

# **Gram Panchayat Spatial Development Plan**

**Sembarambakkam Panchayat  
2020-2030**

**SCHOOL OF ARCHITECTURE AND PLANNING  
ANNA UNIVERSITY**



# GRAM PANCHAYAT SPATIAL DEVELOPMENT PLAN

*for*

SEMBARAMBAKKAM PANCHAYAT  
2020-2030



SCHOOL OF ARCHITECTURE AND PLANNING  
ANNA UNIVERSITY, CHENNAI

DECEMBER, 2020

## PREFACE

India is primarily a rural country with nearly 68.8% of the population living in villages covering 94% of land area, while urban area holds 31.2% of population in 6% of land area. According to the Census of India, in 2001 there were 6,38,588 villages while in 2011 there were 6,40,867 villages, highlighting an increase of 2,279 village within ten years. During the same decade, the number of Towns increased by 2,774; the number of Census towns increased by 2,532; and the statutory towns increased by 242. Further, for the first time since independence the percentage of rural population has declined from 72.19 to 68.84% and the absolute increase in urban population is more than the absolute increase in rural population. As such, Rural India is transforming rapidly and this is due to the uni-directional migration of people from rural to urban areas.

Rural India lags behind Urban India in nearly every indicator of progress. Indian states have legislative frameworks in place for spatio-economic planning of urban areas. However, when it comes to rural areas, there is lack of integration of spatial aspects in development plans. The efforts by government towards improving the scenario can be boosted significantly through spatial decision making, wherein the physical, socio-economic and infrastructure conditions shall be mapped spatially, offering options for data-driven planning.

In 2016, Ministry of Panchayati Raj came up with the Rural Area Development and Plan Formulation and Implementation (RADPFI) Guidelines. The XIV Finance Commission also created an opportunity for responsive local governance at Gram Panchayat level through the preparation of Gram Panchayat Development Plan (GPDP), by the Gram Panchayats. In this regard, The Ministry of Panchayati Raj has assigned the task of preparing Gram Panchayat Spatial Development Plan (GPSDP) for Sembarambakkam village in Tiruvallur district of Tamil Nadu. Sembarambakkam village is located in Poonamallee Taluka of Tiruvallur district, Tamil Nadu with an area of 9.7 Square kilometres and total population of 12132 residing in it.

The GPSDP incorporates the spatial layers corresponding to attributes like physical features, land holding, land ownership, land use in Abadi area, overall physical and social infrastructure, etc; built environment parameters like housing typology, building age, etc.; economic parameters like land-holding wise cropping pattern, etc. It also considers the non-spatial attributes like socio-economic condition, skill level, etc. Primary surveys for physical verification and assessment of socio-economic conditions were part of the study, along with stakeholders and key informant surveys. This made this spatial plan at the village level a participatory plan. A ten-year phasing plan has also been prepared for the proposed interventions.

We hope this Spatial Development Plan (SDP) will make the GPDP more effective and successful one.

## ACKNOWLEDGEMENT

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## LIST OF ABBREVIATIONS

CDB	Community Development Block
CMA	Chennai Metropolitan Area
CMDA	Chennai Metropolitan Development Authority
DEM	Digital Elevation Model
DPC	District Planning Committee
DPSP	Directive Principles of State Policy
GIS	Geographic Information System
GP	Gram Panchayat
GPS	Global Positioning System
GPSDP	Gram Panchayat Spatial Development Plan
HH	Household
HRS	High Resolution Satellite
ICT	Information and Communication Technology
IRS	Indian Remote Sensing
IMD	India Meteorological Department
IMSD	Integrated Mission for Sustainable Development
ISRO	Indian Space Research Organisation
LISS	Linear Imaging Self Scanner
LRDP	Land Resources Development Plan
LULC	Land Use Land Cover
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MoPR	Ministry of Panchayati Raj
MPC	Metropolitan Planning Committee
MTC	Metropolitan Transport Corporation
NABARD	National Bank for Agriculture and Rural Development
NCC	Natural Colour Composite
NIC	National Informatics Centre
NRIS	Natural Resources Information System
NRSC	National Remote Sensing Centre
ORR	Outer Ring Road
PMGSY	Pradhan Mantri Gram Sadak Yojana
PRI	Panchayat Raj Institution
RIDF	Rural Infrastructure Development Fund
RS	Remote Sensing
SDP	Spatial Development Plan
SECC	Socio-Economic Caste Census
SIS-DP	Space based Information Support for Decentralized Planning
SMP	Second Master Plan
SWOT	Strength Weakness Opportunity Threat
WRDP	Water Resources Development Plan

## **CHAPTER 1**

### **1 INTRODUCTION**

#### **1.1 RURAL INDIA IN TRANSFORMATION**

Rural transformation is a proactive, dynamic and positive process of change and development of rural communities in the context of national and global socio-economic changes. It involves bringing features of urban environments into rural settings, changes to systems and processes that favourably impact rural people's standard of living and livelihoods. Rural transformation is usually characterized by changes in civic amenities, female literacy, gender ratio, employment structure, agricultural intensity, crop selection pattern, farm income, labour productivity and major improvements in rural housing and economic and social conditions resulting from industrialization and urbanization.

India is primarily a rural country covering 94% of land with nearly 68.84% of the population living in villages, while urban area holds 6% of land and 31% of population. According to the census 2001, there were 6,38,588 villages while in 2011 there were 6,40,867 villages, highlighting an increase of 2,279 village within ten years. During the same decade, the number of towns have been increased by 2,774: the number of Census towns increased by 2,532 and the statutory towns increased by 242. Further, for the first time since independence the percentage of rural population has declined from 72.19 to 68.84% and the raise in urban population is more than the absolute increase in rural population. As such, rural India is transforming rapidly and this is due to the uni-directional migration of people from rural to urban areas.

The peri-urban interface has emerged mainly due to migration and haphazard pattern of urbanization possess a mix of rural-urban character. Understanding the spatio-temporal pattern of expansion in these areas, and the important of proper planning and management, necessitates the need for spatial development planning of rural areas. The Government schemes and policies has always been a part of providing the facilities and services required for villages. However, the formulation of a spatial development plan for the villages is to be incorporated highlighting the

spatial application of the various facilities and services so that the change which these villages witness will ensure the sustainable development of the country's rural areas.

## **1.2 THE RURAL-URBAN INTERFACE IN RURAL DEVELOPMENT**

Rural areas share a number of characteristics that are distinctly different from urban areas. Development strategies need to be differentiated for urban and rural areas. However, there should be an overall coherence between urban and rural development. Economic development is a dynamic process potentially affecting all areas of a society, and urban growth can be a catalyst for rural economic activities. Population flows are ongoing, not static, so the actual boundaries of rural and urban areas are constantly shifting. Rural areas can often be more prosperous and productive when they are close to, or integrally linked to, urban centres which provide opportunities for agglomeration, major markets, financial resources, and employment options. At the urban periphery and in small and medium towns, the “rural” and “urban” distinctions can be blurred. Non-farm employment (small manufacturing and services) is important in rural economies, and urban agriculture (household plots) is a significant source of food and incomes in many cities.

Urban-rural dichotomy was a discourse that lasted from the 1950s until the end of the 1980s. In this period differences between the countryside and the city were clear. However, we now have global economic changes, new forms taken by industrial production, technological innovations in information and communication, decentralization processes and the need to consider environmental issues at different levels of action. All of these factors have contributed to modify the vision and functions of urban and the rural area within a global context. These changes have produced alternative approaches to urban and rural planning, going from sectoral to comprehensive ones. They have the purpose of assessing the role of territory in its various scales and dimensions: geographical, ecological, cultural and political, and so the levels of development, participation of community actors and administrative management of resources.

### **1.3 NEED FOR INTEGRATED SPATIAL-ECONOMIC PLANNING FRAMEWORK FOR RURAL SETTLEMENTS IN INDIA**

Indian states have a legislative framework in place for spatial-economic planning of urban areas. However, when it comes to rural, there is a lack of integration of spatial aspects in development plans. The Constitution of India requires the states to constitute District Planning Committee (DPC) and Metropolitan Planning Committee (MPC) to consolidate plans at the district and metropolitan level respectively, taking into account the concerns of both rural and urban local bodies. Interestingly, as per the Constitution, DPCs and MPCs are to incorporate spatial planning aspects in the District and Metropolitan Level Plans respectively. However, the legislative framework of most states is yet to be updated to make the spatial planning aspect for rural settlements in India mandatory, in the absence of which sectoral plans lack the desired spatial underpinning.

Spatial planning of villages is of utmost importance to ensure a sustainable development. This realization by government came as guidelines which came recently in 2016 by Ministry of Panchayati Raj known as Rural Area Development and Plan Formulation and Implementation (RADPFI) Guidelines. This was a first step by the government towards spatial planning of rural areas. This is a recent intervention its implementation on ground and its accomplishment has not been apprehended. This project is an opportunity to link and reframe RADPFI Guidelines with Gram Panchayat Spatial Development plan (GPSDP). To demonstrate the planning process the village chosen is Sembarambakkam in Tiruvallur district of Tamil Nadu.

### **1.4 METHODOLOGY FOR PREPARING THE GRAM PANCHAYAT SPATIAL DEVELOPMENT PLAN**

The village that has been chosen for the Gram Panchayat Spatial Development Plan is Sembarambakkam Village located in Thiruvallur district of Tamilnadu as it exemplifies typical peri urban character. This village lies inside the boundary of Chennai Metropolitan boundary Area and is prone to intense transformation due to approaching urbanization. The GPSDP incorporates the spatial layers corresponding to attributes like physical features, land holding and land ownership of revenue lands,



land use in, overall physical and social infrastructure, etc; The study was intensively based on primary survey and Census data 2011. Spatial and Non-Spatial data was collected by team members of SAP, Anna University who made the necessary number of visits to the village.

The project consisted of three major stages; Collection of data (Primary and secondary data) including updating of existing maps and statistics; Gap analysis and identification of the issues within the panchayats as well as potential through the SWOT analysis; and the preparation of the proposal for the development of the panchayats consisting of land use plan, resource management strategies and others.

The data related to demography was procured from Census 2011, which was subsequently updated with information collected from the panchayat office and other government sources. Rest of the data regarding land use for the village area, socio-economic condition of population, services, infrastructure, housing condition etc. was collected on ground. During the visit, meetings were conducted with the Sarpanch and Gram Sabha members. The data collected reflects interest of residents as most of it was procured through household survey. Considering spatial emphasis of the project pertinent spatial data related to land use, cropping pattern, infrastructure, housing etc was collected on ground and then transferred to map through GIS.

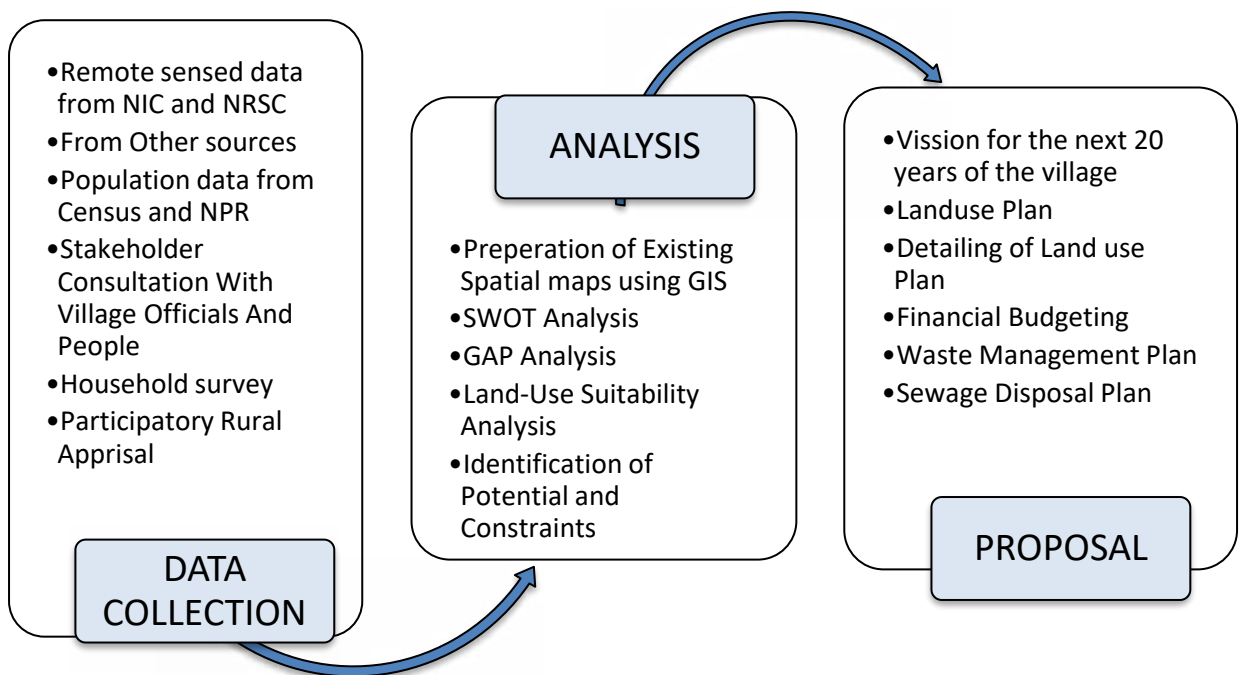


Figure 1: Methodology of the study

## CHAPTER 2

### 2 STUDY AREA

This Chapter describes about the Panchayat Raj institutional set-up existing in Tamilnadu and the Tiruvallur district. Also, the delineation of Village Panchayat for this Development Plan is included along with the brief discussion of its profile of the delineated Planning area.

#### 2.1 PANCHAYATI RAJ INSTITUTIONAL SET-UP IN TAMILNADU

The Directive Principles of State Policy (DPSP) under Article-40 of the Indian Constitution talks about Panchayati Raj System. Panchayat is the basic institution of local self-governance. It is the responsibility of the State to take all the steps for the establishment of the Panchayati Raj. Following the 73rd Constitutional Amendment Act, the three-tier system of Panchayati Raj Institution (PRI), were institutionalized through Part-IX of the Constitution. It comprises of Village Panchayat at local level, Panchayat Union or Community Development Block (CDB) at Block level and District Panchayat at District level. Members under the Panchayat Raj are elected by the people. The Tamil Nadu has a long history of local self-governance as it evident from the *Uthiramerur* stone inscriptions in Kancheepuram district, wherein the village administration was taken care by a Village Assembly known as ‘*Sabai*’ in every village. Further, each village was divided into several wards known as ‘*mandalams*’. This is evident from the epigraph inscriptions found in *Vaikuntha Perumal Temple* near *Uthiramerur*. They used the Pot-ticket system<sup>1</sup> of election (*Kudavolai Murai*) to elect the representatives to the assembly.

In Tamil Nadu, three tier system of Panchayat Raj has been working for the development of the people. Developmental administration is the main objective of these three-tier system. It is responsible for the Implementation of various centrally sponsored, state-funded, and externally aided schemes for provision of basic amenities and other services to the people. Elections are held to elect the representatives for this three-tier institution. Ministry of Municipal Administration

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<sup>1</sup> There is an election ballot, a pot, in which the electors polled candidates of their choice with names written on papers. Each person's preference vote is written on a paper and is dropped into the ballot pot

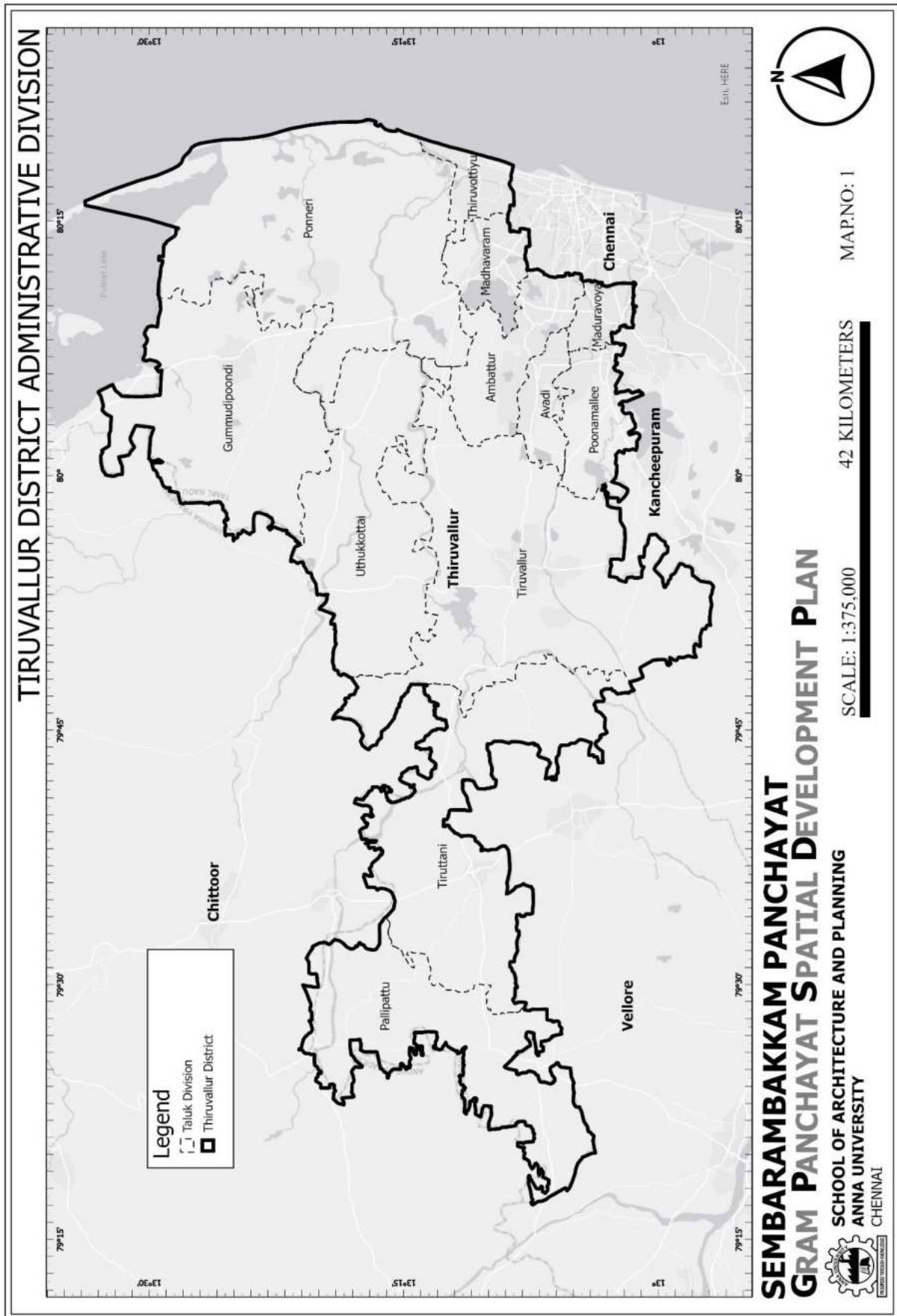
and Rural Development, Government of Tamil Nadu is the State Government governing body for these institutions.

Three tier system of Panchayat Raj is generally referred to as Local Body for both Urban and Rural areas. The urban local bodies act as platform between the people in the urban areas and the administration. Depending on the population and income of the urban areas, there are 3 levels of Local Body institutions in Tamil Nadu; Municipal Corporations, Municipalities and Town Panchayats. The Rural Local Body includes Village Panchayats, Panchayat Unions (co-terminus with Blocks) and District Panchayats. For the Urban Local Body, the elected head of the institutions are Corporation Mayor, Municipality / Town Panchayat Chairperson and Corporation / Municipality / Town Panchayat Councillor.

Village Panchayat is a statutory institution of local self-government. Village Panchayat President along with Village Panchayat Ward Members constitutes Gram Panchayat or Village Panchayat. Major functions of Gram or Village Panchayat in Tamil Nadu are Drinking water supply, construction of public roads, drains, small irrigation projects, maintaining sanitation and public health, lighting on roads and public places, controlling and maintaining village cremation ground and/or cemetery, taking part in agricultural development, maintaining a library and opening elementary school, planting and preservation of trees on the sides of the public roads and collection of taxes

## **2.2 PANCHAYAT RAJ INSTITUTIONAL SET-UP IN TIRUVALLUR DISTRICT**

The District of Tiruvallur has been carved out by bifurcating erstwhile Chengalpattu District (which was renamed as Chengalpattu-MGR/Kancheepuram at the time of 1991 Census). At present this District is comprised of twelve taluks namely Ambattur, Gummindipoondi, Ponneri, Uthukkottai, Tiruvallur, Poonamallee, Tiruttani, Pallipattu, Madhavaram, Maduravoyal, Thiruvottiyur and Avadi and four Revenue Divisions namely Ambattur, Ponneri, Tiruvallur and Tiruttani. The Tiruvallur district is ranked as fourth in terms of the highest population in the state of Tamil Nadu, with the urban population share of 65.1%.



Map 1: Administrative division of Tiruvallur District

The population density of the district was 1098 persons/ sq.km and the district Sex ratio was 987, which is lower when compared to the State’s sex ratio of 996. The district has recorded higher literacy rate (84%) as compared with the State literacy rate of 80.1%. The district decadal population growth during 2001-2011 was 35.3%.

Table 1: Tiruvallur District Local body classification for Development

<b>Local Body Type</b>	<b>Description</b>	<b>No. of Local Bodies</b>
Rural	District Panchayat	1
	Panchayat Unions or CDB	14
	Village Panchayats	526
Urban	Municipalities	5
	Town Panchayats	10

*Source: Tiruvallur District Directory*

Tiruvallur district is one of the fastest developing districts with leading industries like Madras Refineries, Madras Fertilizers, Manali Petro-chemicals, MRF, Ashok Leyland, Tube Investments of India Limited (TI Cycles), Britannia Industries Ltd., Parry India Ltd., Hindustan Motors and notably Ennore thermal power plant, Avadi Tank factory, as well as other 18 Meso and small enterprises (leather, chemical engineering and textiles) are located within it. It also has rural artisans engaged in producing Jute, coconut shell, palm leaf products, paper cups etc. It has regulated markets located in Gummidipoondi, and Red Hills (*Sengundram*). It has good public transport connectivity viz., Chennai – Bangalore Broad gauge railway line, Chennai-Tirupati national highway; two major roads connecting Chennai and Tiruvallur, Pattabhiram, Avadi, Ambattur, Villivakkam and Poonamallee and Koyambedu. It is well connected by MTC bus service. It has good source of Electricity from Ennore Thermal power station- (capacity 450 MW). All villages and hamlets are electrified. Villages in the Thiruvallur district are affected by the growth of the Chennai city and cone under the pressures due to Chennai’s rapid urbanization. Many villages exhibit sub-urban characteristics. Under SMP Chennai - 2026, The CMA falls in three Districts of the Tamil Nadu State viz. Chennai District, part of Thiruvallur District, and part of Kancheepuram District. The extent of the Chennai District (covered in Chennai Municipal Corporation area) is 176 sq.km. In Thiruvallur District out of total district area of 3427 sq.km, 637 sq.km. in Ambattur, Thiruvallur, Ponneri and

Poonamallee taluks fall in CMA. In Kancheepuram District out of 4433 sq.km, 376 sq.km in Tambaram, Sriperumbudur and Chengalpattu Taluks fall in the Metropolitan area.

Table 2: Demography of CD Block in the Tiruvallur District

Name of CD Block	Village Panchayat	Population		
		Persons	Males	Females
Villivakkam	13	104678	53414	51264
Puzhal	7	21437	10795	10642
Minjur	55	164718	82398	82320
Sholavaram	39	141603	71106	70497
Gummidipoondi	61	170877	85803	85074
Tiruvelangadu	42	92280	46091	46189
Tiruttani	27	74230	37124	37106
Pallipattu	33	78816	39384	39432
R.K.Pet	38	104496	52844	51652
Thiruvallur	38	140113	69924	70189
Poondi	49	102279	51098	51181
Kadambattur	43	127964	64332	63632
Ellapuram	53	120509	59727	60782
Poonamallee	28	141280	71070	70210
<b>Total</b>	<b>526</b>	<b>1585280</b>	<b>795110</b>	<b>790170</b>

Source: Census of India 2011

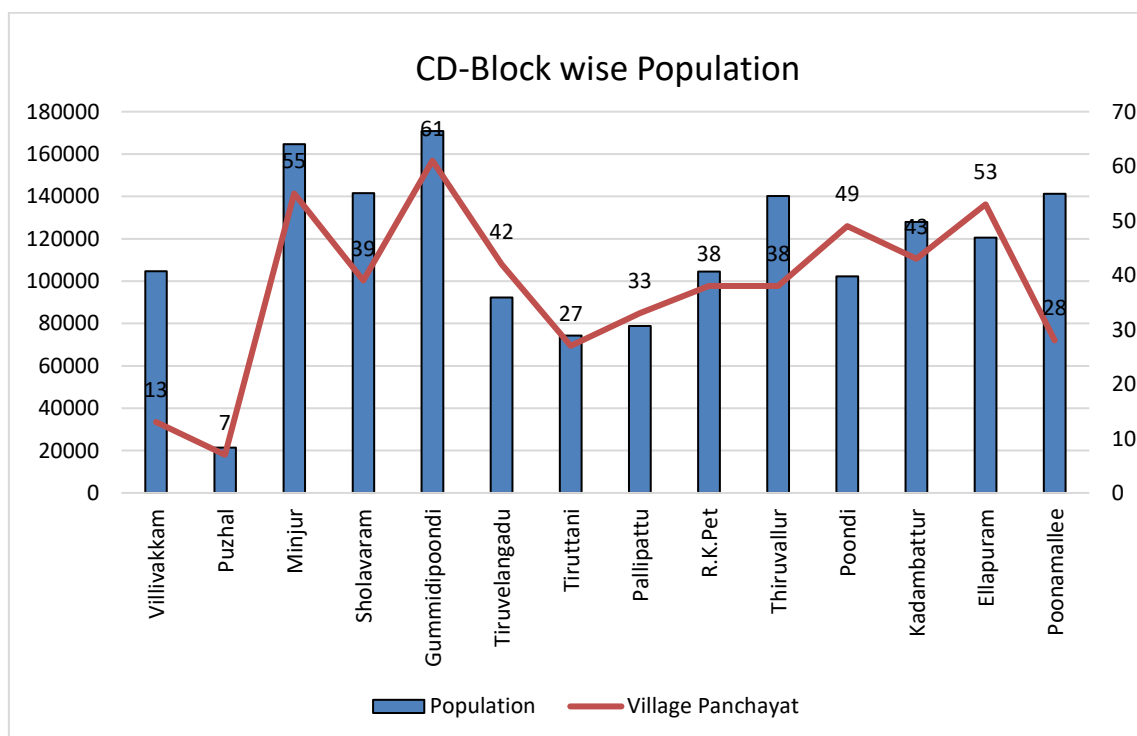


Figure 2: CD Block-wise Population Composition

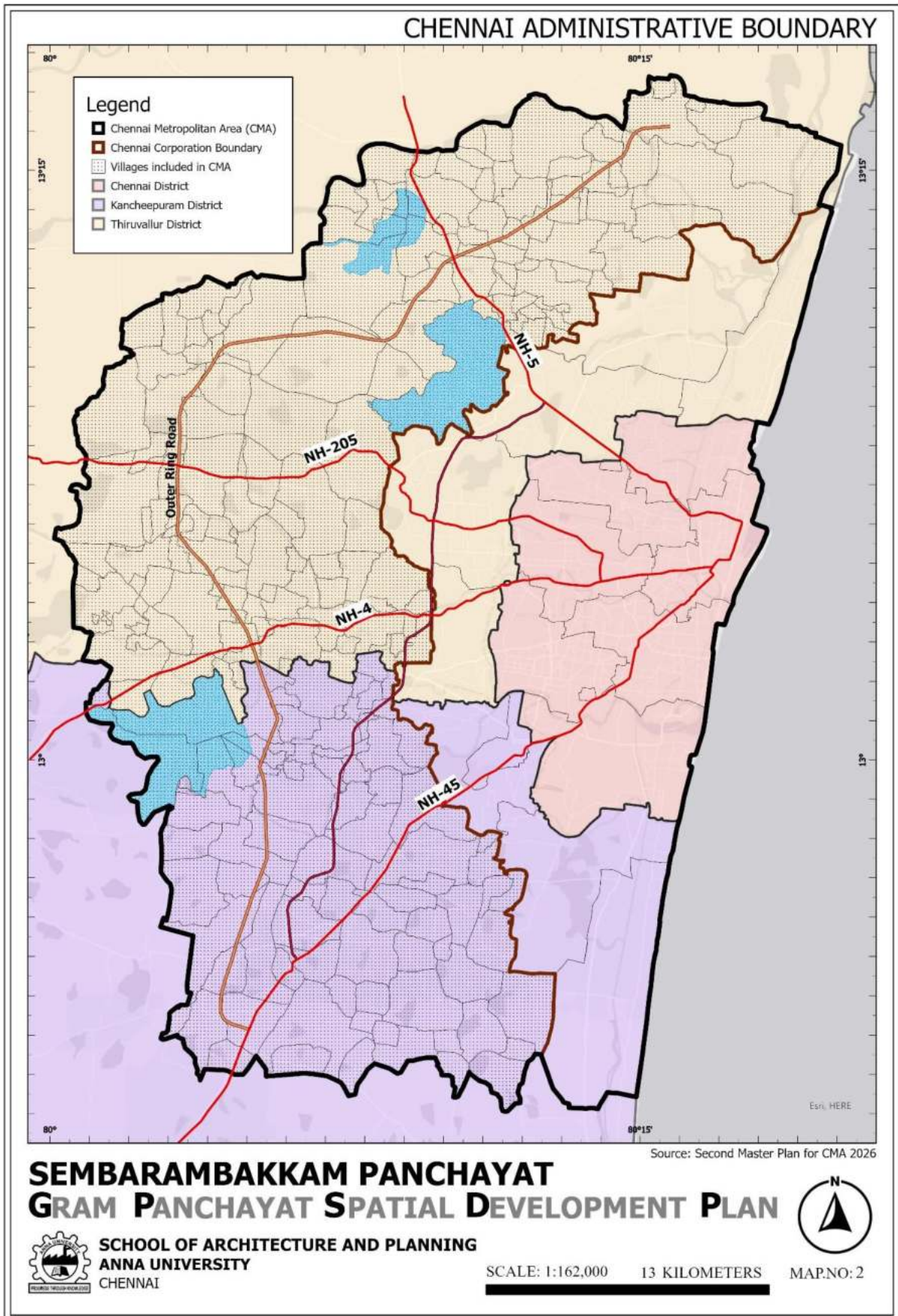
From the *Figure 2: CD Block-wise Population Composition*, the Villivakkam Block and the Poonamallee block shows the irregular composition of Total number of village and total village population than any other blocks in the District of Tiruvallur.

### **2.3 DELINEATION OF GRAM PANCHAYAT**

The Planning area was selected or delineated based on several criteria described below. The Transportation network primarily supports the land-use change pattern, which might result in both ways of development. In Chennai, the development of the Chennai – Bangalore national highway (NH4) was taken up as part of the recommendations made in the first master plan for Chennai, to reduce traffic congestion by connecting the National Highways to the city. The NH4 passes through the village, bifurcating the village connecting the rural nature of the Gram Panchayats with the sprawling urban area. From SMP for Chennai, areas along ORR were identified as potential areas to absorb the future growth as shown in Map 2: Chennai Administrative Boundary. This clearly indicates that the transportation network leads to land use change and has the potential for economic development. Hence one of the main criteria for selecting this gram panchayat is its location along the vicinity of the National Highway. Also considering the availability of data of land use, demography and the potential for socio-economic developments, the planning area is selected. The *Table 2: Demography of CD Block in the Tiruvallur District* shows drastic changes in composition in the Villivakkam and Poonamallee block. Based on the above-mentioned criteria's, Sembarambakkam GP from the Poonamallee Block of Poonamallee Taluk in Thiruvallur district has been selected in order to prepare SDP.

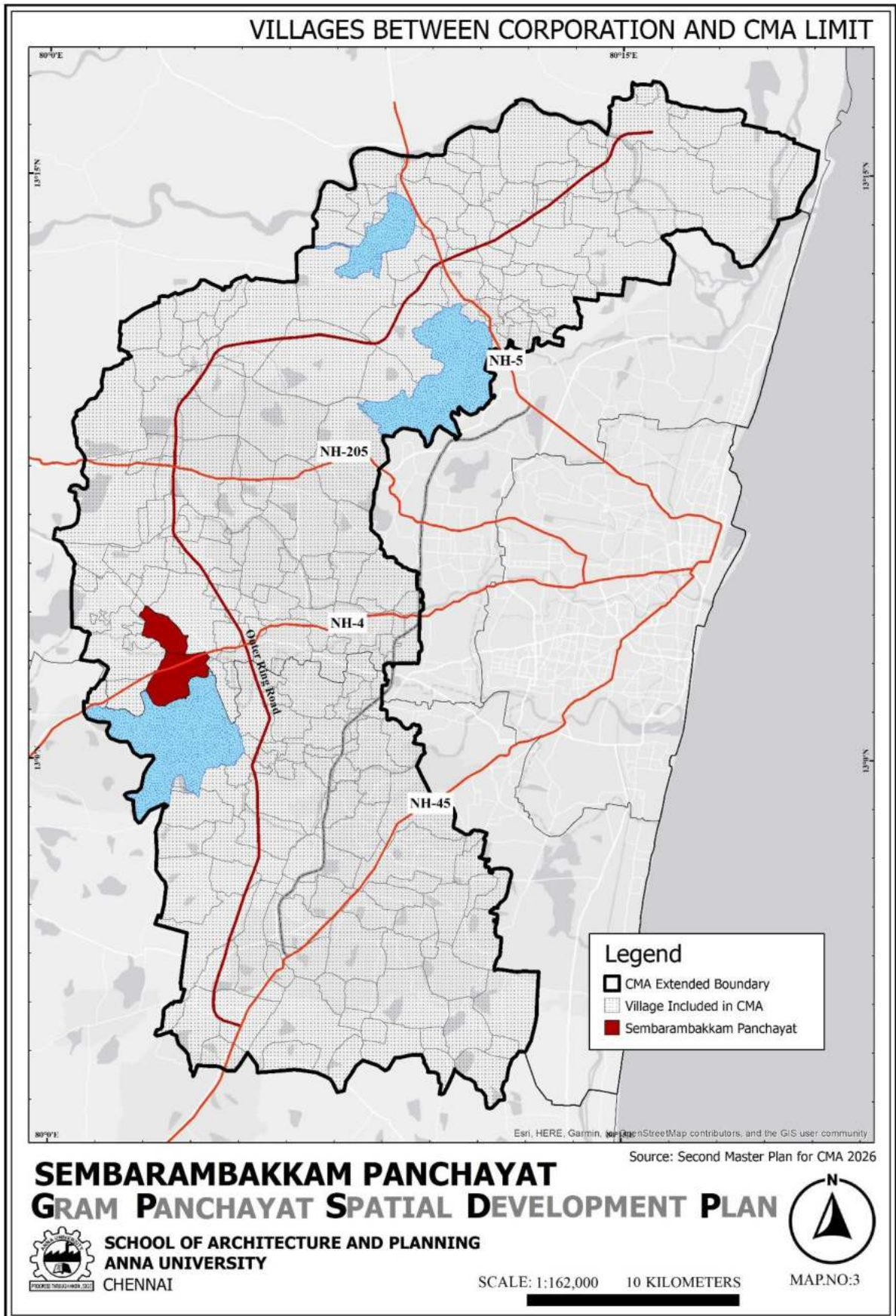
### **2.4 PROFILE OF THE SEMBARAMBAKKAM PANCHAYAT**

The Sembarambakkam Panchayat is a village located in Poonamallee Taluk of Thiruvallur district, Tamil Nadu, with a total of 3033 families residing in it. According to census 2011, the Sembarambakkam Panchayat has a population of 5709, of which 2877 are males and 2832 are females. In Sembarambakkam, population of children with age group of 0-6 is 782 which makes up to 13.69% of total population of Sembarambakkam panchayat.

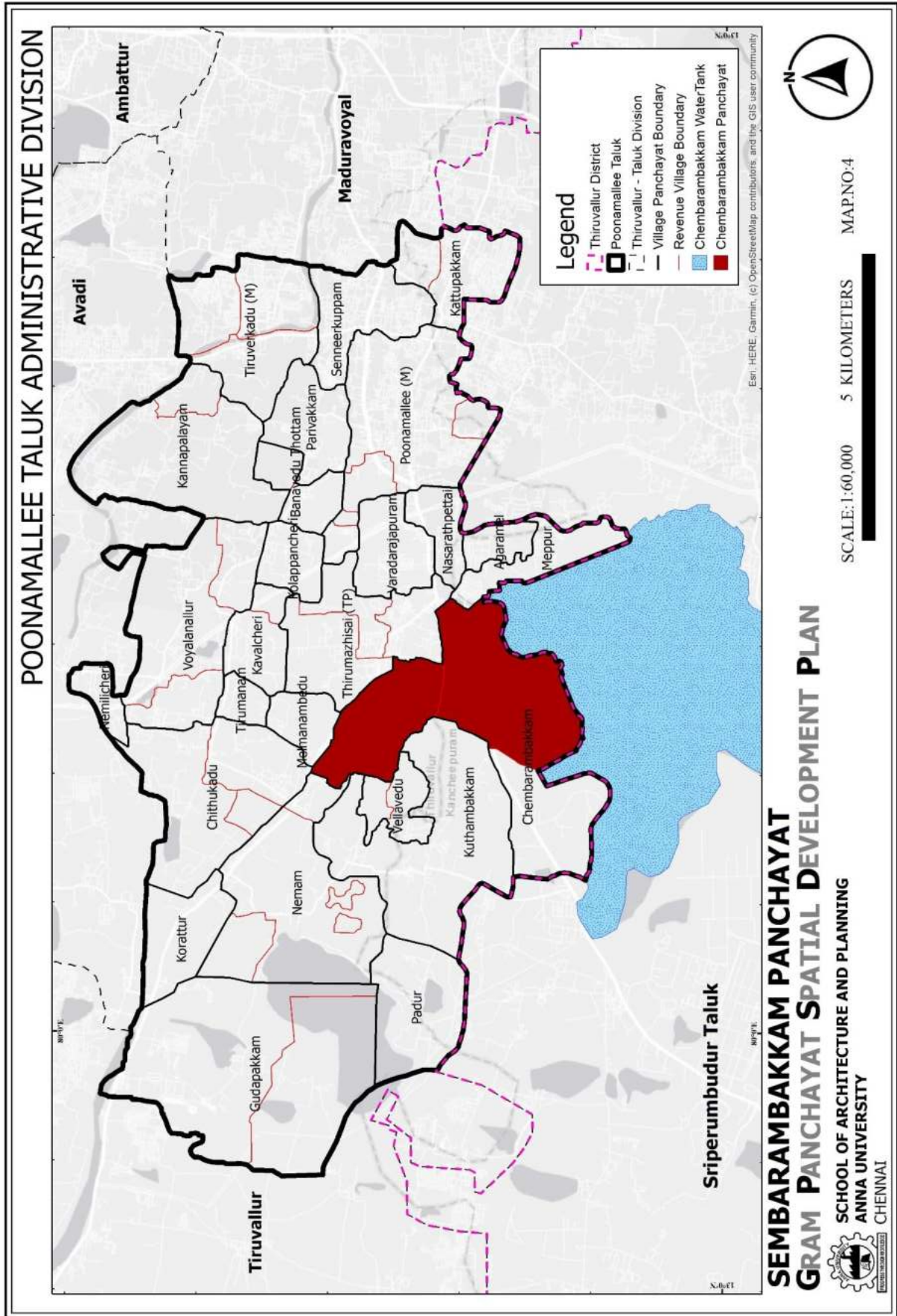


Map 2: Chennai Administrative Boundary





Map 3: Villages between Corporation and CMA Limit



Map 4: Poonamallee Taluk Administrative Division

Average Sex Ratio of Sembarambakkam is 984 which is lower than Tamil Nadu state average of 996. Child Sex Ratio for the Sembarambakkam as per census is 1005, higher than Tamil Nadu average of 943. The literacy rate of Sembarambakkam is 72.38% in 2011, which is lower compared to Tamilnadu state literacy rate of 80.09%.

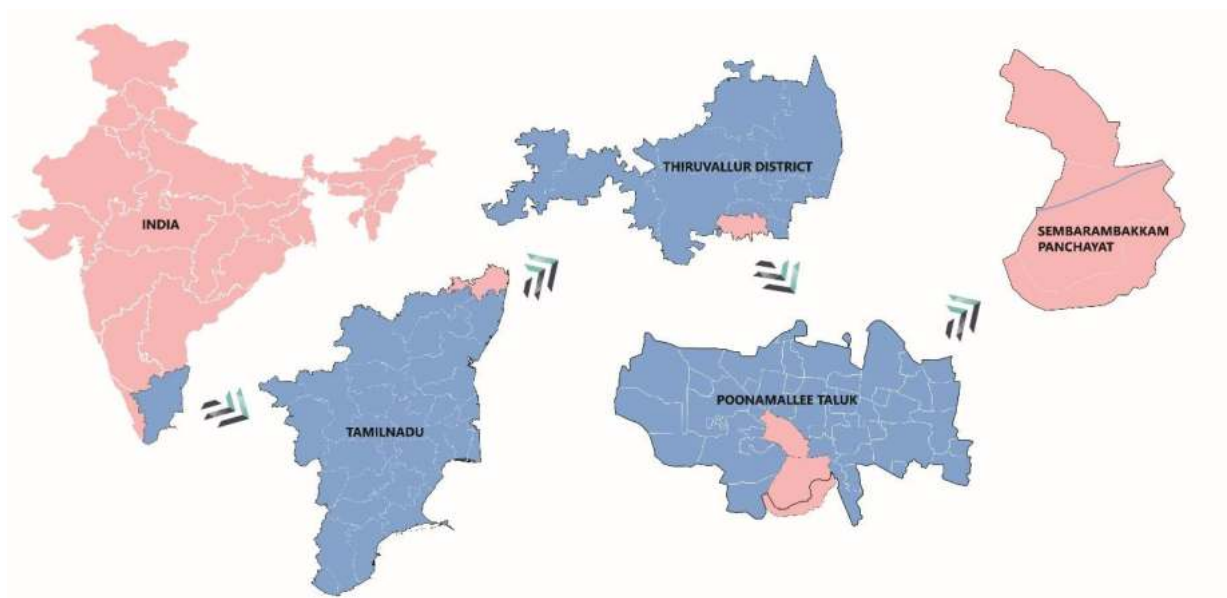


Figure 3: Study area location map of Sembarambakkam GP

Table 3: Demographic profile of Sembarambakkam GP

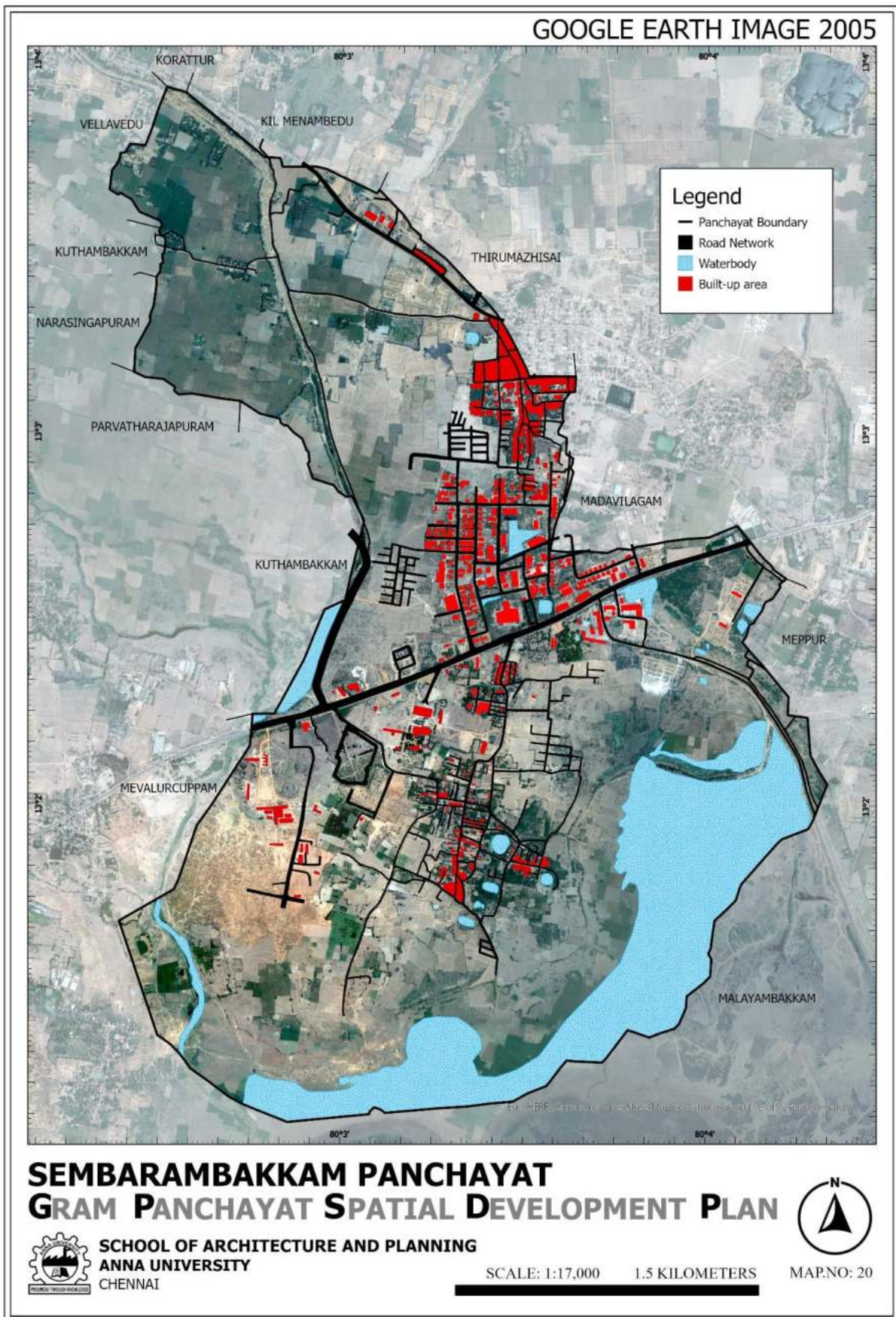
Total Population	5709
Total Male Population	2877
Total Female Population	2832
0-6 Age group Total population	782
0-6 Age group Male population	390
0-6 Age group Female population	392
Total Person Literates	4132
Total Male Literates	2245
Total Female Literates	1887
Total Person Illiterates	1577
Total Male Illiterates	632
Total Female Illiterates	945
Scheduled Caste Persons	1564
Scheduled Caste Males	780
Scheduled Caste Females	784
Scheduled Tribe Persons	70
Scheduled Tribe Males	32
Scheduled Tribe Females	38

*Source – Census of India 2011*

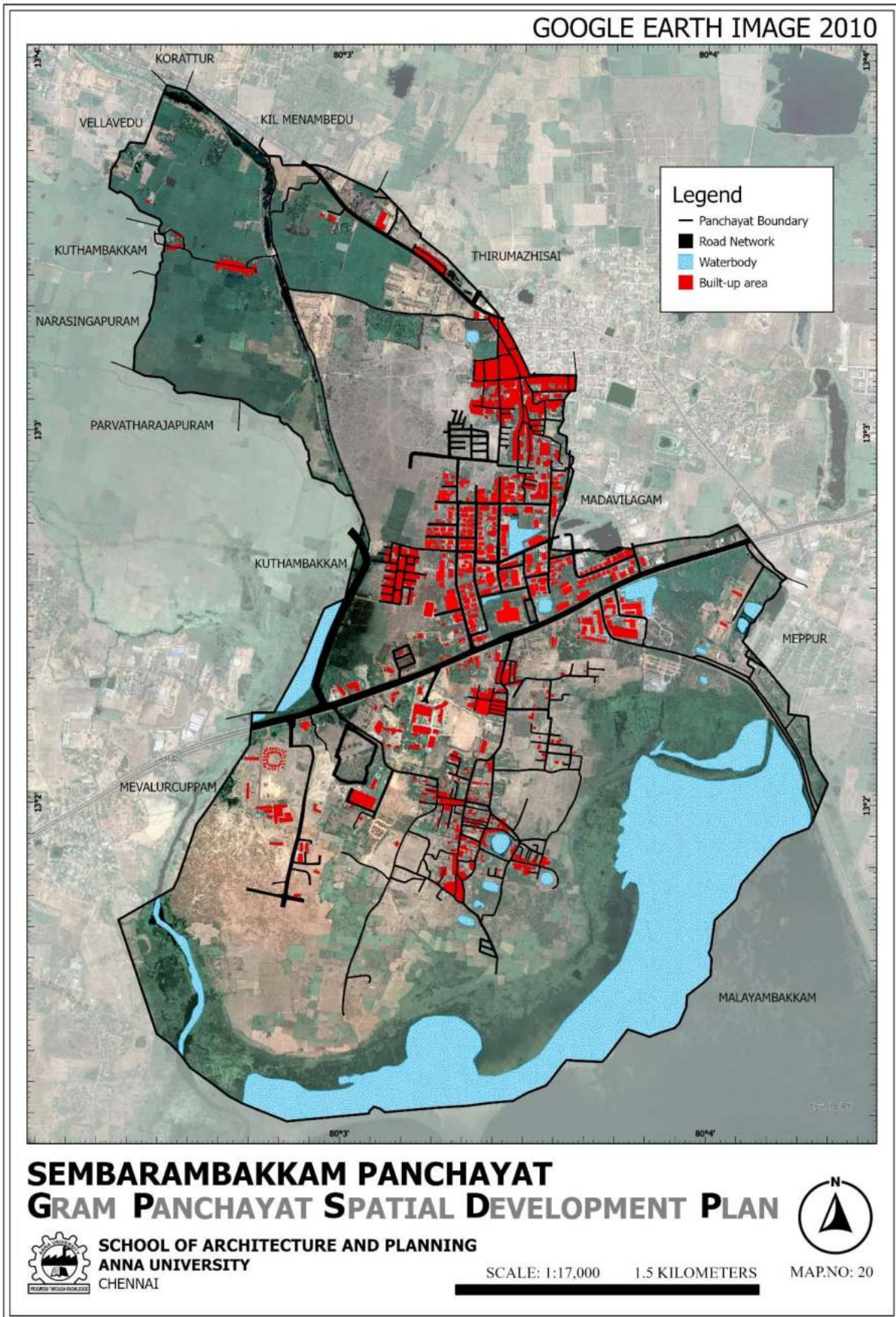
In Sembarambakkam Male literacy stands at 78.03% while female literacy rate was 66.63%. As per constitution of India and Panchayat Raj Act, Sembarambakkam is administrated by Sarpanch (Head of Village) who is elected representative of village.

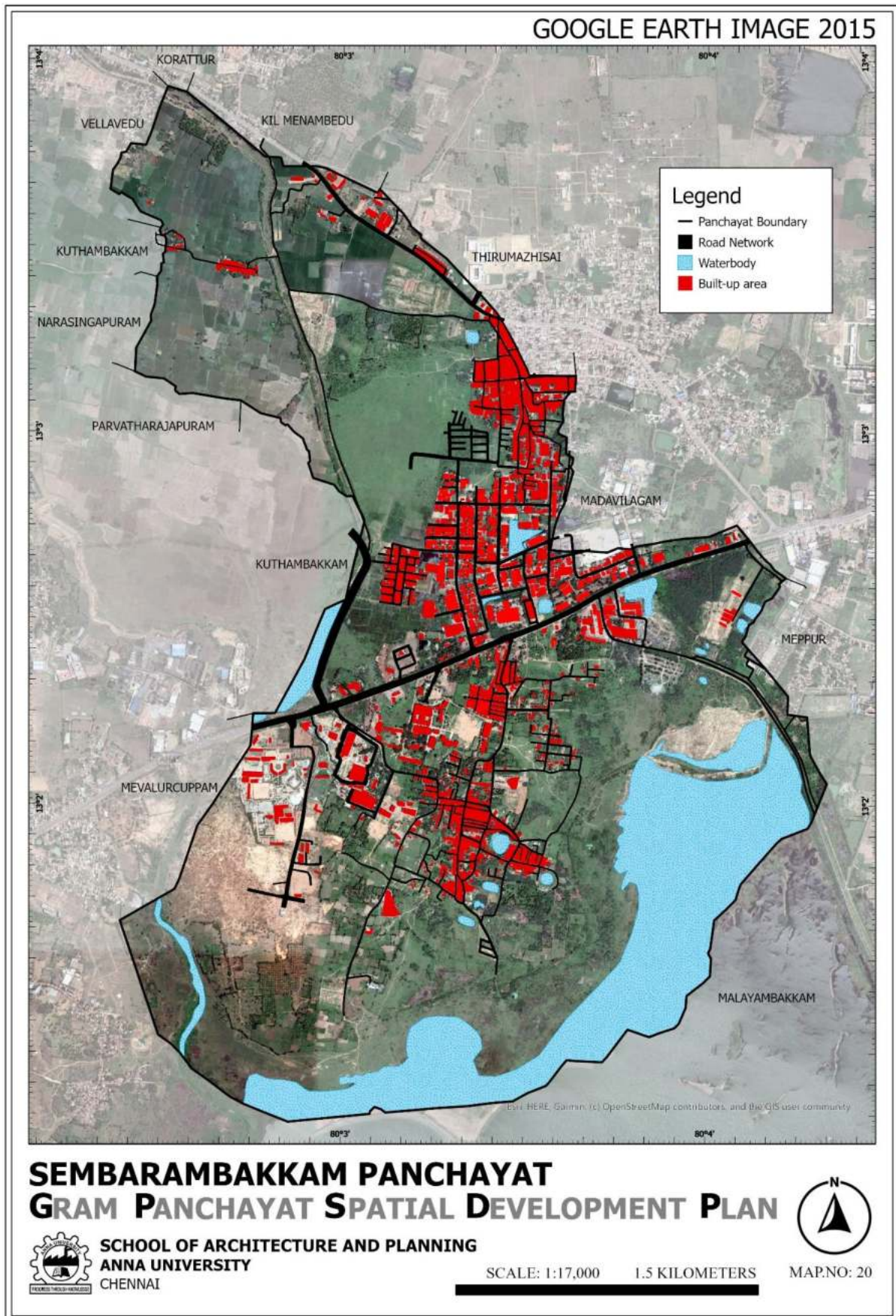
## **2.5 EVOLUTION OF THE VILLAGE**

The village Sembarambakkam got its name from the Chembarambakkam Lake located toward the south of the GP. The lake was built by Rajendra chola during the later chola period. Even though the village got its name from the lake, the village does not receive the benefits of irrigation or domestic water supply, as it is located at a higher altitude from the flood plain area. The agriculture on rain fed lands is still practised around the hamlets of the north-western part and southern part of the village. Due to rapid urbanisation, the village has been changing its character over the years. Though agriculture was the prime occupation 40 years back, due to rapid urbanisation of Chennai over the year's agriculture is not predominantly being practised in the village. A natural population growth pattern was observed over the past decades. The population in 2001 and 2011 was 3649 and 5709 respectively, double folded to 12320 in 2020. One of the reasons for this drastic increase in population was the arrival of SIPCOT industrial development within the village. Apart from SIPCOT industrial development, there is an amusement park named Queensland, EVP film city and various Engineering colleges. As the national highway (NH4) bifurcates the village, a clear difference in infrastructure development can be noticed between the northern and southern part of the village. The evolution of the village over the period of time has been described in the following maps. The Map 5: Evolution study - Google Earth Image 2005, Map 6: Evolution study - Google Earth Image 2010, Map 7: Evolution study - Google Earth Image 2015, and Map 8: Evolution study - Google Earth Image 2020 show the changes in the growth of settlements.

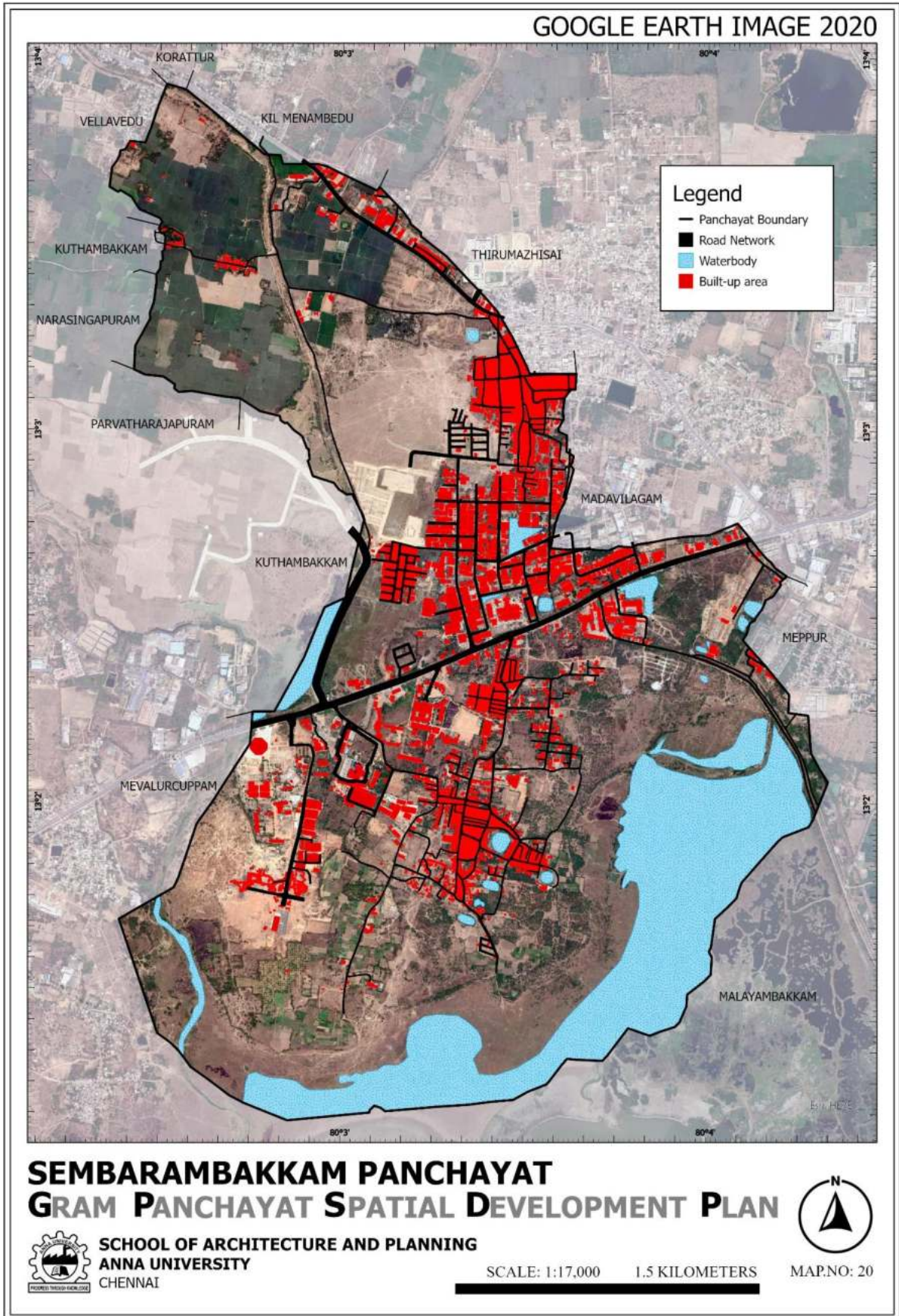


Map 5: Evolution study - Google Earth Image 2005





Map 7: Evolution study - Google Earth Image 2015



Map 8: Evolution study - Google Earth Image 2020



## **2.6 APPLICATION OF GEO-SPATIAL TECHNOLOGY**

The conventional techniques employed to provide spatial information on natural resources are highly tedious, time consuming and more often subjective; whereas satellite remote sensing with synoptic and regular coverage has the requisite potential to provide up to date information in a timely and more objective manner. Remote sensing (RS), Geographic Information System (GIS) and Global Positioning System (GPS) constituting the emerging field of geospatial technology offer great promise for generating spatial information on natural resources at national and subsequent disaggregated levels. With advancements in space technology, availability of high-resolution data and advanced processing techniques, the remote sensing technique has become a powerful tool for mapping and monitoring of natural resources. These techniques have immense potential for providing spatial information on natural resources resource mapping and monitoring at regular intervals.

GIS is a powerful tool for integrating natural resources for development of spatial decision support systems. Thus, geospatial technology along with Information and Communication technology (ICT) has become a very useful technique and powerful tool for providing spatial information including development of land use information systems, towards decision making. Further, the system is also highly useful for updating and monitoring the dynamics of land use changes through the monitoring capabilities of the multi-temporal remote sensing data. Remote Sensing in conjunction with Geographical Information System (GIS) and other IT tools is also emerging as flexible, efficient, speedy, cost-effective and reliable technology for obtaining information on natural resources analysis and modelling. It is an integral part of data management in large number of applications. Spatial information - images and maps, forms the foundation and basis for the most planning and implementation of developmental activities; infrastructure development; disaster management support; environmental monitoring; natural resources management and many other national activities.

Over the last two decades remote sensing and GIS have been widely used for the preparation of different types of thematic layers and integrating them for different

applications that include land and water resources planning, agricultural applications, water resource management, disaster management, forestry applications, watershed management and urban applications etc.

For the Study of Gram Panchayat various thematic maps as spatial database are prepared from Satellite data of CARTOSAT-1, IRS P6 LISS-IV, IRS-1D LISS III datasets and other collateral data from major source. The data acquired from the multi-spectral sensors LISS-IV (5.8m resolution) & CARTOSAT-1 (2.5 m resolution) of the Indian Remote Sensing Satellite (IRS) series are extensively used for generating spatial databases. The data needed for this study is completely relied upon IRSC, where they studied in detail and grouping the collected primary maps into hydro-geomorphological, topographical, land use and land cover, hydrology and socio-economic parameters (*Table 4: Information sources for development planning*).

Table 4: Information sources for development planning

<b>Data/map</b>	<b>Source</b>	<b>Spatial/ Non-spatial</b>	<b>Scale</b>
Digital Elevation Model	CARTOSAT Stereo data	Spatial	10 m
Contour	CARTODEM	Spatial	5m
Geological map	Rajiv Gandhi National Drinking Water Mission, NRSC	Spatial	1:50K
Geomorphological map		Spatial	1:50K
Structures/Lineaments		Spatial	1:50K
Soil Texture	NRIS, NRSC	Spatial	1:50K
Ground water potential map	NRSC	Spatial	1:50K
Ground water quality borewell location map	NRSC	Spatial	1:50K
Land use/ Land cover	High-resolution data	Spatial	1:10K
Drainage map and Surface water bodies	High resolution satellite data	Spatial	1:10K
Meteorological data	IMD	Spatial	25 km grid
Settlement	High-resolution data	Spatial	1:10K
Infrastructure	High resolution satellite data	Spatial	1:10K
Gram Panchayat boundary	NIC	Spatial	1:50K
Village boundaries	NRSC	Spatial	1:50K

*Source: NRSC*

Sometimes, these primary maps are used to produce utilitarian types of maps to serve planning decisions. They are derived, in some cases, by direct translation of single thematic map and in others by combination of two or more thematic maps or chosen parameters of the different themes (*Table 5: Derived spatial databases required for planning*). Natural resources data representing environmental status of the study area that were generated under various national level projects at 1:50,000 scale was considered for the study are presented below. The database was standardized for integrated analysis under GIS environment.

**Table 5: Derived spatial databases required for planning**

Derived map	Theme map	Remarks
Contour/Slope	Topographical map/IRS PAN stereo data	Derived from DEM
Groundwater potential	Geology, Geomorphology, borewell, Lithology and yield data	Integration of thematic maps and point database
Water Resource Development Plan	Slope, soil map, land use, drainage order, lineament, Runoff Potential	Multi Criteria analysis
Land Resource Development Plan	Slope, soil map, land use, Ground Water Potential, Geomorphology	Multi Criteria analysis

*Source: NRSC*

## **2.7 PHYSICAL FEATURES OF SEMBARAMBAKKAM PANCHAYAT**

With the help of High-resolution satellite datasets (5.8m and 2.5m) and Digital Elevation Model (DEM) spatial thematic layers for Sembarambakkam GP were prepared. The Merged product of Cartosat-1 PAN and IRS LISS-IV Mx datasets acquired during 2015-16, in Natural Colour Composite from SIS-DP Phase-II in Natural Colour Composite is shown in *Figure 4: Sembarambakkam GP as seen through HRS data in NCC mode (2.5m)*. Potential tools such as remote sensing and GIS techniques are utilized for generation of various thematic resource maps in conjunction with collateral data. Data integration and generation of development plans are carried out in Geographic Information System environment.

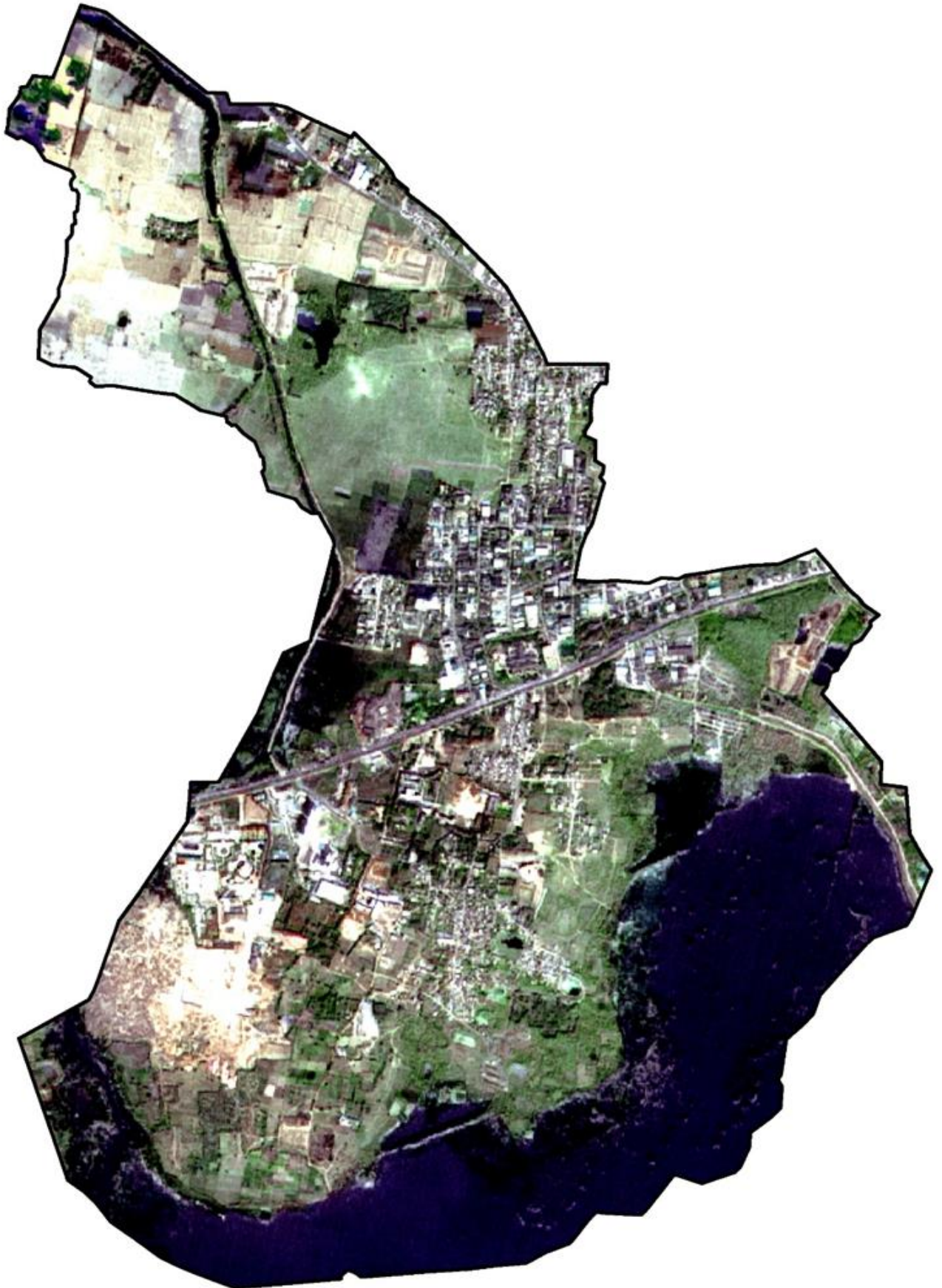
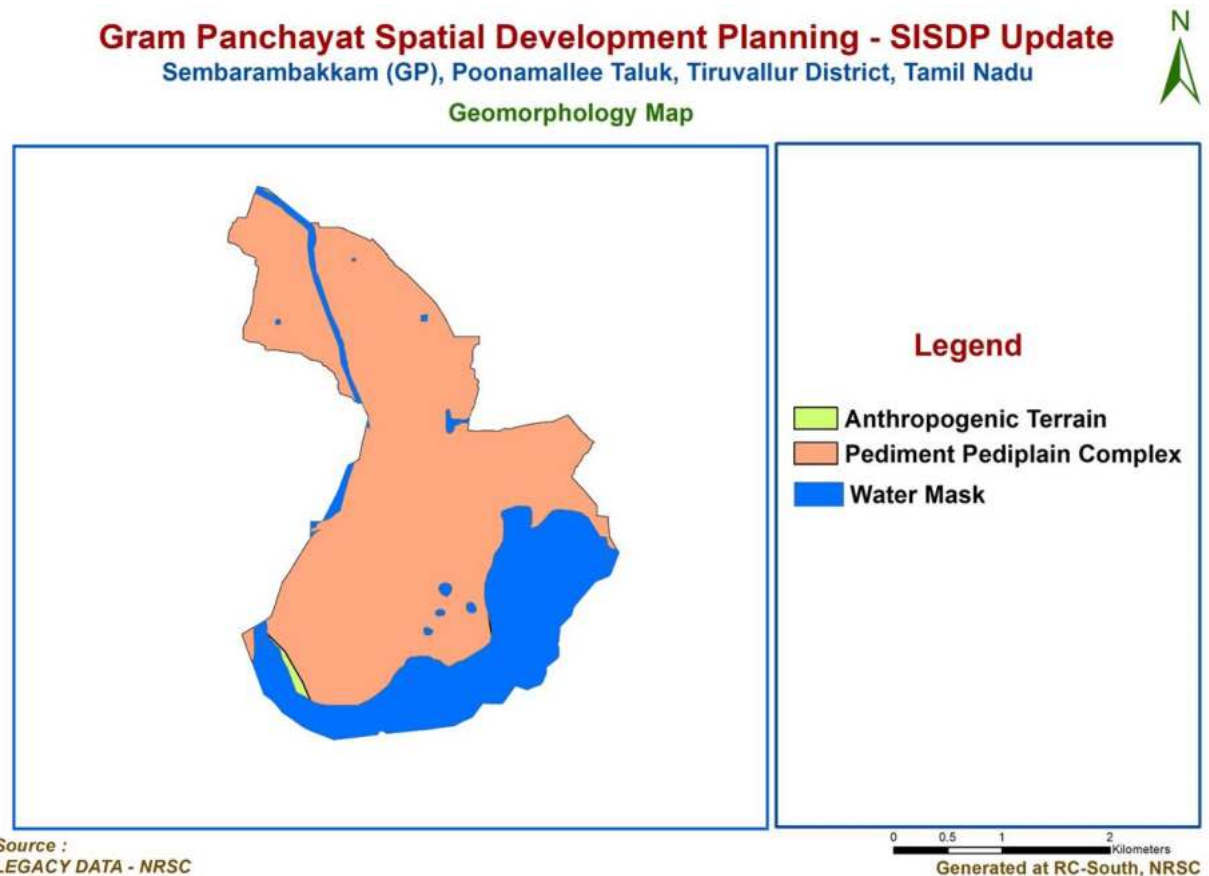


Figure 4: Sembarambakkam GP as seen through HRS data in NCC mode (2.5m)

### 2.7.1 HYDRO-GEOMORPHOLOGY

Geomorphology is the study of landforms, their processes, form and sediments at the surface of the Earth, where Hydro-Geomorphology depict major geomorphic units, landforms majorly comprising of Pedi-plain and valley, and also provide an understanding of the processes relating to groundwater occurrence as well as groundwater prospects. Based on the morphological expressions in the satellite data, *Map 9: Hydro-Geomorphology of Sembarambakkam GP* is prepared.

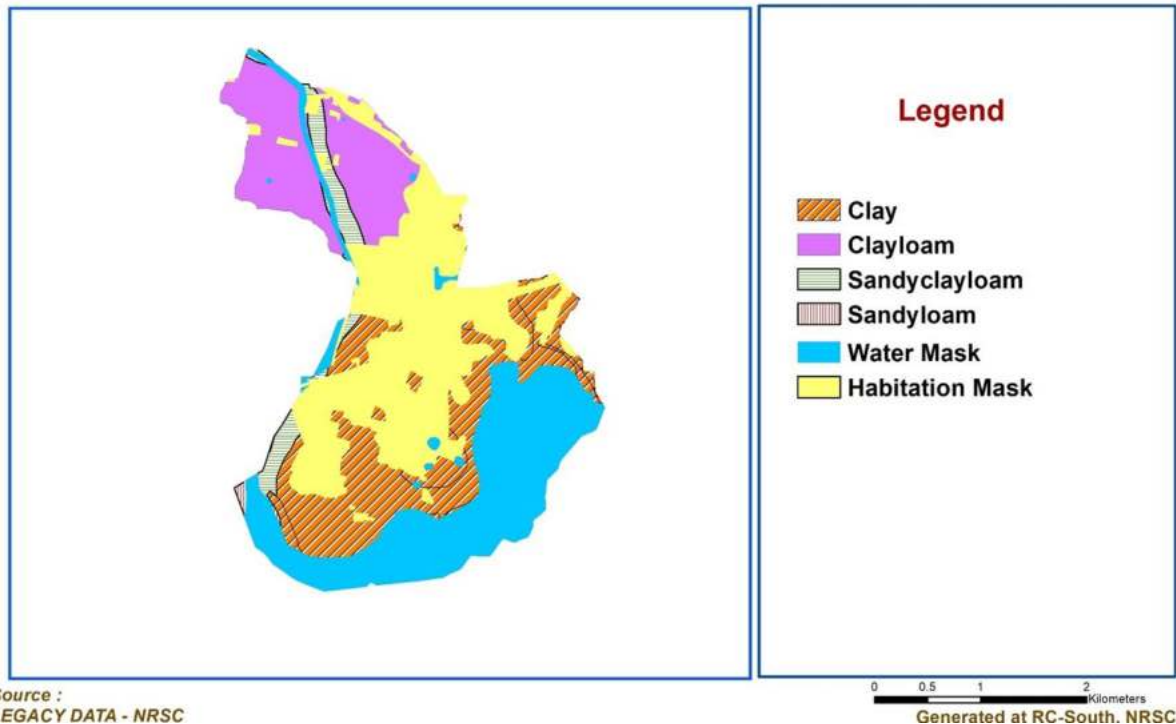


Map 9: Hydro-Geomorphology of Sembarambakkam GP

### 2.7.2 SOIL TEXTURE

Soil texture (such as loam, sandy loam or clay) refers to the proportion of sand, silt and clay sized particles that make up the mineral fraction of the soil. The Spatial distribution of soil texture in Sembarambakkam GP is shown in *Map 10: Soil Texture Map of GP*. In Sembarambakkam Panchayat, it is classified into Loamy Sand, sandy loam (lower half of GP), sandy clay loam (covering majority of GP) and clay loam (mainly towards eastern part of the GP).

**Gram Panchayat Spatial Development Planning - SISDP Update**  
 Sembarambakkam (GP), Poonamallee Taluk, Tiruvallur District, Tamil Nadu  
 Soil Texture Map



Map 10: Soil Texture Map of Sembarambakkam GP

### 2.7.3 SETTLEMENT AND TRANSPORTATION NETWORK

A settlement is an organized human habitation. There are several ways to classify different types of settlements. For Sembarambakkam GP, Settlement and Transportation Layer generated using HRS data at 1:10,000 scale. The statistics of road types and Settlement categories are given in Table 6 and Table 7 respectively. Rural settlement growth in different directions can be analysed using satellite data more explicitly.

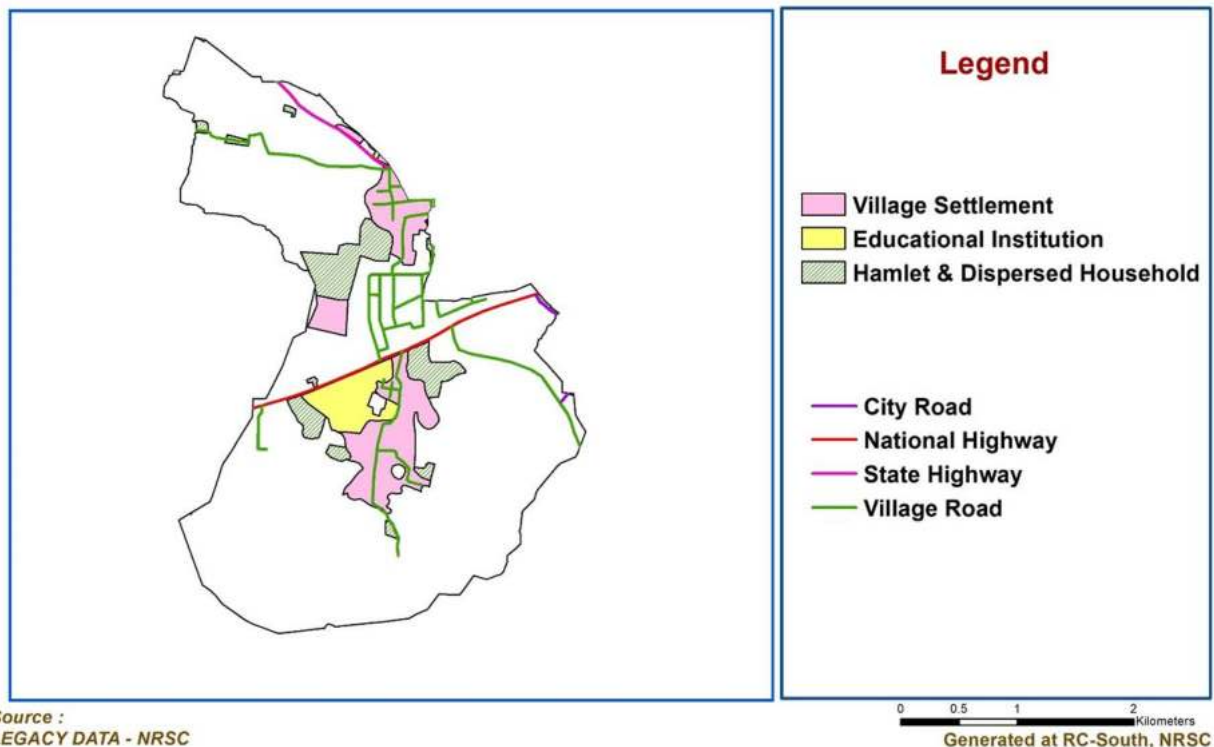
Table 6: Road length for different Road categories in Sembarambakkam GP

S.No.	Road Category	Road Length (km)
1	National Highway	2.65
2	State Highway	1.25
3	District Road	0.35
4	Village Road	13.46
<b>Total</b>		<b>66.78</b>

Table 7: Areal spread of different Settlement categories in Sembarambakkam GP

S.No.	Settlement Category	Area (ha)
1	Village Settlement (VS)	87.0
2	Hamlet & Dispersed Household (HD)	27.18
<b>Total</b>		<b>114.18</b>

**Gram Panchayat Spatial Development Planning - SISDP Update**  
 Sembarambakkam (GP), Poonamallee Taluk, Tiruvallur District, Tamil Nadu  
 Settlement and Transportation Network



Map 11: Settlement and Transportation Network of Sembarambakkam GP

### 2.7.4 LAND USE LAND COVER

High resolution satellite datasets of CARTOSAT-1 PAN and IRS LISS-IV Mx datasets acquired during 2015-16, from SIS-DP Phase-II were merged by data fusion and utilized for preparation of detailed Land Use / Land Cover (LULC) map of Sembarambakkam GP at 1:10,000 scale (Map 13: Existing Land use and Land Cover 2020 from NRSC). The satellite image was used in Natural Colour Composite (NCC) mode of 2.5m spatial resolution. This LULC map was updated using IRS LISS-IV MX of 5.8m spatial resolution acquired during 2018-19. Onscreen visual interpretation technique was adopted in GIS environment for delineating boundaries of various classes using GIS software. Overall, the GP area was divided into 5 major classes, namely, cropland / agricultural plantations, settlements, wasteland, water and other land use / land cover classes. These classes were further subdivided into sub-classes as indicated in *Table 8: Area estimates of various LULC classes in Sembarambakkam GP*. Majority of the area under Sembarambakkam GP is under

Scrub land (212.08 ha) followed by Crop Land / Fallow Land (141.57 ha), Industrial Area (112.79 ha) and Village Settlement (87.0 ha).

Table 8: Area estimates of various LULC classes in Sembarambakkam GP

S.No.	CLASS CATEGORY / NAME	AREA (Ha)
<b>A.</b>	<b>CROPLAND/AGRICULTURAL PLANTATIONS</b>	
1	Crop Land (CL)	141.57
2	Agriculture Plantation / Orchards (AP)	11.12
<i>Sub-total</i>		<i>152.69</i>
<b>B.</b>	<b>SETTLEMENTS</b>	
3	Village Settlement (VS)	87.0
4	Hamlet & Dispersed Household (HD)	27.18
<i>Sub-total</i>		<i>114.18</i>
<b>C.</b>	<b>WASTELAND</b>	
5	Scrub Land	212.08
<i>Sub-total</i>		
<b>D.</b>	<b>WATER</b>	
6	Lakes / Pond (LP)	5.30
7	Canal	15.57
8	Reservoir / Tanks	237.82
<i>Sub-total</i>		<i>258.69</i>
<b>E.</b>	<b>OTHERS</b>	
9	Transportation	11.95
10	Educational Institution	26.84
11	Industrial Area / Brick Kiln	112.79
12	Vegetated Area	4.73
13	Open Area / Playground	22.64
14	Layout	24.01
15	Waterlogged	1.88
16	Film City / Amusement / Theme Park	48.26
<i>Sub-total</i>		<i>253.1</i>
<b>TOTAL</b>		<b>990.74</b>

The settlement / built-up area in the GP covered about 114.18 ha, which was further delineated as village settlement (87.0 ha), and hamlet & dispersed household (27.18 ha). Wastelands occupied 212.08 ha area. Water bodies covered an area of 258.69 ha. Other LULC classes covered the remaining area of 253.1 ha (*Table 8: Area estimates of various LULC classes in Sembarambakkam GP*).

The land use distribution of Sembarambakkam village is typical of peri urban area exhibiting more urban character rather than rural. Sembarambakkam village has a significant area under agriculture at 20% of total area, however land under open



scrub was also significantly high at 28% of total land area in 2011. The other significant land use in terms of area is under the classification core urban at 28%. Water bodies in the form of Tanks constitute about 24% of the overall area, because a part of the Sembarambakkam tank falls within the village boundary. Subsequent development led to reduction in the crop land and open space areas. This was in the form of housing development. The village does not have any significant natural resources. There is no reserve forest or protected areas within the village.

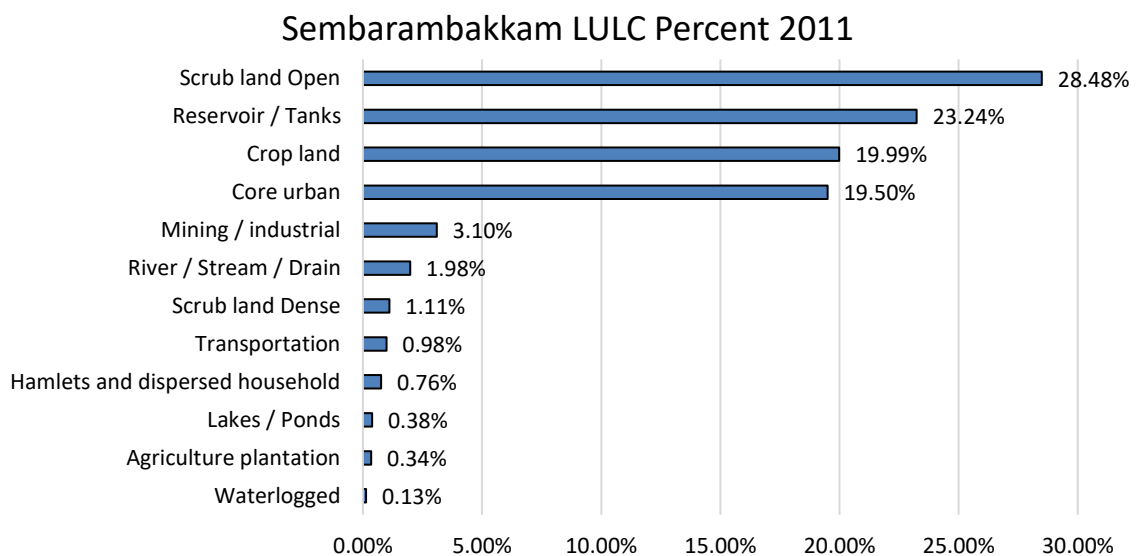


Figure 5: Land use and Land cover percentage of Sembarambakkam GP in 2011

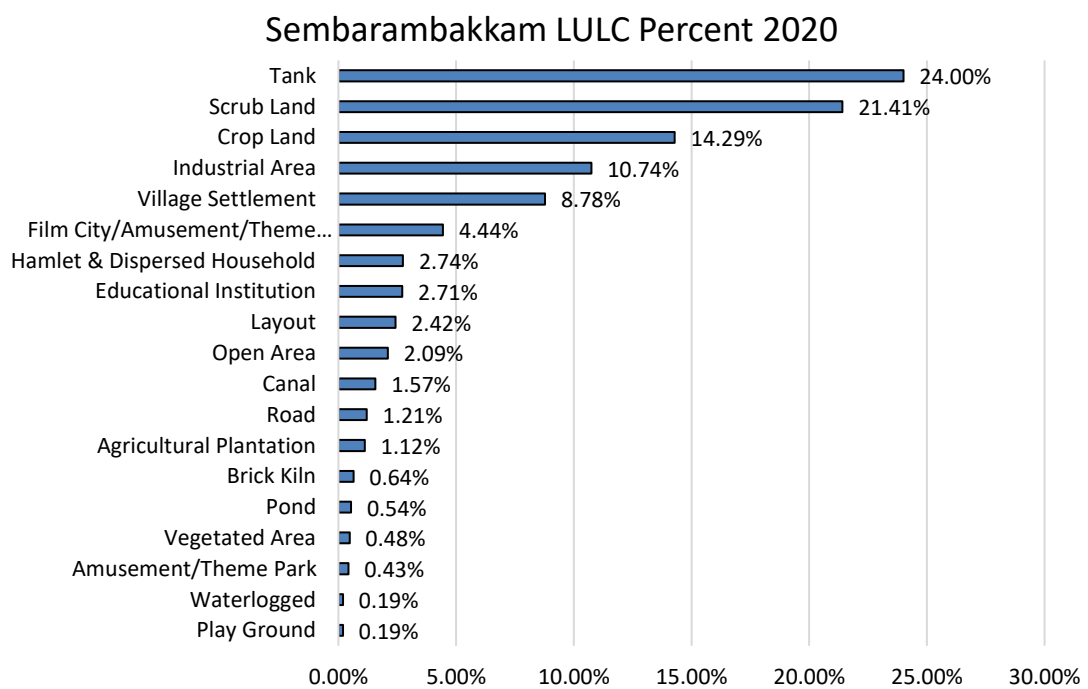
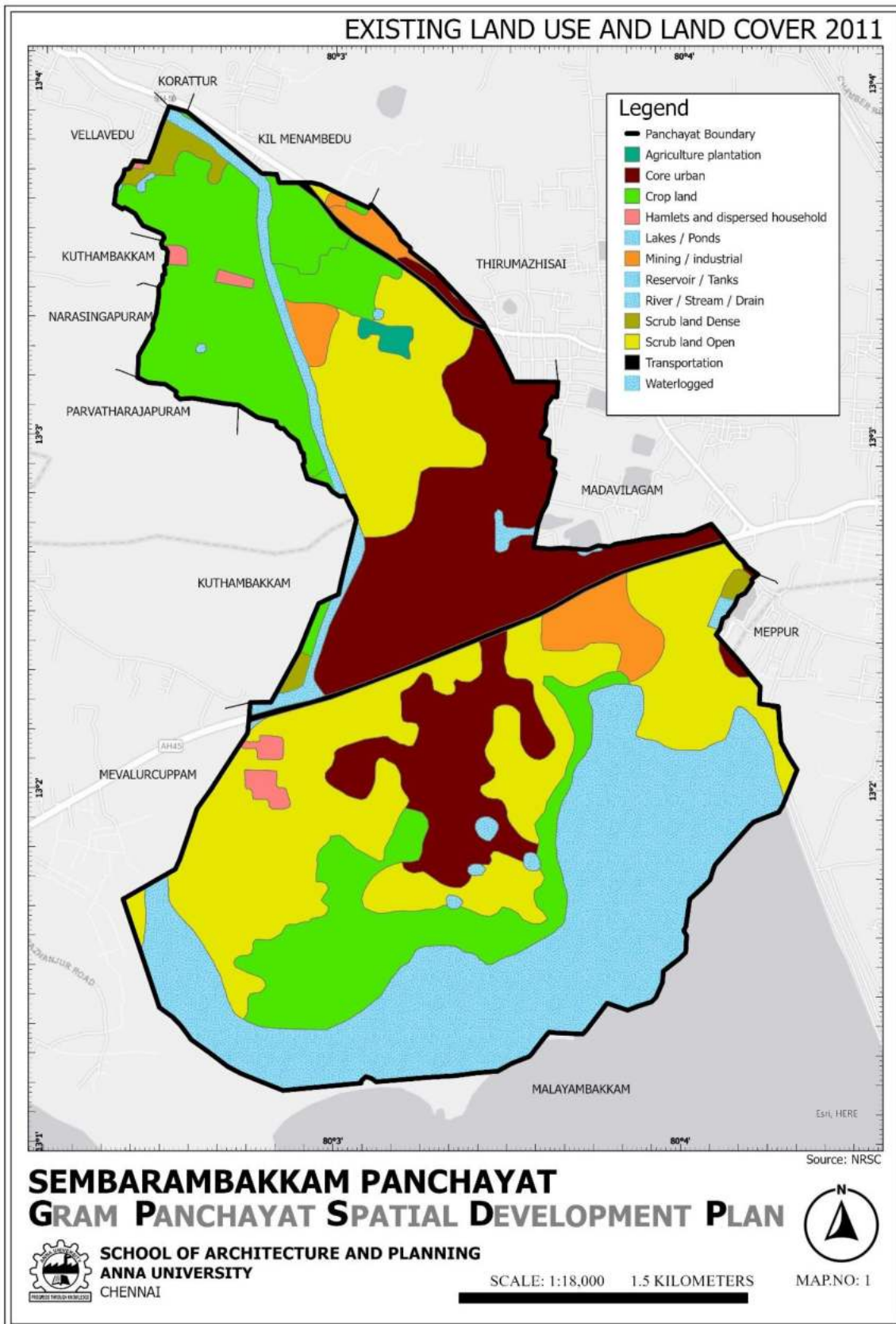
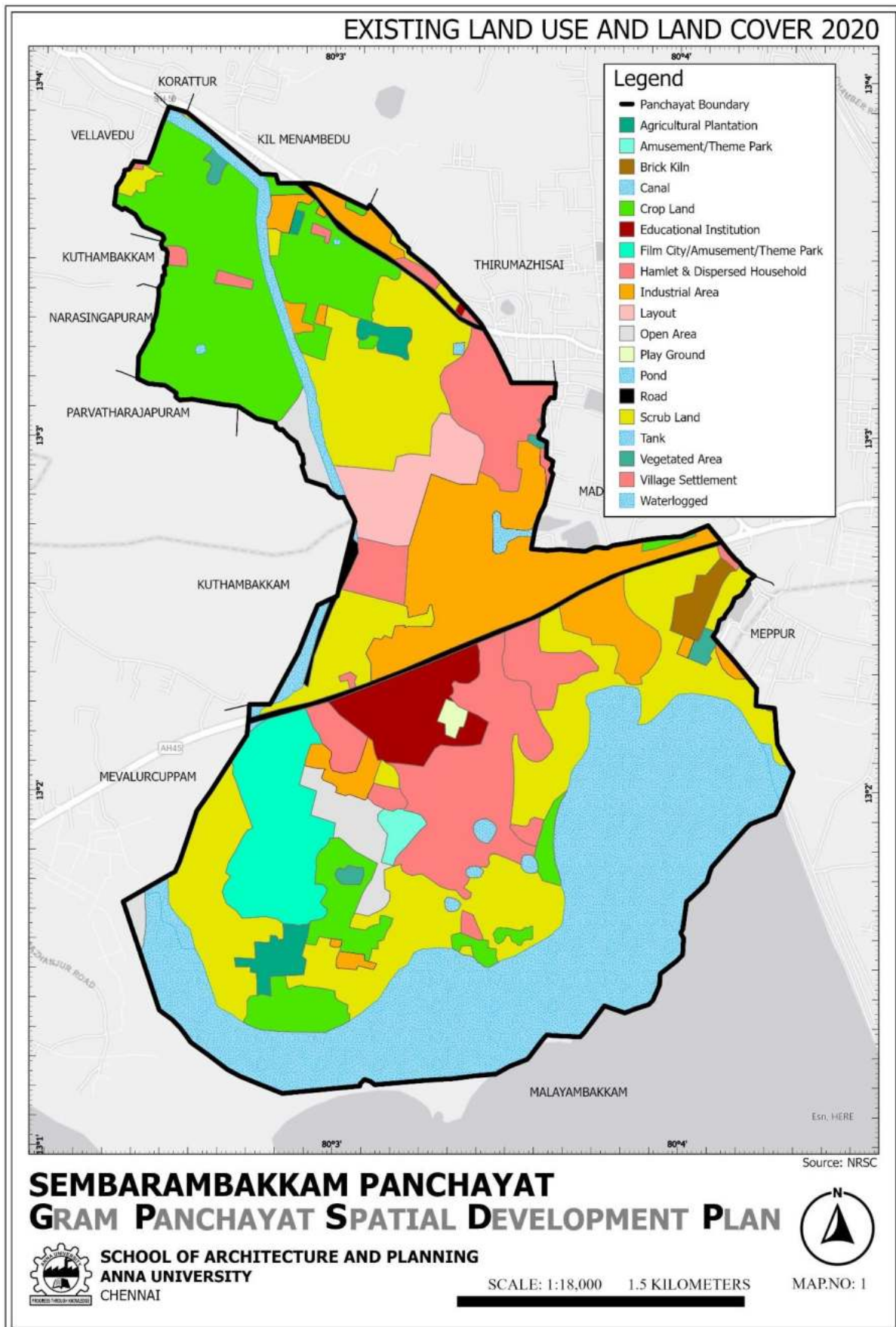


Figure 6: Land use and Land cover percentage of Sembarambakkam GP in 2020



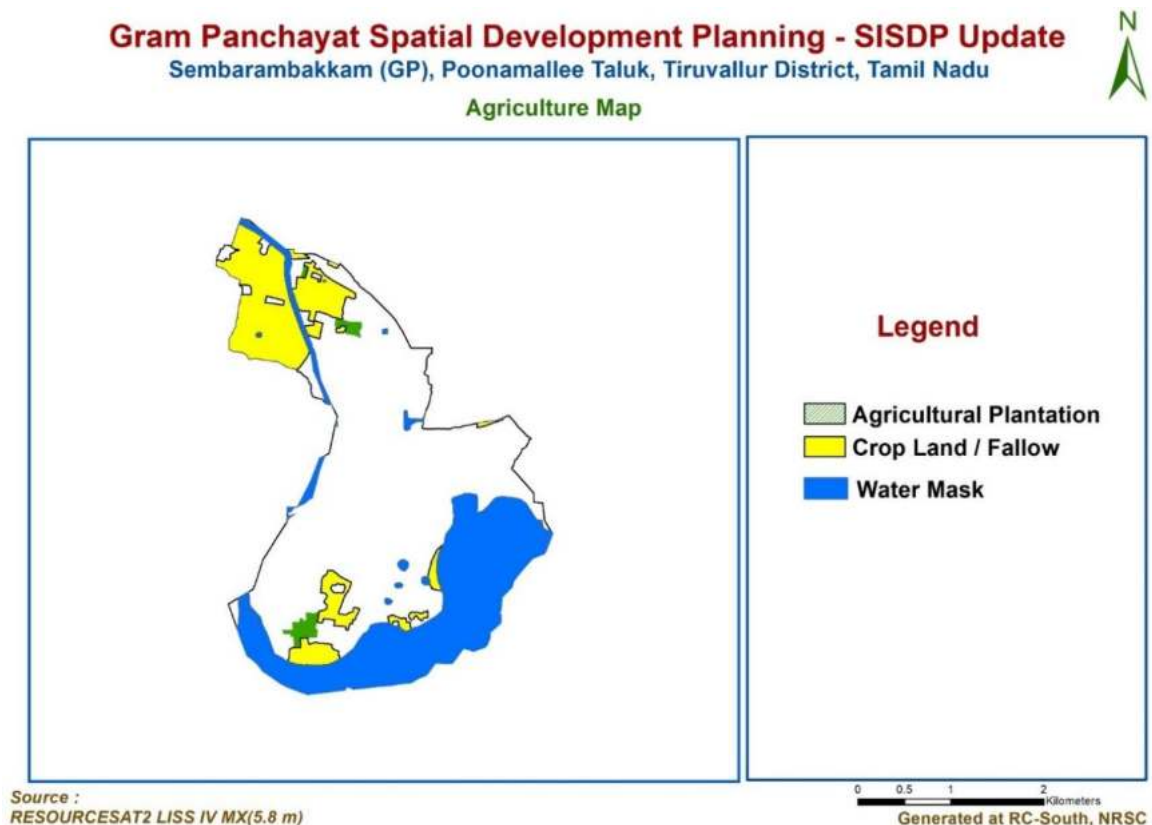
Map 12: Existing Land use Land cover 2011 from NRSC



Map 13: Existing Land use and Land Cover 2020 from NRSC

### 2.7.5 AGRICULTURAL USE

Rural settlements are generally sparsely populated and are mostly in agricultural use. To determine the state of rural nature in the GP, Agricultural land use areas is delineated from LULC of Sembarambakkam GP (Map 14: Agricultural Land-use in Sembarambakkam GP). The result depicts reversely, like sparsely used agricultural land and mostly in settlement area. From which, the land-use change analysis is recommended to understand the state of change in rural nature.



Map 14: Agricultural Land-use in Sembarambakkam GP

### 2.7.6 RAINFALL & RUNOFF ESTIMATES

It is located northeast part of Tamil Nadu and lies in the North latitude between 12°15' and 13°15' East longitude between 79°15' and 80°20'. The average rainfall of the district Tiruvallur is 1104 mm. Out of which 52% has been received during Northeast monsoon period and 41% has been received during Southwest monsoon period. The rainfall data for Sembarambakkam has been obtained from IMD Daily Gridded Rainfall Data Set Over India with grid cell size of (0.25 x 0.25 degree). The annual rainfall of Sembarambakkam varied between 319.1 mm to 2410.4 mm during the period 1980-2010 indicating the temporal variability.

Runoff is a general term to indicate the accumulation of excess rainfall, which traverses over surface/sub surface and occurs when rainfall intensity is greater than the rate at which it is able to infiltrate the soil. In this study, one of the most widely used technique USDA Natural Resources Conservation Service (NRCS) Curve Number (CN) method was used for assessment of runoff potential for GP (USDA-SCS, 1985). The spatial distribution of runoff in the study area was computed. Quantitative assessment of runoff serves as basic information for adopting suitable soil and water conservation measures in a watershed/Gram Panchayat. The rainfall and runoff estimates have been given in Table 9: Rainfall and Runoff variability estimates of Sembarambakkam GP. From the table it is seen that the runoff coefficient varies between 0.14 to 0.41.

**Table 9: Rainfall and Runoff variability estimates of Sembarambakkam GP**

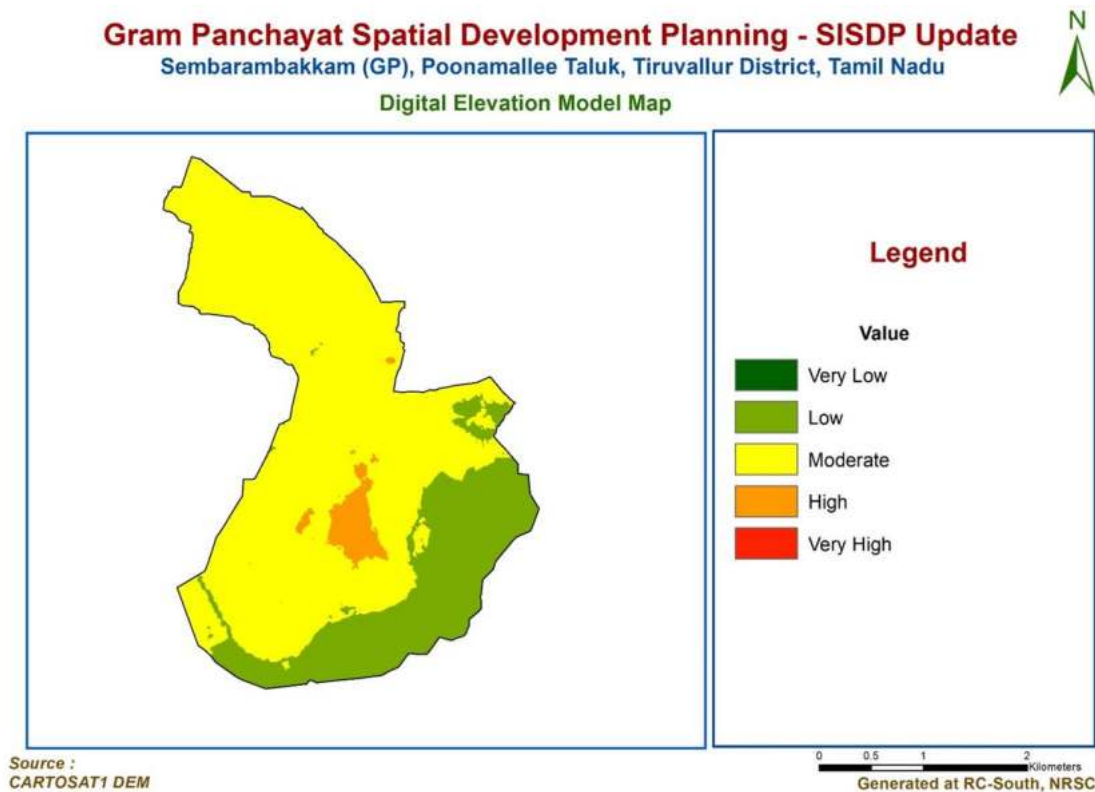
Year	Rainfall (mm)	Runoff	Rainy Days	Meteorological Year	Runoff coefficient
1979	1213	177.1	87	Normal	0.146002
1980	1328.4	294.7	66	Normal	0.221846
1983	1590.4	442.3	86	Normal	0.278106
1984	1897.6	659	78	Wet	0.347281
1985	1657.8	466.9	91	Wet	0.281638
1986	1363	277.4	72	Normal	0.203522
1988	1230.1	255.7	65	Normal	0.207869
1989	1114.3	171	70	Normal	0.15346
1990	1842	486.3	101	Wet	0.264007
1991	1591.9	488.1	79	Normal	0.306615
1992	1056.1	165.8	63	Normal	0.156993
1994	1439.6	499.5	76	Normal	0.346971
1995	1550.5	239.8	82	Normal	0.15466
1996	1995.9	824.6	73	Wet	0.413147
1997	1594.4	335.3	93	Normal	0.210299
2005	2410.4	709.2	96	Wet	0.294225
2006	1213.8	205.2	69	Normal	0.169056
2007	1232	257.6	75	Normal	0.209091
2008	1378.2	319.4	67	Normal	0.231752
2009	1105.8	231.4	56	Normal	0.20926
2010	1975.2	394.2	96	Wet	0.199575

The spatial distribution of runoff in the study area was computed. Quantitative assessment of runoff serves as basic information for adopting suitable soil and water

conservation measures in a watershed/Gram Panchayat. The rainfall and runoff estimates have been given in Table 9: Rainfall and Runoff variability estimates of Sembarambakkam GP, From the table it is seen that the runoff coefficient varies between 0.15 to 0.46.

### 2.7.7 DIGITAL ELEVATION MODEL (DEM)

A digital elevation model (DEM) is a representation of elevation data and is the important parameters for developmental activities in an area. The DEM was derived from CARTOSAT stereo data, which is very much essential for generation of slope and contour maps. DEM is used to determine the topography and slope of the study area. The Digital elevation Model of the GP is represented in the *Map 15: Digital Elevation Model of Sembarambakkam GP*.

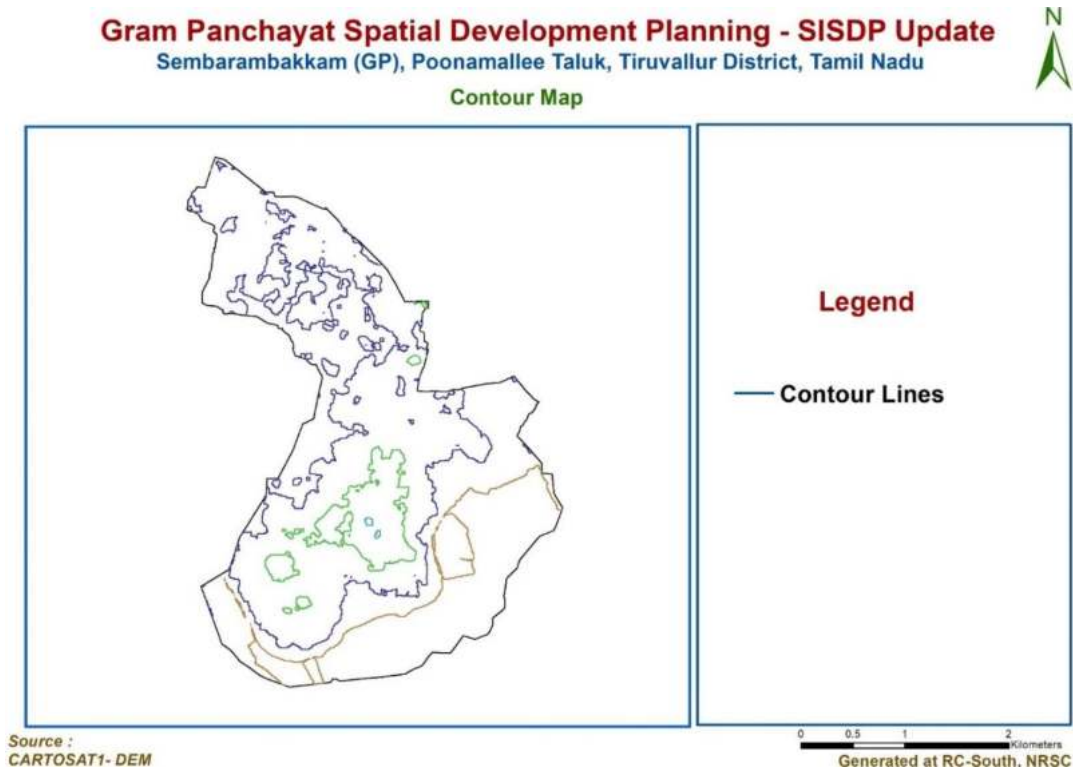


Map 15: Digital Elevation Model of Sembarambakkam GP

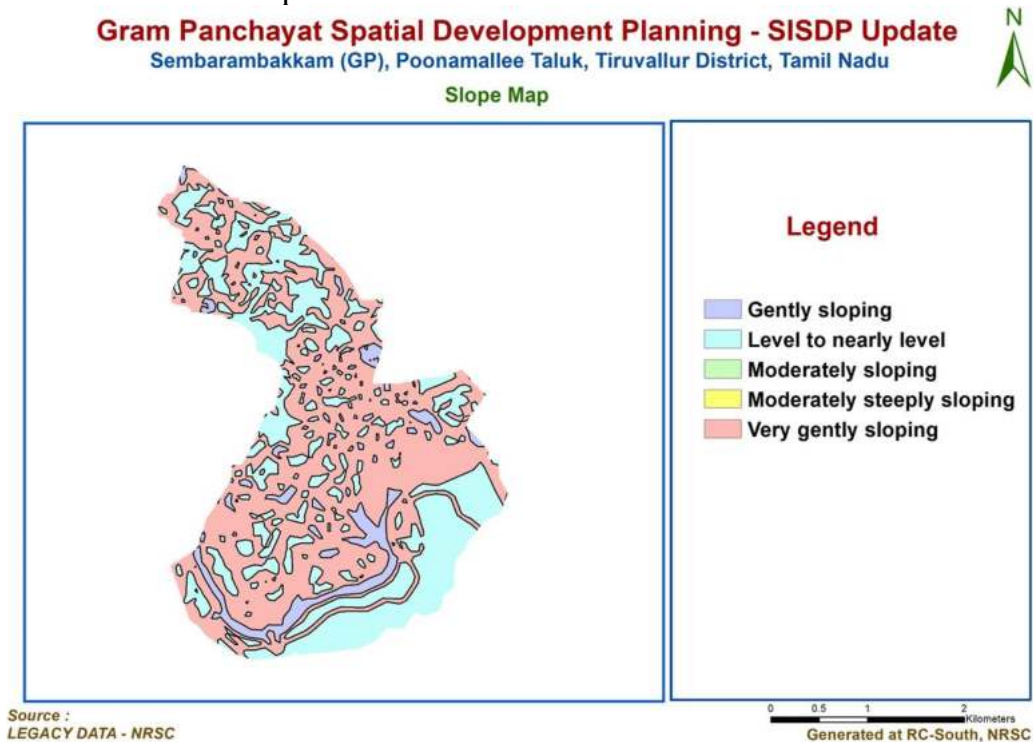
### 2.7.8 TOPOGRAPHY AND SLOPE

Topography is a measurement of elevation, and slope is the percent change in that elevation over a certain distance. The topography is represented with lines that connect points representing the same elevation, called Contours. The Contours at 5m interval and Slope of Gram Panchayat was generated and represented as Map 16:

Contour Interval of Sembarambakkam GP and Map 17: Slope terrain of Sembarambakkam GP respectively. The contour determines the local runoff which is useful to prepare the Drainage network plan and the slope is utilized to determine the Water resource conservatory locations.



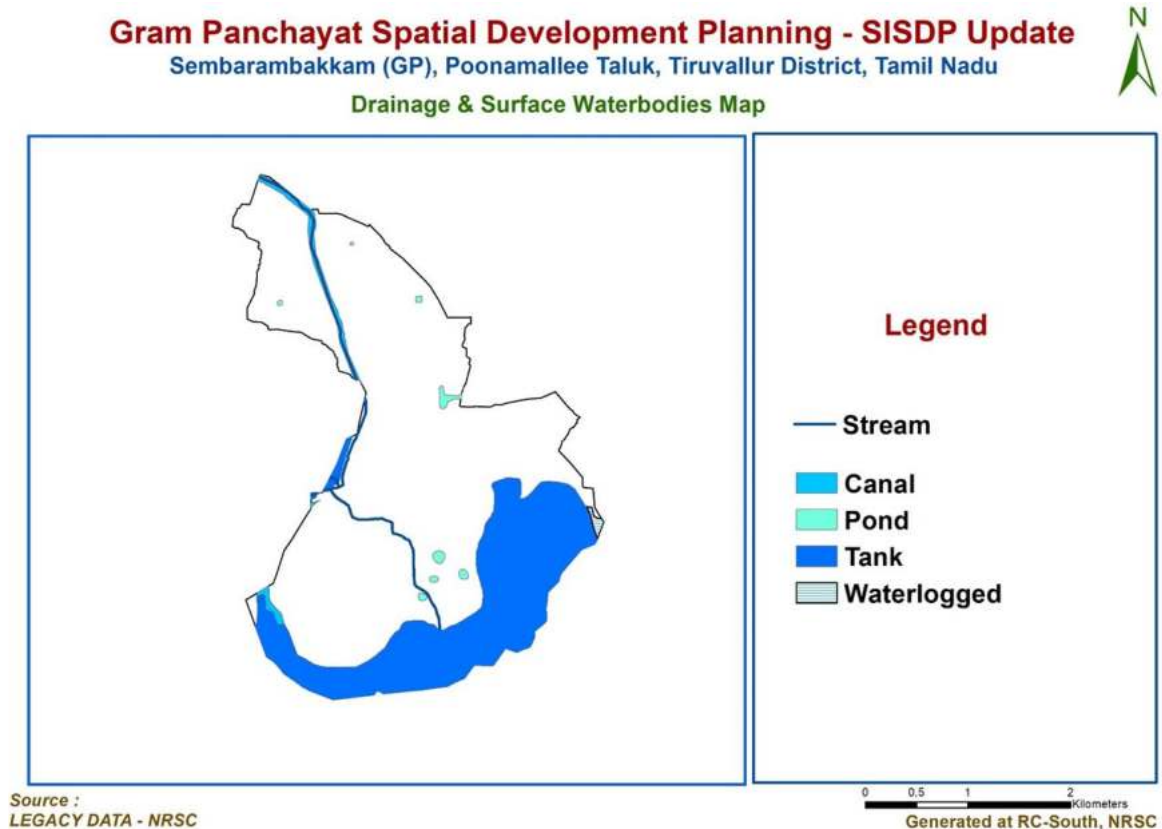
Map 16: Contour Interval of Sembarambakkam GP



Map 17: Slope terrain of Sembarambakkam GP

### 2.7.9 DRAINAGE NETWORK & SURFACE WATER BODIES

Rivers/streams are natural course of water flowing on the land surface along a definite channel and its spatial distribution in the GP is shown as *Map 18: Drainage & Surface Waterbodies of Sembarambakkam GP*. From the Drainage network, the estimates length of the drainage is 5.66 km.



Map 18: Drainage & Surface Waterbodies of Sembarambakkam GP

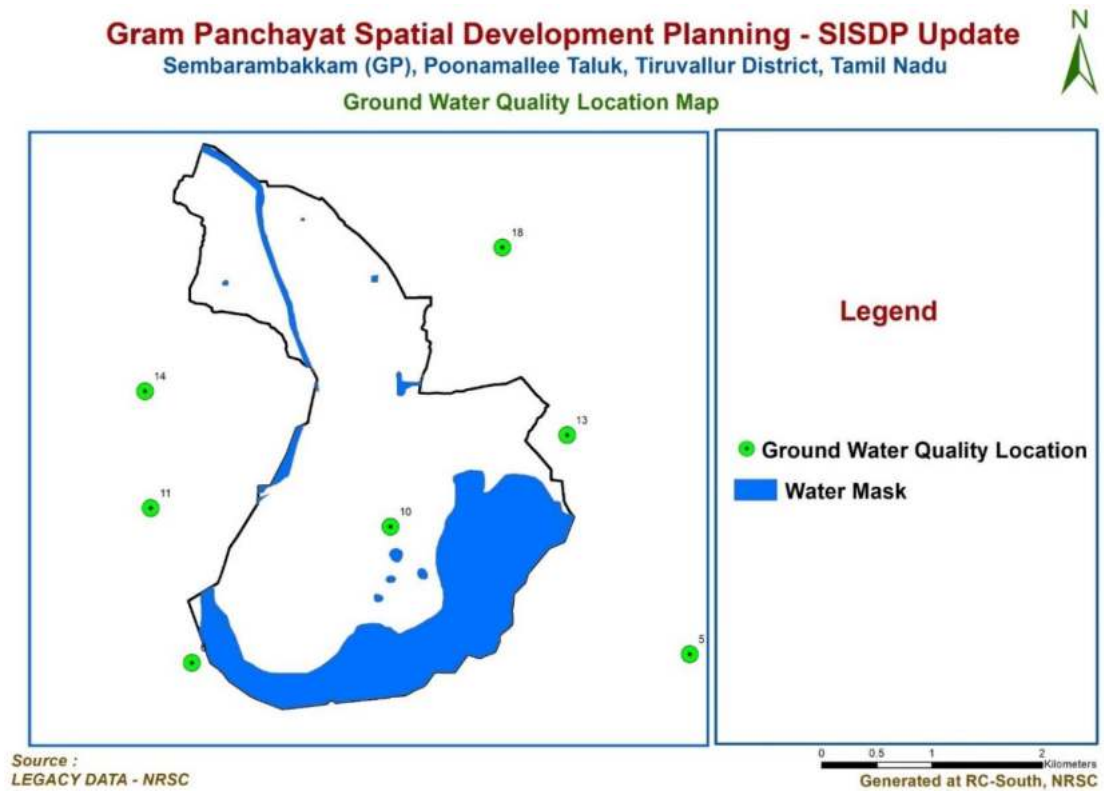
### 2.7.10 GROUND WATER QUALITY

Ground water quality well location map is depicted in Map 19: Ground water Quality Locations of Sembarambakkam GP and the details of pH, Total Dissolved Solids, Hardness, Chemical Constituents like Iron, Chloride, Nitrate and Sulphate content, Alkalinity and Water Quality (Potable, Non-Potable) are given in *Table 10: Ground Water Quality Parameters – Sembarambakkam GP*.

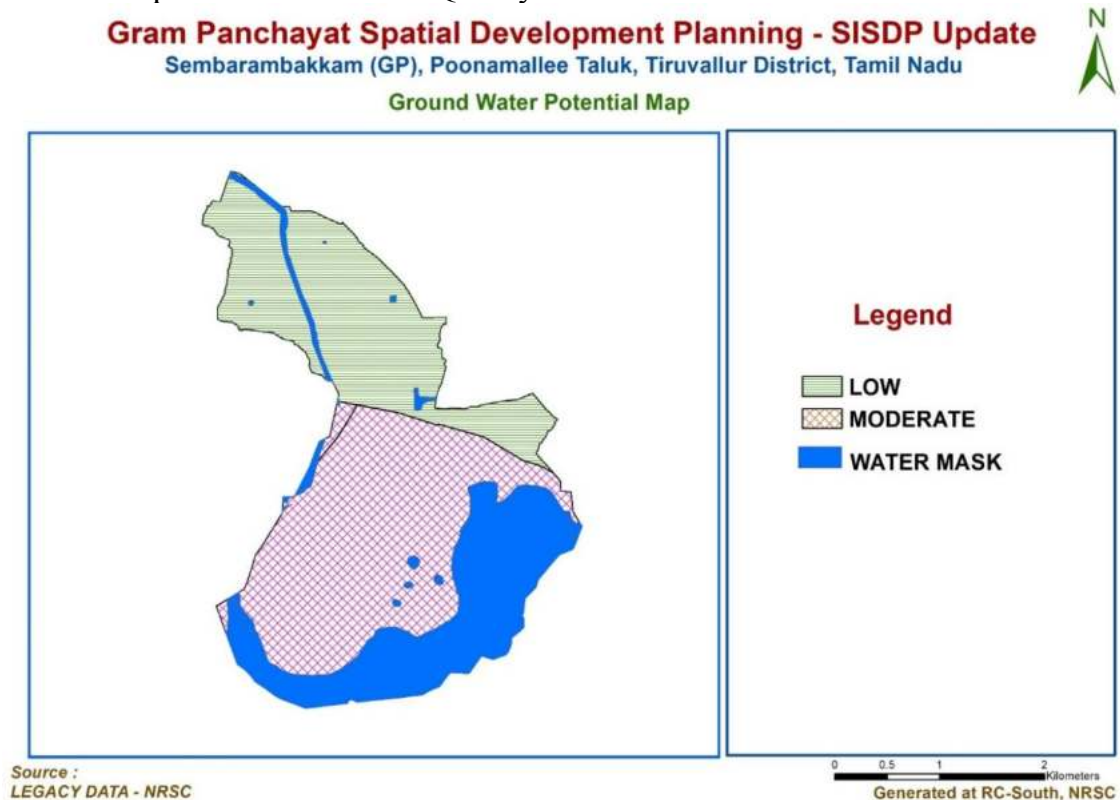
Availability of groundwater cannot be assessed directly from remotely sensed data. Hence, its presence must be inferred from manifestation of surface features which act as an indicator of groundwater. Ground water potential map generated under Rajiv Gandhi Drinking Water Mission carried by NRSC was used for planning



purpose after updating with high resolution satellite data (Map 20: Ground water potential of Sembarambakkam GP).



Map 19: Ground water Quality Locations of Sembarambakkam GP



Map 20: Ground water potential of Sembarambakkam GP

Table 10: Ground Water Quality Parameters – Sembarambakkam GP

<b>Ln</b>	<b>pH</b>	<b>TDS</b>	<b>Hardness</b>	<b>F –</b>	<b>Cl –</b>	<b>NO3-</b>	<b>SO<sub>4</sub><sup>2-</sup></b>	<b>Alkalinity</b>	<b>GWQ</b>
5	7.35	506	255	0.5	0	16	21	155	P
6	7.69	358	135	1.1	0	0	15	176	P
10	7.5	1064	318	0.2	319	9	172	169	P
11	7.54	167	51	0.2	18	13	20	76	P
13	7.37	655	243	0.8	56	9	172	252	P
14	7.03	567	224	0.7	79	11	100	173	P
18	7.09	413	167	0.9	67	17	52	140	P

*\*P- Potable, NP – Non-Potable*

## CHAPTER 3

### 3 CHARACTERISTIC ANALYSIS OF THE VILLAGE

#### 3.1 DEMOGRAPHIC CHARACTERISTICS

From the demographic analysis of Sembarambakkam village, the social composition of the village, age group, sex ratio, racial character and the demographic changes over a period time, have been understood. This analysis is not only limited to the characteristics of the community, but also determines the information about the capacity for future planning and investment.

Table 11: Demographic Statistics of Sembarambakkam GP

Year	1981	1991	2001	2011	*2020
<b>Population</b>	2445	4662	3649	5709	12132
Population growth rate (Annual)	-	9.07%	-2.17%	5.65%	11.25%
Population Density (Per sq.km)	354	676	529	827	1758
<b>Male</b>	1211	2347	1835	2877	6094
<b>Female</b>	1234	2315	1814	2832	6038
Sex Ratio (Females per 1000 Males)	1019.0	986.4	988.6	984.4	990.9
<b>Households</b>	546	1166	864	1503	3033
<b>Literate</b>	841	2286	2244	4132	NA
<b>Illiterate</b>	1604	2376	1405	1577	NA
Literacy Rate (Percent)	34.40%	49.04%	61.50%	72.38%	NA
<b>Worker Population</b>	NA	1967	1423	2133	NA
<b>Non-Worker Population</b>	NA	2695	2226	3576	NA
Employment Rate (Percent)	NA	42.19%	39.00%	37.36%	NA

*Source: Census of India and \*Village panchayat estimate, 2020*

#### 3.1.1 POPULATION GROWTH

Sembarambakkam village has a population of about 12,132<sup>2</sup> in 2020 which has a steep decadal growth by 112.51% from 5,709 (census 2011), as described in Figure 7: Population Growth over the decade 1981 - 2020. The figure shows rapid decadal average growth of about 56.45% between the year 2001 and 2011, which is

<sup>2</sup> - As per Village Panchayat estimate, 2020  
NA – Data Not Available

much higher when compared to the 15.6% decadal average growth of Tamilnadu state and 35.33% decadal average growth of Tiruvallur district during the same period.

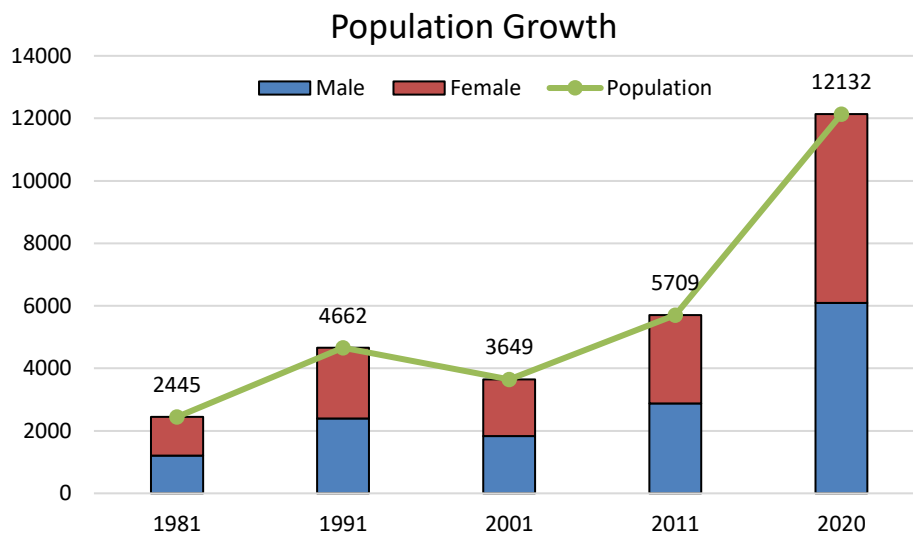


Figure 7: Population Growth over the decade 1981 - 2020  
 Source : Census of India and Village panchayat Estimate, 2020

### 3.1.2 POPULATION DENSITY

Population density is one of the important indices for population concentration. The village is spread across 6.99 sq.km. The population density of Sembarambakkam is 816.74 persons per sq.km in 2011 which is much higher when compared to the state average of 555 persons per sq. km.

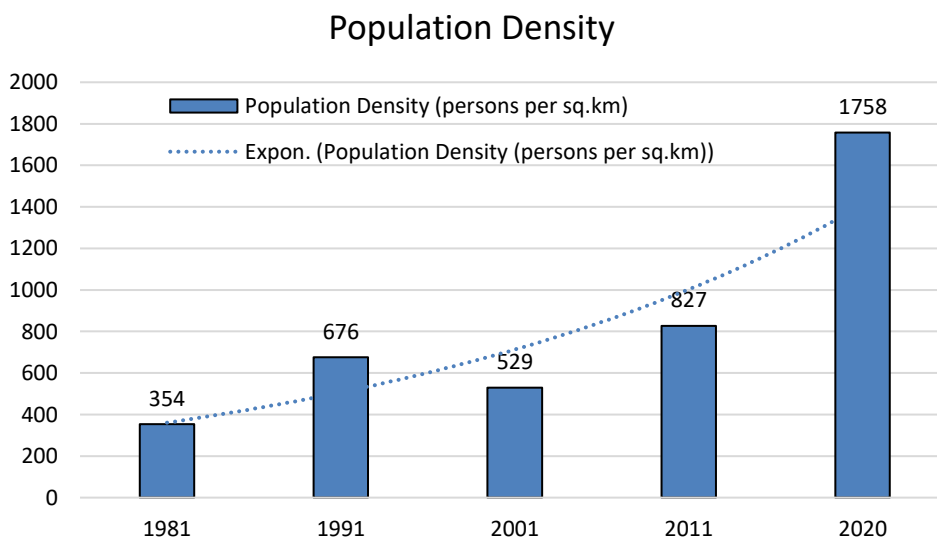


Figure 8: Population Density of Sembarambakkam GP  
 Source: Census of India and Village panchayat estimate, 2020

Population density of Sembarambakkam has seen a sharp growth since 2011, due to the developments of Thirumazhisai township and various social amenities which were established on the NH4. In 2020, the population density of Sembarambakkam has increased to 1735.62 persons per sq.km.(Figure 8: Population Density of Sembarambakkam GP).

### 3.1.3 SEX RATIO

According to Census, the sex ratio of the village in 2011 was 984 females per 1000 males which is almost similar to the Thiruvallur district sex ratio of 987 females per 1000 males. There has been a decrease in sex ratio in Sembarambakkam from 988 females per 1000 males in 2001.

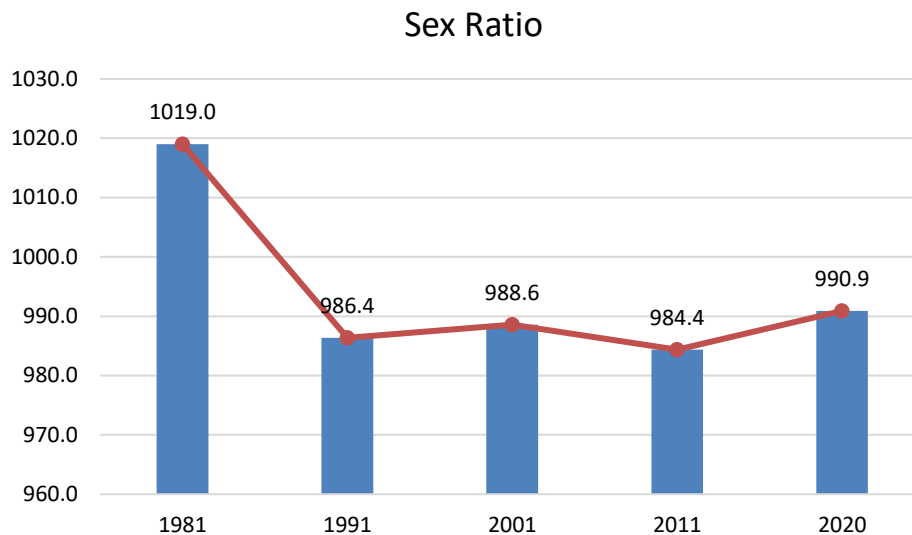


Figure 9: Sex ratio of Population in Sembarambakkam GP  
*Source: Census of India and Village panchayat estimate, 2020*

### 3.1.4 HOUSEHOLD GROWTH

A household includes all the persons who occupy a housing unit as their place of residence. The occupants may be a single family, one person living alone, two or more families living together, or any other group of related or unrelated persons who share living arrangements. According to 2011 census, Sembarambakkam has 1503 households in 2011, and has increased twofold to 3033 households<sup>3</sup> in 2020.

<sup>3</sup> - As per Village Panchayat estimate, 2020

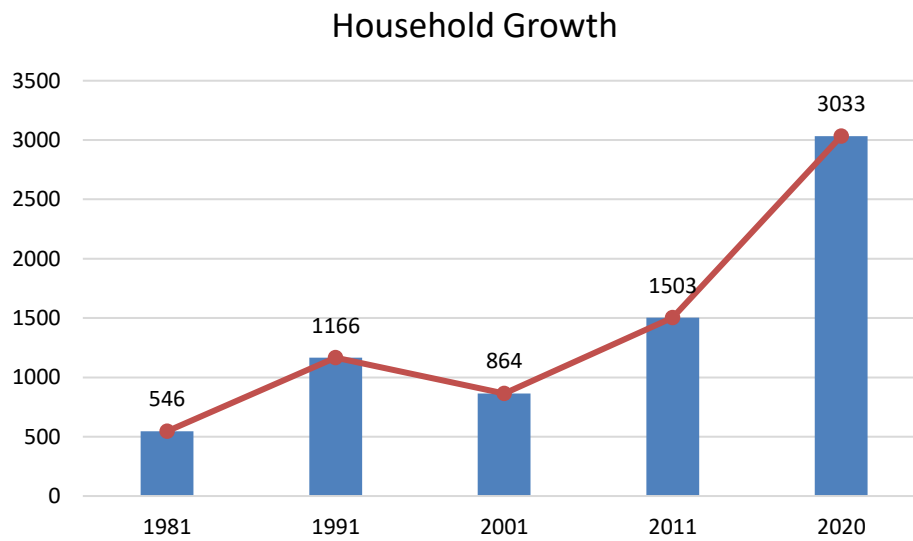


Figure 10: Household Growth over the year 1981 – 2020  
 Source: Census of India

### 3.1.5 LITERACY RATE

The literacy rate (or illiteracy rate) suggests the existence of an effective primary education system and/or literacy programmes existing in the village. The Literacy rate of Sembarambakkam village has increased from 34.4% in 1981 to 72.38% in 2011, which is the lowest on comparison with the Tiruvallur district average of 84%.

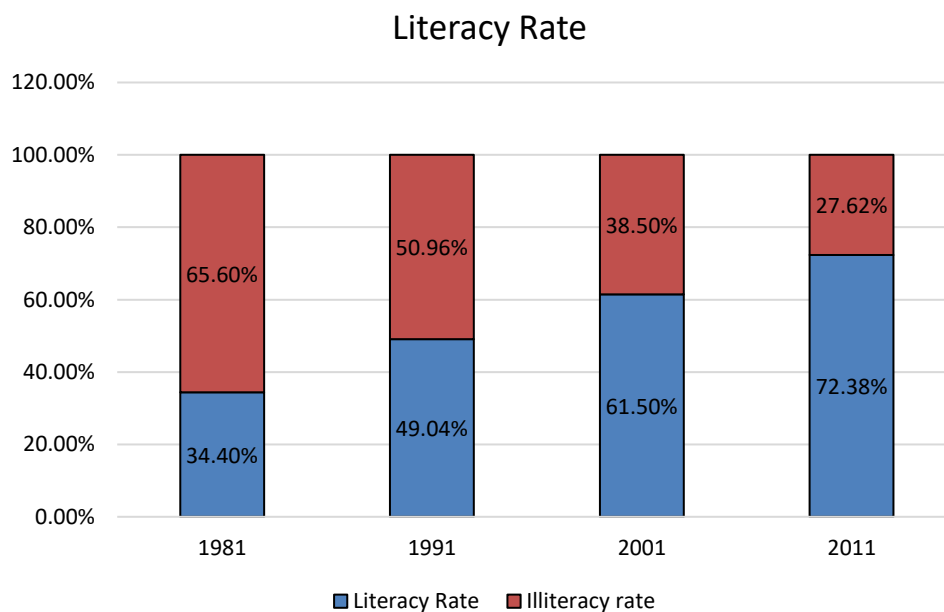


Figure 11: Literacy rate over the year 1991 – 2011  
 Source: Census of India

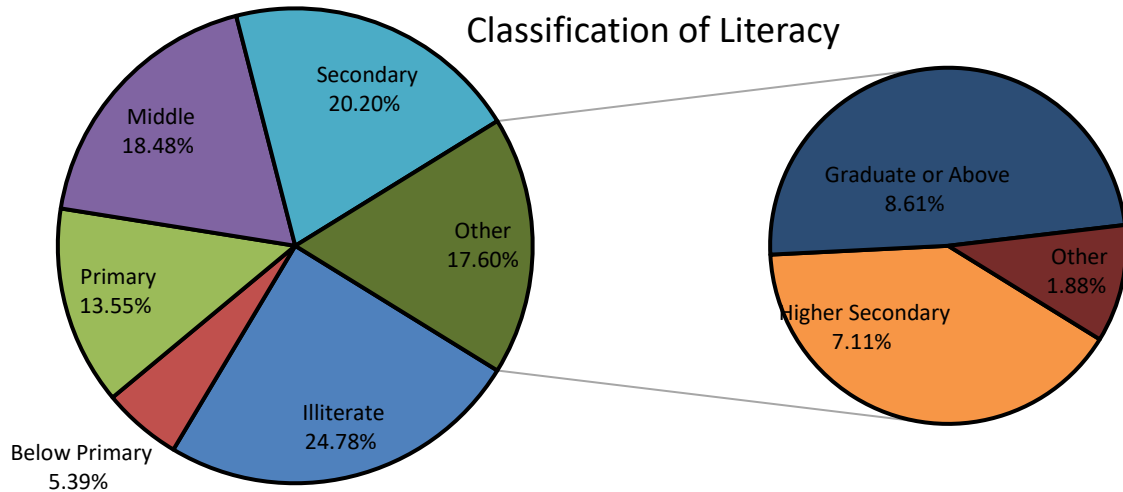


Figure 12: Classification of Literacy rate, 2020  
 Source: Primary sample survey, 2020

Based on primary sample survey conducted, about 63.23 % are literates. About 36.76 % of the population are illiterates. 85.5 % of the village population has literacy level upto high school .

### 3.1.6 EMPLOYMENT RATE

The employment rate is the best measure of the health of the economy as it measures the proportion of the working age population that are employed. According to the primary sample survey, Sembarambakkam has 37.36 % of population engaged in main or marginal work . There is a sharp decline in non-working population from 62.63% in 2011 to 13% in 2020 as shown in the Figure 13: Trends of Employment over the year 1991 - 20.

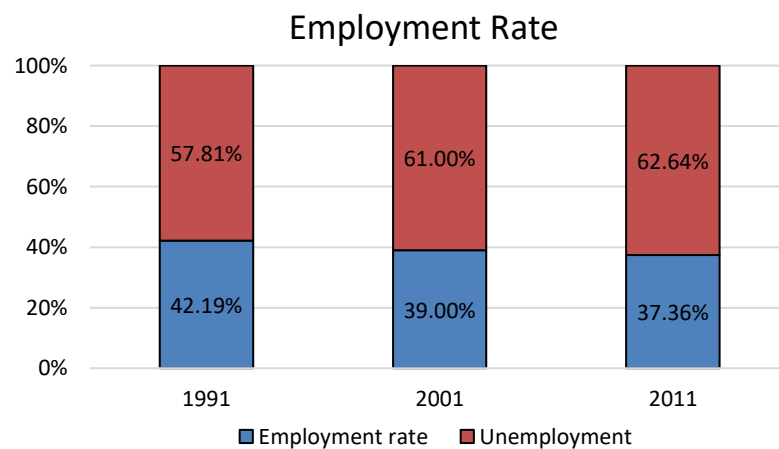


Figure 13: Trends of Employment over the year 1991 - 2011  
 Source : Census of India

### **3.2 LAND-USE CHANGE ANALYSIS**

Land is a limited resource and has pressure from social, economic and environmental needs, including urbanization, industrialization, mining, transportation, rural development, protection of environmentally sensitive zones and resource areas. Unplanned development in rural, peri-urban areas and that in the vicinity of national and state highways also has adverse social, environmental and health hazards. Spatial planning in rural areas is of paramount importance in order to have well-designed rural communities, as well as scientific and orderly disposition of land resource.

This would in turn, foster economic development and contribute to the ease of living along with improvement in the quality of life. The study of land use and land cover (LULC) changes is very important to have proper planning and utilization of natural resources and their management. Knowledge about land use and land cover has become important to overcome the problem of biogeochemical cycles, loss of productive ecosystems, biodiversity, deterioration of environmental quality, loss of agricultural lands, destruction of wetlands, and loss of fish and wildlife habitat. This analysis was done to determine the land use and land cover status in the Sembarambakkam Village Panchayat and to identify land use changes, specially to understand the status of agriculture and the socio-economic development in the village.

#### **3.2.1 LAND USE AND LAND COVER**

Identification of land cover establishes the baseline information for thematic mapping and change detection analysis. It plays a significant role in rural planning by indicating the land utilization aspects, at local, regional and national levels. The present and past land use and land cover information of the Sembarambakkam village is extracted with the help of high-resolution satellite imagery by the NRSC team. From which the changes that are happening in the environment are determined. The LULC of the Sembarambakkam panchayat over the period are shown in the *Map 12: Existing Land use Land cover 2011 from NRSC* and the *Map 13: Existing Land use and Land Cover 2020 from NRSC* respectively. The percentage change of land use



over 2011 and 2020 is determined and represented in the *Table 12: Sembarambakkam- Percentage of land use change from 2011 – 2020.*

**Table 12: Sembarambakkam- Percentage of land use change from 2011 – 2020**

<b>Land use /Land cover</b>	<b>Area in sq.m-2020</b>		<b>Area in sq.m-2011</b>	<b>Change in Area</b>	<b>% of change</b>
Agricultural Plantation	111245.18	Agricultural-plantation	33793.00	77452.18695	229.20
Agricultural-Crop Land / Fallow	1415667.47	Agricultural-Crop land	1977994.98	-562327.508	-28.43
		Scrub land Dense	110256.42		
Scrub Land	2120842.83	Scrub land Open	2819055.22	-698212.39	-24.77
Vegetated Area	47284.14			47284.14	
Pond	53049.95	Lakes / Ponds	37786.90	15263.05	40.39
Tank	2378247.18	Tanks	2300210.61	78036.57	3.39
Canal	155681.38			155681.38	
Stream	16146.23	River/ Channels	196179.24	-180033.01	-91.77
Village Settlement	870028.84				
Layout area	240154.21				
Hamlet & Dispersed Household	271753.69	Hamlets and dispersed household	75412.54	196341.15	260.36
		Core Urban	1929840.84	-1929840.84	
Educational Institution	268408.27				
Open Area	207462.11				
Playground	18968.25				
Brick Kiln	63571.87				
Road	119511.45	Transportation	97451.65	22059.80	22.64
Amusement/Theme Park	482608.81				
Industrial Area	1064359.14	Mining / industrial	306527.78	757831.36	247.23
Water logged	18837.60	Water logged	12798.34	6039.26	47.18786
Total area	11116501.45		11618086.78		

*Source: NRSC - Land use and Land cover*

On comparison with LULC of 2011 and 2020, there is significant increase in Industrial area (247%) and a significant loss in open Scrub land (-25%) as well as agricultural crop land area (-28%). As the village was already developed in 2011 itself, majority changes in the built-up areas were not identified. Though a marginal

increase in residential and industrial areas were noticed, it was impossible to exactly analyse these changes. This is due to the fact that in 2011 land cover maps, a major area under built-up, was classified as core urban and in 2020 land cover maps, this core urban area has been differently classified as residential and industrial area. The drastic development of the village is due to the fact that the NH 4, Chennai -Bangalore national highway passes through the village, as such the land on both sides of the national highway are under high growth corridor influence. As a result, the village has two amusement parks, engineering colleges and significant industrial presence.

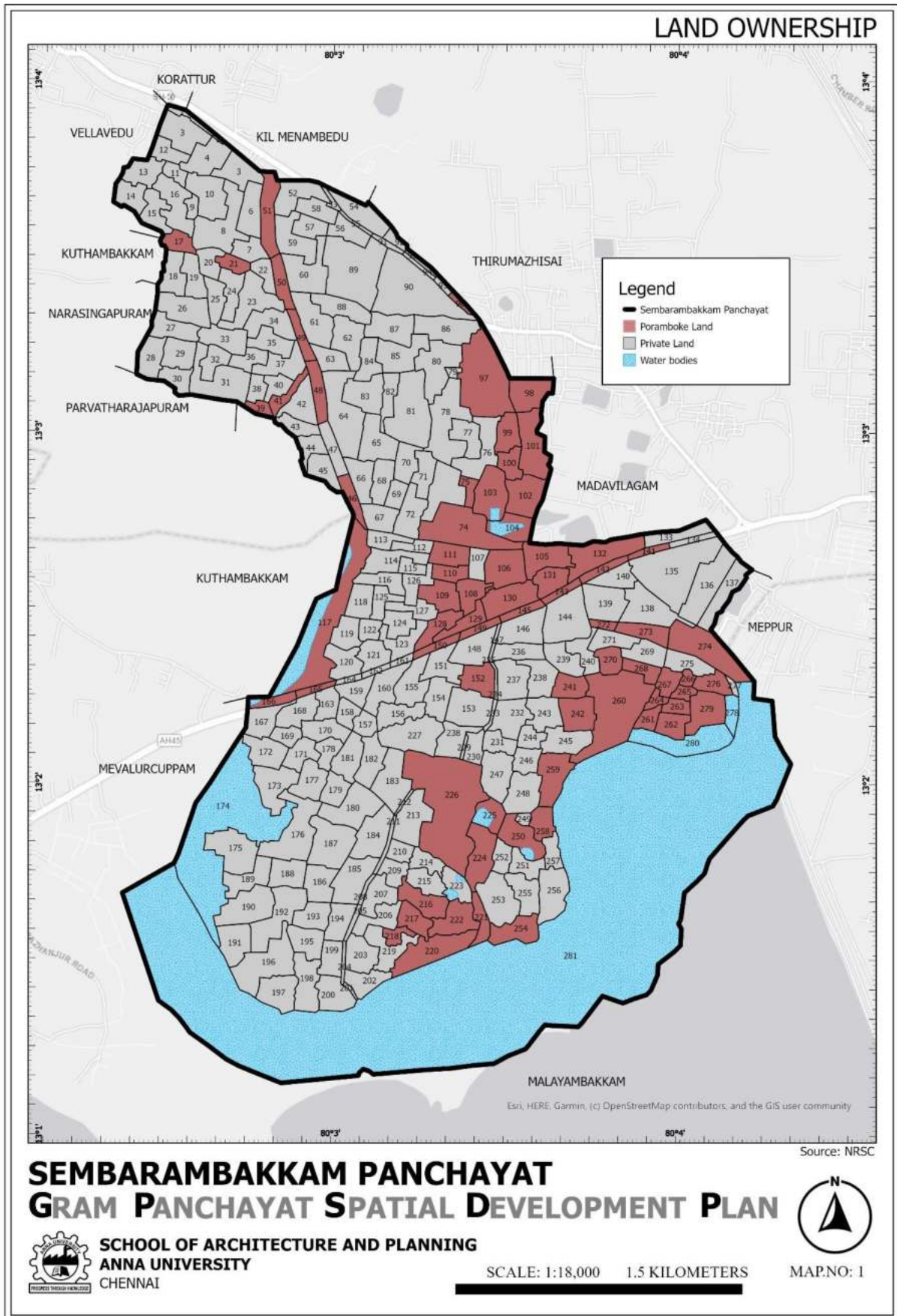
The Second Master Plan of Chennai extends its CMA Limits to the extent of 1189 Sq.km, which includes our study area Sembarambakkam village. Majority of the village has been classified as residential and industrial zones. Therefore, it is expected that development will intensify in this village in the future also. An encouraging trend is persistence of agriculture, even though it has decreased when compared to 2011. There is one playground within the village, other than that no open spaces exist for recreation, especially active recreation.

### **3.2.2 LAND OWNERSHIP**

The village falls under the Ryotwari system of land administration. The understanding of land ownership generally relies upon two major types of land classification. One is the ryotwari lands which consist of private ownership. These lands are under three categories; the Nanjai or traditional wetlands consisting of an area 21 hectares, and 20 acres; the Punjai or traditional dry lands consisting of a total area of 324 hectares, 70 acres and 5 sqm; and Manavari lands or traditional rain fed lands consisting of an area of 149 hectares, 38 acres and 5 sqm<sup>4</sup>. The second is the village common lands called as poramboke lands, owned by the government. These are the tanks, canals, burial grounds, foreshore of the water bodies, communal grazing grounds and the settlement area. The Map 21: Land ownership in Sembarambakkam GP shows the poramboke land in Sembarambakkam Panchayat.

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4 - The data is for Sembarambakkam revenue village, out of which the study area forms a part. It was not possible to get data specific to the study area



Map 21: Land ownership in Sembarambakkam GP

The purpose of determining the public and private land in the Sembarambakkam village is to recognize that public and semi-public facilities, provide necessary services to the community and also to propose new facilities without going for land acquisition.

### 3.3 HOUSEHOLD SURVEY DATA ANALYSIS

The social and economic sample survey analysis for the Sembarambakkam village, Thiruvallur district based on the survey conducted using the GPSDP Survey Application developed by NRSC, ISRO is provided. The findings are purely based on the analysis, evaluation and reviews of primary data collected from 369 households which is approximately 6% of the sample size. This is represented in the Figure 14: Distribution of Sample Household Survey conducted. The figure provides a description of the social and economic conditions and the social impact assessment of Sembarambakkam village.

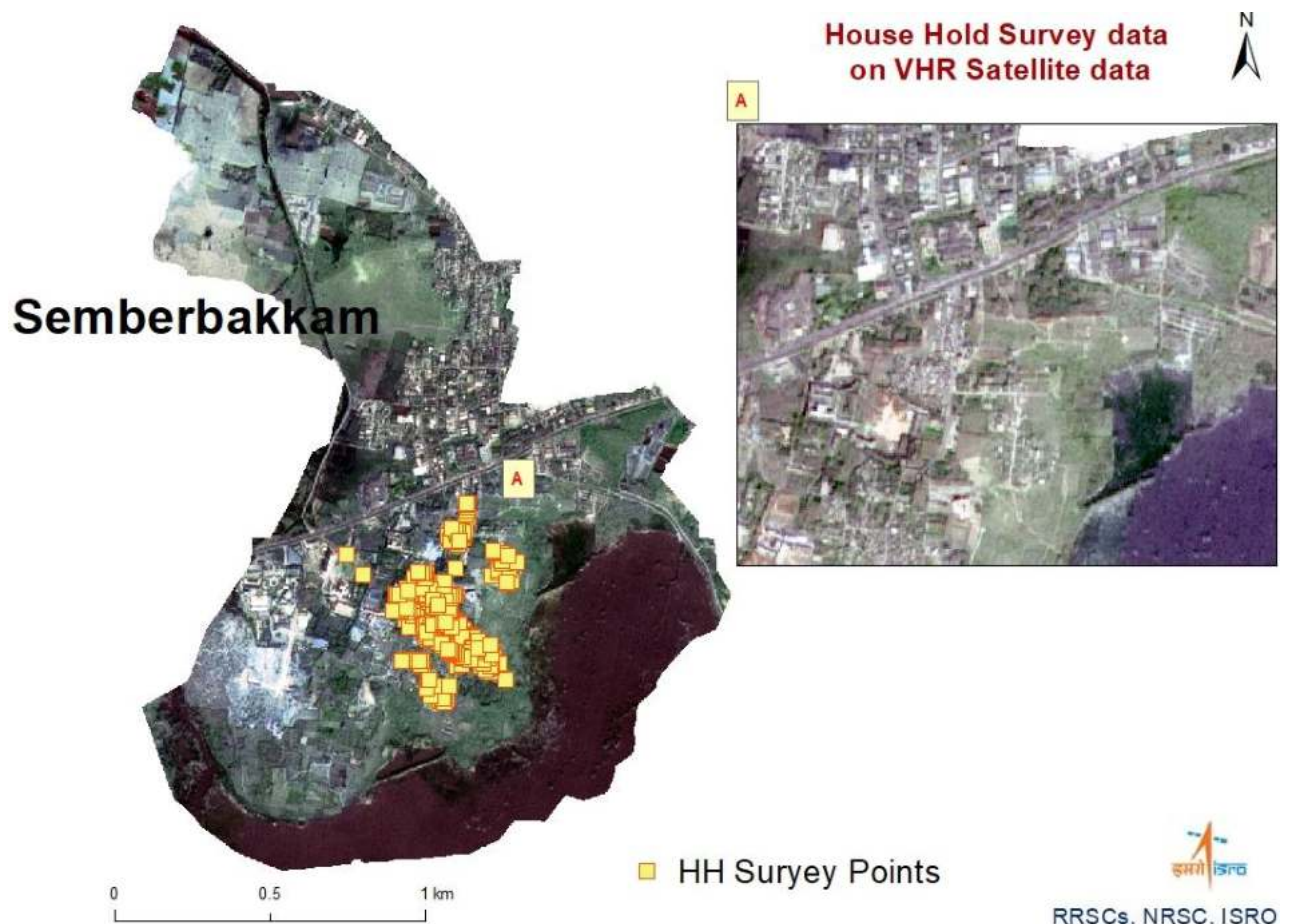


Figure 14: Distribution of Sample Household Survey conducted

### 3.3.1 HOUSING CHARACTERISTICS

#### 3.3.1.1 Housing Ownership

Most of the residents ( 83.42%) in Sembarambakkam own a house and only 17% of them live in a rented accommodation.

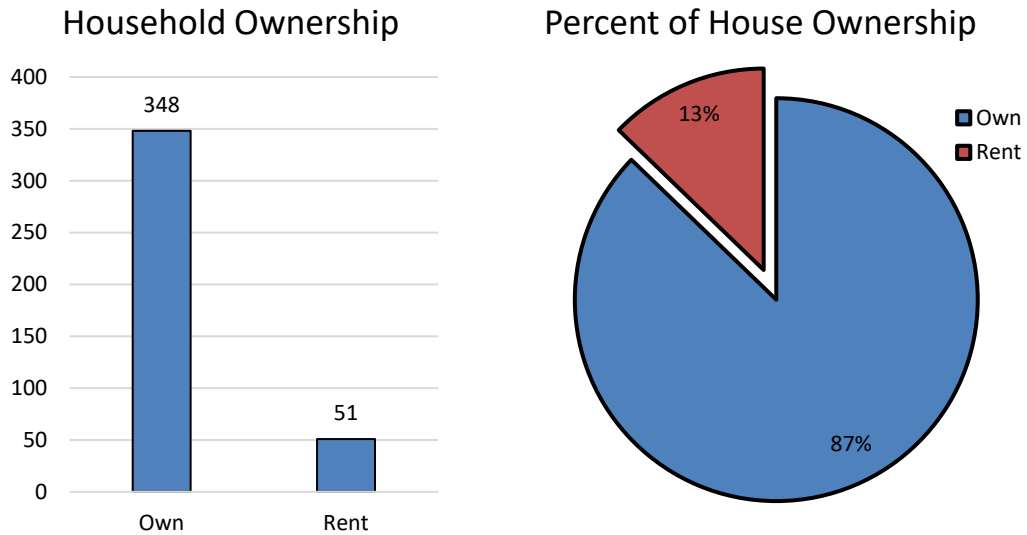
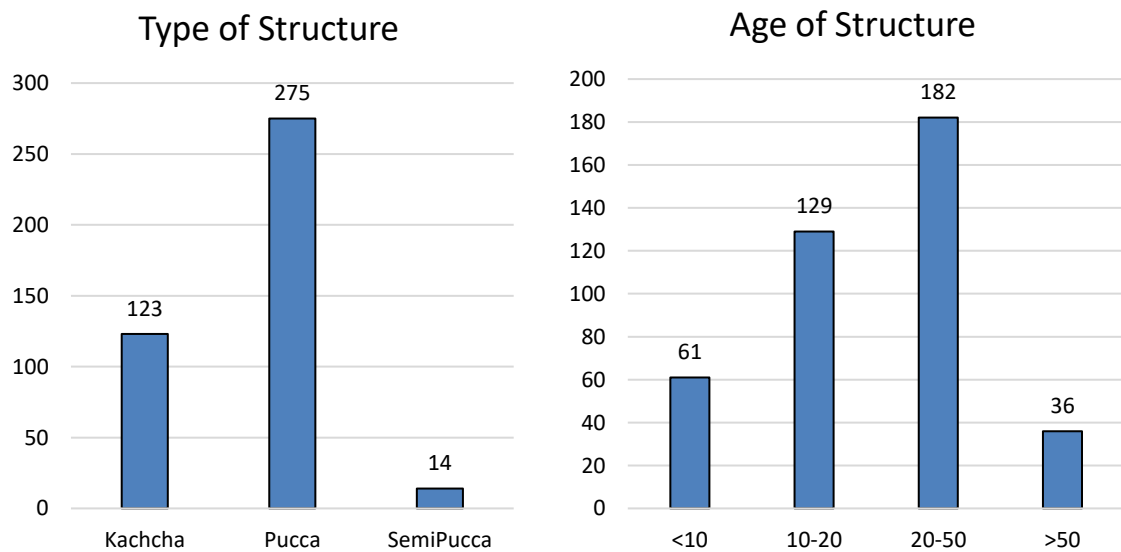


Figure 15: Distribution of Household Ownership

Source: Primary sample survey, 2020

#### 3.3.1.2 House Typology

Around 29 % of the houses are of Kutcha type and 66.74% are Pucca houses. 80.77% of the houses in the village are single storied building. Around 71.15% of the roofs are made of concrete and 14.96% are made of thatch.



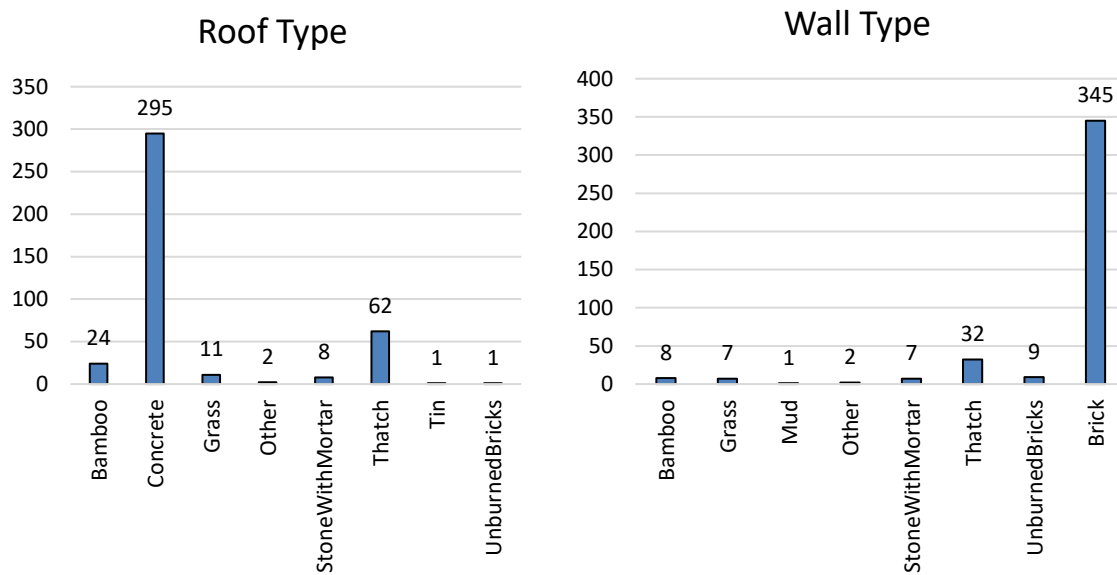


Figure 16: Housing Typology

### 3.3.1.3 Housing Tenure Status

In Sembarambakkam village, the duration of stay for majority of households (about 70%) is above 50 years. The rental accommodation is available within the range of Rs.1000 to Rs.7000 per month with an average monthly rental amount of Rs. 3505.

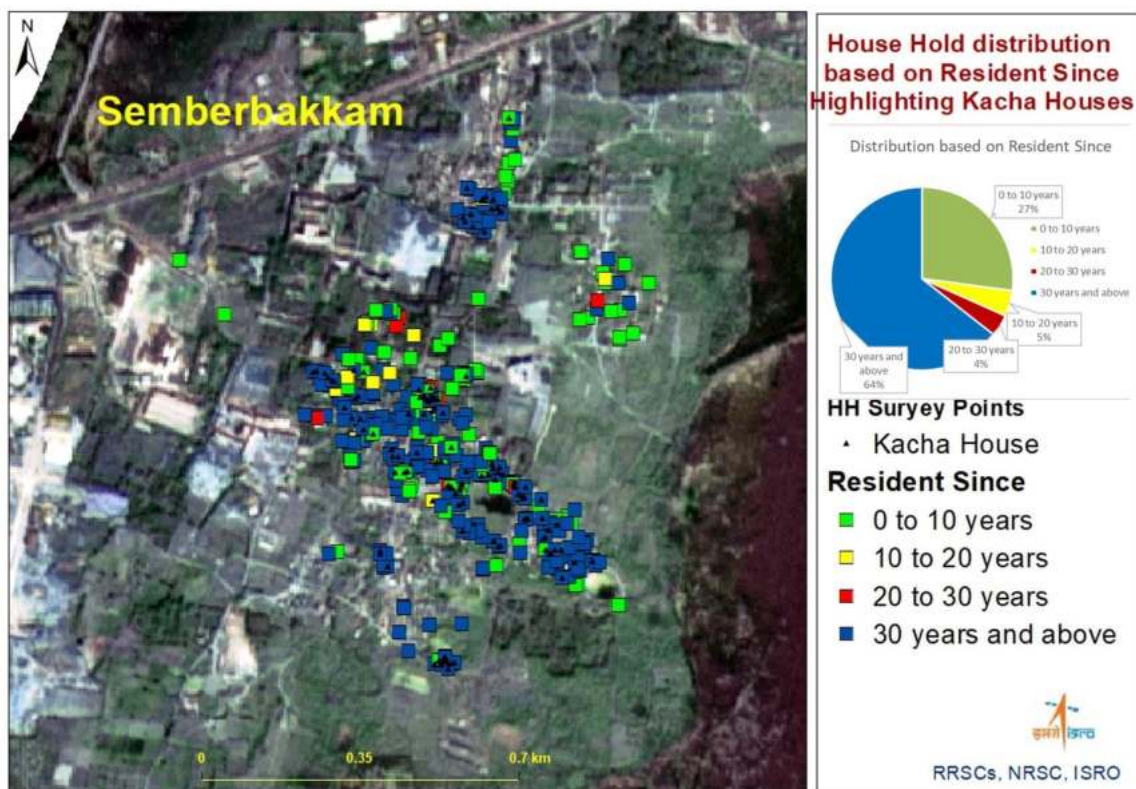


Figure 17: HH Distribution based on Period of Residence

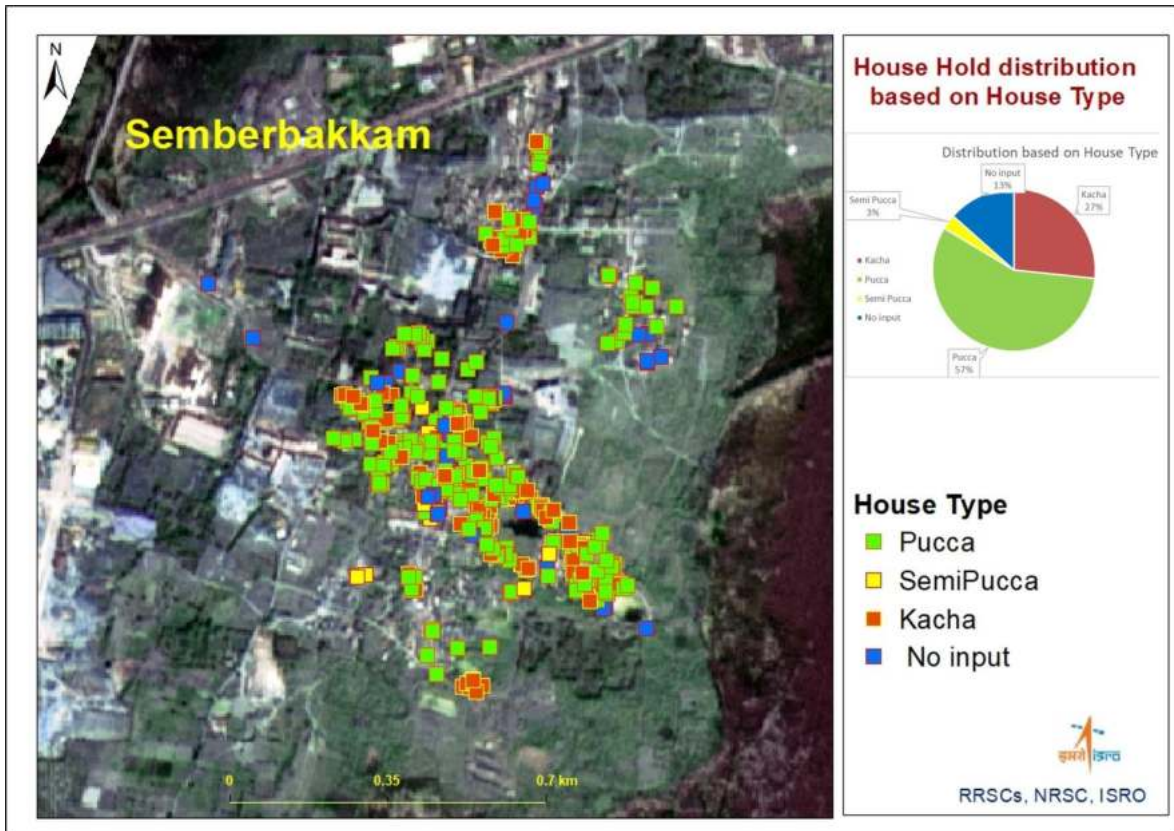


Figure 18: HH Distribution based on Housing Type

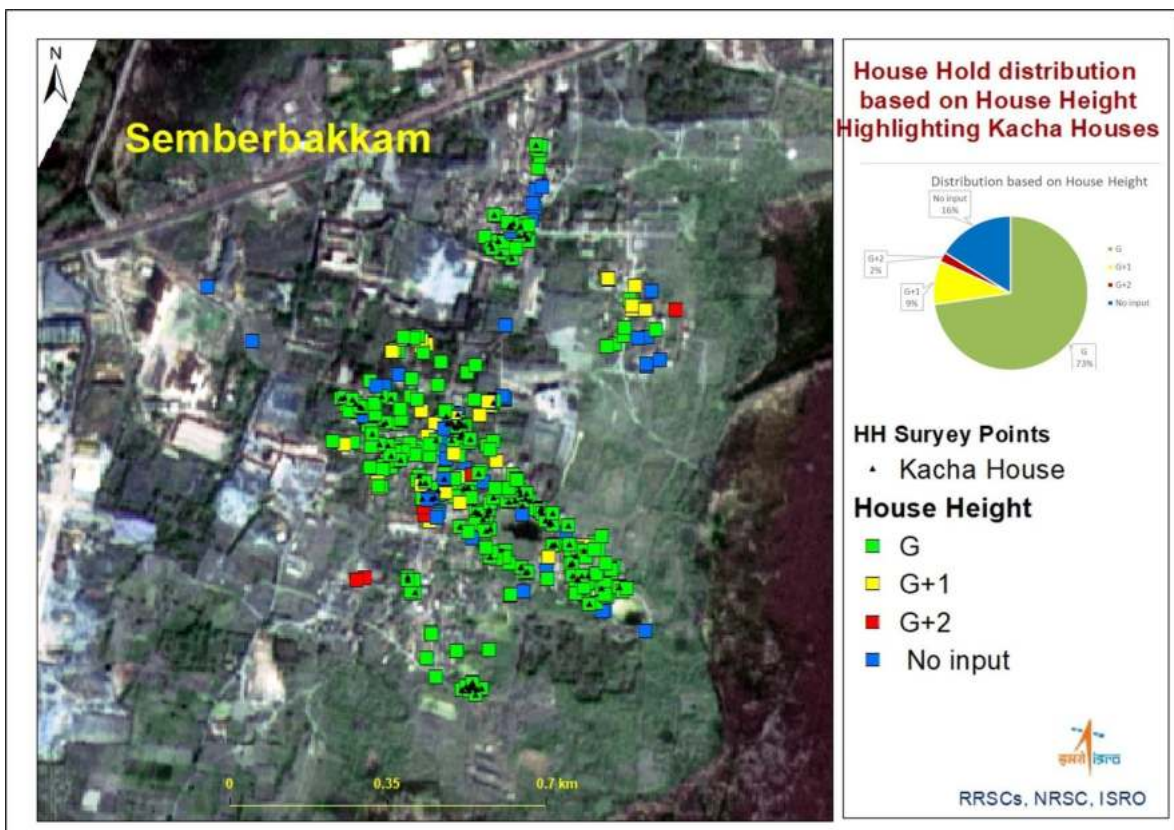


Figure 19: HH Distribution based on Housing Height

### 3.3.1.4 House Condition

Around 76.07% of the houses are in good condition, 20.51% in liveable condition and 0.85% of the houses are in dilapidated condition. Upon the total constructed house within the village, only 4.7% of the houses have been built under the housing schemes sponsored by the government such as the IAY scheme, PMAY scheme and Green house scheme.

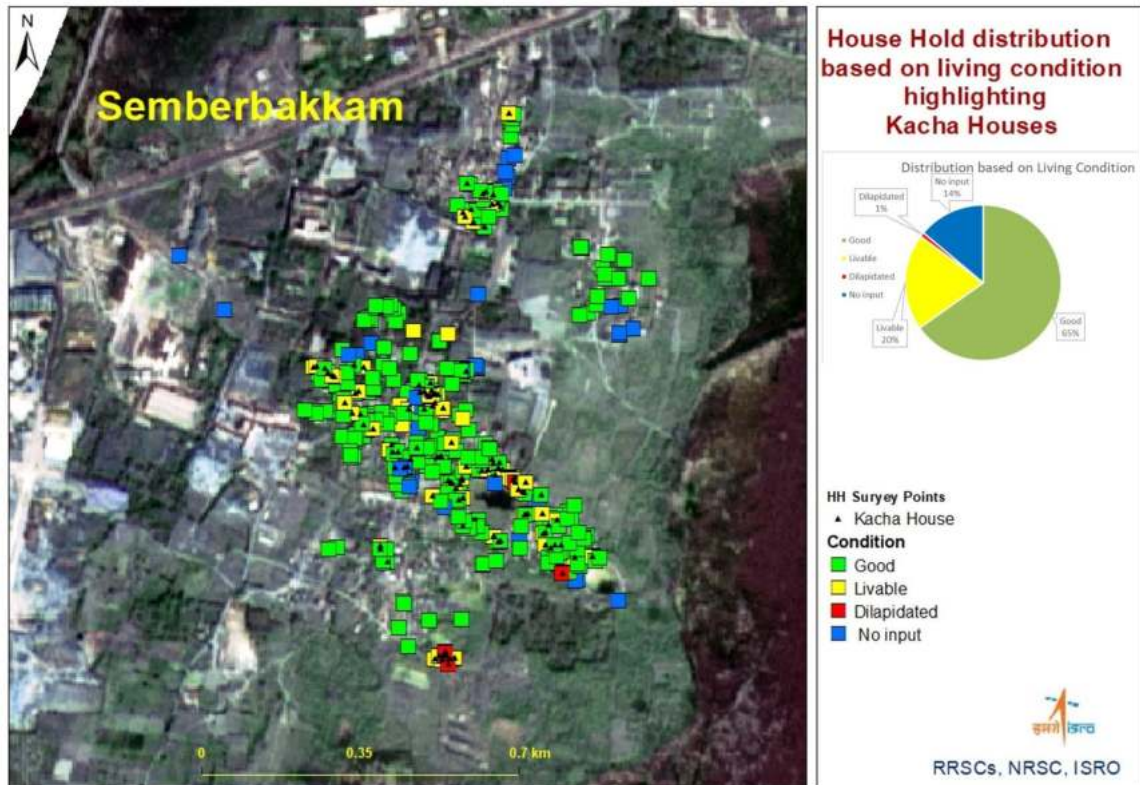
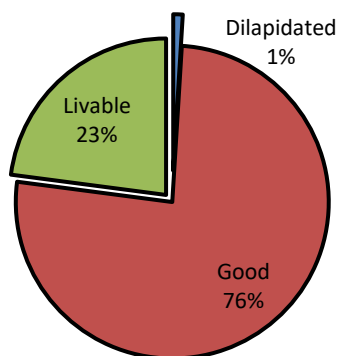


Figure 20: HH Distribution based on liveable condition with Kutcha House

Percentage segregation of House condition



Housing Under Scheme

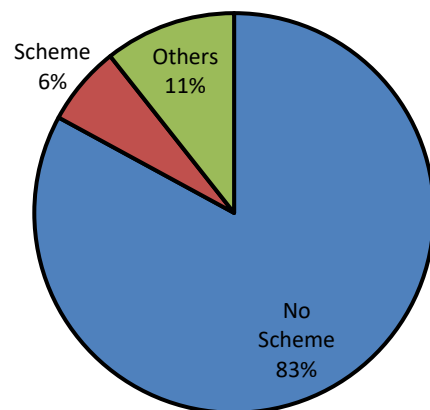


Figure 21: Housing Condition



### 3.3.2 INFRASTRUCTURE AND SERVICES

The data from the household survey regarding the infrastructure services is presented here and the discussion and its inferences have been presented in section 3.6 (Social Infrastructure) and 3.7 (Physical Infrastructure) respectively.

#### 3.3.2.1 Water Supply

For 78.58% of the households, water supply is through Public Taps. 3.41% households are using Private Taps. The rest of the households rely on borewells for their water supply.

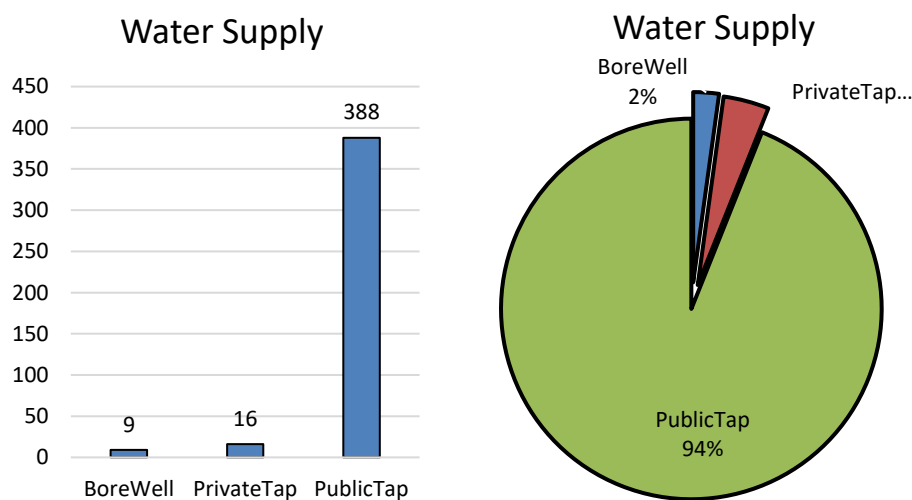


Figure 22: Water supply system in Sembarambakkam GP

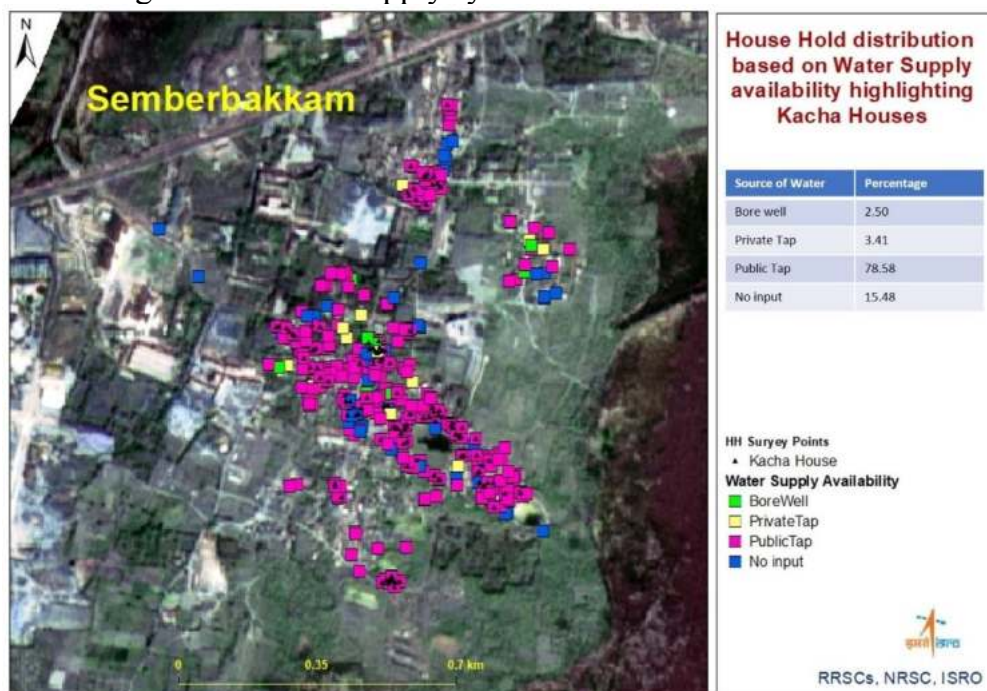


Figure 23: HH Distribution based on source of water supply

### 3.3.2.2 Toilet

82.48% of the village have toilets in their houses. 75.85% houses have Private toilets and 11.97% practise open defecation. Only 9.2% of the entire village use the public toilets.

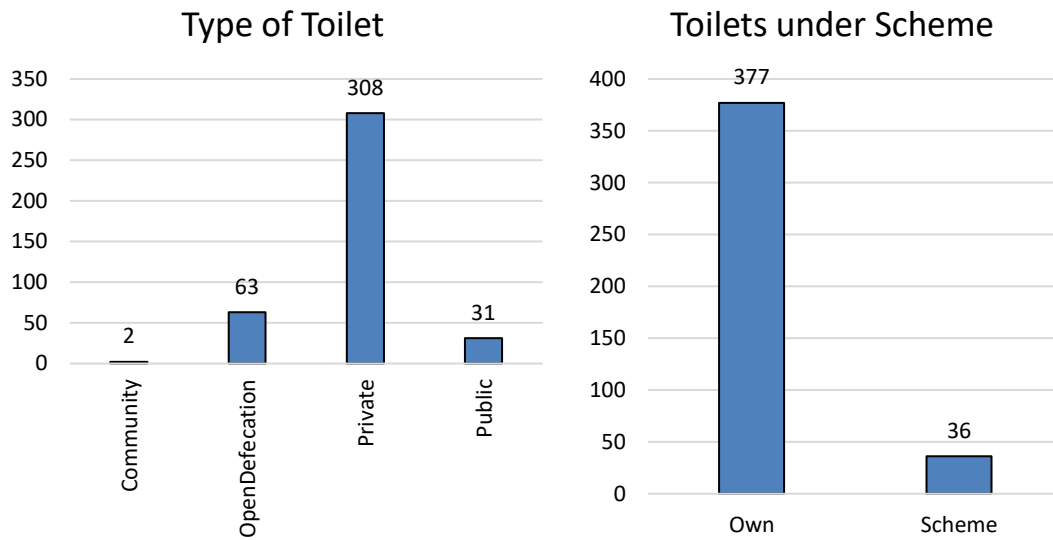


Figure 24: Toilet Facilities available in Sembarambakkam GP

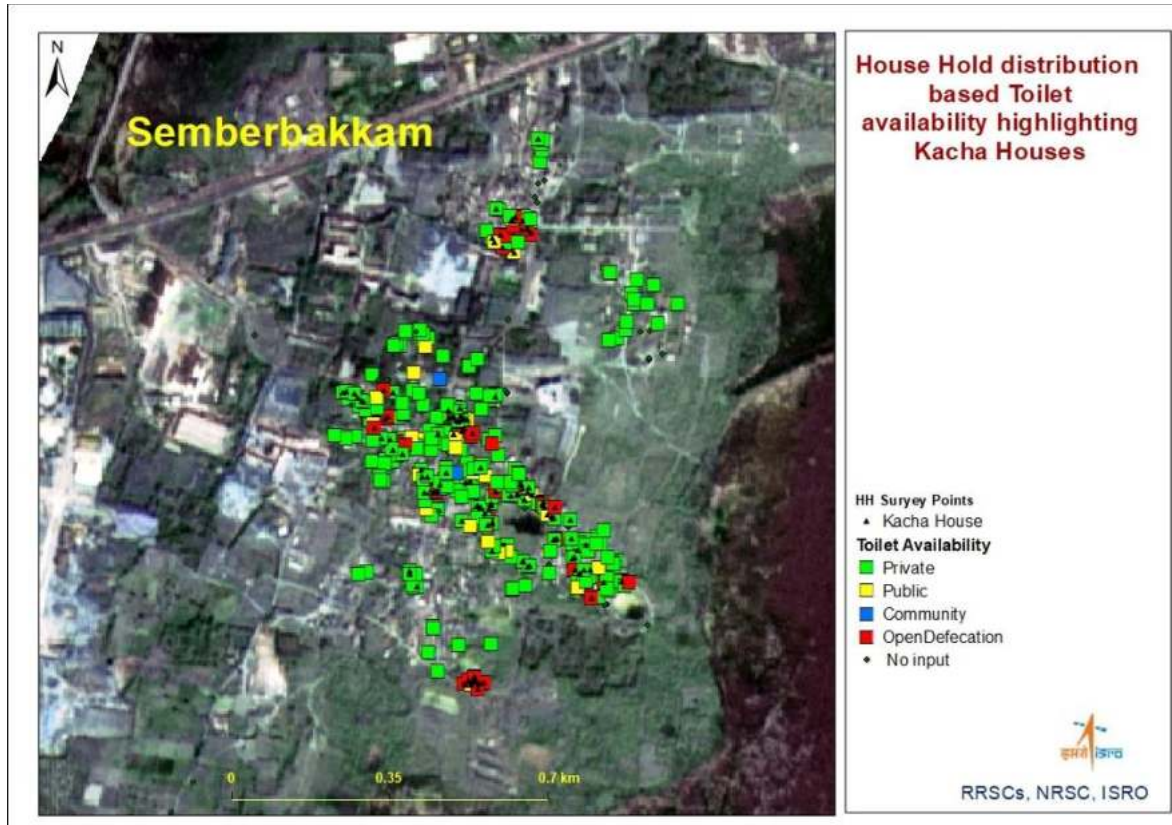


Figure 25: HH Distribution based on Toilet availability with Kutcha House

### 3.3.2.3 Solid Waste management

There is no collection of Solid Waste from 24.6% of the households. 75% of the households dispose their Solid wastes to Collection Carts. Open dumping is prevalent.

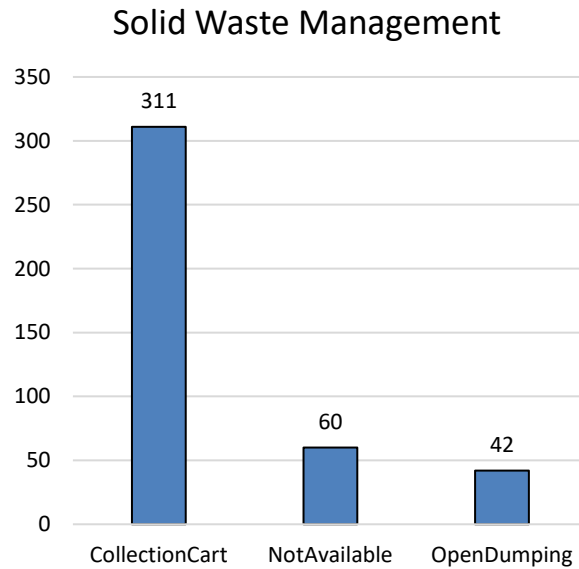


Figure 26: Solid Waste Collection

### 3.3.2.4 Transportation

Two wheelers are the most popular mode of transportation constituting to 58.76%, followed by bus which is 9.1%.

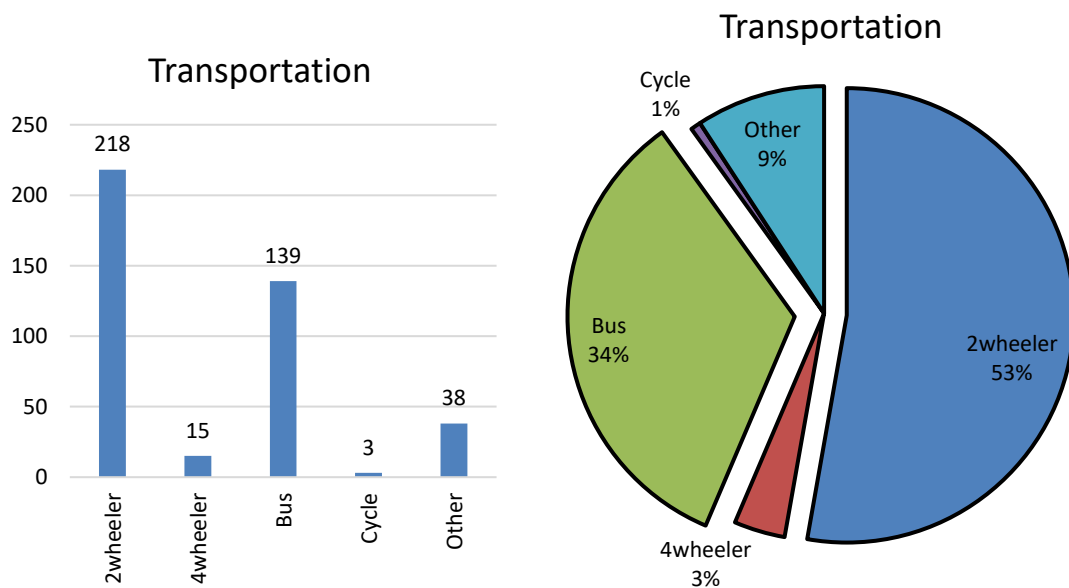


Figure 27: Modal split in the Sembarambakkam GP

### 3.3.3 HOUSE HOLD UTILITIES AND SERVICES

The Households in Sembarambakkam village have television predominantly. Other utilities like radio, solar equipment, computer and vocational training centre are not available or used. About 93% use LPG cylinder for fuel in Sembarambakkam village. 24% of the households use fire wood and 4% use Kerosene as well. Other energy sources such as biogas and cow dung are not prevalent in Sembarambakkam Gram Panchayat. Almost 94% of the Households has electricity connectivity.

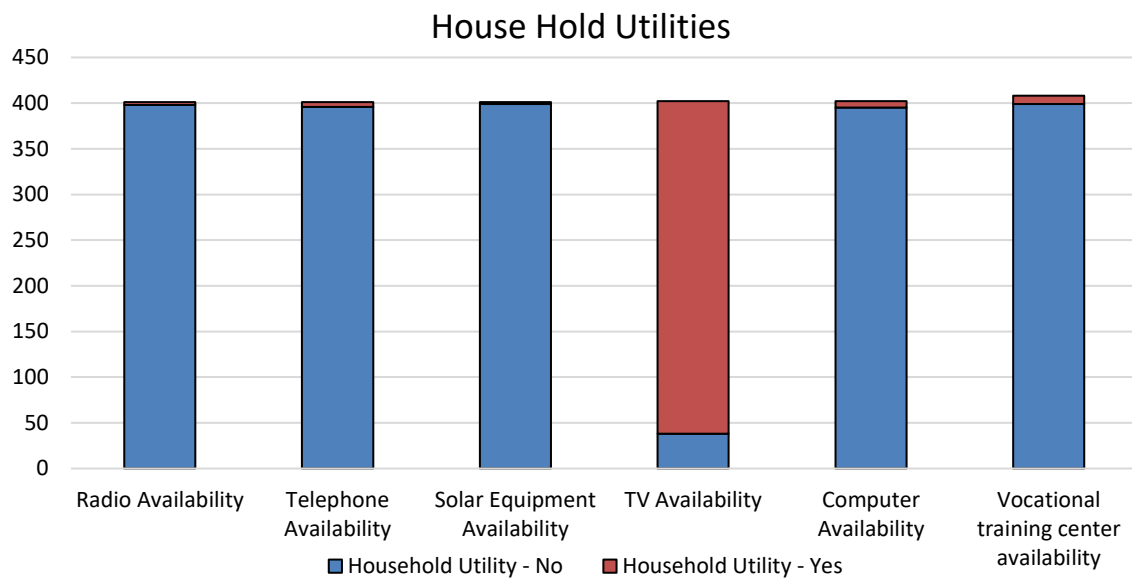


Figure 28: Household Utility

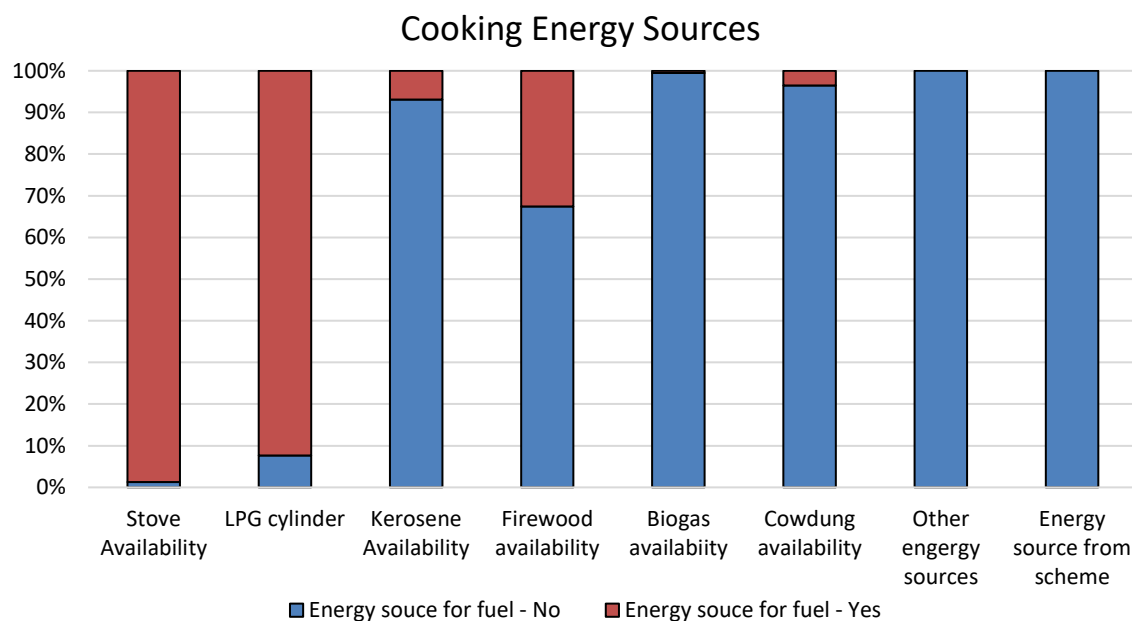


Figure 29: Cooking Energy Source

### 3.3.4 HEALTH CARE

Around 41% of the households pay single visit to the hospital per month and paying average of Rs.713 /- per visit. 78% of the households use public means of transport and 22% use private means of transportation to visit the hospital. 94% of the households have no prominent diseases and 2.4% households have been vaccinated.

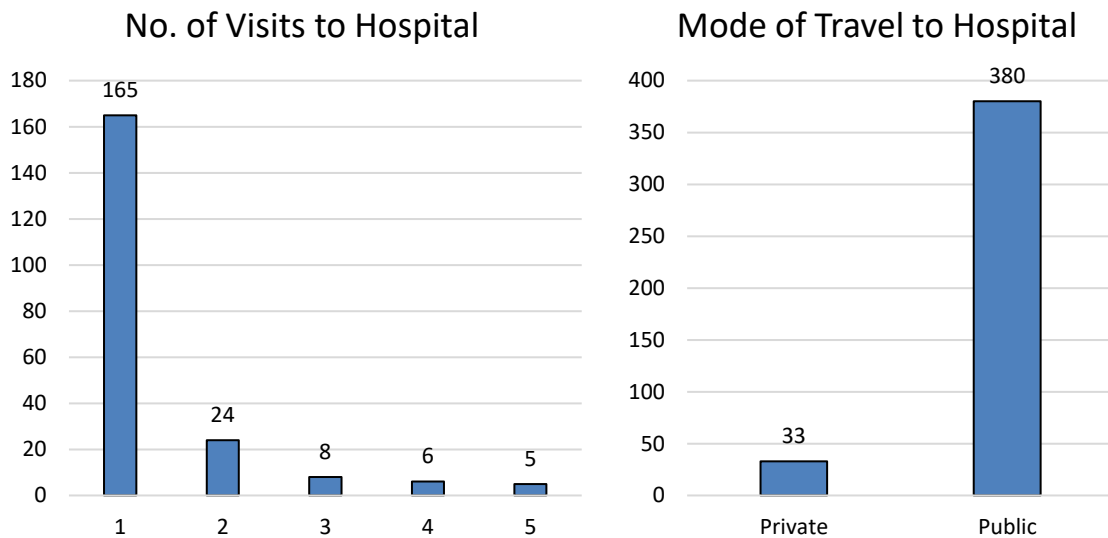


Figure 30: Hospital Care service available in Sembarambakkam GP

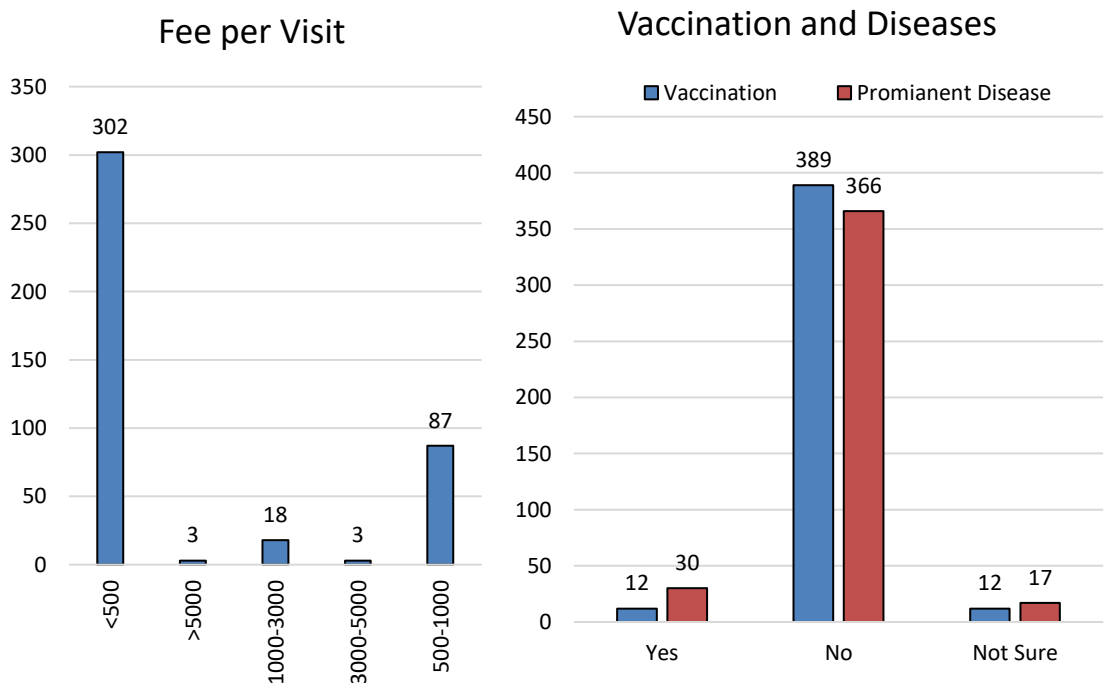


Figure 31: Hospital fee detail and Vaccination

### 3.3.5 FINANCE

#### 3.3.5.1 Expenditure

Households expenditure is ranked from the sample households survey conducted, which determines their maximum preferential spending is on Food, Health and least spending is on the monthly leisure spending.

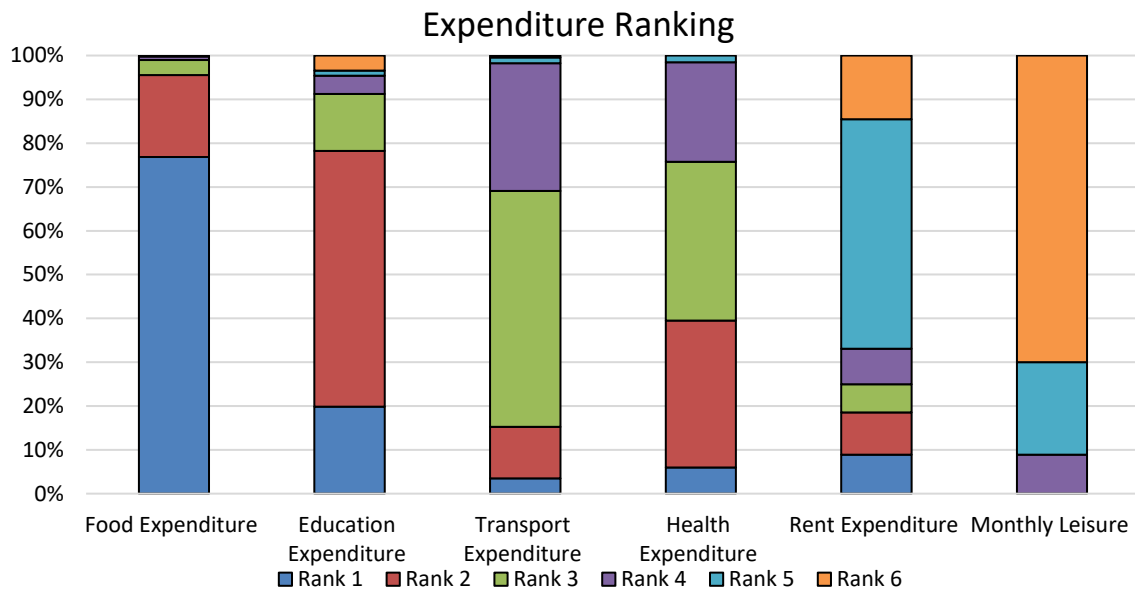


Figure 32: Expenditure Ranking

### 3.3.6 KEY ISSUES AND CONCERNS FROM HOUSE HOLD SURVEY

From the Household survey conducted, the Major concerns of the households are determined and summary of the study is tabulated as *Table 13: Summary - Social Characteristics*, *Table 14: Summary - Housing Characteristics*, *Table 15: Summary - Infrastructure services*, *Table 16: Summary - Fuel Energy*, *Table 17: Summary - Finance*, and the key issues are determined in *Table 18: Key Issues and Concern*.

Table 13: Summary - Social Characteristics

<b>Social Characteristics 2011 Census and 2020 (primary survey GPSDP)</b>		
Category	2011	2020
Total Population of Sembarambakkam village	5709	12132
Number of Males	2877	6121
Number of Females	2832	6011
Number of Children (0-6 yrs.) - Boys	782	NA
Number of Children (0-6 yrs.) - Girls	390	NA
Total literates	4132	NA

Total Male literates	2245	NA
Total female literates	1887	NA
Total SC population	1564	4723
Number of SC Male	780	NA
Number of SC Female	784	NA
Total number of House Holds	1503	3033

Table 14: Summary - Housing Characteristics

<b>Housing – 2020 (primary survey GPSDP)</b>		
Category	Count	%
Total number of House Holds	4500	-
Owner	3780	84%
Renter	540	12%
Years of Stay (< 20 yrs.)	3150	70%
House Type - Pucca	3015	67%
Roof Type - Concrete	3195	71%
Wall Type - Bricks	3780	84%
House Condition - Good	3375	75%
Age of Structure < 20 yrs.	2070	46%
House built using Schemes	270	6%

Table 15: Summary - Infrastructure services

<b>Physical Infrastructure Services – 2020 (primary survey GPSDP)</b>		
Category	Count	Percent
Transportation - 2-Wheeler	2385	53%
Transportation - Bus	1530	34%
Water Supply - Public	4230	94%
Water Supply - Private	180	4%
Electricity - 24hrs	4455	99%
Toilet - Private	3375	75%
Toilet - Public	315	7%
Toilet - Open	675	15%
Solid Waste Management - Not Practiced	675	15%
Solid Waste Management -Collection Cart	3375	75%

<b>Health Care – 2020 (primary survey GPSDP)</b>		
Category	Count	Percent
1 Visit or less / Month to Hospital	4050	90%
Less than Rs 500 per visit	3285	73%
Transportation to Hospital - Public	4140	92%
Transportation to Hospital - Private	360	8%
House Holds Vaccinated	270	6%
No Prominent Disease	3960	88%

<b>Livestock - 2020 (primary survey GPSDP)</b>		
Category	Yes	No
Cow Buffalo Info	28	373
Ox Info	-	401
Goat Info	16	386
Chicken Info	6	398
Horse Info	-	401
Donkey info	-	398
Other Livestock Info	1	-

<b>House Hold Utilities - 2020 (primary survey GPSDP)</b>		
Category	Yes	No
Radio Availability	3	398
Telephone Availability	5	396
Solar Equipment Availability	2	399
TV Availability	364	38
Computer Availability	7	395
Vocational training centre availability	9	399

Table 16: Summary - Fuel Energy

<b>Energy Sources for Fuel - 2020 (primary survey GPSDP)</b>		
Stove Availability	394	5
LPG cylinder	374	31
Kerosene Availability	28	376
Firewood availability	132	273
Biogas availability	2	399
Cow dung availability	14	387
Other energy sources		215
Energy source from scheme		341

Table 17: Summary - Finance

<b>Finance - 2020 (primary survey GPSDP)</b>	
Expenditure	Rank
Food Expenditure	1
Health Expenditure	2
Education Expenditure	3
Transport Expenditure	4
Rent Expenditure	5
Monthly Leisure	6



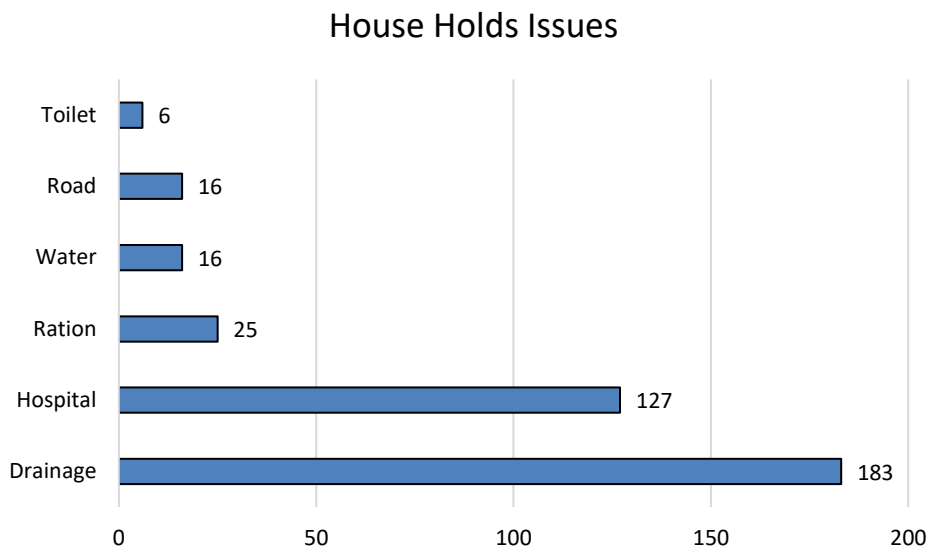


Figure 33: Key Issues inferred from Household survey

Table 18: Key Issues and Concern

<b>Key Issues and Concerns - 2020 (primary survey GPSDP)</b>	
Expenditure	Households
Drainage	183
Hospital	127
Ration	25

### 3.3.7 POPULATION AND HOUSING PROJECTION

The following methods are commonly adopted for predicting future population.

#### 3.3.7.1 Arithmetic Progression Method

$P_n$  - The prospective population after n decades

n- Number of years or decades for which population is to be estimated.

c- Yearly or Per decade increase in population or % increase in population for geometric progression

$P_0$ - Latest known population  $P_0$

r – Average of incremental increase.

$$P_n = P_0 + nc$$

#### 3.3.7.2 Geometrical Progression Method

$$P_n = P_0 \{1 + c/100\}^n$$

3.3.7.3 Incremental Increase Method

$$P_n = P_0 + (nc + (n+1))/2 * r$$

Based on the above the projected population for 20 years is

Sembarambakkam village current population  $P_0$  – 12320 , n - 2 decade and c - 6000 or 50%

a) Arithmetic Progression Method :  $P_n = 12320 + 2 * 6000$   
 $= 24320$

b) Geometrical Progression Method :  $P_n = 12320 * \{1 + 50/100\}^2$   
 $= 27720$

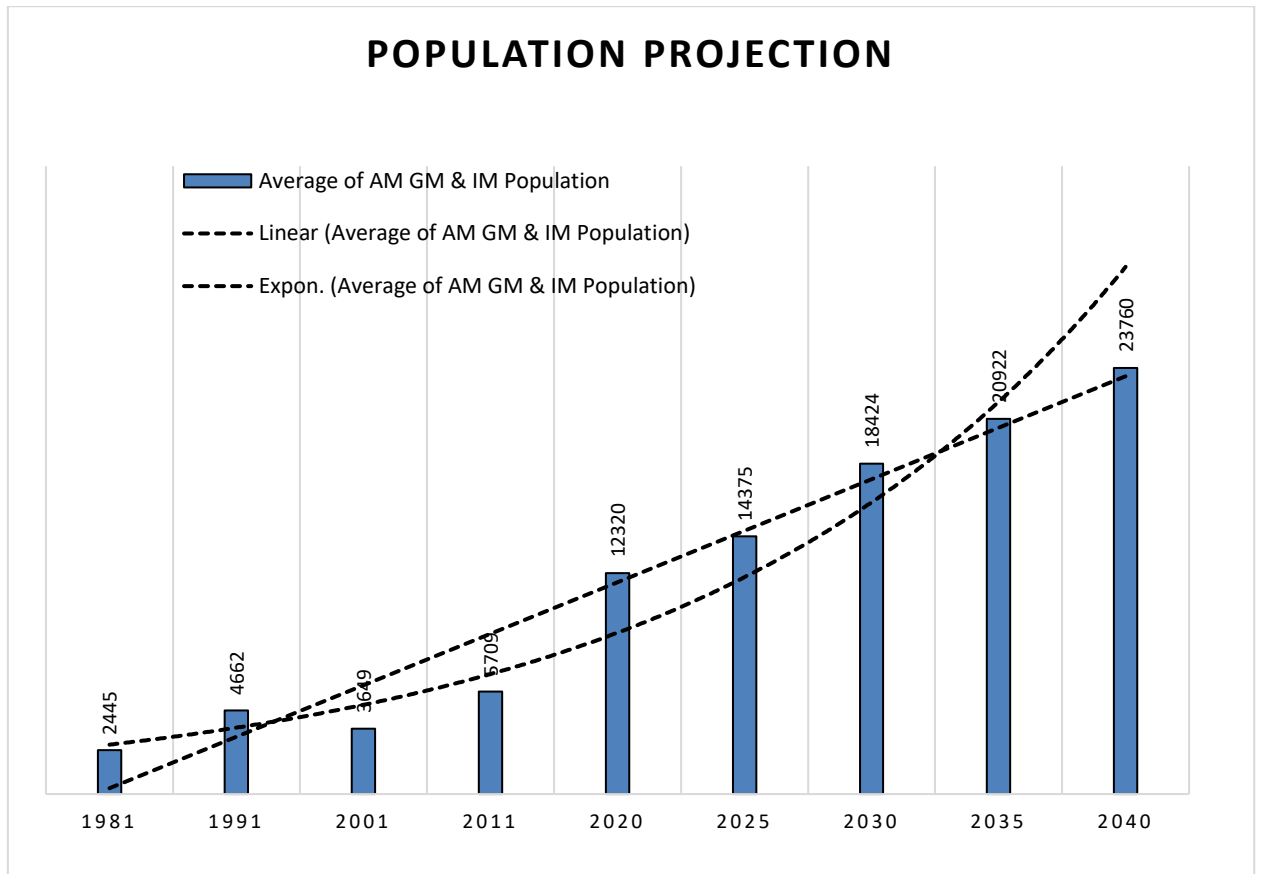


Figure 34: Population Projection for the next 20 years

Using the averages, the projected population for Sembarambakkam for the next 20 years is 23,760 with 7,920 Households (Average of 3 per Household) in 20 years. There will be an addition of 4,887 new households.

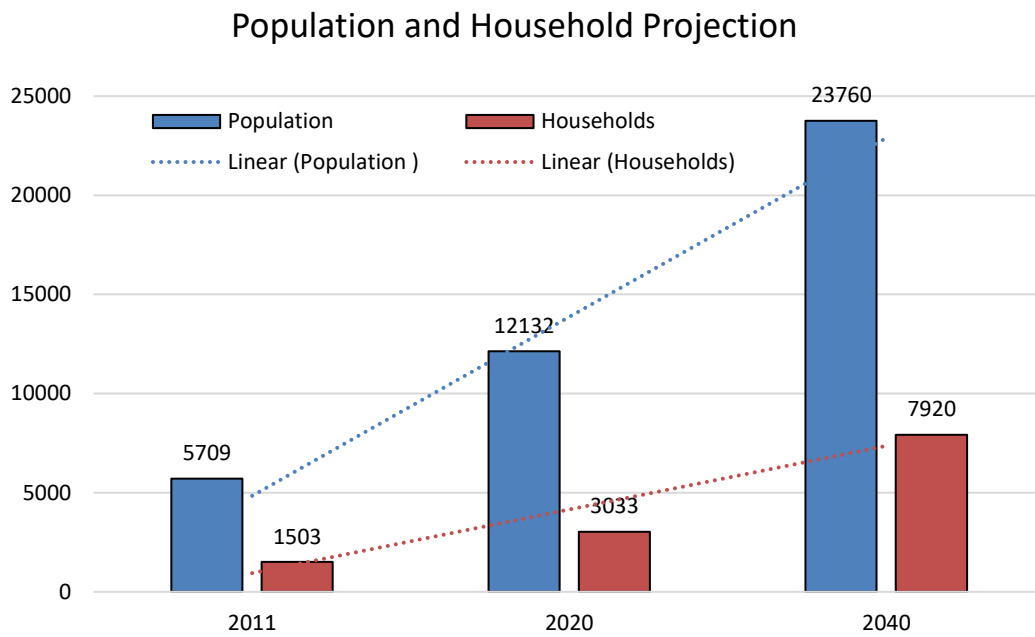


Figure 35: Projected Population comparison

### 3.4 ANIMAL HUSBANDRY

Animal Husbandry and Dairying play an important role in development of rural economy, which indirectly generate revenue and economic growth by creating large self-employment opportunities. But the Livestock population in Sembarambakkam village is insignificant. Out of 400 household survey conducted only in few countable households have livestock. Hence to promote economic development animal husbandry is to be promoted.

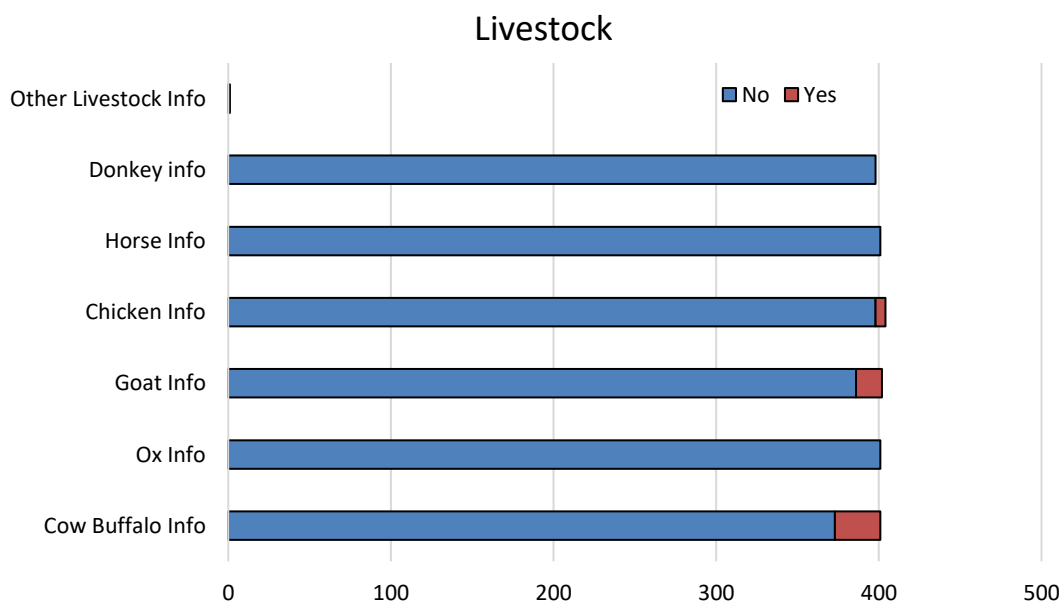


Figure 36: Livestock Population in Sembarambakkam GP

### 3.5 SOCIAL INFRASTRUCTURE

#### 3.5.1 EDUCATION

The Existing educational institutions in the village are shown in Table 19: Education Infrastructure Facilities in Sembarambakkam GP. The location and accessibility of the educational institutions is shown in the *Map 22: Social Infrastructure - Education*. From the primary survey and spatial analysis by creating Voronoi polygon, the village has the required number of Government Anganwadi, Primary and High school as per the guidelines. The village has two engineering colleges namely Loyola Institute of Technology and DM college of Engineering. As per the primary survey, every family in the village send their children to the schools. The village has one primary and secondary Government school and one private primary and higher secondary school. Within the vicinity of the village there are educational facilities with function with the support of private schools and government schools in Thirumazhisai Town Panchayat.

Table 19: Education Infrastructure Facilities in Sembarambakkam GP

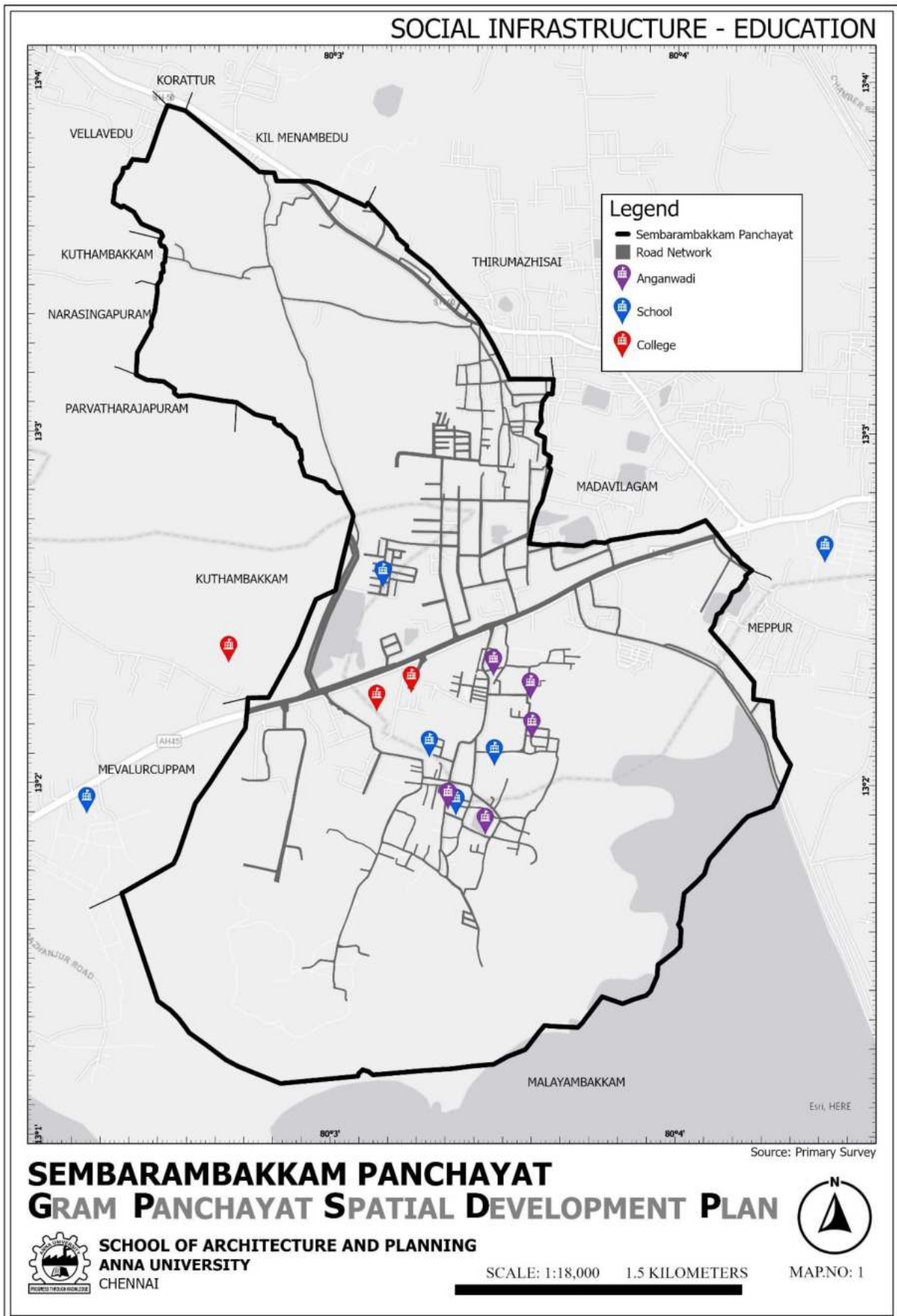
Educational institutions	Norms (RADPFI)	Existing Population (12320)	Projected population (23740)
Anganwadi	1 for 5000 (0.5 Hectare) – within 500 m	4	5
Primary school	1 for 5000 (0.4 to 0.6 Hectare) – within 500 m	1(Private)	5
High school with Primary (1-8)	1 for 15000 (1 Hectare) – within 1 Km	2	2
Higher Secondary with Primary	1 (1 Hectare) – within 500 m	1 (Private)	1
College	0	2	0

(Sources: Derived from RADPFI Guidelines 2016)

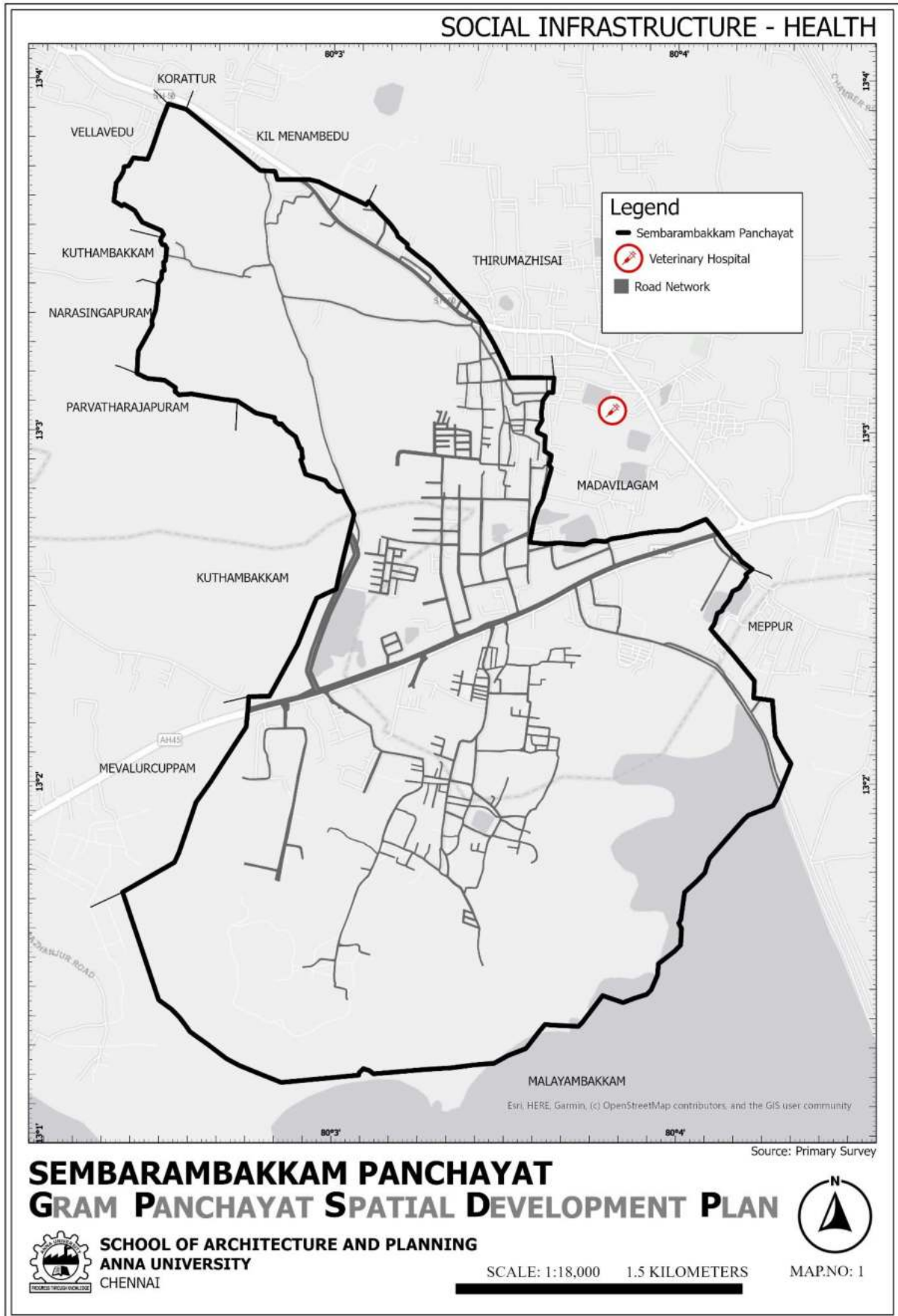
#### 3.5.2 HEALTH

Sembarambakkam village lacks government health facilities within its precinct and they rely on the government hospital in Thirumazhisai Town Panchayat. As per the RADPFI guidelines the village requires three health centres for existing needs and five health centres for the projected population. The villagers take their cattle to the government veterinary health centre located in Thirumazhisai. The location and

accessibility of health facilities situated in the village is shown in *Map 23: Social Infrastructure - Health*.



Map 22: Social Infrastructure - Education



Map 23: Social Infrastructure - Health

### 3.5.3 SOCIO CULTURAL FACILITIES

The existing socio-cultural facilities in the village are mapped and tabulated as *Table 20: Socio-cultural facilities in Sembarambakkam GP* and *Map 24: Social Infrastructure – Socio-Cultural Facilities*. The village has one neighbourhood park, but lacks government playgrounds. The village does not have any public recreation facilities like community spaces for festivals or any other community gathering spaces. Though, the village has sufficient number of religious buildings, lack in public gathering spaces has been observed from the primary survey. There is only one burial ground with crematorium in the village. As per the RADPFI guidelines the village requires 3 burial grounds for the existing population and 5 for the projected population.

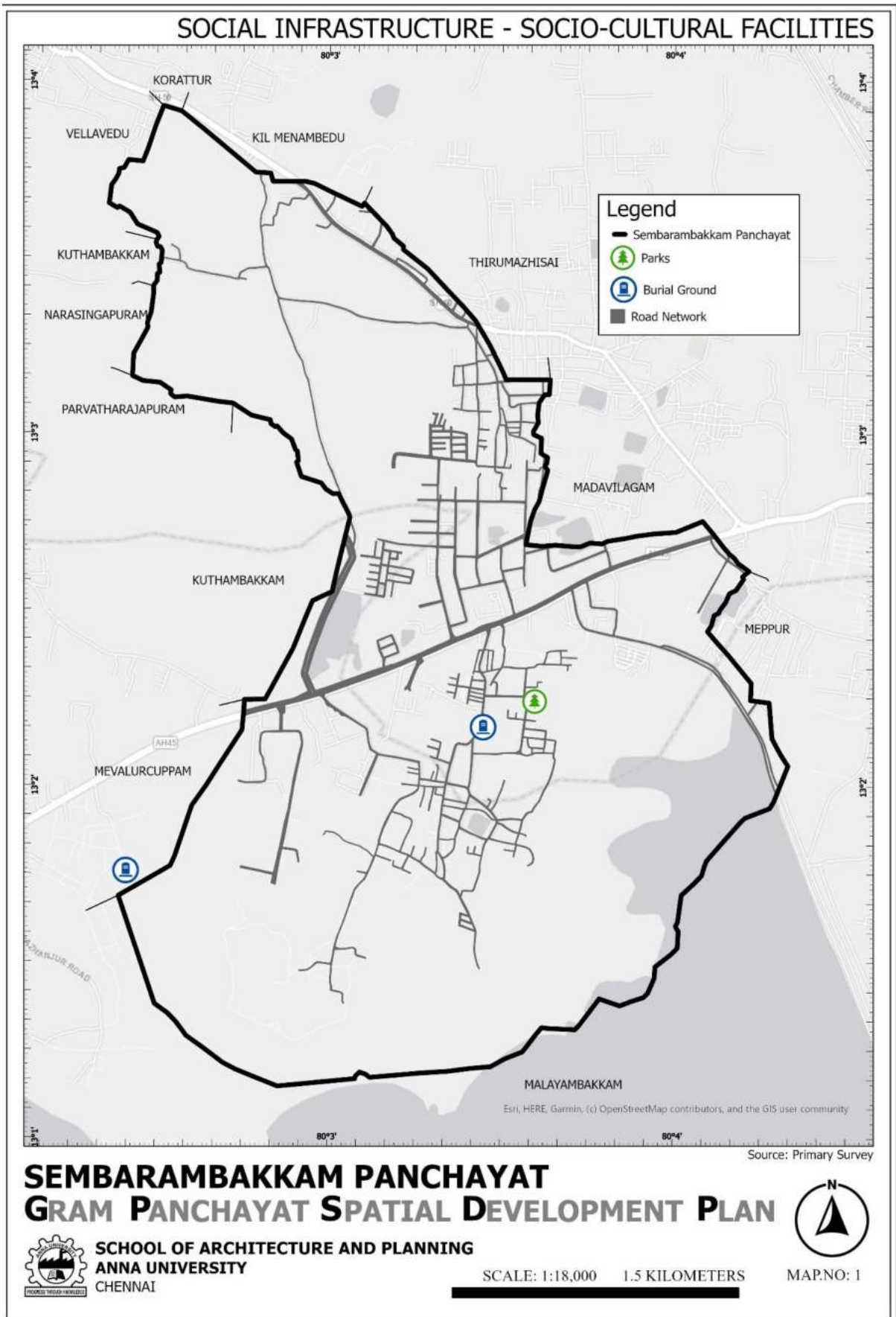
Table 20: Socio-cultural facilities in Sembarambakkam GP

SI No.	Public facilities	Norms (RADPFI)	Existing Population (12320)	Projected population (23740)
1.	Parks	One Housing area Park per 5000 population 9 (0.5 Hectare) and Neighbourhood park for 15000 population (1 Hectare)	1	2
2.	Playground/Ground for fairs and festivals	one per 5000 population (1 Hectare)	0	5
3.	Religious places	one per 5000 – 4nos	1	1
4.	Burial ground with Crematorium	one per block (0.5 Hectare)	1	5
5.	Burial ground	One for 5000 (500 Sq.m)	1	2

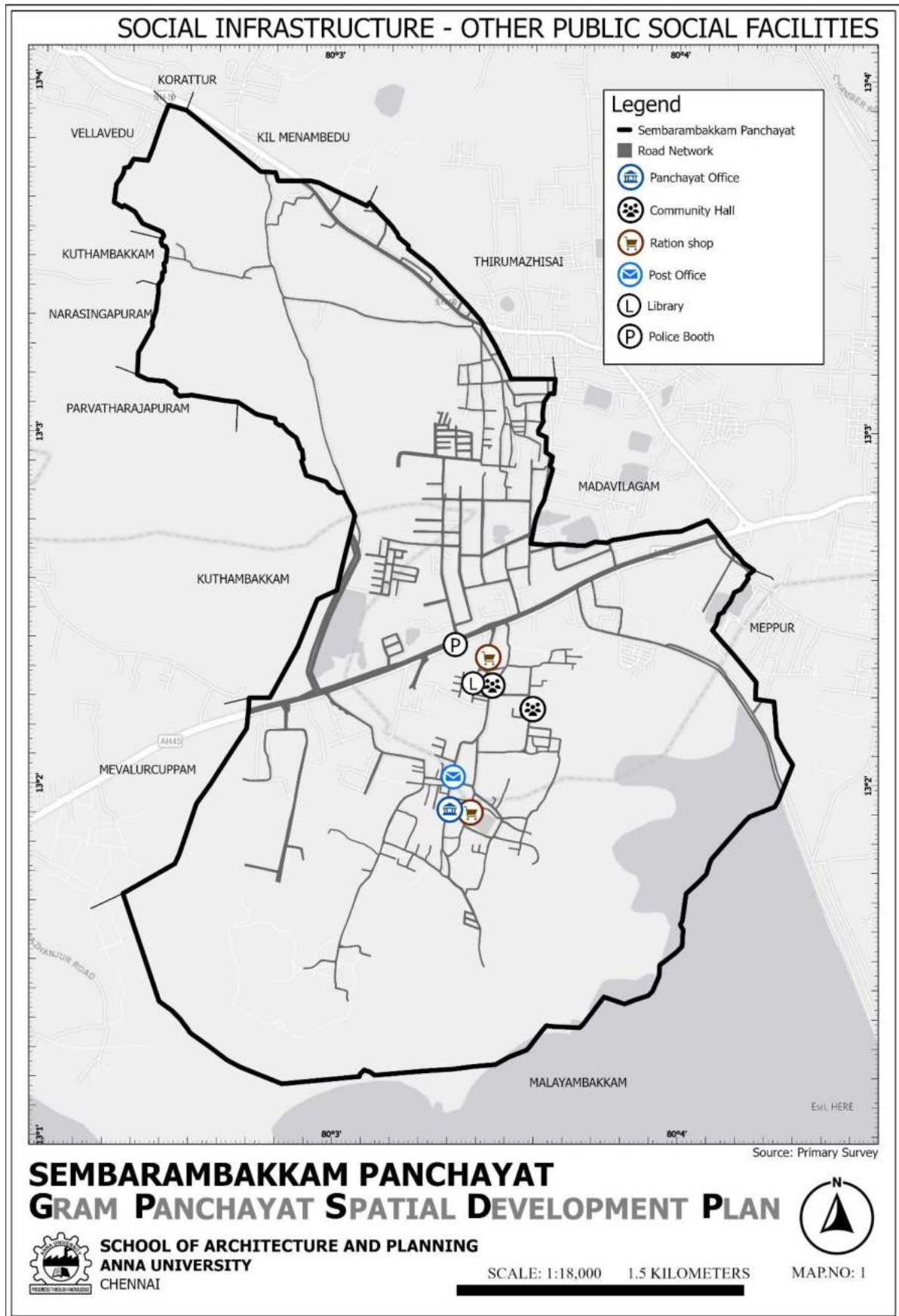
(Sources: Derived from RADPFI Guidelines 2016)

The various other public social infrastructure facilities in the village are mapped and tabulated in *Table 21: Other Public Social Facilities in Sembarambakkam GP* and *Map 25: Social Infrastructure – Other Public Social Facility*. The village has one library, which is used regularly by the villagers, 2 community halls with a capacity of 200 and 2 rations shops. It has been observed that distribution of rice, wheat, dal, oil and kerosene, 6 days a week satisfies the needs of the villages and there is no shortcoming in the above-mentioned social infrastructure facilities.





Map 24: Social Infrastructure – Socio-Cultural Facilities



Map 25: Social Infrastructure – Other Public Social Facility

There is one police outpost, which is sufficient for the existing population. The village has no Government vegetable market. Provision of local markets for selling agriculture produces grown in the village in near future would improve the primary sector occupation. The village has one post office with one staff. The Gram Panchayat office is located centrally near the bus stand and the school. The officials from the Panchayat office stated that frequent meetings are conducted for the benefit of the villagers. State Government support will enhance the functionality of the Panchayat for improving the important sectors like education, agriculture, health, etc.

**Table 21: Other Public Social Facilities in Sembarambakkam GP**

S.No.	Public facilities	Norms (RADPFI)	Existing Population (12320)	Projected population (23740)
1.	Library	1 per15000	1	2
2.	Community hall	1 per15000 (0.5Hectares) – within 1 km	2	2
3.	Ration shop	-	2	-
4.	Public toilet	-	0	-
5.	Police Outpost	-	1	-
6.	Gram Panchayat Office	-	1	-
7.	Post office	-	1	-
8.	Government Market	-	0	-

*(Sources: Derived from RADPFI Guidelines 2016)*

## **3.6 PHYSICAL INFRASTRUCTURE**

### **3.6.1 WATER SUPPLY**

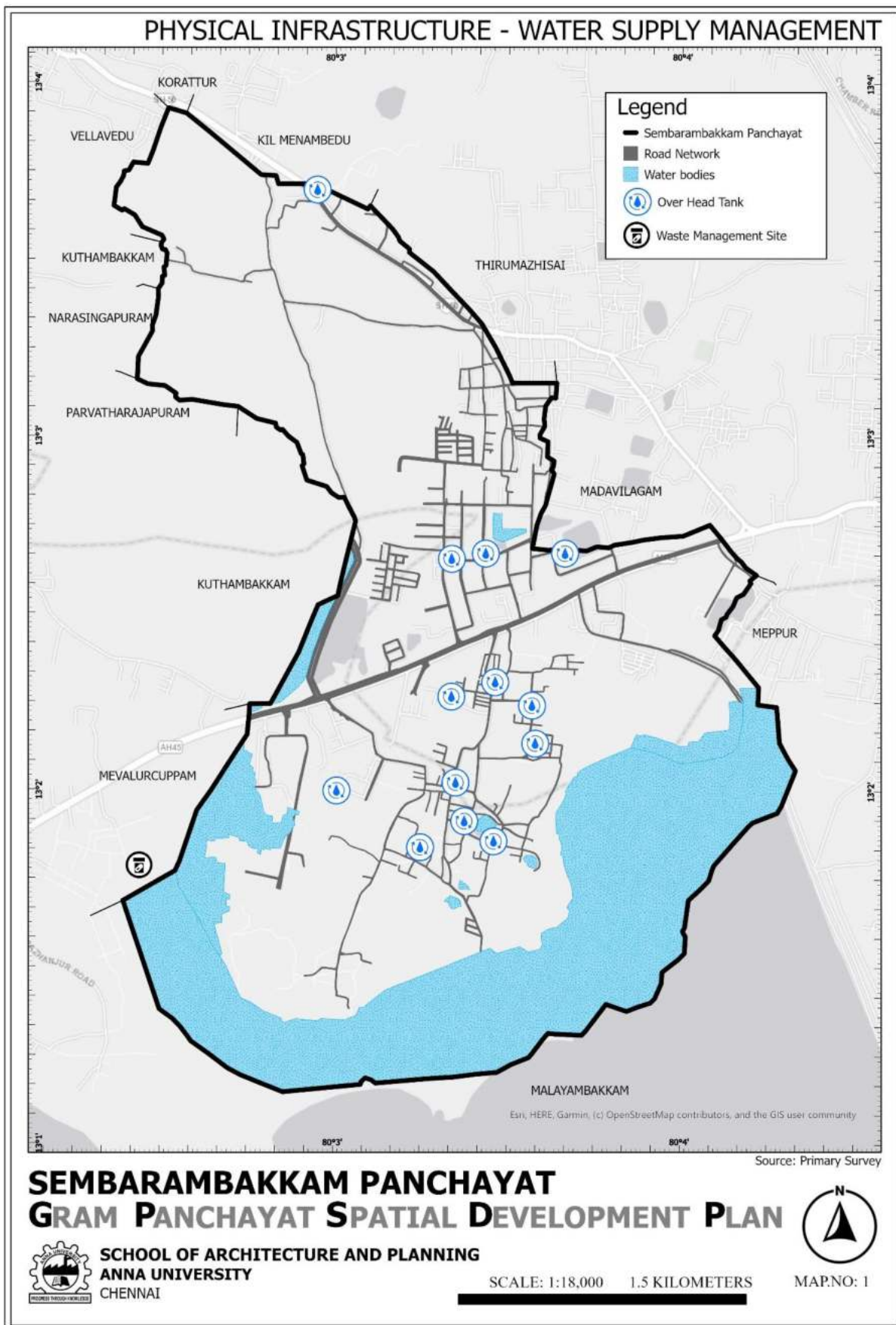
The common sources of water supply in the village are bore wells and hand pumps. However, the major source of water supply in the village is through bore wells. At present, there are nearly twenty bore wells across the village catering to the needs of the people. These bore wells reach up to a depth of 150 m and with the help of mechanized pumping based piped systems, the bore wells pump underground water into the OHTs which are located across the villages at various locations. The water capacity of the OHTs across the village varies from 30,000 litres to 1,00,000 litres. The OHTs across the village are shown in Map 26: Physical Infrastructure – Water Supply.

The Ministry of Jal Shakti has commissioned piped water distribution system in the rural areas. Village is equipped with piped ground water-based supply system. Few households have Functional Household Tap Connections (FHTC). Under the Single Village Scheme, there is sufficient groundwater availability and groundwater is free from chemical contamination. The OHT is filled daily twice, once in the morning and once in the evening to its full capacity. From the OHT, on a regular basis uninterrupted water supply is supplied through pipe connection to the households for two hours daily in the morning and two hours daily in the evening. One Common tap serving eight households is provided across the village. Nearly 10 handpumps are located at various locations across the village providing 24 hours uninterrupted water supply. The village receives 55 litres per capita per day, however, as per the RADPFI guidelines the service level benchmark focuses on 70 litres per capita per day.

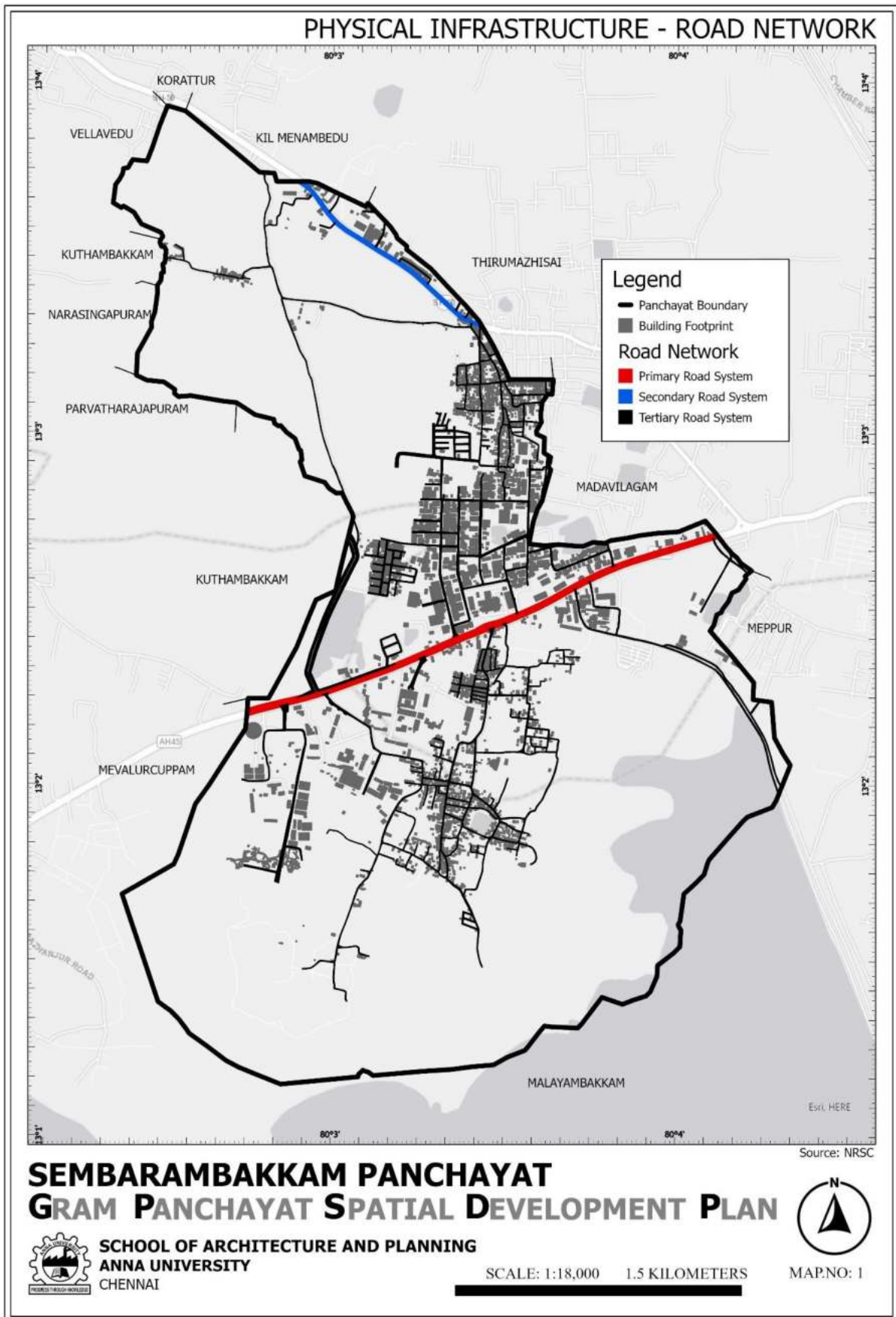
Bore wells is the major source of water supply in the village for Irrigation. There are approximately 32 borewells across the village used for irrigation purpose.

### **3.6.2 ROAD NETWORKS**

The Sembarambakkam village has good road connectivity under the Pradhan Mantri Gram Sadak Yojana. Primary road of width 9 meters connects the village with the outer ring road. Tertiary roads (cement concrete road) of width 4.5 meters with open drains on both sides to facilitate drainage system in the village is provided.



Map 26: Physical Infrastructure – Water Supply



Map 27: Physical Infrastructure - Road Network

Apart from these three road systems, 3 meter mud lanes are also provided in some areas of the village. The road network map is shown in the *Map 27: Physical Infrastructure - Road Network*.

### **3.6.3 SOLID WASTE MANAGEMENT**

Door to Door collection of solid waste is being practised in the village on a daily basis. There are fifteen various types of vehicles that collect solid waste from each house hold: There are four tricycles, ten pushcarts and one Tractor collecting solid waste from various households across the village. One sanitation worker is responsible for collecting solid waste from 75 households. Apart from Door-to-Door collection of solid waste, common dustbins are also provided at various locations across the village for the disposal of solid waste. This solid waste collected from the households in the above-mentioned vehicles along with the solid waste from the common dustbins is being dumped at the designated waste management site. The designated waste management site is shown in *Map 26: Physical Infrastructure – Water Supply*.

It has been identified that segregation of bio-degradable from non-bio-degradable wastes is not being practised at the source. The common dustbins that are provided at various locations across the village of the village are being underutilized and the solid waste is thrown outside the dustbins. Every day collection of waste from the common dustbins, maintenance of the common dustbins and regular transportation of the collected solid waste to the waste management site needs to be carried out.

### **3.6.4 LIQUID WASTE MANAGEMENT**

Discharge of the liquid waste water from the households is discharged onto public streets and also into the storm water drains. The existing storm water drains are of open drain system and are mostly either broken or choked. From few houses, the liquid waste water flows directly onto the streets which lead to the formation of puddles in front of the households. The waste water discharges from the toilets/bathrooms are also let into the storm water drains in some areas of the village. This leads to overflowing of the storm water drain and blockages at different points.

Generation of liquid waste water is almost to the tune of 70 to 80 % of the fresh water coming in a household. Considering the geophysical condition of the village including topography, soil structure & ground water conditions, constructed wetlands can be used for management of the liquid waste water. The liquid waste water can be directed towards the scrub land to improve greenery in the village. In addition, kitchen garden and leach pits can also be constructed there by effectively managing the waste water.

### **3.6.5 SANITATION**

In the past seven years under the Swachh Bharat Mission - Grameen (SBM) and MGNREGA scheme, toilets have been constructed in nearly all the houses in the village. Public toilets have also been provided in the village. There is one public toilet exclusively for ladies, nine public toilets for men, one public toilet for children and three bathing cubicles. Under the state scheme - Chief Minister Solar Powered Green House Scheme (CMSPGHS) nearly 100 houses have been constructed as green houses in the village and green toilets have been constructed for these houses. Most of the toilets in the village have septic tanks. There are few parts in the village that practise open defecation. To make the village ODF, for a cluster of houses (10 houses), a pour flush twin leach pit toilet similar to soak pit can be built at appropriate places

### **3.6.6 ELECTRICITY**

The village receives its electricity from the EB office located beside Sembarambakkam lake. All the houses receive uninterrupted electricity supply. Street light are also provided at equal intervals on the main road connecting the village to the NH4. Under the state scheme - Energization of Street Lights with Solar Power, few of the existing street lights in the Village are replaced with solar powered street lights with an objective of reduction in the maintenance expenditure and promote the concept of renewable energy in rural areas. Under the state scheme - Chief Minister Solar Powered Green House Scheme (CMSPGHS) 100 houses with an area of 300 sq. ft with solar powered lighting have been implemented.



## CHAPTER 4

### 4 PROPOSAL FOR GRAM PANCHAYAT SPATIAL DEVELOPMENT PLAN

*“At the core of Self-Reliant India is a village and agro-based economy”- Shri Narendra Singh Tomar, Union Minister of Panchayati Raj, Rural Development and Agriculture & Farmers Welfare. The honourable secretary, Ministry of Panchayati Raj, Government of India had expressed the wish at the onset of this project that villages should have a quality-of-life equivalent to that of the cities. Our plan for ‘Sembarambakkam’ village is along both these lines. Our vision for the project is ‘By 2030 village will be a place, where people like to live and work, people are well-fed, healthy, educated and environmentally responsible’.*

Sembarambakkam as a village is fortunate as it has good physical and social infrastructure facilities within its vicinity, as a result of urbanisation around the village and its proximity to the Chennai city. However, despite the presence of opportunities and accessibility to the facilities, the socio-economic condition of the inhabitants of the village is poor. Their average income is low and the literacy level is predominantly up to higher secondary only. Therefore, there is a need to uplift the socio-economic condition of the inhabitants of the village.

To ensure that the village is self-reliant, has a good quality of life and the people of the village have a sustained income, there is a need for social upliftment programmes. It is strongly recommended that the panchayat should utilise the presence of many corporate institutions around the village. Programmes for promoting awareness on opportunities for economic upliftment; Vocational training to increase employability and soft skills; and assistance in the form of scholarship for meritorious candidates to further their education need to be formulated and such programmes may be sponsored through the CSR (Corporate Social Responsibility) funds of the corporate institutions surrounding the village.

There is a concentration of facilities in the neighbouring hamlets of this village. There is a need to have equitable distribution of the central facilities for the welfare of the village inhabitants. The panchayat should ensure that the location of the

facilities proposed in the future have a uniform spatial distribution. Our proposals for the village address the existing lacuna in the physical and social infrastructure. Proposals to sustain and improve the natural resources also given. These have been presented in three sections below.

#### **4.1 IMPROVEMENT OF PHYSICAL INFRASTRUCTURE**

Sembarambakkam village is relatively well equipped in terms of physical infrastructure, barring waste management. Sembarambakkam area is on relatively flat land and wide spread development in all directions. Recent development can be seen that of pucca houses built under government schemes. Sembarambakkam area has less area of vacant land under government ownership. Internal village roads and few lanes are made of cement concrete but are very narrow.

With reference to physical infrastructure the proposal has components related to liquid waste management, solid waste management, sanitation and sewage. The proposal also offers source sustainability for drinking water supply and financial sustainability for solid waste management.

##### **4.1.1 WATER SUPPLY**

Sources of water supply can be considered sustainable when it delivers designed quantity of safe water in all seasons. With increase in demand of water supply, source sustainability is of utmost importance to maintain proper water supply in the village. Bore well recharge structures, Roof Top rainwater harvesting structures installed at institutional buildings, such as, schools, Anganwadis, Health centres, Gram panchayat buildings, Community soak pits , Rejuvenating the existing ponds are being proposed.

##### **4.1.2 LIQUID WASTE MANAGEMENT**

For liquid waste management it is recommended to have Soak pits and leach pits at individual residence. The system for liquid waste management is broadly based on the system of soak pits traditionally adopted for building toilets in rural areas but with certain modifications to allow for disposal of household waste water. The model envisages clusters of houses such that for every 10 houses, a soak pit is built to allow water only from the 10 houses to flow into. The soak pit being constructed will be

2m in diameter and 10m in depth. The water from the houses flow in to these soak pits via underground channels and fall into the soak pit. The water will gradually soak into the sides of the pit and filter down to the ground water table.

#### **4.1.3 STORM WATER MANAGEMENT**

Earthen drain with 0.60m width and 0.45m depth with proper connection to the main drain can be undertaken. Earthen drain for the disposal of rainwater stagnation can be planned based on the topography of the settlement. At handpumps a soak pit of 1.50 m diameter and 1.50 m depth can be provided can be provided using MGNREGS funds and this pit can be filled with locally available boulders and sand.

Drain channel on at least one side of a road with ROW less than 9-meter needs to be provided. PVC drain system can be used alongside the roads as it is low cost and will help to avoid unhygienic and insanitary surrounding, mosquito breeding, foul odour and allows for the reuse of wastewater for irrigation.

Various storm water best practices such as holding ponds, can also be constructed in the village for disposal of rainwater. These holding ponds can also be used for recreational purpose during the non-rainy seasons.

#### **4.1.4 SOLID WASTE MANAGEMENT**

For solid waste management, the village is to a large extent well equipped and there is an existing system of solid waste segregation at the designated solid waste management yard. It is proposed to extend this to the source itself by adapting a two-bin system at the household. Separate bins namely green bins and red bins can be distributed to households and can be asked to segregate the waste at the source before handing it to the sanitation workers. In addition, Simple windrow composting for managing wet waste can be practiced and Vermi-composting can also be adopted. However, complete thrust on awareness and behavioural change of the people residing in the village is necessary in this regard. This is to be strengthened by awareness, education and training programmes. Compost pit for biodegradable waste of trapezoidal shape 5 m X5m at bottom and 9.50m X9.50m at top can be provided in every habitation/settlement for the proper disposal of bio-degradable waste.

To further enhance the solid waste management of the village, a sanitary land fill system is proposed for the disposal of waste after segregation. Inorganic waste can be recycled for revenue generation also. For the Financial sustainability of the solid waste management, Sale of compost to organic markets, farmers and individuals can be undertaken through Direct and/or Online marketing. In addition, User fee collection towards the residents can also be collected to pay for the sanitation workers and also for the maintenance of the vehicles.

## **4.2 IMPROVEMENT OF SOCIAL INFRASTRUCTURE**

The village literacy level is below the district average and the predominant population is educated only till high school. There is no higher secondary school in the village and the existing high school is deficient in terms of infrastructure. Hence the up-gradation to higher secondary school is proposed.

Considering the population of the village and the existing facilities, the following social and cultural facilities are proposed; Public health care centre (1 nos); Upgradation of the existing post office; and 3 numbers of Housing park. These are proposed in the village at appropriate locations. There is at present one neighbourhood park in the village and 3 numbers of playground existing in the village for active and passive recreation. One additional playground can be proposed along with the high school (location identified in the master plan). As there are no government land in the northern part of the village suitable for play spaces, it is recommended that 10% of the residential layout area be reserved for open spaces and handed over to the panchayat. The village is at present having sufficient greenery as 2500 trees have been planted in the following hamlets of the village; Lakshmipuram; Santro city; Thandumedu; and Elms nagar.

## **4.3 PROPOSED LAND USE PLAN FOR 2030**

### **4.3.1 GENERATION OF COMPREHENSIVE DEVELOPMENT PLAN**

Conservation and sustainable management practices requires the adoption of basic ecological principles in the management of natural resources to ensure the sustainability. To improve the land resources, it is imperative to first improve the water resources of the region. So, both the plans should complement each other.

### **4.3.1.1 Water Resources Development Plan**

In the present study, WRDP has been achieved using a decision model that involves the logical combination of thematic maps as well as the ground and field knowledge shared by the Partner institution. The water resource development plan includes identification of suitable zones for taking up locale specific activities in the study area which are generally the areas, where certain type of water resource activity is recommended for implementation. Water conservation measures like check dam, percolation tank, bore wells, dug wells etc. fall under location specific activities. The main purpose of these activities is to improve the ground water condition within the GP area which means measures need to be taken to store the water as well as allow water to percolate in to the ground by holding the water in water harvesting structures as much as possible.

In order to identify the suitable zones for location of recharge structures, different thematic layers viz., drainage network with drainage order buffer map, soil, slope and land use/cover and runoff potential were integrated. Subsequently, zones in which the defined conditions of the different thematic layers were fulfilled are identified for location specific activity. The guidelines for the selection of suitable zones for planning location specific activities are adopted from literature (IMSD,1995) The water resource development is shown in Map 28: Water Resources Development Plan map of Sembarambakkam GP

Implementation strategies of some of the recommendations for improving water resources are given in detail

#### **4.3.1.1.1 Rainwater harvesting**

Rainwater harvesting in the site has two components viz., harvesting the roof water and the other, harvesting the surface runoff. In addition, treated waste water is one important source of water.

##### **4.3.1.1.1.1 Roof Water Harvesting to meet drinking water requirement of villages**

Roof water from the buildings and other paved areas to be collected and stored in sumps for reuse and also for recharging the bore wells after filtering (using pebble,

charcoal, sand beds). It would be advantageous to plan this activity while constructing any new building to collect as much roof water as possible and further for diverting this water to the sumps nearby and to the bore wells, after necessary filtering. Designs in this regard need to be worked out separately, taking into consideration of the roof area, rain fall, slope etc.

Roof water could be harvested by connecting the pipes and bringing the rainwater to a common pipe and then to sumps (size depends on roof area and requirement) after passing through filter beds. This water can be used for flushing, gardening, washing etc. For the new buildings under construction, harvesting of roof water, through sumps and recharging borewells could be planned.

#### **4.3.1.1.1.2 Groundwater Recharging through rain water harvested**

Some of the common suggestions for ground water recharge and rain water harvesting to be adopted are

- a) Depth to Water levels during pre- & post-rainy seasons of all existing bore wells are to be monitored at regular intervals
- b) All existing bore wells to be directly recharged (after filtering the roof water)
- c) Existing drain / water ways should be cleaned & maintained and linked
- d) Direct recharging of bore wells will help in recharging depleted fractures and fissures to have sustainable yield from bore wells

#### **4.3.1.1.2 Surface Water Harvesting**

All pits / percolation ponds, check dams, dugout ponds (existing and the planned new ones) together will be able to hold considerable quantity of rainwater for recharging the ground water. Further, the rain water from the study area could be diverted during rainy season to the large covered under ground / Ground Level Reservoirs/ storage tanks (GLR), located on elevated locations and then transported to overhead tanks through pumping for water distribution in the villages. From these GLRs, water could be used for gardening and other purposes through gravity. Storing water in the GLRs will avoid the loss due to evaporation. For all the tanks, silt filters

could be constructed to avoid silting of the tanks. This will also ensure that the water stored in the GLRs is free of silt.

#### **4.3.1.1.2.1 Setting up of STPs**

Setting-up of small STPs to recycle waste water which can be used for secondary uses like gardening, industrial cooling, flushing and other secondary purposes. A dual water supply system can be planned within the GP for potable and non-potable water separately, as a viable option to minimize the pressure on fresh water supply.

#### **4.3.1.1.2.2 Rejuvenation/ Restoration/ Desilting of Tanks**

The Rejuvenation / Restoration / Desilting of tanks is recommended for all bigger tanks which are partially silted up. Lakes are created basically for hydrological reasons for checking floods, recharging and maintaining the ground water table. They also act as sediment traps, prevent clogging up of natural valleys and reduce erosion by regulating runoff. Lakes and Tanks belong to wetland ecosystem and have a larger biological and ecological role. Hence, measures for rejuvenation / restoration / desilting of tanks and lakes in the Gram-Panchayat will definitely build up ground water resources.

#### **4.3.1.1.2.3 Drip irrigation**

Drip irrigation systems deliver water directly to a plant's roots, reducing the evaporation that happens with spray watering systems. Timers can be used to schedule watering for the cooler parts of the day, further reducing water loss. Properly installed drip irrigation can save up to 80 percent more water than conventional irrigation, and can even contribute to increased crop yields.

#### **4.3.1.1.2.4 Farm Ponds / dug out ponds**

Capturing and Storing Water in small to medium sized Farm Ponds is another method of storing water. Polythene sheets were used to reduce the seepage / infiltration losses. Many farms rely on municipal water or wells (groundwater), while some have built their own ponds to capture and store rainfall for use throughout the year. Properly managed ponds can also help to minimize their impact on the

surrounding watershed. This practice may be further encouraged to sustain horticulture, flori-culture & vegetable growing.

#### **4.3.1.2 Land Resources Development Plan (LRDP)**

In the present study, LRDP has been achieved using a decision model that involves the logical combination of thematic maps as well as the ground and field knowledge shared by the Partner institution. For arriving at the suitability of a particular land use activity in the study area, thematic maps viz. land use/cover, soil, slope and groundwater potential maps which were generated using remote sensing and GIS were integrated. Expert's knowledge and the field situation was also considered for formulating the alternate land use plans. Methodology adopted from the GIS based land use planning project initiated in India entitled 'Integrated Mission for Sustainable Development', which generates, analyses and integrates natural resource thematic data in 1:50000 scale, together with satellite remote sensing data has also been a guiding factor in the development plan formulations (IMSD, 1995). The land resource development is shown in Map 29: Land Resources Development Plan map of Sembarambakkam GP.

Some of the general recommendations for LRDP are given below.

- a. Improved Agro-horticulture / Agro-forestry practices (Horticulture Forestry plantations with interspaced cultivation) to bring better returns than the field crops.
- b. Intercropping in horticulture plantations with vegetables in both seasons may bring better benefits to farmers. Different drought resistant tree species are recommended for forest nurseries.
- c. Soil and water conservation measures: The surface run off could be channelized to recharge the existing and failed bore wells after due filtering. Soil conservation measures such as boulder / vegetative checks in the upper reaches, terracing of the sloppy areas; contour trenches; pits around trees could also be taken up in open areas. Vegetation cover to be improved with planting of trees, plants, etc within the open spaces in the village settlement area
- d. Fodder / Tree Plantations: These are suggested in the marginal lands with poor groundwater potential areas and not able to sustain crops. The open



forest areas may be converted into grazing lands by over seeding grasses and fuel wood species and these are recommended to meet the demands of local cattle feeding and fuel requirement of local people.

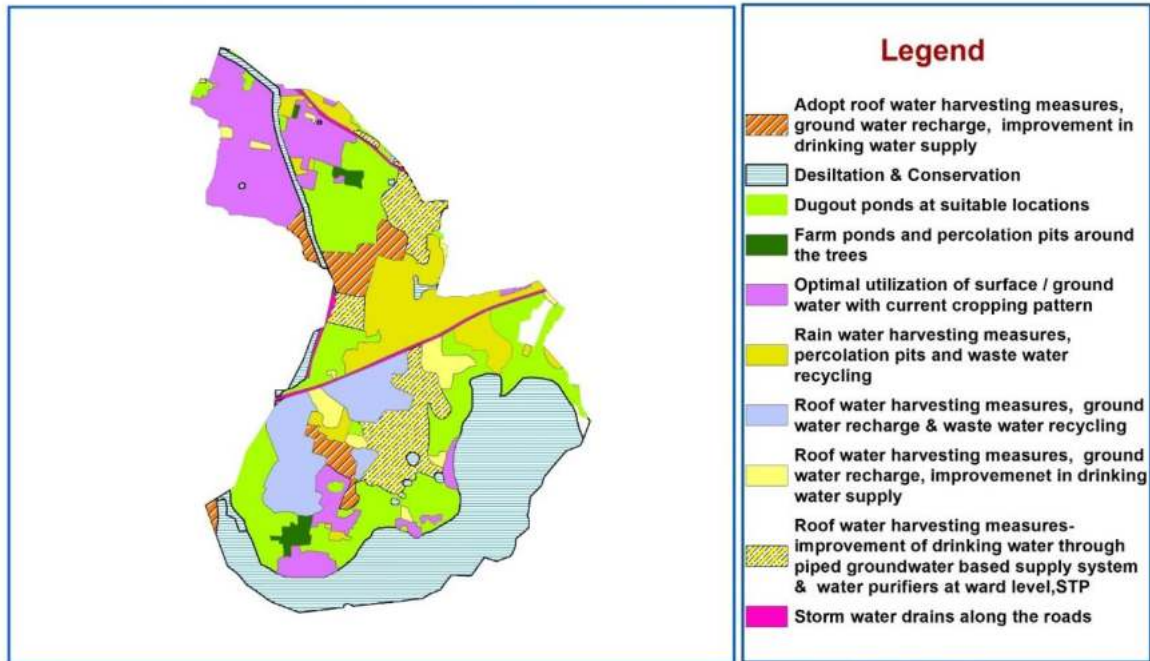
- e. Afforestation: Afforestation is proposed in the forest blanks / open forest areas to increase the density of vegetation. These gaps may have been caused due to several reasons which include grazing in the initial stage and unauthorized tree felling. The economic forest plantations are suggested for compensating forest degradation.
- f. Wasteland development: Land with or without scrub (Scrub Lands) come under this category. Over seeding of grasses and agro-forestry plantation are recommended on upland with or without scrub. Water conservation and harvesting structures like loose boulder check dams / Rock dams using available local stones in middle slopes that will help in raising soil moisture. In higher slopes at higher reaches brushwood dams and rubble dams will arrest soil erosion.
- g. Crop cultivation based on soil texture Sandy soil is not good for plants. However, Melon and Coconut can grow in sandy soil. If water is available for irrigation then crops such as pulses Millets can be grown.

#### **4.3.2 RECOMMENDATIONS & SUGGESTIONS FOR IMPROVING NATURAL RESOURCES**

- a. Sembarambakkam has a significant proportion of Industrial Area where development is proposed adopting Environmental and Pollution Control norms, establishment of effluent treatment plants and increased greenery in those regions.
- b. In Village Settlement areas, tree plantations in open spaces, terrace gardens and avenue plantations are suggested.
- c. Agricultural plantations mostly coconut plantations are the next major category which requires adoption of better management practices to improve its yield as well as setting up small scale industries for increasing the livelihood of the locals. Here in these areas, farm ponds, recharge pits around the trees, percolation pits have been suggested based on the soil category.
- d. For Cropland, existing crop and crop rotation practices with appropriate water resources planning is suggested.

- e. Maintenance and Planned Development with Green Lung Spaces is suggested for Areas having Educational Institutions.
- f. Conservation and Desiltation measures are proposed for Canals, Ponds and Tanks.
- g. Plantations are suggested for Scrub land and Open Areas and these could be developed with better management practices to improve productivity.
- h. Need based development is suggested along the Outer Ring Road, combined with Avenue Plantations and Storm Water Drains on either side of the Road.
- i. Roof water harvesting measures, improvement of drinking water through piped ground water-based supply system, water purifiers at ward level / institutional level are suggested for the buildings/houses within the settlements / Rural Built-up / Hamlets & dispersed households.
- j. Dug wells / borewells have been suggested within the Valley fills and dissected pediments.
- k. Overall, Groundwater recharge measures are proposed for future development in the study GP.
- l. The strategic planning is defined as the future directions for the development of land and water resources in the GP establishing the long-term objectives and mobilizing the financial resources and government policy to achieve goals. Further, involvement of local people is quite necessary as part of education, awareness and consensus. Implementation, monitoring and maintenance of the schemes and evaluation of implemented schemes for their end benefits are also the part of strategic planning activities.

**Gram Panchayat Spatial Development Planning - SISDP Update**  
 Sembarambakkam (GP), Poonamallee Taluk, Tiruvallur District, Tamil Nadu  
**Water Resources Development Plan**

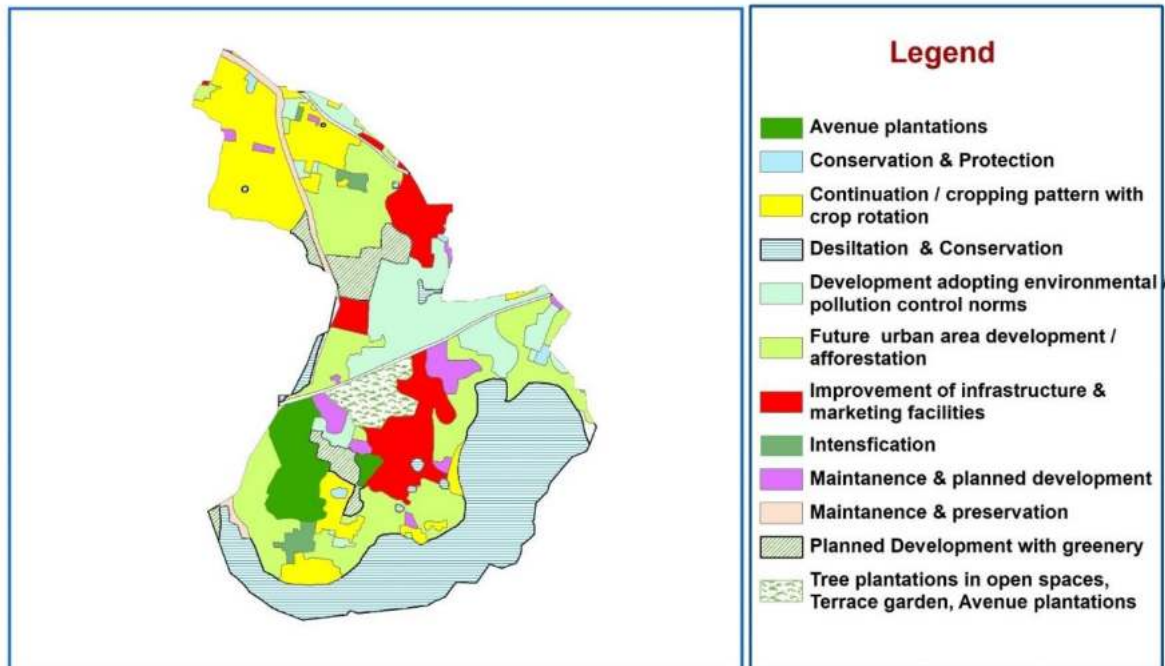


Source :  
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 Generated at RC-South, NRSC

Map 28: Water Resources Development Plan map of Sembarambakkam GP

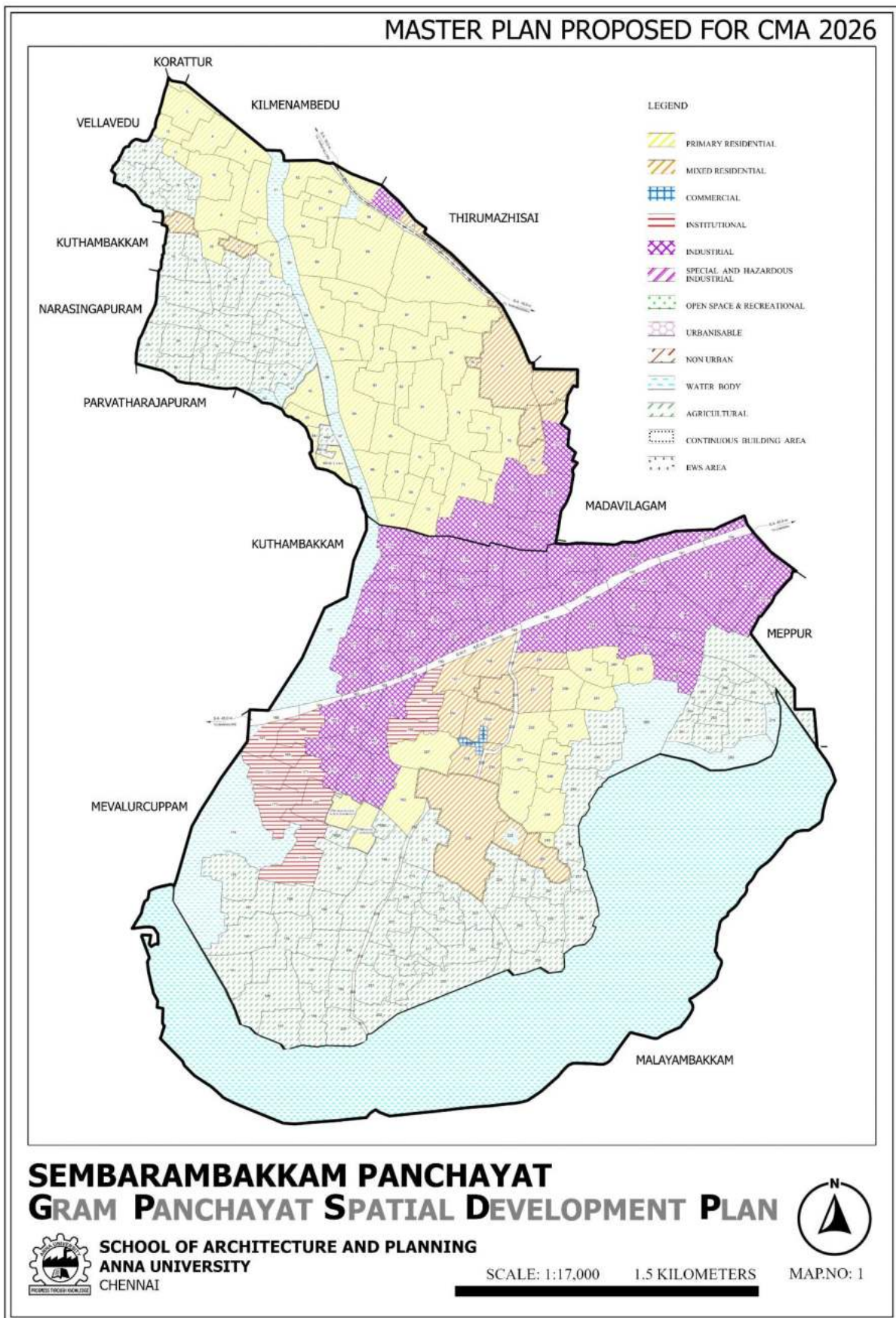
**Gram Panchayat Spatial Development Planning - SISDP Update**  
 Sembarambakkam (GP), Poonamallee Taluk, Tiruvallur District, Tamil Nadu  
**Land Resources Development Plan**



Source :  
 RESOURCESAT2 - LISSIV MX (5m)

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 Generated at RC-South, NRSC

Map 29: Land Resources Development Plan map of Sembarambakkam GP



Map 30: Master Plan Proposed for CMA-2026

### 4.3.3 PROPOSED LAND USE PLAN- SEMBARAMBAKKAM - 2030

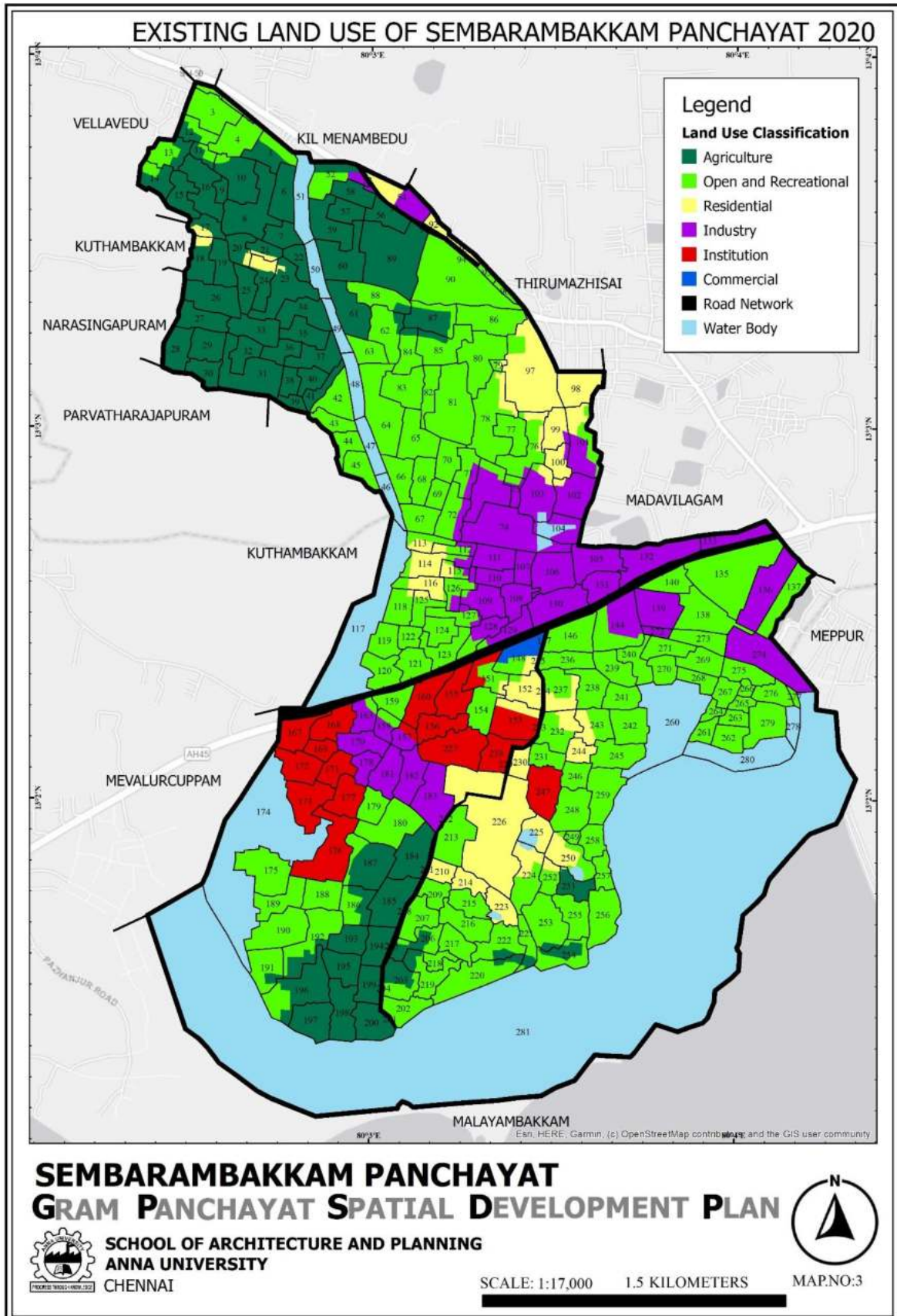
Developmental planning is a complex process of decision making based on the information about the status of resources, socio-economic conditions and institutional constraints. Reliability of the databases, both the spatial and non-spatial, is therefore crucial to the success of the developmental planning. Hence, it is necessary to understand various elements of Gram Panchayat and their interrelationship for ecological planning. From the study of the existing land use *Map 31: Existing Land use of Sembarambakkam Panchayat* in the Sembarambakkam panchayat along with the supportive consideration of *Map 28: Water Resources Development Plan map of Sembarambakkam GP*, and *Map 29: Land Resources Development Plan map of Sembarambakkam GP*, by NRSC and *Map 30: Master Plan Proposed for CMA-2026* by CMDA, the land use for the Sembarambakkam Panchayat for the next 10 years that is upto 2030 is proposed in the *Map 32: Proposed Land Use for Sembarambakkam Panchayat 2030*

Table 22: Existing Land use based on primary survey

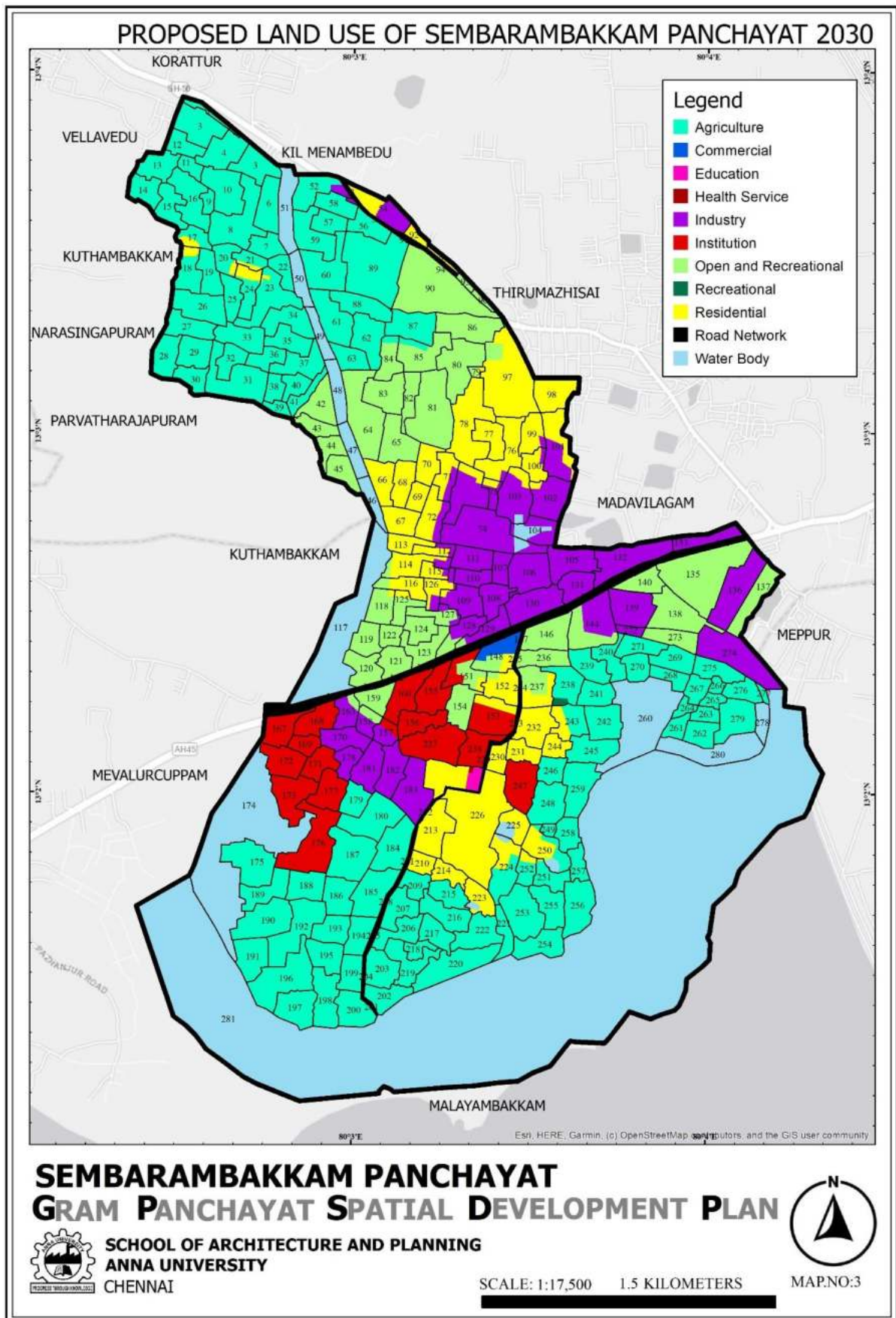
Land use	Percentage
Agriculture	16.07%
Open and Recreational	30.88%
Residential	6.71%
Commercial	0.17%
Institution	4.93%
Industry	9.77%
Road Network	1.57%
Water Body	29.91%

Table 23: Proposed Land use percentage

Land use	Classification	Percentage
<b>Non-Built-up area</b>	Agriculture	31.12%
	Pasture and Other Grazing Land	11.48%
<b>Built-up area</b>	Residential	10.5%
	Institution	4.88%
	Industry	9.67%
	Commercial	0.16%
	Road Network	1.55%
	Health Services	0.38%
	Educational	0.38%
	Recreational	0.28%
Water Body	29.6%	



Map 31: Existing Land use of Sembarambakkam Panchayat 2020



Map 32: Proposed Land Use for Sembarambakkam Panchayat 2030

#### 4.4 DETAILS OF BUDGET, IMPLEMENTATION PERIOD AND EXISTING SCHEMES UNDER THE PROPOSALS CAN BE IMPLEMENTED

This Gram Panchayat has single village scheme and hence these funds allocated under GPDP are considered for phase wise development of the village. However, considering fast expansion of Chennai and surrounding institutional development this village may undergo transformation and might come in planning area.

Table 24: Overview of Plan proposed

S.no	Proposal	Period of implementation	Budget outlay	Relevant Govt. Scheme
<b>I</b>	<b>PHYSICAL INFRASTRUCTURE</b>			
1.	Existing mud roads to be converted to all weather roads	Year 1-2	1030 lakhs	Tamil Nadu Rural Roads Improvement Scheme (TNRRIS) or NABARD-RIDF or PMGSY
2.	<b>Water conservation and Management</b>			
	a. Rooftop rain water harvesting	Year 3-10	Cost as per design of individual system	Tamil Nadu Water Resources Conservation and Augmentation Mission
3.	<b>Grey water Management</b> Soak pits and leach pits at individual residence level for grey water	Year 1-2	-	Awareness promotion and Technical booklet to be dispersed by panchayat
4.	<b>Solid Waste Management</b> a. Source segregation at HH level (two bin system) b. Sanitary landfill site	Year 1-2	Cost as per design of individual system	Swachh Bharat Mission (Gramin)
5.	<b>Rooftop Solar System</b> Solar energy utilization in new projects	Year 2-3	Cost as per design of individual system	Solar Subsidy under Rooftop Solar projects (RTS)
<b>II</b>	<b>SOCIAL INFRASTRUCTURE</b>			
6.	Establishing public and Child-Mother Health Care	Year 2-3	45 lakhs	-



	Centre – 1 nos			
7.	<b>Educational infrastructure</b> a. Higher secondary school	Year 3-5	350 lakhs	Revamped Comprehensive School Infrastructure Development Scheme
8.	Playground and parks	Year 1 – 2	Cost as per design of individual system	-

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