outside the Boulevard area. The basic planning concept of Puducherry Boulevard area has followed the **pattern of Bastide towns** of France with a wall around the town and the **main gates leading** to the main market. With the rest of the areas divided in rectangular blocks. The plan of the city of Puducherry is based on the grid iron pattern of streets with focal points and landmarks.

Figure 1.7 Layout of Boulevard Town



The **Boulevard town functions as central business district** of entire Puducherry region. Added to that the important government buildings and major tourist spots are also situated within the Boulevard area. The roads outside the Boulevard area are organic in pattern with less focal points and nodes for the identity of the region. The layout of Boulevard town is presented in the figure no 1.7.

1.2.2 RAILWAYS AND PORT

The Puducherry railway station is very old. Way back it was used for trading purposes from sea. The railway line starts from the Puducherry port for movement of goods to other parts of the region. At present, the tracks from inside the port are closed due to the decline in port activities. The Puducherry Port is vested with good depth i.e. 10m depth available at 1.2 km and 15m depth at 2.5 km from shore.

The old port located near the Light House and a new port is located in Ariyankuppam. Since mid-2000, there has been a steady rise in the volume of traffic handled at Puducherry Port. Starting with the export of molasses, a number of new cargos like sugar, cement, edible oil, chemicals, oil cakes, and timber are being handled through this port. After 2007 onwards, the port is not being used much by industry since no movement of cargo is happening from the port. The Port development project at Puducherry is likely to generate revenue to the State and provide direct/indirect employment opportunity to the local population.

1.2.3 ADJACENT EMPLOYMENT CENTERS

The Puducherry Planning Area is surrounded by Cuddalore and Villupuram districts of Tamilnadu. Both the districts are primarily rural in character. The fishing activity is the prominent occupation of Puducherry region after agriculture. There is also an Industrial Estate (SIPCOT) on the outskirts of the town on the Cuddalore-Chidambaram road. Cuddalore Port is situated at the confluence of the rivers Uppanar and Paravanar. The port imports timber, potatoes, sugar etc.. Timber arrives from Burma and is sent to Puducherry. Villupuram district is considered an industrially backward district. The manufacturing sector plays vital role in the generation of employment and also major contributor for the economic development of the region though this sector is very limited in study area. Hence, People from Puducherry region are also employed in neighboring regions for their livelihoods due to the nature of scattered land form settlements.



Figure 1.8 French Quarter streetscape

1.2.4 HOUSING

Puducherry is still having the buildings of French architecture, due to the French Rule in the past and conservation efforts made by different agencies. A distinct architectural style is visible in the Boulevard

Town whereas the areas outside the Boulevard Town do not exhibit any particular style. Boulevard Town has French Quarter and Tamil Quarter.



Figure 1.9 Tamil Quarter

Both the quarters follow a continuous wall to wall construction, the two differ from each other in terms of architectural features and streetscape. In French Town, colonial style buildings are seen with long compound walls, elaborate gates, the facades are characterized by vertical columns, tall windows and are coloured cream, yellow and pink. In Tamil town, the streets are lined by verandas and extended porches which are semi-open spaces, used as a space for socializing. In general, high ceilings, tall arched doors and windows with louvers dominate the space inside the houses of Boulevard Town. Floors are mostly cement floor or tiled floor and are polished. Coloured Belgian glass is given in the arched wooden frame above doors and porticos. The uneven character of skyline is found outside the Boulevard area due to densification and disorderly expansion of housing sector. Such patterns of densification serve socioeconomic purposes but also lead to challenges and opportunities to the region. The housing characteristics outside Boulevard town is presented in the figure 1.10.



Figure 1.10 Housing Characteristics outside Boulevard Town

1.2.5 SLUMS

Like any other cities, Puducherry also has slum settlements. Puducherry Slum Clearance Board is taking care to improve the slum areas since 1984. Slum Clearance Board is working to reduce the no. of slums, to provide basic facilities like road, drainage, water supply, toilet blocks, streetlights etc. and to promote better environment in slum area as well as in the adjoining neighbourhood. The no. of notified and identified slums are given in the table no 1-5

Table 1-5 Number of Slum Settlements in PPA, 2011

S. No	Location	No. of Notified Slums[1]	No. of identified Slums[2]	Total No. of Slums
1	Puducherry Planning Area	81	101	182
Source: Puducherry Slum Clearance Board				

[1] Notified Slums: As per Census 2011, all notified areas in a town or city notified as 'Slum' by State, UT Administration or Local Government under any Act including a 'Slum Act'.

[2] Identified Slums: As per Census 2011, a compact area of at least 300 population or about 60-70 households of poorly built congested tenements, in unhygienic environment usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities.

1.2.6 STREET VENDING ZONES

Vending is an important source of employment for many of the urban poor of the city since it requires low skills and small financial inputs. In Puducherry region, many informal markets are present on roadsides and pavements. These informal activities are concentrated along the Jawaharlal Nehru Street, along M.G. Road, Bharathi Street and Rangapillai Street etc. These are daily markets and the type of market differs from vegetable/fish market to clothes market to fruits market etc. Due to large footfall on these streets, traffic congestion takes place. In the Boulevard town, this situation gets worse in peak hours. Hence, there is an urgent need of identifying alternate/dedicated vending zones within and outside Boulevard Town. This will ease the traffic movement on these streets.

In rural areas, also informal markets are observed. They are concentrated mainly near bus stops and major junctions. Apart from these daily markets, there are two weekly markets also. One is along Jawaharlal Nehru and MG road which happens on every Sunday and the other is in Madagadipet village which happens on every Tuesday.



Figure 1.11 Street Vending Activities

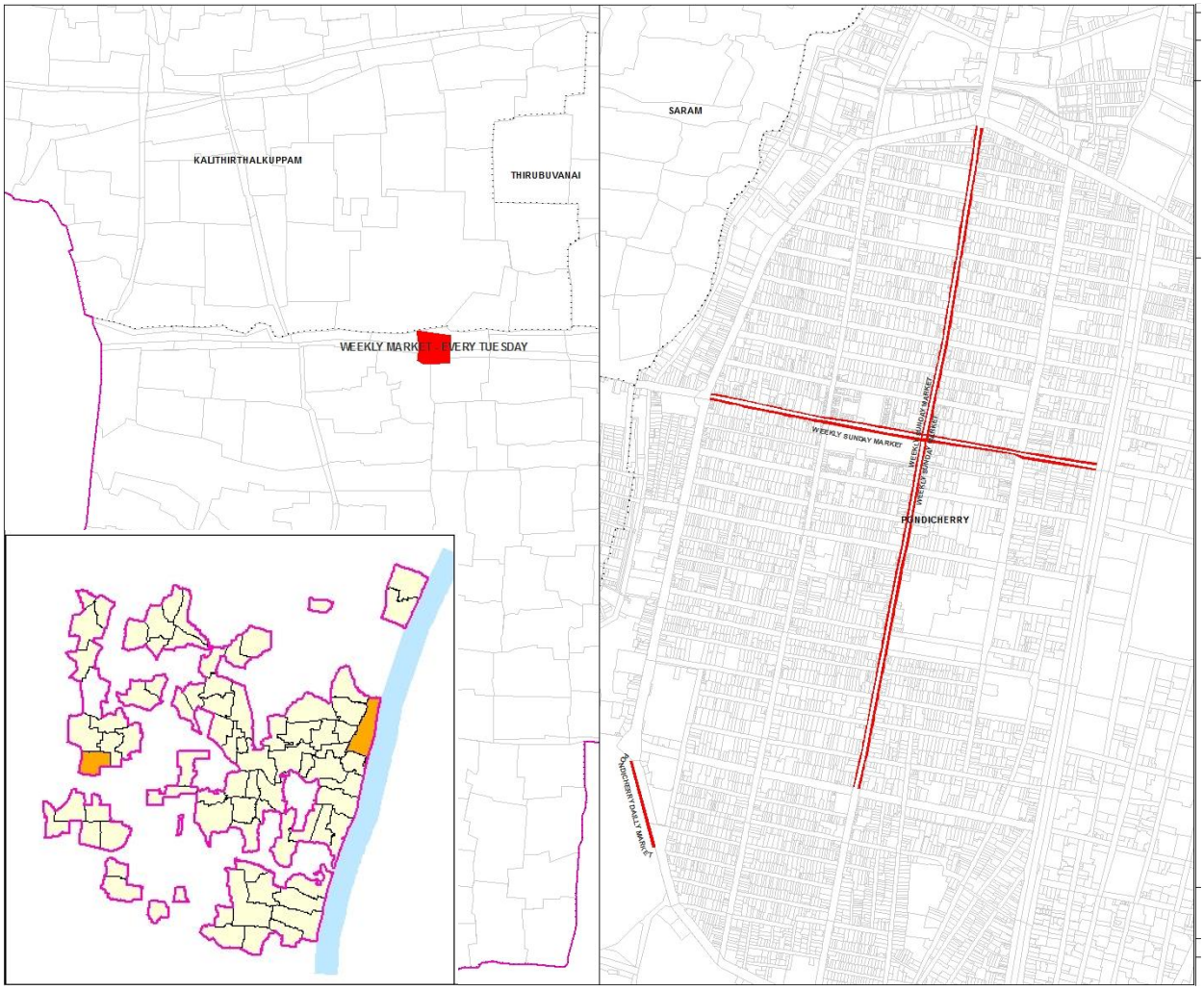


Figure 1.12 Map showing major street vending zones in PPA

1.2.7 RELIGIOUS AND CULTURAL HERITAGE

Puducherry is a host to a rich Indo-French culture as a former French colony in Southern India. Hinduism is the major religion in Puducherry. However, the French influence has created a good amount of Christian followed by Islam which is another popular religion in the city. Puducherry is host to the world-renowned Sri Aurobindo Ashram and the Auroville City, where followers of Sri Aurobindo reside and practice Aurobindo's spiritual teachings. The city is also host to several cathedrals and churches.



Figure 1.13 Aurobindo Ashram

There are numerous Hindu temples such as the Eswaran Koil, Manakula Vinayagar Temple, Kamatchi Amman temple, Kalatheeswara Varadharaja Perumal Temple and Sithanandhar Temple. Cathedrals and Muslim places of prayer include the Sacred Heart Church, Lourdes Church and the Jumma Masjid. The resident population of Puducherry is multi-national and multi-ethnic making Puducherry's culture a cosmopolitan one with strong ties to the indigenous culture of the region.

The people of Puducherry are of Tamil origin but Puducherry is home to a whole host of people from different Indian states as well as from European countries. The French influence lingers on even half a century after their departure which can be witnessed from the architecture and culture of Puducherry. Many of the locals born during French rule opted for French citizenship and continued to have close ties with France sending their children for education etc. The Aurobindo Ashram also attracts substantial number of foreigners - many of whom put down roots in Puducherry.



Figure 1.14 French Town

1.2.8 TOURISM

Tourism is an emerging key component of the service sector in Puducherry. The city has earned a name in the field of Tourism attracting tourists from both inside and outside India. Aurobindo Ashram, Auroville, Boulevard town and the various natural scenic sites and religious sites attract tourists to Puducherry.

Puducherry has five ASI notified monuments including four temples and one early historic site. One of them is Arikamedu, which is in the tentative list of UNESCO world heritage sites as one of the silk route sites in India.



Figure 1.15 Paradise Beach

Apart from heritage, Puducherry is also famous as a spiritual destination. The presence of Sri Aurobindo Ashram and proximity to Auroville attracts large chunk of international as well as domestic tourists every year. Auroville township lies in part of Villupuram, an adjoining district of Tamilnadu. Sri Aurobindo Ashram, found by Sri Aurobindo and The Mother is located in the Boulevard Town. There are many followers of this spiritual community around the globe. There are many religious sites also, like temples, mosques and churches, which attracts local tourists.



Figure 1.16 Botanical Garden

Puducherry is also a popular weekend destination, which can be reached easily from the nearby cities such as Chennai and Bangalore, principally because lower taxation on alcoholic beverages makes drinking in the Union Territory enclave much less expensive than in neighboring states. There are natural scenic sites located in the Puducherry planning Area such as beach along Goubert Avenue, Veerampattinam Beach, Paradise Beach, Botanical garden, Backwaters at Chunnambar, Ossudu Lake etc. and these sites have potential to develop and make Puducherry as tourism hub.

Major strengths of the Puducherry area originate from the rich culture and heritage it inherited from the French era. The natural scenic sites, restoration initiative, heritage tag and good connectivity, with rest of the region makes Puducherry a formidable contender for top destination in India. The weakness of Puducherry area arises from the physical infrastructure scenario which have to be improved to attract major investments in tourism sector. Concentration of tourists in certain locations

like the Promenade Beach creates a feel that Puducherry is a weekend or day visit destinations. Puducherry has the potential to improve and become a major tourist centre in South India. Puducherry's goal should be to convert Puducherry from a day trip and week-end destination to a long-haul destination. The leisure industry should be given incentives to use resources diligently and to encourage eco-tourism. Growth of tourism must be planned properly in terms of physical and social infrastructure.

1.3 BACKGROUND OF PUDUCHERRY PLANNING AREA

The Pondicherry Town & Country Planning Act was enacted in the year 1969, in order to guide the planned development and allocation of land use of rural and urban land in the Union Territory of Puducherry and for the purposes therewith through this Act. Few important provisions related to Comprehensive Development Plan are listed below:

- The Government declares planning area (under section 8 of the Act).
- The Government constitutes the Pondicherry Town & Country Planning Board (under section 3 of the Act).
- The Government in consultation with Pondicherry Town & Country Planning Board constitutes the Planning Authority, whose intention is to control and regulate the development activities in the notified planning area (under section 11 of the Act).
- A Comprehensive Development Plan to be prepared for the planning area (under section 22 of the Act).

Puducherry Planning Authority was constituted during the year 1972, by the Govt. of Puducherry, under the provisions of Pondicherry Town and Country Planning Act, 1969. In 1975, Pondicherry Planning Area was declared vide Government Order Ms.NO.115/75 UD dated 16.10.1975 and the Planning Area comprising the areas within the Municipal limits of Pondicherry Municipality and Oulgaret Panchayat, excluding the Revenue villages of Kalapet, Pillaichavady and Alankuppam. Due to rapid development, the Government of Puducherry declares the entire Puducherry region in the union territory of Pondicherry as Pondicherry Planning area dated 31.07.1989.

1.3.1 GLIMPSE OF PREVIOUS COMPREHENSIVE DEVELOPMENT PLANS

The first interim development plan was prepared during the year 1969 by the Town and Country planning Unit under Public Works Department of Puducherry. The interim development plan is tentative and not as refined as a Comprehensive Development Plan but it serves well the purposes of preventing haphazard development and speculation during the period a Comprehensive Development Plan is under preparation. The draft Comprehensive Development Plan of Pondicherry was duly completed by the Town and Country Planning department during the year 1972 -73.

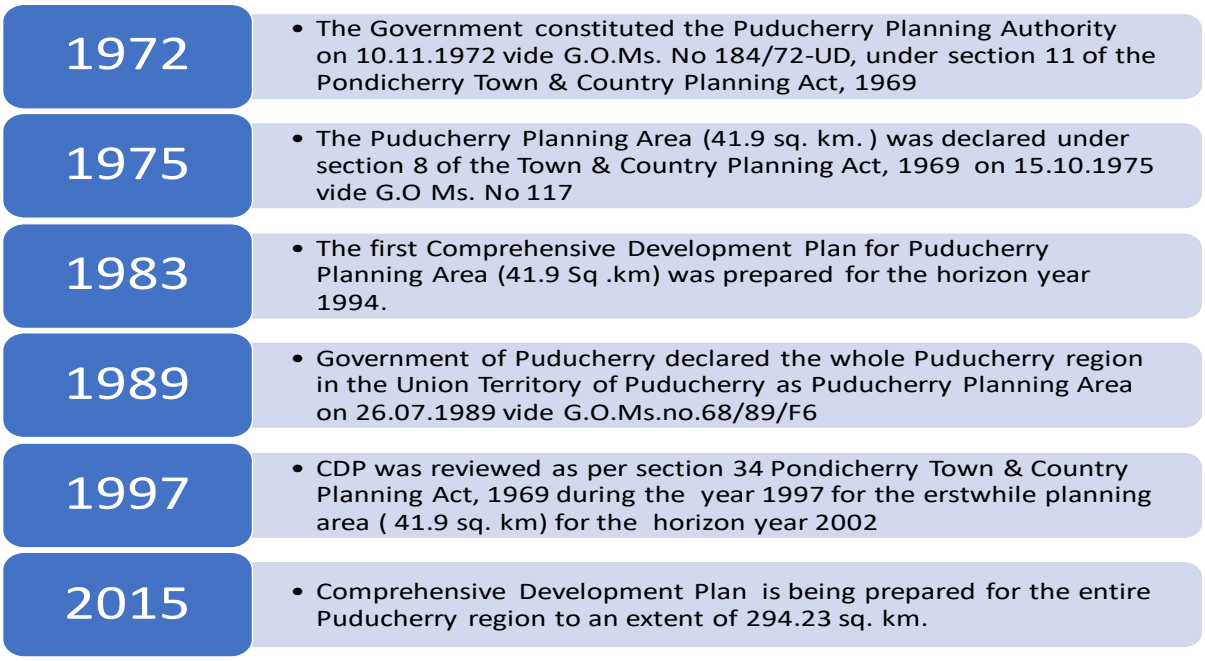


Figure 1.17 Major Events in the Planning of Puducherry

1.3.2 COMPREHENSIVE DEVELOPMENT PLAN 1983

Comprehensive Development Plan (CDP), 1983 was the first planning initiative of Puducherry Planning Authority apart from an Interim Development Plan prepared during the year 1968-69 to control haphazard development. The first CDP prepared in 1983 was prepared under the aegis of the Puducherry Town and Country Planning Act, 1969. In order to achieve physical growth in a balanced manner, the first Comprehensive Development Plan for Pondicherry was prepared and notified in the year 1983. The plan envisioned a population of 3.25 lac for the projected year 1994. This Comprehensive Development plan guided for growth of Puducherry and also regulated the growth within urban areas. Total urban area covered by the first Comprehensive Development Plan is 41.9 sq.km out of which 21.54 sq.km had been taken for planning purposes, with the population of 1.64 lac in 1983.

An attempt was made to promote orderly growth in the system through an efficient provision of services required to cater the needs of masses. The prime objective of the said Comprehensive Development Plan was to develop Pondicherry, as a self-sufficient region to attract more migration by providing the basic urban amenities. Subsequently, the Government of Puducherry extended the boundary of Pondicherry Planning Area to entire Puducherry region, vide Government Order Ms. No. 68/89/F6, dated 26.07.1989. The new Planning Area notified for the entire Puducherry Region to an extent of 294.23 sq. km.

1.3.3 REVIEW OF THE CDP 1983

- The CDP 1983 was framed for a projected population of 3.25 lac within the Planning Area by the year 1994. However, the population as per 1991 census for the area was 3.48 lac and further bound to rise upto 4.82 lac by 2001. Taking these above-mentioned facts into consideration, the CDP was reviewed under the section 34 of the Pondicherry Town & Country Planning Act, 1969.
- Before the review, a detailed land use study was carried out, which took into cognizance the developments that had taken on ground as well as land use changes approved by the government.

- A special committee was formed for the review of the objections and suggestions received by PPA and a decision to re-examine and identify additional areas for residential use was suggested.

1.3.4 COMPREHENSIVE DEVELOPMENT PLAN 1997

Taking into account the fast-paced growth of Puducherry, in the early nineties, due to the industrial & economic development, the Puducherry Planning Authority decided to review the CDP in 1997, under the section 34 of the Pondicherry Town & Country Planning Act, 1969. The map showing proposed land use for the reviewed Comprehensive Development Plan 1997, is presented in Figure 1.19. Further, the Comparative Statement of land use analysis between proposed land use, 1983 and proposed land use, 1997 for Comprehensive Development Plan is presented in Table 1-6.

The major objectives were focused with this plan, as presented in the sequel:

- To promote balanced growth & development
- To decongest the economic pressure on Boulevard Town and to de-centralize the economic activities,
- To conserve the Urban & Architectural Heritage and to provide set of location specific broad planning regulations. The CDP review was done for 41.9 sq.m, out of which 28.64 sq.km was designated with various land uses and allocated for planning purposes.

1.3.5 LIMITATIONS OF CDP REVIEW 1997

- Recognize the developments which have taken place after the CDP has become statutory
- To reassess the developments which have taken place contrary to provisions of the CDP
- To absorb the conversion of land use due to Urban Land Ceiling Act
- Incorporate land use changes

1.3.6 COMPARISON OF CDP 1983 AND 1997

To derive the strategy, it is essential to have a close look at comparative land use analysis between the Comprehensive development plan 1983 and 1997 in order to understand the real shift in the system. It would therefore be useful to briefly trace the evolution and challenges of urban planning in the context of evolving development strategy.

Table 1-6 Comparative Statement of land use analysis between proposed land use 1983 and 1997

S. No	Land use	Area of PLU as per CDP, Year 1983			Final Area Incorporated after recommendations, Year 1997		
		Area (Ha)	% to Developed Area	% to Total Area	Area (Ha)	% to Developed Area	% to Total Area
1	Residential	952.79	44.23%	22.74%	1293.91	45.18%	30.88%
2	Commercial	55.00	2.55%	1.31%	73.02	2.55%	1.74%
3	Industrial	142.00	6.59%	3.39%	210.87	7.36%	5.03%
4	Transport & Communication	506.14	23.49%	12.08%	750.30	26.20%	17.90%
5	Public Utilities and Services	11.13	0.52%	0.27%	38.33	1.34%	0.91%
6	Public & Semi Public	285.00	13.23%	6.80%	271.55	9.48%	6.48%
7	Parks & Play Grounds	161.82	7.51%	3.86%	195.98	6.84%	4.68%

S. No	Land use	Area of PLU as per CDP, Year 1983			Final Area Incorporated after recommendations, Year 1997		
		Area (Ha)	% to Developed Area	% to Total Area	Area (Ha)	% to Developed Area	% to Total Area
8	Major Recreations	40.47	1.88%	0.97%	30.24	1.06%	0.72%
9	**Total Developed Area**	**2154.35**	**100.00%**		**2864.20**	**100.00%**	
10	Canals & Water Bodies	75.69		1.81%	308.09		7.35%
11	Groves & Gardens	25.60		0.61%	102.65		2.45%
12	Green Belt	192.40		4.59%	0.00		0.00%
13	Agriculture	1742.50		41.58%	915.60		21.85%
14	**Total Master Plan Area**	**4190.54**		**100.00 %**	**4190.54**		100.00%

Source: Compiled by the consultant

The table 1-6 clearly indicates that the residential sector is primarily focused in the Comprehensive Development plan 1983. When compared to CDP 83 and CDP 97, the public utilities/services and transportation sectors are planned for the development during the period 1997. In the CDP 1997 though the areas are taken away from green belt and agriculture for the development, it doesn't increase an area of Parks & Play Grounds /Major recreations. It is also observed from the table that the substantial increase in industrial sector from 1983 to 1997 indicates the development trend towards the manufacturing units. All the developments are planned nevertheless at the cost of agricultural land is clearly evident from the table 1-6.

Coming back to current state of the city of Puducherry, the unplanned growth and development in the past decades in the peripheral areas and within municipal areas has increased stress on all kind of existing infrastructures in the system. The road networks are not designed to carry the current vehicle density, the open drain system, still prevails in certain municipal and other areas, there is no underground sewerage systems, in most parts of the outlying regions adjoining to municipal areas. In addition, the growth of population leads to unplanned residential layout development which further overburdens to physical infrastructure of the city, which leads to huge conversion of agricultural land, at an alarming pace.

In the review of the above analysis and considering all these critical points, the Puducherry Planning Authority decided to update & revise the CDP 2002 to prepare Comprehensive Development Plan for entire Puducherry Planning Area to an extent of 294.23 sq.km to accommodate the rapidly changing economic activities, change in land use pattern followed by other development with priorities, potentialities and prospects to navigate towards the orderly growth of development throughout the planning region.

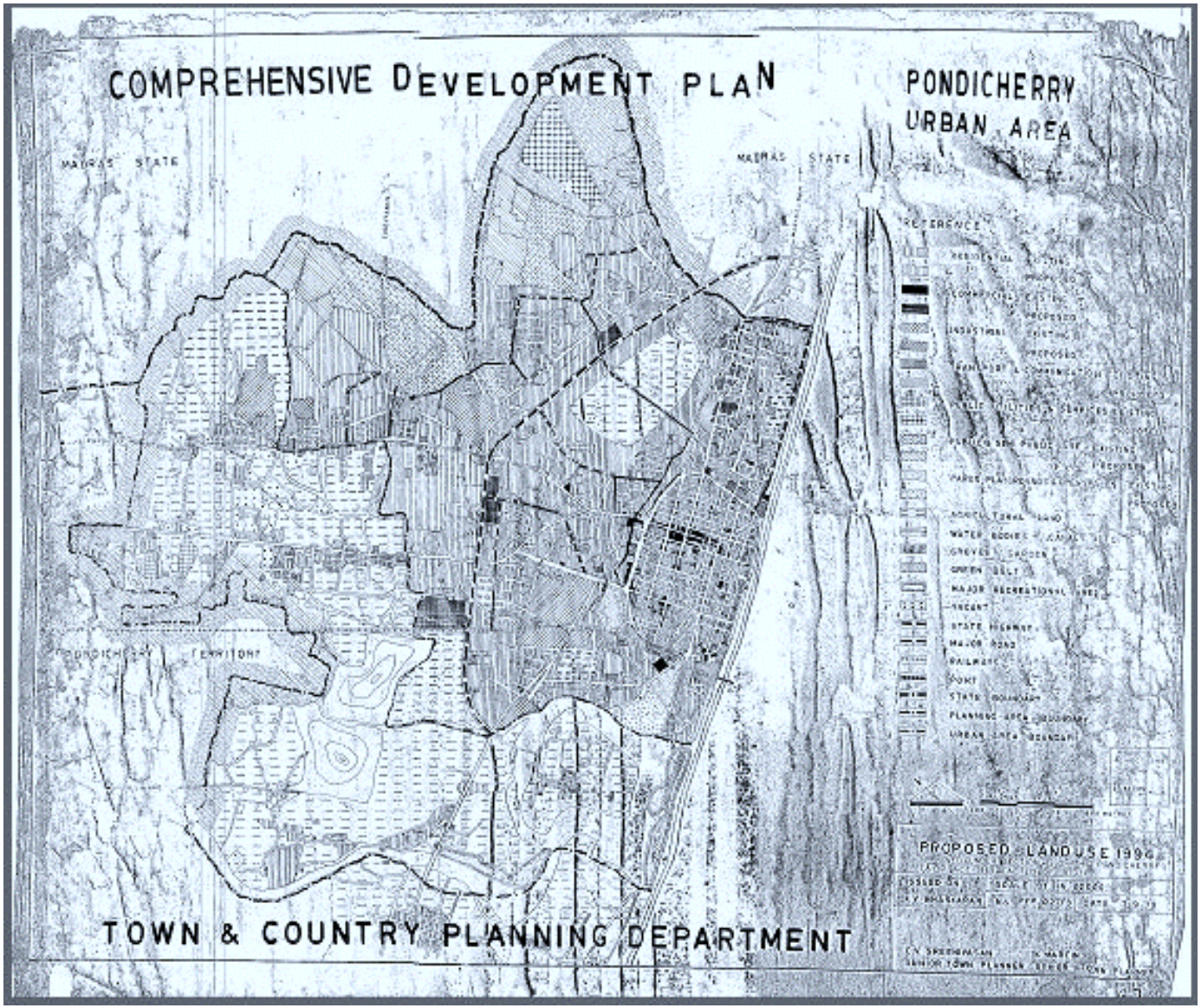


Figure 1.18 Proposed Land Use Map 1994

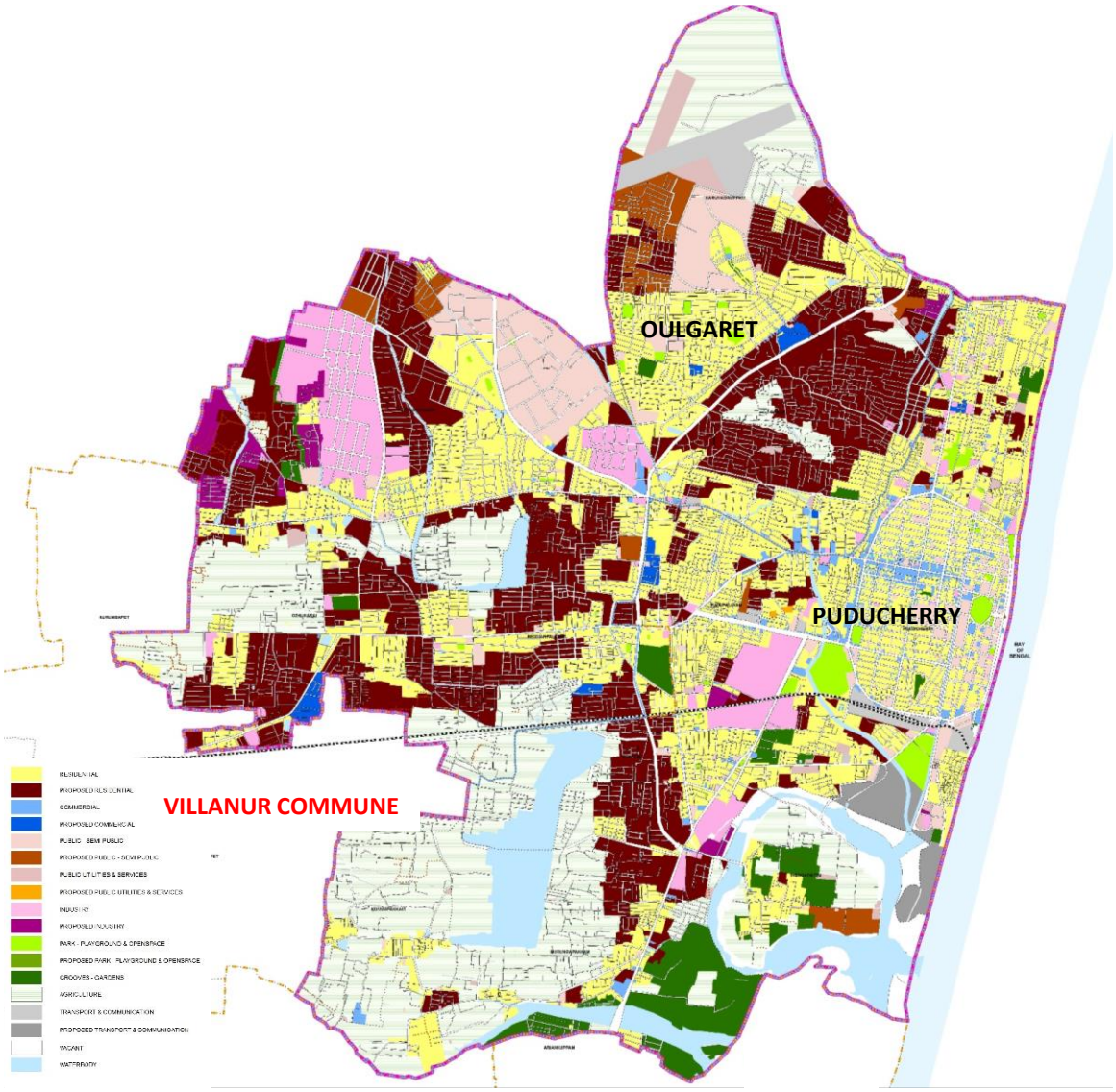


Figure 1.19 Proposed Landuse Map 1997

2 DEMOGRAPHY

Demography deals with the study of human population with respect to size, composition, spatial distribution and changes in population that occur over time etc. Magnitude of population gives an overall dimension of the physical environment and gives a basic information for the assessment of space requirement for various categories of land use within a region. Population assessment can be used to assist in determining the space required for facilities for all segments of the population. It also forms the basis of physical & social infrastructure designs. Thus, demographic analysis has major repercussions on housing market, physical infrastructure, social infrastructure and transportation.

The Puducherry Union Territory's (UT) population according to 2011 census is 12.47 lakhs. The distribution of population for four regions of the UT is illustrated in the table 2-1. The percentage contribution to the total population of the UT is presented in the figure 2.1.

Table 2-1 Population of Puducherry Union Territory, 2011

S. No	District	Population 2011	Area in Sq. Km
1	Puducherry	9,50,289	294.23
2	Karaikal	2,00,222	161.00
3	Yanam	55,626	30.00
4	Mahe	41,816	9.00
Total UT Population		**12,47,953**	**493.23**

Source: Census of India, 2011

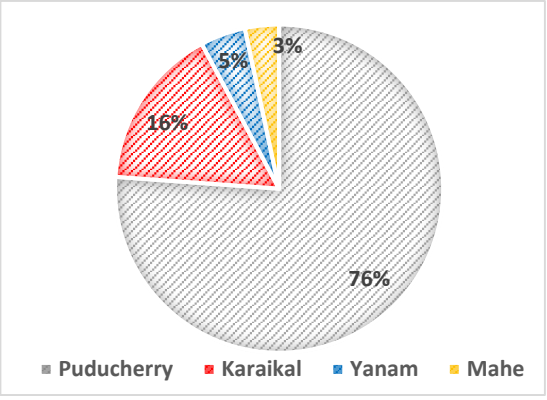


Figure 2.1 Population Distribution in UT, 2011

Considering the geographical area, Puducherry region has the highest area of 294.23 sq.km among all the four regions of Puducherry Union Territory. The table reveals that the highest population is in Puducherry region and the lowest is observed in Mahe region. Thus, high population in Puducherry region indicates higher scope for growing goods and market. Therefore, the manufacturing units shall be developed on a large scale and thus economies of large-scale production can be reaped in the system.

2.1 POPULATION GROWTH TREND IN STUDY REGION

To understand the growth of the city in terms of population and to compute the population projections, it is inevitable to understand the population growth rate over the last few decades in the planning area (Study region).

Table 2-2 Decadal Population Growth rate in Puducherry Region, 1981 to 2011

S. No	Name	Population				Decadal Growth Rate (%)		
		Year 1981	Year 1991	Year 2001	Year 2011	1981-1991	1991-2001	2001-2011
Municipality								
1	Puducherry Municipality	1,62,639	2,03,065	2,20,865	2,44,377	24.9	8.8	10.6
2	Oulgaret Municipality	95,491*	1,59,951*	2,17,707	3,00,104	67.5	36.1	37.8

S. No	Name	Population				Decadal Growth Rate (%)		
		Year 1981	Year 1991	Year 2001	Year 2011	1981-1991	1991-2001	2001-2011
Commune Panchayat								
3	Ariyankuppam	34,107	44,572	54,769	72,055	30.7	22.9	31.6
4	Villianur	50,836	70,428	88,842	1,26,778	38.5	26.1	42.7
5	Mannadipet	39,321	51,259	61,488	86,500	30.4	20	40.7
6	Bahour	37,289	47,225	54,430	68,757	26.6	15.3	26.3
7	Nettapakkam	24,734	31,838	37,231	51,718	28.7	16.9	38.9
Puducherry Planning Area		**4,44,417**	**6,08,338**	**7,35,332**	**9,50,289**	**36.9**	**20.9**	**29.2**
Source: Census of India, 2011								

*Oulgaret Municipality was formed in year 1994 and therefore the population of year 1981 and 1991 is of Oulgaret Commune.

The table 2-2 presents the population growth rate of Puducherry Planning area & figure 2.2 shows the population growth trend of Puducherry Planning Area in the past three decades in corresponding Municipalities & commune panchayats (CP). The table clearly reveals that the Puducherry Planning area witnessed a high growth rate of almost 37 percent in the period 1981-91. During the period 1991-2001 Puducherry Planning area recorded a low decadal growth rate of 20.9% and similar low growth scenario was observed throughout the Puducherry region.

The overall fluctuation in the trend is primarily related to shift in the withdrawal of tax-free status offered to Puducherry and also shift in industrial policies like withdrawal of power subsidies etc. These policy measures hit the industrial sector and allied sectors during this period influencing substantial number of people to migrate to other urban centers in the neighboring regions of Tamilnadu state. After this drop in growth rate, the Puducherry Planning area observed stabilization in 2001-11 period with a moderate decadal growth rate of 29.2%. This is attributed to the fact that Puducherry is attracting a lot of population in the educational sector due to top priority given by the Administration along with improvements in social security in the systems.

The population growth trend (Refer figure 2.2) of the Municipalities and Commune Panchayats (CP) throws light to the fact that Oulgaret Municipality and Villianur Commune Panchayats are having the highest growth rate during the period 1981-91. It is also being observed that the Villianur and Mannadipet Commune Panchayat is having highest decadal growth rate during 2001-11 period. The high growth rate in Villianur and Mannadipet Commune Panchayats may be anticipated primarily due to the developments on the major transport corridor NH-45A towards Villupuram. The development of East coast road to Cuddalore via Ariyankuppam tend to influence the high growth rate in Ariyankuppam Commune Panchayat, whereas Oulgaret & Puducherry Municipality witnessed steady growth rate during 2001-11 period.

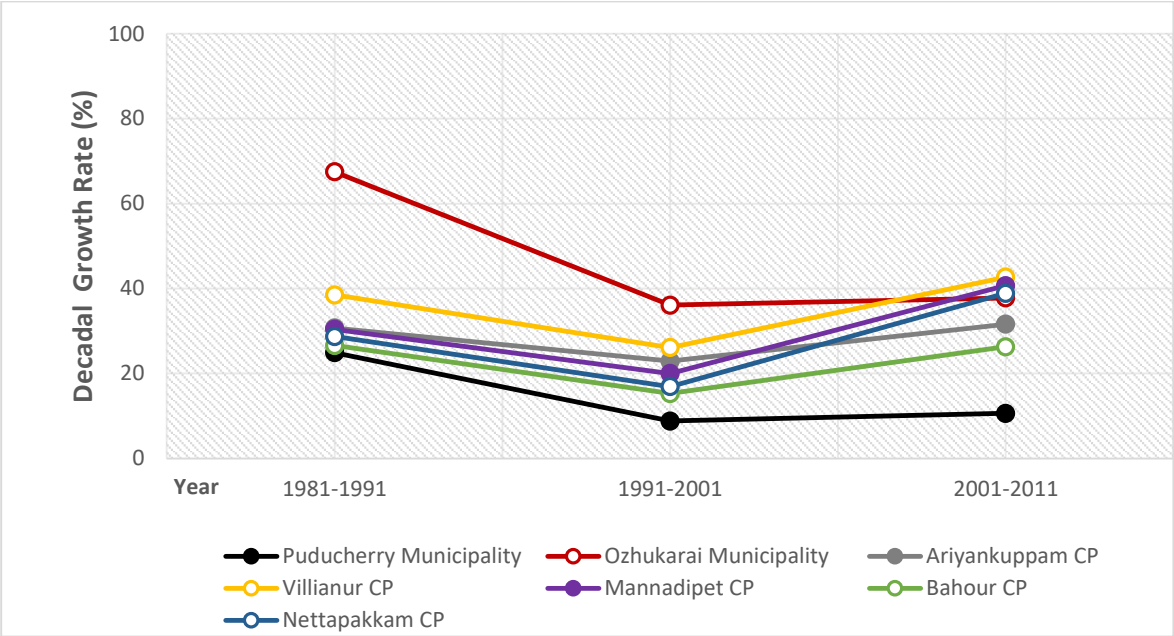


Figure 2.2 Population Growth Rate of last three decades

2.2 POPULATION DENSITY

There is a gradual increase in the population of India with the passing of each day. Whereas the population density of India per square km is also quickly on the rise. A survey of the Indian population density 2011 shows quite a considerable rise in the figures of population density in India.

Table 2-3 Average Population density of India

S. NO	Country	Area (Sq. Km)	Density 2001	Density 2011
1	India (Average)	3,287,240	324	382

Source: Census 2011

The records of population density 2011 of India, state that the density of 2011 has increased from a figure of 324 to that of 382 persons per square kilometre, which is considerably higher than the average population density of the world for 2011, which is 46 per square kilometre. Records reveal that alongwith the wide difference with the population density of the world, there are also a lot of differences in the population density of the various states of India.

2.2.1 NEIGHBOURHOOD STATES POPULATION DENSITY

Table 2-4 Population density of Neighbourhood states

S. No	State	Rank	Area (Sq. Km)	Density 2011 / Sq Km
1	Puducherry (UT)	31	490.77	2,547
2	Kerala	13	38852	860
3	TamilNadu	6	130058	555
4	Andhrapradesh	10	162968	308

Source: Census 2011

The table 2-4 illustrates the records of nearest neighbourhood state density of population during the period 2011. When Compared to overall states of India the Puducherry UT stands 31st in rank for total population and 1st among all the UT's in India. From the table, it is also observed that when

compared to nearby neighbouring states the density of population is higher in Puducherry UT. However, elaborating the ideal population density for any region is a very subjective thing as the density of population in a region is dependent on several factors. They are a) standard of living, b) citizen's human right c) development without causing any harm to the surrounding environment. Therefore, the optimal use of available resources is essential while planning the development for any region to produce the largest per capita income of consumer goods which is believed to be the ideal condition of any system.

2.2.2 POPULATION DENSITY OF PUDUCHERRY UT & REGION

The Puducherry UT comprises of total area of 493.77 sq.km with a total population of 12.47 Lakhs.

The table 2-5 indicates that the overall population density of the Puducherry Union Territory is 25 pph (Persons Per Hectare) in 2011. The highest density is in Mahe which is around 46 pph and minimum density is in Karaikal which is around 12 pph. It is observed from the table that the average density of Puducherry Planning Area as of 2011 is 32 persons per hectare which is more than the UT's average of 25 persons per hectare.

Table 2-5 Population Density in Puducherry Union Territory

S. No.	District	Density 2001 (pph)	Density 2011 (pph)
1.	Puducherry	25	32
2.	Karaikal	10	12
3.	Mahe	40	46
4.	Yanam	18	32
5.	Puducherry Union Territory	20	25

Source: Directorate of Census Operations, Puducherry

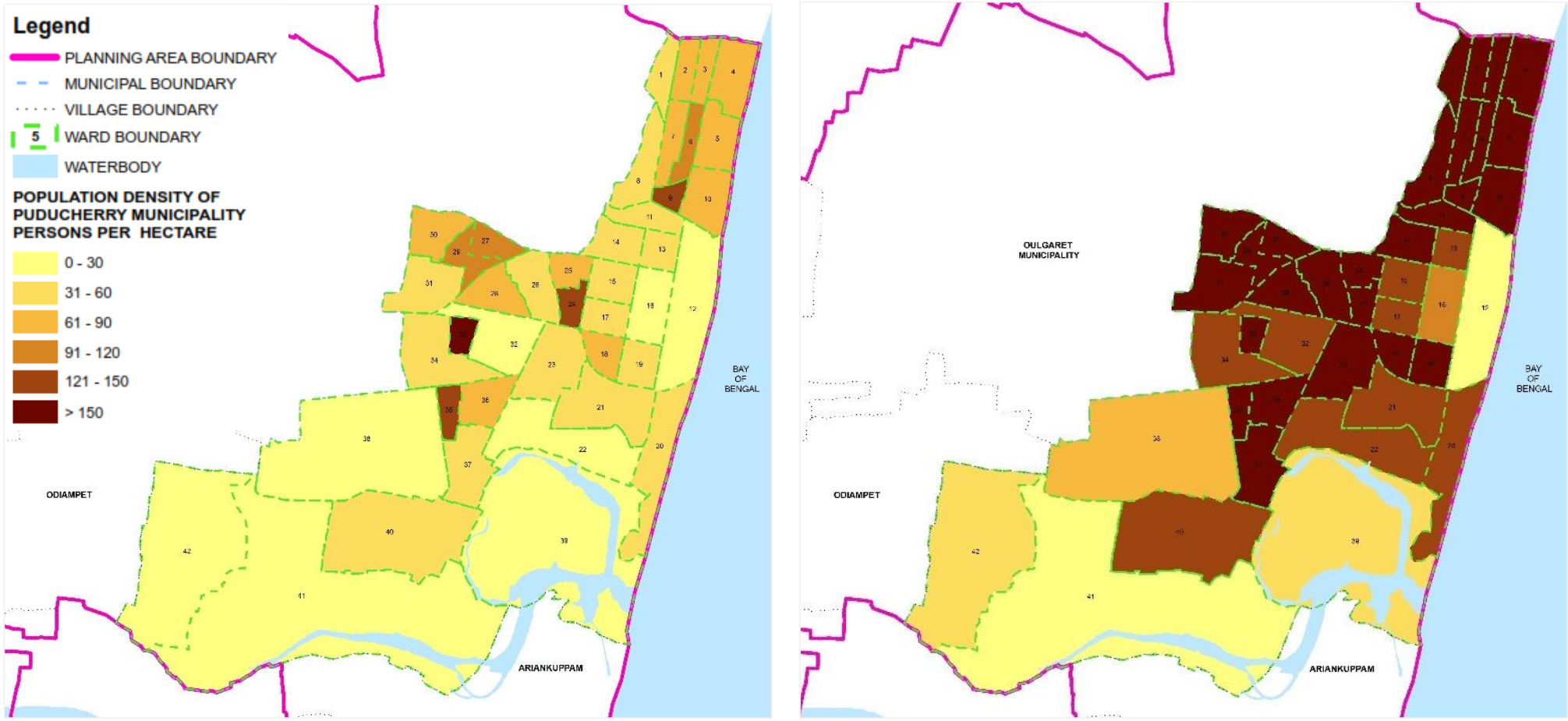
The table 2-6 illustrates the density for Municipalities & Commune Panchayats for 2001 & 2011 in the planning area. From the table, it is evident that the Puducherry Municipality has the highest density though it has a smaller area when compared to Oulgaret. The economic activities in the Puducherry Municipality area attracts large population results in high density. However, in Oulgaret municipality the density has significantly increased from 2001 to 2011 due to lack of land availability for further development in Puducherry Municipality.

Table 2-6 Population Density in Puducherry Planning Area

S. No.	Name	2001 (Persons per hectare)	2011 (Persons per hectare)
A. Municipalities			
1	Puducherry	112	125
2	Ozhukarai	63	87
B. Commune Panchayats			
1	Ariyankuppam	22	30
2	Villianur	13	19
3	Mannadipet	10	13
4	Bahour	10	13
5	Nettapakkam	12	17
Puducherry Planning Area		25	32

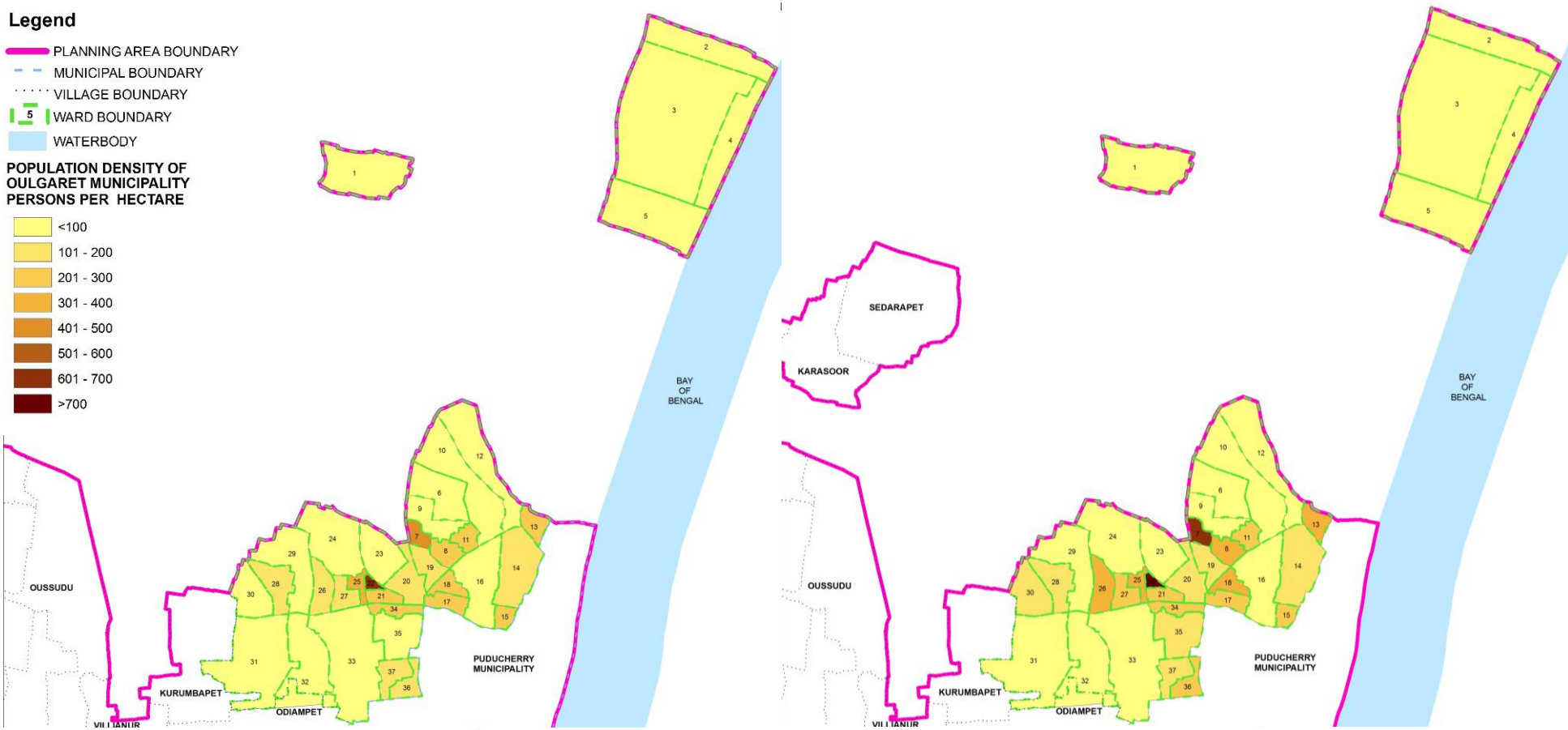
Source: Census of India, 2001 and 2011

In Puducherry Municipality, density has drastically increased in the western and northern side of Boulevard Town from 2001 to 2011. It is clearly illustrated in the figure 2.3 that many development has taken place towards the northern and western parts of Puducherry Municipality due to the presence of Kamaraj Salai, Saram 45ft road and Mahatma Gandhi road.



Population Density 2001 **Population Density 2011**

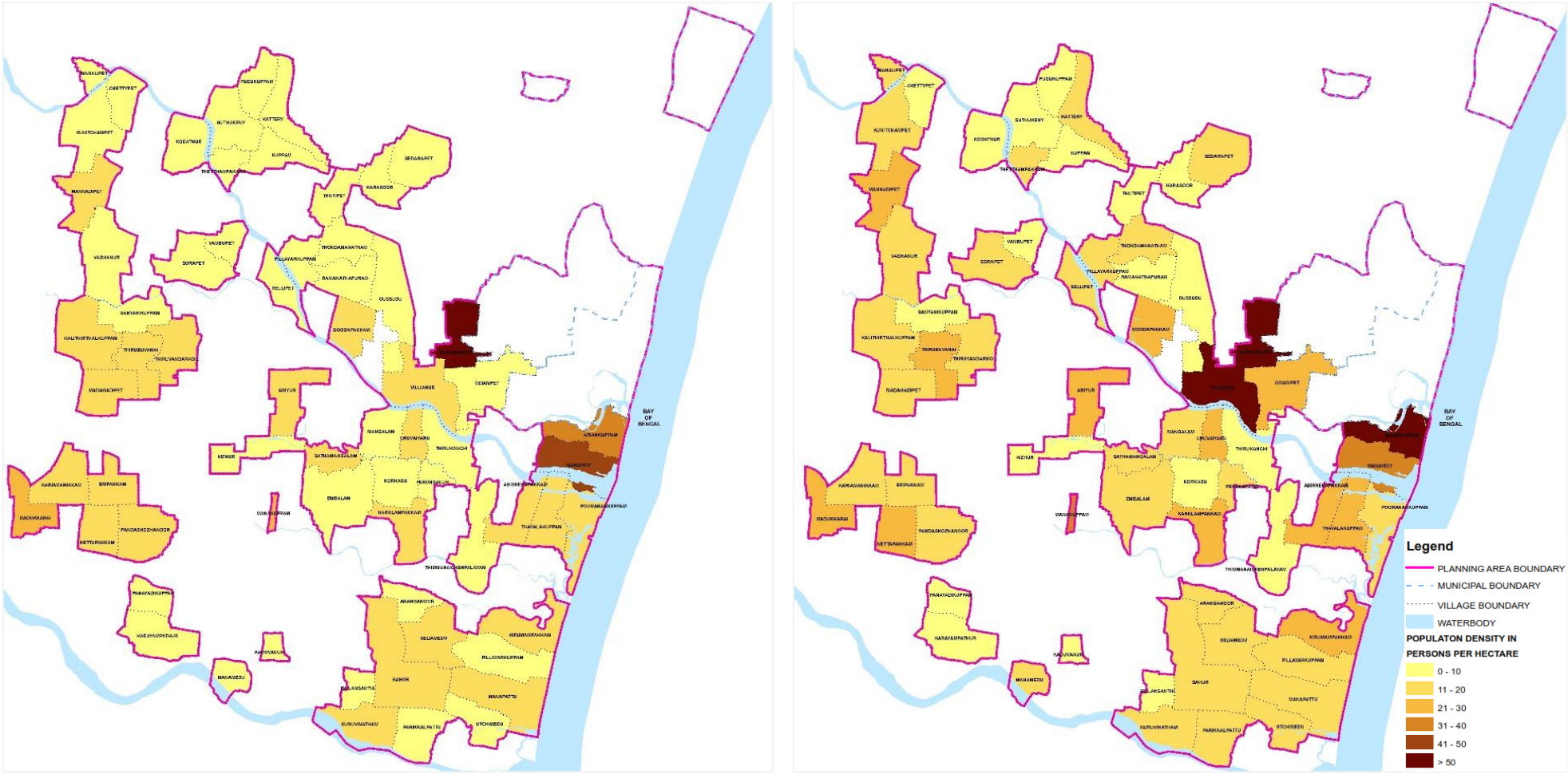
Figure 2.3 Population Density Map of Puducherry Municipality, 2001 & 2011



Population Density, 2001

Population Density, 2011

Figure 2.4 Population Density Map of Oulgaret Municipality, 2001 & 2011



Population Density 2001 **Population Density 2011**

Figure 2.5 Population Density map of Commune Panchayats, 2001 & 2011

From the figure 2.5 it is clear that the density is concentrated in Villianur and Kurumbapet from Villianur Commune Panchayat and Manavely from Ariyankuppam Commune.

2.3 BIRTH & DEATH RATE

Births and deaths are the two most important events in the life of an individual and for the society as a whole.

Table 2-7 Registered Birth & Death 2001-2010, Puducherry UT

Puducherry UT			
S. No.	**year**	**Total Number of Registered Birth**	**Total Number of Registered Death**
1	2001	42753	9119
2	2002	44871	9419
3	2003	45104	9649
4	2004	47253	9806
5	2005	46484	11091
6	2006	49,456	11,234
7	2007	49,397	10,460
8	2008	47,184	11,519
9	2009	47,590	11,681
10	2010	45,666	12,042

Source: Census, 2011

From the table 2-7 it is evident that there is increase in the birth rate and decrease in death rate in Puducherry U````T due to improved infrastructure facilities and health policy initiatives taken up by the Puducherry government. The figure 2.6 illustrates that the trend in both birth and death rate shows the steady increase in overall Puducherry UT.



Figure 2.6 Trend in Birth and Death rate – Puducherry UT

Number of Birth & Death for the Puducherry Planning Area from 2001-2010 is furnished in the table 2-7. The registered birth rates in Puducherry region during 2006 was 49.88 and it gradually decreased to 44.21 in 2010. The death rates in Puducherry region was 11.02 during 2006 and in 2010 it was observed to be 11.41.

Table 2-8 Birth Rate & Death Rate 2006-2010, Puducherry Region

S. No.	Year	Total Births	Birth Rate per 1000 Population	Total Deaths	Death Rate per 1000 Population
1	2006	41,331	49.88	9134	11.02
2	2007	41,242	47.03	8160	9.3
3	2008	39,443	42.7	9278	10.04
4	2009	40,796	41.97	9687	9.97
5	2010	38,524	44.21	9945	11.41

Source: Local Administration Department, Puducherry

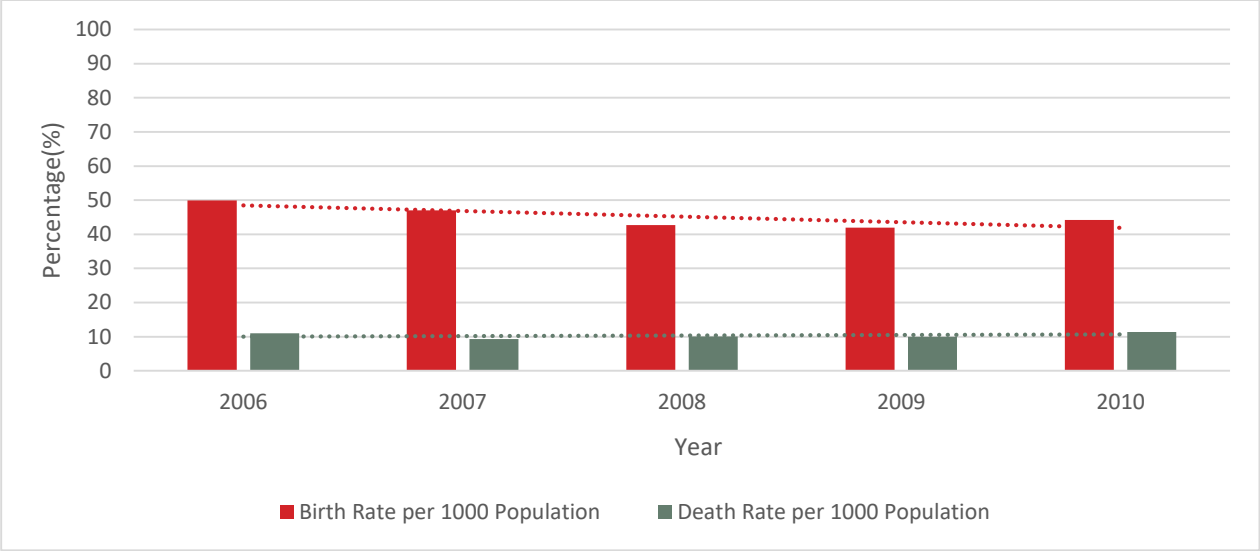


Figure 2.7 Trend in Birth and Death rate of Puducherry Region

It is observed from the table 2-8 that the death rate has increased from 11.02% to 11.14% and birth rate is decreased from 49.44% to 44.21% during the period of 2006 to 2010. From the figure 2.7 it is clear that the birth rate is steadily declining when compared to death rate in Puducherry region which indicates that there is change in the family status from more than 3 children to 1 child and also delayed birth due to the family responsibility of both the parents.

2.4 MIGRATION

The cross-cultural nature of Puducherry is a result of its attractiveness to migrant groups from all over India and around the world, in migration is not only predominant from surrounding states, but also from other states as well.

Table 2-9 Details of Migration, Puducherry Region

Year	1981	1991	2001
In- Migration	102525	148639	205379
Out-Migration	72628	63081	123232

Source: Census

These migrant groups from other parts of India have made their distinctive mark on the patterns of social organizations within Puducherry Planning Area. The details of in migrant population are represented in the table 2-10.

Table 2-10 Details of in migration in Puducherry Planning Area

S. No.	Birth Place	Year 1981	Year 1991	Year 2001
1	Outside India	2,279	2,387	2,047
2	Other states of India	97,601	141,811	194,289
3	Other districts of Puducherry UT	2,645	4,441	9,043
Total in migrant population in Puducherry Planning Area		**102,525**	**148,639**	**205,379**

Source: Census (Census 2011 Migration data is not yet Published)

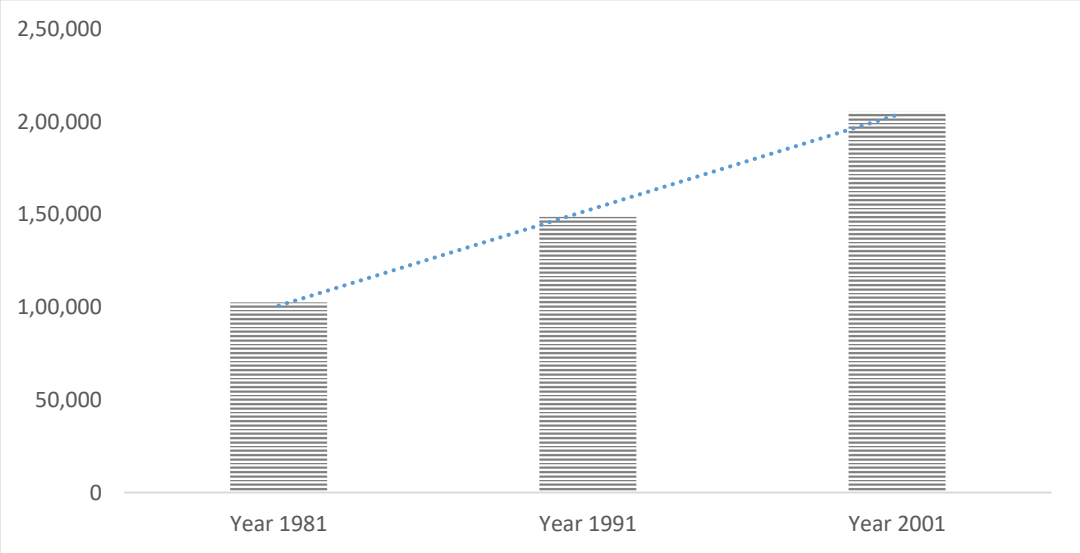


Figure 2.8 Number of In-migrants in Puducherry Region, 1981-2001

It is observed from the figure 2.8, number of in-migrants is gradually increasing from 1981 to 2001. The Percentage share of in-migrants are higher from the other states of India followed by other regions of Union Territory of Puducherry.

There are many reasons for in migration like marriage, education, employment opportunities etc. In Puducherry Planning Area, the highest migration has taken place due to marriage i.e. 34.3% followed by families which has moved with household and work/employment. Hence it is clearly evident that the in migrations are due to the shift in the employment and shift due to marital status with in the regions of Puducherry Planning area.

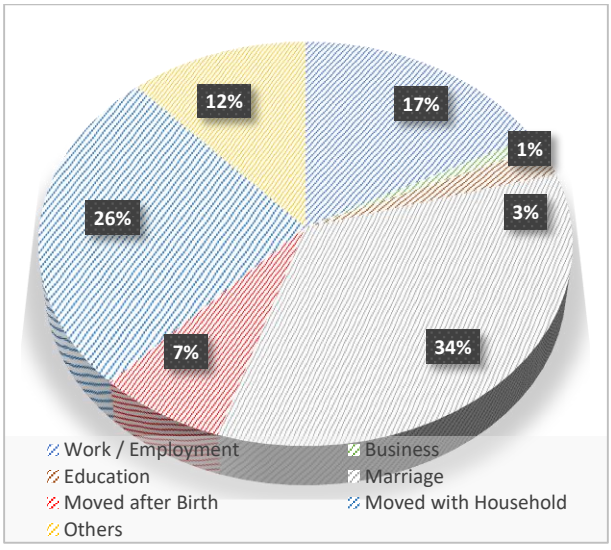


Figure 2.9 Reason for Immigration, Census 2001

Table 2-11 Reasons for migration from Household Survey - 2015

S. No.	Reasons for Migration	Puducherry region (%)
1	Work	11.90
2	Education	4.08
3	Religious	0.05
4	Recreation	0.11
5	Marriage	83.22
6	Others	0.64
Total		100.00

Source: Household survey by Consultant, 2015

The table 2-11 also reveals that the migration is maximum due to marriages within the region and it is identical with the census data. Hence, marriage is the main reason exhibited for migration from one place to other place, followed by 12% of the people migrated from other places due to employment opportunities. The 4% of the people are migrated to Puducherry region due to educational facilities. It is also observed that the migration due to education is increasing from 2001 onwards. From the household survey, it is perceived that the Puducherry Municipality (92%) and Villianur Commune (92.7%) has observed the highest migration due to marriage. It is also being observed that the migration due to employment opportunities are high in Ariyankuppam Commune (15.65%) and Oulgaret municipality (15.7%). Therefore, it is vital to develop more employment opportunities in the identified location to sustain the human resources which in turn will increase the economic development in the system.

2.5 SEX RATIO

Sex ratio is a valuable source for finding the population of women from the total population and what is the ratio of women to that of men in a particular area. In the Census 2011, it was revealed that the population ratio in India for 2011 is 940 females per 1000 of males. The Sex Ratio of 2011 shows an upward trend from the census 2001 data. Census 2001 revealed that there were 933 females to that of 1000 males. India has seen a decrease in the sex ratio till 2001, but after that there has been in slight increase in the sex ratio.

Table 2-12 Sex ratio in India

S. No	Country	year	2001	2011
1	India	Sex Ratio	933	940

Source: census 2001 & 2011

2.5.1 SEX RATIO IN NEIGHBOURHOOD STATES

Table 2-13 Sex Ratio in neighbourhood states

S. No	State	Sex ratio 2001	Sex ratio - 2011
1	Puducherry (UT)	1001	1037
2	Kerala	1058	1084
3	Tamilnadu	987	996
4	Andhra Pradesh	978	993

Source: census 2001 & 2011

The states such as Puducherry (UT) and Kerala have more number of women than men. In year 2011, Kerala houses 1084 females to that of 1000 males. While Puducherry and Kerala are the only

two states where the number of female is more than the number of men. The Puducherry (UT) ranks 2nd in the sex ratio in India after Kerala, is a positive sign for the growth of the region.

2.5.2 SEX RATIO IN PUDUCHERRY REGION

Population enumeration by gender composition is a basic and critical characteristic of demographic analysis. The sex ratio of the Puducherry UT in the year 2011 is 1037 while in the previous census period it was 1001. From the table 2-14, it is perceived that in 2011, the highest sex ratio is in Puducherry Municipality while the lowest is in Villianur Commune Panchayat. However, in the year 2011, sex ratio distribution in the planning area is almost the same in municipalities and commune panchayats. This is mainly due to more health awareness in the rural areas and the overall increase in literacy rate of Puducherry Planning area.

Table 2-14 Details of sex ratio in Puducherry Planning Area

S. No.	Name	Sex Ratio (2001)	Sex Ratio (2011)
Municipality			
1	Puducherry	1,019	1,046
2	Oulgaret	978	1,021
Commune Panchayat			
1	Ariyankuppam	981	1,038
2	Villianur	976	1,018
3	Mannadipet	988	1,019
4	Bahour	970	1,034
5	Nettapakkam	977	1,026
Puducherry Planning Area		990	1,029
Source: Census of India, 2011			

2.6 LITERACY

The average literacy rate of Puducherry Planning Area in year 2011 was 85.44%. Details of literacy rate in the planning area for 2001 & 2011 are furnished in the table 2-15.

Table 2-15 Effective Literacy rate for Puducherry Planning Area in year 2011

Sr. No.	Name	Year 2001			Year 2011		
		Total Literacy Rate (%)	Male Literacy Rate (%)	Female Literacy Rate (%)	Total Literacy Rate (%)	Male Literacy Rate (%)	Female Literacy Rate (%)
Municipality							
1	Puducherry	85.50	92.03	79.14	89.22	93.95	84.72
2	Oulgaret	85.70	92.24	79.03	89.35	93.86	84.97
Commune Panchayat							
3	Ariyankuppam	77.16	86.44	67.77	82.47	89.62	75.61
4	Villianur	75.35	84.59	65.93	81.74	88.67	75.01
5	Mannadipet	71.20	81.74	60.82	78.91	86.84	71.18

Sr. No.	Name	Year 2001			Year 2011		
		Total Literacy Rate (%)	Male Literacy Rate (%)	Female Literacy Rate (%)	Total Literacy Rate (%)	Male Literacy Rate (%)	Female Literacy Rate (%)
6	Bahour	69.30	78.91	59.42	77.69	85.33	70.39
7	Nettapakkam	71.14	81.95	60.05	78.75	86.49	71.25
Puducherry Planning Area		80.65	88.43	72.83	85.44	91.23	79.86

Source: Census

It has been observed from the table that the highest literacy rate is in Oulgaret municipality, which is due to the concentration of educational facilities and high urbanization. While the lowest is in Bahour Commune Panchayat which is constituted by rural villages. The female literacy rates are slightly lower than the overall literacy rates. Thus, **women's education** can be given more importance to build up human capital resources for economic development of Puducherry region.

2.7 AGE STRUCTURE

The age structure categorised by gender for the Puducherry Union Territory is given in the figure no 2.10 based on the census details for year 2011. From figure 2.10, it can be observed that the population of age group between 20 to 45 are found to be more in Puducherry region. The age structure does not indicate the pyramid structure, instead it has the pattern of tree structure which reaches at peak for the age group of 20-24. Therefore, considering the above condition, the same may be forecasted for the Puducherry region. Hence, creating more educational facilities and employment opportunities will generate the positive synergy of this age group towards the economic development of Puducherry region.

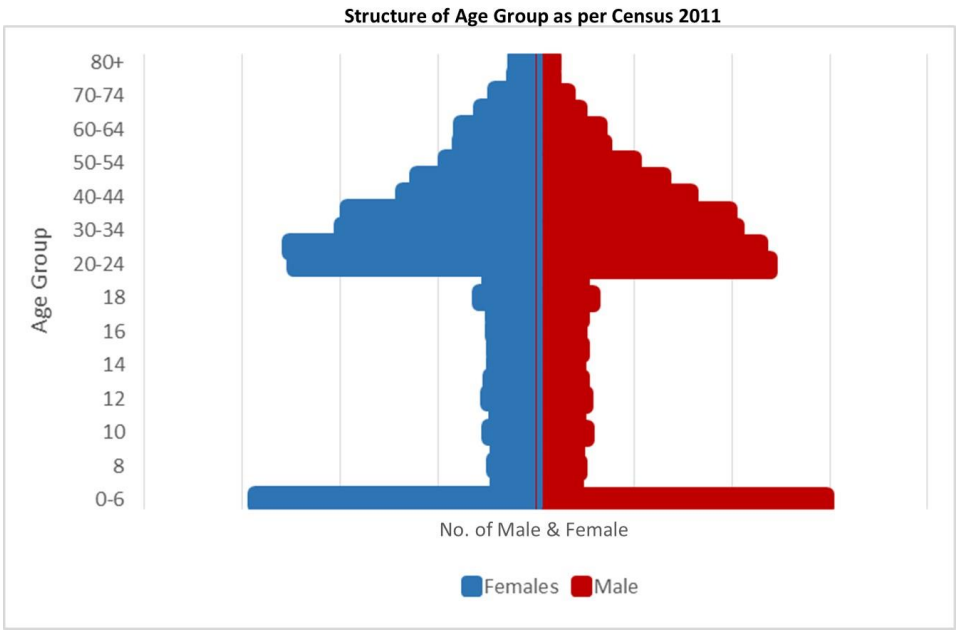


Figure 2.10 Population by Age Group in Puducherry Union Territory, 2011

Table 2-16 Age Group (0-6 Age) Puducherry region

S. No	Age group	2011	2001
1	Child Proportion (0-6 Age)	10.51%	11.86%
2	Boys Proportion (0-6 Age)	10.82%	12.01%
3	Girls Proportion (0-6 Age)	10.20%	11.72%

Source: Census 2011

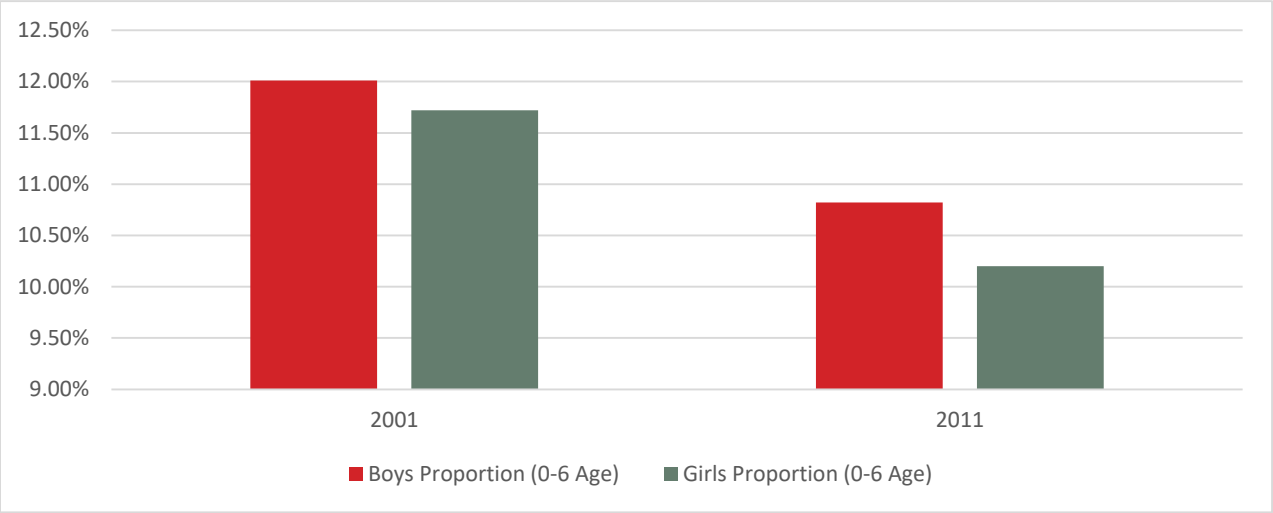


Figure 2.11 Male Female distribution in the age group of 0-6

The figure 2.11 reveals the child population between the age group (0-6). It indicates that the percentage of child population is decreased during the period 2001 to 2011 in Puducherry region. When compared to the data of Union Territory, the percentage of population between the age group (0-6) shows the decline trend in the system. Though the Puducherry region is ranked second in India in sex ratio but the age group between (0-6) shows the decline.

2.8 OCCUPATION STRUCTURE

The occupation structure of the Puducherry region is furnished in the table 2-17.

Table 2-17 Occupation Structure by sectors of economy (2001)

S. No.	Name	Primary Sector		Secondary Sector	Tertiary Sector
		No. of Cultivators	No. of Agricultural Labours	No. of House-hold industry workers	No. of workers in other Services
Municipality					
1	Puducherry Municipality	326	1,210	1,338	71,339
2	Oulgaret Municipality	537	2,387	1,579	70,242
Commune Panchayat					
1	Ariyankuppam	681	3,470	368	14,681
2	Villianur	1,444	11,514	512	19,487
3	Mannadipet	2,363	13,313	456	8,699

4	Bahour	1,525	11,782	305	8,597
5	Nettapakkam	1,362	8,585	506	5,817
Puducherry Planning Area		**8,238**	**52,261**	**5,064**	**1,98,862**
Source: Census of India, 2001					

From the table, it is observed that out of the total working population of Puducherry Planning Area, 23.09 % of working population is engaged in primary sector, 1.91% in secondary sector and 75.01% in tertiary sector. This indicates higher dependency of working population on tertiary sector, followed by primary sector. In rural areas, dependency on primary sector is high. Puducherry municipality is mainly dependent on tertiary sector as majority of tourist activities are concentrated in and around the boulevard town. As there are very less industrial establishments, dependency on secondary sector is very less. The details of work force distribution by sectors of economy for year 2011 are given in table 2-18.

Table 2-18 Occupation Structure by sectors of Economy (2011)

S. No.	**Name**	**Primary Sector**		**Secondary Sector**	**Tertiary Sector**
		No. of Cultivators	**No. of Agricultural Labours**	**No. of House-hold industry workers**	**No. of workers in other Services**
Municipality					
1	Puducherry Municipality	622	846	1,586	84,866
2	Oulgaret Municipality	1,198	1,793	1,755	1,03,364
Commune Panchayat					
1	Ariyankuppam	694	2,927	399	21,191
2	Villianur	1,665	9,411	1,195	34,786
3	Mannadipet	2,314	13,875	754	15,384
4	Bahour	1,772	11,873	305	11,647
5	Nettapakkam	1,036	9,815	294	8,659
Puducherry Planning Area		**9,301**	**50,540**	**6,288**	**2,79,897**
Source: Census of India, 2011					

According to the Census 2011, out of the total working population for Puducherry Planning Area 17.61% work in the primary sector, 1.82% in secondary sector and 80.57% in tertiary sector. The trend continues and it shows higher dependency of working population on tertiary sector, followed by primary sector. Compared to census 2001, there has been a decrease in the percentage of working population in the primary sector and subsequent increase in the percentage of working population in tertiary sector.

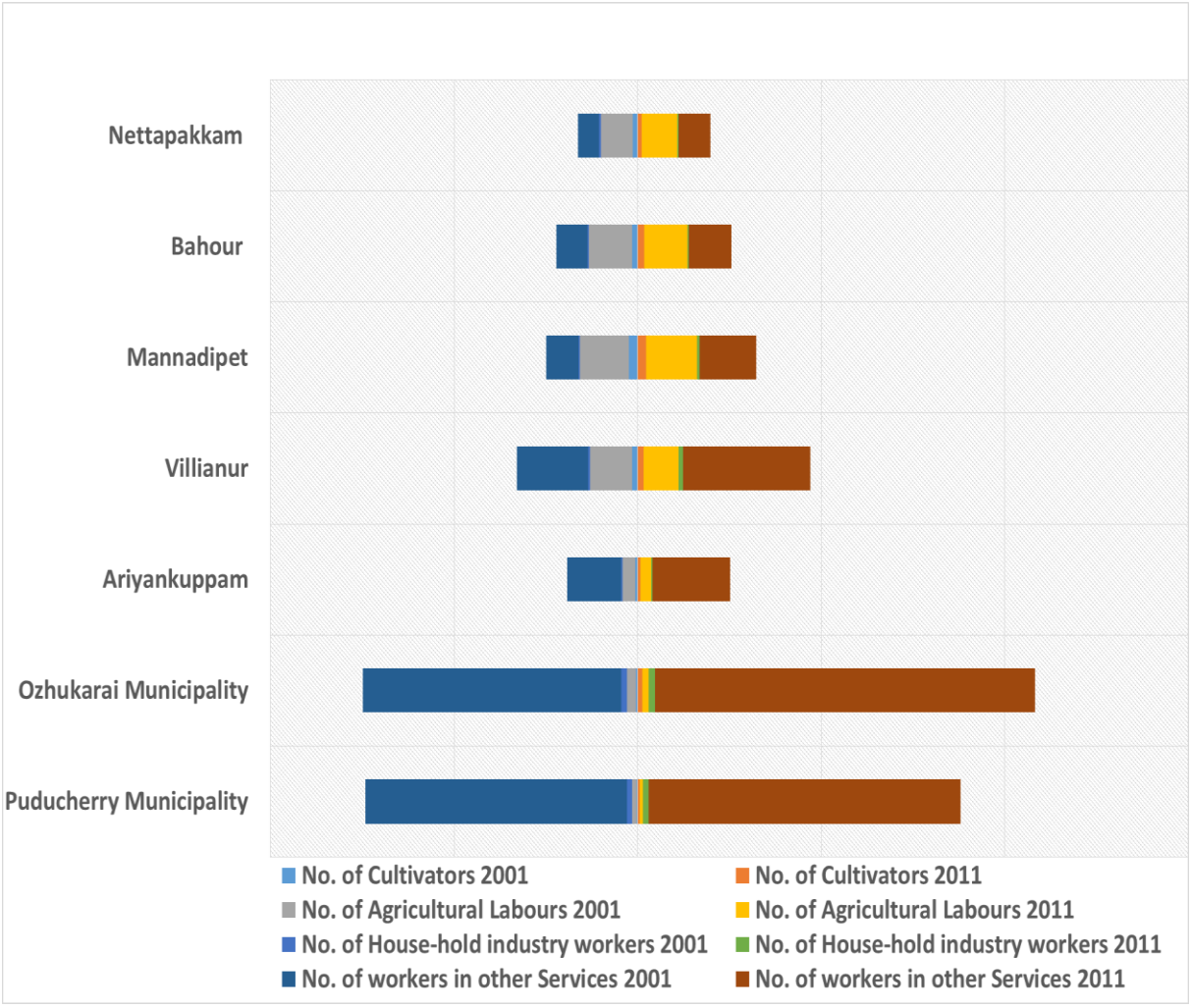


Figure 2.12 Percentage of working population between 2001 and 2011

From the figure 2.12 it is evident that in the year 2011 the maximum percentage of population is engaged in service sector in overall Puducherry Planning Area. It is also observed that the agriculture labours are more in Mannadipet and Bahour communes, which indicates that still majority of the population is dependent on agricultural activities. Hence, the focus shall be on the agricultural development in Mannadipet and Bahour communes as these regions have the potential for such development. Similarly Promoting service-based industries in Municipality including the areas falling under the proposed conurbation area will increase the economy of the region.

2.9 POPULATION COMPOSITION

The Puducherry Union territory's population is composed of all major religions. Hinduism is the major religion in Puducherry city with 83.39% followers. Christianity is second most popular religion in Puducherry city with 10.88% following it. In Puducherry city, Islam is followed by 4.97%, Jainism by 0.16%, Sikhism by 0.03% and Buddhism by 0.03%. Around 0.02% stated 'Other Religion', approximately 0.47% stated 'No Particular Religion'.

Table 2-19 Population by Religious Communities in Puducherry Union Territory, 2001

S. No.	Religion	Percentage
1	Hindus	83.39%
2	Muslims	4.97%
3	Christians	10.88%
4	Sikhs	0.03%
5	Buddhists	0.09%
6	Jains	0.16%
7	Others	0.02%
8	Religion Not Stated	0.47%
9	**All Religions**	**100**

Source: Directorate of Census Operations Puducherry, 2011

2.10 POPULATION PROJECTION METHODS

Population projection is base for any planning decision. It is an attempt to glance into the future population scenario by making certain assumptions, using data related to past, available at that point of time. Projected population is required to calculate future demand for various sectors of physical and social infrastructure. Different methods used for estimating population projection are explained in this section.

2.10.1 ARITHMETIC PROGRESSION METHOD

This method is suitable for large and old city with considerable development. If it is used for small, average or comparatively new cities, it will give lower population estimate than actual value. In this method, the average increase in population per decade is calculated from the past census reports. This increase is added to the present population to find out the population of the next decade. Thus,

Table 2-20 Population Projection for PPA based on Arithmetic Progression Method

S. No	Year	Puducherry Municipality	Ozhukarai Municipality	Ariyankuppam CP	Villianur CP	Mannadipet CP	Bahur CP	Netapakkam CP	Total PPA
1	1961	100,947	39217	20226	30800	25963	23890	17518	258,561
2	1971	134,222	57785	26269	39134	32133	30312	20385	340,240
3	1981	162639	95491	34107	50836	39321	37289	24734	444417
4	1991	203065	159951	44572	70428	51259	47225	31838	608338
5	2001	220865	217707	54769	88842	61488	54430	37231	735332
6	2011	244377	300104	72055	126778	86500	68757	51718	950289
7	2018	264457	336628	79311	140215	94975	75038	56506	1047131
8	2021	273063	352281	82421	145974	98607	77730	58558	1088635
9	2031	301749	404459	92787	165169	110715	86704	65398	1226980
10	**2036**	**316092**	**430548**	**97970**	**174767**	**116769**	**91191**	**68818**	**1296153**
11	2041	330435	456636	103152	184365	122822	95677	72238	1365326

Source: Compiled by Consultants

it is assumed that the population is increasing at constant rate.

- Hence, dP/dt = C i.e., rate of change of population with respect to time is constant.
- Therefore, Population after nth decade will be **Pn= P + n.C (1)**
- Where, Pn is the population after 'n' decades and 'P' is present population.

2.10.2 GEOMETRIC PROGRESSION METHOD

In this method, the percentage increase in population from decade to decade is assumed to remain constant. Geometric mean increase is used to find out the future increment in population. Since this method gives higher values and hence should be applied for a new industrial town at the beginning of development for only few decades. The population at the end of nth decade 'Pn' can be estimated as:

- **Pn = P (1+ IG/100) n (2)**
- Where, IG = geometric mean (%)
- P = Present population
- n = no. of decades.

Table 2-21 Population Projection for PPA based on Geometric Progression Method

Sl. No	Year	Puducherry Municipality	Ozhukarai Municipality	Ariyankuppam CP	Villianur CP	Mannadipet CP	Bahur CP	Netapakkam CP	Total PPA
1	1961	100,947	39217	20226	30800	25963	23890	17518	258,561
2	1971	134,222	57785	26269	39134	32133	30312	20385	340,240
3	1981	162639	95491	34107	50836	39321	37289	24734	444417
4	1991	203065	159951	44572	70428	51259	47225	31838	608338
5	2001	220865	217707	54769	88842	61488	54430	37231	735332
6	2011	244377	300104	72055	126778	86500	68757	51718	950289
7	2018	277125	400107	86099	154683	102493	79761	60277	1160546
8	2021	292471	452592	92927	168449	110223	85001	64365	1266029
9	2031	350031	682563	119846	223817	140452	105082	80105	1701896
10	**2036**	**382928**	**838224**	**136102**	**257992**	**158547**	**116837**	**89365**	**1979995**
11	2041	418918	1029385	154562	297385	178972	129907	99695	2308824

Source: Compiled by Consultants

2.10.3 INCREMENTAL INCREASE METHOD

This method is modification of arithmetical increase method and it is suitable for an average size town under normal condition where the growth rate is found to be in increasing order. While adopting this method the increase in increment is considered for calculating future population. The incremental increase is determined for each decade from the past population and the average value is added to the present population along with the average rate of increase.

- Hence, population after nth decade is Pn = P+ n.X + {n (n+1)/2}.Y (3)
- Where, Pn = Population after nth decade
- X = Average increase
- Y = Incremental increase

Table 2-22 Population Projection for PPA based on Incremental Increase Method

S. No	Year	Puducherry Municipality	Ozhukarai Municipality	Ariyankuppam CP	Villianur CP	Mannadipet CP	Bahur CP	Netapakkam CP	Total PPA
1	1961	100,947	39217	20226	30800	25963	23890	17518	258,561
2	1971	134,222	57785	26269	39134	32133	30312	20385	340,240
3	1981	162639	95491	34107	50836	39321	37289	24734	444417
4	1991	203065	159951	44572	70428	51259	47225	31838	608338
5	2001	220865	217707	54769	88842	61488	54430	37231	735332
6	2011	244377	300104	72055	126778	86500	68757	51718	950289
7	2018	263005	346123	80983	144618	97778	76214	58234	1066956
8	2021	270622	368239	85232	153374	103318	79707	61463	1121954
9	2031	294427	452331	101219	187371	124846	92633	74113	1326939
10	2036	305414	500360	110267	207144	137377	99837	81527	1441926
11	2041	315791	552380	120017	228768	151085	107535	89668	1565243

Source: Compiled by Consultants

2.10.4 EXPONENTIAL INCREASE METHOD

This is the equivalent to the growth of an investment with compound interest Growth is constant, but compounding is continuous.

- It is expressed as Pt = P0 (ert)
- Where P0 = initial population
- Pt = population t years later
- r = annual rate of growth
- e = base of the natural logarithm

Table 2-23 Population Projection for PPA based on Exponential Increase Method

S. No	Year	Puducherry Municipality	Ozhukarai Municipality	Ariyankuppam CP	Villianur CP	Mannadipet CP	Bahur CP	Netapakkam CP	Total PPA
1	1961	100,947	39217	20226	30800	25963	23890	17518	258,561
2	1971	134,222	57785	26269	39134	32133	30312	20385	340,240
3	1981	162639	95491	34107	50836	39321	37289	24734	444417
4	1991	203065	159951	44572	70428	51259	47225	31838	608338
5	2001	220865	217707	54769	88842	61488	54430	37231	735332
6	2011	244377	300104	72055	126778	86500	68757	51718	950289
7	2018	280472	428295	88252	159576	104807	81122	61374	1203899
8	2021	297530	498821	96265	176114	113795	87080	66046	1286315
9	2031	362245	829120	128609	244649	149703	110285	84343	1908955
10	2036	399703	1068941	148653	288349	171706	124113	95313	2296779
11	2041	441035	1378130	171821	339855	196942	139675	107709	2775167

Source: Compiled by Consultants

2.10.5 COMPOUND ANNUAL GROWTH RATE (CAGR) METHOD

The compound annual growth rate (CAGR) is a useful measure of growth over multiple time periods. The CAGR Method is used for further calculations and estimates since; the existing growth trend is going well together with the growth trend of the adopted method.

Table 2-24 Population Projection for PPA based on Compound Annual Growth Method

S. No	Year	Puducherry Municipality	Ozhukarai Municipality	Ariyankuppam CP	Villianur CP	Mannadipet CP	Bahur CP	Netapakkam CP	Total PPA
1	1961	100,947	39217	20226	30800	25963	23890	17518	258,561
2	1971	134,222	57785	26269	39134	32133	30312	20385	340,240
3	1981	162639	95491	34107	50836	39321	37289	24734	444417
4	1991	203065	159951	44572	70428	51259	47225	31838	608338
5	2001	220865	217707	54769	88842	61488	54430	37231	735332
6	2011	244377	300104	72055	126778	86500	68757	51718	950289
7	2018	262309	375709	87308	162608	109843	80975	65096	1143849
8	2021	270392	413686	94797	180913	121686	86855	71842	1240171
9	2031	299176	570257	124716	258164	171186	109717	99797	1633012
10	2036	314698	669530	143050	308395	203039	123314	117621	1879648
11	2041	331025	786086	164079	368401	240820	138597	138629	2167636

Source: Compiled by Consultants

2.11 POPULATION PROJECTION FOR 2036

Population projection has been done using all the five methods. It is important to note that none of the above-mentioned methods is empirical, and they are based on probability. Out of them, Incremental Increase Method has been considered suitable for Puducherry Planning Area.

Table 2-25 Population projection by incremental increase method

S. No.	Year	Population of PPA
1	1961	2,58,561
2	1971	3,40,240
3	1981	4,44,417
4	1991	6,08,338
5	2001	7,35,332
6	2011	950,289
7	2018	10,66,956
8	2021	11,21,954
9	2031	13,26,939
10	**2036**	**14,41,926**

Source: Compiled by Consultants

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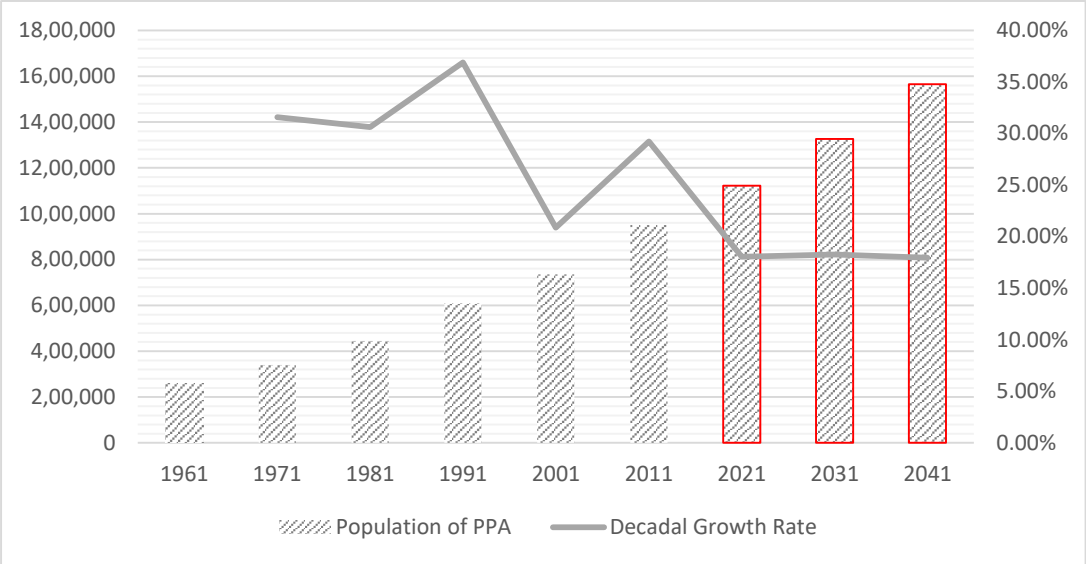


Figure 2.13 Population Projection for year 2036

The important considerations for population estimation are-

- In year 1975, Pondicherry and Mudaliarpet Communes were amalgamated to form Pondicherry Municipality. Therefore, population considered for year 1961 and 1971 for Puducherry Municipality is the summation of population of Pondicherry and Mudaliarpet Communes.
- Oulgaret Municipality was formed in year 1994, therefore population considered for year 1981 and 1991 are of Oulgaret Commune.
- The floating population is not added to the actual population for purpose of population estimation. Instead, it shall be considered for calculation required for provision of infrastructure.
- As per incremental increase method, projected population for year 2036 is **14.42 lac**. The projected population is based on the assumption that the rates at which the area has grown during the previous decades would continue even during the coming decades upto the design period i.e. 2036. However, it would be more appropriate to analyse the probable situation that is likely to be during coming years.
- For projection year 2036, there can be of more growth may be anticipated (13%) compared to the growth rate of the previous decades. The reasons for that are cited below:
    - Proposal of Smart City Development
    - Extension of Railway line from Cuddalore to Puducherry
    - Various road connectivity proposals
    - New industrial policy etc.
- Moreover, the health and educational facility proposals in the Comprehensive Development Plan 2036 plays the vital role in the projected population growth rate. Since Puducherry is well known for the higher standard of education and health facilities the high growth rate may be anticipated for the upcoming years.
- In consideration of all these factors, the growth of population in coming years will not be the same. Hence, it will be appropriate to assume a higher growth rate for the purpose of population projection. Therefore, for year 2036, projected population is coming to be **16.30 lakhs**.

3 ECONOMY

3.1 INTRODUCTION

Cities are the engines of economic growth and development. Economy is very important to analyze issues such as crime, education, public transit, housing, and local government finance. There are multiple ways to ascertain the state of economic base of an area. It is primarily established through the analysis of occupation pattern of the working population of the city or town and through critical analysis of the growth of various activities like industries, trade & commerce, and other tertiary sector activities available in the region. The future financial or economic trends of any region can be predicted with the help of indicators. The indicators of economy are key statistics to reveal the direction or the trend of an economy. There are three broad categories of economic indicators, which are leading indicators, coincident indicators and lagging indicators.

Leading indicators indicate the signal for future events. The recent Industrial policy 2016 and tourism proposals of Puducherry planning area can be considered as leading indicator to explore the economy of the region. Lagging indicator is one that follows an event. If the unemployment rate is rising, it indicates that the economy is degrading in the system. A coincident indicator shows the current state of economic activity within a particular area. Coincident indicators are important because it shows economists and policymakers the current state of the economy. Coincident indicators include employment rate, per capita income, manufacturing sector and the unemployment rate. Though Puducherry region rank 5th in per capita income in India, the unemployment rate is high. Hence, to understand the actual scenario of economy of Puducherry region, this chapter is a concise analysis and understanding of data related to economic activities.

3.2 CURRENT SCENARIO

Economy of a city plays an important role in determining the future pattern of growth and economic development. Puducherry being a famous tourist center, tourism is one of the major source of economy. Apart from that, people are dependent on fishing and agricultural sectors for economy generation. According to the census of 2011, the total working population of the Puducherry Planning Area is around 3.48 lakhs (36.63 %), out of which male working population is 2.58 lakhs and 0.91 lakhs is female working population. This clearly indicates that 6.02 lakhs are dependent population in the Puducherry Planning Area. As far as the total working population is concerned, more than two third (80.57 %) of the working population is engaged in tertiary sector, (17.61 %) in primary sector and very meagre i.e. 1.82 % are in secondary sector. The sectoral distribution of economy is presented in the figure 3.1.

The existing industrial scenario for the Puducherry region is also analyzed to understand the actual scenario. At present, there are around 61 Large Scale Industries (LSI), 178 Medium Scale Industries (MSI) & 6964 Micro/Small Scale Industries registered in Puducherry region as per the audit report 2014-15 of Department of Industry & Commerce. Further it has been observed that in the past 7 years there was growth of 9.6 % LSI's and 11.39 % MSI's in the Puducherry Planning Area. It is clearly evident that tertiary sector has been documented in the system. This is mainly due to comprehensive infrastructure facilities provided by the government agencies in the industrial estates and in line with industrial policies promoted in recent years by Department of Industries and Commerce. The main objectives of the recent Industrial Policy 2016 are as follows: -

- Ensuring balanced and sustainable industrial development in all the regions of the Union Territory, while conserving all aspects of environment.
- Developing a strong manufacturing sector with focus on employment generation, product competitiveness and value addition in products.
- Promotion of rapid industrialization and making Puducherry the most preferred investment destination with the ultimate objective of achieving inclusive growth.
- Achieving higher export growth.

Improving the standard of living through gainful employment by enhancing the employability and skill sets of the work force.

3.3 EMPLOYMENT

3.3.1 OCCUPATION PATTERN

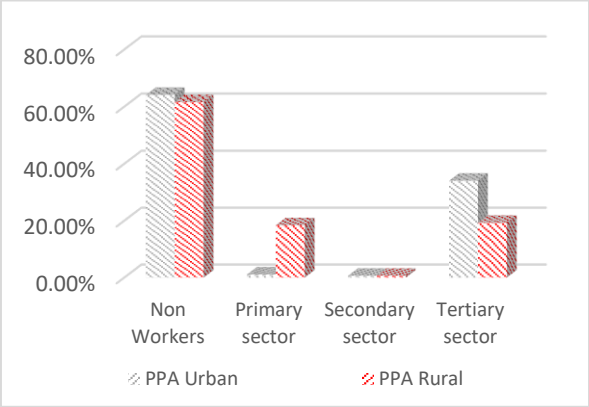


Figure 3.1 Share of Workforce Urban-Rural in PPA, 2011

Employment is one of the key indicator in determining the purchase power and social status of a community. It is evident from the figure 3.2 that engagement in tertiary sector is gradually increasing since 1981, at the cost of primary sector. This can be attributed to the reduction in agricultural land, higher income employment opportunities and urbanization of the planning area. It has been witnessed that the agricultural land earmarked in previous comprehensive development plan has considerably reduced from 1742.5 ha to 271.01 ha i.e., more than three fourth (84.45%). According to census 2011, the majority of the working population (80%) is engaged in tertiary sector which include tourism, trade & commerce, transport, communication and services etc. Figure 3.2 also reveals that an increasing trend has been observed in the tertiary sector (58.24% to 80.57%) during the year 1981-2011 respectively in the system. Further it has been observed that there is decreasing trend in the primary sector during the same period from (39.16% to 17.6%). It can be concluded from the above analysis that the tertiary sector is the major contribution in the economic growth and development of the Puducherry Planning Area.

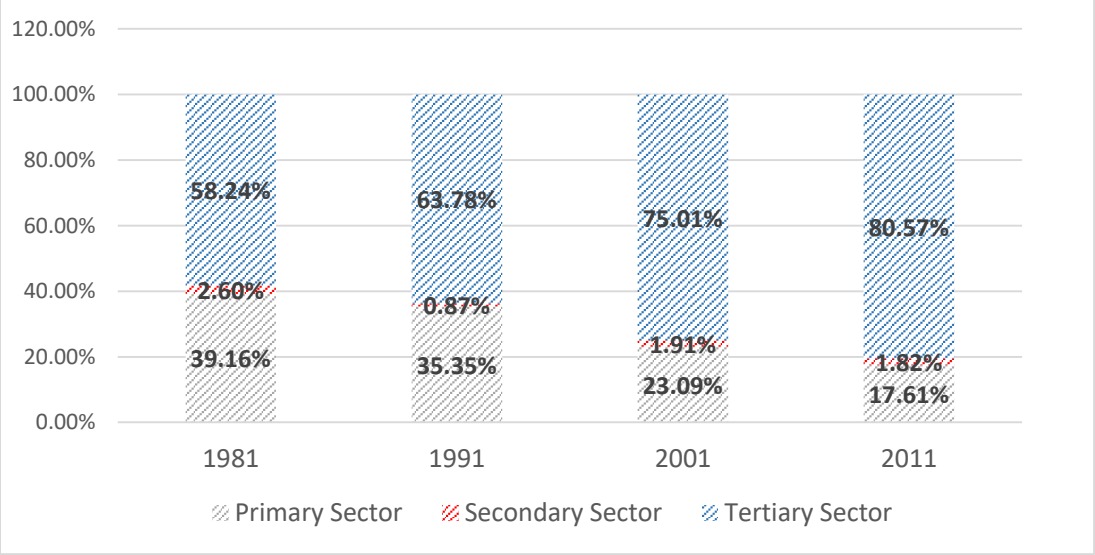


Figure 3.2 Occupational Pattern in PPA, 1981-2011

3.3.2 WORKFORCE PARTICIPATION RATE

The details of workforce participation of Puducherry Planning Area for year 2001 and 2011 are presented in the table 3-1.

Table 3-1 Workforce Participation Rate (2001 and 2011)

		Year 2001			Year 2011		
S. No.	**Name**	**Total Population**	**Working Population**	**Work Participation Rate (%)**	**Total Population**	**Working Population**	**Work Participation Rate (%)**
Municipality							
1	Puducherry Municipality	2,20,865	74,213	33.60	2,44,377	87,920	35.98
2	Oulgaret Municipality	2,17,707	74,745	34.33	3,00,104	1,08,110	36.02
Commune Panchayat							
1	Ariyankuppam	54,769	19,200	35.06	72,055	25,211	34.99
2	Villianur	88,842	32,957	37.10	1,26,778	47,057	37.12
3	Mannadipet	61,488	26,066	42.39	86,500	34,406	39.78
4	Bahour	54,430	22,209	40.80	68,757	25,597	37.23
5	Nettapakkam	37,231	16,270	43.70	51,718	19,804	38.29
Puducherry Planning Area		**7,35,332**	**2,65,660**	**36.13**	**9,50,289**	**3,48,105**	**36.63**

Source: Census of India, 2001 and 2011

The table 3-1 reveals that the workforce participation rate (WPR) for the planning area for year 2011 is 36.63%, and 36.13% in year 2001. This clearly indicates that less growth has been observed from 2001 to 2011 and possible reasons for that can be lack of employment opportunities in the region. The highest workforce participation rate for the year 2011 is in Mannadipet Commune Panchayat, whereas the lowest is observed in Ariyankuppam Commune Panchayat.

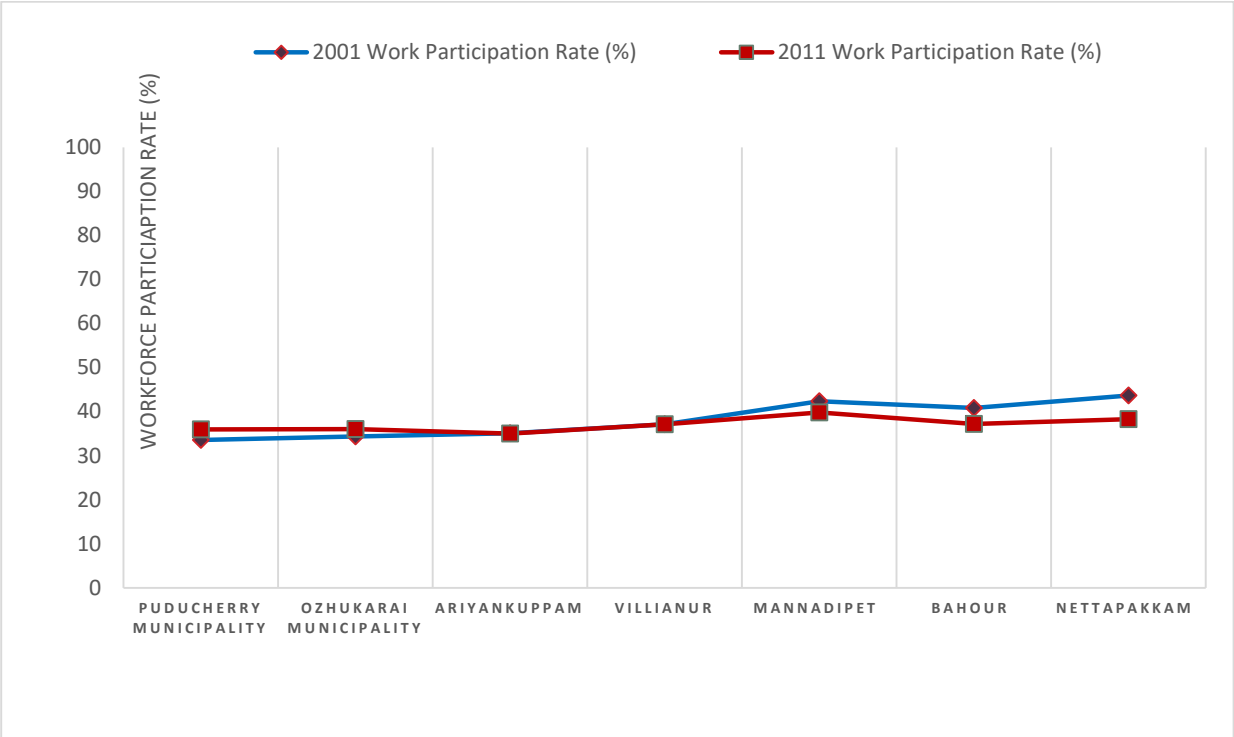


Figure 3.3 Work Rate Participation in PPA, 2001 & 2011

The Figure 3.3 reveals that the workforce participation rate is almost equal in Ariyankuppam and Villianur Commune panchayat since last 2 decades. It is also observed that the work force participation rate in 2011 is decreased in Mannadipet, Bahour and Nettapakkam commune compared to the year 2001. Hence, the drop in workforce participation rates concerns the economy of region for several reasons. The less participation rate, the more the tax base shrinks. It depresses economic growth, and puts pressure on the budget of the region. Further it is interesting to note that workforce participation rate is increasing in the urban area compared to rural area which indicates that there is gradual shift from rural to urban area especially in Ariyankuppam and Villianur Commune panchayats.

3.3.3 WORKFORCE DISTRIBUTION

3.3.3.1 Workforce distribution by type of workers

The details of share of main, marginal and non-working population of the Puducherry Planning Area for year 2001 is furnished in the table 3-2. This table reveals that one third (33.66 %) of the total population is main workers, very meagre (2.44%) falls under marginal workers and two third (63.90%) is non-workers in Puducherry Planning Area. The Higher share of non-working population indicates that lack of employment opportunities/infrastructure is prevailing in the system. The highest percentage of main workers to the total population is in Nettapakkam Commune Panchayat while the lowest is in Puducherry Municipality. These phenomenon highlights that there is a shift from urban to rural migration i.e., reverse migration was observed in the system during the year 2001.

Table 3-2 Workforce distribution by type of workers in Planning Area (2001)

S. No.	Name	Total Population (2001)	Main Workers	%	Marginal Workers	%	Non-Workers	%
Municipality								
1	Puducherry Municipality	2,20,865	71,047	32.17	3,166	1.43	1,46,652	66.40
2	Oulgaret Municipality	2,17,707	71,295	32.75	3,450	1.58	1,42,962	65.67
Commune Panchayat								
1	Ariyankuppam	54,769	17,715	32.34	1,485	2.71	35,569	64.94
2	Villianur	88,842	29,195	32.86	3,762	4.23	55,885	62.90
3	Mannadipet	58,712	22,336	38.04	2,495	4.25	33,881	57.71
4	Bahour	54,430	20,745	38.11	1,464	2.69	32,221	59.20
5	Nettapakkam	37,231	14,220	38.19	2,050	5.51	20,961	56.30
Puducherry Planning Area		7,32,556	2,46,553	**33.66**	17,872	**2.44**	4,68,131	**63.90**
Source: Census of India, 2001								

The details of share of main, marginal and non-workers of Planning Area for year 2011 are presented in the table 3-3.

Table 3-3 Workforce distribution in Planning Area (2011)

S. No.	Name	Total Population (2011)	Main Workers	%	Marginal Workers	%	Non-Workers	%
Municipality								
1	Puducherry Municipality	2,44,377	81,931	33.53	5,989	2.45	1,56,457	64.02
2	Oulgaret Municipality	3,00,104	1,03,179	34.38	4,931	1.64	1,91,994	63.98
Commune Panchayat								
1	Ariyankuppam	72,055	22,958	31.86	2,253	3.13	46,844	65.01
2	Villianur	1,26,778	41,325	32.60	5,732	4.52	79,721	62.88
3	Mannadipet	81,575	25,114	30.79	7,213	8.84	49,248	60.37
4	Bahour	68,757	22,703	33.02	2,894	4.21	43,160	62.77
5	Nettapakkam	51,718	16,595	32.09	3,209	6.20	31,914	61.71
Puducherry Planning Area		**9,45,364**	**3,13,805**	**33.19**	**32,221**	**3.41**	**5,99,338**	**63.40**
Source: Census, 2011								

The table 3-3 indicates that one third (33.19 %) of the total population is main workers, very meagre (3.41%) are marginal workers and two third (63.40%) are non-workers in Puducherry Planning Area. The Higher share of non-working population indicates that, there is lack of employment opportunities

in the planning area. The highest percentage of main workers to the total population is in Oulgaret Municipality whereas the lowest is in Mannadipet Commune Panchayat. These phenomenon highlights that there is migration from rural to urban area in the planning area during the year 2011.

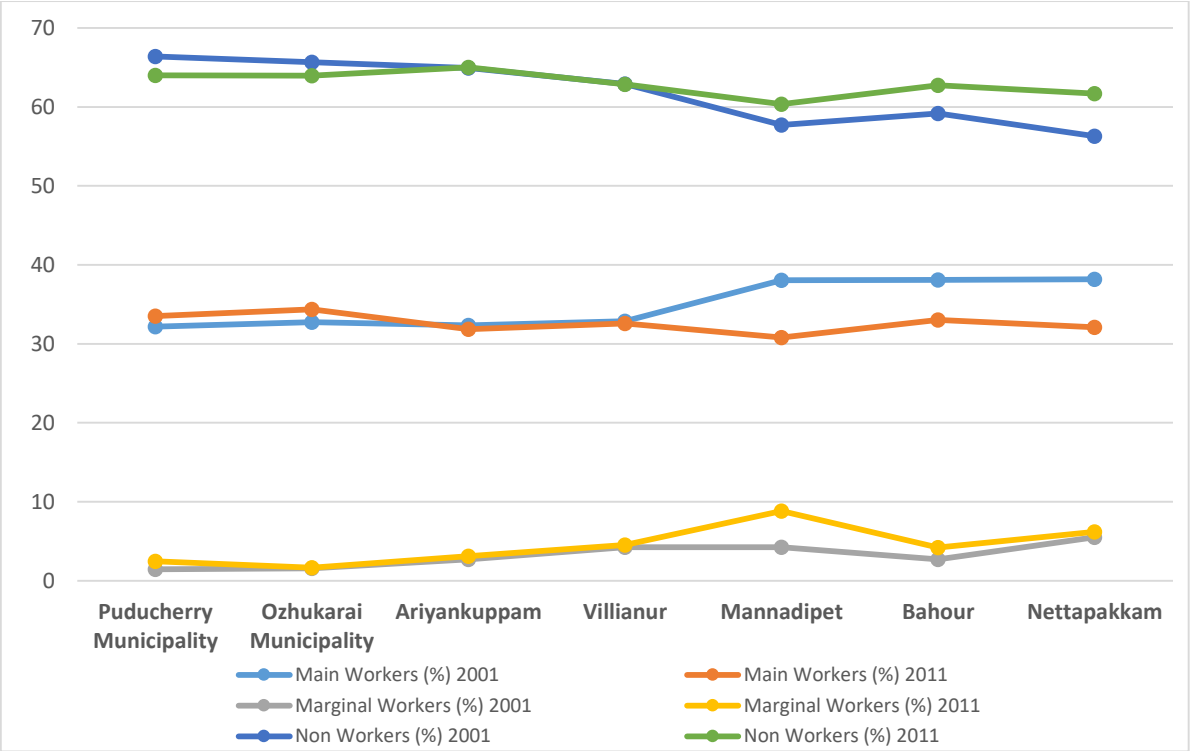


Figure 3.4 Workforce distribution by type of workers, 2001 & 2011

3.3.3.2 Workforce distribution by sectors of Economy

The details of workforce distribution by sectors of economy are described in the table 3-4.

Table 3-4 Workforce Distribution by sectors of Economy (2001)

S. No.	Name	Primary Sector		Secondary Sector	Tertiary Sector
		No. of Cultivators	No. of Agricultural Labours	No. of House-hold industry workers	No. of workers in other Services
Municipality					
1	Puducherry Municipality	326	1,210	1,338	71,339
2	Oulgaret Municipality	537	2,387	1,579	70,242
Commune Panchayat					
1	Ariyankuppam	681	3,470	368	14,681
2	Villianur	1,444	11,514	512	19,487
3	Mannadipet	2,363	13,313	456	8,699
4	Bahour	1,525	11,782	305	8,597
5	Nettapakkam	1,362	8,585	506	5,817

Puducherry Planning Area	**8,238**	**52,261**	**5,064**	**1,98,862**
Source: Census of India, 2001				

The table 3-4 reveals that out of the total working population of Puducherry Planning Area, one fourth (23.09 %) work in the primary sector, very meagre (1.91%) in secondary sector and three fourth (75.01%) in tertiary sector. This composition clearly indicates that there is a higher dependency of working population on tertiary sector, followed by primary sector. However, in rural areas, dependency on primary sector is high. Puducherry municipality is mainly dependent on tertiary sector as major commercial and tourist activities are concentrated in and around the boulevard town. As there are very less processing industrial establishments such as those that take the raw materials produced by the primary sector and process them into manufactured goods and products, the dependency on secondary sector is also very less.

The details of work force distribution by sectors of economy for year 2011 are furnished in the table 3-5.

Table 3-5 Work Force Distribution by sectors of Economy (2011)

S. No.	**Name**	**Primary Sector**		**Secondary Sector**	**Tertiary Sector**
		No. of Cultivators	**No. of Agricultural Labours**	**No. of House-hold industry workers**	**No. of workers in other Services**
Municipality					
1	Puducherry Municipality	622	846	1,586	84,866
2	Oulgaret Municipality	1,198	1,793	1,755	1,03,364
Commune Panchayat					
1	Ariyankuppam	694	2,927	399	21,191
2	Villianur	1,665	9,411	1,195	34,786
3	Mannadipet	2,314	13,875	754	15,384
4	Bahour	1,772	11,873	305	11,647
5	Nettapakkam	1,036	9,815	294	8,659
Puducherry Planning Area		**9,301**	**50,540**	**6,288**	**2,79,897**
Source: Census of India, 2011					

The table above reveals that out of the total working population for Puducherry Planning Area, one sixth (17.61%) is in the primary sector, very meagre 1.82% in secondary sector and three fourth (80.57%) in tertiary sector. The trend continues and it shows higher dependency of working population on tertiary sector, followed by primary sector. Compared to census 2001, there has been a decrease in the percentage of working population in the primary sector and subsequent increase in the percentage of working population in tertiary sector.

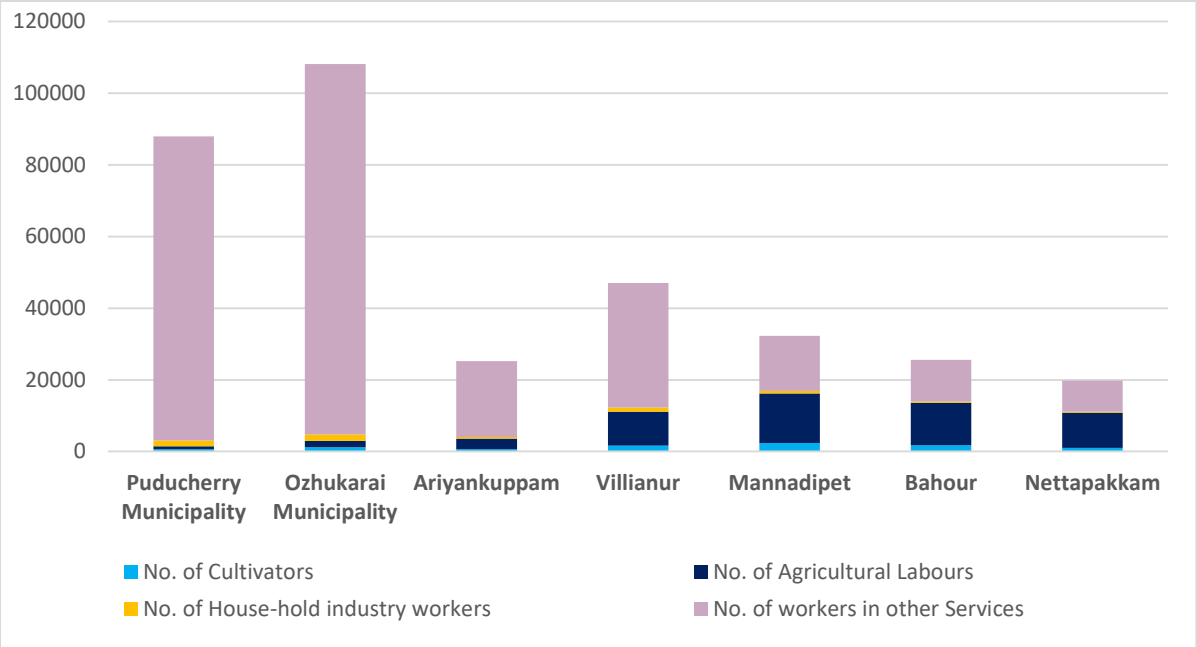


Figure 3.5 Type of working population for various areas of PPA

3.4 GROSS DOMESTIC PRODUCT

Union Territory of Puducherry, one of the Small Territories in the country contributed 0.19 percent of Gross Domestic Product of the country in 2014-15 at 2011-12 constant prices. The table 3-6 indicates that the Gross State Domestic Product of Puducherry with the Compounded Annual Growth Rate of 13.39 percent during 2011-12 to 2014-15 was the fastest growing state in the country. The Gross State Domestic Product (GSDP) of Puducherry was the lowest when compared to fifteen major States and NCT of Delhi. But Puducherry had a relatively high level of Per Capita Income in 2014-15 at 2011-12 prices. The Per Capita Income of Puducherry ranks 5th after NCT of Delhi, Goa, Chandigarh and Sikkim respectively. The Per Capita Income of Puducherry was 5 times higher than the Per Capita Income of Bihar, the poorest State in the country and twice the Per Capita Income of the country in 2014-15 at 2011-12 constant prices.

Table 3-6 Annual Compound Growth Rates of Gross State Domestic Product And Per Capita Income in Selected States At 2011-12 Constant Prices During 2011-12 To 2014-15

S. No	States\Union Territories	Gross State Domestic Product (%)	Per Capita Income (%)
1	Goa	7.48	4.83
2	Gujarat	6.19	3.69
3	Haryana	6.15	3.58
4	Maharashtra	5.28	3.16
5	Punjab	4.36	2.55
6	Andhra Pr.	5.91	4.76
7	Karnataka	6.96	5.38
8	Kerala	5.74	4.31
9	Tamilnadu	4.96	3.66
10	West Bengal	7.05	5.59

S. No	States\Union Territories	Gross State Domestic Product (%)	Per Capita Income (%)
11	Bihar	4.59	2.01
12	Madhya Pr.	4.03	1.82
13	Orissa	4.46	3.00
14	Rajasthan	5.71	3.26
15	Uttar Pradesh	3.98	1.43
16	Delhi	8.44	4.80
17	Pondicherry	13.39	11.83
18	All-India GDP	6.04	4.89

Source: Central Statistics Office, Government of India, Computed

The GSDP of Puducherry at 2011-12 current prices increased from RS.16818.01 crores in 2011-12 to Rs. 26451.13 crores in 2015-16 and Per Capita Income from Rs. 119649 to Rs.173449.

Table 3-7 Gross State Domestic Product (GSDP) And Per Capita Income (PCI) Of Puducherry at 2011-12 Prices

S. No	Year	GSDP Rs. in crore		Per Capita Income in Rs.
		At current prices	At constant prices	At current prices
1	2011-12	16,818.01	16,818.01	1,19,649
2	2012-13	18,875.45	17,310.43	1,30,548
3	2013-14	21,112.57	18,168.50	1,43,045
4	2014-15	23,746.57	20,058.88	1,57,219
5	2015-16	26,451.13	21,144.97	1,73,449

Source: Directorate of Economics and Statistics, Government of Union Territory of Puducherry

3.4.1 GROWTH OF GSDP

The table 3-8 represents that the overall growth of GSDP during the period 1970-71 to 2015-16 was 16.07 percent. It is also observed that the Growth of GSDP of Puducherry was predominantly driven by tertiary sector (17.35 percent) followed by secondary sector (16.65 percent) and primary sector (11.07 percent). The growth in the secondary sector was due to growth of output in manufacturing sector.

Table 3-8 Compound annual growth rate of gross state domestic product and per capita income of Puducherry from 1970-71 - 2015-16 at constant prices (in percentages)

S. No	Period/Sector	Primary sector	Secondary sector	Tertiary sector	Per Capita Income
1	1970-71 to 1992-93	9.09	14.91	10.08	7.47
2	1993-94 to 2010-11	7.68	18.06	17.00	14.91
3	2011-12 to 2015-16	5.34	8.00	7.25	8.87

Source: Directorate of Economics and Government of Statistics, Union Territory of Puducherry

The highest growth was observed in the year 1770-71 to 2015-16 in the tertiary sector. The growth was higher (16.18 percent) in later period (1993-94-2015-16) as against the growth of 11.07 percent

during the period (1970-71 to 1992-93). During the period (1993-94 to 2015-16) the economy of Puducherry fared well as the growth of output in the primary sector (11.29 percent), secondary sector (17.12 percent) as well as in the tertiary sector (16.30 percent) were higher as against 9.09 percent,14.91 percent and 10.08 percent during 1970-71-1992-93.

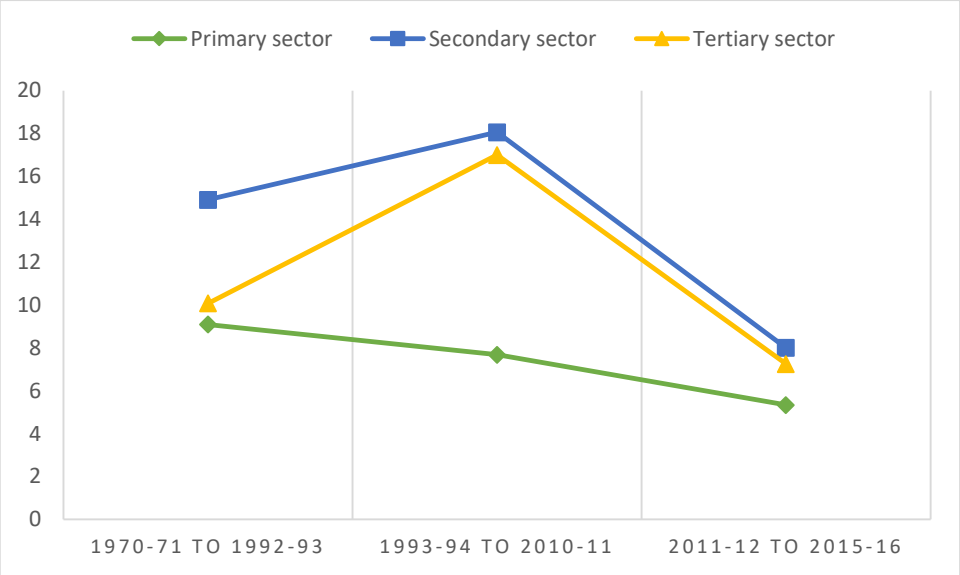


Figure 3.6 Growth of GSDP from 1971 to 2016

A further breakup analysis during this period 1993-94 to 2015-16 reveal that growth of GSDP was decelerating i.e. 16.53 percent during 1993-94 to 2010-11 (10.30 percent) during 2011-12 to 2015-16. During this period growth of primary, secondary and tertiary sector were also lower.

3.4.2 GROSS STATE DOMESTIC PRODUCT (GSDP) OF EACH SECTOR

Agriculture once the mainstay of Puducherry economy in terms of contribution to GSDP has been declining since 1970-71 and the economic activity has moved away from primary sector to secondary and then to tertiary sectors with the growth of the economy.

Table 3-9 Sectoral Distribution of Gross State Domestic Product at Constant Prices

S. No	YEAR	PRIMARY	SECONDARY	TERTIARY
1	1970-71	34	24	42
2	1980-81	19	54	27
3	1993-94	16	35	49
4	1999-00	7	49	44
5	2004-05	5	50	45
6	2011-12	7	48	44
7	2012-13	7	44	49
8	2013-14	6	50	44
9	2014-15	6	49	45
10	2015-16	7	46	48

Source: Directorate of Economics and Statistics, Government of Union Territory of Puducherry.

The primary sector utilizes the natural resources and produces raw materials and basic goods which may be used by the industries or by the end-users. Hence, it can be said that the primary sector serves as a basic sector assisting the growth of the secondary and tertiary sectors. The Secondary sector consists of the industrial sector, engaged in construction activities and manufacturing of

finished goods and tangible products. The secondary sector performs the vital role of catering to the needs of potential consumers of the nation. The Tertiary sector is intangible in nature, concentrating on the services sector. This sector consists of provision of services such as education, medical, hotel and finance needed by the consumers. The table 3-9 indicates that the Income from primary sector accounted for 7 percent in 2015-16 as against 34 percent in 1970-71. The contribution of income from secondary sector to GSDP increased from 24 percent in 1970-71 to 54 percent in 1980-81 decreased to 35 percent in 1993-94. Thereafter it continued to increase, it went up to 50 percent in 2013-14 and in 2015-16 it declined to 46 percent.

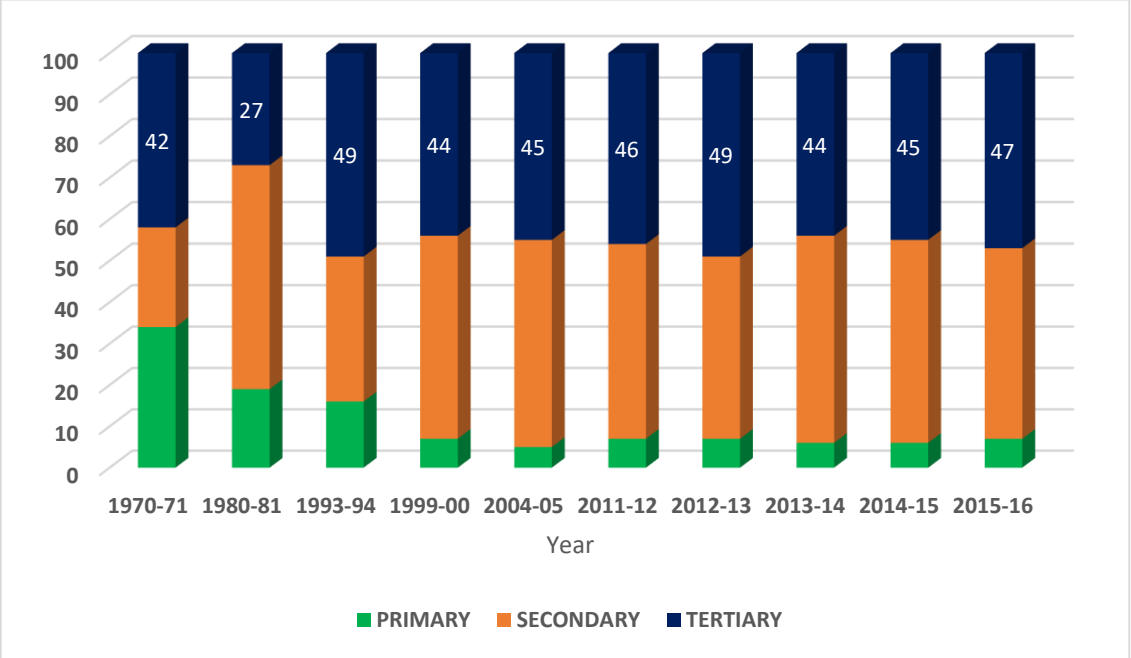


Figure 3.7 Sectoral Distribution of Gross State Domestic Product

The figure 3.7 witnesses that the contribution of income from tertiary sector which decreased from 42 percent in 1970-71 to 27 percent in 1980-81 was increased to 49 percent in 1993-94. In 1999-2000 the contribution from this declined to 44 percent and in 2012-13 again it increased to 49 percent. The contribution in this sector continued to increase and in 2015-16 the contribution from this Sector was 48 percent of total GSDP.

The proportion of contribution across the major components in the three sectors has been presented in figure 3.7. From the table it is also evident that the primary sector such as agriculture, forestry, and fishing have reported a noticeable fluctuation in their share to GSDP. In the tertiary sector, the trade, hotels and restaurants component has exhibited fluctuation in the growth from 2011 to 2016. When compared to other sectors only tertiary sector has been growing phenomenally. Most of the components in the tertiary sector have shown higher growth rates at constant prices. The decline in the proportion of contribution of primary sector to the GSDP is a cause for concern to the health of the economy and society. Hence it provokes the government to provide adequate social risk management measures to protect agriculture and rural population.

3.4.3 GROWTH OF PER CAPITA INCOME

The figure 3.8 indicates that the Per Capita Income of Puducherry at constant prices increased from Rs.825 in 1970-71 to Rs.48,302 in 2004-05 and to Rs.1,19,649 in 2011-12. In 2015-16 Per Capita income of Puducherry went up to Rs.1,41,629 an increase of 171 times during the period 1970-71 to 2015-16. The growth of Per Capita Income during the period 1970-71 to 2015-16 was 13.54 percent. Growth of Per Capita Income during 1993-94 to 2010-11 was higher 15.26 percent as

against the subdued growth of 7.47 percent during 1970-71 to 1992-93. During the period 1993-94 to 2015-16 growth during 1993-94 to 2010-11 was higher (14.96 percent) when compared to the period 2011-12 to 2015-16 (8.87 percent).

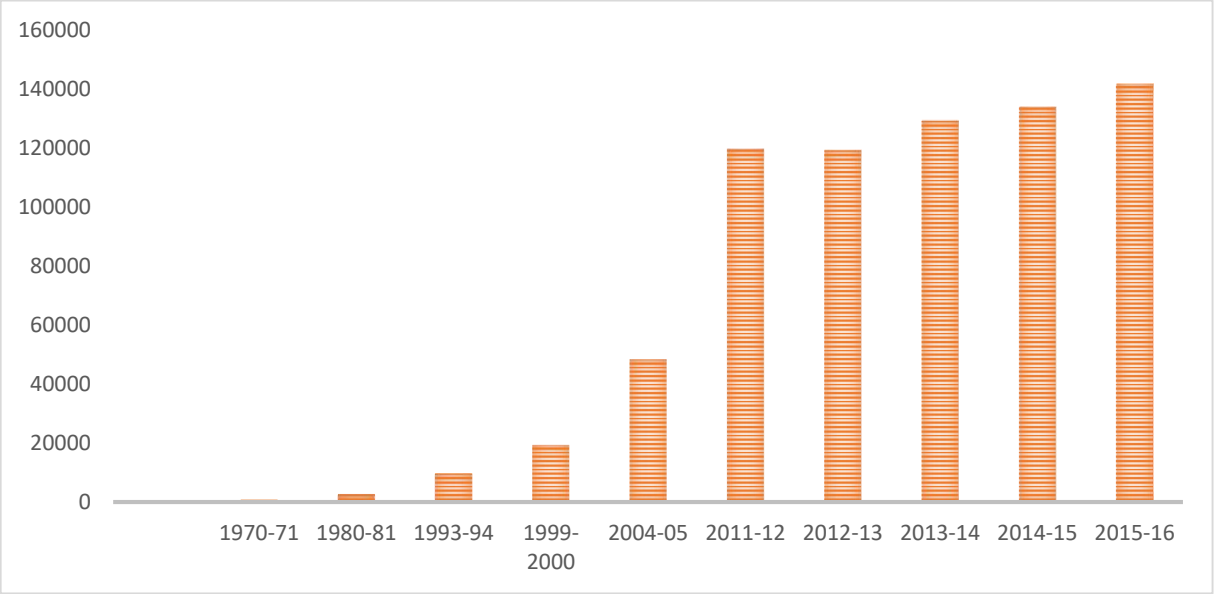


Figure 3.8 Per capita income at Constant prices

Source: Directorate of Economics and Statistics, Government of Union Territory Of Puducherry.

3.5 AGRICULTURE

The Pondicherry region has been experiencing a significant shift in its economy since the seventies. As the Puducherry economy has grown, economic activity has moved away from agriculture to industries and services. The figure 3.9 witnesses that the agriculture now accounts for less than 4 per cent of GSDP in the overall system. The same growth rate may be expected in Puducherry region also. Despite the very less growth rate in agriculture, it remains an important source of livelihood for people in Pondicherry and must register significant growth rates in order to improve the standard of living of those engaged in it. In order to examine how this may be brought about, it is necessary to identify both the constraints faced by agriculture and its potential. The decreasing relative contribution of agriculture to GSDP is partly due to the decreasing area under agriculture.

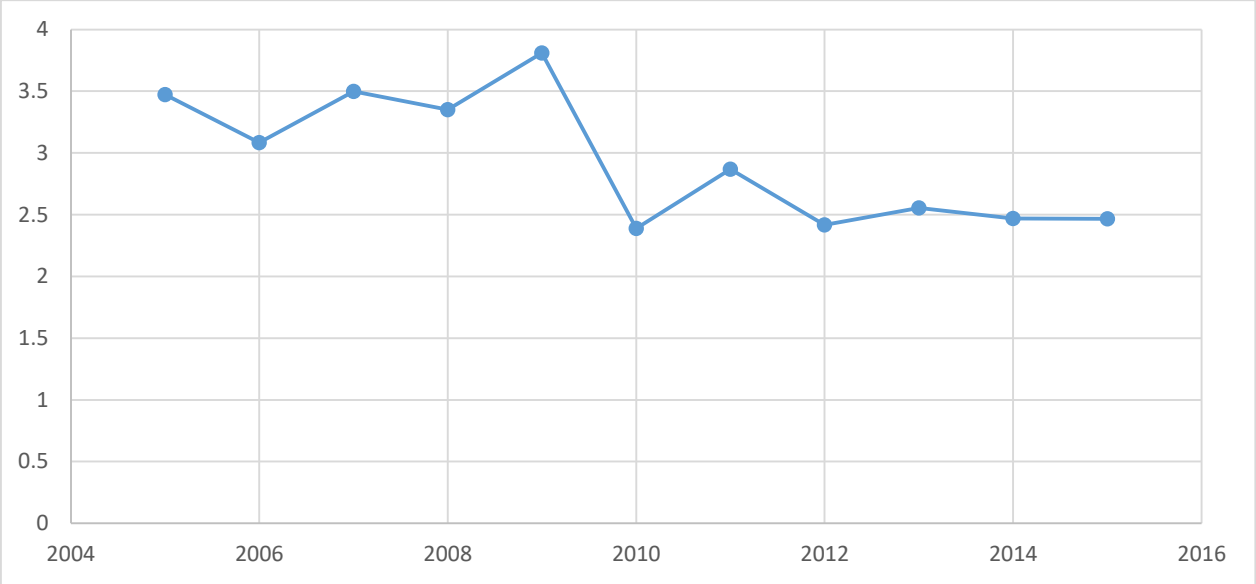


Figure 3.9 GSDP Contribution of Agriculture sector, UT of Pondicherry

3.6 FISHERIES

The Puducherry Planning area has coastline of 24 km long covering 25 coastal villages. Fishermen accounts for about 17% of the total working population as per census 2011. The population of fishermen has been increased marginally, from 60,620 in 2010-11 to 62,694 in 2013.



Figure 3.10 Fish Market

The figure 3.11 reveals that the fishing contribution in overall economy in the Union Territory of Puducherry. It indicates that it is very meagre percent (less than 1.5%) is contributed towards the economy in the system. The same indicator may be anticipated for Puducherry region also. One would expect, given its locational advantage, that fisheries in Pondicherry is having the potential to grow. There is a fishing harbour in Pondicherry which will encourage the development of coastal fisheries. Also with tanks and ponds, there is substantial potential in terms of inland fisheries as well. The Bahour and Oussudu lakes are the two biggest lakes in Puducherry region for fishing purposes. The flying fishery, which lasts from May to July, is the most important seasonal fishery of the region. Now these two lakes are being rehabilitated to serve the drinking water requirements of the city and for tourism purpose.

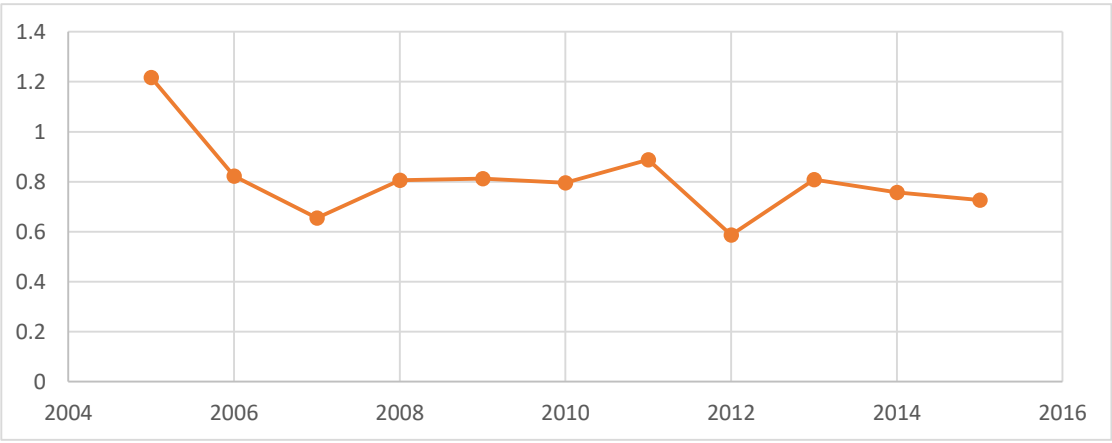


Figure 3.11 Fishing Contribution in overall Economy, UT of Pondicherry

Table 3-10 Quantity of Marine and Inland Production

S. No	Fish	Unit	2007-08	2008-09	2009-10	2010-11	2011-12	2012-13	2013-14
1	Fish Catch (Marine)	MT	18,860	19,755	20,598	17,586	13,873	13,873	13,310
2	Fish Catch (Inland)	MT	3,321	3,538	2,250	2,065	2,219	1,937	2,567
3	Prawn catch (Marine)	MT	845	1,245	1,212	1,333	1,661	1,005	880
4	Prawn catch (Inland)	MT	70	174	85	96	96	84	96
Source: Directorate of Economics and Statistics,2014									

The table 3-10 indicates that the Marine fish production has been reduced by 29.43 % during the period of 2007 to 2014 and Inland fish production has also been reduced by 22.70 % during the same time period. Whereas, the Marine prawn catch has increased by 4.14 % during the period of 2007 to 2014 and Inland prawn catch has increased by 37.14 % during the same period. There is considerable scope for promoting intensive utilization of existing resources with improved technologies in fisheries sector may help in increasing the economy of the region.

3.7 TOURISM

Puducherry is one of the most popular tourist spots for national and international tourists. Tourism plays an important role in contribution of the Union Territory of Puducherry economy by providing direct and indirect employment. The services sector is the engine for Puducherry growth during the past decades. The tourism plays the major role in the contribution of service sector. This trend has persisted over the past decade, and is expected to continue in the future also. The table 3-11 indicates the cumulative GSDP growth of transportation, Communication, Trade, Hotels, railways and restaurants as part of GSDP growth from tourism sector.

Table 3-11 GSDP contribution of Tourism sector, UT of Pondicherry

S. No	Year	GSDP contribution from Tourism
1	2005	1366.51
2	2006	1693.98
3	2007	1901.95
4	2008	2140.78
5	2009	2045.47
6	2010	2246.36
7	2011	2733.88
8	2012	2692.57
9	2013	3363.97
10	2014	3954.84
11	2015	4642.26

Source: Directorate of Economics and Statistics, 2015

Direct spin-offs include the growth of hotels, restaurants and leisure centers. Indirect benefits will come in the form of hospitality services, retailing and transportation. The development of tourism in Puducherry has enabled the growth of shops, commercial establishments and hotels. The increase in the number of shops and commercial establishments may indicate the increase in the number of day visitors from the neighboring states for shopping due to the low sales tax and excise duties in

the UT.

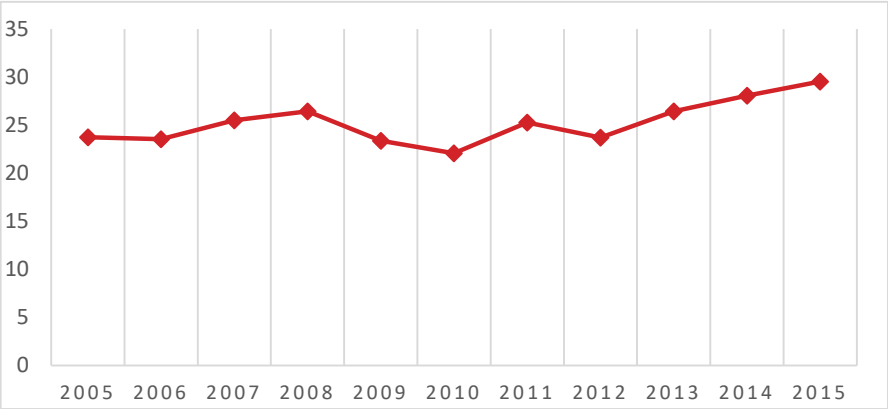


Figure 3.12 Contribution of Tourism in overall Economy

The Figure 3.12 reveals that more than one fourth of contribution of economy are from tourism sector in the system. The same trend may be foreseen for Puducherry region. Lead indicators also show favorable trends for high growth of the tourism sector. Such as the spurt in arrival of foreign tourists into our country, Railway Freight Traffic, and the number of mobile and telephone connections are all indicators of the robust growth of tourism sector in the country and excellent future prospects. As the study of occupation pattern in Puducherry Planning area depicts that majority of the population is engaged in tertiary sector for economy generation. Hence tourism in the UT has to be looked at not only from the economic point of view but also from the social importance of the sector to the people.

3.8 INDUSTRIES

Industry plays a vital role in the economy of Puducherry. Manufacturing industries creates more employment opportunities to young people in Puducherry. The successful manufacturing industry helps in creating new jobs, increasing trade and thereby increasing the GSDP of the region. It can therefore be said that the manufacturing industry immensely contributes to the social development and economic prosperity in the system. Considering the tremendous impact that manufacturing sector exerts on the overall prosperity of Puducherry region, it becomes essential to understand the factors which contribute to the success of the manufacturing sector.

With its reputation of being an investor-friendly, the Union Territory is having proven track record of attracting surplus investment and has witnessed vibrant industrial growth over the years. Even though there was some industrial slow down for a few years because of the general down turn in the economy, the growth continues. Puducherry has 77 large and 8,732 Micro, Small and Medium Enterprises (MSMEs) and with an investment of 2,696 crores. These industries are deemed to be the life line of Puducherry economy providing employment to about one lakh persons. In order to facilitate sustained and balanced industrial development, the first Pondicherry Industrial Policy was notified in 1997 which sought to promote industrial development by bringing in simplified procedure and through a package of fiscal incentives. The policy 1997 improved the industrial growth to a significant level in spite of economic liberalization and introduction of uniform sales tax by the union government during 2000-2001.

3.8.1 INDUSTRIAL POLICY 2013

The industrial policy 2013 attempted to promote sustainable and balanced industrial development by gainfully utilising the human resources so as to improve the standard of living. It had identified agro processing, electronics and software development, leather products, light engineering and textiles as thrust areas. In order to promote industrial development, the policy announced various fiscal incentives and came out with a simplified procedure of licensing. Also, the policy assured

creation of infrastructure facility across the Union Territory apart from the structural changes in the existing system. There was a brief lull after 2012 mainly due to withdrawal of tax concessions and the downturn in the economy at national level.

(i) The policy provided for sensitisation of the technical institutions on training the manpower required for industries; but no study was conducted to identify the skill required by the industry.
(ii) All the tax concessions have been withdrawn and the scheme of subsidy needs to be restructured.
(iii) The policy did not provide for a long-term vision for the infrastructure development.
(iv) The industrial activity has not picked up.

3.8.2 NEED FOR NEW POLICY

The industrial sector plays a vital role in the economic development and there is a need to review the existing industrial policy in view of renewed emphasis laid by the Government of India on the manufacturing sector in the economy and to secure additional employment opportunities to the youth. Manufacturing sector has to be made robust and should become the engine of growth. The present Union Government made a new approach towards growth of industries across the country and adopted several new strategies like MAKE IN INDIA, STARTUP INDIA, STANDUP INDIA, EASE OF DOING BUSNINESS. Accordingly, the Government of Puducherry would also require to frame its new industrial policy in line with new policy initiatives of the Union Government across the country and hence need to rework the existing industrial policy.

3.8.3 NEW INDUSTRIAL POLICY 2016

The new industrial policy has been framed which aims at promoting vibrant industrial growth in the context of overall economic development of the Union Territory with Vision To create "Prosperous Puducherry" through accelerated industrial growth for the overall economic development and better quality of life of the people of Union Territory of Puducherry through proactive services and effective administration.

In Puducherry Planning Area, number of small-scale industries is much more than the medium and large-scale industries. There are two sugar factories and five textile mills in the planning area. There are three industrial estates under the State control and four under PIPDIC control.

3.8.4 SALIENT FEATURES OF NEW INDUSTRIAL POLICY 2016

1. To create electronic manufacturing hub using the large technical resources.
2. To ensure synergy between academia and industries.
3. To ensure rapid, balanced, sustainable ecofriendly industrial development.
4. To bring a significant increase in the GSDP
5. To develop a strong high-tech manufacturing sector.
6. To make Puducherry the most preferred investment destination.
7. To Achieve higher export growth.
8. To provide employment to the youth through skill development and soft skill

3.9 DETAILS OF INDUSTRIES:

The details of industries are given in the table below:

Table 3-12 Number of Industrial units

S. NO	Type of Industries	UNIT	Year wise data (From 2007 to 2014)						
			07-08	08-09	09-10	10-11	11-12	12-13	13-14
1	Small scale	Nos	6295	6414	6533	6649	6751	6831	6902
2	Medium scale	Nos	158	164	171	173	175	175	176
3	Large scale	Nos	57	59	59	61	61	61	61
Source: Directorate of Economics and Statistics									

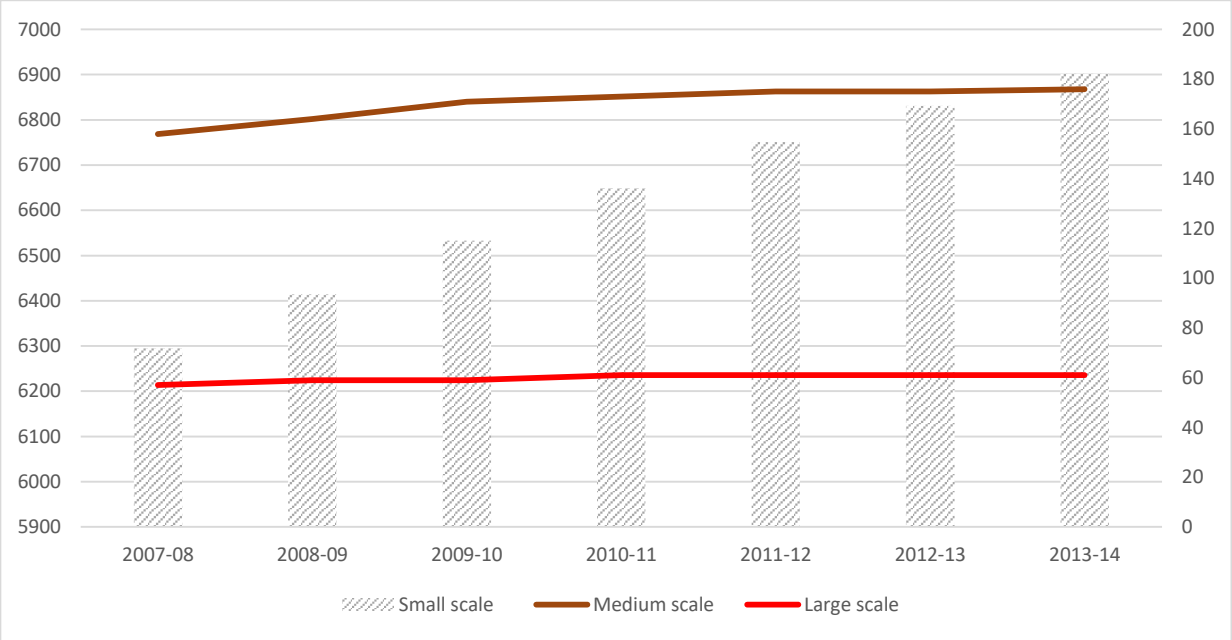


Figure 3.13 Growth in Industrial Units in PPA, 2007-14

It has been observed from the figure 3.13, small scale industries are much higher than medium and Large scale industries. The number of small scale industries are gradually increasing since 2007, but there is not much growth has been observed for Medium and Large scale industries during 2007-2014.

The table 3-13 indicates the GSDP contribution of economy for the past 10 years in the UT of Pondicherry. The GSDP includes the contribution of both the registered and unregistered manufacturing units in the system. It is observed that the industrial contribution is high during the period 2006 and it is very less in the year 2015.

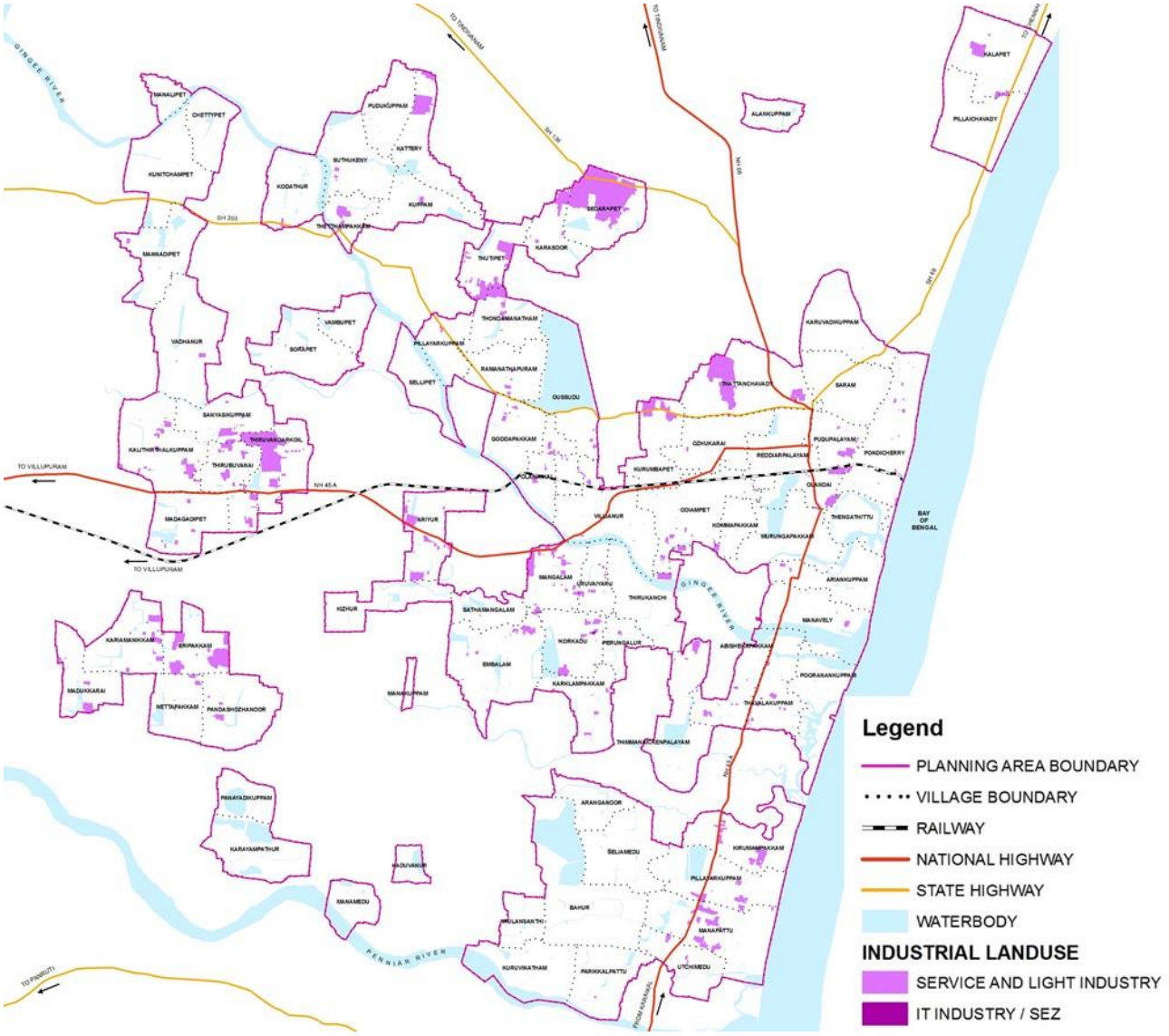


Figure 3.14 Location of Industries in Puducherry region

Table 3-13 GSDP contribution of industrial sector, UT of Pondicherry

S. No	Year	Total GSDP Contribution from Manufacturing units	% to total GSDP
1	2005	2044.99	35.54211
2	2006	3009.15	41.86224
3	2007	2726.11	36.57534
4	2008	2781.98	34.37395
5	2009	3077.72	35.17097
6	2010	3687.3	36.23622
7	2011	3375.61	31.23714
8	2012	3372.86	29.69911
9	2013	3433.11	26.99427

10	2014	3522.58	25.02328
11	2015	3599.4	22.92406

Source: Directorate of economics and statistics

The figure 3.15 reveals that the overall contribution of industrial sector in the system from 2004 to 2016. The trend shows that there is decline from the year 2006 onwards. The reason for the decline in the GSDP may be many industrial units are closed or manufacturing less output due to withdrawal of current subsidies and tax-free concessions. The same declination and reason may be expected in the Puducherry region. Hence encouraging the entrepreneurs by promoting attractive subsidies and policies may support to restore the shutdown industries as well as to open the new manufacturing units in the region which in turn will augment the GSDP from industrial sectors.

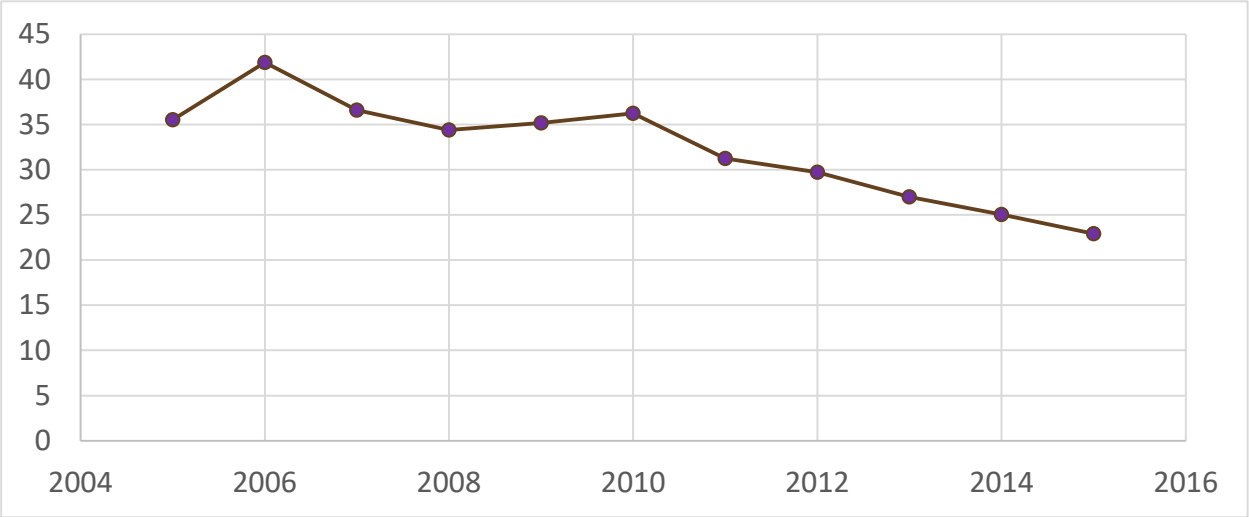


Figure 3.15 Contribution of Industrial economy

3.9.1 PIPDIC

The Pondicherry Industrial Promotion Development and Investment Corporation Limited (PIPDIC) was set up by the Government of Puducherry in 1974 with the twin objective of promoting the Industrial Development of Puducherry and providing financial assistance to entrepreneurs. The main objectives of PIPDIC are Industrial Finance, Development of Industrial Estates, Equity participation, Aiding, counseling, protecting and promoting the interests of Industries in Puducherry.

3.9.1.1 INDUSTRIAL ESTATES

The Govt. of Puducherry had initially started three industrial estates in the Territory in order to motivate the industrial development. Later a Corporation for industrial development has been established in the year 1974 viz. Puducherry Industrial Promotion, Development and Investment Corporation (PIPDIC). Then the corporation has taken over the infrastructure development for industrial promotion. Four industrial estates were developed and allotted to the needy entrepreneurs. All the industrial estates are provided with all necessary basic infrastructure facilities. There are six industrial estate in Puducherry region. They are Kattukuppam, Kirumampakkam, Mettupalayam, Sedarapet, Thattanchavady and Thirubhuvanai. The PIPDIC is financially supporting the interested entreprenuers to promote the industrial development in order to improve the economy in the system.

3.9.2 INFORMATION TECHNOLOGY INDUSTRIES

The Puducherry Information Technology Park is located in the campus of Puducherry Engineering College. It is exclusive for Software development activities. Phase-I of this college had commenced

in October 1999. This vision for the industrial sector will help Puducherry to fulfill the goals of its industrial policy. The Industrial policy vision is also aimed at employment creation and environmental sustainability. On one hand, emphasis has been placed on promoting industries while on the other hand, emphasis has also been placed on promoting industries which are less polluting and to reward industries, which meet environmental standards as well economic development.

3.10 TRADE AND COMMERCE

There are many commercial establishments, which are majorly in urban areas of Puducherry Planning Area. It includes retails trade, wholesale trade, banks and offices, restaurants, private hospitals and nursing homes, cinema halls/ theatre/ auditorium and marriage halls.

3.10.1 PORT

Puducherry has an old port located near the Light House and a new port near is located in Ariyankuppam. At present, the port is not being used much by the industry. Besides, for molasses, few goods are currently being transported through the port despite the modernization of the port facility. (Reference: Puducherry City Development Plan, 2007). This future expansion shall be carried out within the existing layout and boundary only.



Figure 3.16 Old Port

Table 3-14 Details of Import-Export activities in Port

S. NO	Name	UNIT	YEAR					
			2001-02	2002-03	2003-04	2004-05	2005-06	2006-07
1	Export	Tonnes	92,447	7,928	76,493	26,171	55,607	18,330
2	Import	Tonnes	2,834	11,331	31,110	32,379	40,406	15,896
Source: Port department, 2015, Government of Puducherry								

Due to the ongoing port privatization process, there has been no movement of cargo on the port after year 2007.

3.11 CENTRAL BUSINESS DISTRICT (CBD)

The CBD of modern society is such that it integrates a great deal of financial, business, culture and service institutions and lots of supporting facilities, such as business office buildings, hotels and apartments etc., with perfect and convenient traffic, communications and other infrastructures, favorable economic environment and places which are convenient for commercial activities. It takes a large proportion in total investment attracted in cities.

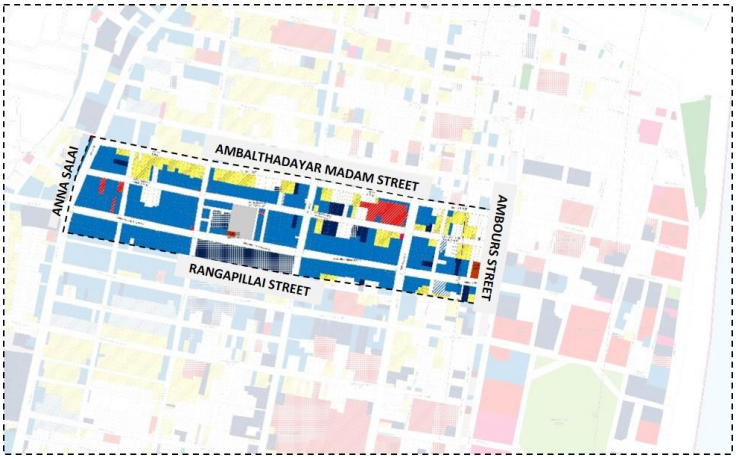


Figure 3.17 Central Business District of Puducherry region

As per the previous Comprehensive Development Plan of 1997, the central business district lies in the Boulevard town. It is bounded by Ambalathadayar Madam Street on the North, Ambur Salai on the East, Rangapillai Street on the South and the Anna Salai on the West. The area is totally commercial with both retail and wholesale activities. The Boulevard area provided the highest service at centralized level and provides extensive services for economy, management, recreation, culture and even administration which directly impact the economy of the region. Due to rapid urbanization the entire boulevard area is gradually shifting to commercial oriented activities. Hence as a part of improving the economy of the region the development plan should focus on the more commercial developments with convenient traffic and parking will encourage more people to involve in the business activities. Considering the overload of the Boulevard area it is necessary to promote growth in other parts of the planning area and along the major transport corridors, dispersal of certain activities to these areas are studied as part of the Comprehensive Development Plan 2036.

3.12 BANKING & FINANCIAL INSTITUTIONS

Puducherry Union Territory is a major banking center for the surrounding hinterlands, this can be supported by analyzing the number of Financial & Insurance Establishments active in the region. The number of establishments in this sector is adopted from the 6th Economic Census Report published by Directorate of Economics & Statistics, Government of Puducherry. As per this document there are around 1244 such establishments active in the region out of this 274 are in rural area and 970 are in urban area.

The statistical handbook 2005 indicates that Puducherry accounted for about 241 banks branches in the State for the financial year 2015. However, the Credit/Deposit Ratio (CDR) accounted for about 78% of the total deposits in the State. The existing government banks operates several schemes to help small scale industries, agriculturists and self-employed persons. Under the lead bank scheme sponsored by the reserve bank of India, the union territory of Pondicherry is assigned to the Indian Bank. The planning area have potential for developing as a financial center for the surrounding towns and investments in this sector should be encouraged by government initiatives and thus increasing the employment opportunity along with higher transactions in the region.

Banking operations form a vital pointer to indicate the economic process of any region. Apart from PIPDIC, Branches of National financial institutions like SIDBI (Small Industrial development bank of India) /NABARD (National Bank for Agriculture and Rural Development)/ NSIC (The national Small industries corporation limited) also exist to support the economic development in Puducherry region.

3.13 EXPORT STATISTICS

The export statistics of Puducherry reveals that the major exports of Puducherry are Chemical and Chemical products and Metal and metal products. Export oriented industries are also to be promoted to develop the overall economy of the region. Steps are also afoot for a paradigm shift from a resource-based economy to knowledge based economy so as to tap the pool of manpower which is already existing in Puducherry Region. Puducherry has a supportive IT Policy as well in this regard which provides a barrier free environment for the entrepreneurs.

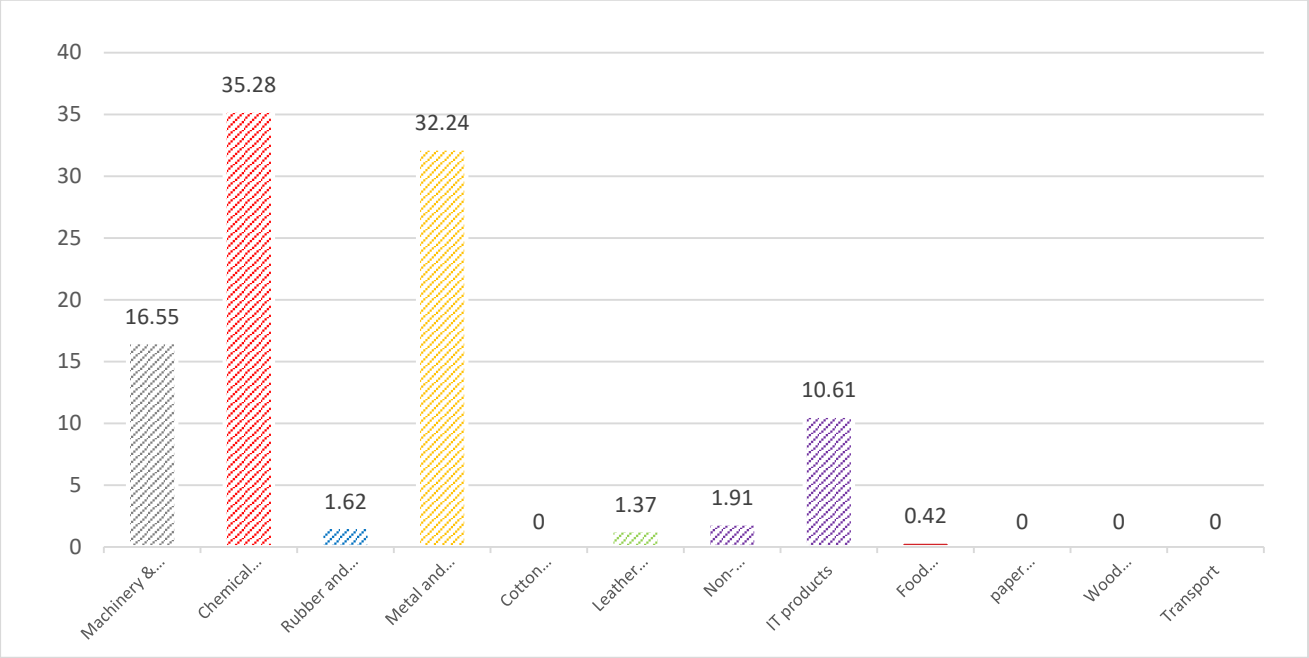


Figure 3.18 Export Statistics

3.14 INFORMAL SECTOR

3.14.1 STREET VENDORS AND ALLIED ACTIVITIES

Vending is an important source of employment for many of the urban poor of the city since it requires low skills and small financial inputs. Puducherry has many informal markets present on roadsides and pavements. These informal activities are concentrated along the Jawaharlal Nehru Street, along M.G. Road, Bharathi street and Rangapillai street. These are daily markets and the type of market differs from vegetable/fish market to clothes market to fruits market etc. In rural areas also, informal markets are observed. They are concentrated mainly near bus stops. Apart from these daily markets, there are two weekly markets also. One is along Jawaharlal Nehru and MG road which happens on every Sunday and the other is in Madagadipet village which happens on every Tuesday.

3.15 BELOW POVERTY LINE POPULATION

The latest information for pertaining to the population of below poverty line for the Puducherry Union Territory is not published as part of the Census 2011, hence the estimates worked out by Planning Commission Government of India are adopted and presented in this section. The table 3-15 indicates that out of the rural population, 17.06 % are below poverty line and in urban this is around 6.03 % of the total urban population in the Puducherry Union Territory and the corresponding total BPL population is around 1.3 Lakhs in the year 2012.

Table 3-15 Puducherry Union Territory Population Below Poverty Line 2011-12

Sl No.	Puducherry Union Territory	Rural		Urban	
	Year	% age of Persons	No. of Persons (lakhs)	% age of Persons	No. of Persons (lakhs)
1	2005	22.9	0.8	9.9	0.7
2	2010	0.2	0.01	1.6	0.1
3	2012	17.1	0.7	6.3	0.6

Source: Press note on Poverty Estimates, 2011-12, Planning Commission

The table 3-16 and 3-17 indicates that per capita income in rural and urban area of Puducherry union territory. The per capita monthly income determined to estimate the population below poverty line for rural and urban parts of Puducherry Union Territory is 1,301 Indian Rupees (INR) and 1,309 (INR) respectively; whereas on the national level it is 816 INR for rural population and 1,000 INR for Urban population. This indicates that development work in the Puducherry region have to focus on providing better employment and livelihood options in the rural areas as well to support the population living in the rural parts of the planning area.



Figure 3.19 Informal markets

Table 3-16 Puducherry Union Territory BPL per capita income - Urban

Puducherry UT - Urban			
Year	2005	2010	2012
Per Capita income	506	778	1309

Source: Press note on Poverty Estimates, 2011-12, Planning Commission

Table 3-17 Puducherry Union Territory BPL per capita income - Rural

Puducherry UT - Rural			
Year	2005	2010	2012
Per Capita income	385	641	1301

Source: Press note on Poverty Estimates, 2011-12, Planning Commission

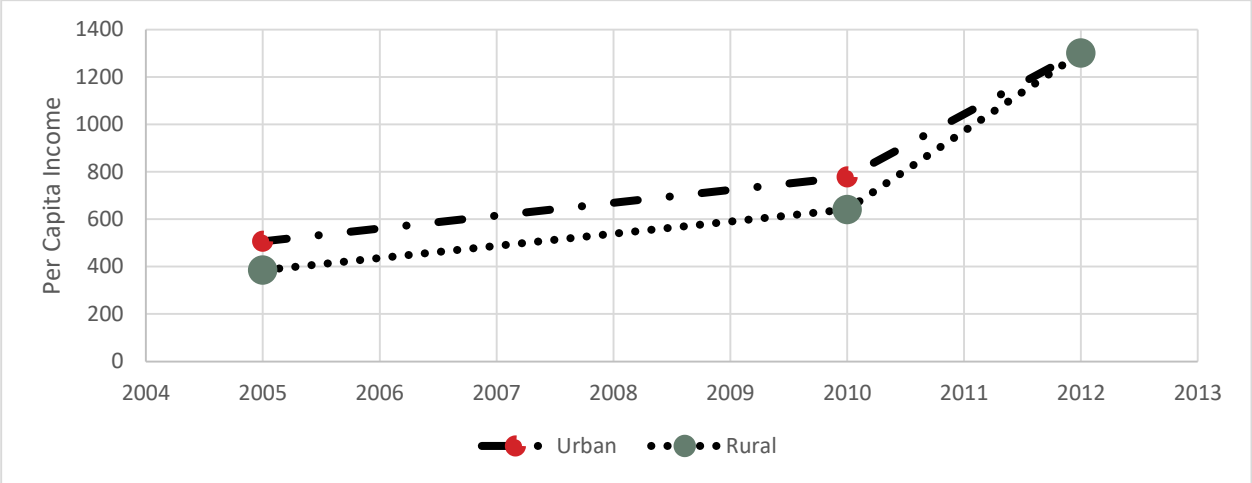


Figure 3.20 Per capita income growth of BPL population in Puducherry UT

From the figure 3.20 it is observed that the per capita income is gradually increased and it is convergence with both rural and urban in the year 2012 which indicates the positive growth in the rural population. From 2010 onwards the graph shows the tremendous increase in the per capita trend due to the supporting policies for the BPL population. Beyond the policies, as a part of reducing the BPL population encouraging the active participation by the grassroot level SHGs, farmers and labourers' forums would improve the relevance and the quality of the schemes. The programme outreach has to be more vibrant to bring down the families in the BPL list in consonance with the aim of attaining Millennium Development Goals.

3.16 EMPLOYMENT PROJECTION

The employment projection for year 2036 is given in the table below:

Table 3-18 Employment Projection for year 2036

Year	Total Population	Total Projected Population	Total working population	Growth Rate in Working Population	Workforce Participation Rate (WPR)
1981	444,417	444,417	128911	-	29.01%
1991	608,338	608,338	202565	57.14%	33.30%
2001	735,332	735,332	265660	31.15%	36.13%
2011	950,289	950,289	348105	31.03%	36.63%
2021	1,121,954	1,121,954	421859	21.187%	37.60%
2031	1,326,939	1,400,000	547422	29.76%	39.10%
2036	1,441,926	1,630,097	658140	20.23%	40.37%

Source: Compiled by Consultant

Considering the scenario that the Workforce Participation Rate (WPR) will increase as the CDP projects will be implemented and more job opportunities will be created, the employment projection is calculated. After consecutive discussions with various govt. departments, the employment projection is worked out based on the optimistic scenario. Thus, the workforce participation rate for year 2036 is coming around 40%, which was 36.63% in year 2011 as per Census 2011.

3.17 POLICIES AND STRATEGIES

Economic planning is concerned with the economic structure of an area and its overall prosperity mainly in terms of production, income, purchasing power etc. The proposals of Comprehensive

Development Plan 2036 need to be supported by a dynamic Economic Development Plan, which creates good jobs for the residents of Puducherry and generates opportunities to invest in town as well as people. Based on the employment projection for year 2036, sufficient land will be allocated to different land uses which through Comprehensive Development Plan 2036 aids to grow the economy.

As described earlier, multi nuclei concept has been adopted for the proposed land use map – 2036 under which three growth centers and four growth points/poles are proposed. This will provide employment opportunities at neighbourhood level across the planning area.

This chapter provides the details of proposal related to economy of the region under various government policies/plans/documents. It also includes the description of relation of proposals of CDP-2036 and the envisaged impact of the same on the economy of the region.

3.17.1 GOVERNMENT POLICIES/INTERVENTIONS TO BOOST THE ECONOMY

Various efforts are being made by the government of Puducherry to boost the economy of the union territory. The government has introduced different policies like IT policy, Industrial policy, vision documents etc. which will aid to enhance the economy of the region. In Comprehensive Development Plan – 2036, due consideration has been given to the proposals given under these policies/documents and land has been dedicated to facilitate most of the proposals. Moreover, the majority of the proposals of Comprehensive Development Plan – 2036 comply with the objective of these policies. Few policies and their objectives are given below:

3.17.1.1 INDUSTRIAL POLICY, 2016

Recently, the government of Puducherry has introduced new industrial policy in 2016. Industrial Policy 2013 was aimed to promote sustainable and balanced industrial development by gainfully utilizing the human resources so as to improve the standard of living. Various thrust areas were identified under this policy like agro processing, electronics and software development, leather products, light engineering and textiles. The need to review the Industrial Policy 2013 arose as the Govt. of India put emphasis on the manufacturing sector, which will lead to creation of additional employment opportunities to the youth. Thus, a new Industrial policy has been framed which aims at promoting vibrant industrial growth in the context of overall economic development of the Union Territory.

The objectives of the New Industrial Policy 2016 are as under:

- To create electronic manufacturing hub using the large technical resources
- To ensure synergy between academia and industries
- To ensure rapid, balanced, sustainable ecofriendly industrial development
- To bring a significant increase in the GSDP
- To develop a strong high tech manufacturing sector
- To make Puducherry the most preferred investment destination.
- To achieve higher export growth.
- To provide employment to the youth through skill development and soft skill under Skill Development Mission and enhancing the employability of youth.

Various strategies have been identified to achieve these objectives. Certain priority industries have been listed. For their obvious compatibility with Puducherry, certain "thrust areas" have been identified. Thrust area industries include electronic manufacturing, IT/ITES, Auto Components, Plastic Products, agro and food processing industries, Marine products, solar power and alternative renewable energy products, leather products excluding tannery, tourism industries and many more. Govt. of Puducherry will also assist the MSME in their efforts to encourage entrepreneurship, employment and livelihood opportunities.

3.17.1.2 PUDUCHERRY VISION DOCUMENT, 2025

This document is prepared by CII with Sriram Charitable Trust to build the vision for Puducherry called 'Vision 2025'. The vision of this report is defined as: "By 2025, Puducherry will be an international destination for higher education, learning, and research; a best-in-class wellness, spiritual, and eco-tourism destination; a hub for high-end services and industries enabled by high-quality infrastructure, connectivity and responsive governance; duly preserving its environment and heritage, and thereby emerging as a model, value-based society".

It is expected that Puducherry will be a service-led economy along with high- end manufacturing industries. Non-polluting economic activity such as IT and ITES, Tourism, Healthcare, Education, Light Engineering and electronics are envisioned to be the drivers of growth of Puducherry. It will be a high-end service led economy along with high end manufacturing, leading to strong growth based on Puducherry's intrinsic strength as a business destination of choice.

The major thrust areas identified under this plan are as under:

- IT, ITES, and knowledge-based industries
- Light engineering – IT Hardware and Electronics. Component manufacturing, etc.
- Tourism
- Education and Research
- Healthcare (good quality hospitals, and post-treatment care, rejuvenation)

Other proposals include the introduction of lower taxes and power tariffs and eco-tourism which will help flourish the economy of the region.

3.17.1.3 THRUST AREAS

Under different documents reviewed previously, all had identified thrust areas. It is important to keep in consideration these identified thrust areas. A comprehensive list of the same is given below:

1. Electronic Manufacturing
2. Auto Components
3. Plastic Products
4. Agro and food processing industry
5. Marine Products
6. Solar power, alternative and renewable energy products
7. Leather products excluding tannery
8. Biotech industries
9. Light Engineering industries
10. Gem and Jewelry
11. Textile, Garments and Apparel Parks
12. Antique Furniture
13. Pharmaceutical Formulations
14. Traditional Handicraft Industries
15. Flavour and Fragrance Industries
16. IT, ITES, and knowledge-based industries
17. Light engineering – IT Hardware and Electronics. Component manufacturing, etc.
18. Tourism Industries
19. Education and Research
20. Healthcare (good quality hospitals, and post-treatment care, rejuvenation)

3.17.2 Tourism Infrastructure

Tourism infrastructure is a component of regional touristic product. Infrastructure is comprised of basic devices, buildings and service institutions, whose existence is crucial to the proper operating of economy and society. Infrastructure is divided into:

- Technical, including basic devices used in transport, communication, gas, heat, power and road industry etc.
- Social, including devices and institutions connected with education, culture, science, health, physical culture and tourism, public administration.

For Puducherry, major infrastructure related to tourism includes accommodation, roads, physical infrastructure, recreational area etc. under the Comprehensive Development Plan - 2036; various proposals have been made which will support to flourish the tourism industry.

Tourism activity has been spread across the planning area. Major tourist places in the planning area includes Boulevard Town, Oussudu Lake, Arikamedu, Ariyankuppam mangrove, boating at chunnambar and paradise beach. The strengthening of tourism will bring more employment opportunities to the planning area. The direct and indirect effects of improved tourism will certainly enhance the economy of the planning area. Therefore, it is important to provide sufficient infrastructure, which facilitates the tourism. Various tourism proposals proposed by govt. of Puducherry are explained in the tourism chapter.

Apparently, as per the analysis, it is felt that all the proposals are required to have sustained growth of the area. Thus, these proposals are adopted under Comprehensive Development Plan – 2036. Appropriate quantum of land will be allocated for specific purposes, which will aid in implementing these proposals in shorter time. Moreover, it is important to facilitate these proposals in order to have smooth functioning of the same.

Around most of the tourist sites proposed, it is ensured that necessities are available at the neighbourhood level like commercial, Public & Semipublic, recreation etc.

3.17.3 IT PROPOSALS

As mentioned earlier, Government of Puducherry has IT policy, 2008 under which IT corridor is proposed. The entire stretch of East Coast Road starting from Ganapathichettikulam to Mullodai and NH 45-A of Villupuram road upto Madagadipet of Puducherry Region is declared as IT Corridor. Additionally, a Multi-Product Special Economic Zone at Sedarapet, IT Park at Kalapet provide world-class infrastructure and business support facilities for IT operations. In addition to that, 10.06 hectare of land in Mettupalayam in proposed to be developed as IT park as proposed by government of Puducherry.

It is envisaged that if the above proposals are implemented, it will create additional job opportunities in the planning area. However, to make the implementation of the same faster, the sufficient land will be dedicated for the above said purpose.

4 EXISTING LANDUSE ANALYSIS – 2015

As part of the preparation of Comprehensive Development Plan - 2036, an extensive existing land use survey was carried out for the entire Puducherry Planning Area. The Existing Land Use was updated based on ground reality on the scientific base map prepared with the help of Satellite Image and Revenue records like village level cadastral sheets, Field Measurement Book sheets and Town Survey Sheets. The Puducherry Planning Area is administratively divided into seven entities, two municipalities and five commune panchayats viz. Puducherry Municipality, Oulgaret Municipality and Villianur, Ariyankuppam, Bahour, Nettapakkam and Mannadipet Commune Panchayats respectively. This chapter presents the existing landuse analysis, 2015 for municipalities, commune panchayats and overall planning area. Further the existing land use analysis of the proposed conurbation area is also discussed to understand the current scenario of the new conurbation area.

4.1 MUNICIPALITIES

Puducherry Planning Area accommodates two municipalities namely Puducherry Municipality & Oulgaret Municipality.

4.1.1 PUDUCHERRY MUNICIPALITY

The total area of Puducherry Municipality is 19.55 sq.km, the detailed existing land use analysis of Puducherry Municipality - 2015 is presented in table 4-2. Puducherry Municipality is bound by Saram & Karuvadikuppam revenue village of Oulgaret Municipality on the North-west, Reddiarpalayam & Odiampet revenue village of Villianur Commune Panchayat on the western side and Ariyankuppam revenue village of Ariyankuppam Commune Panchayat on the southern side. The puducherry municipality comprises of revenue villages of Puducherry, Pudupalayam, Olandai, Thengaithittu, Murungapakkam, Kombakkam.

Table 4-1 Details of Puducherry Municipality

S. No	Description	Details
1.	Area	19.55 Sq. km
2.	Gross Density	12,500 Persons/sq km (125 pph)
3.	Net Density	47,368 Persons/Sq km (473 pph)
4.	Location	City Centre
5.	Major Landmarks	Boulevard Town, Aurobindo Ashram, Bharthi Park, Manakula Vinayagar Temple, Botanical Garden, Goubert Avenue, Railway Station, Port & Fishing Harbour, Stadium, Thengaithittu Mangrooves

Source: Compiled by Consultant

One of the predominant landmark in the Puducherry Municipality is the Boulevard town which lies in the centre of the Puducherry Municipality. Boulevard town is bound by S V Patel Salai Road on the North, Promenade beach on the East, Subbaiah Salai Street on the South and Anna Salai Street on the West. The CBD of the Puducherry region lies in the heart of the Puducherry Municipality. As per gazette, the CBD area is the block between South of Ambalathadayar Madam Street and North of Rangapillai Street and East of Anna Salai and West of Kasim Salai (Ambour Salai) including both sides of Ambalathadiyar Madam Street and Rangapillai Street. City's major commercial activities lies along the J N Street, Rangapillai Street, M G Road, Bussy Street and Ambalathatayar Street. Another major landmark in this precinct is Bharthi Park which is a recreational site for the local as well as floating population. Puducherry Railway station, Port and Fishing harbor are also other major landmarks located in Puducherry Municipality.

The existing land use analysis chart for Puducherry Municipality - 2015 is presented in figure 4.1. In Puducherry Municipality, 5.16 sq.km of land is under residential use and it is the predominant land use in this municipality.

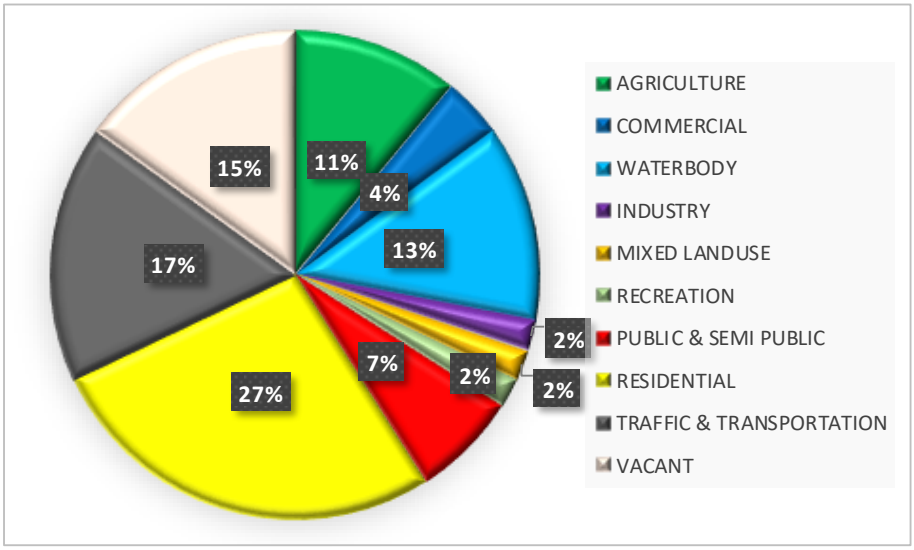


Figure 4.1 Existing Land Use Analysis Chart for Puducherry Municipality-2015

Traffic & Transportation land use occupies 3.39 sq.km of area in Puducherry Municipality. Vacant land use is around 2.98 sq.km and Waterbody is 2.58 sq.km, agricultural land use is 2.13 sq.km of the Puducherry Municipality.

The Public & Semi-Public land use covers 1.25 sq.km in the municipality. The commercial land use in the Puducherry Municipality is occupying 0.85 sq.km, mixed landuse is 0.43 and industrial landuse is observed 0.43 sq.km. The existing land use Map - 2015 for the entire Puducherry Municipality is illustrated in figure 4.2.

Table 4-2 Existing Landuse Analysis for Puducherry Municipality-2015

S. No	Land Use	Area in Sq.KM	Percentage to Total Area
1.	AGRICULTURE	2.13	10.91%
2.	COMMERCIAL	0.85	4.36%
3.	WATERBODY	2.58	13.20%
4.	INDUSTRY	0.43	2.18%
5.	MIXED LANDUSE	0.43	2.21%
6.	RECREATION	0.35	1.79%
7.	PUBLIC & SEMI PUBLIC	1.25	6.38%
8.	RESIDENTIAL	5.16	26.39%
9.	TRAFFIC & TRANSPORTATION	3.39	17.36%
10.	VACANT	2.98	15.22%
11.	**Total**	**19.55**	**100.00%**

Source: Compiled by Consultant

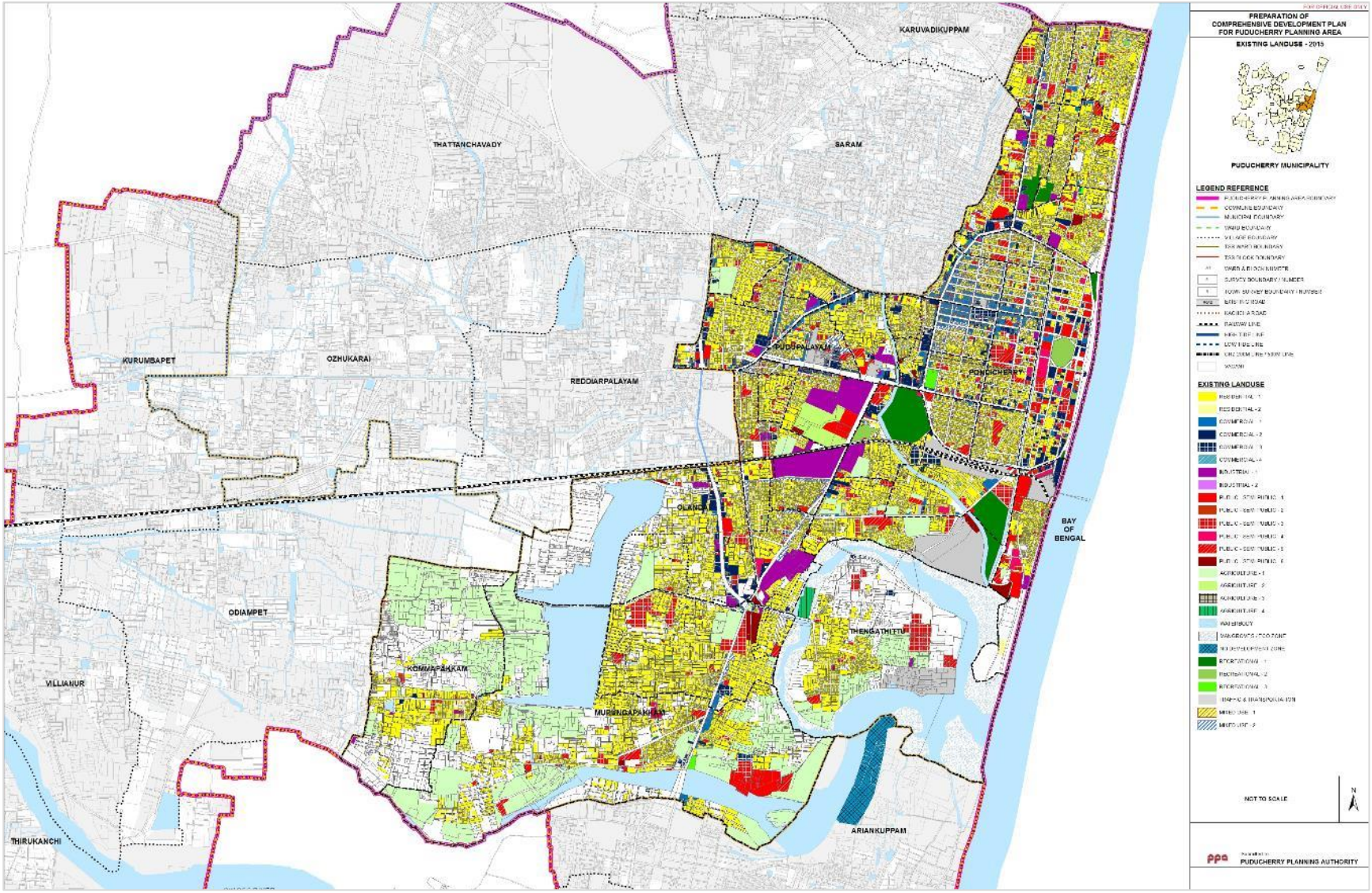


Figure 4.2 Existing Land Use Map – 2015 for Puducherry Municipality

4.1.1.1 RESIDENTIAL

The residential land use is the predominant use in Puducherry Municipality area and it covers 5.16 sq km of area which is around 26.39 % of the total area of the Puducherry Municipality. Residential use is dominant on the Northern and central part of the Puducherry Municipality. Boulevard town is one of the oldest residential settlement within the Puducherry Municipality. Other major settlement contributing to the residential use in the Puducherry Municipality are Pudupalayam, Olandai and Murungapakkam which are major residential area in this municipality. Kombakkam and Thengaithittu are other revenue villages contributing to the residential land use.

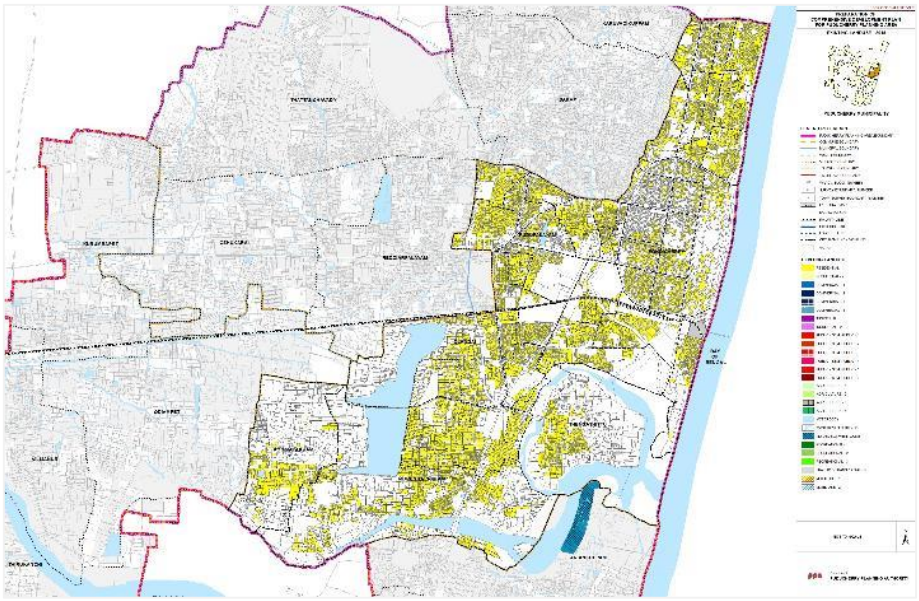


Figure 4.3 Residential Landuse - Puducherry Municipality

4.1.1.2 COMMERCIAL

The commercial land use in the Puducherry Municipality accounts to 4.36% (0.85 sq.km.) of the total area of the Municipality. The CBD of the Puducherry region is the major contributor for the commercial land use in this Municipality. Other than the CBD, commercial land use is observed in

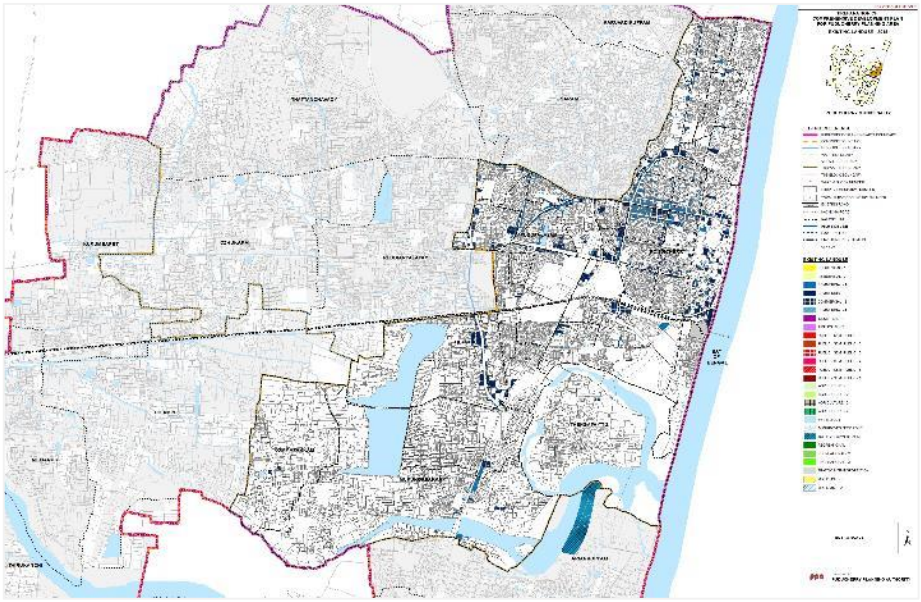


Figure 4.4 Commercial Landuse - Puducherry Municipality

the eastern part of the Boulevard town which is the French Quarters. Predominant commercial use is found on both the sides of Anna Salai Street, East Coast Road within the Puducherry Municipality.

4.1.1.3 INDUSTRIAL

The Industrial Landuse covers around 0.43 sq.km of the Puducherry Municipality which accounts to 2.18% of the total area of the municipality. Out of this 0.43 sq.km of area, major portion is under Swadeshi Mill and Anglo French Textile which are currently non-functional and this provides an opportunity for earmarking these land parcels for public uses like recreational or for development of urban forestry.

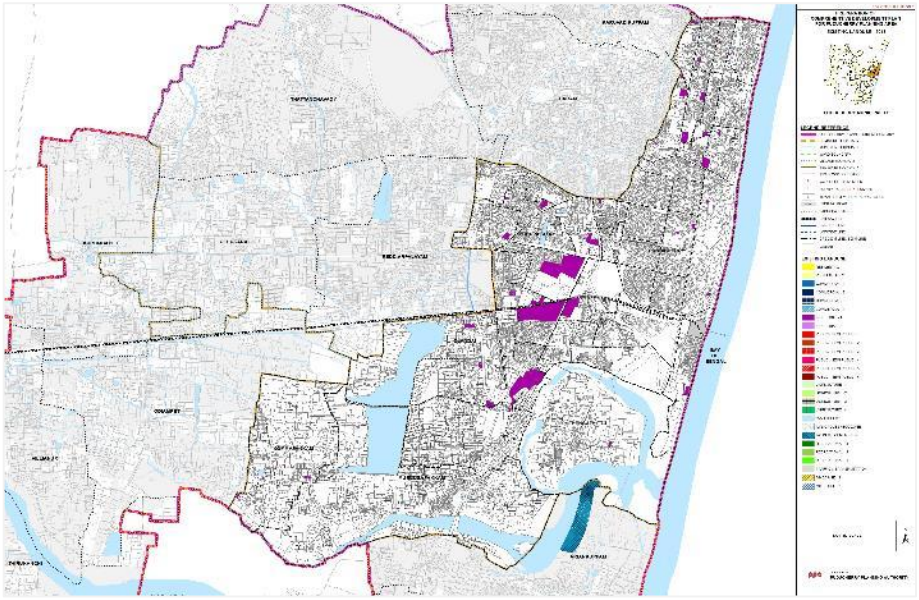


Figure 4.5 Industrial Landuse - Puducherry Municipality

4.1.1.4 PUBLIC & SEMI-PUBLIC

The Public & Semi-public Landuse in the Puducherry Municipality is about 1.25 sq.km which is around 6.38 % of the total area of the Puducherry Municipality. The Boulevard town accommodates several government offices like Governor's Office, Chief Secretariat, Legislative Assembly, Ministry of Finance, Department of Revenue, Public Works Department etc. Further, it has been observed that there are good number of religious buildings like Temples, Churches & Mosques which contributes to the Public & Semi-Public landuse of the Puducherry Municipality area.

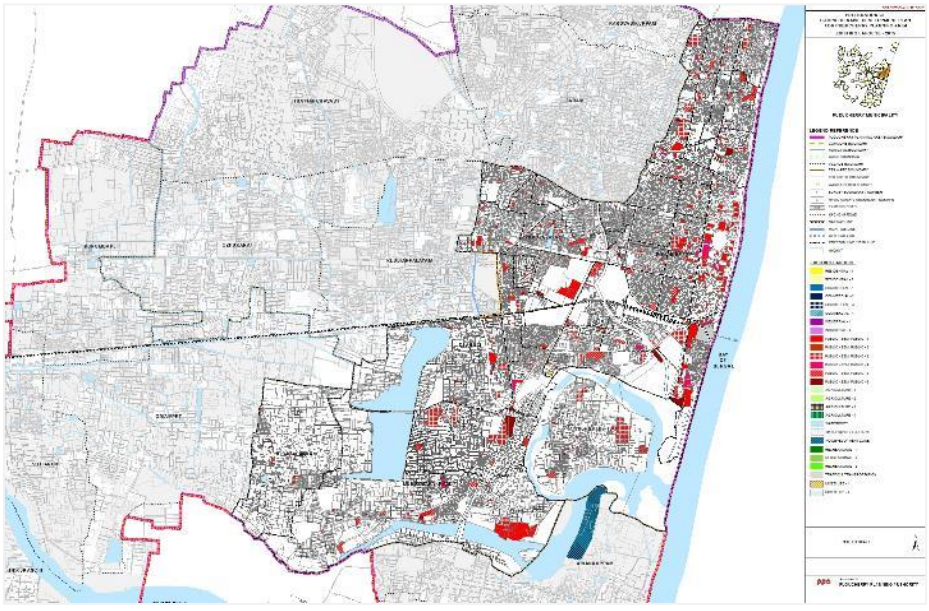


Figure 4.6 Public & Semi-Public Landuse - Puducherry Municipality

4.1.1.5 OPEN SPACES

The recreational land use within the Puducherry Municipality accounts to 0.35 sq.km which is around 1.79% of the total area of the municipality. The important recreational sites within the Puducherry Municipality are Bharthi Park in Boulevard Town, Botanical Garden, situated on the south-western side of the Boulevard town, Indira Gandhi Stadium, located on the southern side of the Boulevard Town adjacent to the Port and the sports ground on Northern side.

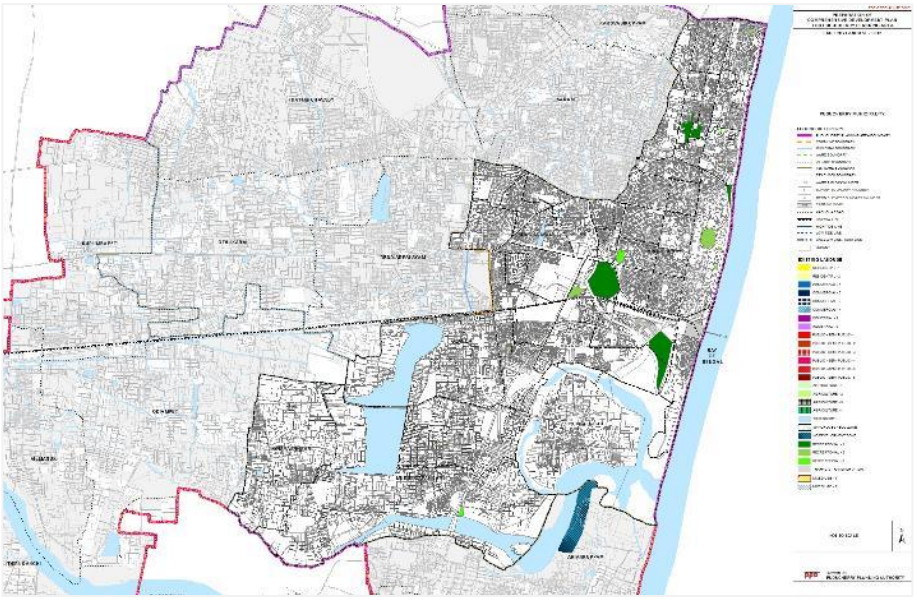


Figure 4.7 Recreational Landuse - Puducherry Municipality

4.1.1.6 TRAFFIC & TRANSPORTATION

Traffic & Transportation covers 3.39 sq.km which is around 17.36 % of the total area of Puducherry Municipality. Large land parcels coming under the traffic & transportation land use in this municipality are Railway Station, Port and Fishing Harbor. Major roads within the Puducherry Municipality are East Coast Road, J.N Street etc.

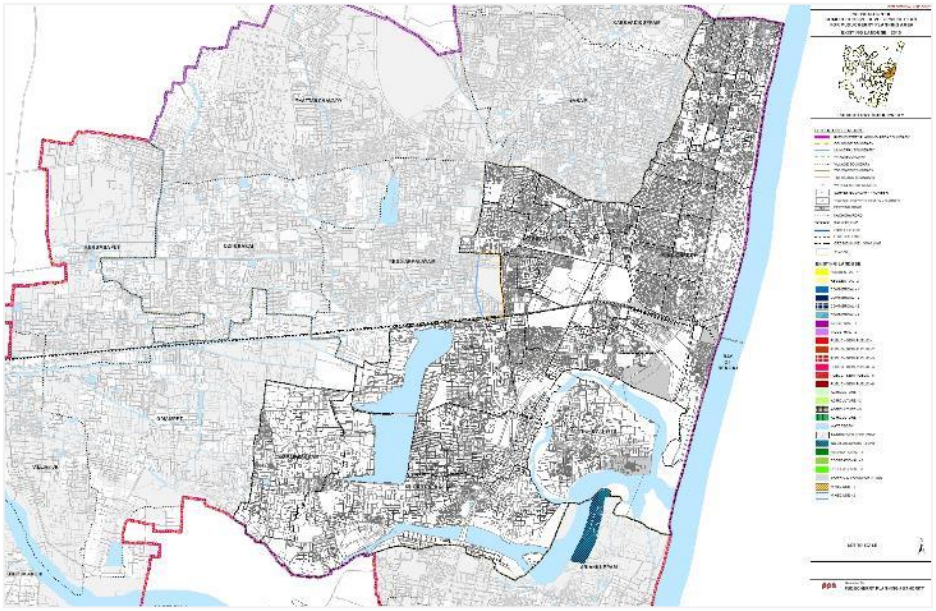


Figure 4.8 Traffic & Transportation Landuse - Puducherry Municipality

4.1.1.7 VACANT

In Puducherry Municipality around 2.98 Sq.km of land is vacant as on year 2015, which accounts for 15.22% land of the total area. Major vacant parcels are located in the revenue villages of Olandai, Kombakkam, Murungapakkam & Thengaithittu. In these villages, a lot of land is developed into layouts and are currently lying vacant. These lands can be utilized for addressing the future needs of the planning area for the plan period.

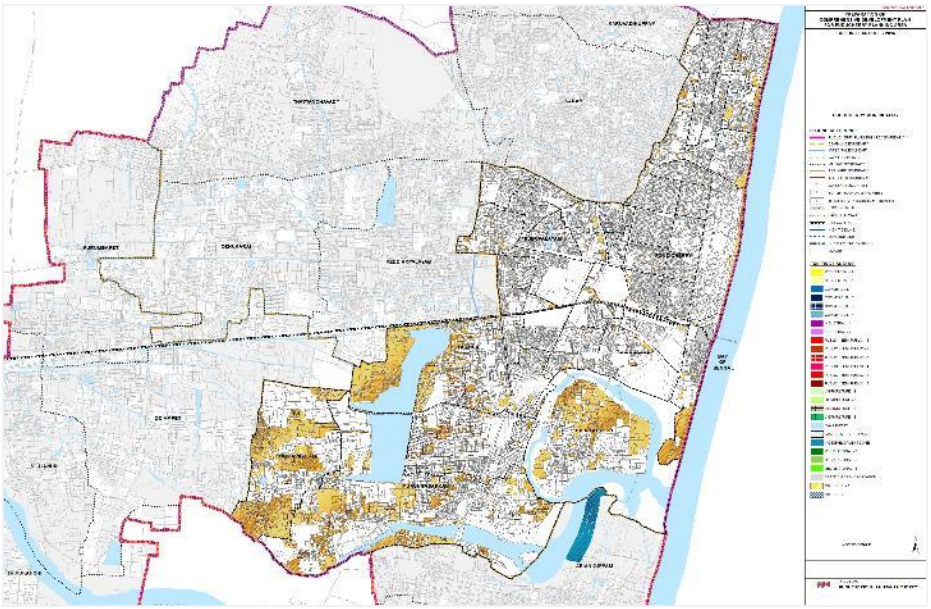


Figure 4.9 Vacant Land - Puducherry Municipality

4.1.1.8 PROTECTED & UNDEVELOPABLE USE

Puducherry Municipality has 2.58 sq km of area falling under protected and undevelopable land use zone. Majority of the area falling under this category is covered by Thengaithittu mangroves, seashore line and Velrampet lake.

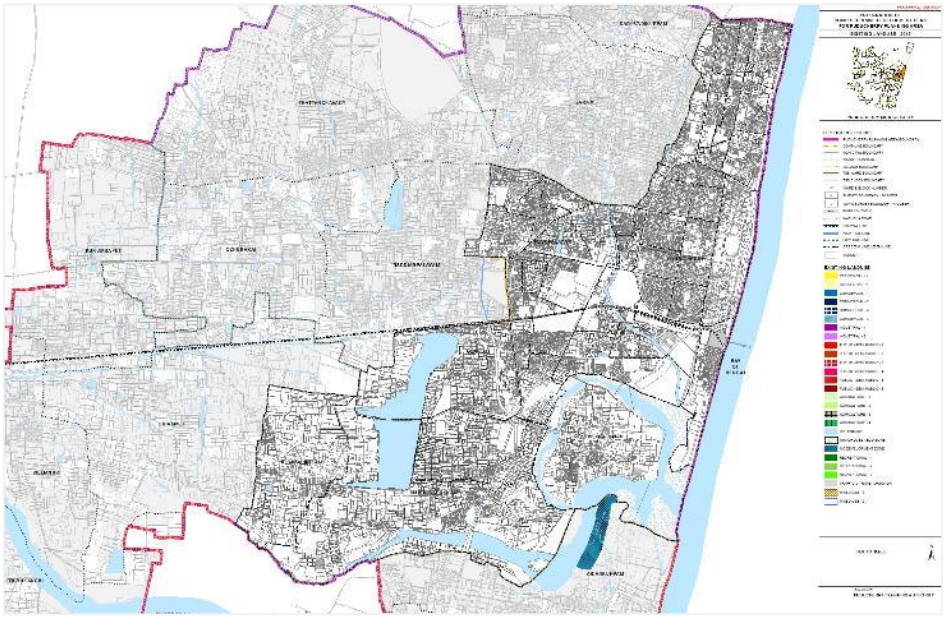


Figure 4.10 Protected & Undevelopable Use Zone - Puducherry Municipality

4.1.2 OULGARET MUNICIPALITY

The total area of the Oulgaret Municipality is 34.55 sq.km. The detailed existing land use analysis of Oulgaret Municipality is given in table 4-4. The Oulgaret Municipality is divided into three land pockets divided by Tamilnadu in between. The villages of Kalapet, Pillaichavady forms one land parcel on the northern side of the Puducherry Planning Area bounded by Tamilnadu state on three sides and Bay of Bengal on one side. Alankuppam is a village interspersed within Tamilnadu state lying on the eastern side of NH-66. Rest of the Oulgaret Municipality is located within the main land of the Puducherry Planning Area bounded by Pudupalayam and Olandai villages of Puducherry Municipality on the eastern side and Kurumbapet & Odiampet villages of Villianur Commune Panchayat on southern and western side of Oulgaret Municipality respectively.

Table 4-3 Details of Oulgaret Municipality

S. No	Description	Details
1.	Area	34.55 sq.km
2.	Gross Density	8,686 Persons/sq km (87 pph)
3.	Net Density	32,925 Persons/sq km (329 pph)
4.	Location	Northern Part of the Planning Area
5.	Major Landmarks	Airport, Puducherry University, JIMPER, Police Headquarters

Source: Compiled by Consultant

The major land marks in Oulgaret Municipality are Puducherry Airport which is in Karuvadikuppam village, Puducherry University which is in Kalapet village, JIMPER in Thattanchavady village, police headquarters etc. The revenue villages falling within Oulgaret Municipality are Oulgaret, Reddiyarpalayam, Saram, Karuvadikuppam, Alankuppam, Kalapet, Pillaichavady and Thattanchavady.

Figure 4.11 gives the existing land use analysis chart for Oulgaret Municipality - 2015 and table 4-4 presents the area under each land use category within the Oulgaret Municipality. In Oulgaret Municipality, 9.12 sq.km of land is under residential use and it is the predominant land use in this municipality.

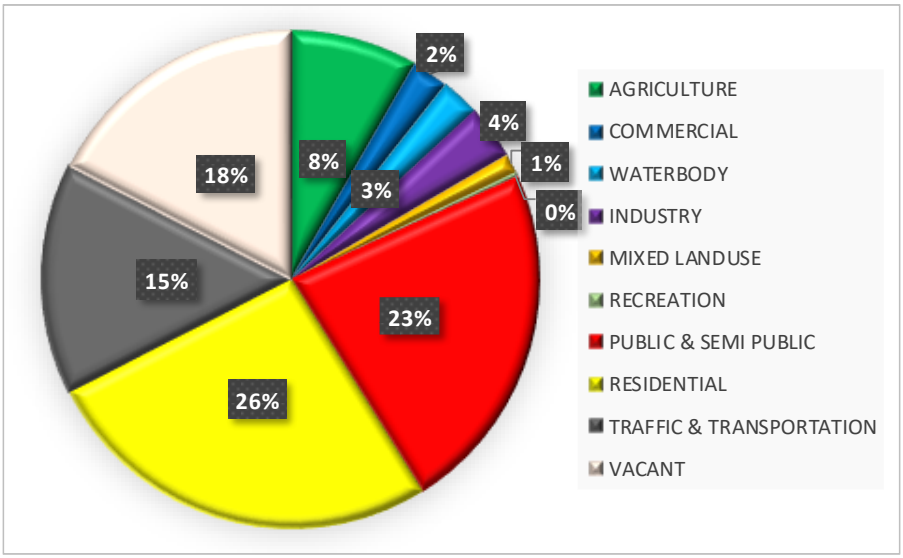


Figure 4.11 Existing Land Use Analysis Chart for Oulgaret Municipality-2015

Table 4-4 Existing Landuse Analysis for Oulgaret Municipality-2015

S. No	Land Use	Area in Sq.KM	Percentage to Total Area
1.	AGRICULTURE	2.86	8.29%
2.	COMMERCIAL	0.82	2.36%
3.	WATERBODY	0.87	2.53%
4.	INDUSTRY	1.21	3.50%
5.	MIXED LANDUSE	0.43	1.25%
6.	RECREATION	0.11	0.31%
7.	PUBLIC & SEMI PUBLIC	7.91	22.89%
8.	RESIDENTIAL	9.12	26.40%
9.	TRAFFIC & TRANSPORTATION	5.18	15.00%
10.	VACANT	6.04	17.47%
11.	**Total**	**34.55**	**100.00%**

Source: Compiled by Consultant

The Public & Semi-Public land use is the second largest and it covers around 7.91 sq.km area of the municipality. Vacant land use is around 6.04 sq.km, Traffic & Transportation land use which occupies 5.18 sq.km. and Waterbody is 0.87 sq.km, agricultural land use is found in 2.86 sq.km of the Oulgaret Municipality area. The commercial land use in the Oulgaret Municipality is occupying 0.82 sq.km, industrial landuse is observed in 1.21 sq.km and mixed land use is found to be 0.43 sq km.

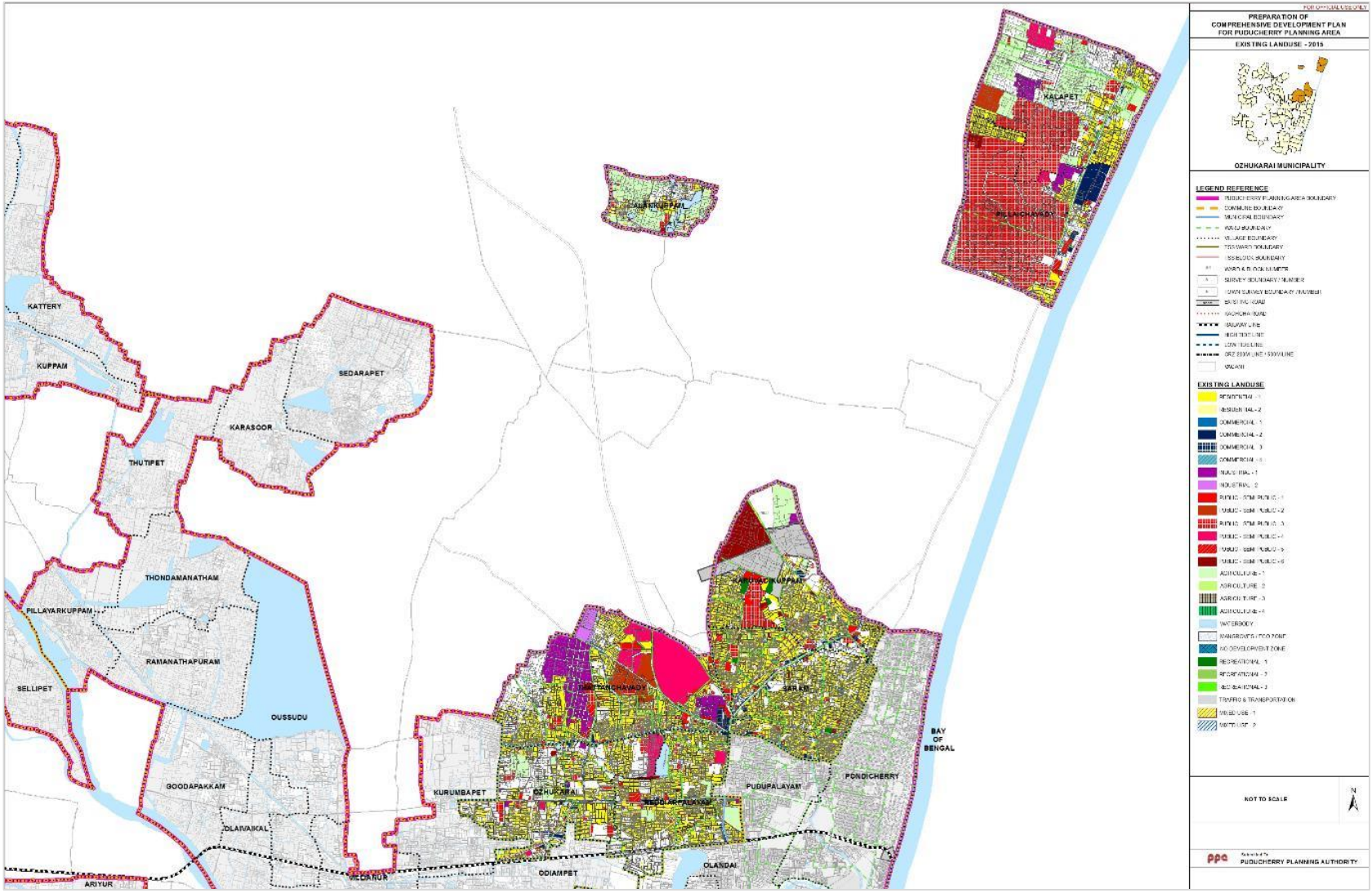


Figure 4.12 Existing Land Use Map Oulgaret Municipality-2015

4.1.2.1 RESIDENTIAL

The major land use in Oulgaret Municipality is residential use which occupies around 9.12 sq.km which is around 26.40% of the total area of the municipality. The population of Oulgaret Municipality as per census 2011 is 3,00,104 and the gross density is 86 persons per hectare and the net residential density is 329 persons per hectare. Major residential settlements within the Oulgaret Municipality are Saram village which is one of the densest developments within the Puducherry Planning Area. Other settlements are Oulgaret, Reddiyarpalayam, Saram, Karuvadikuppam, Alankuppam, Kalapet, Pillaichavady and Thattanchavady. Figure 4.13 shows the area covered under residential land use in Oulgaret Municipality.

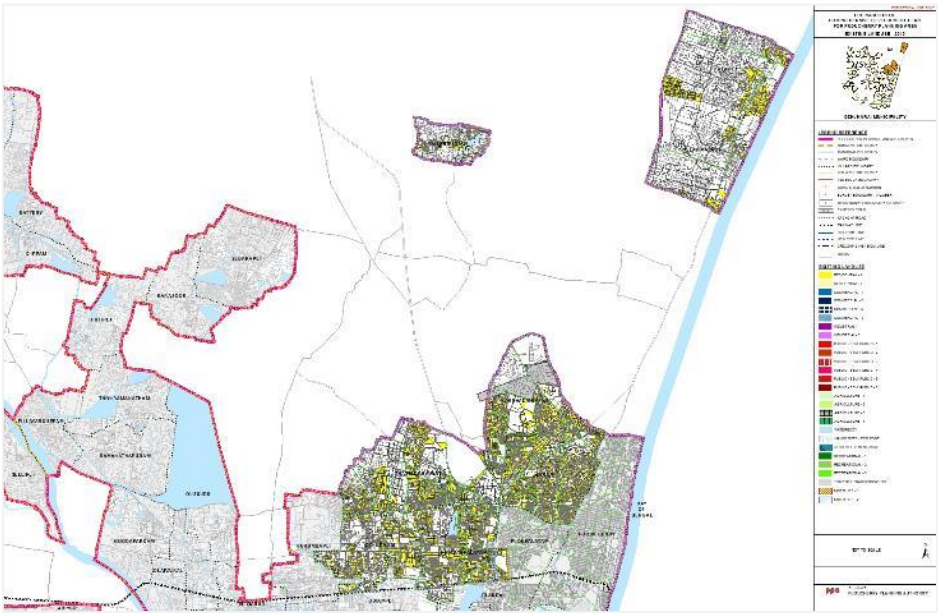


Figure 4.13 Residential Use - Oulgaret Municipality

4.1.2.2 COMMERCIAL

The Commercial land use in Oulgaret Municipality is spreaded in 0.82 sq.km which accounts to 2.36% of the total land area of the municipality. The major commercial development is located on the either sides on the SH-49 or East Coast Road passing through Karuvadikuppam and Saram village within the Oulgaret Municipality limits. Rajiv Gandhi Square is a prominent commercial junction

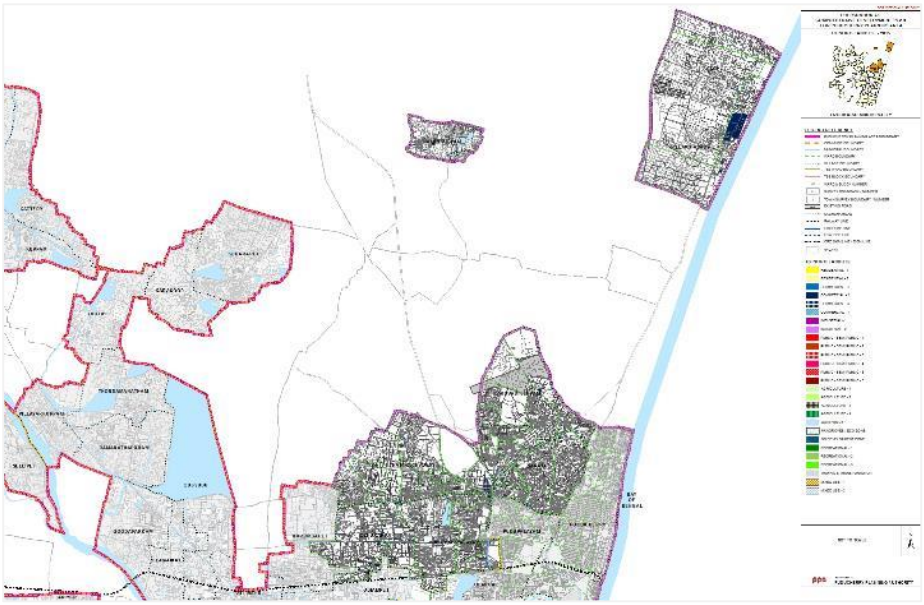


Figure 4.14 Commercial Use - Oulagret Municipality

within Oulgaret Municipality. Figure 4.14 shows the distribution of commercial use in Oulgaret Municipality.

4.1.2.3 INDUSTRIAL

The main Industrial area in Oulgaret Municipality is PIPDIC Industrial Estate, Mettupalayam at Thattanchavady village. The industrial area in Oulgaret Municipality is 1.21 sq.km which is around

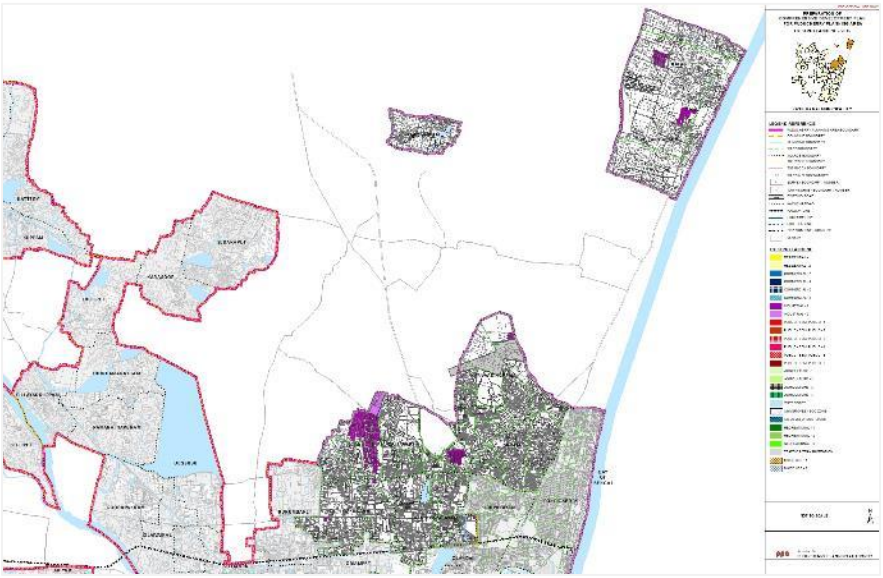


Figure 4.15 Industrial Use - Oulgaret Municipality

3.50% of the total area of Oulgaret Municipality. Figure 4.15 presents the industrial use within Oulgaret Municipality.

4.1.2.4 PUBLIC & SEMI-PUBLIC

The Public & Semi-Public land use contribution in Oulgaret Municipality is 22.89 % of the total area and it is around 7.91 sq.km. Puducherry University occupies a large chunk of land in Kalapet Village.

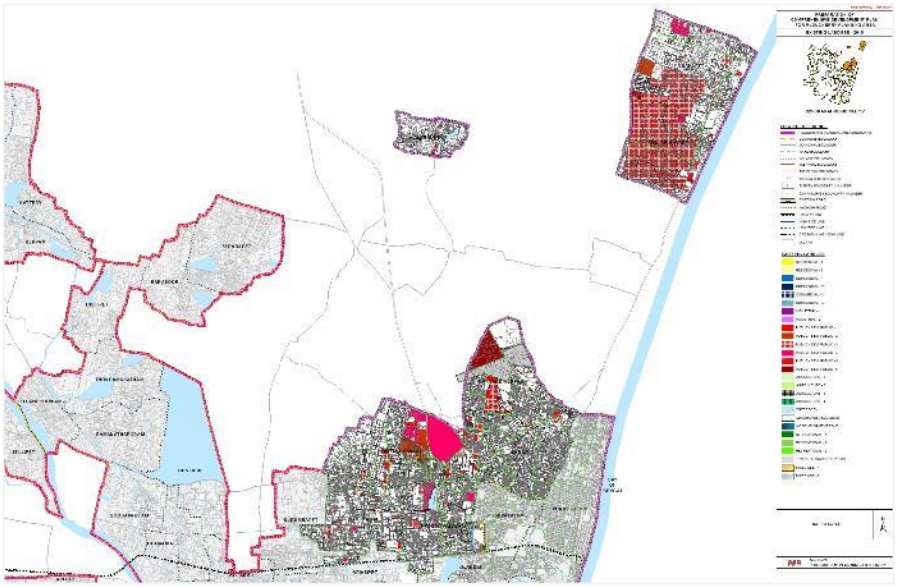


Figure 4.16 Public & Semi-Public Use - Oulgaret Municipality

Other major public and semi-public use within the Oulgaret Municipality is JIPMER which is located on western side of NH-66 in Thattanchavady village. The Public & Semi-Public Use map for Oulgaret Municipality is shown in figure 4.16.

4.1.2.5 OPEN SPACES

The Open Space available in Oulgaret Municipality is 0.11 sq.km which is around 0.31 % of the total area of the municipality. Figure 4.17 shows the Open Space Use map of Oulgaret Municipality.

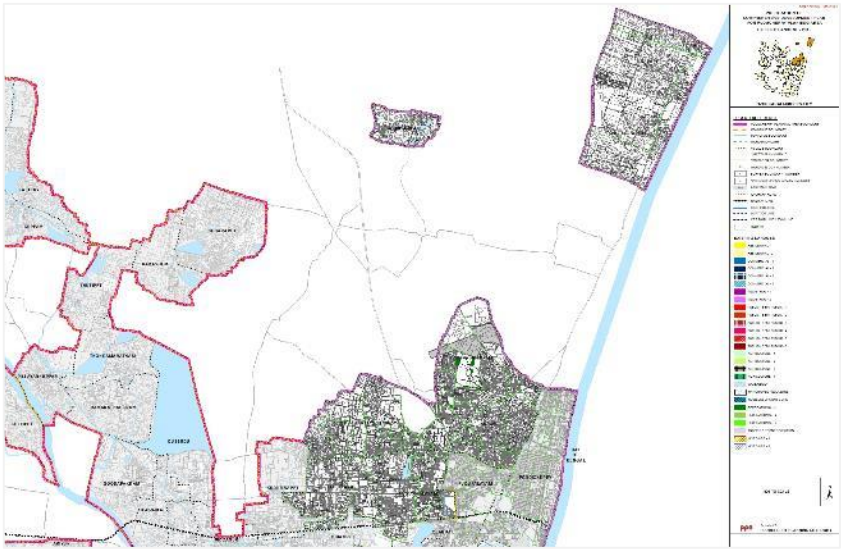


Figure 4.17 Open Space Use - Oulgaret Municipality

4.1.2.6 TRAFFIC & TRANSPORTATION

The traffic & transportation land use in Oulgaret Municipality is around 15.00% of the total area which accounts to 5.18 sq.km. The higher ratio of traffic and transportation land use is due to large land parcels falling under Puducherry Airport. Figure 4.18 shows the Traffic & Transportation Land Use map for Oulgaret Municipality.

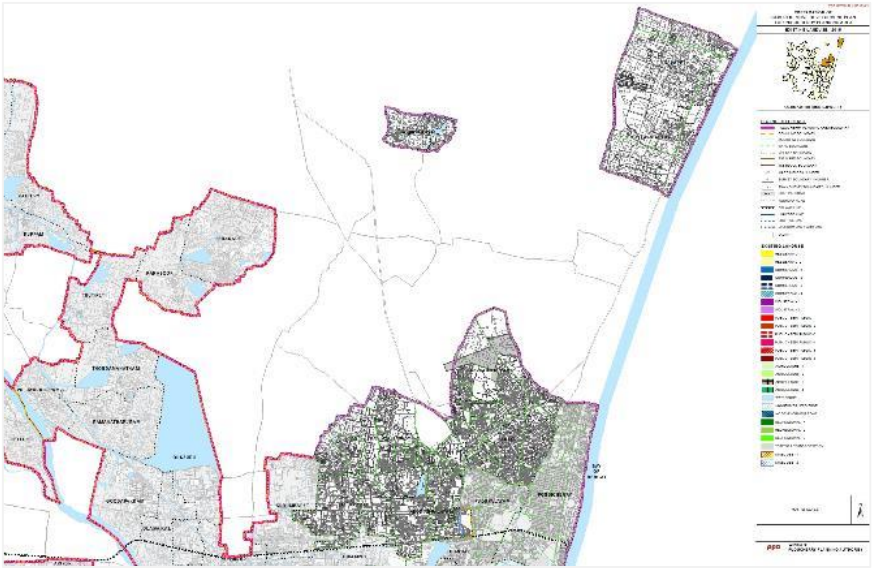


Figure 4.18 Traffic & Transportation Use - Oulgaret Municipality

4.1.2.7 VACANT

In Oulgaret Municipality around 6.04 Sq. Km of land is vacant as on 2015 and it accounts for 17.47% of total area of the Municipality. Most of the vacant land parcels are located in Oulgaret, Alankuppam, Kalapet, Pillaichavady. Most of the vacant land parcels are residential layouts developed and lying vacant. Figure 4.19 shows the vacant land use in Oulgaret Municipality.

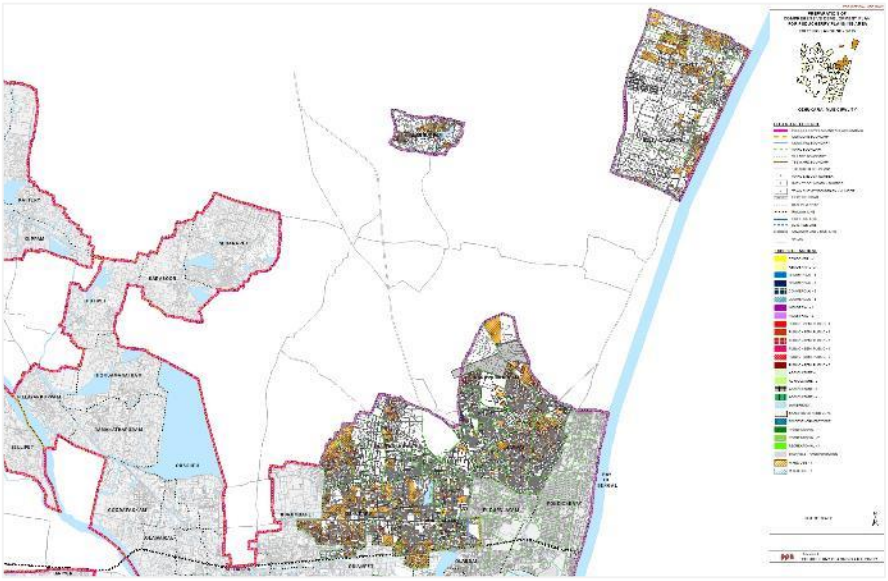


Figure 4.19 Vacant Use - Oulgaret Municipality

4.1.2.8 PROTECTED & UNDEVELOPABLE USE

Around 2.53 % of the total area of the Oulgaret Municipality are under protected or undevelopable use and it is having a coverage of 0.82 sq.km.

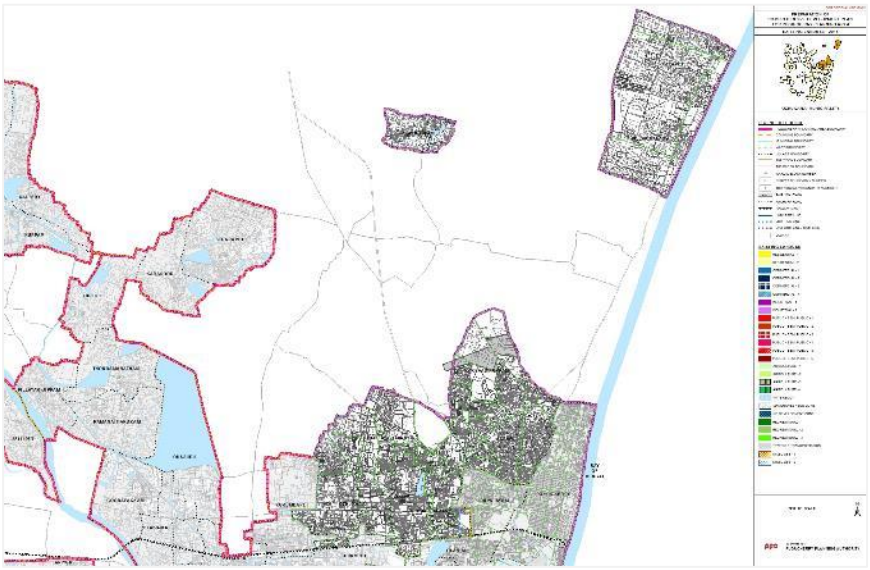


Figure 4.20 Protected & Undevelopable Use - Oulgaret Municipality

4.2 COMMUNE PANCHAYATS

There are five commune panchayats in Puducherry Planning Area namely, Ariyankuppam, Villianur, Mannadipet, Nettapakkam and Bahour Commune Panchayats.

4.2.1 ARIYANKUPPAM COMMUNE PANCHAYAT

The total area of Ariyankuppam Commune Panchayat is 24.38 sq.km, table 4-5 shows the details of the Ariyankuppam CP. It is situated on the South-Eastern side of the planning area, bound by the Thengaithittu and Murungapakkam revenue villages of Puducherry Municipality on northern side, Tamilnadu state on western and southern side.

Table 4-5 Details of Ariyankuppam Commune Panchayat

S. No	Description	Details
1.	Area	24.38 Sq.km
2.	Gross Density	2,955 Persons/sq km (30 pph)
3.	Net Density	22,648 Persons/sq km (226 pph)
4.	Location	Southern part of the Planning Area
5.	Major Landmarks	Arikamedu ASI Site, Chunnambar, Paradise Beach, Le Pondy Resort, Kailash Beach Resort, Timber Mart/Saw Mills

Source: Compiled by Consultant

The major landmarks which falls within the Ariyankuppam Commune Panchayat are Arikamedu ASI Site, Paradise Beach, Le Pondy Resort, Kailash Beach Resort, Timber Market etc.

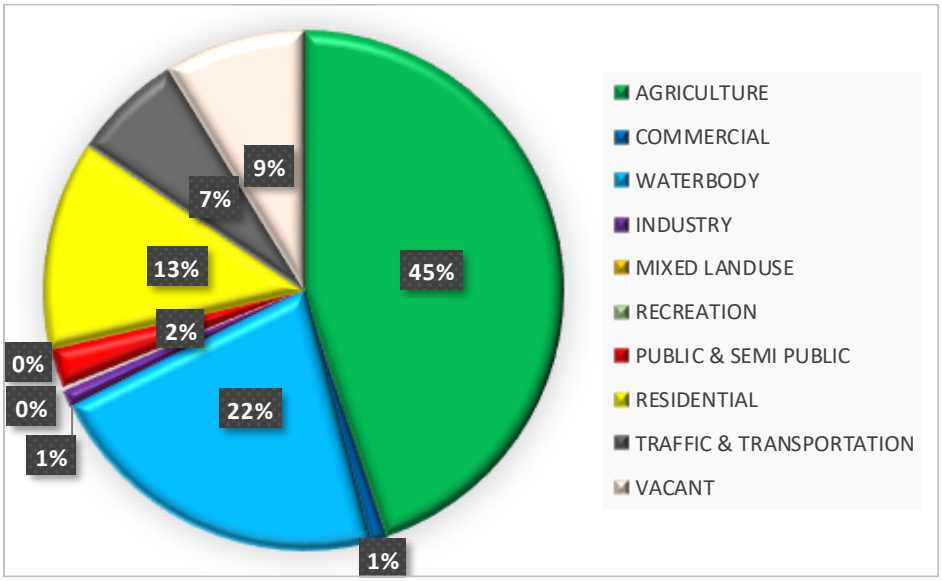


Figure 4.21 Existing Land Use Analysis Chart Ariyankuppam Commune Panchayat-2015

Figure 4.21 shows the existing land use analysis chart for Ariyankuppam Commune Panchayat and table 4-6 shows the existing land use analysis. Out of the total 24.38 sq.km of land area of Ariyankuppam Commune Panchayat, 10.93 sq.km is occupied under agricultural land use and it is the predominant land use within this commune panchayat. The predominance of agricultural land use illustrates the rural character of the Ariyankuppam Commune. Residential land use accounts for 3.18 sq.km area of the Commune Panchayat. The revenue villages coming within Ariyankuppam

Commune panchayat are Pooranakuppam, Thavalakuppam, Abhishekappakam, Manaveli, Ariyankuppam and Thimmanaickenpalayam.

Table 4-6 Existing Landuse Analysis for Ariyankuppam Commune Panchayat-2015

S. No	Land Use	Area in Sq.KM	Percentage to Total Area
1.	AGRICULTURE	10.93	44.84%
2.	COMMERCIAL	0.27	1.09%
3.	WATERBODY	5.30	21.73%
4.	INDUSTRY	0.25	1.04%
5.	MIXED LANDUSE	0.05	0.22%
6.	RECREATION	0.02	0.07%
7.	PUBLIC & SEMI PUBLIC	0.59	2.41%
8.	RESIDENTIAL	3.18	13.05%
9.	TRAFFIC & TRANSPORTATION	1.657	6.80%
10.	VACANT	2.13	8.75%
11.	**Total**	**24.38**	**100.00%**

Source: Compiled by Consultant

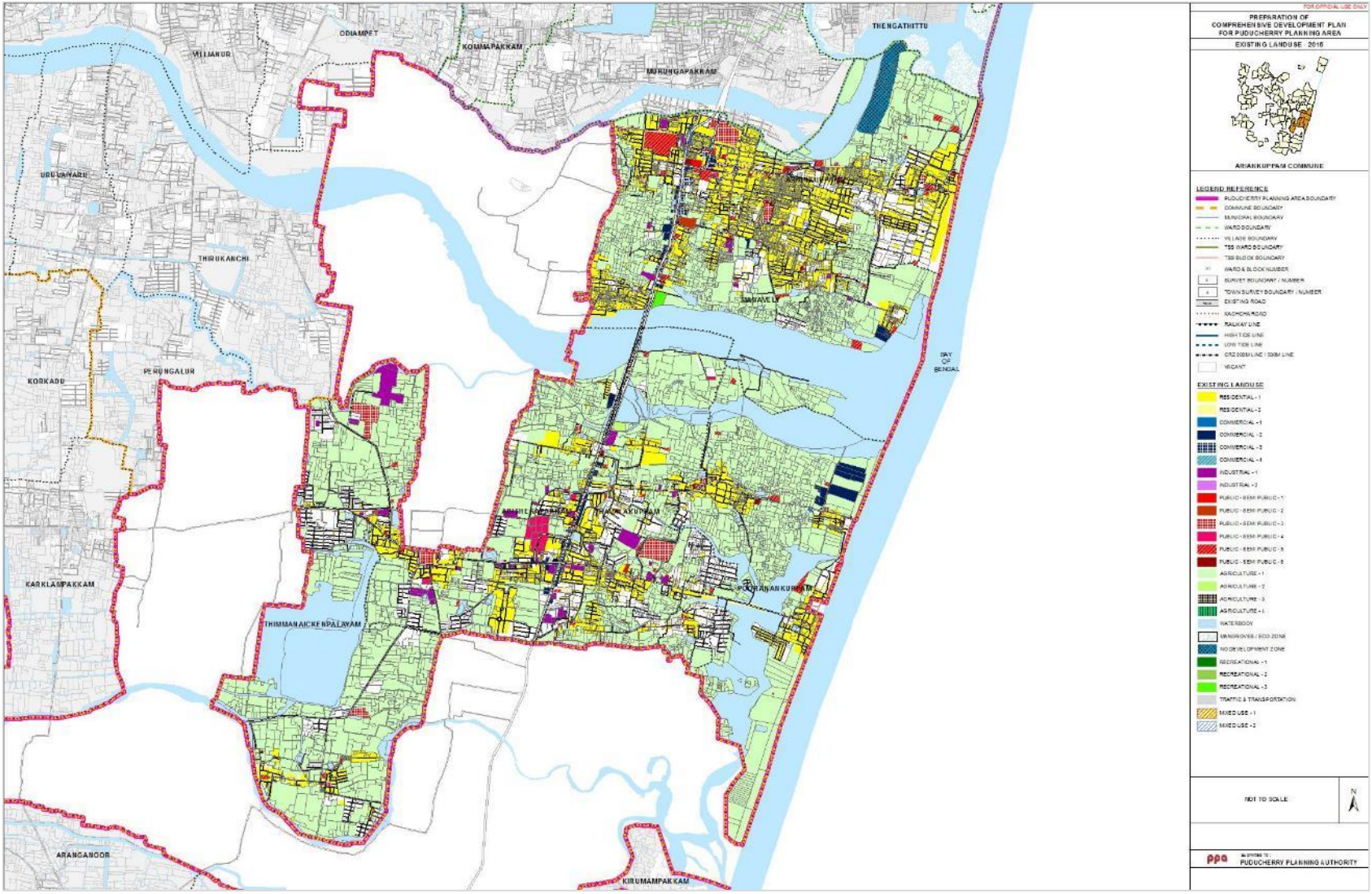


Figure 4.22 Existing Land Use Map Ariyankuppam Commune Panchayat-2015

4.2.1.1 RESIDENTIAL

The figure 4.23 shows the residential use spreaded across the Ariyankuppam Commune Panchayat, it covers around 3.18 sq.km which accounts to 13.05% area of the CP. Residential landuse is concentrated in Ariyankuppam and Manaveli revenue villages which are the major settlements of this Commune Panchayat. Rest of the revenue villages have residential development which are sparsely dispersed. A population of 72,055 occupies Ariyankuppam Commune Panchayat, the gross density is 29 persons per hectare and the net residential density 226 persons per hectare.

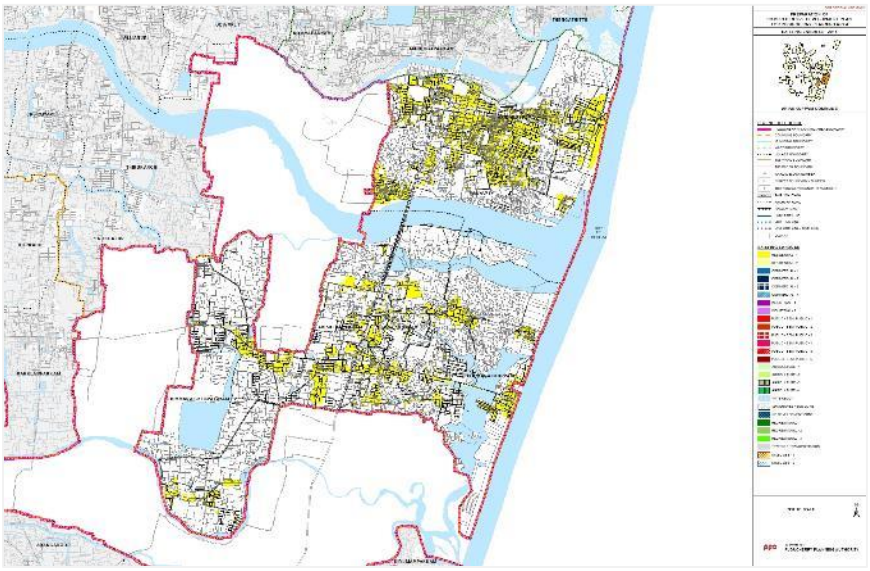


Figure 4.23 Residential Use - Ariyankuppam Commune Panchayat

4.2.1.2 COMMERCIAL

The commercial land use covers 0.27 sq.km which accounts to 1.09% of the total area of the Ariyankuppam Commune Panchayat. Due to the rural nature of the Commune Panchayat, commercial land use is very low and it is mostly located along the East Coast Road and a few resorts along the beach front.

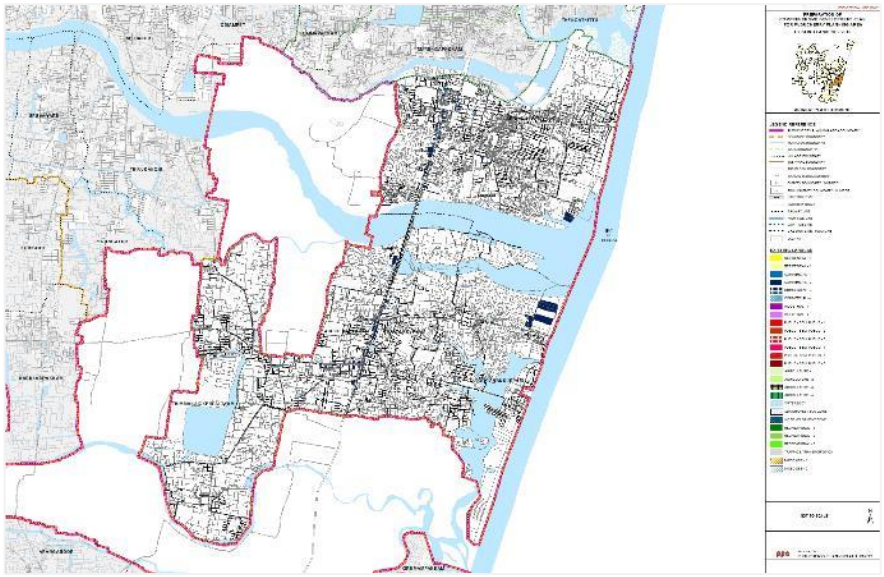


Figure 4.24 Commercial Use - Ariyankuppam Commune Panchayat

4.2.1.3 INDUSTRIAL

The total industrial land use in Ariyankuppam Commune Panchayat is 0.25 sq.km and it accounts to 1.04% of total area of the Municipality. There are no major industrial units in this commune panchayat and most of them are smaller units scattered across the commune panchayat boundary.

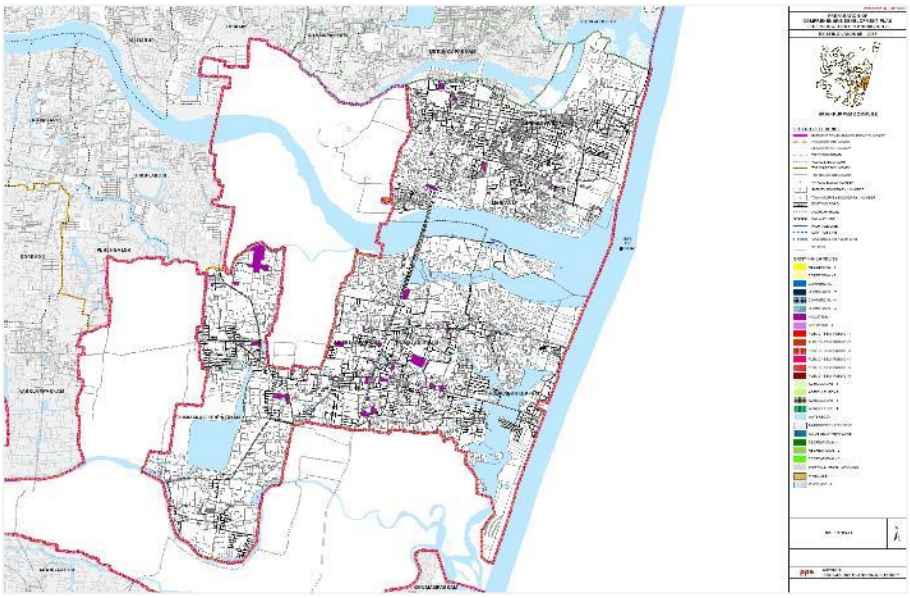


Figure 4.25 Industrial Use - Ariyankuppam Commune Panchayat

4.2.1.4 PUBLIC & SEMI-PUBLIC

The public & semi-public land use within Ariyankuppam Commune Panchayat is 0.59 sq.km which is around 2.41 % of the total area of the municipality. Educational and health institutions are the major public and semi-public uses present in Ariyankuppam Commune Panchayat.

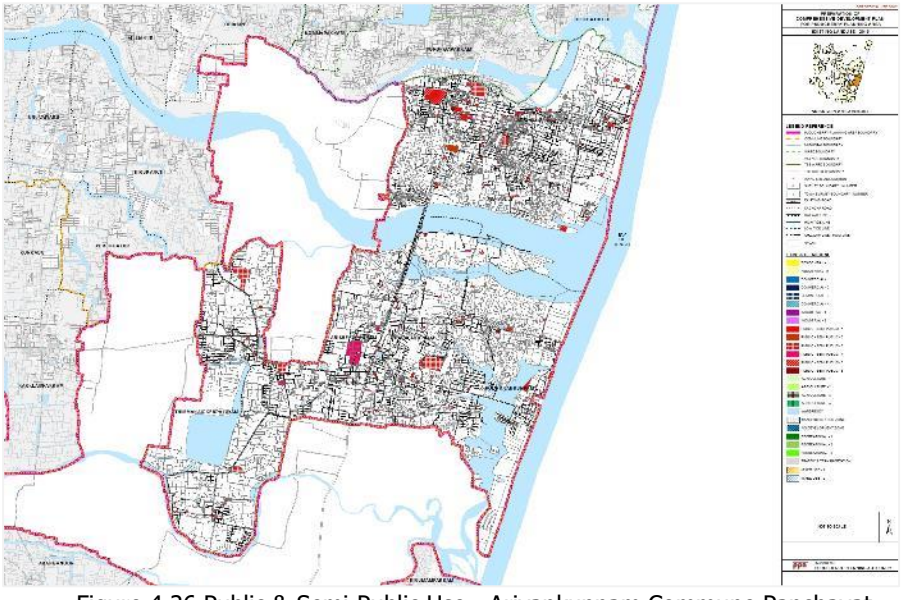


Figure 4.26 Public & Semi-Public Use - Ariyankuppam Commune Panchayat

4.2.1.5 OPEN SPACES

Open space is very low in this commune panchayat, hardly 0.02 sq.km of land is covered in recreational land use.

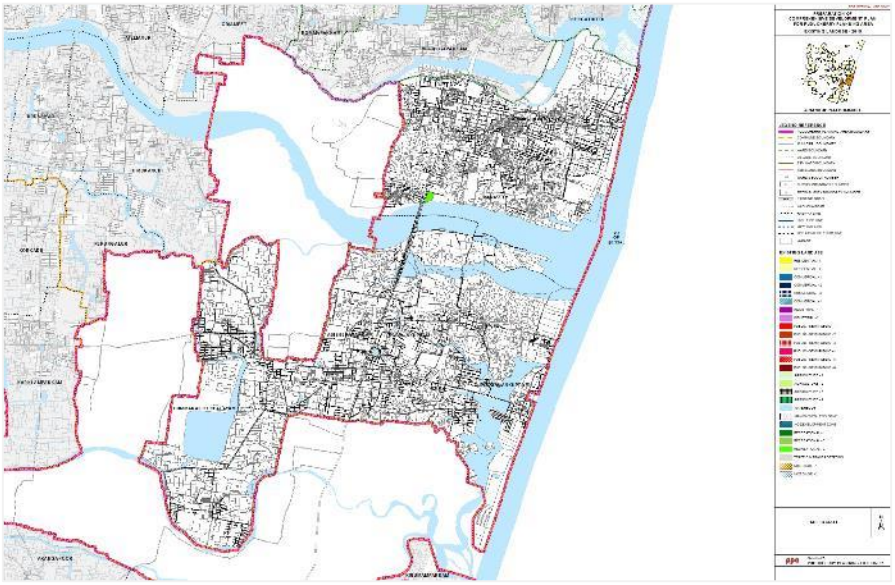


Figure 4.27 Open Space Use - Ariyankuppam Commune Panchayat

4.2.1.6 TRAFFIC & TRANSPORTATION

The area under traffic and transportation is 1.65 sq.km which accounts for 6.8% of the total area of Ariyankuppam Commune Panchayat. Figure 4.28 shows the Traffic and transportation use map for this Commune Panchayat.

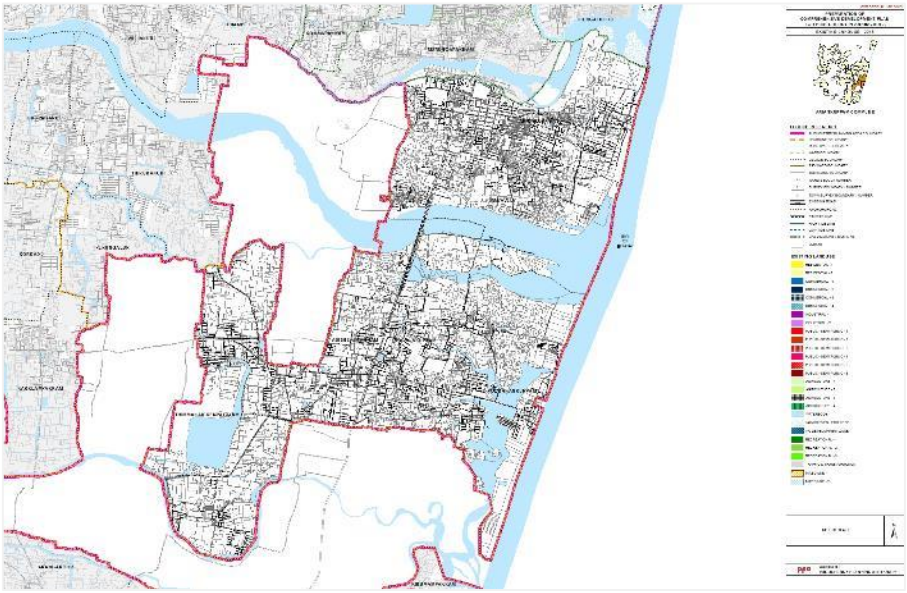


Figure 4.28 Traffic & Transportation Use - Ariyankuppam Commune Panchayat

4.2.1.7 VACANT

The area lying vacant as on 2015 in Ariyankuppam Commune Panchayat is 2.13 sq.km which accounts to 8.75 % of the total area of the CP. Large tracts of agricultural land is converted in residential layout and currently not built on. Thavalakuppam and Abishekapakkam villages have

higher vacant land and this can be attributed to the development which has taken place considering the proximity of these villages to ECR which is a major transit corridor.

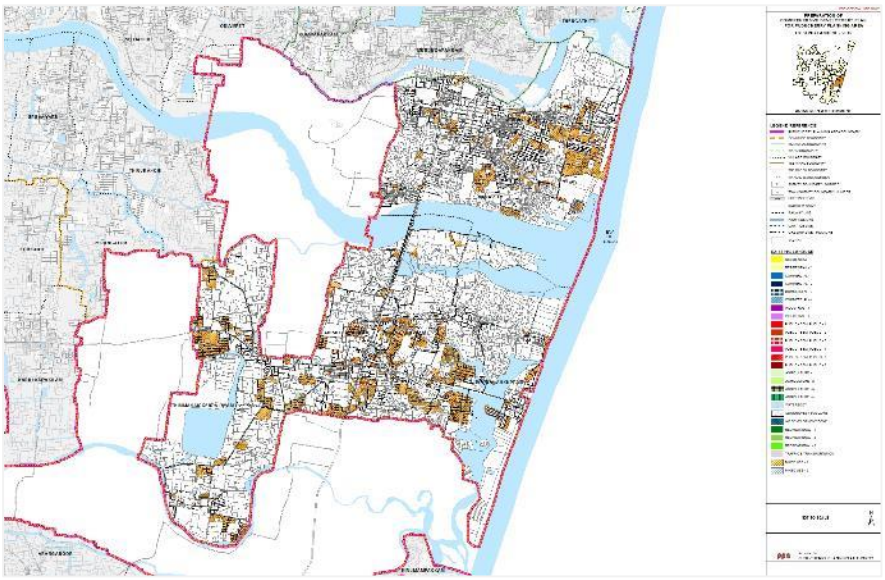


Figure 4.29 Vacant Use - Ariyankuppam Commune Panchayat

4.2.1.8 PROTECTED & UNDEVELOPABLE USE

The protected & undevelopable land use in Ariyankuppam Commune Panchayat accounts for 21.73% of the total land area of the municipality which is 5.3 sq.km. Gingee river or Chunnambar and ponds in Thimmanaickenpalayam and Poornakuppam villages attributes for higher percentage of protected and undevelopable land use in Ariyankuppam Commune Panchayat.

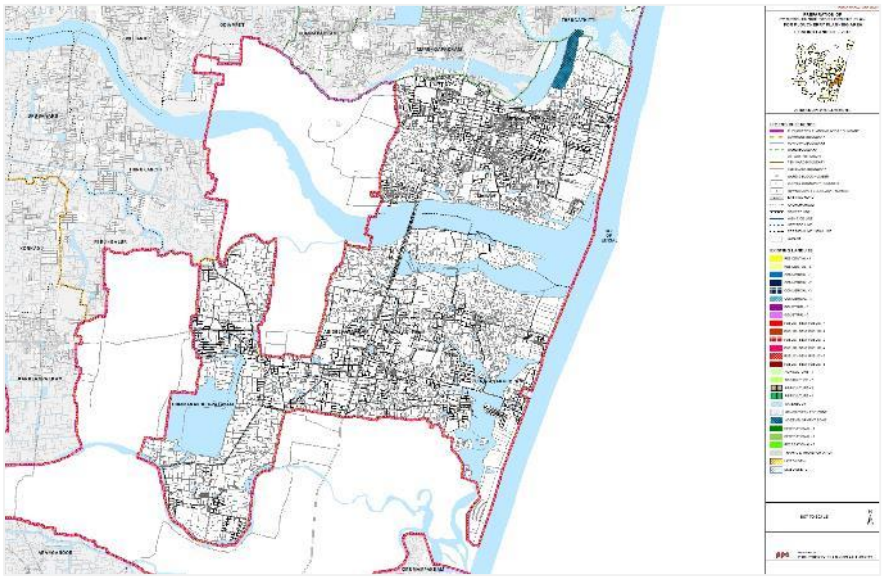


Figure 4.30 Protected & Undevelopable Use - Ariyankuppam Commune Panchayat

4.2.2 VILLIANUR COMMUNE PANCHAYAT

The total area of the Villianur Commune Panchayat is 65.99 sq.km and it is lagest commune panchayat in the Puducherry planning area. Located in the central part of the Puducherry Planning Area. The Gingee River traverses through the Villianur Commune Panchayat dividing it into northern half and southern half. The revenue villages coming under Villianur Commune Panchayat area on the northern side of Gingee River which are Sedarpet Village, Karasoor Village, Thutipet Village, Thondamanatham Village, Pillayarkuppam Village, Ramanathapuram Village, Koodapakkam Village, Olaivaikal Village, Villianur Village, Kurumbapet Village & Odiampet Village. While, the villages which are falling in Villianur Commune Panchayat on southern side of the Gingee River are Ariyur village, Kizhur Village, Sathamangalam Village, Mangalam Village, Uruvaiyaru Village, Thirukanchi Village and Perungalur Village. The details of Villianur Commune Panchayat are given in table 4-7.

Table 4-7 Details of Villianur Commune Panchayat

S. No	Description	Details
1	Area	65.99 Sq. Km
2	Gross Density	1,921 Persons/sq km (19 pph)
3	Net Density	24,775 Persons/sq km (247 pph)
4	Location	Central part of the Planning Area
5	Major Landmarks	Villianur Railway Station, Oussudu Lake, Pogo Land, Thirukameeswarer temple, Our Lady Of Lourde's Shrine, etc..

Source: Compiled by Consultant

The existing land use analysis chart for Villianur Commune Panchayat is given in figure 4.31,

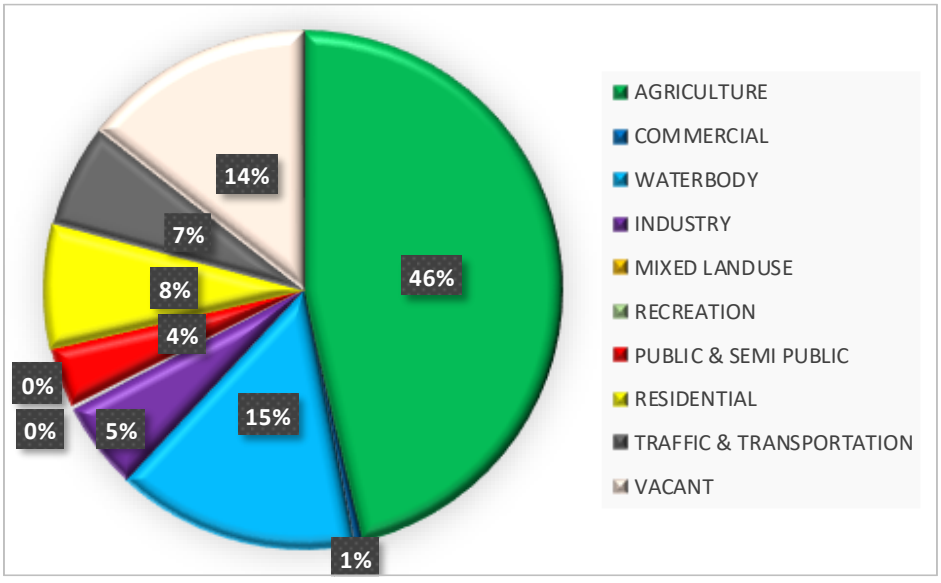


Figure 4.31 Existing Land Use of Villianur Commune Panchayat-2015

agricultural land use which is around 46% is the major land use in Villianur CP, Protected and Undevelopable land contributes to 15% and around 14% of land is lying vacant within this CP. Residential land use is 8%, traffic and transportation is 7%, industrial use is 5% of the Villianur Commune Panchayat. The details of existing landuse analysis for Villianur Commune Panchayat is given in table 4-8.

Table 4-8 Existing Landuse Analysis for Villianur Commune Panchayat-2015

S. No	Land Use	Area in Sq.KM	Percentage to Total Area
1.	AGRICULTURE	30.61	46.38%
2.	COMMERCIAL	0.33	0.50%
3.	WATERBODY	9.95	15.07%
4.	INDUSTRY	3.57	5.40%
5.	MIXED LANDUSE	0.15	0.22%
6.	RECREATION	0.05	0.08%
7.	PUBLIC & SEMI PUBLIC	2.45	3.72%
8.	RESIDENTIAL	5.12	7.75%
9.	TRAFFIC & TRANSPORTATION	4.26	6.46%
10.	VACANT	9.50	14.41%
11.	**Total**	**65.99**	**100.00%**

Source: Compiled by Consultant

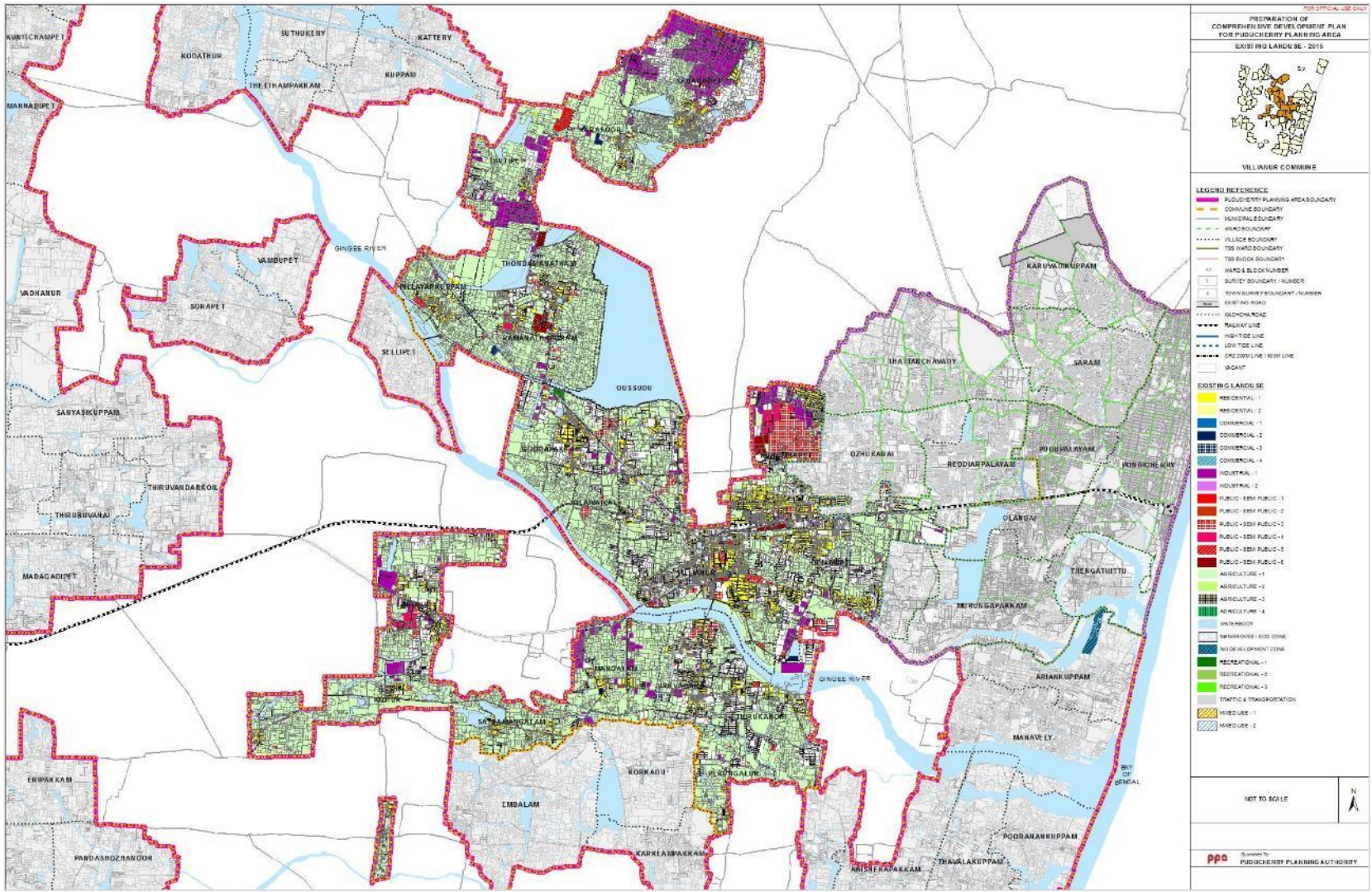


Figure 4.32 Existing Land Use Map of Villianur Commune Panchayat-2015

4.2.2.1 RESIDENTIAL

The figure 4.33 shows the residential use of Villianur Commune Panchayat, the residential use covers 5.12 sq.km which accounts to 7.75% of the total area of Villianur Commune Panchayat. Villianur revenue village is the most densely developed residential settlement in Villianur Commune Panchayat. The gross density of the Villianur Commune Panchayat is 19 persons per hectare and net residential density is 247 persons per hectare.

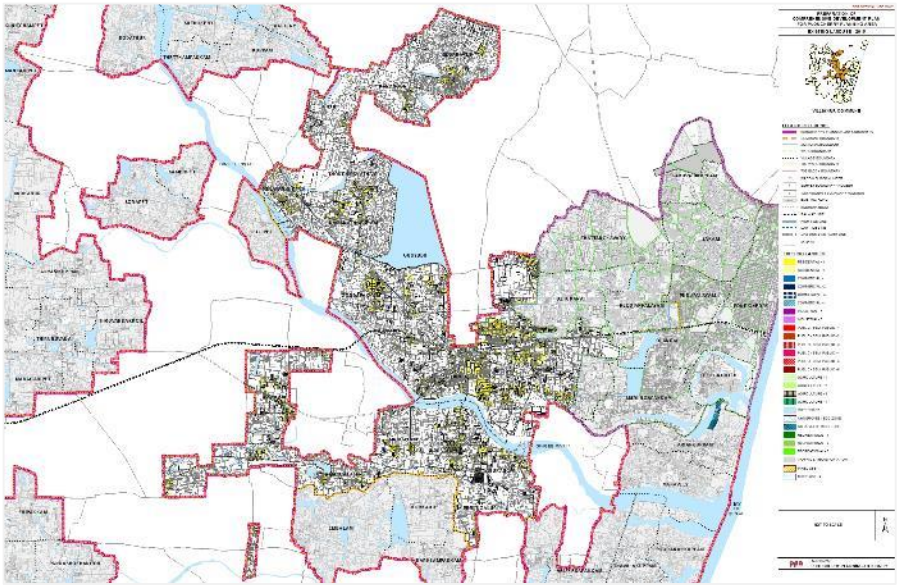


Figure 4.33 Residential Use of Villianur Commune Panchayat

4.2.2.2 COMMERCIAL

The commercial land use in Villianur Commune Panchayat is very less, only 0.33 sq.km of land is covered in this use which accounts to 0.50 % of total area of the Villianur Commune Panchayat. Figure 4.34 shows the commercial land use in Villianur Commune Panchayat.

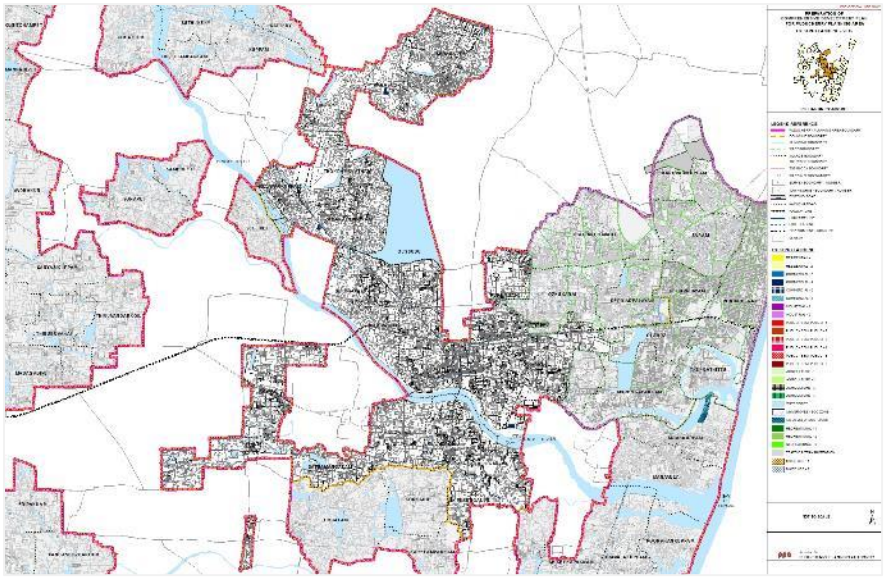


Figure 4.34 Commercial Use of Villianur Commune Panchayat

4.2.2.3 INDUSTRIAL

The Industrial land use in Villianur Commune Panchayat is around 5.4% of the total area and it accounts to 3.57 sq.km area. The figure 4.35 shows the Industrial Land Use of the Villianur Commune Panchayat. Sedarapet Industrial area is the largest contributor to industrial land use in this commune panchayat limits. Other larger land parcel falling in industrial category is observed in Thutipet village and Ariyur Village.

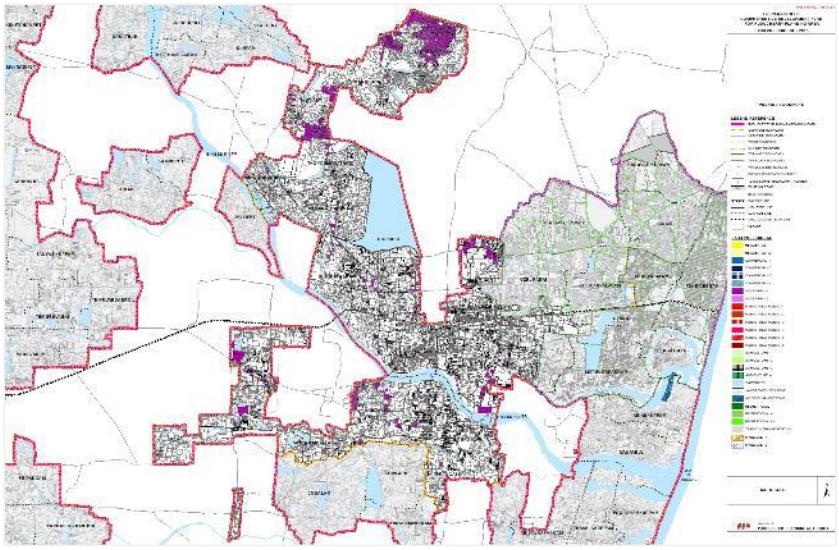


Figure 4.35 Industrial Use of Villianur Commune Panchayat

4.2.2.4 PUBLIC & SEMI-PUBLIC

Public & Semi-Public land use in Villianur Commune Panchayat is covering 3.72% of the total land area of the CP and it accounts to 2.45 Sq.km. The figure 4.36 shows the Public & Semi-Public Use in Villianur Commune Panchayat.

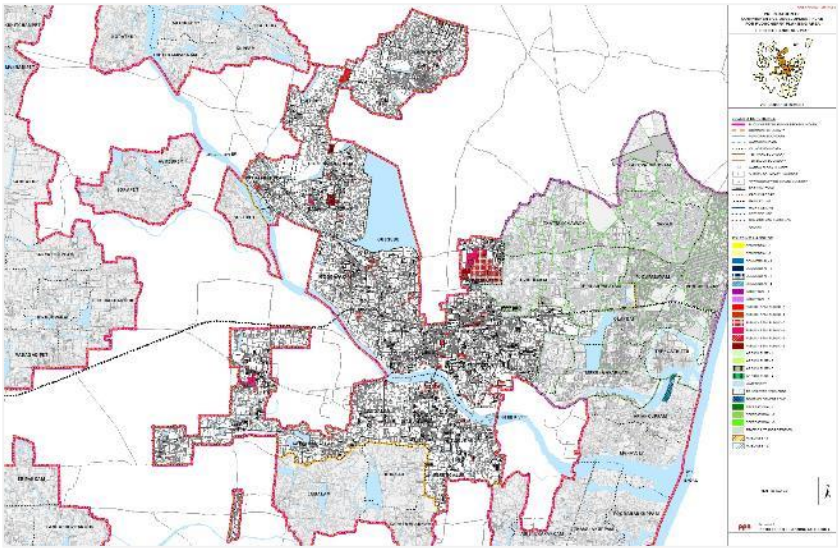


Figure 4.36 Public & Semi-Public Use - Villianur Commune Panchayat

4.2.2.5 OPEN SPACES

Recreational land use in Villianur Commune Panchayat is very low, around 0.08% of the total area of the commune panchayat is under recreational use. The figure 4.37 shows the recreational land use map of Villianur Commune Panchayat.

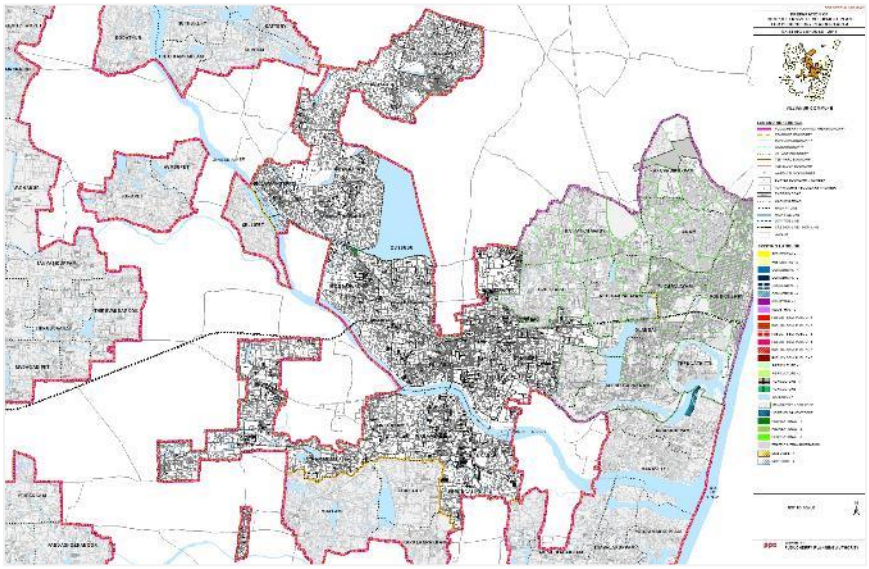


Figure 4.37 Recreational Use - Villianur Commune Panchayat

4.2.2.6 TRAFFIC & TRANSPORTATION

In Villianur Commune Panchayat the traffic & transportation use covers 6.46 % of total area of the CP and it accounts to 4.26 sq.km area. The figure 4.38 shows the traffic and transportation land use map for Villianur Commune Panchayat.

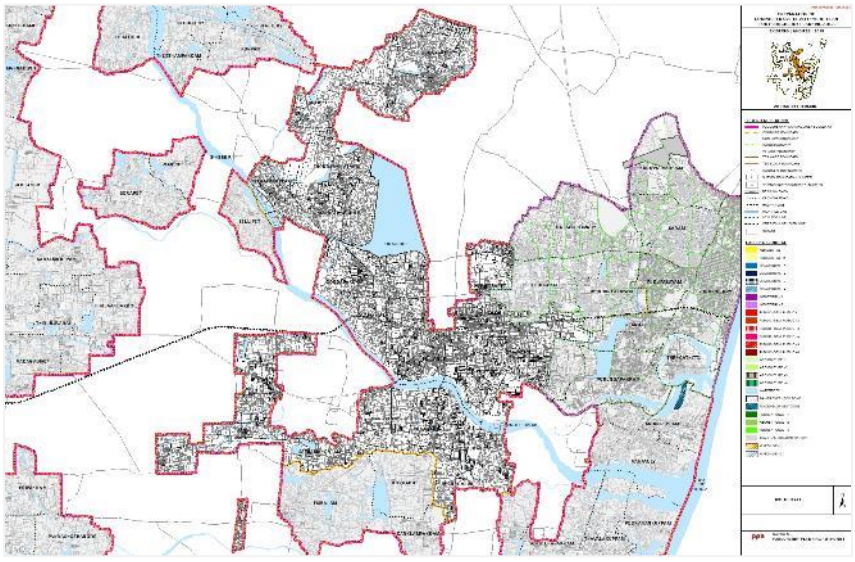


Figure 4.38 Traffic & Transportation Use - Villianur Commune Panchayat

4.2.2.7 VACANT

In Villianur Commune Panchayat around 9.5 sq.km of land is vacant as on year 2015, which accounts to 14.41% of the total area of the CP. Villianur, Uruvaiyaru, Odiampet, and Sedarapet villages have higher concentration of vacant land parcels, most of them are agricultural lands developed as residential layouts. These vacant lands can be used to address the future residential requirements. The figure 4.39 shows the vacant land use in Villianur Commune panchayat.

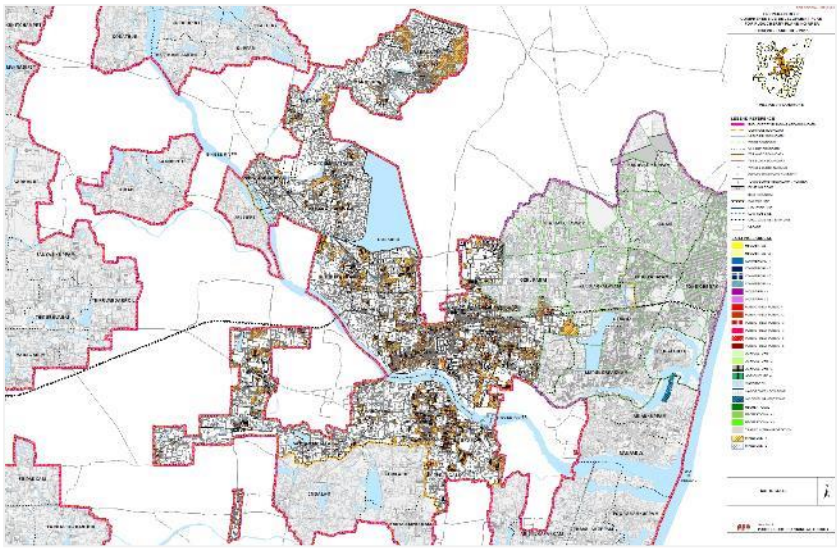


Figure 4.39 Vacant Use of Villianur Commune Panchayat

4.2.2.8 PROTECTED & UNDEVELOPABLE USE

The protected & undevelopable land use in Villianur Commune Panchayat accounts for 15.07% of the total land area of the municipality which is 9.95 sq.km. Oussudu lake and Gingee river attributes for higher percentage of protected and undevelopable land use in Villianur Commune Panchayat.

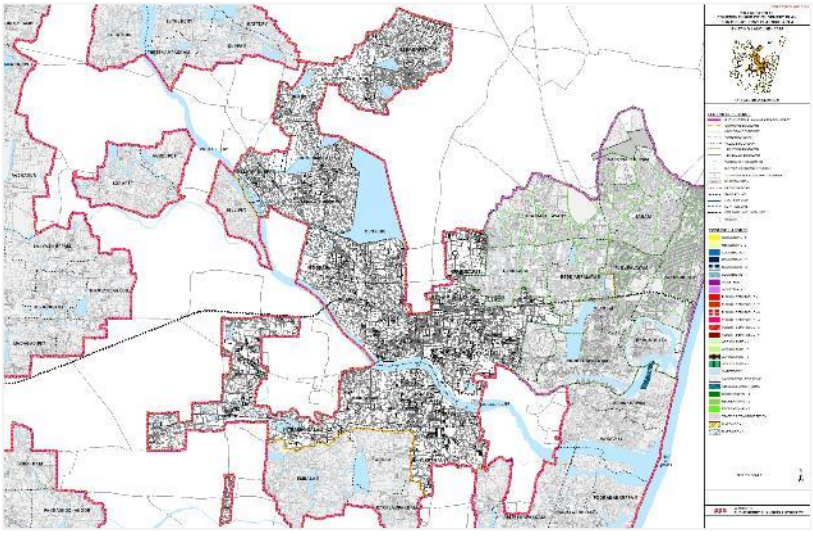


Figure 4.40 Protected & Undevelopable Use - Villianur Commune Panchayat

4.2.3 MANNADIPET COMMUNE PANCHAYAT

Mannadipet Commune Panchayat is the second largest commune panchayat in Puducherry Planning Area, it covers around 64.33 sq.km. It lies on the north - western part of the Puducherry Planning area, the details of Mannadipet Commune Panchayat are given in table 4-9.

Table 4-9 Details of Mannadipet Commune Panchayat

S. No	Description	Details
1.	Area	64.33 Sq.km
2.	Gross Density	1,345 Persons/sq km (13 pph)
3.	Net Density	21,465 Persons/sq km (214 pph)
4.	Location	North-Western part of Planning Area
5.	Major Landmarks	Industrial Estate, ASI Monuments, FCI

Source: Compiled by Consultant

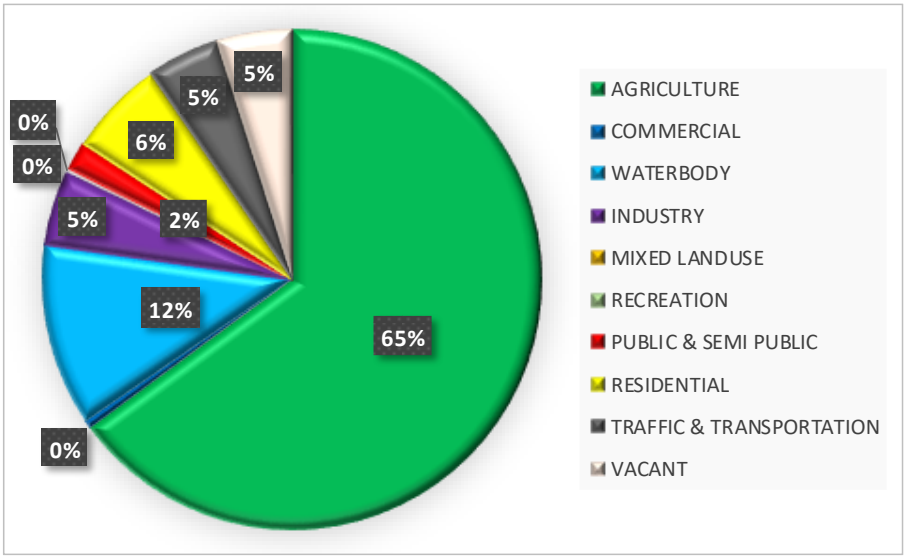


Figure 4.41 Existing Land Use Analysis Chart Mannadipet Commune Panchayat-2015

The existing land use analysis chart for Mannadipet Commune Panchayat is given in figure 4.41, the agricultural land use occupies around 65% of the total commune panchayat area and it is the most prominent land use, the second largest category of land use is under Protected and Undevelopable use which accounts for 12% of the total area. Residential land use covers 6% and Industrial 4.86%, Traffic & Transportation covers 4.75% of the Mannadipet Commune Panchayat.

Table 4-10 Existing Landuse Analysis for Mannadipet Commune Panchayat-2015

S. No	Land Use	Area in Sq.KM	Percentage to Total Area
1.	AGRICULTURE	41.77	64.93%
2.	COMMERCIAL	0.34	0.53%
3.	WATERBODY	7.56	11.76%

S. No	Land Use	Area in Sq.KM	Percentage to Total Area
4.	INDUSTRY	3.12	4.86%
5.	MIXED LANDUSE	0.10	0.15%
6.	RECREATION	0.01	0.02%
7.	PUBLIC & SEMI PUBLIC	1.22	1.89%
8.	RESIDENTIAL	4.03	6.26%
9.	TRAFFIC & TRANSPORTATION	3.053	4.75%
10.	VACANT	3.12	4.84%
11.	**Total**	**64.33**	**100%**

Source: Compiled by Consultant

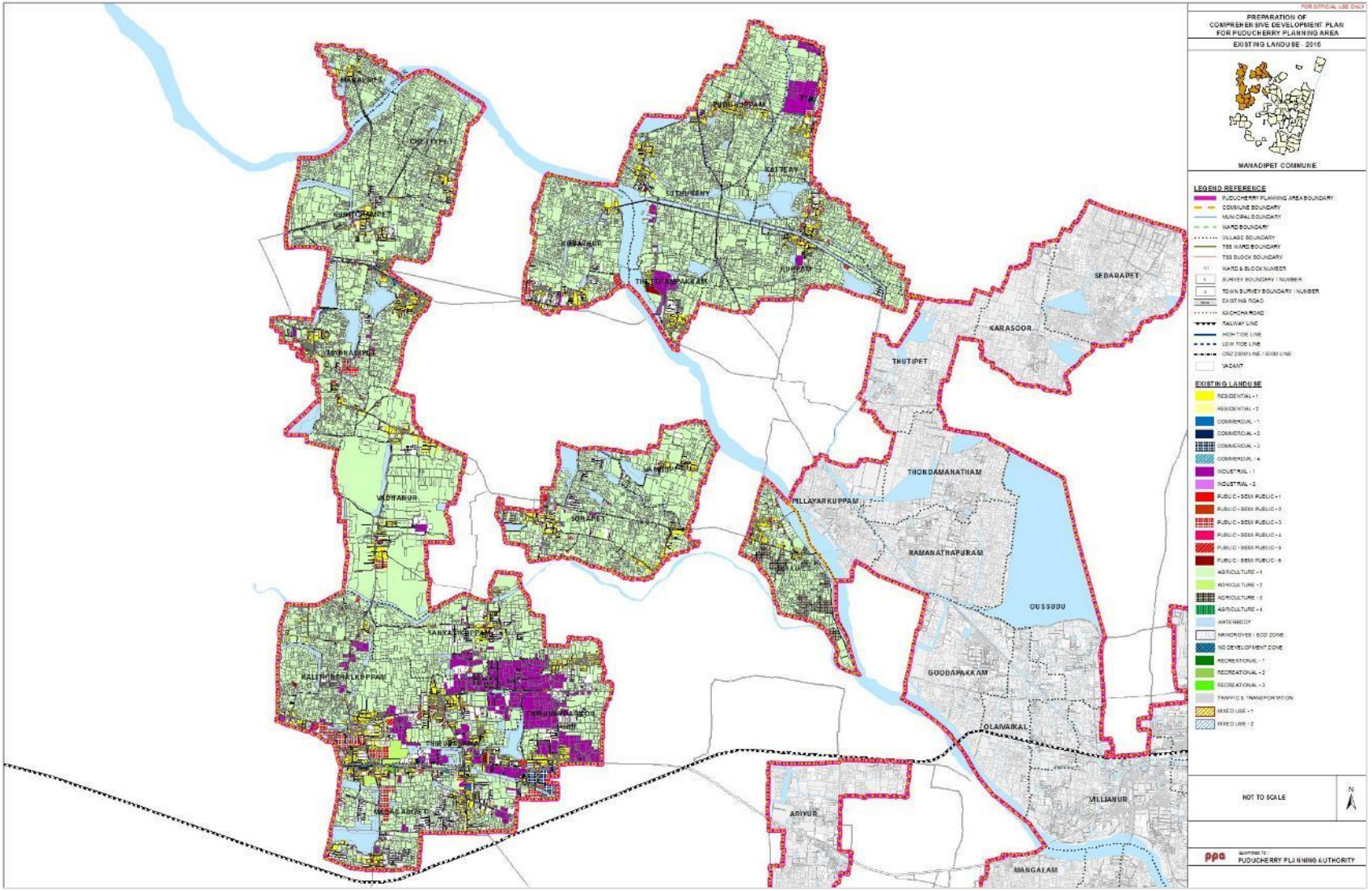


Figure 4.42 Existing Land Use Map Mannadipet Commune Panchayat-2015

4.2.3.1 RESIDENTIAL

The total land under residential use in Mannadipet Commune Panchayat is 4.03 sq.km which is around 6.26% of total area of the commune panchayat. The figure 4.43 shows the residential use in Mannadipet Commune panchayat. Village settlements are major contributor of the residential use in Mannadipet Commune Panchayat. The gross density of this commune is 13 persons per hectare and the net residential density is 214 persons per hectare.

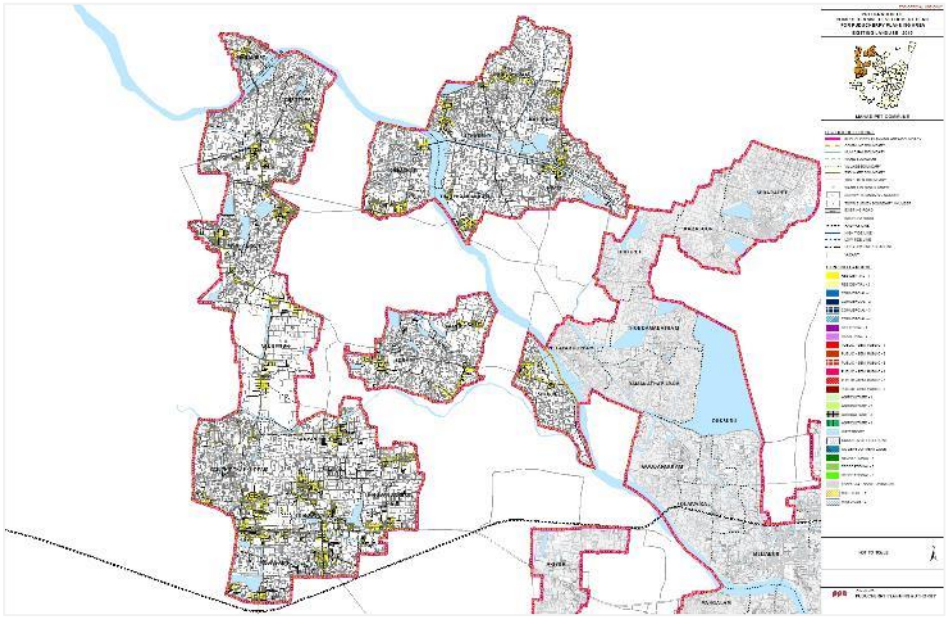


Figure 4.43 Residential Use Mannadipet Commune Panchayat

4.2.3.2 COMMERCIAL

The commercial land use in Mannadipet Commune Panchayat is comparatively low and this is mainly due to the rural and agrarian nature of the commune. Around 0.53% of the total commune area is under commercial use which accounts to 0.34 sq.km. Figure 4.44 shows the commercial land use in

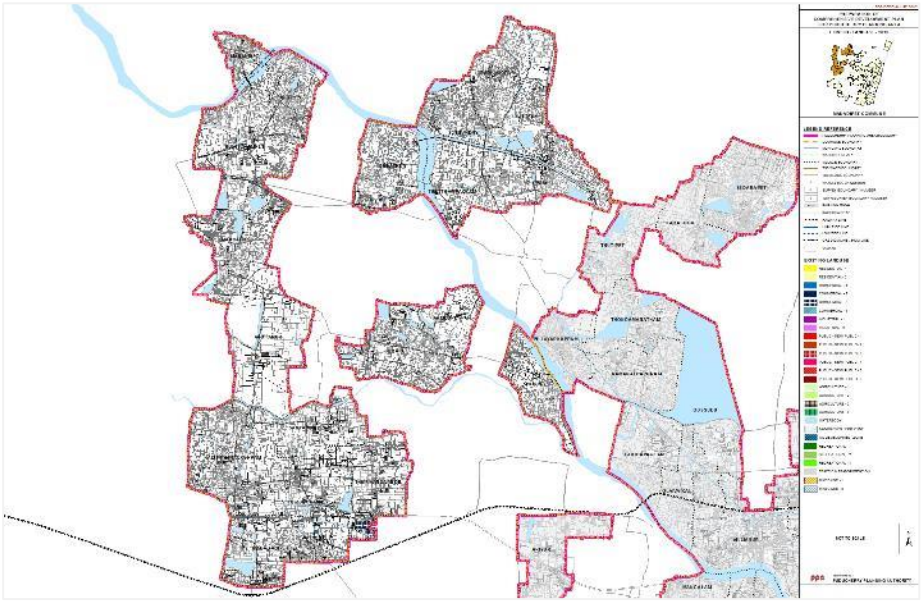


Figure 4.44 Commercial Use Mannadipet Commune Panchayat

the commune panchayat limits.

4.2.3.3 INDUSTRIAL

Industrial land use in Mannadipet Commune Panchayat is shown in figure 4.45 and it accounts for 4.86% of the total area of the Commune Panchayat. Most of these industrial land use is located in Thirubhuvanai, Thiruvandarkoil & Sanyasikuppam Village along the Villupuram-Pondicherry Highway.

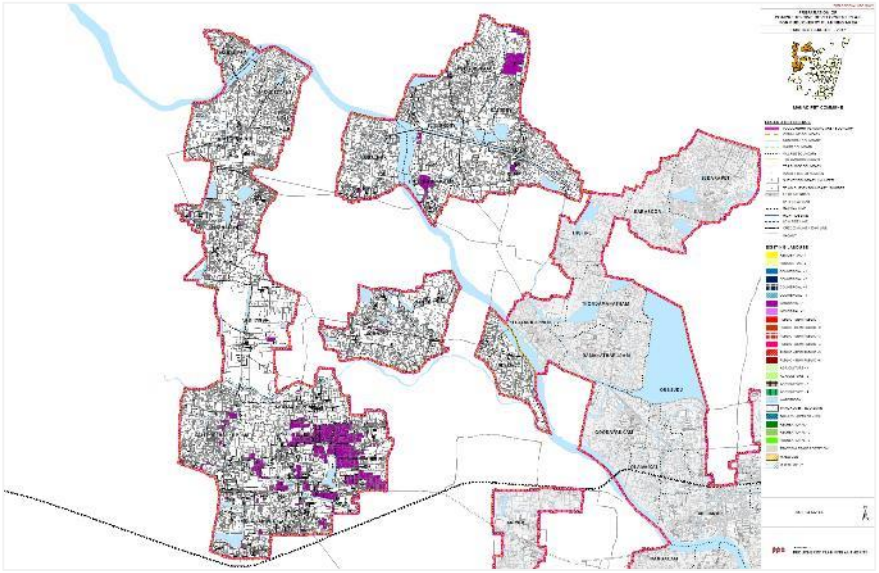


Figure 4.45 Industrial Use Mannadipet Commune Panchayat

4.2.3.4 PUBLIC & SEMI-PUBLIC

In Mannadipet Commune Panchayat 1.89% of the total land area is under Public & Semi-Public land use, this accounts to 1.22 sq.km. The Public & Semi-public use of Mannadipet Commune Panchayat is shown in figure 4.46.

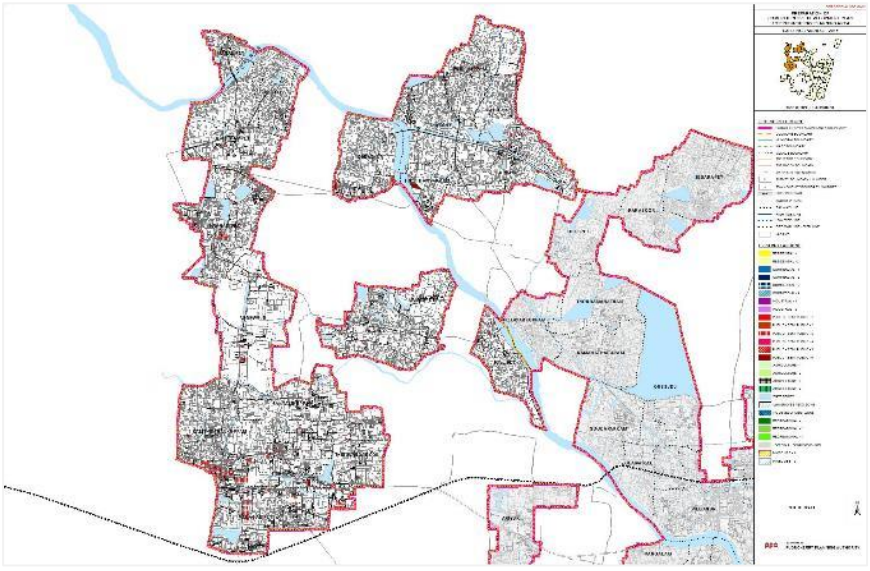


Figure 4.46 Public & Semi-Public Use Mannadipet Commune Panchayat

4.2.3.5 OPEN SPACES

Recreational open spaces in Mannadipet Commune Panchayat is nearly absent, 0.01 sq.km is currently under recreational use. Figure 4.47 shows Open Spaces use of Mannadipet Commune Panchayat.

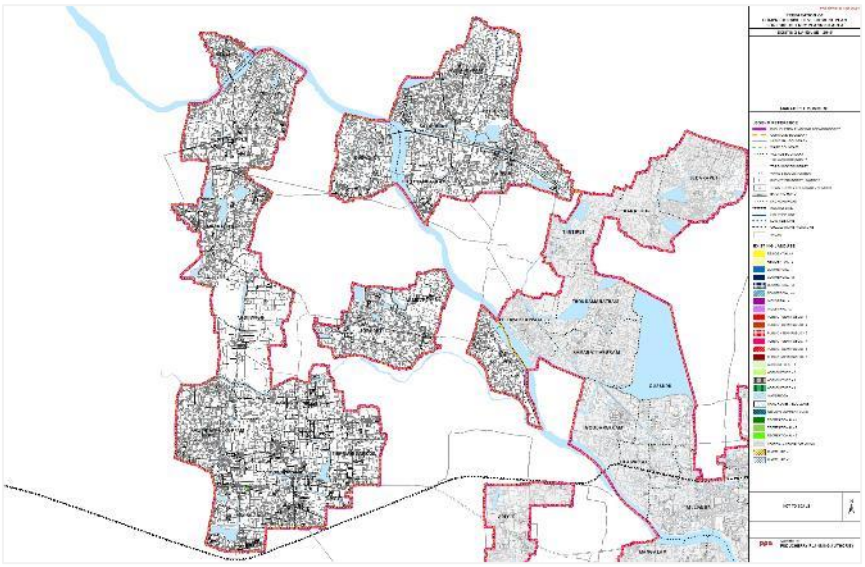


Figure 4.47 Open Spaces Use Mannadipet Commune Panchayat

4.2.3.6 TRAFFIC & TRANSPORATION

In Mannadipet Commune Panchayat, 4.75 % of total land is under traffic and transportation use which accounts to 3.05 sq.km. The traffic & transportation use of this commune is shown in figure 4.48.

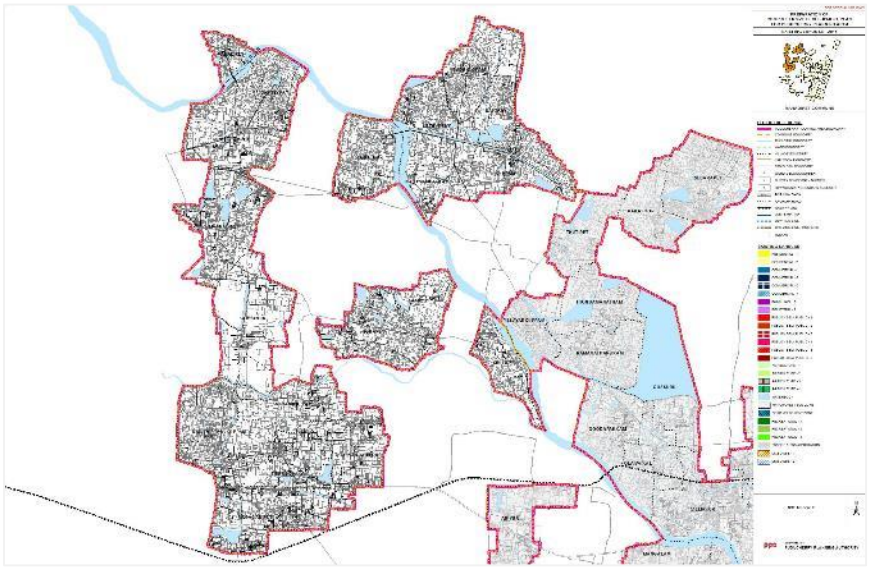


Figure 4.48 Traffic & Transportation Use Mannadipet Commune Panchayat

4.2.3.7 VACANT

In Mannadipet Commune Panchayat the land lying vacant is around 4.84% of the total area of the commune. Compared to other commune panchayats, land under vacant category is low and this can be attributed to less land development activities due to the distance of this commune panchayat with Puducherry city centre and lack of major transit corridors other than the Villupuram Road. Figure 4.49 shows the vacant land in Mannadipet Commune Panchayat.

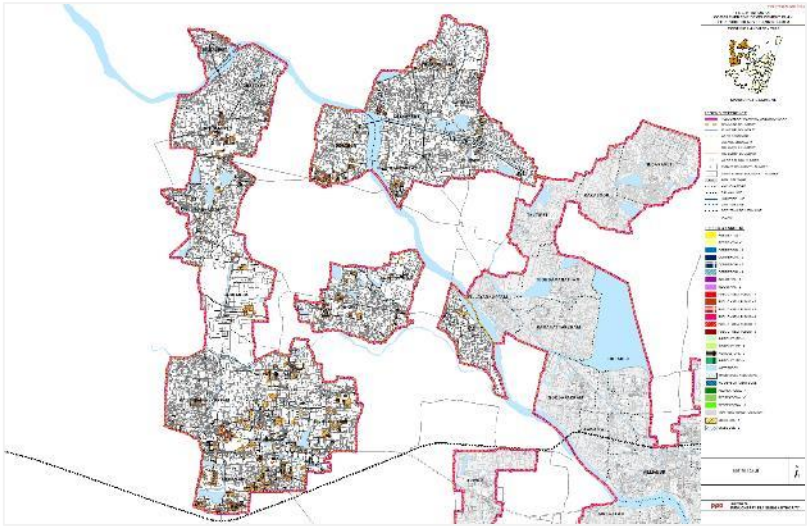


Figure 4.49 Vacant Use Mannadipet Commune Panchayat

4.2.3.8 PROTECTED & UNDEVELOPABLE USE

The protected & undevelopable land use in Mannadipet Commune Panchayat accounts for 11.76% of the total land area of the municipality which is 7.56 sq.km. The figure 4.50 shows the protected & Undevelopable use in Mannadipet Commune Panchayat.

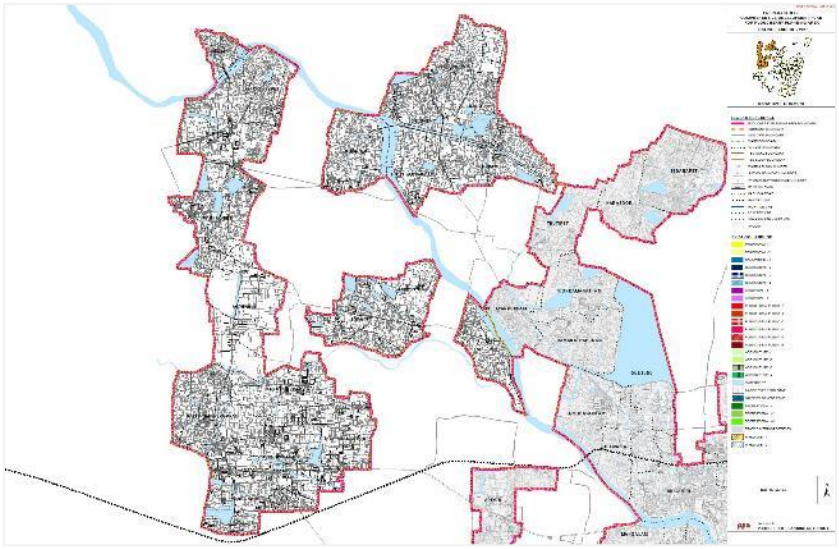


Figure 4.50 Protected & Undevelopable Use Mannadipet Commune Panchayat

4.2.4 NETTAPAKKAM COMMUNE PANCHAYAT

The total area of Nettapakkam commune panchayat is 30.62 sq.km and it lies in the central western part of the planning area. The details of Nettapakkam Commune Panchayat are given in table 4-11. Nettapakkam Commune Panchayat is divided into two parts, the eastern part is bound by Villianur Commune Panchayat and forms the part of the major land mass of the planning area. The western part lies on the south-western part of the planning area and is surrounded by Tamilnadu State.

Table 4-11 Details of Nettapakkam Commune Panchayat

S. No	Description	Details
1.	Area	30.62 Sq.km
2.	Gross Density	1,689 Persons/sq km (17 pph)
3.	Net Density	22,282 Persons/sq km (222 pph)
4.	Location	Central Western Part of the Planning Area
5.	Major Landmarks	MRF, TVS Lucas

Source: Compiled by Consultant

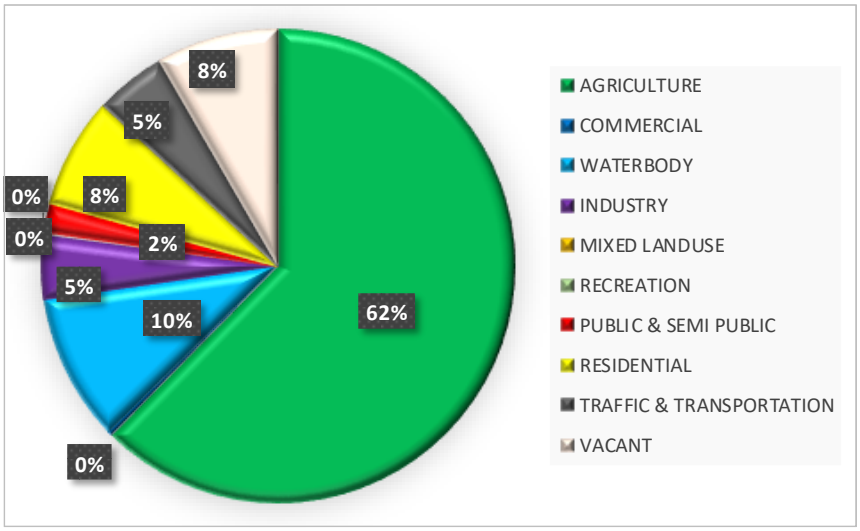


Figure 4.51 Existing Land Use Analysis Chart for Nettapakkam Commune Panchayat-2015

The existing land use analysis chart for Nettapakkam Commune Panchayat is given in figure 4.51 and it's clear that agricultural land occupies 62% of the total land area of the commune panchayat. Around 10% of the land area in this commune panchayat falls under protected and undevelopable land. Residential land covers around 8% of the total area and an equal percentage of area is lying vacant in this commune panchayat.

Table 4-12 Existing Landuse Analysis for Nettapakkam Commune Panchayat-2015

S. No	Land Use	Area in Sq.KM	Percentage to Total Area
1.	AGRICULTURE	19.09	62.36%
2.	COMMERCIAL	0.10	0.34%
3.	WATERBODY	3.07	10.02%
4.	INDUSTRY	1.34	4.37%

S. No	Land Use	Area in Sq.KM	Percentage to Total Area
5.	MIXED LANDUSE	0.05	0.15%
6.	RECREATION	0.01	0.02%
7.	PUBLIC & SEMI PUBLIC	0.61	2.00%
8.	RESIDENTIAL	2.32	7.58%
9.	TRAFFIC & TRANSPORTATION	1.484	4.85%
10.	VACANT	2.54	8.31%
11.	**Total**	**30.62**	**100.00%**

Source: Compiled by Consultant

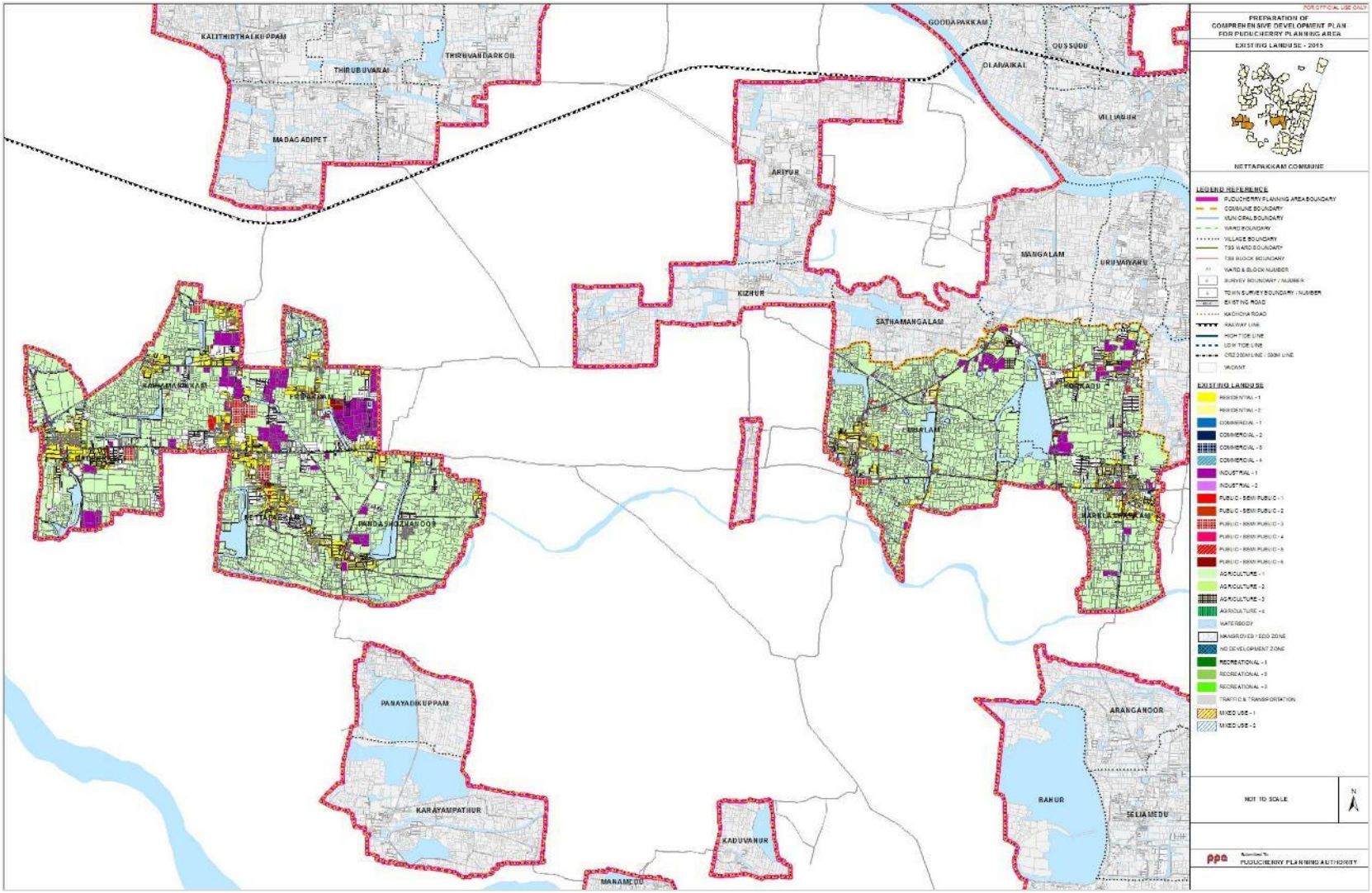


Figure 4.52 Existing Land Use Map Nettapakkam Commune Panchayat-2015

4.2.4.1 RESIDENTIAL

The figure 4.53 shows the residential use of Nettapakkam Commune Panchayat, the residential use covers 2.32 sq.km which accounts to 7.58% of the total area of Nettapakkam Commune Panchayat. The gross density of the Nettapakkam Commune Panchayat is 16 persons per hectare and net residential density is 222 persons per hectare. The residential use in this commune is shown in figure 4.53.

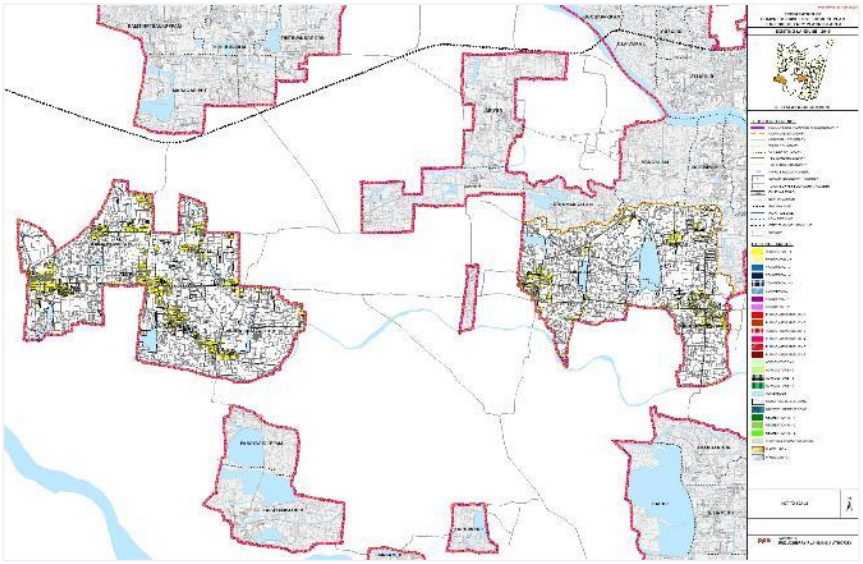


Figure 4.53 Residential Use Nettapakkam Commune Panchayat

4.2.4.2 COMMERCIAL

The commercial land use in Nettapakkam Commune Panchayat is very minimal, only 0.1 sq.km of land is covered in this use which accounts to 0.34 % of total area of the Nettapakkam Commune Panchayat. Figure 4.54 shows the commercial land use in Nettapakkam Commune Panchayat.

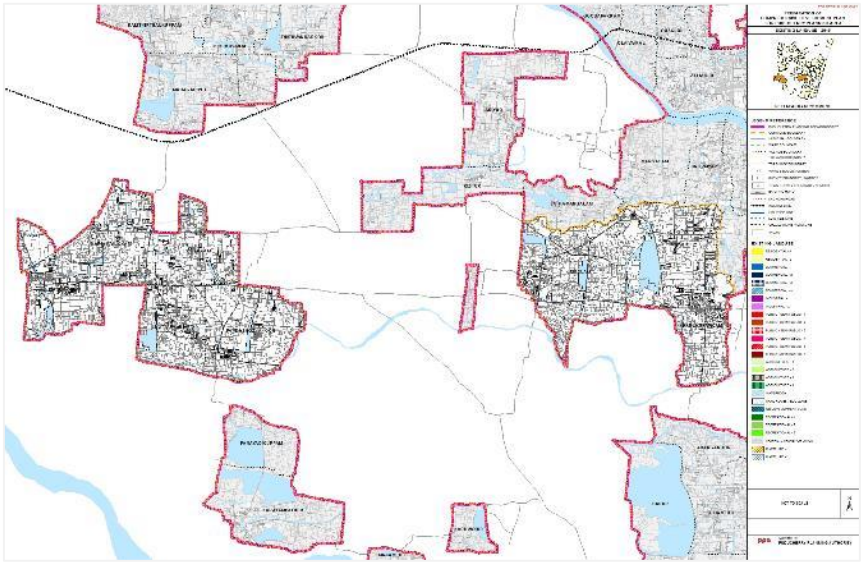


Figure 4.54 Commercial Use Nettapakkam Commune Panchayat

4.2.4.3 INDUSTRIAL

The Industrial land use in Nettapakkam Commune Panchayat is around 4.37% of the total area and it accounts to 1.34 sq.km area. The figure 4.55 shows the Industrial Land Use of the Nettapakkam Commune Panchayat. Major contributors of Industrial land use in Nettapakkam Commune Panchayat are Eripakkam & Kariamanikkam villages.

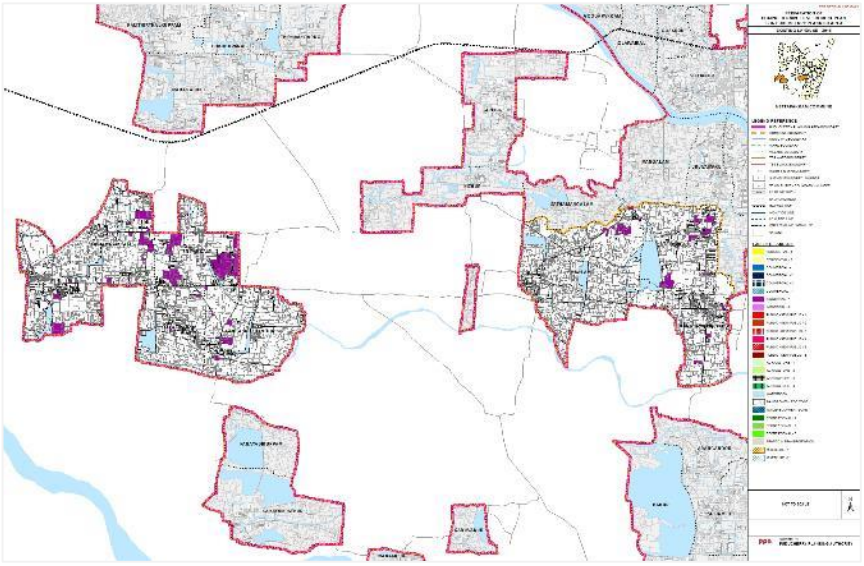


Figure 4.55 Industrial Use Nettapakkam Commune Panchayat

4.2.4.4 PUBLIC & SEMI-PUBLIC

The Public & Semi-Public use of Nettapakkam Commune Panchayat is shown in figure 4.57, around 2.00% of the total land area of the Commune Panchayat is under Public & Semi-Public Use and it accounts 0.61 sq.km.

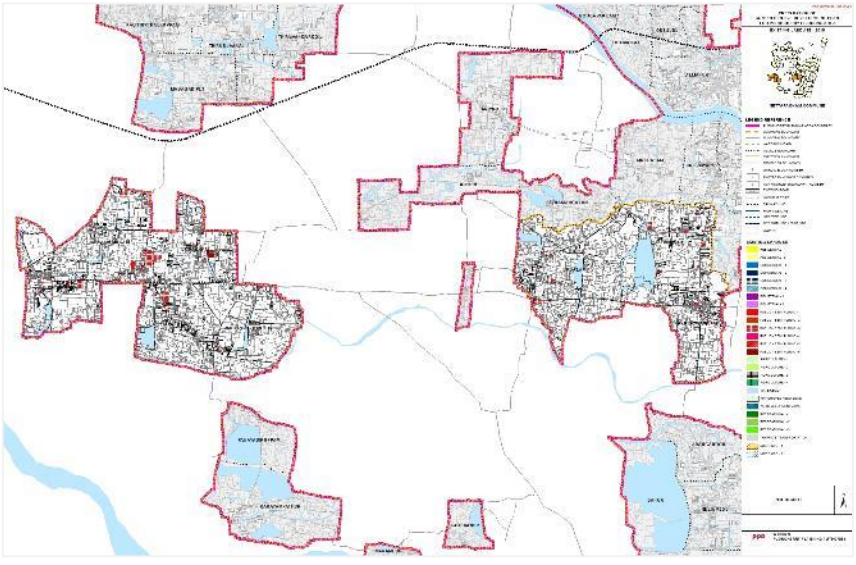


Figure 4.56 Public & Semi-Public Use for Nettapakkam Commune Panchayat

4.2.4.5 OPEN SPACES

Recreational land use in Nettapakkam Commune Panchayat is very low, around 0.02% of the total area of the commune panchayat is under recreational use. The figure 4.58 shows the recreational land use map of Nettapakkam Commune Panchayat.

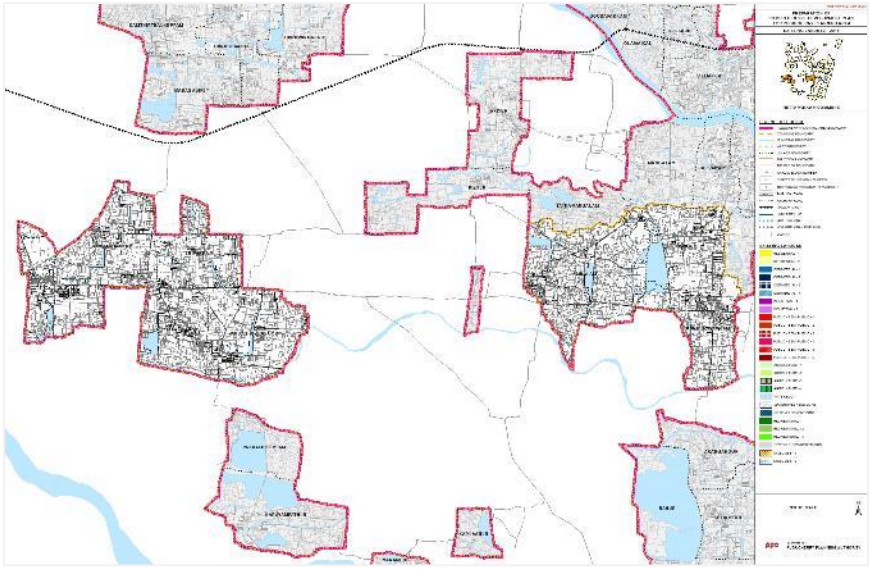


Figure 4.57 Open Space Use for Nettapakkam Commune Panchayat

4.2.4.6 TRAFFIC & TRANSPORTATION

The area under traffic and transportation use is 1.48 sq.km which accounts for 4.85% of the total area of Nettapakkam Commune Panchayat. Figure 4.58 shows the Traffic and transportation use map of Nettapakkam Commune Panchayat.

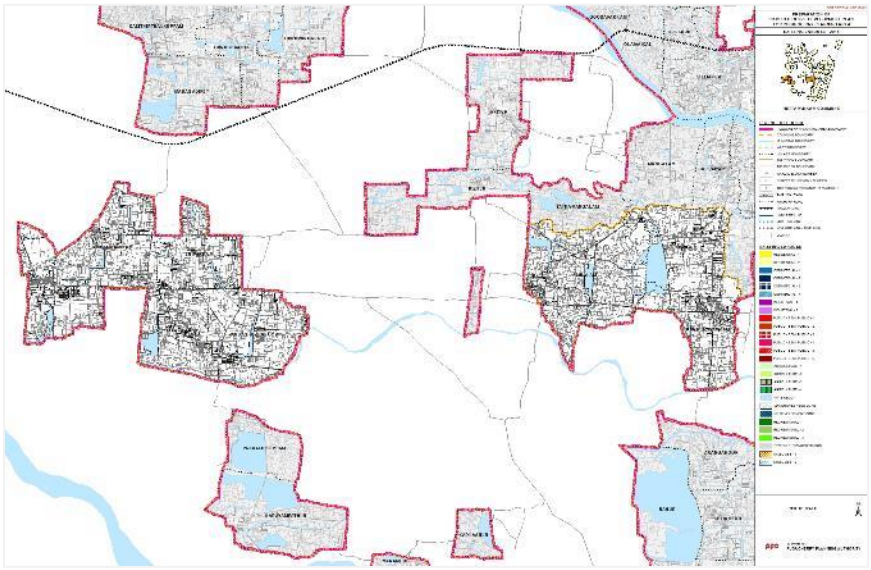


Figure 4.58 Traffic & Transportation Use for Nettapakkam Commune Panchayat

4.2.4.7 VACANT

Nettapakkam Commune Panchayat has around 2.54 sq.km of vacant land, which accounts to 8.31% of the total area of the CP. Karikalampakkam, Korkadu and Nettapakkam villages have higher concentration of vacant land parcels compared to other villages of Nettapakkam Commune Panchayat. Figure 4.59 shows the vacant land use in Nettapakkam Commune panchayat.

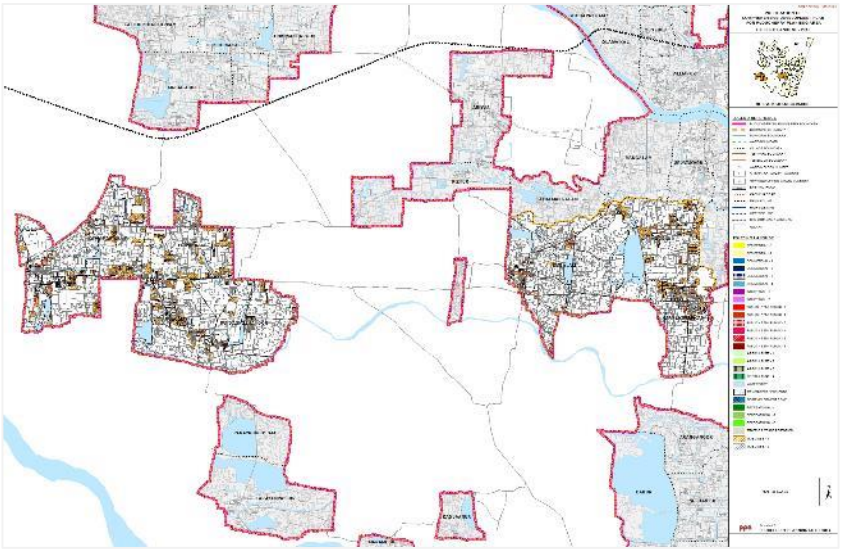


Figure 4.59 Vacant Use for Nettapakkam Commune Panchayat

4.2.4.8 PROTECTED & UNDEVELOPABLE USE

The protected & undevelopable land use in Nettapakkam Commune Panchayat accounts for 8.31 % of the total land area of the municipality which is 2.54 sq.km. The figure 4.60 shows the protected & Undevelopable use in Nettapakkam Commune Panchayat.

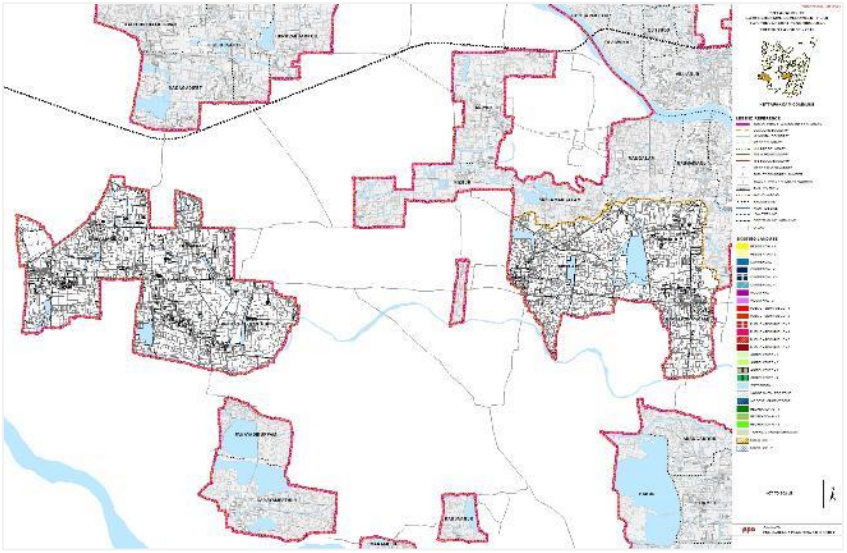


Figure 4.60 Protected & Undevelopable Use for Nettapakkam Commune Panchayat

4.2.5 BAHOUR COMMUNE PANCHAYAT

The Bahour Commune Panchayat is spreaded across 54.82 sq.km on the southern part of the Puducherry Planning Area and it is rice bowl of the Puducherry. The details of Bahour Commune Panchayat are given in table 4-13. The existing land use analysis chart for Bahour Commune Panchayat is shown in figure 4.61 and corresponding details is given in Table 4-14.

Table 4-13 Details of Bahour Commune Panchayat

S. No	Description	Details
1.	Area	54.82 Sq.km
2.	Gross Density	1,254 Persons/sq km (13 pph)
3.	Net Density	21,528 Persons/sq km (215 pph)
4.	Location	Southern most end of the Planning Area
5.	Major Landmarks	Bahour Lake, ASI Monuments and Educational institutions

Source: Compiled by Consultant

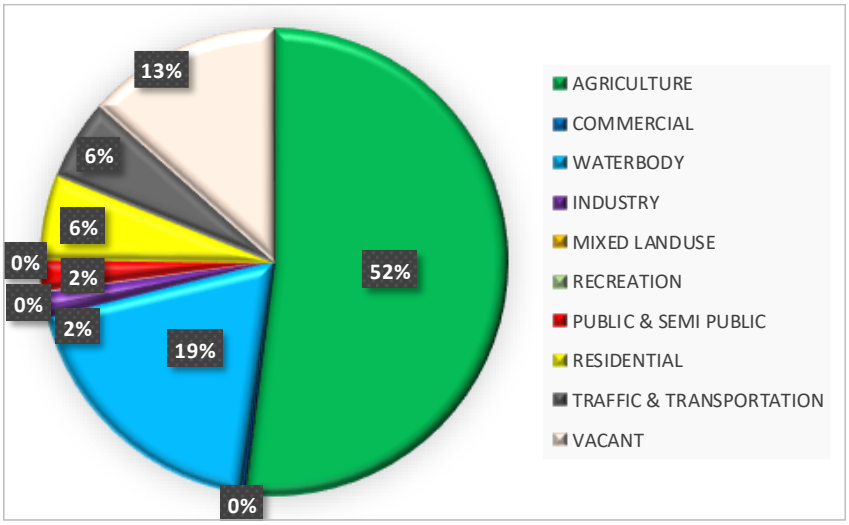


Figure 4.61 Existing Land Use Analysis Chart for Bahour Commune Panchayat-2015

The agricultural land use covers 52% of the total area of Bahour Commune Panchayat, around 19% of land is under Protected & Undevelopable land use category. Residential and Traffic & Transportation land use occupies 6% of the total area of this commune panchayat. Land currently vacant in Bahour Commune Panchayat is 13% of the total commune area.

Table4-14 Existing Landuse Analysis for Bahour Commune Panchayat-2015

S. No	Land Use	Area in Sq.KM	Percentage to Total Area
1.	AGRICULTURE	28.45	51.90%
2.	COMMERCIAL	0.26	0.48%
3.	WATERBODY	10.35	18.89%
4.	INDUSTRY	0.91	1.66%
5.	MIXED LANDUSE	0.04	0.08%
6.	RECREATION	0.02	0.03%

S. No	Land Use	Area in Sq.KM	Percentage to Total Area
7.	PUBLIC & SEMI PUBLIC	1.19	2.17%
8.	RESIDENTIAL	3.19	5.83%
9.	TRAFFIC & TRANSPORTATION	3.086	5.63%
10.	VACANT	7.32	13.35%
11.	**Total**	**54.82**	**100.00%**

Source: Compiled by Consultant

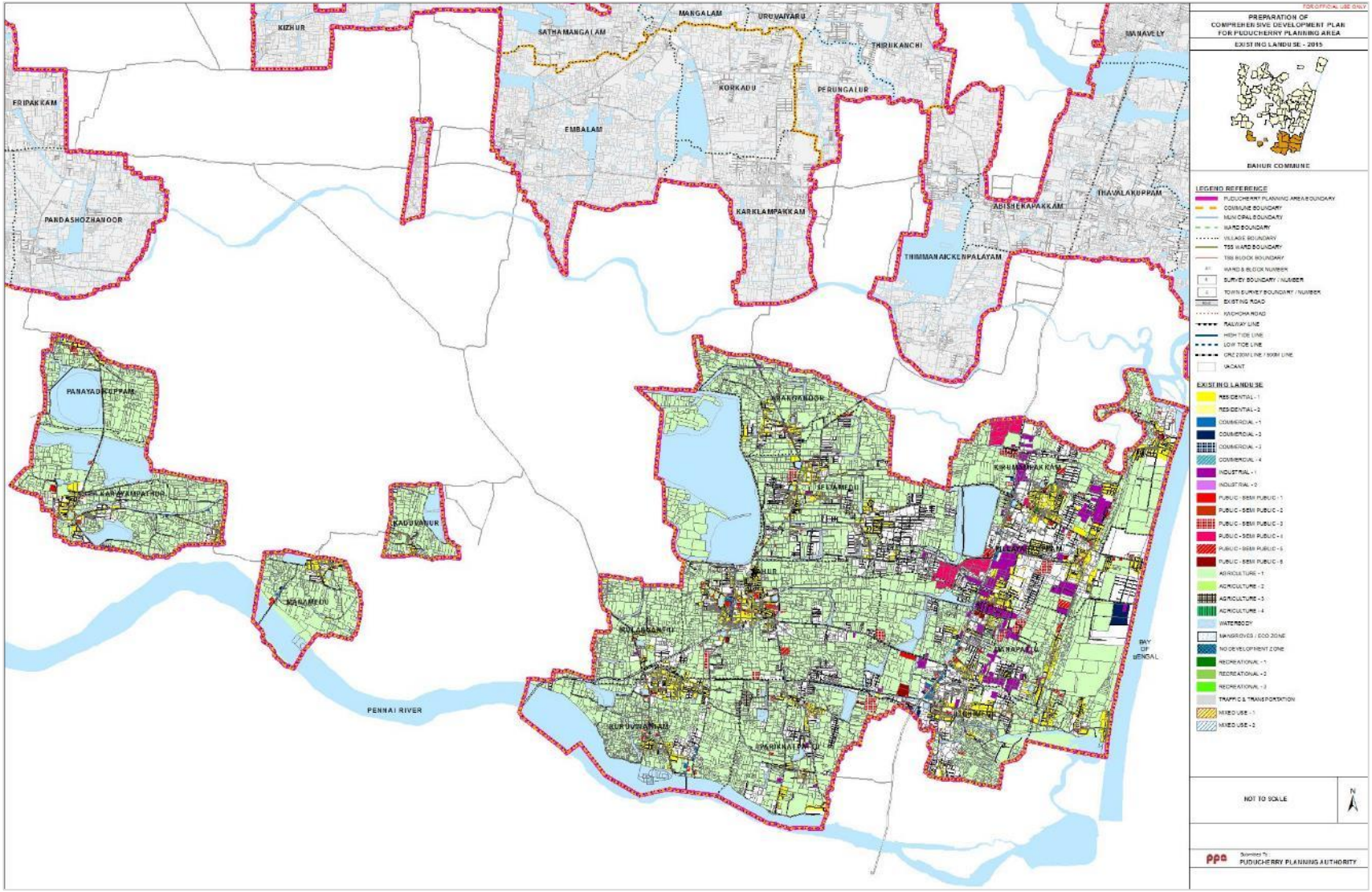


Figure 4.62 Existing Land Use Map for Bahour Commune Panchayat-2015

4.2.5.1 RESIDENTIAL

The figure 4.63 shows the residential use spreaded across the Bahour Commune Panchayat, it covers around 3.19 sq.km which accounts to 5.83 % area of the CP. Residential landuse is concentrated in Bahour, Kirumampakkam, Utchimedu revenue villages which are the major settlements of this Commune Panchayat. The gross density is 12 persons per hectare and the net residential density is 215 persons per hectare.

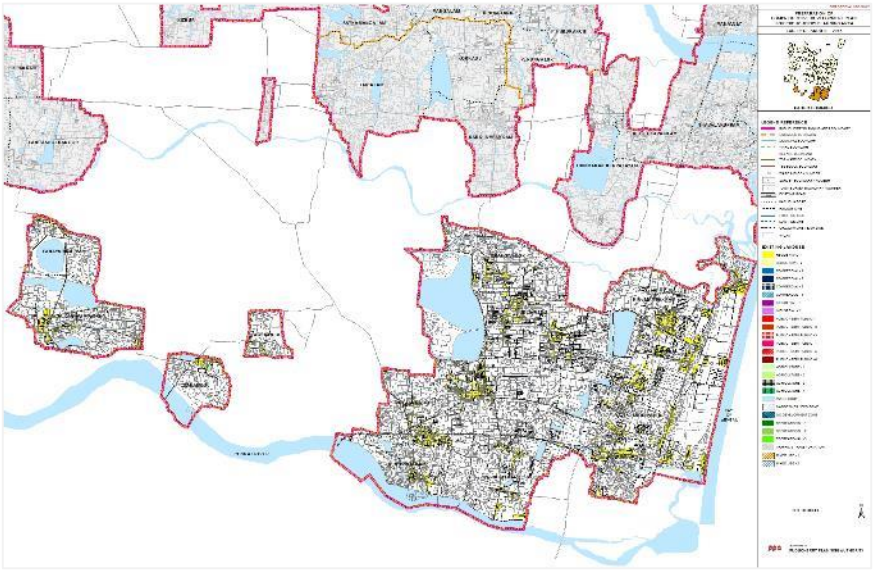


Figure 4.63 Residential Use for Bahour Commune Panchayat

4.2.5.2 COMMERCIAL

The commercial land use in Bahour Commune Panchayat is very minimal, only 0.26 sq.km of land is covered in this use which accounts to 0.48 % of total area of the Bahour Commune Panchayat. Figure 4.64 shows the commercial land use in Bahour Commune Panchayat.

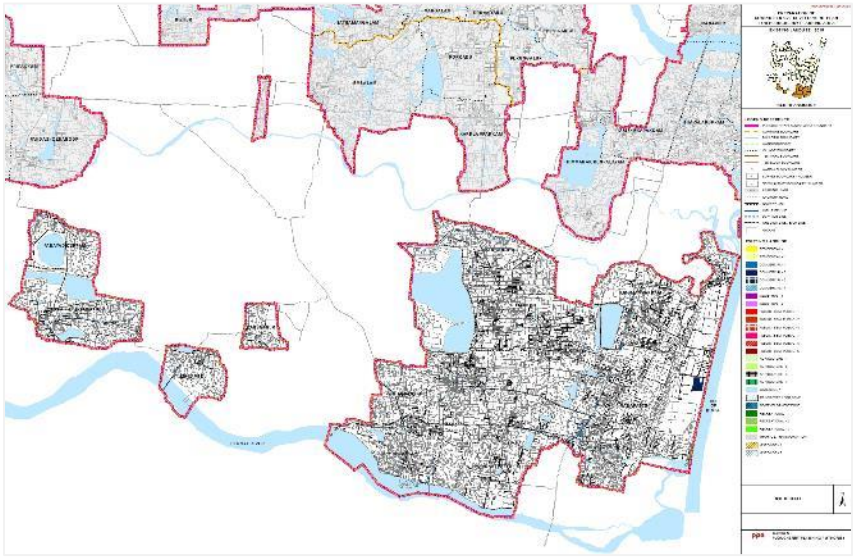


Figure 4.64 Commercial Use for Bahour Commune Panchayat

4.2.5.3 INDUSTRIAL

The total industrial land use in Bahour Commune Panchayat is 0.91 sq.km and it accounts to 1.66 % of total area of the Commune Panchayat. Most of the industrial land use is found on the eastern side of ECR in Pillyarkuppam, Manapattu and Kirumampakkam villages. The industrial land use in Bahour commune panchayat is shown in figure 4.65.

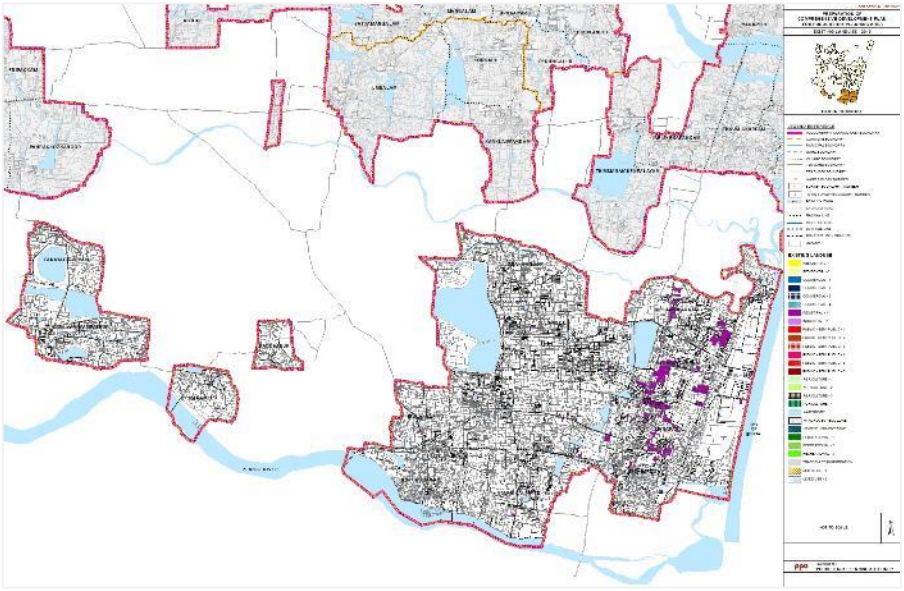


Figure 4.65 Industrial Use for Bahour Commune Panchayat

4.2.5.4 PUBLIC & SEMI-PUBLIC

The public & semi-public land use within Bahour Commune Panchayat is 1.19 sq.km which is around 2.71 % of the total area of the Commune Panchayat's area. Figure 4.66 shows the Public & Semi-Public uses in Bahour Commune panchayat.

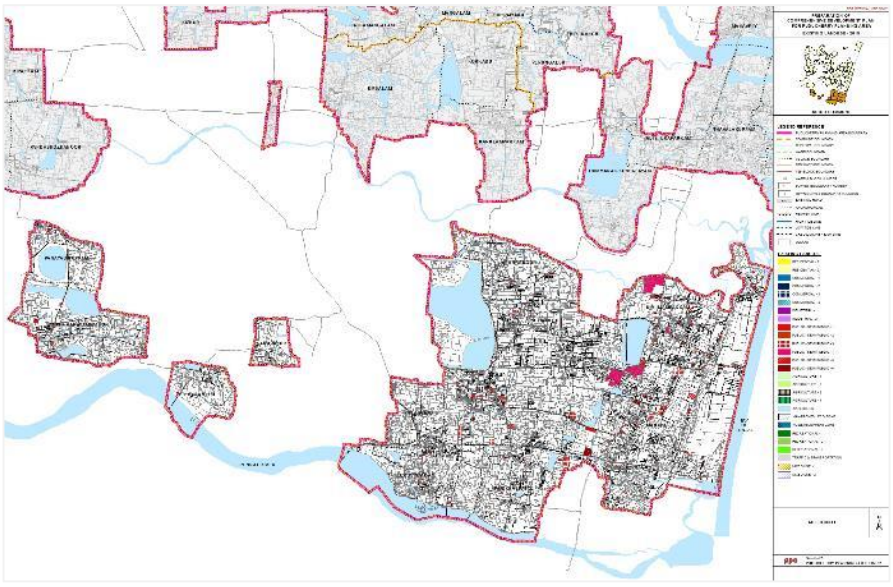


Figure 4.66 Public & Semi-Public Use for Bahour Commune Panchayat

4.2.5.5 OPEN SPACES

The open space land use is very low in this commune panchayat, hardly 0.02 sq.km of land is covered in recreational land use.

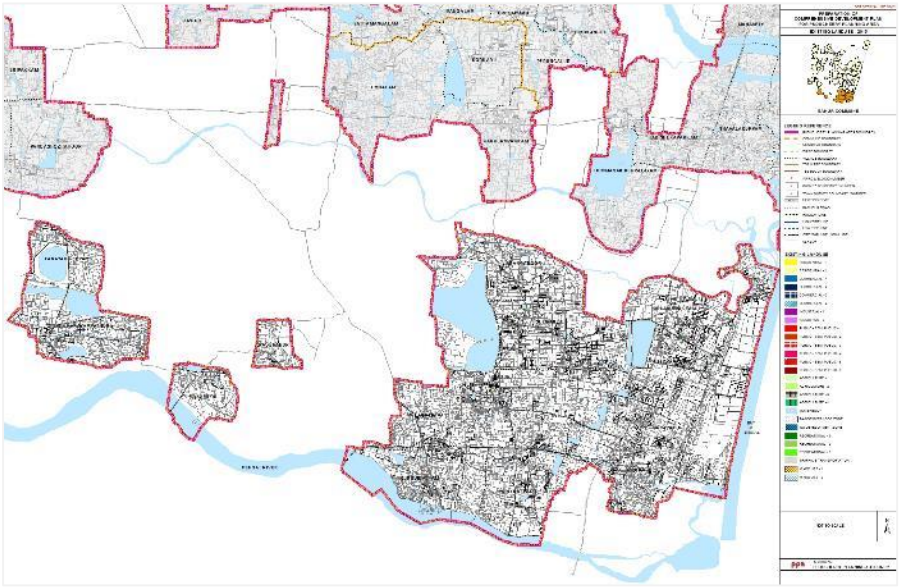


Figure 4.67 Open Space Use for Bahour Commune Panchayat

4.2.5.6 TRAFFIC & TRANSPORTATION

The area under traffic and transportation is 3.08 sq.km which accounts for 5.63% of the total area of Bahour Commune Panchayat. Figure 4.68 shows the Traffic and transportation use map for this Commune Panchayat.



Figure 4.68 Traffic & Transportation Use for Bahour Commune Panchayat

4.2.5.7 VACANT

The land area lying vacant as on 2015 in Bahour Commune Panchayat is 7.32 sq.km which accounts to 13.35% of the total area of the CP. Vacant land percentage is high in Bahour commune, large tracts of agricultural land is converted in residential layout and currently not built on. Kirumampakkam, Pillayarkuppam, Seliamedu, Manapattu and Utchimedu village have higher vacant land percentage and this can be attributed to the development which has taken place considering the proximity of these villages to ECR which is a major transit corridor and also the proximity of these villages to Cuddalore which is a major town on the southern part of the planning area.

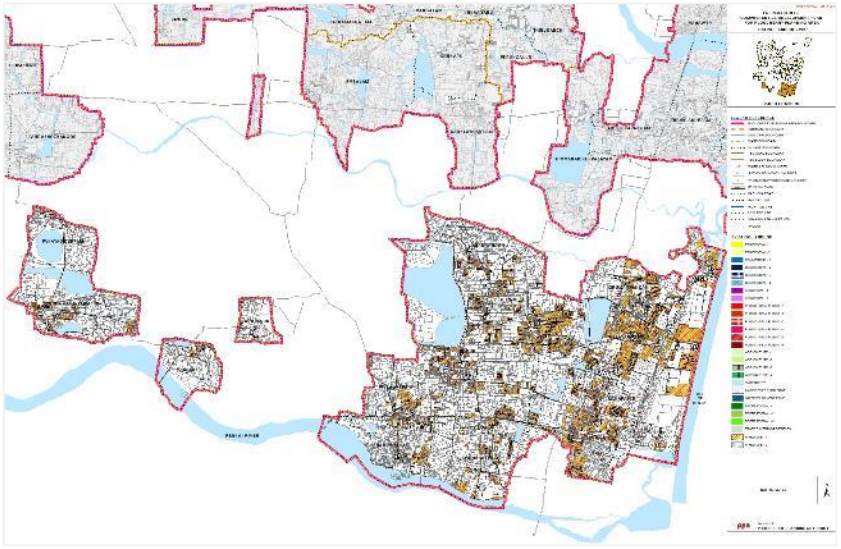


Figure 4.69 Vacant Use for Bahour Commune Panchayat

4.2.5.8 PROTECTED & UNDEVELOPABLE USE

The protected & undevelopable land use in Bahour Commune Panchayat accounts for 18.89 % of the total land area of the municipality which is 10.35 sq. km. The figure 4.70 shows the protected & Undevelopable use in Bahour Commune Panchayat.

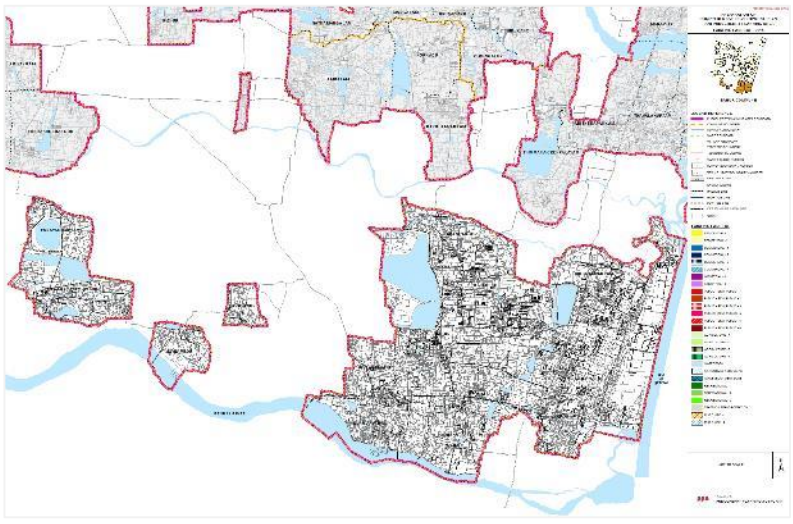


Figure 4.70 Protected & Undevelopable Use for Bahour Commune Panchayat

4.3 PUDUCHERRY PLANNING AREA

The overall existing land use analysis chart for Puducherry Planning Area - 2015 is shown in figure 4.71. Agricultural land use occupies 46% of the total area of the Puducherry Planning Area, Protected

& Undevelopable land use occupies around 14 % of the land area and residential land use is spread over 11% of total land area of the planning area. About 11% of the planning area is currently lying vacant, 8% is under traffic and transportation use, 4% is in industrial land use category and 5% of the Puducherry Planning Area land is under Public and Semi-Public land use category.

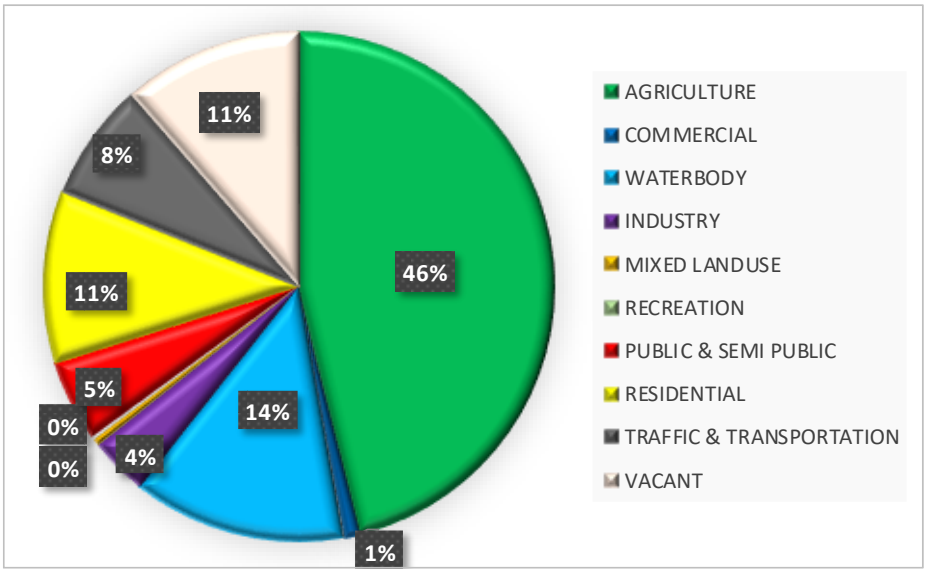


Figure 4.71 Existing Land Use Analysis Chart for Puducherry Planning Area-2015

Details of existing land use analysis-2015 is shown in table 4-15, agricultural land use being the predominant land use in the planning area occupies 135.84 sq.km area, Water body or Protected and Undevelopable use is spreaded over 39.68 sq.km, residential use covers 32.12 sq.km and 33.63 sq.km is currently vacant. Priority should be given to utilize the vacant land to address the future residential requirements of the planning area and compacting the development should be kept as a key point in the preparation of CDP-2036 to avoid sprawl.

Table 4-15 Existing Landuse Analysis for Puducherry Planning Area-2015

S. No	Land Use	Area in Sq.KM	Percentage to Total Area
1.	AGRICULTURE	135.84	46.17 %
2.	COMMERCIAL	2.97	1.01 %
3.	WATERBODY	39.68	13.49 %
4.	INDUSTRY	10.83	3.68 %
5.	MIXED LANDUSE	1.25	0.42 %
6.	RECREATION	0.57	0.19 %
7.	PUBLIC & SEMI PUBLIC	15.22	5.17 %
8.	RESIDENTIAL	32.12	10.92 %
9.	TRAFFIC & TRANSPORTATION	22.114	7.52 %
10.	VACANT	33.63	11.43 %
11.	**Total**	**294.23**	**100.00 %**

Source: Compiled by Consultant

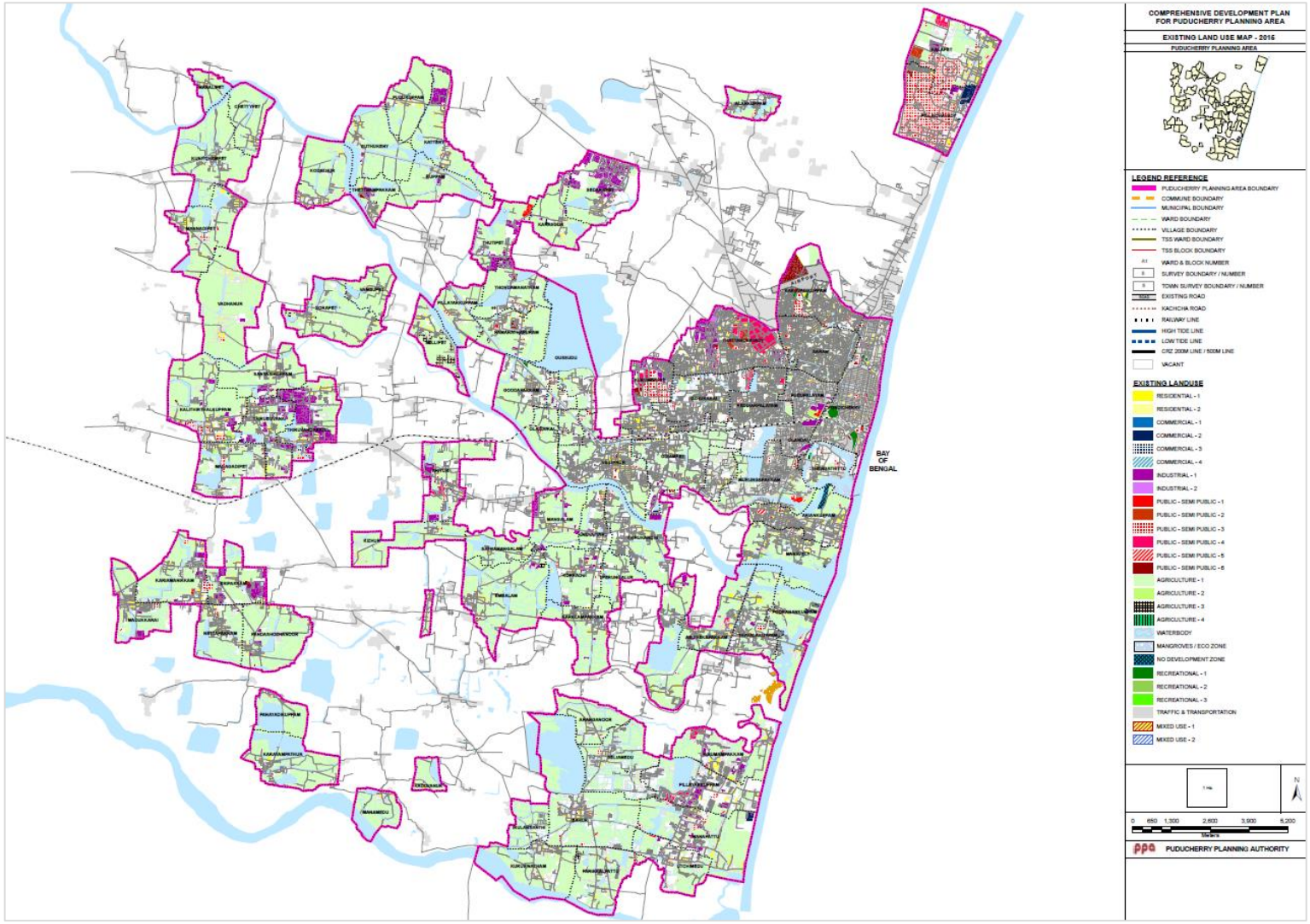


Figure 4.72 Existing Land Use Map for Puducherry Planning Area-2015

Table 4-16 Comparative ELU 2015 - Analysis of Municipalities and Commune Panchayats

S. No	Land Use	Puducherry Planning Area (Area in Sq km)							Entire PPA
		Puducherry	Oulgaret	Villianur	Ariyankuppam	Mannadipet	Bahour	Nettapakkam	
1	Agriculture	2.13	2.86	30.61	10.93	41.77	28.45	19.09	135.84
2	Commercial	0.85	0.82	0.33	0.27	0.34	0.26	0.10	2.97
3	Waterbody	2.58	0.87	9.95	5.30	7.56	10.35	3.07	39.68
4	Industry	0.43	1.21	3.57	0.25	3.12	0.91	1.34	10.83
5	Mixed Landuse	0.43	0.43	0.15	0.05	0.10	0.04	0.05	1.25
6	Recreation	0.35	0.11	0.05	0.02	0.01	0.02	0.01	0.57
7	Public & Semi Public	1.25	7.91	2.45	0.59	1.22	1.19	0.61	15.22
8	Residential	5.16	9.12	5.12	3.18	4.03	3.19	2.32	32.12
9	Traffic & Transportation	3.39	5.18	4.26	1.657	3.053	3.086	1.484	22.11
10	Vacant	2.98	6.04	9.50	2.13	3.12	7.32	2.54	33.63
	Total	**19.55**	**34.55**	**65.99**	**24.377**	**64.323**	**54.816**	**30.614**	**294.22**

Source: Compiled by consultant

The ELU area for both the municipalities and five commune panchayats is shown in the table 4-16 above. The highest area amongst all the Municipalities and Commune Panchayat is of Villianur Commune Panchayat followed by Mannadipet, Bahour, Oulgaret, Nettapakkam and Puducherry. Agricultural area is highest in Mannadipet commune followed by Villianur Commune. Vacant space is highest in Villianur Commune followed by Bahour Commune.

Whereas commercial area is concentrated in the core of the PPA i.e. Boulevard Town. Thus, the Puducherry Municipality has the highest share of commercial area. While, the area of waterbody is highest in Bahour followed by Villianur Commune. This is attributed to the presence of Bahour and Oussudu lake respectively. Industrial area is highest in the Villianur Commune followed by Mannadipet Commune as both the communes have industrial estates. However, residential area is high in Oulgaret Municipality which shows that there is more development happening in this area.

The Existing Land Use area for entire PPA as well as for three categories is presented in the table 4-17. The Conurbation area is a continuous urban area comprising of towns and their outgrowths merged with each other due to physical expansion and population growth. In the case of Puducherry, conurbation area includes Puducherry Municipality, Oulgaret Municipality, Part of Villianur Commune Panchayat and Part of Ariankuppam Commune Panchayat.

Table 4-17 Comparative ELU Analysis of Boulevard Town, Conurbation Area and Outside Conurbation Area

S. No	Land Use	Boulevard Town	Conurbation Area (Excluding Boulevard Area)	Outside Conurbation Area	Entire PPA
1	Agriculture	-	16.36	119.48	135.84
2	Commercial	0.33	1.62	1.02	2.97
3	Waterbody	0.01	5.12	34.55	39.68
4	Industry	0.01	2.41	8.42	10.83
5	Mixed Landuse	0.19	0.77	0.29	1.25
6	Recreation	0.06	0.46	0.05	0.57
7	Public & Semi Public	0.26	10.74	4.21	15.22
8	Residential	0.59	18.44	13.09	32.12
9	Traffic & Transportation	0.62	10.68	10.81	22.11
10	Vacant	0.10	14.33	19.21	33.63
	Total	**2.18**	**80.92**	**211.12**	**294.22**

Source: Compiled by consultant

The Existing Land Use area for entire PPA as well as for three categories is presented in the table above. As it is observed from the table that in boulevard town, there is very less vacant area available which indicates that boulevard town has no further scope of development. Thus, for boulevard town the focus is to conserve the existing buildings or redevelopment in conformity with the heritage importance and special regulations for boulevard town.

While concentrating on conurbation area (excluding boulevard town) has good amount of Agriculture and Vacant area which opens up the scope for development in the area. Additionally, it has large amount of area falling under residential and Public Semi Public categories making it clear that the inflow of people is already there due to various reasons. Moreover, it is located near to CBD and includes area which are observing good amount of development, it is envisaged that the conurbation area will have the highest development in the upcoming years.

As observed from the table above, in the areas outside of conurbation, most of the land is under agricultural use as this is rural area. Thus, more than 50% of the area falls under agriculture use followed by waterbodies. Very less area is covered for residential, commercial, industrial etc.

5 TRAFFIC & TRANSPORTATION

5.1 INTRODUCTION

Transportation plays a vital role towards the mobility of people as well as goods & services of a particular system. People are always mobile and mobility is most important dynamic functions of a city which is having more bearing towards the economic development. In the absence of mobility due to improper transportation system the city functions would be paralyzed which may affect the dynamism of the system.

For the healthy growth, economic prosperity and improved living standards of any area, a high-quality transportation network is essential. In addition, transportation and landuse are to be integrated so as to achieve reduction in trip length, increase in public transport usage etc.

5.2 EXISTING SITUATION

5.2.1 EXISTING ROAD NETWORK

5.2.1.1 ROAD PATTERN

The Boulevard town has a road network in grid iron pattern. All the other areas of the Puducherry Planning Area have a road network that has developed organically over the years.

5.2.1.2 ROAD HIERARCHY

The highways which pass through the Planning Area connect Puducherry to nearby cities. Due to the absence of proper road hierarchy, it is seen that narrow roads with RoW less than 6m emerge from the roads with Right of Way (RoW) 60m. (eg. Villianur Bypass).

Except Highways and few other roads, majority of the roads in the Planning area are having a right of way less than 12m. For example, the roads running across key commercial areas such as Saram are too congested and this leads to increased travel time within the city and deterioration in quality of life in these important nodes of the planning area.

The roads in the Planning area are shown in the figure 5.2 in different categories with respect to their RoW. The RoW in the planning area varies from 3.7 m to 60 m. From the figure 5.2, it can be observed that some of the important roads such as NH 45A do not have a uniform right of way[3]. In municipal areas, NH 45A has a right of way of 15 m whereas in Villianur, the right of way is 60 m. SH 49 has a right of way of 30 m in all the places except Kalapet and Pillaichavady. At Kalapet and Pillaichavady it has a right of way of 24 m. SH 203 has a right of way of 15 m in the municipal areas whereas in the commune areas, its right of way is 12m. NH 66 has a RoW of 30 m in Puducherry whereas it has a RoW of 60 m in Tamilnadu. MG street has RoW of 18 m in Tamilnadu but it reduces to 12 m when it enters Puducherry.

5.2.1.3 National Highways:

National Highways passing through the Planning Area along with its carriage way and type of carriage are presented in table 5-1. The major road network in Puducherry Planning Area is shown in figure 5.2. The figure 5.2 depicts the major roads passing through the planning area.



Figure 5.1 Maraimalai Adigal Salai & Vazhudavur Road, Puducherry Plnning Area

[3] As suggested by Public Works Department, RoW of roads are to be considered as per the RoW shown in the FMB/TSS Sheets

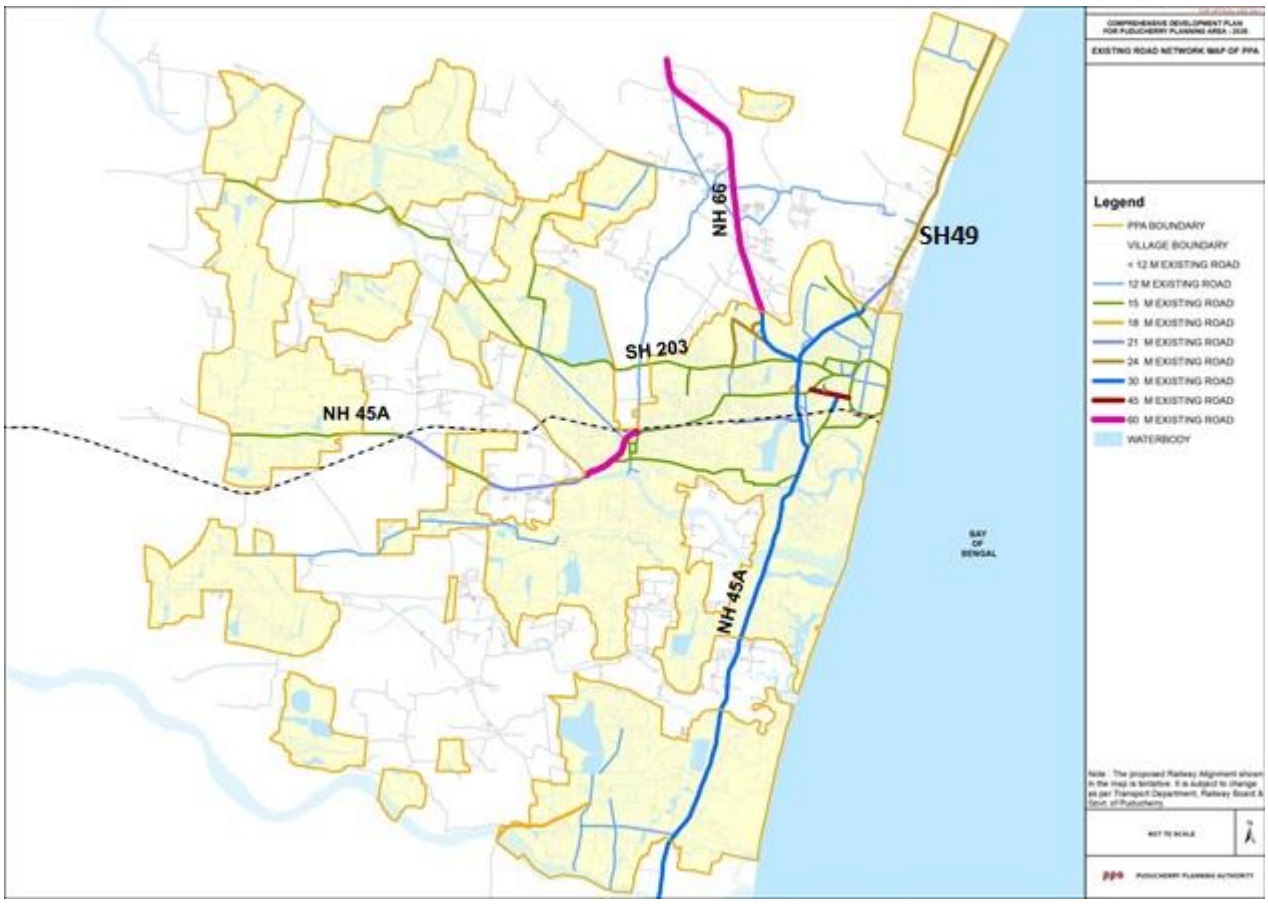


Figure 5.2 Major Road Network Map of Puducherry Planning Area.

Table 5-1 List of National Highways passing through Puducherry Planning Area

S. No.	Name of the Road (NH)	Type of Road	Width of the carriage way in (meters)	No of Lanes
1	Madagadipet to Thiruvandarkoil	NH 45A	45	4 lane
2	Thiruvandarkoil to Vadamangalam	NH 45A	45	4 lane
3	Vadamangalam to Sankaraparani bridge	NH 45A	45	4 lane
4	Sankaraparani bridge to Villianur Bypass road (Villianur Bypass junction near Gopalsamy Kalyana Mandapam)	NH 45A	45	4 lane
5	Villianur Bypass (Gopalsamy kalayanamandapam to MGR Statue)	NH 45A	60	4 lane
6	Villianur MGR statue to Indira Gandhi Statue	NH 45A	22	4 lane
7	Indira Gandhi Statue to Marapalam Junction	NH 45A	30	4 lane
8	Marapalam to Ariyankuppam Bridge	NH 45A	20	4 lane
9	Ariyankuppam bridge to Utchimedu (Mullodai)	NH 45A	30	4 lane
10	Indira Gandhi Square to Gorimedu state border	NH 66	25	4 lane

Source: Compiled by Consultants

5.2.1.4 State Highways

The table 5-2 have the list of major State Highways passing through Puducherry Planning area with their carriage way.

Table 5-2 List of State Highways passing through Puducherry Planning Area

S. No.	Name of the Road (NH)	Type of Road	Width of the carriage way in (meters)
1	Ganapathichettikulam to Pillaichavady - ECR Road till Mathur road Junction	SH 49	18
2	Ganapathichettikulam to Pillaichavady - ECR Road	SH 49	22
3	Karuvadikuppam state border to Rajiv Gandhi Square	SH 49	30
4	Vazhudavur road - Thirukkanur bazaar	SH 203	15
5	Jawaharlal Nehru Road	SH	10.9
6	Mahatma Gandhi Road	SH	10.5
7	Maraimalai Adigal Salai	SH	23.7

8	Lal Bahadur sastri Road	SH	9.5
9	Vazhudavur Road - Raja Theater to Iyyankuttipalayam	SH	12
10	Ellaipillaichavady road	SH	14.5
11	Mill road From Venkata Subba Reddiyar Square to Mudaliarpet Junction	SH	12

Source: Compiled by Consultants



Figure 5.3 East Coast Road, Puducherry Planning Area



Figure 5.4 Puducherry - Cuddalore Road,

5.2.1.5 District roads (Major District Roads /Other District Roads):

Table 5-3 List of Other District Roads (ODR) in Puducherry Planning Area

S. No	Name of the Road (ODR)	Type of Road	Width of the carriage way in (meters)
1	From Guduvaiyaru Bridge to Maducarai State border	ODR	5.5
2	From Karikalampakkam to Embalam	ODR	5.5
3	From P.S. Nallur state border to Madagadipet Junction	ODR	5.5
4	From Guduvaiyaru Bridge to Keezhkumaramangalam bridge	ODR	5.5
5	Madagadipetpalayam road branching from NH45A near Thirubhuvanai	ODR	5.5
6	Link road - From Eripakkam State border to Madukarai Thondareddipalayam Junction	ODR	5.5
7	Karamanikuppam road from NH 45A Junction	ODR	11
8	Murungapakkam Road from Cuddalore Junction to Odiampet	ODR	12
9	Pavazhakaranchavady road	ODR	5.5
10	NH45A Junction to Gundu Salai - Muthiraplayam road	ODR	7
11	Kirumampakkam road	ODR	5.5
12	Kanniakoil road	ODR	5.5
13	Bahour to Irulansandai state border	ODR	5.5
14	Karaimedu road	ODR	5.5
15	Selimedu road (From Aranganur state border to junction of RC)	ODR	5.5
16	Frontier road (From Kuttiankuppam bridge to Panayadikuppam)	ODR	7.5
17	Vazhudavur road - Kalamedupet Junction to Koonimedu state border	ODR	7
18	Koodapakkam Road - from Villianur to Koodapakkam	ODR	10
19	Sanniyasikuppam Road from Gopalankadai to Konerikuppam upto state border	ODR	6
20	Four car street including link Road upto NH-45A	ODR	11
21	Frontier Road - Madagadipet Junction to Mumbrampet State border	ODR	7
22	Moolakulam Road - Moolakulam junction to Gopalan kadai	ODR	7
23	Sellipet Road - Pathukannu Junction to Vadhanur Frontier road	ODR	5.5

S. No	Name of the Road (ODR)	Type of Road	Width of the carriage way in (meters)
24	Suthukeny road	ODR	5.5
25	Sanniyasikuppam Road (Andiyarpalayam to Kothapurinatham State border)	ODR	5.5
26	Thirukkanur road	ODR	7
27	Bye pass road	ODR	5.5
28	Katterikuppam to Lingareddipalayam Sugar Mill road	ODR	7
29	TVS road from NH 45A at Thiruvandarkoil	ODR	9
30	Abishekapakkam to Embalam road	ODR	7
31	Veerampattinam road	ODR	6
32	Nonankuppam road	ODR	5
33	Villianur to bahour road - From NH 45A to Guduvaiyaru Road	ODR	7
34	Murungapakkam road from NH 45A to Kombakkam village	ODR	5.5
35	Rc 19 starting from NH45A ending at Guduvaiyaru bridge	ODR	5.5
36	Rc 30 from Sembiyapalayam to Kizhur Via Sivarandagam	ODR	5.5
37	Karikalampakkam junction to Keezhkumaramangalam bridge	ODR	5.5
38	Sembiyapalayam (Guduvaiyaru Bridge) to Madukarai State border	ODR	5.5
39	Karikalampakkam to Embalam	ODR	5.5
40	PS Nallur State Border to Madagadipet Junction (NH 45A)	ODR	5.5
41	Link road from Eripakkam State border to Madukarai - Thondareddipalayam road	ODR	5.5

Source: Compiled based on PWD road report 2014

5.2.1.6 Collector roads:

The important roads in **Puducherry Boulevard area** is conceived by grid iron pattern of roads which are connected by a peripheral road. These are listed in table 5-4 along with their width of carriage ways.

The Boulevard - Roads delineating the Boulevard Town are Goubert Avenue i.e., Beach road on East to Anna Salai road on West for about 2.14 km Stretch and 1.8 Km from Southern Boulevard on south to S.V. Patel Salai on North which encompasses the Central Business District of entire Puducherry Planning Area on the intersection of Jawaharlal Nehru Street with Mahatma Gandhi Road, Bharathi Street, Mission Street till H.M. Kasim Salai.

The other major city road running within Boulevard is Bussy Street from the Maraimalai Adigal Salai connecting to Goubert Avenue on East. This stretch is completely developed like a Hospital corridor with major Public and semipublic buildings and few shops.

On perusal of the existing road network of Puducherry City it is observed that some of the important roads identified are not uniform in their width and some stretches needs widening to reduce congestion and ease traffic movement. On a perusal of the existing road network it is observed that the Thiruvalluvar Salai – Villianur Main Road from Nellithope Junction running towards north; ends at the Subbaiah Statue Signal having 20 m width needs to be wideneded to 24m road to ease out the traffic congestion.

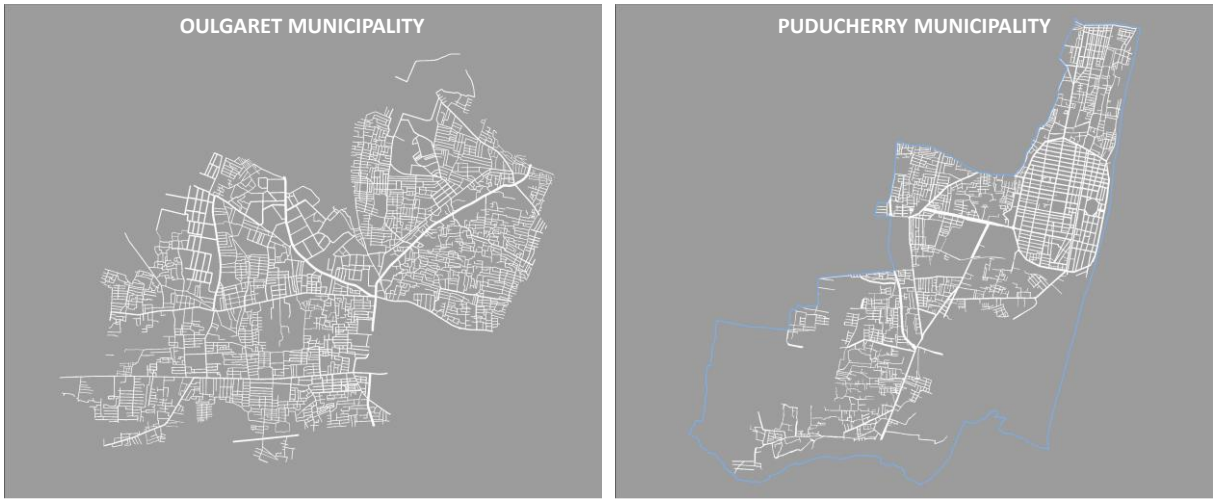


Figure 5.5 Road Network in Municipal Areas of Oulgaret & Puducherry

The following are the list of other district roads / Collector roads which pass through the Puducherry urban area.

Table 5-4 List of roads in urban areas, Puducherry Planning Area

S. No	Name of the Road	Type of Roads	Width of the carriage way in (meters)
1	Anna Salai -Boulevard Road	ODR	11
2	S.V. Patel Salai - Boulevard Road	ODR	12
3	Subbaiah Salai - Boulevard Road	ODR	11
4	Beach Road - Boulevard Road	ODR	9
5	Thiruvalluvar Salai	ODR	16
6	Lenin street	ODR	8
7	Ambour Salai	ODR	7
8	Mission Street	ODR	10
9	Salai Street	ODR	10
10	Thennansalai	ODR	7.1
11	Vaithikuppam Road	ODR	7.1
12	Lawspet Road	ODR	7.5

13	Arts College Road	ODR	7.5
14	30 feet Road	ODR	7.5
15	Airport Road	ODR	7.5
16	Raman Nagar Road	ODR	7.5
17	Link road from Vazhudavur road to NH 66 - Crossing Transport nagar, PIPDIC industrial estate, ITI Mettupalayam	ODR	21
18	Ayyanar Koil street	ODR	6
19	Therodum Veedhi and Pillayar Koil street	ODR	6
20	Anandha Nagar Road -Bharathy street at Kathirkamam Vazhudavur road to Anandha nagar OHT	ODR	6
21	Mariamman Koil street at Oulgaret - Vazhudavur road upto Muthirapalayam road near mariamman Temple	ODR	7
22	Rajaji Nagar Road at Lawspet - Lawspet road upto Airport road near cluny main gate	ODR	12
23	Kuthiravandipathai	ODR	4.5
24	25th Cross road	ODR	14
25	Entrance of Link road leading to transport Nagar	ODR	23
26	Secretary quarters road, Gorimedu	ODR	7
27	Vallalar Salai from Anna Salai junction	ODR	12
28	45 feet byepass road connecting Venkata Nagar and Saram	ODR	12
29	Bis Mill road	ODR	11
30	Thengaithittu road	ODR	7
31	Vazhudavur road junction at Oulagret Municipality - Muthirapalayam road	ODR	7
32	Ranga Nagar - Muthirapalayam road	ODR	20

Source: Compiled based on PWD road report 2014

5.2.1.7 Rural Roads:

The following are the list of major rural roads which pass through the Puducherry rural area.

Table 5-5 List of Rural Roads in PPA

S. No	Name of the Road	Width of the carriage way in (meters)
1	Poraiyur Road	5.5
2	Perambai Road	5.5
3	Ariyapalayam Road	7
4	Kurumabapet Road	3.8

S. No	Name of the Road	Width of the carriage way in (meters)
5	Alankuppam Road	7
6	Mathur Road - I	7
7	Mathur Road -II	5.5
8	Link road between Mathur road I and Kalathumettupathai -I	3.8
9	Kalathumettupathai -I	7
10	Ariyur - Anandhapuram road	7
11	Ariyur - Anandhapuram road	5.5
12	Kalathumettupathai -II	5.5
13	Pillayarkuppam Road	7
14	Ariyapalayam Road from Patthukannu road to Ariyapalayam via senthanatham	5.5
15	Nadarajar nagar road - from Sulthanpet to Nadarajar Nagar	3.8
16	GN palayam road starting from NH 45 A near Arumathapuram level crossing and ending upto Nadarajan Nagar Road	4
17	Konerikuppam Road starting from senthanatham VRO Colony upto Sanniyasikuppam Road near Konerikuppam village.	3.8
18	Burial ground road - to Sankaraparani river	3.8
19	Poraiyur Old Colony Road	4
20	Poraiyur to Poraiyur pet Road	4.5
21	Muthupillai Palayam - Permabai Road	5.5
22	Sulthanpet Link Road from Arasur to Sulthanpet	4
23	Railway Bridge road starting from Konerikuppam	3.8
24	Ramanathapuram hospital Road	3.8
25	Ramanathapuram Road	3.8
26	Thondamanatham Old colony	3.8
27	Thondamanatham Lake Road	3.8
28	Thuthipet Colony Road	3.8
29	Karasur New colony Road	6
30	Kadaperikuppam Road	6
31	Sedarapet canal road	3.8
32	sedarapet Lake Down road	3.8
33	Sedarapet New colony road	3.8
34	Pulaian Salai road	5.5
35	Pillayarkuppampet road and MGR Nagar Road	3.8

S. No	Name of the Road	Width of the carriage way in (meters)
36	Manjolai Road	7
37	Mangalam Road	7
38	Katterikuppam Road from Thuthipet	7
39	Sedarapet old colony Road	3.8
40	Koodapakkam village road - internal Road	3.8
41	Kurumbapet housing board Main Road	7
42	Kurumbapet housing board Internal Road	3.8
43	Mullukattupathai Road	5.5
44	Koodapakkam road - Pathukannu to Sanniyasikuppam Road	3.8
45	Koonichempet to Chettipet Road	5.5
46	Koonichempet to Manalipet Road	7
47	Thethampakkam road	5.5
48	Suthukenny to Pudukuppam road	5.5
49	Katterikuppam to vazhudavur road upto state border	5.5
50	Thirubhuvanai road from NH45A to Thirubhuvanai police station	5.5
51	Pudukuppam to Lingareddipalayam Road	5.5
52	Thirubhuvanai to Athukuthupalayam via Sanniyasikuppam	5.5
53	Vinyagampet to Sorapet Road	5.5
54	Vambupet to Sorapet	5.5
55	Molapakkam road to Sooramangalam road neat OHT	3.8
56	Eripakkam Junction to Kalmandapam main Road	3.8
57	Eripakkam road from Kalmandapam to P.S Nallur branching road to Vadukuppam	3.8
58	Kosa palayam road branching at Madukarai and connecting Molapakkam Road	5.5
59	Kalmandapam to P.S. Nallur	5.5
60	Kozhipakkam Road	5.5
61	Approach road from Pondicherry main road to Kambilikarankuppam	3.8
62	RC 19 connecting via Korkadu Erikarai	5.5
63	Korkadu Village Main road - From Uruvaiyaru road to Korkadu Erikarai	4
64	Road at Ramareddikulam to Vadukuppam	3.8
65	Thondareddipalayam Road	3.8
66	Nallur - Kutchipalayam Erikarai Road	3.8

S. No	Name of the Road	Width of the carriage way in (meters)
67	T.N. Palayam Road	5.5
68	Nallavadu Road	5.5
69	Poornakuppam - Pudukuppam Road	5.5
70	Kasanthittu Road	4
71	Sakkilipalayam and old Cuddalore road in Ariyankuppam	3.8
72	Thirukanchi road (from Uruvaiyaru to Abishekapakkam	5.5
73	Manavely to Kasiviswanathar temple road in Villianur Commune panchayat - NH45A to kasiviswanathan temple	5.5
74	Market street at Villianur	7.5
75	Villianur to Thirukanchi Cremation yard Road	7.5
76	Last Vanniyar street at Villianur	7
77	Mangalam to Uruvaiyaru Road	5.5
78	Ariyur to Sivarandagam Road starting from NH 45A to Sivarandagam	5.5
79	Vadamangalam Road from NH45A to Junction towards south to Managalam near Police Station	5.5
80	Cuddalore Road to Chinna Veerampattinam (Via Odaively, Manavely, Choolaikootai street)	5.5

Source: Compiled based on PWD road report 2014

5.2.1.8 Intersections, Junctions and Circles in Puducherry region

There are 55 major junctions in entire Puducherry Planning Area, out of which 6 are Roundabout / Rotary, 16 are cross intersections, 21 are T-intersections and 14 are Y-intersections. Out of 55 intersections 9 are signalized whereas the rest are non-signalized.



Figure 5.6 Indira Gandhi Statue Junction



Figure 5.7 Anna Statue Junction



Figure 5.8 Rajiv Gandhi Statue Junction

Table 5-6 List of major roundabouts in Puducherry Planning Area

S. No	ROUNDABOUTS / ROTARY
1	Rajiv Gandhi Statue
2	Indira Gandhi Statue
3	Venkata Subba Reddiar Statue
4	Chevalier Sivaji Statue
5	Anna Statue
6	Villupuram - Madagadipet Road Junction

Source: Compiled by Consultants

Table 5-7 List of major cross intersections in Puducherry Planning Area

S. No	CROSS INTERSECTIONS
1	Raja Theater Signal Junction
2	Mahatma Gandhi - S.V. Patel Salai Junction
3	Vazhudavur - Mettupalayam Road Junction
4	Sivaji Ganesan Statue Junction
5	Thavalakuppam -ECR Road Junction
6	Kanniakoil - Bahour Road Junction
7	Bahour - Madha Koil Junction
8	Karikalampakkam Junction
9	Embalam Junction
10	Villianur Bye pass - Olaivaikal Road Junction
11	Pitchayandisithar Koil - Villianur Junction
12	Villianur - Uruvaiyaru Road Junction
13	Mangalam - Uruvaiyaru Road Junction
14	Gundusalai - Villianur Road Junction
15	Pathukannu Junction
16	Anna Salai- 45 Feet Road Junction

Source: Compiled by Consultants

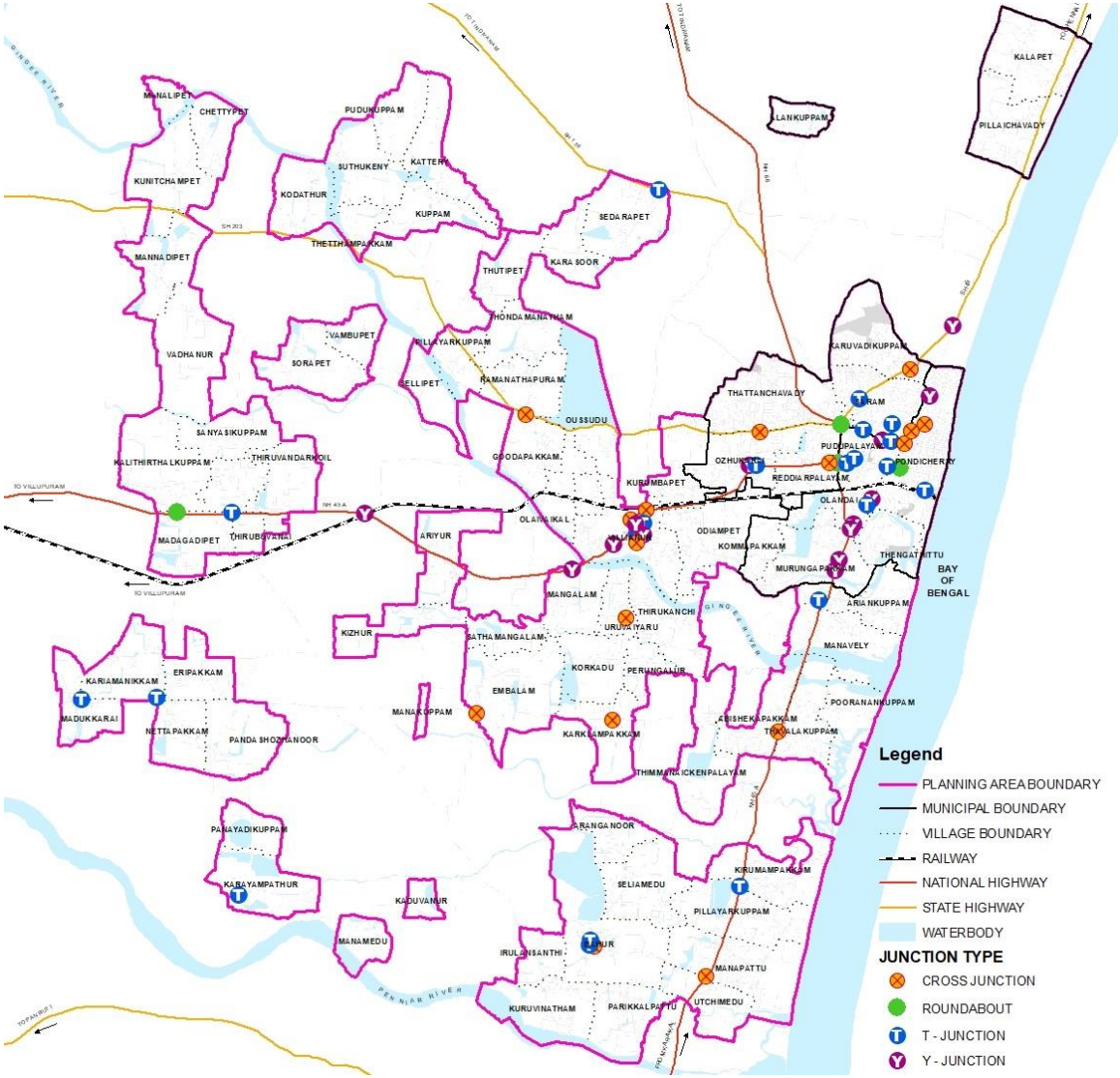


Figure 5.9 Major Intersections and Junctions in PPA

Table 5-8 List of major T-Junctions in Puducherry Planning Area

S. No	T- INTERSECTIONS
1	Nellithope Market Junction
2	Subbaiah Statue
3	Lenin Street - Kamarajar Salai Junction
4	Vallalar Salai -kamarajar Salai Junction
5	South Boulevard - Dr. Ambedkar Junction
6	AFT Cuddalore - Maramalai Adigal Road Junction
7	Vallalar Salai - 45 Feet road Junction
8	ECR - Airport Road Junction
9	Dr. Ambedkar -Cuddalore Road Junction
10	Ariyankuppam Water Tank Junction
11	Kirumampakkam - Cuddalore Road Junction
12	Vedhapuri Natham - Kanniakoil Road Junction
13	Bahour Periya Koil Junction
14	Karayambathur - Nettapakkam Junction
15	Kariyamanikkam Bus Stop Junction
16	Madukkarai - Kariyamanickkam Road Junction
17	Thirubhuvanai - Villupuram Junction
18	Villianur North car - East car road Junction
19	Villianur Commune panchayat Office Junction
20	Mettupalayam - Villianur Road junction
21	Sedarapet - Mailam Road Junction

Source: Compiled by Consultants

Nellithope Market Junction – It is situated at the intersection of Villianur Main Road and point care street. Due to the presence of vegetable and other markets and heavy inflow of traffic, this junction faces the issue of congestion. Other issues include lack of parking and encroachment on the road.

Subbaiah Statue - It is located at the intersection of Villianur Main road and Maraimalai Adigal Salai. It faces heavy traffic as Maraimalai Adigal Salai directly connects to the Boulevard town, which is a tourist attraction as well as existing Central Business District (CBD) of Puducherry.

Lenin Street – Kamaraja Salai Junction – It is a signalized junction and important as it connects Thiruvalluvar Salai and Kamaraj Salai. This junction is congested in peak time as the Kamaraj Salai connects the Rajiv Gandhi Junction and JN Street.

Vallalar Salai - 45 Feet road Junction – Vallalar Salai emanates from Anna salai and connects Kamarajar Salai.

ECR - Airport Road Junction – It is near Lawspet Main road. ECR is about 24 m wide in this stretch and Airport road is approximately 12 m wide at this cross junction. Like other roads of Puducherry, these roads also face the issue of congestion.

Dr. Ambedkar Statue - Cuddalore Road Junction – It is situated near Anitha Nagar. High congestion is observed at this junction as both the roads carries heavy traffic as both connects important areas of the planning area.

Kirumampakkam - Cuddalore Road Junction – It is located near Pillayarkuppam lake and has a character of mixed use development around. Opposite to that, Kirumampakkam bus stand is located which further worsens the traffic.

Thirubhuvanai - Villupuram Junction – Thirubhuvanai has a character of industrial development and villupuram being the important nearby centre, this junction faces heavy traffic especially during peak hours.

Table 5-9 List of major Y-Junctions in Puducherry Planning Area

S. No	Y - INTERSECTIONS
1	Periyar Statue
2	ECR Bypass - M.G Road Junction
3	Kennady Park Junction
4	Cuddalore - Othavadai road Junction
5	Point care Street - Cuddalore road Junction
6	Marapalam Junction
7	Murungapakkam - Cuddalore road Junction
8	ECR - Ariyankuppam Commune Panchayat Road Junction
9	Kandamangalam Railway crossing Junction
10	Mangalam - Villupuram road Junction
11	Villupuram Bypass - Villianur Main Road Junction
12	Villianur East Car - south car road Junction
13	Villianur North Car - West Car Junction
14	Moolakulam - Pitchaiveeranpet Junction

Source: Compiled by Consultants

These intersections are important, as heavy traffic can be anticipated and in view of the fact that there is scope for designing roundabouts, it is desirable to workout suitable designs for constructing Rotaries with Medians on all the arms of the intersection to segregate the traffic movements and minimize accidents and such rotaries will obviate the need for signaling and policing at these intersections.

Periyar Statue – It is at the intersection of Kamaraj Salai and Thiruvalluvar Salai roads. Most of the time congestion is observed at this intersection due to heavy traffic coming/going from/to JN street and boulevard town.

ECR by pass – M.G. Road Junction – As the name suggests, it is the intersection of ECR and MG Road near Kottakuppam. In this stretch of ECR, median is existing and creating comparatively improved vehicular movements than the rest of the city.

Marapalam Junction – It is located near Thengaithittu creating intersection between ECR and Cuddalore Roads. This junction experiences heavy traffic as both roads are important and connects Cuddalore, an industrial town which attracts higher amount of traffic.

Point care Street - Cuddalore Road Junction – This junction is located just north to the Marapalam Junction. This junction come across traffic as the Point care street is narrow and connects an important road Cuddalore Road, which carries enough traffic.

Villianur East Car - South Car Road Junction – It is in the South-Eastern side of the block created by four roads namely, North Car Street, West Car Street, South Car Street and East Car Street. This is highly congested as all these four roads carry heavy traffic throughout the day as it acts as another Central Business District (CBD) for Puducherry and is the centre point of the city in terms of activities.

5.2.2 GROWTH TREND OF VEHICLE POPULATION & ITS COMPOSITION

The study of the vehicle growth, as registered by the R.T.O Puducherry is given below:

Table 5-10 No. of Vehicles in Puducherry Planning Area

Category of vehicle		95-96	96-97	97-98	98-99	99-00	00-01	01-02	02-03	03-04	04-05	05-06	06-07	07-08	08-09	09-10	10-11	11-12	12-13	13-14	14-15
Personal Vehicles	Two-Wheeler	8350	9794	8898	10068	13499	13889	14325	17361	21833	24691	25715	35146	39980	41995	46119	51358	56218	43064	37028	35471
Public Transport	LMV - Non-Transport	2106	2801	1269	993	1786	1291	746	871	1496	2076	2448	3264	3692	3705	4338	5805	7616	5505	5056	4498
	LMV - Transport (Passenger)	215	198	237	200	365	261	193	425	287	367	177	370	250	147	210	205	680	246	136	218
	Heavy Transport (Passenger)	131	88	141	97	421	322	202	457	505	600	314	175	150	120	113	163	180	222	140	269
Total		10802	12881	10545	11358	16071	15763	15466	19114	24121	27734	28654	38955	44072	45967	50780	57531	64694	49037	42360	40456

Source: RTO, Puducherry

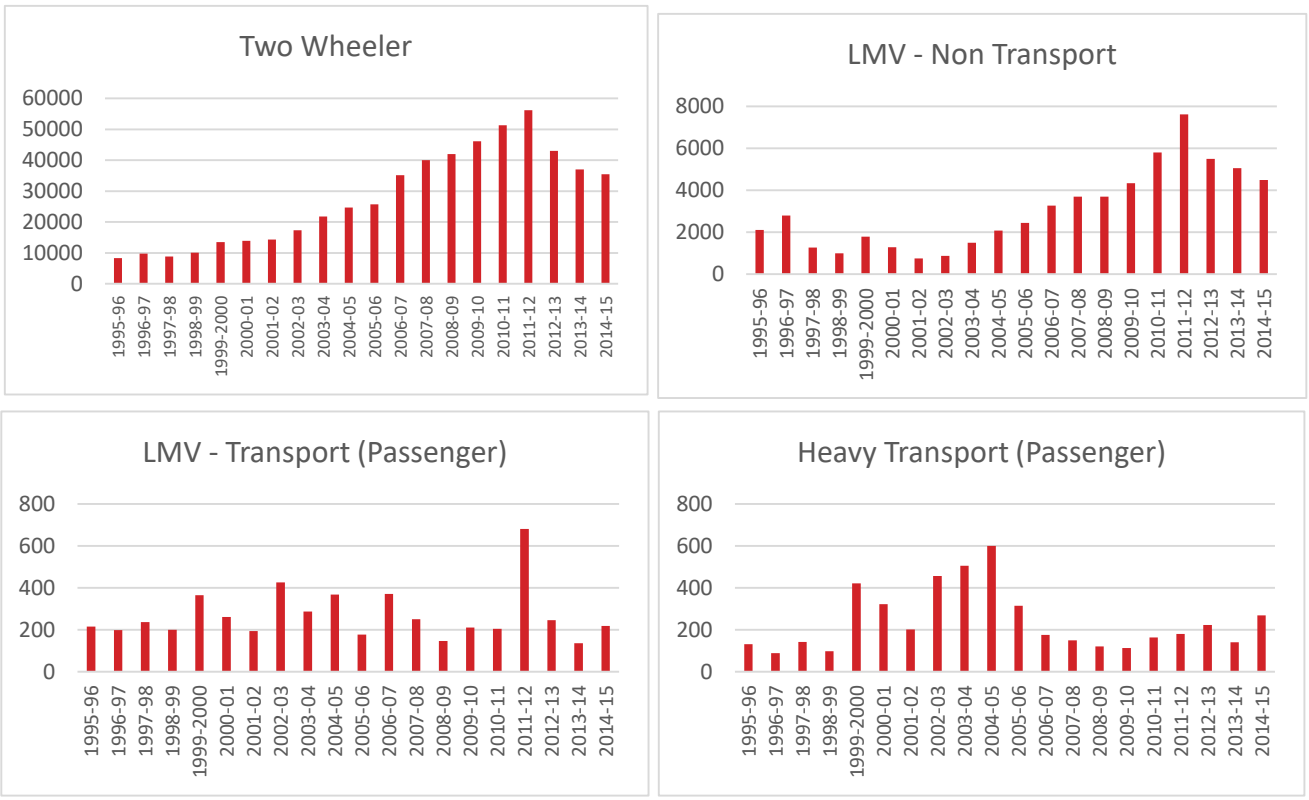


Figure 5.10 Vehicle registration from 1995-2015

In Puducherry Region, the category of vehicles registered with regional transport office are analysed, grouped as four different categories and are presented in the table 5.11

Table 5-11 Major Category of Vehicles registered in Puducherry

S.No	**Two Wheeler**
1	Moped Motor Cycle without gear
2	Scooter
3	Motor Cycle
4	Motor Cycle (IMP)
5	Scooter with Side Car
6	Motor Cycle with Side Car
	LMV - Non Transport
1	LMV (Car)
2	LMV (IMP)
3	LMV (Van)
4	LMV (Jeep/Gypsy)
5	Invalid Carriage
6	Three-Wheeler private
	LMV – Transport (Passenger)
1	Three-wheeler

2	Jeep Taxi
3	Meter Taxi
4	Tourist Taxi / Sp Taxi
5	Station Wagon
6	Maxi Cab
7	Motor Cab/ Vikram
8	Tourist Maxi Cab
9	Private Service Vehicle
10	Ambulance
	Heavy Transport (Passenger)
1	Tourist Bus
2	Educational Institutional Bus
3	Educational Institution Bus (NT)
4	School Bus
5	Omni Bus (Private use)
6	Mini Bus
7	Omni Bus
8	Bus
9	Semi Deluxe Bus

Source: RTO, Puducherry

The figure no. 5.10 shows that the growth in the two-wheeler registration has steadily increased from 1995 to 2011 and after that it is decreasing steadily. This is attributed to the change in policy. While in the LMV- Non-Transport category, the graph is quite fluctuating before 2001. Afterwards, it is increasing and reaches its peak in 2011-12 and then it is decreasing. This also can be attributed to the saturation of the city.

Trip Length:

The results of HH Survey reveals that out of the total HHs surveyed, 31% of commuting population travels less than 1 km, 27% travel between 1-2 km, 13% between 2-3 km, 6% between 3-4 km, 6% between 4-5 km and 17% travel more than 5 km.

Per Capita Trip Rate

The per capita trip rate (PCTR) indicates the mobility of people through a particular mode of transport. It is the ratio of total number of trips made by a particular mode of transport to the total surveyed population. Higher the PCTR values of a mode of transport implies that large number of trips are being made by that particular mode of transport.

Table 5-12 Per Capita Trip Rate of Mode

S. No.	Mode	PCTR
1	Public	0.2
2	Private	0.52

3	Para Transit	0.0096
4	Walking	0.26
5	Others	0.004

Source: Compiled by Consultant based on HH Survey

Mode of Travel

As per the HH Survey, 20% travel through public transportation system, 52% uses Private vehicles, 1% travel through para transit, 26% walk for reaching their destination and 1% of the surveyed population uses other mode of transport.

5.2.3 TRAFFIC MANAGEMENT & ENFORCEMENT

Traffic Management measures are required to optimize the available capacities and rationalize movement pattern. The measures would include

1. Re-organized circulation pattern
2. Restriction on the existing practice of on-street parking
3. Improvement of intersection geometrics and control system
4. Development of off-street parking facilities
5. Provision of pedestrian facilities
6. Identification of pedestrian plazas
7. Introduction of bus priority measures including bus only streets
8. Operation of battery operated mini buses within Boulevard Area
9. Operation of a wide variety of bus services to cater different segments of travel market
10. Installation of traffic signage's and lane marking

The Beach Road is proposed to be pedestrianized from 6 pm to 7:30 am starting from the junction of Dumas Street and Goubert Avenue in south boulevard till old distillery in the northern side of boulevard.



Figure 5.11 Potential Streets for Pedestrianisation

JN Street and Marine Street has the potential to be developed as pedestrianized streets. As Shri Aurobindo Ashram is located on Marine street and attracts major number of tourists. Thus, pedestrianization of this street is proposed. JN Street is well known for local as well as foreign tourists for shopping which makes it congested throughout the day. Thus, JN Street can be developed like Pagoda Street in Singapore. Pagoda Street is a street located in Chinatown within the Outram Planning Area in Singapore. it was converted into a pedestrian mall in 1997. With the urbanisation of Singapore in the mid-20th century, the street reinvented itself as a commercial area for retail trade and services, as well as textile and tailoring. The street is part of the Chinatown Historic District, which has been gazetted for

conservation. Street markets on this street have also reintroduced stalls that provide traditional trades such as watch repairing, fortune-telling and clog making.



Figure 5.12 Private Few Traffic Management Examples

5.2.3.1 PARKING AREAS

The parking areas are an important component in the urban transportation network. The parking areas become very important in the Central Business District areas (CBD) and public activity area, where the traffic movement will be heavy. At present the old jail complex in J.N Street within CBD is temporarily used for two-wheeler parking area. And the paved surface above the Grand Canal is used for both four-wheeler and two-wheeler parking area. This two parking lots are coming under the urban local body control. There are 3 two-wheelers paid parking around the Puducherry central bus terminus and at railway station.

Apart from the above demarcated paid parking area identified, the on-street parking also practiced in the entire Boulevard area where heavy traffic movement or public activity is observed. The on-street parking of vehicles coming within white town area (French Colony) are mainly due to recreation and tourism activities, schools and government buildings. The on-street parking of vehicles coming within Tamil quarters are mainly due to health, trade and commercial activities.

It is observed that need for additional parking area is keenly felt in CBD area and recreation, tourism activities, schools and government buildings which is already congested with heavy traffic. In fact, since the kerb parking reduces the carriage way width, the regulation authorities take action to allow parking on one side only. There is no scope for increasing the on-street parking in CBD area during



Figure 5.13 Two-Wheeler parking



Figure 5.14 Private parking in Shopping Complex



Figure 5.15 Development of Parking Facilities in Boulevard Town

Peak hours. In view of this, there is need for providing off street parking facility in potential commercial areas or in close proximity in CBD area. Multi-level parking can be resorted to provide the needed parking facilities. The following locations are recognized for the provision of parking facilities. These locations were suggested by various stakeholders as well in the stakeholders' meetings conducted as part of the preparation of Comprehensive Development Plan.

Table 5-13 Parking Facility Available in PPA

Parking within Puducherry city area		
No	**Location**	**Type of Parking**
1	Old Jail	Organized Ground Level Parking
2	Above Grand Canal	Organized Ground Level Parking

Source: Compiled by Consultant

The stretch on the grand canal can be developed as dedicated parking. Additionally, the street beside hotel promenade and Mahe de Labourdonnais street can be developed as a dedicated parking area. JN Street and MG Roads are amongst the busiest and congested roads of the boulevard town.

Moreover, the Old Jails premises is proposed as a dedicated parking area and wherever the vacant plots are available, those can be used as dedicated parking areas with special permission from the concerned department.

5.2.3.1.1 PROPOSALS FROM CMP

As per the Comprehensive Mobility Plan, the existing peak parking demand is estimated to 11,632 ECS. It is in this context; a parking management plan has been proposed not only to address deficit but also to cater to the future demand. The parking management has been categorised in three phases under this CMP, which are:

Short Term Management Measures:

To meet the parking demand and to ease the traffic congestion in Boulevard Area, parking from MG Road, Mission Street, Jawaharlal Nehru Street and Rangapillai Street shall be shifted to some other street as it attracts high footfall. However, shifting of parking all of a sudden would result in chaos. Hence, premium parking is suggested on major roads to attract less vehicles. Moreover, **Kamarajar Salai, Thiruvalluvar Salai and Maraimali Adigal Salai Should be provided with one side parking**. **Apart from on street parking, three locations are selected for off street parking one in old jail and second in SETC Depot near Venkata Subba Reddiyar square and the third in old distillery.**

Medium Term Management Measures:

As a medium-term measure, it is recommended to enhance off street parking **facility to multi-level car parking**. The existing off-street parking of central jail, bus stand and the proposed off-street parking in short term measures at SETC Depot and Old Bus Stand are converted into Multi Level car parking.

Long Term Management Measures:

In a long run, french town, which has the inheriting heritage value, should be made parking free zone. **On HM Kassim Road, parking is provided for non-motorized transport which would help the commuters park their vehicle on HM Kassim Road and use NMT to enter french town**. The on-street parking on major roads to be removed totally and minor roads are made paid parking. The facilities in multi-level car parking are to enhance the off-street parking, so that the parking can be done only on the off-street proposed locations. On street parking is open only for non-motorized transport.

5.2.4 POLLUTION DUE TO VEHICULAR EMISSION

The overall Air Quality Index (AQI) can give clear view about ambient air and it reveals that PM10 is mainly responsible to determine the air quality which can be easier for a common man to understand. The PM10 concentration in Puducherry region is predominantly from anthropogenic activities. These activities can be increase in the vehicular movement, road dust etc. From the

measured values, it is observed that the other pollutants like SO2, NO2, SPM etc. are in prescribed limit. Puducherry Pollution Control Committee is monitoring ambient air quality at the following three air Quality monitoring stations in Puducherry Region under National Air Quality Monitoring Program:

1. Local Administration Department near Bharathi Park (Residential)
2. Department of Science, Technology & Environment, Anna Nagar (Residential cum Commercial)
3. PIPDIC Industrial Estate, Mettupalayam (Industrial)

Each station is being monitored for 24 hours a day and two days in a week in a cyclic manner. The pollutant assessed are Suspended Particulate Matter, Particulate Matter of size less than 10 µm, Sulphur-di-oxide (SO2) and Nitrogen di oxide (NO2).

In LAD, the slightly higher concentration PM 10 can be due to vehicular emissions and resuspension of road dust and in PIPDIC industrial estate it may be due to point and non-point sources (Automobiles and industrial emissions). Due to strenuous actions taken by PPCC, viz, upgradation of scrubber in the sulphur handling units, the pollutants levels are within the prescribed limits and considerably has reduced in recent years. One of the other reasons for low pollution levels in coastal cities like Puducherry can be attributed to the excellent dilution effects due to sea and breezes which reduces pollution levels.

5.2.5 ROAD ACCIDENTS

The data in respect of road accidents that have been reported to the police department in the traffic police divisions of Puducherry reveal the following data.

Table 5-14 Details of Accidents based of Injuries & Fatality, PPA

Year	Total Number of Fatal Accidents	Total Number of injuries	Total Number of Non-Injuries
2011	87	416	80
2012	73	473	86
2013	72	496	49
2014	52	467	24
2015	66	500	29
Source: Department of Traffic, Puducherry			

From the table no – 5-14 it is observed that out of the total accidents reported in the Puducherry region the fatal injuries had decreased from 14.92 % in 2011 to 11.32 % in 2015 as per the Department of Traffic, Puducherry. On the other hand, the accidents with injuries has increased from 71.36 % in 2011 to 85.76 % in 2015.

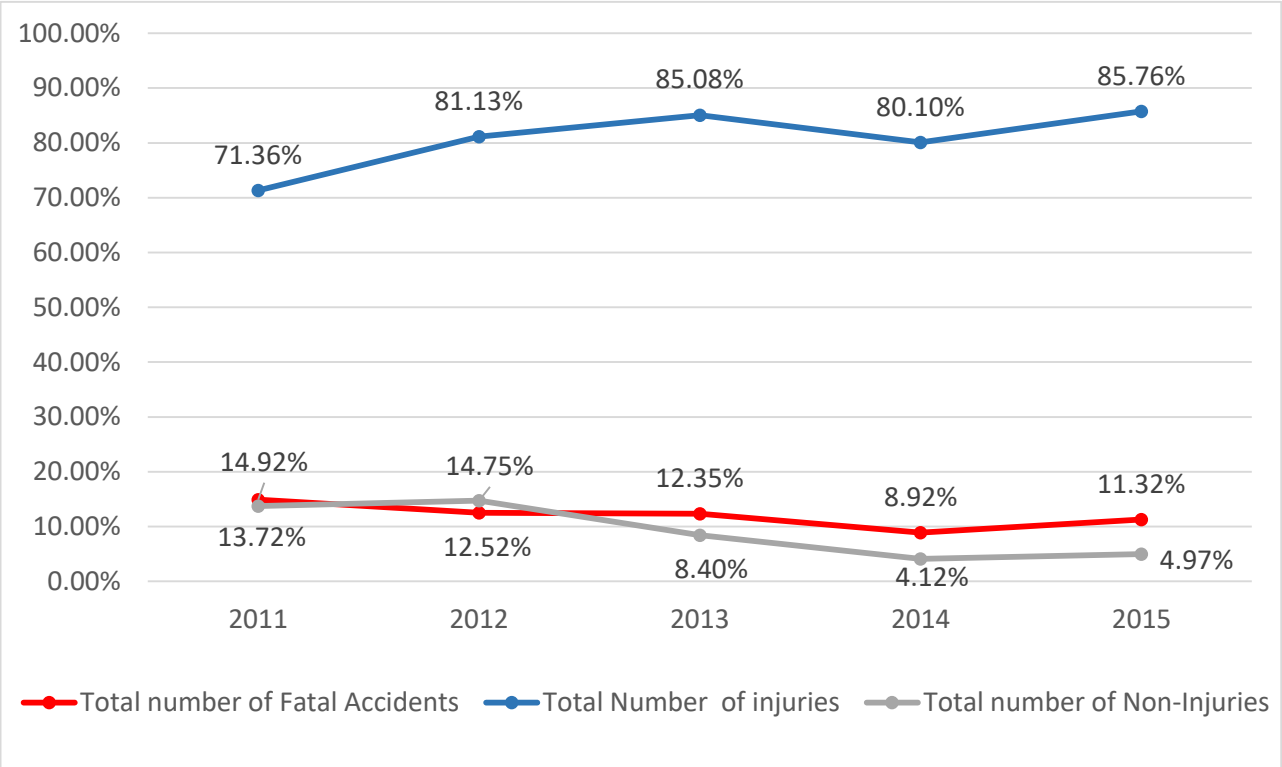


Figure 5.16 Details of accidents in Puducherry Area based on Fatalities & Injuries, 2011-15

5.2.6 TRANSPORTAION

5.2.6.1 TRANSPORTATION BY ROAD

5.2.6.2 URBAN PASSENGER TRANSPORTATION

The Puducherry region has city bus transportation facilities managed by Puducherry Road Transport Corporation (PRTC). The City service division of the PRTC has been operating within the city as well as suburban areas covering entire Puducherry Planning Area, Connecting the following places namely Bahour, Karayambathur, Villianur, Madagadipet, Mannadipet, Sedarapet, Kalapet and Nettapakkam.

Apart from that, there are private bus operators who operates bus from puducherry to other cities and within the region as well. The details of private buses are as below:



Figure 5.17 Puducherry Main Bus terminus view

Table 5-15 Details of Private Buses in Puducherry

Bus Type	Route Type	Route No.	Origin	Destination	No. of Trips
Private	Urban	813	Villianur	Puducherry	7
Private	Urban	813	Puducherry	Villianur	7
Private	Urban	813	Puducherry	Mettupalayam IE	7
Private	Urban	813	Mettupalayam IE	Puducherry	7
Private	Urban	811	Mettupalayam	Puducherry	8
Private	Urban	811	Puducherry	Mettupalayam	8

Private	Urban	811	Puducherry	Indiranagar	8
Private	Urban	811	Indiranagar	Puducherry	8
Private	Urban	812	Villianur	Puducherry	7
Private	Urban	812	Puducherry	Villianur	7
Private	Urban	812	Puducherry	Mettupalayam IE	7
Private	Urban	812	Mettupalayam IE	Puducherry	7
Private	Urban	7799	Gorimedu	Puducherry	6
Private	Urban	7799	Puducherry	Gorimedu	6
Private	Urban	7799	Puducherry	Veerampattinam	6
Private	Urban	7799	Veerampattinam	Puducherry	6
Private	Urban	7797	Gorimedu	Puducherry	10
Private	Urban	7797	Puducherry	Gorimedu	10
Private	Urban	7797	Puducherry	Villianur	3
Private	Urban	7797	Villianur	Puducherry	3
Private	Urban	7797	Puducherry	Veerampattinam	2
Private	Urban	7797	Veerampattinam	Puducherry	2
Private	Urban	2047	Gorimedu	Puducherry	11
Private	Urban	2047	Puducherry	Gorimedu	11
Private	Urban	2047	Puducherry	Veerampattinam	4
Private	Urban	2047	Veerampattinam	Puducherry	4
Private	Urban	2047	Puducherry	lyyankuttipalayam	4
Private	Urban	2047	lyyankuttipalayam	Puducherry	4
Private	Urban	1578	Puducherry	Chinnaveerampattinam	5
Private	Urban	1578	Chinnaveerampattinam	Puducherry	5
Private	Urban	1578	Puducherry	Villianur Kannaki School	5
Private	Urban	1578	Villianur Kannaki School	Puducherry	5
Private	Urban	1579	Puducherry	Chinnaveerampattinam	5
Private	Urban	1579	Chinnaveerampattinam	Puducherry	5
Private	Urban	1579	Puducherry	Villianur Kannaki School	5
Private	Urban	1579	Villianur Kannaki School	Puducherry	5
Private	Urban	5995	Puducherry	Veerampattinam	5
Private	Urban	5995	Veerampattinam	Puducherry	5
Private	Urban	5995	Puducherry	Gorimedu	5
Private	Urban	5995	Gorimedu	Puducherry	5
Private	Urban	5995	Puducherry	Villianur	5
Private	Urban	5995	Villianur	Puducherry	5
Private	Urban	5171	Puducherry	Veerampattinam	3
Private	Urban	5171	Veerampattinam	Puducherry	3
Private	Urban	5171	Puducherry	Gorimedu	8
Private	Urban	5171	Gorimedu	Puducherry	8
Private	Urban	5171	Puducherry	Villianur	4

Private	Urban	5171	Villianur	Puducherry	4
Private	Urban	9745	Puducherry	Veerampattinam	8
Private	Urban	9745	Veerampattinam	Puducherry	8
Private	Urban	9745	Puducherry	Gorimedu	8
Private	Urban	9745	Gorimedu	Puducherry	8
Private	Urban	19	Puducherry	Gorimedu	7
Private	Urban	19	Gorimedu	Puducherry	7
Private	Urban	19	Puducherry	Villianur	7
Private	Urban	19	Villianur	Puducherry	7
Private	Urban	2414	Puducherry	Gorimedu	7
Private	Urban	2414	Gorimedu	Puducherry	7
Private	Urban	2414	Puducherry	Villianur	7
Private	Urban	2414	Villianur	Puducherry	7
Private	Urban	9459	Puducherry	Veerampattinam	3
Private	Urban	9459	Veerampattinam	Puducherry	3
Private	Urban	9459	Puducherry	Gorimedu	12
Private	Urban	9459	Gorimedu	Puducherry	12
Private	Urban	6395	Puducherry	Villianur	8
Private	Urban	6395	Villianur	Puducherry	8
Private	Urban	6395	Puducherry	Kanagachettikulam	8
Private	Urban	6395	Kanagachettikulam	Puducherry	8
Private	Intra City	2828	Puducherry	Gorimedu	10
Private	Intra City	2828	Gorimedu	Puducherry	10
Private	Intra City	2828	Puducherry	Veerampattinam	3
Private	Intra City	2828	Veerampattinam	Puducherry	3
Private	Intra City	2828	Puducherry	Villianur	4
Private	Intra City	2828	Villianur	Puducherry	4
Private	Intra City	355	Thethampakkam	Puducherry	6
Private	Intra City	355	Puducherry	Thethampakkam	6
Private	Intra City	355	Puducherry	Veerampattinam	5
Private	Intra City	355	Veerampattinam	Puducherry	5
Private	Intra City	5000	Puducherry	Villianur	6
Private	Intra City	5000	Villianur	Puducherry	6
Private	Intra City	5000	Puducherry	Konthamur	6
Private	Intra City	5000	Konthamur	Puducherry	6
Private	Intra City	9472	Puducherry	Pudukuppam	3
Private	Intra City	9472	Pudukuppam	Puducherry	3
Private	Intra City	9472	Puducherry	Pannithittu	5
Private	Intra City	9472	Pannithittu	Puducherry	5
Private	Intra City	9472	Puducherry	Kanagachettikulam	2
Private	Intra City	9472	Kanagachettikulam	Puducherry	2

Private	Intra City	7299	Puducherry	Karayamputhur	6
Private	Intra City	7299	Karayamputhur	Puducherry	6
Private	Intra City	589	Puducherry	Melapakkam	6
Private	Intra City	589	Melapakkam	Puducherry	6
Private	Intra City	1944	Puducherry	Karayamputhur	6
Private	Intra City	1944	Karayamputhur	Puducherry	6
Private	Intra City	1944	Puducherry	Kanagachettikulam	3
Private	Intra City	1944	Kanagachettikulam	Puducherry	3
Private	Intra City	1244	Puducherry	Sanniasikuppam	7
Private	Intra City	1244	Sanniasikuppam	Puducherry	7
Private	Intra City	7054	Puducherry	Gorimedu	10
Private	Intra City	7054	Gorimedu	Puducherry	10
Private	Intra City	7054	Puducherry	Thengaithittu	10
Private	Intra City	7054	Thengaithittu	Puducherry	10
Private	Intra City	7967	Puducherry	Gorimedu	6
Private	Intra City	7967	Gorimedu	Puducherry	6
Private	Intra City	7967	Puducherry	Madagadipet	6
Private	Intra City	7967	Madagadipet	Puducherry	6
Private	Intra City	1999	Puducherry	Villianur	8
Private	Intra City	1999	Villianur	Puducherry	8
Private	Intra City	1999	Puducherry	Kanagachettikulam	8
Private	Intra City	1999	Kanagachettikulam	Puducherry	8
Private	Intra City	2529	Puducherry	Madagadipet	5
Private	Intra City	2529	Madagadipet	Puducherry	5
Private	Intra City	2529	Puducherry	Mullodi	5
Private	Intra City	2529	Mullodi	Puducherry	5
Private	Intra City	5955	Puducherry	Sanjivi Nagar	5
Private	Intra City	5955	Sanjivi Nagar	Puducherry	5
Private	Intra City	5955	Puducherry	Pinnatchikuppam	5
Private	Intra City	5955	Pinnatchikuppam	Puducherry	5
Private	Intra City	479	Puducherry	Bahour	7
Private	Intra City	479	Bahour	Puducherry	7
Private	Intra City	479	Puducherry	Kanagachettikulam	2
Private	Intra City	479	Kanagachettikulam	Puducherry	2
Private	Intra City	2809	Puducherry	Madukarai	3
Private	Intra City	2809	Madukarai	Puducherry	3
Private	Intra City	2809	Puducherry	Kanagachettikulam	4
Private	Intra City	2809	Kanagachettikulam	Puducherry	4
Private	Intra City	237	Puducherry	Madukarai	3
Private	Intra City	237	Madukarai	Puducherry	3
Private	Intra City	237	Puducherry	Kanagachettikulam	2

Private	Intra City	237	Kanagachettikulam	Puducherry	2
Private	Intra City	237	Puducherry	Kanagachettikulam	2
Private	Intra City	237	Kanagachettikulam	Puducherry	2
Private	Intra City	3120	Puducherry	Karayamputhur	3
Private	Intra City	3120	Karayamputhur	Puducherry	3
Private	Intra City	3120	Manamedu	Sedarapet	1
Private	Intra City	3120	Sedarapet	Manamedu	1
Private	Intra City	3489	Puducherry	Gorimedu	6
Private	Intra City	3489	Gorimedu	Puducherry	6
Private	Intra City	3489	Puducherry	Madukarai	6
Private	Intra City	3489	Madukarai	Puducherry	6
Private	Intra City	2919	Puducherry	Manamedu	5
Private	Intra City	2919	Manamedu	Puducherry	5
Private	Intra City	3369	Puducherry	Karayamputhur	6
Private	Intra City	3369	Karayamputhur	Puducherry	6
Private	Intra City	4732	Puducherry	Karayamputhur	7
Private	Intra City	4732	Karayamputhur	Puducherry	7
Private	Intra City	2929	Puducherry	Karayamputhur	6
Private	Intra City	2929	Karayamputhur	Puducherry	6
Private	Intra City	6386	Puducherry	Karayamputhur	6
Private	Intra City	6386	Karayamputhur	Puducherry	6
Private	Intra City	6386	Shivaji Nagar	Puducherry	1
Private	Intra City	6386	Puducherry	Shivaji Nagar	1
Private	Intra City	7999	Puducherry	Sedarapet	9
Private	Intra City	7999	Sedarapet	Puducherry	9
Private	Intra City	7999	Puducherry	Chettipet	1
Private	Intra City	7999	Chettipet	Puducherry	1
Private	Intra City	5000	Puducherry	Sedarapet	1
Private	Intra City	5000	Sedarapet	Puducherry	1
Private	Intra City	5000	Puducherry	Karayamputhur	3
Private	Intra City	5000	Karayamputhur	Puducherry	3
Private	Intra City	9599	Puducherry	Kanagachettikulam	6
Private	Intra City	9599	Kanagachettikulam	Puducherry	6
Private	Intra City	9599	Puducherry	Moorthikuppam	6
Private	Intra City	9599	Moorthikuppam	Puducherry	6
Private	Intra City	5591	Puducherry	Madukarai	6
Private	Intra City	5591	Madukarai	Puducherry	6
Private	Intra City	4554	Puducherry	Thirukkanur	5
Private	Intra City	4554	Thirukkanur	Puducherry	5
Private	Intra City	4554	Puducherry	Moorthikuppam	5
Private	Intra City	4554	Moorthikuppam	Puducherry	5

Private	Intra City	8428	Puducherry	Madagadipet	4
Private	Intra City	8428	Madagadipet	Puducherry	4
Private	Intra City	8428	Puducherry	Kanagachettikulam	6
Private	Intra City	8428	Kanagachettikulam	Puducherry	6
Private	Intra City	1675	Puducherry	Karayamputhur	1
Private	Intra City	1675	Karayamputhur	Puducherry	1
Private	Intra City	1675	Puducherry	Kanagachettikulam	7
Private	Intra City	1675	Kanagachettikulam	Puducherry	7
Private	Intra City	1675	Puducherry	Manapet	1
Private	Intra City	1675	Manapet	Puducherry	1
Private	Intra City	7063	Puducherry	Kanniakoil	5
Private	Intra City	7063	Kanniakoil	Puducherry	5
Private	Intra City	7063	Puducherry	Madagadipet	5
Private	Intra City	7063	Madagadipet	Puducherry	5
Private	Intra City	6582	Puducherry	Thirukkanur	7
Private	Intra City	6582	Thirukkanur	Puducherry	7
Private	Intra City	6582	Puducherry	Madagadipet	1
Private	Intra City	6582	Madagadipet	Puducherry	1
Private	Intra City	2727	Puducherry	Puducherry	7
Private	Intra City	2727	Puducherry	Madukarai	1
Private	Intra City	2727	Madukarai	Puducherry	1
Private	Intra City	199	Puducherry	Bahour	7
Private	Intra City	199	Bahour	Puducherry	7
Private	Intra City	1535	Puducherry	Thavalakuppam	3
Private	Intra City	1535	Thavalakuppam	Puducherry	3
Private	Intra City	1535	Puducherry	Thirukkanur	5
Private	Intra City	1535	Thirukkanur	Puducherry	5
Private	Intra City	9499	Puducherry	Madukarai	6
Private	Intra City	9499	Madukarai	Puducherry	6
Private	Intra City	5217	Puducherry	Sedarapet	4
Private	Intra City	5217	Sedarapet	Puducherry	4
Private	Intra City	5217	Puducherry	Soriankuppam	4
Private	Intra City	5217	Soriankuppam	Puducherry	4
Private	Intra City	2929	Puducherry	Karayamputhur	6
Private	Intra City	2929	Karayamputhur	Puducherry	6
Private	Intra City	8687	Puducherry	Gorimedu	9
Private	Intra City	8687	Gorimedu	Puducherry	9
Private	Intra City	8687	Puducherry	Madagadipet	5
Private	Intra City	8687	Madagadipet	Puducherry	5
Private	Intra City	8687	Gorimedu	Villianur	2
Private	Intra City	8687	Villianur	Gorimedu	2

Private	Intra City	6080	Puducherry	Thettampakkam	5
Private	Intra City	6080	Thettampakkam	Puducherry	5
Private	Intra City	6080	Puducherry	Veerampattinam	5
Private	Intra City	6080	Veerampattinam	Puducherry	5
Private	Intra City	3663	Puducherry	Veerampattinam	6
Private	Intra City	3663	Veerampattinam	Puducherry	6
Private	Intra City	3663	Puducherry	Sanniyasikuppam	6
Private	Intra City	3663	Sanniyasikuppam	Puducherry	6
Private	Intra City	6989	Puducherry	Thirukkanur	6
Private	Intra City	6989	Thirukkanur	Puducherry	6
Private	Intra City	345	Puducherry	Molapakkam	6
Private	Intra City	345	Molapakkam	Puducherry	6
Private	Intra City	957	Puducherry	Kanagachettikulam	5
Private	Intra City	957	Kanagachettikulam	Puducherry	5
Private	Intra City	957	Puducherry	Kanniakoil	3
Private	Intra City	957	Kanniakoil	Puducherry	3
Private	Intra City	957	Puducherry	Manalipet	2
Private	Intra City	957	Manalipet	Puducherry	2
Private	Intra City	237	Puducherry	Madukarai	5
Private	Intra City	237	Madukarai	Puducherry	5
Private	Intra City	6979	Puducherry	PS Palayam	6
Private	Intra City	6979	PS Palayam	Puducherry	6
Private	Intra City	1226	Puducherry	Lingareddypalayam	4
Private	Intra City	1226	Lingareddypalayam	Puducherry	4
Private	Intra City	1226	Puducherry	Kanagachettikulam	4
Private	Intra City	1226	Kanagachettikulam	Puducherry	4
Private	Intra City	6486	Puducherry	Chettipet	6
Private	Intra City	6486	Chettipet	Puducherry	6
Private	Intra City	6486	Puducherry	Gorimedu	6
Private	Intra City	6486	Gorimedu	Puducherry	6
Private	Intra City	6804	Puducherry	Kanagachettikulam	5
Private	Intra City	6804	Kanagachettikulam	Puducherry	5
Private	Intra City	6804	Puducherry	Pudukuppam	8
Private	Intra City	6804	Pudukuppam	Puducherry	8
Private	Intra City	2939	Kanagachettikulam	Puducherry	9
Private	Intra City	2939	Puducherry	Kanagachettikulam	9
Private	Intra City	2939	Puducherry	Sedarapet	3
Private	Intra City	2939	Sedarapet	Puducherry	3
Private	Intra City	1599	Puducherry	Thirukkanur	6
Private	Intra City	1599	Thirukkanur	Puducherry	6
Private	Intra City	2799	Puducherry	Sanniyasikuppam	6

Private	Intra City	2799	Sanniyasikuppam	Puducherry	6
Private	Intra City	797	Puducherry	Chettipet	6
Private	Intra City	797	Chettipet	Puducherry	6
Private	Intra City	797	Puducherry	Gorimedu	6
Private	Intra City	797	Gorimedu	Puducherry	6
Private	Intra City	7999	Puducherry	Sedarapet	6
Private	Intra City	7999	Sedarapet	Puducherry	6
Private	Intra City	7999	Puducherry	Katterikuppam	5
Private	Intra City	7999	Katterikuppam	Puducherry	5
Private	Intra City	6446	Puducherry	Pinnatchikuppam	7
Private	Intra City	6446	Pinnatchikuppam	Puducherry	7
Private	Intra City	1949	Puducherry	Katterikuppam	7
Private	Intra City	1949	Katterikuppam	Puducherry	7
Private	Intra City	7779	Puducherry	Kanagachettikulam	5
Private	Intra City	7779	Kanagachettikulam	Puducherry	5
Private	Intra City	7779	Puducherry	Madagadipet	5
Private	Intra City	7779	Madagadipet	Puducherry	5
Private	Intra City	1935	Puducherry	Kanagachettikulam	6
Private	Intra City	1935	Kanagachettikulam	Puducherry	6
Private	Intra City	1935	Puducherry	Kanniakoil	6
Private	Intra City	1935	Kanniakoil	Puducherry	6
Private	Intra City	1993	Puducherry	Madukarai	7
Private	Intra City	1993	Madukarai	Puducherry	7
Private	Intra City	1993	Puducherry	Karayamputhur	1
Private	Intra City	1993	Karayamputhur	Puducherry	1
Private	Intra City	835	Puducherry	lyyankuttipalayam	3
Private	Intra City	835	lyyankuttipalayam	Puducherry	3
Private	Intra City	835	Puducherry	Soriankuppam	6
Private	Intra City	835	Soriankuppam	Puducherry	6
Private	Intra City	5459	Puducherry	Pinnatchikuppam	5
Private	Intra City	5459	Pinnatchikuppam	Puducherry	5
Private	Intra City	5459	Puducherry	Shivaji Nagar	5
Private	Intra City	5459	Shivaji Nagar	Puducherry	5
Private	Intra City	2828	Puducherry	Kanagachettikulam	4
Private	Intra City	2828	Kanagachettikulam	Puducherry	4
Private	Intra City	2828	Puducherry	Pannithittu	3
Private	Intra City	2828	Pannithittu	Puducherry	3
Private	Intra City	2828	Puducherry	Madagadipet	3
Private	Intra City	2828	Madagadipet	Puducherry	3
Private	Intra City	2828	Puducherry	Bahour	1
Private	Intra City	2828	Bahour	Puducherry	1

Private	Intra City	7913	Puducherry	Karayamputhur	6
Private	Intra City	7913	Karayamputhur	Puducherry	6
Private	Intra City	5267	Puducherry	Manamedu	6
Private	Intra City	5267	Manamedu	Puducherry	6
Private	Intra City	5265	Puducherry	Bahour	4
Private	Intra City	5265	Bahour	Puducherry	4
Private	Intra City	5265	Puducherry	Thirukkanur	4
Private	Intra City	5265	Thirukkanur	Puducherry	4
Private	Intra City	9699	Puducherry	Karayamputhur	7
Private	Intra City	9699	Karayamputhur	Puducherry	7
Private	Intra City	1948	Puducherry	Madagadipet	6
Private	Intra City	1948	Madagadipet	Puducherry	6
Private	Intra City	1230	Puducherry	Nallavadu	10
Private	Intra City	1230	Nallavadu	Puducherry	10
Private	Intra City	1230	Puducherry	Kurunji Nagar	6
Private	Intra City	1230	Kurunji Nagar	Puducherry	6
Private	Intra City	6696	Puducherry	Madukarai	2
Private	Intra City	6696	Madukarai	Puducherry	2
Private	Intra City	6696	Puducherry	Karayamputhur	4
Private	Intra City	6696	Karayamputhur	Puducherry	4
Private	Intra City	6228	Puducherry	Madagadipet	6
Private	Intra City	6228	Madagadipet	Puducherry	6
Private	Intra City	7476	Puducherry	Madukarai	3
Private	Intra City	7476	Madukarai	Puducherry	3
Private	Intra City	7476	Puducherry	Gorimedu	4
Private	Intra City	7476	Gorimedu	Puducherry	4
Private	Intra City	7476	Puducherry	Kanagachettikulam	4
Private	Intra City	7476	Kanagachettikulam	Puducherry	4
Private	Intra City	PY 95	Puducherry	Bahour	4
Private	Intra City	PY 95	Bahour	Puducherry	4
Private	Intra City	PY 95	Puducherry	Koonichampet	4
Private	Intra City	PY 95	Koonichampet	Puducherry	4
Private	Intra City	6009	Puducherry	Chettipet	4
Private	Intra City	6009	Chettipet	Puducherry	4
Private	Intra City	6009	Puducherry	Kanagachettikulam	4
Private	Intra City	6009	Kanagachettikulam	Puducherry	4
Private	Intra City	7989	Puducherry	Sanniyasikuppam	6
Private	Intra City	7989	Sanniyasikuppam	Puducherry	6
Private	Intra City	124/PY/95	Puducherry	Kanagachettikulam	6
Private	Intra City	124/PY/95	Kanagachettikulam	Puducherry	6
Private	Intra City	124/PY/95	Puducherry	Pudukuppam	6

Private	Intra City	124/PY/95	Pudukuppam	Puducherry	6
Private	Intra City	6095	Puducherry	Gorimedu	5
Private	Intra City	6095	Gorimedu	Puducherry	5
Private	Intra City	6095	Puducherry	PS Palayam	5
Private	Intra City	6095	PS Palayam	Puducherry	5
Private	Intra City	1958	Puducherry	Lingareddypalayam	6
Private	Intra City	1958	Lingareddypalayam	Puducherry	6
Private	Intra City	175/PY/97	Puducherry	Madukarai	5
Private	Intra City	175/PY/97	Madukarai	Puducherry	5
Private	Intra City	175/PY/97	Puducherry	Gorimedu	5
Private	Intra City	175/PY/97	Gorimedu	Puducherry	5
Private	Intra City	2644	Puducherry	Kanagachettikulam	5
Private	Intra City	2644	Kanagachettikulam	Puducherry	5
Private	Intra City	2644	Puducherry	Bahour	3
Private	Intra City	2644	Bahour	Puducherry	3
Private	Intra City	2644	Puducherry	Arachikuppam	2
Private	Intra City	2644	Arachikuppam	Puducherry	2
Private	Intra City	3408	Puducherry	Thirukkanur	7
Private	Intra City	3408	Thirukkanur	Puducherry	7
Private	Intra City	122	Puducherry	Thirukkanur	7
Private	Intra City	122	Thirukkanur	Puducherry	7
Private	Intra City	4016	Puducherry	Parikalpet	8
Private	Intra City	4016	Parikalpet	Puducherry	8
Private	Intra City	797	Puducherry	Kanagachettikulam	6
Private	Intra City	797	Kanagachettikulam	Puducherry	6
Private	Intra City	797	Puducherry	Bahour	6
Private	Intra City	797	Bahour	Puducherry	6
Private	Intra City	3737	Puducherry	Gorimedu	1
Private	Intra City	3737	Gorimedu	Puducherry	1
Private	Intra City	3737	Puducherry	Madukarai	4
Private	Intra City	3737	Madukarai	Puducherry	4
Private	Intra City	3737	Puducherry	Kanagachettikulam	5
Private	Intra City	3737	Kanagachettikulam	Puducherry	5
Private	Intra City	2040	Puducherry	Sedarapet	6
Private	Intra City	2040	Sedarapet	Puducherry	6
Private	Intra City	2040	Puducherry	Sedarapet	6
Private	Intra City	2040	Sedarapet	Puducherry	6
Private	Intra City	2030	Puducherry	Muttarampet	6
Private	Intra City	2030	Muttarampet	Puducherry	6
Private	Intra City	477	Puducherry	Kariamanikkam	4
Private	Intra City	477	Kariamanikkam	Puducherry	4

Private	Intra City	477	Puducherry	Patthukannu	3
Private	Intra City	477	Patthukannu	Puducherry	3
Private	Intra City	477	Puducherry	Veerampattinam	8
Private	Intra City	477	Veerampattinam	Puducherry	8
Private	Intra City	2079	Puducherry	Nettapakkam	7
Private	Intra City	2079	Nettapakkam	Puducherry	7
Private	Intra City	1997	Puducherry	Veerampattinam	8
Private	Intra City	1997	Veerampattinam	Puducherry	8
Private	Intra City	1997	Puducherry	Gorimedu	5
Private	Intra City	1997	Gorimedu	Puducherry	5
Private	Intra City	2010	Puducherry	Sedarapet	12
Private	intra City	2010	Sedarapet	Puducherry	12
Private	Intra City	777	Puducherry	Lingareddypalayam	6
Private	Intra City	777	Lingareddypalayam	Puducherry	6
Private	intra City	1272	Puducherry	Kanagachettikulam	4
Private	Intra City	1272	Kanagachettikulam	Puducherry	4
Private	Intra City	1272	Puducherry	Madukarai	4
Private	Intra City	1272	Madukarai	Puducherry	4
Private	Intra City	2112	Madagadipet	Puducherry	6
Private	Intra City	2112	Puducherry	Madagadipet	6
Private	Intra City	PY80	Vikkaravandi	Puducherry	4
Private	intra City	PY80	Puducherry	Vikkaravandi	4
Private	Intra City	1920	Puducherry	Kanagachettikulam	3
Private	Intra City	1920	Kanagachettikulam	Puducherry	3
Private	Intra City	1920	Puducherry	Thirukkanur	5
Private	Intra City	1920	Thirukkanur	Puducherry	5
Private	intra City	1920	Puducherry	Manalipet	1
Private	Intra City	1920	Manalipet	Puducherry	1
Private	intra City	456	Puducherry	Madukarai	6
Private	Intra City	456	Madukarai	Puducherry	6
Private	Intra City	456	Puducherry	Gorimedu	6
Private	Intra City	456	Gorimedu	Puducherry	6
Private	Intra City	7766	Puducherry	Karayamputhur	6
Private	Intra City	7766	Karayamputhur	Puducherry	6
Private	Intra City	995	Puducherry	Gorimedu	4
Private	Intra City	995	Gorimedu	Puducherry	4
Private	Intra City	995	Puducherry	Madugarai	4
Private	Intra City	995	Madugarai	Puducherry	4
Private	Intra City	2806	Puducherry	Madagadipet	6
Private	Intra City	2806	Madagadipet	Puducherry	6
Private	Intra City	2806	Puducherry	Kanagachettikulam	6

Private	Intra City	2806	Kanagachettikulam	Puducherry	6
Private	Intra City	PY 88	Puducherry	Thirukkanur	5
Private	Intra City	PY 88	Thirukkanur	Puducherry	5
Private	Intra City	PY 88	Puducherry	Kanagachettikulam	3
Private	Intra City	PY 88	Kanagachettikulam	Puducherry	3
Private	Intra City	PY 88	Puducherry	Manalipet	1
Private	Intra City	PY 88	Manalipet	Puducherry	1
Private	Intra City	4549	Puducherry	Manalipattu	4
Private	Intra City	4549	Manalipattu	Puducherry	4
Private	Intra City	4549	Puducherry	Kanagachettikulam	4
Private	Intra City	4549	Kanagachettikulam	Puducherry	4

Source: Comprehensive Mobility Plan, 2015

5.2.6.3 PUDUCHERRY MAIN BUS TERMINUS

The existing Bus terminal with an area approximately 4 acres at Maraimalai Adigal salai for the whole Puducherry region. The old Bus stand near Botanical garden was also operated few local buses to cater the need of local people. But later with inadequate availability of space the local buses were partially accommodated inside the main bus stand and the place is now utilized for Ulavar Sandhai, generates more traffic volume in the early morning hours. About 63,042 commuters are observed to be using the bus stand in a day in the year 2014.

Table 5-16 Total Number of Commuters from Puducherry Bus terminus, 2009-13

Year	Commuters in lakhs
2009-2010	49.36
2010-2011	52.26
2011-2012	55.17
2012-2013	58.07
2013-2014	63.88

Source: Puducherry Road Transport Corporation, Puducherry

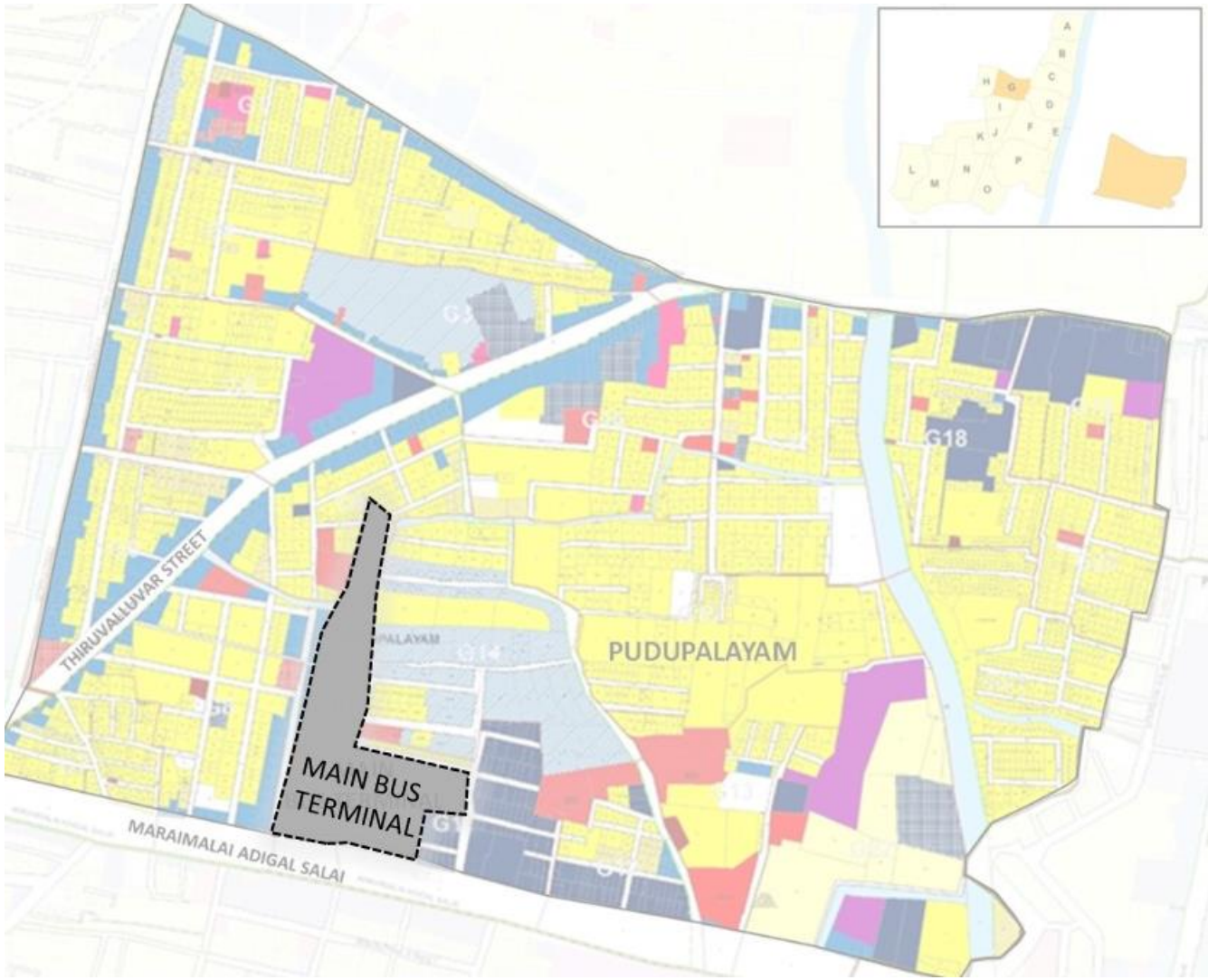


Figure 5.18 Private parking in shopping Complex

5.2.6.4 INTRA CITY BUS SERVICES

The total fleet size of PRTC is 111 buses. In this, 50 buses are used for city bus operations and 61 for intercity bus operation. The Puducherry is fairly connected with local nearby villages with total 23 buses. The city service covers the following localities in Puducherry region.

Table 5-17 List of Intra City Services from Puducherry, 2016

S.NO	ROUTE NAME (Round trip)	NO. OF BUSES
1	Puducherry to Pudukuppam	2
2	Puducherry to Puducherry	1
3	Puducherry to Anandhapuram	1
4	Puducherry to Bahour	2
5	Puducherry to Thirukannur	3
6	Puducherry to Karayamputhur	1
7	Puducherry to Villianur	1
8	Puducherry to Manamedu	1
9	Puducherry to Nallavadu	1
10	Puducherry to Parikalpet	1
11	Puducherry to PIMS	1
12	Puducherry to Chinnakarayambathur	1
13	Puducherry to Sedarapet	2
14	Puducherry to Gorimedu	1
15	Puducherry to Madagadipet	1
16	Puducherry to Mullodai	1
17	Madukarai to PIMS	1
18	Madukarai to Gorimedu	1
Source:- PRTC, Puducherry		

In Puducherry Planning Area, very few areas are covered under the public bus services. As Puducherry is an enclave of Tamilnadu, it has scattered land parcels in different direction. However, PRTC covers almost all the land parcels but does not include all the villages of that area. Except few villages, the remaining villages which are not covered by public buses, majority of them are covered under the private bus routes.

Table 5-18 Details of Urban Bus Service, Puducherry Planning Area

S.NO	ROUTE NAME	NO OF BUSES
1	Indira Nagar to Mettupalayam	1
2	Mettupalayam to Indira Nagar	1
3	Villianur to Mettupalayam	1
4	Mettupalayam to Villianur	1
5	Veerampattinam to Thavalakuppam	1
6	Thavalakuppam to Veerampattinam	1
7	Karikalampakkam to PIMS	1
8	PIMS to Karikalampakkam	1

9	G.H to Chinnaveerampattinam	1
10	Puducherry to Airport	1
11	Railway station to Airport	1
12	Veerampattinam to Gorimedu	1
13	Gorimedu to Veerampattinam	1

Source:- PRTC, Puducherry

The Complete Puducherry urban area is well linked with public transport facilities. The important areas covering within urban area are major hospitals, educational institutions, tourism locations, religious places and major transport nodal points.

5.2.6.5 INTER CITY BUS SERVICES OPERATED BY PRTC

The intercity public transport system table given below:

Table 5-19 List of Inter-City Bus Service from Puducherry Bus Terminus, 2016

S.NO	ROUTE NAME	NO OF BUSES
1	Chennai PP	1
2	Chennai LSS	1
3	Mahe	2
4	Tirupati	3
5	Velankanni	1
6	Karaikal	1
7	Nagapattinam	1
8	Bangalore	3
9	Nagarkoil	2
10	Kumuli	2
11	Chennai ECR	11
12	Villupuram	2
13	Marakkanam	2

Source:- PRTC, Puducherry

Apart from the city services the transport infrastructure available in the city includes the state transport services running to different states. Private bus transport is also available. The transport services operated by transport corporations of Tamilnadu, Kerala, Karnataka, Andhra Pradesh and Mahe are operating through Puducherry using the available infrastructure. It is reported that Puducherry road transport Corporation carries 63.88 lakhs of passengers in the year 2014.

5.2.6.6 Intermediate Public Transport

In Puducherry region, there are two main types of intermediate transport systems prevailing. The first one are cycle, auto rickshaw or taxi to collect the passengers from door to door. The other one is fixed route or informal public transport systems such as share autos, tempos & mini buses from prominent locations like bus stands, commercial streets, public institutes etc. For very short trips within the city and last mile travel to residential layout public transport system offer very less options and hence IPT systems play vital role in this segment as feeder to mass public transport systems. Auto stands are located at all prime points of the city in and around residential layouts, it is considered as the most affordable means of transportation next to Public Transport services.

The shuttle service is also mostly preferred by the working population who commute on a fixed route like from major residential settlements to city bus stand or prominent employment points within the planning area. The tricycle rickshaw is still in function especially in Boulevard area for tourist to have the glimpse of cityscape, cultural heritage, and architecture.

Since the IPT supports especially for the poor, who cannot afford own private vehicles, it provides an alternative to transportation option to the public. Hence introducing the battery rickshaw, Auto rickshaw CNG may support the people to meet the travel of shorter distance of public as well as to cater the tourism population

5.2.7 TRAFFIC CHARACTERISTICS

The traffic stream includes a combination of driver and vehicle behavior. The driver or human behavior being non-uniform, traffic stream is also non-uniform in nature. It is influenced not only by the individual characteristics of both vehicle and human but also by the way a group of such units interacts with each other. Thus, a flow of traffic through any street of defined characteristics will vary both by location and time corresponding to the changes in the human behavior. In Puducherry, due to lack of defined regulations, the characteristics of traffic varies vastly making it heterogeneous in character.

A large number of vehicles move into and out of Puducherry Planning Area indicating the strong interrelationship between the Puducherry Region and its immediate region ie. Urban centers of Tamilnadu. Two wheelers accounted for a large share (40 to 60 %) and the share of cars was reasonably high on Chennai road. Traffic volume on internal city roads are high. Speeds on the roads are generally low ranging between 10 kmph and 27 kmph during the peak hour.

Turning movements at intersections were high resulting in delays and queues. Parking of vehicles is emerging as a major demand and critical problem. The limited capacities of narrow roads of the city are further eroded by parking of vehicles on both sides, all along the road stretches

5.2.7.1 PEDESTRIAN MOVEMENTS

Pedestrian infrastructure is insufficient in the entire urban area. Since the entire CBD area is infringed by off street / on street parking and the pedestrian places are occupied by hawkers, almost stops the walkers walking on the pedestrian and spilling out on roads. The reconnaissance review indicates that a large volume of pedestrians use the Jawaharlal street, Mahatma Gandhi street, Mission street in the Central business district, Bussy street at the periphery of CBD, Ranga Pillai street near Goubert market, Anna Salai, Maraimalai Adigal salai, Kamaraj Salai at the fringe of CBD, JIPMER road near JIPMER hospital and all approach roads to Beach front. These roads should be easily approached by the pedestrians only if there is proper planning for the pedestrian movement is there.

5.3 EXISTING RAIL NETWORK & RAIL TRANSPORTATION

Puducherry railway station is a terminal which is linked by a railway branch line from the five-way junction at Villupuram and Chennai and is part of the southern railway broad gauge system. There are two railway station falling in Puducherry Planning Area one is Puducherry Railway station and the other is Villianur Railway Station. The area of Puducherry railway station and Villianur Railway Station is 83187.4 sq mt and 1718.7 sq mt respectively.

All the trains majorly destined to Chennai Egmore, Villupuram, Tirupati, New Delhi, Kanyakumari, Howrah, Mangalore, Bhubaneswar, Dadar (Mumbai) and Yeshvantpur (Bangalore). The details of number of trains from Puducherry to other nodes are given below:

Table 5-20 List of Trains from Puducherry Railway Station

TRAIN NO	TRAIN NAME	FROM	TO	DAYS	VIA
16116	Exp	Puducherry	Chennai Egmore	Daily	Villupuram
56862	Pass	Puducherry	Villupuram	Daily	Valavanur
17414	Exp	Puducherry	Tirupati	Sunday	Vellore Cantt
22403	SF	Puducherry	New Delhi	Wednesday	Chennai Egmore
16861	Exp	Puducherry	Kanyakumari	Thursday	Cuddalore Port
12868	SF	Puducherry	Howrah	Wednesday	Vellore Cantt
56042	Pass	Puducherry	Tirupati	Daily	Kanchipuram
56038	Pass	Puducherry	Chennai Egmore	Daily	Villupuram
56864	Pass	Puducherry	Villupuram	Daily	Valavanur
16855	Exp	Puducherry	Mangalore Central	Thursday	Vriddhachalam, Salem, Erode
16857	Exp	Puducherry	Mangalore Central	Saturday	Vriddhachalam, Tiruchchirapalli, Karur, Erode
12897	SF	Puducherry	Bhubaneshwar	Wednesday	Chennai Egmore
56866	Pass	Puducherry	Villupuram	Daily	Valavanur
11006	Chalukya Exp	Puducherry	Dadar	Tuesday, Wednesday & Sunday	Vellore Cantt
16574	Exp	Puducherry	Yashvantpur	Saturday	Salem

Source: Puducherry Railway Station

The detail of no of commuters from Puducherry region to surrounding area are given below.

Table 5-21 Number of Commuters from Puducherry Railway Station

NO OF COMMUTERS FROM PUDUCHERRY TO SURROUNDING REGION					
S.NO	**MONTH**	**2011-12**	**2012-13**	**2013-14**	**2014-15**
1	APRIL	34200	54591	46283	46250
2	MAY	36000	75762	66090	56177
3	JUNE	47630	56228	51297	46333
4	JULY	34382	53079	39023	42322
5	AUGUST	36070	55660	42556	40980
6	SEPTEMBER	35103	58502	53346	46730
7	OCTOBER	45302	58707	52539	44995
8	NOVEMBER	34666	50327	40586	36953
9	DECEMBER	42874	53817	46183	39087

10	JANUARY	45340	57266	44753	49171
11	FEBRUARY	57786	43327	33312	29798
12	MARCH	60700	46454	40721	31072
TOTAL		510053	663720	556689	509868

Source: Puducherry Railway Station

From the graph the maximum commuters are travelling in the month of February, March, April and May. Though development in the rail network system in the last 5 years pulled the commuters the overall total commuters are nearly constant. The improper access to bus terminals and railway

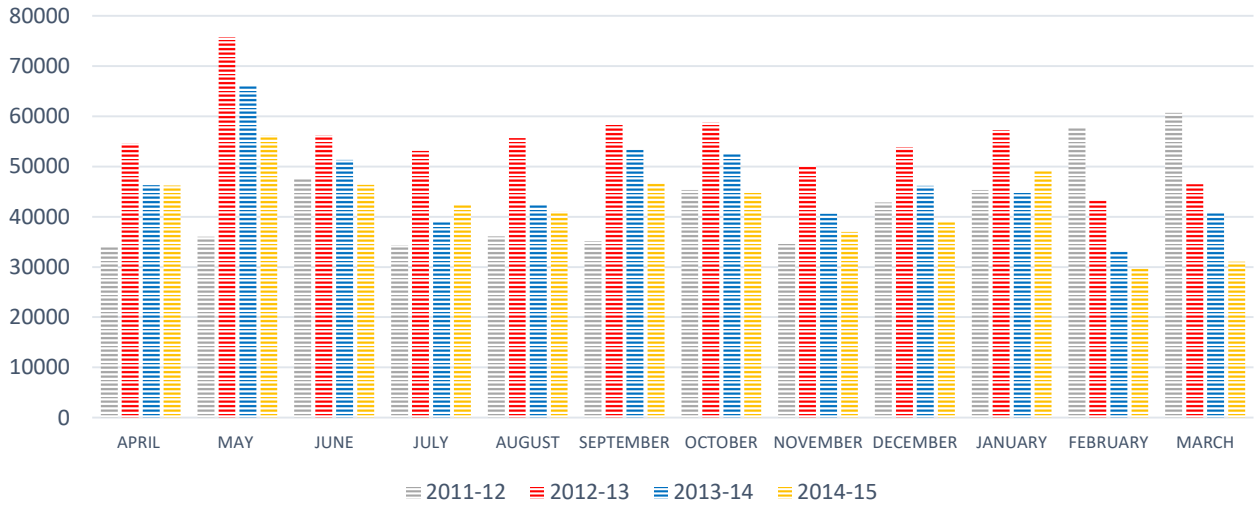


Figure 5.19 Number of Commuters from Puducherry Region to Surrounding Areas, 2011-15

station discourages the people to use rail system. Encouraging the local trains within Puducherry area may reduce the traffic volume on the important corridors.

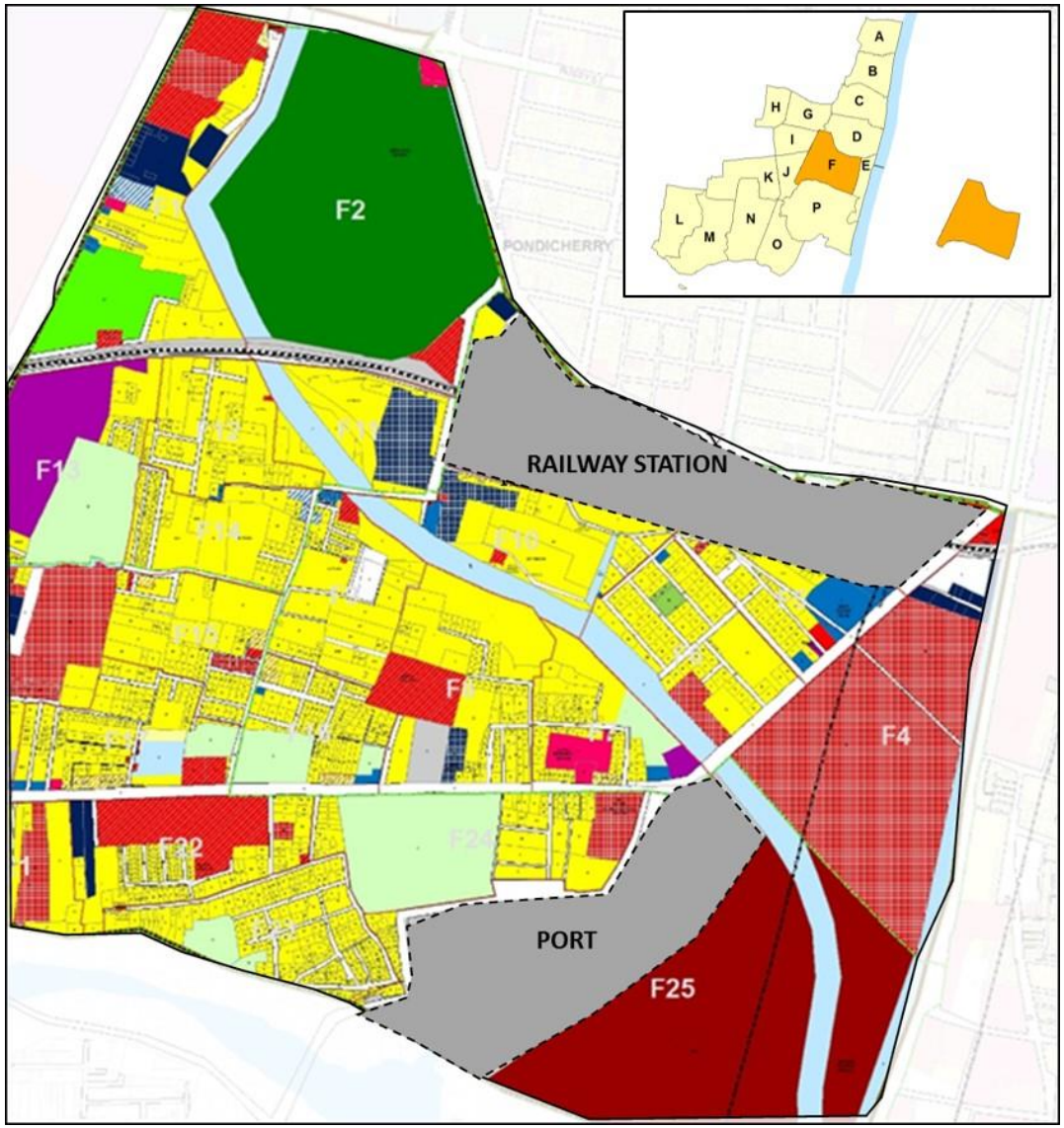


Figure 5.20 Location of Puducherry Railway Station & Port

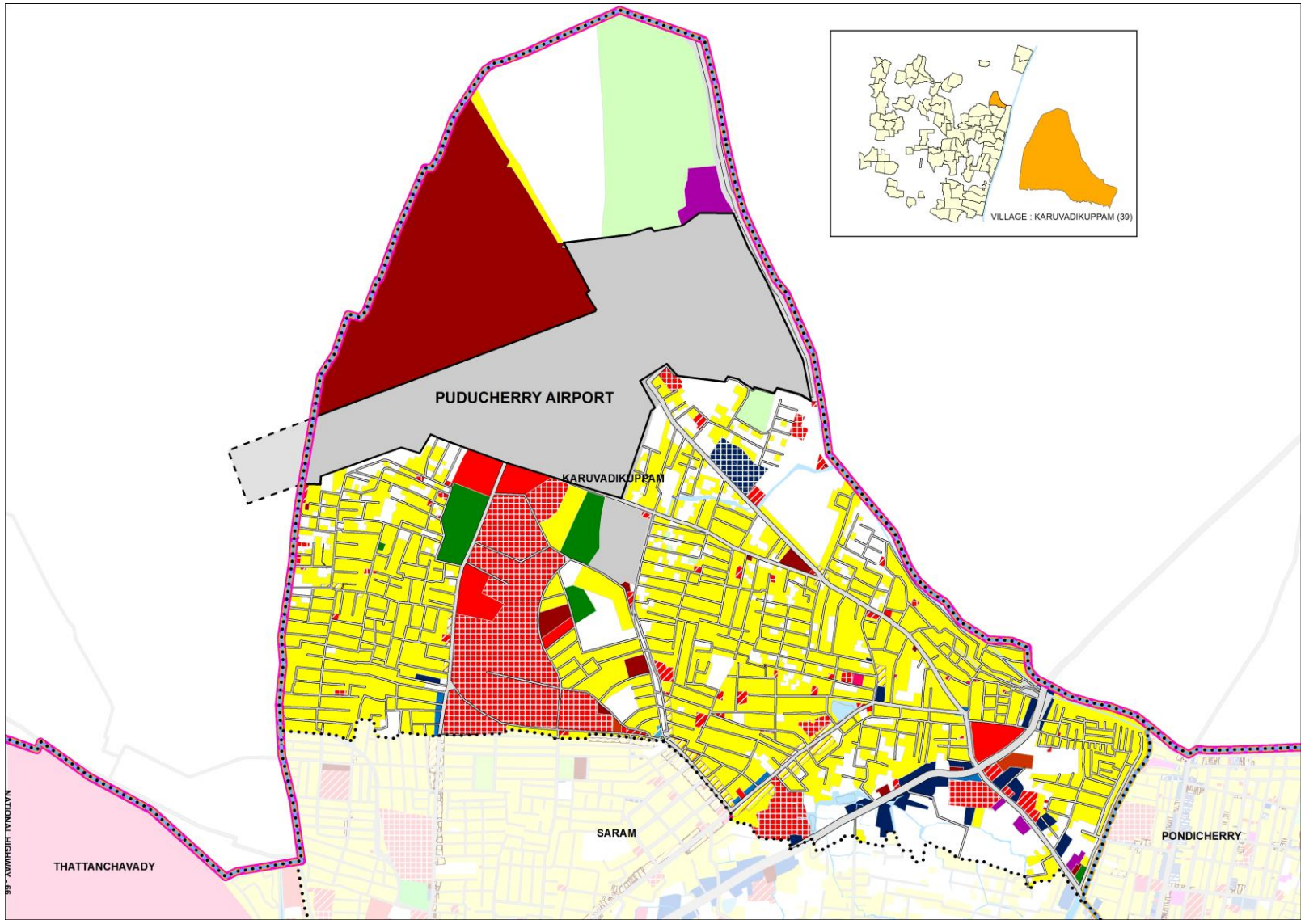


Figure 5.21 Location of Puducherry Airport

5.4 AIRPORT

Puducherry Airport is located at Lawspet in Puducherry with an area of 681134 sq mt. The airport has charter flights and the local flying training school operating out of this airport. The Puducherry Government has decided to expand the Pondicherry Airport to accommodate larger aircraft. Pondicherry Airport has one asphalt runway, 1500 metres long and 30 metres wide. It has a 100 by 150 metre apron and the terminal building can handle 300 passengers during peak hours. Navigational aids at Pondicherry include an Aerodrome beacon. A Memorandum of Understanding was signed between the local Government and the Airports Authority of India in June 2007 for expansion of the airport. In the first phase, the runway was extended by 260 metres to enable landing of ATR type of aircraft.

The ongoing Phase-II will see an extension of an additional 1100 meters of runway by acquiring another 200 acres of land in the adjoining state of Tamilnadu to operate larger jet aircraft

The Puducherry region currently has an airport facility, which is yet to be brought under major civil aviation network. As of now flight service are operated to Bangalore and Hyderabad. The nearest major functional domestic and international airport is in Chennai which is almost 135 km proximity from Pondicherry region. The Bangalore is also easily reachable through airways from Chennai airport.

5.5 PORT

The existing minor port of Pondicherry is situated on the east coast of India between two major ports namely, Chennai and Tuticorin with an area of 325911.10 sq mt. It is an open roadstead anchorage port situated about 150 kms South of Chennai. The port is suitable for lighterage operations during fair weather months (February to September).

Pondicherry port carries a minor share of the total cargo handled at the Indian ports. The cargo handled at Pondicherry port is of diverse nature. The principal commodities include cement, fertiliser, sugar, food grain, molasses and other general cargo. Molasses used to be handled through the old port, but because of the poor condition of the pier this activity has been discontinued and the molasses storage tanks have been removed from the Old Port. The large amount of cargo handled in the 1980's onwards was primarily due to transshipment, an activity that is discontinued in the port from 2007 onwards. There is a proposal to develop the Pondicherry port in association with Kamaraj Port, Ennore, to handle the various types of clean cargos including container cargo, integration of tourism with maritime activity and infrastructure requirements are in pipeline with the development plan.

Table 5-22 Cargo Details of Puducherry Port, 2001-14

DETAILS OF IMPORT / EXPORT FROM 2001 TO 2014				
S.NO	YEAR	CARGO HANDLED	IMPORT	EXPORT
1	2000-01	Molasses		75511
2	2001-02	Molasses		92447
		Styrene Monomer	2834	
3	2002-03	Styrene Monomer	3630	
		Flourspar	7701	
		Cement		7928
4	2003-04	Flourspar	24835	
		Palmolein	6000	
		Machinery	275	

DETAILS OF IMPORT / EXPORT FROM 2001 TO 2014				
S.NO	YEAR	CARGO HANDLED	IMPORT	EXPORT
		Cement		66631
		Sugar		9099
		Fly Ash		753
		Diesel		10
5	2004-05	Flourspar	6494	
		Palmolein	17987	
		Copra meal	7998	
		Cement		23957
		Sugar		2214
6	2005-06	Flourspar	8792	
		Timber log	6003	
		Palmolein	25611	
		Cement		50561
		Neem cake		4525
		organic		500
		wooden boats		21
7	2006-07	Styrene Monomer	3110	
		Flourspar	11000	
		Timber log	1786	
		Cement		15133
		Food items		3197
8	2007-08	Nil	Nil	Nil
9	2008-09	Nil	Nil	Nil
10	2009-10	Nil	Nil	Nil
11	2010-11	Nil	Nil	Nil
12	2011-12	Nil	Nil	Nil
13	2012-13	Nil	Nil	Nil
14	2013-14	Nil	Nil	Nil

Source: Port Department, Puducherry

5.6 SYNCHRONIZATION OF CMP - 2015 & RECOMMENDATION

The Comprehensive Mobility Plan for Puducherry was studied and the following proposals are incorporated in the master plan.

- Road Widening and New linkage proposals
- Railway proposals
- Public Transport Proposals
- 4 Multi Modal Transit Centres

- Transport Nagar
- Multi Level Car Parking
- Road Over Bridges proposals

These proposals are included on the basis of its suitability with the Landuse proposals in the Comprehensive Development Plan.



Figure 5.23 MG Road- Tourists using the carriageway for walking

5.7 ISSUES

5.7.1 BOULEVARD AREA

Boulevard area being the oldest settlement and the hub of multiple activities like commercial (both retail & wholesale), educational, recreational, government institutions etc., attracts a lot of vehicular traffic around the clock. This has led to multiple traffic & transportation related issues within the boulevard area which is also rich in cross cultural heritage. Major issues which are deteriorating the traffic conditions within the boulevard area are problems associated with lack of planned parking, pedestrian traffic conflicts, lack of traffic management systems, encroachments of footpaths & road right of ways.

5.7.2 PARKING

As mentioned earlier, there is no designated parking area in the Puducherry Planning Area. At present, the old jail complex in J.N Street is temporarily used as two wheeler parking area and the paved area above the Grand Canal is used for both four wheeler and two wheeler parking. There are 3 two-wheelers paid parking places around the Puducherry central bus terminus. Apart from the above mentioned paid parking areas, on street parking is practiced in the entire Boulevard area where heavy traffic movement is observed. The on street parking of vehicles coming within French Quarter is mainly due to recreation, tourism activities and work purpose due to the presence of schools and government buildings. The on street parking of vehicles coming within Tamil quarter is mainly due to health care and trade and commerce activities. The on street parking reduces the effective carriageway width thereby inducing congestion. Need for additional parking area is keenly felt in the Boulevard Town because of the recreation activities, tourism activities, commercial activities and due to the presence of schools and government buildings.



Figure 5.22 JN Street – On street parking reducing the effective width of the carriageway

5.7.3 PEDESTRIAN ISSUES

Walkability is an important component of any tourist area. Puducherry being a tourist place, pedestrian facilities such as foot paths are to be provided for the smooth flow of the pedestrians/tourists. In the Planning area, it is observed that many of the roads are devoid of footpaths which causes conflicts between pedestrians and vehicles and there are encroachments in footpaths in certain areas. In Puducherry, there is substantial amount of walk trip especially in the Boulevard Town since it is a tourist place and the main commercial hub. All the important roads

such as MG Street, Mission Street, Bussy Street, Rangapillai Street, Anna Salai, Maraimalai Adigal Salai, Kamaraj Salai, JIPMER road and all approach roads to the Goubert avenue, Ajanta Square and Anna Square which lacks footpaths.

5.7.4 BOTTLENECK POINTS IN PUDUCHERRY PLANNING AREA

The conurbation area being mostly urbanized, face similar issues which area already mentioned in this chapter. Key issues found across the conurbation area are **not upto the mark designed** intersections, lack of road hierarchy, absences of dedicated sufficient parking space around key institutions & nodes, bottlenecks along major roads and pedestrian traffic conflict issues.

There are 12 bottleneck points identified with in Puducherry region out of which 5 bottle neck points are within urban area of Puducherry and 7 bottlesneck points are in the commune panchayats as shown in the figure below. The bottleneck points within urban area cause delay to the commuters to reach their destination in time. The bottleneck areas in the Planning area are highlighted in the figure above. Majority of the bottlenecks are along NH 45A and SH 49.

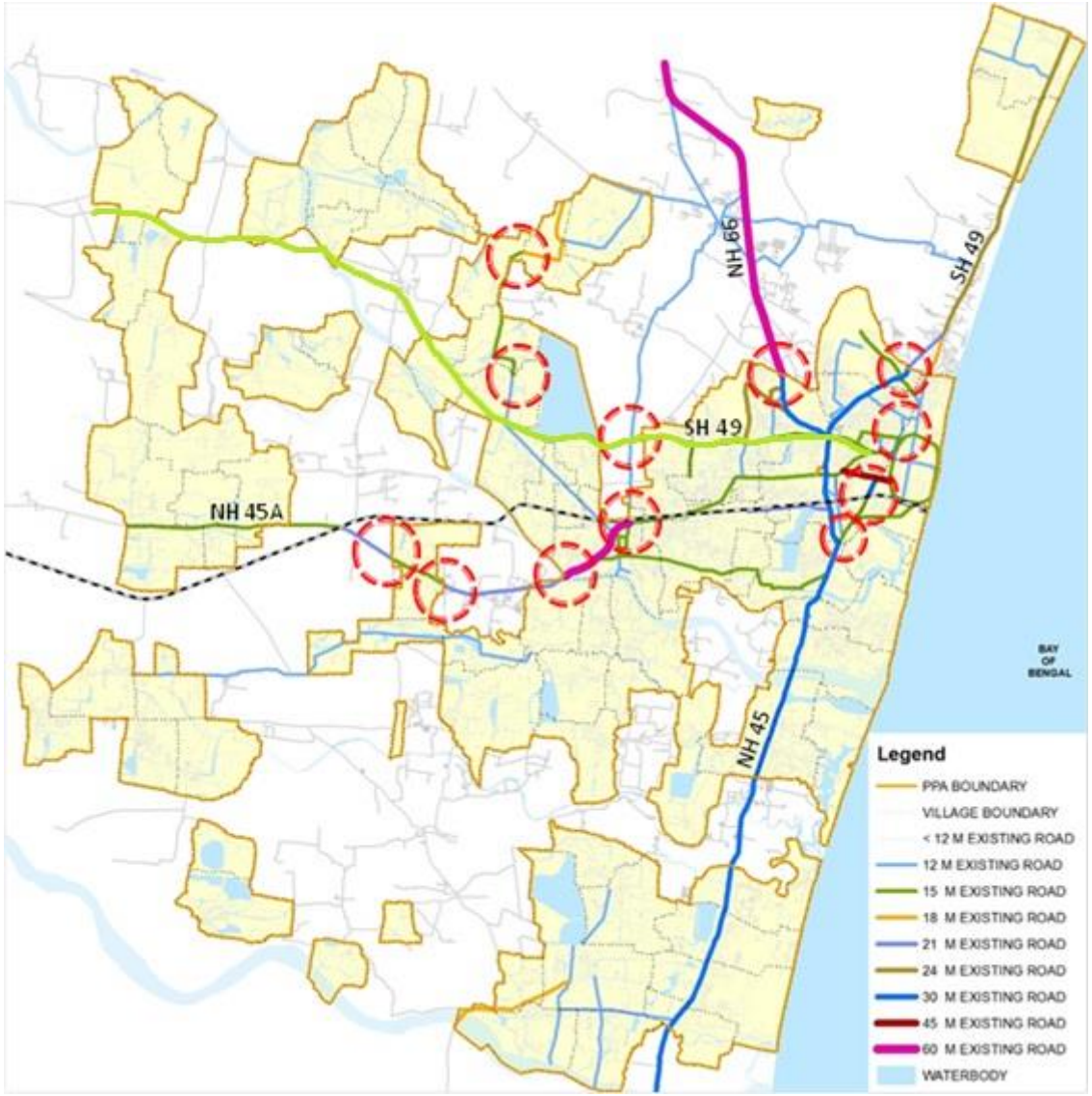


Figure 5.24 Location of Bottlenecks in the Planning Area

Table 5-23 List of bottlenecks in Puducherry Planning Area

S.NO	LOCATION OF BOTTLENECK POINTS IN PUDUCHERRY REGION
1	Railway Gate Crossing near AFT Mill
2	Near Nainar Mandapam Bus Stop
3	Moolakulam Pitchaveeranpet , Junction
4	Thondamanatham Village Turning
5	Thuthipet Karasur Turning
6	ECR near Samipillai thottam
7	NH 45A near Villianur Bus Stop
8	NH 45A near Puducherry Distilleries at Villianur
9	NH 45A Entry at Ariyur Village
10	NH 45A Exit at Ariyur Village
11	NH 66 at Puducherry and Tamilnadu Border
12	MG Road at MG Road Anna Salai Junction

Source: Complied by Consultant

5.7.4.1 OTHER ISSUES

- **Lack of Medians:** In the Planning Area, some of the roads such as ECR in the northern side of Puducherry, NH 45A, Vazhudavur Road (SH 203) do not have medians which makes them less safe to drive. It is to be ensured that all the arterial roads and sub arterial roads should have medians.



Figure 5.25 SH 49 (Without Median)

- **Bus Bay:** At present, the bus bays in the major roads are provided in such a way that it obstructs the smooth traffic movement. Hence, recessed bus bays are to be provided on all the major roads so that the other vehicles can move along the road without any delay.
- **Insufficient Public Transport System:** It is observed that most of the people do not prefer to use the bus service due to heavy passenger load in the buses and inadequate coverage of routes. The outcome of the survey conducted for the Comprehensive Mobility Plan seconds this point.

5.8 PROPOSALS & RECOMMENDATIONS

Proposals and recommendations are given on the basis of the detailed study of Comprehensive Mobility Plan Report, House Hold Survey outcomes on Traffic and Transportation, Stakeholder meeting outcomes and various reports such as Sustainable Regional Planning Framework for PVAC (Puducherry, Villupuram, Auroville and Cuddalore), Master Plans of Cuddalore, Villupuram, Mahabalipuram and Tindivanam.

5.8.1 ROAD HIERARCHY

As described earlier, it is important to device a street classification which is in consideration with the proposed landuse. The roads are classified into the following 3 categories according to their function and activities that take place along the road.

Table 5-24 Road Category Proposed for Puducherry Planning Area

Sl. No.	Category	Characteristics	ROW
1	Arterial	• City to City linking • Largest volumes of traffic • Commercial/Mixed residential uses are predominant along the road	60m
2	Sub-Arterial	• Mixed residential Use along the road • Feeding traffic to arterial roads	24m & 30m
3	Major Roads	• Connecting residential areas with sub arterial roads/arterial roads	18 m & 24m

Source: Compiled by Consultant

5.8.1.1 Arterial Roads

A typical cross section of an arterial road is given in the figure below. It shall have carriageways, median, Multi Functional Zones (MFZ), service lanes and footpaths. Multi functional zone is a zone to accommodate street components such as tree planting, auto rickshaw stand, hawkers zone, bus stop, traffic police booth, fire hydrants, street lights etc. as per the requirement. The RoW of the arterial roads varies between 45m and 60m

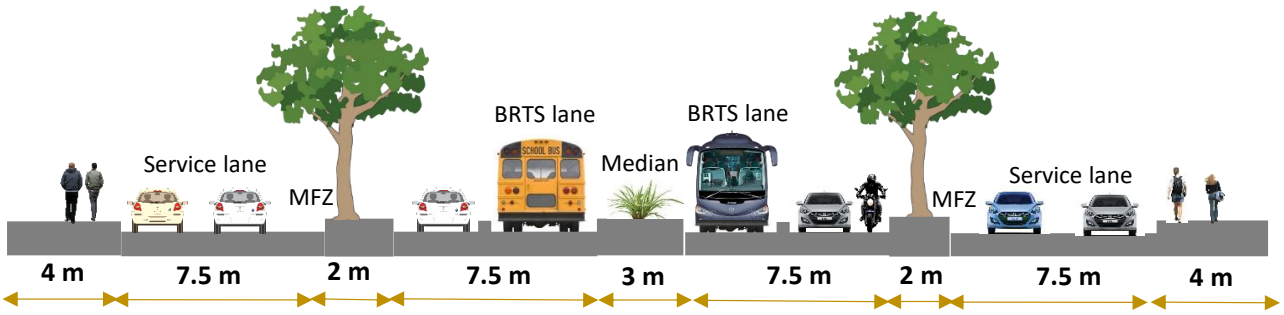


Figure 5.26 Cross Section of 45m wide Arterial Road

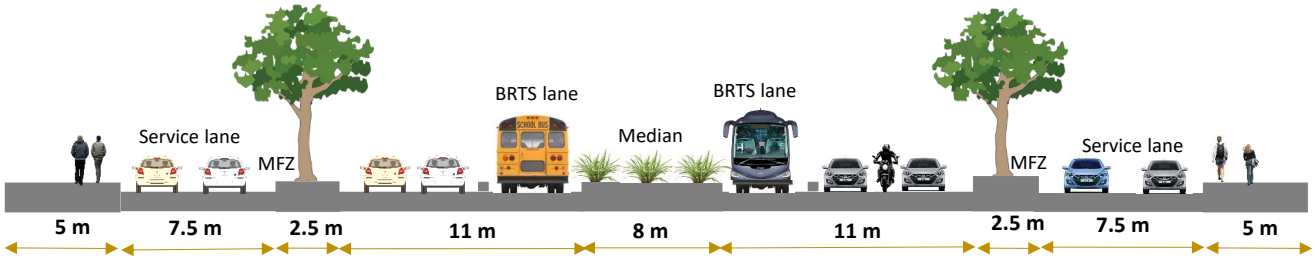


Figure 5.27 Cross Section of 60m wide Arterial Road

5.8.1.2 Sub-Arterial Roads

Sub arterial roads shall have carriage ways, median, service lanes, Multi Functional Zones and sidewalks as shown in the figure. As mentioned earlier, the RoW of the sub-arterial road is between 24m or 30m.

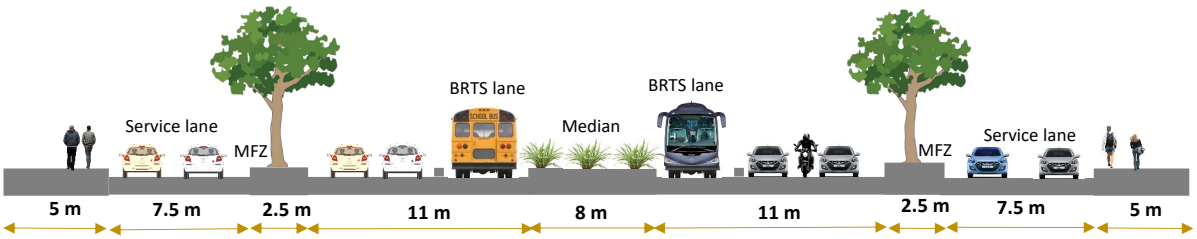


Figure 5.28 Cross Section of 30m wide Sub-Arterial Road

5.8.1.3 Major Roads

Major roads shall have Carriage ways, median, Multi Functional Zones and sidewalks as shown in the figure. As mentioned earlier, the width of the major road is either 18m or 24m.

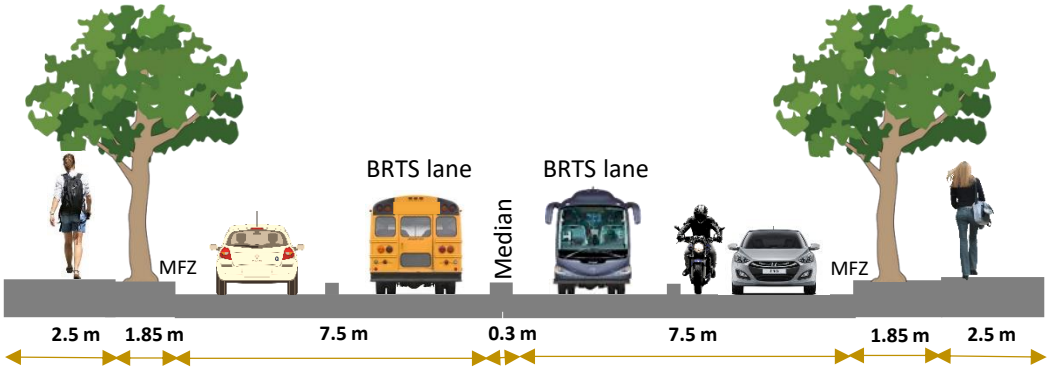


Figure 5.29 Cross Section of 24m Major Road

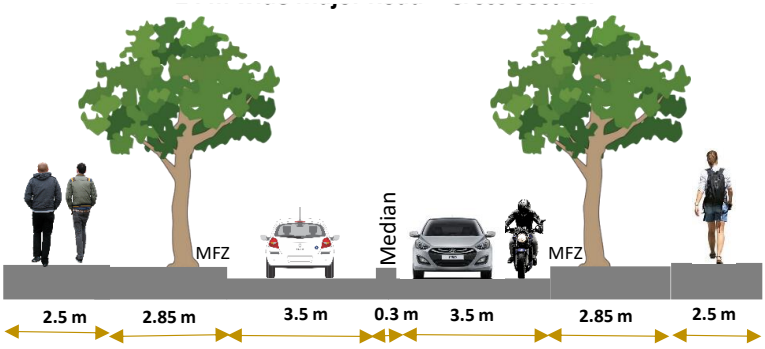
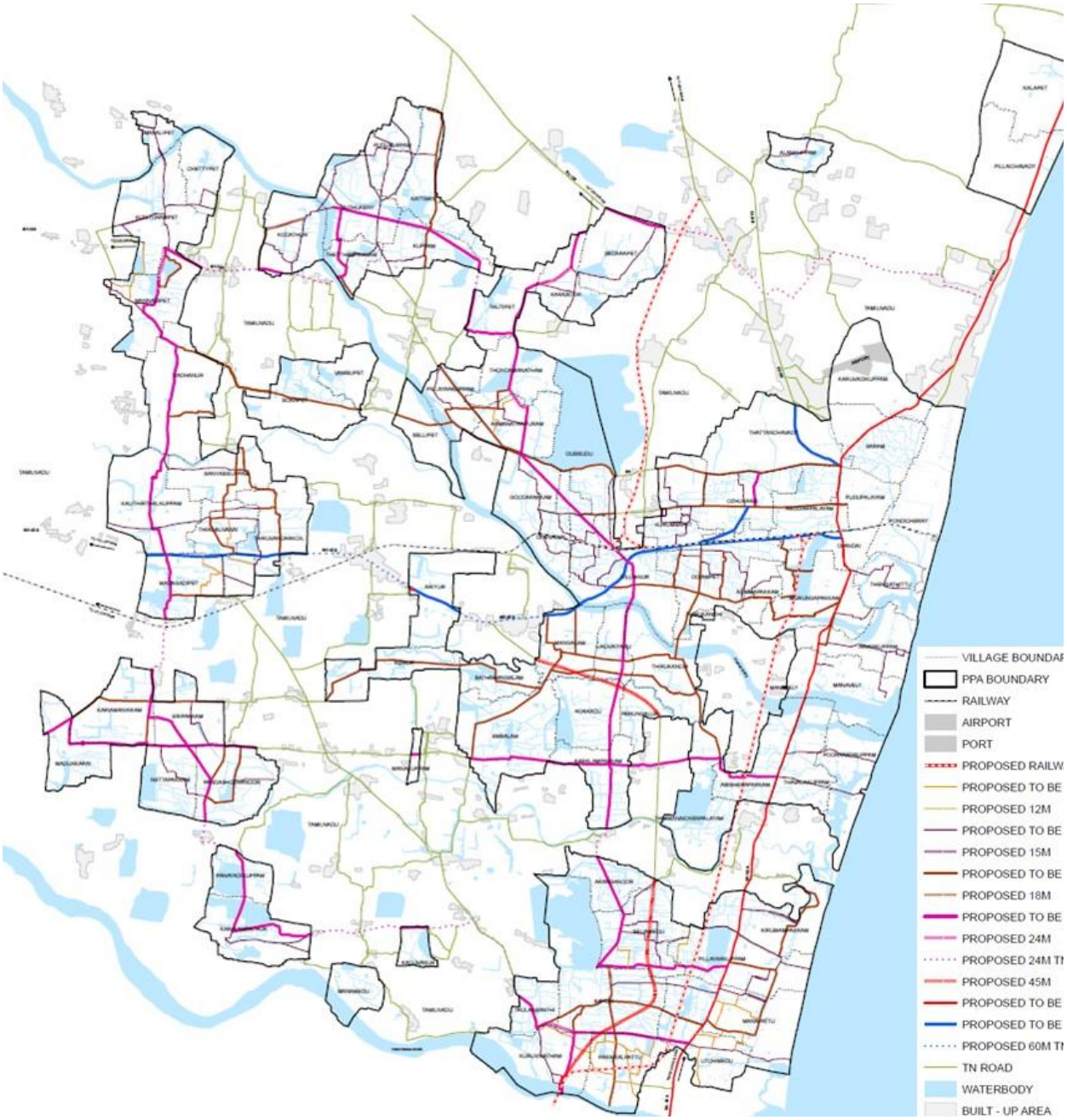


Figure 5.30 Cross Section of 18m Major Road

5.8.2 ROAD PROPOSALS FOR PPA

Road Proposals:



New Roads (New/Missing Linkages)

Sl. No.	Road Name (New/missing Linkages)	Proposed width	Road length	Area of Acquisition (Ha.)
1	Road starting from 15m proposed to be wideneded road and meeting 18m proposed to be wideneded road in Kirumampakkam	15m	879m	1.32
2	Road starting from housing layout and meeting 18m proposed to be wideneded road in Pillayarkuppam	15m	368m	0.55
3	Road starting from housing layout and meeting 18m proposed to be wideneded road in Manapattu	15m	561m	0.84
4	Road starting from 18m proposed to be wideneded road and meeting 24m proposed to be wideneded road in Bahour	18m	505	0.91
5	Road starting from the junction of 24m and 18m proposed to be wideneded roads in Irulansanthi and meeting junction of 24m and 18m proposed to be wideneded roads in Bahour	24m	839m	2.01
6	Road starting from housing layout and meeting 12m proposed to be widened road in Parikalpattu	12m	231m	0.28
7	Road starting from 12m proposed to be wideneded road and meeting with 12m proposed to be wideneded road in Sulliyankuppam	12m	167m	0.2
8	Road starting near Sithalampattu to kaikilampattu	18m	1133m	2.04
9	Road starting from the junction of 15m & 24m proposed to be widened road and meeting at junction of 15m & 24m proposed to be widened road in Karasoor	24m	1116m	2.68
10	Road passing along Thirukkanur lake	24m	1040m	2.5
11	Road passing near Shri Krishna college of Engineering & Technology in Mannadipet	24m	126m	0.3
12	Road bifurcating from Sedarapet main road in Thondamanatham	24m	792m	1.9

Sl. No.	Road Name (New/missing Linkages)	Proposed width	Road length	Area of Acquisition (Ha.)
13	Road starting from Pitchaveeranpet–Moolakulam road and merging with housing layout	15m	208m	0.31
14	Road starting from 12m Proposed to be widened road and meeting with 18m proposed to be widened road in Manapet	12m	218m	0.26
15	Road connecting layouts in kasturbai nagar in Thirubhuvanai palayam	12m	157m	0.19
16	New Alignment of NH 45A passing from Ariyur, Mangalam, Uruvaiyaru, Perungalur, Aranganur, Seliamedu, Bahour, Parikkalpattu & Kuruvinatham	45m	11363m	51.13

Road widening Proposals

Sl. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)
1	Entire East Coast Road (ECR) passing through PPA	24, 30m	18246m	45m	32.84
2	Entire NH 45A passing through PPA	15, 21, 60m	11520m	60m	32.26
3	NH 66 – Rajiv Gandhi square to Gorimedu	30m	2402m	60m	7.21
4	Arumparthapuram to Mudaliarpet (NH 45A bypass)	21m	4126m	60m	16.09
5	Vazhudavoor Road till Vadhanur	9, 12, 15m	22240m	18m	13.34
6	Villianur to Murungapakkam	6, 9, 15, 18m	7350m	18m	4.41
7	Ring Road – Sedarapet-Karasoor-Thutipet-Kuppam-Thethampakkam-Kodathur-Kunichampet-Vadhanur-Madagdipet-Eripakkam-Pandashozhanoor-Panayadikuppam-Karayamputhur-Kaduvanur-Irulansathai-Bahour-Utchimedu	3, 6, 9, 12, 15, 18m	44291m	24m	59.79
8	Road from Thethampakkam, Pillayarkuppam to Ramanathapuram	9m	4203m	18m	3.78

Sl. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)
9	Road from Koodapakkam-Villianur-Uruvaiyaru-Korkadu-Karikalampakkam-Aranganur-Seliamedu-Bahour-Pillaiyarkuppam	9, 12m	26888m	24m	36.3
10	Mangalam to Embalam	6, 9m	10336m	18m	10.85
11	Mangalam to Abhishekapakkam	6, 9m	11264m	18m	11.83
12	Mangalam to Thirukanchi via Uruvaiyaru	3, 6, 9m	4461m	18m	5.35
13	Kariamanikkam-Eripakkam-Kizhur-Sathamangalam	6, 9, 12m	14749m	18m	13.27
14	Road from Arumparthapuram in Odiampet to Thirukanchi	6, 12m	3217m	18m	2.9
15	Road from Indira Gandhi Square to Olaivakal Bus Stop	6, 9, 15m	6130m	18m	4.9
16	Moolakulam to Kurumbapet Bus stop	6, 15m	940m	18m	0.71
17	Pudhucherry Church to Mettupalayam Bus stop via Diamond Nagar	12m	1006m	24m	1.21
18	Muthirayarpalayam Bus stop to Moolakulam Bus stop	9m	1085m	15m	0.65
19	Road passing through residential area in Kurumbapet	6m	1454m	15m	1.31
20	Internal 3 Roads of Sulthanpet in Kurumbapet	6, 9, 12m	4649m	15m	2.79
21	Ossudu Eri Bus stop to junction with Villianur-Koodapakkam Road via Poraiyur	9m	2028m	15m	1.22
22	Roads in Patthukannu, Koodapakkam, Olaivaikal, Ariyapalayam	3, 6, 9m	14526m	15m	13.07
23	Sedarapet to Karasoor via Iyyanar koil lake	9, 12, 15, 18m	5900m	15m	0.89
24	Roads in Kuppam, Kodathur, Suthukeny, Kattery and Pudukuppam	3, 6, 9m	21121m	15m	19.01
25	Thirukannur to Manalipet via Kunitchampet	6, 9, 12m	5976m	15m	3.59

Sl. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)
26	Kunitchampet to Chettypet	6,9m	2921m	15m	2.19
27	Mannadipet to Napalayam	6, 15m	1841m	15m	0.83
28	Kurichipalayam to Sanyasikuppam	6m	2310m	15m	2.08
29	Andiarpalayam to Thiruvandarkoil via Kalitheerthalkuppam	9, 12m	4593m	15m	2.07
30	Perumal koil street to Thiruvandarkoil lake road in Thirubvanai	6, 9m	3078m	15m	2.31
31	Thirubuvanai Bus stop to Pallinaliyanur	9m	1156m	15m	0.69
32	Thirubuvanai Vinayakar kovil street	9m	935	15m	0.56
33	Eripakkam Main road to Madukarai-Thavalakuppam main road via Nathamedu	3, 6m	1621m	15m	1.7
34	Nesavalar Colony in Madukarai to Pandashozhanoor via Nettapakkam	6, 9m	2361m	15m	1.77
35	Karayamputhur to Perichchambakkam	6m	1167m	15m	1.05
36	Soriyankuppam Bus stop to Cuddalore main road	9m	2370m	15m	1.42
37	Kuruvinatham to Kannaiyakoil bus stop via bahour	9, 18m	4731m	18m	2.13
38	Moorthykuppam road	3, 6, 9, 12m	3045m	15m	2.28
39	Road from Bahour to Cuddalore main road meeting near Bhakiyalakshmi Nagar	3, 9m	3074m	15m	2.77
40	Seliamedu to Pinnatchikuppam	6, 9m	3721m	15m	2.79
41	Pinnatchikuppam to Kirumampakkam bus stop via Adhingapet and Pillayarkuppam road	6, 9m	2320m	15m	1.74
42	Kirumampakkam bus stop to beach	6, 9, 12m	2663m	15m	1.6
43	Rajiv Gandhi Engineering college bus stop to Panithittu	3, 6m	777m	15m	0.82

Sl. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)
44	Roads in Irulansanthi, Kuruvinatham, Parikkalpattu, Utchimedu, Manapattu, Pillayarkuppam and Seliamedu	3, 6, 9, 12m	16630	12m	7.48
45	Roads in Ramanathapuram	6m	1430m	12m	0.86
46	Roads in Mannadipet, Thirubuvanai & Madagadipet	3, 6, 9m	6280m	12m	3.77
47	Road starting from Nesavalar colony in Madukarai, passing through Kalmandapam, Manakuppam, Manaveli, Karikalampakkam and merging with ECR in Thavalakuppam	9m	16557m	24m	24.84
48	Sedarapet main road to Erikarai bus stop via Villianur, Pinnatchikuppam Road and merging with ECR in Pillayarkuppam	9, 12, 15m	29703m	24m	35.64
49	Roads in Kunitchampet	3, 9m	2802m	15m	2.52
50	Road around Thirukannur Lake	6, 9m	1408m	18m	1.48
51	Road starting from PS Palayam Bus stop in Vadhanur and merging with road in Tamilnadu	6m	1406m	18m	1.69
52	Road starting from Anjaneyar Koil Street in Sanyasikuppam and merging with NH 45A near Thiruvandar Koil Bus stop	6, 9, 12m	4080m	18m	3.67
53	Road Starting from Sanyasikuppam and merging with NH 45A near Thirubhuvanai Bus stop	9, 12, 18m	3799m	18m	1.9
54	Road from Madagadipet Lake to Cuddalore main Road	9m	1519m	18m	1.37
55	Road in Kariamanikkam	15m	725	18m	0.22
56	Two Roads in Pandashozhanoor	6m	3441m	18m	4.13
57	Vadukuppam Pandashozhanoor road	6m	1167m	15m	1.05
58	Roads in Karayamputhur	6m	3573m	15m	3.22

Sl. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)
59	Ramanathapuram-Sedarapet Road to Pillayarkuppam	6,9 m	2750m	18m	2.89
60	Road from Koonimudakku bus stop to Pillayarkuppam	9m	1628m	15m	0.98
61	Ramanathapuram-Sedarapet Road to Sedarapet main road in Ramanathapuram	6, 9m	1107m	15m	0.83
62	Road from Sanjeevani Nagar to Rayapettai in Alankuppam	9m	1440m	15m	0.86
63	Road starting from Arumparthapuram and merging with Vadamangalam Main Road	6, 9m	2909m	15m	2.18
64	Road Staring from Thattanchavdy Bus stop, passing through Mariamman Koil Street and merging with Vadamangalam Main Road	6m	1273m	18m	1.53
65	Road starting from Manaveli and merging with Vadamangalam Main Road	9m	1420m	18m	1.28
66	Road starting from Mariamman Koil Street passing through Triveni Nagar and Manaveli and merging with proposed 18m Road	6m	1567m	15m	1.41
67	Road in Kombakkam merging with Vadamangalam Main road	6m	1303m	15m	1.17
68	Road starting from NH 45A bypass passing along Velrampet lake and merging with Vadamangalam Main road	9m	2978m	18m	2.68
69	Road starting from Marapalam Bus stop passing through Balamurugan Nagar to Harbour Road in Thengaithittu	3, 6, 9m	2919m	15m	2.63
70	Road starting from ECR in Murungapakkam passing near Puducherry Institute of Health Management	6m	1310m	15m	1.18
71	Road starting from Ariyankuppam new Bus stop passing near Bharthiyar Palkalai Koodam College	12m	1152m	18m	0.69

Sl. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)
72	Veerampattinam Road passing near Shivaji nagar and ending near Chinna Veerampattinam	6, 9m	4425m	15m	3.32
73	Dhrowbathiamman koil Street	9m	537m	15m	0.32
74	Pooranankuppam Road	9m	2645m	15m	1.59
75	Nallavadu Road	9m	2437m	15m	1.46
76	Road from Aladimedu to Etchangadu in Kirumampakkam	9, 12m	3082m	18m	2.31
77	Kirumampakkam to Pillayarkuppam Road	6m	1450m	15m	1.31
78	Seliamedu to Melazhinchipattu	9m	1570m	15m	0.94
79	Bahour to Chinna Arachikuppam via Parikalpattu	9, 12m	3450m	18m	2.59
80	Kuruvinatham to Kanniyakoil via bahour	9, 12, 18m	5612m	18m	2.81
81	Road starting in front of Pillayarkuppam Lake to Manapet Road	9, 12m	1199m	18m	0.9
82	Road starting from Kattukuppam bus stop till housing layout	3, 6m	1734m	15m	1.82
83	Mariamman Koil street passing through Lingareddypalayam and Katterikuppam	9m	4964m	18m	4.46
84	Road starting from Thirukanchi Road and passing through housing layout in Manaveli and merging with 18m proposed to be widened road	6m	942m	15m	0.85

5.8.3 PUBLIC TRANSPORT PROPOSALS

In this section, various public transportation systems adopted by different cities in the country are discussed and their feasibility and viability for Puducherry Planning Area is studied. This assessment is based on the projected population for plan period, proposed developments, decentralization principle adopted as part of the CDP and the growth centers identified beyond the conurbation area. Other key considerations which are assumed while assessing the choice for mass transit are the proposed road widening recommendations are implemented by the concerned departments and there is a shift in use of Public Transportation (PT) in place of private vehicles. Currently the PT share in Urban areas of the planning area is 20.7 % *(Source: - CMP Report)* and which is not sustainable for the overall development of the planning area in a longer run. To achieve the visions set as part of the CDP-2036, which gives emphasis on better quality of life, better connectivity and to maintain an environment friendly means of transportation it's important to study the rail based and bus-based transit system suitable for the planning area. Recommending a particular mode of transit system for an area or corridor depends on the demand of PT in the respective area, available RoW, Land Use along the corridor, and future growth potential of the corridor. It is important to

adopt a mode which will be adequate for future demand levels in both quantity and quality. Hence multi- modal systems which integrates the existing PT system with proposed modes for a seamless journey to the commuters within the planning area is to be adopted.

5.8.3.1 Metro & Mono Rail

Metro rail is one of the most commonly adopted rapid transit system. Kolkata metro being the first mass rapid transit system and Delhi Metro is the first modern metro introduced in the country. Recently, the Government of India has proposed to give assistance for metro rail systems to all cities with more than 1 million population. This segment of rapid transit system is seeing huge growth in recent years due to the volume of passengers it can transport. As of 2016 there are 8 operational metro systems in India, with an operational length of 324 km and around 520 km is under construction.



Figure 5.32 Metro Rail

To sustain an economically feasible metro or mono rail operations a minimum population of 2 million is required as per criteria specified for mode of selection of mass transport system by the National Transport Development Policy Committee, Government of India. The projected population for the planning area is 1.62 million by 2036, hence metro rail and mono rail options are not feasible with projected figures as of now, but the authority can access their feasibility in later half of the plan period understanding the growth and prevailing demand for mass transit.

5.8.3.2 Light Rail Transit System

To assess the viability and feasibility of Light Rail Transit System it is important to understand what a Light Rail Transit System is and its historical development. There are many definitions as per various literatures for Light Rail Transit. It is defined as a mode of urban transportation that uses predominantly reserved but not necessarily grade-separated, right of ways. Electrically propelled rail vehicles operate singly or in trains. It provides a wide range of passenger capabilities and performance characteristics at moderate costs.



Figure 5.33 Mono Rail

In India, LRTS is being planned for multiple cities like Kolkata, Delhi, Bangalore, Kozhikode & Thiruvananthapuram. In bigger cities LRTS will act as feeder network for already existing rapid transit systems for public transportation.

The planning area is poised for growth and a shift in the mode of transportation is essential sustain the growth and improve the quality of living within the planning area. Tram trains or super trams if implemented have the potential to provide better connectivity with the existing growth centers and proposed growth centers and points in the commune panchayats. Trams combine the features of the street cars and that of regional rails, it enhances the use of public transport due to its reach by

connecting town centers with surrounding regions, their flexibility in operating speed and comfortable journey experience. With densification planning concept adopted within the conurbation area and promoting transit oriented development by providing developments along transit corridors, LRT system can be a way forward for the planning area. The identified 4 transport hubs within the planning area can be connected with LRT network which can make utilization of the RoW of the circulation network proposed for the CDP-2036.

5.8.3.3 Diesel Multiple Units

Diesel Electric Multiple Units are self-propelled units consisting of Driving Power Cars and Trailer Cars. DEMU have been developed to give faster service for sub-urban areas where traffic density is high. These have operational features of fast acceleration and fast breaking enabling them to function as a stopping train while maintaining the average speeds of mail/express trains. Currently DEMU coaches are used for sub-urban traffic in large cities like Mumbai, Chennai, Delhi, Kolkata, Pune, Hyderabad & Bangalore.



Figure 5.34 Diesel Multiple Units

The main features of DEMU's

- Fast and frequent services.
- High Acceleration.
- No need for reversals at the terminals as it can be driven from either end.
- Efficient Use of Rolling Stock.
- Electro pneumatic brakes.
- Low capital and maintenance cost.

In the planning area, the existing railway network between Villupuram - Puducherry along with proposed railway lines of Villianur - Cuddalore & Villianur – Tindivanam have the potential to operate DEMU trains operated by the Indian Railways. Introduction of DEMU's in these corridors will increase the connectivity of the communes with hinterland and city center. With introduction of multiple stops along these stretches at 500 m apart in the conurbation areas and 1 km apart outside the conurbation, and with improved circulation network of CDP-2036, the regional connectivity of the planning area will get strengthened.

5.8.3.4 Bus Rapid Transit System

Bus Rapid Transit System (BRTS) are generally a high-quality bus based transit system that focuses its operations in large urban areas with fast, comfortable, cost effective services catered for larger commuter populations. BRTS achieves it through the adoption of dedicated lanes with bus bays and bus stations typically aligned to the center of the road, off board fare collection and fast and frequent operations. BRTS is similar to a light rail system, it is considered to be more reliable, convenient and faster than regular bus services due to the fact that they run on dedicate bus bays and hence not delayed by the regular city traffic.



Figure 5.35 Bus Rapid Transit System

The Puducherry City bus system needs to be improved to attract a large portion of the commuters to avoid the use of private vehicles in favour of public transport. For this the prevailing city bus system needs to be strengthened, this can act as a support for the mass rapid transit systems which are elaborated above. BRTS is a successful system adopted by many Indian cities like Ahmedabad and Indore. Due to faster implementation, lesser capital investment BRTS is a good alternative for sustainable transport solution for the planning area. BRTS can be implemented along the major transit corridors like NH-45A, SH-203, SH-49 and other major roads proposed as part of CDP-2036. Due to the non-contiguous nature of the planning area BRTS on these said roads might have to pass through normal traffic in areas which falls under Tamilnadu, this might affect the operational advantage of BRTS systems.

CURITIBA, BRAZIL

Curitiba's urban development strategy is a model for cities around the world. Accessible public transportation is prioritized when choosing housing and commercial building locations. The public transportation system is exceptional in terms of its affordability for customers, the use of enclosed prepay stations, and the integration of transfer terminals. Since the 1970s, Curitiba has integrated public transportation planning into the overall city plan. In 1972, Curitiba created one of the world's first pedestrian malls in order to reduce vehicle traffic in a busy area. Today, public transportation is the priority in Curitiba's long-term structural plan for urban development. High traffic areas such as shopping centers and high rise apartment buildings are conveniently located next to public transportation stations. This level of accessibility has reduced automobile dependence. Curitiba's long term plan promotes dense land use by developing the city along existing bus routes.Curitiba is regarded as an excellent example of Transit Oriented Development (TOD), which implies that residential, business and recreational areas should be built in high density areas and close to public transport stations. In addition, rather than promoting segregated zoning of land uses, TOD proposes land use mix to reduce the travel distances. By coupling the development of a pedestrian friendly community with an efficient low-emissions Bus Rapid Transit (BRT) system and lower car parking availability, Curitiba has successfully reduced the overall travel of its residents. Planning for Curitiba's next major project has already begun. New roads will be constructed near new residences and businesses, each with access to a new BRT route, the "Green Line." For over 40 years, Curitiba has been able to successful integrate transportation and land-use planning. Such experience has also been a model for other large cities, particularly from emerging economies, which have decided to invest on BRT as the backbone of their public transport system. Curitiba has cooperated with private companies to develop buses which are adjusted to the needs of various types of transit routes.

5.8.4 MULTI MODAL TRANSIT CENTRES

Multi modal transit centers are places of interchange from one mode of transport to another. As discussed earlier the planning area will have the requirement of improved public transportation system through one or more of the mass rapid transit systems like DEM's/Trams, Metro, BRTS etc. Integration of these transit systems in the land use planning will be important for the success of the planning area. Interchange facilities play a vital role in the success of public transportation system of an area, these interchange facilities will be multi-modal transit centers which will accommodate Metro or light rail as well as BRTS & city buses which will improve the transfer of passengers and enhance the connectivity within the planning area.

Through CDP-2036 multiple location area identified for proposed Multi-Modal Transit centers at Villianur, Madagadipet, Pillayarkuppum and Puducherry (Mudaliarpet). Mettupalayam is proposed as Truck Terminal as per Govt. order and private land is already handed over to Oulgaret Municipality. Multi-modal transit centres are brought in to increase the local efficiency of the area by acting as a catalyst for redevelopment of the entire area into rich mix of housing, jobs, shopping and recreational choices by encouraging both private and public sectors. It also increases the dependency on public transport and creates a sense of community pride among the local residents.

5.8.5 MULTI LEVEL CAR PARKING

As discussed above in chapter 5.7 Issues, there is no dedicated parking space available in Puducherry Planning Area. Due to the dier need of parking spaces, Multi-Level Car Parking facilities are proposed at four locations. Multi-Level Car Parkings are proposed at Central jail, SETC Depot and New Bus Stand. This proposal is given in synchronization of Comprehensive Mobility Plan prepared for Puducherry. The need of Multi Level Car Parking will also be required near Existing Railway Station. Multi-Level Car Parking is also suggested to be proposed on the existing site of Railway Station.

5.8.6 ROAD OVER BRIDGES

There are two new fly overs proposed on ECR. As part of widening, flyovers are proposed at the Rajiv Gandhi and Indira Gandhi junction to decongest the junction. The proposal of flyovers is given as per Comprehensive Mobility Plan prepared for Puducherry. The possibility of construction of overbridge from Marapalam Junction to Rajiv Gandhi Junction (in Phase-I) and From Rajiv Gandhi Junction to Karuvadikuppam (in Phase-II) may be explored.

5.8.7 RAILWAY PROPOSALS

The links for Tram Train/DEMU are as follows. The proposal is given as per Comprehensive Mobility Plan prepared for Puducherry.

Puducherry to Villupuram: Along the existing rail network with more frequent and multiple stoppage operations between Puducherry and Villianur. Villianur to Villupuram shall have limited stop operations with major stoppages at Ariyur, Kandamangalam and Madagadipet. The MEMU/DEMU shall be used for regional connectivity with operations extending till Villupuram and Tram-Train if introduced shall operate till Madagadipet using existing rail link. The Tram-Trains may be introduced after implementation of doubling of the existing line so as to improve the efficiency of the operations of Tram-Train once introduced. In Puducherry, the Tram-Train and MEMU/DEMU shall be extended till Puducherry Railway Station. The total route length would be 21.7 km and there shall be stations in a gap of 500m between Puducherry and Villianur and 1000-1500m between Villianur and Madagadipet.

Puducherry to Cuddalore: Rail alignment has been finalised between Transport Department and Indian Railways to implement a rail link between both the towns. Presently, the land acquisition plan has been finalised and is in early planning stage. With the new link in place, Tram-Train can be operated from intial stage as it escalates the image of public transport and can be also be helpful in improving the Public Transport share and shall be operated till Cuddalore. The total route length would be 18km and the stations shall be placed at a distance of 500m till Thavalakuppam and 1000-

1500m from Thavalakuppam to Cuddalore. This is possible only if the double lines are proposed instead of single line. In Puducherry the line shall end at Mudaliarpet where the Cuddalore line intersect and Villupuram Line intersect.

Puducherry to Tindivanam: Presently, the rail link between Tindivanam and Puducherry is also under planning stage. The Puducherry region shall be served with Tram-Train and long distance links shall be served with MEMU/DEMU. The Tram-Train link is expected to start from Mudaliarpet and extend till Sedarapet with route length of 12.2km while MEMU/DEMU shall be from Mudaliarpet to Tindvanam.

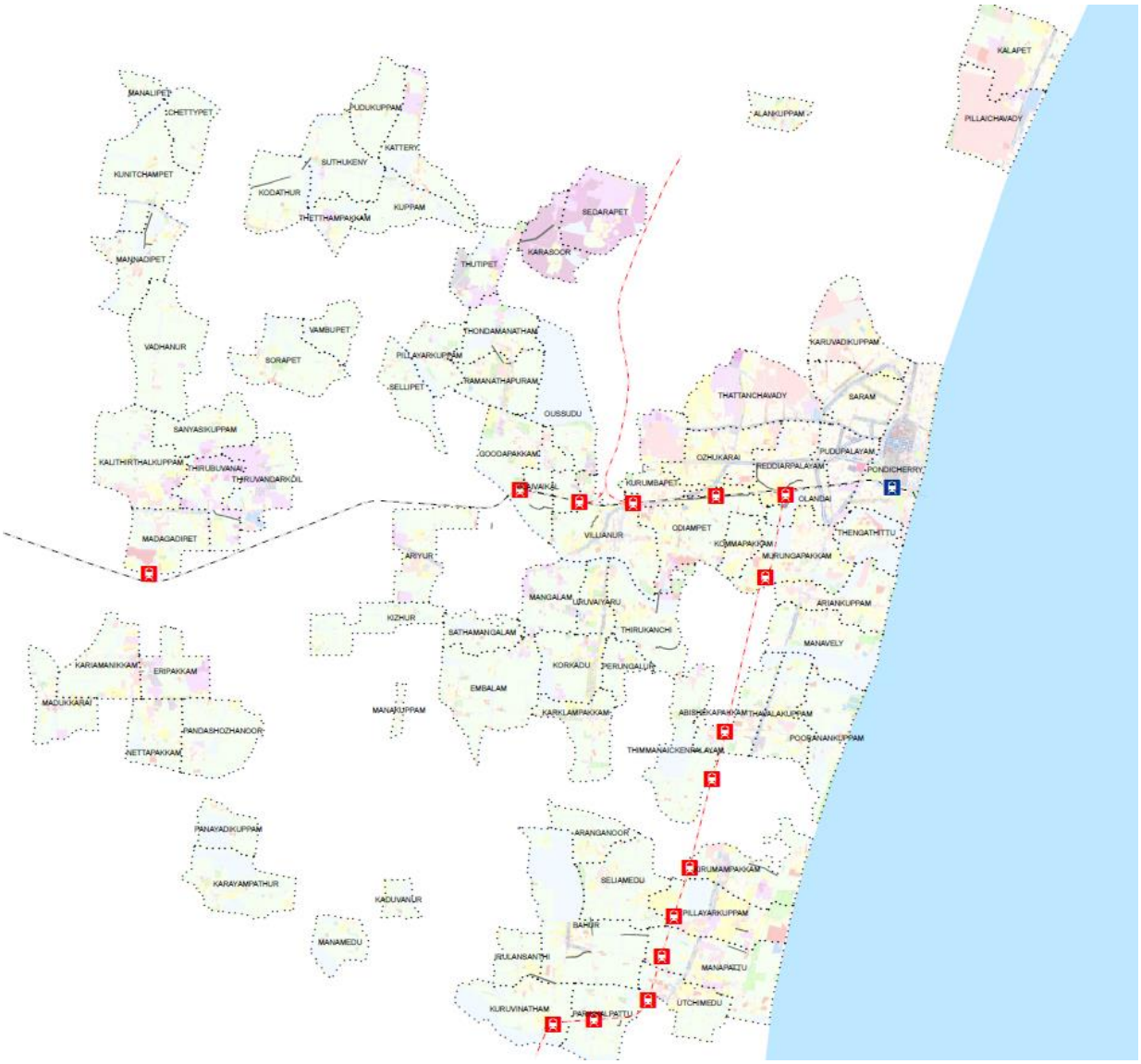


Figure 5.36 Proposed DEMU Stations

Transportation – Public Conveyance

Three-wheeler tempo transportation have to be replaced by four-wheeler transportation. This is one of the major means of transportation in Puducherry. This public transportation service is to be enhanced. This may be explored in Karuvadikuppam (Shivaji Statue) to Gorimedu, Ariyankuppam to New Bus Stand, Rajiv Gandhi Statue to Ayyankuttipalayam, Lawspet-ECR-Gorimedu via Ulavar Market, Tagore Arts and Science College, New bus stand to Railway station, Indira Gandhi statue to Arumparthapuram etc.

5.9 Transit Oriented Development (TOD)

At present, like many other countries, India has a policy for namely National Transit Oriented Development (TOD). Transit Oriented Development is essentially any development, macro or micro, that is focused around a transit node, and facilitates complete ease of access to the transit facility, thereby inducing people to prefer to walk and use public transportation over personal modes of transport. (Source: Transit Oriented Development Policy, Norms and Guidelines by Delhi Development Authority). High density urban growth offers the opportunity for trip lengths to be short. It promotes a high level of accessibility for NMT. It fosters successful, financially viable PT, and enables cities to have low levels of energy use per person in UT. The Government of India would encourage Transit Oriented Development (TOD) with increased FAR along transit corridors with high density of population should form a part of planning.

The major element of TOD is a congregation of housing, jobs, shops, and other activities around PT stations/stops. The physical environment is often enhanced with wide sidewalks, an absence of surface parking lots and large building setbacks. Thus, TOD includes planning for:

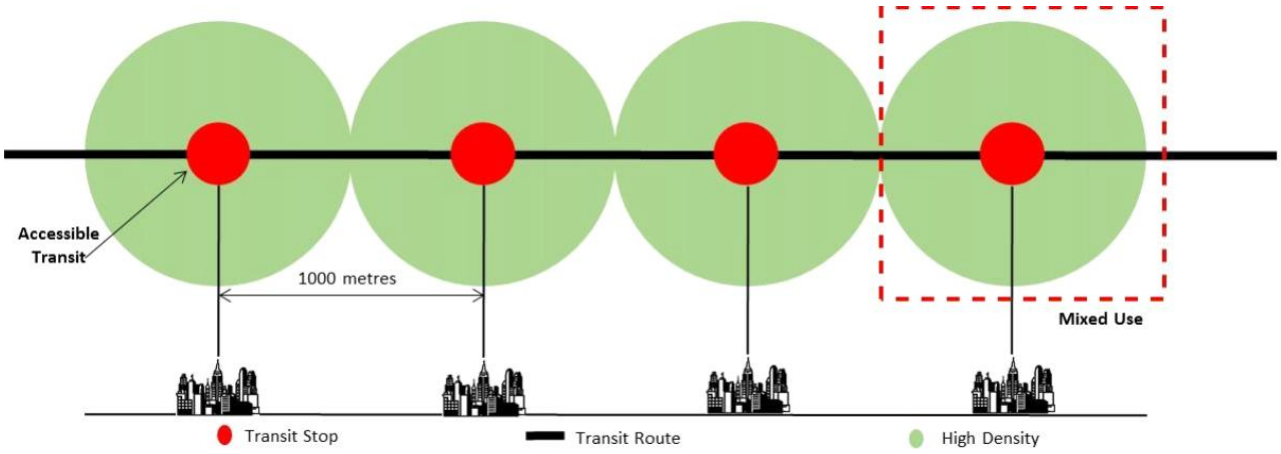
- More people to live close to transit services and to use it
- A rich mix of uses within walking distance of a PT station/stop
- Pedestrian facilities and multi-modal connectivity with focus on moving people
- Making PT station/stop a gateway to the community. Building bye-laws and planning norms should be revised for all cities so as to encourage high FAR and ground coverage along major PT corridors

Basic principles of TOD are follows

TOD integrates land use and transport planning and aims to develop planned sustainable urban growth centers, having walkable and livable communes with high density mixed land-use. Citizens have access to open green and public spaces and at the same time transit facilities are efficiently utilized

TOD focuses on creation of high density mixed land use development in the influence zone of transit stations, i.e. within the walking distance of (500-800 m) transit station or along the corridor in case the station spacing is about 1km TOD advocates pedestrian trips to access various facilities such as shopping, entertainment and work

TOD along Transit Stations



OD increases the accessibility of the transit stations by creating pedestrian and Non-Motorised Transport (NMT) friendly infrastructure that benefits large number of people, thereby increasing the ridership of the transit facility and improving the economic and financial viability of the system. Since the transit corridor has mixed land-use, where the transit stations are either origin (housing) or destination (work), the corridor experiencing peak hour traffic in both directions would optimize the use of the transit system.

Objectives of TOD Policy

- TOD integrates land use and transport planning to develop compact growth centers within the influence zone of 500-800 m on either side of the transit stations i.e. areas within walking distance, to achieve the following objectives
- To promote the use of public transport by developing high density zones in the influence area, which would increase the share of transit and walk trips made by the residents/ workers to meet the daily needs and also result in reduction in pollution and congestion in the influence area.
- To provide all the basic needs of work/ job, shopping, public amenities, entertainment in the influence zone with mixed land-use development which would reduce the need for travel.
- To establish a dense road network within the development area for safe and easy movement and connectivity of NMT and pedestrians between various uses as well as to transit stations.
- To achieve reduction in the private vehicle ownership, traffic and associated parking demand.
- To develop inclusive habitat in the influence area so that the people dependent on public transport can live in the livable communities within the walkable distance of transit stations.
- To integrate the Economically Weaker Sections (EWS) and affordable housing in the influence zone by allocating a prescribed proportion of built-up area for them in the total housing supply.
- To provide all kinds of recreational/entertainment/ open spaces, required for a good quality of life in the influence area.
- To ensure development of safe society with special attention to safety of women, children, senior citizen and differently abled by making necessary amendments to the building bye laws.

Though no mass rapid transport system has been proposed for Puducherry region, ECR and NH-45A for a depth of 200m have been earmarked for mixed commercial use, enabling implementation of TOD along this corridors

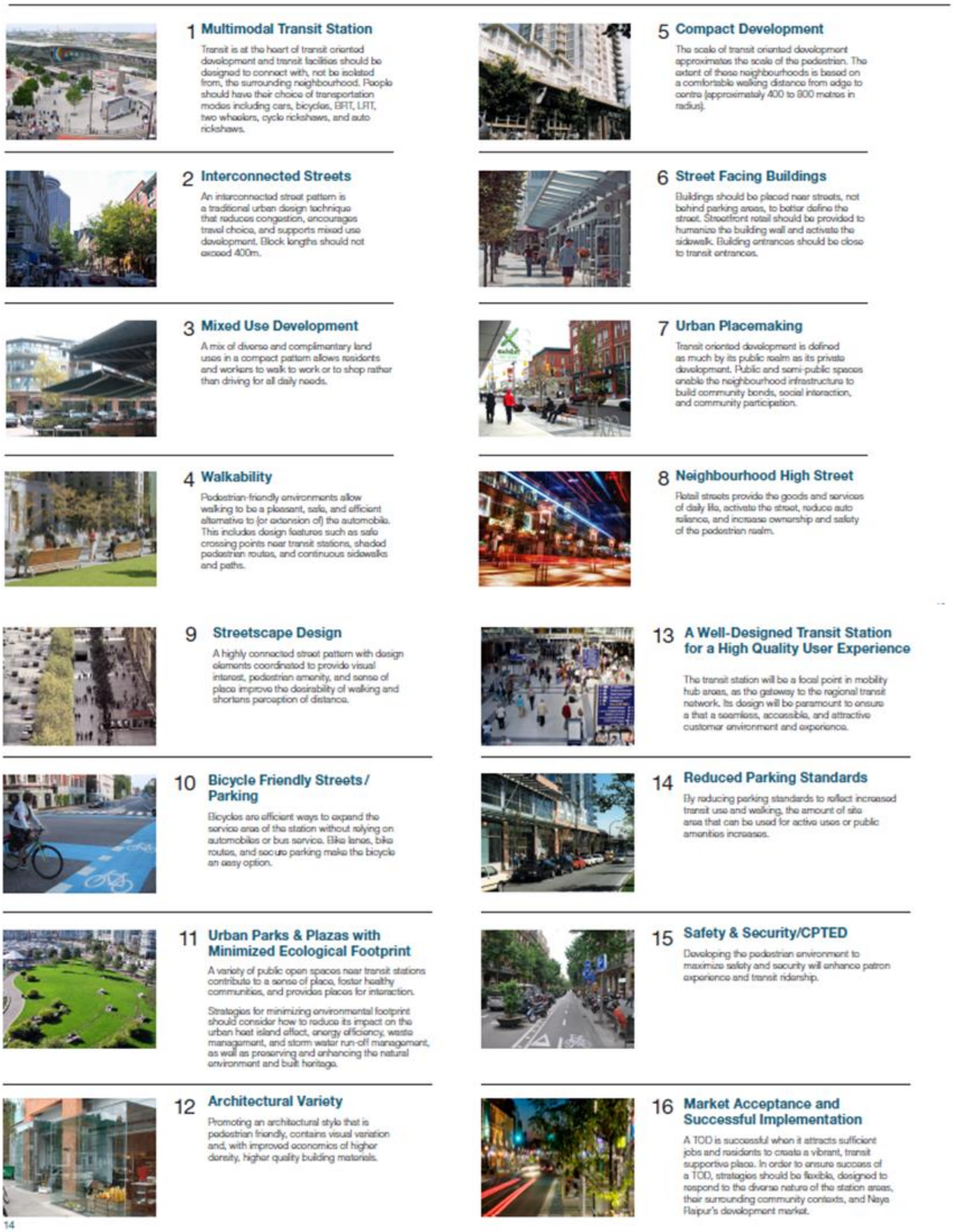


Figure 5.37 TOD Principles

TOD Influence Zone:

- **Enable Transformation** – Transformation from Private vehicle to Public transport
- **Accessible Public Transport** - usage of public transport by making it accessible, by encouraging people to walk and cycle
- **Compact Walkable Communities** - To create livable and affordable communities

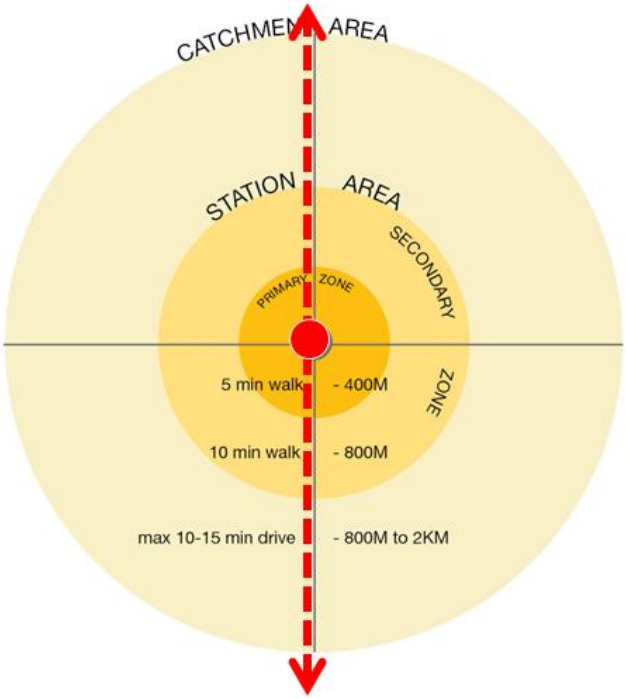


Figure 5.38 Influence Zone



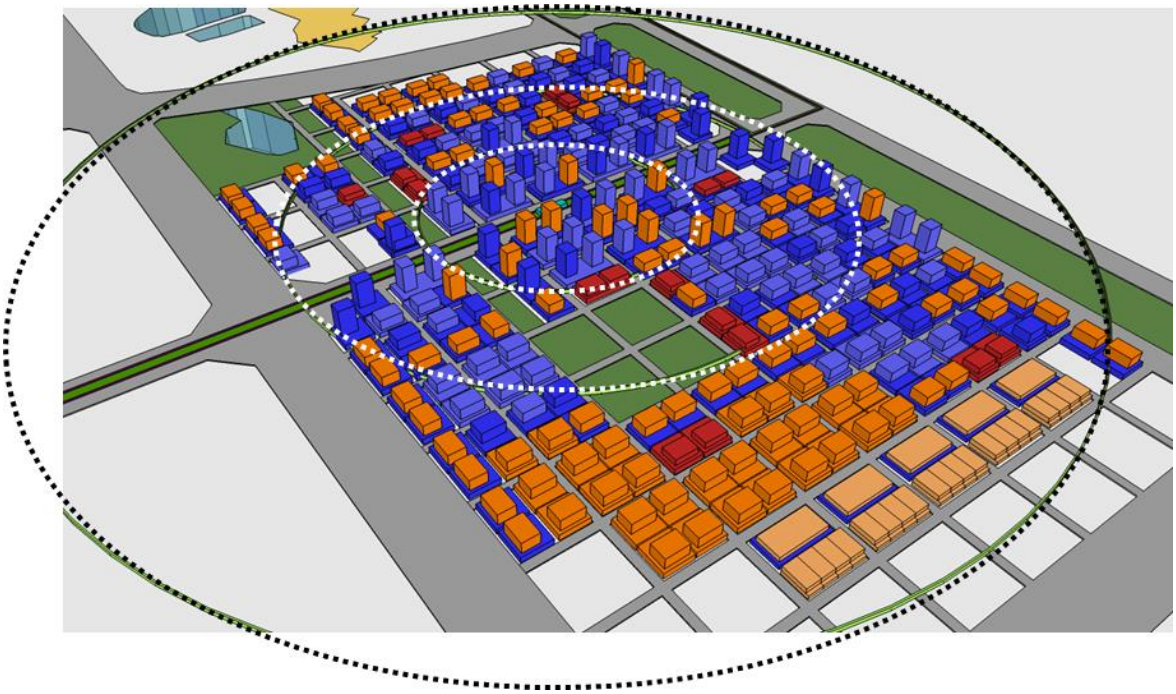


Figure 5.39 Development along TOD Zone

Many cities in India is facing issues in delivering efficient, comfortable and affordable mobility options to its citizens. The current lack of connectivity to the public transportation systems, abundant subsidized parking options as well as lack of safety for walkers, cyclists and women in the cities has resulted in public transportation being relegated to second or even last choice of travel. This has consequentially resulted in the ever increasing number of private vehicles plying in the cities. Our cities need to restructure and redefine how it works, lives and finds means of recreation. This is possible through Transit Oriented Development (TOD). In order to curb these issues, Delhi Development Authority has come up with the policy guideline for Transit Oriented Development. The provisions of TOD include:

- Development/ Redevelopment in TOD zone will be incentivized by providing significantly higher FAR of 400 on the entire amalgamated plot being developed/ redeveloped. However, these higher norms can be availed only for plots of area of 1 Ha or more for which a comprehensive integrated scheme has to be prepared. In contrast, the minimum scheme area for undertaking redevelopment outside TOD zone is 4 Ha. Within an approved scheme area in TOD Zone, development can be taken up in phases for minimum plot size of 3,000 m² at a time. Minimum scheme area for development by Mass Rapid Transit System (MRTS) agencies such as DMRC, Rapid Rail Transit System (RRTS) and Railways will be 3,000 sq m.
- Additional FAR may be availed only through Transferable Development Rights (TDR), for schemes larger than 1 Ha.
- Entire approved layout plan of a scheme will be included in influence zone if more than 50% of the plan area falls inside the influence zone.
- It will be mandatory to use a minimum of 30% of overall FAR for residential use, a minimum of 10% of FAR for commercial use and a minimum of 10% of FAR for community facilities. Utilization of remaining 50% FAR shall be as per the land use category designated in the Zonal Plan. For example, in residential use zone, of the remaining 50% of overall FAR, at least 20% will be for residential use and other uses are permitted up to 30%. Similarly, in commercial use zone, of the remaining 50% of overall FAR, at least 40% will be for commercial use and other uses are permitted up to 10%.

- There shall be a mix of Housing types for a wide range of income brackets within communities with shared public spaces/ greens/ recreational facilities/ amenities, which will minimize gentrification and create more community oriented developments.
- The mandatory residential component covering 30% FAR shall wholly comprise of units of 65 ㎡ area or less. Out of these half of the FAR, i.e. 15% of the total FAR, has to be used for units of size ranging between 32-40 ㎡. Over and above this, an additional mandatory FAR of 15%, i.e. FAR of 60 has to be utilized for Economically Weaker Sections (EWS). The size of EWS units will range between 32-40 ㎡. This is a significant pro-poor and pro middle class measure which will further the objectives of 'Housing for All' Mission.
- For example, in a 1 Ha (10,000 ㎡) plot, the permissible FAR of 400 amounts to 40,000 ㎡. Out of this, it will be mandatory to provide 30% i.e. 12,000 ㎡ for units of 65 ㎡ area or less. Out of this 12,000 ㎡, 50% i.e. 6,000 ㎡ has to be used for units ranging between 32-40 ㎡. Over and above these, it shall be mandatory to use 15% of permissible FAR i.e. 40,000 X 0.15 = 6,000 ㎡ for EWS units ranging between 32-40 ㎡. Thus, in a TOD development/ redevelopment on 1 Ha area, 18,000 ㎡ (45%) of built up area has to be used for providing housing units for the poor and middle class.
- 20% of land shall be used for roads/ circulation areas. 20% area for green open space shall be kept open for general public use at all times. Further, 10% area of green area may be for exclusive use.
- MRTS agencies have been exempted from providing the mandatory 30% residential component which is part of the TOD norms applicable to all other Developer Entities (DEs).
- Computerized single window clearance system shall be adopted for approval of TOD projects.
- Increase in safety especially for women and children using public transport or walking at night shall be facilitated through changes in key Development Code aspects such as revised setback

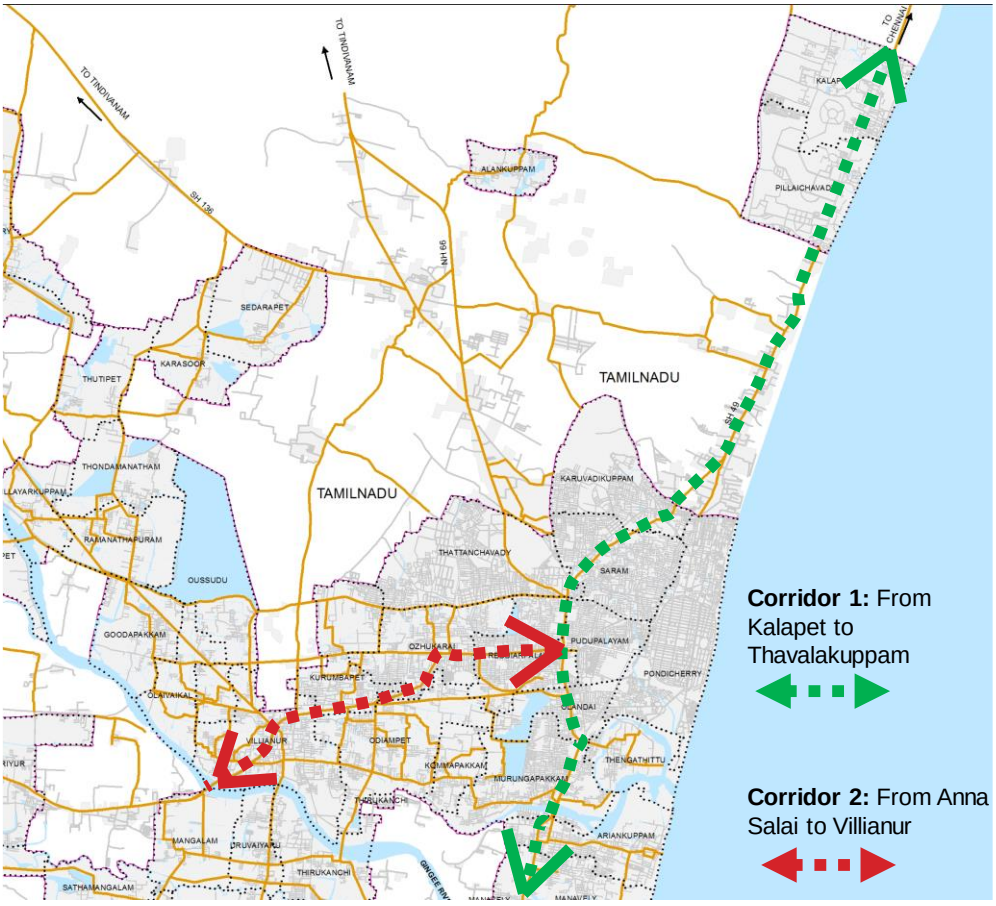


Figure 5.40 Proposed TOD Corridors

norms, dispensing with boundary walls, having built-to-edge buildings with active frontages which provide 'eyes-on-the-street', etc.

Proposed TOD Corridors for Puducherry Planning Area

There are two TOD corridors proposed in Planning Area. Corridor 1 is proposed from Kalapet to Thavalakuppam (ECR) and Corridor 2 is proposed from Annai Salai to Villianur (NH 45A). Mixed Commercial Zone is proposed along both the corridors. The FAR in this zone is suggested to be 250. Apart from this, construction of Multi Story Buildings will be promoted. For Multi Story buildings, the FAR is suggested to be increased from 250 to 300 with height permissibility of 40m from 30m. Hence, density of the surrounding area of the corridors will increase.

These corridors are proposed as Bus Augmentation Corridors under Comprehensive Development Plan for Puducherry due to which connectivity to surrounding locations will be increased. The proposed Multi Modal Transit Center at Villianur is located on the Corridor 2 shown in the map due to which the possibilities of availability of various mode of transportation will be increased. Both the corridors are having Residential, Mixed Residential Zone and Public & Semi-Public Zone along them. For these zones, FAR is suggested to be 250 from 180 with height permissibility of 20m from 15m. These zones will be densified due to such higher provision of FAR and height permissibility. Due to such various provisions, the use of Public Transportation will be increased along these corridors. Mixed use Development shall be promoted along these corridors.

6 HOUSING

6.1 INTRODUCTION

Housing sector is employment intensive, it generates employment during its construction period and also during its life for maintenance purpose. The United Nations Centre for Human Settlements (UNCHS) uses a broader term "Settlement conditions" because it extends to all those components of the physical environment with which an individual or a community comes into contact and which are used on a regular basis for the whole range of human activities - the individual dwelling and its related services, the dwelling's immediate surroundings, community facilities, transportation and communications network and so on.

The importance of housing was universally accepted from the dawn of history. French, under the command of Francois Martin, the first Governor General of Puducherry, set up a factory in Puducherry and built a fort during 1674 A.D with a view to attract the local workforce and soon Puducherry emerged as a prosperous settlement. In 1693, Dutch took over the town and made plans for the expansion of the city limits westwards with a settlement laid out in grid iron pattern. The extension had a structure, which corresponded to a spatial-functional distribution of the different Indian communities such as Brahmins, weavers, merchants, farmers, craftsmen etc. The Dutch design of grid-iron pattern had been partially implemented when the French returned to Puducherry in 1699 and it was completed by them. English destroyed the whole town of Puducherry in 1761. French regained the power in 1765 and rebuilt the town in the old foundations with a fortification.

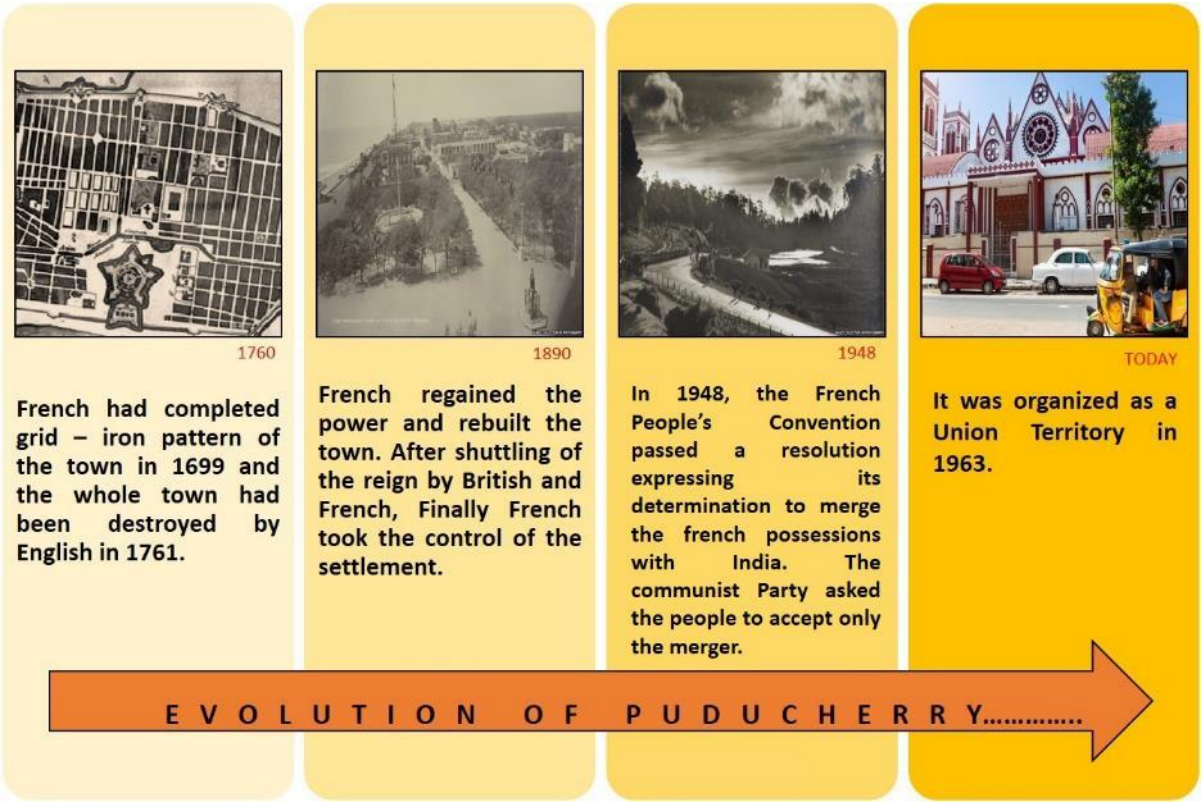


Figure 6.1 Evolution of Settlement in Puducherry

The period from 1761 - 1814 witnessed the shuttling of the reign by British and French rulers. Finally, French took control of the settlements of Puducherry, Mahe, Yanam, Karaikal (2 districts of the present Union Territory of Puducherry) in 1816. The city was both physically and politically devastated by then and there was a strong need to rebuild the city. In 1824, in the place of fortifications, and outer boulevard was laid and the location of the Grand Bazaar was decided in 1826. Over the period the demand for housing increases due to growth of population, rapid pace of

industrialization and urbanization. Hence, the Puducherry Housing Board was constituted under a special enactment viz. the Pondicherry Housing Board Act, 1973 (No.7 of 1974) with the assent of the President of India and also with an avowed object to mitigate the housing shortage by promoting housing and improvement schemes in the Union Territory of Puducherry. This body had started its activities wide open to the public in general and to the shelter less population in particular. Hence with rapid urbanization and changing socio-economic patterns, there is a significant increase in the housing shortage. Therefore, the housing sector is considered to be the engine of growth which has immense potential of giving a push to economy. Therefore, provision of housing can make a significant difference in the economic wellbeing both in rural and urban area in the system.

6.2 EXISTING SCENARIO

In today's context, perhaps the most important issue for urban dwellers is to find an appropriate place to live. It is observed that the price of all kind of housing have been increasing exorbitantly, which indicate that the investment in housing sector is unable to match pace with the increasing demand for housing. Given the importance of housing, there are several issues which need to be tackled to promote the provision of this basic need in Puducherry. Rapid urbanization and rural to urban migration has led to a substantial shortage of housing in the region. The direct result of this is the concentration of informal settlements in the city. Given that the shortage in housing is concentrated at the bottom of the pyramid, the sector can play an important role in the socio-economic development.

Moreover, with the rapid urbanization and significant increase in the housing demand, housing sector is considered to be the engine of immense potential of giving a push to the economy because of its link with the employment generation and livelihood. Therefore, provision of housing can make a significant difference in income of families, both in rural and urban areas. The number of households in Puducherry Planning Area for year 2011 is given in the table 6-1:

Table 6-1 Number of Household in PPA, 2011

Municipality/ Commune Panchayat	**Total Population (2011)**	**% Population**	**Total No. of Households (2011)**	**HH size**
Puducherry	2,44,377	25.7	60,638	4
Oulgaret	3,00,104	31.6	74,133	4
Bahour	68,757	7.2	16,274	4.2
Nettapakkam	51,718	5.4	12,438	4.2
Ariyankuppam	72,055	7.6	17,646	4.1
Mannadipet	86,500	9.1	20,245	4.3
Villianur	1,26,778	13.3	30,139	4.2
Total	9,50,289	100	2,31,513	4.1
Source: Census, 2011				

6.2.1 SIZE OF THE HOUSEHOLD

The 1981 Census data reveals, that the percentage of large households has come down. The 1991 Census shown that more than half of the households in the region were medium sized with an average member of 3 to 5. According to census 2011 the medium sized households (3-4) is predominant because of the increasing trend towards nuclear households. Since the trend in nuclear households and rapid urbanisation are at higher rate, there will be considerable pressure on housing

in coming future. The two municipalities, Puducherry and Oulgaret accommodates more than half of the population (57.3%) of Puducherry Planning Area. The overall household size of the Puducherry Planning area for 2011 is 4.1, which is almost similar to the regions of Yanam and Karaikal, while Mahe has the HH size of more than 5.5. In planning area, HH size is the lowest in Puducherry Municipality and highest in Mannadipet Commune Panchayat. The maximum Household size is observed in rural area while the lowest is observed in urban area.

6.2.2 HOUSING TYPOLOGY

The 'Housing Typology' is the complex nature of regional contexts as places to formulate human habitation. Investigating the interdependencies evolving between a buildings entity and its territory can contribute in the future to development of region. Table 6-2 reveals the number of households living in permanent, semi-permanent and temporary houses within the Puducherry Panning Area. Out of 2,31,513 households, almost 79% are permanent, 8 % are semi-permanent and 12% are temporary houses.

Table 6-2 Distribution of Households living in permanent, semi-permanent and temporary houses

S. No	Puducherry region	Permanent	(%)	Semi-Permanent	(%)	Temporary	(%)
1	Urban	141,039	87.37	8,731	5.41	10,422	6.46
2	Rural	42,108	60.78	10,522	15.19	16,431	23.72
Total		183,147	79.39	19,253	8.35	26,853	11.64
Source: District Census Handbook, Puducherry, Village & Town wise Primary Census Abstract 2011, Directorate of Census Operations, Puducherry – Pg No. 102, 103							

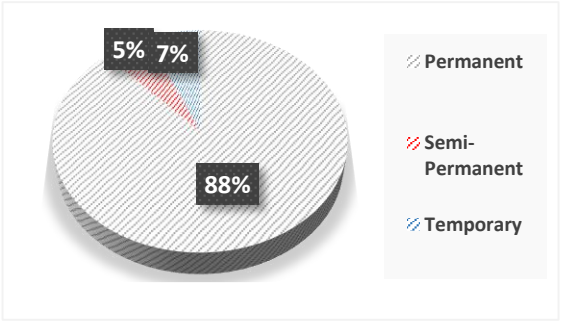


Figure 6.2 Urban Housing Condition in Puducherry Planning Area, 2011

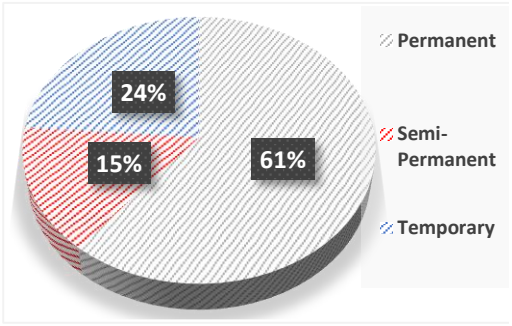


Figure 6.3 Rural Housing Condition in Puducherry Planning Area, 2011

The figure 6.2 indicates that around 88% are permanent households, 5 % are semi-permanent and 7% of dwelling units are temporary units in Puducherry urban area. In rural areas, the percentage of permanent housing is 61%, semi-permanent housing is 15% and temporary housing units are around 24%. Figure 6.3 indicates that around 61% are permanent houses, 15% of dwelling units are semi-permanent and 24% of dwelling units are temporary units in Puducherry rural area. It is also being observed that in rural areas 1/4th (23.72%) of total households are temporary houses. This clearly indicates that focusing the housing development in rural areas is of utmost importance in order to provide basic need of the people.

6.2.3 HOUSING SIZES

According to census 2011, the housing sizes are classified as number of dwelling units with following 5 categories.

1. Dwelling units with no exclusive rooms
2. Dwelling units with single room

3. Dwelling units with two rooms
4. Dwelling units with three rooms
5. Dwelling units with three plus rooms

Based on the above classification, table 6-3 reveals the proportionate of dwelling units by ownership status in urban and rural area of Puducherry Planning Area.

Table 6-3 proportionate of households by ownership of dwellings in Urban area

S. No	Households by ownership of dwellings	Urban		
		Percentage of Owned	Percentage of Rented	Total Percentage
1	No exclusive room	2	2	4
2	One room	21	19	40
3	Two rooms	19	14	33
4	Three rooms	10	6	16
5	Three plus rooms	5	1	6
6	Total	58	42	100

Source: Census, 2011

The table 6-3 it is observed that 21% of total households are owning single room in the urban area and 2 % of the Households are living in both owned and rented dwellings units without any separate rooms. It is also observed that 1% of the Households are living in three plus rooms in rented. In overall the 40% of the households are residing in one room in urban are on the total urban households.

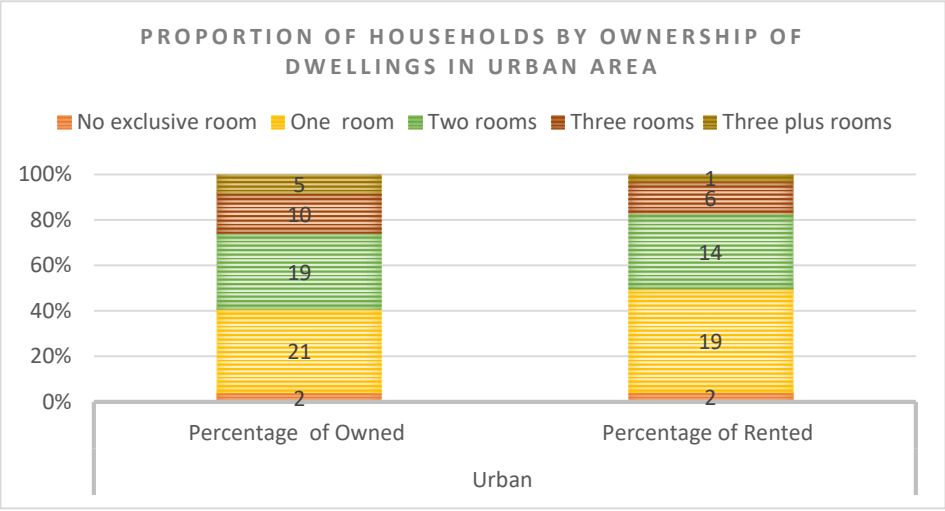


Figure 6.4 Proportion of households by ownership of dwellings in Urban area

The figure 6.4 illustrates that only 5% of the total urban households own the three plus room in the urban area. It is also observed that the ratio of owned to rented households in urban area is 58:42. Hence, it is clear that the 42% of the households are yet to own their house.

Table 6-4 Proportionate of households by ownership of dwellings in Rural area

S. No	Households by ownership of dwellings	Rural		
		Percentage of Owned	Percentage of Rented	Total Percentage
1	No exclusive room	4	1	5
2	One room	35	8	43
3	Two rooms	30	5	35
4	Three rooms	12	1	13
5	Three plus rooms	4	0	4
6	Total	86	14	100

Source: Census 2011

The table 6-4 reveals the proportionate of households by ownership of dwellings in rural area in the region. It is observed that 35% of total households are owning single room in the rural area and 1% of the households are living on rent in dwelling units without any separate rooms. It is also observed that only 4% of the households are living in three plus rooms on owned. Overall, 43% of the households are residing in one room in rural area out of the total rural households.

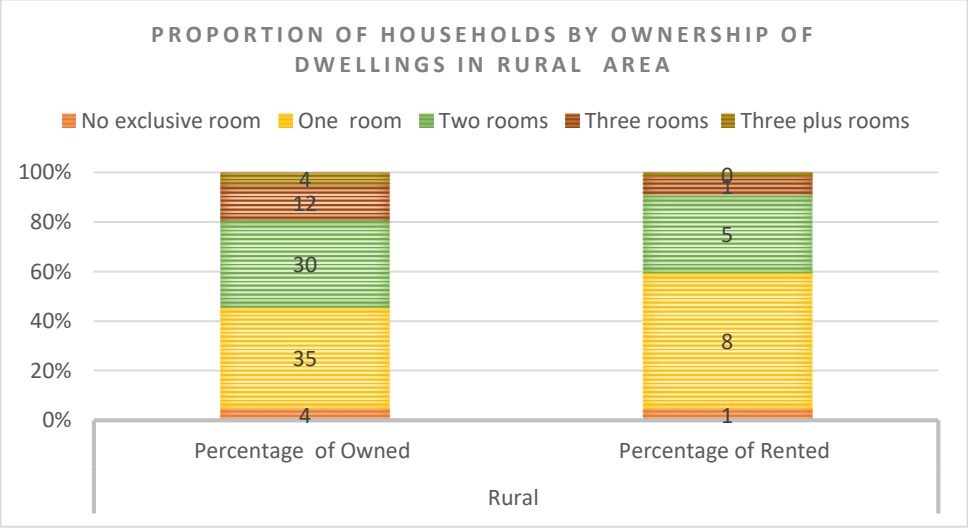


Figure 6.5 Proportion of households by ownership of dwellings in Rural area

The figure 6.5 illustrates that only 4% of the total rural households own three plus room in the rural area. It is also observed that the ratio of households in rural area residing in owned to rented is 86:14. Hence it clearly indicates that 14 % of the households are yet to construct their own house.

Table 6-5 Proportionate of households by ownership of dwellings in Puducherry Planning area

S. No	Households by ownership of dwellings	Puducherry Planning area		
		Percentage of Owned	Percentage of Rented	Total Percentage
1	No exclusive room	3	1	4
2	One room	26	16	41
3	Two rooms	23	11	34
4	Three rooms	11	4	15
5	Three plus rooms	5	1	6
6	Total	67	33	100

Source: Census, 2011

The table 6-5 reveals the proportionate of households by ownership of dwellings in entire Puducherry Planning Area. It is observed that 26% of total households are owning single room in the region and 1% of the households are living in rented dwellings units without any separate rooms. It is also observed that only 1% of the households are living on rented in three plus rooms. Overall, 41% of the total households are residing in one room in Puducherry Planning Area.

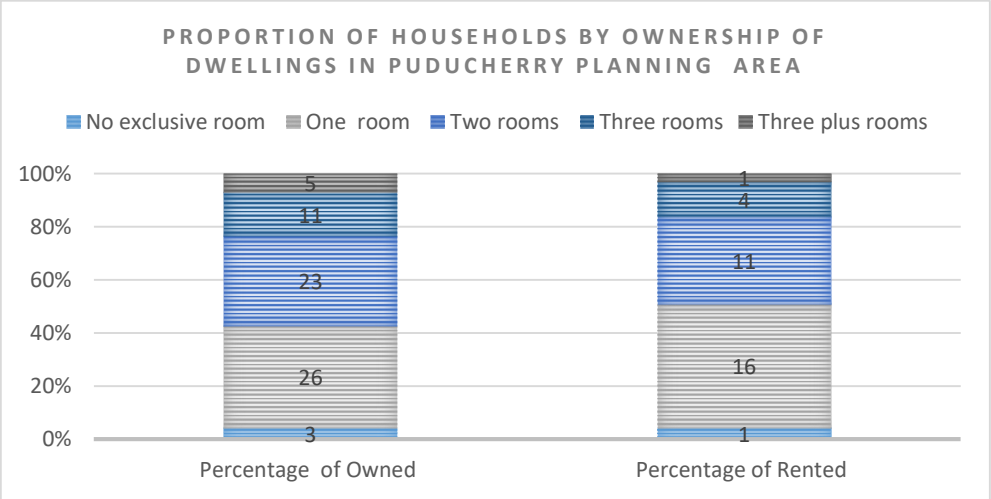


Figure 6.6 Proportion of households by ownership of dwellings in Puducherry Planning area

The figure 6.6 illustrates that only 5% of the total households own three plus room in Puducherry Planning Area. It is also observed that the ratio of household residing in owned to rented household is 67:33 in Puducherry Planning Area. It indicates that 33% of the households are living in rented houses.

6.3 GROWTH OF REAL ESTATE

The real estate sector is one of the most globally recognized sectors. In India, real estate is the second largest employer after agriculture and is slated to grow at 30 per cent over the next decade. The real estate sector comprises of further sub sectors – township, housing, retail, hospitality, infrastructure and commercial. The growth of this sector is well complemented by the growth of the corporate environment and the demand for office space as well as urban and semi-urban accommodations. The construction industry ranks third among the 14 major sectors in terms of

direct, indirect and induced effects in all sectors of the economy. (Source: Department of Industrial policy and promotion 2016)

Puducherry region experienced almost one third increase in population growth between the census year 2001 and 2011. This increasing trend has resulted in promotion of huge amount of all kind infrastructure development in Puducherry Planning Area. With a fair infrastructure availability and proximity to IT hubs like Chennai & Bangalore, Puducherry has opened an immense opportunity for Real Estate as a Holiday home market along with existing commercial & residential requirements of the region. This has led to a boost in the real estate market of Puducherry with builders and developers from across the country investing in the Puducherry Planning Area. Moreover, the industrial infrastructure development carried out by PIPDIC has attracted investments to the region and has played a vital role in promoting industrial development of region and making it an attractive location for investors from across the country. The Government of India along with the governments of the surrounding states has taken several initiatives to encourage the development in the sector. The Smart City Project, where there is a plan to build 100 smart cities, is a prime opportunity for the real estate investors.

The real estate growth witnessed in the region is a result of the aforementioned reasons and it is poised to grow at a good pace with development initiatives taken by the Government of Puducherry and measures adopted as part of CDP which will open more residential properties for development along with industrial properties and IT corridors. With these proposals being adopted and implemented by the government, it will create an exponential growth in the real estate market of the Puducherry region. Hence based on the study of above facts, it indicates that there are 5 growth driven factors of Indian state's real estate. They are:

- Rapid Urbanisation
- Significant rise in consumerism
- Policy and regulatory reforms
- Surge in industrial and business activities
- Increasing demand for newer avenues for entertainment, leisure and shopping

Considering the above factors, the Real estate developers aim to utilise opportunities in line of market demand. Hence, these phenomena of possible development act as catalyst in the development process by creating more demand for residential and commercial area in the Planning Area. On the other hand, it gives boost to the property values and paves the way to keep the real estate sector vibrant in Planning Area. However, while this development is progressive for human beings, sociologist and ecologists are concerned about the fate of the agriculture land. More and more farmers of Puducherry region are forced to sell their lands to builders as they pay lucrative amounts for the plots. Areas which were barren or even wet lands at one point are now seeing construction of residential or commercial buildings. Therefore, in order to bring the orderly development and to protect the fertile agricultural land, the Government of India has come up with "The Real Estate (Regulation and Development) Act, 2016".

6.3.1 THE REAL ESTATE (REGULATION AND DEVELOPMENT) ACT, 2016

The Real Estate (Regulation and Development) Act, 2016 is an Act which protects the interest of purchasers of plots and dwelling units / flats. It further helps to boost investments in the real estate industry. The Act mandates establishment of Real Estate Regulatory Authority (RERA) in each state for regulation of the real estate sector and also acts as an adjudicating body for speedy dispute redressal. The Real Estate Regulatory Authority regulates the real estate sector and ensures sale of plot, apartment or building, as the case may be, or sale of real estate project, in an efficient and transparent manner and also protects the interest of consumers in the real estate sector. The act has got provision for an adjudicating mechanism for speedy dispute redressal and also for establishment of Appellate Tribunal to hear appeals filed under the Act.

The Puducherry Real Estate (Regulation and Development) (General) Rules, 2017 and The Puducherry Real Estate (Regulation and Development) (Agreement for Sale) Rules, 2017 was notified in the Official Gazette on 18-7-2017. Interim Real Estate Regulatory Authority has been established and Secretary to Government (Housing) has been designated as Interim Real Estate Authority and the Office of the Authority has been functioning in the Town & Country Planning Department, Puducherry. District Court, Puducherry has been authorised by the Hon'ble High Court, Madras to function as an Interim Real Estate Appellate Tribunal.

6.3.1.1 SALIENT FEATURES OF THE REAL ESTATE REGULATION ACT (RERA), 2016

1. The act establishes the state - level Real Estate Regulatory Authority for the regulation and promotion of the real estate sector, under section 20;
2. The Act mandates prior registration of a project with the Real Estate Regulatory Authority under section 3(1). It also states that prior to registration no promoter shall advertise, market, book, sell or offer for sale, or invite persons to purchase in any manner any plot, apartment to building in any real estate project registering the real estate project with the Authority;
3. The Act additionally provides for the registration of real estate agents by the real Estate Regulatory Authority under Section 34(a);
4. The Act lays down the functions and duties of promoters under section 4, and under section 5 it provides that once registration is applied for, RERA is given a time period of 30 days to either approve upon registration, the promoter shall be provided with a log-in and password to access the website of the authority, and shall create his web page on the website and enter the details of proposed projects;
5. Under Section 4(2) (l) (d), it makes mandatory upon the promoters to deposit fund amounting to 70 per cent to over the construction cost of the project in a separate bank account to be maintained at a scheduled bank, to prohibit unaccounted money from being pumped in and out of the sector to the detriment of the consumer.
6. The Act states, under section 4(2) (d), the project shall be developed by the promoter in accordance with the sanctioned plans, layout plans and specifications as approved by the competent authorities;
7. Under Section 15(1), promoter shall not transfer or assign his majority rights and liabilities in respect of a real estate project to a third party without obtaining prior written consent from two-third allottees;
8. Under Section 19, the Act provides for the rights and duties of allottees, like allottee shall be entitled to know stage-wise time schedule of completion of the project, right to claim the refund of amount paid along with interest and compensation in the manner as provided under the Act;
9. Under Section 38(1), the Act provides for penalties and offences in case of violations of law by the promoters, allottees and the real estate agents.

6.3.2 NEED FOR HOUSING POLICY

Housing is an important economic activity besides being a necessity. As part of the construction industry, which accounts for more than 50 per cent of the development outlays, housing has emerged as a major sector of economy having backward and forward linkages with almost all other sectors.

With the increasing urbanisation and rural to urban migration for employment, it becomes inevitable to provide basic infrastructure to people. Thus, to meet this demand, Government of India is introducing various policies like Pradhan Mantri Aavas Yojana (Housing for all), affordable housing policies etc. For the vulnerable and weaker sections of the society, the Government is playing the role of direct provider. A Centrally-sponsored scheme called Valmiki Ambedkar Awas Yojana (VAMBAY) was launched with a view to ameliorating the conditions of the urban slum dwellers living below poverty line who have inadequate shelter. The scheme has the primary objective of facilitating the construction and upgradation of the dwelling units in the slum areas and to provide health and enabling urban environment through community toilets under Nirman Bharat Abhiyan, a component of the scheme. The scheme is being implemented through HUDCO.

The Pradhan Mantri Aavas Yojana is being implemented during 2015-2022 and provides central assistance to Urban Local Bodies (ULBs) and other implementing agencies through States/UTs for:

- In-situ Rehabilitation of existing slum dwellers using land as a resource through private participation
- Credit Linked Subsidy
- Affordable Housing in Partnership
- Subsidy for beneficiary-led individual house construction/enhancement

Credit linked subsidy component is being implemented as a Central Sector Scheme while other three components as Centrally Sponsored Scheme (CSS). All statutory towns as per Census 2011 and towns notified subsequently would be eligible for coverage under the Mission.

In the spirit of cooperative federalism, mission provides flexibility to the States for choosing the best options amongst four verticals of mission to meet the demand of housing in their states. Process of project formulation and approval in accordance with the mission Guidelines has been left to the States so that projects can be formulated, approved and implemented faster.

Other than these interventions, various other interventions were done by the government of India. A historical context of policy interventions towards Housing in India is described below:

- The policies of urban development and housing in India have had a long journey since independence. In early 1950s, the pressure of urban population and lack of housing along with basic services was an issue of great concern to the Government as well as to the civil society. It has generally been the responsibility of States to intervene towards meeting the housing requirements of the vulnerable sections of society and to create an enabling environment for provision of shelter to all on a sustainable basis.
- As part of the First Five Year Plan (1951-56), concrete governmental initiatives began with a focus on institution-building and housing for weaker sections of society. Government undertook construction of houses for Government employees and industrial workers (through Industrial Housing Scheme). The urban land was getting scarce for provision of housing especially for the middle and low-income groups, resulting in the government enacting the Urban Land (Ceiling & Regulation) Act, 1976. Housing and Urban Development Corporation (HUDCO) was set up in 1970 to provide affordable housing and provide specialized attention to critical segments of infrastructure development in cities and towns.
- In the late 80's and early 90's, Government envisaged a larger role for the private sector in the construction of housing, whereas government focused on mobilization of resources, provision for subsidized housing for the poor and acquisition of land. The National Housing Bank (NHB) was set up as a wholly owned subsidiary of Reserve Bank of India (RBI), in 1988 under the

National Housing Bank Act, 1987 to expand the base of housing finance. These were coupled with schemes aimed at provision of housing and basic services for the urban poor.

- The first National Housing Policy was announced in 1988 to eradicate houselessness and improve the housing conditions. Thereafter a revised National Housing Policy was announced in 1994 as a by-product of economic reforms process initiated in 1991. The goal of this policy was to increase the supply of land and basic minimum services with a view to promote a healthy environment. Subsequently, a Housing and Habitat Policy was unveiled in 1998 with the vision of "shelter for all" and better quality of life to all citizens by using the potential of public, private and household sectors. The key objective of the policy was on creating strong Public–Private Partnership (PPP) for tackling the housing problem.
- The National Urban Housing and Habitat Policy (NUHHP) 2007 was formulated with the goal of `Affordable Housing for All' with special emphasis on vulnerable sections of society such as Scheduled Castes/Scheduled Tribes, Backward Classes, Minorities and the Urban Poor. The spotlight was on 'habitat development' with a 'Regional Planning Approach' with the role of Government as a 'facilitator' and 'regulator.' The NUHHP-2007 lays emphasis on earmarking of land for EWS/LIG groups in new housing projects while retaining Governments role in social housing so that affordable housing is made available for EWS and LIG categories either on ownership or on rental basis.

Recently, the government of India has also come up with the Draft Model State Affordable Housing Policy for Urban Areas in 2014. The aim of this policy is to "create an enabling environment for providing "affordable housing for all" with special emphasis on EWS and LIG and other vulnerable sections of society such as Scheduled castes/Scheduled Tribes, Backward Classes, Minorities and senior citizens, physically challenged persons in the State and to ensure that no individual is left shelter less. The Policy further aims to promote Public Private People Participation (PPPP) for addressing the shortage of adequate and affordable housing."

In order to supplement the efforts of the State Government, it is anticipated that the Government of India support will be forthcoming in the following aspects:

- Through National Policies, Programmes and Schemes and act as a facilitator in the creation of affordable housing stock.
- The Central Government will also on one hand provide for capital grants support to Affordable Housing projects under various schemes to act as a lever to boost the supply of affordable housing and also provide for greater channelization of credit to the urban poor to enhance their purchasing power on the other.
- Ministry of Housing and Urban Poverty Alleviation from time to time will provide inputs to the Ministry of Finance for providing fiscal and financial incentives to this segment.
- The Government of India shall also strive to accord industry status to the real estate segment.
- The Government of India shall also consider making Viability Gap Funding available for Affordable Housing projects.
- Facilitate greater flow of capital through external sources like the External Commercial Borrowings and Foreign Direct Investment.
- The Central Government will encourage development of new avenues for project financing for Affordable Housing including that from the insurance and pension funds.
- The recent initiatives of Government of India like the Credit Risk Guarantee Fund Trust and Urban Housing Fund needs to be further promoted.

Apart from the interventions to be done by central government, state government also has to intervene in order to achieve the central governments' goal of providing affordable housing for all under the Model State Affordable Housing Policy for Urban Areas.

State interventions and specific actions points under Draft Model State Affordable Housing Policy for Urban Areas:

Since the Constitution of India envisages provision of Housing as the primary responsibility of the State Government, major initiatives are proposed to be taken by the State as part of the vision of the Government to provide affordable housing for all residents. Few interventions are listed below:

- At least 15% of the total project Floor Area Ratio (FAR)/Floor Space Index (FSI) or 35% of the total number of dwelling units, whichever is higher, will be reserved for EWS category.
- The State Government including that of its agencies such as the Urban Development Authorities, Housing Boards, other parastatal agencies and Urban Local Bodies (ULBs) will, as far as possible, provide land for affordable housing projects.
- Subject to any Central Law, a people friendly land acquisition policy for the State will be created for undertaking affordable housing projects.
- Various models for assembling land will be encouraged in both Government and Private sectors by offering trunk infrastructure facilities and transportation linkages to such site.
- The policy aims to create an inventory of land holdings in cities to constitute a land bank and prepare an asset management plan for better management of the available land and targeting its supply to create affordable housing dwelling units. The State shall compile and maintain the inventory.
- The State will also develop innovative ways for capturing the value of land by way of developing infrastructure and regional connectivity.
- The State shall notify a policy on property rights to slum dwellers to provide title to the land and a non-eviction policy for residents of slums with over 5 years of documented stay in a particular location.
- Mortgageable leasehold property rights and land titles for the EWS and LIG categories shall be facilitated by the Revenue Department and the ULBs.
- Infrastructure services including water supply, sanitation, health, education facilities to existing housing colonies where there is absence of such facilities will be ensured.
- Special dispensation to the socially vulnerable sections like senior citizens, women, students, physically challenged, SC/ST/OBC and Minorities, etc. of the State shall be made.
- In situ Slum upgradation of slums and allied infrastructure will be taken up by tying up various schemes of Central and State Government.

The agencies responsible for various works to be implemented in Puducherry under majority of the central government's initiative are Town and Country Planning Department, Housing Board or Slum Board etc..

In puducherry region, due to pressure in the urban areas, rampant development has taken place. Therefore, in order to have a streamlined growth in the coming future, Puducherry will require a Housing policy for the Puducherry regions. Various Indian states like Madhya Pradesh, Chhattisgarh, Maharashtra, Karnataka etc. have introduced housing policy in order to have ordered development in the state. Thus, Puducherry Government shall also come up with a detailed Housing Policy for Puducherry Union Territory. This policy should focus on various issues being faced by regions in terms of Housing.

It is noticed that a large number of unapproved layouts and sub-divisions have been developed in the Puducherry regions without adequate infrastructure and public civic amenities and most of the plots in such layouts and sub-divisions have been purchased by ignorant people and there is no way to convert these layouts and sub-divisions or plots back to their original land use;

It is expedient to regularise the plots in such unapproved layouts or sub-divisions, so as to protect the interests of ignorant purchasers and to mobilise financial resources in order to provide basic infrastructure facilities in areas where such unapproved layouts have come up.

Regularization of unapproved layouts will enable the purchasers to avail institutional finances to build houses at affordable interest rates and to improve their security of tenure and thereby their quality of life.

It is also observed that regularisation of sold out plots alone without considering the layout or sub-division as a whole will result in discontiguous pockets of development, causing enormous difficulties to the Local Bodies to provide services to the regularised plots in isolation and therefore, it is considered necessary to regularise these unapproved layouts and sub-divisions in their entirety by insisting to widen the roads, improve circulation, reserve areas for open space and public purpose to the extent feasible in each layout.

In exercise of the powers conferred by section 70 of the Puducherry Town and Country planning Act, 1969, in respect of compounding of offences, the following order is issued to regularise the unapproved layouts and unapproved sub-division, where any or all plots are sold and registered on or before 30th January, 2017 and situated outside the Comprehensive Development Plan areas in Puducherry regions.

Effect of regularization – Plots regularised under this scheme shall be deemed to be regularised for residential use.

Some imperative objectives of the Housing Policy to be formulated is described as under:

- To facilitate affordable housing in urban and rural areas, create adequate housing stock for Lower Income Group (LIG), Economically Weaker Section (EWS) and shelters for the poorest of the poor on ownership or rental basis.
- To pursue the target of cities without slums through equitable slum redevelopment and rehabilitation strategy and shelters for the poor.
- To deregulate housing sector and encourage competition and public private partnerships in financing, construction and maintenance of houses for Lower Income Groups (LIG) and Weaker Sections of the society.
- To rationalize development control regulations and streamline approval procedures.
- To promote rental housing and incentives to different options of rental housing for weaker sections.
- To facilitate the redevelopment and renewal of inner city areas and dilapidated buildings through options of land assembly; conserving heritage structures and places of archeological importance.
- Encourage technology innovation, training and capacity building of the construction workers to enhance their productivity and improve quality of housing stock.
- To promote larger flow of funds for investment in housing and infrastructure using innovative products and appropriate institutional mechanism.
- To encourage progressive shift from target orientation to a demand driven approach as also from a subsidy based housing scheme to cost sharing or cost recovery-cum-subsidy schemes.
- To provide for mandatory construction of EWS/LIG housing by the private sector in the government-provided land, government facilitated site or their own projects.
- The policy will orient towards setting up of a land bank to ensure smooth supply of land for projects specifically meant for construction of houses to low income segment households
- To create skilled manpower for building construction industry and create employment opportunity for low income group.
- To conserve ecologically sensitive areas and promote environmentally sustainable cities and townships.
- To establish Management Information System to strengthen monitoring of building activity in the Union Territory.

6.4 LAND AND REAL ESTATE MARKETS

Puducherry is popularly known as "A little piece of Medieval France in India". As far as tourist movement is concerned, Puducherry is a beautiful and a captivating place. With large availability of land, water, labour and power supply, investors are getting attracted towards Puducherry real estate. Also, the land rates in Puducherry region are moderate than the ones in its surrounding locations. Over the last decade, the region has brought an enormous improvement in its infrastructure facilities which have served as a basis for major tertiary growth in the system. The contribution from industrial sector has shot to 49.1% in 2016 from 46% in 2011, which clearly underlines the growth in the sector. This may give a boost to Puducherry property market by producing a demand for both the commercial spaces and residential units. Apart from the active support of manufacturing units, high concentration of prominent hardware producers such as IBM, WIPRO etc., Pondicherry has a proficient technical workforce for the software industry.

6.4.1 PUDUCHERRY AND OULGARET MUNICIPALITY

The Puducherry region's real estate market can be easily understood as French quarters, Tamil quarters, Municipality areas and outside Municipal areas. Property prices in the French quarter between 12,000 and 17,000 per sqft. In other words, a 1,400 sqft two-bedroom apartment costs between 1.7 crore and 2.4 crore, depending on the amenities (car park, power back-up) on offer. Those prices compare well with properties in Gurgaon, Bangalore or Chennai. French quarter's real estate has always been costly because demand exceeds supply. Many potential investors in high-end property start out as visitors or high-end tourists and later settle here. That list includes expats as well as Indians from other parts of the country. Puducherry's high-end properties have always attracted a 50:50 mix of local to outside investors, including people from other states. Many of these apartments are second homes for the owners who spend winter months here. There are only a handful of apartment blocks and very few secondary sales apartments in the Boulevard area. This supply crunch has resulted in the high property prices.

During 2017, the price of properties in Puducherry starts from around minimum ₹32.00 lacs while the average price of properties is ₹4.92 crore. There are localities in Puducherry which are showing an upward price trend such as Moolakulam - Reddiyarpalayam road, Kadirkamam Vazhudavur road, Lawspet airport road, Villiyanur Uruvaiyaru road and Thavalakuppam Cuddalore road. overall, Puducherry has a price trend which is moving up since the last 5 years.

6.4.2 COMMUNE PANCHAYATS

The property rates in Ariyankuppam, starts from ₹40 lacs and the average price of properties in Ariyankuppam is ₹56 lacs and maximum it goes upto 85 lacs. Ariyankuppam has shown an upward trend since the last 5 years. The property rates in Nettapakkam, starts from ₹20 lacs and goes upto maximum ₹50 lacs and the Nettapakkam has shown a moderate trend since the last 5 years. The property rates in Villianur main road starts from minimum ₹50 lacs and goes maximum to ₹1.5 crores. Thus, it is clear that Villianur has shown a high trend since the last 5 years. The property rates in Madagadipet, starts from minimum of ₹35 lacs and the maximum to ₹50 lacs thus showing a high trend since the last 5 years. The property rates in Bahour, starts from minimum ₹35 lacs and the maximum is ₹50 lacs showing a high trend since the last 5 years.

6.5 HOUSING SHORTAGE POPULATION & PAVEMENT DWELLERS

Housing shortage is defined as the set of populations who does not hold any house. There may be a growing concern for homeless across big cities during winters, but progress in construction of night shelters has been very slow across most of the states despite the centre providing 75% of funds required for building and refurbishing shelters for the urban homeless. In absence of city level data on the houseless population and pavement dwellers, the houseless population is derived from the data published as part of census of India, 2011. Details of housing stock, Municipality/Commune panchayat wise in Puducherry planning Area were computed based on the census of India, 2011 and are presented in the table 6-6.

Housing shortage is calculated by subtracting the total number of households to number of housing stock (No of residential units). The table 6-6 indicates the approximate number of houseless population of Puducherry Planning Area. Taluk wise population is given with urban-rural breakup, Puducherry Planning Area have a houseless population of around 28000 which is 2.98% of total population. During the existing land use - 2015 survey, it was observed that the ratio of population dwelling on the pavement is very low in the planning area as compared to other major cities in India. In metro cities, these population accounts to a sizable ratio.

Table 6-6 Shelterless Population/Housing shortage of Puducherry Planning Area

S.No	Puducherry Planning area	No of Households 2011	Total No of housing stock 2011	Housing shortage
1	Puducherry Municipality	60,638	55,648	4,990
2	Ariyankuppam Commune	17,646	16,408	1,238
3	Oulgaret Municipality	74,133	68,832	5,301
4	Villianur Commune	30,139	23,565	6,574
5	Mannadipet Commune	20,245	16,078	4,167
6	Bahour Commune	16,274	12,481	3,793
7	Nettapakkam Commune	12,438	9,388	3,050
	Total	**2,31,513**	**2,02,400**	**29,113**

Source: Compiled based on the Census 2011

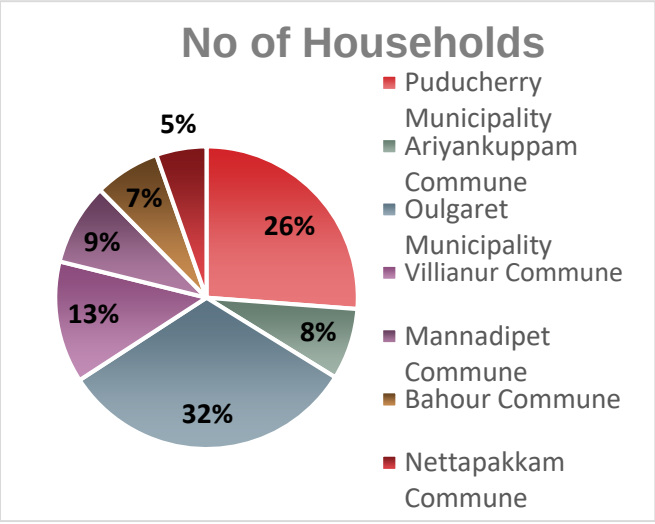


Figure 6.7 Total Housing Stock in Puducherry Planning Area for 2011

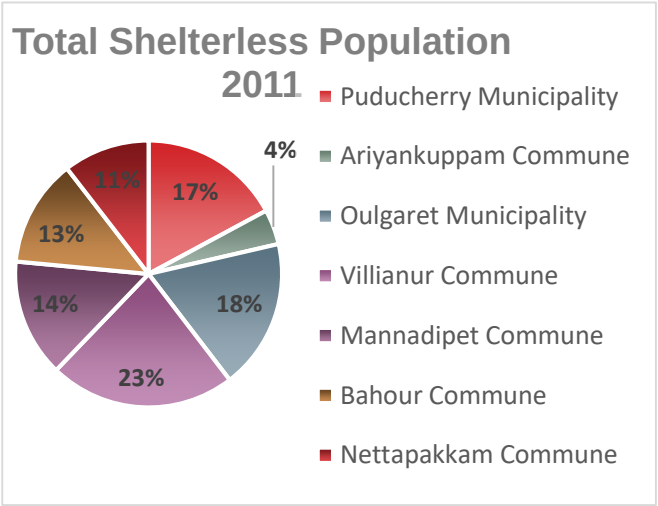


Figure 6.8 Rural Houseless Population in Puducherry Region, 2011

6.6 SLUMS

A Slum, for the purpose of Census, has been defined as residential areas where dwellings are unfit for human habitation by reasons of dilapidation, overcrowding, faulty arrangements and design of such buildings, narrowness or faulty arrangement of street, lack of ventilation, light, or sanitation facilities or any combination of these factors which are detrimental to the safety and health. According to Census, slums are categorized into notified and identified slums. The high rate of growth of urban population and its accumulative nature with a population has led to increasing problem of housing, reducing privacy and overcrowding in small house, steady growth of slums and unplanned settlements and severe effect on civic services in urban areas in the system.

6.6.1 REASON FOR SLUMS

The Puducherry region presents a wide range of activities in various institutional, Commercial and tourism sectors. Growth in such activities, possibilities of absorption in various service sectors, scope of employment in trade and business activities, hawking, retailing, carting etc., could have attracted more rural poor to the urban. Due to their economic status, these urban poor are unable to get a house within their limited income and hence occupy vacant spaces wherever available and lead a marginal level of living. These habitations in due course develop into slums proliferate exponentially further due to rapid urbanization and natural growth of population. In this scenario, the role of Government in tackling the slum becomes more pertinent.

6.6.2 IMPACT OF SLUMS

The development of slums leads to Poor environmental conditions in such areas which lead to poor health, which aggravates poverty and often results in lower educational levels, as well as loss of income owing to sickness, disease, and increased spending on health care, which may deplete household savings. On the other hand, environmental problems exacerbate urban poverty and poor neighbourhoods suffer disproportionately from inadequate water and sanitation facilities and indoor air pollution. Poor people living in slum are often forced to live in environmentally unsafe areas, steep hillsides and flood plains or polluted sites near solid waste dumps, open drains and sewers, and polluting industries. Conflicts like quarrel, clash and fight in the squatters of this area is a regular phenomenon. This creates noise and violence which leads to lack of security in the area and disturbs the city dwellers, particularly the nearby residents, office workers, and school children. Besides, many of the residents are involved in prostitution, drug trafficking, hijacking, smuggling etc. These activities threaten the social and cultural environment of the city.

6.7 STATE PUBLIC SECTOR IN HOUSING ACTIVITIES

As part of preventing the growth of slum and providing basic amenities to urban poor there are many state public sector organization and co-operative society supporting for the development of housing sector.

6.7.1 SLUM CLEARANCE BOARD

The Puducherry Slum clearance board was established during the year 1986 in order to prevent the growth of slums, to prevent the eviction of slums and to provide basic amenities to the slum dwellers. The works of the Pondicherry Slum Clearance Board, are carried out mainly under the following schemes as listed below.

1. Slum Upgradation Programme (SUP)
2. Environmental Improvement scheme in Urban Slums (EIUS)
3. The Perunthalaivar Kamarajar Centenary housing scheme for houseless poor (PKCHS)
4. Chief Minister's Sanitation Schemes (CMSS)
5. JNNURM Schemes.

Table 6-7 Details of Slums and their population at various regions in Puducherry Union Territory

S. No.	Region	Notified Slums	Identified Slums	Total No. of Slums	Population
1.	Puducherry	81	101	182	81,463
2.	Karaikal	45	44	89	26,890
3.	Mahe	0	9	9	4,059
4.	Yanam	0	22	22	31,250
5.	**Total**	**126**	**176**	**302**	**1,43,662**

Source: Census 2011

Puducherry Slum Clearance Board has identified total 302 slums within the Puducherry Union Territory. Table 6-7 illustrates the details of slums within the Union Territory. There are around 126 notified slums and 176 identified slums. Highest number of slums are observed in Puducherry region with a total of 182 slums out of which 81 are notified and 101 are identified which accommodates around 81,463 population. The lowest number of slums are observed in Mahe Region with 9 identified slums which accommodates around 4059 population. The table 6-7 further indicates that around 8.57% of total population of Puducherry Planning Area are living in slums. Thus, CDP-2036 should focus on housing development in EWS & LIG to make sure that adequate housing options are available for population of all social & economic sections. It is also observed that Puducherry region has got 42% of notified slums and 58% of Identified slums in the overall system.

6.7.1.1 NOTIFIED SLUMS

Areas notified as slums by the respective municipalities, corporations, local bodies or development authorities are treated as "notified slums". In any city, it is generally observed that the slum is developed mostly near their working places. Slum dwellers first prefer the location of land which is nearer to the workplace and then they prefer the location where basic amenities such as water, proximity to public transport etc. is available. That is why slums generally develop near the industries, wholesale-markets, godowns, railway stations and even in residential areas. They generally use public-transport or slow moving vehicles such as cycle, rickshaws etc. as it is economical. The table 6-8 represents the list of notified slums in Puducherry Planning area. The figure 6.9 shows the location of notified slums across the Planning area.

Table 6-8 List of Notified Slums

NOTIFIED SLUMS 2016		
S. No	**Name**	**Area (Sq Km)**
1	Kanniamman Koil thoppu (M.M Thottam)	0.00334
2	Chinnanarimedu	0.002334
3	Kulathumettu Street Oulgaret	0.003962
4	Vazhumuni Street	0.003824
5	Thattanchavady Mariyammankoil street	0.030877
6	Chavukkupet (Muthiyalpet)	0.007964
7	Pillaithottam (Nellithoppu)	0.00264
8	Karamanikuppam (Nellithoppu)	0.001673
9	Kalaraipet (Nellithoppu)	0.020365
10	Muslim Kalarai Street (Vanarapet)	0.003193

NOTIFIED SLUMS 2016		
S. No	**Name**	**Area (Sq Km)**
11	Netaji Nagar	0.015801
12	Mottaithoppu	0.000853
13	Narimedu - Kamarajarnagar	0.004761
14	Nesavalar Nagar	0.01754
15	Thengaithittu Street	0.016765
16	Kudhiraikulam	0.000823
17	Kurusukkuppam (N) & (S) and Sea Shore	0.032129
18	Karuvadikuppam (Mettustreet)	0.011686
19	GN Palayam - Oulgerpet	0.01098
20	Kavundampalayam_Mariyamman koil street	0.017752
21	Kavundampalayam	0.004634
22	Ramalinganagar	0.004055
23	Veemakavundampalayam	0.035524
24	Ottampalayam - Villiyanur	0.002352
25	Kalathumedu Street	0.009653
26	Kombakkam Villiyanur road	0.003511
27	Iyyanarkoil street	0.003522
28	Harijon colony - Kombakkam Villiyanur	0.011734
29	Puthunagar 2	0.065666
30	Puthunagar 1	0.044065
31	Puthunagar 3	0.060242
32	Kulathumettu street - Kombakkam	0.011636
33	Ellaiyamman koil thoppu	0.00803
34	Naipatty	0.003421
35	Udayarthottam	0.011214
36	Kottupalayam	0.005088
37	Chinnayanpet	0.006493
38	Raman nagar	0.002276
39	Natarajan nagar - Oulgret	0.020794
40	Iyankuttipalayam Mariyamman Street	0.00327
41	Muthumariyamman koil street - Lawspet	0.003177
42	Thulukkanathamman nagar	0.01568

NOTIFIED SLUMS 2016		
S. No	**Name**	**Area (Sq Km)**
43	Parayari thottam	0.002462
44	K C Nagar	0.004497
45	South street (Veerampattinam)	0.046769
46	Pillayarkoil street Ariyankuppam	0.001038
47	Sathyamoorthynagar	0.011763
48	Veemanagar Manthoppu	0.007399
49	Boomiyanpet - Mettu Street	0.00235
50	Sokkanathanpet	0.012441
51	Meenatchipet	0.003847
52	Shanmugapuram - Kathirkamam	0.020724
53	Vellavari Nagar	0.010054
54	Ramsinghnagar	0.009111
55	Anithanagar	0.021376
56	Nagammal Nagar	0.011191
57	Arunthathi Nagar - Ariyankuppam	0.024894
58	Vannankulam	0.004678
59	Chavaryapet	0.008306
60	Kothaval Mudhaliyar Thottam	0.001303
61	Appavugramani thottam	0.00125
62	Jaffarbai Thottam	0.003156
63	Kalaraipet (Vennila Nagar)	0.021467
64	Shakthi Nagar	0.035871
65	Kanndoctor Thottam	0.020961
66	Sakkilipalayam& Poongulam (Kennedy nagar)	0.003077
67	Saint Paul Pet	0.015991
68	Anandammal Sathiram	0.023524
69	Anna nagar	0.009761
70	Athuvaikkal pet	0.021898
71	Manthoppu Kombakkam	0.006545
72	Periyapet Villiyanur	0.024536
73	Thandukkarai street	0.037895
74	Thattanchavady M M Koil Street	0.034247

NOTIFIED SLUMS 2016		
S. No	**Name**	**Area (Sq Km)**
75	Chinnakuyavarpalayam	0.002048
76	Karuvadikuppampet	0.001513
77	Alankuppam	0.082103
78	Annai Nagar	0.050748
79	Alankuppam Annaipudhunagar	0.040546
80	Chinnayapuram	0.012462
81	Ellaiyammannagar	0.002442
	TOTAL SQM	**1.201543**

Source: Slum Clearance Board, Puducherry

From the above table 6-8 it is observed that the Notified slums occupies about 1.2 Sq Km of an area in Planning area.

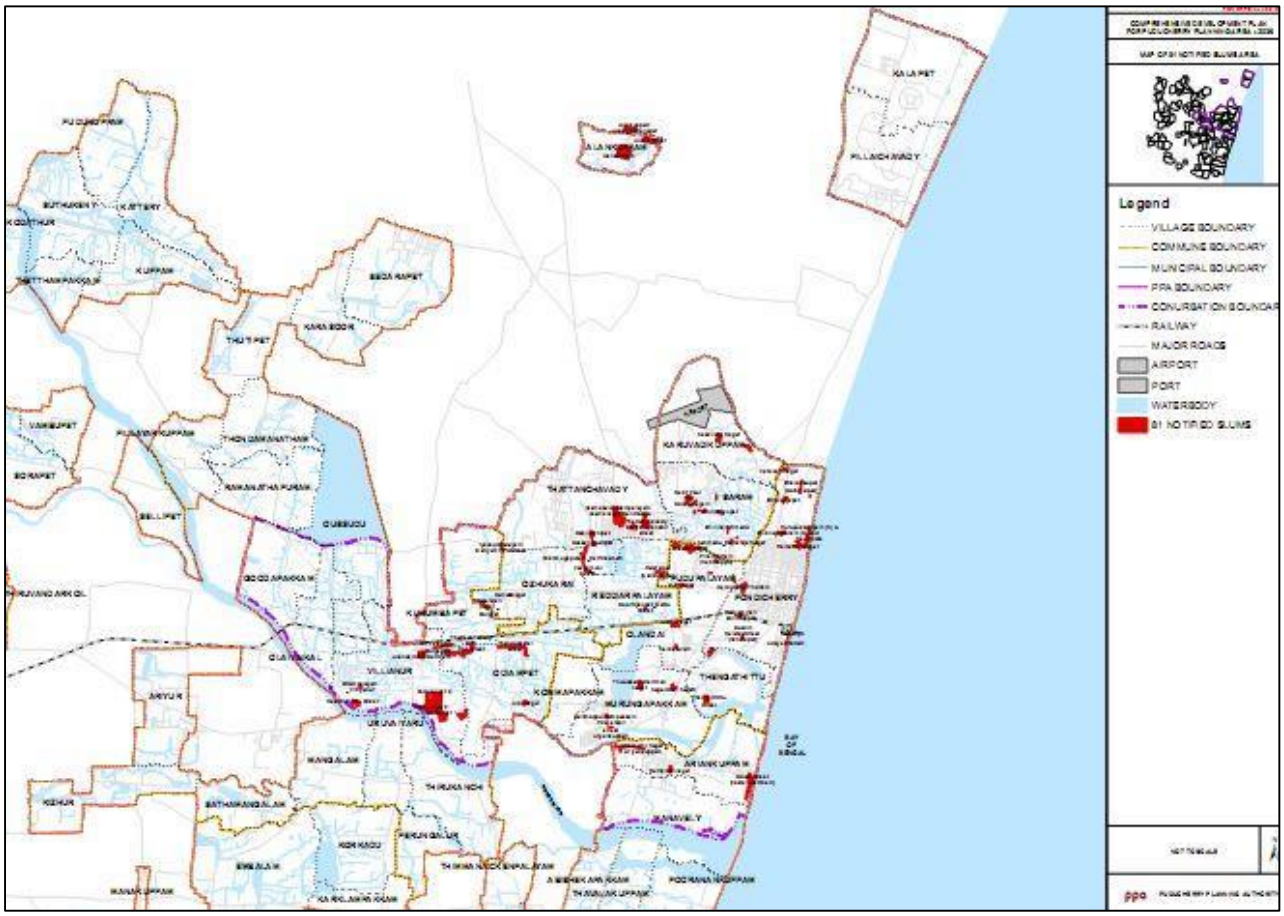


Figure 6.9 Location map showing the notified slums with Puducherry Planning area.

6.7.1.2 Identified slums:

As per Census of India identified slum is defined as "A compact area of at least 300 population or about 60-70 households of poorly built congested tenements, in unhygienic environment usually with inadequate infrastructure and lacking in proper sanitary and drinking water facilities". Such areas should be identified personally by the Charge Officer and also inspected by an officer nominated by Directorate of Census Operations. This fact must be duly recorded in the charge

register. Such areas may be considered as Identified slums. These 'identified slums' are not eligible for any 'legal protection and municipal services. The identified slums are further classified based on tenability conditions. Such that the notified slums and identified slums are classified as Semi tenable, tenable and Untenable. The Puducherry planning area have more number of Identified slums than notified slums. The table 6-9 represents the list of identified slums.

Table 6-9 List of Identified Slums

IDENTIFIED SLUMS			
S. No	**Name**	**Tenability**	**Area (Sq km)**
1	Mettupalayam	Semi Tenable	0.012358
2	Vadukkupet Mariyamman Koil St	Semi Tenable	0.003762
3	Vanjinathan Nagar	Semi Tenable	0.004313
4	Maduvupet	Semi Tenable	0.013117
5	Neruppukuzhi	Semi Tenable	0.006958
6	Pudhupettai (Samathikuttai)	Semi Tenable	0.010507
7	Solai Nagar	Semi Tenable	0.119155
8	Ambethkar nagar at Ariyankuppam	Semi Tenable	0.005498
9	Thakkakuttai (Villiyanur)	Semi Tenable	0.017466
10	Annai Indira Nagar	Semi Tenable	0.009489
11	Rodiar Pet	Semi Tenable	0.022651
12	Velrampet Main Road	Semi Tenable	0.011184
13	Vaithikuppam (Rajbhavan)	Semi Tenable	0.052012
14	Velan Nagar (Velanthoppu)	Semi Tenable	0.014387
15	Lenin Nagar (S.P. Thottam)	Semi Tenable	0.017292
16	Depasan Pet	Semi Tenable	0.007573
17	TV Nagar	Semi Tenable	0.053016
18	Karuvadikuppam Ediyanchavadi	Semi Tenable	0.007678
19	Thattachavady (Madhakovil Street)	Tenable	0.005025
20	Chettikulam Kombakkam	Tenable	0.005735
21	Palkaran street Thengathittu	Tenable	0.01079
22	Murungapakkampet , Ariyakuppam	Tenable	0.039969
23	Poornankuppam Veethi , Ariyankuppam	Tenable	0.011445
24	Kabsin St, Ariyankuppam	Tenable	0.004144
25	Sokkanathanpet Harijan Colony	Tenable	0.00942
26	Dobikhanna	Tenable	0.023563
27	Kurunji Nagar	Tenable	0.019287
28	Thirumoolar Nagar	Tenable	0.00302
29	Nainarmandapam	Tenable	0.007511
30	Ambedkar nagar (attupatti)	Tenable	0.006755

31	Arasur pet	Tenable	0.027449
32	Arunthathipuram (ORLEANPET)	Tenable	0.009305
33	Puthu Nagar Thengathittu south	Tenable	0.025578
34	Vadakkupet Thengathittu	Tenable	0.009061
35	Periyapet Pudhunagar Ariyankuppam	Tenable	0.017374
36	Mettu street Ariyankuppam	Tenable	0.031523
37	M.G.R. Nagar at Ariyankuppam	Tenable	0.018859
38	Kattabomman Nagar at Manaveli	Tenable	0.019317
39	Shanmuga Nagar at Ariyankuppam	Tenable	0.038152
40	Periyar Nagar at Manaveli	Tenable	0.009268
41	Kuppam Pet - Villiyanur	Tenable	0.006609
42	Bhavani Nagar part Ariyankuppam	Tenable	0.007421
43	Kalaignar Nagar	Tenable	0.01067
44	Toll Gate at Manaveli	Tenable	0.010666
45	Subbiah Nagar at Ariyankuppam	Tenable	0.030193
46	Sinnatha Goundar street at Ariyankuppam	Tenable	0.008026
47	Sethilal Nagar at Ariyankuppam	Tenable	0.009932
48	K.V. Nagar at Villianur	Tenable	0.022695
49	Natarajan Nagar at Villianur	Tenable	0.014838
50	Moorthy Nagar at Villianur	Tenable	0.015376
51	Pudhu Nagar-M.P. Palayam	Tenable	0.013391
52	Mettu street Veerampattinam	Tenable	0.020113
53	Moolakkadai at Villianur	Tenable	0.006271
54	Kombakkam Pudhunagar	Tenable	0.020806
55	Pitchaveeranpet Harijan colony	Tenable	0.028906
56	Ateriar Shanthi	Tenable	0.01048
57	Rajiv Gandhi Nagar	Tenable	0.00488
58	Ashogan Street	Tenable	0.020681
59	Fransuva thottam	Tenable	0.01276
60	Kurumbapet	Tenable	0.005111
61	Kamaraj Nagar (Gorimedu)	Tenable	0.051744
62	Pudhu nagar (Reddiyarpalayam)	Tenable	0.097561
63	Name Not found	Tenable	0.027481
64	Kalmedu Pet	Tenable	0.056583

65	Amma nagar	Tenable	0.01465
66	Thattanchavadypet	Tenable	0.015755
67	Nethaji Nagar	Tenable	0.076284
68	Priyadarshini Nagar	Tenable	0.012509
69	J.J. Nagar	Tenable	0.070257
70	Velrampet	Tenable	0.034149
71	Poonkulam Saram	Tenable	0.008832
72	Arani Street	Tenable	0.010792
73	Rasu udayar thottam	Tenable	0.013492
74	Karunajothi Nagar	Tenable	0.005634
75	Poraiyarkulam	Tenable	0.003758
76	Dharmapuri	Tenable	0.002198
77	Chinnakalapet	Tenable	0.019744
78	Palani gramani thottam	Tenable	0.002547
79	Kumaragurupallam	Tenable	0.002804
80	Padmini thottam	Tenable	0.001231
81	Pudu Nagar (Raddiyar Palayam)	Tenable	0.046141
82	Sethilal Nagar - Lawspet	Tenable	0.008476
83	Thideer Nagar	Tenable	0.016785
84	Ambethkar Nagar	Tenable	0.006843
85	Govindasalai	Tenable	0.006704
86	Sakkilipalayam	Tenable	0.005555
87	Gopalankadaipet	Tenable	0.002879
88	Arapani Avvai Thottam	Tenable	0.008064
89	Avvai Nagar	Tenable	0.008842
90	Mansolai - R.K. Nagar Ariyankuppam	Un Tenable	0.017675
91	Poornangkuppam Street(Manavely) Sudalai Street	Un Tenable	0.00459
92	Vinoba Nagar	Un Tenable	0.008776
93	Thiruvalluvar street	Un Tenable	0.002458
94	Sudalai Road at Manaveli	Un Tenable	0.005369
95	Othavadai street - G.N palayam at Villianur	Un Tenable	0.026882
96	Ganibai Thottam	Un Tenable	0.005812
97	Davidpet	Un Tenable	0.008573
98	Bharathi Mill Thittu	Un Tenable	0.003824

99	Ezhil Nagar	Un Tenable	0.001632
100	Boomianpet (Harijan colony)	Un Tenable	0.032005
101	M.S. Agragaram	Un Tenable	0.003308
	Total		**1.779989**

Source: Slum Clearance Board, Puducherry

From the table 6-9 it is understood that there are 18 semi tenable slums, 71 tenable slums and 12 Untenable slums across the Puducherry Planning Area. The tenability is based on the number of slum household who have recognized tenure rights, e.g., patta, possession certificate, occupancy right, etc. as a ratio of non-rental slum households that are living in tenable slums. Hence, it is understood that 71% of slums are tenable in the system.

The total area of identified slums is 1.779 Sq km. Out of which 7% of area are under the Semi tenable, 71% of area are under the tenable and 22% of area are Un tenable. It clearly shows that the maximum households in slums have the tenability rights within the Puducherry region. The figure 6.10 shows the location of identified slums across the Planning area.

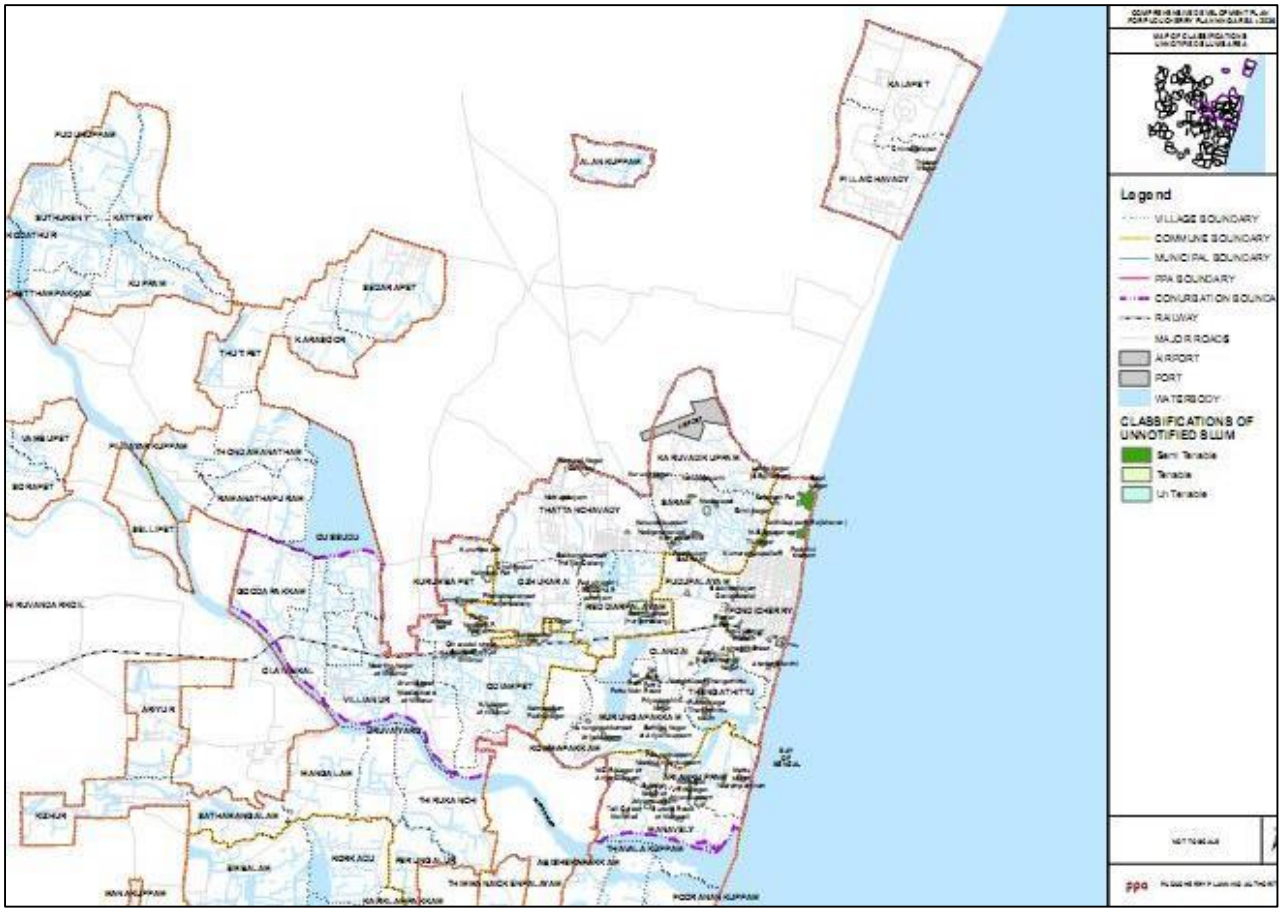


Figure 6.10 Map showing the different types of slums with tenability index

6.7.2 SLUM UPGRADATION PROGRAMME

The scheme aims at acquiring sites in various parts of urban areas and to construct tenements and provide developed plots under "Sites and Services" concept to the slum dwellers. Improvement works to the existing Slums are being implemented through the Slum Clearance Board. The tenements in storeyed blocks are made available to the slum dwellers on rental basis. Apart

from that, upgradation of slum areas by extending basic amenities viz., roads, water supply, sewerage, education, health, electricity, social infrastructure are also undertaken.

Table 6-10 List of Slum Up gradation Programme, Puducherry Region

Sl. No.	Name of place	No. of flats
1	Kuruchikuppam	216
2	Kann Doctor Thottam	384
3	Kumaragurupallam	224
4	Sakkilipalayam	120
5	Boomianpet	516
6	Odiampet	60
7	Mottaithoppu	40
Total		**1560**

Source: Website of Town and Country Planning Department, Puducherry as on April 2017

6.7.2.1 ENVIRONMENTAL IMPROVEMENT IN URBAN SLUMS

Under Urban Development sector, the slum clearance board undertakes the Environmental Improvement in urban slums which aims to improve the environmental conditions in the existing slums by extending physical infrastructure services like roads, drains, toilet blocks, water supply etc.

6.7.2.2 PERUNTHALAIVAR KAMARAJAR HOUSING SCHEME FOR HOUSELESS POOR

The objective of the scheme is to provide financial assistance to each of the Houseless Poor families falling in Below Poverty Line (BPL) category to construct a house who do not possess a pucca house on his/her/their own plot in urban or rural areas and to make the U.T. of Puducherry " a Hutless" state. Under this scheme financial assistance / subsidy of Rs. 2,00,000/- is being given to the 10000 BPL families every year. The ownership of the said plot shall have been acquired through any one of the following modes namely: -

a. House site on free of cost assigned by the Government of Pondicherry
b. Natham Patta / Kudiyiruppu Patta
c. Acquisition of plot by purchase/partition/donation/settlement/inheritance etc., through legally valid documents

6.7.2.3 RAJIV AWAS YOJNA (RAY):

Rajiv Awas Yojna a path breaking centrally sponsored scheme for the slum dwellers and urban poor envisages a "Slum Free India" through encouraging states to tackle the problem of slums in holistic manner. The main objectives of RAY are -

1. Bringing existing slums within the formal system and enabling them to avail the same level of basic amenities as the rest of the town.
2. Redressing of failures of the formal system that lie behind the creation of slums.
3. Tackling the shortage of urban land and housing that keep shelter out of reach of the urban poor and force them to resort to extra-legal solutions in a bid to retain their sources of livelihood and employment.

Under the RAY scheme the Government of Puducherry worked out the slum free city plan of action for Puducherry region.

6.7.2.4 PRADHAN MANTRI AWAS YOJANA

The "Pradhan Mantri Awas Yojana (Urban) - Housing for All" was launched by Government of India with an objective of providing houses to every family by the year 2022. The Mission is being implemented during 2015-2022 and provides central assistance to Urban Local Bodies (ULBs) and other implementing agencies through States/UTs. The "Pradhan Mantri Awas Yojana (Urban) - Housing for All" has following four Sub-schemes giving options for beneficiaries, ULBs / Implementing Agencies and the State Governments:

1. In-situ Slum rehabilitation of Slum Dwellers
2. Credit Linked Subsidy Scheme.
3. Affordable housing in partnership with Public & Private sectors.
4. Beneficiary Led Individual House Construction or enhancement.

6.7.2.5 OTHER ON-GOING PROJECTS BY SLUM CLEARANCE BOARD

To address the housing issues faced by the urban poor population of the planning area, Puducherry Slum Clearance Board had initiated few projects under government schemes to provide better housing facility for the slum population. Table 6-11 enlists the on-going and proposed projects by the government within the planning area. In Reddiarpalayam around 1136 dwelling units are under construction, 48 dwelling units are proposed in Vazhakulam and 48 dwelling units are proposed in Boomianpet location.

Table 6-11 List of Current Slum Clearance Board Projects in Puducherry Planning Area, 2015

S. No	Project Status	Name of the project	Location	No. of DU's
1	On-going (JNNURM)	Construction of 1136 dwelling units in 71 blocks at Lambert Saravanan Nagar, Reddiarpalayam, Puducherry	Reddiarpalayam	1136
2	In pipeline	Construction of 96 dwelling units in 4 blocks at Chinnaiyapuram, Puducherry	Vazhakulam	96
3	Proposed	Construction of two blocks of 24 tenements each in Park Area at Jawahar Nagar	Boomianpet	48

Source: Slum Clearance Board Puducherry 2015

6.7.3 PUDUCHERRY HOUSING BOARD

The Puducherry Housing Board was constituted under a special enactment viz. The Pondicherry Housing Board Act, 1973 (No.7 of 1974) with the assent of the President of India and also with an avowed object to mitigate the housing shortage by promoting housing and improvement schemes in the Union Territory of Puducherry. The Board started its functioning from May 1975. Puducherry Housing Board is premier housing agency in the Puducherry Union Territory formed with an aim to provide house to the shelter less poor people. It also builds houses for middle income and high income categories.

The Puducherry Housing Board has so far constructed 4152 houses out of which 830 is for EWS of the Society. In addition to the construction of houses, the Board has developed 524 plots and sold to the general public. The schemes are normally promoted with the financial assistance of financial institution viz. HUDCO. Sometimes the schemes are carried out by Board's own funds. The execution of works is supervised by Puducherry Housing Board, while the execution is carried out with the assistance of outside contractors.

6.7.3.1 Housing Board Grants-in-aid Scheme

The Puducherry Housing Board is provided with Seed Capital to meet out the short fall in implementing Housing Schemes for Various Categories of People, viz, Low income Group, Middle Income Group. In this Scheme, parcels of land are developed into housing plots wherein the HIG, MIG, LIG and EWS houses are constructed by Puducherry Housing Board. To make up the short fall while implementing the scheme, funds are provided in the form of 'Grants-in-Aid'. The Puducherry Housing Board has so far promoted 4152 MIG / LIG / EWS category Houses and Flats in Puducherry and Karaikal regions. The Board has also developed 524 plots in different locations of Puducherry region is given in the table 6-13 below.

Table 6-12 List of numbers of flats in each location at Puducherry region

S. No	Location	Houses / Flats
1	Indira Nagar	12
2	Vazhakulam	96
3	Solai Nagar	150
4	Nettapakkam	82
5	Shanmughapuram	169
6	Lawspet	912
7	Kurumbapet	566
8	Thiyagumudaliyar Nagar	688
9	Jawahar Nagar	792
10	Viduthalai Nagar	520
13	P.K. Salai	149
14	Lawsthottam	16
Total		4152

Source: Website of Town and Country Planning Department, Puducherry

Table 6-13 List of Plots Developed in each location at Puducherry region

S. No	Location	Developed plots
1	Saram	17
2	Villianur	78
3	Thavalakuppam	107
4	Moolakulam	45
5	Lawsthottam	183
6	Villianur	46
7	Ariankuppam	48
Total		524

Source: Website of Town and Country Planning Department, Puducherry

6.7.3.2 Other Ongoing Schemes under Puducherry Housing Board

The other pipeline projects by Puducherry Housing board are 32 MIG flats at Murungapakkam and 64 LIG and 40 HIG Flats at Suthanthira Pon Vizha Nagar.

6.7.4 PONDICHERRY STATE CO-OPERATIVE HOUSING FEDERATION LTD

The Pondicherry State Coop. Housing Federation has the prime objective to raise funds and to issue loans to the members of the Primary Co-operative Housing Societies in the entire Union Territory of Pondicherry affiliated to the Federation. Funds are obtained from Government of Pondicherry & Financial institutions like Life Insurance Corporation of India, Mumbai and National Housing Bank, New Delhi and HUDCO New Delhi. The Federation repays its instalment promptly without any default to the Financing agencies. Loans under various schemes are being extended to the primary Societies. In order to meet out the increasing cost of constructions & the maximum loan amount of Rs.15.00 lakhs have been issued to an individual for new construction. To meet the requirement of repairs, remodelling, extension works etc, a loan of Rs.2.00 lakhs per member is also being sanctioned. List of developed housing sites in UT of Puducherry are furnished in the table 6-14.

6.7.4.1 Developed Housing Sites

Table 6-14 List of Co-operative Housing Societies in UT of Puducherry Region

S. No.	Name of the Society	No. of layouts developed	No. of plots allotted
1	Pondicherry Co-operative Housing Society	11	937
2	Karaikal Co-operative Building Society	5	429
3	SBI Staff Co-Op. Housing Society	1	52
4	Pondicherry Teachers Co-Op. Housing Society	1	283
5	Nettapakkam Commune Coop. Housing Society	3	96
6	Panchayat Empl. Coop. Housing Society	2	58
7	PWD Engineer's Coop. Housing Society	3	174
8	Mannadipet Commune Coop. Housing Society	1	40
9	JIPMER Staff Coop. Housing Society	3	226
10	Bahour Commune Coop. Housing Society	1	50
11	Pondicherry State Coop. Bank Empl. Co-operative Housing Society	1	49
12	Pondicherry Coop. Empl. Co-operative Housing Society	1	111
13	Villianur Coop. Housing Society	3	97
14	Pondicherry Industrial Workers Co-operative Housing Society	5	956
15	Pondicherry Automobile Workshop Staff Co-operative Housing Society	2	91
16	Pondicherry Health Empl. Co-operative Housing Society	1	65
17	Mahe Coop. Housing Society Ltd.	1	10
18	Central Govt. Empl. Coop. Housing Society	1	23
19	Electricity Empl. Coop. Housing Society	1	118
20	Pondicherry General Insurance Co-operative Housing	1	47

	Society		
21	Pondicherry Govt. Officials Co-operative Housing Society	2	186
22	Pondicherry University Faculty Co-operative Housing Society	1	22
23	Pondicherry Labour Dept. Empl. Co-operative Housing Society	1	28
24	Pondicherry Coop. Sugar Mills Empl. Co-operative Housing Society	1	22
25	Pondicherry Telecom Empl. Co-operative Housing Society	1	60
26	Pondicherry AIR & TV Staff Co-operative Housing Society	1	30
27	Jawahar Coop. Housing Society Ltd	2	407
Total		**57**	**4667**
Source: Website of Co-operative Department, Govt. of Puducherry			

6.7.5 ADI-DRAVIDAR WELFARE DEPARTMENT

This department provides financial assistance in the form of subsidies for the construction of low-cost dwelling units for Scheduled Caste people. Their activities in this sector are as follows and details of allotment of house site pattas at different areas are presented in the table 6-15.

Table 6-15 List of Allotments by Adi-Dravidar Welfare Department

S.No.	Name	No. of plots allotted
1	Ariyankuppam	172
2	Embalam	655
3	Orleanpet	404
4	Nellithope	220
5	Mudaliarpet	413
6	Thattanchavady	100
7	Reddiarpalayam	99
8	Ossudu	839
9	Thirubuvanai	753
10	Villianur	363
11	Uppalam	232
12	Mannadipet	924
13	Nettapakkam	731
14	Oulgaret	924
15	Muthialpet	80
16	Lawspet	165
17	Bahour	1073
18	Kuruvinatham	599
	Total	**8,746**

Source: Website of Adi Dravidar Welfare Department, Puducherry

6.7.6 DISTRICT RURAL DEVELOPMENT AGENCY (DRDA)

DRDA is responsible for implementation of Indira Awas Yojana (IAY) in the UT of Puducherry. The main objective of the scheme is to provide "Housing for All" by the year 2022, IAY the rural housing scheme, has been revamped to Pradhan Mantri Awaas Yojana-Gramin (PMAY-G). The assistance is given to the BPL families who are having own Patta of 215 sq.ft. for construction of pucca houses. Under this scheme 300 houses are proposed to be constructed in 2015-2016 fiscal year. The salient features of the scheme are Implementing the rural housing scheme of Pradhan Mantri Awaas Yojana – Gramin, Enhancing the unit assistance to Rs.1,20,000 in plain area and Using SECC (Socio Economic Caste Census-2011) data for identification of Beneficiaries.

6.7.7 FACTORS CAUSING HOUSING SHORTAGE

There are several factors which would affect the housing shortage. The recent technique in finding the housing shortage is published by Ministry of urban poverty and alleviation. There are 5 major factors which decides the housing shortage in the system. They are -

1. Congestion factors
2. Obsolescence factors
3. Non-Durability
4. Present housing shortage
5. Calculation of housing shortage for 2036 for the projected population

6.7.7.1 CONGESTION FACTOR:

Congestion factor is the ratio of households that are residing in unacceptable congested conditions, from physical and socio-cultural viewpoints (i.e. married couples sharing the room with other adults etc.,) or the percentage of households in which each married couple does not have separate room to live. The table 6-16 indicates that the congestion factor for each Municipalities/Commune

Panchayats according to the census 2011. It is observed that the planning area shows a uniform congestion factor for all the Municipalities/communes in Puducherry region for the year 2011.

Table 6-16 Congestion Factor of Puducherry Planning Area, 2011

S. No	Municipalities / Commune Panchayats	Total Population Census 2011	No exclusive room for marriage couples - 2011	HH - 2011	Congestion factor - 2011
1.	Puducherry Municipality	2,44,377	2,744	60,638	0.05
2.	Oulgaret Municiaplity	3,00,104	3,291	74,133	0.04
3.	Ariyankuppam Commune Panchayat	72,055	809	17,646	0.05
4.	Villianur Commune Panchayat	1,26,778	1,343	30,139	0.04
5.	Mannadipet Commune Panchayat	86,500	916	20,245	0.05
6.	Bahour Commune Panchayat	68,757	740	16,274	0.05
7.	Nettapakkam Commune Panchayat	51,718	556	12,438	0.04
Total		**9,50,289**	**10,399**	**2,31,513**	**0.04**

Source: Compiled based on the Census 2011

6.7.7.2 OBSOLESCENCE FACTORS

Obsolescence factors is all the bad houses, excluding those that are less than 40 years old and all houses ages 80 years or more. Obsolescence are the households living in obsolete buildings (40 to 80 years old in a bad structural condition, and 80 or more years) and excluding temporary houses (to avoid double counting). The table 6-17 illustrates the Obsolescence Factor for Puducherry Planning Area according to Census 2011.

Table 6-17 Obsolescence Factor of Puducherry Planning Area, 2011

S. No.	Municipalities / Commune Panchayats	Total no of houses above 50+ yrs from Total HH in PPA	Tot HH PPA	Obsolescence factor
1.	Puducherry Municipality	1,520	60,638	0.03
2.	Oulgaret Municipality	3660	74,133	0.05
3.	Ariyankuappam Commune Panchayat	1,020	17,646	0.06
4.	Villianur Commune Panchayat	3,080	30,139	0.10
5.	Mannadipet Commune Panchayat	1,160	20,245	0.06
6.	Bahour Commune Panchayat	1,840	16,274	0.11
7.	Nettapakkam Commune Panchayat	960	12,438	0.08
8.	**Total PPA**	**13240**	**2,31,513**	**0.06**

Source: Compiled based on Household survey 2015 and census 2011

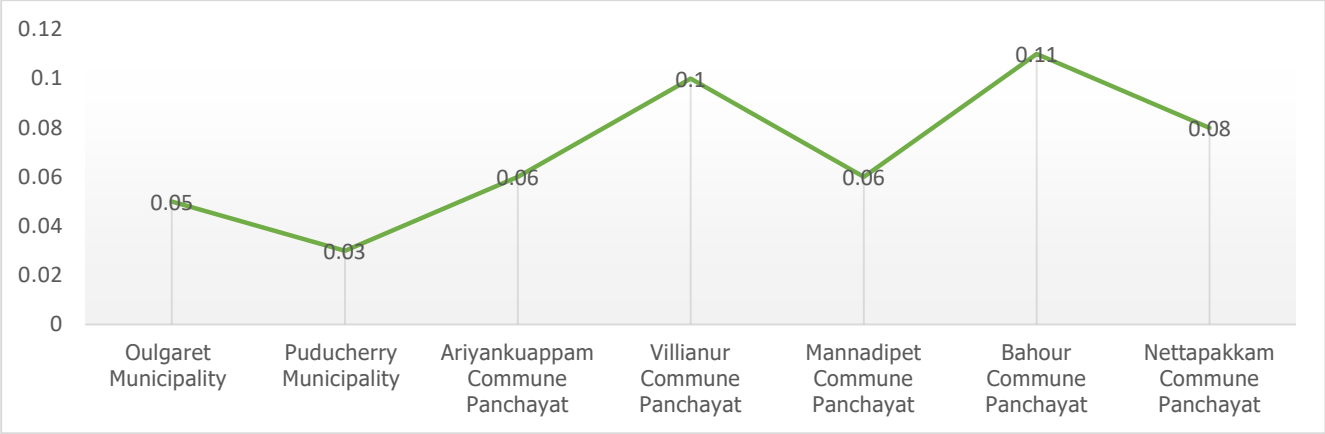


Figure 6.11 Obsolescence Factor of Puducherry Planning Area

The figure 6.11 reveals that the highest obsolescence factor is observed in Bahour and Villianur Commune which indicates that the status of housing condition is poor with respect to the overall housing condition of the Puducherry Planning Area. It is also observed that the lowest Obsolescence factor is in Puducherry municipality which also witnesses the high quality of socio-economic status in the region mainly due to the urban nature of the area and developments which are in tune with the overall development of the Puducherry region.

6.7.7.3 NON-DURABILITY

Non-durability is the no. of temporary houses which are not suitable for living or Non-serviceable units are taken out. Temporary/ kutcha houses are those in which both the walls and roof are made of materials that need to be replaced frequently. As per the census definition, temporary houses are made with walls and roofs made of temporary material. Walls can be made of grass, thatch, bamboo, plastic, polythene, mud, unburnt bricks or wood. Roofs can be made of grass, thatch, bamboo, wood, mud, plastic or polythene. Hence the non-durability of housing is the difference between the number of housing stock to the number of permanent houses. The table 6-18 represents the details of permanent, semi-permanent house and temporary house within the Puducherry region.

Table 6-18 Non-durability of Housing in Puducherry Planning Area,2011

S. No	Municipalities / Commune Panchayats	Permanent	Semi-Permanent	Temporary	No of housing stock
1	Puducherry Municipality	51558	4090	4541	55648
2	Oulgaret Municipality	65705	3127	3852	68832
3	Ariyankuppam CP	15202	1206	1339	16408
4	Villianur CP	19736	3829	6153	23565
5	Mannadipet CP	13465	2613	4198	16078
6	Bahour CP	9977	2504	3864	12481
7	Nettapakkam CP	7504	1884	2906	9388
8	**Total**	183147	19253	26853	202400

Source: Census 2011

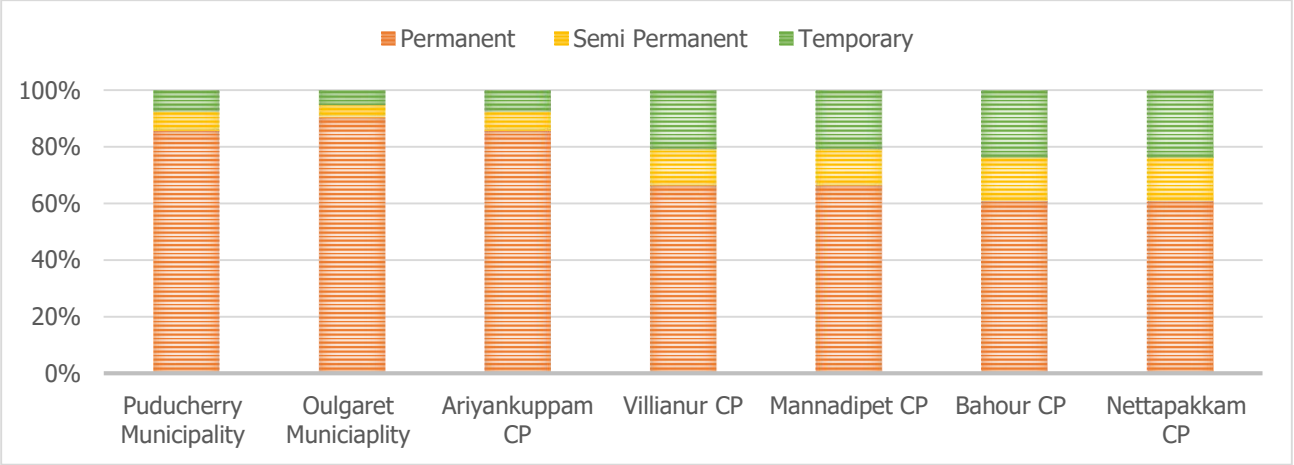


Figure 6.12 Non-durability of Housing in Puducherry Planning Area

The figure 6.12 indicates that the percentage of permanent housing is more in urban area (Puducherry and Oulgaret Municipality). It is also observed that the semi-permanent and temporary houses are more in Villianur and least in Ariyankuppam Commune. This phenomenon reveals that Villianur is rapidly urbanizing which demands more number of housing stock is the future.

6.7.8 ESTIMATION OF HOUSING SHORTAGE

Based on the Ministry of Housing and Urban Poverty Alleviation, National housing shortage, the final estimation of housing shortage is calculated based on the corresponding factors such as homeless population, Non-durability factor, Congestion factor, Obsolescence. It has been calculated based on the census 2011. The details of housing shortage based on census 2011 data are presented in the table 6-19.

Table 6-19 Details of Housing shortage

S. no	Housing Shortage	No of Shortage Households
1	Shortage due to Homeless Population	29,113
2	Shortage due to Non-durability	48,366
3	Shortage due to Congestion	10,399
4	Shortage due to Obsolescence	13,240
5	Housing need during the plan period (2011-2036)	1,61,836
Total		**2,62,954**

Source: Compiled based on census 2011

Hence the overall housing demand projected for the entire Puducherry Planning Area for 2036 is 166999. The table 6-20 reveals the housing shortage for the urban and rural areas for the projected year 2036.

Table 6-20 Housing Demand for Puducherry Planning Area, 2036

S. No.	Housing shortage	Housing Shortage - Urban	Housing Shortage - Rural	Total Shortage - PPA
1.	No of households not having houses in 2011 (Homeless population in 2011)	12,246	16,867	29,113
2.	No of temporary houses in 2011 (No of Non-durable houses)	20,977	27,389	48,366
3.	Shortage due to congestion in 2011	7,003	3,395	10,399
4.	Shortage due to obsolescence in 2011	9,266	3,974	13,240
5.	Demand arising between 2011 to 2036	68,068	93,768	1,61,836
TOTAL HOUSING SHORTAGE (2011 - 2036)		**1,17,560**	**1,45,393**	**2,62,954**

Source: Compiled by Consultant

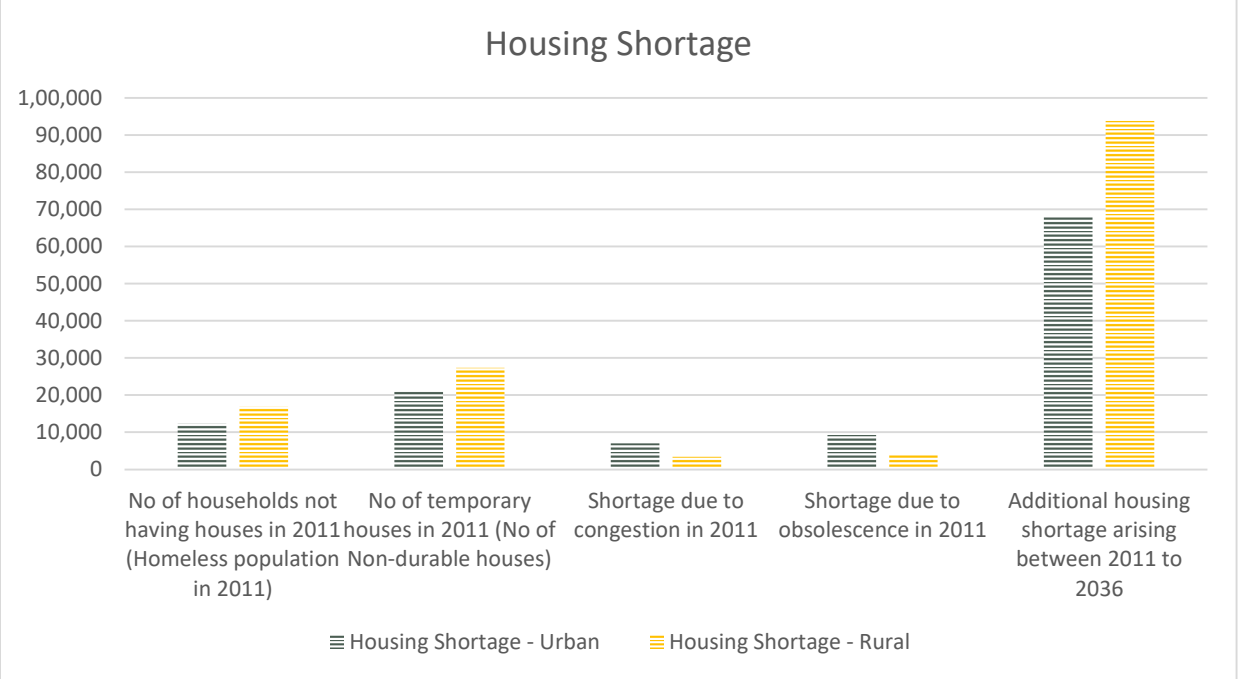


Figure 6.13 Housing Shortage & Demand for Puducherry Planning Area, 2036

6.7.9 TOTAL HOUSING SHORTAGE FOR PPA

The table 6-21 indicates that the maximum demand is there in Villianur Commune Panchayat where some of the villages are proposed under the new conurbation boundary in the Comprehensive development plan 2036. It is also observed that the Puducherry Municipality and the Oulgaret Municipality is having the highest housing shortage of 59,952 and 71,788 respectively during the year 2036. While looking into the Commune Panchayat, Villianur Commune Panchayat has the highest housing demand for the 2036. It clearly depicts that this commune is being urbanized at higher level in the Puducherry planning area.

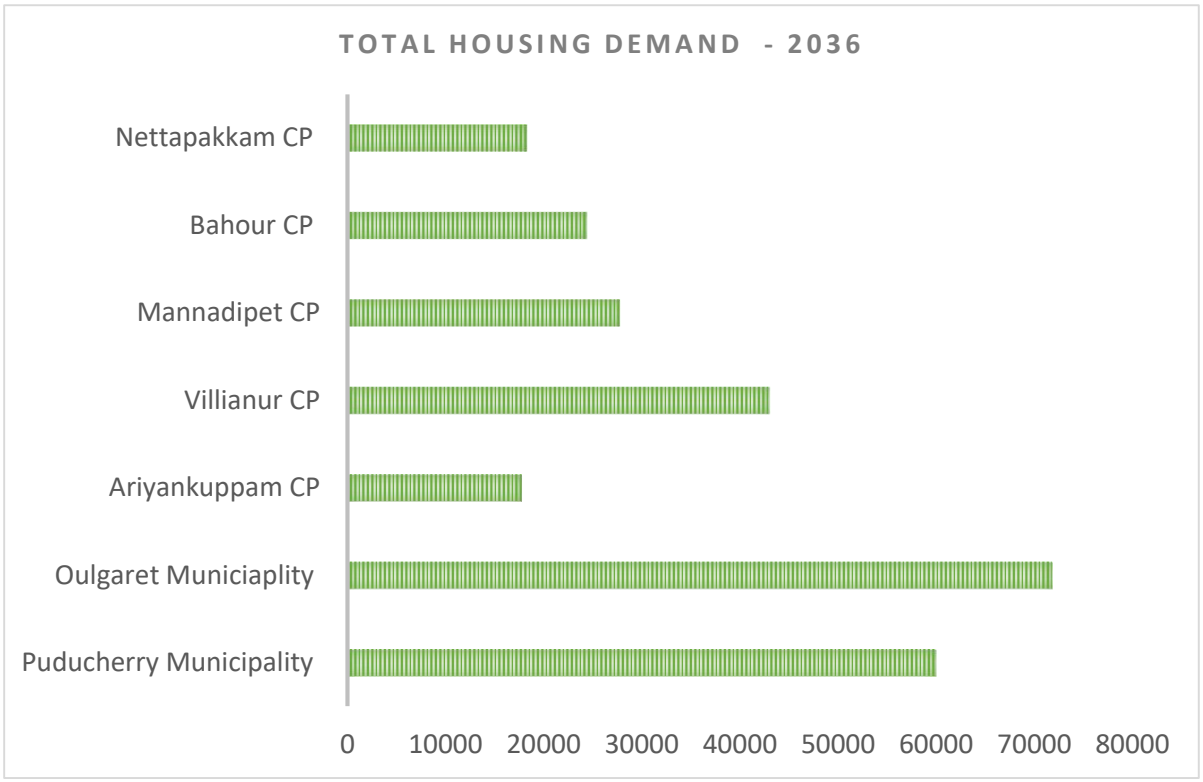


Figure 6.14 Total Housing Demand in PPA 2036

Table 6-21 Total Housing shortage for Puducherry Planning area – 2036

S.No.	Municipalities / Commune Panchayats	Total Population	No. of Households - 2011	No. of Housing stock - 2011	Housing Gap - Factor 1	No. of Permanent House	No. of non-durable houses - Factor 2	Congestion factor - % of No of HH with no exclusive rooms for married couple	Shortage due to congestion factor - Factor 3	Obsolescence factor - % of No of HH with 50 & 80 years and more	Shoratge due to Obsolescence factor - Factor 4	Projected Population for 2036	Projected increase in population from 2011 to 2036	Housing requirement for the increase in population - Factor 5	Total Housing demand - 2036 (Factor 1+2+3+4+5)
1	Puducherry Municipality	244377	60638	55648	4990	51558	9080	0.05	2744	0.03	1520	419172	174795	41618	59952
2	Oulgaret Municipality	300104	74133	68832	5301	65705	8428	0.04	3291	0.05	3660	514759	214655	51108	71788
3	Ariyankuppam CP	72055	17646	16408	1238	15202	2444	0.05	809	0.06	1020	123594	51539	12271	17782
4	Villianur CP	126778	30139	23565	6574	19736	10403	0.04	1343	0.10	3080	217458	90680	21590	42990
5	Mannadipet CP	86500	20245	16078	4167	13465	6780	0.05	916	0.06	1160	148371	61871	14731	27754
6	Bahour CP	68757	16274	12481	3793	9977	6297	0.05	740	0.11	1840	117937	49180	11710	24380
7	Nettapakkam CP	51718	12438	9388	3050	7504	4934	0.04	556	0.08	960	88710	36992	8808	18308
	PPA	950289	231513	202400	29113	183147	48366	0.04	10399	0.06	13240	1630000	679712	161836	262954

Source: Compiled by Consultant

6.8 HOUSING SHORTAGE BASED ON INCOME GROUP

Table 6-22 Housing shortage based on income group

S. No	Municipalities / Commune Panchayats	Total housing Demand - 2036	EWS- 20%	LIG - 30%	MIG - 40%	HIG - 10%
1	Puducherry Municipality	59,952	11,990	17,986	23,981	5,995
2	Oulgaret Municipality	71,788	14,358	21,537	28,715	7,179
3	Ariyankuppam CP	17,782	3,556	5,335	7,113	1,778
4	Villianur CP	42,990	8,598	12,897	17,196	4,299
5	Mannadipet CP	27,754	5,551	8,326	11,102	2,775
6	Bahour CP	24,380	4,876	7,314	9,752	2,438
7	Nettapakkam CP	18,308	3,662	5,492	7,323	1,831
8	**PPA**	**262,954**	**52,591**	**78,886**	**105,182**	**26,295**

Source: Compiled by Consultant

As per the Ministry of Urban Poverty and Alleviation the population is categorised based on the income level such as Economically Weaker Section (EWS), Low Income Group (LIG), Medium Income Group (MIG) and High-Income Group (HIG).

The table 6-22 indicates that the housing shortage for 2036 is calculated for each classification based on income level. This table helps to earmark the affordable housing in the Puducherry Planning Area and would also help to formulate the housing policy.

6.9 AFFORDABLE HOUSING PROPOSAL

The Town and country Planning department have identified the location for affordable housing for slums at Chinnayapuram and Jaffarbai Thottam, Kumaragurupallam and distillery quarters and other sites under the SMART city to eradicate the slums within the system. The total number of houses proposed are 1100 on the above-mentioned locations.

Apart from that, few more sites have been identified based on certain parameters. The parameters taken into consideration while selecting the site are mentioned below:

- Proximity of the site to the settlement
- Ownership of land (Government land have been selected)
- Land use of the site (vacant or agricultural land has been selected)

Based on the abovementioned criteria, few sites have been identified in the planning area. The identified sites are given below:

Table 6-23 List of Revenue Survey Numbers identified for affordable housing

S. No.	SURVEY NO	VILLAGE NAME	COMMUNE NAME
1	108/11	Kunitchampet	Mannadipet Commune
2	21/1A(PART)	Mannadipet	Mannadipet Commune
3	179/12	Mannadipet	Mannadipet Commune
4	75/5	Madagadipet	Mannadipet Commune
5	37/1	Sorapet	Mannadipet Commune
6	18/17(PART)	Sellipet	Mannadipet Commune
7	28/4	Sellipet	Mannadipet Commune
8	48/5	Thirukanchi	Villianur Commune
9	95/13	Sathamangalam	Villianur Commune
10	125/3	Kizhur	Villianur Commune
11	17/10	Manakuppam	Villianur Commune
12	23/10 (PART)	Manakuppam	Villianur Commune
13	44/1	Nettapakkam	Nettapakkam Commune
14	145/1 (PART)	Pandashozhanoor	Nettapakkam Commune
15	80/1(PART)	Manamedu	Nettapakkam Commune
16	68/8 (PART)	Manamedu	Nettapakkam Commune
17	68/5 (PART)	Manamedu	Nettapakkam Commune
18	103/2	Thavalakuppam	Ariankuppam Commune
19	139/4 (PART)	Pooranankuppam	Ariankuppam Commune
20	181/1 (PART)	Pillayarkuppam	Bahour Commune
21	174/1	Pillayarkuppam	Bahour Commune
22	31 / 2,3,4,5,6,	Kirumampakkam	Bahour Commune
23	32/1, 2A, 2B, 2C,	Kirumampakkam	Bahour Commune
24	186/1 (TS No 18), Ward B, Block 7 Chinnayapuram	Puducherry	Puducherry Municipality
25	241/1, TS No 31/1, Ward C, Block 1 - Kumaragurupalayam	Puducherry	Puducherry Municipality

Implementation strategy of affordable housing detailed in the chapter 13 of this report.

6.10 STRATEGIES FOR HOUSING & INCLUSIVE DEVELOPMENT

The housing strategies adopted for the CDP-2036 is based on the principles of densifying areas where there is ample infrastructure available and land is available for residential development. Through the development control regulations, the authority intends to promote high rise development to optimize the utilization of land and infrastructure and increase the housing stock in the planning area at minimum infrastructure cost to the government. The authority has adopted the mixed use land use to promote residential use adjacent to the employment centers and in areas where the employment centers are absent or in areas far from the residential areas, the authority has tried to bring in employment generating landuses in an attempt to strengthen these areas and promote better housing options nearby for the local population.

Providing residence adjacent to the employment center safeguards the interest of Economically weaker sections who prefers to stay closer to work and avoid transportation cost. It is also advised

through the CDP-2036 to promote affordable housing by earmarking land for residential projects for economically weaker sections of the planning area. Through CDP-2036 the authority has identified the new conurbation for 2036 which forms a continuous development with residential as a major land use to address the major housing requirements of the planning area. This also enables the merger of unplanned development taken place during the last few decades into main urban development of the planning area with proper circulation network and basic infrastructure.

7 INFRASTRUCTURE

7.1 INTRODUCTION

Infrastructure is the key determinant to promote comfortable living environment to the community which decide the functions towards their socio-economic development of the city. Provision of adequate physical and social infrastructure facilities are very much essential to achieve sustainable development. Physical and social Infrastructure is the basic requirement which decides the quality of urban and rural life & overall productivity of the people. The adequacy and accessibility of infrastructure facilities are two important factors which affect the quality of life which needs to be addressed for any Planned Development. This chapter deals with the analysis of existing conditions of physical infrastructure such as Water Supply, Sewerage System, Solid Waste Management and Power as well as social infrastructure viz., Health and Educational facilities. Based on the analysis and clear understanding of existing scenario, forecasted the physical and social infrastructure for the projected year 2036. Therefore, it is inevitable requirement to assess the existing infrastructure condition to understand the level of infrastructure services in the system. In general, there are three kinds of infrastructure in the system, they are: Physical, Social and Economic infrastructures respectively.

7.2 PHYSICAL INFRASTRUCTURE

In order to understand the existing scenario of physical infrastructure in the planning area, the consultant has conducted series of discussions and meetings with the PWD and respective commune panchayats. Various data regarding details about water supply viz. Amount of water supply, Hours of Supply, number of bore wells, details of sewerage system viz. capacity of STPs, sewerage network, and details of drainage etc. have been procured from Public Health Division of PWD, Puducherry. Data about the same has been procured from municipalities and commune panchayats in the Puducherry Region.

Puducherry Planning Area has the population of 9.5 lacs (Census, 2011) and the population is projected to increase up to 16.3 lacs for the projected year 2036. Moreover, approximately 2294 tourist visit Puducherry each day (Department of Tourism, 2013) and it is projected that by year 2036, nearly 4300 tourists will visit Puducherry each day. Therefore, in order to meet the future demand, calculation of the same for various sectors is necessary and the same is dealt with in this chapter.

7.2.1 WATER SUPPLY

Water is one of the important resource essential for the development any region, an amble supply of the same is to be made sure to suffice the domestic, industrial and irrigation requirements within the planning area. Currently the planning area is dependent on both ground and surface water sources to address the water requirements of the area. Due to the non-contiguous geographical nature of the planning area and for better management water supply within the planning area is divided into two, urban area and rural area.

7.2.1.1 WATER SUPPLY IN URBAN & RURAL AREAS

As already mentioned, water supply is one of the prime infrastructure services a city needs and a proper supply of water for its population ensures the city have strong basic infrastructure. Public Works Department of Puducherry is responsible for water supply in the municipal area of Puducherry and Oulgaret and some area of Ariyankuppam and Villianur communes. The map showing the boundary of the area covered by PWD for water supply is given in figure 7.1. The existing source of water supply to the urban area is ground water only i.e. bore wells. The total amount of water extracted for water supply is 112 MLD which creates immense pressure on ground water table. The ground water table is continuously decreasing and due to this water quality is also hampering. In some of the bore wells, the quality of the water is not meeting the standards of CPHEEO. But in absence of any alternate source, people have to depend on those bore wells. Bore wells which are

near to the coastal areas are facing the problem of salinity intrusion. Hence there is an urgent requirement of identifying alternative surface water source for the need of the future population.

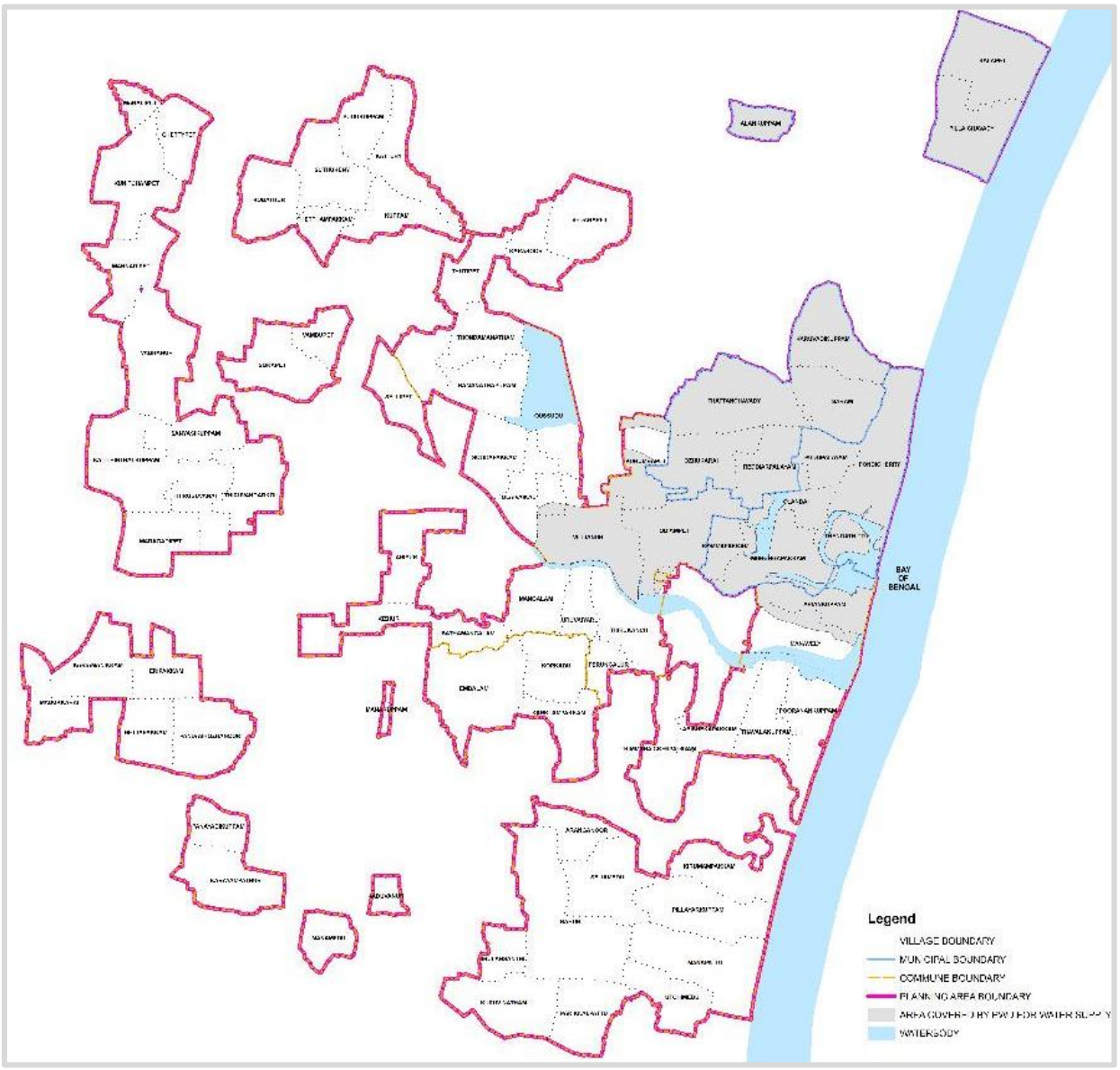


Figure 7.1 Area covered by PWD for Water Supply

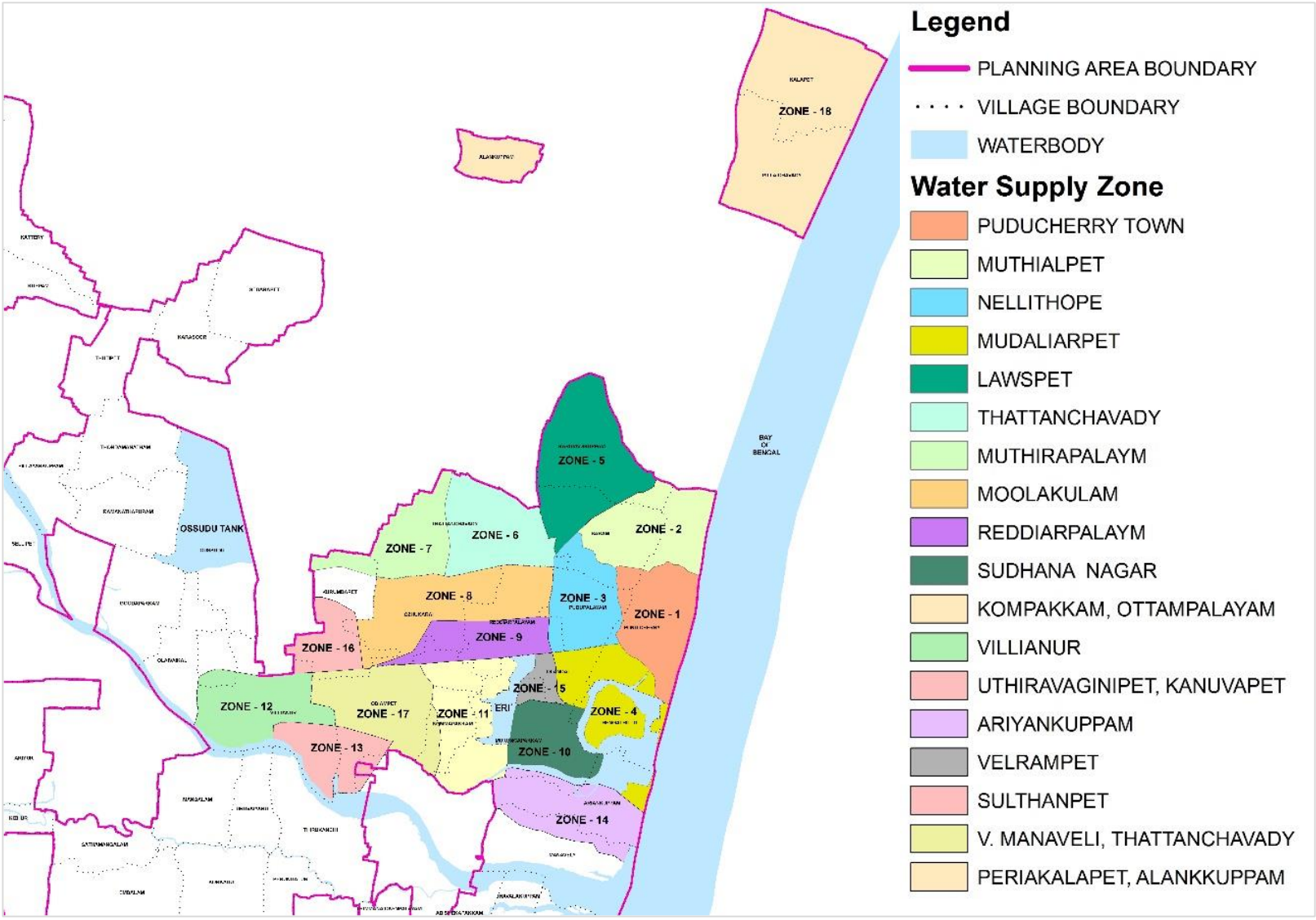


Figure 7.2 Water Supply Zones in Urban Areas of Puducherry Region

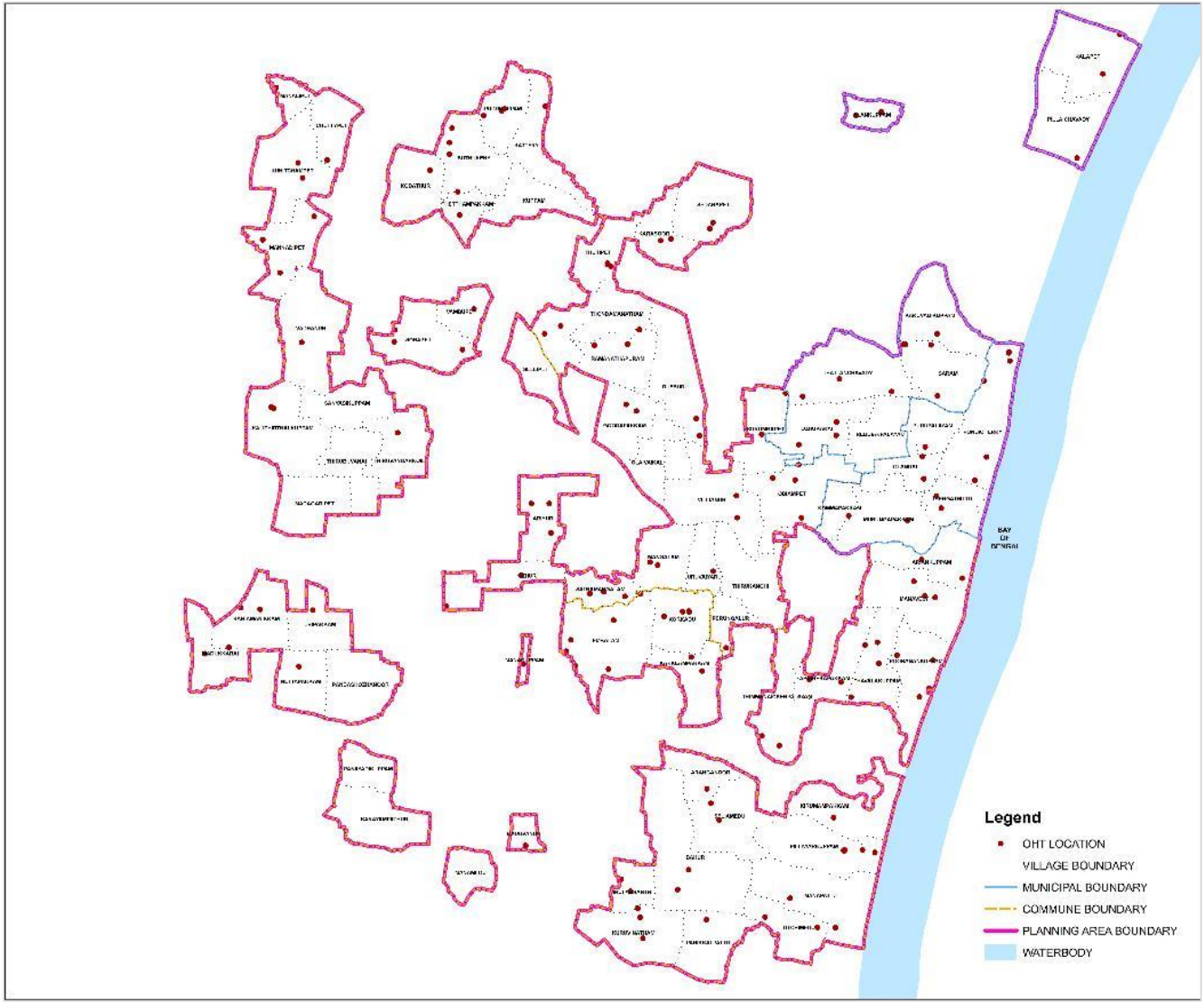


Figure 7.3 Map of the location of OHT as per ELU - 2015

The water supply system covering the urban area is presented in figure 7.2 which indicates the villages covered by PWD for water supply in Puducherry are, Pudupalayam, Olandai, Thengathittu, Kombakkam, Murungapakkam, Ariyankuppam, Saram, Karuvadikuppam, Thattanchavady, Kombakkam, Murungapakkam, Ariyankuppam, Saram, Karuvadikuppam, Thattanchavady, Reddiarpalayam, Oulgaret, Odiampet, Villianur, Part of Kurumbapet, part of Ossudu and part of Manavely. The area covering these villages are divided in to 18 zones. These zones are Puducherry Town, Muthialpet, Nellithope, Mudaliarpet, Lawspet, Thattanchavady, Muthirapalayam, Moolakulam, Reddiarpalayam, Sudhana Nagar, Kombakkam-Ottampalayam, Villianur, Uthiravaginipet-Kanuvapet, Ariankuppam, Velrampet, Sulthanpet, Villianur Manaveli-Thattanchavady and Periakalapet-Alankuppam.

7.2.1.2 EXISTING WATER SOURCE

The existing source of water supply to Puducherry region is ground water only i.e. through bore wells. There are totally 227 bore wells in and around Puducherry. The total amount of water extracted for water supply is 112 MLD, which is completely drawn from bore wells

7.2.1.3 WATER TREATMENT

There is no scientific water treatment plant available for the existing water supply system in Puducherry Planning Area. The only treatment which is being done is chlorination.

From Bore wells, the sub surface water is directly extracted and stored into sumps and then to the overhead tanks of the respective zones. Chlorination is carried out before the water gets pumped into OHTs. and in the distribution main also to maintain the required residual chlorine level as per CPHEEO. In the areas wherever the iron content is high, iron removal plants are installed in the system.

7.2.1.4 WATER SUPPLY SYSTEM

In water storage system, there are 25 Over Head Tanks across the urban area and 10 more OHTs are under construction and 15 OHTs are proposed in various zones. There is also a Ground Level Reservoir of 2.64 ML capacity at Muthirapalayam where the water flows by gravity. The total capacity of existing, under construction and proposed OHTs are 61.60 ML. A map showing the location of OHTs in the entire planning area is furnished in figure 7.3.

7.2.1.5 WATER QUALITY

Water quality is tested for pH, turbidity, colour, odour and other parameters at the PWD laboratory. The residual chlorine is maintained as 0.2 mg/l at consumer end, standard recommended as per the guidelines by the CPHEEO.

In some of the bore wells, the value of TDS and nitrate are more than the desired standards. Also, the value of chloride, iron etc. are more than the prescribed standards. But in case of absence of alternate source of supply, it is acceptable as per IS 10500: 2012 standard. All these defected tube wells will be abandoned once various proposed projects will be implemented.

7.2.1.6 AUGMENTATION OF WATER SUPPLY

The aim of PWD project is to augment the drinking water supply in Puducherry region with per capita water supply of 135 lpcd for the projected year of 2048. 2018 has been considered as base year, 2033 as an intermediate stage and 2048 projected year. The main objectives of augmentation project of water supply are given below:

1. To have an immediate action plan for augmentation of water supply source, strengthening, rehabilitation and improvements in water supply system.
2. To have a long-term action plan for extension and improvement of water supply system including augmentation of source.

3. The improvement in the water supply system shall be done while keeping in view the future population growth for the projected year of 2048.
4. Reduction in the O&M cost in order to achieve an affordable tariff for water supply so as to improve the service level and to increase the coverage area of water supply.
5. To provide AMR (Automatic meter reading) water meters to the HHs which are connected.
6. To provide SCADA systems in the proposed source augmentation area.
7. To provide 3 Nos of R.O. plants with a capacity of 5 MLD each at community level.
8. To provide a Water Treatment Plant of 5 MLD at Thirukanchi.
9. To provide 50 MLD desalination plant in the second phase.

This study intends to achieve a long-term vision in different aspects of the water supply, and they are:

- Meeting the water supply demand for the projected year 2048 with required number of ESRs and distribution network.
- Eliminating all the stand posts
- Providing water supply connection to the urban poor.
- Automation and modernisation of water supply system
- Obtaining 100% recovery of user charges
- Computerising the collection and billing system for water supply
- To improve the quality of drinking water to high standards
- Capacity building to cop up with increase in tariff

7.2.1.7 Calculation of Future Demand Projections

In order to calculate the demand for a projected year, it has to be calculated for certain stages as per CPHEEO Manual. The three stages are mentioned below:

1. Intermediate Stage (15 years from the base year) - 2033
2. Ultimate stage demand (30 years from the base year) - 2048

The water supply demand should include the fire demand, institutional demand, industrial demand etc. as per the CPHEEO guideline. In order to calculate the demand, it is essential to calculate the projected population for the defined stages. The domestic water supply demand is taken as 135 lpcd. The Projected population considered for this project is as under:

Table 7-1 Population Projection for year 2048 under water supply augmentation project

S. No.	Method of Population Projection	Estimated Population for 2018	Projected Population for 2033	Projected Population for 2048
1	Arithmetic Progression Method	8,05,081	11,93,130	15,81,179
2	Geometric Progression Method	7,96,537	12,03,567	18,17,697
3	Incremental Increase Method	7,55,133	10,08,857	13,11,666

Source:PWD- Compiled by the consultant

For this study, the population projection from geometric progression method has been considered in order to calculate the future demand.

The total demand for the projected year considering the fire demand and unaccounted water loss (15%) is given in the table 7-2.:

Table 7-2 Water Demand for as per Augmentation of Water Supply Source & Rehabilitation System in Urban Areas in Puducherry by PWD

S. No		Population	Amount of Water supply (lpcd)	Total demand in MLD	Population	Amount of Water supply (lpcd)	Total demand in MLD	Population	Amount of Water supply (lpcd)	Total demand in MLD	Population	Amount of Water supply (lpcd)	Total demand in MLD
		Year 2013			**Year 2018**			**Year 2033**			**Year 2048**		
1.	Demand for existing population	6,94,670	135	93.78	7,96,537	135	107.528	12,03,567	135	162.482	18,17,697	135	245.389
2.	Fire Demand 100*((population)/1000^1/2)/1000			2.636			2.822			3.469			4.263
3.	Unaccounted Water (15%)			14.464			16.552			24.893			37.448
4.	**Total Demand**			**110.878**			**126.902**			**190.844**			**287.10**

Source: Compiled by the consultant

As it is seen from the above table, the total demand for the base year is 126.902 MLD and for final stage is 287.10 MLD. Currently, total water being supplied to Puducherry is 112 MLD. The total deficit for base year is 14.90 MLD and for the final stage it is 175.10 MLD.

To meet the future demand, following proposals have been made under this project:

- 3 numbers of RO plants will be installed.
- 84 number of new tube wells will be constructed
- 5 new collection wells will be constructed
- A water treatment plant with a capacity of 5 MLD is proposed at Thirukanchi, which will be extracting water from Sankarabharani River.
- AMR (Automatic Meter Reading) system will be adopted to measure the volume of water passing through the line.
  It is also proposed to have SCADA based wire/wireless automation philosophy for the present and future upgradation of pump houses in 6 different zones.

Service Level Benchmark recommended by Ministry of Urban Development:

A Handbook on Service Level Benchmarking has been developed and released by the MoUD. It seeks to:

- identify a minimum set of standard performance parameters for the water and sanitation sector that are commonly understood and used by all stakeholders across the country;
- define a common minimum framework for monitoring and reporting on these indicators; and
- set out guidelines on how to operationalise this framework in a phased manner.

The framework encompasses 28 performance indicators out of which, the indicators for water supply are listed below:

- Coverage of water supply connections
- Per capita supply of water
- Extent of metering of water connections
- Extent of non-revenue water
- Continuity of water supply
- Quality of water supplied
- Cost recovery in water supply services
- Efficiency in redressal of customer complaints
- Efficiency in collection of water supply-related charges

For each of these indicators, the handbook provides detailed guidelines on the definition, calculation methodology, monitoring guidelines, a service goal (to be achieved over a period of time) and data reliability grading scale.

7.2.1.7.1 SUMMARY OF WATER DEMAND

Existing Water Supply in Urban Area is 112 MLD. Existing Water Supply in Rural Area is 32 MLD. Total Existing Water Supply in Planning Area is 144 MLD. Existing Water Demand @135 lpcd is 128.28 MLD.

Presently, Water Supply is more than Water Demand. During the Stakeholders' Consultation workshops with the officials of Commune Panchayats, it came out that the present supply of water in rural areas are higher than the demand.

Water Demand for 2036 is taken @135 lpcd for Conurbation Area and the area which is outside Conurbation as per URDPFI Guidelines 2015 and CPHEEO manuals. Water Demand for Puducherry Planning Area for 2036 is given below in the table 7-3.

Table 7-3 Water Demand for 2036 in PPA

S. No	Particulars	Demand for 2036
1.	Total Projected Population for PPA	16,30,000
2.	Tourist Population per day	6,500
3.	Total Population (1+2)	16,36,500
4.	Water Demand @ 135 lpcd for planning area in 2036	220.93 MLD
5.	Fire Demand For Urbanisable Area For Rural Area	 3.40 MLD 2.19 MLD
6.	Total water Demand (4+5)	226.52 MLD
7.	**Total water demand including Water loss @ 15% of water demand [4+(15% x 4) + 5]**	**259.65 MLD**

S. No	Particulars	Demand for 2036
8.	WTP Capacity	259.65 MLD
9.	Storage – GLSR @ 67% of WTP	173.96 ML (including Existing capacity of 27.10 ML)
10.	Storage – ESR @ 33% of WTP	85.68 ML

Source: - Compiled by the consultant

The water Demand of entire planning area for 2036 will be around 260 MLD considering tourist population, fire demand and 15% of water losses *(Source: CPHEEO manual for water supply)* during water supply. In absence of water treatment plan in planning area, there is an urgent need of Water Treatment Plant. Around 5 ha of land shall be required for Water Treatment Plant (calculated based on URDPFI Guidelines 2015). Additional GLSR & OHT storage requirement is to be provided considering the future requirements of year 2036. The capacity of OHT and GLSR are worked out based on the thumb rules set for calculating storage capacity.

7.2.1.8 PROPOSED STRATEGIES

The water should be supplied clean in adequate quantity, conveniently and as economically as possible. Rising demand of water due to rapid urbanisation is putting enormous stress. While planning the water supply system for an area, it is evident to consider water conservation aspects, which may be possible through optimal use of available water resources, prevention and control of wastage of water and effective demand management.

The strategic actions which are required to be taken up in the water sector include surface water source identification and modification/strengthening of its existing distribution network, line losses as well as adequate water supply in rural areas. This is suggested to be done through replacement and increasing coverage of water distribution by addition of new pipeline network. PWD has already prepared detailed report for Augmentation of water supply source and rehabilitation system in urban areas of Puducherry District. The water demand is calculated as per the report is 287.10 MLD for the year 2048.

Table 7-4 Proposals augmenting Water Demand for 2036 in PPA

S. No	Proposals by PWD	Total Capacity
Augmenting Water Demand by Use of Sub-Surface Water		
1.	3 nos. of R.O. (Reverse osmosis) Plants for water purification each at Thirukanchi, Kattamanikuppam and Rainbow Nagar (5 MLD each)	15 MLD
Augmenting Water Demand by use of surface water		
2.	Water Treatment Plant at Thirukanchi by drawing surface water from Sankarabharani River	5 MLD
3.	Desalination Plant	50 MLD
4.	Water to be drawn from Oussudu lake and water treatment plant with the same capacity proposed at Muthirapalayam	20 MLD

Source: Report on Augmentation of water supply source & rehabilitation of system in Urban areas of Puducherry District, 2015-16, PWD, Puducherry

Hence total 75 MLD of water would be fetched from surface water and 15 MLD from the ground. Water demand of 90 MLD is fulfilled through the proposals mentioned above. As mentioned above, the water demand for the planning area would be around 260 MLD out of which 128.28 MLD is

existing supply. Hence total supply of water would be 218.28 MLD (90 MLD+128.28 MLD). Hence till 2036 there would be a gap of 41.37 MLD.

Desalination Plant will be proposed to meet the gap of water demand of 41.37 MLD. Around 15 Ha. of land will be required for the Desalination plant. The project cost will be approximately 320 cr. It is proposed in Pillayarkuppam Village *(Survey No. 172, 186, 188/1)* in Bahour Commune near Bay of Bengal. The adequate land is available in Pillayarkuppam village.

For areas outside conurbation, respective Commune Panchayats will have to arrange for the water supply without hampering the environment. It came out during the discussion held with State Ground Water Unit and Soil Conservation Department that the construction of new borewells should not be allowed up to 6 kms from the coastal line to avoid the sea water intrusion.

- **Rainwater Harvesting**
  Rain water harvesting must be made mandatory in newly developed houses to increase ground water potentials.
- **Check Dams**
  Feasibility of Check Dams in rural areas (outside conurbation area) to support irrigation needs and as source of drinking water has to be checked. It is recommended to construct Check Dams on Gingee river.
- **Desilting of Tanks**
  The water tanks located outside conurbation area are recommended to undergo desilting process. This will increase the capacity of the tanks and ultimately lead to better ground water recharge.
- **Ground Water Recharging**
  As agricultural land is being converted to urban use, identifying sites for additional groundwater recharge is essential to keep water supplies balanced. The existing village tanks which are normally silted and damaged can be modified to serve as recharge structure. The village tanks can be converted into recharge structure. Several such tanks are available which can be modified for enhancing ground water. Construction of Percolation well is also an option for ground water recharge.
- **Recycling of Grey Water**
  Recycling of Grey Water is proposed for Car wash, landscaping, industrial cooling, flushing etc. recycling of Grey Water should be promoted.

7.2.2 SEWERAGE SYSTEM

7.2.2.1 EXISTING SEWERAGE SYSTEM

Puducherry has underground sewerage system only in some part of the municipal area of Puducherry and Oulgaret. The disposal of sewage is being practiced through soak pit and septic tank. The existing capacity of Sewage Treatment Plant is 17.5 MLD. Out of 17.5 MLD of total capacity of STP, 15 MLD STP is located at Lawspet and 2.5 MLD STP is located at Dubrayapet. A map showing the area having existing sewerage system with the location of existing STP is shown in figure 7.4. In rest of the areas, Septic tanks are existing. Private agencies are cleaning the septic tanks in the planning area.

7.2.2.2 DEMAND FOR 2036

As per CPHEEO manual, 80% of water supply may be expected to reach the sewers. Hence, the sewage generation for the year 2036 is calculated as 80% of the water supply. The sewage generation for entire planning area for 2036 will be around 165.63 MLD (80% of water demand worked out above).

Table 7-5 Sewage Generation & STP Capacity for 2036 in PPA

S. No	Particulars	Demand for 2036
1.	Projected Population	16,30,000
2.	Tourist Population per day	6,500
3.	Total population	16,36,500
4.	Sewerage Generation @ 80% of water supply (80% of row no. 4 of water demand table)	176.74 MLD
5.	Sewage Treatment Plant Capacity required till 2036	44.24 MLD (excluding Existing Capacity of 17.5 MLD + Under Construction 51 MLD* + Proposed STP with total capacity of 64 MLD)

**Source: Schematic representation of existing and proposed sewage treatment plant capacities with zone wise flow generation obtained from PWD, 2016*

Total capacity of STP would be 132.5 MLD (Including Existing Capacity of 17.5 MLD + Under Construction 51 MLD + Proposed STP with total capacity of 64 MLD). Hence STP Capacity required in 2036 would be 44.24 MLD (176.74 MLD – 132.5 MLD). To meet the gap, strategies are proposed below.

7.2.2.3 PROPOSED STRATEGIES

For the purpose of collection and conveyance of sewage, the urban area has been divided into 9 zones. These zones are covering some area of Puducherry and Oulgaret Municipalities. Out of these nine zones, sewerage system is existing in two zones. In order to treat the sewage generated from the proposed network, two more sewage treatment plants are proposed. Figure 7.5 shows the nine sewerage and the details about the nine sewerage zones are given in table 7-6.

Table 7-6 List of Sewerage Zones in PPA

S. No	Zone	Details	STP	Area Covered (Sq.km)
1.	Zone 1	Puducherry Town	STP I, Lawspet	2.03
2.	Zone 2	Muthialpet and surrounding areas	STP I, Lawspet	2.00
3.	Zone 3	Mudaliarpet and surrounding areas	STP II, Dubrayapet	4.24
4.	Zone 4	Nellithope and surrounding areas	STP I, Lawspet	4.29
5.	Zone 5	Lawspet and surrounding areas	STP I, Lawspet	1.29
6.	Zone 6	Thattanchavadi and surrounding areas	STP III, Kanaganeri	Nil

7.	Zone 7	Muthirapalayam and surrounding areas	STP III, Kanaganeri	Nil
8.	Zone 8	Moolakulam and surrounding areas	STP III, Kanaganeri	Nil
9.	Zone 9	Reddiarpalayam and surrounding areas	STP III, Kanaganeri	Nil
Source: Report on Status of Sewerage System - 2015, PWD				

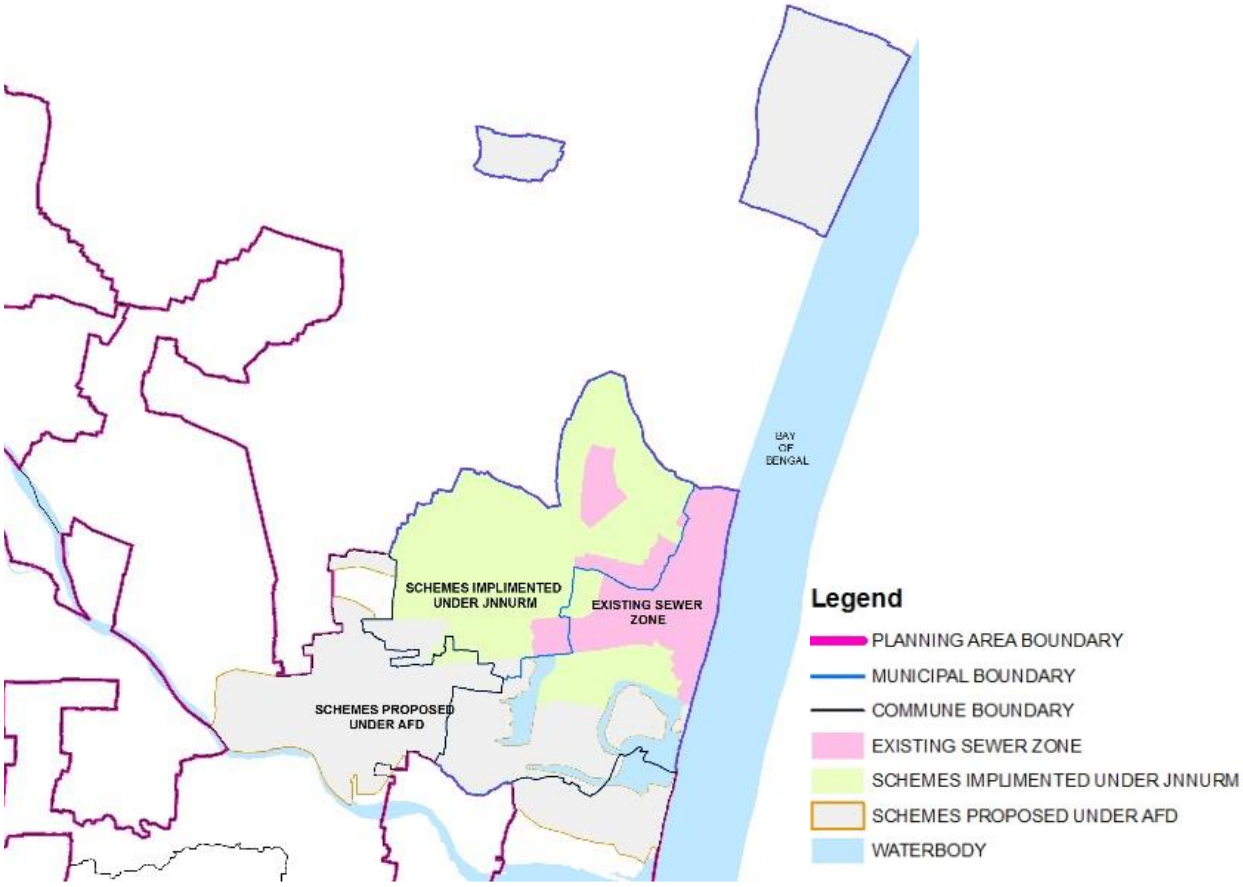


Figure 7.4 Map showing extent of existing Sewerage System and proposed Sewerage System by PWD

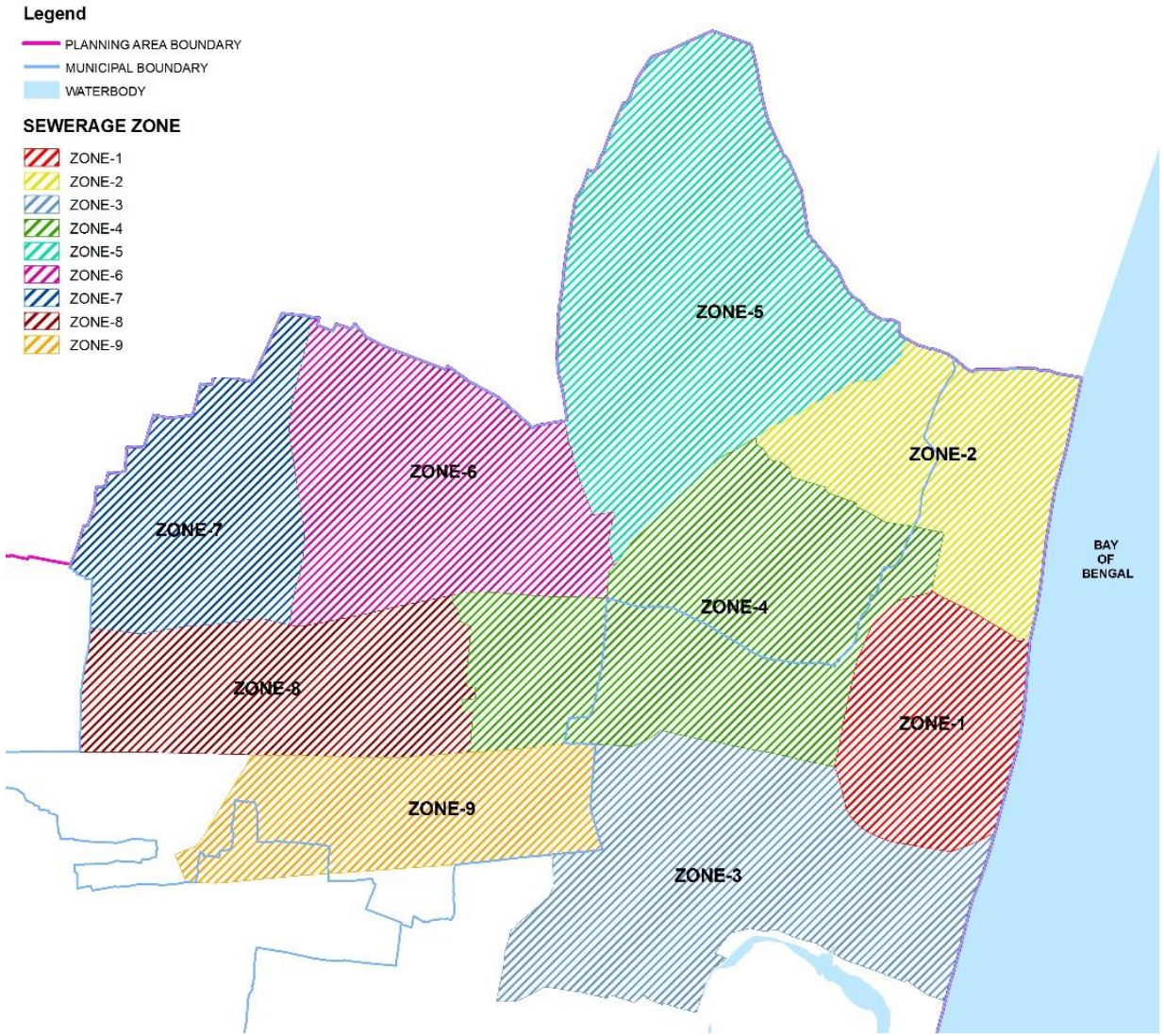


Figure 7.5 Map showing extent of 9 zones proposed by PWD for Sewerage System

The details about existing as well as on going sewage treatment plant is shown in the table below:

Table 7-7 Details of Existing & Proposed Sewage Treatment Plants

S. No.	STP LOCATION	Capacity in MLD	Status
1.	STP I, Lawspet	15	Existing
2.	STP II, Dubrayapet	17.5	Under Progress
3.	STP III, Kanaganeri	17	Under Progress
Source: Sewerage Report, PWD			

The sewerage of Zone 1, 2, 4 and 5 is currently treated in STP-I which is located at Lawspet having capacity of 15 MLD. The sewerage of Zone 3 flows in to STP-II which is located at Dubrayapet having capacity of 17.5 MLD. The sewerage of Zone 6, 7, 8 & 9 is planned to be treated in STP-III which is proposed at Kanaganeri.

7.2.2.3.1 PROPOSED PROJECTS

There is a proposal to extend the sewerage network in some of the areas. The Details of the same is given in the table 7-8.

Table 7-8 The proposed STPs and their capacities

S. No.	Area	STP Capacity in MLD	Area covered (sq.km)
1.	Villianur	19	7.21
2.	Ariyankuppam	21	7.86
3.	Kalapet	7	2.66
4.	Sudhana Nagar	12	4.38
5.	Krishna Nagar	5	1.70
6.	**Total**	**64**	
Source: Sewerage Report, PWD			

As mentioned above STP of total 17.5 MLD is already existing in Lawspet and Dubrayapet. The 3 STPs are under construction at Lawspet, Dubrayapet and Kanaganeri with the capacity of 17 MLD each. Total 64 MLD of STPs are proposed at Villianur, Ariankuppam, Kalapet, Sudhana Nagar and Krishna Nagar. The total capacity of STP in the planning area will be 132.5 MLD. Rest of the demand will be fulfilled with DEWATS (Decentralised Wastewater Treatment Systems) mentioned below.

There should be no outfall of any sewerage in raw form in water body without treatment. The outfall from STP should comply with the standards for sewage disposal thereby minimizing environmental risks due to contamination. Use of recycled water should be proposed for recharging lakes and water bodies.

Separate arrangement to be provided for sewer and storm water to avoid mixing of the two. Hence existing drains will be covered and dedicatedly shall be used for storm water drainage.

7.2.2.3.2 OTHER STRATEGIES

Recycling of water should also be implemented in the city. Treated water from DEWATS (Decentralised Wastewater Treatment Systems) can be used for agriculture, gardening and even for flushing. The DEWATS system is an effective and efficient wastewater treatment solution that minimizes water and soil pollution in housing complex/settlements. DEWATS technology is based on the principle of low cost and low-maintenance since most important parts are locally available and work without technical energy inputs. DEWAT system is proposed for conurbation area as well as outside conurbation area. Outside conurbation area, respective commune panchayats can implement such system to treat waste water.

Details of the system is mentioned below:

In a centralized treatment, the wastewater/ effluent generated from various sources such as houses, hotels, schools, markets, hospitals, industries, etc. is collected and carried by covered drains to a centralized treatment plant. This centralized sewage network needs high infrastructure investment, high maintenance cost, needs skilled technical manpower and ample energy.

Decentralized waste treatment systems based on aerobic treatment are developed and designed by the Western countries. Aerobic treatment procedures include stabilization ponds, trickling filters, activated sludge process, extended aeration ponds, rotating contact beds etc. DEWATS is the latest technology for sewer treatment, which is very cost effective as compared to present system of treatment of sewer. It can be operated from household level to a zone level or at city level.

- **Low on maintenance**

This system aims at using local materials in design while following rigorous technical norms. It tries to be as low in energy intensity as possible and, in favourable circumstances, the whole treatment process of wastewater can be completely gravity driven without any energy requirement at all. Power cuts, load shedding or even accidental switching off of motors/ pumps do not hamper the functioning of the treatment plant. The quantum of waste water which can be handled by DEWATS systems can be as low as 100 liters (1 cu m) to as high as 1,000 cu. m. can be handled. The system requires very little or no maintenance, but the performance needs to be monitored regularly.

A typical system for a domestic household consists of a primary treatment system consisting of a settling and floating tank, a secondary treatment system of an up-flow type baffled reactor which digests wastewater anaerobically, a tertiary treatment in sub-surface horizontal flow sand filters with reed beds, and, finally, a polishing pond for oxygenation and UV disinfection from the sun's rays.

- **Effective**

The treatment of wastewater is highly effective and consistently meets pollution norms. Since the baffled reactors work very well, there is complete digestion of solids and usually there are no emptying or cleaning requirements unlike a septic tank. The quality of treated wastewater that emerges into the polishing pond is good enough for landscape applications. The reed bed system in the filter part can be a very good landscape feature with plants like canna offering a colorful and verdant look.

The DEWATS approach reports an 80- 85% reduction in Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD), 80% reduction in phosphates and 60% reduction in ammonia from the input wastewater.

To meet the gap of STP capacity of 44.24 MLD, DEWATS system is proposed. The proposed locations for DEWATS systems are mentioned below:

- **Villianur Commune:** in Thirukanchi village, southern side of the Gingee river (5 MLD)
- **Villianur Commune:** in Koodapakkam Village, northern side of Gingee river near Railway Line (5 MLD)
- **Bahour Commune:** in Parikkalpattu village, northern side of Penniyar River (10 MLD)

- **Ariyankuppam Commune**: in Abhishekapakkam village, southern side of Gingee river (10 MLD)
- **Mannadipet Commune**: in Saniyasikuppam village, near solid waste management site (10 MLD)
- **Nettapakkam Commune**: in Pandashozhanoor village, in south east side of the village, near Tamilnadu Boundary (5 MLD)

7.2.3 STORM WATER DRAINAGE

7.2.3.1 EXISTING STORM WATER DRAINAGE

The terrain of the Planning Area is almost flat with an elevation varying from 15 metres from MSL. River Gingee and Pennaiyar are forming the two main drainage basins.

In PPA, due to the absence of underground storm water drainage system, open drains are existing along the roads. This drain carry water from kitchens as well as rain water. The water from these channels goes to the bigger channels and ultimately discharges it into the waterbody. The particulars of the drains are given in the table 7-9.

Table 7-9 Length of the drains in the Puducherry Planning Area

S. No	Municipality/Commune Panchayat	Length of the drain (km)	% to road length
1.	Puducherry Municipality	32.398	12.21
2.	Oulgaret Municipality	45.335	13.57
3.	Ariyankuppam CP	4.26	2.80
4.	Villianur CP	36.7	49.86
5.	Nettapakkam CP	9.57	9.44
6.	Mannadipet CP	42.78	64.99
7.	Bahour CP	44.34	51.91

Source: Municipalities and Commune Panchayats

7.2.3.2 PROPOSED STRATEGIES

- Rectification of slope and width of drains shall be done, wherever required.
- Provision of new storm water drainage network as per phase wise requirements worked out considering key parameters of precipitation intensity, catchment delineation, percolation characteristics and surface runoff.
- Existing drains which can be used as storm water drains, need to be upgraded based on engineering aspects & runoff calculation.

7.2.4 SOLID WASTE MANAGEMENT

7.2.4.1 SOLID WASTE MANAGEMENT IN URBAN AREAS

The total generation of solid waste in Puducherry and Oulgaret Municipality is 97 MT and 120 MT respectively. The door to door collection of solid waste is happening in Boulevard Town and most of the municipal areas. The collected waste is transported by Lorry/truck and disposed at Kurumbapet dumping yard. In absence of any treatment for Solid waste, it is being dumped in the site without any treatment except composting treatment to a meager portion of the waste. Except at the composting sites, the segregation of waste does not happen anywhere. The Rag pickers collect usable materials and sometimes they burn the waste to collect the valuable materials. Open dumping causes obnoxious odour, flies menace and ground water contamination by leachate percolation. The existing practice poses greater challenges to the public health, environment and aesthetic value of the city.

The source of solid waste generation is given in Table 7-10 Among the various sources, residential area is the major generator of waste.

Table 7-10 Various Sources of Solid Wastes in Puducherry Urban Area

S. No	Waste Source	% of Total
1.	Residential	68
2.	Commercial	14
3.	Restaurants/Hotel/Marriage Hall	11
4.	Market	4
5.	Hospital	3
6.	**Total**	**100**

Source: DPR for Municipal Solid Waste Disposal Through Incineration Process, 2014

7.2.4.2 QUANTITY OF WASTE GENERATED

The quantity of MSW generated depends on numerous factors such as population, food habits, standard of living, degree of commercial activities and seasons. The increasing urbanization and changing lifestyles have increased the waste generation rate of Indian cities.

Criteria for assessing waste generation

- Projected populations for the design period
- Existing per-capita waste
- Annual rate of increase of per capita waste generation

In India, the amount of waste generated per capita is estimated to increase at a rate of 11.4 % annually (Source: CPHEEO SWM MANUAL). The quantity of waste generated in Puducherry region is calculated based on this annual increase rate. It has been estimated that per capita waste generation in Pondicherry is 500 gm (including residential, commercial, street sweeping and industrial wastes).

7.2.4.3 SOLID WASTE MANAGEMENT IN RURAL AREAS

7.2.4.3.1 Ariyankuppam Commune Panchayat

Domestic garbage, without segregation, is collected and dumped in municipal yard and panchayat yard. Around 28 tonnes of solid waste is generated per day in this commune panchayat limits and its collected by tricycle and carried to dumping yards on tractors. In all the public places and markets, garbage cleaning work is done on regular basis. Streets are cleaned on every alternate day.

7.2.4.3.2 Villianur Commune Panchayat

Segregation at source is not practiced in Villianur Commune Panchayat, around 35 tonnes of solid waste is generated per day. The waste are collected in tricycles and transported to the composting sites using tractors. Vermiculture using scientific method is used for production of composite manure and recovery of plastic for recycling.

7.2.4.3.3 Bahour Commune Panchayat

In Bahour the waste is collected without any segregation, transported and dumped at the dumping yards at Bahour and Parikkalpet.

7.2.4.3.4 Nettapakkam Commune Panchayat

Around 24 tonnes of solid waste is generated in Nettapakkam Commune Panchayat, door to door collection is employed in certain parts of the commune and rest of the area street bins are provided. Composting and recovery of plastics are practiced before dumping the waste in municipal yards.

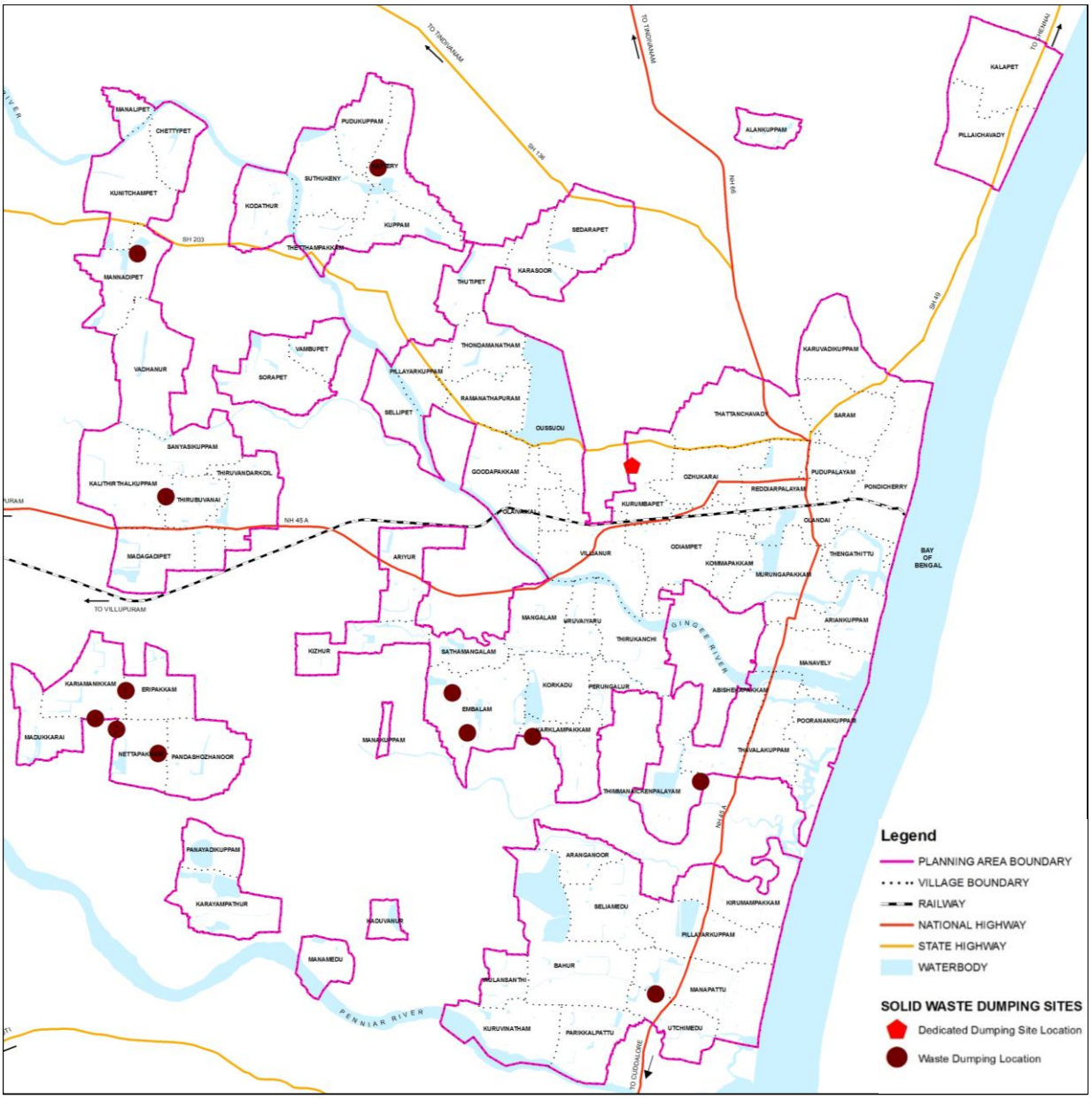


Figure 7.6 Solid Waste Dumping Locations within PPA

7.2.4.4 ESTIMATES OF SOLID WASTE GENERATION

The total generation of solid waste in Puducherry and Oulgaret Municipality is 97 MT and 120 MT respectively. The Solid Waste generation in Commune Panchayats are around 162 MT per day. Total solid waste generation in planning area is 379 MT. The door-to-door collection of solid waste is happening in Boulevard Town and most of the municipal areas. The collected municipal waste is transported by Lorry/truck and disposed at Kurumbapet dumping yard. In absence of any treatment for Solid Waste, it is being dumped in the site without any treatment. In rural areas, also solid waste is being dumped at various sites by Commune Panchayats.

7.2.4.5 SOLID WASTE DEMAND PROJECTION

For urban area, per Capita Waste Generation for 2015 is taken as 400 gms[4]. As given in the DPR for MSW Disposal through Incineration Process, it is assumed that per Capita Waste generation rate increases at a rate of 1.4 percent annually. Hence per capita waste generation for 2036 is 536 gms.

Table 7-11 Solid Waste Generation & Demand of Disposal Site for 2036

S. No	Particulars	Demand for 2036
1.	Projected Population for Conurbation Area Projected Population for outside Conurbation Area	11,49,578 4,80,422
	Total Projected Population for PPA	16,30,000
2.	Tourist Population per day	6,500
3.	Solid Waste Generation **In Conurbation Area @536 gms/cap/day** **Outside Conurbation Area @ 300 gms/cap/day**	 619.66 MT 144.13 MT
4.	Disposal site area for Conurbation Area[5] Disposal site area for outside Conurbation Area	**7.43 Ha** Site decided & mentioned below as per discussion held with commissioners of commune panchayats

Source: Compiled by Consultant

7.2.4.6 PROPOSED STRATEGIES

Solid Waste Management (SWM) refers to a systematic process that comprises of waste segregation and storage at source, primary collection, secondary storage, transportation, secondary segregation, resource recovery, processing, treatment, and final disposal of solid waste.

Waste hierarchy - The waste hierarchy refers to the "3 Rs" reduce, reuse and recycle, which classify waste management strategies according to their desirability in terms of waste minimization.

[4] It is assumed as per URDPFI Guidelines 2015. In Residential areas, it is mentioned 0.3 to 0.6 kg/cap/day for waste generation in URDPFI Guidelines 2015

[5] As per URDPFI Guidelines 2015, 6 Ha of land is required for composting 500 TPD of solid waste. Based on triangulation method, the land required for composting 877.16 MT of solid waste, disposal site area is calculated.

- Reduce - (Household level) Awareness to minimize waste generation, segregating waste at the source by residents. Segregation of waste at source is essential e.g. Biodegradable and non-biodegradable.
- Reuse - (Community Level) Reusing of waste, Waste pickers will collect Papers, Plastic, Clothes and Glass waste.
- Recycling – (City level) Recycling of waste by manufacturing industrial products eg. Metal, glass.
- People's participation is essential to ensure a well-managed system.
- There is need to conduct an education campaign on waste management and health related issues in school.
- Municipalities must spread messages through radio, television, newspapers and hoarding about the advantages of clean city. Such efforts will reduce the open waste and waste at storage sites.
- Stakeholders and NGOs Participation- Cleanliness awareness brochures and holdings, explaining rules and regulations can be introduced at hotels, private transport agents, shopping plazas, tourist information kiosks.
- Dumping of any kind of waste on roadside/ open spaces should be strictly banned and charged fine.

7.2.4.6.1 General Strategies

7.2.4.6.1.1Storage of waste

Storage of waste at source is the first essential step of Solid Waste Management. Every household, shop and establishment generate solid waste on day-to-day basis. The waste should normally be stored at the source of waste generation till collected for its disposal. Biodegradable waste and non-bio-degradable waste should be collected in separate bins from the source.

7.2.4.6.1.2Primary collection of waste

Primary collection of waste is the second essential step of Solid Waste Management activity. Primary collection system is necessary to ensure that waste stored at source is collected regularly and it is not disposed of on the streets, drains, water bodies, etc. Municipalities and Commune panchayats should arrange for the primary collection of waste stored at various sources of waste generation by any of the following methods or combination of more than one method:

- Doorstep collection of waste through non-motorised and motorised vehicles with active community participation.
- Collection through community bins
- Doorstep or lane-wise collection of waste from authorised/unauthorised slums or collection from the community bins to be provided in the slums by Municipalities and Commune panchayats.

7.2.4.6.1.3Waste Storage Depots

This is the third essential step for an appropriate Solid Waste Management System. All the waste collected through Primary Collection System, from the households, shops and establishments has to be taken to the processing or disposal site either directly necessitating a large fleet of vehicles and manpower or through cost effective systems which are designed to ensure that all the waste collected from the sources of waste generation is temporarily stored at a common place called "Waste Storage Depots" and then transported in bulk to the processing or disposal sites. Such temporary arrangement for storage of waste is popularly known as dust bin. This facility has to be so designed that the system synchronizes with the system of primary collection as well as transportation of waste. Locations for bins/depots of appropriate size should be identified at planning stage.

7.2.4.6.1.4Transportation of Solid Waste

Transportation of the waste stored at waste storage depots at regular intervals is essential to ensure that no garbage bins/containers overflow and waste does not litter on the streets. Hygienic conditions can be maintained in cities/towns only if regular clearance of waste from temporary waste storage depots (bins) is ensured. Transportation system has to be so designed that it is efficient,

yet cost effective. The system should synchronize with the system of waste storage depot and should be easily maintainable.

7.2.4.6.1.5Disposal of Waste

Waste after treatment must be disposed in a manner that does not create any instance of environmental pollution and public nuisance. The MSW Rule 2000 defines waste disposal as an activity, which involves "final disposal of municipal solid wastes in terms of the specified measures to prevent contamination of ground-water, surface water and ambient air quality".

The landfill design shall be aimed to minimize the following:

- The ingress of water into the landfill,
- The production of leachate, its subsequent outflow and uncontrolled dispersions into surrounding aquatic environment,
- The accumulation, migration and uncontrolled release of landfill gas into the atmosphere.

7.2.4.6.2 Rural Areas & Growth Centers (Outside Conurbation Area)

7.2.4.6.2.1Approximate Quantity of Waste Generated

The projected population for outside conurbation is 4,80,422 for 2036.it is assumed that per capita waste generation will be 300 gms/day. Hence per capita waste generation for 2036 will be approximately 144.13 MT/day.

7.2.4.6.2.2Collection Method

The collection of waste should be through collection points in the rural areas. The respective commune panchayats will collect the solid waste from the bins and transport to the final disposal site. The collection points for commune areas are mentioned below.

For Mannadipet Commune, the collection point will be in Mannadipet village, Sanyasikuppam village and Suthukeny village.

For Nettapakkam Commune, the collection point will be at Pandashozhanaoor village.

For Bahour Commune, the collection point will be on Kannikoil to bahour Road in Utchimedu village.

For villages outside conurbation area but within Ariyankuppam and Villianur Commune will have the collection bins at various locations.

7.2.4.6.2.3Dumping sites, land fill or compost plants

The disposal site of solid waste for the rural area will be designated at various locations which are mentioned below.

For Mannadipet Commune, the final disposal site for solid waste will be in Sorapet village.

For Nettapakkam Commune, the final disposal site for solid waste will be in Embalam Village.

For Bahour Commune, the final disposal site for solid waste will be in Pillayarkuppam village on the northern side of the Pillayarkuppam lake.

For villages outside conurbation area but within Ariyankuppam and Villianur Commune will have the solid waste dumping site at T.N.Palayam and at Karasoor respectively.

7.2.4.6.3 Conurbation Area

7.2.4.6.3.1Approximate Quantity of Waste Generated

The projected population of Conurbation area is 11,49,578 for 2036. It is assumed that Per Capita Waste generation rate increases at a rate of 1.4 percent annually (*Source: Detailed project report (DPR) for municipal solid waste disposal through incineration process prepared by Department of Science, Technology & Environment, Puducherry in November 2014*). Hence per capita waste generation for 2036 is assumed to be 536 gms/day. Solid Waste generation by 2036 for conurbation area will be approximately 619.66 MT/day.

7.2.4.6.3.2Collection Method

As mentioned above in Primary Collection of Waste, it is proposed collection through community bins and lane-wise collection of waste.

7.2.4.6.3.3Adoption of Latest technology in optimization of collection routes

One of the method for the optimization of the waste collection system is based on GIS technology. To adopt this method of optimization of solid waste, steps mentioned below should be followed:

- Analyse the existing status of waste collection bins with their locations.
- Analyse the existing status of collection routes
- Optimise the collection routes in terms of minimum time and distance taken using network analyst
- Reallocating of the waste collection bins through field survey as well as rescheduling waste collection routes via routing optimisation

7.2.4.6.3.4Dumping sites, land fill or compost plants

Presently the municipal waste is being dumped at Kurumbapet dumping site since 2010. Government of Puducherry has acquired 23.88 acres (9.66 Ha.) of land from Oulgaret Municipality in Kurumbapet village (R.S. Nos: 58/1B/2, 60/1, 61/2, 61/3, 62/1, 62/2A, 62/2B, 62/2C, 62/4, 62/5 & 62/6) for setting up Municipal Solid Waste Processing and Landfill facility *(Source: Detailed Project Report (DPR) for municipal solid waste disposal through incineration process prepared by Department of Science, Technology & Environment, Puducherry in November 2014)*. As mentioned above the solid waste generation by 2036 will be 619.66 MT, 7.43 Ha. of land will be required for composting site. As per the DPR prepared for Municipal solid waste disposal, 68% of solid waste is being generated from Residential areas, followed by commercial areas, Restaurants/Hotels/Marriage Halls, Market and Hospitals. Out of these areas 29% of the waste is of vegetables and fruits, 24.3% of food waste, 8.23% of leaves waste which can be recyclable (61.53%).

7.2.5 ELECTRICITY

7.2.5.1 POWER GRID OF PUDUCHERRY PLANNING AREA

The present power demand of the Union Territory including that of the four regions of Puducherry, Karaikal, Mahe and Yanam is 465 MW *(Source: http://electricity.puducherry.gov.in/power/pondy.htm)* during peak period. There is no power generation in the Union Territory except that a 32.5 MW Gas based Power Plant operated by the Pondicherry Power Corporation Limited. The demand is normally being met from the power allocation from Central Generating Stations (CGS), drawal of power from neighbouring state Electricity Boards and the Gas Power Plant of Pondicherry Power Corporation Limited. At present there is no shortage in meeting the requirements of the present demand in any of the four regions. Figure beside shows the existing Electrical Grid of Puducherry planning Area.

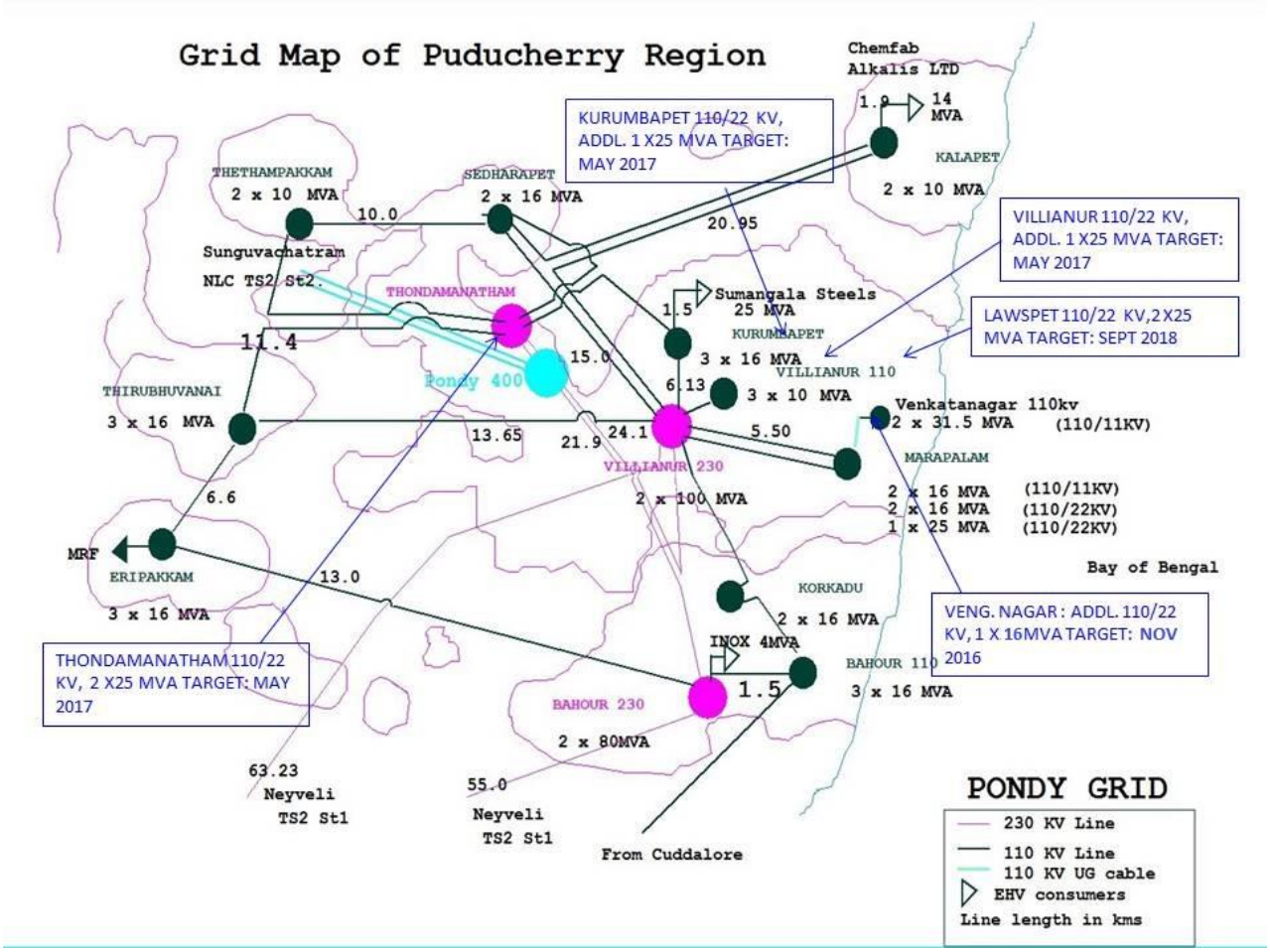


Figure 7.7 Electrical Grid of Puducherry Planning Area

7.2.5.2 POWER SUPPLY DEMAND PROJECTION

The power supply to the Puducherry, Mahe, Yanam and Karaikal was 387.2 MW in 2013-14. The actual demand in 2011 was 260.99. the power demand for 2036 is calculated by assuming 2.74 kWh per capita per day considering domestic, commercial, industrial and other requirements as per URDPFI guidelines 2015. The power demand for the 2036 will be 395.09 MW.

Table 7-12 Power Demand for 2036

Particulars	**2011**	**2036**
Population	9,52,522	16,36,500 (Including 6,500 tourist population)
Power Requirement @2.74 kWh per capita per day	260.99	395.09

** Power demand – 2.74 kWh per capita per day considering domestic, commercial, industrial and other requirements as per URDPFI guidelines 2015*

As per the population 2011 for Puducherry Planning Area, the Power Demand is 260.99 MW considering 2.74 kwh per capita per day. The Power Supply as per Electricity Department in Puducherry region is 357.89 MW (as on 11th July 2016) (Maximum peak attained)(Source: http://electricity.puducherry.gov.in/power/Sub-station%20load_Pdy.pdf). At present there is no shortage in meeting the requirements of the present demand in Planning Area.

The Power Requirement for Puducherry Planning Area in 2036 will be 395.09 MW. The present capacity of installed sub-stations in Planning Area are 416 MW which is more than the requirement

till 2036. Even if the possibility of use renewable energy is to be explored and promoted. The strategies are proposed below:

7.2.5.3 PROPOSED STRATEGIES

- There are various other sources, such as Wind energy and solar energy for generating power which is required to be explored.
- Additional solar energy to be sold to public grid/ electricity authority.
- Sector-wise power demand needs should be worked out which will be helpful in proper planning & estimating future power requirement.
- The increasing power demand of the UT of Puducherry would be met if the already confirmed allocation of power to tune of 67 MW from on-going Kudankulam Atomic Power Station *(Draft Annual Plan 2014-15)*.
- **SMART GRID** - The Government of India, Ministry of Power has taken up the process of establishment of SMART GRIDS in India with an objective of achieving most efficient management of Distribution system and to deliver best possible service to consumers. For this purpose, MOP has set up INDIA SMART GRID TASK FORCE (ISGTF) and INDIA SMART GRID FORUM (ISGF) to advice on issues related to implementation of SMART GRID projects.
- Incorporation of Renewal Power Obligations (RPO) in building byelaws (applicable to major building projects >20,000 sq.ft.)
- Tax concession on material and appliances procured for renewable energy products.

7.3 SOCIAL INFRASTRUCTURE

A well-developed Social-Infrastructure system is essential for enhancing the livability of Cities. Facilities for Social-Development such as Health facilities and Educational facilities contribute to the overall Socio-economic development of the city. Development of physical infrastructure cannot use in overall development at the desired level if the social infrastructure is not simultaneously developed. Social development is usually referred to as the commitment towards realizing the vision of the city.

7.3.1 EDUCATIONAL FACILITIES

Puducherry has emerged as one of the main educational hubs in South India. It houses higher order of academic and professional institutions covering specializations in many branches of Art, Science, Engineering, Technology, and Medicine etc. Puducherry bears various educational Institutions including Institute of National Importance.

7.3.1.1 EDUCATIONAL FACILITIES IN PRE-PRIMARY & SECONDARY EDUCATION

The existing scenario of Primary, Middle school and Higher secondary school for the Puducherry planning area is shown in the table given below:

Table 7-13 No. of Pre-primary Schools to Secondary Schools

S. No.	Description	Number
1.	Pre-Primary Schools	404
2.	Primary Schools	182
3.	Middle School	59
4.	High School	133
5.	Higher Secondary School	115

Source: Directorate of Economics and Statistics, Govt. of Puducherry






Figure 7.8 Primary and Higher Secondary school in the Puducherry Planning area

7.3.1.2 EDUCATIONAL FACILITIES IN HIGHER EDUCATION

The existing scenario of university, Art/Science/Commerce colleges and professional colleges for the Puducherry planning area is shown in the table given below:

Table 7-14 No. of Higher Education Institutions

S. No.	Description	Number
1.	University	1
2.	Art/Science/Commerce Colleges	13
3.	Professional Institutes (Below Degree level)	52
4.	Professional Colleges (Degree level/Above)	36

Source: Directorate of Economics and Statistics, Govt. of Puducherry

There are 1 University, 13 Art/ Science/ Commerce Colleges, 52 Professional Institutes (Below Degree level) and 36 Professional Colleges (Degree level/Above) in the Puducherry Planning Area.

The prominent institutes in the Puducherry Planning Area are illustrated in the table 75 and the figure 7.9 shows the spatial distribution of the educational facilities in the Planning area.

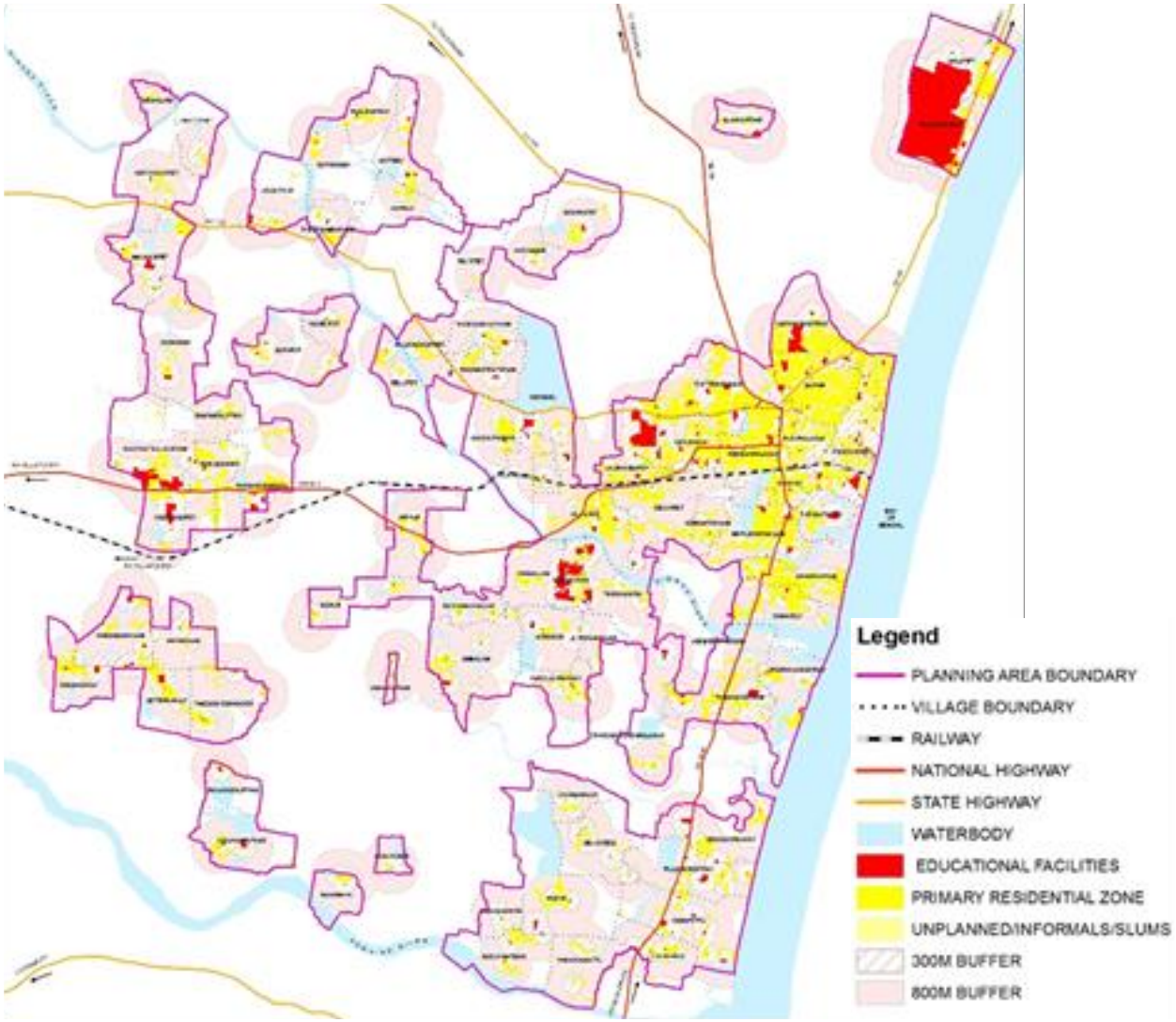


Figure 7.9 Spatial Distribution of Educational Facilities in the Puducherry Planning Area

Table 7-15 List of Prominent Educational Institutions in Planning Area

S. No.	Name of the Institute	
1.	JAWAHARLAL INSTITUTE OF POSTGRADUATE MEDICAL EDUCATION & RESEARCH (JIPMER)	
2.	MAHATMA GANDHI MEDICAL COLLEGE AND RESEARCH INSTITUTE (MGMCRI)	
3.	PUDUCHERRY ENGINEERING COLLEGE (PEC)	
4.	RAJIV GANDHI COLLEGE OF ENGINEERING AND TECHNOLOGY (RGCET)	
5.	RAJIV GANDHI INSTITUTE OF VETERINARY EDUCATION AND RESEARCH (RIVER)	
6.	SRI MANAKULA VINAYAGAR ENGINEERING COLLEGE (SMVEC)	
7.	INDIRA GANDHI MEDIAL COLLEGE AND RESEARCH INSTITUTE - [IGMC &RI]	

It is observed that major educational facilities are concentrated in the two Municipal Areas of Puducherry and Oulgaret. Primary educational facilities are almost evenly distributed throughout the Planning Area. Also, it can be seen that all the Educational Facilities are situated in close proximity to the Residential Areas.

7.3.1.3 EDUCATIONAL FACILITY DEMAND PROJECTION

7.3.1.3.1 PRESENT AND FUTURE DEMAND: EDUCATIONAL FACILITIES-SCHOOL LEVEL

Table 7-16 Demand-Supply Gap Assessment of Educational Facilities: School Level

Existing Scenario						Desired Level as per URDPFI guidelines	Short Term		Medium Term		Long Term		LAND REQUIREMENT AS PER FUTURE NEED						
													Area Requirement (Ha)	Short Term		Medium Term		Long Term	
S.No	Particular	Indicator	Unit	Current Level (2015)	Current Gap		2021		2031		2036			2021		2031		2036	
							Demand	Gap	Demand	Gap	Demand	Gap		Gap	Total Area Requirement (Ha)	Gap	Total Area Requirement (Ha)	Gap	Total Area Requirement (Ha)
1	Population			1014957			1121954		1326939		1,630,000								
2	School	Nursery school	Number	104	302	2500	449	345	531	82	652	121	0.08	345	27.58	82	6.56	121	9.70
		Primary school (I-V)	Number	182.00	21	5000	224	42	265	41	326	61	0.40	42	16.96	41	16.40	61	24.24
		Senior secondary school (VI –XII)	Number	192.00	-57	7500	150		177		217	40	1.80					40	72.73
		Integrated school without hostel facility (I-XII)	Number	0.00	10	100000	11	11	13	2	16	3	3.50	11	39.27	2	7.17	3	10.61
		Integrated school with hostel facility (I-XII)	Number	0	10	100000	11	11	13	2	16	3	3.90	11	44	2	8	3	11.82
		School for physically challenged	Number	0	23	45000	25	25	29	5	36	7	0.70	25	17	5	3	7	5

		School for mentally challenged	Number	0	1	1000000	1	1	1	0	2	0	0.20	1	0	0	0	0	0

Source: Compiled by Consultant

7.3.1.3.2 PRESENT AND FUTURE DEMAND: EDUCATIONAL FACILITIES-COLLEGE LEVEL

Table 7-17 Demand-Supply Gap Assessment of Educational Facilities: College level

S.No	Existing Scenario	Indicator	Unit	Current Level (2015)	Current Gap	Desired Level as per URDPFI guidelines	Short Term		Medium Term		Long Term		LAND REQUIREMENT AS PER FUTURE NEED						
													Area Requirement (Ha)	Short Term		Medium Term		Long Term	
							2021		2031		2036			2021		2031		2036	
							Demand	Gap	Demand	Gap	Demand	Gap		Gap	Total Area Requirement (Ha)	Gap	Total Area Requirement (Ha)	Gap	Total Area Requirement (Ha)
1	Population			1014957			1121954		1326939		1630000								
2	College	College (including Hostel area)	Number	13	-5	125000	9	0	11	0	13	0	5	0	0	0	0	0	0
		University Campus	Number	1	7	125000	9	8	11	2	13	2	5	8	40	2	8	2	12
		Technical education (Below Degree level)	Number	26	-16	100000	11	0	13	0	16	0	8	0	0	0	0	0	0

		Technical centre (Degree and Above)	Number	7.2	-6	1000000	1	0	1	0	2	0	33	0	0	0	0	0	0

Source: Compiled by Consultant

7.3.1.3.3 SUMMARY OF DEMAND FOR EDUCATIONAL FACILITIES

The demand of various Educational Facilities for the year 2036 is mentioned below in the table. The calculations are done based on URDPFI Guidelines 2015.

Table 7-18 Demand of Educational Facilities & Land Requirement for 2036

S. No.	Particular	Demand in 2036	Land required in 2036 (Ha)
1.	Pre-Primary, Nursery school	652	9.70
2.	Primary school (I-V)	326	24.24
3.	Senior secondary school (VI -XII)	217	72.73
4.	College (including Hostel area)	13	12
5.	University Campus	13	12
6.	Technical education (Below Degree level)	16	24
7.	Technical center (Degree and Above)	2	0

Source: Compiled by Consultant

Based on the area requirement for each unit, land requirement for the above mentioned educational facilities is worked out. There will be a need of 154.67 Ha. of land for the above mentioned educational facilities.

7.3.1.4 PROPOSED STRATEGIES

- There should be constant review of the educational requirements of the planning area based on the latest census data and as per the guidelines adopted by the Educational department.
- The distribution of schools should be in such a way that the spatial distribution standards mentioned in URDPFI guidelines is satisfied.
- Government schemes should be formulated in such a manner to promote higher enrolment especially in the case of a girl child and reduction in school drop-out rate.
- Educational department recruitment process should be tightened to make sure only highly skilled teachers are recruited and there should be periodical review of the skill sets of the teachers already recruited.
- Puducherry already have a good number of technical educational institutes and it attracts a large student population from surrounding states, considering this the Education Department should assess the feasibility of having Research institutes in emerging scientific and technological fields and business schools.
- Central Government Skill development mission should be utilized to create a large pool of skilled man power in automotive, mechanical and electrical field. This will in turn attract investors to establish their manufacturing plants within the planning area to tap into the skilled man power along with industrial promotion measures already in place in the planning area.

7.3.2 HEALTH FACILITIES

7.3.2.1 CURRENT SCENARIO

There are 60 Primary Health Centre/Sub-Centers, 11 Community Health Centre/ESI Dispensaries, 15 Sub centers, 15 Nursing Homes / Rehabilitation center, General Hospitals / Specialty Hospitals in the Puducherry Planning Area. The spatial distribution of the medical facilities in the PPA is shown in the figure below. Along with these there are medical colleges and institutes like JIPMER, MGMCRI catering for the need of the population at local level as well as regional level.

Table 7-19 Existing Health Facilities

S. No.	Health Facilities in PPA	Number (as per Census 2011)
1	Primary Health Center /Sub- Center	60
2	Community Health Center / ESI	11
3	Nursing Homes / Rehabilitation center General Hospitals / Specialty Hospitals	15

Source: Census of India 2011

The map shows the 300m and 800m serving buffer for the health facilities which are already existing in the planning area. It can be observed from the map that Healthcare Facilities are almost evenly distributed in the Planning Area. In the Commune Panchayats Villianur and Bahour, Health Facilities are sparsely distributed and some of the residential areas in these Commune Panchayats are deprived of such facilities. The village wise health facilities are shown in the chapter 12.4.

7.3.2.2 HEALTH FACILITY DEMAND PROJECTION

7.3.2.2.1 PRESENT AND FUTURE DEMAND: MEDICAL SERVICES

Table 7-20 Demand-Supply Gap Assessment of Medical Services

Existing Scenario						Desired Level as per URDPFI guidelines	Short Term		Medium Term		Long Term		LAND REQUIREMENT AS PER FUTURE NEED						
													Area Requirement (Ha)		Short Term		Medium Term		Long Term
S. No	Particular	Indicator	Unit	Current Level (2015)	Current Gap		Demand	Gap	Demand	Gap	Demand	Gap		Gap	Total Area Requirement (Ha)	Gap	Total Area Requirement (Ha)	Gap	Total Area Requirement (Ha)
1	Population		Number	1014957			1121954		1326939		1,630,000								
2	General Hospital	Hospital with 500 beds	Number	6.00	-2	250000	4		5		7	1	6.00	0	0.00	0	0.00	1	7.27
3	Intermediate Hospital (Category A)	Hospital with 200 beds	Number		10	100000	11	11	13	2	16	3	3.70	11	41.51	2	7.58	3	11.21
4	Intermediate Hospital (Category B)	Hospital with 80 beds	Number	1	9	100000	11	10	13	2	16	3	1.00	10	10.22	2	2.05	3	3.03
5	Polyclinic with observation beds		Number	0	10	100000	11	11	13	2	16	3	0.30	11	3.37	2	0.61	3	0.91

Existing Scenario						Desired Level as per URDPFI guidelines	Short Term		Medium Term		Long Term		LAND REQUIREMENT AS PER FUTURE NEED						
													Area Requirement (Ha)		Short Term		Medium Term		Long Term
S. No	Particular	Indicator	Unit	Current Level (2015)	Current Gap		Demand	Gap	Demand	Gap	Demand	Gap		Gap	Total Area Requirement (Ha)	Gap	Total Area Requirement (Ha)	Gap	Total Area Requirement (Ha)
6	Nursing Homes	25 to 30 beds	Number	2	21	45000	25	23	29	5	36	7	0.30	23	6.88	5	1.37	7	2.02
7	Dispensary		Number	94	-26	15000	75		88		109	2	0.30	0	0.00	0	0.00	2	0.60
8	Specialty	200 Beds	Number	0	10	100000	11	11	13	2	16	3	0.30	11	3.37	2	0.61	3	0.91
9	Multi-Specialty	200 Beds	Number	0	10	100000	11	11	13	2	16	3	0.30	11	3.37	2	0.61	3	0.91
10	Family Welfare Centre		Number	0	20	50000	22	22	27	4	33	6	0.30	22	6.73	4	1.23	6	1.82
11	Diagnostic Centre		Number	0	20	50000	22	22	27	4	33	6	0.30	22	6.73	4	1.23	6	1.82
12	Veterinary Hospital for pets		Number	5	-3	500000	2		3	0	3	1	0.30	0	0.00	0	0.12	1	0.18

Existing Scenario						Desired Level as per URDPFI guidelines	Short Term		Medium Term		Long Term		LAND REQUIREMENT AS PER FUTURE NEED						
													Area Requirement (Ha)		Short Term		Medium Term		Long Term
S. No	**Particular**	**Indicator**	**Unit**	**Current Level (2015)**	**Current Gap**		**Demand**	**Gap**	**Demand**	**Gap**	**Demand**	**Gap**		**Gap**	**Total Area Requirement (Ha)**	**Gap**	**Total Area Requirement (Ha)**	**Gap**	**Total Area Requirement (Ha)**
	and animals																		
13	Dispensary for pets and animals and birds		Number	0	10	100000	11	11	13	2	16	3	0.30	11	3.37	2	0.61	3	0.91
14	Rehabilitation Centre		Number	1															

Source: Compiled by Consultant

7.3.2.2.2 SUMMARY OF DEMAND FOR HEALTH FACILITIES

Under Health Sector, the focus would be on the development in the Health sector which improve the Health Infrastructure. A paradigm shift in the focus of health care from 'disease control' to 'disease prevention' and from 'communicable disease management' to 'non-communicable disease management' is being implemented which will modify the life style practices.

Table 7-21 Demand of Health Facilities & Land Requirement for 2036

S. No.	Particular	Demand in 2036
1	General Hospital	13
2	Dispensary	109
3	Vetenary Hospital for pets and animals	3

Source: Census of India 2011

Based on the URDPFI Guidelines 2015, the demand of health facilities in 2036 for Puducherry Planning Area is worked out. There will a need of 13 general hospitals, 109 dispensaries and 3 vetenary hospitals for pets and animals till 2036. This shall be spatially distributed in the planning area. Based on the area requirement for each unit, land requirement for the above-mentioned health facilities is worked out. There will be a need of 20.23 Ha. of land for the above-mentioned health facilities.

7.3.2.3 PROPOSED STRATEGIES

Puducherry Planning Area is having some reputed medical research institutes which provided best medical facilities and medical education. The rural health system has to be strengthened to improve the medical services delivery to the poor. Government agencies carrying out the planning and implementation of the initiatives in medical services have to be provided with enough funds to upgrade the existing medical infrastructure in the government hospitals and for modernization of life saving medical equipment's. It should be made sure that the hospitals are equipped with adequate equipment's and man power to serve the population within the planning area and around it. There should be periodic monitoring and assessment of the health infrastructure within the planning area. Also, due care should be taken while allocating land for medical institutions or establishments to make sure the spatial distribution standards stipulated in URDPFI guidelines area satisfied.

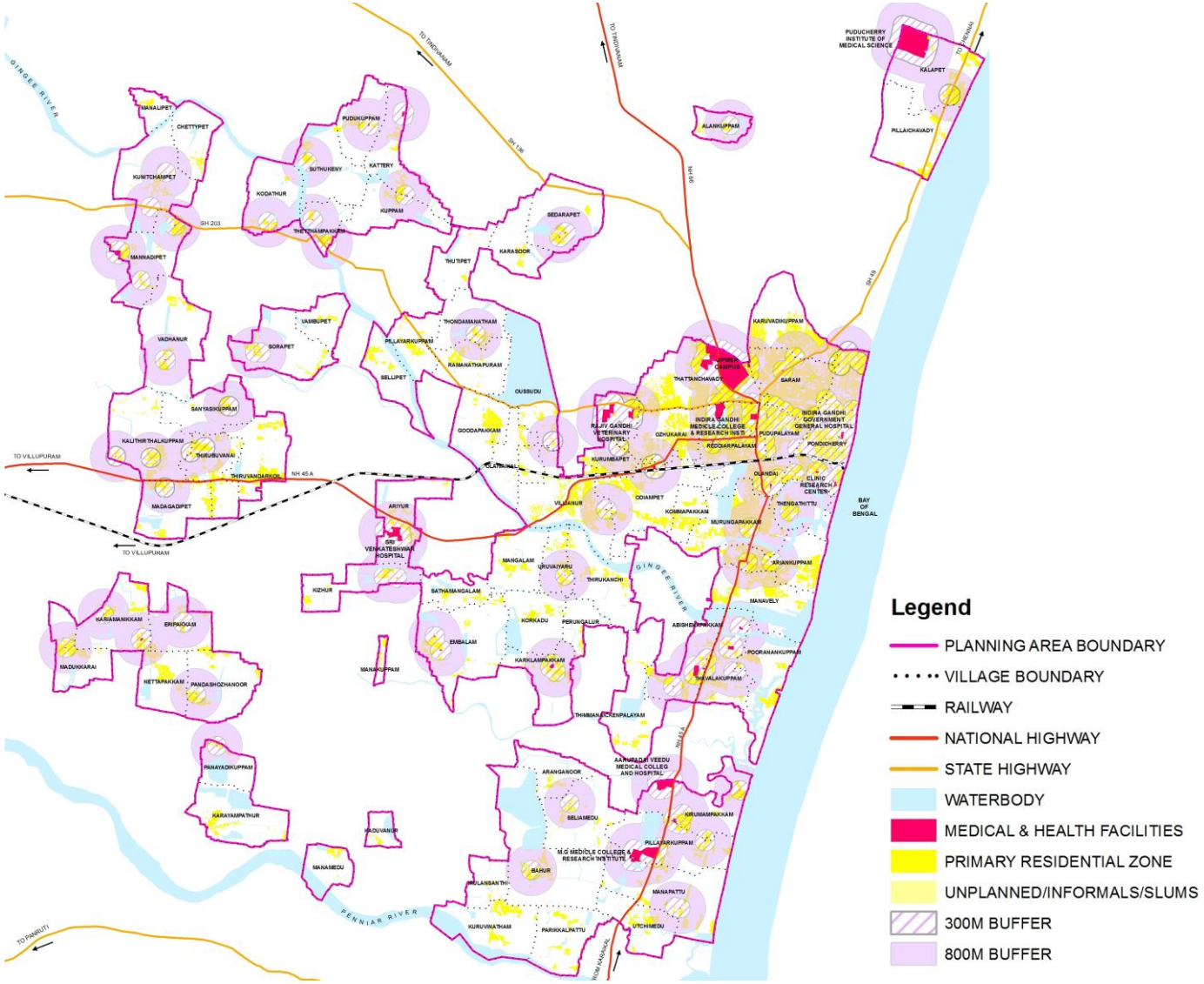


Figure 7.10 Spatial Distribution of Healthcare facilities in the Puducherry Planning Area

7.3.3 COMMUNITY ROOM/HALLS

Bahour CP has 28, Mannadipet CP has 15, Ariyankuppam has 10, Nettapakkam has 7 and Villianur CP has 10 Community Halls.

7.3.4 BURIAL GROUND

There are 20 burial/cremation grounds in Puducherry Municipality whereas Oulgaret Municipality contains 21 burial/cremation grounds. Mannadipet CP has 44 burial/cremation grounds and Nettapakkam CP has 31 burial/cremation grounds and Ariyankuppam has 16 burial/cremation grounds.

7.4 DISTRIBUTION OF SERVICES

7.4.1 POSTAL SERVICES

Puducherry Planning Area comes under the Pondicherry Division of the Indian Postal Services, this division was formed on 01.01.1968 and it was carved out of the erstwhile South Arcot Postal Division. It is headquartered in Puducherry Union territory and it covers Puducherry region of the Union territory, Tindivanam, Vanur, Villupuram Taluk and part of Cuddalore Taluk of Tamilnadu State. This division consists of three Head Post Office and 67 Sub Post Offices. As per the postal department, there are around 37 rural post offices and 31 urban post offices within the Puducherry region.

8 HERITAGE & CULTURE

8.1 HERITAGE

8.1.1 INTRODUCTION

Historically, India has attracted various traders from the European countries such as Portugal, France, Dutch, England etc. to establish business alliances and subsequently establish their colonies. Unarguably, colonization has resulted in several cultural exchanges in the subcontinent. Its imprints are still left unharmed in many cities of India in different forms such as architecture, music, literature etc.

Puducherry is one among the Indian cities where French established their colonies. The city still houses a settlement laid out in Grid Iron pattern called Boulevard Town and it attracts a considerable number of tourists every year from within and outside India. Puducherry region contains 21 state government notified heritage buildings in Boulevard Town and 5 ASI protected monuments in Puducherry including 4 temples and one early historic site. Also, it is famous as a spiritual destination due to the presence of Aurobindo Ashram and proximity to Auroville. It contains several religious sites such as temples, mosques and churches which attract local tourists. The siddhar jeeva Samadhi temples are also very famous in the Puducherry Planning Area. There are 30 locations of Jeevasamadhi which has the potential to be developed.

8.1.2 HISTORICAL BACKGROUND

Puducherry is said to be the place where Saint Agastya founded his school to teach and learn Vedas and hence it was once known as Vedapuri. Excavations at Arikkamedu, an archaeological site, reveals that Romans made a visit to Puducherry in 1st century A.D., to trade textile, pottery and some precious stones. The mentioning of a trade centre namely 'Poduke' along the Indian coast in 'The Periplus of the Erythraean Sea', amid 1st century European document which describes the trade routes, confirms this finding. Puducherry is the Tamil interpretation of 'new settlement'.

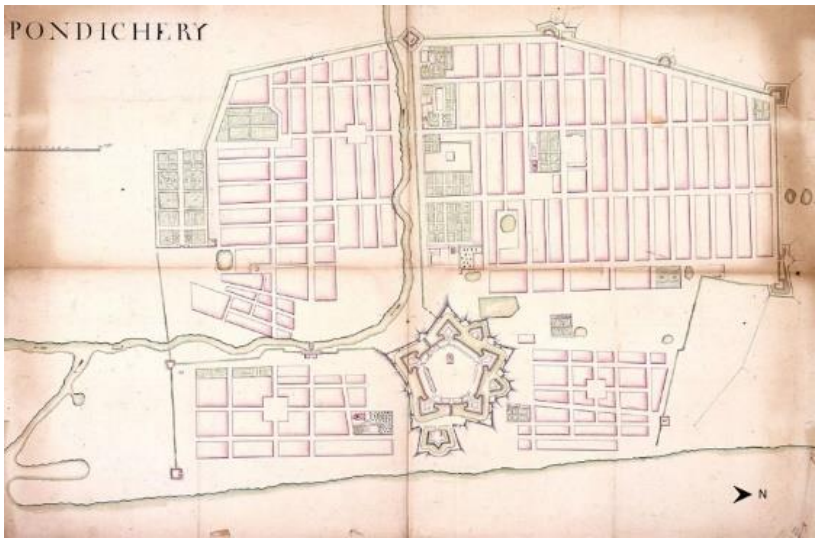


Figure 8.1 Layout map of Old Boulevard Town with Fort Louis at the present location of Bharathi Park

The history of Puducherry can be broadly classified into two periods: Pre-Colonial period and Colonial Period. The Pre-Colonial period started with the reign of the Pallavas who ruled Puducherry from 325 A.D. - 900 A.D., followed by the Chola dynasty in the time period from 900 A.D. - 1279 A.D., which again followed by Pandya Dynasty from 1279 A.D. - 1370 A.D. Puducherry was under the rule of Gingee, as a part of Vijayanagar Empire from 1370 A.D. - 1638 A.D. In 1494 A.D., Portuguese discovered a trade route to India and they established a factory in Puducherry in the 16th century; indicating the commencement of the foreign connections in Puducherry. The Portuguese were driven away by the ruler of Gingee later. Subsequently came the Dutch's who founded a factory in 1618 which was abandoned rapidly. Ruler of Gingee offered the land to the Danes who subsequently developed Textile Trade in Puducherry. Danes had to leave the place after Bijapur conquered Gingee. Massive destruction happened in Puducherry while Bijapur defeated Gingee. Sher Khan Lodi, the Governor of the Gingee region invited Dutch to restore the prestige of the city. When Dutch

rejected the offer, he invited the French who already had trading centres in the North, Mahe and Madras to open a trading centre in Puducherry.

In 1673 A.D., Bellanger, a French officer took up residence in the Danish lodge in Puducherry. In 1673, Francois Martin, the first Governor General of Pondicherry, converted a small fishing village into a flourishing Port Town. French set up a factory in Puducherry and built a fort with a view to attract the local workforce and soon Puducherry emerged as a prosperous settlement. In 1693, Dutch took over the town and made plans for the expansion of the city limits westwards with a settlement laid out in gridiron pattern. The extension had a structure, which corresponded to a spatial-functional distribution of the different Indian communities such as brahmins, weavers, merchants, farmers, craftsmen etc. The Dutch design of gridiron pattern had been partially implemented when the French returned to Puducherry in 1699 and it was completed by them. French also built inside the city a Fort namely, Fort Louis to store arms, ammunitions and other commodities. It was a pentagonal shaped fort, which acted as the citadel for the town for more than 50 years. It withstood many attacks and calamities finally destroyed by English in 1761. It was situated at the present location of Bharathi Park. English destroyed the whole town of Puducherry in 1761. French regained the power in 1765 and rebuilt the town in the old foundations with a fortification.

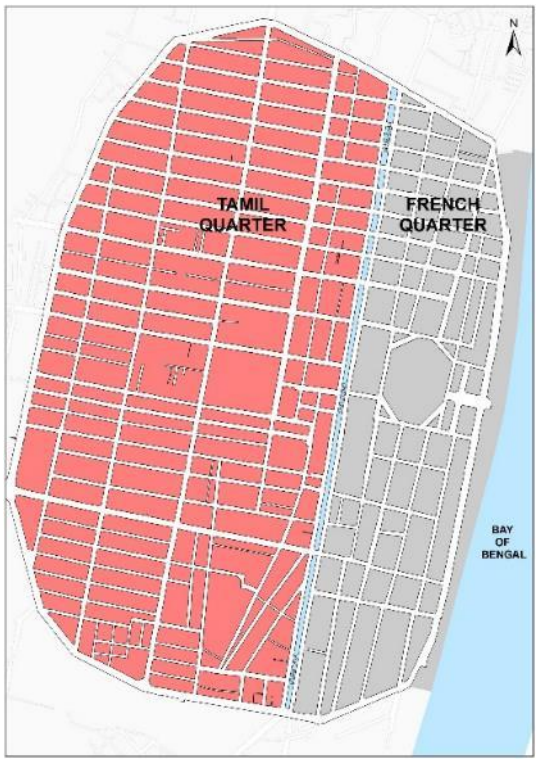


Figure 8.2 Layout Plan of Boulevard Town

8.1.3 ARCHITECTURAL HERITAGE

Puducherry town's history dates back to 1st century AD, which is evident from excavation at the heritage site Arikamedu, which points towards trade activities with Romans. Later, this port town became a busy trading centre for colonial powers mainly the French & the Dutch. The French expanded their activities in Puducherry Town and built an Oval shaped town with grid patterned layouts which remains same till date. This grid pattern was laid down by the Dutch who had occupied Puducherry before the French. The oval shaped town comprised of two quarters, the native and the French. The two different quarters have contrasting style of architecture and this contributes to the architectural heritage of the Puducherry region.

Puducherry have a rich heritage in two distinctive styles of the French and the native Tamil. It is important to preserve these styles to carry forward the cross-culture image of the Puducherry area. The Boulevard town has inherited significant architectural heritage which is evident from the well planned layout of two distinct quarters. It is a confluence of two quarters viz. French quarter and Tamil quarter which are separated by a canal called Grand Canal which was built for storm water drainage. Eastern part of the town is known as French Town and western part of the town is known as Tamil Town. The buildings in the French Town are built in French colonial architecture and those in the Tamil town are built in Franco-Tamil Architecture: a mix of French Architecture and vernacular Tamil Architecture.

8.1.4 ARCHITECTURAL CHARACTERS

The Boulevard Town presents two distinct architectural styles in the Tamil and French quarters, which are separated by a canal and unified by a rectilinear grid plan. In the French Town, the

buildings are in European style adapted to a tropical climate, whereas in the Tamil Town area they are in the local vernacular. While maintaining their individual identities, the two styles have influenced one another, evolving into a synthesis: Franco-Tamil architecture.

8.1.4.1 French Precinct

The French town is developed along the East coast line in the Puducherry town. The Bharati park is the focal point within this precinct. Government building and residential areas are observed throughout the French town. The streets in French town are characterised by continuous development, full or partial street frontage. The garden walls are high, the gateways are constructed in a detailed fashion, and the walls are divided into smaller panels.

Most of the houses in French town are constructed on similar plan with minor variations in size and orientation. The houses are constructed within a high compound walled sites with detailed ornate gates. Most of the house designs in the French town are symmetrical in plan and façade which opens up to the front garden or court. Colonnaded porticos were provided in most of the houses front façade to have a smooth transition to the garden or the court. The roofing in French town was locally inspired flat Madras Terrace. Majority of houses in the French town flaunts French architectural style barring a few on the northern side of the French town, which are low rise Tamil style buildings. The private garden court forms the major space on to which the other building spaces open. In most cases the entrance court and private court are combined and the interior facades, arcades and colonnades.



Figure 8.3 Architectural style of French precinct

The interiors are more ornate than the exterior and high ceilings, high arched doors and windows with louvered shutters and bands, characterise the rooms. Series of arched openings are usual in the case of long halls. The ceilings are marked by heavy wooden beams and joists, the huge wall area is sometimes divided into ornate panels by plaster decoration and a simple cornice runs below the celling beam. The floors are smoothly finished cement screed or occasionally made with teak wood.

8.1.4.2 Tamil Precinct

The Tamil town lies towards the west of the French town separated by Grand Canal. This part of the town is developed around three focal points, the Temples of the northwest, the church and the mosque in the south-eastern part of the Tamil town. In spite of different religious quarters, the Tamil town shares common architectural style. The significant feature of Tamil Town streets are the street verandas with platform which are typical of vernacular Tamil architecture. Building in this part of the town usually feature a combination of flat and pitched tiled roofs. Most of the houses are characterised by a series of open, semi-covered and covered spaces with subtle levels.

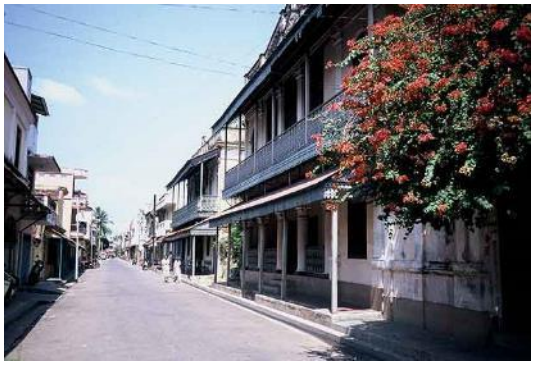



Figure 8.4 Architectural style of Tamil precinct

The veranda acted as a transition from street to house, with finely carved wooden door and vestibule. The mutram (Open courtyard) becomes the important place which are another prominent feature of Tamil houses, which is the central space and around which all other private spaces are arranged. This place act as a major source for lighting and ventilation. It is usual for Tamil houses to have a rear courtyard which usually consisted of a well and a tree, this area was used for keeping livestock and other domestic utilities. In case of two storied buildings this space is covered and converted into clearstory. Beyond the mutram are the more private spaces like the pooja room, kitchen, storerooms, bedrooms etc.

8.1.4.3 Franco – Tamil Precinct

The synthesis of French and Tamil architectural styles has given rise to Franco – Tamil architecture where the ground floor displays Tamil architecture featuring thinnai, thalvaram, carved ornate wooden doors and columns etc., while the first floor displays French influence showing pilasters, masonry columns with capitals, arched windows, plastered decorations, ornament elements etc.

8.1.5 HERITAGE SITES

Puducherry region have several heritage sites and building, few of them are declared as Archeological Survey of India Sites and few of the buildings are notified as heritage building due to their architectural and cultural heritage with respect to the history of the Puducherry region. The governments at the central and state have taken serval measures to preserve the heritage buildings in the Puducherry Planning Area. Archeological Survey of India had earmarked five sites within PPA for preservation and the list of same is given in table 8-1. Out of these five, Arikamedu is a prominent site and it is in the tentative list of UNESCO World Heritage Sites as one of the Silk Route Sites in India. Government of Puducherry have notified 21 buildings in the Boulevard town as Heritage Buildings vide G.O. Ms. No. 13/2015-Hg dated 17.06.2015), for protection/conservation of these buildings and matters connected therewith. The figure 8.6 represents the some of the notified heritage buildings in the study area.

Table 8-1 List of ASI protected Monuments in Puducherry

S.No.	Name of the monument/site	Locality
1	Mulanathaswami Temple	Bahour
2	Varadaraja Perumal Temple	Thirubhuvanai
3	Thirukundangudi Mahadeva Temple	Madagadipet
4	Sri Panchanadiswara Temple	Thirubhuvanai
5	Arikamedu	Ariyankuppam
Source: Archaeological Survey of India website, as on 17.4.2015		



Figure 8.5 Location of Important Buildings in the Boulevard Town

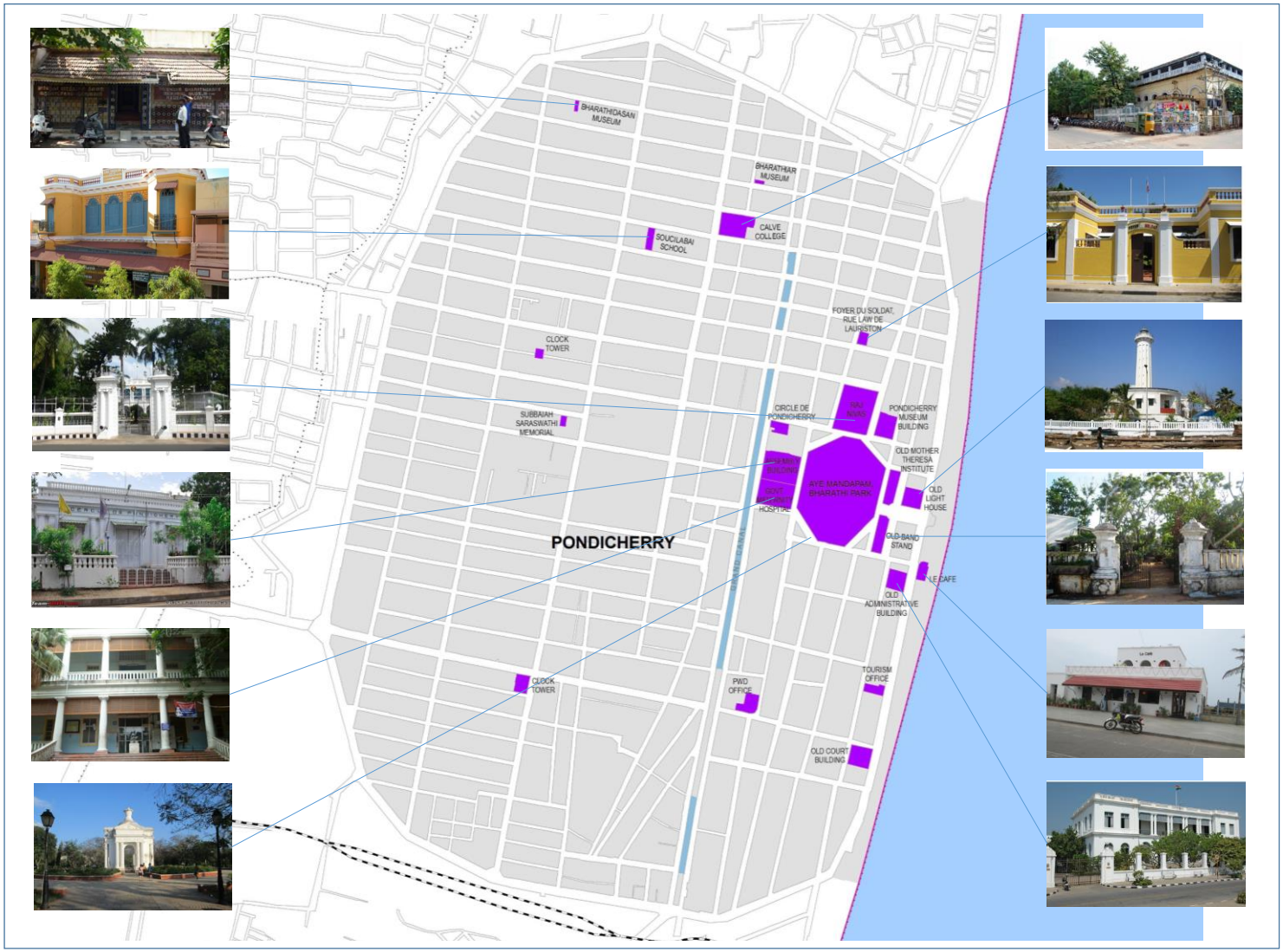


Figure 8.6 Location of some of the Notified Heritage Buildings in the Boulevard Town

8.1.6 PROPOSED STRATEGIES

Heritage buildings in "Pondy", which attract tourists from all around the world, are disappearing. A recent survey report shows that of the 1,807 heritage buildings listed in 1995, only 442 were still standing in 2015. The decline has brought the spotlight back on the absence of stringent rules and poor conservation. The decline is most visible in structures dominated by Tamil architecture. It is mainly because commercial activities are happening more in the Tamil quarter.

Lack of maintenance, development activities, division of traditional property among heirs by private owners and lack of awareness is also the main reason for buildings simply disappearing. Improving the appropriate heritage regulation to protect these buildings will help in retaining the rich cultural heritage character of Puducherry and would also help in augmenting the development in the tourism sector. Hence a State Level Heritage Conservation and Advisory Committee (SLHCAC) was constituted in order to suggest measures to the Government in the matters relating to conservation of Heritage Buildings in Union Territory of Puducherry and notified 21 Government owned building to preserve its rich heritage characters. This kind of rich heritage building may be identified further in the study region to bring under one umbrella of Heritage regulations to protect and maintain the heritage buildings.

8.1.6.1 Heritage Conservation Proposals



Figure 8.7 Heritage Conservation process

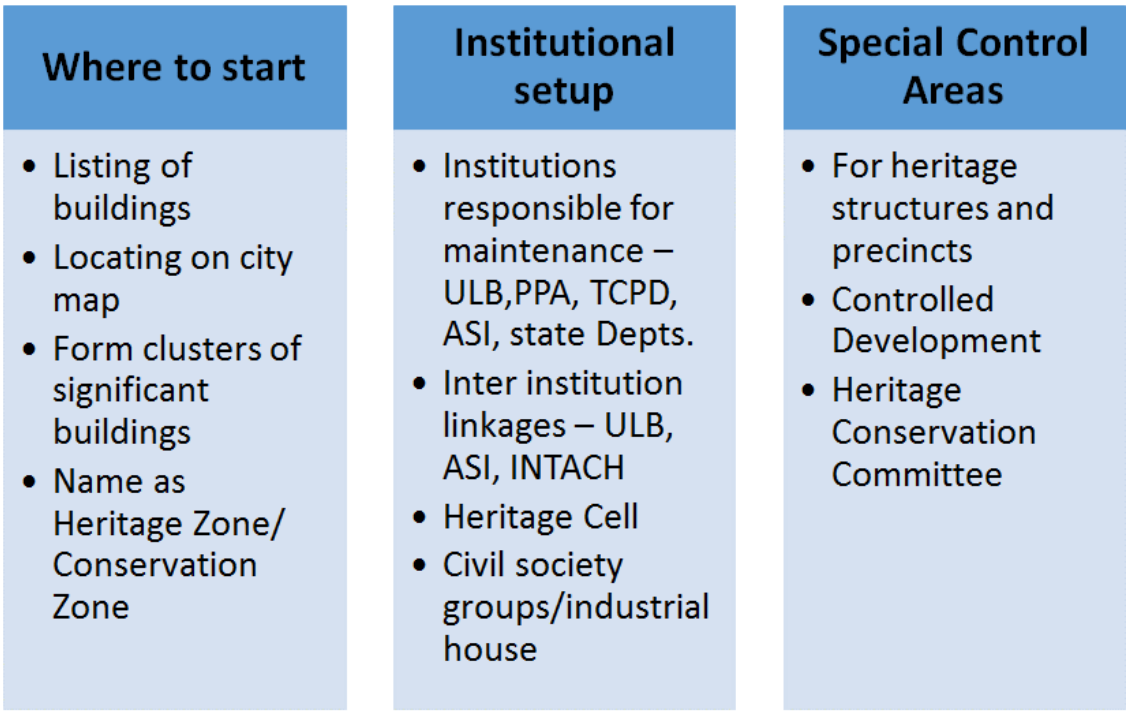


Figure 8.8 Heritage Conservation Chart

For the conservation of heritage buildings, the abovesaid steps are to be followed. Amongst these, Puducherry has already started initiatives towards conservation of the building by notifying the list of buildings important for its heritage value. Other than that, Puducherry has already formed Heritage committee to look after the heritage of the town.

8.2 CULTURE

The people of Puducherry are multinational and multi ethnic by nature and thus have a cosmopolitan culture but still they have strong hold to the native tradition of the region. One of the characteristics of the territory of Puducherry is that they have a diverse culture and thus resulting in a secular attitude. The Boulevard Town offers a multi-religious community, with each practicing their own heritage traditions and values and living in social harmony.



Figure 8.9 Multi religious community settlement plan within Boulevard

When it comes to the music and the dances of the people of Puducherry, it is a very visible picture of the extension of the southern styles of classical music and dance. Despite its French character, Puducherry is a perfect example of Indian culture. All the festivals are celebrated with great excitement and enthusiasm by the people of Puducherry like elsewhere in the country. Pondicherry has an interesting cross-cultural history and its built form lends a unique identity to the town. Hence, Pondicherry remained a seat of great commercial, strategic, and political importance, where cultural traditions from many parts of Europe have fused to create a coherent and dynamic continuing community.

8.2.1 SOCIO-CULTURAL SIGNIFICANCE

Puducherry also became a place for residence of highly acclaimed literary figures, both of national and regional fame since Puducherry was well-known route of exile and of protection under British rule. Some of the famous persons from Puducherry are listed below.

1. Subramania Bharati, great Tamil poet (1908)
2. V.V.S. Iyer, Tamil writer (1910), considered as the father of modern Tamil short stories.
3. Sri Aurobindo (1910), editor of the nationalist journal "Vande Mataram" and revolutionary leader of Calcutta
4. Mirra Alfassa and Sri Aurobindo later established the Sri Aurobindo Ashram (1926)

9 TOURISM

9.1 INTRODUCTION

Tourism sector is emerging as the largest service industry for generating employment and boosting economic growth, having forward and backward linkages. Puducherry has earned a name in the field of Tourism attracting tourists from both inside and outside India. Aurobindo Ashram, Auroville, Boulevard town and the various natural scenic sites and religious sites attract tourists to this place.

9.2 TOURISM DESTINATIONS

9.2.1 AUROVILLE

Auroville is a township in Villupuram: an adjoining district of Tamilnadu, which houses around 2000 people from all over the world. It was founded in 1968 by Mirra Alfassa, popularly known as 'The Mother': the spiritual collaborator of Sri Aurobindo: an Indian nationalist, philosopher, yogi and a poet who lived in Puducherry. Auroville was conceived as a 'place of research into the ideal of human unity'. Designed by the French Architect Roger Anger, Auroville sends a positive vibe into the inhabitants or visitors. It is in a rural setting, with deep red earth landscape and widespread



Figure 9.1 Auroville

forestation with narrow earth roads linking the settlements in Auroville. Auroville houses Matrimandir a place for silent concentration which contains the world's biggest man-made crystal ball. Auroville visitors centre has got a permanent exhibition on the history and philosophy of the project. Even though Auroville Township doesn't belong to Puducherry Region, it is one of the major nearby tourist destinations and can't be left unmentioned.

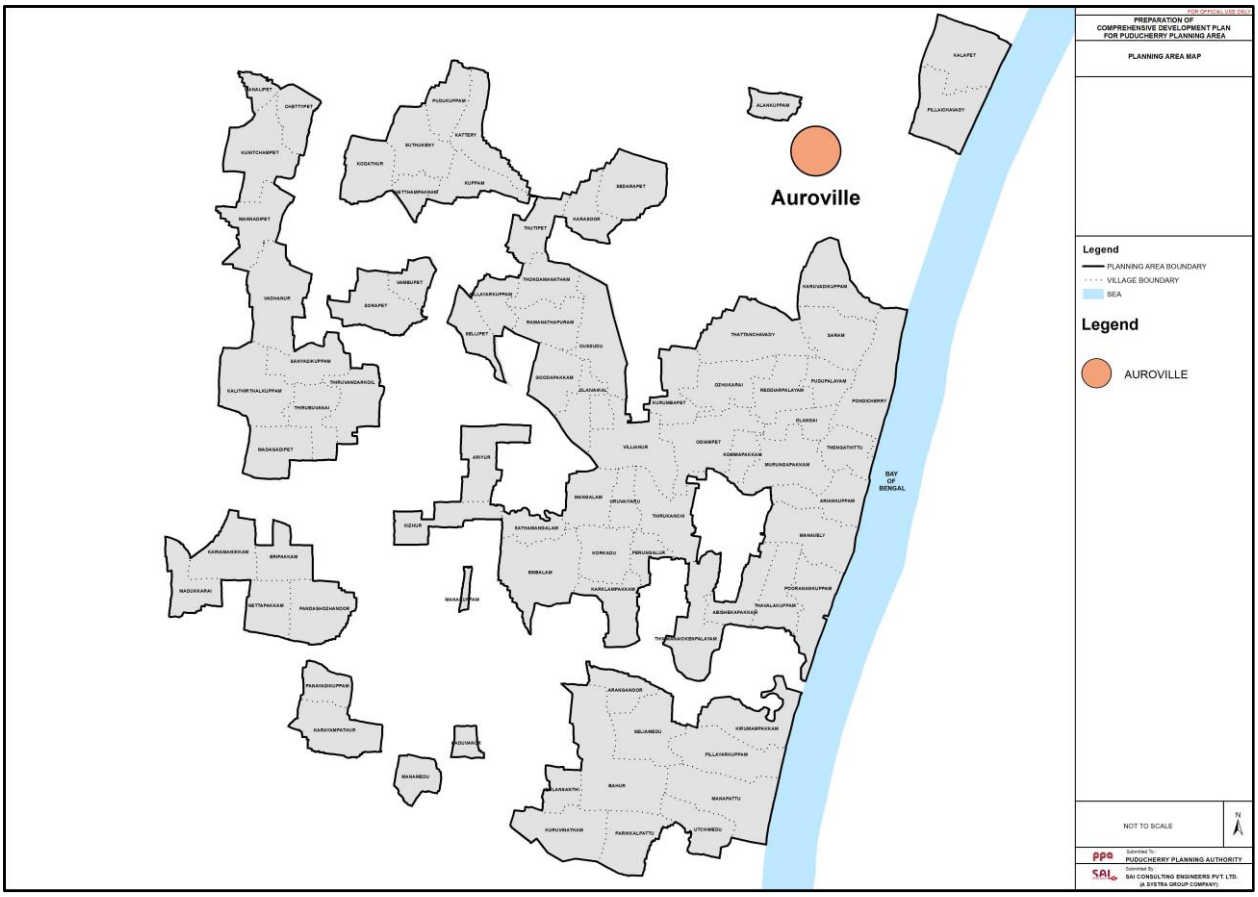


Figure 9.2 Location of Auroville

9.2.2 OTHER NEARBY TOURIST DESTINATIONS

Within 160 kms radius of Puducherry, there are many important tourist destinations. Puducherry comes in various tourist circuits of South India most of which start and end in Chennai.

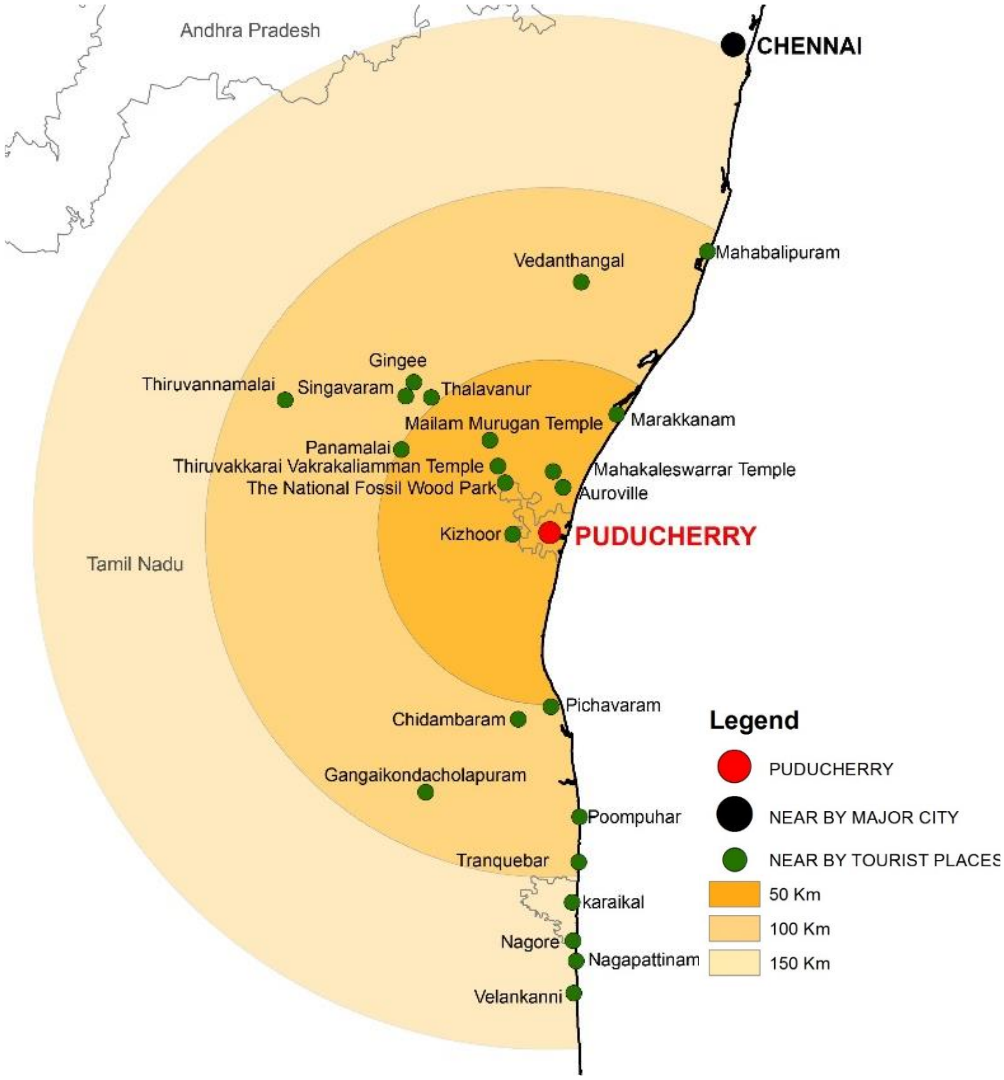


Figure 9.3 Map Showing Locations of Important Nearby Tourist Places

9.2.2.1 TOURIST LOCATION FROM PUDUCHERRY WITHIN THE RADIUS OF 150KM

MAHABALIPURAM: The temple city of Mahabalipuram (also Mamallapuram) is situated approximately 100 km north of Puducherry, was the major seaport of the ancient Pallava kingdom based at Kanchipuram. A wander round the town's magnificent, World Heritage listed temples and carvings inflames the imagination, especially at sunset.



Figure 9.4 Mahabalipuram



Figure 9.5 Thillai Natarajar Temple

CHIDAMBARAM: The temple is located 60 km away from Puducherry. Chidambaram is a town in the district of Cuddalore in the state of Tamilnadu. The town is famous for the Thillai Natarajar Temple and the annual chariot festival held in the months of December-January (In the tamil month of Marghazhi known as "Margazhi Urchavam") and June to July (In the tamil month of Aani known as "Aani Thirumanjanam"). The temple is known as one of the foremost of all temples (Kovil) in Shaivism and has influenced worship, architecture, sculpture and performance art for over two millennium.

POOMPUHAR BEACH: The beach is located 100 km from Puducherry. It is a natural and ancient beach located in Poompuhar, Tamilnadu along the Bay of Bengal. The beach starts from the Kaveri river and extends upto 3 km in the north side towards Neithavasal. The sand of this beach spreads out till around 3 kilometers. Chitra Pournami is an important festival for this beach which happens during the full moon in Tamil month Chittrai. There also occurs a Holy dip in the mouth of Kaveri river which is celebrated during new moon in the Tamil month of Thai and Adi.



Figure 9.6 Poompuhar Beach



Figure 9.7 Gingee Fort

GINGEE: The fort is located approximately 70 km far from Puducherry. Originally the site of a small fort built by the Chola dynasty during the 9th century AD, Gingee Fort was modified by Kurumbar during the 13th century. As per one account, the fort was built during the 15–16th century by the Nayaks, the lieutenants of the Vijayanagara Empire and who later became independent kings (Nayaks of Gingee).

GANGAIKONDA CHOLAPURAM: It was built during medieval India and was erected as the capital of the Cholas by Rajendra Chola I, the son and successor of Rajaraja Chola, the great Chola who conquered a large area in South India. This historical site was declared as World Heritage Site by UNESCO in 1987.



Figure 9.8 Gangaikonda Cholapuram



Figure 9.9 Thirunallar Temple

THIRUNALLAR TEMPLE: The temple is situated around 130 km far from Puducherry. When we enter the temple the images of four great Saiva Saints Appar, Sundarar, Thirugnanasambandar and Manickavasagar and 63 Nayanmars are represented at the Southern pragara of the temple. There is also additional attraction in the shape of holy tanks which exists here are said to possess healing powers literally and metaphorically. According to legends the temple belongs to 7th century B.C. to Jupiter in size and magnitude.

MANDAGAPATTU: Mandagapattu Tirumurti Temple is a Hindu temple situated in the village of Mandagapattu in the Villappuram district of Tamilnadu, India. It is 57 km from Puducherry. Hence, from rock by the Pallava ruler Mahendravarman I in honour of the Hindu Trinity, the cave temple is considered to be the oldest stone shrine to a Hindu god to be discovered in Tamilnadu. In one of his inscriptions, Mahendravarman I boast that he caused a stone temple to be built in honour of the Hindu Trinity without the use of brick, mortar, timber or metal.

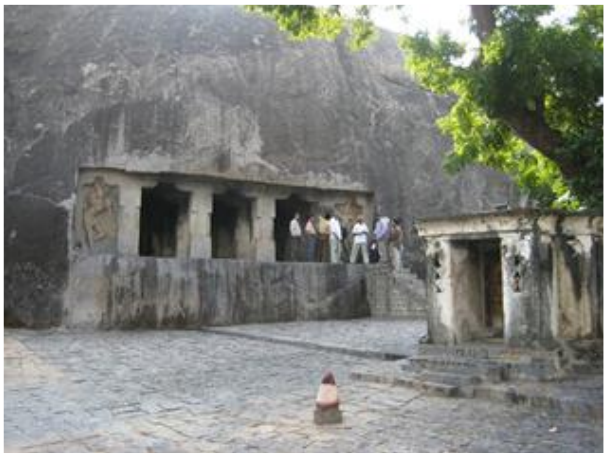


Figure 9.10 Mandagapattu



Figure 9.11 Tharangambadi

THARANGAMBADI: Tharangambadi, formerly Tranquebar, is a town in the Nagapattinam district. It is 116 km from Puducherry. It was a Danish colony from 1620 to 1845, and in Danish it is still known as Trankebar. Tranquebar was occupied by the British in February 1808 during the Napoleonic Wars but was restored to Denmark following the Treaty of Kiel in 1814 and the Norwegian Declaration of Independence. Along with the Danish settlement of Serampore in Bengal, it was sold to the British in 1845. Tranquebar was then still a busy port, but it later lost its importance after a railway was opened to Nagapattinam.



Figure 9.12 Velankanni Church

VELANKANNI CHURCH: Velankanni has one of the country's biggest Catholic pilgrimage centres, the Basilica of Our Lady of Good Health. It is situated 150 km from Puducherry. Devoted to Our Lady of Good Health, it is popularly known as the "Lourdes of the East". Its origins can be traced back to the 16th century. It is built in the Gothic style, was modified by Portuguese and then further expanded later on due to the influx of pilgrims. The church building was raised to the status of basilica in 1962 by Pope John XXIII. Velankanni has been chosen as one of the heritage cities for HRIDAY - Heritage City Development and Augmentation Yojana scheme of Government of India.

PANAMALAI: Talagirisvara Temple is a Hindu temple located in the village of Panamalai in the Villupuram district of Tamilnadu, India. It is situated 66 km from Puducherry. Narasimhavarman II, also known as Rajashiman is credited with constructing structural temples of Pallava dynasty namely the Shore Temple at Mamallapuram, Kailasanatha Temple and Talagirisvara temple at Panamalai. The temple is built on a small hillock overlooking the Panamalai lake. This 7th Century structure has a Vimana which resembles that of Kailasanatha temple of Kanchipuram.



Figure 9.13 Panamalai



Figure 9.14 Pithchavaram

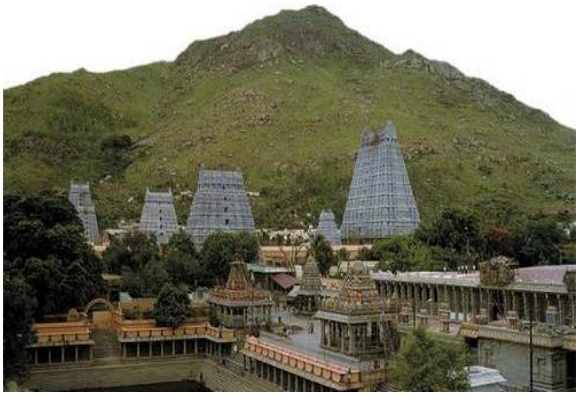
PITCHAVARAM: The Pitchavaram Mangrove Forest near Chidambaram is the world's second largest mangrove forest. Pitchavaram mangrove forest is located between two prominent estuaries, the Vellar estuary in the north and Coleroon estuary in the south. The Vellar-Coleroon estuarine complex forms the Killai backwater and Pichavaram mangroves. The backwaters are interconnected by the Vellar and Coleroon river systems and offer abundant scope for water sports such as rowing, kayaking and canoeing.


Figure 9.15 Singavaram

SINGAVARAM: Singavaram is located near Gingee town and is famous for a rock cut cave temple, known as Sri Ranganathesvara temple. it is situated 73 km from Puducherry. This cave temple is taken as a Pallava cave temple by most of the scholars on basis of its architectural style. Scholar Dubreuil suggests that Singavaram could be Simhapura, the capital of Simhapuranadu. The speciality of this temple is the idol of 14 feet long in a reclining form.

TALAVANUR: Shatru Malleswaralayam Rock Cut Temple is in Thalavanur, 16 kms from Gingee, Villupuram District and 28 from Puducherry a drivable distance from Puducherry. It was built by the Pallava king, Mahendra Varman (580 to 630 A.D). This is a fine example of temple architecture built without the use of conventional materials. It is one of earliest rock cut cave temple in Tamilnadu.


Figure 9.16 Talavanur


Figure 9.17 Thiruvannamalai

THIRUVANNAMALAI: Tiruvannamalai is one of the most venerated places in Tamilnadu. It is 105 km from Puducherry. In ancient times, the term "Annamalai" meant an inaccessible mountain. The word "Thiru" was prefixed to signify its greatness, and coupled with the two terms, it is called Tiruvannamalai. The temple town of Tiruvannamalai is one of the most ancient heritage sites of India and is a centre of the Saiva religion. The Arunachala hill and its environs have been held in great regard by the Tamils for centuries. The temple is grand in conception and architecture and is rich in tradition, history and festivals.

VEDANTHANGAL: Vedanthangal Bird Sanctuary is a 30-hectare (74-acre) protected area located in the Kancheepuram District of the state of Tamilnadu, India. More than 40,000 birds (including 26 rare species), from various parts of the world visit the sanctuary during the migratory season every year. Vedanthangal is home to migratory birds such as pintail, garganey, grey wagtail, blue-winged teal, common sandpiper and the like. Vedanthangal is the oldest water bird sanctuary in the country. This area was a favourite hunting spot of the local landlords in the early 18th century.


Figure 9.18 Vedanthangal

THE NATIONAL FOSSIL WOOD PARK, Thiruvakkarai: The National Fossil Wood Park, Thiruvakkarai is a geological park located in the Villupuram District in Tamilnadu and is maintained by the Geological Survey of India. The park was established in 1940 and is located 1 km east of Tiruvakkarai village on the road between Tindivanam and Pondicherry.



Figure 9.19 Fossil Wood Park, Thiruvakkarai



Figure 9.20 Irumbai Mahakaleshwarrar Temple

IRUMBAI MAHAKALESHWARRAR TEMPLE: This temple is hailed as one of the Thevara stalas, with Lord Siva as the prime effigy. This temple is a hoary one but now renovated into a stunning temple. This temple is anchored a few kilometers from Auroville village. Prathosam, Shivaratri, Karthigai, Brahmotsavam, and Thaipusam are some of the notable festivals commemorated in this temple.

KIZHUR: It was on November 1, 1954, that the then French settlements of Pondicherry (Puducherry), Karaikal, Mahe and Yanam was transferred to the Indian Government, following a referendum in Kizhur. The day is also referred to as De Facto Merger Day. The Treaty establishing De Jure Cession of French Establishments in India was signed in May 1956, and the Instruments of Ratification of Treaty of Cession between India and France in respect of the settlements were exchanged on August 16, 1962.



Figure 9.21 Kizhur

9.2.2.2 RELIGIOUS DESTINATIONS

Puducherry holds a number of religious institutions such as temples, churches and mosques. There are most importantly 7 temples, 5 churches and 3 mosques in Puducherry which are visited by tourists, mostly local tourists. Some of the major Religious Institutions are shown in page no 291 to 292.

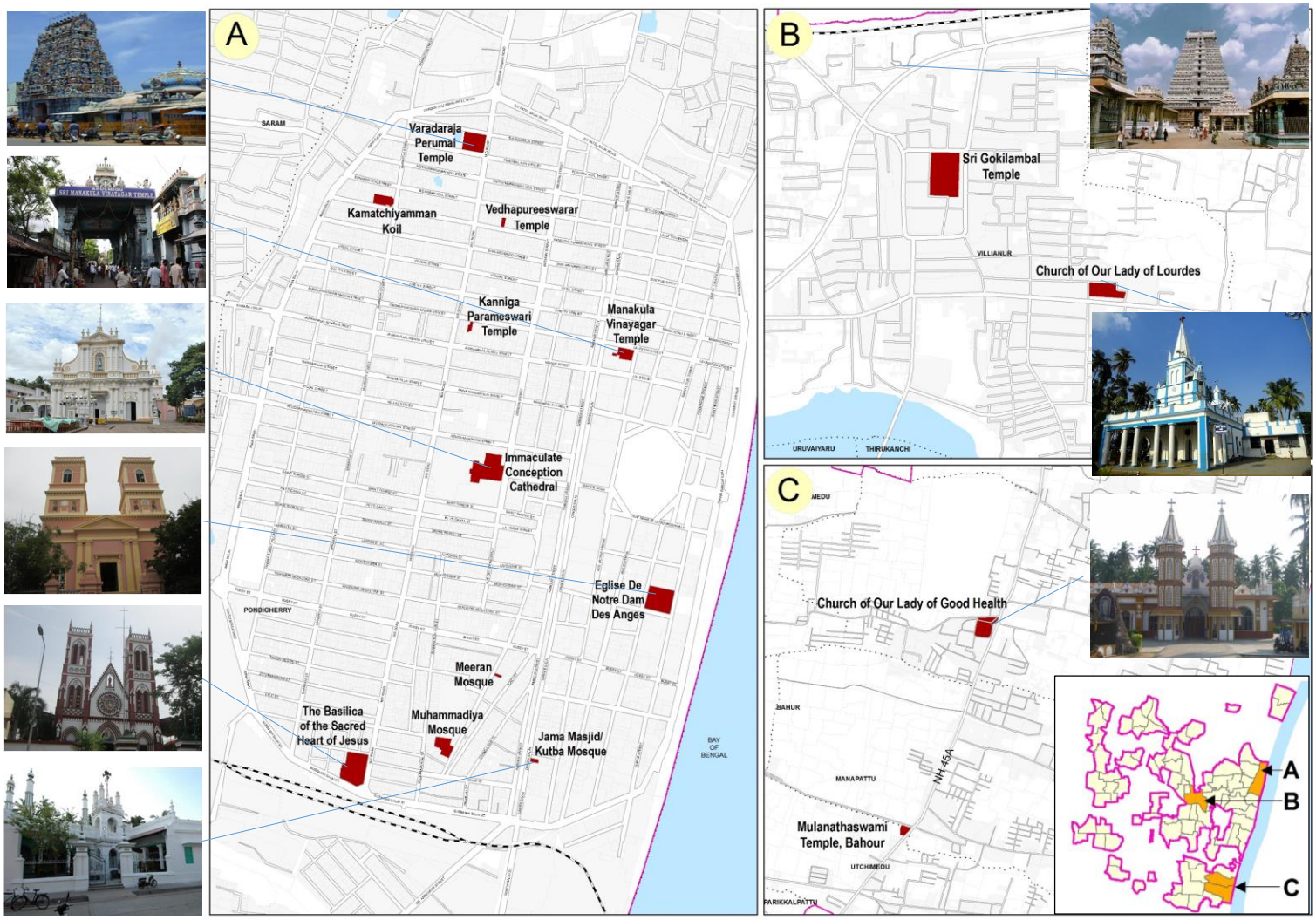


Figure 9.22 Location of some Religious sites in the Puducherry Planning Area

IMMACULATE CONCEPTION CATHEDRAL: Built in 1770 in Baroque Architecture style, this church stands as an important landmark in the Tamil precinct.

This church was built thrice in different years i.e., 1693 by Dutch, 1730 and 1761. The interesting information is that the church was rebuilt at the same site every time.



Figure 9.23 Immaculate Conception Cathedral



Figure 9.24 Notre Dame Anges Church

NOTRE DAME DES ANGES CHURCH :

Our Lady of Angels Church (also called Eglise de notre Dame des Anges, White Chapel, Kaps Koil) is the fourth oldest church in Puducherry. This church, built in 1855 is a fine example of Classical Church Architecture. The original structure was built in Greco Roman architecture by Napolean III in 1855, with the architect being Louis Guerre.

THE BASILICA OF THE SACRED HEART OF JESUS:

The church is a fine example of Gothic architecture. It has stained glass panels which depict events from the life of Jesus Christ and saints of the catholic church. Recently, it has developed as one of the famous pilgrim spots for the Christians.



Figure 9.25 Basilica Church



Figure 9.26 Manakula Vinayagar Temple

MANAKULA VINAYAGAR TEMPLE:
This temple built in Dravidian Temple Architecture was built in 1704 and the temple is dedicated to Lord Ganesha. During the tenure of Dupleix, there were attempts to destroy the temple but the temple was finally spared owing to strong protests from the Hindu population and the threat of British and Maratha invasion of the territory. Hence, Manakula Vinayagar Temple was in existence before the French came and settled in Pondicherry i.e. before 1666.

ESWARAN TEMPLE / VEDAPUREESWARAR TEMPLE

This temple is dedicated to Lord Shiva - also known as the Eswaran Dharmaraj Koil - is located on M.G. Road, adjacent to the Varadaraja Perumal Temple. It is 75 feet tall colourful 'gopuram' is adorned by statues of gods and goddesses like most temples in South India. In 1748, during Governor Dupleix's rule, the original temple - Vedapuri Eswaran Koil - was demolished and razed to the ground.



Figure 9.27 Eswaran Temple

JAMA MASJID/ KUTHBA MOSQUE:



Figure 9.28 Jama Masjid

The Kuthba Mosque is a famous mosque located in Puducherry. Kuthba Mosque, a 17th century mosque, is the first mosque in Pondicherry (Puducherry), which is home to several places of worship. It is also referred to as the Jamia Mosque predating Colonial occupation and is a glaring example of the secular culture of the region and country. In all probability, it was the first Mosque built in Pondicherry. The architecture of Kuthba mosque combines the features of French colonial style and Islamic style.

9.2.3 ASI SITES

Archaeological Survey of India has notified 5 sites as archaeological monuments within the Puducherry Planning Area, these sites are maintained by ASI. The figure 9.31 shows the location of these ASI sites within the Puducherry Planning area



Figure 9.29 Location of ASI Sites in Puducherry Planning Area

9.2.3.1 THIRUKUDANGUDI MAHADEVA TEMPLE

This small but beautiful temple was built by Rajaraja chola I during the period 985 A.D -1016. The temple has a square sanctum, circular griva and domical sikhara. Niches of the sanctum are now empty but the sculptures that were there are now kept in Puducherry. On the top niches around the sikhara are Vishnu on the west, Brahma on the North, Subramanya on the east and dakshinamoorthy on the south of the Devi shrine faces south. The old name of the place was Thirukudankudi. This place was part of the bigger village of Thiruyana Mahadevi Chaturvedi mangalam now called Thirubhuvanai in Jayam Kondas Mandalam.



Figure 9.30 Thirukudangudi Mahadeva Temple

9.2.3.2 VARADARAJA PERUMAL TEMPLE

Varadaraja Perumal temple, one of the oldest temples of Puducherry district, is one of the protected monuments of Archaeological Survey of India. It is built in Dravidian style of Architecture and is said to be one of the temples where idols from all temples of the locality were kept during French and Muslim invasions in Puducherry. It is 800 years old temple.



Figure 9.31 Varadaraja Perumal Temple

9.2.3.3 ARIKAMEDU

Arikamedu, a Silk Route Site is located approximately 4 km south of Pondicherry which was once an early Roman trade centre. A rare site in India with cultural continuity from 300 BC to 1800 AD. It was the Capital of the Mauryan Empire 2nd & 3rd Centuries BC. Presently, an archaeological site, where Mortimer Wheeler accomplished his renowned excavation during the 1940s. It once used to be a fishing colony and a port for maritime commerce with Romans and Greco-Romans in the early centuries of 1st millennium. It is Arikamedu which is mentioned as Poduke in 'Periplus of the Erythraean Sea' document.



Figure 9.32 Arikamedu Archaeological Site, Puducherry

The major imports at this port were bangles, vessels, wines etc. while the major exports were textiles, beads, semi-precious gems, glass and shell bangles. Currently the site houses the remains of a perpendicular wall and a mission house. It is also said that beads appear on the bank of the river after a downpour. As mentioned earlier, Arikamedu is an ASI protected monument. Also, Arikamedu is in the tentative list, to be considered for nomination in the UNESCO World Heritage Sites as one of the Silk Route sites in India.

9.2.3.4 SRI PANCHANDISWARA TEMPLE



Figure 9.33 Mulanathaswami Temple

The temple is praised in the hymns of saint Tirugnana Sambandar. This is the 16th Shiva Temple of Nadunadu region praised in Thevaram hymns. Lord Brahmma the creator also had five heads as Lord Shiva. Brahmma grew proud of this equality. It so happened once that Mother Parvathi mistook Brahmma as Lord Shiva and extended the honours which Brahmma did not refuse. The confusion arose because both had five heads. Lord Shiva removed one head of Brahamma. Brahmma realized his pride and punished him and begged Shiva's pardon. This event took place here. As Lord Shiva removed one head of Brahmma, he is named Vadukeeswarar. There are 8 pillars in the Artha Mandapa before Lord's shrine. Worshipping Lord at this spot would bring royal honors and benefits to the devotee. Mother Tirupurasundari is gracing with Mahalakshmi attributes from a separate shrine, bearing the name Vadugur Nayaki. The Archeological survey of India listed Sri Panchandiswara temple considering the time period and importance of the temple.

9.2.3.5 MULANATHASWAMI TEMPLE



Figure 9.34 Mulanthaswami Temple

Mulanathaswami temple is located in the southern part of the Puducherry Planning Area in Bahour Commune Panchayat. The temple is said to be constructed in Chola Dynasty (300 BCE to 1279 CE) and it is evident from the marvelous sculptures which display Chola Architecture. This temple is declared as an archaeological monument and is maintained by Archaeological Survey of India.

9.2.3.6 STRATEGIES TO DEVELOP ASI SITES

1. Bring about visible improvements at monuments and sites, heritage complexes and their environs
2. To bring monuments back into lifestyle and culture of local communities
3. Environmental development in and around the heritage sites
4. Structural conservation, scientific preservation and refurbishment of monuments
5. Display of cultural texts, direction boards, signage, etc
6. Providing tourist friendly amenities, popular authentic historical literature
7. Illumination of monuments

9.2.4 SIDDHAR SPIRITUAL CIRCUITS

Pondicherry is a place of fun to many, but inherently it had been a place of salvation since ancient times. Not many people know or realize that all in there are 30 siddhars who attained jeeva samadhi in and around Pondicherry. Siddhars are not Gods. But these are people who actually lived in this world and performed miracles. These spiritual circuits should be well

connected as a part of the tourism promotion to make the tourist stay for few more days which in turn will support the economy of the region.

Table 9-1 Siddhar Spiritual Circuits

S No.	Siddhars Jeeva Samadhi	Location
1.	SRI THOLAIKADHU SIDDHAR MANAKKULA VINAYAGAR TEMPLE	PUDUCHERRY
2.	SRI NARAYANA PARADESI SWAMIGAL	VAITHIKUPPAM, PUDUCHERRY
3.	SRI MOWLASAHID MEYGNANI	MULLAA STREET PUDUCHERRY
4.	SRI NAGALINGA SWAMIGAL	AMBALATHADYAR MADAM, PUDUCHERRY
5.	SRI SIDDHANADHA SWAMIGAL	KARUVADIKUPPAM
6.	SRI SAKTHIVEL PARAMANDHA SWAMIGAL	KARAMANIKUPPAM
7.	SRI AKKA SWAMIGAL	VAITHYKUPPAM, PUDUCHERRY
8.	SRI KAMBILI GNANADESIGA SWAMIGAL	THATANCHAVADI
9.	SRI PERIAVARGALUKKU PERIYAVAR	THATANCHAVADI
10.	SRI SANDHA NANDHA SWAMIGAL	SARADHAMBAL PEDAM 100 FEET ROAD
11.	SRI SUBRAMANIYA AVINAVA SACHIDHANADHA BHARATHI SWAMIGAL	SARADHAMBAL PEDAM 100 FEET ROAD
12.	SRI VEDHANANDHA SWAMIGAL	THIRUVALLUVAR NAGAR, MUTHIYALPETTAI
13.	SRI ARAVINDHAR ASHRAM	PUDUCHERRY
14.	SRI ANNAI-ARAVINDHAR ASHRAM	PUDUCHERRY
15.	SRI MANNURUTI SWAMIGAL	THENANJALAI STREET
16.	SRI SHIVA SADAIYAPPAR SWAMIGAL	BOOMIYAAN CHATIRAM (NEAR BHARATHI THEATRE)
17.	SRI KATHIRVEL SWAMIGAL	BRINDHAVANAN SIDDHAN KUDI
18.	SRI SHIVA PRAKASA SWAMIGAL	NALLATHUR
19.	SRI AZHAGAR SIDDHAR	THENAMPAKKAM
20.	SRI RAMPARADESHI SWAMIGAL	VILLIYANUR
21.	SRI APPAR SWAMIGAL	YEMBALAM

S No.	Siddhars Jeeva Samadhi	Location
22.	SRI MAHAN VANNARA PARADESHI SWAMIGAL	ODHIYAMPATTU
23.	SRI VIYOMO SWAMIGAL	KANUVAAPETTAI
24.	SRI KARANAPATTU KANDHASAMY	KARANAPATTU, YEMBALAM
25.	SRI LA SRI ARULSAKTHI ANNAI-IN SIDDHAR PEDAM	PILLAYARKUPPAM, GRAMAMPAKKAM
26.	SRI LA SRI ULAGANADHAGALARANDHAN SWAMIGAL	SORIYANGKUPPAM PALLI, PAKUR
27.	SRI SATTI SWAMIGAL	ULAVARKARAI (SIVAN KOIL)
28.	SRI DEVARASU SWAMIGAL	VANNIYA NALLUR (NEAR SUNAMBEDU)
29.	SRI THENGAI SWAMIGAL	ARUMAPARTHA-PURAM
30.	SRI DHATCHINAMOORTHY SWAMIGAL	PALLI THENNAL, VILLIYANUR

Source: Compiled by Consultant

9.2.5 BEACHES

Puducherry is blessed with a scenic coastline which houses number of beaches; the major beaches are Paradise Beach, Promenade Beach, Vembakirappalaiyam Beach and Veerampattinam Beach.

9.2.5.1 PARADISE BEACH

This coconut tree lined beach is situated 8 km away from the city and can be accessed only from Chunnambar Resort via boats. The beach is popular for its scenic beauty. It has got several amenities such as showers, rest rooms, restaurants for food and beverage etc.



Figure 9.35 Paradise Beach

9.2.5.2 PROMENADE BEACH

The beach is lined with the 1.5 km long Promenade: the pride of Puducherry. There are several landmarks along the beach such as Le Café, War memorial, Joan of Arc's statue, heritage town hall, Statue of Mahatma Gandhi, Dupleix statue, Old Light House, remains of old pier and customs house etc. Handicraft bazars, food courts, restaurants, guest houses and luxury hotels along with a Tourist Information Centre cater to the needs of the tourists.



Figure 9.36 Promenade Beach

9.2.5.3 VEERAMPATTINAM BEACH

Veerampattinam, which is located between Pondicherry and Cuddalore, is the biggest coastal village in the Union Territory of Puducherry. The beach is 7 kms from the city centre and is well connected to the city through frequent bus services. The beach is very close to Arikamedu archaeological site and is one of the longest and beautiful beaches in South India which attracts tourists. One can watch the fishermen ply their trade and working with traditional fishing nets at dedicated sites near to the beach.



Figure 9.37 Veerampattinam Beach

9.2.5.4 VAMBAKEERAPPALAIYAM BEACH

The shallow beach is very close to the new light house and movie shooting takes place here often. The Puducherry government has decided to develop the Vambakeerappalayam beach near the lighthouse into a tourist spot and named it 'Pondy Marina'. The government has decided to develop 7 beaches in Puducherry into tourist spots, one among them is Vambakeerappalayam beach.



Figure 9.38 Vambakeerappalaiyam Beach

9.3 PROPOSED STRATEGIES TO BOOST TOURISM

- Promote Homestays to help tourists experience U.T.'s culture
- The Puducherry government wants to boost tourism in Puducherry. As part of this, they intend to promote homestay, heritage and spiritual circuit in the Union Territory.
- Targeting the middle and upper middle-class tourists, the homestay units are proposed which will enable them to experience Puducherry hospitality, cuisine, customs and traditions by staying with families.
- This system will benefit the owner of the house and make it easy for tourists who find it difficult to get hotel accommodation in peak season.
- The Union Government has sanctioned Rs. 85.28 crore under the Coastal Circuit in 'Swadesh Darshan' Scheme for Puducherry. The government plans to use the funds to

develop seven beaches, including Kalapet beach, Dubrayapet Beach, Arikamedu Beach and Chinna Veerampattinam Beach.

- The Union Tourism Ministry has sanctioned a sum of Rs. 100 crore each for 'Heritage Tourism' and 'Spiritual Tourism' in the Union Territory. Under this scheme, the government proposes to beautify the beach promenade, Nehru Street, Grand Canal, St.Vinnearpu Annai Church, Sacred Heart Church and Lourdes Annai Church (Our Lady of Lourdes Shrine), Villianur.
- They also plan
    - To revitalize streetscapes in the Boulevard
    - Establish a cultural complex with art and digital museum at Old Distillery
    - Construct toilet facilities in Raj Bhavan, Uppalam and Orleanpet
    - Improve works in the tourism building at Beach Road
    - Restore Ananda Ranga Pillai House, Dumas Church bell-tower and many other heritage buildings.
- Under the Heritage Circuit the following works will be taken up:
    - Beautification and extension of beach promenade in southern and northern side; Revitalisation of streetscapes in the Heritage Area in Puducherry
    - Beautification and improvement of Nehru Street in Puducherry
    - Development of Franco-Tamil village in Puducherry (Ariyankuppam Commune Panchayat)
    - Beautification of Grand Canal in Puducherry
    - Toilet facilities to be provided at tourist spots
- As part of the Spiritual Circuit project, the government plans to develop infrastructure in key temples such as Varadaraja Perumal Temple, Vedapureeswarar Temple, Gangai Varaga Natheeswarar Temple, Thirukanchi, St.Vinnearpu Annai Church, Nellithope and Sri Thirukameeswarar Kokilambigai Temple in Villianur.
- The government has proposed an outlay for the Art and Culture department. The Romain Rolland Library in Puducherry will be modernised with the support of National Mission Libraries.
- Public toilets at every major junction and public gathering spots as well as developing areas are to be provided for public convenience. It is to be provided especially in Boulevard area where the tourists inflow is higher so that it can be utilized fully.
- Development of a Lakeside Spa Resort, with 40 to 50 beds capacity on the banks of Oussudu Lake. Alternatively, lakeside cottages may be set up. There should be good landscaping of the area, with lots of greenery around.
- Besides the usual amenities available in a star hotel, such as multi cuisine restaurant, well stocked bar, conference hall, men's beauty parlour or saloon, boutique shop, etc, the resort complex would have a swimming pool and, massage parlour cum health club which are essential features of a Spa Resort.
- Guided boat rides on the lake could be provided to the resort guests who show a preference for it. Angling kit could be provided too for those who wish to amuse themselves with on-board fishing.
- Even if the lake should remain just about partially full for about 4 – 5 months in a year, the resort / cottages should be able to attract business from high end commercial travellers, foreigners and the like. As in the Virgin Island at the Chunnambar Water Complex, solar power and wind generated electricity may be used in the Oussudu Lake Resort Complex.
- Jointly with the present owner, or otherwise, a few garden cottages in the coconut grove overlooking the Chunnambar Lake could be established. The cottages could be

at an elevated level from the ground. This location provides a very scenic view of the Chunnambar lake and the Virgin Island, with frequent movement of boats in the waters.

- Construction of conference hall and some commercial would increase the physical and economic activities in the area close to the Chunnambar Water Sports Complex.
- At Chunnambar, an aerial rope way between the boat jetty and Virgin Island would provide for an attractive novelty in reaching the island. Zip line would also provide an adventurous experience to the tourists between the banks of the Gingee River.
- PTDC may operate night time boating services during Moonlit nights, New year eve nights and other festive occasions to provide connectivity to the Virgin Islands in the Chunnambar Water Sports Complex. Local residents and domestic tourists from nearby centers might be enthusiastic about:
    - Boating on Chunnambar on moonlit nights and New Year eve nights.
    - Celebrate the New Year eve night on the island.
    - Dine and dance relaxation on the Virgin Island on these nights.
- Initiate efforts for establishing Pondicherry Boat Club on the lines of Madras Boat Club. With sponsorship and membership support from business and educational institutions, sports bodies like SAI etc, boating, and rowing activities could be strengthened in the Chunnambar Complex. Annual rowing and sailboat competitions could also be held. Over a period of years, with suitable nurturing and back up by the institutions involved in this activity, this could become a sporting event at the Chunnambar Water Sports Complex (Like the annual Nehru Cup Boat Festival in Alappuzha) in future.
- Provision of public amenities at the Chunnambar Water Sports Complex and Oussudu lake area.
- By providing suitable incentives, encourage setting up at choice locations a few beer pubs which have aesthetic and upscale ambience. Tourists and commercial travellers who do not take up hotel accommodation during their visit to Pondicherry are likely to patronise such bars.
- Establishment of budget accommodation at one or more suitable locations to cater to the short-period lodging facilities required by visiting artists for participation in the cultural / fine arts / religious festivals, pilgrims, sports persons, student groups / others may be examined by the tourism authorities. Alternatively, like the Grey-hound bus stations in the USA, locker-chests and wash facilities may be provided for those who opt for these amenities only instead of room accommodation.
- A number of government departments of Puducherry such as the Town & Country Planning Department, Department of Electricity, PWD, Water Supply and Drainage, Education, Forest and Wildlife, Fisheries, Transport, Tourism etc are implementing a number of schemes to improve the quality of life of citizens of Pondicherry. This will not only indirectly help in attracting tourists, but also in increasing the number of days of tourists stay in Pondicherry.
- Except the ITDC's Ashok Hotel complex, none of the leading national hospitality chains such as the Taj, Oberois, Leela group and ITC hotels division have yet to come to Puducherry. Presence of quality national and international hotel chains will not only attract the high spending domestic / foreign tourists but also attract business conferences / seminars / workshops etc. Suitable steps may be taken in this regard by the authorities concerned to promote holding of conferences / seminars etc in the better class Puducherry hotels / resorts.
- In spite of a long coastline, the utilization of its potential to develop tourist interest is low at present.

- To facilitate smooth and fast transportation between the coastal towns of Pondicherry and Karaikal, a hovercraft service can be considered. Business people from both these regions as well as visiting businessmen from elsewhere in the country could be major source of business for hovercraft service.
- Development of Oceanarium at Manapattu Revenue Village in Puducherry by National Institute of Ocean Technology (NIOT), Ministry of Earth Science (MoES), Government of India.

General Strategies for the boost of Tourism:

- Regulating and planning for Tourism to preserve ecology, environment and areas of tourism value.
- Reducing pressure on Puducherry city by planning, developing self- contained state of art Tourist destinations in the surrounding settlements.
- Eliminating haphazard and unplanned/ sub-standard development around sites of tourism value.
- Promoted Puducherry as a Quality Tourist destination rather than as a mass tourist place.
- Leveraging the concept of Eco-Tourism for the development of places of tourist value.
- Leveraging Tourism for promoting and enhancing the state economy and generation of employment.
- Planning tourism supportive infrastructure with care and put in place on priority in order to exploit the full potential of tourism.
- Planning and developing state of art Convention Centres and supportive facilities to make Puducherry Global Convention Hub.
- Making adequate arrangements for parking as part of the planning tourist sites.
- Planning the circulation pattern for tourist in such a way that City tours can be held for tourists visiting the local sites of heritage value.
- Making Provisions for Public Transportation so that City Bus Tours can be taken up to promote tourism within the city and to minimize traffic on the roads.
- Leveraging strength of Boats to start city tours involving various water bodies, lakes and rivers.

10 ENVIRONMENT

10.1 INTRODUCTION

Environment plays an important role in the sustainability of a region. The balance between different environmental aspects and development defines the progress and livability of an area. The most crucial factors which affects the livability of an area are primarily, land and water. With an increase in the demand of the water, the demand for urban land is also increasing. People flock to urban areas to seek employment, entertainment, shopping and generally a higher standard of living. At the same time, environmental infrastructure for works and services are inadequate to serve the resulting increase in population and population densities.

The inevitable congestion causes environmental hazards and degradation until strategies for reversing environmental deterioration can be implemented. Hence, the magnitude of urban population growth in developing countries is a direct indicator of the degree of spatial concentration of people, industries, commerce, vehicles, energy consumption, water use, waste generation and other environmental stresses. Several environmental aspects are considered and studied to access the environmental conditions of the planning area. This analysis is presented in this chapter along with proposed strategies to safeguard the environment of the planning area.

10.1.1 PHYSIOGRAPHY

The region in general is a flat plain with an average elevation of about 15 m above the mean sea level (MSL). The terrain becomes little undulating with prominent high grounds varying from 30 to 45 m above the MSL towards interior North and North Western part of the region. There are three major physiographic units: Coastal Plain, Alluvial plain and Uplands.

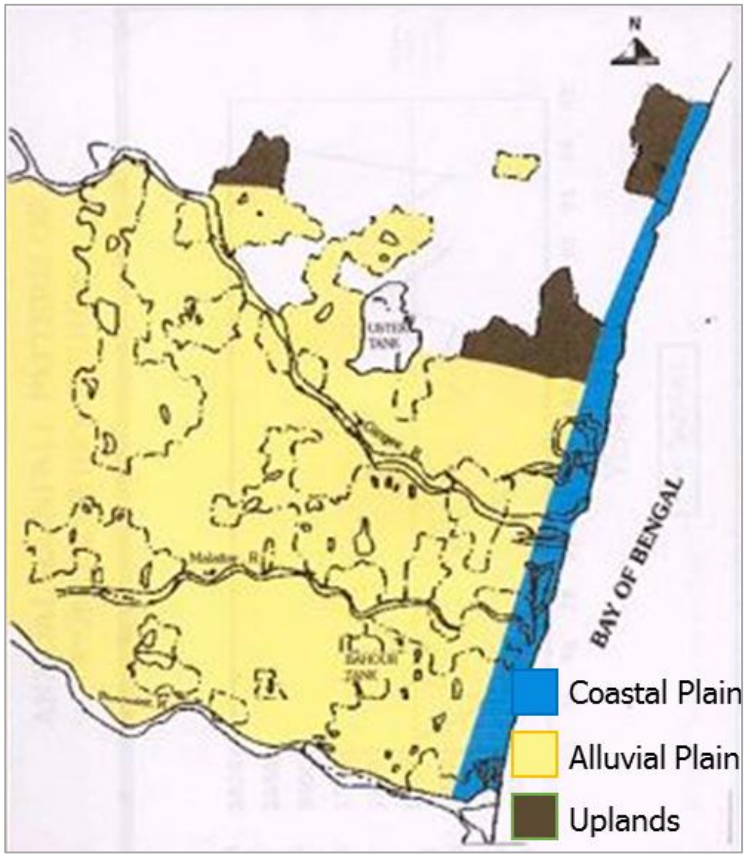


Figure 10.1 Physiography Map of Puducherry Region

10.1.2 HYDROGEOLOGY (GROUND WATER TABLE)

The sedimentary formations occurring in the entire region are represented by Cretaceous, Paleocene, Mio-Pliocene and Quaternary formations (multilayered aquifer system). Ground water occurs in these formations both water table as well as confined conditions and is being developed by dug wells, dug-cum-bore wells and tube wells. The main aquifers that contribute ground water in Puducherry are a) Alluvial Aquifer b) Cuddalore sandstone (Tertiary Aquifer) c) Vanur & Ramanathapuram sandstone (Cretaceous Aquifer). The three aquifers are presented in the figure 10.2. Among the three water bearing formations of cretaceous age the Ramanathapuram and Vanur formations form potential aquifers. They occur in the North-Western part of Puducherry region. The thickness of the aquifer ranges between 38 m and 98 m. Ground water occurs under confined conditions and the piezometric head is about 20 m to 33 m below ground level.

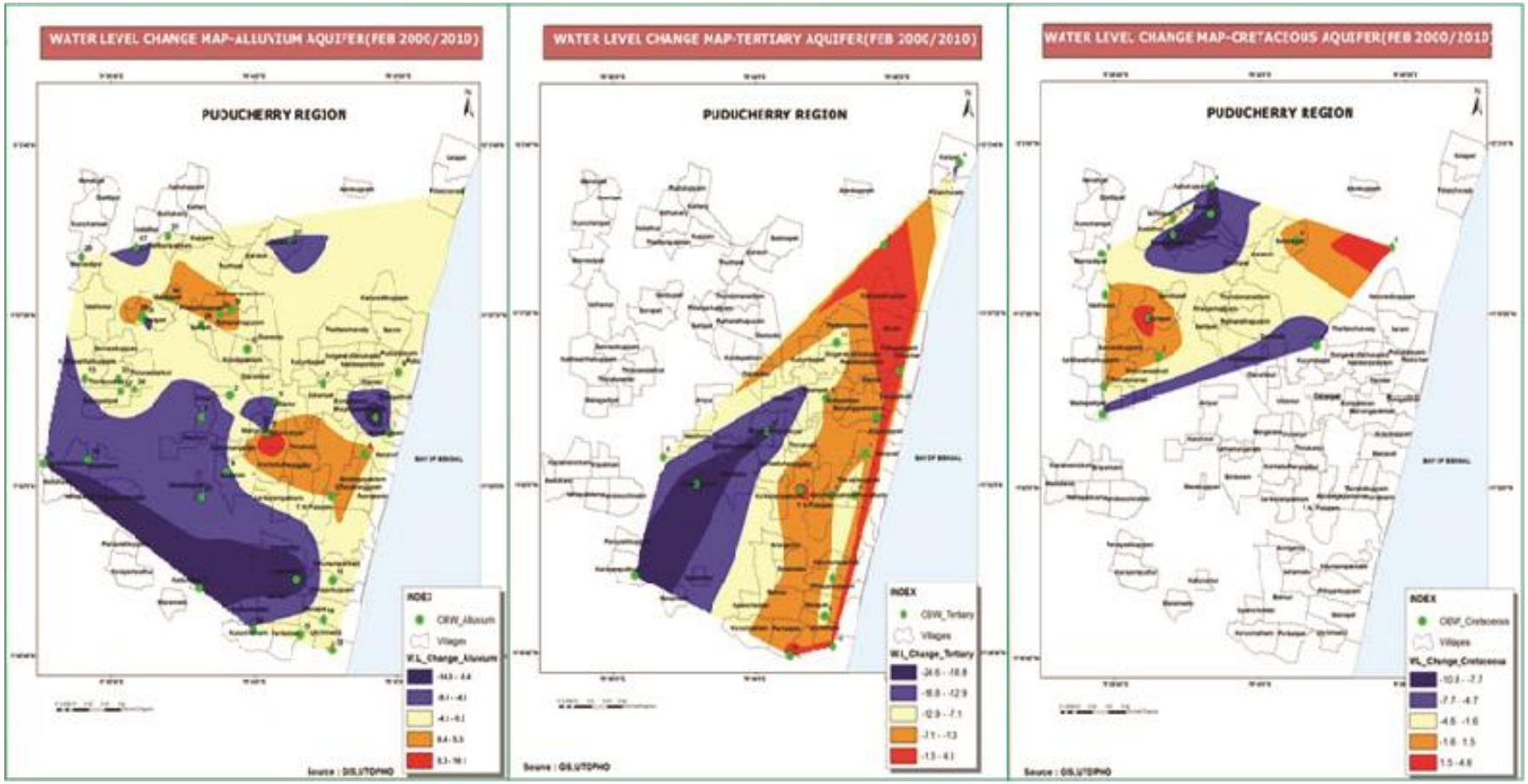


Figure 10.2 Aquifers contribute to ground water table in Puducherry region

To study the water table, Puducherry Government has constructed about 100 observation units under State Ground Water Unit of Agriculture Department. These tube wells piercing different aquifer system and the water level data are periodically collected. It is observed that the water table in the alluvial aquifer ranges from 5 to 20 mts. In Cuddalore sandstone formation, the water table is in the range of 15 m to 26 m whereas in cretaceous aquifer, the water table is 20 to 45 mts. From 2011 onwards, declining trend is noticed for the water table, i.e., on an average there is a drop by 1 mt to 1.5 mts per year in spite of rainwater harvesting measure which are widely adopted in the region. This scenario indicates that the Puducherry region is highly dependent on ground water for all purposes.

10.1.3 GEOLOGY

The entire area of Puducherry region is covered by sedimentary formations, ranging in era from cretaceous to recent, except a small extent of area in the Northeastern part of Puducherry. The oldest sedimentary formations are the cretaceous sediments of Mesozoic era and are exposed in the North-Western part of the region and North of Sankaraparani river. The trend of these formations is North East-South West. Four stratigraphic units namely Ramanathapuram, Vanur sandstone, Ottai claystone and Thuruvai limestone formations have been identified. The Paleocene formations of the Lower Tertiary are represented by the Kadaperikkuppam and Manaveli formations in the region.

The trend of these formations is similar to the cretaceous formations. The Kadaperikuppam formations are exposed near Pillaiyarkuppam, Sedarapattu, Kadaperikuppam and Alankuppam. The thickness of this formation varies widely which may be due to the unevenness of the cretaceous basement. The thickness of the formation varies from 30 m to 130 m at outcrop area and maximum thickness of 450 m is observed at Manapet along the coast in the South-Eastern side. The recent (Quartemary) formation in the region is represented by laterites and alluvium laterites occur as thin cap over the Cuddalore formation. Thick alluvial deposits are built up along the course of Pennaiyar and Sankaraparani rivers covering three fourths of Puducherry region. The thickness of alluvium varies from 10 m to 55 meters at different places.

10.1.4 WIND DIRECTION

In Puducherry region, the wind direction is not the same throughout the year. It changes from season to season. Over Puducherry, the wind will be from either west or southwest during southwest monsoon season, i.e., June to September. It will be from northeast or north during Northeast monsoon season, i.e., October to December. However, Sea breeze plays a key role as Puducherry is a coastal station. When westerly winds are weak (particularly during south west monsoon season) sea breeze over rides and blows from the east in the afternoon timings on most of the days. During northeast monsoon season the sea breeze strengthens the already prevailing easterly winds. Thus, easterly winds blow most of the days in a year particularly in the afternoon. However, the sea breeze can penetrate only up to a maximum

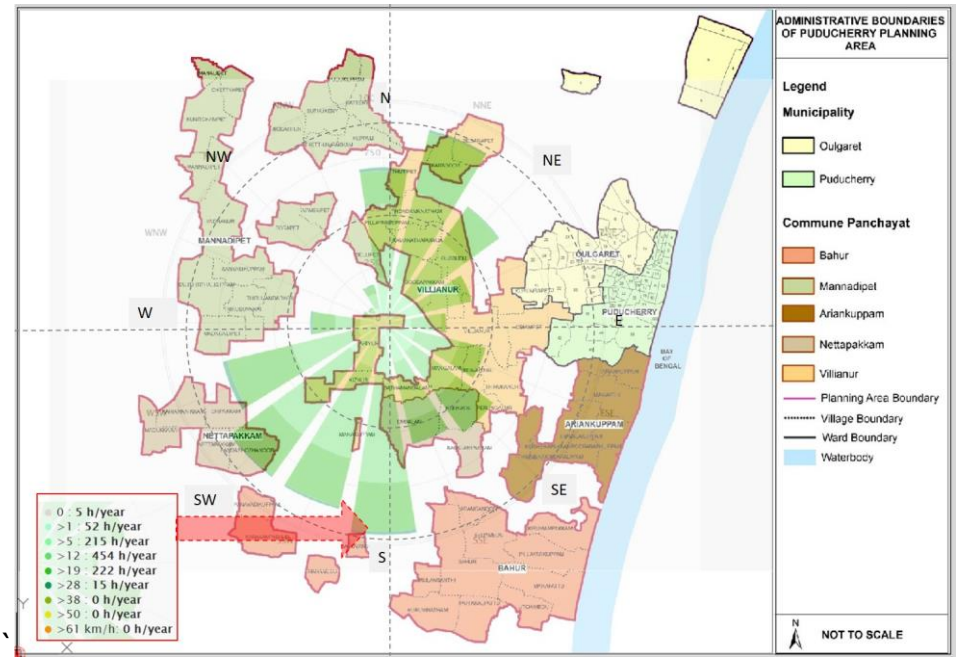


Figure 10.3 Wind rose diagram for Puducherry Area

of 20 kms inside the land. The predominant wind directions for Puducherry region are given in detail in the table 10-1

Table 10-1 Predominant Wind direction in Puducherry region

S. No	Season	Predominant Wind Direction
1	Winter Season	NNE or ENE
2	Summer Season	SW
3	South West Monsoon	W or SW
4	North East Monsoon	N or NE

Source: Compiled by Consultant

The figure 10.3 denotes a class of wind rose diagrams designed to display the distribution of wind direction experienced at a given location over a period of time.

10.1.5 CLIMATE AND RAINFALL

The Puducherry region experiences tropical hot climate with very small diurnal variation in temperature and moderate rainfall. Precipitation occurs as south-west monsoon from July to September and north east monsoon from October to November. Rainfall happens as cyclonic storms mainly during the North-East monsoon which comprises of 50% of the total rainfall. The low lying coastal areas are prone to floods by tidal waves immediately after most of the storms during north east monsoon.

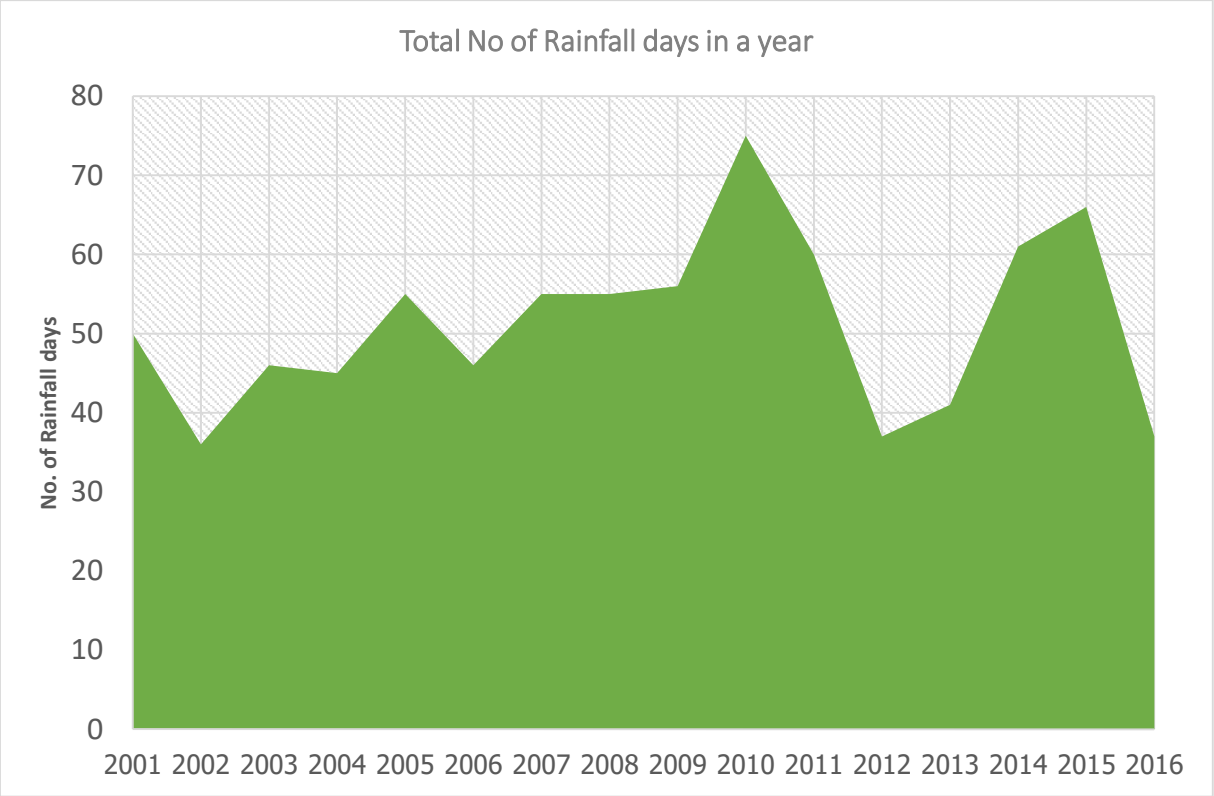


Figure 10.4 Total No. of Rainfall days in a year

November is the rainiest month which accounts for 35% of the total rainfall. There are about 52 rainy days in a year. The figure 10.5 represents the maximum rainfall occurred in 2010 (75 days) in the last 15 years. The least days of rainfall in the last 15 years was 2016 (37 days)

which may be anticipated for the sunnier days in the region. This reveals that the total no of rainfall days is reducing due to global warming and deforestation within the system.

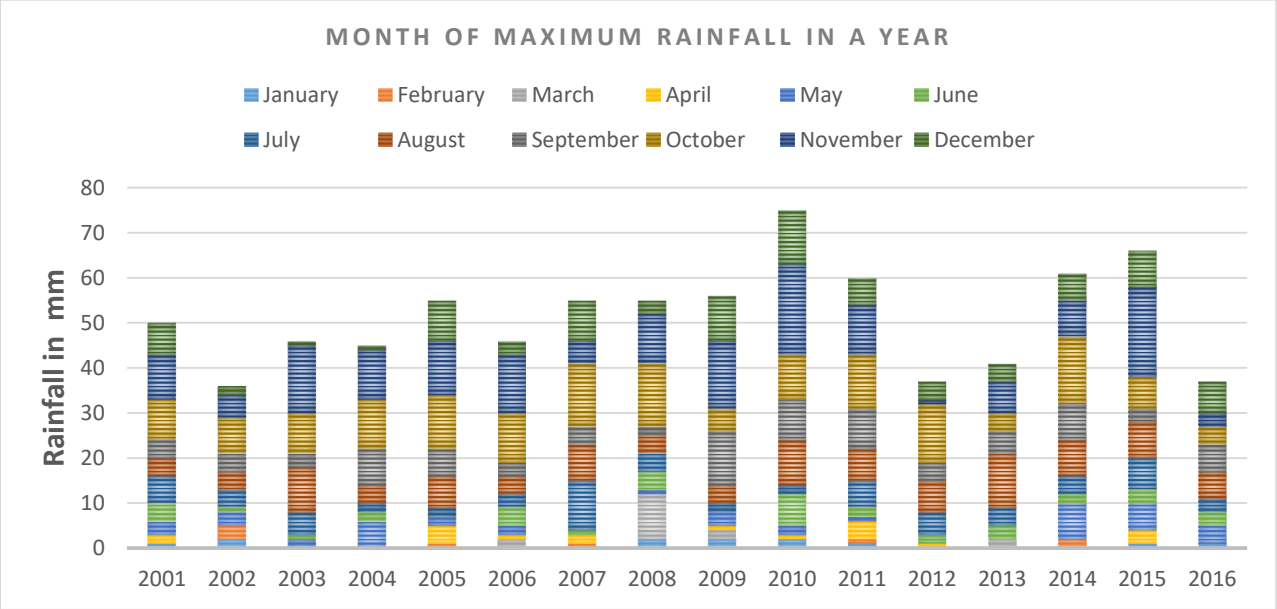


Figure 10.5 Month of maximum rainfall in a year

The figure 10.5 indicates that the maximum rainfall occurs in the month of October to December. January and February are the coolest months with minimum temperatures of about 19 degree Celsius. Summer occurs from March to June with mean diurnal temperature of about 22 degree Celsius and a maximum temperature of 43 degree Celsius. A high relative humidity is another characteristic which is due to it's proximity to the sea.

10.2 CURRENT SCENARIO

Urbanization has got its own advantages and disadvantages. The main advantage is that it provides scope for provision of common infrastructure facilities. The main disadvantage is that it creates more strain on the resources (including land and water). The environmental consequences of urban growth are considerable. Cities are prolific users of natural resources and generators of wastes. The urban ways of living contribute to relatively more pressure on resources. Migration of people to cities puts enormous pressure on the infrastructure in terms of available land, water etc. Some of the issues will be water scarcity and water pollution, air pollution, climate and Heat Island Effect, poor management of solid wastes, urban congestion etc. in the system. Economic activities also constitute an indirect pressure in the sense they increase the movement of men and material. This leads to increased fuel consumption, waste generation etc.

Puducherry faces many issues like coastal erosion, filthy situation due to open drains, poor solid waste management, encroachments around waterbodies, ground water exploitation etc. There are numerous lakes/waterbodies situated in the planning area but due to urbanization and haphazard development, some serious threats are occurring to these natural resources. Ousteri/Oussudu lake and Bahour lake are the biggest lakes of planning area and there are two rivers flowing across the planning area namely, Gingee river and Pennaiyar river. Additionally, the city is dependent on ground water in the absence of perennial sources, which leads to exploitation of ground water. As a result, seawater intrusion is taking place in the areas near to seacoast.

10.2.1 STRENGTH OF COASTAL STRETCH

Today about half of the world's population live within 200 kilometers of a coastline. By 2025, that figure is likely to be double. The high concentration of people in coastal regions has produced many economic benefits, including improved transportation links, industrial and urban development, revenue from tourism, and food production. Cities in coastal areas require a special interest as they constitute important growth poles and gates to the hinterland as well as centers of economic growth involving human activities such as tourism, transport and fishing and sensitive environments and ecosystems. The main characteristics of Puducherry coastal cities include:



Figure 10.6 Coastal Erosion in Thengaithittu

1. Tourist services
2. A street pattern related to the landform
3. A direct relationship to the foreshore and a wide choice of uses associated with the coastal edge
4. An extensive range of edge conditions, such as parks, beaches and waterfront promenades
5. A range of smaller suburbs and suburban centers surrounding the city center economic
6. A full range of Hotels, resorts and residential building types.

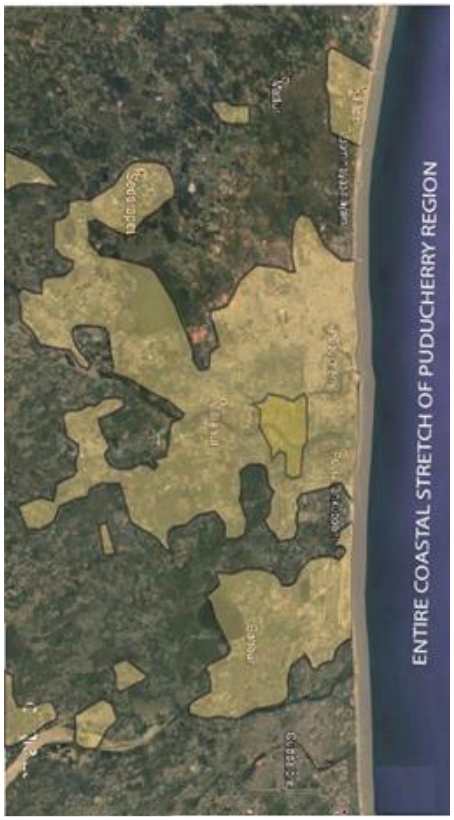


Figure 10.7 Coastal stretch of Puducherry region

Hence, the Puducherry Coastal regions with growing population are undergoing environmental decline. The reasons for environmental decline are complex, but population factors play a significant role. The combined effects of booming population growth and economic benefits. Some of the few environmental issues faced by Puducherry region are coastal erosion and salt water intrusion towards the landward side in the system.

10.2.1.1 COASTAL EROSION

Like any other coast in the world, Puducherry's coast is subject to natural sand movements due to wave action. The sand movement happens in a cycle in which sand is taken away from the coast between November to January and it is deposited back between February to October. The coast is undergoing erosion due to multiple reasons. Coastal erosion started in 1986 with the construction of a new harbor, which consisted of two breakwater structures (rocky wall-like structures which protrude from the seashore into the sea), at the mouth of

Ariyankuppam Estuary. The structure started to interfere with the natural drifts of sand and the coast in the northern part of the harbor started eroding whereas the southern part started expanding due to sand deposition. To prevent the erosion on the northern part, a sea wall was built along the shore from Ariyankuppam to Kottakuppam which aggravated the problem by shifting the erosion further northwards. The erosion has resulted in loss of home and livelihoods of fishing community. The underwater sandbars along the coast, which obstructs the waves and tsunami have disappeared from the northern part of the harbor thereby increasing the disaster risks.

10.2.1.2 SALT WATER INTRUSION

In Puducherry Region, the usage of ground water due to increasing demands from all sectors such as agriculture, domestic and industries leads to over extraction in the system. Though there is proper regulation control to protect the ground water usage, the Tamilnadu region imbibes the ground water which aggravates the ground water exploitation within Puducherry region.



Figure 10.8 Depth of Salt water intrusion in Puducherry region

Eventually, over exploitation of groundwater has led to seawater intrusion in the coastal areas of region in the system. As shown in the figure 10.8, in the southern parts of planning area, seawater intrusion has taken place till 3 to 4 km inland while inside the city area it has reach up to 2 km inland and in the northern parts it is till 1 km inland. Ground water exploitation on a large scale deeper down the earlier levels have resulted in intrusion and percolation of sea water, turning ground water in to salinity. Hence the TDS content has also started to increase considerably from east to west. Thus, it is important to provide attention and mitigative measures to this crucial issue.

10.2.2 WATERBODIES

Puducherry region has 84 system and Non-system tanks in the entire planning area. The details of the list of tanks located within Puducherry region according to the Public Works Department is presented in the table 10-2.

Table 10-2 Details of tanks in Puducherry Region

S. No.	Name of Tank	Village No.	Exact location (Village)	System / Non-System	Ayacut Area (Ha)	Water Spread Area (Ha)
1	Alankuppam Tank	19	Alankuppam	NS	20.64	8.57
2	Pudupalayam tank	37	Pudupalayam – Ayacut have been urbanized			
3	Kanakan Eri	36	Reddiarpalayam	NS	89.66	12.04
4	Olandai tank	41	Olandai	S	72.47	42.57
5	Murungapakkam tank	44	Murungapakkam	S	46.73	41.08
6	**Ousteri Tank**	**29**	**Oussudu**	**S**	**1537.64**	**802.80**
7	Thondamanatham Vellavari	25	Thondamanatham	S	51.07	35.79
8	Kadaperi Tank	25	Thondamanatham	NS	34.98	15.66
9	Thutipet Tank	24	Thutipet	NS	17.48	9.44
10	Karasoor Tank	23	Karasoor	NS	23.46	16.76
11	Sedarapet Perieri	22	Sedarapet	NS	37.12	18.62
12	Sedarapet Sitheri	22	Sedarapet	NS	10.95	5.98
13	Katteri Puduthangal	17	Katteri & Kuppam	S	40.99	4.10
14	Katteri Pazhayathangal	17	Katteri & Kuppam	S	17.71	3.42
15	Kuppam Tank	18	Kuppam	NS	47.34	3.75
16	Katterikuppam Tank	15	Katteri, Kuppam & Suthukeny	S	94.97	49.80
17	Suthukeny Otteri	15	Suthukeny	NS	75.36	7.59
18	Thethampakkam Tank	14	Thethampakkam	S	13.49	8.90
19	Suthukeny Perieri	15	Suthukeny	NS	94.74	25.80
20	Kaikalapet Tank	13	Kodathur	S	11.34	3.42
21	Kodathur Tank	13	Kodathur	S	28.72	5.60

S. No.	Name of Tank	Village No.	Exact location (Village)	System / Non-System	Ayacut Area (Ha)	Water Spread Area (Ha)
22	Chettipet Tank	2	Chettipet	S	26.48	6.89
23	Manalipet Tank	1	Manalipet	NS	7.82	4.30
24	Kunitchampet Pudueri	3	Kunitchampet	S	84.64	15.02
25	Kunitchampet Pazhayaeri	3	Kunitchampet	S	32.07	16.12
26	Mannadipet Tank	4	Mannadipet	S	11.69	4.17
27	Thirukkanur Perieri	4	Mannadipet	S	63.77	18.43
28	Thirukkanur Chinneri	4	Mannadipet	S	20.20	18.32
29	Sompet Tank	4	Mannadipet	S	25.92	22.95
30	Vadhanur Tank	5	Vadhanur	S	164.73	106.37
31	Sorapet Perieri	11	Sorapet	NS	87.00	20.82
32	Sorapet Pudueri	11	Sorapet	NS	9.31	5.20
33	Vambupet	12	Vambupet	NS	39.31	11.07
34	Sanyasikuppam Tank	9	Sanyasikuppam	S	5.06	4.10
35	Pidarikuppam Tank	9	Sanyasikuppam	S	3.51	
36	Thiruvandarkoil Tank	10	Thiruvandarkoil	S	75.32	16.45
37	Thirubuvanai Tank	8	Thirubuvanai	S	31.08	6.02
38	Madagadipet Tank	7	Madagadipet	S	87.89	20.93
39	Nallur Tank	7	Madagadipet	S	51.31	25.54
40	Ariyur Tank	52	Ariyur	NS	21.40	7.90
41	Pangur Tank	52	Ariyur	NS	31.05	6.27
42	Mangalam Tank	49	Mangalam	NS	30.59	2.93
43	Uruvaiyar Tank	48	Uruvaiyar	NS	33.45	3.08
44	Thirukanchi Tank	47	Thirukanchi	S	15.45	3.49
45	Keezhagraharam Tank	47	Thirukanchi	S	21.88	1.11

S. No.	Name of Tank	Village No.	Exact location (Village)	System / Non-System	Ayacut Area (Ha)	Water Spread Area (Ha)
46	Abishegapakkam Tank	67	Thimmanaickenpalayam	S	308.90	42.43
47	Mannapanthangal	65	Karikalampakkam	S	11.78	1.10
48	Karikalampakkam Tank	65	Karikalampakkam	S	82.95	4.33
49	Perungalur Perieri	66	Perungalur	NS	14.50	3.47
50	Perungalur Chinneri	66	Perungalur	NS	14.51	2.85
51	Korkadu Tank	64	Korkadu	S	202.97	65.26
52	Embalam Vakraneri	63	Embalam	S	81.69	14.97
53	Embalam Sitheri	63	Embalam	S	48.09	1.52
54	Melsathamangalam Tank	50	Sathamangalam	S	88.34	25.50
55	Keezhsathamangalam Tank	50	Sathamangalam	S	88.34	25.50
56	Embalam Vannaneri Tank	63	Embalam	S	43.59	13.89
57	Sivaranthagam Tank	51	Kizhur	S	46.35	8.07
58	Kizhur Tank	51	Kizhur	NS	5.17	1.94
59	Pandashozhanoor Tank	58	Pandashozhanoor	S	125.61	24.06
60	Nettapakkam Tank	57	Nettapakkam	S	61.71	29.87
61	Eripakkam Tank	56	Eripakkam	NS	26.67	5.90
62	Suramangalam Tank	55	Kariamanikkam	NS	15.63	8.03
63	Kariamanikkam Tank	55	Kariamanikkam	NS	46.81	12.43
64	Madukarai Tank	54	Madukarai	S	88.63	15.67
65	Panayadikuppam Sitheri Tank	59	Panayadikuppam	S	12.67	0.76
66	Panayadikuppam Perieri Tank	59	Panayadikuppam	S	80.06	65.91
67	Karayamputhur Odaperi	60	Karayamputhur	S	89.47	91.44

S. No.	Name of Tank	Village No.	Exact location (Village)	System / Non-System	Ayacut Area (Ha)	Water Spread Area (Ha)
68	Karayamputhur Vannaneri	60	Karayamputhur	S	31.70	18.58
69	Manamedu Tank	61	Manamedu	S	69.31	7.63
70	Kaduvanur Tank	62	Kaduvanur	S	8.73	19.55
71	Ottanthangal Tank	62	Kaduvanur	S	19.92	_
72	Bahour Tank	76	Bahour	S	728.98	321.55
73	Aranganur Tank	75	Aranganur	S	20.44	2.96
74	Nirnayanpet tank	75	Aranganur - No such tank			
75	Seliamedu Tank	74	Seliamedu	S	27.56	4.59
76	Adingapet Tank	74	Seliamedu	S	36.60	2.00
77	Kirumambakkam Tank	73	Pillaiyarkuppam	S	203.39	65.25
78	Pinnatchikuppam Tank	74	Seliamedu	S	27.47	1.15
79	Kudiyirupupalayam & Pirivupalayam Tk.	74	Seliamedu	S	17.63	2.41
80	Manapet Tank	81	Manapet	S	79.54	22.67
81	Utchimedu Tank	80	Utchimedu	S	26.37	5.10
82	Keelparikalpet Tank	79	Parikalpet	S	69.49	8.05
83	Melparikalpet Tank	79	Parikalpet	S	39.86	6.60
84	Arachikuppam Tank & Sadakulam thangal	79	Parikalpet	S	22.73	5.13
85	Kuruvinatham Tank	78	Kuruvinatham	S	13.69	9.58
86	Irulansandai Tank	87	Irulansandai & Kuruvinatham	S	135.13	5.70
87	Bahour Sitheri	76	Bahour	S	23.48	5.65
88	Kalitheerthalkuppam Tank	6	Kalitheerthalkuppa m	NS	39.91	10.68

Source: PWD, Irrigation division, 2015

10.2.2.1 DETERIORATION OF WATERBODIES

From the Existing Land use survey, it was observed that the Water bodies of planning area are deteriorating due to various reasons like encroachments around water bodies, solid waste dumping, disposal of untreated wastewater etc. Ousteri lake, Bahour lake, Karasoor lake, Thondamanatham lake, Olandai lake, Vadhanur lake, Panayadikuppam lake, etc. are some of the important and big lakes which supports for the drinking and agricultural purposes in the system. These tanks are interlinked and designed in such a way that water from the nearby rivers would proceed to fill tanks one by one in a cascading manner.

The tanks were made in such a way that if a tank in the system got filled up to the appropriate level, the excess water would flow out into the next one in the system alongwith the earthen channels. But due to the rapid urbanization and pressure on the real estate, it is also observed that there is disturbance in the interconnectivity of channels which leads to the deterioration of the waterbodies. This continuous phenomenon leads to shrinkages of waterbodies. Hence at present only less than 50% of tanks and related Ponds are existing in the Puducherry region.

10.2.3 NATURAL DRAINAGE

Natural drainage pattern plays a vital role in any aspect of the city like provision of infrastructure, draining of excess water, recharge of waterbodies etc, Natural drainage systems mimic natural processes reduce the amount of surface water getting to our traditional drainage systems and reduce the risk of surface water flooding. Drainage can be either natural or artificial.

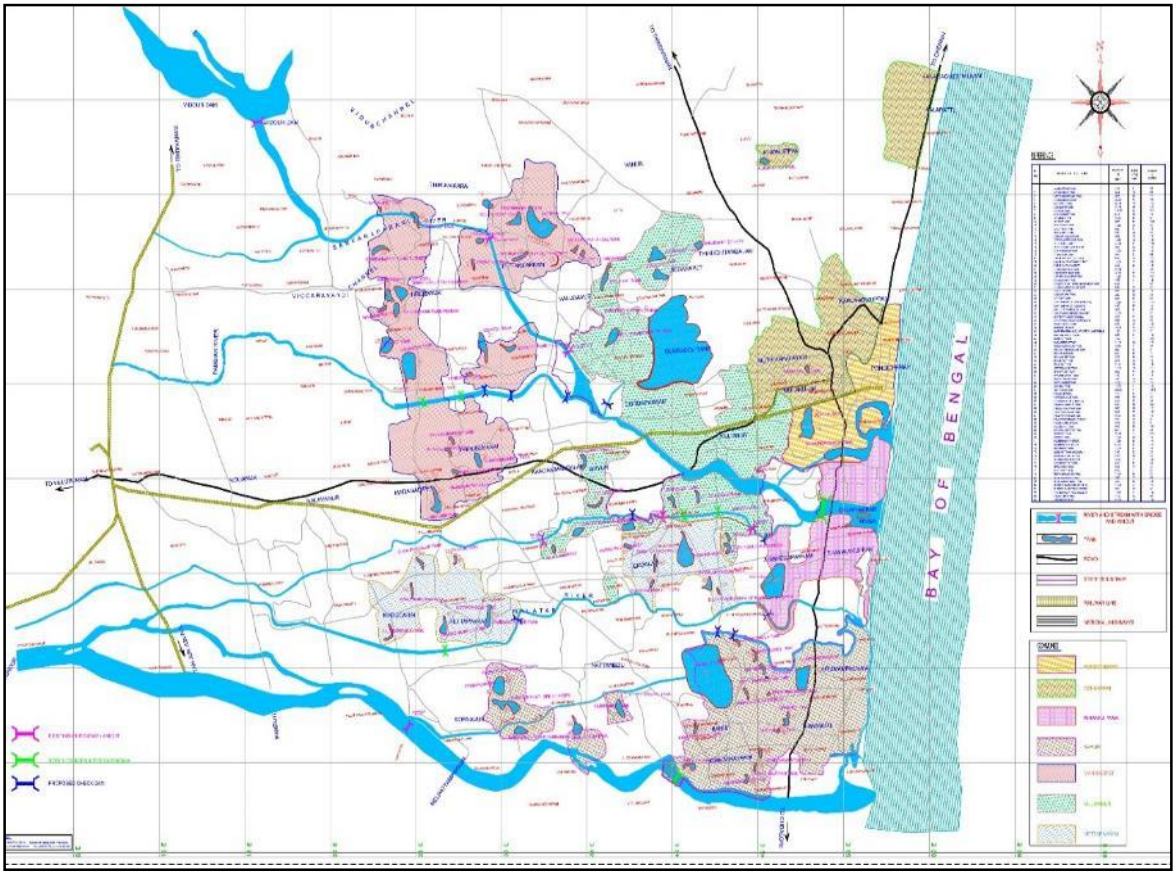


Figure 10.9 Natural Drainage Map

Across the Puducherry region many areas have natural drainage which would help in reducing the flood. This means that excess water flows to lakes and rivers naturally in the system. The length of different rivers and tributary channels are maintained by PWD.

Table 10-3 List of Natural drainage in Puducherry Region

S No	Natural drainage in Puducherry region	Types of channels	Length in Km
1	Sankaraparani River	Main channel	34.0 KM
2	Pennaiyar River	Main channel	13.0 KM
3	Pambaiyar	Tributary channel	69.0 KM
4	Guduvaiyar River	Tributary channel	19.3 KM
5	Malatar River	Tributary channel	10.0 KM

Source: PWD, Irrigation division

Natural drainage, however, is often inadequate and artificial or man-made drainage is required. There are two types of artificial drainage: surface drainage and subsurface drainage.

10.2.3.1 DISTURBANCE IN NATURAL DRAINAGE

Natural drainage pattern plays a vital role in any aspect of the city like provision of infrastructure, draining of excess water, recharge of waterbodies etc. Therefore, it should be respected and kept intact. At present, the natural drainage pattern of the town is disturbed by anthropogenic activities viz. encroachment on the drains/waterbodies, dumping of solid waste, disposal of untreated wastewater etc. As a result, various issues arise, like flooding, drying of water bodies, water logging etc. These issues can be addressed by providing buffer area on both the sides of the canals. This buffer area would also help us to maintain the canals without any hindrances.



Figure 10.11 Untreated sewage flowing into the sea



Figure 10.10 Open drains across the city

10.2.4 SURFACE DRAINAGE

Surface drainage is the removal of excess water from the surface of the land. This is normally accomplished by shallow ditches, also called open drains. The shallow ditches discharge into larger and deeper collector drains. In order to facilitate the flow of excess water toward the drains, the field is given an artificial slope by means of land grading. In Puducherry Region, the open drainage canals such as Gorimedu, Karuvadikuppam, Mettu vaikkal, Pallavaikal and Uppar which were once used for carrying water for irrigation, are now being used as drainage system due to rapid urbanisation and increase in municipal sewage generated in the town. Apart from the natural drainage system, the two-main man made drainage system in the Boulevard town are Grand Canal and Petit canal.

10.2.4.1 GRAND CANAL AND PETIT CANAL

The Grand Canal situated in the boulevard area is designed during the French period. This canal channelizes the water of a small rivulet called Uppar. A sewer also passes to the west of the town in the direction of Uppalam within the boulevard area. The Grand canal was designed to regulate its flow from south to north and extended beyond to the northern boulevard. Once the Petit Canal was functioned as a squalid cesspit to dispose the solid waste and sewage of the boulevard area. But now it is just concrete, because of irregular maintenance in the system.

10.2.4.2 PROBLEMS DUE TO OPEN DRAINS

Except few areas, almost everywhere open drains run across the roads/streets carrying grey water. This creates filthy situation in the surrounding areas. Sometimes, solid waste is dumped in these drains which worsens the condition. Apart from bad smell, unhygienic condition and creation of diseases prone environment, mosquito breeding are severe problems generated due to open drains. Apart from polluting the natural resources, this condition leads to filthy situation and mosquito breeding in the city as the open drains runs across the city. The desilting of all canals is important to prevent flooding during monsoon season in Puducherry.



Figure 10.12 Open Drains Running across the Puducherry Planning Area

10.2.5 STORM WATER DRAINAGE

Surface water is lakes, rivers, ponds and other water collection areas. Storm water eventually empties into surface waters, so it is important that the storm water should be as clean as possible. The Public Works Department, Puducherry is preparing the DPR for Puducherry and Oulgaret Municipalities to implement the comprehensive storm water drainage system. Though the city has adequate coverage, the capacity of the drains is inadequate to carry the storm water run-off during the monsoon period which results in inundation/flooding in many parts of the City. The city has higher and lower contours having elevation difference of about 15-20 m. Almost 58% of Puducherry's area is covered under Storm Water Drainage System. The table 10-4 reveals the total length of storm water drainage covered in urban areas.

Table 10-4 Length of Storm water drainage in Urban areas.

S. No	Puducherry Urban area	Length in Km
1	Oulgaret Municipality	45.335
2	Puducherry Municipality	32.398
TOTAL		**77.733**

Source: PWD, Storm water drainage

The storm water run-off from the catchment areas such as Lawspet, Mettupalayam, JIPMER campus which are located in the higher contour is flowing towards low lying areas such as

Krishna Nagar, Rainbow Nagar, Venkata Nagar, Indira Gandhi Square, Boomianpet, Natesan Nagar, Anna Nagar etc. and causes inundation every year. It is a recurring and long term problem and these areas are severely affected every year. The deprived drainage system is also due to encroachment of drains by public in certain drains and choking of drains due to indiscriminate disposal of municipal solid waste. During November/December 2015, due to vigorous rainfall intensity, many households in the aforesaid locations were under storm water and prolonged inundation forced the people to vacate their houses and stayed outside and on their rooftop as the situation was like flooding which was a disaster condition in Oulgaret and Puducherry Municipalities.

10.2.6 POLLUTION

Union Territory of Puducherry has been ranked 16th position among all States and UTs of India based on the Environmental Performance Index (EPI) by the Planning Commission of India. The Cumulative EPI is a measure of the Environmental wellbeing of the state which is calculated based on 5 Categories namely Air Pollution, Forest, Water quality, Waste management and Climate Change.

Table 10-5 Environmental Performance Ranking

Sl. No	Criteria	Ranking
1	Air Pollution	1
2	Forest	35
3	Water quality	5
4	Waste Management	12
5	Climate Change	25

Source: DSTE Annual Report 2012-2013

10.2.6.1 AIR POLLUTION

Pollution Control Committee is monitoring ambient air quality at the following three air Quality monitoring stations in Region under National Air Quality Monitoring Program:

1. Local Administration Department near Bharathi Park (Residential)
2. Department of Science, Technology & Environment, Anna Nagar (Residential cum Commercial)
3. PIPDIC Industrial Estate, Mettupalayam (Industrial)

Each station is being monitored for 24 hours a day and two days in a week in a cyclic manner. The pollutant assessed are Suspended Particulate Matter, Particulate Matter of size less than 10 µm, Sulphur-di-oxide (SO_2) and Nitrogen di oxide (NO_2). The figure 10.13 depicts the result of these four parameters.

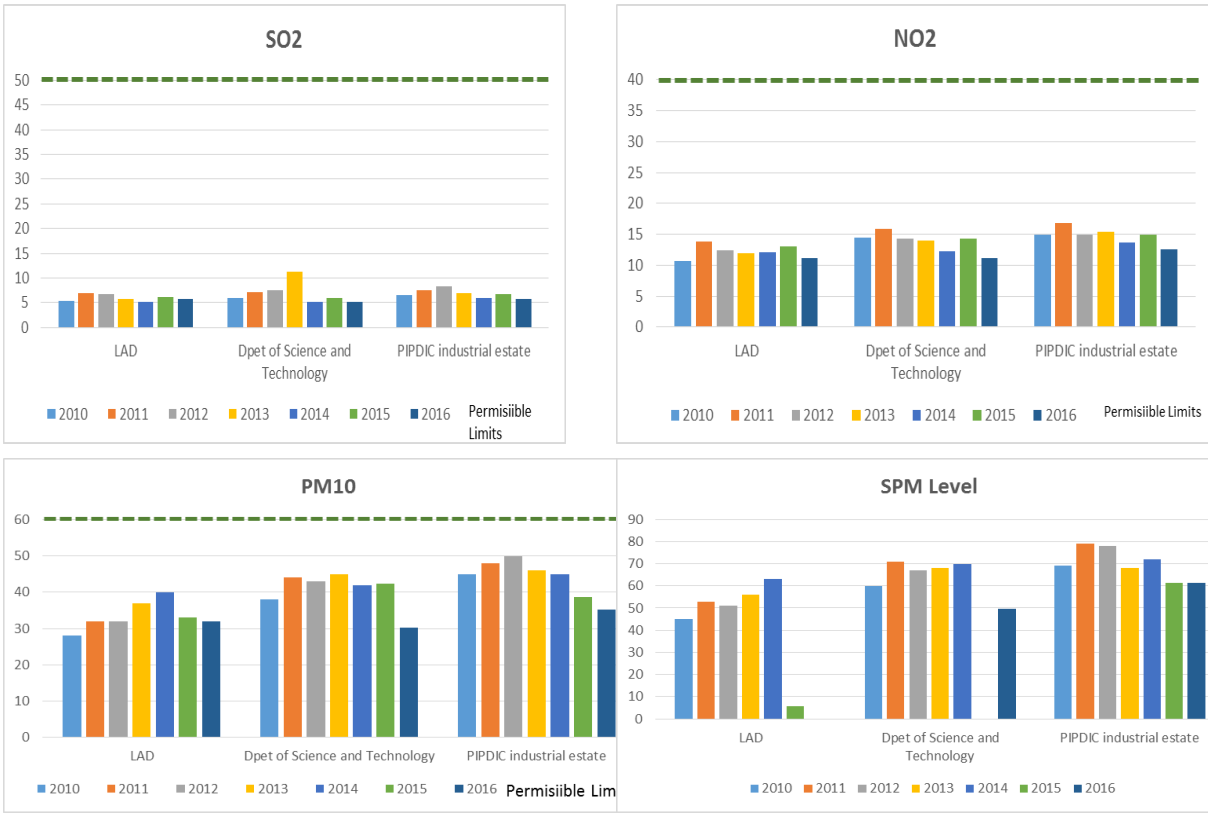


Figure 10.13 Average SO2, NO2, PM10 and SPM levels measured at different locations

As it is seen from the above graphs, the annual average concentrations of the pollutants in all the three Air Quality monitoring locations are within the prescribed standard limits. But during the occasions of Diwali and Boghi Festival, the concentration of suspended Particulate Matter was found to be exceeding the prescribed limit.

10.2.6.2 LAND POLLUTION

Land is one of the most important and limited resource and it is directly or indirectly linked to most of the sectors like industrial, agricultural, residential etc. Improper disposal of municipal and industrial wastes apart from polluting water resources has degraded land as well. Its degradation will directly affect the agricultural activities and ground water quality. Once ground water quality is affected, it will affect the water supply of the planning area since Planning Area is predominantly depended on ground water. In certain areas of the planning area like Kalapet & Kurumbapet unregulated mining of sandstone/red earth had resulted in the formation of deep ravines and has led to loss of fertile topsoil. This has degraded the land to a large extend in terms of agricultural use.

Sand mining is another activity which affects the land quality and rendering the land's capability to retain water and thus affecting the ground water recharge of the region. Improper handling and storage of raw materials and final products and discharge of untreated or improperly treated effluents degrade the land. It is very difficult to reclaim lands contaminated with heavy metals. Technologically and economically it is a difficult option. It will have an irreversible impact. Even cultivation in such lands is dangerous as some of the plants tend to accumulate these heavy metals and when they are consumed will have adverse effect on health. Hence to overcome this kind of issues and to suppress the municipal solid waste in the rapid urbanizing world, the Ministry of Environment, Forest and Climate Change has notified the Solid Waste Management rules 2015. Salient features of solid waste rules 2015 are discussed in the infrastructure chapter.

10.2.6.3 WATER POLLUTION

Surface water quality has been monitored at three locations viz. Bahour Lake, Chunambar Lake and Ousteri Lake. The observation data for last two years i.e. 2013 and 2014 are within the prescribed limit for surface water standards. In the case of Groundwater, it was observed that Total Dissolved Solids (TDS), Chloride and Total Hardness exceeds the desirable limits at some locations such as Thengaithittu, Mettupalayam, Radhakrishnan Nagar (Oulgaret), Mission street and Uruvaiyar in Region. TDS is highest in Radhakrishnan Nagar (Oulgaret). The higher concentrations of TDS, Chloride and Total hardness is due to the ingress of salt water and geological conditions. Unbridled growth of obnoxious weeds and accumulation of tonnes of garbage have completely chocked the Grand Canal, which passes through the Boulevard area.

Backwaters in Ariyankuppam are facing a serious threat of pollution due to domestic waste water, agricultural drainage and untreated industrial effluent discharges into the streams which reaches the inner harbour waters especially during rainy season. Sulphide level was found to be on the higher side in Ariyankuppam backwaters. Also, the area is threatened by population pressure, aqua culture operations, mangrove environment conversion to new shrimp ponds, dredging for landfills and building ports, industrial estates and housing estates for human habitation.

10.2.7 ECO SENSITIVE AREAS

10.2.7.1 MANGROVES

Baseline ecological studies of Puducherry mangroves are important for monitoring, management and conservation of mangrove ecosystems. Mangroves are buffers between the land and the sea. Coastlines throughout the world are facing serious problems of coastal erosion and threat of rising sea levels due to global warming have increased the threats by several folds. In Puducherry, mangroves are present in the Ariyankuppam, Thengaithittu, Murungapakkam, Veerampattinam, Moorthikuppam, Pudukuppam and Nalavadu. The mangroves situated in the backwaters of Ariyankuppam, Murungapakkam and Thengaithittu vegetation is dominated by Avicennia species and suaeda species. The growth of mangrove species is in the form of small thickets scattered over the Ariyankuppam back water from Thengaithittu to Veerampattinam.



Figure 10.14 Mangroves at Ariyankuppam

Negligence of the people and a lack of understanding of the importance of mangroves will led to the problem of destruction. Hence these areas are affected by manmade disturbances such as rapid urbanization, harbor development activities and continuous dredging for the easy transport of fishing and unloading vessels. It is observed that the water is being polluted here with the discharge of sewage without proper treatment coupled with the dumping of solid waste leads to ecological imbalance in the system. It is also observed that the Thengaithittu and Ariyankuppam receives water carrying wastes from adjacent agriculture lands and industries in addition to domestic municipal and distillery effluents which leads to further

damage to the mangroves. Therefore, protection of mangroves plays a vital role in stabilizing these areas in the system.

10.2.7.2 BIRD SANCTUARY

In Puducherry region, there is only one Sanctuary in Villianur Commune Panchayat. "Sanctuary" means an area declared, whether under sec. [26(A)5] or sec 38, or deemed, under sub section (3) of Sec.66 to be declared, as a wildlife bird sanctuary. Table 10.6 indicates the details of wildlife sanctuary located in Puducherry Planning area. In the year 2008, the Government of Puducherry considering the ecological, faunal, floral, geomorphological, natural or zoological significance, for the purpose of protecting, propagating and developing wildlife or its environment, declared the Oussudu lake area as a sanctuary.

Table 10-6 Details of Wildlife Sanctuary in Puducherry Region

S. No.	Name of Wildlife Sanctuary	Year of Notification	Total Area (km^2)
1	Oussudu Lake Bird Sanctuary	2008	3.9

Source: Compiled by Consultant

10.2.7.3 COASTAL REGULATION ZONE

Ministry of Environment and Forest passed a notification in 1991 under the Environment Protection Act 1986 known as Coastal Regulation Zone notified on 19th February 1991 in which it is declared that the coastal stretches of seas, bays, estuaries, creeks and backwaters which are influenced by tidal action, up to 500 m from HTL and the land between HTL and LTL are to be considered as Coastal Regulation Zone (CRZ) and imposed certain restrictions in the CRZs. Puducherry is the First UT to declare the CRZ notification in 1991 which is highly appreciated by the Supreme court of India. Till 1998, the provisions of the notification were monitored and enforced by a High Power Committee of the Development Department of the Government of UT. The construction activities were regulated by the respective Planning Authorities of each District of UT. To monitor the activities closely, Puducherry Coastal Zone Management Authority (PCZMA) is constituted in 1998 which is responsible for the effective implementation of the provisions of the CRZ notification.

10.2.7.4 BACKGROUND ON THE CRZ NOTIFICATION FROM 1991 TO 2010

Under the Environment (Protection) Act the MoEF had issued the Coastal Regulation Zone Notification in 1991 for the protection of the coastal areas. The regulatory approach of the CRZ 1991 was rather simplistic: it was aimed primarily at permitting only those activities that are absolutely dependent on being located in the coastal environment and to keep out the rest. Accordingly, various activities were restricted while others were permitted but subjected to specific obligations and conditions. In addition, the entire Coastal Regulation Zone was classified into different zones, i.e., CRZ-I, CRZ-II, CRZ-III and CRZ-IV based on ecological considerations and the extent of the development of human settlement (urban or rural).

The zones difined with different regulations about which activities would be allowed within their geographical scope. Under the 1991 Notification, the responsibility for implementation was primarily assigned to the State Government. The 1991 Notification stated that the respective coastal State Government should identify, classify, and record all the CRZ areas in the State Coastal Zone Management Plans (SCZMP) and have them approved by the MoEF. Throughout the following years, however, it became obvious that the CRZ 1991 faced severe implementation deficits. As the demands of growth and development assert their pressures

on the coastal environment, the challenge of implementing coastal zone regulations will likely mount upon enforcement authorities forced to address CRZ 2011.

10.2.7.5 DEVELOPMENT OF THE COASTAL REGULATION ZONE NOTIFICATION 2011

In 2011, a new CRZ notification was passed with certain modifications in the earlier notification. As per the new notification, no more SEZ projects are allowed in the CRZ. Every development/project falling inside CRZ needs clearance under CRZ Notification from PCZMA. The area upto 200m from the HTL is declared as 'No construction zone'. CRZ is further divided into CRZ I, CRZ II, CRZ III and CRZ IV. Department of Science, Technology and Environment of Puducherry Government introduced the Integrated Coastal Zone Management Project of MoEF wherein specific proposals for Beach Restoration and Shoreline Protection have been included.

10.2.7.6 SALIENT FEATURES OF CRZ 2011

1. It extends the scope of the Notification to include territorial waters within the CRZ.
2. The islands of Andaman and Nicobar and Lakshadweep, owing to the unique and ecologically sensitive nature of their environment, and the marine areas surrounding these islands up to their territorial limits have been separately covered under the purview of the Island Protection Zone Notification.
3. The Notification introduces the concept of a 'hazard line' that would be demarcated by the MoEF. Natural disasters such as tsunamis and floods cause major devastation in the coastal zone; the main purpose of defining a hazard line is to indicate threatened areas and thus to protect the life and property of the coastal communities as well as the coastal infrastructure. Accordingly, the guidelines for the preparation of Coastal Zone Management Plans suggest that, 'no developmental activities other than those listed above shall be permitted in the areas between the hazard line and 500 m or 100 m or width of the creek on the landward side.
4. The CRZ 2011 lays down a detailed procedure for obtaining approval for developmental projects falling within the limits of the Coastal Regulation Zone. Moreover, post clearance monitoring and enforcement mechanisms have been established.
5. A new category called areas requiring special consideration has been introduced in the 2011 Notification. Its purpose is to provide a special regime for the most critical coastal environments, which consist of (i) the CRZ areas of Greater Mumbai, Kerala and Goa, and (ii) the extremely vulnerable coastal areas such as Sunderbans.
6. The 2011 Notification provides states with clear guidelines for the preparation of Coastal Zone Management Plans.
7. The 2011 Notification puts in place concrete measures to combat industrial pollution from land-based activities in order to prevent erosion and other forms of environmental degradation in coastal areas.

10.2.7.7 INCREASING CLARITY IN CRZ 2011

Due to the unpredictable nature of ecosystems, it must be acknowledged that the concept is still far from having a clear content. Nevertheless, the ecosystem approach acknowledges the need to take into account the effects of individual activities on the ecosystem as a whole. To give importance to the ecosystem approach, management laws shall include clear and judicially reviewable legal commitments to reduce the overall pressure on coastal and marine ecosystems and protect habitats and species. Based on the above scenario the Puducherry Government is reviewing the CRZ 2011 with the help of Indian Remote Sensing department, Anna university. Since the review is still under process CRZ 2011 is effective in the study region.

10.2.8 URBAN FORESTRY

Urban forestry is the management of trees for their contribution to the physiological, sociological and economic well being of the urban society. Urban forestry deals with woodlands, group of trees and individual trees where people live. The need for urban forestry is to be planned & integrated and systematic approach to urban tree management should be stressed. Planning is important because trees are very often considered as an afterthought once development has taken place rather than being incorporated in the original design phase. Union Territory of Puducherry does not have prominent forest resources in abundance. According to the direction of Hon'ble Supreme Court for the identification of Forest area in the Union Territory of Puducherry, the Committee identified 669.36 ha of forests which includes 52.14 ha on Govt. Forest lands, 617.22 on lands other than Government Forest lands. The Forest Department is initiating and implementing various schemes for the conservation of natural resources. Pondicherry being a small area need to be protected with utmost care and concern to conserve the valuable natural resources.

10.2.8.1 VADHANUR TANK SITE PLANTATION

In the offshore area of Vadhanur Tank Tree Plantation were created in an area of 18 Ha. So far, the major tree seedlings planted are Babul, subabul, Kodukapuli, Neem, Teak. The plantation thus created is maintained by Eri Sangam Vadhanur.

10.2.8.2 PLANTATION AT MANAPET

In the Coastal area of Manapet, Government land was acquired and plantation was created to an extent of 30 ha. The fruit seedlings such as Cashew, Mango, Sapota, Amala, Guava and miscellaneous tree seedlings, such as rain tree, golden shower, Neem Teak, Tamarind, Naval were planted.

10.2.8.3 KATTERIKUPPAM TANK SITE PLANTATION

In the offshore area of Katterikuppam Tank the tree plantation were undertaken in an area of 12 Ha. The tree seedlings such as Teak, Babul, Subabul, Kodukapuli, Neem were planted. Now it is 5 years old plantation.

10.2.8.4 SWADESHI COTTON MILLS FOREST

The forest exists on industrial land over the total extent of 12-43-85 (H.A.C). The vegetation counts of thick multilayered forest vegetation. The vegetation predominantly of spontaneous growth, is distinguished by the extensive presence of undergrowth, climbers, lianas and creepers in addition to trees. As many as 184 species of flora have been reported in this area.

10.3 GREEN BELT AND RECREATIONAL AREA

10.3.1.1 GREEN BELTS

The Union Urban Ministry's housing policy 1998 stressed the need for creation of green belts and Parks and Gardens wherever possible to increase green cover by Forest Department. This would help us to develop more number of Parks and green spaces, which are the backbone of the sustainable and high quality urban environment in the system. Apart from the creation of green belts there are 2 major lakes Oussudu and Bahour which is to be protected by creating the social forest around the lake.

10.3.1.2 RECREATIONAL AREA

Parks and recreation services are often cited as one of the most important factors in surveys of how livable communities are. Parks provide gathering places for families and social groups, as well as for individuals of all ages and economic status, regardless of their ability to pay for access. The Puducherry region lacks recreational areas, parks and playgrounds. The total area falling under parks and playgrounds is 0.56 sq.km, which is 0.2% of total Planning Area according to Existing Land Use area 2015. At present, the prominent recreational areas are Bharathi park, Botanical garden and Promenade beach.

10.4 PROPOSED STRATEGIES

In order to mitigate the above mentioned environmental issues, few proposals have been given in CDP - 2036, which is an effort to protect the environment of the region.

10.4.1 PROTECTION OF WATER BODIES, WATER CHANNELS AND DRAINS

Water is the most precious gift of nature. Today, both surface and subsurface water in India and other South Asian cities is facing huge quantity and quality threat. Thus, it is crucial to protect the available source of water i.e. rivers, lakes, ponds, water channels etc. These waterbodies not only provide drinking water, support livelihoods and biodiversity but also control the rate of runoff and subsequently control the runoff. Puducherry Region has two major water bodies namely, Oussudu lake and Bahour lake. Considering the ecological importance of these two lakes few proposals are given, which are given below.

10.4.1.1 OUSSUDU/OUSTERI LAKE

Name: OUSSUDU LAKE

Area: 390 Hectares

Description: Declared sanctuary under the wildlife (Protection) Act, 1972

Boundary: Oussudu and Koodapakkam villages in South, Ramanathapuram and Thondamanatham villages in West, Thutipet and Karasur villages in North.

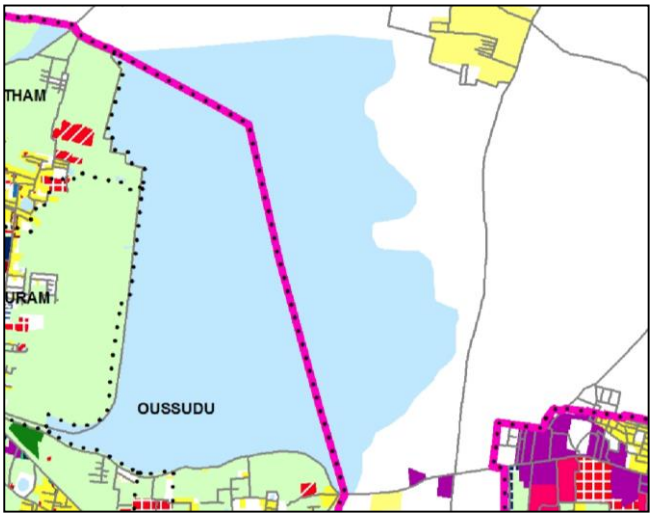


Figure 10.15 Location of Oussudu Lake

Oussudu lake also known as Ousteri lake is around a century old man-made Lake and is the largest lake in the Puducherry region. It is situated about 10 km from town, is a notified sanctuary, and was nominated to be a Ramsar Site. However, for various reasons; this inclusion has not taken place. It is one of the 93 Indian wetlands identified as highly important by The International Union for Conservation of Nature Resources (IUCN) and it is the most important freshwater lake in the Puducherry region. The lake is spread over an area of 390 hectares (GO for declaration of Sanctuary) having a complex structure - consisting of water, wetland/marsh and mudflats. The vegetation ranges from small herbs to trees, which supports migratory as well as native birds during summer and winter.

It becomes of utmost importance to preserve a waterbody of this much importance. In order to protect and conserve it, it is proposed to provide a buffer of 50 m around the Oussudu lake under CDP - 2036. Apart from acting as a buffer zone, this area will be developed as a major recreational area for as well as surrounding regions. The water in Oussudu lake comes from the following sources: (i) the run-off from the lake basin and direct interception by the water body; (ii) the water which is diverted by the Suthukenni check dam through the Suthukenni channel to the lake. Therefore, it is important to conserve even the water channels, which brings water to the lake. A buffer needs to be given to the water channels as well.



Figure 10.16 View of Oussudu/Ousteri Lake

A large waterbody like Oussudu attracting a large number of migrating birds from various corners of the world is itself an asset. However, this requires very careful management to see that it remains a place attractive to the migratory birds. The major problems which is faced by lakes of these kind is pollution arising out of various anthropogenic activities like free flow of untreated sewage to the waterbody, flowing of hydrocarbon elements along with the rainwater in the lake or untreated industrial effluent flowing into the waterbody. It is the general experience that development close to the lake borders with impervious cover invariably increases the phosphate content in the lake. Therefore, the following actions will be necessary to be taken by the local self-government.

- Similarly, ensuring that no untreated industrial effluent/waste water reaches the lake.
- A regular system of monitoring the quality of water at the points where the storm water channel meet the lake.
- Regular census of birds and in case the coming of any particular species is going down, to enquire to the possible causes.
- To obtain the opinion of ornithologist about the status of planktons in the lake to keep a watch of algae bloom or hyacinth coverage of the water body.
- To collect the record of past incidences of death of fish with probable causes for such incident.
- The idea would be to see whether development of any kind is having any direct impact of the water quality and quantity of the feedstock for the migratory birds.
- Maintenance to see quality and safety of the areas where nests are built or where the eggs are laid.

However, Comprehensive Management Action Plan for conservation of Oussudu sanctuary is already prepared in 2011.

10.4.1.2 BAHOUR LAKE


Figure 10.17 View of Bahour Lake

Another important waterbody in the planning area is Bahour Lake, which is situated in Bahour commune and is the second largest lake in Puducherry region. At present, it is working as a recreational space for local people. It is proposed to provide a buffer of 50 m around this lake also. Recreational activities are proposed in this buffer area. Moreover, it is important to preserve the water channels, drains, which bring water to this lake as the disturbance of that will lead to water logging in certain areas and sufficient water will not reach to the lake. Thus, the primary drains bringing water to the lake are given a buffer of 50 m from the edge of the drain as per National Green Tribunal's (NGT) order to the govt. of Karnataka. The buffer area of 50 m is proposed as a regulated development zone.

10.4.2 PROTECTION OF SEASHORE FROM COASTAL EROSION

Various studies have been done by different funding agencies like world bank, ADB, AFD to curb the erosion. Similar studies shall be conducted to minimize the coastal erosion in Puducherry Region.

10.4.3 PROTECTION OF WATER CHANNELS

Protection/conservation of water channels is as much important as preserving a lake as these are the main channels, which brings water to the waterbody. Every stream, tributary, or river has an associated watershed, and small watersheds aggregate together to become larger watersheds. Stream systems have been classified according to their relative position within a stream network in order to understand, discuss, and explore similarities and differences between them. Many stream order classification systems have been developed, but no single system has been universally accepted. One of the earliest methods developed, and arguably the most commonly used method today, was developed by Strahler in 1952. In this system, the smallest head-water tributaries are called first-order streams. Where two first-order streams meet, a second-order stream is created; where two second-order streams meet, a third-order stream is created; and so on.

The major/important water channels with their orders are identified and the identified primary, secondary and tertiary water channels are given a buffer. The buffer zone for water bodies are categorized according to proposed planning strategy. The detail of the buffers are given in the proposed strategy. In this buffer zone, regulated development is allowed. Protecting the drains will ultimately provide a smooth drainage in the area reducing the risk of flooding and water logging, ensuring uninterrupted flow of water to the waterbody.

Other than this, detailed Environmental Management Plan has to be prepared which extensively studies the environmental parameters of the region. Under which numerous proposals can be developed. One of them can be identification of various catchments where the ground water recharge can take place. A concept of green infrastructure can also be adopted. At the site scale, different green infrastructure proposals consisting of site-specific management practices (such as interconnected natural areas) that are designed to maintain natural hydrologic functions by absorbing and infiltrating precipitation where it falls can be introduced.

10.4.4 PROTECTION OF MANGROVES

Mangrove forests are among the most threatened habitats in the world. They may be disappearing more quickly than inland tropical rainforests, and so far, with little public notice. Conservation of mangroves is important due to its various benefits like,

- It Protects the land from erosion
- Acts as an important natural shield against natural disasters like cyclones, ecological disasters etc.
- Good source of timber, fuel and fodder
- Saves the marine diversity
- Purifies the water by absorbing impurities and harmful heavy metals
- Potential source of tourism and recreation

Thus, it is of utmost importance to protect the rich mangroves. Like general practices in India, the mangrove area in Thengaithittu village shall be declared as the protected area Indian Forest Conservation Act, 1980 & the Wildlife (Protection) Act, 1972. By providing legislative support to the area, protection of this environmentally rich area will be more efficient.

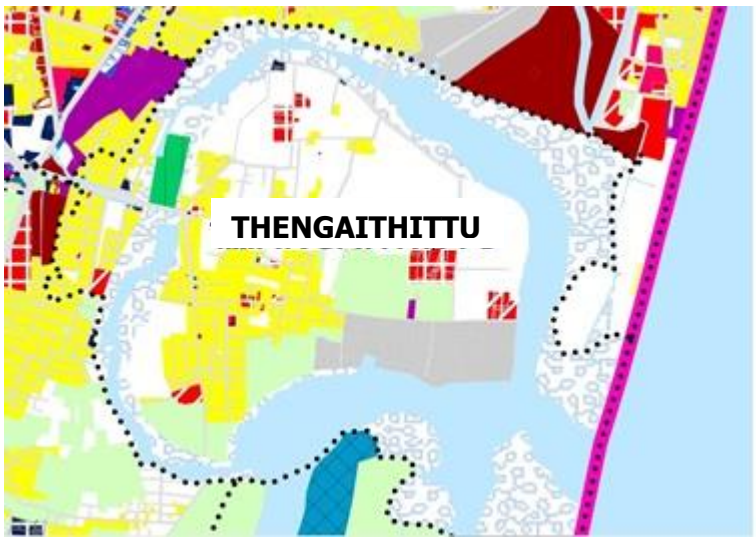


Figure 10.18 Thengaithittu Mangrove

10.4.5 SUMMARY OF ENVIRONMENTAL STRATEGIES

1. The water bodies (ponds/Lakes) within conurbation area should follow the 20m buffer from the edge of the water body boundary.
2. The water bodies (ponds/Lakes) outside the conurbation area should follow the 30m buffer from the edge of the water body boundary.
3. The ecological sensitive areas such as Bahour lake, Oussudu lake and Thengaithittu mangrooves should have the buffer of 50 m.
4. The canals and rivers which does not fall under the CRZ should have the 15 m on both the sides.
5. To avoid further deterioration of the mangrove, it is proposed to declare the Thengaithittu mangrove area as protected area.
6. Puducherry is facing major problem in terms of water supply. There is scarcity of availability of water and the only source of water for planning area is groundwater. To mitigate this issue, it is mandatory to store the fresh water i.e. rainwater. The rainwater harvesting provisions are given in the building bye-laws.
7. There is a lack of green spaces/recreational area in the planning area. Thus, after the detail study the city level and neighbourhood level parks/playgrounds are proposed.
8. Bahour is known as the Rice bowl of the planning area. Hence, it is imperative to preserve this rich and fertile agricultural land. This area is preserved by declaring dedicated agriculture zone under CDP – 2036 and Regulated Development will be allowed in certain parts of this area.

9. Untreated wastewater/industrial effluent should not be allowed to discharge in any natural drains/waterbodies. Underground sewerage network has to be provided with adequate sewage treatment facilities.
10. Solid waste dumping in the water bodies has to be prevented.

11 DISASTER MANAGEMENT

11.1 INTRODUCTION

Disaster is an undesired calamitous event that seriously disrupts the functioning of a community or society and causes human, material and economic or environmental losses that exceed the community's or society's ability to cope using its own resources. Disasters are usually caused by nature but in some cases it can be caused by human actions as well. Disaster can be broadly classified into Water and Climate related, Geology related and Accident related.

India has been traditionally vulnerable to natural disasters on account of its unique geoclimatic conditions. Floods, droughts, cyclones, earthquakes and landslides have been recurrent phenomena. About 60% of the landmass is prone to earthquakes of various intensities; over 40 million hectares is prone to floods; about 8% of the total area is prone to cyclones and 68% of the area is susceptible to drought.

At the national level, the Ministry of Home Affairs is the nodal Ministry for all matters concerning disaster management. The Central Relief Commissioner (CRC) in the Ministry of Home Affairs is the nodal officer to coordinate relief operations for natural disasters. The CRC receives information relating to forecasting/warning of a natural calamity from India Meteorological Department (IMD) or from Central Water Commission of Ministry of Water Resources on a continuing basis. The Ministries/Departments/Organizations concerned with the primary and secondary functions relating to the management of disasters include: India Meteorological Department, Central Water Commission, Ministry of Home Affairs, Ministry of Defense, Ministry of Finance, Ministry of Rural Development, Ministry of Urban Development, Department of Communications, Ministry of Health, Ministry of Water Resources, Ministry of Petroleum, Department of Agriculture & Cooperation. Ministry of Power, Department of Civil Supplies, Ministry of Railways, Ministry of Information and Broadcasting, Planning Commission, Cabinet Secretariat, Department of Surface Transport, Ministry of Social Justice, Department of Women and Child Development, Ministry of Environment and Forest, Department of Food.

Puducherry Planning Area being a coastal region is prone to climate related natural calamities like heat wave, drought, thunder, lighting, cyclone, floods, storm, tornado & hurricane. Geology related natural calamities can be in the form of earthquake and Tsunami. In addition to these natural calamities there can be manmade disasters like accidents from fire, oil spills, chemical spills and vehicular accidents.

11.2 CURRENT SCENARIO

Puducherry region has 24 km coastline and this stretch is prone to many natural disasters like cyclone and floods. This region has a history of cyclones and associated storm surges which have inundated vast areas of land along the coastal stretches of the Puducherry region. Keeping the past history of disasters and susceptibility of the region to natural disasters, Department of Revenue & Disaster Management, Puducherry has formulated a "Disaster Management Action Plan, 2014." The basic objective of current Disaster Management Action Plan is to protect all the residents and the wealth of the region from all sort of untoward incidents through the following objectives:

- To prevent loss of human lives and property.
- Institutionalization of disaster management in district administration level.
- Encourage a culture of disaster preparedness.
- Vulnerability reduction and disaster mitigation through better planning process.
- Creation of best government mechanism to handle and unprecedented events.
- Instant response and effective decision making in disasters.
- Better coordination of relief and rehabilitation in the aftermath of a disaster.
- Better coordination of all line departments in disaster management.

- Regular updates of resources in and around the district.

The highest flood level of the river system running through Puducherry region is given in table 11.1 and water holding capacity of the tanks are given in table 11-2 to understand the extent to which the region can withstand the flood situation.

Table 11-1 Details of River Systems in Puducherry Region

S. No.	Name of the River	Total Length (Km)	Unprecedented Flood Level (m)	Highest Flood Level (m)	Moderate Flood Level (m)	No. of Breaches Occurred on River Banks
1.	Gingee River	34.00	2.60	2.25	1.20	Nil
2.	Pennaiyar	6.00	2.40	2.10	1.50	Nil
3.	Guduvaiyar	19.30	1.30	1.00	0.50	Nil
4.	Pambaiyar	13.00	1.50	1.00	0.70	Nil
5.	Malatar	10.00	2.30	1.95	1.20	Nil

Source:- Department of Revenue & Disaster Management, Puducherry

Table 11-2 Water Level & Capacity of Tanks in Puducherry Region

S. No.	Name of the Tank	Name of Commune	Full Tank Capacity(MCFT)	Full Tank Depth (Meters)
1.	Murugapakkam Tank	Puducherry Municipality	31.00	1.85
2.	Olandai Tank	Puducherry Municipality	14.00	2.15
3.	Sorapet Periyeri	Mannadipet Commune	23.00	1.60
4.	Sorapet Puthueri	Mannadipet Commune	3.85	10.50
5.	Sorapet Chinneri	Mannadipet Commune	3.70	1.25
6.	Vambupet Tank	Mannadipet Commune	10.27	1.30
7.	Kodathur Tank	Mannadipet Commune	6.00	2.00
8.	Kaikilapet Tank	Mannadipet Commune	2.00	2.00
9.	Chettipet Tank	Mannadipet Commune	12.30	1.50
10.	Kunichampet Puthueri	Mannadipet Commune	5.00	2.60
11.	Kunichampet Pazhayaeri	Mannadipet Commune	4.60	2.00
12.	Manadipet Tank	Mannadipet Commune	2.00	1.80
13.	Manalipet Tank	Mannadipet Commune	0.78	1.80
14.	Sompet Tank	Mannadipet Commune	13.50	2.00
15.	Thirukkanur Periya Eri	Mannadipet Commune	13.00	2.30
16.	Thirukkanur Chinna Eri	Mannadipet Commune	28.00	2.00
17.	Vadhanur Tank	Mannadipet Commune	-	3.10
18.	Vikkiravandy Anaicut	Mannadipet Commune	-	2.00

19.	Silkeripalayam Check Dam	Mannadipet Commune	-	1.50
20.	Sanniyasikuppam Check Dam	Mannadipet Commune	-	1.50
21.	Pillayarkuppam anicut	Villianur Commune	-	2.00
22.	Sagadapet Bed Dam	Mannadipet Commune	-	2.00
23.	Sorapet Check Dam	Mannadipet Commune	-	2.00
24.	Chunnambar Check Dam	Ariyankuppam Commune	-	1.65

Source:- Department of Revenue & Disaster Management, Puducherry

Table 11-3 summarizes the loss of human life due to natural disasters in the Puducherry Region. The highest number of loss is observed during the Tsunami of 2004 which took around 601 human life's and displaced many to temporary shelters for months.

Table 11-3 Details of Natural Calamities in Puducherry Region

S. No.	Year	Details of Calamity	No. of death
1.	2004	Tsunami Tragedy	601
2.	2005	Heavy Rain/Flood in Puducherry during North East Monsoon	5
3.	2006	-	Nil
4.	2007	Due to Whirl wind that occurred on 14.05.2007	4
		Cyclone During the month of August 2007	2
5.	2008	Nisha Cyclone	4
6.	2009	Heavy Rain due to North East Monsoon	4
7.	2010	Heavy Rain due to North East Monsoon	4
8.	2011	Thane Cyclone	12

Source: - Department of Revenue & Disaster Management, Puducherry

11.3 CYCLONES & FLOODS

Heavy rains are a predominant feature of the Puducherry Region during the months of October, November and December, due to the lack of proper gradient and it inundates low-lying areas, coastal areas and areas adjacent to natural drains & water bodies. Heavy rain fall is often accompanied by cyclones during North East Monsoon. In Puducherry region, Puducherry and Bahour are the coastal taluks that lie in the heavy wind and cyclone zone while Oulgaret and Villianur lies in the flood zone. Puducherry has the land slope from west to east and from north to south. Puducherry is classified as a multi hazard prone district. Cyclones and floods have wreaked havoc in the city several times in the past few decades. A part of the problem owes its genesis to the location of the district. The district has a coastline of approximately 24 km. Therefore, the district is vulnerable to the cyclonic depressions and the resultant rains, which cause floods. The drainage pattern is poor in the region and the encroachments of natural drains, and water bodies during drought years has created a very difficult situation in the planning area. Slightly high rainfall from the normal level can lead to flood condition is several parts of the planning area and it disrupts the normal life of the local population living in low lying areas. Several residential areas like Krishna Nagar, gets inundated even for normal rainfall conditions.

Puducherry region was hit with very severe cyclonic storm "Thane" on 30th December 2011, with devastating effects and a trail of destruction to public and private properties. Hundreds of trees were uprooted leading to blockage of major road networks and severe power disruption. Hundreds of huts have been completely damaged and tidal waves of 1.5 meters were reported, and mainly fishing hamlets were affected.

Table 11-4 Cyclone Thane Damage & Population Affected

S. No.	Year	State	Disaster Type	Affected Dist.	Population Affected (million)	Damage in Crore
1.	2011	Pondicherry	Cyclone	1	0.95	2000
2.	2011	Pondicherry	Flood	2 (Puducherry & Karaikal)	0.30	333

Source: - Department of Science, Technology & Environment, Puducherry

11.4 TSUNAMI

A Tsunami cannot be prevented but the impact of a tsunami can be mitigated through urban/land planning, siting away from shorelines, community preparedness, timely warnings, and effective response. Puducherry region witnessed the Tsunami in the year 2004, it was one of the deadliest natural calamities ever happened in the history of the region. It was caused by an earthquake under the sea in the India Ocean which caused waves with height of 15 m. As per the statistics of DSTE, Puducherry around 30000 people were rendered homeless in the Union Territory of Puducherry. Around 601 people lost their life's due to this natural calamity and mostly fisherman in this region lost lives and many were missing. As per official data's around 0.43 million people were affected by this disaster and 3.80 crore worth damage was caused.

Table 11-5 Tsunami Damage & Population Affected

S. No.	Year	State	Disaster Type	Affected Dist.	Population Affected (million)	Damage in Crore
1.	2004	Pondicherry	Earthquake Tsunami	2	0.430	3.80

Source: - Department of Science, Technology & Environment, Puducherry

11.5 EARTHQUAKE

Around 58 % of the territory of India is vulnerable to earthquake, and the country has experienced 3 main earthquakes in the past few decades. The state of Gujarat has experienced a major earthquake in January 2001, Jammu & Kashmir in October 2005 and Sikkim in 2011. The major consequences of any earthquake are wide spread human and material losses, excessive damage to infrastructure and services. According to the Geographical Survey of India, Seismic Zoning Map of the country, Puducherry region lies in Zone-II which is said to be the least active semis zone in the Country. The Southern part of the country were the Puducherry region lies has observed only moderate's earthquakes in Kerala in 2000, Karnataka in 2001 and Tamilnadu in 2001.

11.6 DISASTER VULNERABLE AREA MITIGATION PLAN

Any disaster management plan or emergency management plan consists of four phases, namely: Mitigation, Preparedness, Response and Recovery. The mitigation component in an emergency management plan is aimed at reducing the risk, impact, effects of a disaster. Hence careful planning in the mitigation phase is important to reduce or eliminate the Long-term risk to human life, property from natural and manmade calamities. It's important to have mitigation plans led by local community, working together to identify, plan for in the event of a disaster and reduce vulnerabilities and promote long term personal and community resilience and sustainability. Mitigation plans can concentrate on both pre-disaster and post disaster efforts to reduce the impact of the disaster.

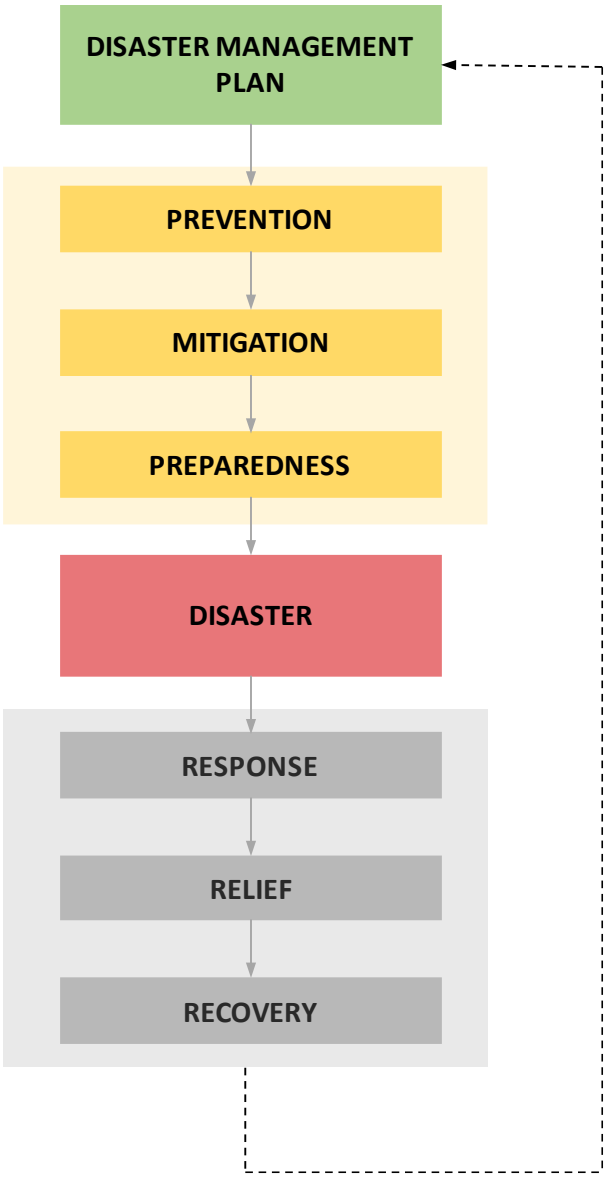


Figure 11.1 Disaster Management Plan Process

Pre-disaster Mitigation should focus on projects and interventions to address natural and man-made disaster to reduce risk to the population and property. This is mainly achieved by strengthening the resilience of National/State Infrastructures. Post-disaster Mitigation efforts are primarily designed to reduce future damage in an affected area and decrease the loss of life and property due to the incidents following the disaster. The essential steps of hazard mitigation are: -

- Hazard Identification.
- Vulnerability Analysis.
- Defining a Hazard Mitigation Strategy.
- Implementation of Hazard Mitigation Activities and projects.

The Puducherry region is more prone to Floods & Cyclone than any other natural disasters hence the disaster vulnerable area mitigation plan focuses on flood and cyclone related eventualities and how can it be mitigated and have a better preparedness. It is important to note that disaster management is an integrated task involving various government departments of Puducherry region and the plan should focus on prevention, preparedness, mitigation, response and relief measures.

11.6.1 PREVENTION PLAN

As part of prevention of the said natural disasters, the following measures can be adopted by concerned government departments to avoid and minimize the impacts of natural disasters.

- The Public Works Department should monitor the major water bodies like rivers, streams, lakes for constant flow of water, rising levels, and identify potential areas along the water bodies which need additional embankment or revetments and these works should be implemented on priority before the onset of the season.
- Power and Communication should carry out through inspection of power lines, communication lines for defects and rectify them. Trees and branches which may damage power and communication lies should the trimmed or removed.
- Health department should ensure that the primary and community health centers are equipped with medicines and medical staff. Preventive vaccines for epidemics should be stocked in adequate quantity. Chlorination of drinking water should be ensured to avoid the outbreak of epidemics in the event of cyclones and floods.
- The Department of Revenue & Disaster Management is the nodal agency in the Puducherry Region and has already handled several flood and cyclone situation in the region. From this experience, it should be able to identify the low lying and vulnerable areas and the population of such places must be warned to be alert and to be ready to move to the cyclone shelters or to safer areas or to the relief camps in case of warning of disaster.
- The Department of Civil Supplies & Consumer Affairs should decide for creation of buffer stock of food grains by making required withdrawal from the Food Corporation of India. Also, adequate quantities of Kerosene and diesel should be procured and made available through the Fair Price Shops.
- Department of Agriculture should take steps to publicise precautionary measures to be taken to save the standing crops in the vulnerable areas. Farmers should be encouraged to have platforms in their fields to stock the crops. Desilting of public and private irrigation channels should be ensured for quick drainage of paddy fields.
- Fisheries & Fishermen Welfare Department shall alert all the coastal villages and hamlets about the impending natural calamity and advice the fishermen not to venture into sea till normalcy is restored.
- Department of School Education shall keep all schools ready for accommodating the evacuees and keep the Central Kitchens to function around the clock with in charge of the centres. NCC and NSS students shall also be grouped to send them for relief works.
- Transport Department should keep ready the list of sufficient numbers of earthmoving vehicles, transportation vehicles such as trucks, tractors, tippers, poclains, mini buses etc. Further, all the listed vehicles allocated in connection with calamity has to be kept in roadworthy condition for using them in emergency.
- Fire Services Department shall keep available sufficient number of rescue materials, like life jackets, buoys, ladders and ropes.
- Department of Animal Husbandry & Animal Welfare should store fodder, cattle feed, poultry food etc. and also carry out the inoculation of animals against epidemics. The Key Village Units should harbour stray cattle with shelters.
- Local Bodies shall make arrangements for availability of Generators and pump sets at short notice. For areas with water logging Local bodies should clear the L & U type drains which normally clog due to plastic materials and silt.
- The Police Department shall set up a Search & Rescue Team which shall contain at least 20 Police Personnel for each jurisdiction of the Superintendent of Police.
- Similarly, the Fire Services Department shall set up Search & Rescue Team consisting of at least 6 members of each Fire Service Station.

11.6.2 PREPAREDNESS PLAN

For having an effective preparedness plan for the Puducherry region, its important to identify the key agencies government and non-government that forms the action group or task force during all the phases of the disasters (Pre, during and post-disaster operations). Responsibility and role of the agencies have to be well defined based on their capabilities. Its necessary to make sure that necessary equipments, materials, supplies, communication and transportation are in line with the National Disaster Plans. This will improve the efficiency of the institutional mechanism of the concerned government agencies of the region. The following measures can be put in place for having a better preparedness plan for the Puducherry region: -

- The region should be divided into zones and each zone will function under a zonal officer who is in the capacity of Puducherry Civil Service Officer.
- The Tahsildar of the respective zones will work in coordination with the Zonal Officer.
- The Zonal officer should report to the Dy Collector (Revenue) cum Sub-Divisional Magistrate
- Required number of task force should be formulated under various zones based on the area covered and it should be headed by Dy. Tahsildar.
- The desired team composition of each task force should be as follows: -
    - Revenue Officials
    - Welfare Inspector
    - Civil Supply Inspector
    - Fisheries Inspector
    - Junior Engineer PWD
    - Junior Engineer Electricity Department
    - Required No. of Gangman and Luscar
    - Village Level Worker from Rural Development Department

- The headquarters of the Task force should be suitably identified within the area it is working and it should be provided with necessary communication facilities.
- The Task force should be in direct contact with the Zonal Officer and also Central Control Room.
- There should be enough contingency fund and provisions for the task teams to work in case for emergencies.

11.6.3 MITIGATION PLAN

For a successful mitigation plan it is necessary to identify short, medium and long term mitigation measures for various hazards for structural and non-structural risks and damages. Mitigation measures should focus to reduce both the effect of the disaster and the vulnerable conditions to it, in order to reduce the scale of a future disaster and its impacts. Mitigation measures should also focus at reducing physical, economic and social vulnerability of the region at the event of the disaster. Cyclone mitigation and preparedness largely hinges on the preparedness of the community. The following steps can be taken to reduce the risk in the unfortunate event of the said natural disasters.

- Restore Communication networks
- The task force in association with Search & Rescue Teams of Police and Fire should thoroughly search the affected area for survivors and injured.
- In case of heavy flooding and inundation, vehicular access may be restricted and hence suitable rafts/boats should be used to rescue and evacuate the people affected by the floods.

- The water logged in low lying residential areas should be pumped out and the pumped out water could be let through the nearest natural drain or canal. Also, fire engines can be deployed to pump out water from affected areas during emergencies.
- Any breach in rivers, streams or natural drains should be protected with adequate sand bags or creation of temporary embankments to avoid further damage to property and human life.
- In case of heavy storms, power supply to areas which are in the primary path of the storm can be disconnected to avoid hazards due to breakage of power lines. Provisions should be made to provide generators for temporary power supply to storm affected areas.
- Relief camps should be opened in appropriate locations were a large number of people are affected.
- Health facilities like General hospitals and Medical Colleges should be ready to accept crowd in case the primary health centers gets over crowded.

11.6.4 RESPONSE PLAN

Response measures are those taken immediately prior to and following disaster impact. It is important to have clear organization structures with established line of authority within the government mechanism to handle the response plan in case of natural calamities. The plan should detail out the various phases from early warning to rehabilitation and the roles that agencies play in reaching the vulnerable and affected to identified disaster support infrastructure located in the Puducherry Region. Response plans include formation of functional teams and providing plans for transportation, evacuation, search and rescue, and rehabilitation. They are supported by supervisory zone based teams assuring food, shelter, water, medicine to the vulnerable in order to uphold physical and psychological health. Survey and assessment should be the part of response activity.

11.6.4.1 EARLY WARNING

The Puducherry region falls under the Area Warning Centre, Chennai, and during natural disasters the center issues warnings through the Cyclone Warning Dissemination System installed in the Office of the District Magistrate. The Department of Revenue and Disaster Management should ensure that the warning messages are communicated to the following offices: -

- Lt. Governor
- Chief Minister
- Chief Secretary to Government
- Relief & Rehabilitation Commissioner
- Secretary to Government (Revenue) & the Ministries and Secretaries

Central Control Room has to be opened immediately and the Revenue Department have to circulate the warning to all line departments and connect with disaster management to set up their respective control room. The cyclone warning has to be communicated to All India Radio for broadcasting the same every 30 minutes. Also, the same have to be advertised through cable TV and other media.

11.6.4.2 MOBILIZATION OF TASK FORCE

Immediately after receiving the official warning about the probability of cyclone, flood or heavy rain, the respective zonal officers should make sure the task forces which are under his/her jurisdiction should group itself at the headquarters and ready to act in case of eventuality.

11.6.4.3 ASSESSMENT OF THE SITUATION

At the onset of the event the task force should get in touch with the villagers & elders of the village to collect the ground level situation, impacts of the event and assess the need for

relocation or evacuation of the vulnerable population residing in low lying and affected areas. Based on the number of population identified for relocation the task force has to make sure they are relocated safely to the relief shelters and provisions for food and basic necessities are planned.

11.6.4.4 RESPONSE & RESCUE OPERATIONS

The Task Force should immediately report about the loss of lives, livestock and damages to public properties to the Central Control Room. The head of the Task Force shall liaise with the S.H.O., of the respective jurisdiction to ensure whether there is any causality and rush the injured to the nearest Primary Health Center. The Task Force shall utilize the services of the Police and Fire Services Department in responding to the disaster.

The Zonal Officer and the Task Force Leader shall seek the aid of the Search & Rescue Team of the Police and Fire Services Department in rescue operations. The Task Force should establish contacts with the affected villages and visit all the villages affected as quickly as possible. If it is not possible to reach the places due to inaccessibility or high floods or failure of communications etc., it shall be reported to the District Magistrate who shall arrange for conduct of Aerial Survey. If people are marooned, the District Magistrate shall inform the Government to seek the assistance of the Army to rescue the people when their lives are in danger, otherwise air dropping of food can be organised. List of areas wherein air dropping of food, rescue and aerial survey need to be done and should be got ready. However, Army should be requisitioned only when the State Government is not in a position to handle the critical situation.

11.6.4.5 EVACUATION

It is the vested responsibility of the field level officials of the Department of Revenue & Disaster Management to evacuate the population from the low-lying areas and in the coastal areas on receipt of severe cyclone warning, in coordination with the task force. The people have to be evacuated and sheltered at the identified safer places/shelters. Once the floods hit, evacuation centers should be triggered into action. Depending upon the gravity of the situation, the Task Force shall requisition the Search & Rescue Team of the Police & Fire Services Departments for evacuation/rescue operations.

In order to avoid panic among the population the Task Force has to explain about the importance of their evacuation and the injured, if any, should be treated in safe shelters. The Task Force has to keep census of the evacuees. As soon as the normalcy is restored, the evacuees shall be allowed to go back to their dwellings. The Task Force should ensure provision of food and water to the evacuees.

11.6.5 RELIEF & RECOVERY

In the unfortunate event of a natural calamity like a cyclone or flood its important focus on the methods and activities to restore life line support physical infrastructure like adequate water supply, power and communication networks, accessibility to the site. These have to be the described in the disaster management plan- relief & recovery part. In the coastal part of the Puducherry region the communities are depended on the specific infrastructure for their livelihood and these should be identified and methods to restore them in short/medium/long term have to be identified and respective funding reequipments have to be made available and followed by speedy decision making process.

In the Puducherry Region, the Relief Commissioner plays direct and active role in relief. The Relief Commissioner either directly or through the respective District Collectors, co-ordinates and monitors the relief efforts using all the resources available with the Union Territory Government. For timely assistance to the people affected by natural disasters it is necessary to have correct assessment of extend of damage to crops, public & private properties and loss of human lives and livestock. The emergency relief measures and relief measures in the

aftermath of a disaster is generally carried out in compliance with Calamity Relief Fund Norms by Relief & Rehabilitation Commissioner.

The task force is responsible for collecting the extend of the damages with respect to number of houses damaged, loss of human lives, number of person injured, information about individual families, their income, property and assets. The zonal officer has to prepare a report on the same to be sent to the Sub/Dy Collector Revenue. The mentioned assessment is to be carried out on priority basis so that the Nodal Department in the Puducherry Region which is the Department of Revenue and Disaster Management can extend relief assistance in time in order to mitigate the effect of the natural disaster.

11.7 CITY DISASTER MANAGEMENT PLAN

The points mentioned above should be part of a larger city or region level disaster management plan. The Disaster Management Act, 2005 has brought a change from Response & Relief oriented approach to proactive and comprehensive approach. This has encouraged many Indian cities to develop and formulate a City Disaster Management Plan, the same should be worked for Puducherry Region as well to enable it to be better prepared in the case of natural disasters in the future. As part of the Comprehensive Development Plan-2036 the authority feels there is a need for a CDMP for the planning area covering the following general principles: -

- Risk & Hazard Assessment
- Planning
- Organization
- Resource Utilization
- Need for Specialist
- Training

Generally, the CDMP prepared for the planning area should include sectoral plans covering the following aspects of disaster & emergency management: -

- Overall Preparedness
- Rehabilitation
- Emergency Response
- Prevention
- Mitigation
- Recovery
- Reconstruction
- Capacity Building Plans

Based on the above discussed general principles a detailed City Disaster Management Plan (CDMP) for Puducherry Planning Area have to be prepared for strengthening the institutional mechanism.

12 SPATIAL STRATEGY AND LANDUSE PLANNING - COMPREHENSIVE DEVELOPMENT PLAN 2036

12.1 INTRODUCTION

Landuse planning refers to the rational and judicious approach of allocating available land resources to different land using activities and for different functions consistent with the overall development vision / goal of a particular region. The main objectives of land use planning area

1. To promote efficient utilization and disposition of land ensure the highest and best use of land.
2. To promote desirable pattern of land uses to prevent wasteful development.
3. To preserve areas of ecological, aesthetic, historical and cultural significance.

In the chapter, it details out the visions, goals & planning concepts adopted for the preparation of Comprehensive Development Plan for Puducherry Planning Area-2036. It then presents the guiding principles and strategies adopted for various sectors and the applications of planning theories & techniques. Later on, in the chapter it elaborates the Land use policies & growth center models adopted. The chapter concludes a detailed explanation of the concept plan for the planning area prepared based on the strategies to achieve the overall visions & goals.

12.2 VISION, GOALS AND PLANNING CONCEPTS

The Comprehensive Development Plan for Puducherry Planning Area 2036 is initiated with the aim of achieving a better economic growth, better infrastructure facilities, and higher quality of life for the planning area while keeping the heritage, culture and form of the city intact and preserving the environment of the area. To achieve these, it is essential to set out goals and adopt the planning concepts and guiding principles so as to ensure maximum benefits and least adverse effects. The discontinues & non-homogenous geographical profile of the planning area which is a historical accident has thrown several challenges towards ensuring continuity and proper planned development. Despite this limitation, through forethoughts & reasonable approach to the situation desired results could be achieved. This section elaborates the vision statement, goals that are formulated to achieve the goals and the planning concepts, which will guide to achieve the same.

12.2.1 VISION

The Vision for the planning area perceived around the following core ideas:

1. Preserving our historical past, maintaining the livability of the present, and transforming our future through the implementation of the highest quality planning, to enhance the level of infrastructure service to all people of Puducherry Region.

2. Plan and implement the future by guiding the physical and economic development of Puducherry Region while enhancing the quality of life for all through a comprehensive range of planning to promote the cultural, built and natural heritage in a sustainable manner.

3. Expand urban infrastructure to encourage appropriately compact, connected, and synchronized development by unlocking the potential of urbanization for better economic, social, and environmental outcomes at the heart of the government's economic strategy.

The road map to achieve the vision will include the following:

1. To generate higher service facilities for attracting various developmental activities, investors and industrial houses.

2. To generate facilities and activities to support small investors, informal sectors and slum inhabitants and rural migrants.

3. To improve the Transport Network system for faster communication and high standard linkages between the Growth Centers and their rural hinterlands.

4. To transform the whole region to a pollution free zone with conservation of bio-diversity and environment.

5. To manage the natural and human resources for followed development.

6. To frame land policies and development proposals for eradicating bottlenecks for future development.

7. To provide decent housing for all sections of people living in the region.

8. To formulate a Disaster Management Policies to tackle natural hazards.

9. To provide high levels of physical and social infrastructure ensuring safe drinking water, improved sanitation, well distributed education, health, recreation and cultural facilities.

10. To convert the region to a learning and cultural centre for the state as well as nation.

11. To transform the region to a hub of tourism through preserving and promoting the rich cultural heritage, with high standard facilities and convenience.

12. To design an effective development control mechanism with a high value of public serviceability.

13. To reenergize the institutional and administrative system to manage future urban development in the region, through proper institutional mechanism.

12.2.2 GOALS

Socially Beneficial; Regionally Contextual; Environmentally Sustainable; Financially Viable; Institutionally Executable; and Politically Acceptable.

12.2.3 PLANNING CONCEPTS

It is essential for any Comprehensive Development Plan to adopt the appropriate planning concept before arriving at the proposed land use Map for the city. The planning concepts are the drivers to solve the existing issues of the city and also paves the way for positive development in the system. The city will be developed over the period to achieve the goals and vision framed under the Comprehensive Development plan. Based on the guiding principle of the planning concept and navigate towards achieving, the key planning concepts adopted are decentralization, densification and planning interventions.

12.2.3.1 DECENTRALIZATION

The word "decentralization" can carry a variety of concepts like financial, administrative, service delivery or activities decentralization. It is the process of redistribution of administrative, economic and urban functions away from a central or congested area into the areas having potential for development. It is very much essential when the CBD becomes saturated, quality of life starts deteriorating and room for further development is low. By considering these points there is need to analyze the present situation of the core areas of

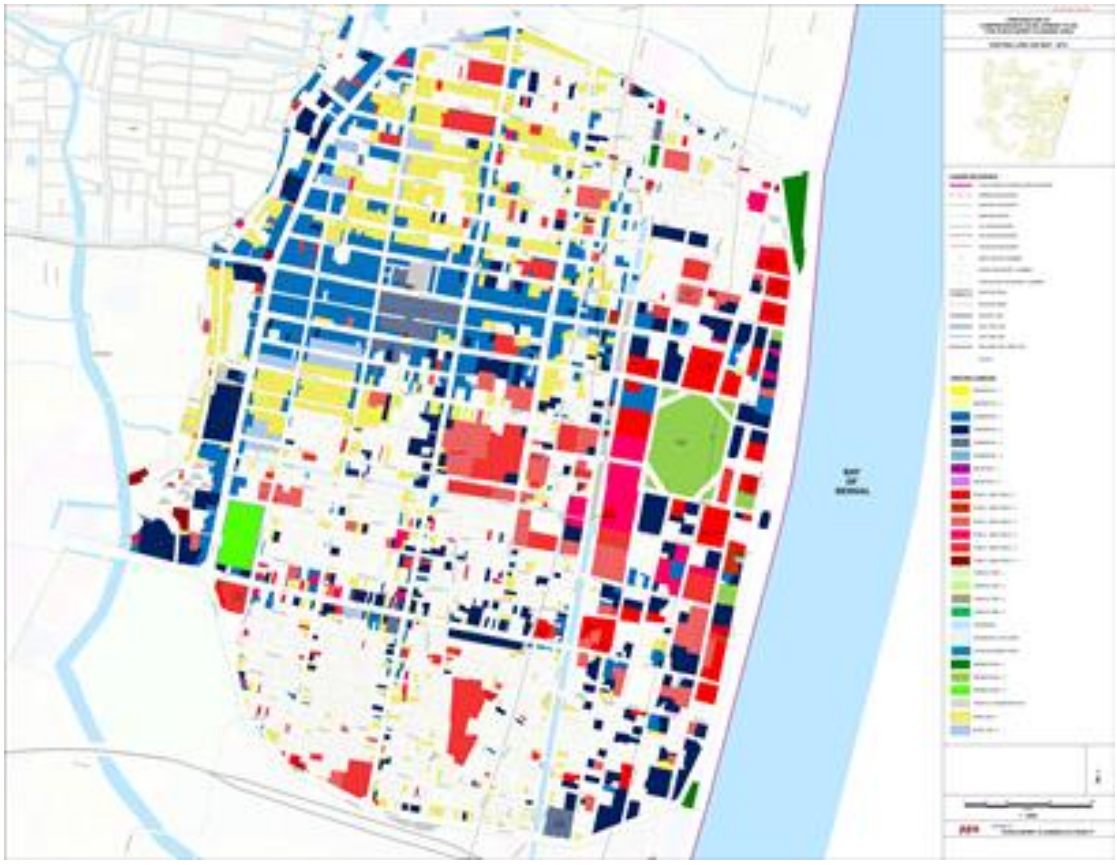


Figure 12.1 Mixed Use, Commercial & Public and Semi-Public Activities in Boulevard Town

the Puducherry Planning Area in order to understand the potential problems of traffic congestion in and out of core areas during peak hours.

The core area of Puducherry viz. boulevard town and surrounding areas, being heart and soul of Puducherry district, has emerged as one of the most congested area due to concentration of large number of commercial activities, public facilities, administrative offices and population leading to high degree of congestion. The mixed use development is reflected in the land use plan are presented in the figure 12.1. It is also been evident that the density of commercial and public & semi-public use is much higher in the Boulevard area compared to the rest of the planning area. In order to tackle the over dependency of Boulevard town for commercial and public purposes like recreation and education. There is urgent need to have a long term strategy to decentralize the commercial activities to other centers identified across the planning area. By way of distributing the commercial activities along with public activities to these centers will bring jobs and shopping needs closer to the homes of the majority of the population, which leads to reduced travel time into the core areas, reduce peak hour congestions as well as vehicular emissions. Decentralization can bring in new economic development in these centers making them more affordable for business locations. This also supports the Sustainable Regional Planning Framework formulated for the region and the proposals given in Comprehensive Mobility Plan for Puducherry.

Thus, the Comprehensive Development Plan for PPA-2036 aims to decongest the city core through well defined strategies by introduction of open spaces and decentralization of commercial activities and also to maintain the existing profile & inherent heritage. Decentralization of some major activities like the wholesale market, commercial centers will open up land parcels for other uses like recreational use which are inadequate in the core area. Majority of the commercial activities like street vending, weekly markets, hotels, retail shopping etc. are concentrated in and around the Puducherry town.

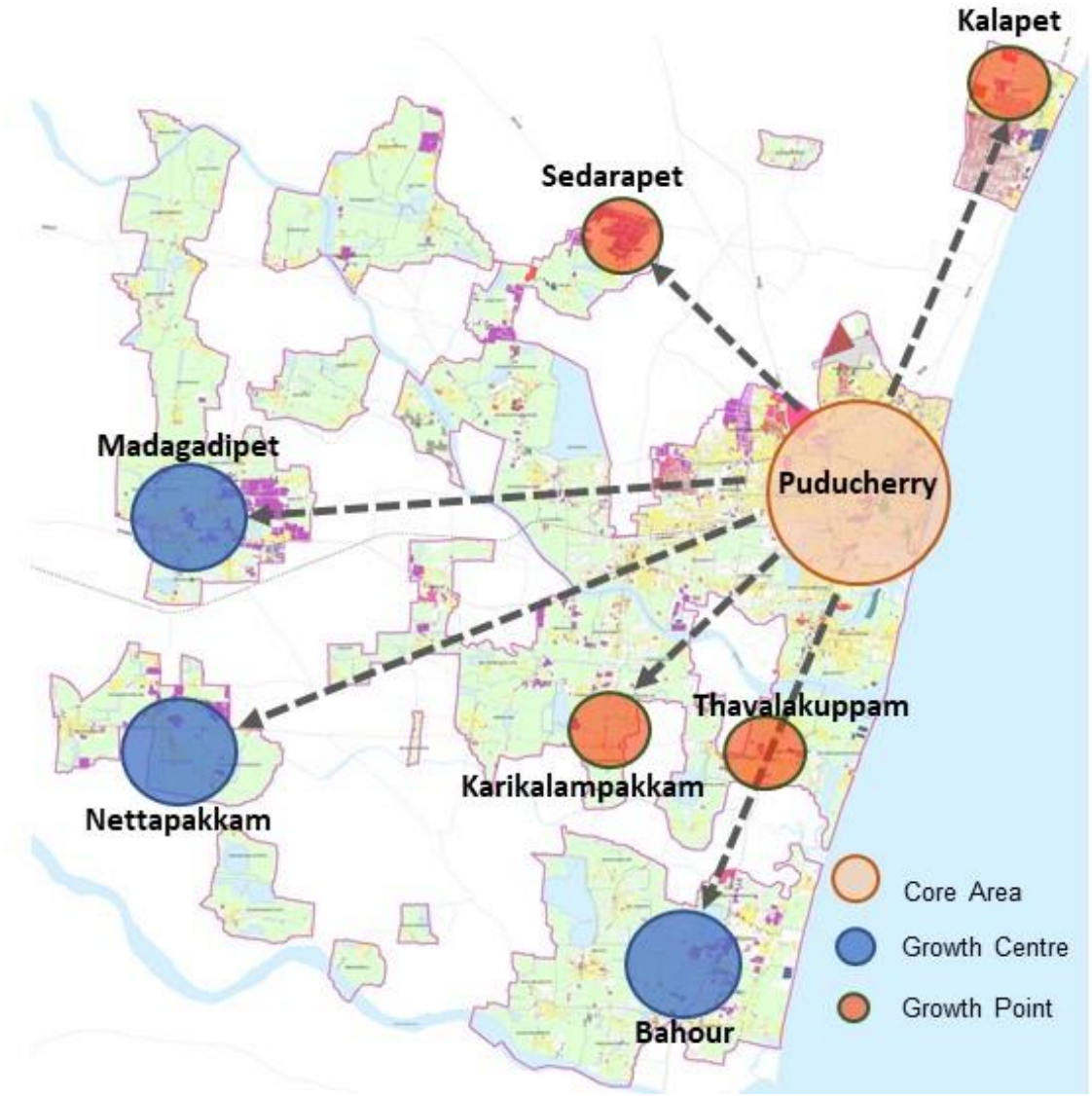


Figure 12.2 Decentralization

Therefore, it is very much essential to distribute these activities across planning area. Keeping this in mind after detailed study and through investigation three growth centers were identified in the system i.e.,

(i) Bahour
(ii) Nettapakkam
(iii) Madagadipet.

Further four growth points were analyzed in order to promote hinterland which support growth centers.

(i) Thavalakuppam
(ii) Karikalampakkam

(iii) Sedarapet
(iv) Kalapet

The location of all the growth centers and growth points across the Puducherry planning area are presented in the figure 12.2. The commercial, public semipublic land uses are proposed across all the identified growth centers and growth points in order to reduce the congestion in the Puducherry town and to create employment opportunities near to residential communities. These growth centers and growth points are identified based on the long term strategy to distribute the growth and development across the study area to promote multiple urban centers within the planning area. This will encourage sustainable option for transportation and reduce trip generation to the already congested area.

While choosing the growth centers due care was taken to give priority for areas that are served with better connectivity in the proposed Comprehensive Development Plan and their proximity to potential Multi Modal Transit Centers. Thus, making them suitable for relocating commercial activities along with public and semi-public use which will enable easy access to the public. Decentralization also avoid agglomeration of economies in the CBD areas and reduces commuting cost by optimal spatial distribution of the employment centers within the planning area. Through re-distribution of commercial and other uses towards the growth centers would increase the revenue for the urban local bodies in the system. Further it is also to be highlighted that the study area (Puducherry region) is not a contiguous and scattered among 13 settlements across the Tamilnadu state. Therefore, the conventional planning theories and techniques could not be employed in the system. In view of the location specific phenomenon, the optimal regional concept has been chosen and the same is here justified to adopt growth pole theory Multinuclei concept on the system.

12.2.3.2 DENSIFICATION

Urban densification is widely considered as a sustainable urban policy to create some sort of compaction process to attain more sustainable urban development. It differs widely from the private transport oriented urban sprawl which is observed in many India cities which leads to the following undesired characters for the planning area: -

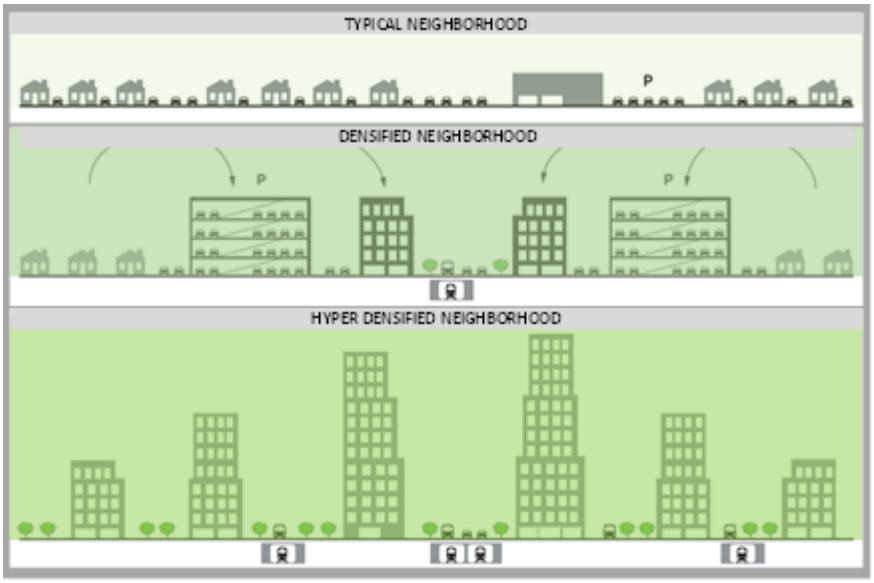


Figure 12.3 Compact City development

Longer distance between urban functions like residence, employment centers, commercial centers, recreational facilities etc.

a) Loss of open land and agricultural land to speculative developments
b) Social segregation and class based divide
c) Inadequate infrastructure
d) Poor access to services and facilities

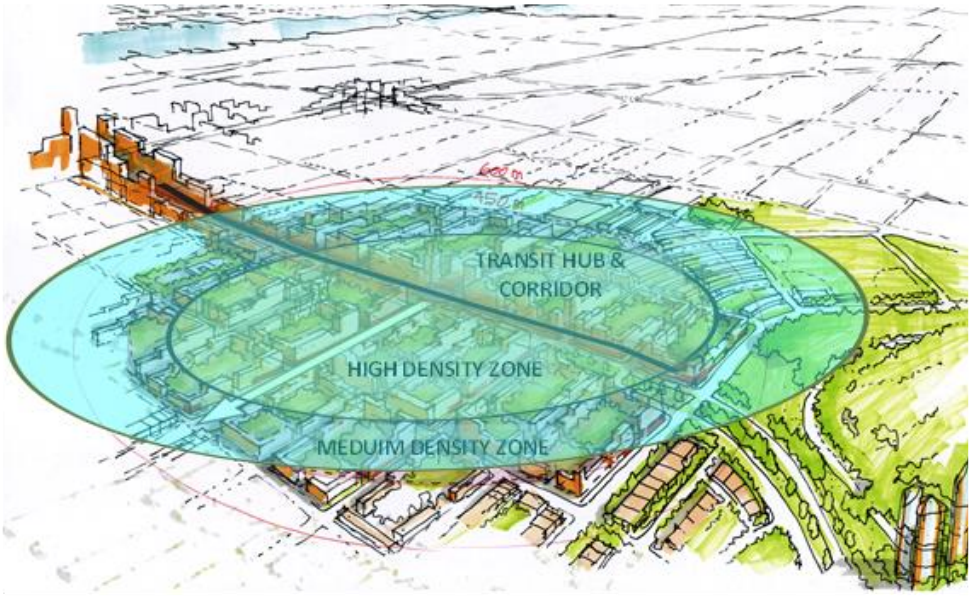


Figure 12.4 Densified transit corridor

If left unattended the urban area within the planning area will expand to such a degree that they become unmanageable and inefficient in terms of services delivery. Keeping aforementioned points in mind it's important to adopt the densification policy which is in relevance with the national level policies of spatial planning and transit oriented planning

directing cities to adopt densification along transit corridors and zones which are already well served with all kind of infrastructure. Densification emphasis the inter-relationship between spatial planning, infrastructures, in particular transportation infrastructure. The principle behind this planning concept is that the densification will lead to residential development and infill developments to be more viable due to minimum spending on infrastructure and proper circulation network already exists in the system. Densification is the increased use of space vertically, so as to accommodate more people in a certain geographical area which results to increase population density as well as Dwelling Unit Density. Densification or urban compaction typically involves consolidation of activities and uses and strategic densification of residential locations.

The primary objective of densification is to reduce the commuting distance, which will in turn result in walkable friendly area, less travel distance reduces energy consumption and finally minimum environmental pollution. The area on the both the sides of major arterial/district roads are densified to prevent the urban sprawl, which is currently taking place in Puducherry. It is one of the methods of Sustainable Landuse Planning through TOD. Moreover, the entire proposed conurbation area is proposed to be densified to accommodate more people inside conurbation area.

12.2.3.3 PLANNING INTERVENTIONS

The planning interventions has to be proposed for key land use categories in order to prevent haphazard development. Currently, lot of urban sprawl has happened inside the planning area away from the city, which creates huge task to provide adequate infrastructure to the sprawled development. Therefore, under Comprehensive Development Plan, proposals have been framed in a way that will limit the growth to certain limit. Considering that, the major commercial activities are proposed in dedicated commercial and mixed use residential zone corridors. The high-density residential areas, commercial areas and other public & semi public

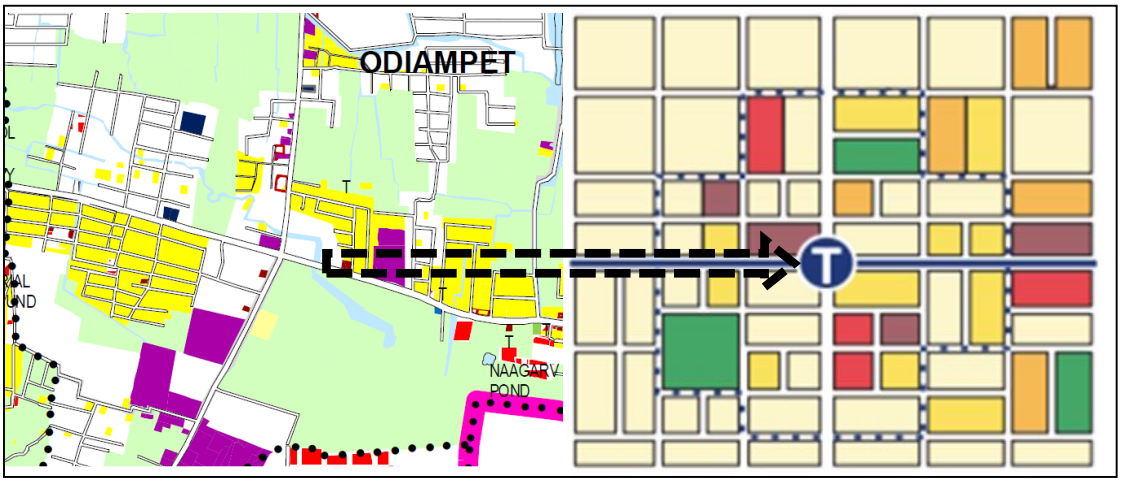


Figure 12.5 Transit Oriented & Non-Transit Oriented Development

areas are proposed near major transportation nodes, such as Multi modal transit centers, bus stands etc. to minimize the travel distance. Major recreational areas are proposed in close vicinity to the major residential areas. Moreover, the proposals have made sure that all the residential areas are having adequate amenities.

12.2.3.4 PROPOSED MULTI MODAL TRANSIT CENTERS:

There are four multi modal transit centers proposed under Comprehensive Mobility Plan at Villianur, Madagadipet, Pillayarkuppam, Puducherry (Mudaliarpet). Around these Multi modal transit centers/Transport Hubs, the major commercial activities and public & semipublic

activities are proposed which will be surrounded by high density residential development. Moreover, fertile agricultural areas such as Bahour and Nettapakkam are protected with special regulations. The ecologically sensitive areas such as area around lakes/ponds, river, mangrove are protected by providing buffers around it. The areas of heritage importance are also given special consideration while framing the proposals.

The growth centers identified under Comprehensive Development Plan 2036 are Mannadipet (Madagadipet), Bahour and Nettapakkam. The identified growth points are Karikalampakkam, Thavalakuppam, Sedarapet and Kalapet. The concept of growth centers and growth points, which is used in Comprehensive Development Plan 2036, is elaborated in the later part of this chapter. This exercise is carried out to retain the character of the communes and to create economic opportunities at multiple location within the planning area.

12.3 SUSTAINABILITY FRAMEWORK FOR COMPREHENSIVE DEVELOPMENT PLAN-2036

12.3.1 KEY SUSTAINABILITY ISSUES

Sustainable development is an evolving concept. Brundtland definition of sustainable development is that meet the needs of the present without compromising the ability of future generations to meet their needs". Sustainability is divided into three dimension:

- Environmental
- Economic
- Socio-Cultural

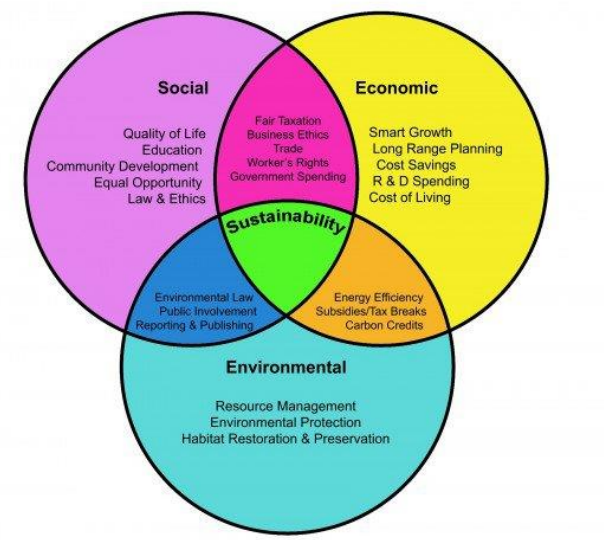


Figure 12.6 Sustainability and its various sub System

The Puducherry Planning area key issues, which affect the sustainability of the region, with three dimensions are furnished below:

12.3.1.1 ECONOMIC

- Decreasing trend in the fish production
- Reduction in agricultural land and dependency on agriculture for economy generation

12.3.1.2 ENVIRONMENT

- Flat terrain posing financial challenges in laying out of physical infrastructure such as Drainage and Water Supply systems
- Open drains creating filthy and unhealthy environment for the surroundings.
- Disposal of untreated sewage directly to the water bodies
- Absence of scientific landfill sites for solid waste management
- Mixing of bio-medical waste with municipal solid waste in certain dumping sites
- Lack of Park and Open Spaces in the Planning Area
- Dependency on ground water for water supply which leads to over exploitation and ultimately end up with sea water intrusion in the system.
- According to PWD, water supply the quality of borewells is that the total alkalinity and total hardness as CaCo3, TDS and chloride are exceeding the acceptable limit. However, in absence of any alternate source, people have to depend on those bore wells.
- Bore wells, which are near to the coastal areas, are facing the problem of salinity intrusion
- Coastal erosion

- Deterioration of waterbodies



Figure 12.7 Environmental Issues in Puducherry Region

12.3.1.3 SOCIO-CULTURAL

- High floating population creating stress on physical infrastructure
- Insufficient public transport system
- Insufficient pedestrian space
- High density concentration in urban areas which lead to heavy congestion and traffic associated problems.
- Inadequate off street parking areas in the Boulevard town, causing on street parking and thereby creating traffic congestion
- Lack of Comprehensive traffic management plan in the system
- Lack of Health Facilities in the Rural system
- Lack of recreation spaces and play grounds in rural system
- Lack of Heritage Legislation

12.3.2 FRAMEWORK

The conceptual sustainability framework covers four theme areas to achieve sustainable development in the area. They are explained in the figure 12.8.

12.3.2.1 LANDUSE AND ACCESS

The landuse planning should be done in such a way that it encourages walkability, use of public transport system and ensures healthy social life. As explained in the Planning concepts, densification and planning interventions are appropriate planning techniques to achieve the aforementioned goals.

12.3.2.2 COMMUNITY

The community which is comprised of 'people' is the prime component of sustainability. It should be made sure that there is active social life, by providing recreational areas. In addition, the community shall be safe, planning for housing shall be inclusive and the community shall be well engaged to achieve the sustainable development goals.

12.3.2.3 CLIMATE AND ENERGY

Energy shall be conserved since the supply is very limited. In addition, the use of renewable energy resources such as solar energy, wind energy, tidal energy, bio mass, geothermal energy shall be encouraged to ensure an uninterrupted supply of energy especially in the form of 'electricity'.

12.3.2.4 RESOURCE MANAGEMENT

The natural resources are to be protected to ensure balance in the overall ecosystem. The resources are to be consumed in such a manner that it doesn't affect the ecological balance. In this light, the groundwater exploitation has to be minimized and alternative sources are to be explored.

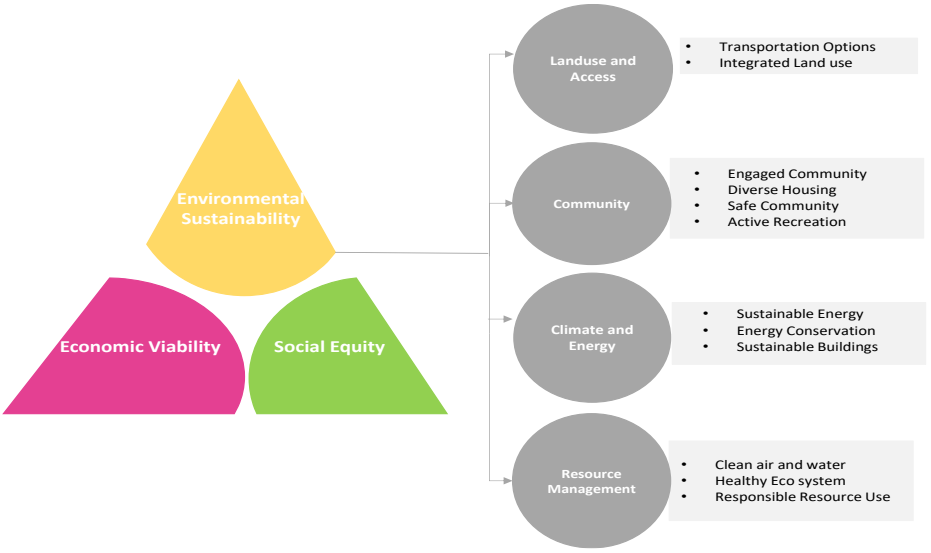


Figure 12.8 Sustainability Framework

12.4 APPLICATION OF PLANNING THEORIES AND TECHNIQUES

12.4.1 ORDER OF SETTLEMENT

12.4.1.1 HIERARCHY OF EXISTING SETTLEMENTS

The existing scenario and level of urbanization and urban pattern reflect migration from nearby areas putting pressure on the existing infrastructure of the city. This phenomenon affects the growth and leads to the policy failure. In order to set the trend, it is important to understand the structure of population and its characteristics to develop the proposed settlement classification to meet the growing needs of urbanization in future and to ensure the balance development of the region.

Puducherry region is unique in its spatial pattern i.e., it is interspersed planning area with 14 enclaves of land parcels with Tamilnadu region in between. Hence it is evidently implicit that the whole Puducherry region reflects bioregional in nature. As a preliminary study the classification of settlement can be understood based on hierarchy of population in the system and it is furnished in the table 12-1.

Table 12-1 Level of Hierarchy of Settlement based on Population

S. No	LEVEL OF HIERARCHY	CLASSIFICATION OF SETTLEMENTS	POPULATION SCALE
1.	L1	Growth poles / Growth Foci	500,000 to 2,500,000
2.	L2	Growth Center	25,000 to 500,000
3.	L3	Growth points	10,000 to 25, 000
4.	L4	Service centers	5000 – 10000
5.	L5	Central villages	Less than or equal to 5000

Source: Growth Pole Theory, Francis Perroux

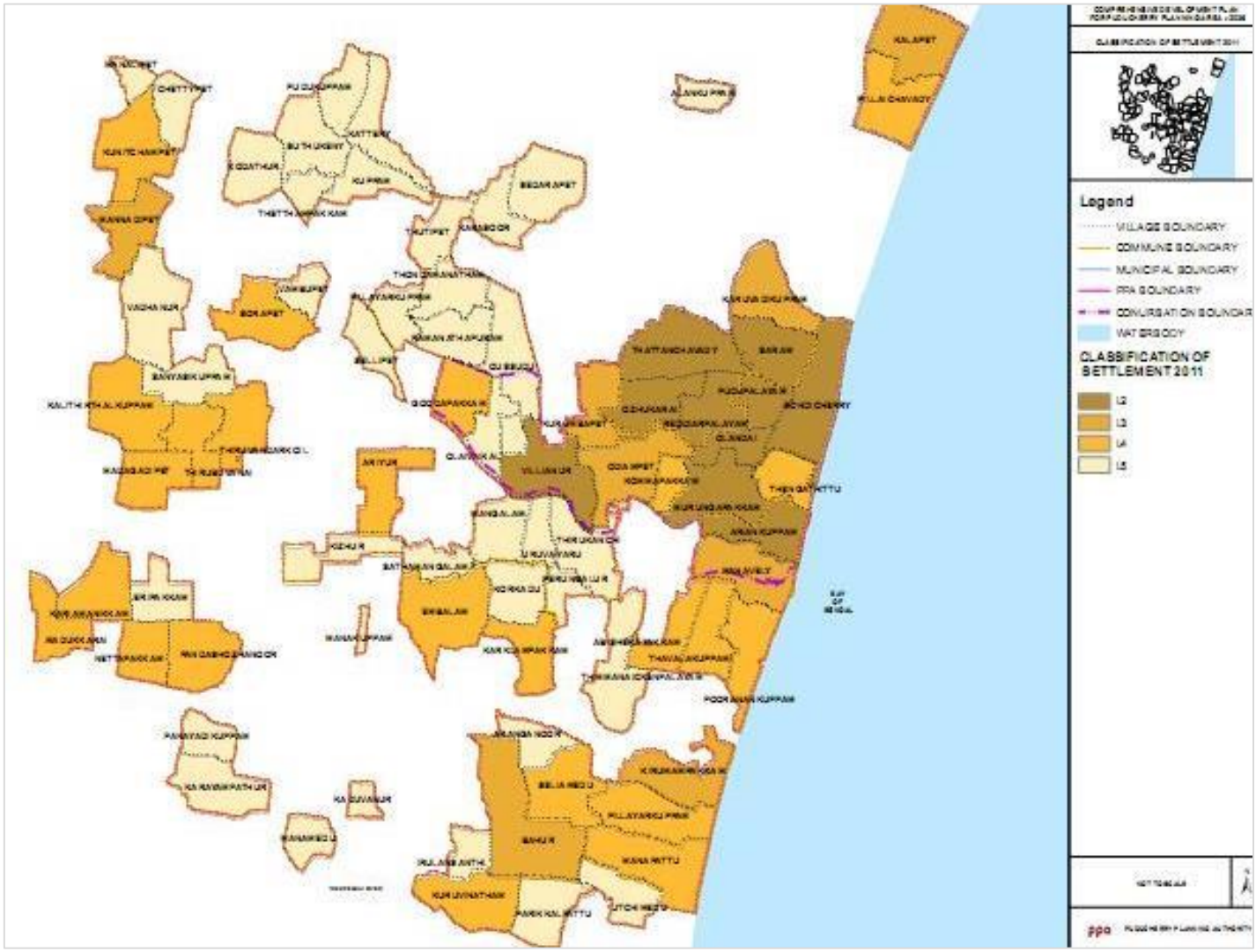


Figure 12.9 Classification of settlement based on census Population 2011

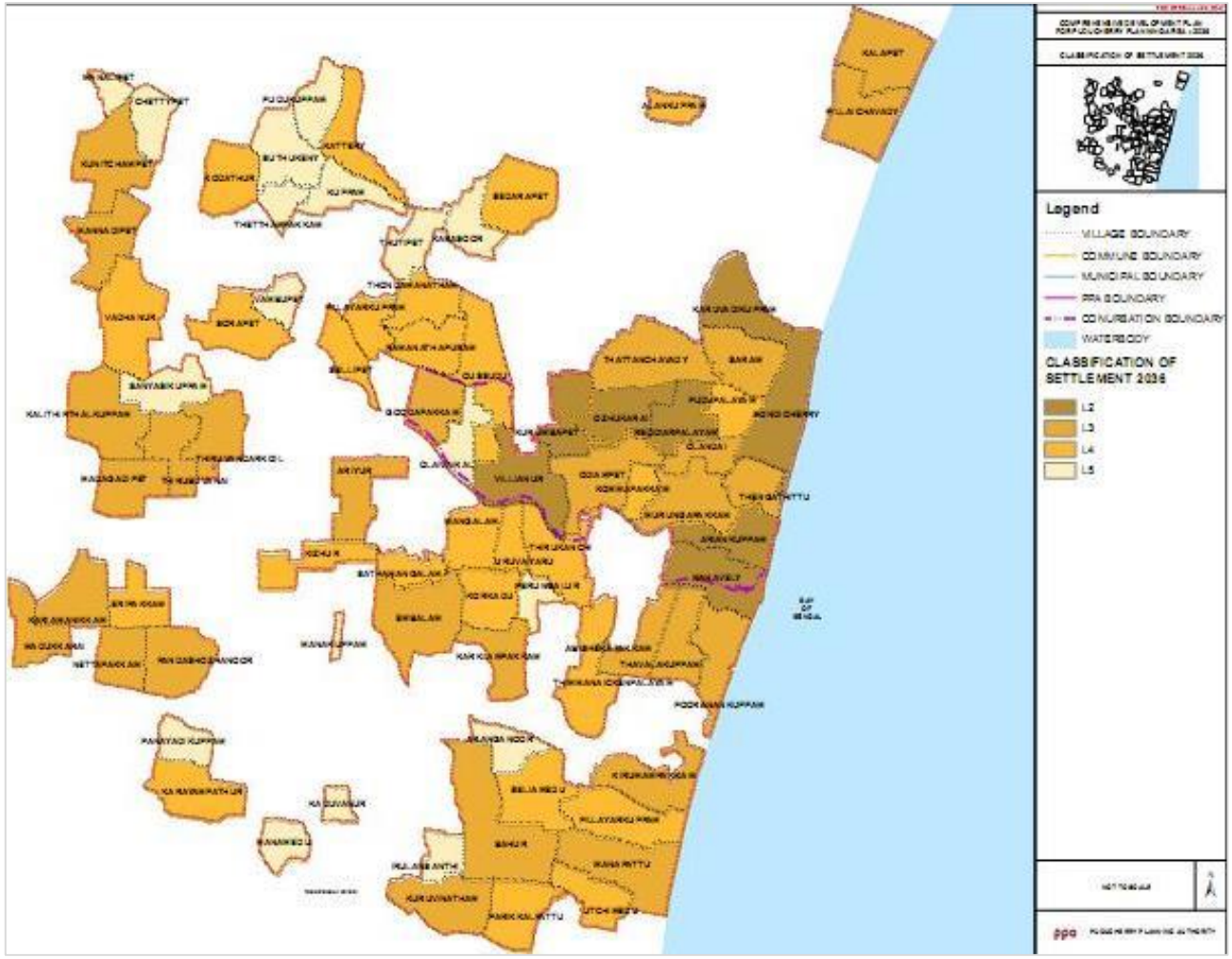


Figure 12.10 Classification of settlement based on Projected Population 2036

12.4.1.2 SCALOGRAM ANALYSIS

12.4.1.2.1 Central Functions and Centrality in Puducherry Region

The Central functions of Puducherry region has been restricted exclusively to the services and facilities available in the villages of Puducherry region. Villages vary in size, both in population and in the magnitude of services being rendered to their immediately adjacent areas. This creates gradation in the settlements, some to be designated as central places and some as dependent. A central village is the village with more services than one would expect of this size which is catering services for neighboring villages as well as with higher levels of functions and larger its servicing area. One of the important components of centrality index is threshold population which is defined as the minimum population size of a center for the support of functions like services and facilities.

12.4.1.2.2 Indicators of Centrality

There are number of indicators for measuring the centrality such as basic institutional services such as educational and medical services, markets, banks and communication were chosen as measures of centrality for Puducherry region. Matters relating to communication were accomplished by post offices and telephone offices. Law and order and Security matters are accomplished by Police institutions. The data analyzed mainly has been done by using the quantitative techniques like Weighted Index, Composite Index Method and few simple mathematical calculations, considering the present demands, distribution and pattern of population, social amenities like educational facilities, health and veterinary facilities, communication facilities, and other utilities has been analyzed. These functions were considered to have a bearing on the centrality of villages in Puducherry region and become indirectly responsible for the growth and development of the region.

12.4.1.2.3 Scalogram

The scalogram analysis on the basis of empirical studies, is a technique potentially capable of identifying and measuring any underlying simple structure of selected regional dimensions. Entering the basic data of health and education facilities in each villages of Puducherry planning area, to understand the existence of different facilities for 81 villages of Puducherry planning area in the system.

Table 12-2 Scalogram Analysis for Villages, Puducherry Planning Area

COMPREHENSIVE DEVELOPMENT PLAN-PUDUCHERRY 2036														
Villages / Services		**Educational Facilities - 2011 - (Both Govt and Private)**			**Health Facilities - 2011 (Both Govt and Private)**			**Security and defence - 2011**		**Communication Facilities**	**Trade and Commerce**			**Total**
Name	**Population - Census 2011**	**No of Pre-primary, Primary and Middle schools**	**No of Higher Secondary & High School**	**No of Technical institutes, University and other colleges**	**No of Primary Health Center /Sub-Center**	**No of Community Health Center / ESI**	**No of Nursing Homes / Rehabilitaion center General Hospitals / Speciality Hospitals**	**No of Police Station / Outpost**	**No of Fire Station**	**No of Post and Telephone exchange facility**	**No of Godowns / whole sale**	**No of Banks**	**No of Weekly/ Informal Markets**	**Weightage**
Karikalampakkam	6558	1	1	1	X	1	X	1	X	1	1	1	X	8
Madukkarai	9049	1	1	1	1	X	X	1	1	1	X	1	X	8
Nettapakkam	6331	1	1	1	1	X	X	1	X	1	X	1	X	7
Kariamanickam	7685	1	1	1	1	X	X	X	X	1	X	1	X	6
Korkadu	3418	1	1	1	1	X	X	X	X	1	1	X	X	6
Embalam	8331	1	1	1	1	X	X	X	X	X	X	1	X	5
Pandasozhanur	5643	1	1	1	1	X	X	X	X	X	X	X	X	4
Eripakkam	4703	1	X	1	1	X	X	X	X	X	X	X	X	3
Mannadipet	11176	1	1	1	1	X	X	1	1	1	X	1	X	8
Thirubuvanai	9374	1	1	1	1	1	X	1	1	X	X	1	X	8
Katteri	4292	1	1	1	1	X	X	1	X	1	X	1	X	7
Madagadipet	7253	1	1	1	1	X	X	X	X	X	X	1	1	6
Kalithirthalkuppam	8862	1	1	1	1	X	1	X	X	X	X	X	X	5
Thiruvandarkoil	7078	1	1	1	1	X	X	X	X	X	1	X	X	5

COMPREHENSIVE DEVELOPMENT PLAN-PUDUCHERRY 2036														
Villages / Services		**Educational Facilities - 2011 - (Both Govt and Private)**			**Health Facilities - 2011 (Both Govt and Private)**			**Security and defence - 2011**		**Communication Facilities**	**Trade and Commerce**			**Total**
Name	**Population - Census 2011**	**No of Pre-primary, Primary and Middle schools**	**No of Higher Secondary & High School**	**No of Technical institutes, University and other colleges**	**No of Primary Health Center /Sub-Center**	**No of Community Health Center / ESI**	**No of Nursing Homes / Rehabilitaion center General Hospitals / Speciality Hospitals**	**No of Police Station / Outpost**	**No of Fire Station**	**No of Post and Telephone exchange facility**	**No of Godowns / whole sale**	**No of Banks**	**No of Weekly/ Informal Markets**	**Weightage**
Sorapet	5110	1	1	1	1	X	X	X	X	X	X	1	X	5
Kodathur	3605	1	1	1	1	X	X	X	X	X	X	X	X	4
Kunichampet	5692	1	1	1	1	X	X	X	X	X	X	X	X	4
Vadanur (Disputed)	4925	1	1	1	X	1	X	X	X	X	X	X	X	4
Sanyasikuppam	2375	1	1	1	1	X	X	X	X	X	X	X	X	4
Thethampakkam	2109	1	1	1	X	X	X	X	X	X	X	X	X	3
Kuppam	2731	1	1	1	X	X	X	X	X	X	X	X	X	3
Sellipattu	2893	X	1	1	1	X	X	X	X	X	X	X	X	3
Suthukeny	2637	X	X	1	1	X	X	X	X	X	X	1	X	3
Manalipet	1244	X	X	1	1	X	X	X	X	X	X	X	X	2
Chettipet	1822	1	X	1	X	X	X	X	X	X	X	X	X	2
Vambupet	1111	1	X	1	X	X	X	X	X	X	X	X	X	2
Pudukuppam	2211	X	X	1	X	X	X	X	X	X	X	X	X	1
Villianur (CT) (URBAN)	34383	1	1	1	1	1	X	1	1	X	1	1	X	9
Sedarapet	4756	1	1	1	1	1	X	1	1	X	X	1	X	8

COMPREHENSIVE DEVELOPMENT PLAN-PUDUCHERRY 2036														
Villages / Services		**Educational Facilities - 2011 - (Both Govt and Private)**			**Health Facilities - 2011 (Both Govt and Private)**			**Security and defence - 2011**		**Communication Facilities**	**Trade and Commerce**			**Total**
Name	**Population - Census 2011**	**No of Pre-primary, Primary and Middle schools**	**No of Higher Secondary & High School**	**No of Technical institutes, University and other colleges**	**No of Primary Health Center /Sub-Center**	**No of Community Health Center / ESI**	**No of Nursing Homes / Rehabilitaion center General Hospitals / Speciality Hospitals**	**No of Police Station / Outpost**	**No of Fire Station**	**No of Post and Telephone exchange facility**	**No of Godowns / whole sale**	**No of Banks**	**No of Weekly/ Informal Markets**	**Weightage**
Mangalam	4320	1	1	1	X	X	X	1	X	X	1	1	X	6
Ariyur	8758	1	1	1	1	X	1	X	X	X	X	X	X	5
Uruvaiyar	4568	1	1	1	1	X	X	X	X	X	X	1	X	5
Odiampet (OG)(Urban)	13365	1	1	1	1	X	X	X	X	X	X	X	X	4
Kizhur	2955	1	1	1	1	X	X	X	X	X	X	X	X	4
Thondamanatham	4090	1	1	1	1	X	X	X	X	X	X	X	X	4
Koodapakkam	7147	X	1	1	1	X	1	X	X	X	X	X	X	4
Oussudu	3227	1	1	1	1	X	X	X	X	X	X	X	X	4
Sathamangalam	2977	1	X	1	1	X	X	X	X	X	X	1	X	4
Thirukanchi	4207	1	1	1	X	X	X	X	X	X	X	1	X	4
Kurumbapet (GP) (URBAN)	19506	1	X	1	1	X	X	X	X	X	X	X	X	3
Ramanathapuram	2841	1	1	1	X	X	X	X	X	X	X	X	X	3
Ulaivaikkal	1224	1	X	1	X	X	X	X	X	X	X	X	X	2

COMPREHENSIVE DEVELOPMENT PLAN-PUDUCHERRY 2036													
Villages / Services		**Educational Facilities - 2011 - (Both Govt and Private)**			**Health Facilities - 2011 (Both Govt and Private)**			**Security and defence - 2011**		**Communication Facilities**	**Trade and Commerce**			**Total**
Name	**Population - Census 2011**	**No of Pre-primary, Primary and Middle schools**	**No of Higher Secondary & High School**	**No of Technical institutes, University and other colleges**	**No of Primary Health Center /Sub-Center**	**No of Community Health Center / ESI**	**No of Nursing Homes / Rehabilitaion center General Hospitals / Speciality Hospitals**	**No of Police Station / Outpost**	**No of Fire Station**	**No of Post and Telephone exchange facility**	**No of Godowns / whole sale**	**No of Banks**	**No of Weekly/ Informal Markets**	**Weightage**
Karasur	1752	1	X	1	X	X	X	X	X	X	X	X	X	2
Perungalur	1765	1	X	1	X	X	X	X	X	X	X	X	X	2
Pillaiyarkuppam	2744	1	X	1	X	X	X	X	X	X	X	X	X	2
Thutipet	939	1	X	1	X	X	X	X	X	X	X	X	X	2
Manakuppam	1254	1	X	1	X	X	X	X	X	X	X	X	X	2
Ariyankuppam (URBAN)	29808	1	1	1	1	1	X	1	X	1	1	1	X	9
Thavalakuppam	9212	1	1	1	1	X	1	1	X	X	X	1	X	7
Manavely (CT) (URBAN)	15666	1	1	1	1	X	X	X	X	X	1	X	X	5
Abishegapakkam	7124	1	1	1	1	X	X	X	X	X	X	1	X	5
Purnankuppam	6766	1	X	1	1	X	X	X	X	1	X	X	X	4
Thimmanaickenpalayam	3479	X	X	1	1	X	X	X	X	X	X	X	X	2
Kirumampakkam	10133	1	1	1	1	1	1	1	X	1	X	1	X	9
Bahour	10927	1	1	1	1	X	X	1	1	1	X	1	X	8
Seliamedu	5984	1	1	1	1	X	X	X	X	1	X	1	X	6

COMPREHENSIVE DEVELOPMENT PLAN-PUDUCHERRY 2036													
Villages / Services		**Educational Facilities - 2011 - (Both Govt and Private)**			**Health Facilities - 2011 (Both Govt and Private)**			**Security and defence - 2011**		**Communication Facilities**	**Trade and Commerce**		**Total**
Name	**Population - Census 2011**	**No of Pre-primary, Primary and Middle schools**	**No of Higher Secondary & High School**	**No of Technical institutes, University and other colleges**	**No of Primary Health Center /Sub-Center**	**No of Community Health Center / ESI**	**No of Nursing Homes / Rehabilitaion center General Hospitals / Speciality Hospitals**	**No of Police Station / Outpost**	**No of Fire Station**	**No of Post and Telephone exchange facility**	**No of Godowns / whole sale**	**No of Banks**	**No of Weekly/ Informal Markets**	**Weightage**
Karayamputhur	4518	1	1	1	1	X	X	1	X	X	X	1	X	6
Manapattu	8227	1	X	1	1	X	X	X	X	X	X	1	X	4
Outchimedu	3959	1	1	1	1	X	X	X	X	X	X	X	X	4
Pillaiarkuppam	5309	1	X	1	1	X	1	X	X	X	X	X	X	4
Manamedu	2345	1	X	1	1	X	X	X	X	X	X	1	X	4
Kuruvinatham	7289	1	1	1	X	X	X	X	X	X	X	X	X	3
Panayadikuppam	1316	1	X	1	1	X	X	X	X	X	X	X	X	3
Aranganur	2426	X	X	1	1	X	X	X	X	X	X	1	X	3
Parikalpet	3835	1	X	1	1	X	X	X	X	X	X	X	X	3
Irulansathai	1670	1	X	1	X	X	X	X	X	X	X	X	X	2
Kaduvanur	819	1	X	1	X	X	X	X	X	X	X	X	X	2
Thattanchavady	81772	1	1	1	1	1	1	1	1	1	1	1	X	11
Saram	91881	1	1	1	1	X	1	1	X	1	1	1	X	9
Karuvadikuppam	22146	1	1	1	X	X	1	1	X	1	1	1	X	8
Reddiyarpalayam	42673	1	1	1	1	1	1	1	X	X	X	1	X	8

COMPREHENSIVE DEVELOPMENT PLAN-PUDUCHERRY 2036														
Villages / Services		**Educational Facilities - 2011 - (Both Govt and Private)**			**Health Facilities - 2011 (Both Govt and Private)**			**Security and defence - 2011**		**Communication Facilities**	**Trade and Commerce**			**Total**
Name	**Population - Census 2011**	**No of Pre-primary, Primary and Middle schools**	**No of Higher Secondary & High School**	**No of Technical institutes, University and other colleges**	**No of Primary Health Center /Sub-Center**	**No of Community Health Center / ESI**	**No of Nursing Homes / Rehabilitaion center General Hospitals / Speciality Hospitals**	**No of Police Station / Outpost**	**No of Fire Station**	**No of Post and Telephone exchange facility**	**No of Godowns / whole sale**	**No of Banks**	**No of Weekly/ Informal Markets**	**Weightage**
Kalapet	15847	1	1	1	1	X	1	1	1	X	X	X	X	7
Oulgaret	34283	1	1	1	1	X	1	X	X	X	1	X	X	6
Alankuppam	4932	1	1	1	1	X	X	X	X	X	X	X	X	4
Pillaichavady	6570	1	1	1	1	X	X	X	X	X	X	X	X	4
Puducherry	83373	1	1	1	1	1	1	1	1	1	1	1	1	12
Pudupalayam	62742	1	1	1	1	1	1	1	1	1	1	1	X	11
Olandai	59041	1	1	1	X	X	1	1	X	1	1	1	1	9
Kombakkam	7472	1	1	1	1	X	X	X	X	X	3	X	X	7
Murungapakkam	25209	1	1	1	1	X	X	X	X	X	1	X	X	5
Thengaithittu	6540	1	1	1	1	X	X	X	X	X	1	X	X	5

Source: Compiled by Consultant

From the table 12-2 it is observed that the existence of different facilities is marked for each village. The X mark represents the absence of that particular facilities, and the number 1 indicates the presence of facilities in the villages. Based on the presence of facilities the total weightage is calculated which is illustrated in the table 12-3.

Table 12-3 Weightage obtained for each Facilities

S. No	Facilities	Weightage
1.	No of Weekly/ Informal Markets	27.00
2.	No of Fire Station	8.10
3.	No of Community Health Center / ESI	7.36
4.	No of Nursing Homes / Rehabilitaion center General Hospitals / Specialty Hospitals	5.40
5.	No of Post and Telephone exchange facility	4.50
6.	No of Godowns/ whole sale	4.26
7.	No of Police Station / Outpost	3.68
8.	No of Banks	2.38
9.	No of Higher Secondary & High School	1.42
10.	No of Primary Health Center /Sub- Center	1.35
11.	No of Pre-primary, Primary and Middle schools	1.09
12.	No of Technical institutes, University and other colleges	1.00

Source: Compiled and obtained by consultant

The weightage of each facilities indicates that the highest the weightage, greater the scarcity of facilities across the study area. Hence it is also observed from the table 12-3 that the educational facilities are more sufficient at present and followed by the health facilities. The distribution of market facilities and commercial facilities are found to be insufficient on the overall planning area or it is agglomerated at one point. Hence its important to decentralize the commercial activities in the system to have the balanced growth.

12.4.1.3 COMPOSITE INDEX OF EACH FACILITIES:

Composite index is defined as the ratio between the weightage of each facility to the total number of the respective facilities and the Cumulative index is the sum of the index of each facility. Based on the above cumulative index value the villages are prioritized and the order of settlements are identified.

Table 12-4 Composite Index Analysis

S.No	Villages / Services		Educational Facilities - 2011 - (Both Govt and Private)						Health Facilities - 2011 (Both Govt and Private)						Security and defence - 2011				Communication Facilities		Trade and Commerce						Sum of Composite index of each facilities
	1		2		3		4		5		6		7		8		9		10		11		12		13		
	Name	Population - Census 2011	No of Pre-primary, Primary and Middle schools	Composite index	No of Higher Secondary & High School	Composite index	No of Technical institutes, University and other colleges	Composite index	No of Primary Health Center /Sub- Center	Composite index	No of Community Health Center / ESI	Composite index	No of Nursing Homes / Rehabilitation center General	Composite index	No of Police Station / Outpost	Composite index	No of Fire Station	Composite index	No of Post and Telephone exchange facility	Composite index	No of Godowns/ whole sale	Composite index	No of Banks	Composite index	No of Weekly/ Informal Markets	Composite index	
1	Puducherry	83373	25	27.25	41	58.22	6	6	4	5.4	2	14.72	18	97.2	1	3.68	1	8.1	4	18	16	68.16	13	30.94	3	81	418.67
2	Pudupalayam	62742	11	11.99	9	12.78	3	3	2	2.7	1	7.36	6	32.4	2	7.36	0	0	3	13.5	8	34.08	7	16.66	0	0	141.83
3	Olandai	59041	5	5.45	5	7.1	3	3	0	0	0	0	5	27	1	3.68	0	0	1	4.5	2	8.52	3	7.14	2	54	120.39
4	Murungapakkam	7472	6	6.54	3	4.26	3	3	1	1.35	0	0	0	0	0	0	0	0	0	0	6	25.56	0	0	0	0	40.71
5	Thengaithittu	25209	7	7.63	3	4.26	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	3	12.78	0	0	0	0	28.02
6	Kombakkam	6540	1	1.09	1	1.42	4	4	1	1.35	0	0	0	0	0	0	0	0	0	0	3	12.78	0	0	0	0	20.64
7	Karikalampakkam	6558	2	2.18	2	2.84	4	4	0	0	1	7.36	0	0	1	3.68	0	0	1	4.5	4	17.04	1	2.38	0	0	43.98
8	Kariamanickam	7685	5	5.45	2	2.84	3	3	2	2.7	0	0	0	0	0	0	0	0	1	4.5	0	0	1	2.38	0	0	20.87

S.No	Villages / Services		Educational Facilities - 2011 - (Both Govt and Private)						Health Facilities - 2011 (Both Govt and Private)						Security and defence - 2011				Communication Facilities		Trade and Commerce						Sum of Composite index of each facilities
	1		2		3		4		5		6		7		8		9		10		11		12		13		
	Name	Population - Census 2011	No of Pre-primary, Primary and Middle schools	Composite index	No of Higher Secondary & High School	Composite index	No of Technical institutes, University and other colleges	Composite index	No of Primary Health Center /Sub- Center	Composite index	No of Community Health Center / ESI	Composite index	No of Nursing Homes / Rehabilitation center General	Composite index	No of Police Station / Outpost	Composite index	No of Fire Station	Composite index	No of Post and Telephone exchange facility	Composite index	No of Godowns/ whole sale	Composite index	No of Banks	Composite index	No of Weekly/ Informal Markets	Composite index	
9	Embalam	8331	3	3.27	3	4.26	4	4	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	2	4.76	0	0	17.64
10	Nettapakkam	6331	1	1.09	4	5.68	3	3	1	1.35	0	0	0	0	1	3.68	0	0	1	4.5	0	0	1	2.38	0	0	21.68
11	Madukarai	9049	2	2.18	2	2.84	2	2	1	1.35	0	0	0	0	1	3.68	1	8.1	1	4.5	0	0	1	2.38	0	0	27.03
12	Korkadu	3418	4	4.36	1	1.42	1	1	1	1.35	0	0	0	0	0	0	0	0	1	4.5	1	4.26	0	0	0	0	16.89
13	Pandasozhanur	5643	3	3.27	1	1.42	1	1	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.04
14	Eripakkam	4703	3	3.27	0	0	1	1	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.62
15	Mannadipet	11176	5	5.45	6	8.52	2	2	1	1.35	0	0	0	0	1	3.68	1	8.1	2	9	0	0	2	4.76	0	0	42.86
16	Kalithirthalkuppam	8862	4	4.36	3	4.26	4	4	1	1.35	0	0	1	5.4	0	0	0	0	0	0	0	0	0	0	0	0	19.37
17	Madagadipet	7253	3	3.27	3	4.26	3	3	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	1	2.38	1	27	41.26

S.No	Villages / Services		Educational Facilities - 2011 - (Both Govt and Private)						Health Facilities - 2011 (Both Govt and Private)						Security and defence - 2011				Communication Facilities		Trade and Commerce						Sum of Composite index of each facilities
	1		2		3		4		5		6		7		8		9		10		11		12		13		
	Name	Population - Census 2011	No of Pre-primary, Primary and Middle schools	Composite index	No of Higher Secondary & High School	Composite index	No of Technical institutes, University and other colleges	Composite index	No of Primary Health Center /Sub- Center	Composite index	No of Community Health Center / ESI	Composite index	No of Nursing Homes / Rehabilitation center General	Composite index	No of Police Station / Outpost	Composite index	No of Fire Station	Composite index	No of Post and Telephone exchange facility	Composite index	No of Godowns/ whole sale	Composite index	No of Banks	Composite index	No of Weekly/ Informal Markets	Composite index	
18	Thiruvandarkoil	7078	2	2.18	4	5.68	3	3	1	1.35	0	0	0	0	0	0	0	0	0	0	1	4.26	0	0	0	0	16.47
19	Thirubuvanai	9374	1	1.09	3	4.26	2	2	1	1.35	1	7.36	0	0	1	3.68	1	8.1	0	0	0	0	2	4.76	0	0	32.60
20	Katteri	4292	1	1.09	3	4.26	1	1	2	2.7	0	0	0	0	1	3.68	0	0	1	4.5	0	0	3	7.14	0	0	24.37
21	Kodathur	3605	3	3.27	1	1.42	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.04
22	Kunitchampet	5692	1	1.09	2	2.84	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.28
23	Vadanur (Disputed)	4925	3	3.27	1	1.42	1	1	0	0	1	7.36	0	0	0	0	0	0	0	0	0	0	0	0	0	0	13.05
24	Sorapet	5110	3	3.27	1	1.42	1	1	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	1	2.38	0	0	9.42
25	Sanyasikuppam	2375	1	1.09	1	1.42	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.86
26	Thethampakkam	2109	2	2.18	1	1.42	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.60

S.No	Villages / Services		Educational Facilities - 2011 - (Both Govt and Private)						Health Facilities - 2011 (Both Govt and Private)						Security and defence - 2011				Communication Facilities		Trade and Commerce						Sum of Composite index of each facilities
	1		2		3		4		5		6		7		8		9		10		11		12		13		
	Name	Population - Census 2011	No of Pre-primary, Primary and Middle schools	Composite index	No of Higher Secondary & High School	Composite index	No of Technical institutes, University and other colleges	Composite index	No of Primary Health Center /Sub- Center	Composite index	No of Community Health Center / ESI	Composite index	No of Nursing Homes / Rehabilitation center General	Composite index	No of Police Station / Outpost	Composite index	No of Fire Station	Composite index	No of Post and Telephone exchange facility	Composite index	No of Godowns/ whole sale	Composite index	No of Banks	Composite index	No of Weekly/ Informal Markets	Composite index	
27	Kuppam	2731	1	1.09	1	1.42	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.51
28	Sellipattu	2893	0	0.00	1	1.42	1	1	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.77
29	Manalipet	1244	0	0.00	0	0	1	1	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.35
30	Chettipet	1822	1	1.09	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.09
31	Suthukeny	2637	0	0.00	0	0	1	1	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	1	2.38	0	0	4.73
32	Vambupet	1111	1	1.09	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.09
33	Pudukuppam	2211	0	0.00	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1.00
34	Bahour	10927	5	5.45	5	7.1	6	6	1	1.35	0	0	0	0	1	3.68	1	8.1	2	9	0	0	2	4.76	0	0	45.44
35	Kirumampakkam	10133	3	3.27	3	4.26	4	4	1	1.35	1	7.36	1	5.4	1	3.68	0	0	2	9	0	0	2	4.76	0	0	43.08
36	Seliamedu	5984	7	7.63	1	1.42	3	3	2	2.7	0	0	0	0	0	0	0	0	1	4.5	0	0	1	2.38	0	0	21.63

S.No	Villages / Services		Educational Facilities - 2011 - (Both Govt and Private)						Health Facilities - 2011 (Both Govt and Private)						Security and defence - 2011				Communication Facilities		Trade and Commerce						Sum of Composite index of each facilities
	1		2		3		4		5		6		7		8		9		10		11		12		13		
	Name	Population - Census 2011	No of Pre-primary, Primary and Middle schools	Composite index	No of Higher Secondary & High School	Composite index	No of Technical institutes, University and other colleges	Composite index	No of Primary Health Center /Sub- Center	Composite index	No of Community Health Center / ESI	Composite index	No of Nursing Homes / Rehabilitation center General	Composite index	No of Police Station / Outpost	Composite index	No of Fire Station	Composite index	No of Post and Telephone exchange facility	Composite index	No of Godowns/ whole sale	Composite index	No of Banks	Composite index	No of Weekly/ Informal Markets	Composite index	
37	Manapattu	8227	5	5.45	0	0	4	4	2	2.7	0	0	0	0	0	0	0	0	0	0	0	0	1	2.38	0	0	14.53
38	Karayamputhur	4518	3	3.27	2	2.84	2	2	1	1.35	0	0	0	0	1	3.68	0	0	0	0	0	0	2	4.76	0	0	17.90
39	Outchimedu	3959	2	2.18	1	1.42	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.95
40	Pillaiarkuppam	5309	2	2.18	0	0	2	2	1	1.35	0	0	1	5.4	0	0	0	0	0	0	0	0	0	0	0	0	10.93
41	Kuruvinatham	7289	2	2.18	1	1.42	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5.60
42	Manamedu	2345	2	2.18	0	0	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	1	2.38	0	0	7.91
43	Panayadikuppam	1316	1	1.09	0	0	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.44
44	Aranganur	2426	0	0.00	0	0	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	1	2.38	0	0	5.73
45	Irulansathai	1670	1	1.09	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.09
46	Parikalpet	3835	1	1.09	0	0	1	1	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.44

S.No	Villages / Services		Educational Facilities - 2011 - (Both Govt and Private)						Health Facilities - 2011 (Both Govt and Private)						Security and defence - 2011				Communication Facilities		Trade and Commerce						Sum of Composite index of each facilities
	1		2		3		4		5		6		7		8		9		10		11		12		13		
	Name	Population - Census 2011	No of Pre-primary, Primary and Middle schools	Composite index	No of Higher Secondary & High School	Composite index	No of Technical institutes, University and other colleges	Composite index	No of Primary Health Center /Sub- Center	Composite index	No of Community Health Center / ESI	Composite index	No of Nursing Homes / Rehabilitation center General	Composite index	No of Police Station / Outpost	Composite index	No of Fire Station	Composite index	No of Post and Telephone exchange facility	Composite index	No of Godowns/ whole sale	Composite index	No of Banks	Composite index	No of Weekly/ Informal Markets	Composite index	
47	Kaduvanur	819	1	1.09	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.09
48	Ariyankuppam (URBAN)	29808	14	15.26	3	4.26	4	4	2	2.7	1	7.36	0	0	1	3.68	0	0	1	4.5	7	29.82	2	4.76	0	0	76.34
49	Manavely (CT) (URBAN)	15666	3	3.27	3	4.26	2	2	2	2.7	0	0	0	0	0	0	0	0	0	0	8	34.08	0	0	0	0	46.31
50	Thavalakuppam	9212	5	5.45	2	2.84	3	3	2	2.7	0	0	1	5.4	1	3.68	0	0	0	0	0	0	2	4.76	0	0	27.83
51	Pooranankuppam	6766	4	4.36	0	0	2	2	2	2.7	0	0	0	0	0	0	0	0	1	4.5	0	0	0	0	0	0	13.56
52	Abishekapakkam	7124	1	1.09	1	1.42	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	1	2.38	0	0	8.24
53	Thimmanaickenpalayam	3479	0	0.00	0	0	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.35
54	Villianur (CT) (URBAN)	34383	11	11.99	12	17.04	6	6	2	2.7	1	7.36	0	0	1	3.68	1	8.1	0	0	2	8.52	3	7.14	0	0	72.53
55	Odiampet (OG) WARD	13365	4	4.36	5	7.1	4	4	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	16.81

S.No	Villages / Services		Educational Facilities - 2011 - (Both Govt and Private)						Health Facilities - 2011 (Both Govt and Private)						Security and defence - 2011				Communication Facilities		Trade and Commerce						Sum of Composite index of each facilities
	1		2		3		4		5		6		7		8		9		10		11		12		13		
	Name	Population - Census 2011	No of Pre-primary, Primary and Middle schools	Composite index	No of Higher Secondary & High School	Composite index	No of Technical institutes, University and other colleges	Composite index	No of Primary Health Center /Sub- Center	Composite index	No of Community Health Center / ESI	Composite index	No of Nursing Homes / Rehabilitation center General	Composite index	No of Police Station / Outpost	Composite index	No of Fire Station	Composite index	No of Post and Telephone exchange facility	Composite index	No of Godowns/ whole sale	Composite index	No of Banks	Composite index	No of Weekly/ Informal Markets	Composite index	
	NO-0008 (URBAN)																										
56	Ariyur	8758	3	3.27	4	5.68	2	2	1	1.35	0	0	1	5.4	0	0	0	0	0	0	0	0	0	0	0	0	17.70
57	Sedarapet	4756	2	2.18	2	2.84	3	3	1	1.35	1	7.36	0	0	1	3.68	1	8.1	0	0	0	0	1	2.38	0	0	30.89
58	Uruvaiyaru	4568	1	1.09	3	4.26	5	5	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	1	2.38	0	0	14.08
59	Mangalam	4320	3	3.27	1	1.42	1	1	0	0	0	0	0	0	1	3.68	0	0	0	0	2	8.52	1	2.38	0	0	20.27
60	Kurumbapet (GP) (URBAN)	19506	4	4.36	0	0	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.71
61	Kizhur	2955	2	2.18	1	1.42	2	2	2	2.7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.30
62	Thondamanatham	4090	2	2.18	2	2.84	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.37
63	Koodapakkam	7147	0	0.00	2	2.84	2	2	1	1.35	0	0	1	5.4	0	0	0	0	0	0	0	0	0	0	0	0	11.59

S.No	Villages / Services		Educational Facilities - 2011 - (Both Govt and Private)						Health Facilities - 2011 (Both Govt and Private)						Security and defence - 2011				Communication Facilities		Trade and Commerce						Sum of Composite index of each facilities
	1		2		3		4		5		6		7		8		9		10		11		12		13		
	Name	Population - Census 2011	No of Pre-primary, Primary and Middle schools	Composite index	No of Higher Secondary & High School	Composite index	No of Technical institutes, University and other colleges	Composite index	No of Primary Health Center /Sub- Center	Composite index	No of Community Health Center / ESI	Composite index	No of Nursing Homes / Rehabilitation center General	Composite index	No of Police Station / Outpost	Composite index	No of Fire Station	Composite index	No of Post and Telephone exchange facility	Composite index	No of Godowns/ whole sale	Composite index	No of Banks	Composite index	No of Weekly/ Informal Markets	Composite index	
64	Oussudu	3227	3	3.27	1	1.42	1	1	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	7.04
65	Sathamangalam	2977	2	2.18	0	0	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	1	2.38	0	0	7.91
66	Ulaivaikkal	1224	2	2.18	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.18
67	Ramanathapuram	2841	1	1.09	1	1.42	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4.51
68	Thirukanchi	4207	1	1.09	1	1.42	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	2.38	0	0	6.89
69	Karasoor	1752	1	1.09	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.09
70	Perungalur	1765	1	1.09	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.09
71	Pillaiyarkuppam	2744	1	1.09	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.09
72	Thutipet	939	1	1.09	0	0	2	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3.09
73	Manakuppam	1254	1	1.09	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.09
74	Thattanchavady	81772	19	20.71	13	18.46	8	8	6	8.1	2	14.72	6	32.4	2	7.36	1	8.1	2	9	1	4.26	5	11.9	0	0	143.01

S.No	Villages / Services		Educational Facilities - 2011 - (Both Govt and Private)						Health Facilities - 2011 (Both Govt and Private)						Security and defence - 2011				Communication Facilities		Trade and Commerce						Sum of Composite index of each facilities
	1		2		3		4		5		6		7		8		9		10		11		12		13		
	Name	Population - Census 2011	No of Pre-primary, Primary and Middle schools	Composite index	No of Higher Secondary & High School	Composite index	No of Technical institutes, University and other colleges	Composite index	No of Primary Health Center /Sub- Center	Composite index	No of Community Health Center / ESI	Composite index	No of Nursing Homes / Rehabilitation center General	Composite index	No of Police Station / Outpost	Composite index	No of Fire Station	Composite index	No of Post and Telephone exchange facility	Composite index	No of Godowns/ whole sale	Composite index	No of Banks	Composite index	No of Weekly/ Informal Markets	Composite index	
75	Saram	91881	9	9.81	11	15.62	5	5	1	1.35	0	0	2	10.8	2	7.36	0	0	1	4.5	2	8.52	8	19.04	0	0	82.00
76	Karuvadikuppam	22146	13	14.17	4	5.68	3	3	0	0	0	0	1	5.4	2	7.36	0	0	1	4.5	1	4.26	2	4.76	0	0	49.13
77	Kalapet	42673	4	4.36	8	11.36	7	7	2	2.7	0	0	1	5.4	1	3.68	1	8.1	0	0	0	0	0	0	0	0	42.60
78	Reddiyarpalayam	15847	6	6.54	8	11.36	3	3	1	1.35	1	7.36	3	16.2	1	3.68	0	0	0	0	0	0	3	7.14	0	0	56.63
79	Oulgaret	34283	5	5.45	5	7.1	2	2	1	1.35	0	0	4	21.6	0	0	0	0	0	0	3	12.78	0	0	0	0	50.28
80	Alankuppam	4932	3	3.27	1	1.42	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8.04
81	Pillaichavady	6570	2	2.18	1	1.42	2	2	1	1.35	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6.95

Source: Compiled by Consultant

12.4.1.4 ORDER OF SETTLEMENTS IN URBAN AREA

To understand the depth of order of settlements the analysis has been carried out separately for the urban and rural areas of Puducherry region which helps us to identify the next growth centers and growth points. The table 12-5 indicates that the identification of order of settlements within the municipality area of Puducherry region.

Table 12-5 Order of Settlements in Urban Areas of Puducherry Planning Area

S. No	Villages / Services		Order of settlements		Orders
	Name	Population - Census 2011	Sum of Composite index (CI) of each facility	Rank based on Composite Index value	
1	Puducherry	202270	418.67	1	Greater degree of difference of Composite Index value between 1st and 2nd rank
2	Thattanchavady	7011	143.01	2	1
3	Pudupalayam	6511	141.83	3	1
4	Olandai	12359	120.39	4	2
5	Saram	6355	82	5	2
6	Reddiyarpalayam	13351	56.63	8	4
7	Oulgaret	236305	50.28	9	4
8	Karuvadikuppam	13291	49.13	10	4
9	Kalapet	12289	42.6	16	4
10	Murungapakkam	9225	40.71	18	4
11	Thengaithittu	7472	28.02	21	5
12	Kombakkam	6540	20.64	28	5
13	Alankuppam	4932	8.04	48	5
14	Pillaichavady	6570	6.95	56	5

Source: Compiled by Consultant

12.4.1.5 ANALYSIS OF ORDER OF SETTLEMENTS WITHIN URBAN VILLAGES

It is also observed from the table 12-5 that the Puducherry is saturated with the existing development and it has got the facilities which suffices its population and supports the major out growth areas of municipalities. This saturation is due to extensive development within the limited area or the agglomeration of commercial and social facilities within the Puducherry core area. The Puducherry core area is one of the oldest settlement in the planning area and also acts as the Central Business District (CBD) for the entire region in the system. Therefore, the table clearly indicates that the Puducherry core area has to be decentralized to have balanced development throughout the region. It is also observed that Thattanchavady serves as central service center after Puducherry. The Kalapet and Pillaichavady provides services such as major educational institutions in the system. Hence due to its locational advantage and proximity it is well to be retained as knowledge zone for the entire Planning area.

12.4.1.6 ORDER OF SETTLEMENTS IN RURAL AREA

Table 12-6 Order of Settlements in Rural Areas of Puducherry Planning Area

S. No	Villages / Services		Order of settlements		Orders
	Name	Population - Census 2011	Sum of Composite index of each facilities	Rank based on CI value	
1	Ariyankuppam (URBAN)	29808	76.34	1	1
2	Villianur (CT) (URBAN)	34383	72.53	2	2
3	Manavely (CT) (URBAN)	15666	46.31	3	4
4	Bahour	10927	45.44	4	4
5	Karikalampakkam	6558	43.98	5	4
6	Kirumampakkam	10133	43.08	6	4
7	Mannadipet	11176	42.86	7	4
8	Madagadipet	7253	41.26	8	4
9	Thirubuvanai	9374	32.6	9	5
10	Sedarapet	4756	30.89	10	5
11	Thavalakuppam	9212	27.83	11	5
12	Madukarai	9049	27.03	12	5
13	Katteri	4292	24.37	13	6
14	Nettapakkam	6331	21.68	14	6
15	Seliamedu	5984	21.63	15	6
16	Kariamanickam	7685	20.87	16	6
17	Mangalam	4320	20.27	17	6
18	Kalithirthalkuppam	8862	19.37	18	6
19	Karayamputhur	4518	17.9	19	6
20	Ariyur	8758	17.7	20	6
21	Embalam	8331	17.64	21	6
22	Korkadu	3418	16.89	22	6
23	Odiampet (OG) WARD NO-0008 (URBAN)	13365	16.81	23	6
24	Thiruvandarkoil	7078	16.47	24	6
25	Manapattu	8227	14.53	25	6
26	Uruvaiyar	4568	14.08	26	6
27	Pooranankuppam	6766	13.56	27	6
28	Vadanur (Disputed)	4925	13.05	28	6

S. No	Villages / Services		Order of settlements		Orders
	Name	Population - Census 2011	Sum of Composite index of each facilities	Rank based on CI value	
29	Koodapakkam	7147	11.59	29	7
30	Pillayarkuppam	5309	10.93	30	7
31	Sorapet	5110	9.42	31	7
32	Thondamanatham	4090	8.37	32	7
33	Kizhur	2955	8.3	33	7
34	Abishegapakkam	7124	8.24	34	7
35	Kodathur	3605	8.04	35	7
36	Manamedu	2345	7.91	36	7
37	Sathamangalam	2977	7.91	37	7
38	Kurumbapet (GP) (URBAN)	19506	7.71	38	7
39	Kunichampet	5692	7.28	39	7
40	Pandashozhanur	5643	7.04	40	7
41	Oussudu	3227	7.04	41	7
42	Outchimedu	3959	6.95	42	7
43	Thirukanchi	4207	6.89	43	7
44	Sanyasikuppam	2375	5.86	44	7
45	Aranganur	2426	5.73	45	7
46	Eripakkam	4703	5.62	46	7
47	Kuruvinatham	7289	5.6	47	7
48	Suthukeny	2637	4.73	48	7
49	Thethampakkam	2109	4.6	49	7
50	Ramanathapuram	2841	4.51	50	7
51	Panayadikuppam	1316	4.44	51	7
52	Ulaivaikkal	1224	4.18	52	7
53	Sellipattu	2893	3.77	53	7
54	Kuppam	2731	3.51	54	7
55	Parikalpet	3835	3.44	55	7
56	Thimmanaickenpalayam	3479	3.35	56	7
57	Irulansandy	1670	3.09	57	7
58	Karasur	1752	3.09	58	7
59	Perungalur	1765	3.09	59	7

S. No	Villages / Services		Order of settlements		Orders
	Name	Population - Census 2011	Sum of Composite index of each facilities	Rank based on CI value	
60	Pillayarkuppam	2744	3.09	60	7
61	Thutipet	939	3.09	61	7
62	Manalipet	1244	2.35	62	7
63	Chettipet	1822	2.09	63	7
64	Vambupet	1111	2.09	64	7
65	Kaduvanur	819	2.09	65	7
66	Manakuppam	1254	2.09	66	7
67	Pudukuppam	2211	1	67	7

Source: Compiled by Consultant

12.4.1.6.1 ANALYSIS OF ORDER OF SETTLEMENTS WITHIN RURAL VILLAGES

From the above table 12-6 it indicates that the outgrowth villages such as Ariyankuppam, Manavely, Villianur are fastest growing villages at the Commune level which are at the threshold reach of 1st & 2nd order at present. These three villages have the potential to become the first order settlement in due course of time in overall planning area. Therefore, considering the above scenario, the proposal to be planned in such a manner that these villages should be proposed within the new conurbation area. Since these villages are well served with existing road networks and infrastructure facilities, developing them as infill development and densification is good opportunity to support Transit Oriented Development in future. After the extensive study of the location of the villages the new conurbation area is identified and proposed taking into account the natural boundaries, level of infrastructure facilities and the proximity to the municipal area.

12.4.1.7 ORDER OF SETTLEMENTS FOR ENTIRE PUDUCHERRY PLANNING AREA

Table 12-7 Order of Settlements of Puducherry Planning Area

S. No	Villages / Services		Order of settlements		
	Name	Population - Census 2011	Sum of Composite index of each facilities	Rank	Orders
1	Puducherry	83373	418.67	1	First
2	Thattanchavady	81772	143.01	2	Fifth
3	Pudupalayam	62742	141.83	3	Fifth
4	Olandai	59041	120.39	4	Sixth
5	Saram	91881	82	5	Sixth
6	Ariyankuppam (URBAN)	29808	76.34	6	Sixth
7	Villianur (CT) (URBAN)	34383	72.53	7	Sixth

S. No	Villages / Services		Order of settlements		
	Name	Population - Census 2011	Sum of Composite index of each facilities	Rank	Orders
8	Reddiyarpalayam	22146	56.63	8	Seventh
9	Oulgaret	42673	50.28	9	Seventh
10	Karuvadikuppam	15847	49.13	10	Seventh
11	Manavely (CT) (URBAN)	15666	46.31	11	Seventh
12	Bahour	10927	45.44	12	Seventh
13	Karikalampakkam	6558	43.98	13	Seventh
14	Kirumampakkam	10133	43.08	14	Seventh
15	Mannadipet	11176	42.86	15	Seventh
16	Kalapet	34283	42.6	16	Seventh
17	Madagadipet	7253	41.26	17	Seventh
18	Murungapakkam	7472	40.71	18	Seventh
19	Thirubuvanai	9374	32.6	19	Seventh
20	Sedarapet	4756	30.89	20	Seventh
21	Thengaithittu	25209	28.02	21	Seventh
22	Thavalakuppam	9212	27.83	22	Seventh
23	Madukarai	9049	27.03	23	Seventh
24	Katteri	4292	24.37	24	Seventh
25	Nettapakkam	6331	21.68	25	Seventh
26	Seliamedu	5984	21.63	26	Seventh
27	Kariamanickam	7685	20.87	27	Seventh
28	Kombakkam	6540	20.64	28	Seventh
29	Mangalam	4320	20.27	29	Seventh
30	Kalithirthalkuppam	8862	19.37	30	Seventh
31	Karayamputhur	4518	17.9	31	Seventh
32	Ariyur	8758	17.7	32	Seventh
33	Embalam	8331	17.64	33	Seventh
34	Korkadu	3418	16.89	34	Seventh
35	Odiampet (OG) WARD NO-0008 (URBAN)	13365	16.81	35	Seventh
36	Thiruvandarkoil	7078	16.47	36	Seventh
37	Manapattu	8227	14.53	37	Seventh

S. No	Villages / Services		Order of settlements		
	Name	Population - Census 2011	Sum of Composite index of each facilities	Rank	Orders
38	Uruvaiyaru	4568	14.08	38	Seventh
39	Pooranankuppam	6766	13.56	39	Seventh
40	Vadanur (Disputed)	4925	13.05	40	Seventh
41	Koodapakkam	7147	11.59	41	Seventh
42	Pillayarkuppam	5309	10.93	42	Seventh
43	Sorapet	5110	9.42	43	Seventh
44	Thondamanatham	4090	8.37	44	Seventh
45	Kizhur	2955	8.3	45	Seventh
46	Abishegapakkam	7124	8.24	46	Seventh
47	Kodathur	3605	8.04	47	Seventh
48	Alankuppam	4932	8.04	48	Seventh
49	Manamedu	2345	7.91	49	Seventh
50	Sathamangalam	2977	7.91	50	Seventh
51	Kurumbapet (GP) (URBAN)	19506	7.71	51	Seventh
52	Kunichampet	5692	7.28	52	Seventh
53	Pandasozhanur	5643	7.04	53	Seventh
54	Oussudu	3227	7.04	54	Seventh
55	Outchimedu	3959	6.95	55	Seventh
56	Pillaichavady	6570	6.95	56	Seventh
57	Thirukanchi	4207	6.89	57	Seventh
58	Sanyasikuppam	2375	5.86	58	Seventh
59	Aranganur	2426	5.73	59	Seventh
60	Eripakkam	4703	5.62	60	Seventh
61	Kuruvinatham	7289	5.6	61	Seventh
62	Suthukeny	2637	4.73	62	Seventh
63	Thethampakkam	2109	4.6	63	Seventh
64	Ramanathapuram	2841	4.51	64	Seventh
65	Panayadikuppam	1316	4.44	65	Seventh
66	Ulaivaikkal	1224	4.18	66	Seventh
67	Sellipattu	2893	3.77	67	Seventh
68	Kuppam	2731	3.51	68	Seventh

S. No	Villages / Services		Order of settlements		
	Name	Population - Census 2011	Sum of Composite index of each facilities	Rank	Orders
69	Parikalpet	3835	3.44	69	Seventh
70	Thimmanaickenpalayam	3479	3.35	70	Seventh
71	Irulansandy	1670	3.09	71	Seventh
72	Karasur	1752	3.09	72	Seventh
73	Perungalur	1765	3.09	73	Seventh
74	Pillaiyarkuppam	2744	3.09	74	Seventh
75	Thutipet	939	3.09	75	Seventh
76	Manalipet	1244	2.35	76	Seventh
77	Chettipet	1822	2.09	77	Seventh
78	Vambupet	1111	2.09	78	Seventh
79	Kaduvanur	819	2.09	79	Seventh
80	Manakuppam	1254	2.09	80	Seventh
81	Pudukuppam	2211	1	81	Seventh

Source: Compiled and derived by consultant

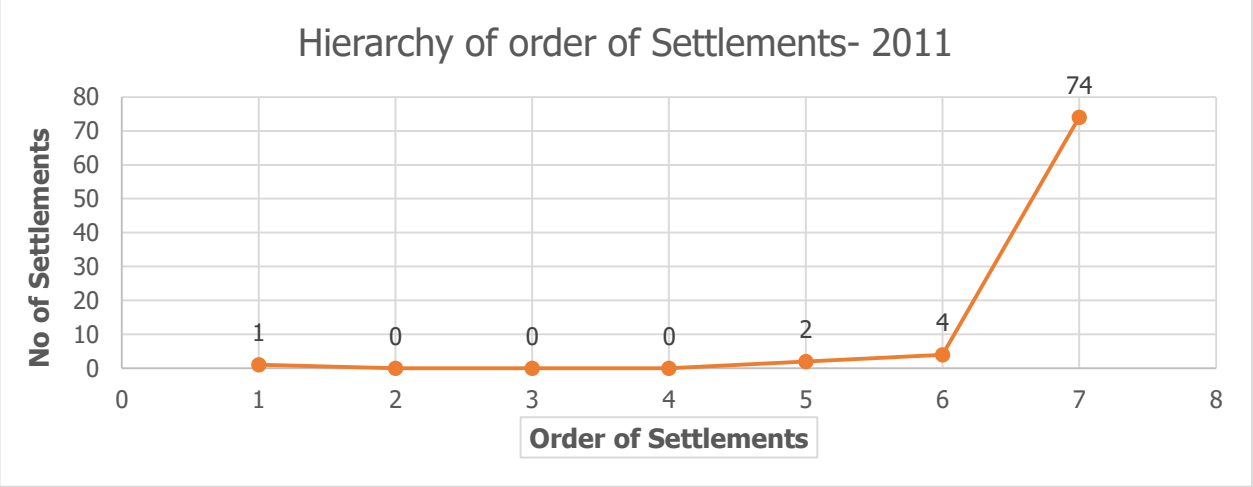


Figure 12.11 Number of settlements vs order of settlements

12.4.1.7.1 ANALYSIS OF ORDER OF SETTLEMENTS OF ENTIRE PUDUCHERRY PLANNING AREA

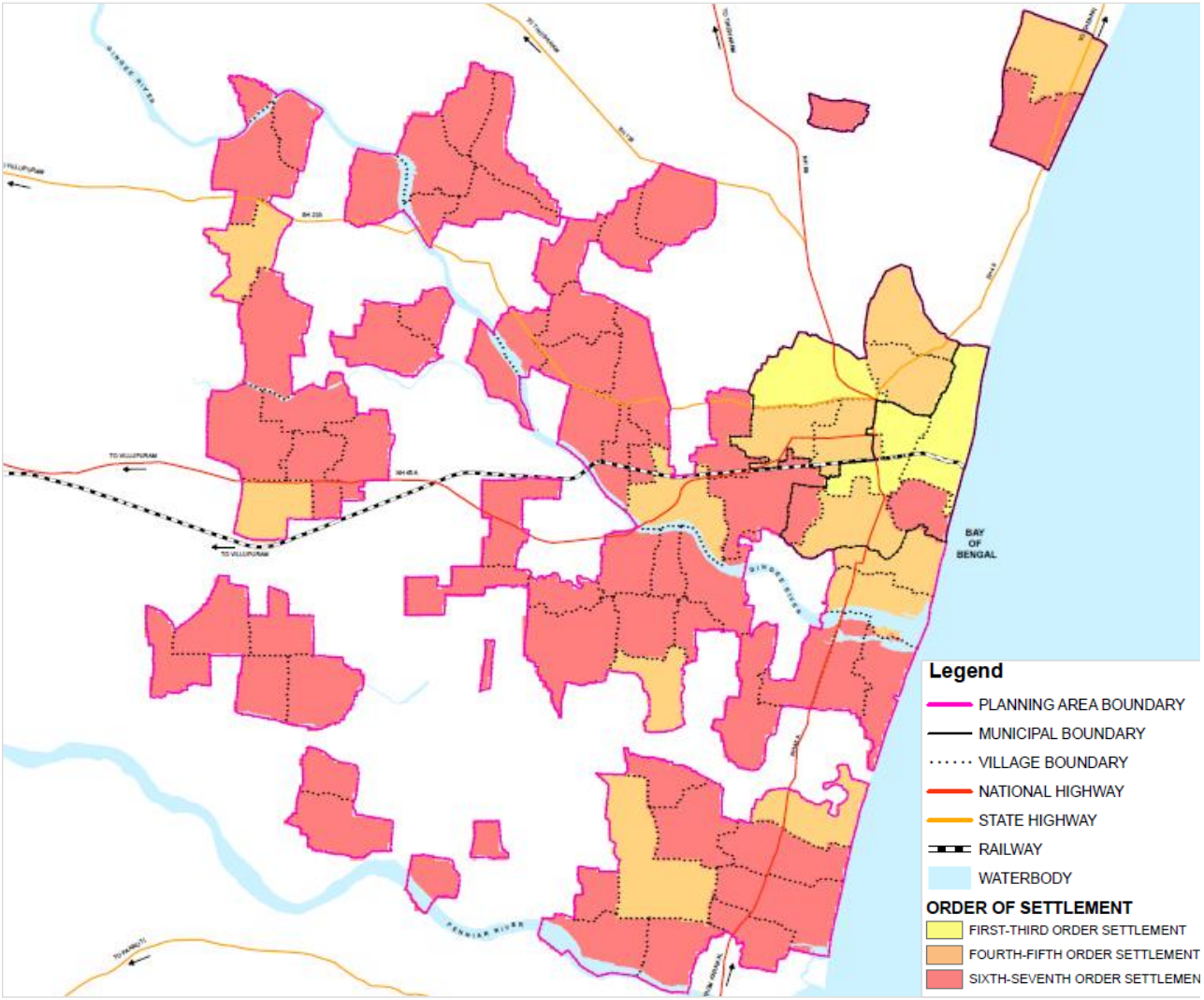


Figure 12.12 Map illustrating order of settlement in Puducherry Planning Area

Table 12-8 No of order of settlements - 2011

S. No	Orders of settlements	No of Settlements
1	1	1
2	2	Nil
3	3	Nil
4	4	Nil
5	5	2
6	6	4
7	7	74

Source: Compiled by Consultant

➢ First Order Settlements

The table 12-7 clearly indicates that the Puducherry ranks first as first order settlement, where the highest value of Cumulative index is 418.67. Though the population of Puducherry is less, compare to that of Oulgaret but number of facilities existing in Puducherry are more. Hence it implicates that the facilities are concentrated in the Puducherry core area. Therefore, the application of decentralization concept is very vital to attain balanced growth within the planning area. The difference in cumulative index value between the first and fifth order settlements ascertains the existing scenario that the Puducherry is congested with Government institutions and educational institutions along with the commercial centers like Central Goubert market which carry whole sale activities for the region. The major reason for congestion in Puducherry municipality is clustering of important facilities ranging from Government buildings to all commercial activities, Cultural centers, library, recreational and spiritual activities as well as it is still under the influence of political and cultural influence by French government to pull more people and facilities in the core area.

Due to the presence of major urban activities in such a small area, it had led to sever pressure on infrastructure and parking leads to overall deterioration of quality of living. It's also important to note that, the core area is a major tourist center attracting tourist from India & abroad, hence preserving the quality and inherited heritage is a critical aspect of this Comprehensive Development Plan-2036.

➢ Second Order Settlements, Third Order Settlements & Fourth Order Settlements

Based on table 12-8, it is also been observed that second, third and fourth order classification has nil number of settlements which clearly indicates that the remaining areas are highly dependent on Puducherry for the major facilities. The cumulative index value gap between the first order and the fifth order indicates that the infrastructure facilities are not evenly distributed. Hence due care is to be taken while formulating proposals in such a way that the central villages, growth centers and growth points are evenly located both geographically and based on the population ratio.

➢ Fifth Order Settlements

Based on the table 12-8, it is also been observed that there are 2 settlements under the fifth order settlement, namely Thattanchavady and Pudupalayam, which are at a proximity of 6 Km from Puducherry core town area. The gap between the value of first order settlement and fifth order settlement is very high. It is important to understand that the growth of service delivery facilities and infrastructure in a particular area is not only depended on the population size but also be influenced by political factors.

➢ Sixth Order Settlements

Table 12-8 indicates that sixth order settlement has got 4 number of settlements ie. Olandai, Saram, Ariyankuppam and Villianur. These are the settlements within the continuous geographical area of urban boundary. These areas have got the high potential for development due to proximity to Central Business District and major transit corridors. Though the Ariyankuppam and Villianur are the outgrowth of Puducherry and Oulgaret Municipality these villages are still lacking with infrastructure facilities. Hence it is highly dependent on the Puducherry CBD area. These settlements act as an interconnecting link between the urban and peri-urban area of the region in the system. With proper planning intervention, such as infill developments, and identification of activities to trigger investments which will facilitate overall development of the region.

➢ Seventh Order Settlements

Table 12-8 it indicates that there are 74 settlements which belong to both urban and rural area during the year 2011. These settlements have less composite index values indicates that lack of facilities with respect to the population it serves. One of the major factors limiting the growth of

certain villages is the fact that planning area is non-contiguous and these villages are disconnected from the main core of the planning area. Many of these rural settlements in this category are dependent on the agricultural resources with insufficient market & storage facilities for their products to sale. The few areas located in the major road connectivity which have the potential to develop as second and third order hierarchy of settlements. The Villages such as Manavely, Thengaithittu, Murungapakkam, Thavalakuppam, Madagadipet, Mannadipet, Bahour, Kirumampakkam, Kalitheerthalkuppam and Sedarapet are the villages which have the potential to be developed as growth centers and growth points.

The spatial pattern of distribution and the ranking of settlements on the basis of both simple aggregations of facilities and on the composite indices provide indications to the existing pattern of hierarchy and space relations. The different levels of settlement hierarchy reflect different levels of nodality or centrality. The size of settlement can be established on the basis of population or the functions available in those settlements. However, the study also brings out the fact that a large sized settlement need not necessarily have a higher rank on the basis of composite functions. Added to that the Puducherry Municipality is over loaded with all amenities and it is high time to decongest the city. Identification of settlement to develop as 2nd and 3rd order settlements to focus the balanced growth in overall Puducherry region can be witnessed from this study.

12.4.1.8 PROCEDURE ADOPTED FOR THE PROPOSED HIERARCHY OF SETTLEMENTS

The concept as per the Crystallor's Central place theory in identifying the proposed hierarchy of settlements is that spatial distribution of settlements of various hierarchies should be centrally located (as far as possible) with respect to the service area or population to be served. Theoretically speaking, there will be one first order settlement serving the entire region. The service area of a settlement is hexagonal in shape as per the Crystallor's theory.

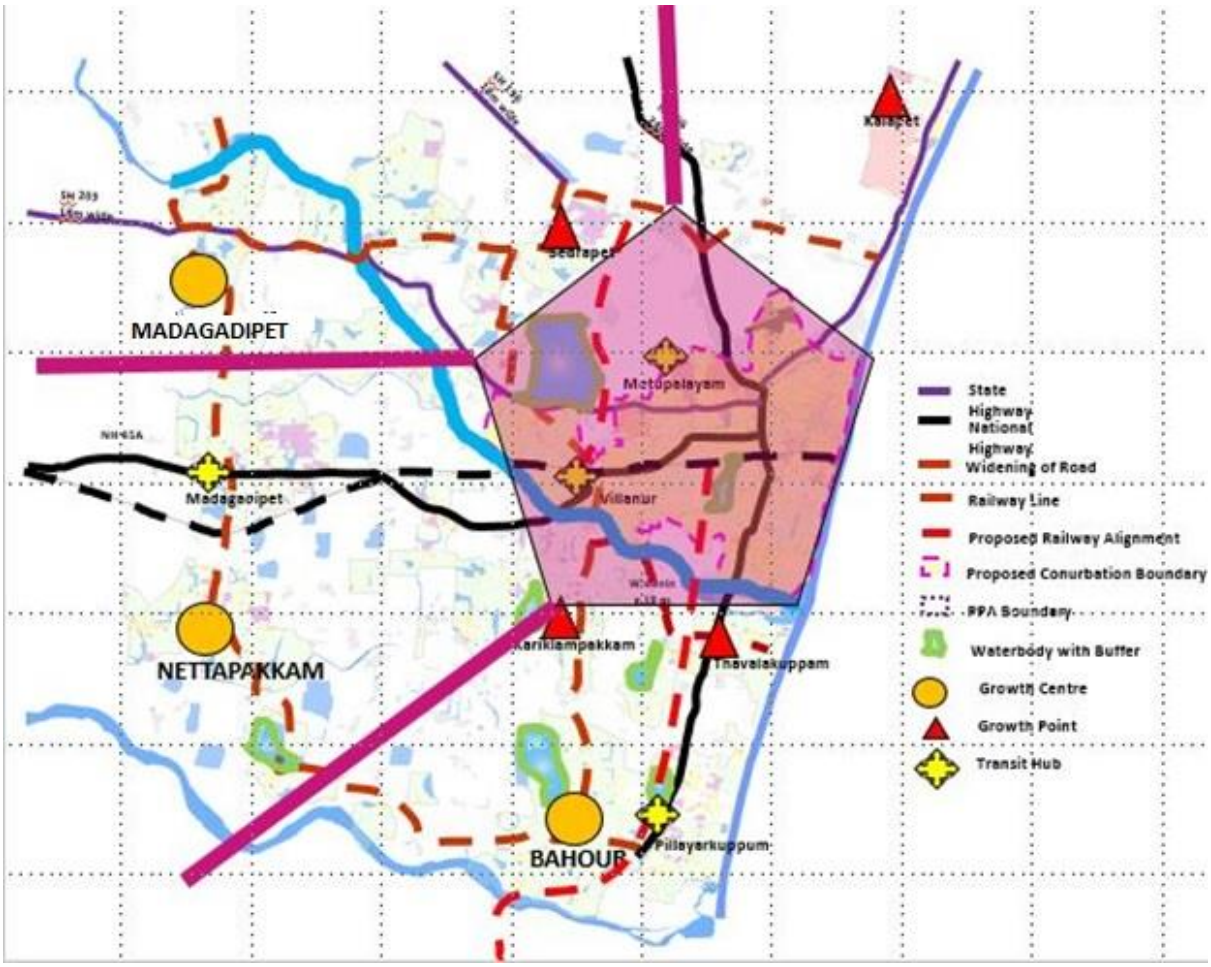


Figure 12.13 Proposed first order settlement serving Growth center and Growth point

The Crystallor's Central Place theory stipulates that the lower order settlements are placed at the vertices of the hexagonal shaped service area of the higher order settlements. But here the service area of the first order settlement is the entire municipality areas and outgrowth which covers in the contiguous pattern of land forms and hence it is assumed that there are at least major seven (7) second order settlements one from each of the sub regions (North division, North-West division, South-West division and South-division) of the region. The vertices of the service area determine the location of the next lower settlements i.e. the third order and fourth order settlement. The remaining settlements of the region are assumed to be having the lowest order, i.e. the fifth and sixth order settlement.

12.4.1.9 PROPOSED HIERARCHY OF SETTLEMENTS

The existing hierarchy of the settlements, especially of those settlements with higher order, cannot be shuffled altogether. Though there is wide difference between the first order and consecutive one the few villages fit into the proposed conurbation boundary where growth foci may be anticipated in the system. Hence this entire conurbation area will act as growth foci. Identification of second order settlements While assessing the proposed hierarchy of settlements of the region after 20 years, the villages in the major transportation corridor has been considered which already serving the hinterlands will function as growth centers and growth points.

Table 12-9 No of order of settlements - 2036

S. No	Orders of Settlements	Number of Settlements - 2036
1	1	11
2	2	14
3	3	14
4	4	14
5	5	14
6	6	14
Total		81

Source: Compiled by Consultant



Figure 12.14 Proposed hierarchy of order of Settlements - 2036

In the entire region those settlements in the seventh orders as per the existing hierarchy of settlements are taken as such with a slight modification while identifying the proposed hierarchy of settlements. The modification is that the existing Seventh order settlements are split into III, IV, V and VI order based on the growth center and growth point development approach. Further the III and IV order are combined together to function as growth nodes and V and VI order are combined to function as service villages to have the balance development across the region.

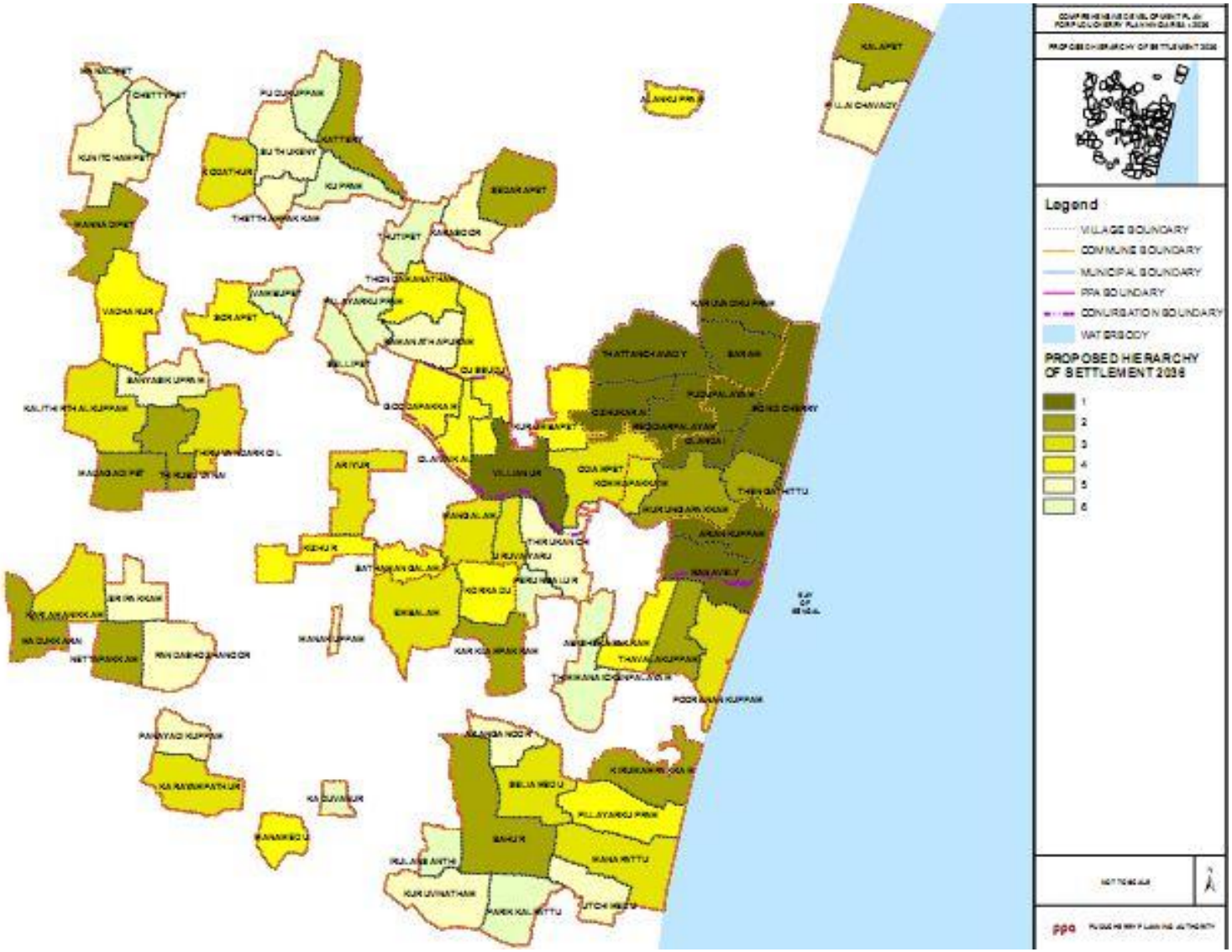


Figure 12.15 Proposed order of settlements 2036

From the figure 12.15 it has been observed that Mannadipet, Nettapakkam, and Bahour function as important growth centers and Kalapet, Thavalakuppam and Kariklampakkam are found to be the major growth points, which has more than 60% of growth rate from 2011 to 2036. It's also important to note that these areas are well served with the existing road network. Though the Sedarapet is found to have a growth rate of 35%, the promotion of SEZ zone and the recent Industrial policy 2016 is to be consider attracting major development and hence Sedarapet have a major push to be developed as another growth point within planning area to serve the surrounding hinterlands of region in the system.

12.4.1.10FUNCTIONAL CHARACTER OF PROPOSED HIERARCHY OF SETTLEMENTS

Puducherry has a unique settlement pattern where by, the function of a settlement cannot be limited to the usual classification of urban or rural. There exists a character exhibiting a combination of the two which needs to be explored. The proposed hierarchy of settlements shows that there exists semi urban and semi-rural character in settlements in addition to the urban and rural character. The functional character of the settlements is presented in the table 12-10. The spatial distribution of the settlements based on its character shows a clear demarcation in the pattern of the settlements in four categories ie., Urban, Semi urban, semi-rural and rural in nature.

Table 12-10 Proposed function of order of settlements - 2036

Oder of settlements	**No of Settlements**	**Functional Character of settlements**	**Nature of settlement**
1	11	Proposed Conurbation area / Growth foci	Urban
2	14	Proposed Growth centers and Growth points	Semi Urban
3	14	Growth nodes	Semi Rural
4	14		
5	14	Service villages	Rural
6	14		
Total	**81**		

Source: Compiled by Consultant

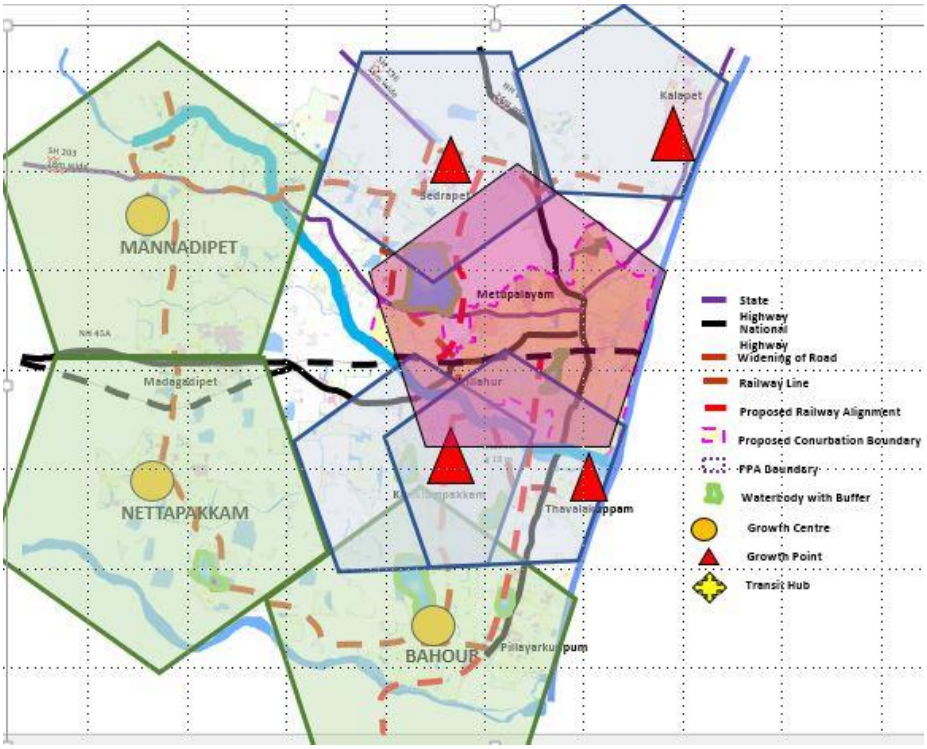


Figure 12.16 Proposed second order settlement serving Service centers and Rural villages

12.4.1.11POLARISATION EFFECT

The centrality study reveals that due to development proposals how far the growth centers and growth points creates the polarization effect in the study region and helps us to identify the dominant or vibrant region where poles of development are concentrated, and the development of economic activities are more. The figure 12.17 represents the vibrant area across the study region in the system. It clearly indicates that the fast growth may be anticipated in the villages passing through the NH45A and Uruvaiyaru road from Villianur to Bahour and ECR - Thavalakuppam to Cuddalore road.

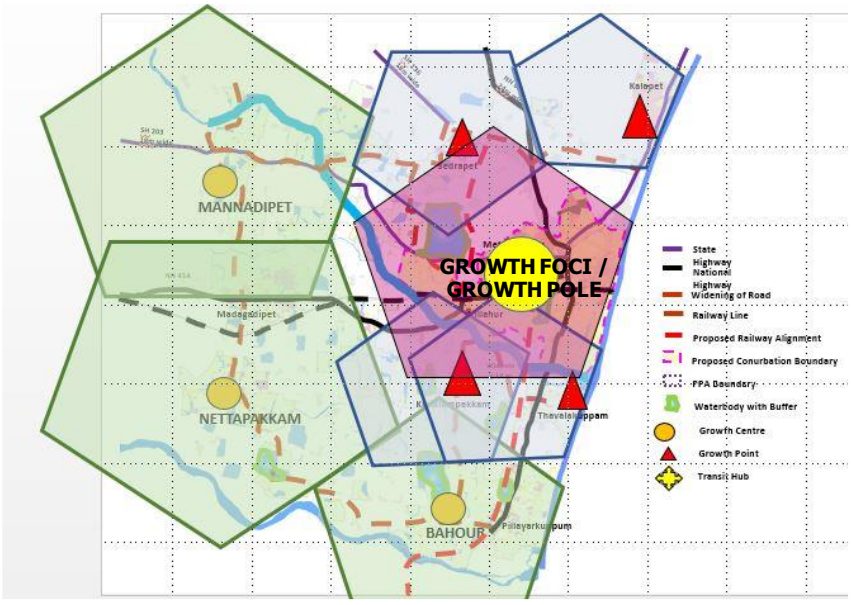


Figure 12.17 Map illustrating Polarization Effect in Puducherry Region

Table 12-11 List of villages under Polarisation effect of proposed growth centers

VILLAGES UNDER THE POLARISATION EFFECT OF PROPOSED GROWTH CENTERS - BAHOUR					
S.NO	**LIST OF VILLAGES**	**TAMILNADU / PUDUCHERRY**	**TALUK**	**TOWN / VILLAGE**	**RURAL / URBAN**
1	Bahour	PUDUCHERRY	Bahour	VILLAGE	Rural
2	Kuruvinatham	PUDUCHERRY	Bahour	VILLAGE	Rural
3	Irulansandy	PUDUCHERRY	Bahour	VILLAGE	Rural
4	Parikalpet	PUDUCHERRY	Bahour	VILLAGE	Rural
5	Aranganur	PUDUCHERRY	Bahour	VILLAGE	Rural
6	Seliamedu	PUDUCHERRY	Bahour	VILLAGE	Rural
7	Outchimedu	PUDUCHERRY	Bahour	VILLAGE	Rural
8	Kaduvanur	PUDUCHERRY	Bahour	VILLAGE	Rural
9	Karayamputhur	PUDUCHERRY	Bahour	VILLAGE	Rural
10	Panayadikuppam	PUDUCHERRY	Bahour	VILLAGE	Rural
11	Manamedu	PUDUCHERRY	Bahour	VILLAGE	Rural
12	Kirumampakkam	PUDUCHERRY	Bahour	VILLAGE	Rural
13	Pillayarkuppam	PUDUCHERRY	Bahour	VILLAGE	Rural
14	Manapattu	PUDUCHERRY	Bahour	VILLAGE	Rural
15	Tennambakkam	TAMILNADU	Cuddalore	VILLAGE	Rural
16	Kilkumaramangalam	TAMILNADU	Cuddalore	VILLAGE	Rural
17	Chellancheri	TAMILNADU	Cuddalore	VILLAGE	Rural
18	Melalinjippattu	TAMILNADU	Cuddalore	VILLAGE	Rural
19	Malaipperumal Agaram	TAMILNADU	Cuddalore	VILLAGE	Rural
20	Kalaiyur	TAMILNADU	Cuddalore	VILLAGE	Rural
21	Karaimedu	TAMILNADU	Cuddalore	VILLAGE	Rural
22	Pallipattu	TAMILNADU	Cuddalore	VILLAGE	Rural
23	Irandayiravilagam	TAMILNADU	Cuddalore	VILLAGE	Rural
24	Nattapattu	TAMILNADU	Cuddalore	VILLAGE	Rural
25	Chinnakanganankuppam	TAMILNADU	Cuddalore	VILLAGE	Rural
26	Uchchimedu	TAMILNADU	Cuddalore	VILLAGE	Rural
27	Subauppalavadi	TAMILNADU	Cuddalore	VILLAGE	Rural
28	Periyakanganankuppam	TAMILNADU	Cuddalore	VILLAGE	Rural
29	Gunduuppalavadi (CT)	TAMILNADU	Cuddalore	TOWN	Urban
30	Kondur (CT)	TAMILNADU	Cuddalore	TOWN	Urban
31	Tottappattu	TAMILNADU	Cuddalore	VILLAGE	Rural

VILLAGES UNDER THE POLARISATION EFFECT OF PROPOSED GROWTH CENTERS - MANNADIPET					
S.NO	**LIST OF VILLAGES**	**TAMILNADU / PUDUCHERRY**	**TALUK**	**TOWN / VILLAGE**	**RURAL / URBAN**
1	Mannadipet	PUDUCHERRY	Villianur	VILLAGE	Rural
2	Kodathur	PUDUCHERRY	Villianur	VILLAGE	Rural
3	Suthukeny	PUDUCHERRY	Villianur	VILLAGE	Rural
4	Thethampakkam	PUDUCHERRY	Villianur	VILLAGE	Rural
5	Chettipet	PUDUCHERRY	Villianur	VILLAGE	Rural
6	Manalipet	PUDUCHERRY	Villianur	VILLAGE	Rural
7	Kunitchampet	PUDUCHERRY	Villianur	VILLAGE	Rural
8	Mannadipet	PUDUCHERRY	Villianur	VILLAGE	Rural
9	Vadanur	PUDUCHERRY	Villianur	VILLAGE	Rural
10	Kalithirthalkuppam	PUDUCHERRY	Villianur	VILLAGE	Rural
11	Sanyasikuppam	PUDUCHERRY	Villianur	VILLAGE	Rural
12	Thiruvandarkoil	PUDUCHERRY	Villianur	VILLAGE	Rural
13	Thirubuvanai	PUDUCHERRY	Villianur	VILLAGE	Rural
14	Madagadipet	PUDUCHERRY	Villianur	VILLAGE	Rural
15	Vambupet	PUDUCHERRY	Villianur	VILLAGE	Rural
16	Sorapet	PUDUCHERRY	Villianur	VILLAGE	Rural
17	Iveli	TAMILNADU	Vanur	VILLAGE	Rural
18	Elayandapattu	TAMILNADU	Vanur	VILLAGE	Rural
19	Sengamedu	TAMILNADU	Vanur	VILLAGE	Rural
20	Tirumangalam	TAMILNADU	Viluppuram	VILLAGE	Rural
21	Chittalambattu	TAMILNADU	Viluppuram	VILLAGE	Rural
22	Maduraipakkam	TAMILNADU	Viluppuram	VILLAGE	Rural
23	Seyyaduvinnan	TAMILNADU	Viluppuram	VILLAGE	Rural
24	Tennavarayanbattu	TAMILNADU	Viluppuram	VILLAGE	Rural
25	Pagandai	TAMILNADU	Panruti	VILLAGE	Rural
26	Mungilpattu	TAMILNADU	Viluppuram	VILLAGE	Rural
27	Mathur	TAMILNADU	Viluppuram	VILLAGE	Rural
28	Muttarampattu	TAMILNADU	Viluppuram	VILLAGE	Rural
29	Kaliingamalai	TAMILNADU	Viluppuram	VILLAGE	Rural
30	Nerkunam	TAMILNADU	Viluppuram	VILLAGE	Rural
31	Seshanganur	TAMILNADU	Viluppuram	VILLAGE	Rural
32	Kumulam	TAMILNADU	Viluppuram	VILLAGE	Rural

VILLAGES UNDER THE POLARISATION EFFECT OF PROPOSED GROWTH CENTERS - NETTAPAKKAM					
S.NO	**LIST OF VILLAGES**	**TAMILNADU / PUDUCHERRY**	**TALUK**	**TOWN / VILLAGE**	**RURAL / URBAN**
1	Nettapakkam	PUDUCHERRY	Bahour	VILLAGE	Rural
2	Embalam	PUDUCHERRY	Bahour	VILLAGE	Rural
3	Karayamputhur	PUDUCHERRY	Bahour	VILLAGE	Rural
4	Pandasozhanur	PUDUCHERRY	Bahour	VILLAGE	Rural
5	Madukkarai	PUDUCHERRY	Bahour	VILLAGE	Rural
6	Kariamanickam	PUDUCHERRY	Bahour	VILLAGE	Rural
7	Eripakkam	PUDUCHERRY	Bahour	VILLAGE	Rural
8	Nettapakkam	PUDUCHERRY	Bahour	VILLAGE	Rural
9	Kizhur	PUDUCHERRY	Villianur	VILLAGE	Rural
10	Arugur	TAMILNADU	Villianur	VILLAGE	Rural
11	Pallineriyanur	TAMILNADU	Viluppuram	VILLAGE	Rural
12	Aliyur	TAMILNADU	Viluppuram	VILLAGE	Rural
13	Palichcheri	TAMILNADU	Viluppuram	VILLAGE	Rural
14	Kottambakkam	TAMILNADU	Viluppuram	VILLAGE	Rural
15	Pallippuduppattu	TAMILNADU	Viluppuram	VILLAGE	Rural
16	Mandagapattu (E)	TAMILNADU	Viluppuram	VILLAGE	Rural
17	Kondur (CT)	TAMILNADU	Cuddalore	TOWN	Urban
18	Arpisampalaiyam	TAMILNADU	Viluppuram	VILLAGE	Rural
19	Siruvandadu	TAMILNADU	Viluppuram	VILLAGE	Rural
20	Mokshakulam	TAMILNADU	Viluppuram	VILLAGE	Rural
21	Chokkambattu	TAMILNADU	Viluppuram	VILLAGE	Rural
22	Parasureddipalaiyam	TAMILNADU	Viluppuram	VILLAGE	Rural
23	Kongambattu	TAMILNADU	Viluppuram	VILLAGE	Rural
24	Mettupalaiyam	TAMILNADU	Viluppuram	VILLAGE	Rural
25	Rampakkam	TAMILNADU	Viluppuram	VILLAGE	Rural
26	Sorappur	TAMILNADU	Viluppuram	VILLAGE	Rural
27	Viranam	TAMILNADU	Viluppuram	VILLAGE	Rural
28	Pagandai	TAMILNADU	Viluppuram	VILLAGE	Rural
29	Sornavur (Melpadi)	TAMILNADU	Viluppuram	VILLAGE	Rural
30	Sornavur (Kilpadi)	TAMILNADU	Viluppuram	VILLAGE	Rural

The table 12-11 indicates the polarization effect of proposed growth centers in the study region. It reveals that on an average the growth center serves for about 10,000 population and spatial spread effect for about 90 Sq km on average. Some few identified census town from Tamilnadu region will support the development and some rural villages from Tamilnadu region also will benefit from this growth centers.

The regional imbalances are a result of uncontrolled concentration of growth at certain places due to various geographical, social, political and economic factors. Generally, such a growth steals the development of hinterland and leads to skewed pattern of development. Growth generally does not take place simultaneously at all places but is concentrated in few places. Either the growth centers are planned and developed or developed and planned. Hence such places are called growth centres.

Hence to attain a balanced regional development in planning area the spread effect or polarization effect of growth centers are also studied in detail to understand the magnitude of spread and the services it will provide for the surrounding hinterlands. These Growth poles should be developed with a diversified economic structure with various exogenous factors. The backbone of growth center is that propulsive economic centers can be infused into a core center so that there is "spread" of economic growth from that -center. Spread, in a spatial sense, is defined as the set of processes whereby the absolute levels of development of a peripheral area increase due to diffusion from a core area.

12.4.2 LEVEL OF URBANIZATION

Urbanization levels of a planning area is measured by the percent of the total population living in urban parts of the planning area. And urban growth is defined as the rate at which the population of an urban area is increasing over a period of time. Urban growth is mainly driven by the movement of people from rural hinterlands to the urban areas in search of livelihood options, better living conditions, better health and educational facilities etc. This often leads to further agglomeration of economic activities in these urban areas and triggering a greater economic growth at the expense of the rural belts in the region. The level of urbanization is regarded as an index of economic development of the planning area. It also helps in understanding the growth potential of several nodes within the planning area. Economic growth results in the shift in demand and therefore it leads to reallocation of resources –land, labour and capital- out of primary sector - agriculture into secondary & tertiary sector- manufacturing and services. Hence an urban settlement is not just characterized by relative importance of manufacturing and services but more importantly, by high density of population. The pace of urbanisation and consequential changes occurring in shifting from rural to urban areas are causing tremendous pressure on Urban Infrastructure and basic services delivery systems of these areas and drastically deteriorating the quality of life certain urban areas. Due to the above discussed points its important to study the degree of urbanization in the Puducherry Planning Area and consider it as a key indicator of the current socio-economic development status of its villages. A detailed analysis in this direction will help in understanding the need of infrastructure development in various parts of the planning area and it will also help in identifying various pockets within the planning area which have to be preserved as agricultural areas.

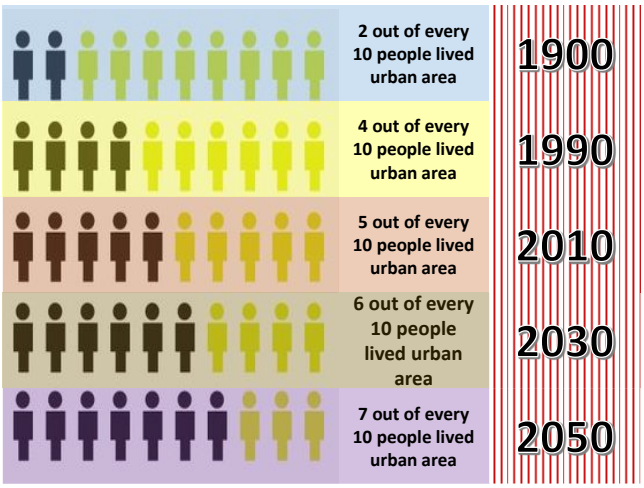


Figure 12.18 Global Urbanization Trend

12.4.2.1 TRENDS IN URBANISATION

The trend in urbanization based on the census shows that it's focusing towards the balanced development of both primary and service sectors. Hence when considering the Puducherry region it is needed to find the villages with tangible transformation to urbanization. Hence the below study helps to find the urbanization in the near future and the villages potential to develop as agriculture and its allied activities.

Table 12-12 Trends in Urbanization in Puducherry Region

TRENDS IN URBANISATION IN PUDUCHERRY REGION								
S. No.	Year	Puducherry Municipality Population	Oulgaret Municipality Population	Out growth population	Total urban population	Total Population of Puducherry Planning Area	Percentage of urban population	Decadal growth Percentage
1	1961	100947	39217	-	140164	258561	54.21%	
2	1971	134222	57785	-	192007	340240	56.43%	36.99%
3	1981	162639	95491	34756	292886	444417	65.90%	52.54%
4	1991	203065	159951	55024	418040	608338	68.72%	42.73%
5	2001	220865	217707	70880	509452	735332	69.28%	21.87%
6	2011	244377	300104	99363	643844	950289	67.75%	26.38%
7	2021	270622	368239	146785	785646	1121954	70.02%	22.02%
8	2031	294427	452331	173603	920361	1326939	69.36%	17.15%
9	2036	305414	500360	200441	1006215	1630000	61.73%	9.31%

Source: Compiled by Consultant

12.4.2.2 FACTORS OF URBANISATION

Urbanization reveals temporal, spatial and sectoral changes in the demographic, social, economic, technological and environmental aspects of life in a region. These indicators will have the direct impact on several determinants. The determinants of urbanization can broadly be categorized into three categories of economic, social and demographic determinants. Such as

- Economic- Work force distribution in Primary, secondary and tertiary sectors.
- Social - Level of services based on educational, health and communication facilities.
- Demographic – Population and density

Based on the above 3 determinants, the five variables have been adopted in rural villages (67 Villages) in Puducherry planning area to study the degree of growth of urbanization. The 5 variables are

a) Variable 1: Workforce population distribution engaged in Secondary and Tertiary sector activities (Census 2011)
b) Variable 2: Level of services of Social infrastructure (Based on secondary data)
c) Variable 3: Households (Census 2011)
d) Variable 4: Density of Population (Census 2011)
e) Variable 5: Work force population distribution engaged in Primary Sector activities (Census 2011)

The villages are ranked based on each of the above 5 variables. To compute the average degree of urbanization, the average rating scale method is adopted by assuming the weightage to each variable depending upon the influence towards urbanization on each variable.

Table 12-13 Rating Scale for each variable

S. No	Variable	Influence towards Urbanisation	Rating scale / weight
1.	Workforce population distribution engaged in Secondary and Tertiary sector activities	Very strong	5
2.	Level of services of Physical and Social infrastructure	Strong	4
3.	Number of Households	Moderate	3
4.	Population Density	Low	2
5.	Work force population distribution engaged in Primary Sector activities	Very low	1

Source: Compiled by Consultant

12.4.2.2.1 VARIABLE 1: WORKFORCE POPULATION DISTRIBUTION ENGAGED IN SECONDARY AND TERTIARY SECTOR ACTIVITIES

The tertiary activities are mainly the urban activities which are influencing the people from rural to urban areas. This Migration of population is itself indicative of the spillover effect of growing population. The rapid expansion of employment in the secondary and tertiary sector such as manufacturing, transport, Commerce and new services such as education, health and recreation pushes the people from rural to urban. Due to the impact of large percentage of workforce engaged in Secondary & Tertiary activities along with migration from rural to urban areas, the variable-1 have the highest weightage among all the 5 variables.

12.4.2.2.2 VARIABLE 2: LEVEL OF SERVICES OF SOCIAL INFRASTRUCTURE

The level of services of Social infrastructure means the existence of social amenities such as the availability of health, education, communication facilities make the area a preferred choice for residential and demand for such areas increases drastically increasing the land value of the area. Hence the accumulation of social amenities also plays a vital role in the process of urbanization. Thus, the variable 2 is assigned a weightage of 4 among the 5 variables.

12.4.2.2.3 VARIABLE 3: HOUSEHOLDS

The Change in Occupation and income opportunities from agriculture to tertiary sectors force the majority of the people to stay closer to their work environment in spite of higher property rates and rentals in employment centers with respect to income level. Hence apart from the change in the occupation pattern from primary to tertiary and the level of services provided by each village, the rapid shifting of household's population is also due the in-migration to urban areas from rural parts of the planning area and other hinterland. Hence the household also plays a part in the process of determining the level of urbanization of an area. Thus, the variable 3 stands in rating or weightage 3 among the 5 variables.

12.4.2.2.4 VARIABLE 4: DENSITY OF POPULATION

Urbanization is a primary driver of a city's landscape conversion, with far-reaching effects on landscape pattern and form of the city, it also affects the spread of population across the cityscape deciding many other urban functions. The urban attributes such as growth in population and density will impact the degree of urbanization in an area due to the change in occupation pattern and availability of services. Certain areas in the planning area are showing higher density levels particularly due to the constraint in the availability of land with existing infrastructure, higher land rates, proximity to employment and commercial centers. This also implies the rapid urbanization of

these areas and accumulation of services and employment opportunities around them. Hence it is an important function in the study of level of urbanization of the area since the density indirectly implies many other urban functions. Due to this the Variable 4 stands in rating 2 among the 5 variables.

12.4.2.2.5 VARIABLE 5: WORK FORCE POPULATION DISTRIBUTION ENGAGED IN PRIMARY SECTOR ACTIVITIES

Rapid urbanization signifies a structural change in the economy- a change in the occupational pattern from the primary sector to secondary and tertiary sectors. The forces causing such a change are in the nature of "pull" or "push" factors. The push factors have been more dominant due to structural changes in the rural economy such as increasing pressure on agricultural land and declining man-land ratio. Hence due to the disparities in per capita income between primary and tertiary sectors and the growing contribution of population involved in non-agricultural activities in the overall workforce population and decline numbers of population engaged in primary sectors of the economy. Due to these reasons the variable 5 is assigned a weightage of 1 in this level of urbanization analysis.

12.4.2.3 LEVEL OF URBANISATION OF RURAL VILLAGES IN PUDUCHERRY PLANNING AREA

Table 12-14 Level of Urbanization for Rural Villages in Puducherry Planning Area

VILLAGE NAME	Existing Pop-2011	Density-PPH-2011	PPH 2011 RANK	PPH-2036-RANK	Class of Settlement	Workforce Population 2011	WF - CLASS 2011-RANK	WF - CLASS-2036	Workforce Distri Primary 2011	WFD - P% - 2011	PRIM-RANK-2011	Workforce Distri Secon 2011	WFD - S% - 2011	Workforce_ Distri Terti_011	WFD - T% - 2011	Workforce Distri Secon & Teri 2011	SEC - TERI-RANK-2011	Existing Household - 2011	Existing HH% - 2011	HH - 2011-RANK	Composite Index	Order of Settle Rural	AVERAGE RATING SCALE	LEVEL OF URBANISATION - RANK - 2011
ARIANKUPPAM	29808	82	1	1	L2	10181	1	2	305	3	7	193	2	9683	95	9876	1	7300	41	2	76.34	1	1.85	1
VILLIANUR	34383	61	2	2	L2	1944	6	1	178	9	7	40	2	1726	89	1766	6	8174	46	1	72.53	2	2.17	2
MANAVELY	15666	31	5	5	L3	5390	4	4	591	11	7	101	2	4698	87	4799	4	3837	22	4	46.31	4	2.32	3
BAHOUR	10927	12	5	7	L3	3840	5	5	1536	40	4	38	1	2266	59	2304	6	2586	15	5	45.44	4	2.59	5
KARIKLAMPAKKAM	6558	20	5	5	L4	2346	6	6	975	42	4	30	1	1341	57	1371	7	1577	9	6	43.98	4	2.59	5
KIRUMAMPAKKAM	10133	22	6	5	L3	3529	5	6	1233	35	5	41	1	2255	64	2296	6	2398	14	5	43.08	4	2.52	4
MANNADIPET	11176	28	5	5	L3	4244	5	5	1692	40	4	143	3	2409	57	2552	6	2616	15	5	42.86	4	2.59	5
MADAGADIPET	7253	20	6	6	L4	2837	6	6	1276	45	4	78	3	1483	52	1561	6	1698	10	6	41.26	4	2.50	4
THIRUBUVANAI	9374	29	5	5	L4	3299	5	6	950	29	5	46	1	2303	70	2349	6	2194	12	6	32.60	5	2.59	5
SEDARAPET	4756	10	5	7	L5	1712	6	7	295	17	6	29	2	1388	81	1417	7	1131	6	7	30.89	5	2.56	5
THAVALAKUPPAM	9212	26	5	5	L4	3085	6	6	373	12	7	56	2	2656	86	2712	6	2256	13	6	27.83	5	2.43	4

VILLAGE NAME	Existing Pop-2011	Density-PPH-2011	PPH 2011 RANK	PPH-2036-RANK	Class of Settlement	Workforce Population 2011	WF - CLASS 2011-RANK	WF - CLASS-2036	Workforce Distri Primary 2011	WFD - P % - 2011	PRIM-RANK-2011	Workforce Distri Secon 2011	WFD - S % - 2011	Workforce_ Distri Terti_011	WFD - T % - 2011	Workforce Distri Secon & Teri 2011	SEC - TERI-RANK-2011	Existing Household - 2011	Existing HH % - 2011	HH - 2011-RANK	Composite Index	Order of Settle Rural	AVERAGE RATING SCALE	LEVEL OF URBANISATION - RANK - 2011
MADUKARAI	9049	29	5	5	L4	3238	5	6	1573	49	4	36	1	1629	50	1665	6	2176	12	6	27.03	5	2.65	5
KATTERY	4292	12	5	6	L5	1710	6	7	662	39	4	104	6	944	55	1048	7	1005	6	7	24.37	6	2.69	5
NETTAPAKKAM	6331	22	6	6	L4	2441	6	6	960	39	4	66	3	1415	58	1481	6	1523	9	6	21.68	6	2.59	5
SELIAMEDU	5984	13	6	6	L4	2397	6	6	1342	56	3	43	2	1012	42	1055	7	1416	8	6	21.63	6	2.71	6
KARIAMANIKKAM	7685	20	6	6	L4	2625	6	6	1720	66	2	44	2	861	33	905	7	1848	10	6	20.87	6	2.76	6
MANGALAM	4320	13	6	6	L5	1746	6	7	724	41	4	45	3	977	56	1022	7	1027	6	7	20.27	6	2.67	5
KALITHIRTHALKUPPAM	8862	16	6	6	L4	3345	5	6	1673	50	4	68	2	1604	48	1672	6	2074	12	6	19.37	6	2.67	5
KARAYAMPUTHUR	4518	10	5	7	L5	1763	6	7	1299	74	2	16	1	448	25	464	7	1069	6	7	17.90	6	2.79	6
ARIYUR	8758	23	6	5	L4	3488	5	6	1406	40	4	72	2	2010	58	2082	6	2082	12	6	17.70	6	2.67	5
EMBALAM	8331	13	6	6	L4	3441	5	6	1844	54	3	59	2	1538	45	1597	6	2004	11	6	17.64	6	2.72	6
KORKADU	3418	10	5	7	L5	1314	7	7	695	53	3	33	3	586	45	619	7	822	5	7	16.89	6	2.66	5
ODIAMPET	13365	25	5	5	L3	774	7	5	71	9	7	16	2	687	89	703	7	3177	18	5	16.81	6	2.46	4
THIRUVANDARKOIL	7078	18	6	6	L4	2628	6	6	803	31	5	52	2	1773	67	1825	6	1657	9	6	16.47	6	2.54	4

VILLAGE NAME	Existing Pop-2011	Density-PPH-2011	PPH 2011 RANK	PPH-2036-RANK	Class of Settlement	Workforce Population 2011	WF - CLASS 2011-RANK	WF - CLASS-2036	Workforce Distri Primary 2011	WFD - P % - 2011	PRIM-RANK-2011	Workforce Distri Secon 2011	WFD - S % - 2011	Workforce_ Distri Terti_011	WFD - T % - 2011	Workforce Distri Secon & Teri 2011	SEC - TERI-RANK-2011	Existing Household - 2011	Existing HH % - 2011	HH - 2011-RANK	Composite Index	Order of Settle Rural	AVERAGE RATING SCALE	LEVEL OF URBANISATION - RANK - 2011
MANAPATTU	8227	13	6	6	L4	2921	6	6	1120	38	5	39	1	1762	60	1801	6	1947	11	6	14.53	6	2.54	4
URUVAIYARU	4568	25	5	5	L5	1486	7	7	483	33	5	39	3	964	65	1003	7	1086	6	7	14.08	6	2.57	5
POORANANKUPPAM	6766	17	6	6	L4	2681	6	6	622	23	6	15	1	2044	76	2059	6	1657	9	6	13.56	6	2.50	4
VADHANUR	4925	14	6	6	L5	2079	6	7	1460	70	2	62	3	557	27	619	7	1153	7	6	13.05	6	2.76	6
KOODAPAKKAM	7147	22	6	6	L4	2782	6	6	1214	44	4	38	1	1530	55	1568	6	1699	10	6	11.59	7	2.63	5
PILLAYARKUPPAM	5309	11	5	7	L4	1702	6	7	320	19	6	46	3	1336	78	1382	7	1257	7	6	10.93	7	2.62	5
SORAPET	5110	12	5	6	L4	2037	6	6	1392	68	2	41	2	604	30	645	7	1196	7	6	9.42	7	2.82	6
THONDAMANATHAM	4090	13	6	6	L5	1405	7	7	380	27	5	50	4	975	69	1025	7	972	6	7	8.37	7	2.59	5
KIZHUR	2955	9	5	7	L5	1167	7	7	598	51	4	15	1	554	47	569	7	702	4	7	8.30	7	2.65	5
ABISHEKAPAKKAM	7124	23	6	6	L4	2432	6	6	770	32	5	27	1	1635	67	1662	6	1745	10	6	8.24	7	2.58	5
KODATHUR	3605	10	5	7	L5	1682	6	7	1199	71	2	39	2	444	26	483	7	844	5	7	8.04	7	2.82	6
SATHAMANGALAM	2977	14	6	6	L5	1300	7	7	583	45	4	8	1	709	55	717	7	708	4	7	7.91	7	2.63	5
MANAMEDU	2345	11	5	7	L5	734	7	7	528	72	2	11	1	195	27	206	7	555	3	7	7.91	7	2.74	6

VILLAGE NAME	Existing Pop-2011	Density-PPH-2011	PPH 2011 RANK	PPH-2036-RANK	Class of Settlement	Workforce Population 2011	WF - CLASS 2011-RANK	WF - CLASS-2036	Workforce Distri Primary 2011	WFD - P % - 2011	PRIM-RANK-2011	Workforce Distri Secon 2011	WFD - S % - 2011	Workforce_ Distri Terti_011	WFD - T % - 2011	Workforce Distri Secon & Teri 2011	SEC - TERI-RANK-2011	Existing Household - 2011	Existing HH % - 2011	HH - 2011-RANK	Composite Index	Order of Settle Rural	AVERAGE RATING SCALE	LEVEL OF URBANISATION - RANK - 2011
KURUMBAPET	19506	54	3	3	L3	11404	1	3	1046	9	7	233	2	10125	89	10358	1	4637	26	4	7.71	7	2.52	4
KUNITCHAMPET	5692	11	7	7	L4	2293	6	6	1219	53	3	59	3	1015	44	1074	7	1332	8	6	7.28	7	2.72	6
OUSSUDU	3227	5	7	7	L5	1179	7	7	486	41	4	14	1	679	58	693	7	767	4	7	7.04	7	2.62	5
PANDASHOZHANOOR	5643	13	6	6	L4	2539	6	6	1888	74	2	13	1	638	25	651	7	1357	8	6	7.04	7	2.79	6
UTCHIMEDU	3959	13	6	7	L5	1386	7	7	760	55	3	14	1	612	44	626	7	937	5	7	6.95	7	2.68	5
THIRUKANCHI	4207	9	7	7	L5	1589	6	7	702	44	4	81	5	806	51	887	7	1000	6	7	6.89	7	2.68	5
SANYASIKUPPAM	2375	7	7	7	L5	944	7	7	558	59	3	5	1	381	40	386	7	556	3	7	5.86	7	2.66	5
ARANGANOOR	2426	11	7	7	L5	1089	7	7	834	77	2	11	1	244	22	255	7	574	3	7	5.73	7	2.70	6
ERIPAKKAM	4703	17	6	6	L5	1860	6	7	1196	64	3	13	1	651	35	664	7	1131	6	7	5.62	7	2.75	6
KURUVINATHAM	7289	15	6	6	L4	2826	6	6	1996	71	2	29	1	801	28	830	7	1725	10	6	5.60	7	2.79	6
SUTHUKENY	2637	6	7	7	L5	1193	7	7	800	67	2	6	1	387	32	393	7	617	3	7	4.73	7	2.70	6
THETTHAMPAKKAM	2109	13	6	6	L5	801	7	7	394	49	4	34	4	373	47	407	7	494	3	7	4.60	7	2.63	5
RAMANATHAPURAM	2841	9	7	7	L5	1204	7	7	624	52	3	14	1	566	47	580	7	675	4	7	4.51	7	2.66	5

VILLAGE NAME	Existing Pop-2011	Density-PPH-2011	PPH 2011 RANK	PPH-2036-RANK	Class of Settlement	Workforce Population 2011	WF - CLASS 2011-RANK	WF - CLASS-2036	Workforce Distri Primary 2011	WFD - P % - 2011	PRIM-RANK-2011	Workforce Distri Secon 2011	WFD - S % - 2011	Workforce_ Distri Terti_011	WFD - T % - 2011	Workforce Distri Secon & Teri 2011	SEC - TERI-RANK-2011	Existing Household - 2011	Existing HH % - 2011	HH - 2011-RANK	Composite Index	Order of Settle Rural	AVERAGE RATING SCALE	LEVEL OF URBANISATION - RANK - 2011
PANAYADIKUPPAM	1316	6	7	7	L5	692	7	7	604	87	1	7	1	81	12	88	7	311	2	7	4.44	7	2.75	6
OLAIVAIKAL	1224	5	7	7	L5	640	7	7	277	43	4	6	1	357	56	363	7	291	2	7	4.18	7	2.62	5
SELLIPET	2893	11	7	7	L5	1189	7	7	746	63	3	13	1	430	36	443	7	677	4	7	3.77	7	2.66	5
KUPPAM	2731	9	7	7	L5	1289	7	7	939	73	2	27	2	323	25	350	7	639	4	7	3.51	7	2.70	6
PARIKKALPATTU	3835	10	7	7	L5	1814	6	7	1512	83	1	4	0	298	16	302	7	908	5	7	3.44	7	2.83	6
THIMMANAICKENPALAYAM	3479	7	7	7	L5	1442	7	7	960	67	2	7	0	475	33	482	7	852	5	7	3.35	7	2.70	6
KARASOOR	1752	6	7	7	L5	669	7	7	98	15	6	12	2	559	84	571	7	417	2	7	3.09	7	2.54	4
THUTIPET	939	3	7	7	L5	389	7	7	141	36	5	6	2	242	62	248	7	223	1	7	3.09	7	2.58	5
PILLAYARKUPPAM	2744	12	7	6	L5	1059	7	7	449	42	4	16	2	594	56	610	7	652	4	7	3.09	7	2.62	5
PERUNGALUR	1765	12	7	6	L5	715	7	7	374	52	3	23	3	318	44	341	7	420	2	7	3.09	7	2.66	5
IRULANSANTHI	1670	9	7	7	L5	567	7	7	325	57	3	5	1	237	42	242	7	395	2	7	3.09	7	2.66	5
MANALIPET	1244	11	7	7	L5	527	7	7	362	69	2	9	2	156	30	165	7	291	2	7	2.35	7	2.70	6
CHETTYPET	1822	7	7	7	L5	713	7	7	387	54	3	5	1	321	45	326	7	426	2	7	2.09	7	2.66	5

VILLAGE NAME	Existing Pop-2011	Density-PPH-2011	PPH 2011 RANK	PPH-2036-RANK	Class of Settlement	Workforce Population 2011	WF - CLASS 2011-RANK	WF - CLASS-2036	Work force Distri Primary 2011	WFD - P % - 2011	PRIM-RANK-2011	Workforce Distri Secon 2011	WFD - S % - 2011	Workforce_ Distri Terti_011	WFD - T % - 2011	Workforce Distri Secon & Teri 2011	SEC - TERI-RANK-2011	Existing Household - 2011	Existing HH % - 2011	HH - 2011-RANK	Composite Index	Order of Settle Rural	AVERAGE RATING SCALE	LEVEL OF URBANISATION - RANK - 2011
VAMBUPET	1111	6	7	7	L5	546	7	7	446	82	1	3	1	97	18	100	7	260	1	7	2.09	7	2.75	6
MANAKUPPAM	1254	33	5	5	L5	503	7	7	306	61	3	4	1	193	38	197	7	298	2	7	2.09	7	2.69	5
KADUVANUR	819	8	7	7	L5	337	7	7	236	70	2	1	0	100	30	101	7	194	1	7	2.09	7	2.70	6
PUDUKUPPAM	2211	8	7	7	L5	1050	7	7	691	66	2	22	2	337	32	359	7	517	3	7	1.00	7	2.70	6

Source: Compiled by Consultant

12.4.1.2.4 RANKING OF LEVEL OF URBANISATION

Table 12-15 Ranking of Level of Urbanization in Puducherry Planning Area

VILL NO.	VILLAGE NAME	Rank of variables					TOTAL	AVERAGE RATING SCALE	LEVEL OF URBANISATION -2011
		Secondary and Tertiary	Order of Settlement	Household	Density (Persons per hectare)	Primary sectors			
		Weightage of Variables							
		5	4	3	2	1			
43	ARIYANKUPPAM	1	1	2	1	7	12	2.00	1
33	KURUMBAPET	1	7	4	3	7	22	2.64	2
70	MANAVELY	4	4	4	5	7	24	2.71	3
32	VILLIANUR	6	2	1	2	7	18	2.89	4
69	THAVALAKUPPAM	6	5	6	5	7	29	2.93	4
72	KIRUMAMPAKKAM	6	4	5	6	5	26	3.00	4
71	POORANANKUPPAM	6	6	6	6	6	30	3.00	4
46	ODIAMPET	7	6	5	5	7	30	3.03	4
23	KARASOOR	7	7	7	7	6	34	3.06	5
22	SEDARAPET	7	5	7	5	6	30	3.07	5
10	THIRUVANDARKOIL	6	6	6	6	5	29	3.07	5
81	MANAPATTU	6	6	6	6	5	29	3.07	5
8	THIRUBUVANAI	6	5	6	5	5	27	3.07	5
7	MADAGADIPET	6	4	6	6	4	26	3.08	5
68	ABISHEKAPAKKAM	6	7	6	6	5	30	3.10	5

VILL NO.	VILLAGE NAME	Rank of variables					TOTAL	AVERAGE RATING SCALE	LEVEL OF URBANISATION -2011
		Secondary and Tertiary	Order of Settlement	Household	Density (Persons per hectare)	Primary sectors			
		Weightage of Variables							
		5	4	3	2	1			
24	THUTIPET	7	7	7	7	5	33	3.12	5
76	BAHOUR	6	4	5	5	4	24	3.13	5
4	MANNADIPET	6	4	5	5	4	24	3.13	5
73	PILLAYARKUPPAM	7	7	6	5	6	31	3.13	5
57	NETTAPAKKAM	6	6	6	6	4	28	3.14	5
6	KALITHIRTHALKUPPAM	6	6	6	6	4	28	3.14	5
52	ARIYUR	6	6	6	6	4	28	3.14	5
54	MADUKARAI	6	5	6	5	4	26	3.15	5
25	THONDAMANATHAM	7	7	7	6	5	32	3.16	5
48	URUVAIYARU	7	6	7	5	5	30	3.17	5
30	KOODAPAKKAM	6	7	6	6	4	29	3.17	5
29	OUSSUDU	7	7	7	7	4	32	3.19	5
47	THIRUKANCHI	7	7	7	7	4	32	3.19	5
31	OLAIVAIKAL	7	7	7	7	4	32	3.19	5
26	PILLAYARKUPPAM	7	7	7	7	4	32	3.19	5
65	KARIKALAMPAKKAM	7	4	6	5	4	26	3.19	5

VILL NO.	VILLAGE NAME	Rank of variables					TOTAL	AVERAGE RATING SCALE	LEVEL OF URBANISATION -2011
		Secondary and Tertiary	Order of Settlement	Household	Density (Persons per hectare)	Primary sectors			
		Weightage of Variables							
		5	4	3	2	1			
49	MANGALAM	7	6	7	6	4	30	3.20	5
63	EMBALAM	6	6	6	6	3	27	3.22	5
50	SATHAMANGALAM	7	7	7	6	4	31	3.23	5
14	THETTHAMPAKKAM	7	7	7	6	4	31	3.23	5
17	KATTERY	7	6	7	5	4	29	3.24	5
9	SANYASIKUPPAM	7	7	7	7	3	31	3.26	5
28	RAMANATHAPURAM	7	7	7	7	3	31	3.26	5
27	SELLIPET	7	7	7	7	3	31	3.26	5
66	PERUNGALUR	7	7	7	7	3	31	3.26	5
77	IRULANSANTHI	7	7	7	7	3	31	3.26	5
2	CHETTYPET	7	7	7	7	3	31	3.26	5
51	KIZHUR	7	7	7	5	4	30	3.27	5
3	KUNITCHAMPET	7	7	6	7	3	30	3.27	5
74	SELIAMEDU	7	6	6	6	3	28	3.29	5
80	UTCHIMEDU	7	7	7	6	3	30	3.30	6
56	ERIPAKKAM	7	7	7	6	3	30	3.30	6

VILL NO.	VILLAGE NAME	Rank of variables					TOTAL	AVERAGE RATING SCALE	LEVEL OF URBANISATION -2011
		Secondary and Tertiary	Order of Settlement	Household	Density (Persons per hectare)	Primary sectors			
		Weightage of Variables							
		5	4	3	2	1			
64	KORKADU	7	6	7	5	3	28	3.32	6
75	ARANGANOOR	7	7	7	7	2	30	3.33	6
15	SUTHUKENY	7	7	7	7	2	30	3.33	6
18	KUPPAM	7	7	7	7	2	30	3.33	6
67	THIMMANAICKENPALAYAM	7	7	7	7	2	30	3.33	6
1	MANALIPET	7	7	7	7	2	30	3.33	6
62	KADUVANUR	7	7	7	7	2	30	3.33	6
16	PUDUKUPPAM	7	7	7	7	2	30	3.33	6
53	MANAKUPPAM	7	7	7	5	3	29	3.34	6
55	KARIAMANIKKAM	7	6	6	6	2	27	3.37	6
5	VADHANUR	7	6	6	6	2	27	3.37	6
58	PANDASHOZHANOOR	7	7	6	6	2	28	3.39	6
78	KURUVINATHAM	7	7	6	6	2	28	3.39	6
60	KARAYAMPUTHUR	7	6	7	5	2	27	3.41	6
59	PANAYADIKUPPAM	7	7	7	7	1	29	3.41	6
79	PARIKKALPATTU	7	7	7	7	1	29	3.41	6

VILL NO.	VILLAGE NAME	Rank of variables					TOTAL	AVERAGE RATING SCALE	LEVEL OF URBANISATION -2011
		Secondary and Tertiary	Order of Settlement	Household	Density (Persons per hectare)	Primary sectors			
		Weightage of Variables							
		5	4	3	2	1			
12	VAMBUPET	7	7	7	7	1	29	3.41	6
13	KODATHUR	7	7	7	5	2	28	3.43	6
61	MANAMEDU	7	7	7	5	2	28	3.43	6
11	SORAPET	7	7	6	5	2	27	3.44	6

Source: Compiled by Consultant

12.4.1.2.5 ANALYSIS OF LEVEL OF URBANISATION

In the level of urbanization analysis the lowest weightage gives the highest degree of level of urbanization and the highest weightage gives the lowest degree of level of urbanization. Outcomes of this analysis is illustrated in the above table. Ariyankuppam village shows the fast urbanization followed by Kurumampet and Manavely villages. These villages are attracting population from surrounding areas paving way for residential developments and agglomeration of economic activity is observed due to its proximity to major transportation network of ECR and NH 45A. Followed by these villages are Villiianur, Thavalakuppam, Kirumampakkam, Poornakuppam and Odiampet in the level of urbanization. The villages which are in the 5th degree of urbanization already portray major urbanization effects and these may grow at much faster pace due to the opportunities available for these areas to attract more investments and grow in tertiary sector. The villages in the 6th degree of urbanization shows more primary sector dominance and these should be retained as agriculture based villages for the self-sustainability. Also these villages can contribute towards the green coverage for the planning area which is shrinking due to the development pressure and unplanned development which has taken place during past decades. Arangoor & Seliamedu village displays strong agricultural characters at the same time their geographical proximity to Uruvaiyaru-Bahour road which is a prominent road in the planning area provides these villages with strong positive factors to absorb ribbon development along this corridor.

Hence from the above study it clearly shows that the proposed master plan should focus on the findings of new conurbation area boundary based on the level of urbanization without disturbing the Primary activities to some extent. But the Challenge in front of us is that the few villages could not be the part of conurbation boundary though the level of urbanisation is fast. Since it is noncontiguous with the existing urban area. But the villages which are not in contagious with the new conurbation it will be focused and planned to develop as a growth centers and growth points to have the sustainable development. Hence considering the geographical features of the villages followed with the constraint of natural boundaries the list of urbanized villages are considered to meet the future need. The villages added to the existing municipalities are Villianur, Olaivaikal, Koodapakkam, ossudu, Odiampet from Villianur commune Panchayat and Ariyankuppam and Manavely from Ariyankuppam commune panchayat form the new conurbation area of 71.59 sq km to meet the future urban population.

12.4.3 PLANNING AREA MORPHOLOGY

The development of urban forms was affected by many factors, such as geographical location, history, colonial situation, and religion. The qualitative analysis was made from the historical development of cities, their situated continents and the natural or human-made determinants of urban forms. This kind of urban morphological study is from the geographic view and concentrates on how the elements of settlements shape the urban structure. The analysis is focused on the open space, distance and built-up spaces.

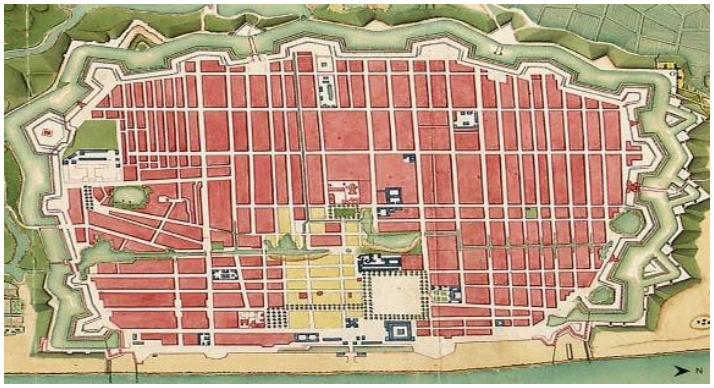


Figure 12.19 Boulevard Town Plan

This analysis have measured the spatial correlation of proximity between the Residential activity, Commercial activity, Open spaces and population density, where these measures contribute to the modeling of city's spatial structure. The degree of interconnection, in the sense it is a syntactical characteristic of the road connectivity and the proximity could attract more traffic flow, more pedestrians; even increase the density of land use of the surrounding areas.

12.4.1.3 Morphological Factors

The major morphological factors of cities include natural determinants and human-made determinants. The natural determinants are studied from the geographical location of city, terrain and the spread of settlement. The human-made determinants for the form of a city are influenced by human intervention. The Puducherry planning area is a non-contiguous area from the very beginning of the history. Hence the physical characteristics of entire Puducherry region and its spatial growth pattern are highly interlinked and dependent on the connectivity.

The morphological form of boulevard area in Puducherry municipality is the planned settlement from the French period onwards and still is sustained due to its grid iron pattern of road network and closer to the coastal stretch for the ease of drainage facilities. Hence the formation of road network, the distance between the 12 enclaves of Puducherry region plays a vital role in the spatial growth pattern of entire Puducherry region.



Figure 12.20 Puducherry Municipality Plan

12.4.1.3.1 FACTORS INFLUENCING URBAN MORPHOLOGY

Based on the above factors it is concluded that the influential factors forms the urban form.

1. Site factors
2. Historical and cultural factors
3. Functional factors
4. Government influence – Administrative boundaries
5. Social values
6. Economic forces (Circulation and accessibility to economic activities)

Hence from 1693 to 2015 the urban forms have slowly changed due to the above mentioned factors.

12.4.1.3.2 CORRELATION TECHNIQUE

To evaluate the impact of land-use relationship on urban metabolism, it is calculated that the correlation coefficient of the residential land use area, Commercial land use area, Transportation area and open space area to study the interlink between the structure of urban morphology. The degree of correlation between the determinants are determined by the value of "r". When the correlation value r is greater than Zero the relationship between the two determinants are stronger and highly dependent on each other. When the correlation value is less than zero the relationship between the two determinants are very weak. When the correlation value is equal to zero there is no relationship between the determinants. The details of magnitude of relationship is shown in the table 12-16.

Table 12-16 Magnitude of Relationship

S. No	Correlation Value " r"	Magnitude of relationship
1.	-1 to -0.5	Strong Negative
2.	0.5 to 1	Strong Positive
3.	-0.5 to -0.3	Moderate Negative
4.	0.3 to 0.5	Moderate Positive
5.	-0.3 to -0.1	Weak Negative
6.	0.1 to 0.3	Weak Positive
7.	0	No relationship

Source: Correlation Theory (Statistics)

12.4.1.3.3 MORPHOLOGICAL ANALYSIS OF GROWTH FORM BETWEEN THE EXISTING MUNICIPALITIES & COMMUNES BASED ON THE DISTANCE

Table 12-17 Morphological analysis of growth form between the existing CBD to Municipalities & Communes using correlation technique

S. No	Municipalities / Commune Panchayat	Commercial area in Hectares - X	Distance from Existing CBD area - Y	x2	y2	X*Y
1.	Puducherry Municipality	85	1	7225	1	85
2.	Oulgaret Municipality	82	7.5	6724	56.25	615
3.	Ariyankuppam	27	4.5	729	20.25	121.5
4.	Villianur	33	7.5	1089	56.25	247.5
5.	Mannadipet	34	27	1156	729	918
6.	Bahour	26	18	676	324	468
7.	Nettapakkam	10	26	100	676	260
8.	**Total**	297	**91.5**	17699	1862.75	2715
Correlation Co-efficient - "r"= (-0.6331)						

Source: Compiled by Consultant

The table 12-17 indicates that the Correlation r value of the interrelationship between the location of each Commune and Municipalities. The proximity between them shows strong negative relationship. Hence it is also observed that the urban forms are developing only where there is continuous availability of land spaces in planning area. Mannadipet, Nettapakkam and Bahour are located more than 15 to 25 km from CBD, the magnitude of connectivity with Puducherry CBD is very minimum. Hence from the analysis the western part of Mannadipet and Nettapakkam are highly interrelated to nearby Villupuram town (5 km from Mannadipet) for their commercial activities and Bahour are highly connected to nearby Cuddalore town (5 Km Bahour) for their commercial activities. Hence considering the geographical form of Puducherry Planning area the development plan should focus the individual commune as separate entity for growth and sustainability.

12.4.1.3.4 MORPHOLOGICAL ANALYSIS BETWEEN RESIDENTIAL AREAS AND EXISTING RECREATION SPACES

Table 12-18 Morphological analysis of growth form between residential areas and existing recreation using correlation technique

S. No	Municipalities / Commune Panchayat	Total Residential Area (Hectares) - X	Recreation area in Hectares - Y	x2	y	X*Y
1.	Puducherry Municipality	516.00	35.00	266256	1225	18060
2.	Oulgaret Municipality	912.00	11.00	831744	121	10032
3.	Ariyankuppam	318.00	2.00	101124	4	636
4.	Villianur	512.00	5.00	262144	25	2560
5.	Mannadipet	403.00	1.00	162409	1	403
6.	Bahour	319.00	2.00	101761	4	638
7.	Nettapakkam	232.00	1.00	53824	1	232
8.	**Total**	3212	57	1779262	1381	32561
Correlation Co-efficient - "r"= 0.3828						

Source: Compiled by Consultant

The table 12-18 indicates that the Correlation r value of the interrelationship between the residential area in each Commune and Municipalities and the availability of existing recreation area shows moderate positive relationship. Hence the development proposal should focus in allocation of more recreational spaces, parks, play grounds and Multi-Purpose open ground to bring strong interrelationship between open space and residential areas which may increase the healthy social life of the people living.

12.4.1.3.5 MORPHOLOGICAL ANALYSIS BETWEEN COMMERCIAL AREAS AND RESIDENTIAL AREAS

Table 12-19 Morphological analysis of growth form between commercial areas and residential areas using correlation technique

S. No	Municipalities / Commune Panchayat	Total Residential Area (Hectares) - X	Commercial area in Hectares - Y	x2	y	X*Y
1.	Puducherry Municipality	85	516.00	7225	266256	43860
2.	Oulgaret Municipality	82	912.00	6724	831744	74784
3.	Ariyankuppam	27	318.00	729	101124	8586
4.	Villianur	33	512.00	1089	262144	16896
5.	Mannadipet	34	403.00	1156	162409	13702

6.	Bahour	26	319.00	676	101761	8294
7.	Nettapakkam	10	232.00	100	53824	2320
8.	**Total**	297	3212	17699	1779262	168442
Correlation Co-efficient - "r"= 0.8150						

Source: Compiled by Consultant

The table 12-19 witnessed that the Correlation r value of the interrelationship between Commercial development and residential development from each Commune and Municipalities shows strong positive relationship. Hence the Development Plan should focus the residential and commercial (mixed land use proposals) on the major network corridors. Since there is strong interrelationship between the development of residential area and commercial area it is very much necessary to focus on mixed land uses while framing the development proposals and development control rules and regulations.

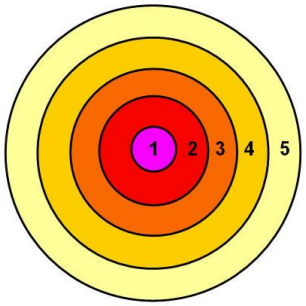
12.4.1.3.6 SUGGESTION FROM MORPHOLOGICAL ANALYSIS

The above study clearly shows that how the form of human settlements and their formation and transformation due to the historical, functional, economical decides the fabric of the region. The transformation of settlements from the grid iron pattern to haphazard development on the outer are due to rapid urbanization and population growth. Beyond these reasons the non-contiguous settlement plays vital role in framing the urban fabric which is also the opportunity to decide the future plan and trend in growth. Hence to have a sustainable city development the enclaves of urban morphology of Puducherry region should be considered as separate entity to have the strong relationship between the different functional activities. Therefore, the application of Multi Nuclei concept seeks to be suitable concept to promote the self-sustainable development of Puducherry region.

12.5 APPLICATION OF PLANNING THEORIES

From the above detailed analysis of the planning area based on order of settlement, level of urbanization, planning area morphology it's evident that the growth over the last few decades are spearheaded due to certain factors like spatial organization of the several urban functions of commerce, production, education, and much more. One of the most important forces determining where certain activities or growth is focused within a city deals with the price of land. Thus, it is important to understand different urban models developed over the course of time. The different planning theories are explained in the following section to understand which theoretical model suits best for the planning area.

12.5.1 CONCENTRIC ZONE MODEL



1 CBD (central business district)
2 Transition zone
3 Blue-collar residential
4 Middle-income residential
5 Commuter residential

Figure 12.21 Concentric Zone Model

The Concentric Zone model is a model of the internal structure of cities in which social groups are spatially arranged in a series of rings. The concentric zone model was resulted from a study of Chicago in the 1920's by Ernest Burgess. This model is also known as Bull's eye Model. The idea behind this model is that the city grows outward from a central area in a series of rings. The size of the rings may vary, but the order always remains the same. Under this model, five concentric functional zones are recognized. At the center was the CBD (1). The zone of transition (2) was characterized by residential deterioration and encroachment by business and light manufacturing. The zone of independent workers' homes (3) was primarily occupied by the blue collar (wage-earners, manual laborers) labor force. The zone of better residences (4) consisted mainly of the middle-class. Finally, the commuters' zone (5) was the suburban ring, consisting mostly of white-collar workers who could afford to live further from the CBD. This model was dynamic. As the city grow, the inner zones encroached on the outer ones.

DISADVANTAGES :

- This model was developed for American cities and had limited applicability elsewhere.
- The model does not take into account any physical barriers and gentrification - which may occur in the cities.
- It does not address local urban politics and forces of globalization.

12.5.2 SECTOR MODEL

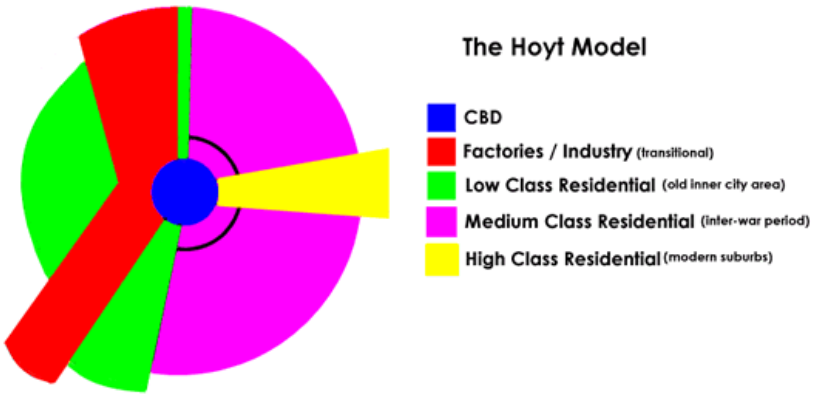


Figure 12.22 Sector Model

In the late 1930s, Homer Hoyt's sector model was published, partly as an answer to the drawbacks of Burgess' concentric zone model. This model was based both on urban land-use pattern and on demography. Hoyt accepted the existence of business district at the core, but suggested that various groups expand outward from the city centre along railroads, highways and other transportation arteries. As technology dealing with transportation and communication was improving, growth alone created more of a pie-shaped urban structure. Hoyt discovered that land rent (for residential, commercial, or industrial) could remain consistent all the way from the CBD to the city's outer edge.

Based on the above observation, Hoyt theorized the following:

- Cities tend to grow in wedge-shaped patterns—or sectors—emanating from the core business district and centered on major transportation routes.

- Higher levels of access meant higher land values; therefore, many commercial activities would be carried on in the central business districts, but manufacturing units would be developed in a wedge surrounding transportation routes.
- Residential areas would grow in a wedge-shaped pattern with a sector of low-income housing bordering manufacturing/industrial sectors (traffic, noise and pollution would make these areas least desirable), while middle and high income households would be located as far away as possible from manufacturing industrial units.

DISADVANTAGES :

- The theory is based on nineteenth century transport and does not make allowances for private cars that enable commuting from cheaper land outside city boundaries. This occurred in Calgary in the 1930's when many near-slums were established outside the city but close to the termini of the street car lines. These are now incorporated into the city boundary but are pockets of low cost housing in medium cost areas.
- No reference is given to out of town development.

12.5.3 MULTIPLE NUCLEI MODEL

In the 1940s, Chauncy Harris and Edward Ullman, arguing that neither of the earlier models adequately reflected city structure, proposed the multiple nuclei model. This model was based on the notion the CBD was losing its dominant position and primacy as the nucleus of the urban area. Several of the urban regions would have their own subsidiary but competing "nuclei." As manufacturing cities became modern cities and modern cities became increasingly complex, these models became less and less accurate.

Today, there are urban realms, components of giant conurbations (connected urban areas) that function separately in certain ways but are linked together in a greater metropolitan sphere. In the early postwar period (1950s), rapid population diffusion to the outer suburbs created distant nuclei, but also reduced the volume and level, of interaction between the central city and these emerging suburban cities. By the 1970s, outer cities were becoming increasingly independent of the CBD to which these former suburbs had once been closely tied. Regional shopping centers (e.g., malls) in the suburban zone were becoming the new CBDs of the outer nuclei.

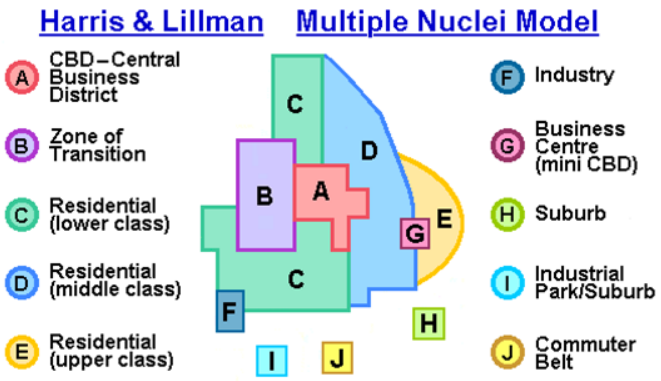


Figure 12.23 Multiple Nuclei Model

ADVANTAGES:

The advantages of this model lie in its multi nuclei approach - many sources give slight variants on the model shown in the diagram, since the model is rather flexible and adapts to local situations (the exact positions of the nuclei are not important but only the basic trends) so it can be modified to match the city under consideration.

DISADVANTAGES :

- Negligence of height of buildings.
- Non-existence of abrupt divisions between zones.
- Each zone displays a significant degree of internal heterogeneity and not homogeneity.
- Unawareness of inertia forces.
- No consideration of influence of physical relief and government policy.

- The concepts may not be totally applicable to oriental cities with different cultural, economic and political backgrounds.

12.5.4 URBAN REALM MODEL

Vance's urban realms model is an extension of the multiple-nuclei model and is based on the San Francisco Bay area but has been applied to other US cities. The key feature is the emergence of large self-sufficient urban areas, each focused on a center independent of the traditional downtown and central city. The area, shape and other characteristics of each realm depends upon the following several factors:

1. The terrain – mountains and rivers and other barriers will help to determine the extent and shape of a region.
2. The size of the metropolis – a larger metropolis may have more and larger realms.
3. The amount of economic activity within each realm – a determinant of the area it can serve and hence its size.
4. The transport infrastructure available within each realm – an easily accessible economic core increases the area of influence and thus size of each realm.

Transport infrastructure between realms – e.g. circumferential links (such as freeways) and airports such that people no longer have to travel to the CBD and its central realm in order to travel to other

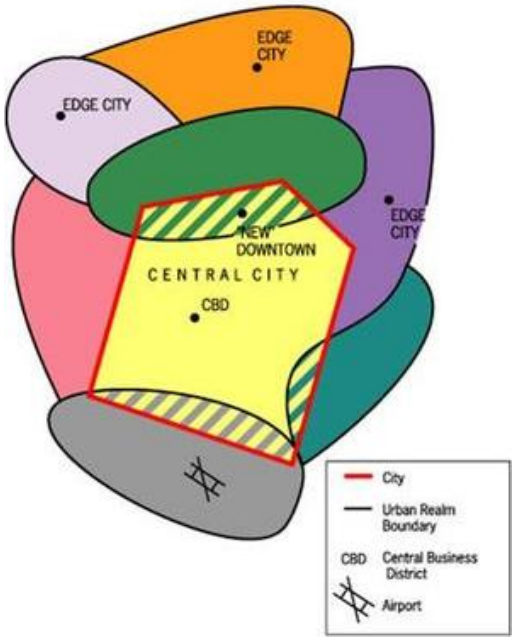


Figure 12.24 Urban Realm Model

realms and to another metropolis. If a realm can become more important in this manner, then it may increase in importance. E.g. West Los Angeles is within easy reach of the LAX airport (along the freeway) but to travel by train residents have to travel to the CBD (by bus or car).

ADVANTAGES :

- If the city is successful,
- It can accommodate a large and growing population easily due to its automobile dependence.
- Each realm has its own economic strength, so overall the metropolis can be an economic powerhouse and can become some self sufficient.

- This model helps make use of all of the areas of the city

DISADVANTAGES:

If a model fails, then the city displays a large amount of urban sprawl. Urban sprawl is the uncontrolled expansion of urban areas. Urban areas will expand into previously rural areas.

12.5.5 CENTRAL PLACE THEORY

Central Place Theory (CPT) is an attempt to explain the spatial arrangement, size, and number of settlements. The theory was originally published in 1933 by a German geographer Walter Christaller who studied the settlement patterns in southern Germany. In the flat landscape of southern Germany Christaller noticed that towns of a certain size were roughly equidistant. By examining and defining the functions of the settlement structure and the size of the hinterland he found it possible to model the pattern of settlement locations using geometric shapes.

ADVANTAGES :

- The theory helps us understand the organization from a theoretical perspective and the spatial distribution.
- Important in Policy Making.

DISADVANTAGES:

- The theory doesn't incorporate the temporal aspect in the development of central places.
- The theory is good for agricultural regions but not industrial or postindustrial regions.

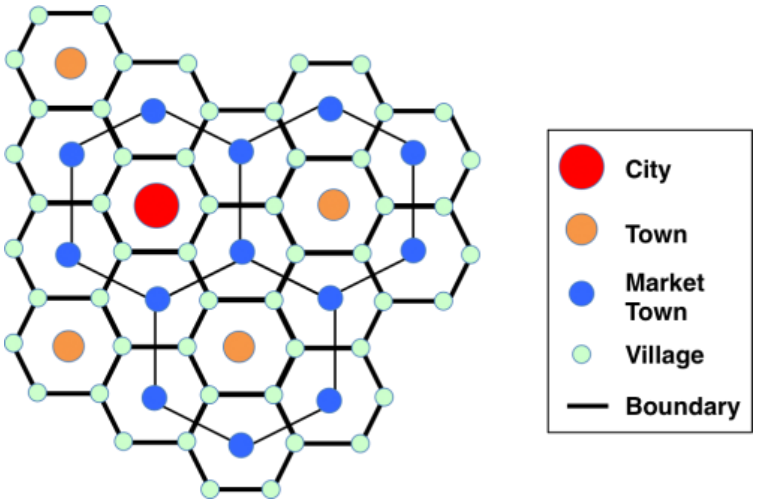


Figure 12.25 Central Place Theory

12.5.6 A MODEL BEST SUITED FOR PUDUCHERRY

After studying above mentioned theory, following analysis has been conducted.

It is evident that concentric zone model is not suitable for Puducherry as it was developed mostly for American cities and does not take into consideration any physical barrier or gentrification. Similarly, Sectoral model is also not applicable to PPA as there is no allowances for private cars while considering the transportation sector. Additionally, it doesn't include any reference for the development which occurs immediately after town, which is the scenario in almost all Indian cities.

In the case of urban realm model, if a model fails, then the city will start developing large amount of urban sprawl. This can't be applicable to Puducherry due to the absence of contiguous mass of land. Additionally, in todays' context, a city should focus less urban sprawl as a city can't afford to

lose its agricultural area. Central place theory is also not applicable to Puducherry as it is good for agricultural regions.

Multiple Nuclei Model is best suited for Puducherry as it has a unique character of non contiguous land mass. Additionally, the city has already developed a character where the application of this theory will become inevitable. The Major issues of the city can be solved with Multiple Nuclei Model. Some of the issues include, the high-level congestion in the boulevard town, increasing urban sprawl and decreasing agricultural land, haphazard development inside the planning area. Additionally, this model is flexible and can fit according to the local condition of a city/town. The other major reasons to adopt the Multi Nuclei Model in Puducherry region are listed below.

- Puducherry region possess flat terrain.
- Puducherry region is a noncontiguous settlement pattern paves the opportunity to develop the decentralization model.
- The administrative boundaries (noncontiguous settlement pattern) itself create the ways to decentralize the core activities from Central Business District.
- Puducherry region and Tamilnadu regions are sharing the major road network.
- Multi Nuclei model allows the even distribution of resources allocations.

12.6 CONCEPTUAL PLAN FOR PUDUCHERRY PLANNING AREA 2036

To achieve the vision and goals set for the planning area it is critical to have a concept, which illustrates the long-term direction guided by planning principles.

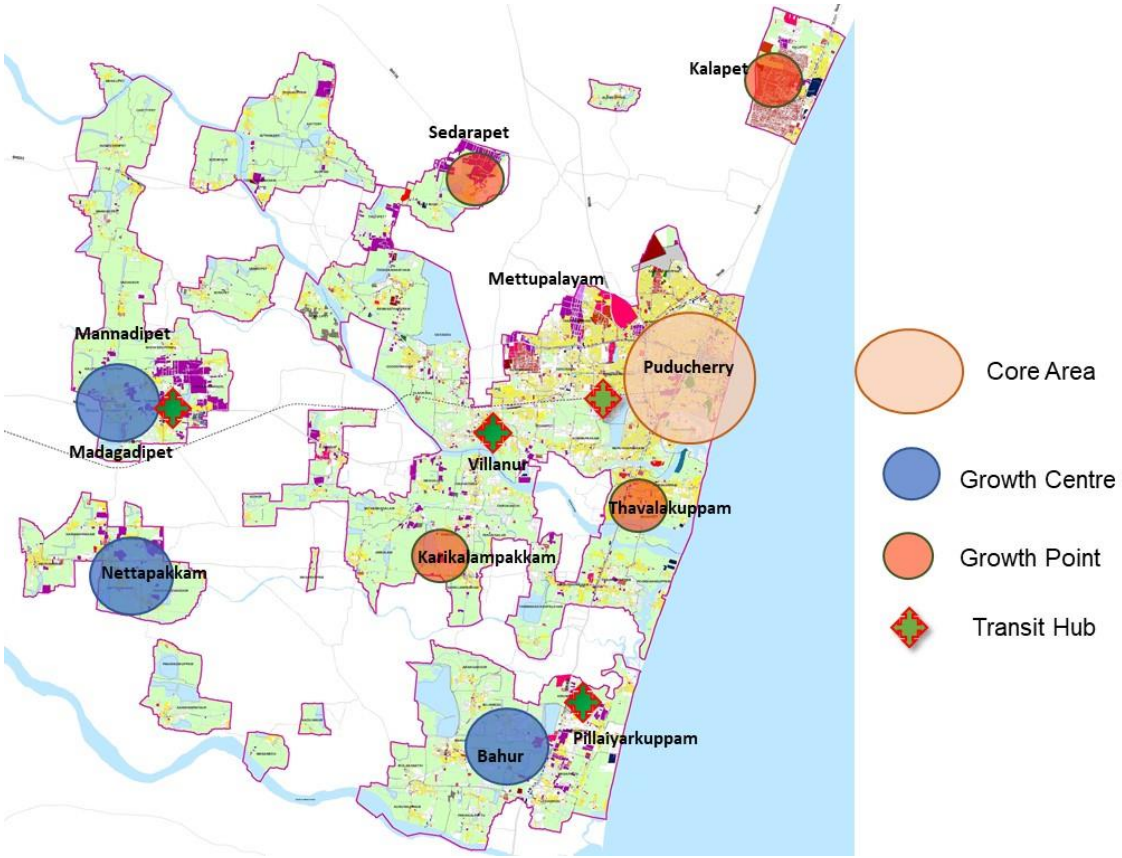


Figure 12.26 Concept Plan for Puducherry Planning Area-2036

Several considerations were taken into account while formulating the concept for the planning area, which are listed below.

- Socio-demographic Projections
- Current Growth Trends
- Level of Urbanisation
- Stakeholder Meeting Suggestions
- Suggestions from various government organisation, NGOs etc.
- Existing Physical & Social Infrastructure
- Existing Land Use Analysis & Land Availability for Future Development
- Economy of planning area
- Govt. Policies & Future Projects

Based on the various analysis and exploration the nodal points are identified for the projected year 2036. The figure 12.26 reveals that the identification of growth centers, growth points and location for the Multi Modal Transit Centres in Puducherry region. They are detailed in the table 12-20.

Table 12-20 Details of development centers and Nodal points

MULTI NUCLEI MODEL PUDUCHERRY PLANNING AREA- 2036		
S. No	**Development centers**	**Nodal point**
1	Growth centers	Bahour
		Nettapakkam
		Madagadipet
2	Growth points	Kalapet
		Sedarapet
		Karikalampakkam
		Thavalakuppam
3	Transit hubs	Villianur
		Madagadipet
		Puducherry (Mudaliarpet)
		Pillayarkuppam

Source: Compiled by Consultant

The planning area currently accommodates 9.5 lakhs of population with a gross density of 32 persons per hectare and this population is projected to grow to almost 16 Lakhs by 2036. The planning area have certain inherited nodes like the Boulevard Town, Institutional zones, Municipal areas & its out growth and the rural hinterland. For ease of planning, the Puducherry Planning Area is divided into three zones as mentioned below.

12.6.1 THE BOULEVARD AREA- CONSERVATION ZONE

As it's already mentioned in the City Context chapter, Puducherry is a heritage city attracting a large number of tourists throughout the year. One of the major attractions in the Puducherry Planning Area is "The Boulevard Town." The Grand Canal earmarks a clear bifurcation between the French & Tamil towns within the Boulevard Town. This area has inherited both European Classical Style architecture as observed in the French Town and strong vernacular influence in the Tamil town. The Tamil town is further divided into various quarters mainly inhabited by Hindus, Christians and Muslims. The Boulevard town is rich in cultural and religious diversity.

The urbanization observed in the past decades in the Puducherry city has left its marks on the Boulevard town as well. With increasing population density, deteriorating infrastructure facilities and quality of life has threatened the most priced heritage feature of the planning area. Many of the buildings with rich heritage values has made way for new constructions owing to the pressure of urban growth and constraints of land for development within the boulevard town.

To conserve this rich heritage from any further deterioration it is important to study the boulevard town as a separate entity within the planning area, which requires special development controls and heritage sensitive planning approach. Therefore, this area is dealt separately while framing the proposals for the Puducherry planning area and it is shown in the figure 12.27.

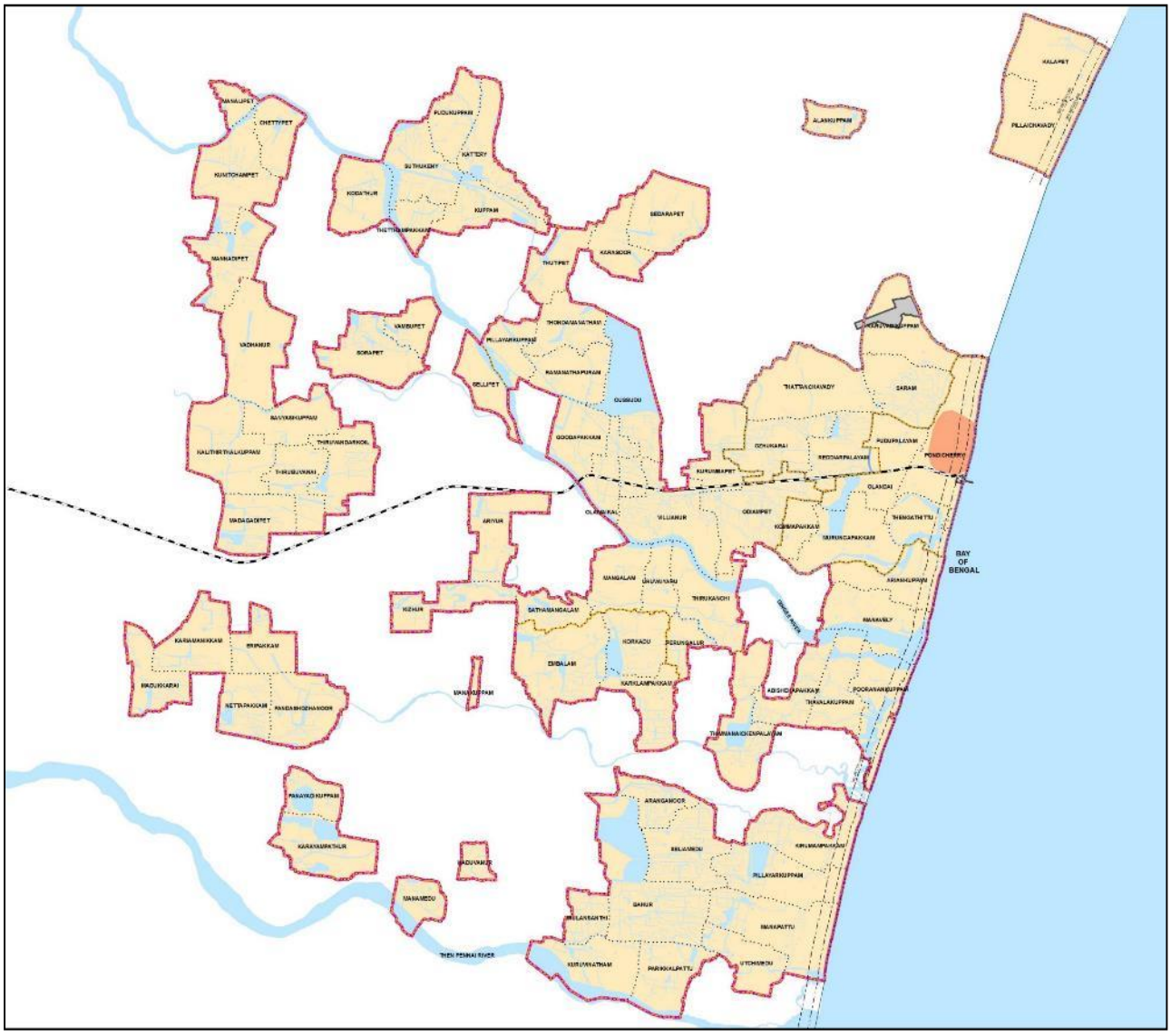


Figure 12.27 Boulevard area -Conservation Zone of Puducherry planning area - 2036

12.6.2 THE CONURBATION AREA- DENSIFICATION ZONE

Conurbation area is a continuous urban area comprising of towns and their outgrowths merged with each other due to physical expansion and population growth. In the case of Puducherry, conurbation area includes Puducherry Municipality, Oulgaret Municipality, part of Villianur Commune Panchayat and Part of Ariankuppam Commune Panchayat. The continuous development has occurred up to Villianur village and Kurumbapet Village due to existence of NH 45A and SH 203 on western side of Puducherry. The continuous development also has occurred due to Gingee River in Manavely village on southern part of Puducherry. This area is also well connected through NH 45A. The villages included in the conurbation area are listed below.

Table 12-21 Proposed Conurbation areas - 2036

PROPOSED CONURBATION AREAS - 2036				
S. No	**Oulgaret Municipality**	**Puducherry Municipality**	**Villianur Commune panchayat**	**Ariyankuppam Commune Panchayat**
1	Alankuppam	Pondicherry	Oussudu	Ariankuppam
2	Kalapet	Pudupalayam	Koodapakkam	Manavely
3	Pillaichavady	Olandai	Olaivaikal	-
4	Thattanchavady	Thengaithittu	Villianur	-
5	Oulgaret	Murungapakkam	Kurumbapet	-
6	Reddiarpalayam	Kombakkam	Odiampet	-
7	Saram	-	-	-
8	Karuvadikuppam	-	-	-
	8	6	6	2
Total no of revenue villages covered within the conurbation area				22

Source: Compiled by Consultant

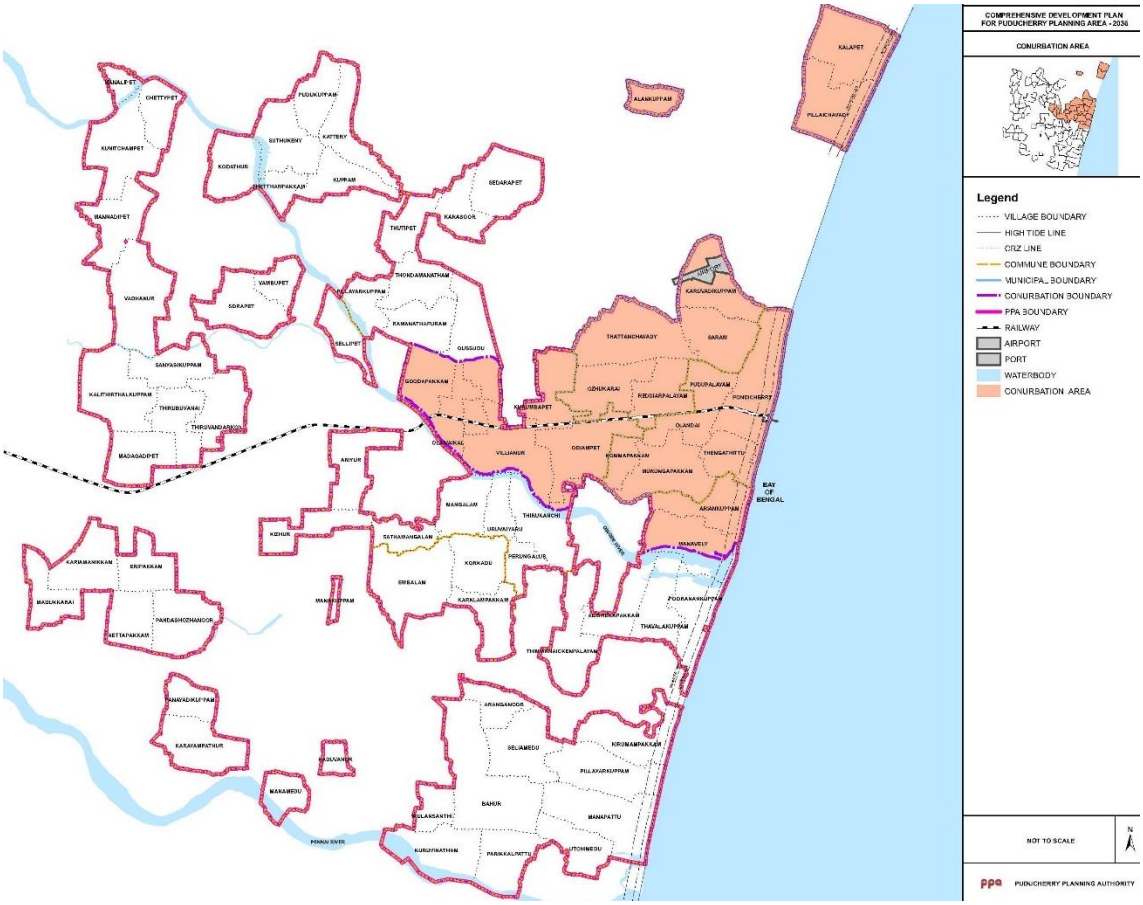


Figure 12.28 Conurbation area – Densification Zone of Puducherry planning area – 2036

12.6.2.1 EXISTING LAND USE OF CONURBATION AREA

The various industries, the educational and health sectors, trade and commerce and transportation sector are responsible for the city's function. Puducherry has been observed to be a multi-functional town having characters of trade and commerce cum industries cum administration.

The existing land use pattern of the conurbation area shows the dominance of residential area. It can be observed that a considerable area is under Public-Semi Public use as this land use consists of the administrative and government buildings, educational institutions, medical institutions, social amenities and public utilities being part of this land use. The maximum developed area is on the eastern side of planning area towards the boulevard town. There is a dense network of roads within the boulevard area. But outside that there are only some radial roads connecting various communes and the nearby state of Tamilnadu. There is large parcel of land occupied under the Airport. Commercial areas are mainly located in Boulevard Town and along the major transportation corridors. The area for Recreational Use is practically negligible, since there are not many green spaces, parks and gardens. There is a considerable area under industrial uses also. PIPDIC Industrial Estate is located in Thattanchavdy Village. But industries in the estate are not fully functional and most of the industries outside industrial estate are shut down since long. The existing land use area on new conurbation area is **83.10** sq.km.

12.6.3 RURAL AREAS & GROWTH CENTERS

Based on the Multi Nuclei Theory explained in the earlier section:

The formation mainly happens when the CBD gets saturated with developmental activities and there is hardly any room for further development. Thus, it demonstrates the complex nature of urban areas. In the light of this, three growth centers and four growth points are identified in Puducherry Planning Area since there is a dire need to decentralize the commercial/public semi-public activities towards outskirts of the urban area.

Three Growth centers are proposed in Bahour, Manadipet (Madagadipet) and Nettapakkam while the growth points are proposed in Karikalampakkam, Thavalakuppam, Sedarapet and Kalapet.

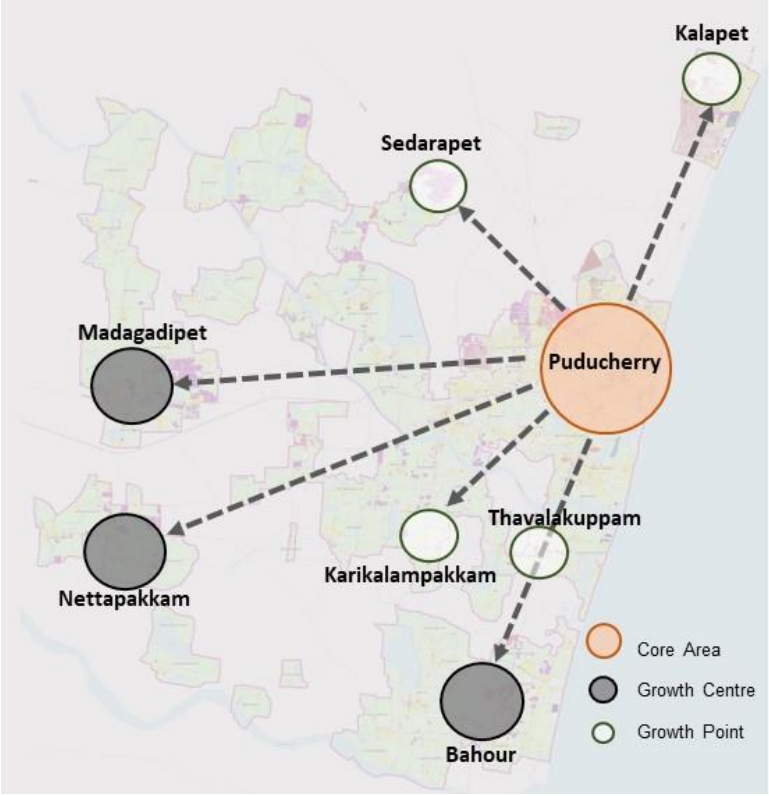


Figure 12.29 Concept Plan for Puducherry Planning Area-2036

12.6.3.1 Bahour Growth Centre

Salient Features:

- Located along NH 45A
- Rice bowl of the area
- Fertile agricultural land
- Proximity to Cuddalore which is an industrial estate
- Proposal of multi modal transit centre and oceanarium at Manapet
- Special tourism Zone in Manapattu
- Existing character of trade and commerce

Bahour commune located in the southern side of planning area is known as the rice bowl of the area and has very fertile chunks of agricultural land. Moreover, the commune used to have 54.94% (3028 ha out of 5511 ha) of the total land area under rice cultivation in 2006. As per the recent data, the net sown area has declined approximately 18% from 2008 to 2013. Thus, protection of this prime agricultural land is necessary for preserving the dwindling numbers of agricultural land and to increase the employment opportunities in primary sector. Moreover, preserving the big chunk of agricultural land will enhance the overall environment of the PPA. Thus, Bahour commune is proposed as an agricultural growth centre. Other reasons stating the potential of Bahour commune to be developed as a growth centre are mentioned below:

- Bahour Commune is 7 km from Cuddalore and industrial area are existing at Manapattu, Pillayarkuppam and Utchimedu. These villages are situated along the ECR. Puducherry IT policy 2008 recommends IT Hub along NH 45A/ECR indicating the chances of employment generation in future. Multi Modal Transit Centre is proposed at Pillayarkuppam in Bahour Commune. Hence, these villages in Bahour may be developed as Growth Centre.
- Since Bahour has very fertile agricultural land, to support the agricultural activity in Bahour, special permission is given in the agricultural zone of Bahour commune, where the Godowns, Agricultural tool and equipment repairing, Cold Storage and allied activities etc. are allowed.

Hence, commercial zone is proposed along the stretch of NH 45 A falling under Bahour Commune.

- Bahour is situated 15 Km from Puducherry town via ECR and 10 Km via Uruvaiyaru road, both these roads has ribbon development and potential to develop.
- Since the PPA is Non-contiguous area, it is essential to focus on Bahour as self-sustainable development to the extent which will reduce the generation of trips from Bahour to Puducherry everyday.
- Moreover, the presence of many educational institutions in Kirumampakkam and Pillayarkuppam, Proposed Special tourism zone in Manapattu village accelerates the scope of Bahour to function self sufficiently.
- The proposal of adventure sports facilities and Oceanarium in Manapattu village will Pull the population from the near by region especially from Cuddalore and Villupuram which will further strengthen the development.
- Agricultural belt in villages of Irulansandy, Kuruvinatham and Parikalpattu will act as green zone for Bahour.
- Bahour will have the impact of proposed outer ring road and Proposed Industries in Cuddalore.

12.6.3.2 Madagadipet Growth Centre

Salient feature:

- Situated on NH 45A
- Proximity to Thirubuvanai & Thiruvandarkoil, which are industrial estate
- Potential to be developed as an industrial estate
- Availability of land for development

- Madagadipet is situated around 20 km from Puducherry town via NH 45A and closer to Villupuram town it has got its own potential to develop.
- Development of Madagadipet as Multi Nuclei / Self sustainable center may reduce the traffic flow to Puducherry and Villianur.
- There are three ASI sites in and around the growth centre which can be developed as important tourist centres.
- The presence of already existing industries will attract a greater number of industries. Tool based industries are proposed to be strengthened by capacity building programs.
- Apart from this, Madagadipet is also proposed as a Multi Modal Transit Centre which will attract and boost the development in the surrounding area. People travelling from Villupuram to Puducherry can interchange the mode of transport from Madagadipet.
- Existing Railway line is also passing from the southern side of the Madagadipet. The Growth centre can take an advantage of this connectivity as well. DEMU is proposed over this route as an important mode of regional transport between Villupuram and Puducherry. DEMU station is proposed in Madagadipet which is shown in map in chapter 5.8.7 (refer figure 5.36). Due to this connectivity, the Growth centre will be further flourished in terms of development.

12.6.3.3 Nettapakkam Growth Centre

Salient features:

- Availability of major agricultural land
- Availability of manpower
- Proximity to the NH-45A
- Existence of rural character

Nettapakkam commune is known for agricultural activities. Around 54% of the working population is dependent on primary sectors for their economy generation. Thus, it is proposed to be developed as an agricultural hub where agricultural activities are promoted and sufficient commercial areas are proposed to facilitate agricultural allied activities. Agricultural research centers are proposed in Nettapakkam commune where various research can be carried out. Other reasons stating the potential of Nettapakkam commune to be developed as a growth center are mentioned below:

- Majority of the area in this commune falls under agriculture category and the residents are dependent on primary sector for economy generation.
- In consideration of this aspect, Nettapakkam has been proposed as agricultural Growth Centre where agriculture and its allied activities will be promoted.
- The connectivity with NH-45A will accelerate the scope of development for this area.
- Eco village tourism is proposed here as the existing character of the area has the potential to be developed as an Eco village tourism. Moreover, this will act as a livelihood option for the residents of the area.

12.6.3.4 Growth Points

The selected points will produce self-sustaining growth. In Puducherry Planning Area, four growth points have been identified viz. Sedarapet/ Karasur, Kalapet, Karikalampakkam and Thavalakuppam.

12.6.3.4.1 Kalapet Growth Point

Kalapet, which is located on the northern side of the planning area has presence of Pondicherry University which is well known across the country. Moreover, it has the potential of development along beach side as it has the beach available for development. Thus, it is proposed as a growth point. In this area, activities supporting the educational institutes will be developed. Beach side development is proposed in the Kalapet to attract the tourists and this will reduce the burden of the promenade beach.

12.6.3.4.2 Thavalakuppam Growth Point

Thavalakuppam Growth Point which is located on the southern side of the planning area, has the close proximity to NH-45A. It's close proximity to the proposed IT corridor and special tourism zone enables this area with great potential to grow as a growth point attracting investments and being a node for services for the surrounding areas.

12.6.3.4.3 Sedarapet/Karasur Growth Point

- Currently, large area (around 170 ha) in Sedarapet & Karasur (PIPDIC Industrial Estate) is falling under Industrial category. Availability of land and future population growth requirements encourage the surrounding area to be developed as an industrial estate (Industrial General Category) for addressing the industrial land requirement to suffice the employment opportunities required for the future population.
- The initiatives taken by Puducherry government through Industrial policy-2013 will encourage investments within the Planning Area earmarking land for industrial development. Also it will aid to strengthen the position of Puducherry as a regional hub in area of service industry, education, health, food & vegetable processing & automobile components.
- The strong connectivity with SH 136 will facilitate the development of industries, as it will provide ease of transportation of goods.

12.6.3.4.4 Karikalampakkam Growth Point

It is situated in between Villianur and Bahour. It acts as connecting link between these upcoming growth centre Bahour and Multi Modal Transit Centre of Villianur. The road connecting these places are proposed to be 4 lane, which will enhance the movement along this road. Karikalampakkam being situated along this road, enhances its opportunities for development. Thus, it is proposed as a Growth Point under this Comprehensive Development Plan.

12.6.4 LAND REQUIREMENT FOR PPA

Based on certain mathematical calculations, population projection for 2036, Existing Land Use distribution, application of planning theories, Level of Urbanisation, considering concept of growth centres, growth points and transit nodes, URDPFI Guidelines 2015, major proposals from the government and various departments, the Land requirement for PPA is worked out as below:

Table 12-22 List of villages excluding Growth Center, Growth Point & Transit Nodes

LIST OF VILLAGES EXCLUDING THE GROWTH CENTER, GROWTH POINT & TRANSIT NODES										
VILL NO.	Village NAME	Commune Panchayat	Rank of variables					TOTAL	AVERAGE RATING SCALE	LEVEL OF URBANISATION - 2011
			Secondary and Tertiary	Order of Settlement	Household	Density (Persons per hectare)	Primary sectors			
			Weightage of Variables							
			5	4	3	2	1			
72	KIRUMAMPAKKAM	BCP	6	4	5	6	5	26	3.00	1
23	KARASOOR	VCP	7	7	7	7	6	34	3.06	1
10	THIRUVANDARKOIL	MCP	6	6	6	6	5	29	3.07	1
81	MANAPATTU	BCP	6	6	6	6	5	29	3.07	1
8	THIRUBUVANAI	MCP	6	5	6	5	5	27	3.07	1
7	MADAGADIPET	MCP	6	4	6	6	4	26	3.08	1
68	ABISHEKAPAKKAM	ACP	6	7	6	6	5	30	3.10	1
24	THUTIPET	VCP	7	7	7	7	5	33	3.12	1
6	KALITHIRTHALKUPPAM	MCP	6	6	6	6	4	28	3.14	1
52	ARIYUR	VCP	6	6	6	6	4	28	3.14	1
54	MADUKARAI	NCP	6	5	6	5	4	26	3.15	1
25	THONDAMANATHAM	VCP	7	7	7	6	5	32	3.16	1
48	URUVAIYARU	VCP	7	6	7	5	5	30	3.17	1
47	THIRUKANCHI	VCP	7	7	7	7	4	32	3.19	1
26	PILLAYARKUPPAM	VCP	7	7	7	7	4	32	3.19	2
49	MANGALAM	VCP	7	6	7	6	4	30	3.20	2
63	EMBALAM	NCP	6	6	6	6	3	27	3.22	2
50	SATHAMANGALAM	VCP	7	7	7	6	4	31	3.23	2
14	THETTHAMPAKKAM	MCP	7	7	7	6	4	31	3.23	2
17	KATTERY	MCP	7	6	7	5	4	29	3.24	2
9	SANYASIKUPPAM	MCP	7	7	7	7	3	31	3.26	2
28	RAMANATHAPURAM	VCP	7	7	7	7	3	31	3.26	2
27	SELLIPET	MCP	7	7	7	7	3	31	3.26	2
66	PERUNGALUR	VCP	7	7	7	7	3	31	3.26	2
77	IRULANSANTHI	BCP	7	7	7	7	3	31	3.26	2
2	CHETTYPET	MCP	7	7	7	7	3	31	3.26	2
51	KIZHUR	VCP	7	7	7	5	4	30	3.27	2

LIST OF VILLAGES EXCLUDING THE GROWTH CENTER, GROWTH POINT & TRANSIT NODES										
VILL NO.	Village NAME	Commune Panchayat	Rank of variables					TOTAL	AVERAGE RATING SCALE	LEVEL OF URBANISATION - 2011
			Secondary and Tertiary	Order of Settlement	Household	Density (Persons per hectare)	Primary sectors			
			Weightage of Variables							
			5	4	3	2	1			
3	KUNITCHAMPET	MCP	7	7	6	7	3	30	3.27	2
74	SELIAMEDU	BCP	7	6	6	6	3	28	3.29	2
80	UTCHIMEDU	BCP	7	7	7	6	3	30	3.30	3
56	ERIPAKKAM	NCP	7	7	7	6	3	30	3.30	3
64	KORKADU	NCP	7	6	7	5	3	28	3.32	3
75	ARANGANOOR	BCP	7	7	7	7	2	30	3.33	3
15	SUTHUKENY	MCP	7	7	7	7	2	30	3.33	3
18	KUPPAM	MCP	7	7	7	7	2	30	3.33	3
67	THIMMANAICKENPALAYAM	ACP	7	7	7	7	2	30	3.33	3
1	MANALIPET	MCP	7	7	7	7	2	30	3.33	3
62	KADUVANUR	BCP	7	7	7	7	2	30	3.33	3
16	PUDUKUPPAM	MCP	7	7	7	7	2	30	3.33	3
53	MANAKUPPAM	VCP	7	7	7	5	3	29	3.34	3
55	KARIAMANIKKAM	NCP	7	6	6	6	2	27	3.37	3
5	VADHANUR	MCP	7	6	6	6	2	27	3.37	3
58	PANDASOZHANUR	NCP	7	7	6	6	2	28	3.39	4
78	KURUVINATHAM	BCP	7	7	6	6	2	28	3.39	4
60	KARAYAMPUTHUR	BCP	7	6	7	5	2	27	3.41	4
59	PANAYADIKUPPAM	BCP	7	7	7	7	1	29	3.41	4
79	PARIKKALPATTU	BCP	7	7	7	7	1	29	3.41	4
12	VAMBUPET	MCP	7	7	7	7	1	29	3.41	4
13	KODATHUR	MCP	7	7	7	5	2	28	3.43	4
61	MANAMEDU	BCP	7	7	7	5	2	28	3.43	4
11	SORAPET	MCP	7	7	6	5	2	27	3.44	4

As already mentioned in chapter 12.4, above is the list of villages classified under level of urbanization. Based on the level of urbanization the villages are classified under 4 levels. The distribution of land requirement in growth center, growth point, transit nodes and 4 levels of villages are mentioned below in the table.

Table 12-23 Distribution of Landuse in Growth Center, Growth Point & Transit Nodes and in Rural Area

Distribution of Landuse in Growth Center, Growth Point & Transit Nodes and in Rural Area – 2036 (Hectares)									
S. No	**Land use classification**	**Additional area to be provided in outside Conurbation area**	**Growth center**	**Growth point**	**Transit nodes**	**Rural Villages**			
			40%	**25%**	**15%**	**L1 - 8%**	**L2-6%**	**L3-4%**	**L4-2%**
1	Residential	1878.087	751.235	469.522	281.713	150.247	112.685	75.123	37.562
2	Commercial	39.686	15.874	9.922	5.953	3.175	2.381	1.587	0.794
3	Public-Semi Public	534.222	213.689	133.555	80.133	42.738	32.053	21.369	10.684
4	Industrial	1217.661	487.064	304.415	182.649	97.413	73.060	48.706	24.353
5	Recreational	132.900	53.160	33.225	19.935	10.632	7.974	5.316	2.658
6	Mixed Residential Zone	42.348	16.939	10.587	6.352	3.388	2.541	1.694	0.847
7	Mixed Commercial Zone	58.354	23.342	14.589	8.753	4.668	3.501	2.334	1.167
8	Mixed Industrial Zone	91.259	36.503	22.815	13.689	7.301	5.476	3.650	1.825
9	Traffic & Transportation	865.349	346.140	216.337	129.802	69.228	51.921	34.614	17.307
	Total	**4859.866**	**1943.946**	**1214.966**	**728.980**	**388.789**	**291.592**	**194.395**	**97.197**

It is assumed that 40% of the land will be required in growth centre, 25% in growth point, 15% in transit nodes and in rural area, 8% in level 1 villages, 6% in level 2 villages, 4% in level 3 villages and 2% in level 4 villages.

Table 12-24 Distribution of Landuse in Growth Center, Growth Point & Transit Nodes

Distribution of Landuse in Growth Center, Growth Point & Transit Nodes – 2036 (Hectares)												
S. No	DEVELOPMENT CENTERS	GROWTH CENTER				GROWTH POINT				TRANSIT NODES - 10%		
	VILLAGES/LAND USE	MADAGADIPET - 35%	NETTAPAKKAM - 30%	BAHOUR - 35%	TOTAL	THAVALAKUPPAM - 35 %	KARIKALMAPAKKAM - 35%	SEDARAPET - 30%	TOTAL	MADAGADIPET - 50%	PILLAYARKUPPAM - 50%	TOTAL
1	Residential	262.93	225.37	262.93	751.23	164.33	164.33	140.86	469.52	140.86	140.86	281.71
2	Commercial	5.56	4.76	5.56	15.87	3.47	3.47	2.98	9.92	2.98	2.98	5.95
3	Public-Semi Public	74.79	64.11	74.79	213.69	46.74	46.74	40.07	133.56	40.07	40.07	80.13
4	Industrial	170.47	146.12	170.47	487.06	106.55	106.55	91.32	304.42	91.32	91.32	182.65
5	Recreational	18.61	15.95	18.61	53.16	11.63	11.63	9.97	33.22	9.97	9.97	19.93
6	Mixed Residential Zone	5.93	5.08	5.93	16.94	3.71	3.71	3.18	10.59	3.18	3.18	6.35
7	Mixed Commercial Zone	8.17	7.00	8.17	23.34	5.11	5.11	4.38	14.59	4.38	4.38	8.75
8	Mixed Industrial Zone	12.78	10.95	12.78	36.50	7.99	7.99	6.84	22.81	6.84	6.84	13.68
9	Traffic & Transportation	121.15	103.84	121.15	346.13	75.72	75.72	64.90	216.33	64.90	64.90	129.80
	Total	680.38	583.18	680.38	1943.95	425.24	425.24	364.49	1214.97	364.49	364.49	728.98

Based on the land requirement assumed in table 12-23, detailed land requirement for Madagadipet, Nettapakkam and Bahour growth centers, Thavalakuppam, Karikalampakkam and Sedarapet growth points and Madagadipet & Pillayarkuppam transit nodes are calculated.

12.7 PROPOSED LAND USE AND ZONING

This chapter includes the details of proposed land use and concentrates in detail on the individual proposed land use categories. As explained earlier, the total project area includes puducherry municipality, oulgaret municipality and five commune panchayats. In the CDP, the total area has been divided into three zones for proposals: **Boulevard Town, conurbation area and rest of the planning area**. In the previous chapter, it is explained that multi nuclei concept has been adopted for the CDP – 2036 and in light of that, each growth centre and growth points are given land uses such that they can act as self-sustainable centres in terms of economy generations and civic amenities as well.

12.7.1 PROPOSED LAND USE FOR BOULEVARD

As briefed earlier, Boulevard Town is having French influence, the land use planning becomes very critical. Due to existance of buildings with French architecture in Boulevard Town, the due consideration is given for their preservation while proposing landuses. The Existing Public and Semi-

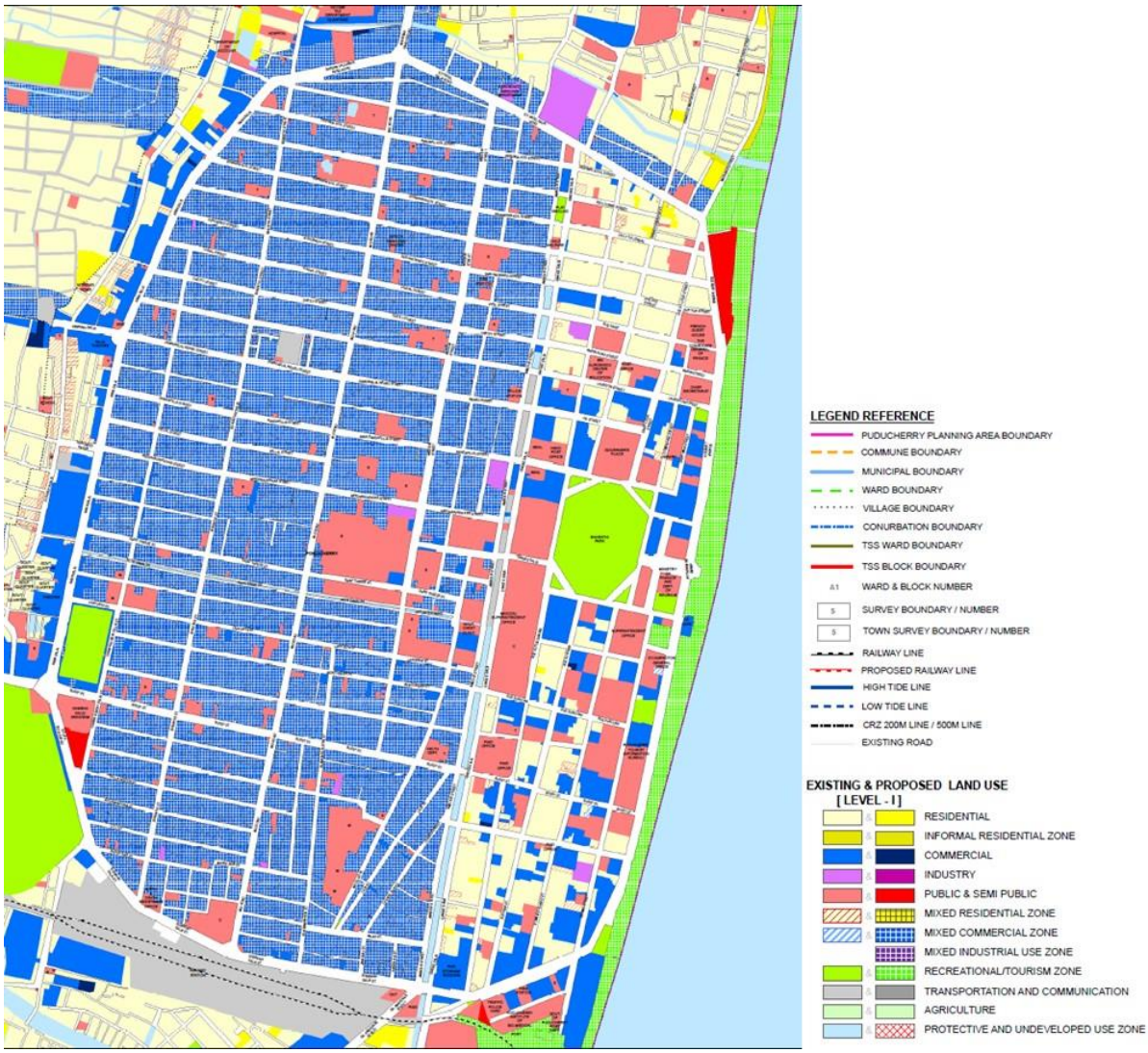


Figure 12.30 Proposed Land Use Map of Boulevard -2036

Public Zone and 21 heritage buildings notified by the government are kept intact as they are important landmarks of Boulevard area. The central jail is proposed for parking. These proposals will help in easing out the parking issue of the Boulevard Town. The beach at Promenade is proposed as Recreational/Tourism Zone. The land between Sardar Patel Salai to Subbaiah Salai is proposed

as Mixed Commercial Zone in the western side of Grand Canal. The northern side of Sardar Patel Salai road is also proposed as Mixed Commercial Zone up to depth of 50m. The existing land use in White town (eastern side of Grand Canal) is kept as it is as the buildings are of rich heritage value. The proposals of SMART City are also incorporated while preparing Comprehensive Development Plan for Puducherry. Proposals such as Art and Digital Museum Complex at Old Distillery site (earmarked as Public and Semi-Public Zone), Urban Entertainment Village at Old Port site (earmarked as Recreational / Tourism Zone), Retail Commercial and Administrative Complex at AFT Mill Site (Earmarked as Commercial and Public and Semi-Public Zone) are incorporated in the Comprehensive Development Plan for Puducherry.

The implementation and Urban Design guidelines for Boulevard Town are mentioned in chapter 13.6.2.

Table 12-25 Proposed Land Use Area - Boulevard

S. No.	PLU Classification	Area (in Ha.)	Percentage
1	Residential	10.05	4.56
2	Commercial	11.90	5.40
3	Public Semi Public	27.49	12.47
4	Industrial	0.73	0.33
5	Recreational/Tourism Zone	12.33	5.59
6	Mixed Residential Zone	3.53	1.60
7	Mixed Commercial Zone	87.68	39.77
8	Transportation & Communication	66.75	30.28
Total Developed Area		**220.48**	**100**

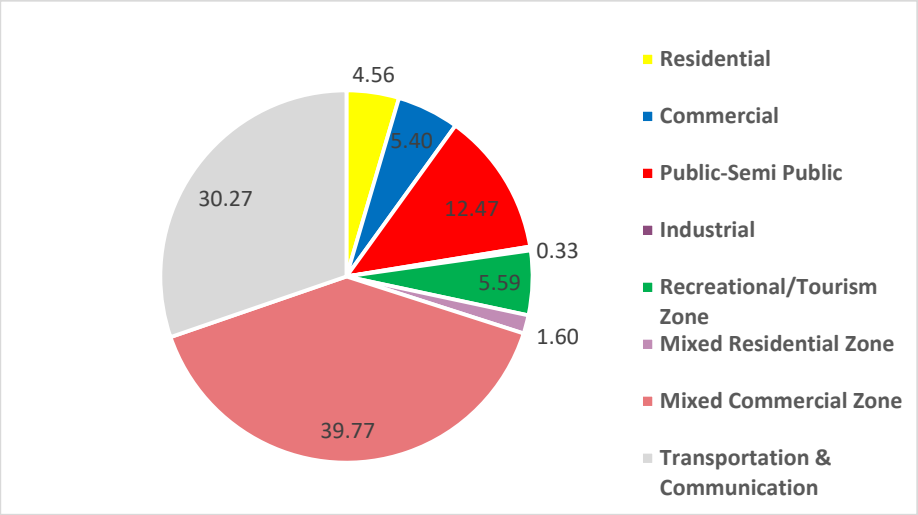


Figure 12.31 Proposed Land Use Analysis - Boulevard

In Boulevard town, total residential area of 10.05 Ha is proposed for development and 11.90 Ha as commercial development. In case of residential development, no new residential area is proposed; only the existing residences is to be kept as residential while in case of commercial development, new commercial areas have been proposed. Stretches along Bussy street, JN Street, Rangapillai

street etc. are proposed as commercial development. These commercial development is mostly retail. Wholesale markets are not allowed as a part of decentralisation process of Boulevard Town.

Public & Semi-Public Zone is proposed in 27.49 Ha of land and 0.73 Ha of land is kept for industrial land use. As explained earlier, boulevard town lacks recreational space, thus 12.33 Ha of land is proposed as recreational development. Other than that, mixed residential and mixed commercial development is proposed. The highest area is falling under traffic & transporation category i.e. 67 Ha. This is attributed to the dense road network of the area.

12.7.2 PROPOSED LAND USE FOR CONURBATION AREA

12.7.2.1 PROPOSED RESIDENTIAL ZONE

Majority of the residential areas are proposed as infills of the existing residential developments. Major residential chunk is proposed between Villianur and Pondicherry Town as it is envisaged that the area till Villianur will be a developed area and will act as a conurbation area and few chunks in north western side of Villianur. As conurbation area will be facing the higher pressure of development, ample residential area is proposed in order to accommodate the future expansion which will take place in the future.

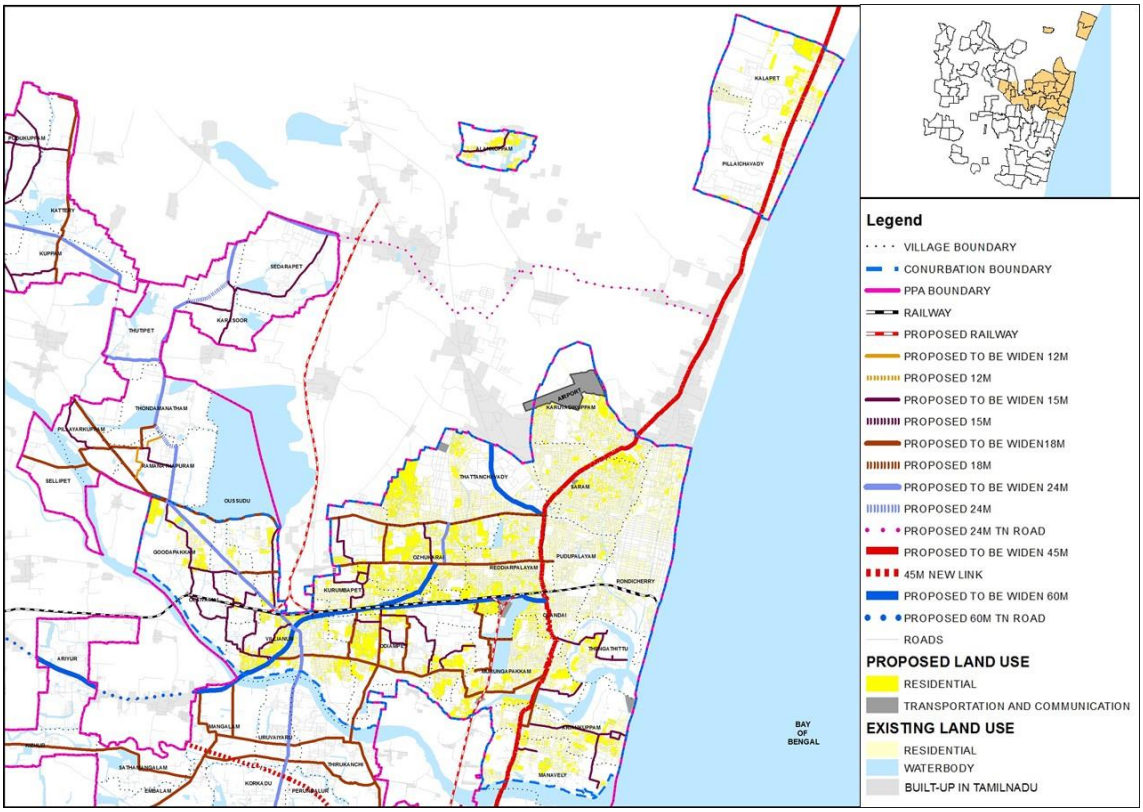


Figure 12.32 Proposed Residential Map

12.7.2.2 PROPOSED MIXED RESIDENTIAL ZONE

In most of the areas, the existing character of development in Puducherry is of the mixed character, where the ground floor is used as commercial and the first floor as residential zone and/or vice versa. Keeping this trend intact the authority has introduced Mixed Residential Zone where both commercial and residential development is allowed with restriction stipulated in the Development Control Regulations. In this category, residential will be prominent category followed by commercial.

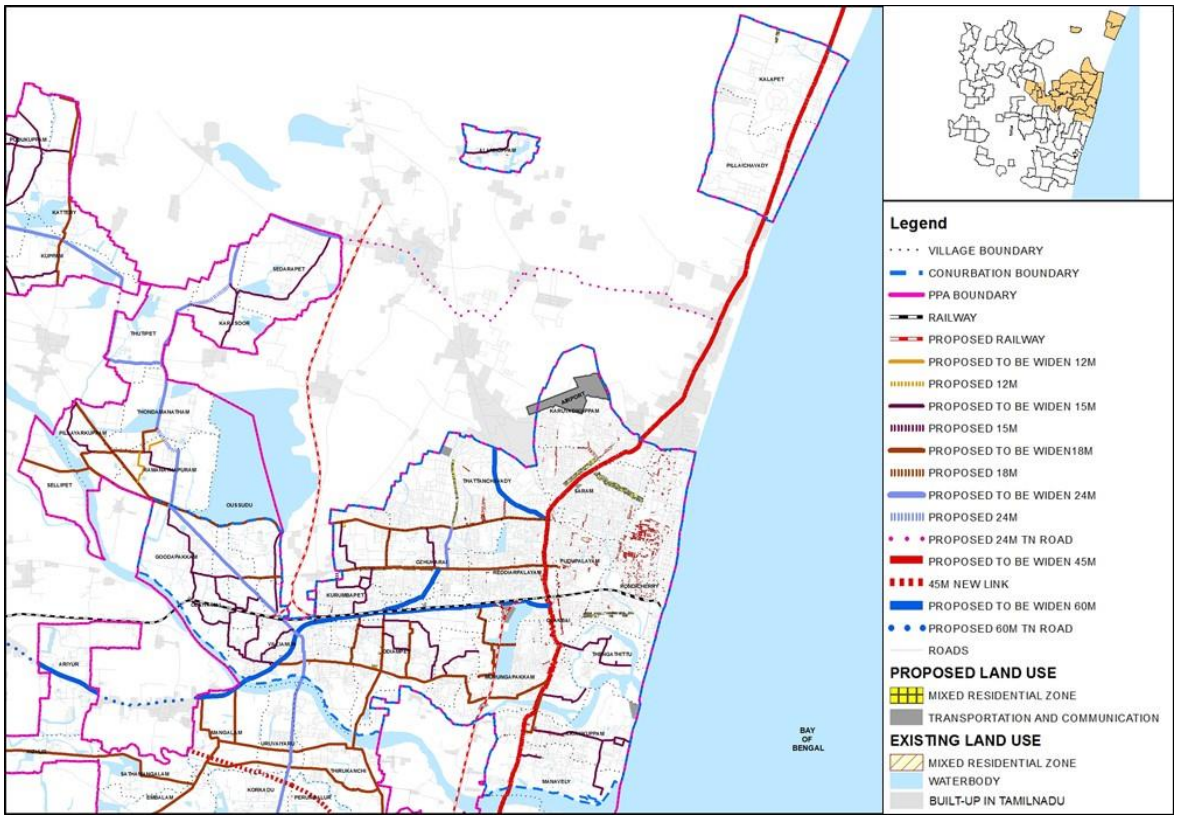


Figure 12.33 Proposed Mixed Residential Zone

- On Dr. Ambedkar Road, mixed residential is proposed on 50 m on both the side.
- Along Krishna Nagar Main Road upto 50 m of depth, mixed residential is proposed.
- On lawspet main road 50 m on both the side is proposed as mixed residential.
- On PIPDIC (Puducherry Industrial Promotion, Development and Investment Corporation) main road, 50 m on eastern side is proposed as mixed residential.
- Along some stretch of Vazhudavour road, 50 m is proposed as mixed residential near Oulgaret and Kurumbapet villages.
- Along Bahour road, near Perungalur upto 50 m depth of mixed residential is proposed on both the side of road.

12.7.2.3 PROPOSED COMMERCIAL ZONE

In today's context, integration between transportation and land use has become inevitable as both are interrelated and creates impact on each other. The proposed transportation network is explained in detail in the previous chapter. Like observed in many of the Indian cities, majority of the commercial development takes place along the transportation corridors and these act as the development axis for the area. In consideration to this, major commercial areas are proposed at key intersections taking advantage of the transit accessibility of these sites, along arterial roads and other major roads within the planning area.

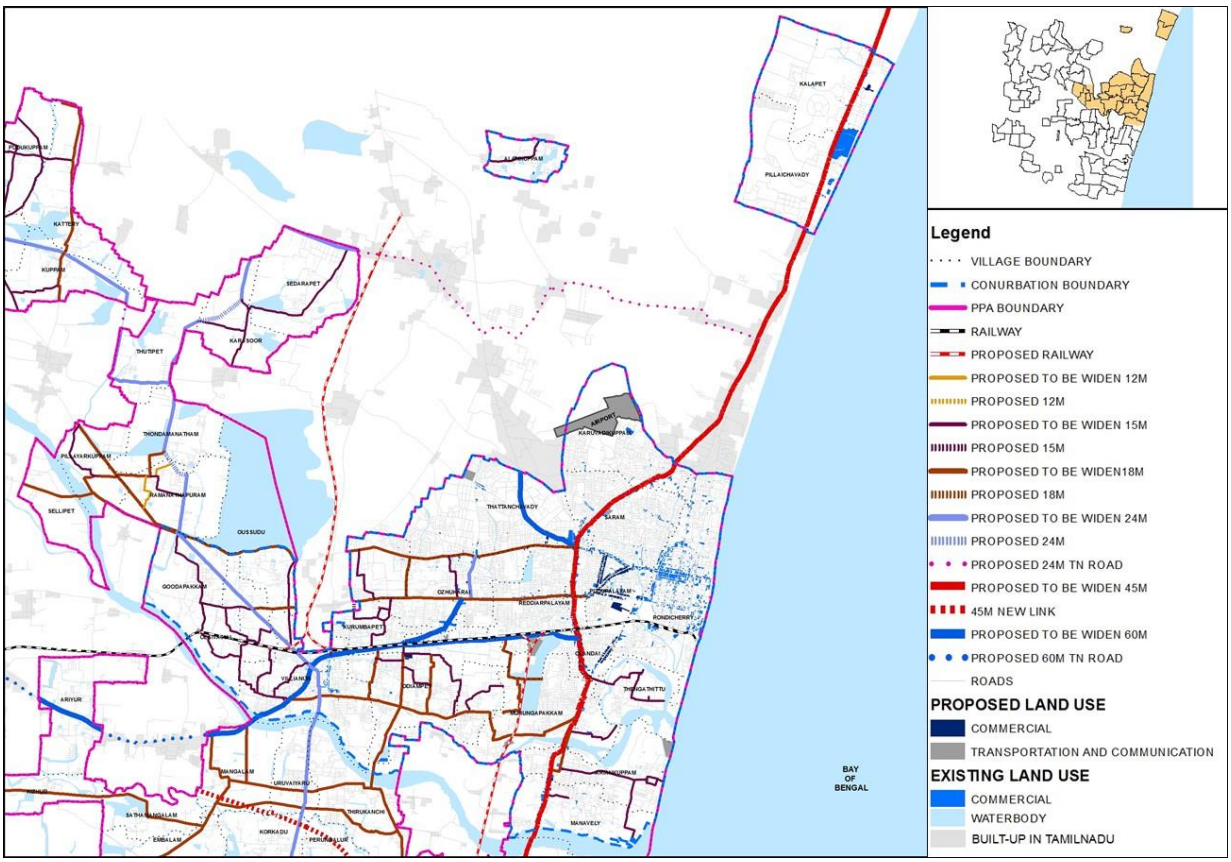


Figure 12.34 Proposed Commercial Zone

Commercial area is proposed near Pudupalayam village, Olandai and a small patch near thattanchavady. Additionally, some commercial area is proposed along the major roads like JN Street, Busy Street etc.

- On ECR, commercial zone is proposed on 100m of both the sides of road from Ganapathichettikulam to Bahour.
- Along the stretch falling in Thavalakuppam village, an overlay zone is proposed where IT industries are allowed. This is in conformity with the IT policy under which an IT corridor is proposed from Ganapatichettikulam to Mullodai. However, the potential for development of IT corridor lies in this stretch due to the existing character of the area.
- On NH-45A, from Indhira Gandhi junction to Villianur (till pennaiyar river), Commercial zone is proposed on both the sides of road till 100 m.
- Along Maraimalai Adigal Salai, commercial zone is proposed for width of 100m on both the side of the road.

12.7.2.4 PROPOSED MIXED COMMERCIAL ZONE

In Puducherry region, the existing character is of mixed character. Keeping this in mind, this category has been introduced where the prominent landuse will be commercial followed by residential landuse.

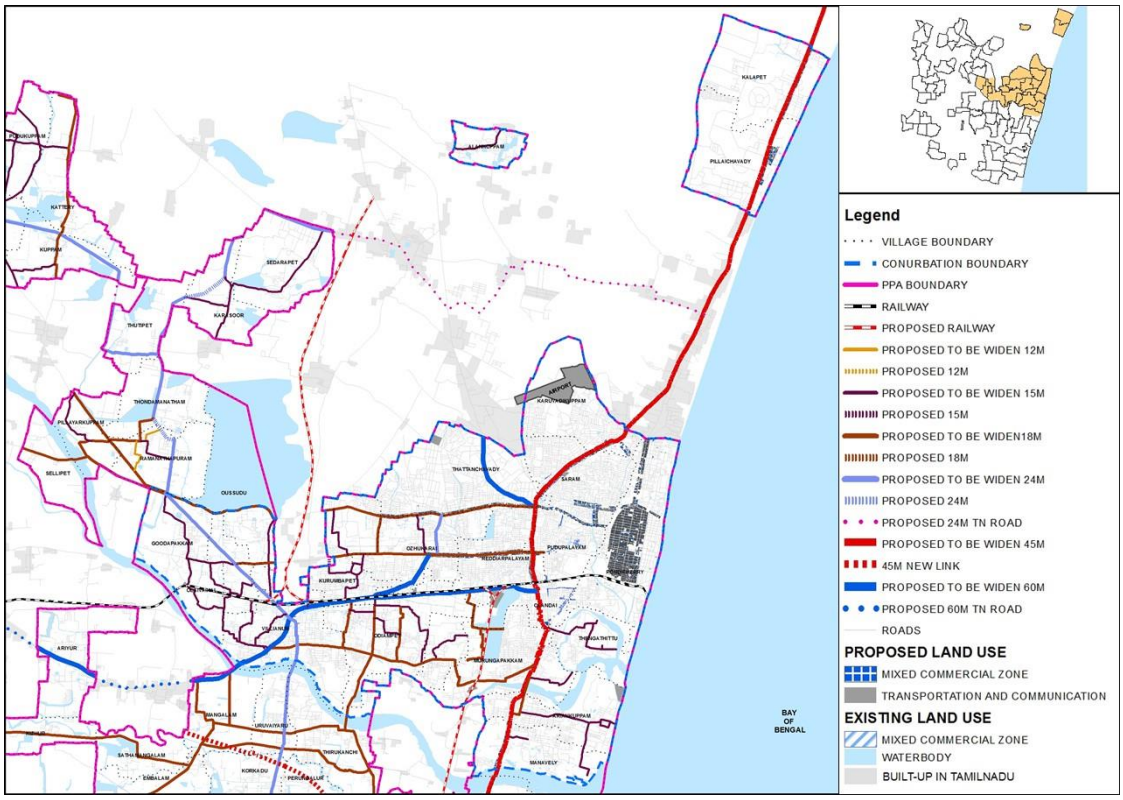


Figure 12.35 Proposed Mixed Commercial Zone

Mixed Commercial is proposed in the following areas:

- Along MG road in the northern side of Boulevard town 50m on both the sides of the road is poposed as mixed commercial zone (from Muthiyalpet Salai street to Atithi Hotel).
- On the northern side of Kamaraj Salai, 50 m is proposed as mixed commercial zone from Rajiv Gandhi Junction till Boulevard Town.

12.7.2.5 PROPOSED INDUSTRIAL ZONE

The government of Puducherry has put major emphasis on the industrial sector to led the growth story of Puducherry, the latest industrial policy is formulated to achieve the aspirations of the government. Through CDP-2036 the planning authority is supporting the greater goals set by the government by earmarking specific industrial lands suitable for the thrust areas identified in the Industrial policy-2016. A big industrial estate is proposed in Sedarapet, which is notified as industrial estate and houses many industries at present. Thus, has a potential to be developed as an industrial estate. Few industries are proposed in Thutipet village also. Some scattered industrial areas are proposed in the conurbation area. The proposed industrial area map is shown below:

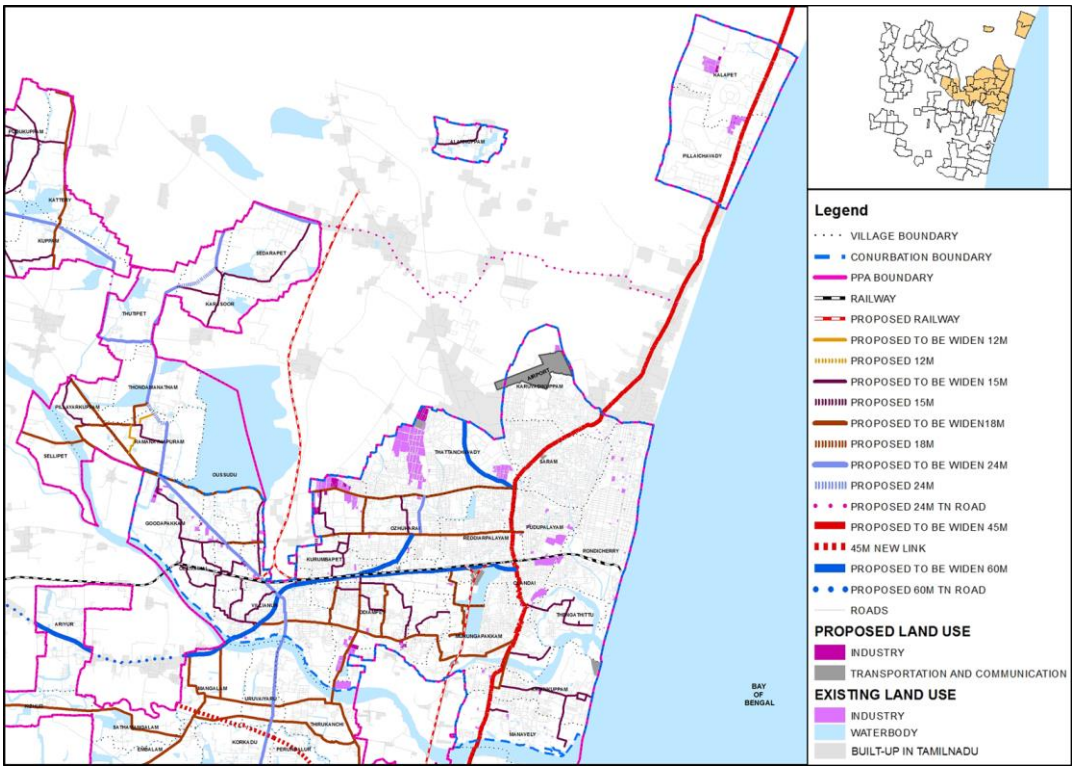


Figure 12.36 Proposed Industrial Area Map

12.7.2.6 PROPOSED MIXED INDUSTRIAL ZONE

In this zone, prominent landuse will be industrial zone. Green categories of industries will be permitted to be developed in this zone. Other than industrial category, residential and commercial both categories will be allowed in this zone. The Map showing proposed mixed industrial zone is given below:

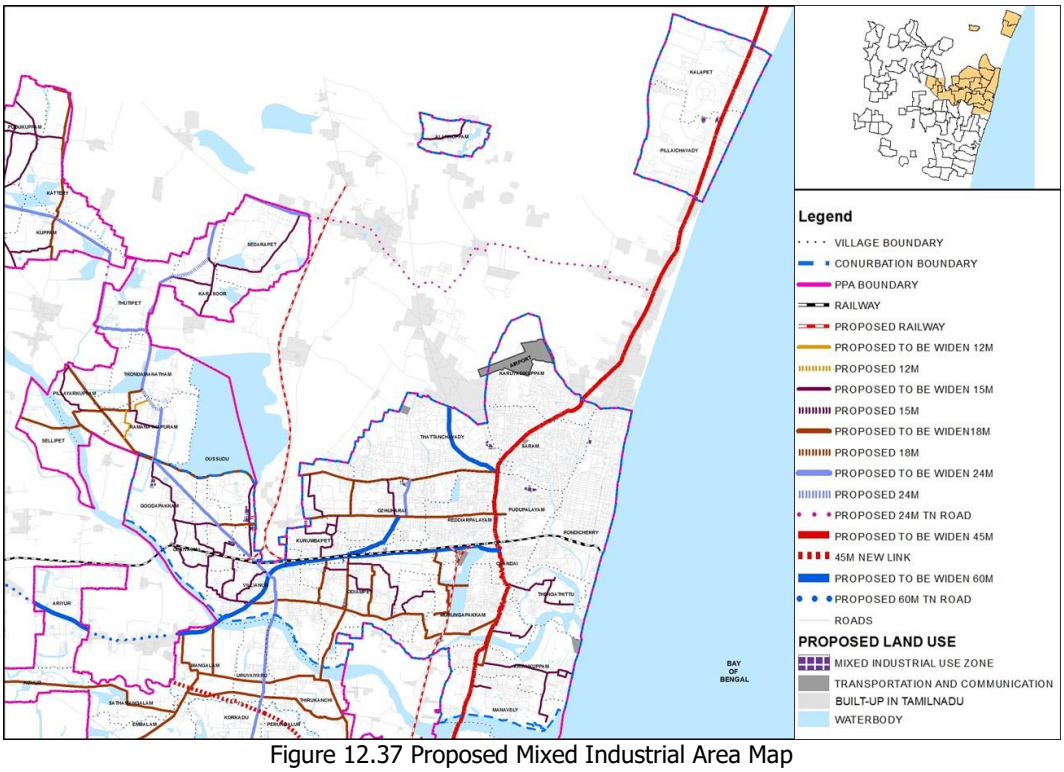


Figure 12.37 Proposed Mixed Industrial Area Map

12.7.2.7 PROPOSED PUBLIC SEMI-PUBLIC ZONE

Puducherry is home for many educational and health institutes like Puducherry University, JIPMER, Engineering Colleges, Medical Colleges, it is considered a favorite destination among students in the Southern part of India. This has led to many educational and health institutes being established within the planning area leading to an increase in percentage of land falling under the public and semi-public category against the prescribed limit of URDPFI guidelines for PSP land use. As already discussed in the previous chapters, the CDP-2036 aims at promoting Education and Health as a major service sector attracting investment and creating job opportunity for the local population. Therefore, more PSP land use is proposed in order to suffice the requirement of the future projections. PSP land use in allowed in mixed residential areas also with certain provisions. Kalapet and Pillaichavady villages are proposed as an educational hub.

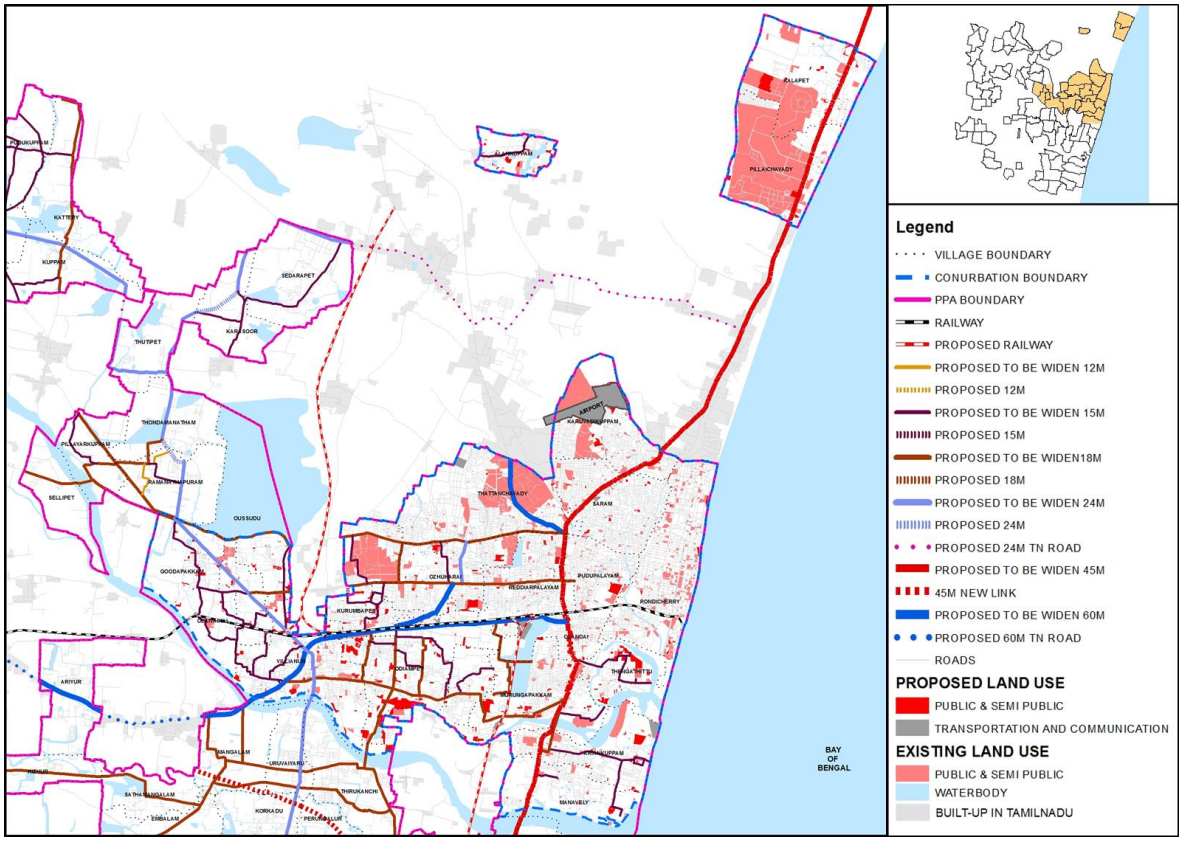


Figure 12.38 Proposed Public and Semi-Public Zone

12.7.2.8 PROPOSED GREEN/RECREATIONAL SPACES

The major green areas are proposed surrounding the waterbodies like Oussudu lake and Bahour lake. Around Oussudu and Bahour lakes a buffer of 50 m is given. Other than these major lakes, around waterbodies falling in conurbation area, a buffer of 20 m is to be given. Around Thengaithittu mangroves, a buffer of 50 m is proposed where recreational area will be developed. Moreover, canal and rivers will have a buffer of 15 m on both the sides. Apart from that, some government lands have been identified and are proposed as a green area in order to make the implementation easier. In Murungapakkam village, a sports centre is also proposed. In the neighbourhood level, recreational areas are proposed. The proposed recreational area map is given below:

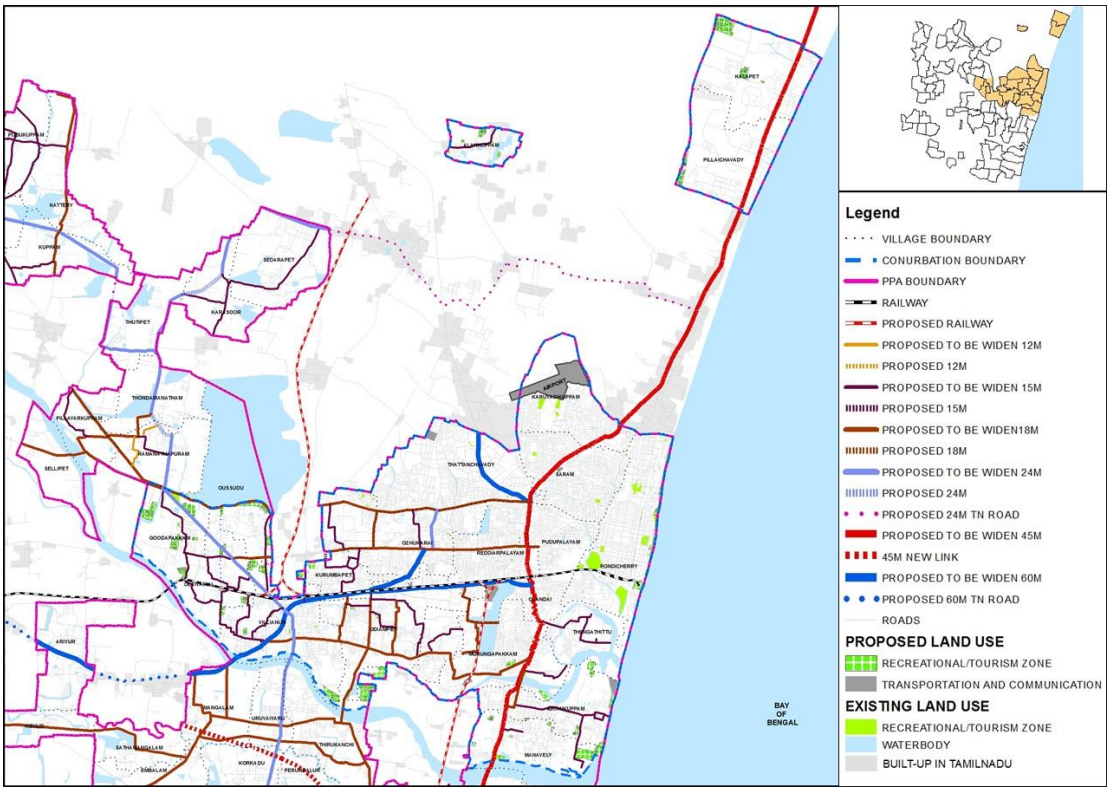


Figure 12.39 Proposed Green/Recreational Area Map

12.7.2.9 PROPOSED PUBLIC UTILITY ZONE

The public utility zone is proposed near airport where there is existing sewage treatment plant. Other than that, scattered public utility zones are proposed in Ramanathapuram, Oulgaret, Eripakkam, Utchimedu, Kurumbapet etc. Moreover, the public utility use is allowed in all the land use categories.

Solid waste energy processing unit is proposed at Kurumbapet village, Bahour, Kattery and Madagadipet.

12.7.2.10PROPOSED AGRICULTURAL ZONE

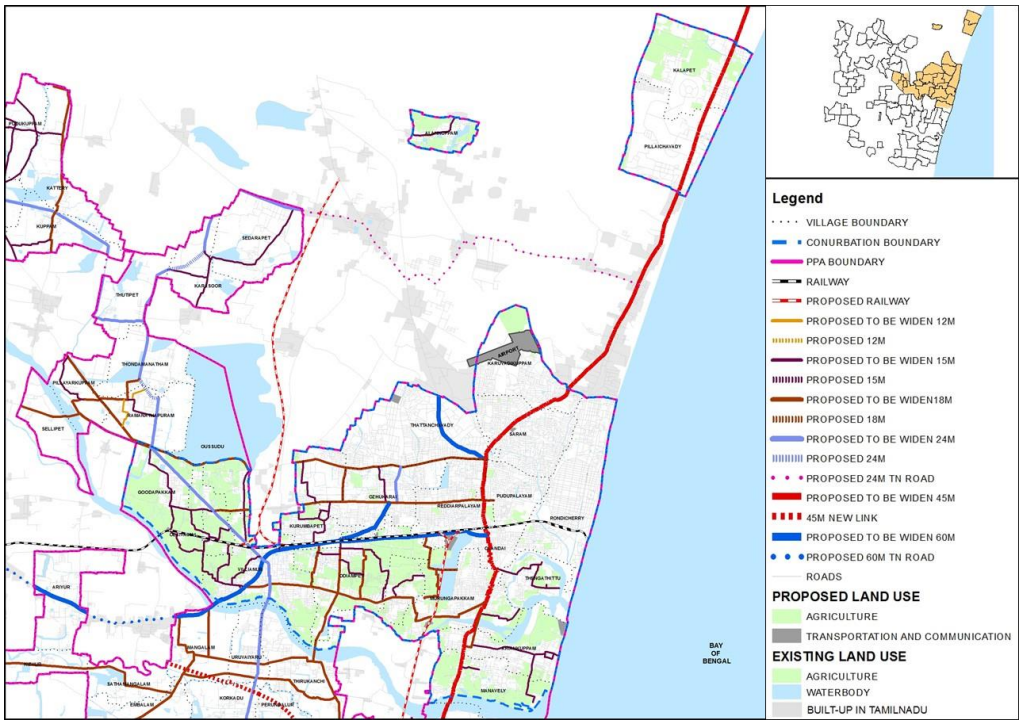


Figure 12.40 Proposed Agricultural Zone Map

With the rapid growth and expansion of cities, agricultural lands starts declining. Thus, this issue is meticulously dealt with, by providing dedicated agricultural lands in the planning area. The agricultural lands are protected till possible extent. Except conurbation area, in rest of the area agricultural land are proposed to be preserved. As mentioned earlier, Bahour commune has very fertile agricultural land. Moreover, many large chunks of agricultural lands have been kept intact in Mannadipet, Nettapakkam and Villianur communes.

12.7.2.11PROPOSED PROHIBITED AREA

It is the 100m buffer given to the ASI monuments as per the "The Ancient Monuments and Archeological Sites and Remains Act, 1958. In this area no construction activities are allowed.

12.7.2.12PROPOSED RESTRICTED AREA

It is the 200m buffer given to the ASI monuments after 100 m buffer as per "The Ancient Monuments and Archeological Sites and Remains Act, 1958". In this zone, some construction activities are allowed with special permissions.

12.7.2.13SPECIAL POLLUTION CONTROL MEASURES

The provision of adequate green spaces will act as breathing spaces for the surrounding areas. Thus, adequate green space is proposed under CDP – 2036. This will abate the air pollution of the surrounding areas.

Apart from that, underground sewerage network is proposed which will provide clean environment in the city and will reduce the land pollution, as the drains will be lined. The proposal of scientific landfill site for solid waste will also reduce the pollution in that area.

Moreover, all the industries shall have to follow the prescribed criteria of Puducherry Pollution Control Board. The emission and discharge of the effluent has to be in conformity of the specific pollution

control guidelines. Additionally, with the improved public transportation system more people will use Public Transport other than private vehicles. This will ultimately reduce the emissions and will improve the air quality of the area.

Table 12-26 Proposed Land Use Area – Conurbation Area

S. No.	PLU Classification	Area (in Ha.)	Percentage for total area
1	Residential	2762.40	33.24
2	Commercial	153.95	1.85
3	Public-Semi Public	1294.11	15.57
4	Industrial	252.19	3.04
5	Recreational/Tourism Zone	233.91	2.82
6	Mixed Residential Zone	81.04	0.98
7	Mixed Commercial Zone	248.75	2.99
8	Mixed Industrial Zone	11.68	0.14
9	Transportation & Communication	1203.38	14.48
Total Developed Area		**6241**	**75.11**
10	Agriculture	1542.7	18.57
11	Protective & Undeveloped Use Zone	525.23	6.32
Total Area		**8309**	

12.7.3 PPA LANDUSE PLAN

As described in chapter 12.6 Growth Centres, Growth Points and Multi Modal transit centres are proposed. Bahour, Madagadipet and Nettapakkam are proposed as Growth Centres. Kalapet, Thavalakuppam, Sedarapet and Karikalampakkam are proposed as Growth Points. Madagadipet, Villianur, Pillayarkuppam and Puducherry (Mudaliarpet) are proposed as Multi Modal Transit Centres. Mettupalayam is proposed as Truck Terminal. The land in and around Growth Centres, Growth Points and Multi Modal Transit Centres are proposed for significant development till 2036.

Bahour Growth Centre is proposed mainly for conservation of fertile Agricultural land. Apart from this Residential Zone is proposed to cater the future requirement of Bahour Commune till 2036. Development is proposed along NH 45A (Cuddalore main road) on both the sides. There are existing industrial units on this road. To support this activity, Mixed Commercial zone is proposed. To promote tourism activity Recreational Zone/Tourism Zone is also proposed in Manapattu, Pillayarkuppam and Kirumampakkam.

Madagadipet Growth Centre is adjacent to Industrial Estate located in Thirubuvanai and Thiruvandarkoil. There are 3 ASI sites located in Madagadipet, Thiruvandarkoil and Thirubuvanai. Due to proximity to such locations, it has got potential to develop. To support the Industrial activity, Mixed Industrial Zone is proposed in Thiruvandarkoil. Apart from this, Madagadipet is on proposed 24m wide outer ring road which will increase the connectivity to rest of the planning area.

Nettapakkam Growth Centre is also proposed mainly for conservation of fertile Agricultural land. To promote and support agricultural activity in the growth centre, agriculture based industrial units in Mixed Industrial zone are proposed.

Pondicherry University is located in Kalapet Growth Point. Due to existance of such an important landmark, Mixed Commercial zone along the SH 49.

Due to existance of timber based commercial units, mixed commercial zone is porposed along NH 45A in Thavalakuppam growth point. Residential zone is also proposed to cater the future need of the growth point.

Sedarapet is having ample amount of Industrial area. To cater the future need of employment, Sedarapet growth point is proposed as Industrial growth point. Industrial zone is also proposed in Karasoor.

Karikalampakkam growth point is located on the junction of Uruvaiyaru-bahour road and Nettapakkam-Abhishekapakkam road. Due to such locational advantage, existing mixed residential development as well as proximity to Villianur, mixed residential zone is proposed in this growth point.

As per government notification, part of Mettupalayam is designated for the purpose of establishing truck terminal. Hence part of Mettupalayam is proposed as truck terminal. Due to existing railway station and availability of land, villianur is also proposed as one of the Multi Modal transit Centres. Madagadipet and Pillayarkuppam are proposed as Multi Modal Transit Centres in Comprehensive Mobility Plan prepared by Transport Department, Puducherry. Hence this places are proposed as Multi Modal Transit Centres which will help traffic coming to Puducherry from Villupuram and Cuddalore.

The wholesale market/godowns are located at Thattanchavdy. Survey no. 242/1A (Part), 242/2A/1A, 242/2A/1B, 242/1C, 242/1D, 242/3, 242/4, 258/1A, 258/2A/1A, 258/2A/1A, 258/2A/1C, 258/2A/1D, 258/2A/2A, 258/2A/2B, 258/4A/1B (Part), 258/4A/1A (Part), 258/4B, 258/5, 259/1, 259/2A, 259/2B/1, 259/2B/2, 259/2B/3A and 259/2B/3B are proposed as wholesale markets/godowns in thattanchavdy village near Rajiv Gandhi square.

The proposed area for PPA for year 2036 has been worked out based on the URDPFI guidelines for medium urban centres.

Table 12-27 Proposed Land Use Area – PPA

S. No.	PLU Classification	Area (in Ha.)	Percentage to total developed area	Percentage to the total area
1	Residential	5136.93	41.09	17.46
2	Commercial	236.83	1.89	0.80
3	Public-Semi Public	1970.92	15.77	6.70
4	Industrial	1511.5	12.09	5.14
5	Recreational/Tourism Zone	552.81	4.42	1.88
6	Mixed Residential Zone	148.72	1.19	0.51
7	Mixed Commercial Zone	323.4	2.59	1.10
8	Mixed Industrial Zone	142.19	1.14	0.48
9	Transportation & Communication	2477.07	19.82	8.42
Total Developed Area		**12500**	**100**	**42.48**
10	Agriculture	12967.34		44.07
11	Protective & Undeveloped Use Zone	3955.76		13.44
Total Area		**29423**		**100**

12.7.3.1 Proposed Street Vending Zones

Provisions of "The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014"

The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014 is an act to protect the rights of urban street vendors and to regulate street vending activities.

As per this act, Town Vending Committee" is to be constituted by the appropriate government. In the case of Puducherry, Municipality and Commune Panchayat wise, Town Vending Committees are to be formulated. The Town Vending Committee shall conduct a survey of all existing street vendors, within the area under its jurisdiction, and subsequent survey shall be carried out at least once in every five years. Every local authority shall in consultation with the planning authority and on the recommendations of the Town Vending Committee, once in every five years, prepare a plan to promote the vocation of street vendors. The plan for street vending prepared by the local authority shall be submitted to the appropriate Government for approval and that Government shall, before notifying the plan, determine the norms applicable to the street vendors.

As per this act, the "vending zone" means an area or a place or a location designated as such by the local authority, on the recommendations of the Town vending committee, for the specific use by street vendors for street vending and includes footpath, side walk, pavement, embankment, portion of a street, waiting area for public or any such place considered suitable for vending activities and providing services to the general public.

The plan for street vending shall contain all the following matters namely:

- Determination of spatial planning norms for street vending

- Earmarking of space or area for vending zones
- Determination of vending zones as restriction free vending zones, restricted vending zones and no vending zones.

Consequential changes needed in the existing master plan, development plan, zonal plan, layout plan and any other for accommodating street vendors in the designated vending zones.

In the CDP – 2036, as per "The Street Vendors (Protection of Livelihood and Regulation of Street Vending) Act, 2014" dedicated street vending locations are suggested.

As discussed in chapter 1.2.6 Street Vending Zones, the existing street vending activity is concentrated along the Jawaharlal Nehru Street, along M.G. Road, Bharathi Street and Rangapillai Street etc. These are daily markets and the type of market differs from vegetable/fish market to clothes market to fruits market etc. Apart from these daily markets, there are two weekly markets also. One is along Jawaharlal Nehru and MG road which happens on every Sunday and the other is in Madagadipet village which happens on every Tuesday.

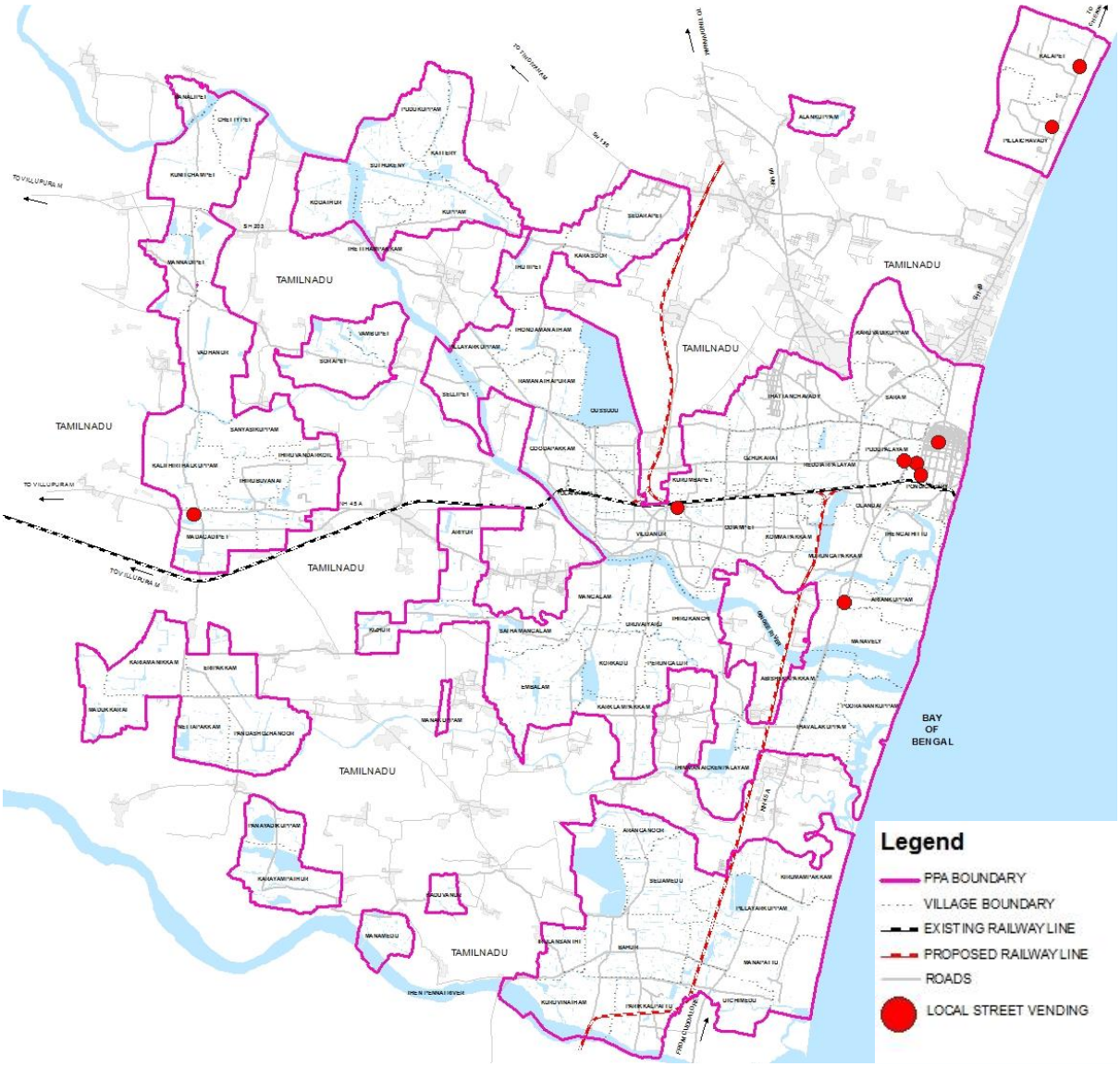


Figure 12.41 Proposed Street Vending Locations in Puducherry Planning Area

By looking at existing street vending locations, street vending locations in Puducherry Planning Area are suggested. As shown in the map above the street vending locations are proposed near botanical garden (along Lal Bahadur Shashtree Road), on the eastern side of botanical garden (along existing vegetable market), in front of Anglo French Textiles (on Marai malai adigal Salai), on Nehru Street. Apart from this, the street vending locations are also proposed in Kalapet and Pillaichavady village along ECR. Due to existence of Puducherry University, street vending activity is viable near the University. Due to existing Villianur Railway Station and proposed Multi Modal Transit Centre, the street vending is proposed in front of villianur railway station. Street vending activity is also proposed in madagadipet due to existence of weekly market.

12.7.4 ROAD NETWORK & TRANSPORTATION

As explained in the Traffic and Transportation chapter, two kinds of road proposals are proposed under CDP - 2036:

- Road widening
- Proposed roads

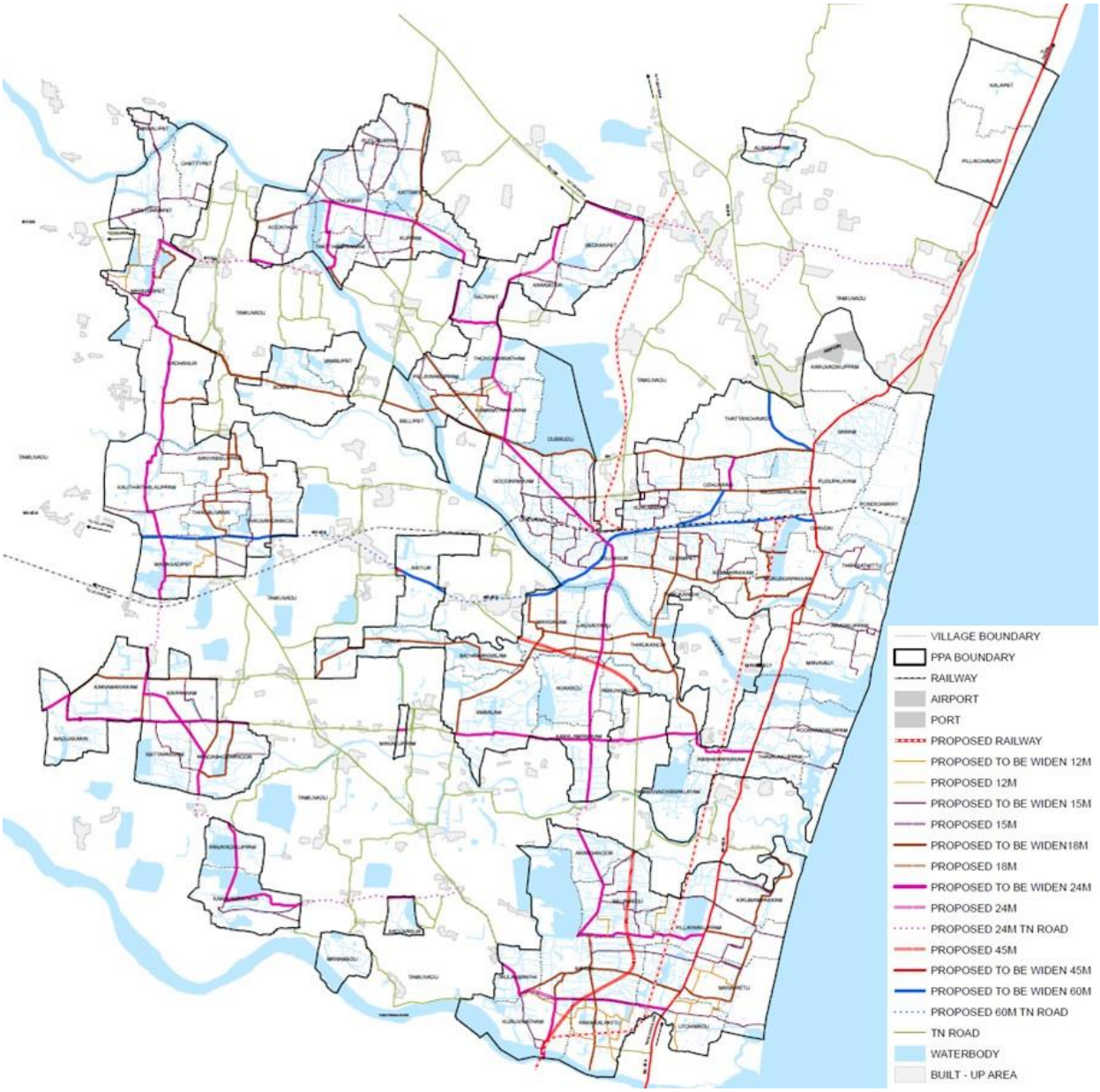


Figure 12.42 Proposed T&T Map

These roads are further classified into arterial, sub-arterial and major roads. The major roads of planning area like ECR and NH 45 A are proposed to be 45 & 60 m wide respectively.

13 IMPLEMENTATION AND MONITORING

13.1 PROVISIONS GIVEN IN THE PUDUCHERRY TOWN AND COUNTRY PLANNING ACT 1969

In order of secure planned development of Puducherry Planning Area, it will be important that proposals defined in the Comprehensive Development Plan of Puducherry are implemented on the ground in letter and spirit. The concept defined in the Comprehensive Development Plan for securing rational development shall not be achieved unless it is adequately supported through a well-defined mechanism for ensuring its proper implementation.

Use and Development of land

As per Section 36 of the Act, no person can use or permit or carry out any development in the Planning area without conformity with the Development Plan after coming into operation of the Development Plan. No development can be taken up by an individual and Department of the Government without the permission of the Competent Authority for which an application shall be made accompanied by documents and fee, as may be prescribed under Section 37. Act provides for regulating all constructions / development undertaken by any person including stopping of illegal construction, imposing penalties, demolition of buildings etc.

Acquisition and disposal of land

Section 48 of the Act provides for acquisition of land as per the provisions under Land Acquisition Act, 1894 for public purpose. The Planning Authority may, at any time, and for the purposes of a Development Plan acquire any land with the sanction of the Government. Land is acquired by the Government and then transferred to the Authority for development on payment of compensation.

Levy of Development charge

As per Section 53 of the Act and Rule 82, where permission for a change in the use or development of any land or building is granted in the whole or any part of the planning area, and such change or development is capable of yielding a better income to the owner, the Planning Authority may levy a not exceeding 1/3rd of the estimated increase in the value of the land or building for permitting such change in use or development.

13.2 SALIENT FEATURES DEVELOPMENT CONTROL REGULATIONS

For better implementation of the Comprehensive Development Plan, it is to be controlled through Development Control Regulations. To derive the Development Control Regulations for Puducherry Planning Area, Gross Residential Density is worked out.

As per URDPFI Guidelines 2015, the gross density for developed area of Large City (Population having 5 lakh to 10 lakh) in Plain Areas should be 125-175 PPH. As per Census 2011, the population of Puducherry Planning Area is 9,50,289 with total area of 294.23 sq.km. The gross density of the planning area is 32 PPH. The Gross Residential Density is 128 PPH which is matching with the URDPFI guidelines 2015. As per incremental increase method, projected population for year 2036 is 14.42 lakhs for the planning area. For projection year 2036, there can be of more growth and anticipated (13%) compared to the growth rate of the previous decades. The reasons for that are cited in chapter 2.11 Population Projection 2036. For year 2036, projected population is coming to be 16.30 lakhs. By considering projected population of 16.3 lakhs, the proposed gross residential density is worked out to be 159 PPH which is also almost matching with the URDPFI Guidelines 2015.

Table 13-1 Existing and Proposed Gross Residential Density for Puducherry Planning Area

S. No.	Municipality /Commune	Area (Ha)	Population (2011)	Gross Density, 2011 (PPH)	Gross Residential Density, 2011 (PPH)	Projected Population (2036)	Proposed Gross Residential Density, 2036 (PPH)
1	Puducherry (M)	1955	244377	125	214	419172	288
2	Oulgaret (M)	3455	300104	87	127	514759	172
3	Ariyankuppam (CP)	2438	72055	30	125	123594	158
4	Villianur (CP)	6599	126778	19	103	217458	121
5	Mannadipet (CP)	6433	86500	13	99	148371	128
6	Bahour (CP)	5482	68757	13	88	117937	86
7	Nettapakkam (CP)	3062	51718	17	113	88710	128
	Puducherry Planning Area	**29423**	**950289**	**32**	**128**	**1630000**	**159**

Development Control Regulations in Boulevard Area

Development Control Regulations in Boulevard area are worked out by looking into Land Use proposed for the year 2036. In Boulevard area, French Town (White Town) is consisting more of Public buildings, Government office buildings and Residences in French Architectural character. To preserve this valuable heritage character, existing land use is kept as it is. As shown in the table above, the FAR and maximum permissible height is proposed to keep as same as existing FAR and existing maximum permissible height. As the Commercial Activity is already going on in Tamil Town of Boulevard area, the western side of the grand canal is proposed as Mixed Commercial land use except public & semi public use, transport and communication and recreational use earmarked in the Tamil precinct. This will support the concept of densification in the Conurbation area. The Existing FAR in Central Business District (CBD) is 250 the existing permissible maximum height in CBD is 17m. The FAR and height has been proposed for the Tamil town of boulevard as 300m and 20 m respectively. The setbacks are not compulsory in entire Boulevard Area. The Ground Coverage in Tamil town and White Town shall not ecxceed 75% and 50% respectively.

Table 13-2 Salient Features of Development Control Regulations

Development Control Regulation in Boulevard Area			
Tamil town in boulevard area earmarked for mixed commercial use zone		**White Town**	
Proposed FAR	300	Existing/Proposed FAR	120
Proposed Permissible Height	20m	Existing/Proposed Permissible Height	10.5m
Setbacks	Not Compulsory	Setbacks	Not Compulsory
Ground Coverage	75%	Ground Coverage	50%

Development Control Regulation outside Boulevard Area							
Low Rise Buildings		**Multistory Building**		**Mixed Residential, Mixed Commercial Land Use**		**Mixed Industrial Land Use**	
Existing FAR	180	Existing FAR	250	Existing FAR	180	Existing FAR	NA
Existing Permissible Height	15m	Existing Permissible Height	30m	Existing Permissible Height	15	Existing Permissible Height	NA
Proposed FAR	220	Proposed FAR	300	Proposed FAR	250	Proposed FAR	150
Proposed Permissible Height	17m	Proposed Permissible Height	40m (with Fire provisions)	Proposed Permissible Height	20m	Proposed Permissible Height	15m
Setbacks	As per prevailing Bye-Laws	Setbacks	As per prevailing Bye-Laws	Setbacks	As per prevailing Bye-Laws	Setbacks	as per prevailing Bye-Laws of Industrial Zone
Ground Coverage	70%	Ground Coverage	45%	Ground Coverage	70%	Ground Coverage	as per prevailing Bye-Laws of Industrial Zone

REGULATION FOR MIXED COMMERCIAL ZONE

In this use buildings or premises shall be permitted only for the following purposes and accessory uses:

a. Normally permissible uses:
   (i) All activities normally permissible in the Residential use zone, mixed residential use zone and commercial use zone as prescribed in the Puducherry Building Bye-Laws and Zoning Regulations, 2012.
b. The uses permitted with the special sanction of the Puducherry Planning Authority:
   (i) All uses that may be permitted in the Residential use zone, Mixed Residential use zone and commercial use zone with the special sanction of the Puducherry Planning Authority as prescribed in the Puducherry Building Bye-Laws and Zoning Regulations, 2012.

REGULATION FOR MIXED INDUSTRIAL USE / ZONE:

In this use buildings or premises shall be permitted only for the following purposes and accessory uses:

a. Permissible uses:
   (i) Industries coming under light manufacturing and small scale industries under the green category industries and service industries as prescribed in the Puducherry Building Bye-Laws and Zoning Regulations, 2012.
   (ii) Residential buildings and Commercial buildings.

Note 1:

The Government of Puducherry has framed a scheme for regularisation of unapproved layouts and sub-divisions lying outside the Comprehensive Development Plan Area in Karaikal and Puducherry Regions vide G.O.Ms.No: 20/2017-Hg., dated 20-10-2017. As per this G.O. plots regularised under this scheme shall be deemed to be regularised for residential use. Therefore, the plots/layouts regularised under the scheme shall be deemed to be regularised for residential use even they have been earmarked for some other use in the Comprehensive Development Plan for Puducherry 2036.

It has been noticed that the Department of Revenue and Disaster Management, Social

Welfare Department, Adi Dravidar Welfare Department, etc., have issued LGR patta to BPL families. These lands where the LGR pattas have been issued shall be deemed to be earmarked for Residential use even they have been earmarked for some other use in the Comprehensive Development Plan for Puducherry 2036.

Note 2:

In the buffer area around the lake and river wherever the development already occurred before the notification of CDP for Puducherry 2036 and wherein building plan permits have already been issued by the Puducherry Planning Authority or regularisation of plots/layouts have been done by the Puducherry Planning Authority, the same shall be excluded from the buffer area.

Development Control Regulations outside Boulevard Area

Development Control Regulations outside Boulevard area are worked out by looking into proposals given for the year 2036. The major roads such as East Coast Road (ECR) and NH 45A (Puducherry-Villianur-Villupuram road) and Puducherry to Manavely are passing through Conurbation area. There are Mixed kind of activities going on along both the roads presently. These roads are acting as spine of the Planning Area. These roads are under Bus augmentation routes under Comprehensive Mobility Plan prepared for Puducherry. To increase the use of Public Transportation and to densify the surrounding area for optimization of proposed public transportation system, Mixed Commercial Zone is proposed in which the FAR is suggested to be 250 with maximum permissible height of 20m and ground coverage of 70%. The FAR for the Multi Storey Building is suggested to be increased from 250 to 300. The maximum permissible height is suggested to be increased from 30m to 40m with 45% of Ground Coverage. With this increase in height, the Fire Department is suggested to be facilitated with appropriate firefighting equipment so as to avoid unnecessary damage caused by fire in critical situation. With the increase in height and FAR in Multi Storey buildings and other buildings, the surrounding area of both the roads will be densified which will support the proposal of Transit Oriented Development Corridor. For low rise building the FAR is suggested to be increased from 180 to 220. The maximum permissible height is also suggested to be increased from 15m to 17m with ground coverage of 70%. By proposing this, the area outside boulevard will be densified for the optimal use of public transport as well as expensive land. For the proposed sites of Affordable Housing as mentioned in the Chapter of housing, the FAR is suggested to be 400.

13.3 POLICY FRAMEWORK RELATED ACTIONS

It will be important to focus on following to achieve the effective implementation besides promoting planned development of the local area. This should include:

- Putting in place appropriate order of manpower in Town Planning and Engineering within the Authority
- Creating a dedicated Enforcement Wing for implementing the Development Plan
- Creating Land Bank – creation of inventory of Government Land through which status of Government land can be monitored (buying & selling of Government Land)
- Looking at new options for generating resources for funding the development work for making urban development self – financing.
- Involving Private, Corporate and Cooperative Sectors as major partners in the Planning, Development & Implementation of Development plan through an investor friendly framework.
- Creating awareness among people about the role and importance of Comprehensive Development plan including its major provisions and schemes to make local citizens as partners in the development process and in providing appropriate quality of life.
- Creating a High-Powered Board for coordinating the activities of various departments operating within the planning area and define Policy Framework for implementation of Comprehensive Development plan.
- Maintaining a GIS based system for updating database and monitoring of comprehensive development plan implementation (CDP is already prepared on GIS platform which has to be updated time to time)
- Phasing of development and developing trunk infrastructure including major roads, water supply, sewerage, drainage or electricity etc. as per priority.
- Formulation of the annual plan and identification of projects for implementation within the framework of approved Development plan - adopting Project Based Approach.
- Transforming the role of Government /Authority from 'Provider to Enabler' and devising innovative methods of resource mobilization.
- Making use of different central and state government schemes to finance major proposals in the CDP.

13.4 LAND POOLING AND PLOT RECONSTITUTION FOR PLAN IMPLEMENTATION

Based on the pattern followed in states of Maharashtra and Gujarat, CDP advocated the use of land pooling and reconstitution mechanism to manage, service, reconstitute the private land and promote planned development. The mechanism involves development without acquisition of land involving land owners as equitable interests in the development process. The entire development cost is generated out of part sharing of increase in land values due to planned development of the area. Land is earmarked for roads, open spaces, parks, play grounds and amenities including healthcare and education. Planning Authority also gets land from the scheme, which is disposed off by the designated agencies to raise resources to meet the development cost and pay the cost of land, which is used for public purpose, etc. Land owners get full compensation of land, which is used by public agencies and shares the cost of development. The scheme is prepared in consultation with land owners, which minimize the chances of conflict between land owners and the Planning Authority. Development agency on its parts gets land for roads, open spaces, amenities, etc. free of cost without resorting to land acquisition. The developed land which is made available to land owners can be disposed off by him in the open market at a negotiated price fetching him higher returns.

Land Pooling and Redistribution Scheme (Town Planning Scheme)

It is a land development technique undertaken by the land owners who pool their land to receive a good layout, following a procedure involving:

- Notifying an area for Town Planning Scheme.
- Pooling of land of different land owners to the Authority.
- Preparing a detailed scheme as per the provision of CDP indicating the original and final plots, roads, open spaces, amenities, involving the land owners.
- Redistribution of final plots after charging betterment contribution and paying compensation for the land used for public purposes, transferred to the local authority.
- The role of development authority remains most critical in order to finalise the scheme by involving land owners, preparing layout plans, getting it approved from land owners and the state government and ensuring execution of scheme. In the entire process land is developed as per the plan involving no acquisition of land. This is the major feature which distinguishes Town Planning Scheme from other modes of land assembly like bulk acquisition or bulk acquisition of selected land for public amenities. After the Town Planning Scheme is finalized, entire land earmarked for public purposes involving roads, open spaces, amenities, etc. vests with the local authority without paying any compensation and is generally called "Land Acquisition without tears". It makes land owners also happy because they lose only part of their land used for public purposes and get the remaining land after planning with freedom of disposal in urban markets. Compensation is also paid to the land owners for the land which is used for public purpose. However, the scheme has been found to popular in large cities with adequate demand of land. Scheme has one drawback that it takes considerable time for finalization. However, the model adopted by state of Gujarat for speedier framing of T. P. Scheme could be used for formulation of T. P. Scheme on time bound basis. This method can be considered for adoption by Puducherry Planning Authority after detailed study of various aspects of the scheme and legal framework required to make these schemes a reality. It would also require placement of trained manpower to be put in place to frame and finalise the T.P. Scheme.

Spatial planning of any urban area tends to increase the land value of that area. A further increase takes place when the actual development works start. It's a common experience that ULBs excepting a few municipal corporations lag badly in executing the development works which mainly consist of basic civic services. This is mainly on account of the paucity of funds. Since the spatial planning and the development works tend to increase the land prices, it was thought necessary to mop up a part of the incremental increase in prices for the purpose of carrying of the developmental work. Traditionally this has been sought to be achieved by levying charges at two stages termed betterment charges and development charges. As soon as the spatial planning is finalised, the authorities responsible for spatial planning levies a charge termed as betterment charges.

Unfortunately, this charge, however, does not lead to any net income for the planning authority. This is because the entire rationale seems to be individual owners of plot are going to surrender land owned by them for the development works and therefore, are entitled to some compensation. The cost of carrying on the planning work will be offset. Therefore virtually speaking there will be no net income to the planning authority.

Anticipated expenditure for laying of roads and various other civic services. Part of the increment of land value on account of this is sought to be mocked up by levying the development charges. However, actual amount generated falls much below the expenditure for levying the services. Secondly, this charge is levied and collected when a person owning a plot comes for actual development on that plot. Here also this hardly serves the purpose of effectively providing the fund backup needed for actually executing development jobs.

The government has therefore in various states has made provision for a part of the land under development to devolve on the spatial planning authority. The idea is that funds generated by the sale of the devolved land would be helping the institutions to carry on the development works, if need be, by borrowing funds from the public finance institutions by putting the sum as margin money.

The provision of levy of Development Charges is specified in The Pondicherry Town and Country Planning Act, 1969.

In case the state government agrees to resorting to land pooling methodology for executing town planning, the suitable provisions can be made for reservation of land for the planning authority for generating funds needed for actual development. In this context, as is being done in Maharshtra and Gujarat.

Land Pooling scheme may be adopted for Government land such as GP Land (Government Poramboke Land), HRI & WAKF Board Land as well as land under custody of local bodies to create land bank in Puducherry Planning Area.

13.5 VITAL PROJECTS

For the implementation of the Comprehensive Development Plan of Puducherry Planning Area, some of the projects are identified. The table below shows the sector wise location and details of the projects identified for the Comprehensive Development Plan of Puducherry Planning Area.

Table 13-3 List of Vital Projects

S. No.	Category / Sector	Village Name	Proposed Projects	Survey Number	Details / Remarks
1	Social Infrastructure	Kalapet	Educational Hub (Public & Semi-Public Zone)	56/1, 56/2, 56/3, 56/4, 56/5, 56/6, 59/1, 60/1, 60/2, 60/3, 60/4, 61/1, 61/4, 61/5	Puducherry University, Pondicherry Engineering college (PEC), Pondicherry Institute of Medical Science, Dr.Ambedkar Law college, ect.. are existing in Kalapet and Pillaichavdy. Both the villages are proposed majorly for Educational Hub, for the future expansion of the University, Public and Semi-Public Zone, etc.. is proposed in these villages.
2		Pillaichavady		52/5, 170/2B (Part)	
3	Economy	Thattanchavady (Mettupalayam)	IT SEZ/Electronic Manufacturing Cluster (EMC)	68 (PART), 69/1, 69/2, 69/3, 69/4, 69/5, 70/1, 70/2, 70/3, 70/4, 71/1, 71/2, 71/3	As per Government Order, the said survey numbers in Thattanchavdy Revenue village are designated as IT SEZ/Electronic Manufacturing Cluster (EMC). The land was transferred by the Oulgaret Municipality to the Directorate of Information Technology for setting up of an IT SEZ/Electronioc Manufacturing Cluster (EMC). The land is classified as Industrial Zone in Proposed Land Use Map 2036.
4		Nettapakkam	Agriculture Research Centre	109/5	As Nettapakkam Commune is proposed as Agriculture Growth Centre, Agriculture Research Centre is proposed in Nettapakkam Village.
5	Recreation	Murungapakkam	Sports Centre	22/2	Sports Centre is proposed for Indoor Games in Murungapakkam Village for Recreational activity for the public.
6	Recreation / Tourism	Manapattu	Adventure Sports Facility	191, 192/1, 192/2, 194, 195/1, 195/2	By looking in to the potential of the place, Adventure Sports Facility is proposed in Manapattu village. The site is designated as Recreational / Tourism Zone zone to keep the equipments. Tools, machineries, Boats, changing rooms, hotels, cafes, restaurants etc.
7		Manapattu	Oceanarium	187/1, 187/2, 189, 190	Development of Oceanarium at Manapattu Revenue Village in Puducherry by National Institute of Ocean

S. No.	Category / Sector	Village Name	Proposed Projects	Survey Number	Details / Remarks
					Technology (NIOT), Ministry of Earth Science (MoES), Government of India.
8		Oussudu	Oussudu Lake Development	36/3, 33/1 TO 33/3, 34/1 TO 34/4, 27/1 TO 27/4, 27/6, 27/7, 11/1 TO 11/3, 12/1 TO 12/6, 13/1, 57/1 TO 57/5, 58/1 TO 58/5, 59/2 TO 59/4	By looking into the potential to develop the site, the surrounding area is Oussudu Lake is proposed for Recreational purpose. Apart from this, Oussudu Lake is also designated for Bird Sanctuary.
9		Kirumampakkam	Development of Star Resort	165/2, 168/2 TO 168/4, 169/1, 170/1, 170/2, 170/2A, 171/3, 172/1A, 172/2B	Presently there is an absence of Star rated resorts in Puducherry. Apart from very few Resorts, there are no high-end Resorts available in Puducherry. To boost the Tourism Activity in Puducherry, there is a dire need of Resorts in Puducherry. The site at beach of Kirumampakkam and Pillayarkuppam in Bahour Commune have strong potential to be developed for Star rated Resorts.
10		Pillayarkuppam	Development of Star Resort	176, 177, 179/1A	
11		Bahour	Bahour Lake Development	15	To cater the need of the public for the Recreational Activity, the surrounding area of Bahour Lake is proposed for Recreational purpose.
12		Seliamedu	Bahour Lake Development	1, 2, 3/1 TO 3/4, 4/1 TO 4/10, 193/1 TO 193/6, 194, 195, 192/1 TO 192/5, 196, 197/1, 200, 201, 202	
13		Pandashozhanoor	Eco-Tourism Development	213/1 TO 213/5, 212/1 TO 212/9, 210/4A, 210/4B, 211/1, 211/3 TO 211/14, 207/1, 208/1	As Nettapakkam Commune is proposed as Growth Centre, Pandashozhanoor village in Nettapakkam Commune is the best suitable location to develop the Eco-Tourism.
14		Poornankuppam	Development of Tourism Zone	48/2, 49, 56, 55, 50/2A, 50/2B, 51/2	There are existing star resorts located in Poornankuppam near the beach. There is a potential to develop further this area as

S. No.	Category / Sector	Village Name	Proposed Projects	Survey Number	Details / Remarks
15	Physical Infrastructure	Poornankuppam	Solid Waste Management	5	To cater the need of the solid waste dumping, the site is proposed in Ariyankuppam Commune, the site is proposed in Poornankuppam Village after consultation with the officials of Ariyankuppam Commune Panchayat.
16		Madagadipet	Solid Waste Management	106/1	To cater the need of the solid waste dumping, the site is proposed in Mannadipet Commune, the site is proposed in Madagadipet Village after consultation with the officials of Mannadipet Commune Panchayat.
17		Nettapakkam	Solid Waste Management	144/3	To cater the need of the solid waste dumping, the site is proposed in Nettapakkam Commune, the site is proposed in Nettapakkam Village after consultation with the officials of Nettapakkam Commune Panchayat.
18		Saniyasikuppam	Solid Waste Management	3/3	To cater the need of the solid waste dumping, the site is proposed in Mannadipet Commune, the site is proposed in Saniyasikuppam Village after consultation with the officials of Mannadipet Commune Panchayat.
19		Kurumbapet	Solid Waste Dumping Site	60/1, 61/2, 62/1, 62/2A, 62/2B, 62/2C, 62/4, 62/5, 62/6	Solid Waste dumping site is already existing in Kurumbapet village.
20		Bahour	Solid Waste Energy Processing Unit	94/1, 95/2	To cater the need of the solid waste dumping, the site is proposed in Bahour Commune, the site is proposed in Bahor Village after consultation with the officials of Bahour Commune Panchayat.
21		Koodapakkam	5 MLD DEWATS System	149/1A, 149/1B	To cater the need of treatment of Sewage in various commune, total of around 45 MLD DEWATS system is proposed in Villianur Commune, Ariyankuppam Commune, Nettapakkam Commune, Mannadipet Commune and
22		Thirukanchi	5 MLD DEWATS System	26/6, 26/7	

S. No.	Category / Sector	Village Name	Proposed Projects	Survey Number	Details / Remarks
23		Abhishekapakkam	10 MLD DEWATS System	8/3, 10/11B, 10/12 TO 10/16	Bahour Commune. DEWATS system is proposed because it is best suitable for Puducherry. This requires lesser area and implementation cost.
24		Parikkalpattu	10 MLD DEWATS System	183/3, 182/4, 182/5 TO 182/7A, 182/7B, 203/2	
25		Pandashozhanoor	5 MLD DEWATS System	227/7	
26		Saniyasikuppam	10 MLD DEWATS System	3/7B, 3/8, 3/9A, 3/9B, 3/10A, 3/10B, 3/11 TO 3/18	
27		Pillayarkuppam	Desalination Plant	172, 186, 188/1	To cater the need of the future requirement of the projected population as well as to avoid ground water exploitation and absence of any other water source, Desalination Plant is proposed at Pillayarkuppam village near Bay of Bengal from where the raw water can be fetched.
Demu Stations (Puducherry To Cuddalore Line)					
28	Transportation and Communication	Olandai (Mudaliarpet)	Demu Station/Multi Model Transit Centre	1/1A, 2/2B, 2/3B, 2/3C, 2/4A, 2/4B, 2/4C, 3/3A/1A/12, 3/3A/1A/6, 3/3A/1A/7, 3/3A/1A/9, 3/4, 3/5, 5/3A, 5/3B, 6/1 TO 6/3, 7/1 TO 7/3, 8/1A TO 8/1C, 126/1, 126/2A/1, 126/2A/2, 127/1, 127/2A/1 TO 127/2A/5, 127/2B, 127/2C/1 TO 127/2C/5	DEMU stations are proposed as per Comprehensive Mobility Plan for Puducherry. The stations are proposed at a distance of 500m or 1000-1500m.
29		Murungapakkam	Demu Station	11/1, 11/2	
30		Abhishekapakkam	Demu Station	131/2 TO 131/4	

S. No.	Category / Sector	Village Name	Proposed Projects	Survey Number	Details / Remarks
31		Thimmanaickenpalayam	Demu Station	95/3	
32		Kirumampakkam	Demu Station	18/2, 18/3, 19/2	
33		Pillayarkuppam	Demu Station/Multi Model Transit Centre	37/3, 37/4, 37/6, 37/7, 38/1, 38/2	
34		Manapattu	Demu Station	35/2	
35		Parikkalpattu	Demu Station	121/8, 123/1 TO 123/3, 76/4, 78/1	
36		Kuruvinatham	Demu Station	177/5, 176/4A/1	
Demu Stations (Puducherry To Villupuram Line)					
37	Transportation And Communication	Odiampet	Demu Station	90/3, 90/4, 90/5, 90/7, 90/8	DEMU stations are proposed as per Comprehensive Mobility Plan for Puducherry. The station are proposed at a distance of 500m or 1000-1500m.
38		Ossudu	Demu Station	132/5, 132/6, 132/8, 132/9, 132/10	
39		Koodapakkam	Demu Station	167/5, 167/6	
40		Madagadipet	Multi Model Transit Centre	55/1 TO 55/3, 55/5, 55/6	Madagadipet is proposed as Multi Model Transit Centre in Comprehensive Mobility Plan for Puducherry. This will ease out the transportation needs for who travels to and from Villupuram.
41		Villianur	Multi Model Transit Centre	211/1, 211/3	Railway Station is already existing in Villianur. Apart from this it is proposed as Multi Model Transit Centre in Comprehensive Mobility Plan for Puducherry.
42		Thattanchavady (Mettupalayam)	Truck Terminal	68 (PART)	As per Government Order, the private lands at Mettupalayam in Thattanchavdy revenue Village were acquired and handed over to Oulgaret Municipality for the purpose of establishing Truck Terminal.

S. No.	Category / Sector	Village Name	Proposed Projects	Survey Number	Details / Remarks
43		Karasoor	Transport Nagar	7/8A TO 7/8D, 7/7, 7/9B, 17/1, TO 17/6, 16/1 TO 16/4, 18/1 TO 18/6, 14/1 TO 14/5, 19/1, 19/2, 20/1, 20/2, 21/1, 21/1 TO 21/4, 21/6 TO 21/8, 22PART	Industrial area is already existing in Karasoor and Sedarapet villages. Apart from this, to boost the economy and employment generation, Industrial area is proposed. To cater need of loading unloading facility, servicing, repairing tools and equipment, Transport Nagar is proposed.
44		Saram	Proposed Bus Stand	155/2	Proposal of Bus Stand in Saram will ease out the pressure on existing bus stand. This bus stand is proposed for the buses operating for Tindivanam and Chennai.

13.6 PHASING & COSTING

Phasing is done for the development to take place incrementally over the period of time, according to the financial resources available. Initial projects are to be selected in such a manner that they act as catalysts for economic growth of the city. Generally, it includes projects such as knowledge cities, business and high tech parks and commercial centres etc. These will cause huge inflow of people to the city for education and employment.

For puducherry planning area, the implementation of the proposals is divided into three phases; short term, Medium term and long term. The proposlas to be implemented in these phases are described below:

13.6.1 PHASING AND COSTING OF PROJECTS

Table 13-4 Projects Phasing and Costing

Phase – I Projects					
S. No.	**Projects to be taken up on priority (short term proposals)**	**Total Project Cost (In Cr.)**	**Cost in Phase I (2018-2020) (In Cr.)**	**Cost in Phase II (2021-2025) (In Cr.)**	**Cost in Phase III (2026-2036) (In Cr.)**
1	Oussudu lake development	75	50	25	
2	Adventure Sports Facility at Manapattu	20.5	20.5		
3	Oceanarium at Manapattu	100	50	25	25
4	Development of Resort in Kirumampakkam & Pillayarkuppam under Recreational/Tourism Zone	100	50	50	
5	Multi modal transit centre at Villianur	25	25		
6	Multi Level Car Parking at Central Jail	10.5	10.5		
7	Indira Gandhi Flyover	50.4	50.4		
8	Rajiv Gandhi Flyover	87.36	87.36		
9	Truck Terminal at Mettupalayam	20	20		
10	5 MLD DEWATS system in Villianur Commune (Goodapakkam village)	0.25	0.25		
11	5 MLD DEWATS system in Villianur Commune (Thirukanchi village)	0.25	0.25		
12	Development of Coastal Circuit in 'Swadesh Darshan' scheme for Puducherry	85.28	85.28		
13	**Development of Heritage Tourism**				
	1.Revitalize streetscape in Boulevard	75	50	25	
	2.Development of Cultural Complex with Art and Digital Museum at Old Distillary	100	75	25	
	3.Development of Yoga and wellness centre at Uppalam	75			75
	4.Construction of toilet facilities	30	20	10	
	5.Improvement of tourism building at Beach road	60	40	20	
	6.Restore Ananda Ranga Pillai House, Dumas Church bell-tower & other heritage buildings	90	40	30	20

Phase – I Projects					
S. No.	**Projects to be taken up on priority (short term proposals)**	**Total Project Cost (In Cr.)**	**Cost in Phase I (2018-2020) (In Cr.)**	**Cost in Phase II (2021-2025) (In Cr.)**	**Cost in Phase III (2026-2036) (In Cr.)**
	7.Beautification and improvement of Nehru Street	50	30	20	
	8.Development of Franco-Tamil village in Ariyankuppam Commune	60	35	25	

Phase – II Projects					
Sr. No.	**Projects to be taken up on priority (Medium term proposals)**	**Total Project Cost (In Cr.)**	**Cost in Phase I (2018-2020) (In Cr.)**	**Cost in Phase II (2021-2025) (In Cr.)**	**Cost in Phase III (2026-2036) (In Cr.)**
1	Two multi modal transit centres are to be developed in the second phase at Pillaiyarkuppam & Madagadipet	50		50	
2	Beautification of Grand Canal	110.25	80	30.25	
3	Multi Level Car Parking at SETC Depot & New Bus Stand	21		21	
4	Development of Bahour lake	12		12	
5	Provision of bus stand at Saram	35		35	
6	Development of Cold Storage, Agricultural tool and equipment repairing and allied activities	5		5	
7	10 MLD DEWATS system in Ariyankuppam Commune (Abhishekapakkam village)	0.5		0.5	
8	10 MLD DEWATS system in Bahour Commune (in Parikkalpattu village)	0.5		0.5	
9	Development of Spiritual Circiut (Development of Infrastructure at Varadaraja Perumal Temple, Vedapureeswarar Temple, Gangai Varaga Natheeswarar Temple, Thirukanchi, St.Vinorpu Annai Church, Nellithope and Sri Thirukameeswarar Kokilambigai Temple in Villianur)	200	100	50	50

Phase – III Projects					
Sr. No.	**Projects to be taken up on priority (long term proposals)**	**Total Project Cost (In Cr.)**	**Cost in Phase I (2018-2020) (In Cr.)**	**Cost in Phase II (2021-2025) (In Cr.)**	**Cost in Phase III (2026-2036) (In Cr.)**
1	Development of Transport Nagar	25			25
2	Development of Desalination Plant (41.37 MLD)	320	120	100	100
3	Multi Level Car Parking at Railway Station	10.5			10.5
4	Agriculture Reaserch Centre at Nettapakkam	3.5			3.5
5	Development of eco-village tourism at Nettapakkam	50			50
6	Development of Tourism Zone in Thavalakuppam (near Poornankuppam)	100			100
7	5 MLD DEWATS system in Nettapakkam Commune (Pandashozhanoor Village)	0.5			0.5
8	10 MLD DEWATS system in Mannadipet Commune (Saniyasikuppam village)	0.5			0.5
	Total Cost	**2058.79**	**1039.54**	**559.25**	**460**

13.6.2 PHASING AND COSTING OF NEW ROADS (NEW/MISSING LINKAGES)

For New Roads (New/Missing Linkages), the road length and area of acquisition is calculated. Cost of implementation as per market rate is calculated. To calculate the cost of acquisition for the implementation of roads, the G.L.R. Value is taken into consideration. The average G.L.R. Value is calculated for the survey numbers from which the new roads are proposed. The G.L.R. Value is taken from the official website of Revenue and Disaster Management Department of Puducherry. Guilde Line Register Values 2014-15 (for Puducherry and Karaikal Region) w.e.f. 01-07-2014 is taken into consideration for calculating approximate cost of land acquisition.

Road wise Area of acquisition, cost of implementing roads (as per market value), average G.L.R. Value, cost of acquisition as per average G.L.R. Value and Phase of the road is shown in the table below. The total cost of implementing new roads is worked out to be around 183 cr. and the total cost of acquisition considering average G.L.R. Value is worked out to be around 52 cr. Hence, the total cost of implementing new roads would be approximately 235 cr.

Table 13-5 New Roads (New / Missing Linkages) Phasing and Costing

S. No.	Road Name (New/missing Linkages)	Proposed width	Road length	Area of Acquisition (Ha.)	Cost of New Road (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
1	New Alignment of NH 45A passing from Ariyur, Mangalam, Uruvaiyaru, Perungalur, Aranganur, Seliamedu, Bahour, Parikkalpattu & Kuruvinatham	45m	11363m	51.13	1,406,075,000	8246573.274	421,647,291.50	PHASE - I
2	Road starting from Pitchaveeranpattinam – Moolakulam road and merging with housing layout	15m	208m	0.31	7,750,000	31754500.000	9,843,895.00	PHASE - II
3	Road starting from the junction of 24m and 18m proposed to be widened roads in Irulansanthi and meeting junction of 24m and 18m proposed to be widened roads in Bahour	24m	839m	2.01	52,260,000	3964545.455	7,968,736.36	PHASE - II
4	Road starting from 15m proposed to be widened road and meeting 18m proposed to be widened road in Kirumampakkam	15m	879m	1.32	33,000,000	6932564.047	9,150,984.54	PHASE - III
5	Road starting from housing layout and meeting 18m proposed to be widened road in Pillayarkuppam	15m	368m	0.55	13,750,000	5810000.000	3,195,500.00	PHASE - III
6	Road starting from housing layout and meeting 18m proposed to be widened road in Manapattu	15m	561m	0.84	21,000,000	5085000.000	4,271,400.00	PHASE - III
7	Road starting from 18m proposed to be widened road and meeting 24m proposed to be widened road in Bahour	18m	505	0.91	22,750,000	4360000.000	3,967,600.00	PHASE - III

S. No.	Road Name (New/missing Linkages)	Proposed width	Road length	Area of Acquisition (Ha.)	Cost of New Road (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
8	Road starting from housing layout and meeting 12m proposed to be widened road in Parikalpattu	12m	231m	0.28	7,980,000	6196200.215	1,734,936.06	PHASE - III
9	Road starting from 12m proposed to be widened road and meeting with 12m proposed to be widened road in Sulliyankuppam	12m	167m	0.2	5,700,000	12958551.130	2,591,710.23	PHASE - III
10	Road starting near Sithalampattu to karikalampakkam	18m	1133m	2.04	51,000,000	2510000.000	5,120,400.00	PHASE - III
11	Road starting from the junction of 15m & 24m proposed to be widened road and meeting at junction of 15m & 24m proposed to be widened road in Karasoor	24m	1116m	2.68	69,680,000	4305705.059	11,539,289.56	PHASE - III
12	Road passing along Thirukkanur lake	24m	1040m	2.5	65,000,000	1520000.000	3,800,000.00	PHASE - III
13	Road passing near Shri Krishna college of Engineering & Technology in Mannadipet	24m	126m	0.3	7,800,000	1520000.000	456,000.00	PHASE - III
14	Road bifurcating from Sedarapet main road in Thondamanatham	24m	792m	1.9	49,400,000	14531754.575	27,610,333.69	PHASE - III
15	Road starting from 12m Proposed to be widened road and meeting with 18m proposed to be widened road in Manapet	12m	218m	0.26	7,410,000	4360000.000	1,133,600.00	PHASE - III
16	Road connecting layouts in kasturbai nagar in Thirubhuvanai palayam	12m	157m	0.19	5,415,000	8511180.481	1,617,124.29	PHASE - III
				Total	**182.60 Cr.**	**Total**	**51.56 Cr.**	

13.6.3 PHASING AND COSTING OF ROAD WIDENING

For road widening proposals, the existing width, proposed width and average area of acquisition is calculated. The market value for road widening is calculated. The cost of land acquisition as per average G.L.R. Value as mentioned above is also calculated. The approx. cost of road widening as per market

value is worked out to be 1215 Cr. and cost of land acquisition would be around 1706 Cr. hence total cost of road widening proposals would be around 2921 Cr.

Table 13-6 Road widening Phasing and Costing

S. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)	Cost of Road Widening (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
1	Entire NH 45A passing through PPA	15, 21, 60m	11520m	60m	32.26	88,71,50,000	43290026.6	1,39,65,36,256.56	PHASE - I
2	Aruparthapuram to Mudaliarpet (NH 45A bypass)	21m	4126m	60m	16.09	44,24,75,000	163570987	2,63,18,57,178.85	PHASE - I
3	Road from Indira Gandhi Square to Olavaikal Bus Stop	6, 9, 15m	6130m	18m	4.9	12,25,00,000	96377413	47,22,49,323.65	PHASE – I
4	Internal 3 Roads of Sulthanpet in Kurumbapet	6, 9, 12m	4649m	15m	2.79	6,97,50,000	45215782.4	12,61,52,032.80	PHASE - I, PHASE – II
5	Entire East Coast Road (ECR) passing through PPA	24, 30m	18246m	45 m	32.84	90,31,00,000	137974136	4,53,10,70,628.40	PHASE - II
6	NH 66 – Rajiv Gandhi square to Gorimedu	30m	2402m	60m	7.21	19,82,75,000	177610334	1,28,05,70,505.92	PHASE - II
7	Vazhudavoor Road till Vadhanur	9, 12, 15m	22240m	18m	13.34	33,35,00,000	44645420.5	59,55,69,908.83	PHASE - II
8	Villianur to Murungapakkam	6, 9, 15, 18m	7350m	18m	4.41	11,02,50,000	63927169	28,19,18,815.29	PHASE - II
9	Road from Thethampakkam, Pillayarkuppam to Ramanathapuram	9m	4203m	18m	3.78	9,45,00,000	4436778.79	1,67,71,023.84	PHASE – II

S. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)	Cost of Road Widening (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
10	Road from Koodapakkam-Villianur-Uruvaiyaru-Korkadu-Karklampakkam-Aranganoor-Siliamedu-Bahour-Pillayarkuppam	9, 12m	26888m	24m	36.3	94,38,00,000	15179075.5	55,10,00,441.56	PHASE – II
11	Mangalam to Embalam	6, 9m	10336m	18m	10.85	27,12,50,000	14393616.8	15,61,70,742.20	PHASE – II
12	Mangalam to Thirukanchi via Uruvaiyaru	3, 6, 9m	4461m	18m	5.35	13,37,50,000	9976830.82	5,33,76,044.90	PHASE – II
13	Kariamanikkam-Eripakkam-Kizhur-Sathamangalam	6, 9, 12m	14749m	18m	13.27	33,17,50,000	15274288.1	20,26,89,802.97	PHASE – II
14	Road from Arumparthapuram in Odiampet to Thirukanchi	6, 12m	3217m	18m	2.9	7,25,00,000	19490834.8	5,65,23,421.00	PHASE – II
15	Moolakulam to Kurumbapet Bus stop	6, 15m	940m	18m	0.71	1,77,50,000	79655543.6	5,65,55,435.95	PHASE – II
16	Puthucheri Church to Mettupalayam Bus stop via Diamond Nagar	12m	1006m	24m	1.21	3,14,60,000	118406889	14,32,72,335.84	PHASE – II
17	Muthirayarpalayam Bus stop to Moolakulam Bus stop	9m	1085m	15m	0.65	1,62,50,000	107642626	6,99,67,707.21	PHASE – II
18	Road passing through residential areas in Kurumbapet	6m	1454m	15m	1.31	3,27,50,000	32034460	4,19,65,142.59	PHASE – II

S. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)	Cost of Road Widening (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
19	Ossudu Eri Bus stop to junction with Villianur-Koodapakkam Road via Poraiyur	9m	2028m	15m	1.22	3,05,00,000	22604951.6	2,75,78,040.90	PHASE – II
20	Thirukannur to Manalipet via Kunitchampet	6, 9, 12m	5976m	15m	3.59	8,97,50,000	5600803.45	2,01,06,884.37	PHASE – II
21	Nesavalar nagar to Pandashozhanoor via Nettapakkam	6, 9m	2361m	15m	1.77	4,42,50,000	19817102.3	3,50,76,271.00	PHASE – II
22	Road starting from Nesavalar colony, Madukkarai passing through Kalmandapam, Manakuppam, Manaveli, Karikalampakkam and merging with ECR in Thavalakuppam	9m	16557m	24m	24.84	64,58,40,000	22520708.2	55,94,14,391.07	PHASE - II
23	Road from Madagadipet Lake to Cuddalore main Road	9m	1519m	18m	1.37	3,42,50,000	13993541.4	1,91,71,151.78	PHASE - II
24	Marriamman Koil street passing through Lingareddypalayam and Katterikuppam	9m	4964m	18m	4.46	11,15,00,000	24542518.8	10,94,59,634.02	Phase II
25	Nallavadu Road	9m	2437m	15m	1.46	3,65,00,000	22591738.4	3,29,83,938.11	PHASE - II

S. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)	Cost of Road Widening (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
26	Sedarapet main road to Erikarai bus stop via Villianur, Pinnatchikuppam Road and merging with ECR in Pillayarkuppam	9, 12, 15m	29703m	24m	35.64	92,66,40,000	17442560.9	62,16,52,871.04	PHASE - II, PHASE - III
27	Road starting from Arumparthapuram and merging with Vadamangalam Main Road	6, 9m	2909m	15m	2.18	5,45,00,000	22440134.6	4,89,19,493.33	PHASE - II, PHASE - III
28	Ring Road – Sedarapet-Karasoor-Thutipet-Kuppam-Thethampakkam-Kodathoor-Kunitchampet-Vadhanur-Madagdipet-Eripakkam-Padashozhanoor-Panayadikuppam-Karayamputhur-Kaduvanur-Irulansanthi-Bahour-Utchimedu	3, 6, 9, 12, 15, 18m	44291m	24m	59.79	1,55,45,40,000	9933636.56	59,39,32,130.12	PHASE - II, PHASE - III
29	Mangalam to Abhishekapakkam	6, 9m	11264m	18m	11.83	29,57,50,000	14236639.8	16,84,19,448.31	PHASE – III
30	Roads in Pathukanu, Koodapakkam, Olavaikal, Ariyapalayam	3, 6, 9m	14526m	15m	13.07	32,67,50,000	12456689.8	16,28,08,935.10	PHASE – III
31	Sedarapet to Karasoor via Iyyanar Kovil lake	9, 12, 15, 18m	5900m	15m	0.89	2,22,50,000	6584451.02	58,60,161.41	PHASE – III

S. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)	Cost of Road Widening (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
32	Roads in Kuppam, Kodathur, Suthukeny, Kattery and Pudukuppam	3, 6, 9m	21121m	15m	19.01	47,52,50,000	6343667.38	12,05,93,116.98	PHASE – III
33	Kunitchampet to Chettypet	6,9m	2921m	15m	2.19	5,47,50,000	4527672.23	99,15,602.18	PHASE – III
34	Mannadipet to Napalayam	6, 15m	1841m	15m	0.83	2,07,50,000	7801128.1	64,74,936.32	PHASE – III
35	Kuchipalayam to Sanyasikuppam	6m	2310m	15m	2.08	5,20,00,000	2642000	54,95,360.00	PHASE – III
36	Andiarpalayam to Thiruvandarkoil via Kalitheerthalkuppam	9, 12m	4593m	15m	2.07	5,17,50,000	8772413.35	1,81,58,895.63	PHASE – III
37	Perumal koil street to Thiruvandarkoil lake road in Thirubvanai	6, 9m	3078m	15m	2.31	5,77,50,000	8655987.08	1,99,95,330.16	PHASE – III
38	Thirubuvanai Bus stop to Pallinaliyanur	9m	1156m	15m	0.69	1,72,50,000	13634732.7	94,07,965.55	PHASE – III
39	Thirubuvanai - Vinayakarkovil street	9m	935	15m	0.56	1,40,00,000	11840688.9	66,30,785.79	PHASE – III
40	Eripakkam Main road to Madukarai-Thavalakuppam main road via Nathamedu	3, 6m	1621m	15m	1.7	4,25,00,000	18406213.7	3,12,90,563.24	PHASE – III
41	Karayamputhur to Perichchambakkam	6m	1167m	15m	1.05	2,62,50,000	24408044.5	2,56,28,446.72	PHASE - III
42	Soriyankuppam Bus stop to Cuddalore main road	9m	2370m	15m	1.42	3,55,00,000	7443065.66	1,05,69,153.24	PHASE - III

S. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)	Cost of Road Widening (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
43	Kuruvinatham to Kannaiyakoil bus stop via bahour	9, 18m	4731m	18m	2.13	5,32,50,000	8935900	1,90,33,467.00	PHASE - III
44	Moorthykuppam road	3, 6, 9, 12m	3045m	15m	2.28	5,70,00,000	9755700.09	2,22,42,996.21	PHASE - III
45	Road from Bahour to Cuddalore main road meeting near Bhagiyalakshmi Nagar	3, 9m	3074m	15m	2.77	6,92,50,000	4360000	1,20,77,200.00	PHASE - III
46	Seliamedu to Pinnatchikuppam	6, 9m	3721m	15m	2.79	6,97,50,000	12411479	3,46,28,026.44	PHASE - III
47	Pinnatchikuppam to Kirumampakkam bus stop via Adhingapet and Pillayarkuppam road	6, 9m	2320m	15m	1.74	4,35,00,000	12162122.1	2,11,62,092.45	PHASE - III
48	Kirumampakkam bus stop to beach	6, 9, 12m	2663m	15m	1.6	4,00,00,000	20936693.8	3,34,98,710.13	PHASE - III
49	Rajiv Gandhi Engineering college bus stop to Panithittu	3, 6m	777m	15m	0.82	2,05,00,000	30857552.9	2,53,03,193.40	PHASE - III
50	Roads in Irulansanthi, Kuruvinatham, Parikkalpattu, Utchimedu, Manapattu, Pillayarkuppam and Seliamedu	3, 6, 9, 12m	16630	12m	7.48	21,31,80,000	13516849	10,11,06,030.78	PHASE - III
51	Roads in Ramanathapuram	6m	1430m	12m	0.86	2,45,10,000	5892131.32	50,67,232.94	PHASE - III

S. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)	Cost of Road Widening (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
52	Roads in Mannadipet, Thirubuvanai & Madagadipet	3, 6, 9m	6280m	12m	3.77	10,74,45,000	6438418.73	2,42,72,838.61	PHASE - III
53	Roads in Kunitchampet	3, 9m	2802m	15m	2.52	6,30,00,000	11249262.6	2,83,48,141.87	PHASE - III
54	Road around Thirukannur Lake	6, 9m	1408m	18m	1.48	3,70,00,000	9371410.12	1,38,69,686.98	PHASE - III
55	Road starting from PS Palayam Bus stop in Vadhanur and merging with road in Tamilnadu	6m	1406m	18m	1.69	4,22,50,000	1227000	20,73,630.00	PHASE - III
56	Road starting from Anjaner Koil Street in Sanyasikuppam and merging with NH 45A near Thiruvandar Koil Bus stop	6, 9, 12m	4080m	18m	3.67	9,17,50,000	6645702.58	2,43,89,728.45	PHASE - III
57	Road Starting from Sanyasikuppam and merging with NH 45A near Thirubhuvanai Bus stop	9, 12, 18m	3799m	18m	1.9	4,75,00,000	8924983.85	1,69,57,469.32	PHASE - III
58	Road in Kariamanikkam	15m	725	18m	0.22	55,00,000	10280344.5	22,61,675.78	PHASE - III
59	Two Roads in Pandashozhanoor	6m	3441m	18m	4.13	10,32,50,000	12088551.1	4,99,25,716.17	PHASE - III
60	Vadukuppam Pandashozhanoor road	6m	1167m	15m	1.05	2,62,50,000	10791400	1,13,30,970.00	PHASE - III
61	Roads in Karayamputhur	6m	3573m	15m	3.22	8,05,00,000	24408044.5	7,85,93,903.27	PHASE - III

S. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)	Cost of Road Widening (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
62	Ramanathapuram-Sedarapet Road to Pillayarkuppam	6,9 m	2750m	18m	2.89	7,22,50,000	2541901.69	73,46,095.87	PHASE - III
63	Road from Koonimudaku bus stop to Pillayarkuppam	9m	1628m	15m	0.98	2,45,00,000	4018803.37	39,38,427.31	PHASE - III
64	Ramanathapuram-Sedarapet Road to Sedarapet main road in Ramanathapuram	6, 9m	1107m	15m	0.83	2,07,50,000	12199497.7	1,01,25,583.06	PHASE - III
65	Road from Sanjeevani Nagar to Rayapettai in Alankuppam	9m	1440m	15m	0.86	2,15,00,000	53821313.2	4,62,86,329.39	PHASE - III
66	Road Staring from Thattanchavdy Bus stop, passing through Mariamman Koil Street and merging with Vadamangalam Main Road	6m	1273m	18m	1.53	3,82,50,000	30095261.8	4,60,45,750.50	PHASE - III
67	Road starting from Manaveli and merging with Vadamangalam Main Road	9m	1420m	18m	1.28	3,20,00,000	10862664.2	1,39,04,210.12	PHASE - III

S. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)	Cost of Road Widening (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
68	Road starting from Mariamman Koil Street passing through Thiriveni nagar and Manaveli and merging with proposed 18m Road	6m	1567m	15m	1.41	3,52,50,000	28602183.6	4,03,29,078.89	PHASE - III
69	Road in Kombakkam merging with Vadamangalam Main road	6m	1303m	15m	1.17	2,92,50,000	40904198.1	4,78,57,911.73	PHASE - III
70	Road starting from NH 45A bypass passing along Velrampet lake and merging with Vadamangalam Main road	9m	2978m	18m	2.68	6,70,00,000	96770721.2	25,93,45,532.83	PHASE - III
71	Road starting from Marapalam Bus stop passing through Balamurugan Nagar to Harbour Road in Thengaithittu	3, 6, 9m	2919m	15m	2.63	6,57,50,000	102260495	26,89,45,102.26	PHASE - III
72	Road starting from ECR in Murungapakkam passing near Puducherry Institute of Health Management	6m	1310m	15m	1.18	2,95,00,000	25200000	2,97,36,000.00	PHASE - III

S. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)	Cost of Road Widening (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
73	Road starting from Ariyankuppam new Bus stop passing near Bharthiyar Palkalai Koodam College	12m	1152m	18m	0.69	1,72,50,000	135629709	9,35,84,499.46	PHASE - III
74	Veerampattinam Road passing near Shivaji nagar and ending near Chinna Veerampattinam	6, 9m	4425m	15m	3.32	8,30,00,000	26240374.6	8,71,18,043.66	PHASE - III
75	Dhrowbathiamman koil Street	9m	537m	15m	0.32	80,00,000	96340150.7	3,08,28,848.22	PHASE - III
76	Pooranankuppam Road	9m	2645m	15m	1.59	3,97,50,000	31898744.2	5,07,19,003.23	PHASE - III
77	Road from Aladimedu to Etchangadu in Kirumampakkam	9, 12m	3082m	18m	2.31	5,77,50,000	12953311.8	2,99,22,150.27	PHASE - III
78	Kirumampakkam to Pillayarkuppam Road	6m	1450m	15m	1.31	3,27,50,000	21564721.9	2,82,49,785.72	PHASE - III
79	Seliamedu to Melazhinchipattu	9m	1570m	15m	0.94	2,35,00,000	8224275.57	77,30,819.03	PHASE - III
80	Bahour to Chinna Arachikuppam via Parikalpattu	9, 12m	3450m	18m	2.59	6,47,50,000	6355548.38	1,64,60,870.30	PHASE - III
81	Kuruvinatham to Kanniyakoil via bahour	9, 12, 18m	5612m	18m	2.81	7,02,50,000	11340273.4	3,18,66,168.29	PHASE - III
82	Road starting in front of Pillayarkuppam Lake to Manapet Road	9, 12m	1199m	18m	0.9	2,25,00,000	12636011.2	1,13,72,410.12	PHASE - III

S. No.	Road Name	Existing Width	Road length	Proposed to be widened	Area of Acquisition (Ha.)	Cost of Road Widening (INR)	Average GLR Value/Ha.	Cost of Acquisition as per Average GLR Value	Phase
83	Road starting from Kattukuppam bus stop till housing layout	3, 6m	1734m	15m	1.82	4,55,00,000	9389276.49	1,70,88,483.21	PHASE - III
84	Road starting from Thirukanchi Road and passing through housing lauout in Manaveli and merging with 18m proposed to be widened road	6m	942m	15m	0.85	2,12,50,000	22018170.1	1,87,15,444.56	Phase III
					Total	**1,215.12 Cr.**	**Total**	**1705.74 Cr.**	

13.7 RESOURCE MOBILISATION

Availability of adequate resources is essential for the successful implementation of the Comprehensive Development Plan. This demands rejuvenation of urban centers to attract more and more investments in those areas. Implementation of the CDP requires huge amount of financial resources and it is impossible for the Planning Authority to bear such huge amount of money. There are certain fiscal mechanisms that can be adopted for mobilizing the financial resources.

Land remains the critical element of urban development and accordingly can be leveraged to raise resources for urban development and implementation of the CDP. Land values remains closely linked with the use to which the land is put and permission is granted to use the land in urban context. From the experiences, it is found that the only mechanism to fund the urban infrastructure is to undertake and promote planned development either by the parastatal agencies or by the private, cooperative, corporate sectors. Both these mechanisms can be leveraged by Development Authority to raise resources/ implement the CDP provided the legal framework permits the same and authorizes the Authority to regulate it.

It is proposed to have a Municipal Corporation with a jurisdiction same as Conurbation Area shown in the map below.

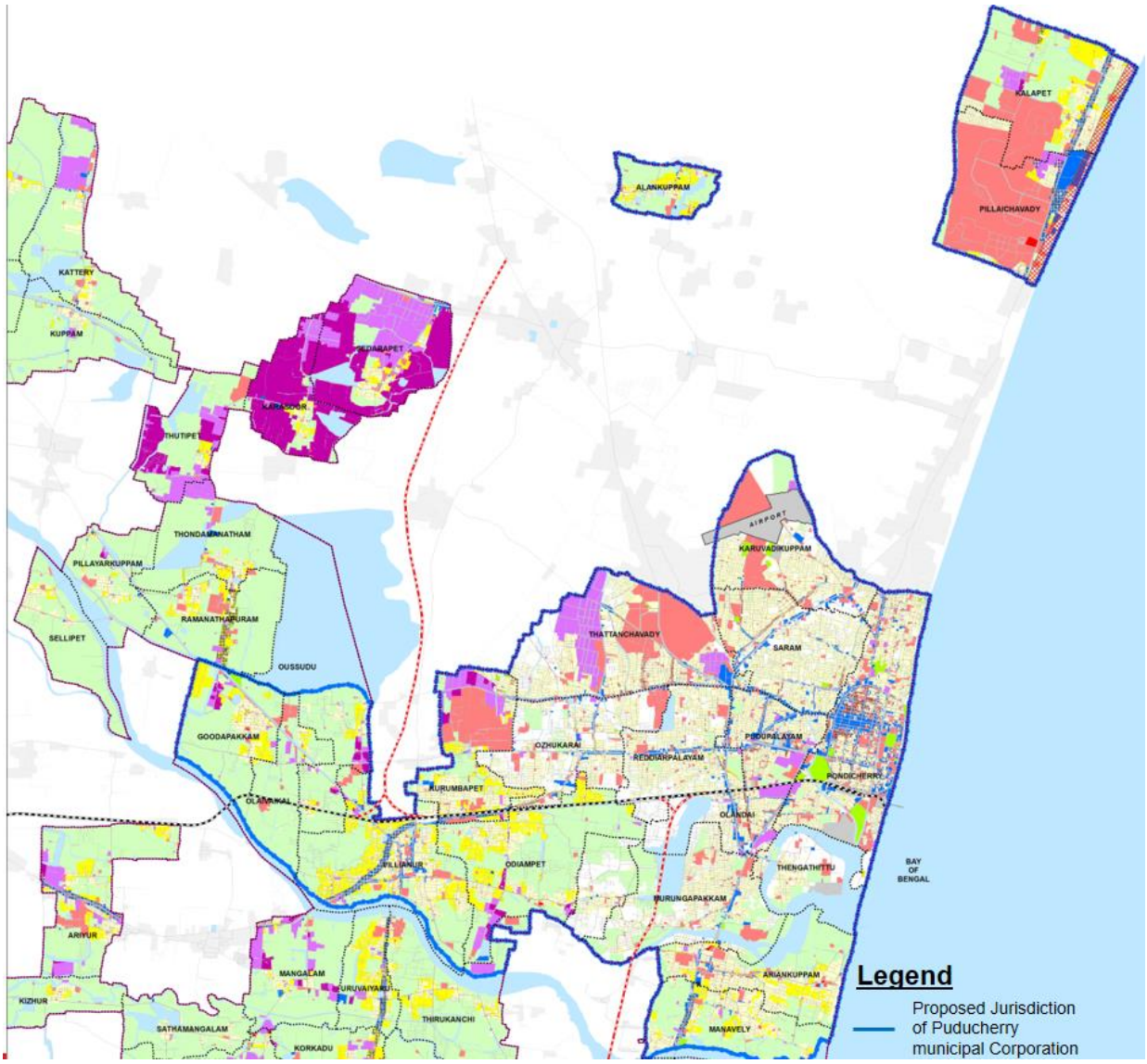


Figure 13.1 Proposed jurisdiction of Puducherry municipal Corporation

The revenue generation for Puducherry Municipal Corporation shall be as mentioned below.

13.7.1 LAND BASED FINANCING MECHANISMS

Apart from the government grants or development funds from the upper tiers of government, the ULBs would require adequate funds from their own sources to meet the objectives of facilitating urban development. Thus, it is inevitable for any local body to generate revenue. Table below shows categorywise sources of revenue of ULBs in India. Most of the ULBs use tax sources and grants to finance their activities, while the other sources of revenue are often ignored or not tapped to the potential that exists. For example, public debt available from market – both institutional and individual/retail investors – is rarely accessed to finance the creation of new urban development infrastructure.

Municipal Revenue Sources in Indian states/ULBs

Revenue Head/Category	**Sources of Revenue**
Tax Revenue	Property Tax, Advertisement Tax, Tax on Animals, Vacant Land Tax, Taxes on Carriages and Carts
Non-Tax Revenue	User Charges, Municipal Fees, Sale & Hire Charges, Lease amounts
Other Receipts	Sundry receipts, Law charges costs recovered, Lapsed deposits, Fees, Fines & Forfeitures, Rent on Tools & Plants, Miscellaneous Sales etc.
Assigned (Shared) Revenue	Entertainment Tax, Surcharge on Stamp duty, Profession Tax, Motor Vehicles Tax
Grants-in-aids	(i) Plan Grants made available through planned transfers from upper tier of Government under various projects, programmes and schemes (ii)Non-Plan Grants made available to compensate against the loss of income and some specific transfers
Loans	Loans borrowed by the local authorities for capital works etc. – HUDCO, LIC, State and Central Governments, Banks and Municipal Bonds

Source: Mohanty P.K., 'Finansing Urban Infrastructure: Some innovative Practices of Resource Mobilisation, CGG working paper, June 2003

Municipal Resource mobilization needs not only strengthening the existing revenue sources but also using other sources of revenue. Therefore, both conventional and non-conventional sources need to be tapped to the extent possible within the City. The ULBs may benchmark their levy and utilization with reference to the better performing peers within the State as well as outside it. The ULBs may use the general principles of users pay, beneficiaries pay and polluters pay to the justification such that the citizens are well aware of the need for their contribution towards larger societal cause. Table below shows conventional and non-conventional resources that can be tapped by the ULBs.

S. No.	**Service Revenue Source**	**Conventional Source**	**Non-Conventional Source**
1	Property Related	Composite Property Tax	Vacant Land Tax, Service Taxes, Surcharge on Land Registration Duty
2	Water Supply Related	Water Charges	Water Supply Donations, Water Supply Connection Charges, Water Benefit Tax, Water Betterment Charges

S. No.	Service Revenue Source	Conventional Source	Non-Conventional Source
3	Sewerage Related	Sewerage Charges	Sewerage Donations, Sewerage Connection Charges, Sewerage Benefit Tax, Sewerage Betterment Charges
4	Solid Waste Management Related	Conservancy Charges	Bulk Garbage Collection Charges
5	Town Planning Related	Building Permit Fee, Development Charges	Betterment Charges; External Betterment Charges; Open Space Contribution; Impact fee; Transferable Development Right; Premium FSI, Sub-division charges; Planning Permission Betterment
6	Engineering Related	No Sources	Road Cutting Charges, Street Tax, Frontage Tax, Cess on Infrastructure, Motor Vehicle Tax/Surcharge on Tax on Petrol and Diesel
7	Trade Licensing Related	Trade Licensing Fee	Business License Fee
8	Advertisement Related	Advertisement Tax	Hoarding Charges, Advertisement Placement Fees, Cable TV Fee, TV Advertisement Charges
9	Shops and Establishment Related	Shop Room rent	Royalty on Auctions

Source: Mohanty P.K., 'Finansing Urban Infrastructure: Some innovative Practices of Resource Mobilisation, CGG working paper, June 2003

- **Change of Land Use Charges for change of land use from one use to another:** The landuse conversion charge is determined by the newly permitted landuse of that area which is capable of yielding a better income for the land owner.
  The Puducherry Town & Country Planning Act, 1969 provides for levying Development Charges on landowners. Where permission for a change in the use or development of any land or building is granted in the whole or any part of the planning area, and such change or development is capable of yielding a better income to the owner, the Planning Authority may levy a charge not exceeding 1/3rd of the estimated increase in the value of the land or building in the prescribed manner for permitting such change in use or development.
- **FAR:** Intensity of land utilization depending upon Floor Area Ratio (FAR). Higher FAR means higher order of charges to be paid –tradable FAR.
- **Internal Development Charges and External Development Charges (IDC and EDC):**
  Instrument of development charges have been used extensively to recover the cost of providing new service and infrastructure in areas proposed to be covered by Development Plans. This mechanism has helped in providing development within the approved colonies in terms of roads, water supply, sewerage, sanitation, drainage, electricity etc. besides the social infrastructures involving education, health care, landscape etc. without involving any

cost to the Planning Authority as these costs are loaded as integrated part of pricing of developed plots which are made available to people after development.

In addition to internal development charges, charges for external development are also collected by development agencies. These charges include the cost of providing city level services involving arterial / ring roads, bypasses, under bridges /over bridges, water treatment plants, sewage treatment plants, major electrical network, trunk services, city level healthcare, education and other services. This is done through the process of working out total cost of development, as per the proposals defined in the development in the master plan. Based on the total developed area under different uses, external development cost is worked on the unit basis of area which is then charged from the developers while granting permission for development. External Development Charges (EDC) is then pooled in the City Development Fund which is then used for funding various projects prepared as per the provisions of the development plan.

- **Vacant land taxes:** levied on vacant land kept within the urban limits to minimize speculation and raise money on account of non-utilization of urban services.
- **Tax on land value increase:** Land values continue to increase in urban context due to various development projects undertaken by the Planning Authority (for eg. Comprehensive Development Plan) and economic phenomenon of rise in general prices. A basic objective of Land Value Increment Tax is to capture some of this increase for the benefits of the community. This kind of tax is widely used in numbers of countries including Italy, Malaysia, Australia, Korea, Canada and New Zealand.
- **Planning Charges:** Since preparation of master plan, zonal plan and working out detailed schemes and granting planning permission involves expenditure on the part of Planning Authority, accordingly they can be recovered as integral part of the planning permission so as to raise resources. Further, this approach will help in effective implementation of the Master Plan through increased intervention of planning system.
- **Sale or lease of publicly held land:** Public land assets are sold to private parties. This mechanism requires a detailed inventory of government land, market valuation and strategic decisions about the best use of a particular land. Auctions shall be open for the disposal of land. The provision for this mechanism is given in Section 52 of Puducherry Town and Country Planning Act 1969 and Section 72 of Puducherry Town and Country Planning Rules.
- **Remunerative Projects**: Planning Authority should take up remunerative projects which augment financial positions and generate revenue for the Authority and subsequently social infrastructure projects can be taken up out of the funds generated from the same. Income from remunerative projects is in the form of rental income from properties like shopping complexes, market fees, parking fee and income from other real assets owned by the PPA.

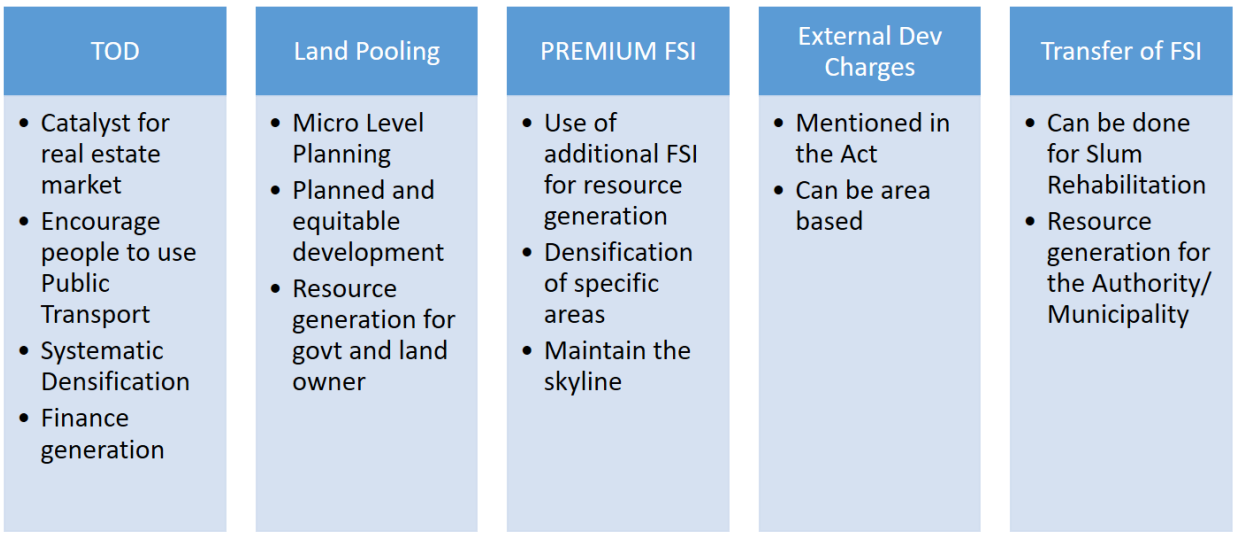


Figure 13.2 Resource Mobilisation

The ULBs need to exploit various land based revenues, which have greater implication to urban growth and development and concomitant problems like slum formation, redevelopment, rehabilitation and resettlement. The funds realized from land based revenue sources can be effectively deployed for the improvement of urban poor people living in the slum areas. Several of these sources may already exist in the ULBs but the potential of the same may not have been exploited to fullest extent. Also, there are several other forms of revenues (or, variants of revenues) that need to be tapped and exploited.

13.7.2 INVOLVING PRIVATE SECTOR

Considering the enormity of urban development, requirement of enormous resources, level of service/ infrastructure required to ensure appropriate quality of life in Puducherry, it will be critical to involve large number of reputed players in the urban development process in order to ensure effective implementation of master plan. With limited resources available with the parastatal agency, achieving the objective of the comprehensive development plan and its effective implantation appears to be a remote possibility. Accordingly, it will be desirable to make private sector as an active and supportive partner in the process of development and implementation of the CDP.

Mechanism of involving private sector will have to be defined clearly in a transparent manner through well-defined policy and legal framework in order to remove any mismatch or ambiguity. Level playing fields have to be created between Private and Public sectors so as not to put private sector in a position of disadvantage. A supportive and exclusive mechanism/ framework will have to be put in place to provide time bound clearance to the private sector development, meeting all the defined norms, standards and conditions of development. Attempt should be made to attract reputed developers in the state in order to usher a new era and culture of urban development. Minor developers should be avoided in order to minimize the chances of mushrooming planned development and ensure provision and development of integrated city level services. Minimum chunk of land to be developed should be defined which can be sustained as self -contained neighbourhoods having all basic amenities of services, physical / social infrastructures to meet the day to day needs of residents. Well-defined standard of development shall form integral part of such development, so that uniformity of development is ensured.

Licensing of developers would be integral and critical part of involving private developers in order to ensure their liability for the development works taken up by them. Legal, institutional and procedural framework for involving private sector in urban development / implementation of master plan needs to be worked out on the basis of detailed study carried out of the pattern adopted by states of Haryana, Punjab, Uttar Pradesh, Maharashtra, Gujarat (where they have put in place successful models of urban development involving private sector. However, such model would need modification depending on the conditions existing in the Puducherry to make it successful operationally.

Public Private Partnership can have brought into various projects such as Commercial Plaza at the present Goubert market, landscaping and street furniture along Grand Canal etc.

Apart from the above-mentioned financing mechanisms, easy access to institutional finance, market borrowing and efficient pricing of all chargeable urban services will also contribute to financial resource mobilization.

13.7.3 BEST PRACTICES

Land Management Process- Gujarat

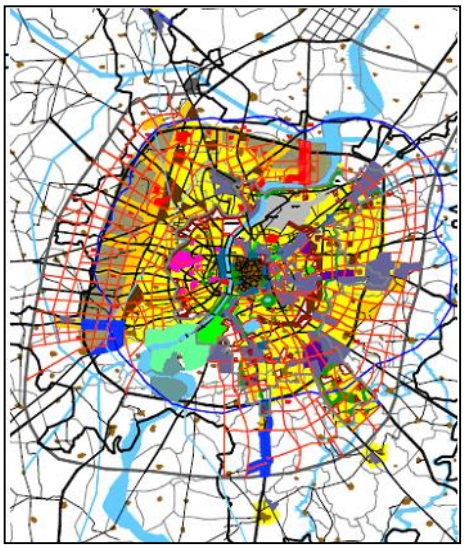
As the city grows, more land in the surrounding regions gets transformed from rural to urban uses. In the absence of an effective mechanism, this transformation is haphazard and results in congestion and low levels of infrastructure provision. To ensure planned new growth, most cities rely on large-scale land acquisition and development of planned layouts. However, this becomes difficult with the increase in land values as well as the active resistance to displacement by displaced landowners. Therefore, it has become imperative to introduce more fair, equitable and inclusive methods of land consolidation that cause minimal displacement if at all. The good example of such a mechanism is

from the land process of Gujarat.

Urban planning in Gujarat is a two-step process as prescribed in the GTPUDA and its Rules. The first step is to prepare a "Development Plan" (DP) for the entire city or development area. The second step is to prepare "Town Planning Schemes" (TPS) for smaller portions of the development area for which the Development Plan is prepared.

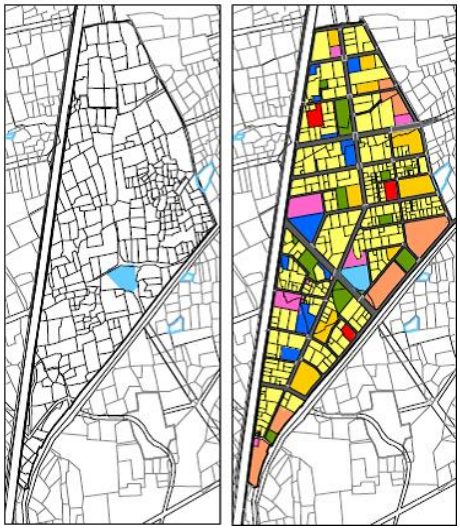
1. Development Plan (DP)

- Provides Overall Development Framework
- Overall Direction of Urban Expansion
- Land use Zoning
- City level road network
- City Level Infrastructure (Utilities & Amenities)
- Reservations of Land for other Public Purposes
- Reservations of Land for Housing for Urban Poor
- Transport Planning
- Development Control Regulations (DCRs)



2. Town Planning Scheme (TP)

- It is an effective instrument for implementation of Master plan
- It is whole to part- Master plan is Macro level and Town planning schemes is a Micro level planning
- Land Reconstitution- Large chunk of land can be acquired for public purpose through reconstitution of land
- neighbourhood Level Road Network
- Local Level Infrastructure Implementation
- Costs are distributed; all owners loose same proportion of land; Benefits are shared
- Public inputs are sought; grievances are redressed



Before TP Scheme After TP Scheme

Automated Parking System- Bangalore

Parking of vehicles in congested city area is major challenge to city government today. Banning alone does not help as it affects business for the shopkeepers and outsourcing the system means irregularities and less income for the city government. Bangalore Municipal Corporation has come up with a promising solution- a partnership with shopkeepers themselves.

Innovative solution- The Brigade road considered as a shopper's paradise in Bangalore was heavily congested with high traffic volumes on roads causing frequent traffic jams. Therefore to remove parking on Brigade Road, the BMC in association with the Brigade Shops Establishments Association (BSEA) established Automated Parking as a sustainable measure to resolve the issue.

Working of parking meter?



- Park the car in the bay, insert money into the meter depending on the time limit, obtain the parking ticket.
- Punch in the license number, data, starting time and ending time.
- Leave the ticket inside the car on the windscreen.
- If parking time exceeds 2 hours or if the ticket is not placed in the car, traffic police will tow away the vehicle and a fine of Rs. 500 will be levied.

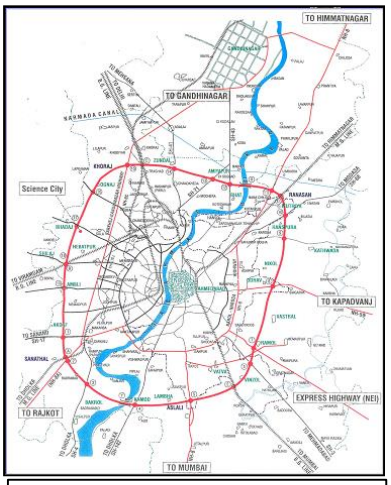
Results

- There are a total of nearly 85 parking bays, accommodating approximately 1623 cars in a day on rotation.
- The revenue generated is three times that of the old system.
- Fifty percent of the revenue generated goes to BMC as its share and the balance is used by the BSEA for maintenance of the parking meters, paying the guards, pave ment maintenance etc.

Key Learning's

- Introduction of technological tools in governance enables ULB to keep pace with the changing times.
- This project can be used in any city/town where unmanageable parking has been an issue.

Public- Private Partnership for Road Infrastructure Development - Ahmedabad



Sardar Patel ring road in Ahmedabad demonstrates how PPP models can be used effectively for city Infrastructure development. AUDA has managed to implement a project of such large scale in a brief period of time and set an example for other Development Authorities and ULBs to replicate this success story. Ahmedabad Urban development Authority (AUDA) has developed BOT model to carry out Phase-II development of Ring road.

Private Sector was involved for all technical inputs from initial stage of the project including Planning, technical and financial feasibility studies, surveys, detailed design, construction, supervision and construction quality control to achieve efficiency.

Private participation was involved for following work:

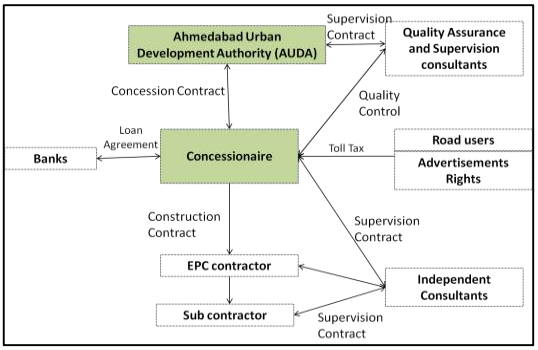
- Junction development
- Plantation along the road
- Toll tax collection
- Signage development

Other PPP Initiatives of AUDA

1. Junction board and signage development
2. Pay and use toilet facilities
3. Housing for the poor
4. Mechanized parking
5. Garden Maintenance

BOT Model use for Ring road:

BOT model shows an integrated partnership between AUDA and the private party, enabling AUDA to transfer responsibility of design, procurement, construction, operation and maintenance of the road and its facilities to the private party.



The private company generates revenue by collecting fees in the form of toll tax from people using the ring road during the operation and maintenance period.

Key Learning's:

- A participatory approach results in creation of urban infrastructure in a rapid and efficient manner.
- Professional approach to planning and implementation of infrastructure projects.
- Land development through TP scheme leads to an equitable and easy mechanism to acquire land for infrastructure project.

Toll Plaza



AUDA Ring Road



Plantation with Private Partnership



Junctions developed with private partnership



Signage's developed along the ring road with private partnership



Junctions developed with private partnership



Public- Private Partnership (PPP) For Affordable Housing- Rajasthan

Public private Partnership (PPP) is merging as an efficient model for delivery of services across various sectors. The concept of PPP in housing sector has evolved widely in order to meet large demand of housing.

PPP approach allows state agencies to overcome resource deficit, improve cost recovery and increase supply of houses based on demand. The public sector owns controls and regulates the use of land which is the most valuable resource for any housing project.

New Initiatives was launched under the affordable Housing Policy, 2009 for using PPP model in Rajasthan. Different PPP models were adopted for meeting the emerging housing demand.

Model: 1 Mandatory Provision

- Private developers to reserve 15% of the dwelling units or 5% of the residential area whichever is higher to be used for EWS/LIG housing in each of their township/Group Housing schemes

Model: 2 Private Developers on Private Land

- Developer to construct G+3 EWS / LIG flats on 25-40% land owned by him
- These flats should be handed over to Govt. at pre-determined price
- Developer gets additional FAR, twice the permissible limit on entire plot
- Additional FAR can be utilised on remaining plot area or exchanged for TDR
- Waiver of EDC, Plan approval fees, Conversion charges; lower stamp duty

Model: 3 Private Developers on Acquired Land

- Selected developer can take up construction of EWS/LIG/MIG-A flats on the land acquired by ULBs
- Land would be made available to developer on payment of compensation (Land Acquisition cost + 10% Administration charges)

Model: 4 Private Developers on Government Land

- Government land to be offered free of cost to the developer to be selected through an open bidding process
- Developer offering maximum number of EWS/LIG flats, free of cost to the ULB would be awarded the project. At least 50% houses should be of EWS category
- Developer shall be free to use the remaining land as per his choice for residential purpose with 10% for commercial use

Various incentives to Developers are as follows:

- FAR- Double the permissible Floor Area Ratio
- Complete waiver of external Development Charges, Building Plan Approval Fees, Conversion charges & reduction in stamp duty
- Commercial use upto 10% of plot area
- Fast track approval of the project within 30 days
- Buy back of flats by nodal agency of the government at predetermined prices

Key Learning's:

- Shortage of affordable housing is emerging as a major challenge for the government, which can be tackled through a series of measures and policy guidelines
- Joint approach brings together the technical and managerial expertise of the private sector with the accountability and fair pricing of the public sector to improve the housing delivery

Participatory Approach Towards Resolution of Urban Issues- Mumbai

A collaborative approach between the Municipal Corporation of Greater Mumbai (MCGM) and local residents led to clean and green environment. This success story has resulted in the establishment of Residents' Associations in Mumbai under the title of Advanced Locality Management (ALM). The concept of ALM seems to be leading to truly participative urban governance in Mumbai.

Case Situation-

The ALM scheme was started in Joshi Lane, Ghatkopar, which lies in the northeastern suburb of Mumbai. The citizens of Joshi Lane were facing the problem of solid waste which gathered on the streets, blocking vehicular traffic and causing stink. Local residents met with representatives of MCGM to resolve the issues. An empowered Residents' Association was formed and with MCGM, and they jointly strategized the SWM processes such as door-to-door collection, segregation, sweeper management and financials.

The idea of ALM was thus born. Authorities at MCGM along with citizens converted this idea into policy.

Strategies Adopted-

- Residents decided to collectively apply the principle of three 'R's, 'reduce-reuse-recycle' along with segregation of waste at the source.
- Adoption and beautification of locality by developing greenery.
- Control the activities of Hawkers.
- Encourage environment friendly activities like water harvesting.
- Liaise with the local ward office of MCGM for redressal of problems/grievances/obtaining permissions.
- Display hoardings, signboards and have cards to identify ALMs and their workers.
- MCGM to coordinate between ALMs and other authorities like Police, electricity & telephone companies and Public Work Department (PWD)
- MCGM to give active, effective and timely support to ALMs to fulfill their responsibilities in spirit of true partnership.

Key Learning-

- Given the will of the local government and that of an inspired leadership, it is not only possible to involve the citizens in management of civic affairs but also to manage social change.
- An entry-level activity for small institutions can actually promote sustainable environmental management.

- Municipal Corporation of Greater Mumbai (MCGM) concept of Advanced Locality Management (ALM) approach in participative urban management has led to multiplying the scope of work of ALM beyond the SWM. With the success of the ALMs in SWM, MCGMs delegated additional functions to them. These included beautification of the localities and maintenance of gardens, parks and roads.

The success of the ALM scheme in one community led to its widespread replication in other areas of the metro city.

13.8 RECOMMENDATIONS & PLANNING POLICY

13.8.1 IMPORTANCE OF PLANNING POLICY GUIDELINES

It is necessary to create an appropriate policy framework for transfer of Government Land to Development Authorities, allotment of land and properties by Development Authorities, establishment of Comprehensive Development Plan Infrastructure Development Fund and institutional mechanism required for implementation of Comprehensive Development Plan proposals and regulatory framework in an effective and efficient manner.

CDP of a city and surrounding areas is usually the guiding force for Urbanization. In context of Puducherry, it is the CDP, the statutory document for guiding the process of Urbanization of larger urban areas. The CDP creates a long-term vision for development of a city and peripheral areas and provides frame work for organized Urban Development.

The present system of implementation of CDP lacks coordination and an integrated mechanism, which has thrown up following challenges. Firstly, the process of Urbanization requires vacant lands, both government and private, to be developed for the purpose of urban settlements through the process of land assembly and planning. This process should be equitable, effective, and efficient and time bound. In absence of Policy tools like Transferable Development Rights (TDRs), land pooling mechanisms etc., optimum results could not been achieved. Secondly, to roll out all projects contained in CDP, mobilization of financial resources at unprecedented level is required. successful CDP implementation will require seamless coordination between land allotment, assembly, management, planning and development activities. the task of building and expanding a city to the projected population will require involvement of multiple stakeholders including various departments of Government; therefore, same requires an effective Institutional Mechanism for steering and guiding the process. The challenge of environmentally sustainable and climate proofing of the development needs to be addressed by developing regulatory mechanisms for protection of waterbodies, canals, river, Sustainable Urban Transport strategies through Transit Oriented Development etc.

13.8.2 GENERAL ISSUES ASSOCIATED WITH INDIAN CITIES RELATED TO PLANNING POLICY

The growth of India's urban population has not been accompanied with proportionate increases in urban infrastructure and service delivery capabilities. Cities in India face a range of challenges to meet demand and supply gaps in urban regions, in such areas as water, waste management, energy, mobility, the built environment, education, healthcare and safety. The challenges may exacerbate further if timely and adequate action is not taken. The concept of a planned urban administration is yet to be addressed in India's cities and severe supply and demand gaps are driving cities towards a planned approach to tackle urbanization. Piecemeal efforts have been made but they lack the thrust to address mega issues. Urban India faces challenges across sectors, with some requiring immediate attention and others requiring long-term action.

Rapid urbanization in India has led to increased demands for providing state-of-art infrastructure in Urban Local Bodies (ULBs) and the ULBs are continually looking for new sources of funds in order to meet the requirements of creating and upgrading infrastructure. ULBs have to play a crucial role in implementing the urban rejuvenation programmes, but they lack the resources to execute the programmes. Inadequate institutional capacity, inadequate revenues, a lack of collaboration between multiple planning and administration bodies lead to improper implementation of planning policies. Such issues for are described below.

Poor collaboration among Planning and Administrative Bodies

The urban governance structure is fragmented in India. At one end of the spectrum lie such cities as Ahmedabad, in which the ULB provides all services, and at the other end are cities such as Bangalore, in which over 10 agencies are involved in providing urban services. Agencies involved in the planning and administration include ULBs, parastatals, state government agencies and development authorities, among others. With each agency under a different leader,

the goals of the agencies are often unaligned, which leads the city to operate in siloes.

Insufficient Capacity

The institutional challenges create a vicious cycle. The inadequate resources coupled with a poor governance structure and archaic processes result in inadequate and low-quality service delivery. Such service delivery attracts lower user charges and compliance that further degrades urban governance and finance.

Inadequate Revenue Base

The ULBs are thus constrained in the absence of funding sources for urban development projects. The major source of revenue for urban local governments are property taxes and user charges but low charge out rates and poor compliance in the payment of charges and taxes have led to financial dependence on the state government.

With declining sources of revenue, local governments must seek funds from the state governments even to fund operational expenses such as the salaries of employees.

Promoting Public-Private Policy Frameworks

PPPs for urban development have had mixed results in India. Urban rejuvenation programmes have encouraged private-sector participation but the following issues must be resolved to attract the best firms:

- Project funding is a challenge with low user charges and insufficient other value capture mechanisms. Although ULBs are not financially independent, they must make projects financially viable through adequate funding mechanisms.
- The sharing of risks in public-private partnership projects has often been suboptimal with revenue risk often passed on to the private sector.
- Government agencies have limited capacity to perform the preparatory work required to develop projects appropriately. The lack of time to ensure good-quality project development could result in reduced private sector interest, mispricing, cost escalation or delays in execution.
- Outstanding and delayed payments to the private sector have resulted in a loss of confidence, aggravated by long-standing disputes.

13.8.3 APPROACH ADOPTED TO DERIVE PLANNING POLICY

To derive the planning policy, certain approach was adopted. The first step was to collect the primary data and secondary data for the planning area. For obtaining Primary data, Household survey as well as Transportation survey was conducted. Apart from these, interaction with government officials, institutions, NGOs, various stakeholders were held to understand strengths, weaknesses, opportunities and threats for the planning area. Secondary data for Demography, Environment, Heritage, Tourism, Economic base, Physical Infrastructure, Social Infrastructure, Housing, Traffic & Transportation etc. were collected from various government departments. The satellite imagery was procured from NRSC, Hyderabad to generate scientific base map. Village wise cadastral maps, Town Survey Sheets, FMB sketches were also procured to be the part of seamless base map. Existing land Use survey was conducted to earmark accurate existing land use on base map.

Simultaneously, analysis for demography, economy, Physical Infrastructure including water supply, sewage, solid waste management and drainage, Social Infrastructure including education, health, recreation, government organisation etc., Heritage & Tourism, Traffic & Transportation, Housing, Environment were carried out. Considering the population growth in the study region, village level analysis was done to understand the urbanisation pattern. Last four decades for the villages were analysed along with availability of physical as well as social infrastructure. All the existing available infrastructure facilities based on primary and secondary survey were analysed. After thorough analysis and clear understanding, the policies proposed by Government of India were also studied and incorporated according to the study region. The policies proposed by Puducherry government such as Industrial Policy 2016, Information Technology Policy 2008, Puducherry vision document 2025 etc. were also studied.

After analysing village level situation of planning area, consulting various stakeholders, options and strategies for planning area are derived. Growth Centres, Growth Points and Transit nodes were identified based on the analysis carried out to give the proposal for future development. Based on the Growth Centres, Growth Points and Transit nodes, circulation pattern of the planning area is proposed with proper hierarchy of roads. The land use based proposals are given at three levels such as overall Puducherry planning area, conurbation area and boulevard area. Various government projects such as SMART city, AMRUT, Tindivanam-Puducherry and Puducherry-Cuddalore railway line are incorporated in the proposal of CDP-2036.

By looking into the issues for implementing planning policy for Puducherry such as multiple disciplinaries for development works, lack of proper coordination among government departments etc., the planning policy for implementation of Traffic & Transportation proposals, Proposals of Public & Semi Public uses, proposals of Environment preservation, to develop affordable housing in planning area, for heritage conservation and for various development projects are derived.

13.8.4 PLANNING POLICY

1. Planning Policy for implementation of Traffic & Transportation Proposals

To derive the planning policy for implementation of traffic & transportation proposals, issues of this sector should be kept in to consideration. Key issues found across the planning area are not upto the mark designed intersections, lack of road hierarchy, absences of dedicated sufficient parking space around key institutions & nodes, bottlenecks along major roads and pedestrian traffic conflict issues.

By looking into the future demand for the roads for the projected population, the roads proposed for widening are proposed in such a way that it minimizes disturbances to the surrounding plot owners. The road widening is proposed within the FMB with maximum possible manner. The new linkages are proposed wherever the missing links are identified. It is also proposed in such a manner that it does not disturb surrounding settlement. The proposals for road widening and new linkages are described in detail in chapter 5.8. Proposals are also given in synchronization with the Comprehensive Mobility Plan (CMP). Peripheral outer ring road, inner ring road and missing link roads are proposed to connect the different enclaves to avoid the haphazard traffic flow of Puducherry region. These proposed roads are identified and studied extensively on the ground, analyzed and verified such that the maximum length of the roads falls under the jurisdiction of Government of Puducherry. To enhance the orderly growth through the transportation network system TOD concepts is also applied to have the sustainable development in the study region. Proposals of Public Transportation, Transit nodes, road widening proposals, proposal for new linkages are adopted from CMP. Parking locations are identified in Boulevard area to manage the traffic congestion within Boulevard area. The area of central jail is already used as parking area presently.

The other proposals of Traffic & Transportation sector such as transit nodes should be implemented through Land acquisition under the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (LARR). The proposals of road widening, new linkages and parking are to be implemented through the said act.

2. Planning Policy for implementation of Public & Semi Public uses

To derive the planning policy for implementation of proposals of Public & Semi Public uses, issues of this sector should be kept in to consideration. Looking in to the broader level, Puducherry Planning Area is having sufficient educational and healthcare facilities. JIPMER, Pondicherry University, Rajiv Gandhi Hospital etc. are very renowned institutions of National level existing in Puducherry. The villages of the planning area are also having sufficient health and educational facilities. For the future

requirement of the projected population, Public & Semi Public land uses are proposed in planning area.

The Public & Semi Public land uses are proposed on Government Land for easy implementation of public services. This will minimize the hurdles faced during land transaction. As Public & Semi Public land uses are proposed on Government Land, it will be executed at a faster rate. For proposals earmarked over HRI and WAKF board land, concerned authority such as Education Department, Health Department, PWD, Police Department, Fire Department etc. can take the land on lease and develop it for the public purpose.

3. Planning Policy for implementation of Environmental proposals

To derive the planning policy for implementation of environmental proposals, issues of this sector should be kept in to consideration. From the Existing Land use survey, it was observed that the Water bodies of planning area are deteriorating due to various reasons like encroachments around water bodies, solid waste dumping, disposal of untreated wastewater etc. Oussudu lake, Bahour lake, Karasur lake, Thondamanatham lake, Ozhandai lake, Vadhanoor lake, Panayadikuppam lake, etc. are some of the important and big lakes which supports for the drinking and agricultural purposes in the system. But due to the rapid urbanization and pressure on the real estate, it is also observed that there is disturbance in the interconnectivity of channels which leads to the deterioration of the waterbodies. This continuous phenomenon leads to shrinkages of waterbodies. Hence at present only less than 50% of tanks and related Ponds are existing in the Puducherry region. Apart from this, the natural drainage pattern of the town is disturbed by anthropogenic activities viz. encroachment on the drains/waterbodies, dumping of solid waste, disposal of untreated wastewater etc. As a result, various issues arise, like flooding, drying of water bodies, water logging etc. These issues can be addressed by providing buffer area on both the sides of the canals. This buffer area would also help us to maintain the canals without any hindrances. Apart from this, areas such as Bahour, Nettapakkam are known as Rice Bowl of the region. Due to rapid urbanization, land under agricultural activities are decreasing. Decline in land under agriculture is to be controlled in such areas of the planning area.

Hence, the buffers are proposed around water bodies within conurbation area and outside conurbation area. Buffers are also proposed for ecological sensitive areas such as Oussudu lake, Bahour lake and Thengaithittu mangroves. Canals and rivers are also proposed to be protected with buffers. Such buffers are mentioned below:

Sr. No.	Particulars	Proposed Buffer
1	The waterbodies (ponds/lakes) within Conurbation area	20m
2	The waterbodies (ponds/lakes) outside Conurbation area	30m
3	Ecological Sensitive areas	
	3.1 Oussudu lake	50m
	3.2 Bahour lake	50m
	3.3 Thengaithittu mangrooves	50m
4	Canals and rivers which does not fall under the CRZ	15m (on both side of canal & River)

To avoid further deterioration of the mangrove, it is proposed to declare the Thengaithittu mangrove area as protected area.

There is a lack of green spaces/recreational area in the planning area. Thus, after the detail study the city level and neighbourhood level parks/playgrounds are proposed.
Bahour is known as the Rice bowl of the planning area. Hence, it is imperative to preserve this rich and fertile agricultural land. This area is preserved by declaring dedicated agriculture zone under CDP – 2036 and Regulated Development will be allowed in certain parts of this area.
Untreated wastewater/industrial effluent should not be allowed to discharge in any natural drains/waterbodies. Underground sewerage network has to be provided with adequate sewage treatment facilities.

The land belongs to such buffer area should be developed under strict regulations. Strict monitoring for the implementation of buffer area should be followed. Regulated development with special permission from PPA will be allowed in such buffer areas. Existing structures in the buffer areas shall remain as it is. Permission for redevelopment on site of existing structures or renewation may be obtained from PPA. Permission for any new development may be obtained from PPA in consultation with TCPD, Puducherry.

4. Planning Policy for implementation of Affordable Housing in planning area

Owning a house is considered a big issue in today's societies. As such, an exact measure of housing affordability is essential to ensure the need for shelter. Housing is the basic human needs; it is also one of the most important components of urban economic development in any country. In addition, the socioeconomic stability of a country is always depending on the housing affordability of the country. For this reason, housing is a valuable asset that always has a great impact on societal well-being. Housing affordability became greater focus in every society; and the affordability problem with regard to housing market is one of the most controversial issues within most developed and developing countries.

As mentioned in the chapter 6.2, most critical issue for urban dwellers is to find an appropriate place to live. It is observed that the price of all kind of housing have been increasing exorbitantly, which indicate that the investment in housing sector is unable to match pace with the increasing demand for housing. Given the importance of housing, there are several issues which need to be tackled to promote the provision of this basic need in Puducherry. Rapid urbanization and rural to urban migration has led to a substantial shortage of housing in the region. The direct result of this is the concentration of informal settlements in the city. Given that the shortage in housing is concentrated at the bottom of the pyramid, the sector can play an important role in the socio-economic development.

Moreover, with the rapid urbanization and significant increase in the housing demand, housing sector is considered to be the Engine of immense potential giving a push to the economy because of its link with the employment generation and livelihood. Therefore, provision of housing can make a significant difference in income of families, both in rural and urban areas.

Public Housing in Singapore – a successful model

Today, more than 80% of Singapore's population is living in public flats, with 93% of them owning their flats. Because of this, the public housing model of Singapore is considered as one of the most successful examples of affordable housing models in the world. The Housing and Development Board (HDB) is Singapore's public housing authority and a statutory board under the Ministry of National Development. As Singapore's sole housing agency, the HDB is unique in its organizational structure, function, and approach to housing. It operates like a single, comprehensive source for housing development and coordinates planning, land acquisition, construction, financing, and policy for housing in Singapore. By centralizing its public housing effort, Singapore has avoided the problems of government silos and fragmentation of duties that are associated with multi-agency implementation.

The unique aspect of Singapore's housing model is that emphasis is on ownership rather than rental. Affordability is ensured through a set of modalities, including the provision of different unit sizes, progressive mortgage payments (based on income levels), low interest rates and government subsidies. For example, government subsidizes low-income groups and first-time buyers for buying houses. Till date, HDB has developed more than 900,000 flats in Singapore, which have been given to Singaporeans.

Housing for All by 2022 – A National Mission

In June 2015, the Union Cabinet chaired by the Prime Minister gave its approval to the "Housing for All by 2022" - National Mission for Urban Housing to address the issue of affordable housing in urban areas. National Urban Housing Mission seeks to meet the gap in urban housing units by 2022 through increased private sector participation and active involvement of the States. It has four broad components or verticals out of which credit linked subsidy would be implemented as a Central Sector Scheme and not a Centrally Sponsored Scheme.

a) Slum rehabilitation of Slum Dwellers with participation of private developers using land as a resource - The Centre would provide a grant of INR 1 lakh per house to the state for deployment in the development of any slum rehabilitation project

b) Promotion of affordable housing for weaker section through credit linked subsidy - An interest subsidy of 6.5% on housing loans will be provided to EWS/LIG categories, which can be availed upto a tenure of 15 years.

c) Affordable housing in partnership with Public & Private sectors - Central assistance at the rate of INR 1.5 lakh per house for the EWS category will be provided.

d) Subsidy for beneficiary-led individual house construction or enhancement- Central assistance at the rate of INR 1.5 lakh per house for the EWS category will be provided

The affordable housing is proposed over government land for easy implementation. Puducherry Housing Board can easily develop the affordable housing proposed over government land. The survey numbers for the development of affordable housing are mentioned in chapter 6.9.

5. Planning Policy for Heritage conservation

As discussed in chapter 8 of Heritage & Culture, the boulevard has buildings with French architecture which reflects French heritage. The Government of Puducherry has identified 21 heritage buildings for conservation. The heritage buildings in the Boulevard are being converted in to commercial activities which lead them to loss of heritage value of the French rule. These buildings must be preserved as it is as they are with the great heritage importance. The heritage conservation in Boulevard area can be done through Transfer of Development Rights (TDRs). TDRs are given for preservation of heritage landmark buildings and is a way to compensate the property owners for loss in revenue on their properties. Transfer of Development Rights (TDR) is a zoning technique used to permanently protect cultural resources by redirecting development that would otherwise occur on these resource lands to areas planned to accommodate growth and development.

Transfer of Development Rights programs enable landowners within cultural resource areas to be financially compensated for choosing not to develop some or all of their lands. These landowners are given an option under municipal zoning to legally sever the "development rights" from their land and sell these rights to another landowner or a real estate developer for use at another location. The land from which the development rights have been severed is permanently protected through a conservation easement or other appropriate form of restrictive covenant, and the development value of the land where the transferred development rights are applied is enhanced by allowing for new or special uses, greater density or intensity, or other regulatory flexibility that zoning without the TDR option would not have permitted.

Establishing a TDR program involves the following basic steps:

- Establish the TDR option and administrative provisions. Use of TDRs must be established as a voluntary option.
- Establish the area of high resource conservation value
- Determine the number of TDRs allocated to each landowner within the high resource conservation area (usually a simple mathematical formula – e.g., one TDR for every five (5) acres)
- Establish the procedure for severance of TDRs
- Provision of the use of a Deed of Transferable Development Rights document
- Establish the procedure for conservation of heritage buildings
- Establish the receiving area (area or areas planned to accommodate growth). Potential receiving areas can be residential, commercial, industrial, or institutional in character, or any combination thereof.

6. Framework for application of Value Capture Finance (VCF) methods to projects

VCF seeks to enable States and city governments raise resources by tapping a share of increase in value of land and other properties like buildings resulting from public investments and policy initiatives, in the identified area of influence.

The different instruments of VCF are; Land Value Tax, Fee for changing land use, Betterment levy, Development charges, Transfer of Development Rights, Premium on relaxation of Floor Space Index and Floor Area Ratio, Vacant Land Tax, Tax Increment Financing, Zoning relaxation for land acquisition and Land Pooling System.

Some Indian cities through state urban regulations have been developing and exercising some of VCF mechanisms – The Mumbai Metropolitan Region Development Authority (MMRDA) and City and Industrial Development Corporation Limited (CIDCO) have used different Value Capture methods including Betterment levy to finance infrastructure development in the urbanizing areas. Tamilnadu and Maharashtra have made Land Value Tax applicable to urban areas too under which increase in land value is tapped through increased revenue tax. West Bengal has formulated a system to capture gains from land use conversion. Area based Development charges are being resorted to in Andhra Pradesh, Gujarat, Maharashtra, Tamilnadu and Madhya Pradesh. Karnataka, Gujarat and

Maharashtra have made enabling provisions for enabling Transfer of Development Rights to buy additional FSI/FAR.

Value Capture Methods

- **Land Value tax –** considered the most ideal value capture tool which apart from capturing any value increment, helps stabilize property price, discourage speculative investments and is considered to be most efficient among all value capture methods. Maharashtra and Tamilnadu, through state laws have expanded the scope of this mechanism to cover urban land also. Globally, land value tax is widely used in Denmark, Australia and New Zealand.

- **Fees for changing Land use** (agriculture to non-agriculture) – land revenue codes provide for procedures to obtain permission for conversion of land use from agriculture to non-agricultural use.

- **Betterment levy** – one-time upfront charge on the land value gain caused by public infrastructure investment.

- **Impact fees** are the fees levied from the owners with illegal construction to get them converted into authorized development.

- **Vacant Land Tax (VLT)** — applicable on those landowners who have not yet initiated construction on their lands. In Andhra Pradesh, the Greater Hyderabad Municipal Corporation (GHMC) imposes a tax of 0.5% of the registration value of the land if not used exclusively for agriculture purpose or is vacant without a building.

- **Tax Increment Financing (TIF)** — one of the most popular Value Capture tools in many developed countries, especially the United States. In TIF, the incremental revenues from future increases in property tax or a surcharge on the existing property tax rate is ring-fenced for a defined period to finance some new investment in the designated area. Tax Increment Financing tools are especially useful to finance new investments in existing habitations. Some of the Smart City Proposals have planned for TIF in their area-based developments (ABD).

- **Land pooling System (LPS)** — a form of land procurement where all land parcels in an area are pooled, converted into a layout, infrastructure developed, and a share of the land, in proportion to original ownership, returned as reconstituted parcels. In India, States such as Gujarat and Haryana have used land assembly programs where the owners agree to exchange their barren lands for infrastructure-serviced smaller plots. Gujarat has used these tools to guide the development of Ahmedabad city and its surrounding infrastructure.

Framework for application of VCF methods to projects

Project initiation - At the time of initiation of the project the rules and regulations governing Value Capture in the Union Territoty need to be studied and possibilities.

Planning - The area of influence of the project will be the area in which land and property values are expected to increase due to project location. The starting point is the value impact assessment in the area of influence, which should form a part of the Detailed Project Report (DPR). Next, stakeholders who will benefit from the setting up of the project will have to be identified and consultations held with them right from the stage of project initiation.

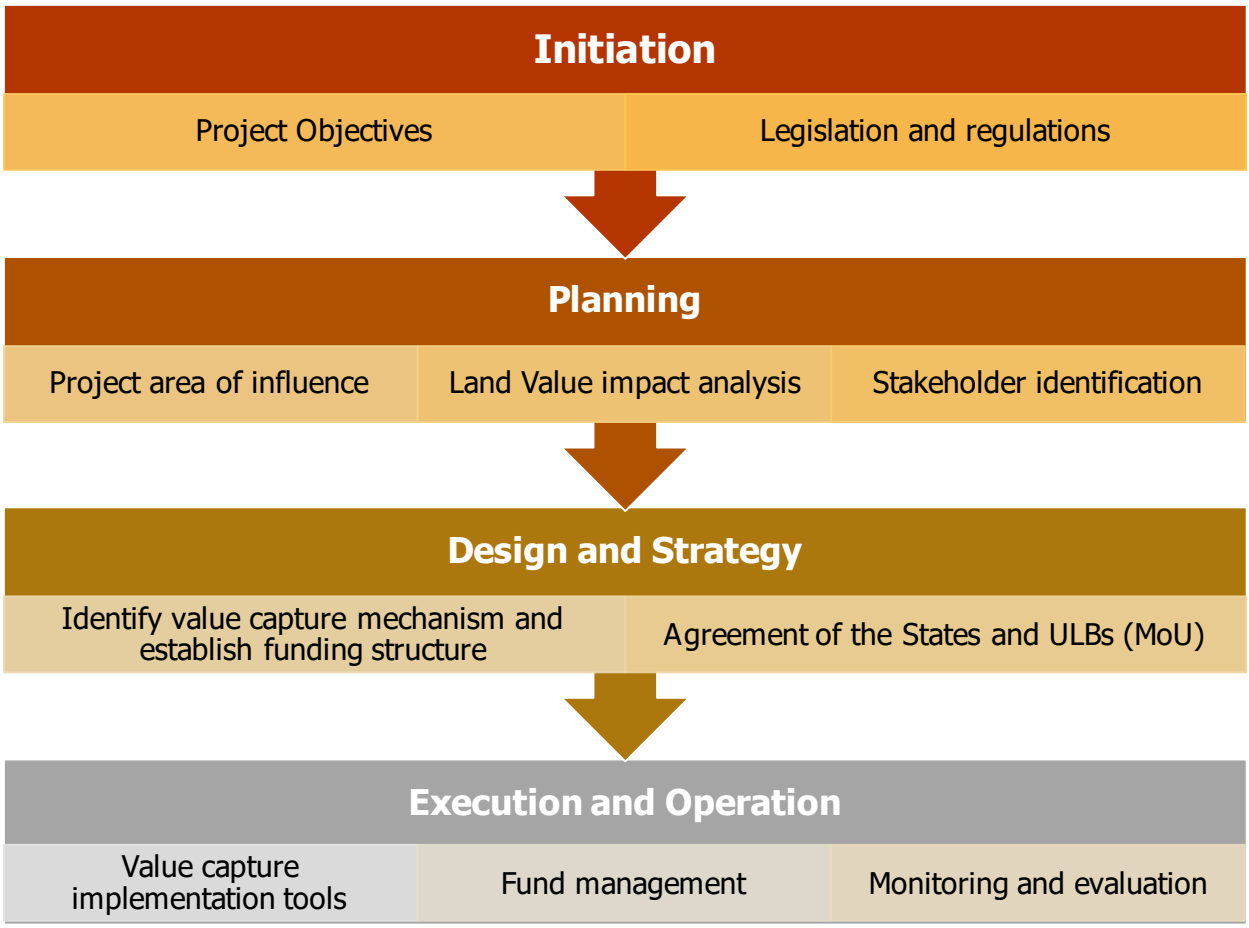


Figure 13.3 Steps required for Project based VCF policy framework

Design and Strategy - The Value Capture methods for funding project need to be identified and these methods have to be put in place by the State Governments. This will include the type and number of VCF tools to be applied, methods of assessing, levying and collecting the incremental value generated, time period during which the VCF tools will be in operation, etc.

Execution and Operation - The value capture method for the project should be implemented and an efficient mechanism for monitoring of fund management put in place. Regular monitoring and evaluation of the project progress will have to be established and put in the public domain. Figure 13.3 gives the details of the steps to be taken by the Central/State Governments and their agencies at the time of doing project feasibility studies.

13.9 URBAN DESIGN GUIDELINES

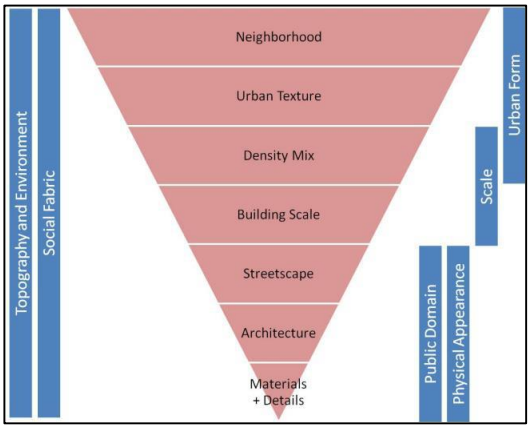
Urban design is the discipline through which planning and architecture can create or renew a sense of local pride and identity. It has great potential for enhancing the visual image and quality of Neighbourhoods by providing a three-dimensional physical form to policies described in a comprehensive plan. Urban design is process of giving shape to built environment which may address group of buildings of specific character, important streets public spaces etc. This will make urban areas functional, more attractive and sustainable. It focuses on design of the public realm, which is created by both public spaces and the buildings that define them.

Urban design is done at various scales viz. at macro scale of urban structure in terms of planning/zoning, transportation and infrastructure networks to the micro scale in terms of street furniture, lighting etc. This section deals with urban design guidelines for certain important areas viz. core area of city, areas with environmental significance, special heritage areas etc. These guidelines direct the process of revitalization, planning, design and management of such areas.

13.9.1 KEY CONSIDERATIONS FOR ENTIRE PPA

Few considerations are stated below which are essential to arrive at a basis for formulating Urban Design guidelines for urban fabric:

Design Places for People: To make urban places more functional and acceptable these places must be safe, comfortable, vibrant, varied attractive and distinctive.



Design to Enrich Existing context: To enrich qualities and context of existing urban places. This means encouraging a distinctive response that arises from and complements its setting and applies at every scale region, city, town, neighbourhood and street.

Design to enhance accessibility: To make places easily accessible and which are well integrated physically and visually with its surroundings.

Work with Landscape: Design should be such as to strike a balance between natural and manmade environment and utilize each intrinsic resource and character viz. climate, landform, landscape and ecology

Design with Usage of Mixed Forms: Stimulating, enjoyable and convenient places meet a variety of demands from the widest possible range of users and social groups. The design element should weave together different building forms, uses and densities.

Economic Viability: For projects to be, developable and well cared for, they must be economically viable, well managed and maintained. This means understanding the market considerations of developers, ensuring long-term commitment from the community and the local authority, defining appropriate delivery mechanisms and seeing this as part of the design process.

Design for Change: Design needs to be flexible enough to respond and adapt to future changes in use, lifestyle and demography. This means designing for energy and resource efficiency; creating flexibility in the use of property, public spaces and the service infrastructure and introducing new approaches to transportation, traffic management and parking.

13.9.1.1 VISION

To guide physical development towards a desired scale and character that is consistent with the social, economic and aesthetic values of the City.

13.9.1.2 URBAN DESIGN OBJECTIVES

- To ensure that new development makes a positive contribution to sustainability and the urban fabric
- To enhance and protect the landscape qualities
- To enrich the distinct topographic and landscape qualities and characteristics of the town
- To ensure that all development responds positively to the existing patterns of urban form and character, the landscape qualities, historic and cultural elements and social dimensions and aspirations of the town.
- To reinforce the structure and image of the town as an attractive place to live, do business, recreate and as a tourist attraction.
- To ensure that the declared arterial network of transport and movement corridors makes a positive contribution to town's image.

13.9.1.3 COMPONENTS OF URBAN DESIGN

The following aspects need to be considered to arrive at the basis for policies affecting the urban fabric:

- Areas of significance in built environment.
- Visual integration of the city.
- Policy for tall buildings.
- Policy on unhindered access movement, parking and pedestrian realm.
- Policy on Hoardings, Street furniture and Signage.
- Urban Design Scheme.
- Policy for design of pedestrian realm.
- City structure plan and Urban Design objective.
- Policy for conservation of Heritage Precincts Buildings and Zones.

13.9.1.4 SIGNIFICANT AREAS OF BUILT ENVIRONMENT

In CDP, following significant areas are identified that needs special urban design consideration.

- New Housing/ neighbourhood development
- Waterfront Development – Oussudu Lake and Bahour Lake
- Heritage and ASI monuments
- City Gateways
- Streetscapes

New Housing Schemes/ NEIGHBOURHOOD Development

Built Character:

Group Housing is a cluster or group of attached homes around common lawns, gardens, or play areas. Such areas should provide residents with both private and common outdoor spaces. These common spaces can also foster social interaction amongst residents, between residents of Group Housing. This should be designed to maintain a sense of privacy yet to allow for interaction between neighbors. Yards and entry courtyards when abutting a street or common space should be separated through physical elements such as open or low fencing, screens, and low hedges or walls.

If pocket park areas are provided, they should reflect character of neighbourhood and contain elements such as lawn, children's play areas etc. When a Group Housing area is enclosed by neighbourhood scale streets, multiple perimeter or street corner gardens may connect multifamily residents with the surrounding neighbourhood better than internalized common space. If feasible,

these common spaces should be easily observable from unit windows. These common spaces share common area supervision responsibilities among a close-knit group of neighbors.

Category of Development

High rise low density The category is defined by the development where there is more of a marginal space between highrise buildings in form of pedestrianisation, recreational spaces, buffers etc. This kind of development shall be reviewed as Low density because per person to space ratio comparatively is higher.

High rise High density The category is defined by the development where there is a little marginal space between high-rise buildings. This kind of development shall be reviewed as high density because per person to space ratio is comparatively lower.

Low rise low density The category is defined by the development where there is more marginal space between low-rise buildings. This kind of development shall be reviewed as Low density because per person to space ratio is comparatively high.

Low rise High Density The category is defined by the development where there is a little marginal space between low-rise buildings. This kind of development shall be reviewed as high density because per person to space ratio is comparatively low.

Following needs to be encouraged:

- For new Residential Development create edge or boundary conditions in neighbourhood for creating a sense of enclosure
- Buildings along the street compatible with other neighbourhood types in the immediate vicinity.
- Buildings which harmonize with the surrounding neighbourhood.
- Parking areas removed from primary pedestrian zones.
- Cluster of houses around a common open space with appropriate landscaping.

Following needs to be discouraged:

- Buildings that don't relate physically or visually to adjacent shared spaces.

Circulation

The vehicular circulation system generally includes internal circulation drives with parking areas. Important streets should be enhanced with streetscapes and sidewalks. The experience of moving on these roads can be enhanced through use of various elements such as street lighting, roadside plantation, and development of important Junctions etc. Pedestrian circulation should be promoted through provision of walkways and direct connections to adjacent streets.

- For important routes being used by Tourists, devices such as information kiosks, directional signs and maps can be used to help tourists easily locate their destinations.
- For major roads, individual road solutions shall be given to complement abutting land uses with controlled densities, roadside plantation etc.
- neighbourhood streets should be designed to provide safe and convenient access for vehicles and pedestrians and to relate to the type of neighbourhood and uses through which the streets travel. They should provide safe and attractive designs including composition of street landscaping with sidewalks/paths. neighbourhood streets can provide a visual experience and lower the speed of local traffic by aligning with a neighbourhood focal point such as a park, a fountain or a sculpture.
- Street patterns should interconnect and encourage easy access from one neighbourhood to another & also discourage high speed travel. Individual streets should maintain adequate travel ways for emergency and service vehicle access.

Following needs to be encouraged:

- Destination assistance devices such as information kiosks, and directional signs for tourists.
- Roads relating to a neighbourhood focal point such as a street passing by a pocket park, terminating at a vista point, or interrupted by a fountain.
- Visual screening of parking areas.
- Contiguous pedestrian routes.
- Interconnected but low speed neighbourhood streets.
- Landscaping in the right of way that relates to the adjacent uses.
- Perimeter road patterns compatible with the adjacent neighbourhood street system.
- Low speed traffic techniques such as intersection at focal points.

Following needs to be discouraged:

- Parking areas located between buildings and pedestrian oriented streets.
- Pedestrian circulation patterns that discourage walking to neighbors or community destinations.
- Random curvilinear streets.

Landscaping

Landscaping should be used to soften the mass of buildings and to provide usable common space for residents. The use of elements such as evergreen groundcover and small shrubs around common spaces can add variety and delineate boundaries while allowing for surveillance. When hard surfaces are predominant feature, visual relief and interest can be provided through use of plantations such as plants with flowers and special interest plants. Common park space should be located so that it is visible to residents and accommodate a variety of activities for differing age groups.

Following needs to be encouraged:

- Trees that provide year-round visual interest such as evergreen groundcover & hardy landscaping plantings.
- Landscaping solutions such as parks/gardens in large open areas which add depth and space.
- Elements such as low walls, fences, screens, or hedges to delineate outdoor spaces.
- Adequate use of garden lighting to accentuate landscaping and pathways in the evening.
- An uninterrupted flow of landscaping between buildings and the streets by placing elements
- Abutting streets, trails or common spaces fence styles, such as low or open fences that encourage interaction between private and public spaces.
- Paving solutions for driveways and public walkways that complement the architectural and landscape character of the area such as stone, masonry or concrete.

Following needs to be discouraged:

- High walls and solid fences adjacent to pathways or shared open space.

13.9.1.5 Water Front Development

There is scope for development of Oussudu Lake and Bahour Lake using urban design tool, the existing image of these areas can be transferred into a new livable and environmental friendly image. While developing areas near water bodies the following urban design guidelines needs to be considered.

- Development around and adjacent to water bodies in Puducherry should be taken up in a sensitive manner.
- Integrated development on lakefronts with the natural environment to preserve and enhance views, and protect areas of natural drainage.

- Minimise grading to maintain the natural topography, while contouring any landform alterations to blend into the natural terrain.
- Screen development adjacent to natural features as appropriate so that development does not appear visually intrusive, or interfere with the experience within the open space system. The provision of enhanced landscaping adjacent to natural features could be used to soften the appearance of or buffer development from the natural features.
- Use building and landscape materials that blend with and do not create visual or other conflicts with the natural environment
- Design and site buildings to permit visual and physical access to the natural features from the public right-of-way.
- Encourage location of entrances and windows in development adjacent to open space to overlook the natural features.
- Protect views from public roadways and parklands to natural canyon, resource areas, and scenic vistas.
- Preserve views and view corridors along and/or into waterfront areas from the public right-of-way by decreasing the heights of buildings
- Provide public pedestrian, bicycle, and equestrian access paths to scenic view points, parklands, and where consistent with resource protection, in natural resource open space areas.
- Provide special consideration to the sensitive environmental design of roadways that traverse natural open space systems to ensure an integrated aesthetic design that respects open space resources. This could include the use of alternative materials such as "quiet pavement" in noise sensitive locations, and bridge or roadway designs that respect the natural environment.
- Special considerations should be given to the appropriate scale, height and disposition of building blocks along the waterfront to avoid blockage of sea/land breezes and prevailing winds.

13.9.1.6 PUBLIC SPACES

Public spaces include public plazas, squares or other gathering spaces in each neighbourhood center. neighbourhood centre is a geographically localised community within a larger city, where members of a community tend to gather for group activities, social support, public information, and other purposes. They may sometimes be open for the whole community or for a specialized group within the greater community.

District centers, commercial areas, Public/ Semipublic and Recreational Areas in Comprehensive Development Plan demands Proper Campus Planning and care to maintain the protocol of the city.

13.9.1.6.1 Organised Informal Market/Food Plazas

To stop encroachment of all types of Informal markets, Comprehensive Development Plan have provided organized spaces for informal markets, hawkers, handicraft shops etc. these markets will be majorly located in District Centers and Core areas.

The informal and organized sector is a major source of employment in the economic fabric of the city for which the following approach is proposed:

- Earmarking of 'Hawking' and 'No Hawking' Zones at neighbourhood and cluster levels.
- The weekly markets to be identified and planned / developed.
- New areas for informal trade to be developed and integrated with housing, commercial, institutional and industrial areas.
- Provision of common basic services like toilets, water points, etc.
- Institutionalizing designs of stalls, push-carts and mobile vans.
- Design outdoor open areas as "outdoor rooms," developing a hierarchy of usable spaces that create a sense of enclosure using landscape, paving, walls, lighting, and structures.
- Design such markets/ haats to accommodate a variety of artistic, social, cultural, and recreational opportunities including civic gatherings such as festivals, markets, performances, and exhibits.

- Consider artistic, cultural, and social activities unique to the neighbourhood and designed for varying age groups that can be incorporated into the space.
- Use landscape, hardscape, and public art to improve the quality of markets/ haats.
- Encourage the active management and programming of these markets.
- Design outdoor spaces to allow for both shade and the penetration of sunlight.
- Frame parks and plazas with buildings which visually contain and provide natural surveillance into the open space.
- Involvement of NGOs envisaged.
- Address maintenance and programming.

13.9.1.7 CITY GATEWAYS

Road:

- Non-residential public buildings with pleasing appearance should be located on entry corridors.
- Attractive landscape should be developed in accordance with the highway landscape norms.
- Segregation of goods and passenger vehicles at the entry point through separate lanes to improve the visual environment.

Rail:

- Enhancing visual experience for commuters through appropriate landscape along railway tracks. This can be done by growing colorful plantations along railway corridors, keeping wide grazing lands, mounting flags at the entry of railway stations.
- Reconstruction / redevelopment of existing stations should be undertaken through comprehensive Urban Design schemes.
- Attractive designs should be evolved for new stations.

Air:

- Designing landmarks, nodes, edges of the city in a manner that they can be recognized outstandingly in aerial views. This can be achieved by composing and contrasting scale, color, landscape of structure and boundary with surrounding area.
- Natural and built environment should be revitalized to give an impression of global city.
- The overall green cover in this zone should be enhanced and protected.

13.9.1.8 STREETSCAPE

Hoardings & Signage:

- Hoardings, sign boards, directional boards, bill boards, neon sign bards, balloons, banners etc. have become symbols of present day urban scape and important instruments of outdoor publicity and public information. These, if located properly and aesthetically, may enhance the visual quality of the city. Otherwise, these may cause hazards, obstruction and visual pollution etc.
- Design signage to effectively utilize sign area and complement the character of the structure and setting
- Architecturally integrate signage into design.
- Include pedestrian-oriented signs to acquaint users to various aspects of a development.
- Place signs to direct vehicular and pedestrian circulation.
- Post signs to provide directions and rules of conduct where appropriate behavior control is necessary.
- Design signs to minimize negative visual impacts.
- Address community-specific signage issues in community plans, where needed.
- A major cause for present day chaos on the roads is that the road infrastructure, signage and road markings are not in accordance to the standards laid down by the Motor Vehicle Rules

- and Highway Code.
- Safety of road users shall be one of the prime consideration while planning / designing of road network and infrastructure.
- Appropriate road signage and markings are excellent means of educating road users about road safety rules and road discipline and add to the road beautification. These prevent the deviant behaviour of motorists and at the same time provide useful route related information.
- Concerned road owning agencies shall be responsible for installing the appropriate road signage and markings on regular basis.

Street Furniture:

- Public art is an important part of the urban spatial experience, which can be incorporated in the form of functional objects such as street furniture and paving designs.
- Street furniture should be designed sensitively considering the land use, intensity of activity and other identified design districts. Their design must also reflect respect to pedestrians and physically challenged people.
- Access provisions for the physically challenged should be made from the street to overcome curb heights, rain water gratings etc.
- Locate street trees in a manner that does not obstruct ground illumination from streetlights.
- Shade paved areas, especially parking lots.
- Parking spaces close to the entrance should be reserved for physically challenged.
- Exclusive parking bays are proposed near major intersections as part of road R/W with adequate landscaping to provide for parking of mobile repair vans, PCR vans, ambulances, cranes, fire tenders and other public utility vehicles.

Street Frontage:

- Create street frontages with architectural and landscape interest to provide visual appeal to the streetscape and enhance the pedestrian experience.
- Locate buildings on the site so that they reinforce street frontages.
- Relate buildings to existing and planned adjacent uses.
- Ensure that building entries are prominent, visible, and well-located.
- Maintain existing setback patterns, except where community plans call for a change to the existing pattern.
- Establish or maintain tree-lined residential and commercial streets. Neighbourhoods and commercial corridors in the town that contain tree-lined streets present a streetscape that creates a distinctive character.
- Minimize the visual impact of garages, parking and parking portals to the pedestrian and street façades.

Pedestrian Friendly City:

- Major work centres, where large number of pedestrian networks emerge and culminate, should have enhanced facilities for the pedestrians.
- This will lead to more sensitive and intricate design of street furniture, making major image able components part of daily urban experience.
- Design landscape bordering the pedestrian network with new elements, such as a new plant form or material, at a scale and intervals appropriate to the site. This is not intended to discourage a uniform street tree or landscape theme, but to add interest to the streetscape and enhance the pedestrian experience.
- Use effective lighting for vehicular traffic while not overwhelming the quality of pedestrian lighting.
- Pedestrian networks affect spaces in a very distinctive way.
- Establishment of pedestrian networks in any area reveals its vitality.
- They provide richness in terms of spatial experience and community interaction etc.

Transit Integration:

- Provide attractively designed transit stops and stations that are adjacent to active uses, recognizable by the public, and reflect desired neighbourhood character
- Design safe, attractive, accessible, lighted, and convenient pedestrian connections from transit stops and stations to building entrances and street network
- Provide generous rights-of-way for transit, transit stops or stations.
- Locate buildings along transit corridors to allow convenient and direct access to transit stops/stations.

Parking:

- Reduce the amount and visual impact of surface parking lots
- Encourage placement of parking along the rear and sides of street-oriented buildings.
- Avoid blank walls facing onto parking lots by promoting treatments that use colors, materials, landscape, selective openings or other means of creating interest.
- Design clear and attractive pedestrian portico/pathways and signs that link parking and destinations.
- Locate pedestrian pathways in areas where vehicular access is limited.
- Avoid large areas of uninterrupted parking especially adjacent to community public view sheds.
- Build multiple small parking lots in lieu of one large lot.
- Retrofit existing expansive parking lots with street trees, landscape, pedestrian paths, and new building placement.
- Promote the use of pervious surface materials to reduce runoff and infiltrate storm water.
- Use trees and other landscape to provide shade, screening, and filtering of storm water runoff in parking lots.

Utilities:

- Minimize the visual and functional impact of utility systems and equipment on streets, sidewalks, and the public realm.
- Convert overhead utility wires and poles, and overhead structures such as those associated with supplying electric, communication, community antenna television, or similar service to underground.
- Design and locate public and private utility infrastructure, such as phone, cable and communications boxes, transformers, meters, fuel ports, back-flow preventors, ventilation grilles, grease interceptors, irrigation valves, and any similar elements, to be integrated into adjacent development and as inconspicuous as possible.
- To minimize obstructions, elements in the sidewalk and public right of way should be located in below grade vaults or building recesses that do not encroach on the right of way (to the maximum extent permitted by codes).
- If located in a landscaped setback, they should be as far from the sidewalk as possible, clustered and integrated into the landscape design, and screened from public view with plant and/or fencelike elements.
- Traffic operational features such as streetlights, traffic signals, control boxes, street signs and similar facilities should be located and consolidated on poles, to minimize clutter, improve safety, and maximize public pedestrian access, especially at intersections and sidewalk ramps.

Other street utilities such as storm drains and vaults should be carefully located to afford proper placement of the vertical elements.

13.9.2 KEY CONSIDERATIONS FOR BOULEVARD AREA

The Objective of Revival of Core Area through various strategies and urban design elements are:

- Integration of old and new city
- In order to regulate the movement pattern, idea to regulate smooth circulation within core zone.
- To achieve organized connectivity of the nodes, Landmarks (focal point), junctions etc.

- To create sense of place and belonging in the neighbourhood.
- To create an individual identities or character of the place.

13.9.2.1 City Centre and Extension

A city centre is the commercial, cultural and often the historical, political and geographic heart of a city. The city centre is the (often historical) area of a city where commerce, entertainment, shopping and political power are concentrated. A city centre is often the first settled part of a city, which can make it the most historical part of a city.

Various strategies for City Centre are:

- Continuity of the sidewalks should be maintained, in terms of the width, surface, tree and street furniture Activities such as amusement parks, sports activities, food plazas etc. to be introduced to make the Spaces more attractive even after working hours.
- Introduction of activities such as traditional/craft bazaar,
- Enhance areas along identified heritage walk/rides to attract tourists in terms of Urban design elements.
- Detailed Schemes to be prepared to integrate mass transit stations, safe pedestrian, parking areas with major activity areas viz. recreational areas. Many areas in core city can be pedestrianised and made completely free of vehicular traffic to restore the human scale and convenient living.
- Proper use of existing spaces for development of parking zones upto a limited area of core city and converting the rest into pedestrian zone
- Revitalization of existing markets within core city for tourist attraction and for developing neighbourhood feeling among locals.
- Most of the area shall be inclusive of Urban Green and Public realms
- Signage and lighting: for visual accessibility, Boulevard Town should be provided with proper lighting system and signages. As Puducherry is tourist destination, signages in Tamil and English should be promoted. Moreover, lighting has to be provided to the buildings which are of heritage importance in order to have visually appealing view.
- A unified colour scheme should be adopted for government buildings in order to give the identity to the govt. buildings and enhancing the visual appeal.

13.9.2.2 Consideration for Boulevard Area

Proposals for revitalizing the glory of core city are:

- Conservation approach to retain the overall traditional character of the core area.
- Visual integration of major landmarks to revitalize the past glory. Enhance the existing visual link between the major landmarks.

13.9.2.3 District Centres

A District Centre has been envisaged as a multiple service providing campus, catering to surrounding urban area. The core commercial area such as Wholesale markets, shopping complexes, office buildings, etc. shall be reviewed as a District Centre. The similar definition does not imply to the informal markets but if the informal markets are part of any above category that shall be reviewed and organized in District centre.

There are few common components that should dealt through Urban Design perspective to maintain and enhance the ultimate urban character and image.

1. Landscape
2. Parking
3. Pedestrian Movement
4. Public Spaces
5. Unique Building Character

General Guidelines:

- The area provided for landscape as part of the district centre should weave through the entire district centre to create a pleasant environment.
- Detailed Urban Design and Landscape Schemes should be prepared to integrate Public Transport Terminals, safe pedestrian walkways, parking areas, recreational and cultural areas, etc.
- The envelope, FAR, architectural features of the District Center buildings should be merged with surrounding area.
- A certain percentage of open area should be made mandatory in district center design so that it can be used as recreational area, exhibition purpose or any local festivals.
- Continuity of the sidewalks should be maintained in terms of the width, surface treatment, curb cuts, tree and street furniture locations, for the pedestrians and disabled.
- A district centre should be accessible from the surrounding residential areas through the pedestrian approach or by subways etc. The intermediate public transport should be introduced to increase the mobility within the City Centre.
- An adequate parking should be provided in District Center.
- Provision of common basic services like Public toilets, water points, etc.
- Signage and lighting: for visual accessibility, district center should be provided with proper lighting system and signages. As Puducherry is tourist destination, signages in English as well as Hindi should be promoted.
- Use of alternative renewable sources of energy should be encouraged for new buildings (especially those of commercial or institutional nature), traffic signals and public signage, etc
- Planned district centres in city (forming a multi nodal city structure) can be best utilized for creating public spaces and through these, District Centers City will be livelier, inviting and livable.
- As per the proposal of Govt. of India, few free wi-fi zones should be provided in order to encourage the Digital India.

14 INSTITUTIONAL FRAMEWORK

Current Institutional Setup for Land Use conversion

The land owner who wants to convert the land use applies to PPA with a land use conversion requisition letter as an application. The application is forwarded to Town and Country Planning Board, Puducherry. The Town and Country Planning Board puts such applications in the meeting of the Town and Country Planning Board for which Chairman is the Minister incharge of Town and Country Planning Department. The applications which are approved by the Town and Country Planning Board, gets the permission for land use conversion. In this entire process of approval for land use conversion, Agriculture Department or Director of Survey and Land Records, Puducherry are consulted.

14.1 PROPOSED INSTITUTIONAL FRAMEWORK

Institutional Responsibilities contain Development Plan formulation, effective implementation, strict monitoring of following General Development Regulations and funding mechanism. For effective implementation, available land resource is to be managed very judiciously and infrastructure is to be provided along with proper maintenance from time to time. As mentioned in Chapter 13.5, it is proposed to have Puducherry Municipal Corporation (PMC) with same jurisdiction of Conurbation Area for obtaining substantial funds from State Government as well as Central Government, which

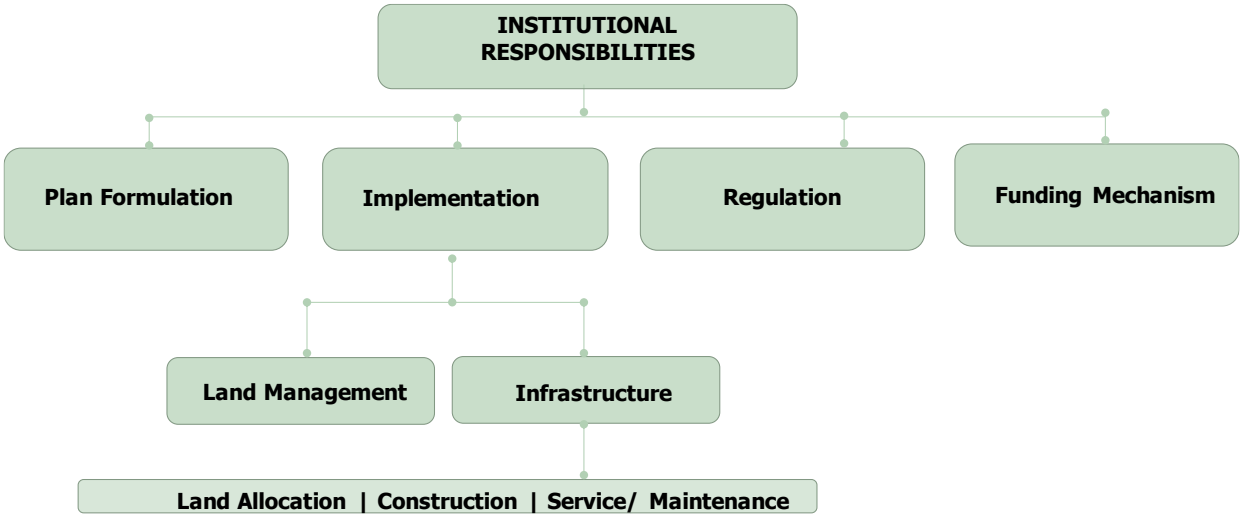


Figure 14.1 Institutional Responsibilities

will lead to effective implementation of the Comprehensive Development Plan. For better implementation of Comprehensive Development Plan, responsibilities are to be allocated very judiciously. The roles and responsibilities of the various stakholders for implementation of CDP in Boulevard, Conurbation Area and outside Conurbation Area are described in the table given below:

Table 14-1 Roles and responsibilities of the various institution in Boulevard, Conurbation Area and outside Conurbation Area

	S. No.	Task	Boulevard	Within Conurbation Area	Outside Conurbation Area
Plan Formulation	1	Review & Updation of Development Plan	PPA	PPA (in consultation with PMC)	PPA
	2	Town Planning Schemes (TPS as mentioned in chapter 13.3)	No TPS to be proposed	PMC	PPA
Implementation	**Land Management**				
	3	Town Planning Scheme	N.A.	PMC	PPA
	4	Development Plan	PMC	PMC	PPA
	5	Land Acquisition	District Collector	District Collector	District Collector
Physical Infrastructure	**Physical Infrastructure - Construction**				
	6	Water Supply	PWD	PWD	PWD
	7	Sewerage	PWD	PWD	PWD
	8	Storm Water Drainage	PWD	PWD	PWD
	9	Solid Waste Management	PMC	PMC	Commune Panchayat+PPA
	Physical Infrastructure – Operation & Maintenance				
	10	Water Supply	PMC	PMC	Commune Panchayat+PPA
	11	Sewerage	PMC	PMC	Commune Panchayat+PPA
	12	Storm Water Drainage	PMC	PMC	Commune Panchayat+PPA
	13	Solid Waste Management	PMC	PMC	Commune Panchayat+PPA
Roads	**Roads**				
	14	NH-National Highway	NHAI	NHAI	NHAI
	15	SH-State Highway	R&B, PWD	R&B, PWD	R&B, PWD
	16	ODR-Other District Roads	R&B, PWD	R&B, PWD	R&B, PWD
	17	MDR-Major District Roads	R&B, PWD	R&B, PWD	R&B, PWD
	18	DP Roads	PMC	PMC	Commune Panchayat+PPA
	19	TP Roads	PMC	PMC	Commune Panchayat+PPA
Social Infra	**Social Infrastructure – Construction, Operation & maintenance**				
	20	Schools	PMC	PMC	Commune Panchayat+PPA
	21	PHC, CHC, Hospital	PMC	PMC	Commune Panchayat+PPA

	S. No.	Task	Boulevard	Within Conurbation Area	Outside Conurbation Area
	22	Recreational Spaces	PMC	PMC	Commune Panchayat+PPA
Regulation	23	Non Agricultural Conversion (Conversion of land from agricultural use to non-agricultural uses)	PMC+TCPD & TCPD Board	PMC+TCPD & TCPD Board	PPA+TCPD & TCPD Board
	24	Development Permission (A Development Permission shall mean Permission for development granted by the Competent Authority)	PMC	PMC	PPA
	25	Building Permission It is mandatory to obtain a Building Permission from the Competent Authority prior to occupancy or use being made of any building)	PMC	PMC	PPA
	26	Environmental Clearance*	MoEF & CC For category 'A' projects or from the SEIAA of puducherry	MoEF & CC for Category 'A' projects or from the SEIAA of Puducherry	MoEF & CC For Category 'A' projects or from the SEIAA of Puducherry
	27	Areas Exempt from Regulations	1. Airport 2. Port 3. Railway Property 4. Industrial Estate Property		
Funding Mechanism	28	**Development Plan**			
		Development Charge – One time charge based on the Section 53 of the Puducherry Town & Country Planning Act, 1969	PPA income to be collected by PMC	PPA income to be collected by PMC	PPA
	29	**Development Permission as per GDCR**			
		Scrutiny Fee	PMC	PMC	PPA
		Water Charges	PMC	PMC	PPA
		Security Deposit	PMC	PMC	PPA
	30	**Town Planning Schemes**			
		Betterment Charges	PMC	PMC	PPA
		Sale of Public Purpose Plots (Land Bank)	PMC	PMC	PPA

Note: Category 'A' and Category 'B' projects are mentioned in schedule of the notification published in the Gazette of India, Extraordinary, Part-II, and Section 3, Sub-section (ii) by MINISTRY OF ENVIRONMENT AND FORESTS, New Delhi 14th September 2006

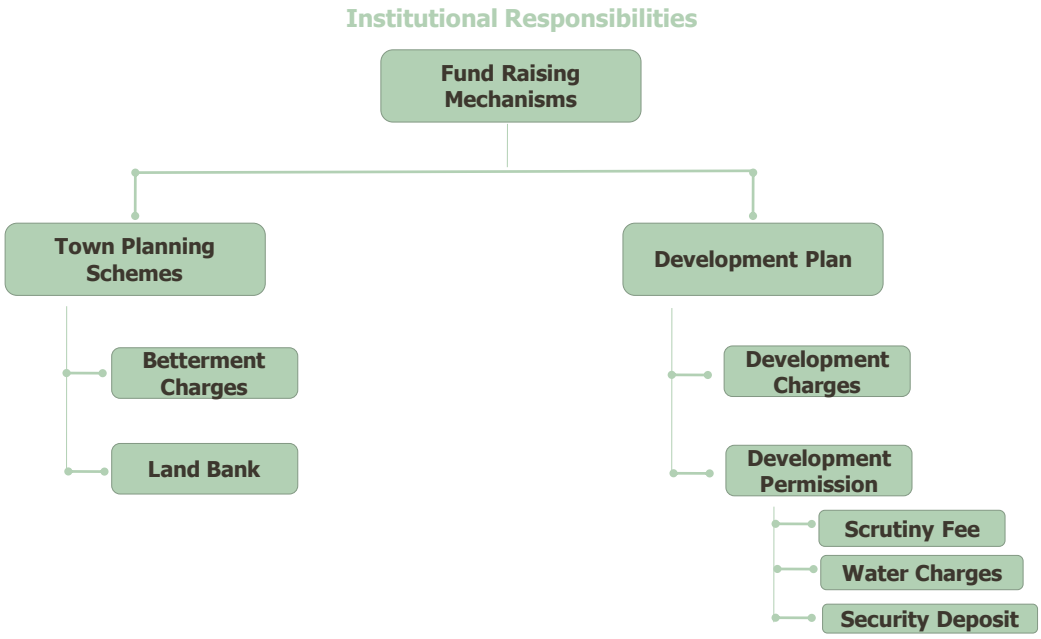


Figure 14.2 Fund raising mechanism

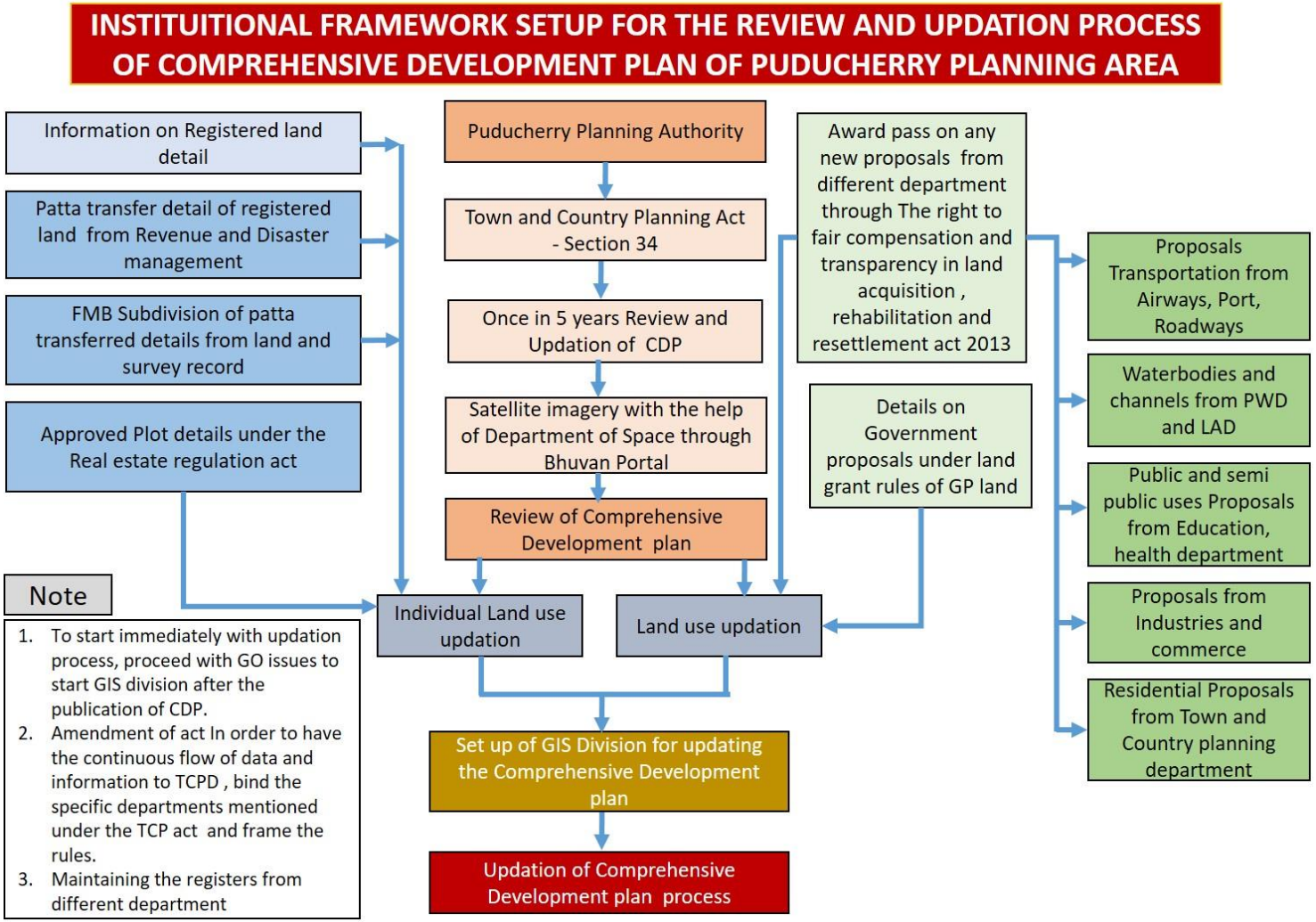


Figure 14.3 Proposed Institutional setup among various departments, Puducherry

Proposed Institutional Setup for the review and Updation process of CDP

The institutional framework for the review and Updation process of CDP of Puducerry Planning area is shown in the chart above. As per section 34 of Town and Country Planning Act, 1969, once in 5 years review and Updation of CDP is to be done. Based on the updated satellite imageries and ground verification, the land use is to be continuously cross verified with the proposed land use of CDP 2036. To maintain such records, PPA has to set up the GIS Cell for monitoring and updation in CDP.

For any land use conversion, Department of Revenue and Disaster management as well as Director of Survey and Land records are to be consulted to obtain the details such as patta transfer of registered land and FMB subdivision of patta transferred. Any approved plot should be in conformity with Real Estate Regulation Act, 2017. Based on the conformity, land use can be updated in GIS based CDP. For any land acquisition, as per the right to fair compensation and transperancy in land acquisition, rehabilitation and resettlement act, 2013, 80-85% consent of general public is to be sought. Any land acquisition for proposal related to airways, port, roadways from transport department, proposal related to water channels and water bodies from PWD and LAD, proposal related to public-semi public uses (Social Infrastructure) from Health and Education Department, proposal related to Industry from Industry and Commerce and any housing related proposals from Housing Department or Town and Country Planning Department shall be done in accordance with the right to fair compensation and transparency in land acquisition, rehabilitation and resettlement act, 2013. Such kind of proposals are to be updated in the GIS based CDP.

14.2 ROLE OF MUNICIPAL CORPORATION IN CDP

Municipal Corporation will be responsible for operation and maintenance works in water supply, sewerage, storm water drainage, Solid Waste Management, DP & TP roads and street lighting. The other responsibilities are described below:

- The construction, diversion, maintenance and improvement of streets, bridges, squares, gardens, tanks, ghats, wells, channels, drains, latrines and urinals;
- The watering and cleaning of streets;
- Lighting;
- Water-supply;
- Conservancy including sewage disposal;
- Acquiring, keeping and equipping of open spaces for public purposes;
- Planting and preservation of trees;
- Construction of dwelling houses;
- Maintenance and improvement of education;
- Construction and maintenance of hospitals, dispensaries, orphanages, maternity houses, dharmasalas, guest houses etc.;
- Promotion of vaccination;
- Prevention of the spread of dangerous diseases;
- Construction and maintenance of municipal markets and slaughter houses;
- Assistance to public libraries;
- Giving of relief in time of famine, scarcity or any other natural calamity;
- Urban Planning including town planning;
- Disposal of the dead animals or bodies;
- Establishment and maintenance of burial grounds;
- Implementation of the planning in the municipal area as a part of the Development Plan;
- Regulation of slaughter houses and tanneries;
- Fire Services;
- Urban forestry and protection of the environment;
- Safeguarding the interest of the weaker section;
- Slum improvement and up-gradation;
- Promotion of urban amenities;

- Registration of births and deaths;
- Regulation of slaughter houses and tanneries;
- Adult education and non-formal education;
- Health and family planning;
- Welfare of SC and ST;
- Maintenance of municipal markets;
- Maintenance of monuments and historical places;
- Clearing Public Street and places; etc

References:

1. Audit report, Department of Industry & Commerce, Puducherry, 2014-2015