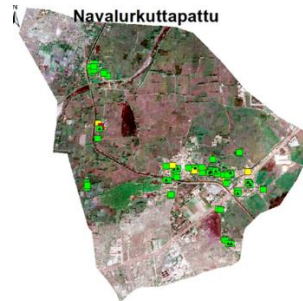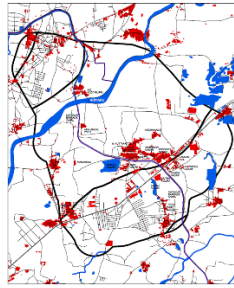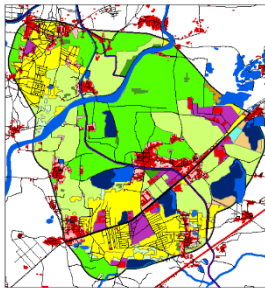सत्यमेव जयते

MINISTRY OF PANCHAYATI RAJ
Government of India

SPATIAL PLANNING IN GRAM PANCHAYATS

NAVALURKUTTAPATTU GRAM PANCHAYAT

(Srirangam taluk, Tiruchirapalli district, Tamil Nadu**)**

Department of Architecture
National Institute of Technology
Tiruchirappalli

(in collaboration with Regional Remote Sensing Centre - South,

NRSC/ISRO, Govt. of India, Bengaluru)

JANUARY 2021

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ACKNOWLEDGEMENTS

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List of Abbreviations

DEM   Digital Elevation Model

DOP   Date of Pass

FCC   False Colour Composite

NCC   Natural Color Composite

GIS   Geographic Information System

GP   Gram Panchayat

GPS   Global Positioning System

GPSDP   Gram Panchayat Spatial Development Plan

ICT   Information and Communication Technology

IRS   Indian Remote Sensing

LULC   Land Use Land Cover

RS   Remote Sensing

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

Remarkable economic growth, with significant achievements in the areas of agriculture, health, rural development, poverty alleviation, education and science & technology, has been experienced in India during last few decades. Still the rural poor face unemployment, poor infrastructure, low literacy level, inequality, low per capita income and consequent low standards of living. Most of the developments are taking place in urban areas and rate of development is high in metros and large cities. These developmental activities taking place in urban areas extend to peri-urban areas as haphazard development mainly in villages adjoining the urban areas located on NH and major highways and. These haphazard, unregulated developments also lead to environment and other issues in the rural areas.

The rural areas have vast land area, the natural resource that is indispensable for development activities. For any nation, effective utilization of natural resources and their management are extremely essential. Hence, there is a need to catalyze the planning process at grassroots level. 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 professional assessment of the ground situation and proposals for the future sustainable development within the bounds of demographic, physical, socio-economic, jurisdictional and financial aspects for the gram panchayat – NAVALURKUTTAPATTU, located in Srirangam taluk and Tiruchirappalli district is presented in this report.

1.2 TIRUCHIRAPPALLI DISTRICT

Tiruchirappalli District in Tamil Nadu is located on the banks of the Kaveri River in Tamil Nadu, India. The main town in Tiruchirappalli District and the headquarters is the city of Tiruchirappalli. As per 2011 census data, the district had a population of 2,722,290 with 1,013 females for every 1,000 males.
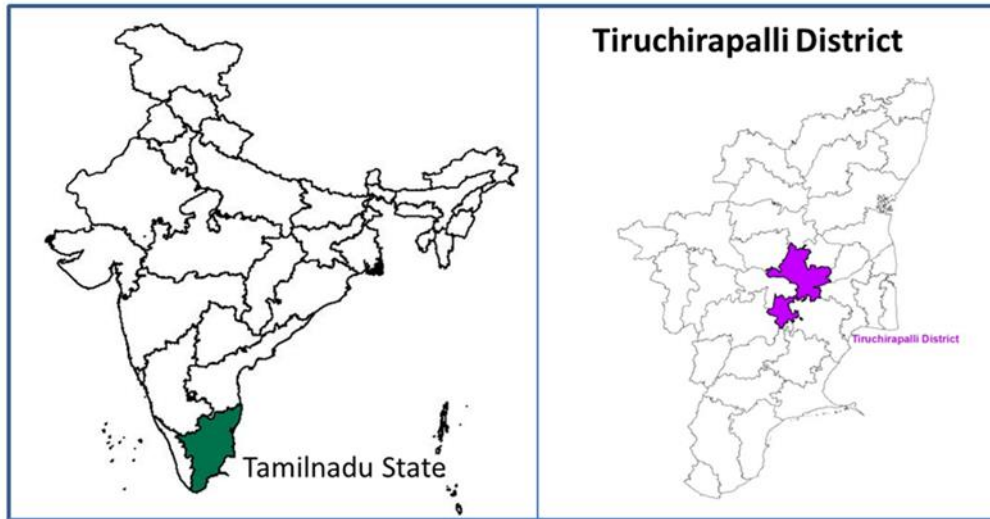
Source: Regional Remote Sensing Centre - South, NRSC/ISRO, Govt. of India, Bengaluru
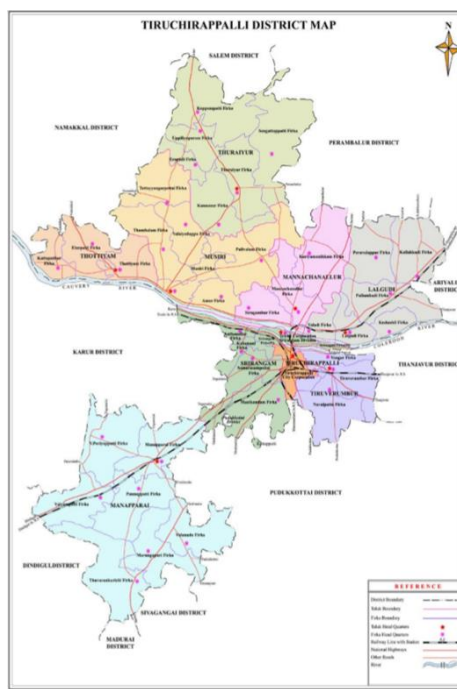
Source: Tiruchirappalli District Census Handbook 2011

Figure 1.1 Tiruchirappalli District

The extent of the district is 4,404 square kilometres and bounded in the north by Salem district, in the northwest by Namakkal district, in the northeast by Perambalur district and Ariyalur District, in the east by Thanjavur District, in the southeast by Pudukkottai District, in the south

by Madurai District and Sivagangai District, in the southwest by Dindigul district and, in the west by Karur district. The Kaveri river flows through the length of the district and is the principal source of irrigation and drinking water.

According to 2011 census, Tiruchirappalli district had a population of 2,722,290 with a sex-ratio of 1,013 females for every 1,000 males. The Scheduled Castes and Scheduled Tribes accounted for 17.14% and 0.67% of the total population respectively. The average literacy of the district was 74.9%, compared to the national average of 72.99%. Tiruchirappalli district had a total of 698,404 households. There were a total of 1,213,979 workers, comprising 161,657 cultivators, 319,720 main agricultural labourers, 25,174 in house hold industries, 575,778 other workers, 131,650 marginal workers, 9,012 marginal cultivators, 59,062 marginal agricultural labourers, 5,212 marginal workers in household industries and 58,364 other marginal workers in Tiruchirappalli District according to 2011 census (District Census Handbook 2011).

Tiruchirappalli is a place of historic, cultural and economic importance. The district has a rich and diverse cultural heritage. The prominent historical monuments in Tiruchirappalli include the Rock fort, the Ranganathaswamy temple at Srirangam, the Erumbeeswarar Temple at Tiruverumbur, the Jambukeswarar temple at Thiruvanaikaval and Our Lady of Lourdes Church. Several temples having religious importance and having heritage values are located within the district and also in nearby districts. The district has several tourist attractions also. The tourist places include Railway museum, Mukkombu, Kallanai, Pachamalai, Puliyancholai falls, butterfly park, etc. The district is also known for its exquisite handicrafts, castings and South Indian musical instruments.

The economy of the district is mainly farming and also metal based and other industries. The agriculture practice is sustained by a network of irrigation sources and improved methods of cultivation. The vast tracts of the land in this district are irrigated by the major rivers are Kaveri, Kollidam and their tributaries. The major crops are rice, sugarcane, banana/plantain, coconut, cotton, betel, corn, groundnut, etc. With the commissioning of Bharat Heavy Electricals Limited in the 1960s, the district endured extensive economic development in the industrial development. Major industries in Tiruchirappalli include Bharat Heavy Electricals Limited (BHEL), High Energy Projectile Factory (HEPF), Golden Rock Railway Workshop, Ordinance Factory Tiruchirappalli, Light and heavy metal based industries, Food Processing, Sugar Mills,

Cigar Making, Hosiery and garments, IT/BPO, manufacturing of Synthetic Stones for Jewellery, etc.

Tiruchirappalli district is also well known educational centre in Tamil Nadu. The major educational institutions are National Institute of Technology Tiruchirappalli, Tamil Nadu National Law School, Indian Institute of Management, Bharathidasan University, Anna University Tiruchirappalli, Indian Institute of Information Technology Tiruchirappalli, Government Medical College, National Research centre for banana, and Agricultural College & Research Institute. The district has a private medical college and several business schools, engineering, arts and science, polytechnic colleges. The district has several reputed schools including two Kendriya vidyalayas.

Tiruchirappalli district has 04 revenue divisions, namely Tiruchirappalli, Srirangam, Lalgudi and Musiri. The district has 11 taluks namely Tiruchirappalli west, Tiruchirappalli east, Lalgudi, Manapparai, Musiri, Thuraiyur, Mannachanallur, Srirangam, Thottiyam, Thiruverumbur, and Marungapuri. The number of revenue villages in each of the taluks is 13, 11, 93, 51, 61, 67, 46, 59, 30, 31 and 45 respectively. The gram panchayat NAVALUR KUTTAPATTU is located within Srirangam taluk.
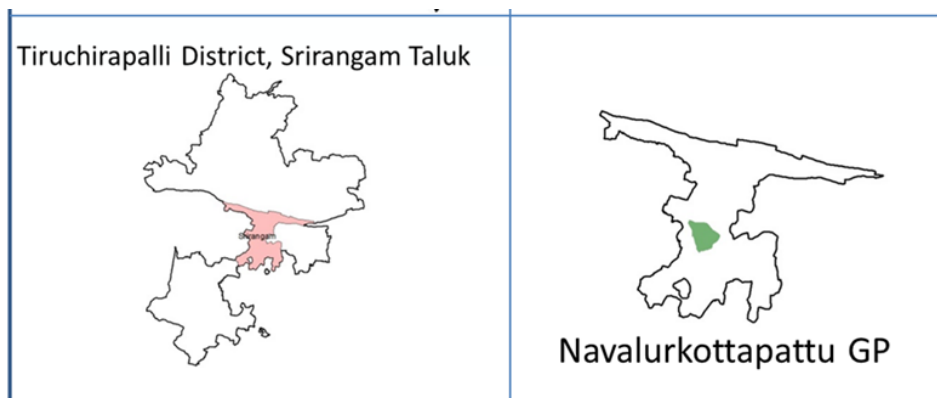
Source: Regional Remote Sensing Centre - South, NRSC/ISRO, Govt. of India, Bengaluru

Figure 1.2 Srirangam Taluk and Navalurkuttapattu GP

1.3 SRIRANGAM TALUK

The headquarters of the Srirangam taluk is the town of Srirangam. This taluk has 59 revenue villages. As per 2011 census, the population of Srirangam taluk is 210,361 with 104,734 males and 105,627 females. Out of the total population, 13.3% people lives in Urban areas while 86.7% lives in the Rural areas. There were 1009 women for every 1000 men. The sex ratio of

4

urban areas in Srirangam Taluk is 1,031 while that of rural areas is 1,006. The literacy rate of taluk is 73.24%. The male literacy rate is 78.85% and the female literacy rate is 65.76% in Srirangam Taluk. The population of Children of age 0-6 years in Srirangam Taluka is 22274 which is 11% of the total population (District Census Handbook 2011).
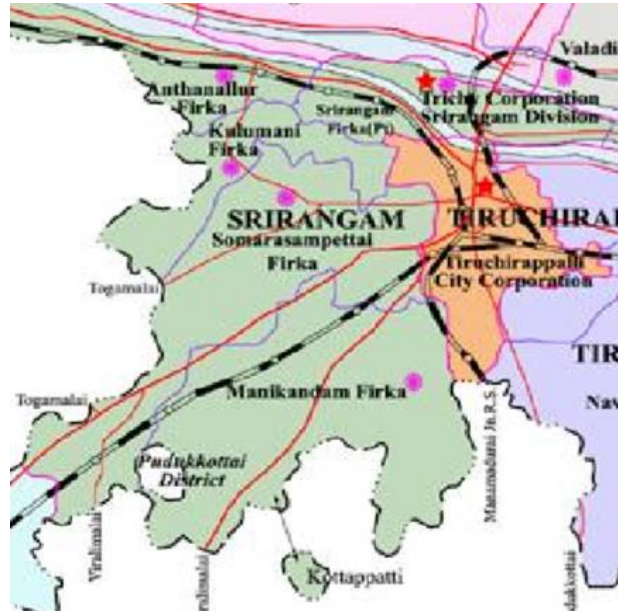
Source: Tiruchirappalli District Census Handbook 2011

Figure 1.3 Srirangam Taluk

1.4 MANIKANDAM PANCHAYAT UNION

Manikandam Panchayat Union is one of the 14 blocks in Tiruchirappalli District. It is situated in Srirangam taluk and includes 21 village panchayats apart from Manikandam Town Panchayat. This block is considered to be in a backward position in agricultural as well as industrial development. The main crops of the block are paddy, maize and banana. The larger portion of the cultivated area is rain fed. There is a network of 8 banks (6 commercial banks + 2 cooperative banks) and one NGO rendering financial support and skill training to the SHGs.

Map showing the Panchayat Villages of Manikandam Block
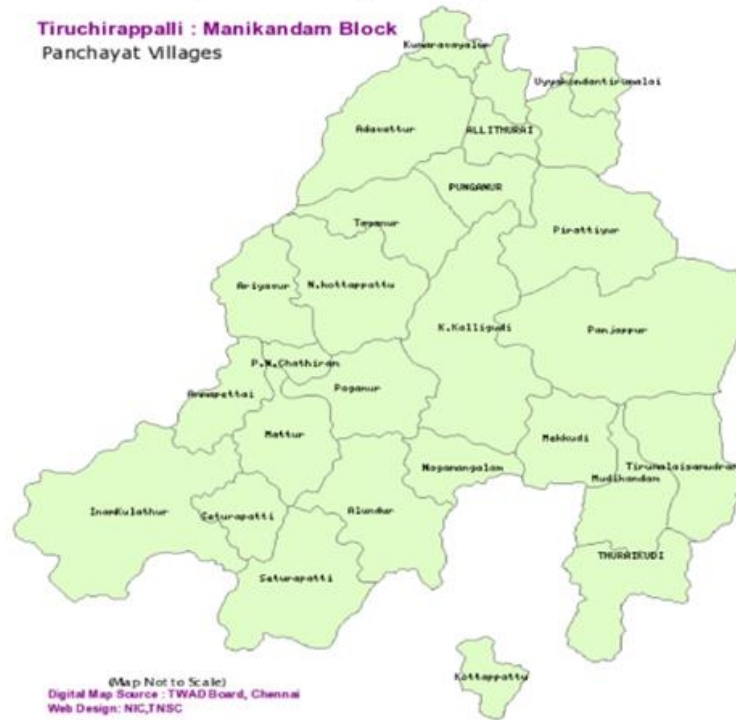
Source: TWAD Board Chennai

Figure 1.4 Manikandam Panchayat Union

1.5 NAVALURKUTTAPATTU GRAM PANCHAYAT

Navalurkuttapattu is a large village located in Manikandam panchayat union, Srirangam Taluk of Tiruchirappalli district, Tamil Nadu. As per 2011 census, there were 1589 residential houses in this GP. The Navalurkuttapattu village has population of 5310 of which 2629 are males while 2681 are females in 2011 (District Census Handbook 2011).

As per constitution of India and Panchyati Raaj Act, Navalurkuttapattu village is administrated by Sarpanch (Head of Village) Mr. S. George Fernandez, who is elected representative of village. Navalurkuttapattu comprises of 15 hamlets namely Navalur, Adi Dravider Kudiyiruppu, Aravangalpatti, Manalmedu, Anbu Nagar, Navalurkuttapattu, Kuttapattu, Keelakkadu, Ambedkar Nagar, Bharathi Nagar, Vannankoil, Santosh Nagar, Gandhi Nagar, Muthukkulam and Thirunagar. All the hamlets are well connected with pucca roads. The location of various hamlets is shown in Figure 1.5.
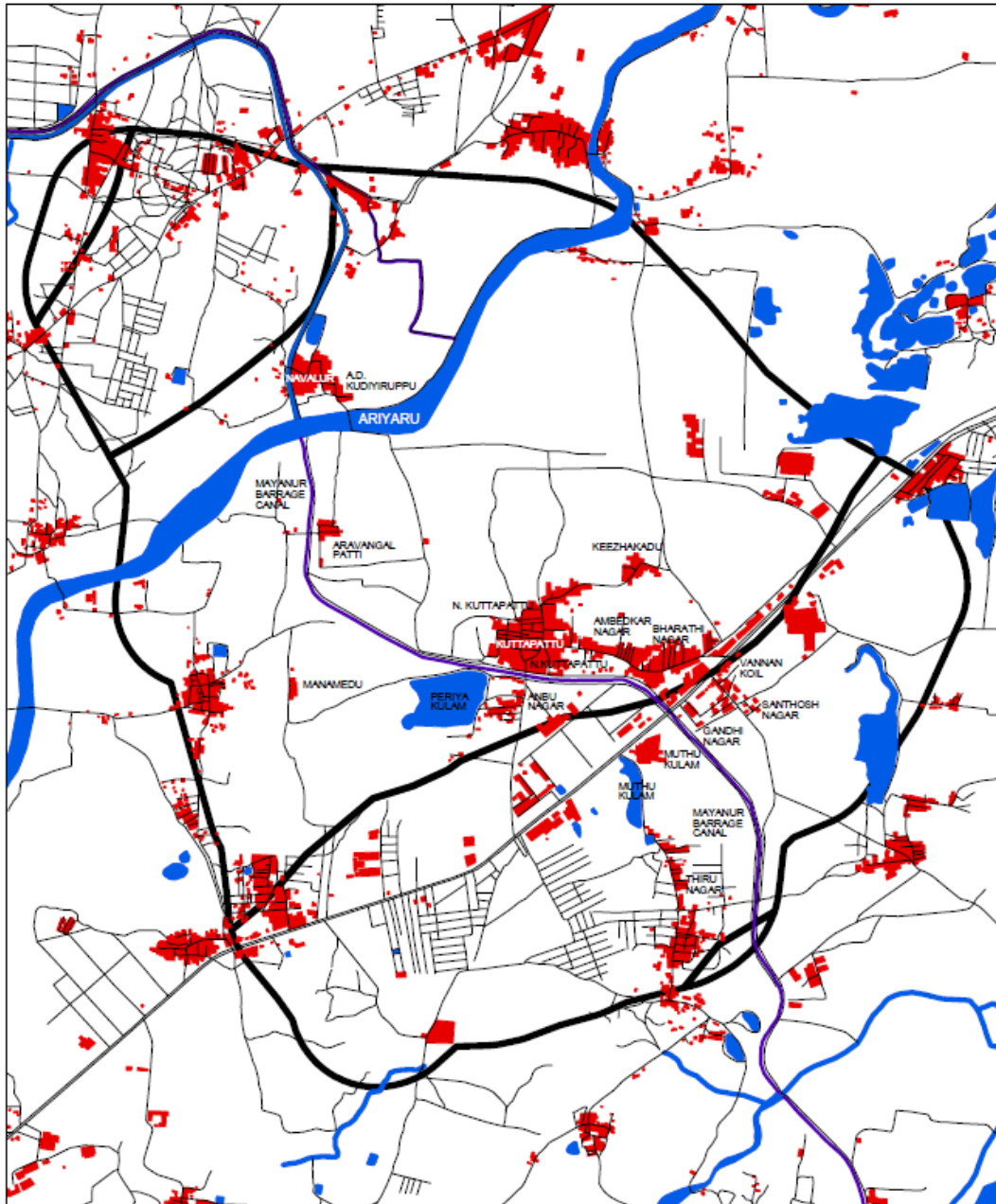
Figure 1.5 Hamlets and Road Networks – Navalurkuttapattu GP

1.6 OBJECTIVES

The basic objectives include

1. To understand the demographic profile and their socio-economic characteristics;

2. To ascertain the current status of physical infrastructure, services & facilities, open space & recreation and geographical & natural resources;

3. To assess the present gaps and future needs of this GP in terms of economy, physical infrastructure, services & facilities, and open space & recreational facilities

4. To propose effective utilisation and management of natural resource of the GP.

5. To propose integrated development strategies for the GP.

As the information on natural resources of a region is crucial to any planning process, the present study was taken up with the following objectives (*Regional Remote Sensing Centre - South, NRSC/ISRO, Govt. of India, Bengaluru*):

1. Inventory and spatial analysis of natural resources that include thematic layers viz., infrastructure layers, LU/LC, slope, drainage network & water bodies, contours, soil etc.

2. Generation of Land and Water resource development plans

1.7 METHODOLOGY

1.7.1 INVENTORY OF NATURAL RESOURCES USING GEOSPATIAL TECHNOLOGIES

(Regional Remote Sensing Centre - South, NRSC/ISRO, Govt. of India, Bengaluru)

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.

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 this 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 modeling. 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.

1.7.2 DATA COLLECTION

The required data for spatial planning of gram panchayat was obtained through

1. Field studies: The field studies were carried out mainly to update the land use map, marking the location various facilities and also to understand the present problems faced by the people of this GP.
2. Household surveys: Household surveys were carried out in 5% of the households using the mobile app developed by NRSC. The household survey was carried out in 90 households covering all hamlets, different socio-economic groups of population and different typologies of houses (Refer 1.5).
3. Discussions/ feedback from various stakeholders: The information regarding the facilities available, shortcomings and expectations were collected through informal discussions and feedbacks from different sections of people.

4. Gram panchayat office: The details regarding population, housing, infrastructure, facilities, welfare projects being carried out and budget of GP were obtained from the gram panchayat office.

5. Revenue Department – Village Administrative Officer & other revenue records of state government: Survey number wise land records, extent of land area occupied by various uses, etc., were collected.

6. Information/ Data/ Maps published by NIC & NRSC

7. Census data: The demographic details were obtained from Tiruchirappalli District Census Handbooks – 1961, 1981, 1991, 2001 and 2011.

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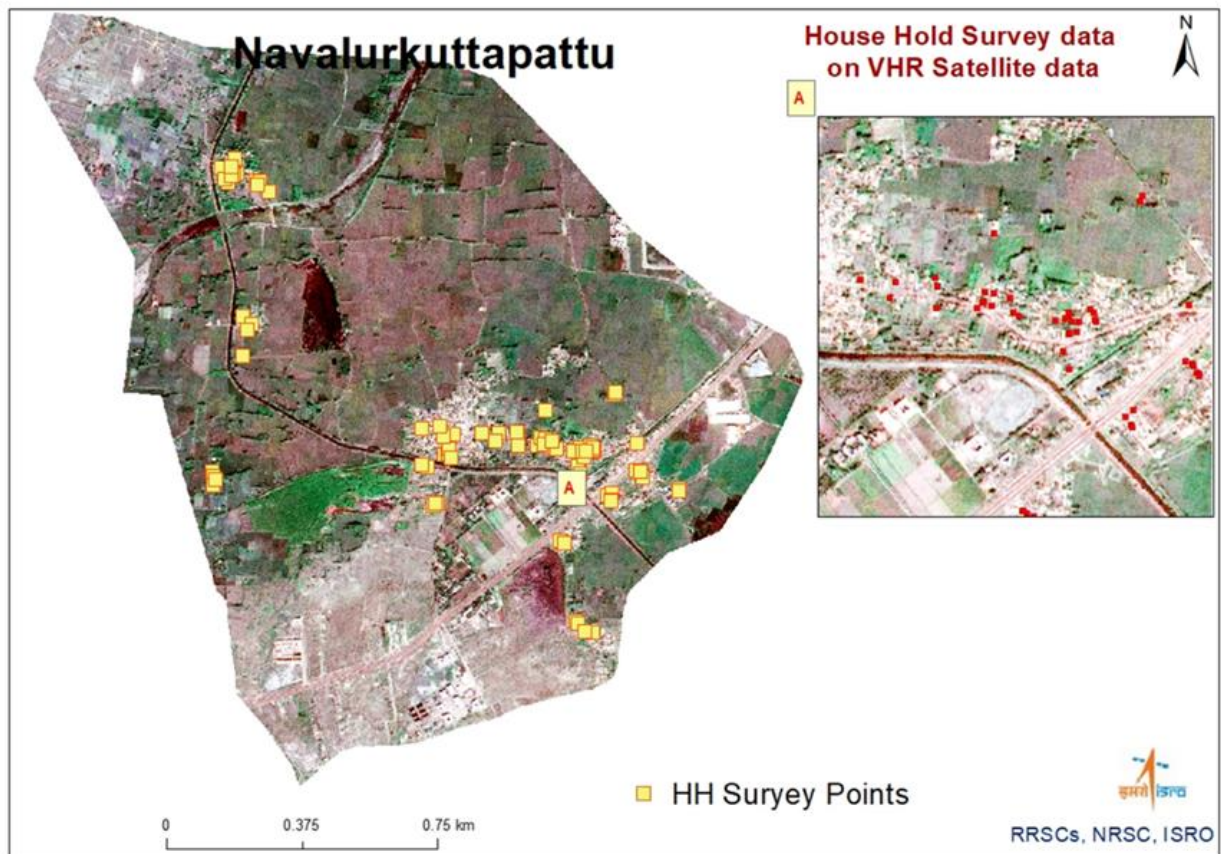
Figure 1.6 Household Survey Points – Navalurkuttapattu GP

CHAPTER 2

EXISTING SPATIAL DETAILS OF GRAM PANCHAYAT

2.1 INTRODUCTION

Navalurkuttapattu GP is extending on either side of NH45 connecting Tiruchirappalli and Dindugal on the western direction from Tiruchirappalli city. Navalurkuttapattu GP extends from 10°44'29.60"N to 10°46'52.68"N latitude and 78°34'40.95"E to 78°37'0.23"E longitude. This GP is connected to Tiruchirappalli by NH 45 on the southern side and Tiruchirappalli – Thogamalai road on the northern side.

2.2 PHYSICAL EXTENT

The geographical area of this GP is 1125.39.5 hectares. 780.92 hectares is under dry land category that include crop land and fallow. The overall extent of wet lands is 77.35.5 hectares, of which 75.71.5 hectares is crop land and 1.64.0 hectares is fallow land. 11.14.5 hectares of land is under fallow category (with taxation & non-taxation) and the extent of govt. land (poramboke) is 255.97.5 hectares.

Table 2.1 Land Details – Navalurkuttapattu GP

Classification	Area		%	Crop Land	Fallow
	Hectare	Ares			
Total Dry Lands	780	92.0	69.40	455.87.78	325.04.22
Total Wet Lands	77	35.5	06.90	75.71.5	1.64.0
Fallow & Other Uses	11	14.5	1.00		
Govt. Land (Poramboke)	255	97.5	22.70		
Total	1125	39.5	100	531.59.28	

Source: Land Records, 2020, VAO office, Navalur kuttapattu GP.
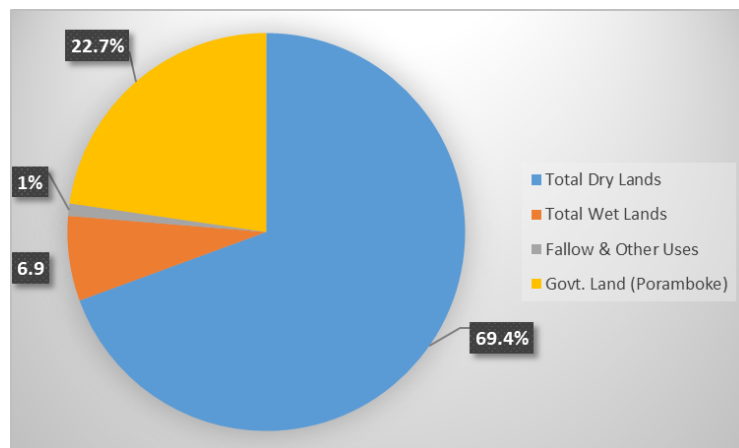
Figure 2.1 Land Details – Navalurkuttapattu GP

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2.3 LAND USE/ LAND COVER DETAILS

The major land area is under agricultural use. The non-agricultural uses such as water bodies, housing and other areas of hamlets, institutional areas, scrub and fallow lands occupy significant percentage of land area. As per Tiruchirappalli district census handbook 2011, 376 hectares of land area was under non-agricultural uses, 71.7 hectares under fallow lands other than current fallows, and 164.4 hectares under current fallows. The net sown area was 513.2 hectares, of which 500.4 was irrigated land area and 12.9 hectares un-irrigated land area (Tiruchirappalli District Census Handbook, 2011).

The extent of various land uses/ land cover as per the land records are stated in this section. The extent of present land area under each land use/ land cover category is given in the section 2.6.2
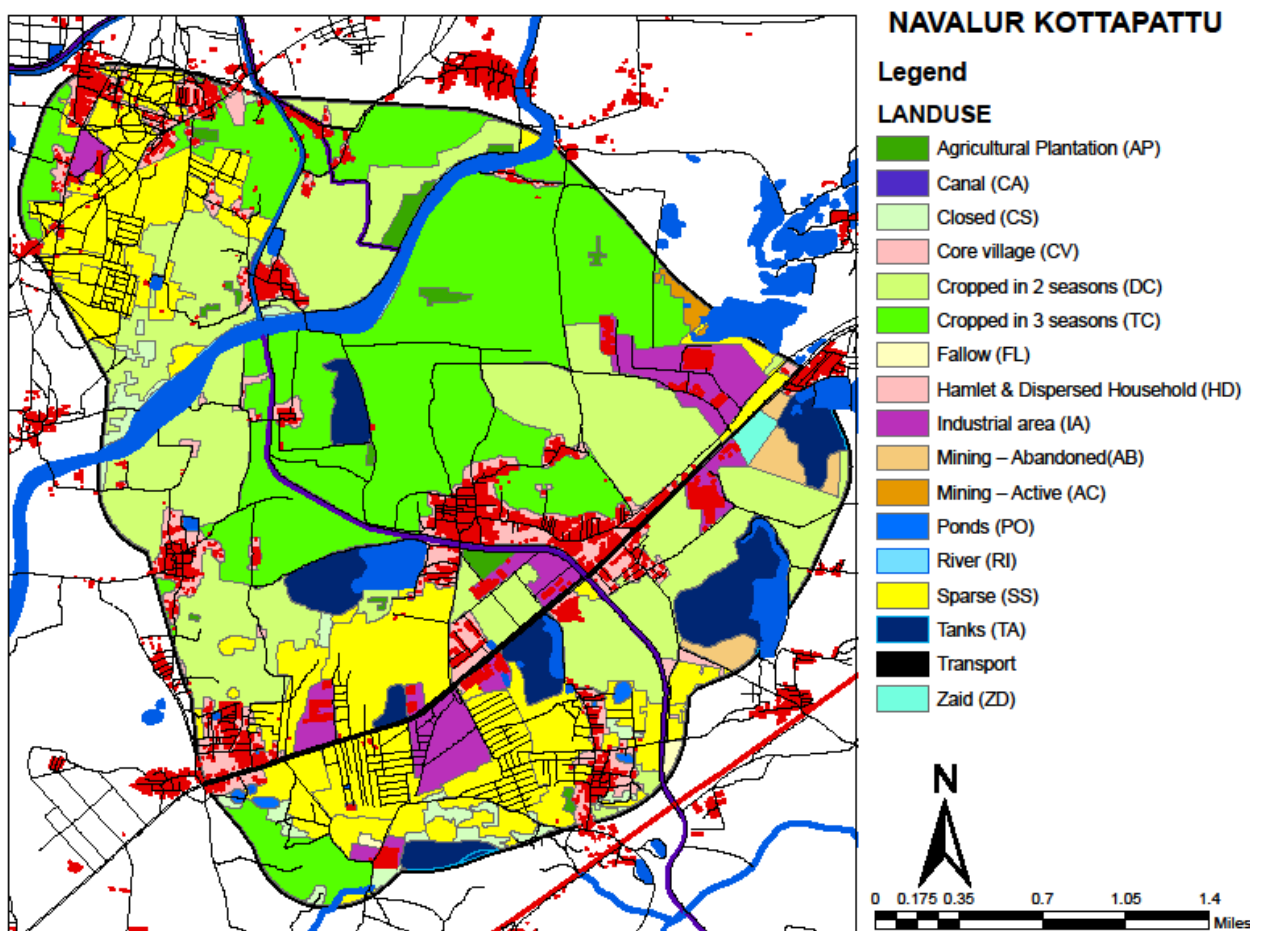
Source: Regional Remote Sensing Centre - South, NRSC/ISRO, Govt. of India, Bengaluru

Figure 2.2 Land Use/ Land Cover – Navalurkuttapattu GP

Agriculture

In the year 2020 cropping carried out in 531.59.28 hectares, out of which dry land is 455.87.78

hectares and wet lands is 75.71.5 hectares.

Housing Area (Natham)

As per the revenue records, the vacant housing areas (not built-up, vacant plots) occupy 85.33.5 hectares and the housing area with buildings (houses) occupy 39.64.5 hectares.

Roads

National Highway (4 lanes) for a length of 4.98 kms runs across this GP. This GP has all weather approach roads to all hamlets and also foot paths and paths for bullock carts/ vehicles in the hamlets and also in agricultural fields. As per the revenue records the total area under village roads and paths is 20.72 hectares.

Table 2.2 Extent of various Land use/ Land cover – Navalurkuttapattu GP

Land use/ Land cover	Area	
	Hectares	**Ares**
Housing (Village Natham) plots (House buildings & vacant plots)	39	64.5
Agricultural land (cultivated in 2020)	531	59.28
Approach roads/ streets/ Footpath/ paths for bullock carts (incudes paths within agricultural land)	20	72.2
Crematorium/ Burial grounds	0	61.5
Religious places	1	08.5
Water Bodies	122	56.0

Source: Land Records, 2020, VAO office, Navalurkuttapattu GP & Field Surveys.

Figure 2.3 Agricultural Fields, Pathways and Irrigation Channels

Water Bodies

River Ariyaru flows across this GP. Mayanur barrage canal that runs through the GP is the

major source of water supply for agriculture mainly in wet lands. There are 4 ponds, 3 Check dams, and 18 Tanks. The areas occupied by the water bodies is as given below:

Table 2.3 Extent of Water Bodies – Navalurkuttapattu GP

Water Body	Area
Ponds & Tanks	93.14.5 Hectares
River	24.90.5 Hectares
Canals and other drainage channels	4.51.0 Hectares
Total	122.56.0 Hectares

Source: Land Records, 2020, VAO office, Navalurkuttapattu GP

Figure 2.4a Ariyaru River

Figure 2.4b Mayanur Barrage canal   **Figure 2.4c Periyakulam**

Institutional and Industrial Areas

Apart from schools, three major educational campuses, i.e., Tamil Nadu National Law University, Agriculture and Horticulture College and a private engineering college. The total and area under institutional land use is 65.78 hectares. The industrial development in this GP occupies about 38.58 hectares.

2.4 INVENTORY OF NATURAL RESOURCES USING HIGH RESOLUTION SATELLITE DATA

(*Regional Remote Sensing Centre - South, NRSC/ISRO, Govt. of India, Bengaluru*)

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.

2.4.1 INFORMATION SOURCES FOR DEVELOPMENTAL PLANNING

Satellite data IRS -1D LISS III data, Cartosat and IRS P6 LISS IV data and other collateral data form major source for preparation of various thematic maps as spatial database. The data acquired from the multi-spectral sensors LISS IV (5.6 m resolution) and CARTOSAT (2.5 m resolution) of the Indian Remote Sensing Satellite (IRS) series are extensively used for generating spatial databases to update the spatial layers needed for generating the value-added Land Resource and Water Resource Development plans. The data needed for this study is studied in detail and the collected primary maps have been grouped into hydro-geomorphological, topographical, land use/land cover, hydrology and socio-economic parameters (Table 2.4).

Table 2.4: Information sources for development planning

Data/map	Source	Spatial/Non-spatial	Scale
Digital Elevation Model	Cartosat Stereo data	Spatial	10 m
Contour	CARTODEM	Spatial	5m
Geological map	Rajiv Gandhi National Drinking Water Mission	Spatial	1:50K
Geomorphological map		Spatial	1:50K
Structures/Lineaments		Spatial	1:50K
Soil Texture	NRIS	Spatial	1:50K
Land use/cover	Very 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		Spatial	1:10K
Infrastructure	High resolution satellite data	Spatial	1:10K
Village boundaries		Spatial	1:50K

Subsequently, 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 2.5). Natural resources data representing environmental status of the study area that were generated under various national level projects at 1:50000 scale was considered for the present study and are presented below. The database was standardized for integrated analysis under GIS environment.

Table 2.5: 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, bore well, 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

2.5 SATELLITE DATA USED

(*Regional Remote Sensing Centre - South, NRSC/ISRO, Govt. of India, Bengaluru*)

High resolution (2.5m) and medium resolution 5m satellite datasets and Digital Elevation Model (DEM) were used for preparation of spatial thematic layers for Navalurkuttapattu GP.

2.5.1 HIGH RESOLUTION SATELLITE DATA (HRS DATA)

Merged product of Cartosat-1 PAN and IRS LISS-IV MX datasets acquired during 2015-16, in Natural Colour Composite i.e. NCC mode of 2.5m spatial resolution was used for GPSDP planning (Figure 2.5).

Gram Panchayat Spatial Development Planning - SISDP Update

Navalurkottapattu (GP), SrirangamTaluk, Tiruchirappalli District, Tamil Nadu

Navalurkottapattu satellite image 2015-16

Legend

Natural Colour Composite

0   0.45   0.9   1.8
Kilometers

Generated at RC-South, **NRSC**

Source :
CARTOSAT1+ RESOURCESAT2 LISSIV
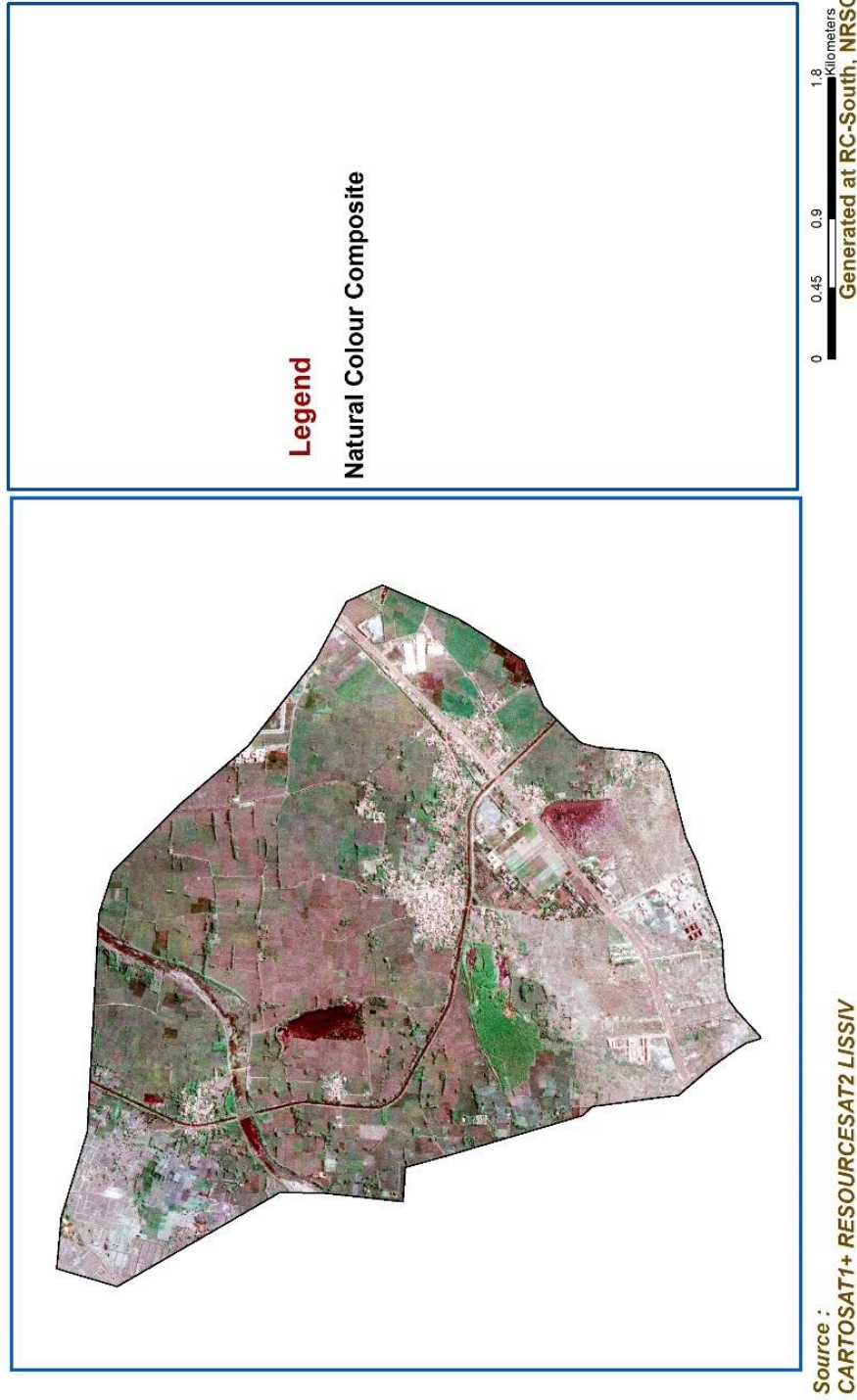
Figure 2.5: Navalurkuttapattu GP as seen through HRS data in NCC mode (2.5m)

2.5.2 MEDIUM RESOLUTION SATELLITE DATA (MRS DATA)

RESOURCESAT LISS-IV MX datasets acquired during 2019 in False Color Composite i.e. FCC mode of 5.0m spatial resolution was used for GPSDP planning (Figure 2.6).
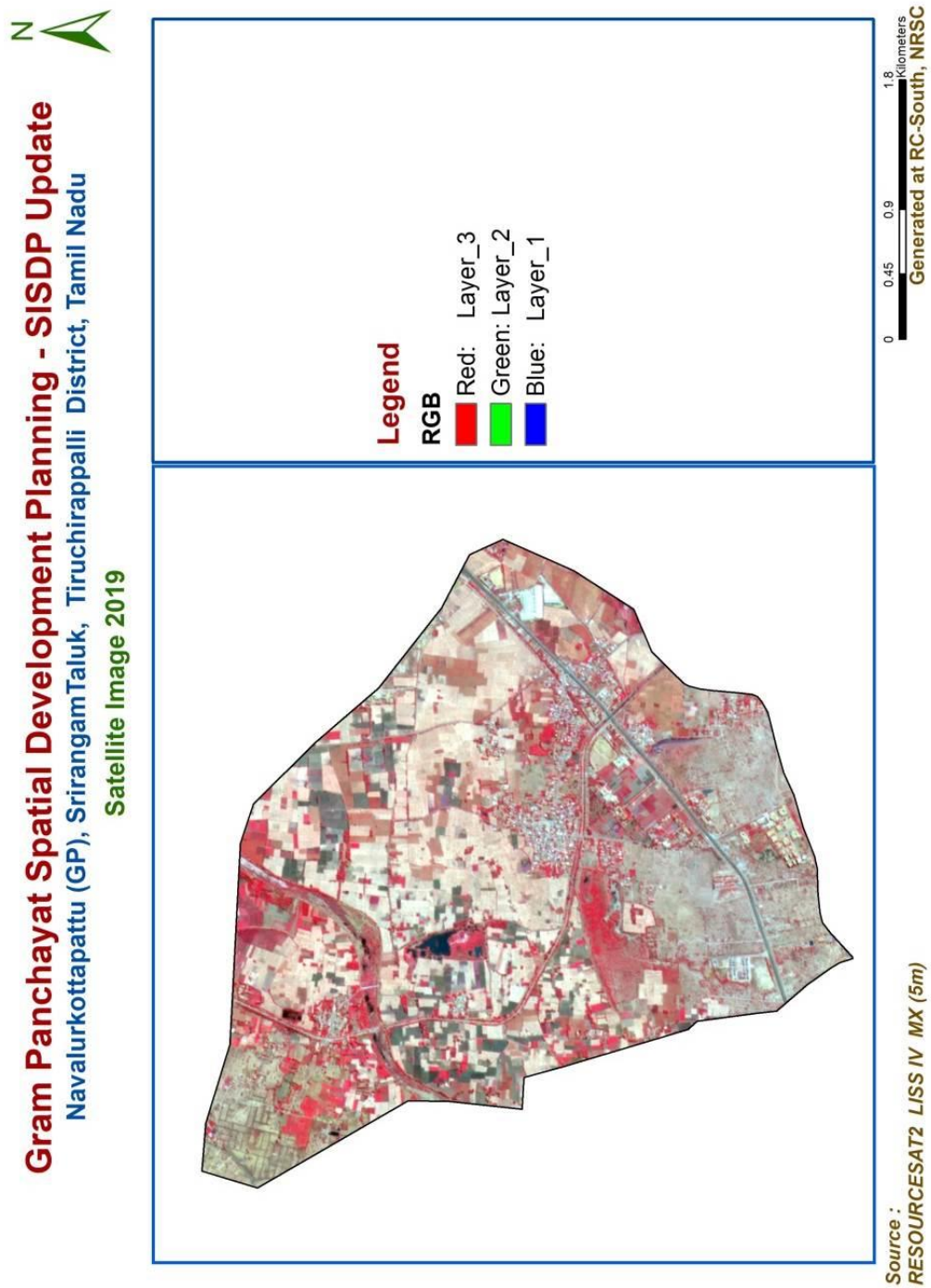
Figure 2.6: Navalurkuttapattu GP as seen on RESOURCESAT LISS4 data in FCC mode 5.0m

2.6 SPATIAL LAYERS

(Regional Remote Sensing Centre - South, NRSC/ISRO, Govt. of India, Bengaluru)

Spatial layers representing the synoptic view of GP were generated at 1:10,000 scale.

2.6.1 SETTLEMENT AND TRANSPORTATION LAYER

For Navalurkuttapattu GP, Settlement and Transportation Layer was generated using HRS data at 2.5m resolution at 1: 10,000 scale (Figure 2.7). Growth of settlement in a particular direction can be analyzed using satellite data more explicitly. Details of type-wise road length are given in Table 2.6.

Table 2.6: Estimates of type-wise road length for Navalurkuttapattu GP

S. No.	ROAD CATEGORY	ROAD LENGTH (KM)
1	National Highway	4.98
2	Village Road	51.17
3	Other road	1.64
	TOTAL	**57.79**
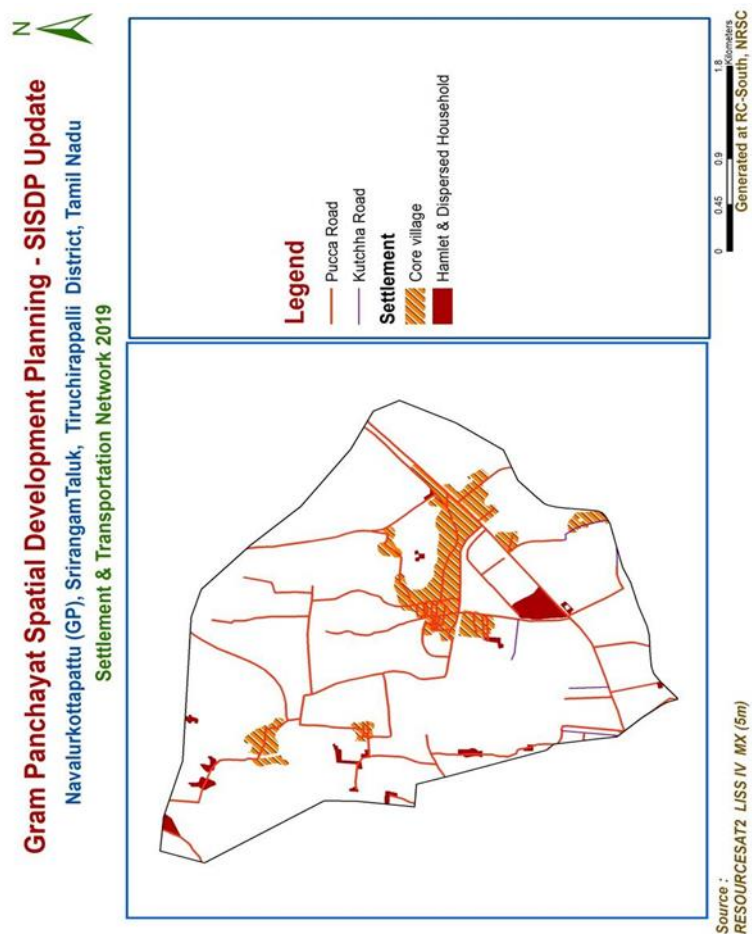
Figure 2.7: Settlement & Road network of Navalurkuttapattu GP

2.6.2 LAND USE LAND COVER MAP (1: 10,000 SCALE)

High resolution satellite data of 2.5m spatial resolution was utilized for preparation of detailed Land Use / Land Cover (LULC) map of Navalurkuttapattu GP. Onscreen visual interpretation technique was adopted in GIS environment for delineating boundaries of various classes using ArcMap 10.5 software. The merged satellite image was zoomed up to 1:5000 scale to delineate the feature boundaries. The final LULC map was prepared at 1:10,000 scale (Figure 2.8). Area estimates of various LULC classes in Navalurkuttapattu GP are summarized in Table 2.7. Overall, the GP area was divided into 5 main categories, namely, cropland / agricultural plantations, settlement, wasteland, water and other land use land cover classes. These categories were further subdivided into theme wise classes as indicated in Table 2.7 and the map legends.

Table 2.7: Area estimates of various LULC classes in Navalurkuttapattu GP (1:10k map)

S.No.	CLASS CATEGORY / NAME	AREA (Ha)
A.	CROPLAND/AGRICULTURAL PLANTATIONS	
1	Crop Land	686.15
2	Agriculture Plantation / Orchards	10.57
	Sub-total	696.72
B.	SETTLEMENTS	
3	Hamlet & Dispersed Household	13.97
4	Industrial Area	38.58
5	Core Village	93.66
6	Institutions	65.78
7	Layout / Open land	109.89
	Sub-total	321.88
C.	WASTELAND	
8	Sparse scrub land	95.48
9	Dense scrub land	2.82
	Sub-total	98.30
D.	WATER	
10	Lakes / Pond	2.18
11	River (RI)	27.94
12	Tanks	68.86
13	Canal	15.68
	Sub-total	114.66
E.	OTHERS	
14	Transport Network	10.11
	Sub-total	10.11
	TOTAL	1241.67
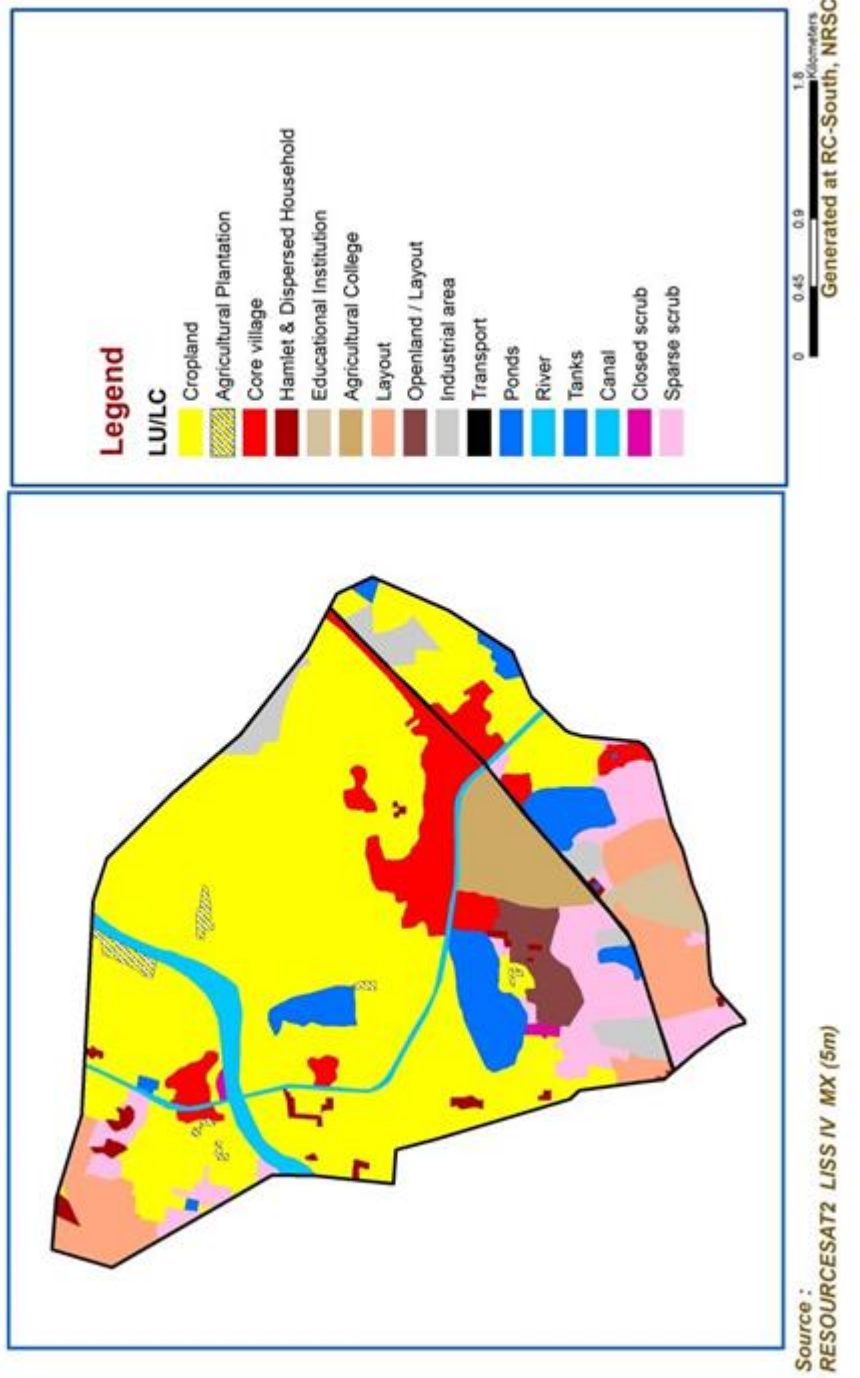
Figure 2.8: LULC map of Navalurkuttapattu GP at 1:10K scale

Majority of the area under Navalurkuttapattu GP is under cropland (686.15 Ha), followed by agricultural plantations/orchards, (10.57 Ha). These two classes cover about half of the entire GP area (56%). The settlement / built-up area in the GP covered about 321.88 Ha, which was further delineated as village settlement (93.66 Ha), hamlet & dispersed household (13.97 Ha) and layouts/ open land (109.89 Ha), Institutions (65.78 Ha). Wastelands occupied 98.3 Ha area,

comprising of sparse scrub land (95.48 Ha), Dense scrub area (2.82 Ha). Water bodies covered an area of 114.66 Ha (27.94 Ha by river and 68.86 Ha by Tank and 15.68 Ha by canal). Other LULC classes covered the remaining area of 10.11 Ha.

2.6.3 LAND USE LAND COVER MAP (1: 50,000 SCALE)

IRS LISS-III multispectral satellite data of spatial resolution 24 m acquired during 2015-16 was used to prepare Land Use Land Cover Map at 1:50,000 scale (Figure 2.9). At a broad level, classes were categorized into Kharif crop land, Crop in 2 seasons, Agricultural plantation, Rural built-up, swamp / mangroves, creeks and river.
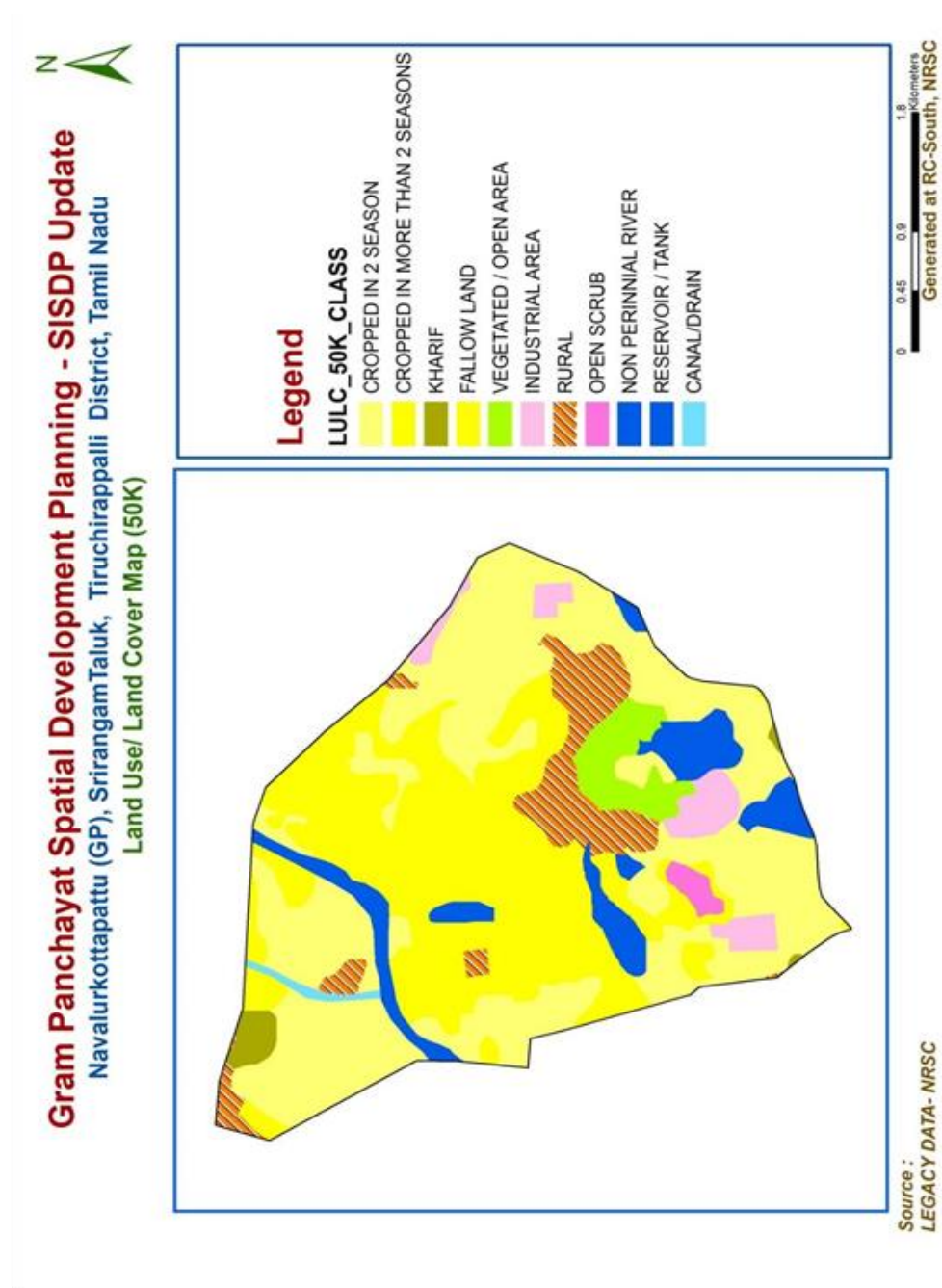
Figure 2.9: LULC map of Navalurkuttapattu GP at 1:50K scale

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2.6.4 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 Figure 2.10. The estimates of drain length are given in Table 2.8. The GP has three major tanks.

Table 2.8: Estimates of drain length for Navalurkuttapattu GP

S.No.	DRAIN CATEGORY	DRAIN LENGTH (KM)
1	River	2.38
2	Canal	5.53
	TOTAL	**7.91**
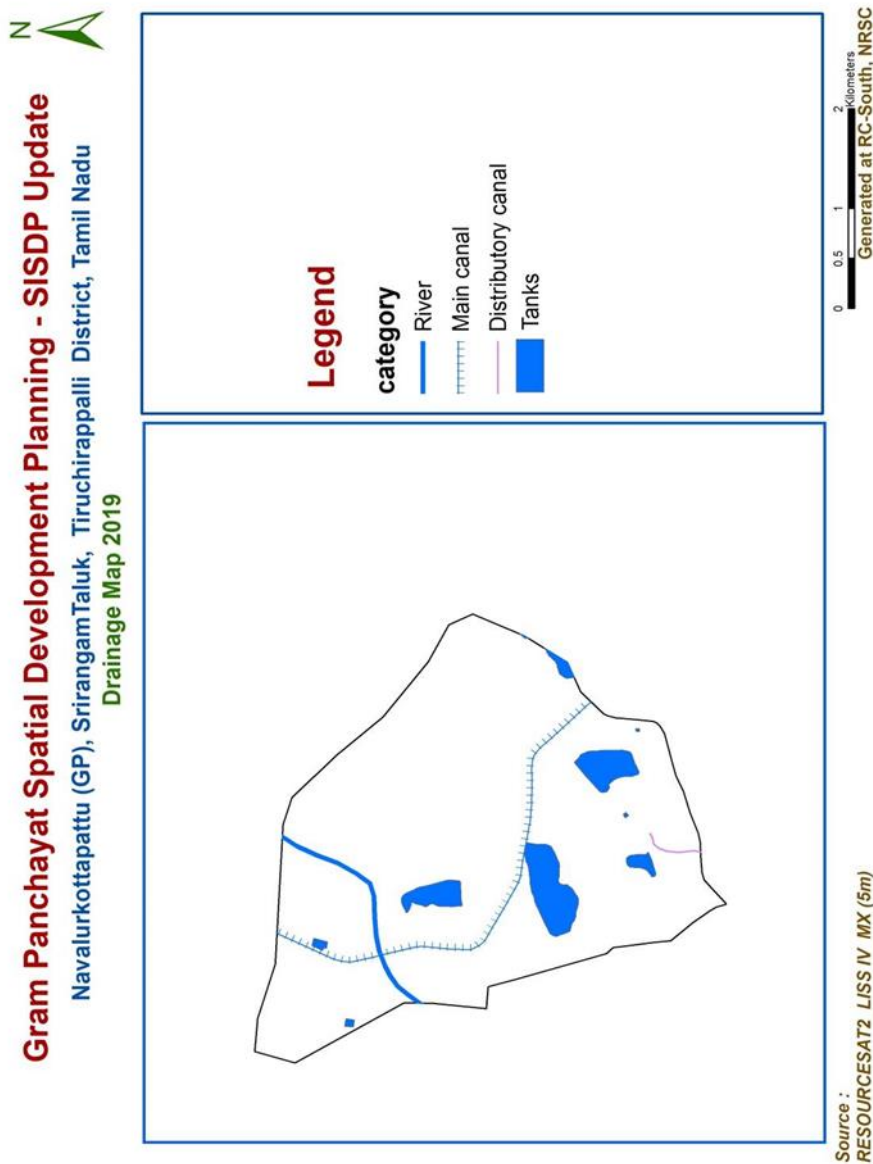
Figure 2.10: Drainage & Surface Waterbodies Map of Navalurkuttapattu GP

2.6.5 SLOPE MAP

CartoDEM was used for generation of the slope layer and it plays an important role in developing the Water Resource Development Plan (Figure 2.11).

2.6.6. GEOMORPHOLOGY MAP

Hydro-geomorphological maps depict major geomorphic units, landforms and provide an understanding of the processes relating to groundwater occurrence as well as groundwater prospects. Based on the morphological expressions in the satellite data, geomorphological map prepared at 1:50000 scale is presented in Figure 2.12.

2.6.7 SOIL TEXTURE MAP

Spatial distribution of soil texture in Navalurkuttapattu GP is shown in Figure 2.13. It is divided into clay, loamy sand, sandy clay loam and sandy loam.
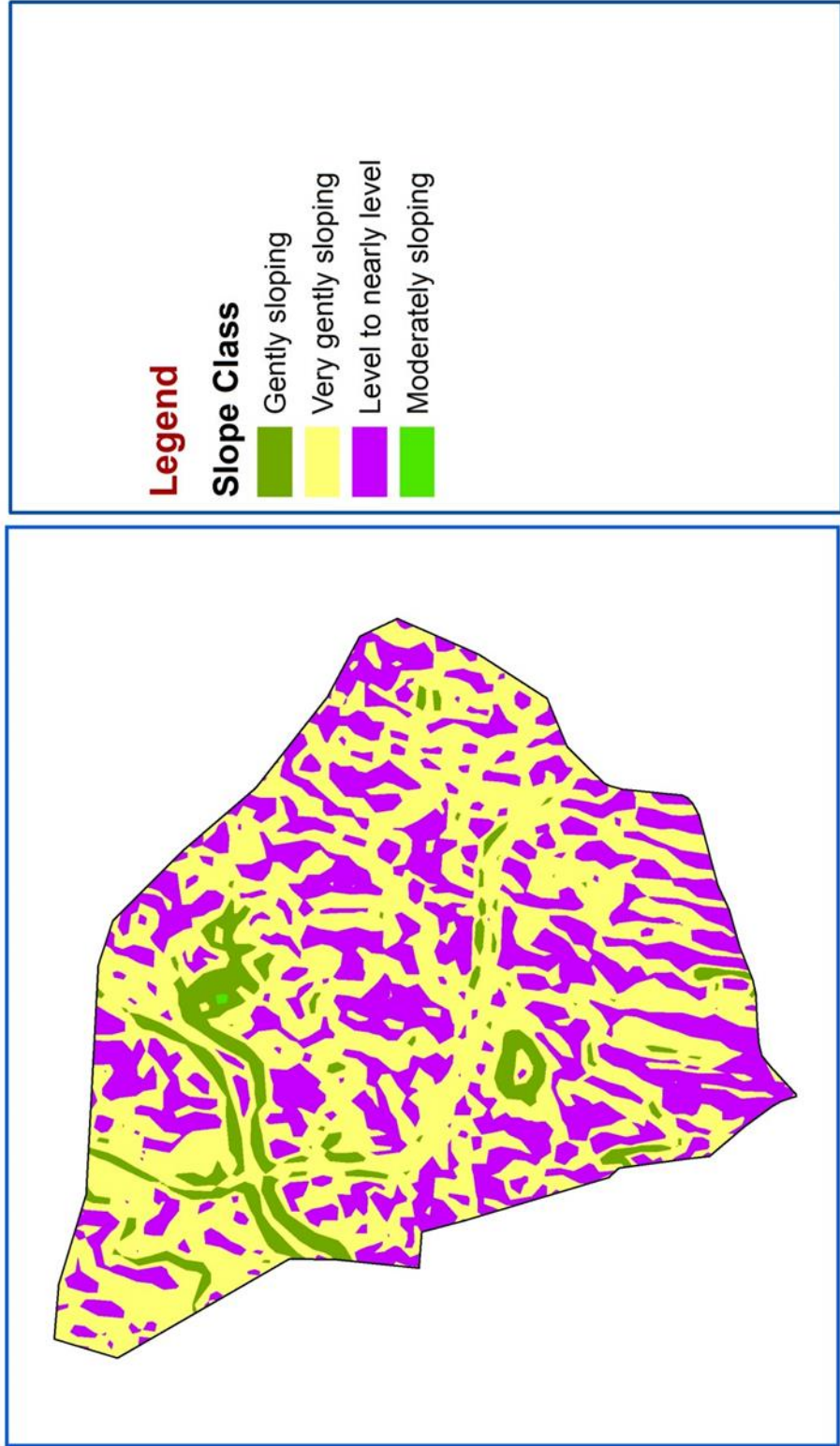
Figure 2.11: Slope Map of Navalurkuttapattu GP
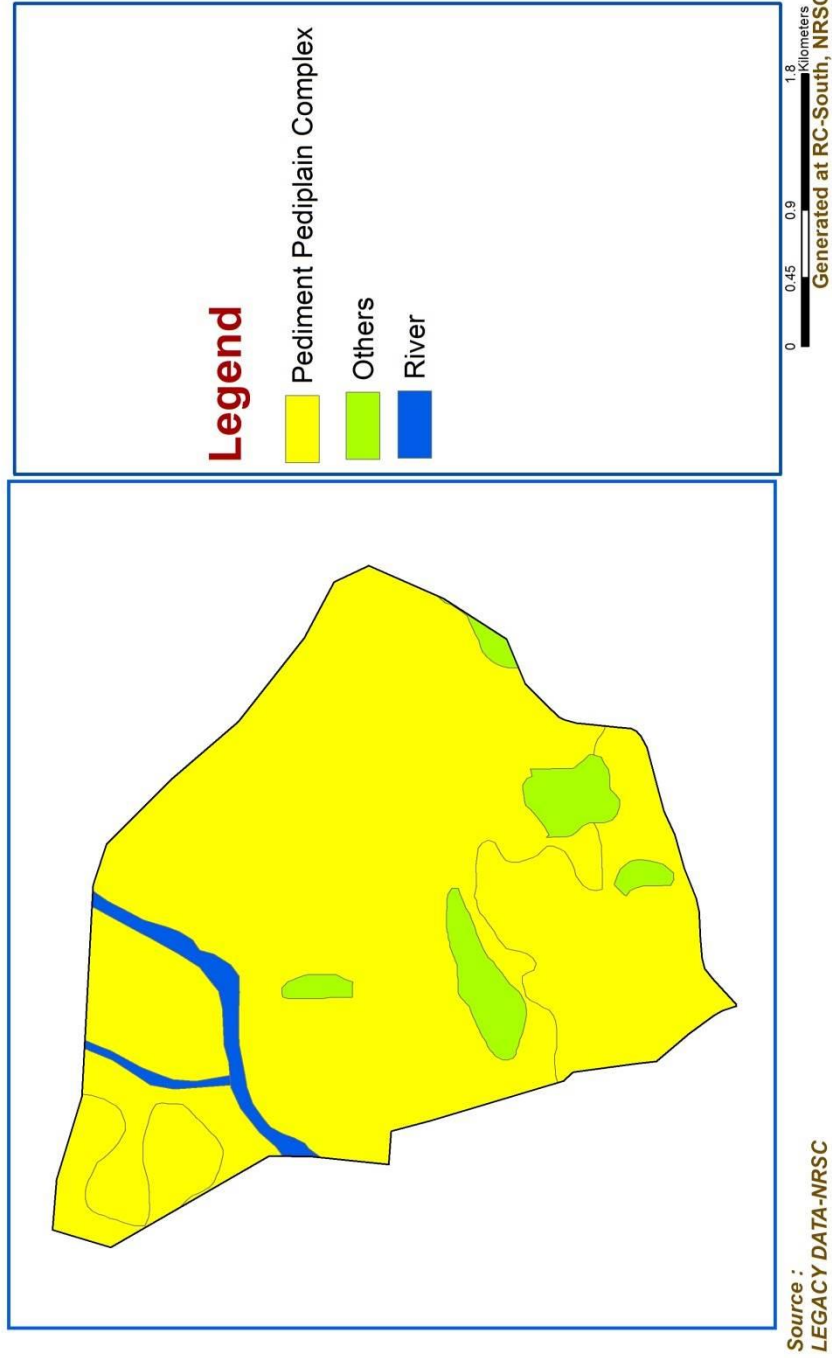
Figure 2.12: Geomorphology map of Navalurkuttapattu GP
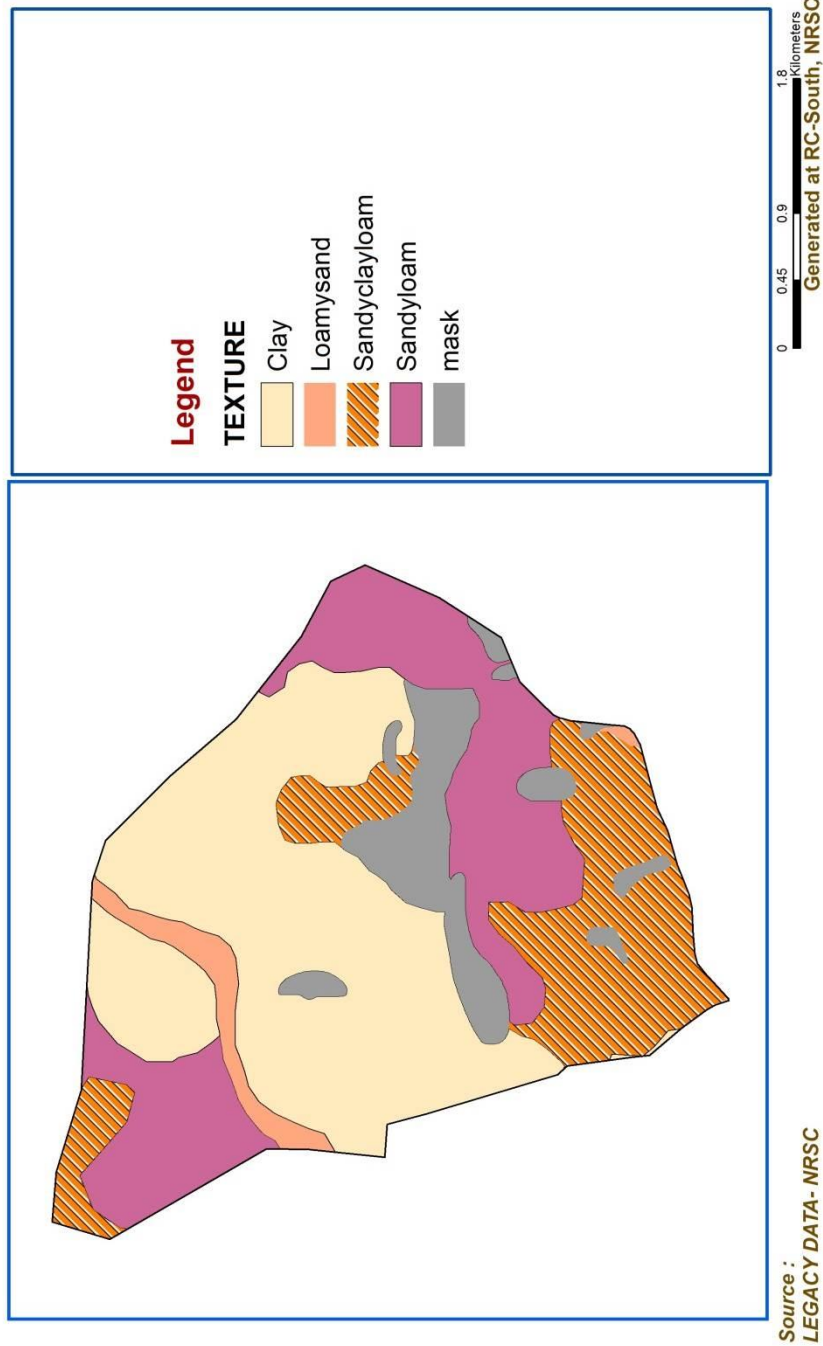
Figure 2.13: Soil map of Navalurkuttapattu GP

2.7 DERIVED SPATIAL LAYERS
(Regional Remote Sensing Centre - South, NRSC/ISRO, Govt. of India, Bengaluru)

2.7.1 AGRICULTURE MAP

Agricultural areas under Gram Panchayat were delineated from LULC layer at 1:10,000 scale (Figure 2.14) depicting crop land and agricultural plantations.

Gram Panchayat Spatial Development Planning - SISDP Update
Navalurkottapattu (GP), SrirangamTaluk, Tiruchirappalli District, Tamil Nadu
Agriculture Map 2019

Legend

LU/LC

Cropland

Agricultural Plantation

Transport

Generated at RC-South, NRSC

Source :
RESOURCESAT2 LISS IV MX (5m)
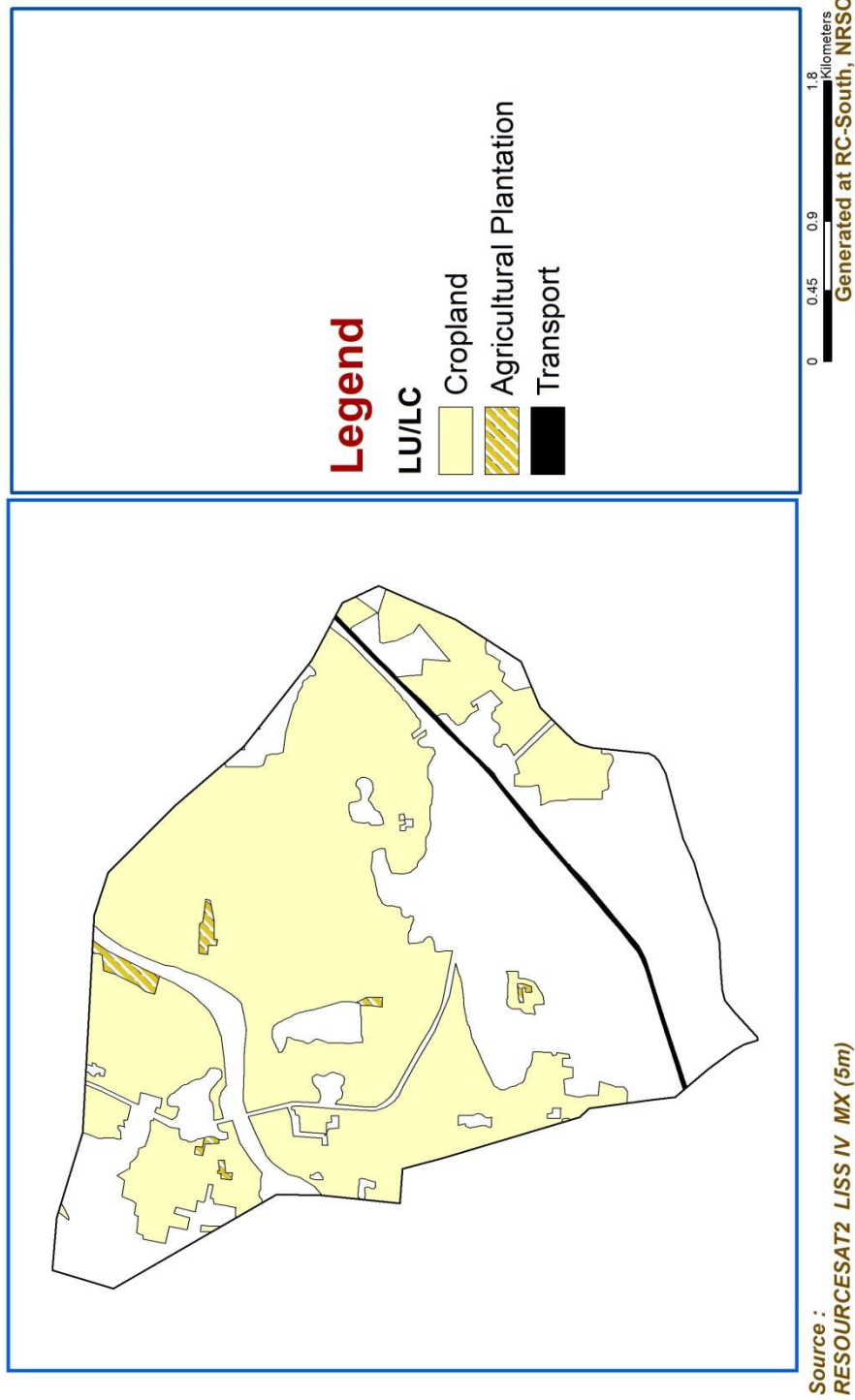
Figure 2.14: Agriculture map of Navalurkuttapattu GP

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2.7.2 GROUND WATER QUALITY WELL LOCATION MAP

Ground water quality well location map is depicted in Figure 2.15. The ground water quality details are from archived data collected during 2005-2006 and it is only indicative.
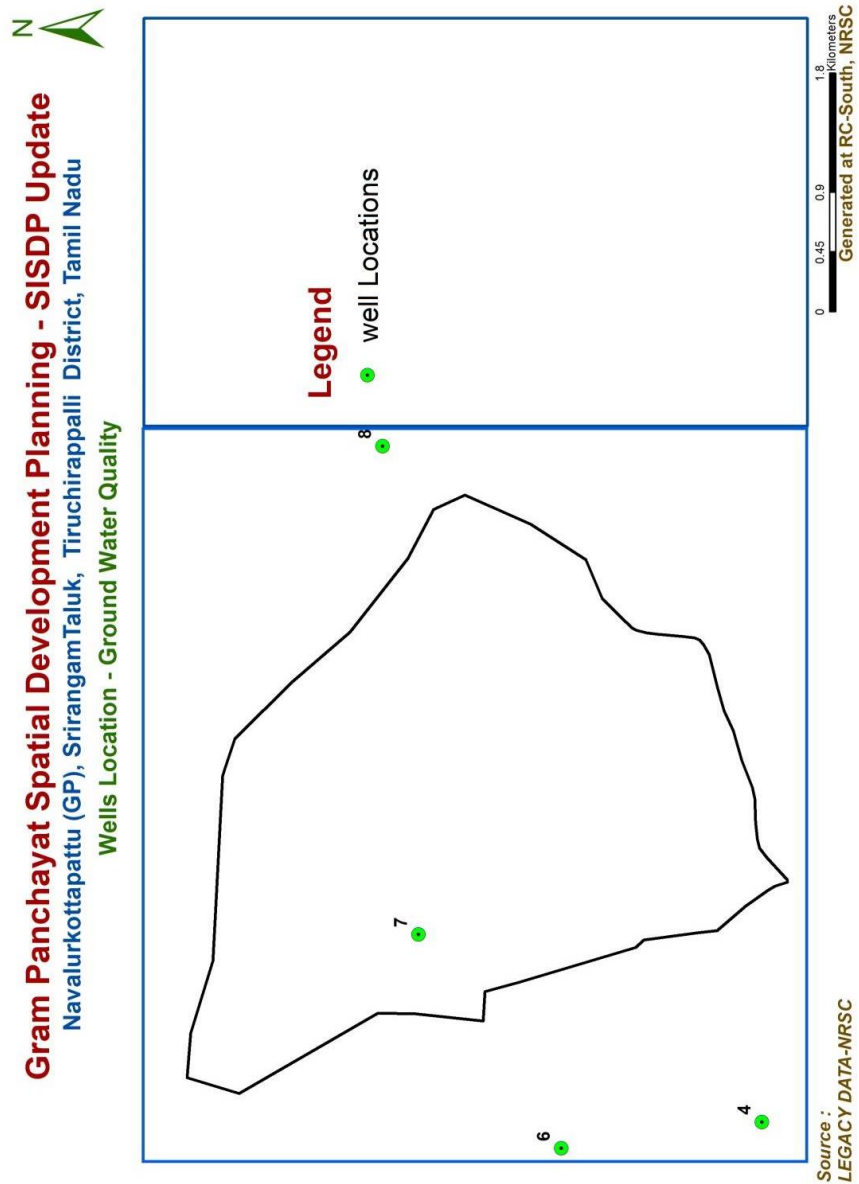
Parameters	Loc_4	Loc_6	Loc_7	Loc_8
pH	8	8	8	8
TDS	620	2760	525	2760
HARDNESS	158	220	130	240
FLUORIDE	0	0	0	1
CHLORIDE	98	980	98	980
IRON	0	0	0	0
NITRATE	4	4	4	0
SULPHATE	32	40	24	33
ARSENIC	0	0	0	0
ALKALINITY	280	320	224	320
GWQ	Potable	Non Potable	Potable	Non Potable

Figure 2.15: Ground water quality well location map of Navalurkuttapattu GP

CHAPTER 3

DEMOGRAPHY

3.1 INTRODUCTION

The distribution of population and the houses in the various hamlets of the gram panchayat are given in Table 3.1. The largest hamlet in terms of number of houses and population is Kuttapattu accounting for 24.35% of houses and 17.98% of population. Other larger hamlets are Bharathi Nagar, Navalur, Vannankoil and N. Kuttapattu.

Table 3.1 Details of Habitats of Navalurkuttapattu Gram Panchayat

Sl. No.	Habitation Name	Total Houses	%	Total Population	%
1.	Navalur	179	11.26	560	10.49
2.	A. D. Kudiyiruppu	063	03.96	210	03.93
3.	Aravangalpatti	062	03.95	350	06.55
4.	Manamedu	022	01.38	115	02.15
5.	Anbu Nagar	111	06.99	270	05.05
6.	N. Kuttapattu	122	07.68	442	08.28
7.	Kuttapattu	387	24.35	960	17.98
8.	Keelakkadu	032	02.01	180	03.37
9.	Ambedkar Nagar	070	04.41	325	06.08
10.	Bharathi Nagar	192	12.08	710	13.30
11.	Vannankoil	131	08.24	420	07.86
12.	Santhosh Nagar	033	02.08	270	05.05
13.	Gandhi Nagar	041	02.58	118	02.21
14.	Muthukkulam	060	03.78	228	04.27
15.	Thirunagar	084	05.29	182	03.40
	TOTAL	1589		5340	

Source: Gram Panchayat Office & Village Administrative Officer

The total population of Navalurkuttapattu GP was 5310 in the year 2011 (District Census Handbook, 2011). The population of Navalurkuttapattu GP has increased steadily from 2335 in 1961 to 5310 in 2011 (Ref table 3.2 & Figure 3.1).

Table 3.2 Demographic Characteristics

Year	1961	1981	1991	2001	2011	2019*
Total Population	2335	3428	4264	4943	5310	5364
Decadal Growth Rate	-	23.40	24.38	15.92	7.42	

Source: District Census Handbook, 1961, 1981, 1991, 2001 & 2011 * Mission Antyodaya Survey 2019
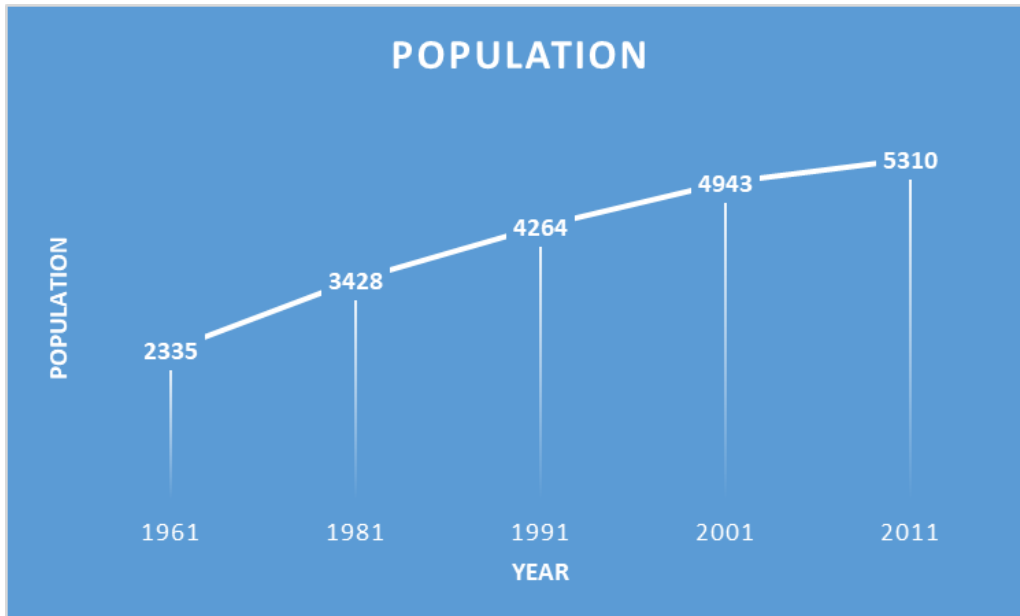
Figure 3.1: Decadal wise Population

Steady decline in the decadal growth rate of population was noticed in this gram panchayat. The decadal growth rate was 23.40 during 1971-1981, 24.38 during 1981-1991, 15.92 during 1991-2001 and 7.42 during 2001-2011 (Figure 3.2).
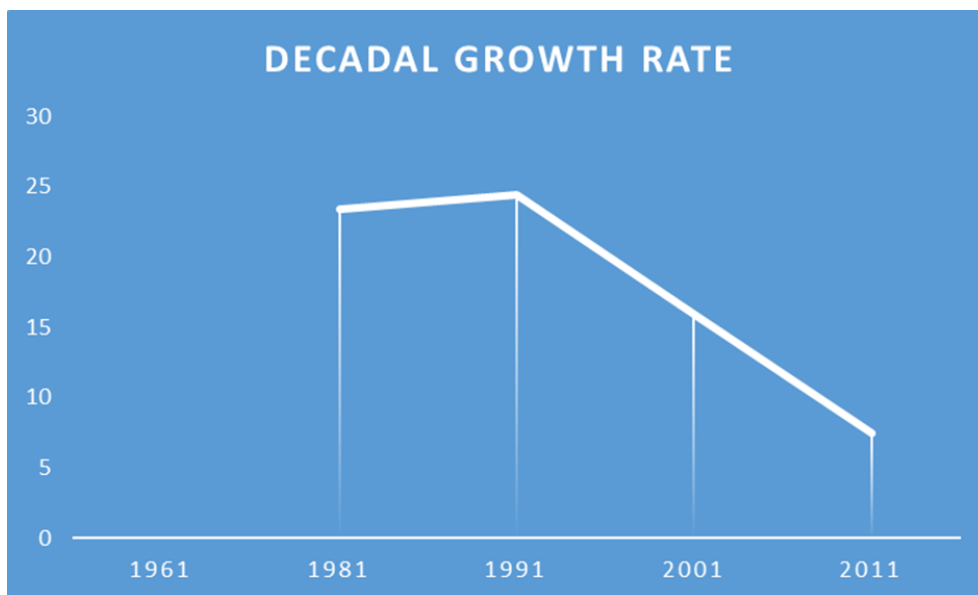
Figure 3.2: Decadal wise Population Growth Rate

3.2 SEX-RATIO

Out of the total population, 2629 are males while 2681 are females as per Population Census 2011. The percentage of male population is 49.51 and female population is 50.49. It is observed that the percentage of female population was slightly less than 50% till 2001, whereas increased to 50.49 during the period 2001 to 2011(Refer Table 3.3). According to 2011 census, the sex-

ratio was 1021 females for every 1000 males compared to the district sex-ratio of 1,013 females for every 1,000 males (Tiruchirappalli District Census Hand Book, 1961, 1981, 1991, 2001 & 2011).

Table 3.3: Details of Male and Female Population

Year	1961	1981	1991	2001	2011
Total Population	2335	3428	4264	4943	5310
Male	1172	1719	2155	2481	2629
%	50.20	50.15	50.54	50.20	49.51
Female	1163	1709	2109	2462	2681
%	49.80	49.85	49.46	49.80	50.49

Source: District Census Handbook, 1961, 1981, 1991, 2001 & 2011

3.3 LITERACY RATE

Navalurkuttapattu village has lower literacy rate compared to Tamil Nadu. In 2011, literacy rate of Navalurkuttapattu village was 68.63 % compared to 80.09 % of Tamil Nadu. In Navalurkuttapattu Male literacy stands at 76 % while female literacy rate was 61.40 %.

Table 3.4: Decadal wise Literacy Rate

Year	1961	1981	1991	2001	2011
Literates	545	1450	1852	3102	3644
%	23.34	27.83	43.43	62.76	68.62
Male Lit.	491	957	1161	1801	1998
%	41.9	55.7	53.9	72.6	76.0
Female Lit.	54	493	691	1301	1646
%	4.6	28.8	32.8	52.8	61.4

Source: District Census Handbook, 1961, 1981, 1991, 2001 & 2011
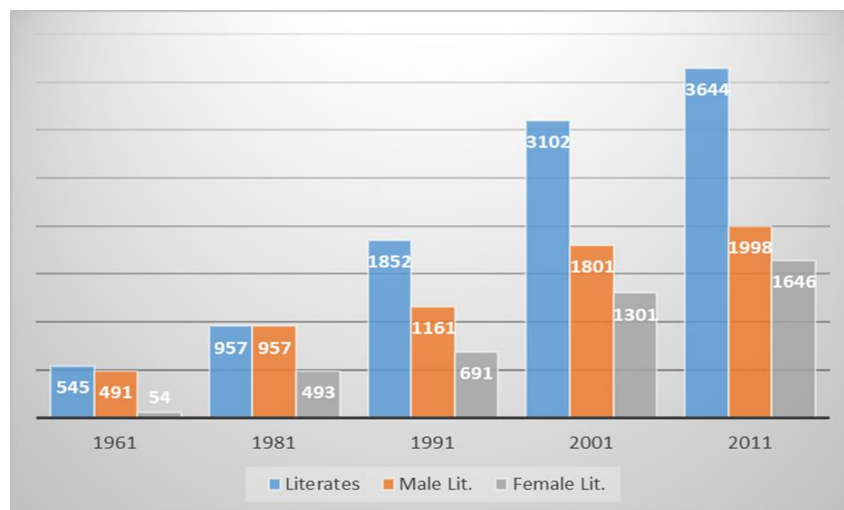
Figure 3.3: Decadal wise Literacy Rate

3.4 POPULATION OF CHILDREN

As per 2011 census, in Navalurkuttapattu village population of children with age 0-6 is 574 which makes up 10.81 % of total population of village. Though the average Sex Ratio of Navalurkuttapattu village is higher than Tamil Nadu state average, the Child Sex Ratio for the Navalurkuttapattu as per census 2011 is 858, lower than Tamil Nadu average of 943 (Table 3.5).

Table 3.5 Details of Age Group (0-6)

Year	1991	2001	2011
Total Children	606	520	574
Male	318	270	309
Female	288	250	265

Source: District Census Handbook, 1991, 2001 & 2011

4.1 EMPLOYMENT DETAILS

As per 2011 census, the total workers were 50.17% of total population and the percentage of non-workers was 49.28 (Table 4.1 & Figure 4.1).

Table 4.1: Details of Total Workers of Navalurkuttapattu

Year	Total Workers	%	Workers Male	Workers Female	Total Non-Workers	%	Non Workers Male	Non Workers Female
1961	1309	56.06	774	535	1026	43.94	398	628
1981	1243	36.26	955	288	2185	63.74	763	1419
1991	2214	51.93	1247	967	2050	48.07	908	1142
2001	2507	50.72	1417	1090	2436	49.28	1064	1372
2011	2664	50.17	1593	1071	2646	49.83	1036	1610

Source: District Census Handbook, 1961, 1981, 1991, 2001 & 2011
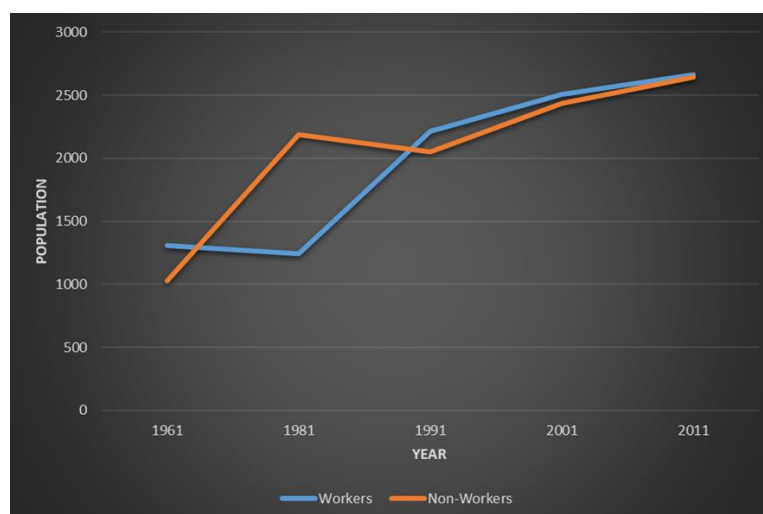
Figure 4.1: Decadal wise workers Details

It is observed that percentage of total workers increased from 1981(36.26%) to 1991 (51.93) and afterwards there is slight drop in the percentage of total workers of the total population.

4.1.1 WORKERS – CLASSIFICATION

The activities in which the workers have engaged has changed over decades. In 1961 majority of workers were cultivators, followed by people engaged as agricultural labourers, household industries and other works. It is observed that there is a shift pattern of change in the activities

the workers are engaged. In 2011, more number of people engaged in other works, followed by working as agricultural labourers and involved in cultivation (Table 4.2).

Table 4.2: Decadal wise Classification of Workers

Year	Total workers	Cultivators	Agri. Lab.	Household Ind.	Other Workers	Marginal Workers
1961	1309	932	201	41	41	-
1981	1243	573	480	33	157	03
1991	2214	794	984	21	102	150
2001	2507	619	872	32	542	442
2011	2664	553	812	19	1070	210

Source: District Census Handbook, 1961, 1981, 1991, 2001 & 2011

There is a gradual decline in the number of cultivators from 1961 to 2011. Steady increase in the number of people work as agricultural labours from 1961 to 1991 and thereafter decrease in the number of people work as agricultural labours from 1991 to 2011. The number of people engaged as other workers increased significantly from 1991 to 2011 (Figure 4.2).
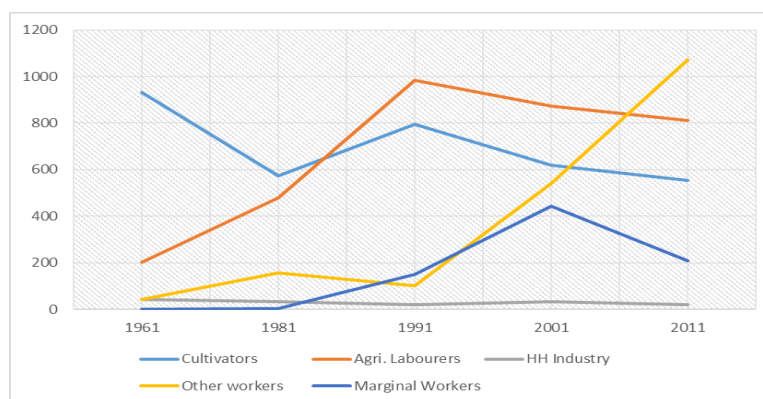
Figure 4.2: Decadal wise Classification of Workers

The household survey revealed that large section of people in this GP mostly work as agricultural labour, and also as unskilled and semi-skilled labour in construction and other service related activities. Large section of households is found to be benefitted by the MGNREGA scheme. Most people work in this GP and in nearby villages, whereas few people engaged in construction and other service related activities commute daily to Tiruchirappalli and nearby urban areas for work. Number of people migrated either temporarily or permanently to larger urban areas are very insignificant.

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4.2 INCOME AND EXPENDITURE PATTERN OF HOUSEHOLDS

Household surveys revealed that the daily wages of people range from Rs. 150 (unskilled/ part-time labours) to Rs. 600 per day (Skilled labours). The monthly salary was Rs. 4000 (unskilled) to Rs. 15000 (Semi skilled/ skilled). Very few people working in large cities were getting salary of Rs. 40000 to Rs. 60000 per month. Most of the earnings of the household is spent on food (58%), followed by health (30%) and education (9%).
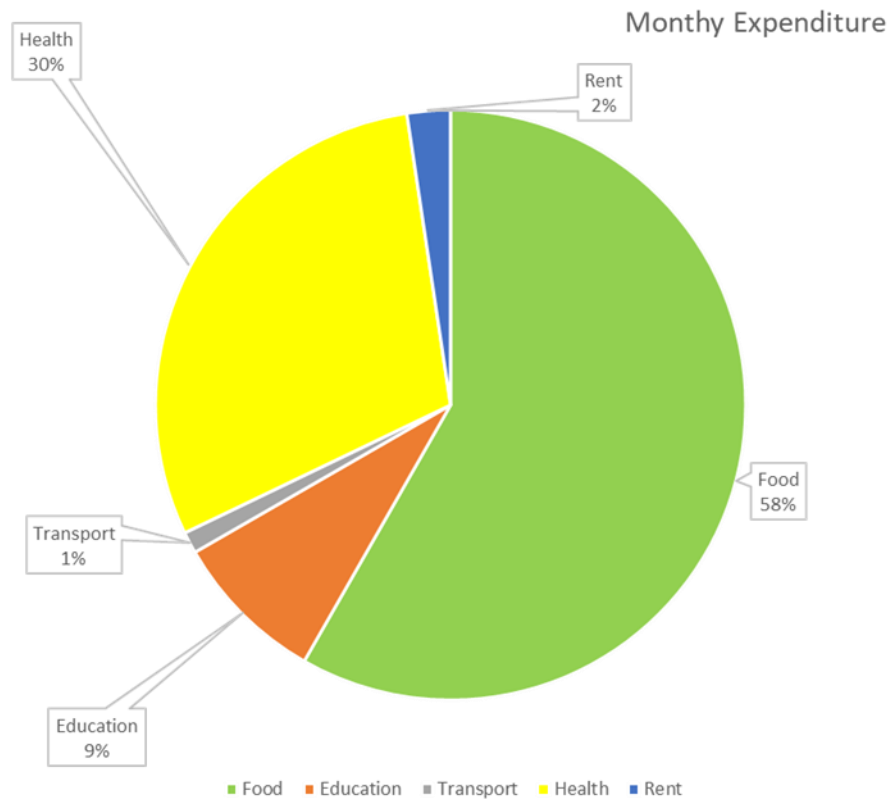
Figure 4.3: Expenditure Pattern of People

4.3 AGRICULTURE

About 54.29% of households engaged majorly in farming related activities, whereas 45.71% households engaged majorly in non-farm activities (Mission Antyodaya Survey Gaps 2019, Ministry of Rural Development). The total extent of agricultural lands as per the land records of the village is 858 hectares 27.5 Ares, out of which 780 hectares 92 Ares are dry lands and 77 hectares 35.5 Ares are wet lands. The total irrigated land area is 552 hectares 91.28 Ares, out of which 447 hectares 56.28 Ares are dry lands and 75 hectares 35 Ares are wet lands. Out of the total dry lands, single crop was planted in 455.87.78 hectares, two crops in 158.81.48

hectares and 325.04.22 hectares was fallow lands. Out of the total dry lands, single crop was planted in 75.71.5 hectares, two crops in 43.37 hectares and 1.64 hectares was fallow lands.

Table 4.3: Land Area under Agriculture

Classification	Area		%	Crop	%	Fallow	%
	Hectare	Ares		Land			
Dry Lands	780	92.0	69.39	455.87.78	58.38	325.04.22	41.62
Wet Lands	77	35.5	06.87	75.71.5	97.88	1.64.0	02.12
Total	1125	39.5	100	531.59.28	47.24		

Source: Land Records, 2020, VAO office, Navalurkuttapattu GP

The extent of irrigated dry land under cultivation was 447.56 hectares and irrigated wet lands was 75.35 hectares during the year 2020. The lands irrigated through tributary channels of the river and canal and also by bore wells. Only 8 farmers (1.18%) use drip/sprinkler irrigation (Mission Antyodaya Survey Gaps 2019, Ministry of Rural Development). The available agriculture related facilities include seed centre, soil testing centre and a fertilizer shop. This GP doesn't have facilities such as primary processing facilities for agricultural produces, warehouse/ storage facilities for food grains and agro equipment hiring facilities.

Figure 4.4: Paddy Fields (Wet lands) & Corn Fields (Dry lands)

4.4 ANIMAL HUSBANDRY

Approximately 30% of the people have cattle. Though large or medium scale dairy or poultry farming is not practised, individuals have cows, buffaloes, goats and chicken. Milk collection is being carried out by cooperative milk society functioning in the central village of this GP. People rear cows, goats and poultry. A Veterinary hospital is located in this village. Facilities such as livestock extension services, poultry/ goatary development projects are lacking in this GP.

Figure 4.5a: Animal Husbandry

Figure 4.5b: Grazing pastures

4.5 INDUSTRIES

The industries present in this GP include wood processing/ works, mineral water plants, soft drinks factory and small scale service industries. Warehouse facilities for industries are also located in this GP. All the industrial developments are located along the NH or in areas adjoining the NH. The industries are not providing employment opportunities for local people on a larger scale.

4.6 SELF HELP GROUP

There are 34 self-help groups in this village. The total members are 408, out of which 11 are male and 397 females. These self-help groups function with financial grant from Government and bank loan. They are mainly involved in the marketing of agricultural products such as flowers, vegetables and fruits. Members of this groups twice in a month for planning their activities. The members stated that they need training and financial assistance and loan to diversify their activities in order to enhance their income. The members of these groups

expressed training is required in fields such as tailoring, basket weaving, soap making, candle making and any such household industries.

Figure 4.6 Self-help group training centre

4.7 MIGRATION PATTERN

The inward migration of people from other areas to this Gram Panchayat for permanent residency (working outside) in the last five years is around 50 Families. Daily commuters to work in this village include those working in Educational Institutions and other establishments located in this GP. Very few individuals migrated to other places to work in industries and other offices. Lot of people commute nearby places and to Tiruchirappalli for work daily.

CHAPTER 5

HOUSING

5.1 INTRODUCTION

Housing is one of basic human necessities, the other two being food and clothing. Every habitat is facing with the problem of getting sufficient quantity and desired quality housing. In Navalurkuttapattu GP there were 1589 houses spread across 15 habitats.

Table 5.1 Habitation wise Distribution of Houses

Sl. No.	Habitation Name	Total Houses	%
1.	Navalur	179	11.26
2.	A. D. Kudiyiruppu	063	03.96
3.	Aravangalpatti	062	03.95
4.	Manamedu	022	01.38
5.	Anbu Nagar	111	06.99
6.	N. Kuttapattu	122	07.68
7.	Kuttapattu	387	24.35
8.	Keelakkadu	032	02.01
9.	Ambedkar Nagar	070	04.41
10.	Bharathi Nagar	192	12.08
11.	Vannankoil	131	08.24
12.	Santhosh Nagar	033	02.08
13.	Gandhi Nagar	041	02.58
14.	Muthukkulam	060	03.78
15.	Thirunagar	084	05.29
TOTAL		1589	

Kuttapattu has maximum number of habituated house (387 nos.) followed by Bharathi Nagar (192 nos.), Navalur (179 nos.). N. Kuttapattu (122 nos.) and Anbu nagar (111 nos.). Other habitations have less than 100 nos. habitable houses (Table 5.1).

5.2 NUMBER OF HOUSEHOLDS

There are 1307 households in this GP in the year 2011. The number of households have increased from 494 in the year 1961 to 1307 in the year 2011 (Table 5.2).

Table 5.2 Number of Households and Household Size

Year	Total Pop.	Households	Household size
1961	2335	494	4.72
1981	3428	731	4.69
1991	4264	968	4.40
2001	4943	1146	4.31
2011	5310	1307	4.09

5.2.1 HOUSE-HOLD SIZE

It is interesting to note that the average household size has decreased from 4.72 in the year 1961 to 4.09 in 2011(Table 5.2).

In household survey carried out, it was observed that the percentage of households with 4 members (30%) was maximum (Refer Figure 5.1), followed by households with 3 members (24%), households with 2 members (19%), households with 5 members (17%) and households with 1member (10%).
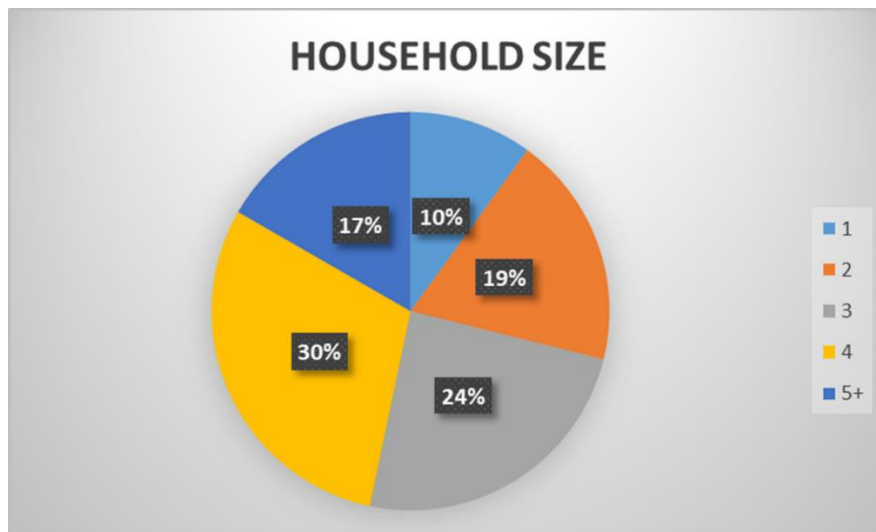
Source: Household Survey, 2020

Figure 5.1 Percentage Distribution of Households based on Household Size

5.3 LENGTH OF RESIDENCY

The length of residency of 53.3% of households is 30 years and above, 26.7% households from 20 to 30 years, 11.1% of households from 10 to 20 years and 8.9% of households below 10 years, among the households surveyed. It is also observed that most of the households with less than 10 years of length of stay are living in hamlets located close to NH (Refer Figure 5.2).
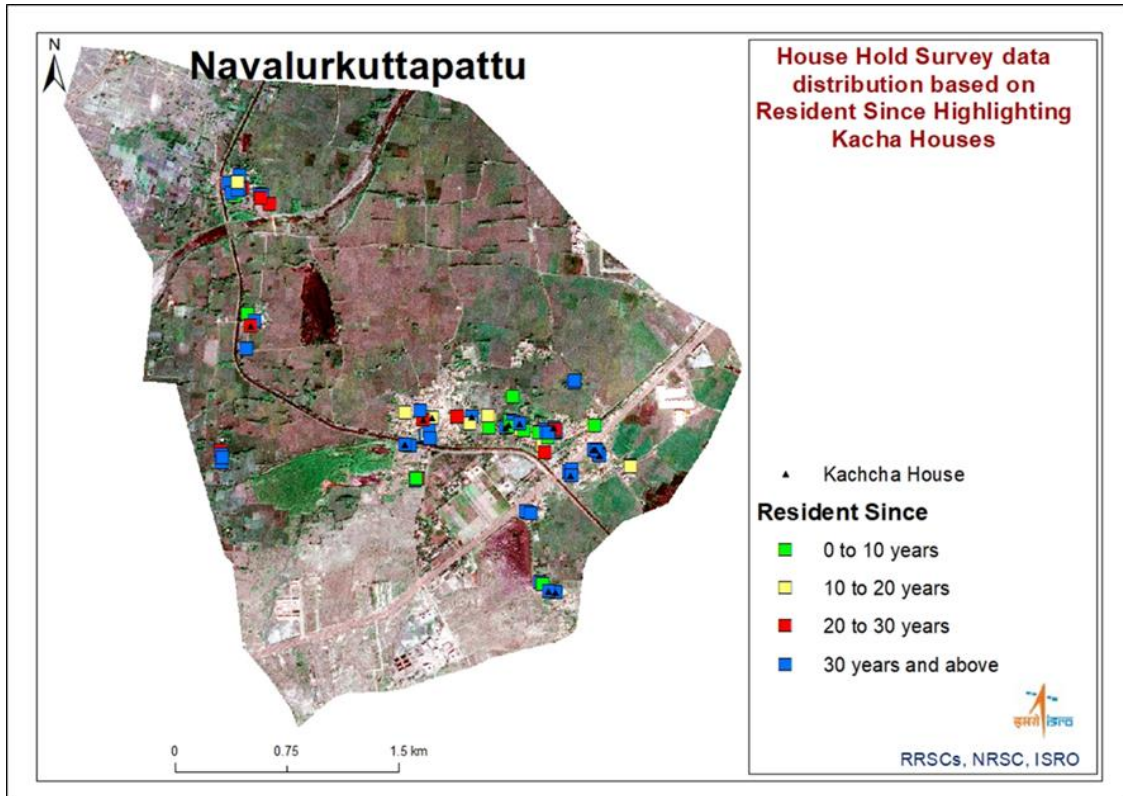
Figure 5.2 Distribution of Households based on Length of Stay

5.4 RESIDENTIAL HOUSES – AGE OF THE BUILDINGS

Major percentage (36.67%) of the residential buildings are 10-20 years old, followed by buildings 20-50 years old (28.88%) and less than 10 years old (25.55%) among the surveyed households. Only 8.88% of residential buildings are more than 50 years old (Table 5.3).

Table 5.3 Classification of Residential Houses based on Age of the Buildings

Sl. No.	Age of the Buildings (years)	Percentage
1	<10	25.55
2	10 - 20	36.67
3	20 - 50	28.88
4	>50	08.88

5.5 RESIDENTIAL HOUSES – CONDITIONS

As per Mission Antyodaya Survey Gaps 2019, Ministry of Rural Development report, 2.01% of households of this GP live in houses constructed with kuchcha wall and roof materials (Mission Antyodaya Survey Gaps Report, Ministry of Rural Development, 2019). Among the houses surveyed (household survey), 50% were pucca houses, 32% were semi-pucca and 17%

kacha houses (Figure 5.3). It is observed that the few kuchcha houses are present in all hamlets of this GP.

In the case of pucca and semi-pucca residential houses Concrete and roof tiles are the roof materials and bricks were used for the construction of walls. Thatch and metal sheets are the roof materials and mud walls used for kuchcha residential houses. (Figure 5.4)
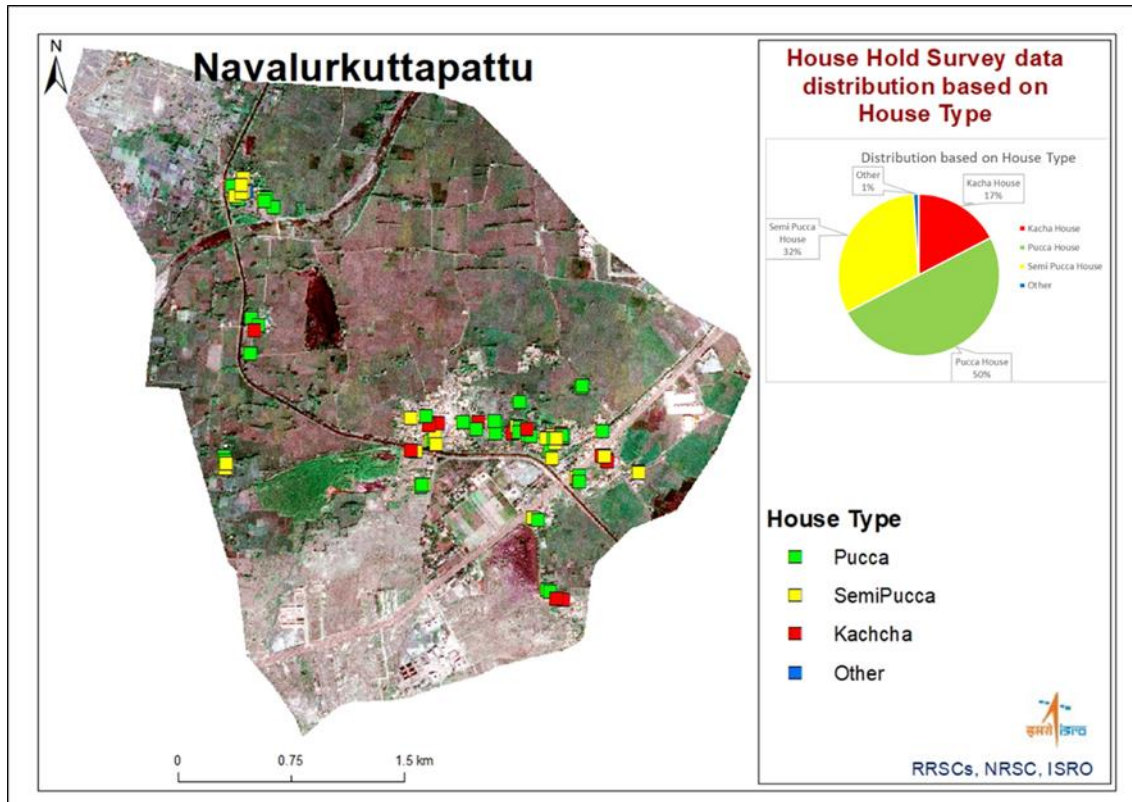
Figure 5.3 House Type Distribution

Figure 5.4 Different House Types & construction materials

In this GP, 76% of residential houses were in good condition, 21.5% in liveable conditions and 1.5% in dilapidated conditions (https://bhuvan-panchayat3.nrsc.gov.in). The field survey also revealed that around 1.11% of residential buildings were in dilapidated conditions, 32.2% in liveable conditions and 56.6% in good conditions (Table 5.4).

Table 5.4 Residential Houses - Conditions

S.N	Residential houses - Conditions	Percentage Source: https://bhuvan-panchayat3.nrsc.gov.in	Percentage Source: Household survey
1	Good	76	56.66
2	Liveable	21.5	32.22
3	Dilapidated	1.5	1.11

5.6 RESIDENTIAL BUILDINGS – OWNERSHIP STATUS

Among the houses surveyed, 95% household live in their own houses, whereas only 5% live in rented buildings. The rent of the buildings was varying from Rs. 500 to Rs. 2500 depending on the area and type of the building (Figure 5.5).
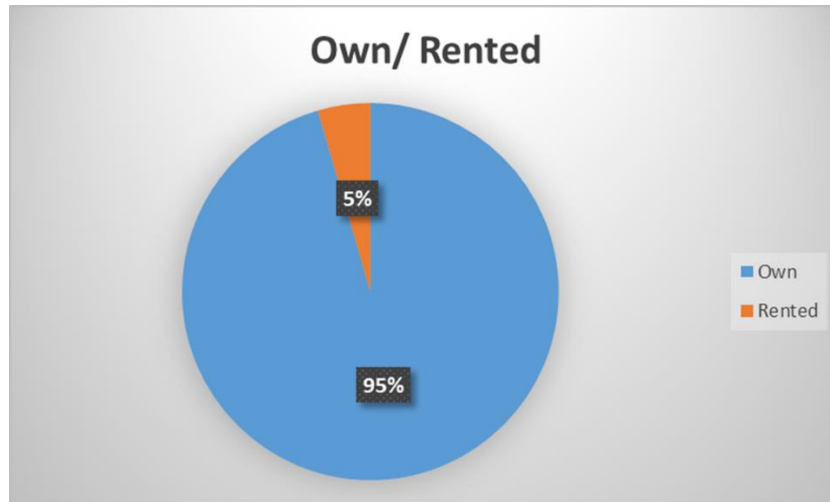
Figure 5.5 Residential Buildings – Ownership Status

5.7 HEIGHT OF RESIDENTIAL BUILDINGS

Most of residential buildings, i.e., 91% of surveyed buildings have only ground floor, whereas 7.95 of the buildings are of G+1 storey height and 1.1% are of G+2 storey height (Figure 5.6)
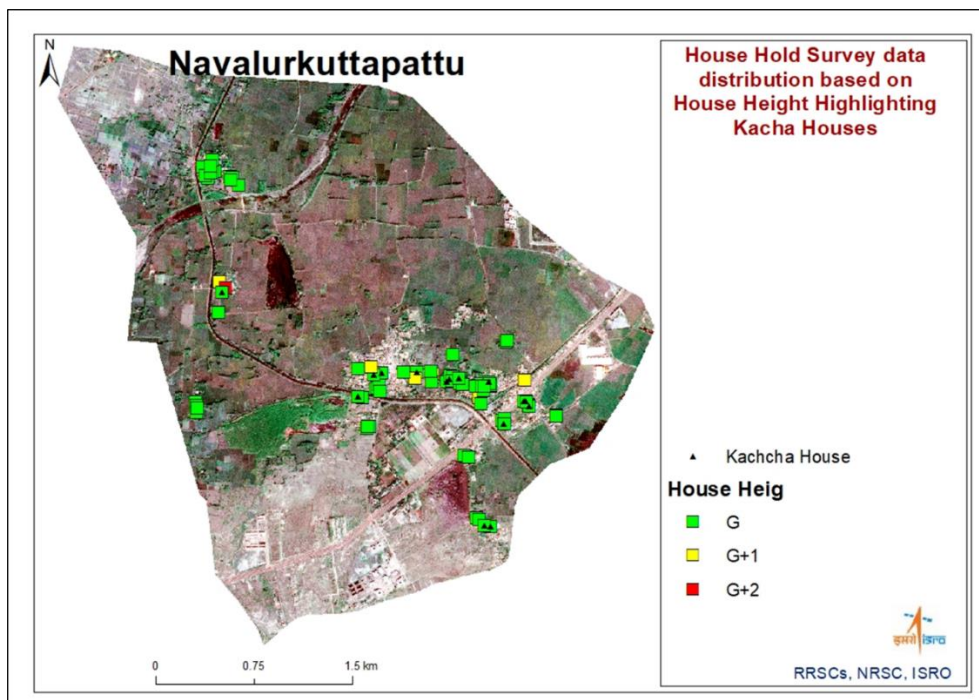
Figure 5.6 Height of Residential Buildings

5.8 CONSTRUCTION OF RESIDENTIAL BUILDINGS – BENEFICIARIES FROM GOVT. SCHEMES

About 121 households have got a PMAY house (completed or sanctioned), whereas another 22 households are in the permanent wait list. 42 Households got benefit from State specific housing scheme and 12 households are in the permanent wait list of State specific housing Scheme (Mission Antyodaya Survey Gaps Report, Ministry of Rural Development, 2019).

Figure 5.7: Houses Constructed under Govt. Scheme

CHAPTER 6

COMMUNITY FACILITIES AND UTILITIES

6.1 INTRODUCTION

The details of presence of community facilities and utilities with regard to water supply, sanitation, drainage, road infrastructure, health services, community facilities, etc., were obtained from primary survey and secondary sources are presented in this chapter.

6.2 WATER SUPPLY

The gram panchayat has piped water supply scheme covering all the hamlets. The source for water supply distribution is river Kavery and also bore wells. The water supply distribution system has 18 overhead tanks (Figure 6.1) and 87 public taps on various streets of all hamlets. More than 50% of the (858 nos.) individual houses are given water supply house service connection. In addition, there are about 27 hand pumps provided for water supply. Most of the areas in all hamlets are provided with continuous water supply system.
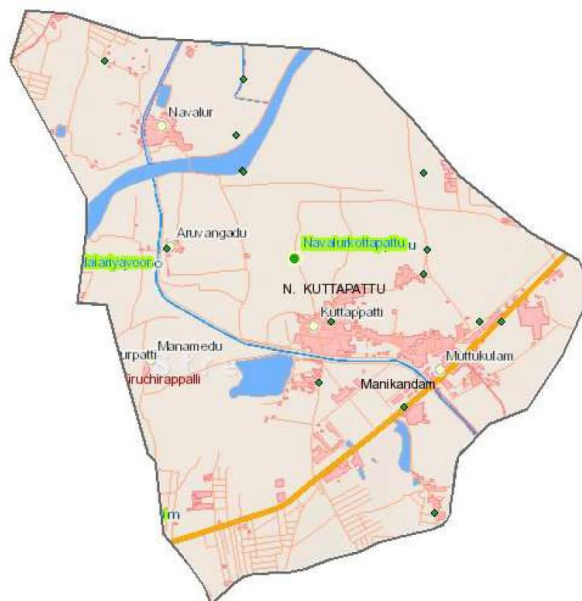
Source: NIC, Gram Manchitra, Dept. of Panchayat raj

Figure 6.1: Map Showing the Location of Overhead Water Tanks

The distribution of households (among the surveyed households) based on source of water supply is presented in Figure 6.2. During the household survey it is learnt that very small percentage of households use bore well and well (each 1% of households) as source of water supply, whereas 33% have water supply connections at their individual houses and 61% use public taps.
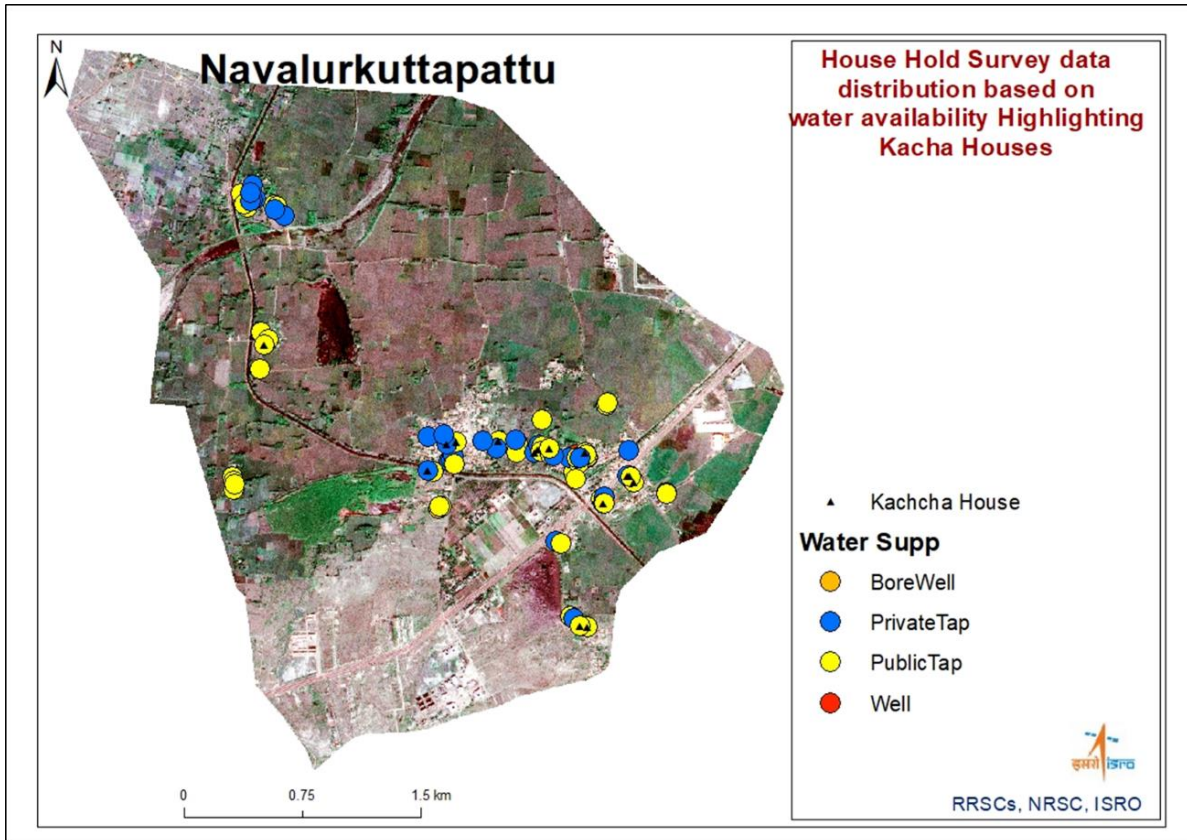
Figure 6.2: Distribution of Households (among the surveyed) Based on Source of Water Supply

Figure 6.3: Overhead Water Tank , Public tap & Private tap

6.3 SOLID WASTE DISPOSAL

The solid waste is disposal is carried out by Door to Door Collection from the individual houses. The collected solid waste is segregated at three different places, i.e., Anbu Nagar, Vannankoil and Navalur. The non-biodegradable waste is sold to external agencies, whereas vermi composting is done with biodegradable waste (Figure 6.4a). It is observed during

household survey that still smaller percentage of people have their own composting pits (6.4d) and also practice open dumping (Figure 6.5).

Figure 6.4a: Vermi compost yard

Figure 6.4b: Waste segregation shed

Figure 6.4c: Garbage bins on main street

Figure 6.4d: Private composting pit
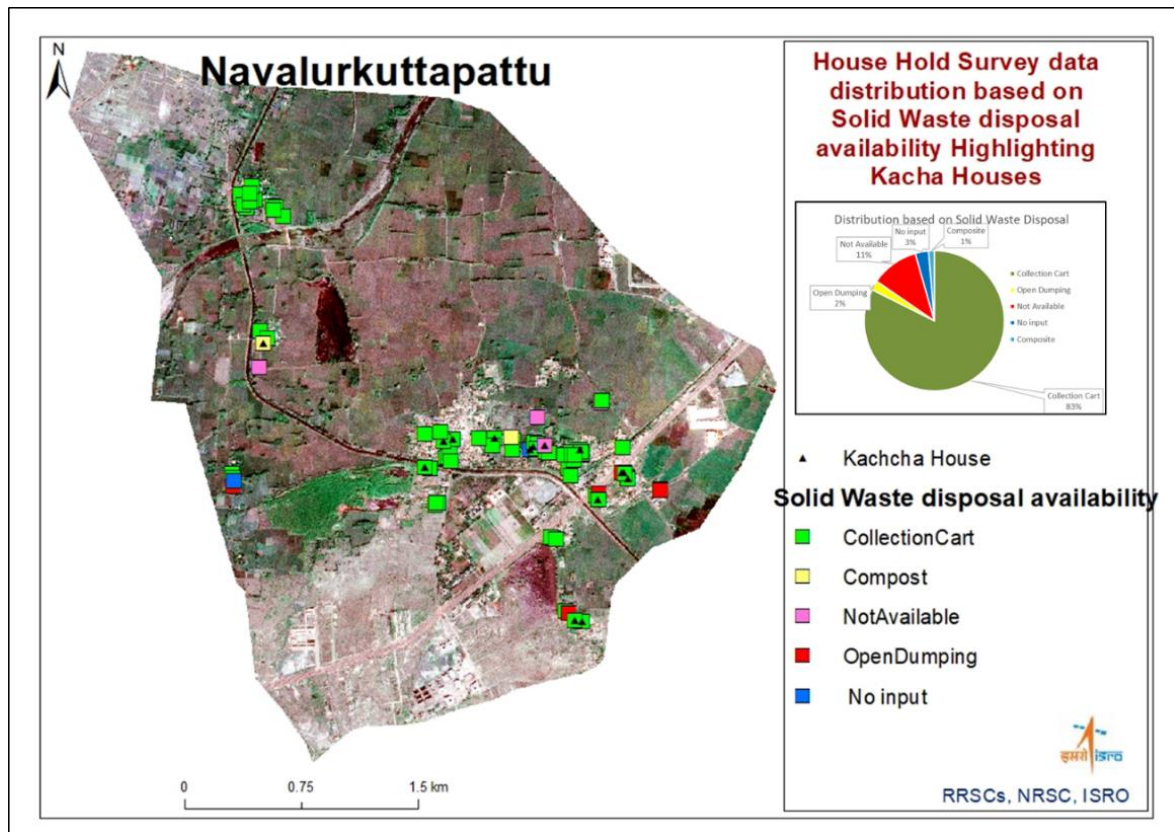
Figure 6.5: Solid Waste Disposal Availability

6.4 SANITATION

Large number of individual houses have Toilets. Public Toilets are constructed in the villages for the use of people living residential houses without private toilets (Figure 6.6a). Soil waste is disposed through Leach Pits/ Septic Tanks at individual houses. Household survey indicated that 87.8% of the residential houses have their individual toilets and about 12.2% of residential houses use public toilets or still practice open defecation in the entire village. Majority of the people i.e., 76% of houses having individual toilets in this GP utilised Government scheme (Figure 6.6b) and constructed toilets with the govt. aid (Figure 6.7). It is noticed that the public toilets have been maintained well.

Figure 6.6a: Public Toilets

Figure 6.6b: Individual Toilets (Govt. Scheme)
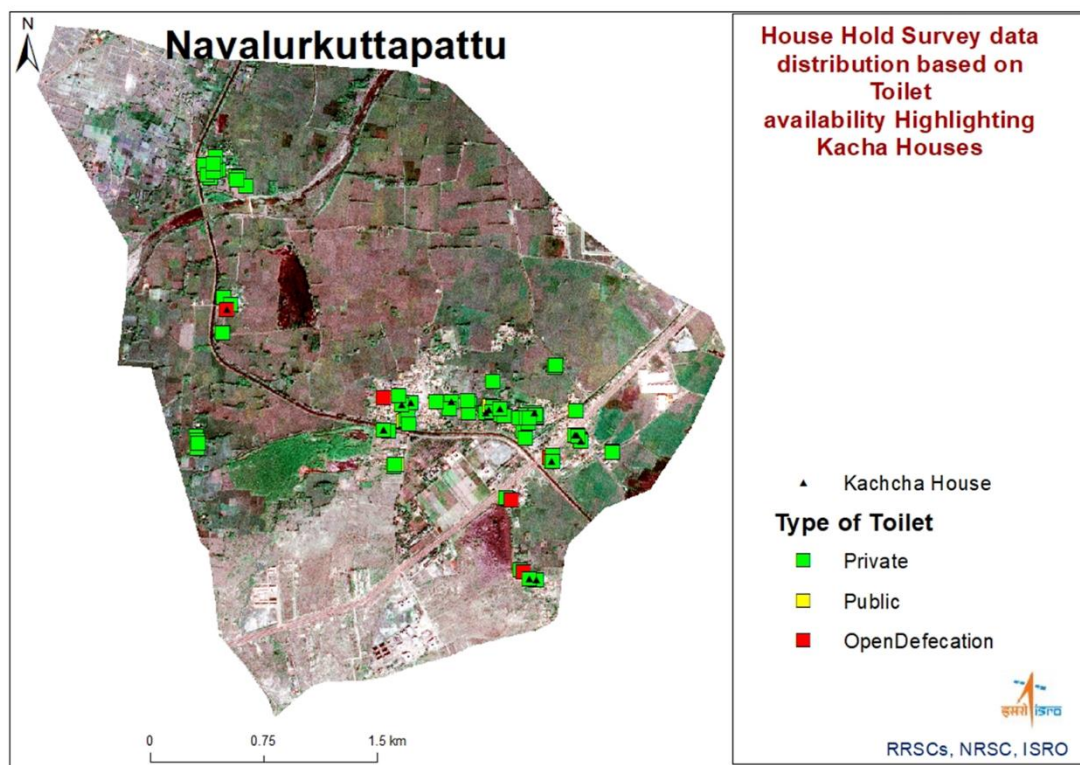
Figure 6.7: Toilet Availability

6.5 STORM WATER DRAINAGE

Storm water drains/ gutters are constructed mostly along cement concrete paved road stretches (Figure 6.8). The details of road length and the stretches in which drains constructed and road stretches in which storm water drains not constructed are given in the Table 6.1.

Figure 6.8: Drains on Either side of Streets

Table 6.1 Details of Storm Water Drainage

Sl. No.	Habitation Name	Storm water Drains Constructed		Road stretches/ length not Constructed
		Length in M	**Road stretches covered**	
1.	Navalur	924	05 on either side & 01 on one side	09 (3115m)
2.	A. D. Kudiyiruppu	436	02 on either side	02 (130m)
3.	Aravangalpatti	566	04 on either side	03 (1415m)
4.	Manamedu	-	-	02 (60m)
5.	Anbu Nagar	368	01 (on both sides)	09 (1959m)
6.	N. Kuttapattu	1375	04 on either side & 04 on one side	01 (383)/ 04 (453 on one side)
7.	Kuttapattu	1200	06 on either side & 13 on one side	08 (808)/ 11 (2142 on one side)
8.	Keelakkadu	315	01	01 (30m)
9.	Ambedkar Nagar	874	03 (on both sides)	05 (447)
10.	Bharathi Nagar	2329	05 on either side & 03 on one side	06 (1071)/ 03 (305 on one side)
11.	Vannankoil	-	-	10 (844)
12.	Santhosh Nagar	-	-	02 (338)
13.	Gandhi Nagar	360	02 both sides	-
14.	Muthukkulam	490	02 both sides	02 (261)
15.	Thirunagar	84	01	06 (2130)

6.6 POWER

All hamlets have electricity supply as source of power. 24 - hours power supply is given for residential buildings, whereas 12 - hours power supply is given for pumps for agriculture irrigation. About 87 households are harnessing solar energy by roof top mounted solar panels (Fig 6.9).

Figure 6.9: Roof Top Solar Panels in House Constructed under State Govt. Scheme

6.7 STREET LIGHT

Pole mounted street lighting is provided in all the streets of this Gram panchayat. A high mast lighting is provided in the central area of the main village, i.e., Navalurkuttapattu (Fig 6.11). Around 30 lamps are powered by solar panels (Fig 6.10). Most (659 nos.) of the street lighting lamps are energy efficient LEDs (Gram Panchayat office)

Figure 6.10: Solar Panels for streetlighting

6.8 PUBLIC TRANSPORT

Bus is the only mode of public transportation available for the people of various hamlets. Frequent bus services are available along the NH on the southern end and also state highway on the northern end of the GP. In addition, bus services are available to the interior hamlets. The services of private taxis and autos are also available in this GP.

Figure 6.11: Bus stop in central village

6.9 ROAD NETWORK

The gram panchayat is spread on either side of NH45 that connects this GP to Tiruchirappalli and other places. Highway on the northern side connects this gram panchayat to Tiruchirappalli town and other facilities around the village. The hamlets are connected to the major roads as well as interconnected by all-weather roads/ streets. The details of different types of roads based on the type of pavement under each habitat of the GP is given in the Table 6.2

Figure 6.12: NH45 junction on north and south side

Table 6.2 Habitation wise length of roads under each category of pavement materials

Sl. No.	Habitation Name	Road Length		
		Cement Concrete Roads	Bitumen topped roads	Semi/ Unpaved roads
1.	Navalur	266	612	2695
2.	A. D. Kudiyiruppu	351	-	-
3.	Aravangalpatti	283	500	915
4.	Manamedu	-	-	60
5.	Anbu Nagar	304	639	1200
6.	N. Kuttapattu	598	715	-
7.	Kuttapattu	1031	229	493
8.	Keelakkadu			30
9.	Ambedkar Nagar	551	-	33
10.	Bharathi Nagar	820	707	311
11.	Vannankoil	-	539	305
12.	Santhosh Nagar	267	-	71
13.	Gandhi Nagar	180	-	-
14.	Muthukkulam	245	166	95
15.	Thirunagar	134	-	1996
	TOTAL	5030	4107	8204

Source: Gram Panchayat Office

Figure 6.13: Views of Streets

6.10 BANKS/ ATMs

One bank is located in this GP. There are 03 ATMs, one State bank of India and two UCO Bank ATM, located along the National Highway. As per Mission Antyodaya Survey Gaps 2019, Ministry of Rural Development report 647 households are having Jan-Dhan bank account.
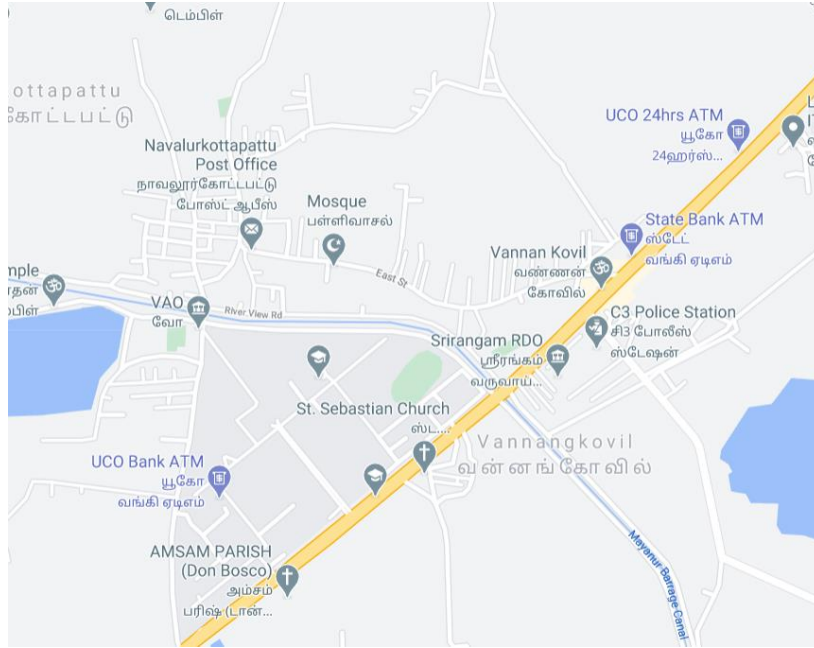
Source: Google Map

Figure 6.14: Location of ATMs

6.11 PUBLIC DISTRIBUTION SHOP

PDS are located in Navalur, Navalurkuttapattu and Muthukulum hamlets. The PDS shops are districted across the GP (Figure 6.15).
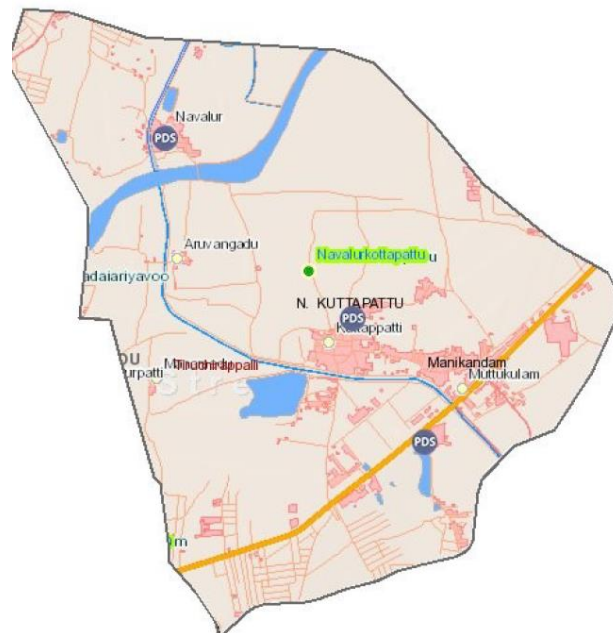
Source: NIC, Gram Manchitra, Dept. of Panchayat raj

Figure 6.15: Location of PDS

Figure 6.16 PDS

6.12 EDUCATIONAL FACILITIES

6.12.1 SCHOOLS:

There are 01 Panchayat Union Primary/ Middle School, 01 Govt. aided Middle School, 01 Govt. aided Higher Secondary School and 02 Un aided Schools (Vincent Matriculation School and Sushi Educational Trust are located in this GP.

Figure 6.17a Govt Primary school

Figure 6.17b Govt Middle school

6.12.2 COLLEGES AND UNIVERSITIES:

The educational institutions include an Agricultural College/ Horticulture College, Arts college, Engineering College, School of Business Management, Don Bosco ITI and National Law University.

6.13 HEALTH FACILITIES

Primary Health sub centre is located in this gram panchayat at Muthukkulam hamlet (Figure 6.18).
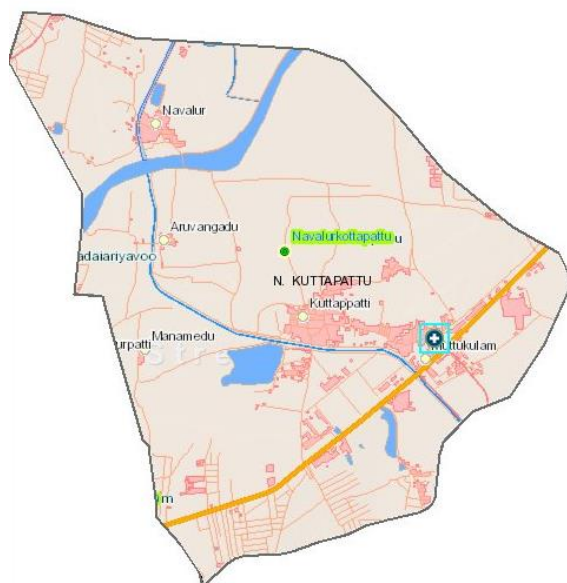
Source: NIC, Gram Manchitra, Dept. of Panchayat raj

Figure 6.18: Location of Primary Health Sub centre

Figure 6.19a: Primary Health Sub centre

Figure 6.19b: Veterinary hospital

The nearest Govt. primary health centre is located at Inamkulathur, which is at a distance of 13 kms from Navalurkuttapattu and approximate travel time is 20 minutes (Figure 6.20).

Health Facilities

Figure 6.20: Location of nearby Health Facilities

The major health facilities such as district/ medical college hospital, private multi-speciality hospitals are located in Tiruchirappalli city, at a distance of about 15kms and travel time of 30 minutes. Maternity and child welfare centre and TB clinic are located within 10kms distance from this GP. One allopathic medical practitioner and two medical practitioners with other degree are available in this GP for medical consultations. Two pharmacies (medicine shops) are located in this GP. From the household surveys, people either go to Govt. primary health centre at Inamkulathur and government and private hospitals located in Tiruchirappalli.

6.14 POST OFFICES

Two post offices, one sub post office (Ranjithapuram) in Tamil Nadu National Law University Campus and one branch post office at Kuttapattu hamlet, are located in this GP.

Figure 6.21: Location of Post Offices

Figure 6.22: Post Office & VAO Office

6.15 OTHER FACILITIES

The other community facilities present in this GP include:

   i.   Anganwadis

   ii.   Milk cooperative society, located in Navalurkuttapattu hamlet

   iii. Three community halls located in Kuttapattu, Navalur and Vannankoil main road

   iv. Shops catering the day to day needs of people

   v.   Burial grounds/ Crematorium for all sections of people

Figure 6.23a Anganwadi

Figure 6.23b Community Hall

Figure 6.23c View of Shops near NH junction

Figure 6.23d Crematorium

Figure 6.23e Other facilities

Primary agricultural cooperative society is not located within this GP. The nearest cooperative society is located in Periyanayakichatram village, which is about 3.5kms from Navalurkuttapattu village.

Figure 6.23f Places of Worship in Navalurkuttapattu

CHAPTER 7

PROJECTIONS AND PROPOSALS

7.1 INTRODUCTION

Agriculture is the major economic activities of the people of this GP. It is noticed that there was increase in 'other workers' and decrease in cultivators and agricultural labourers since 1991. People also expressed that the profit from farming is only marginal. As agriculture related works are only seasonal, people shift to unskilled works in Tiruchirappalli and nearby areas.

In this GP, the literacy rate and skill level of people is low particularly in the population category of above 40 years of age. Household/ Cottage industries are not present in this GP. The educational institutions and couple of industries in this GP are offering employment for the local people to a very limited extent due to education and skill level of the people. Most community facilities, infrastructure and utilities are provided to in hamlets.

7.2 ISSUES/ DEFICIENCIES AND EXPECTATIONS OF RESIDENTS

The various issues/ deficiencies and also the expectations pointed out by the residents of this GP are as given below:

i. Not much profit from Agriculture and related activities. Expect better pricing and also nearby marketing place for their agricultural produces.

ii. Lack of Job Opportunities: The farm based actvities and jobs are seasonal and remaining part the year people find difficult to get employment. People expect more number of work days under MGNREGS scheme.

iii. People those work agriculture labors and as labors in other services have stated that their wages are low and hence not able to save money (No Savings)

iv. Health Centre – As only primary health sub centre is located in this GP people go to Inamkulathur and Tiruchirappalli for better facilities. People informed that substantial expenditure is incurred for medical treatment, i.e., transport and also treatment charges if they visit private hospitals. People expect a primary health centre located in the central village of this GP.

v. Bus Facilities: People informed that they incur expenditure in hiring private vehicles or using their own vehicles as available bus services connecting all hamlets to

Tiruchirappalli is less frequent. People expressed that more frequent bus services connecting all hamlets to Tiruchirappalli.

vi. Common/ Public Toilets: Lack of public toilets close to residential buildings not having individual toilets.

vii. Absence of parks and playgrounds in all hamlets of this GP: In all hamlets people expressed that parks and paly ground is required for the residents.

viii. Open Drains: Water gets stagnated and hence facing the problems of mosquitos and also odour. Some places people let in the waste water from the houses.

ix. Dilapidated Houses: Good number of people got a PMAY houses and also houses (Pasumai Veedu) under state govt. housing scheme. Still very small percentage of people live in dilapidated houses and they expressed that they need assistance through government schemes for construction of houses.

x. Lack of greenary (on the roads and forestry)

xi. As most working class people are either semi-skilled or unskilled, people expressed that training may be provided to them to make them either skilled or semi-skilled by establishing skill development/ job training centres.

xii. People expect assistance both technical and financial to encourge household/ cottage industries in this GP.

7.3 POPULATION PROJECTIONS

The population growth (natural and also net migration) of this GP is calculated using different population projection models. The population is projected for the next 30 years, i.e., 2051. The maximum population arrived from various models is adopted for this study. The final adopted population is given in the table 7.1.

Table 7.1: Projected Population – Navalurkuttapattu GP

Year	2021	2026	2031	2036	2041	2046	2051
Population	5695	6075	6480	6900	7345	7810	8304
0-6	570	610	650	690	735	780	830
6-18	1094	1144	1180	1260	1340	1425	1515

The population of children of 0-6 age group is around 10.50% in the last two decades. It is assumed that the children shall be around 10% of the total population, the population of children under two categories, i.e., 0-6 and 6-12 age groups are worked out.

7.4 PROPOSALS - AGRICULTURE

Paddy is the major crop for 2 seasons in a year. Other crops include flowers, and vegetables. People expressed that the prices for the agricultural produces have not increased in proportionate to increase in the prices of fertilisers, labour wages, etc. The main issue noticed with agriculture is crop pattern. Proper rotation of crops and/ or alternate crops in farming can be explored. As per District Census Handbook 1961, the major crops in GP include Paddy, plantain, sugarcane in wet lands; and Coconut, Black gram, Green gram, Maize and others in dry lands. Discussions with people revealed that they are not cultivating certain other crops mainly due to the difficulty in marketing and also logistical issues.

PROPOSALS (0-5 yrs.):

- Encouraging farmers for alternate crops – less water intensive, value added process (Plantain, Sugarcane, Pulses, Flowers, Vegetables) in addition to paddy.
- Rotation crops – Less water intensive crops can be cultivated during summer

PROPOSALS (5-10 yrs.):

- Small and marginal farmers may be encouraged to cultivation of Flowers, Vegetables and pulses. Small scale farmers market along the NH can be developed where farmers can sell their products directly.
- Establishment of Warehouses and Dry/ Cold storage in the GP or in nearby place common to this and nearby GPs (Guidelines for Rurban clusters, SPA, Delhi, 2019).
- Encouragement/ support from the nearby sugarcane industries/ Agriculture based industries for the farmers to go for alternate crops.

PROPOSALS (10-20 yrs.):

- Household/ Cottage industries for value added products
- Development of agricultural processing establishments such as Rice mill, pulse processing, etc., (Guidelines for Rurban clusters, SPA, Delhi, 2019).

7.5 PROPOSALS – AGRICULTURE RELATED ACTIVITIES

PROPOSALS (0-5 yrs.):

- Encouraging more people/ households to engage in animal husbandry/ Dairying/ Poultry related activities.
- State Govt. schemes, giving subsidy/ loans for cattle (being implemented) can be implemented in a large scale.

PROPOSALS (5-10 yrs.):

The self-help groups (SHGs) may be trained and supported for following activities:

- Milk Producers Co-operative Society
- Poultry Farms
- Organic manure can be produced from the waste and sold to farmers at subsidized rates.

PROPOSALS (10-20 yrs.):

People may be trained and supported for the following:

- Household/ Cottage industries for value added diary/ poultry products
- Feeds for cattle & Poultry (mainly SHGs)

7.6 PROPOSALS - INDUSTRIAL/ OTHER ECONOMIC ACTIVITIES

PROPOSALS (0-5 yrs):

Initiatives on enhancing the skill level of the people by imparting training (Ex: Construction related activities: Masons, Fitters, Welding, Electrical, Plumbing, etc.,) to enhance their employability. This can be carried out by developing a skill development workshops in collaboration with nearby technical institutions and industries. Skill development centre may be established in this GP itself (Guidelines for Rurban clusters, SPA, Delhi, 2019). People may be encouraged and supported for the development of agro-based household (cottage industries) economic activities

PROPOSALS (5-10 yrs):

People may be encouraged and supported for the development of Household/ Cottage industries related to Agriculture and Animal Husbandry and also service industries close to NH (with employment of local people). The GP also can plan for modern rice mills, in which they can go for large scale production of rice, thereby employment can be given to some unskilled and smi-skilled people and increase the revenue of the GP.

7.7 PROPOSALS – HOUSING

The additional housing stock requirement calculated, assuming that the average household size shall be 4 and about 2% of the existing housing (dilapidated) need replacement. No additional land areas are required for residential use in the interior hamlets to accommodate the additional housing requirement as good amount vacant housing areas (Natham) is already available. The additional houses and the land area requirement are given in Table 7.2.

Table 7.2: Future Housing Requirements – Navalurkuttapattu GP

YEAR	NO. OF HOUSES	ADDITIONAL HOUSES REQUIRED	ADDITIONAL LAND AREA REQUIRED
2021	1589	32	10000 sq. m.
2031	1980	215	55000 sq. m.
2041	2225	245	65000 sq. m.
2051	2475	250	66000 sq. m.

The strategies for housing development are as stated below:

1. The Short – Term strategies include

- Replacement of Dilapidated houses with central/ State Housing Schemes (Both schemes are being implemented);

- Priority in implementation of schemes for kutcha and dilapidated structures in the implementation of housing schemes.

- Need to regularize the conversion of dry agricultural land into residential plots and go for orderly development in areas along the NH and the main access road from NH to Navalurkuttapattu. Areas identified and marked in Figure 7.1

2. The Long – Term include

- Development of areas for future residential development mainly to accommodate migration of people for residing. Areas identified and marked in Figure 7.1.

- Institutional Housing requirement is likely to increase with the development of educational institutions in this region.
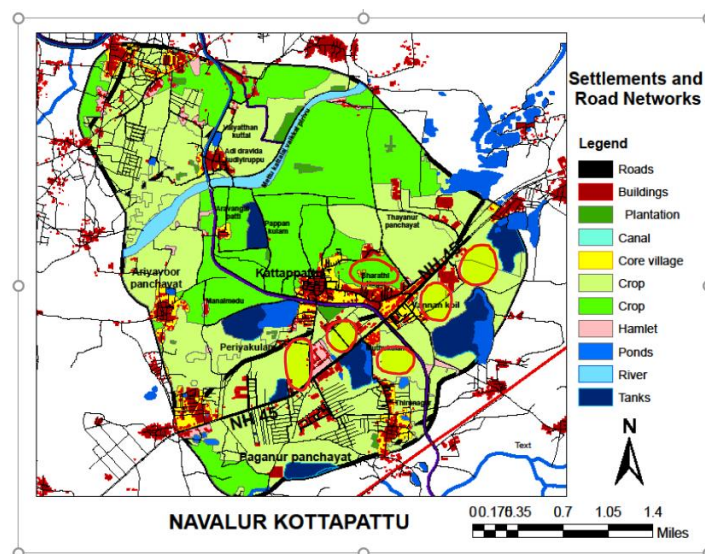
Figure 7.1 Areas for Future Housing Development

7.8 PROPOSALS – INFRASTRUCTURE AND COMMUNITY FACILITIES

7.8.1 WATER SUPPLY

At present the water supply scheme covers all hamlets, providing sufficient water supply through individual connections and street taps. Water supply scheme need to be extended to all new developing housing areas. The quantity of water requirement for entire is projected adopting URDPFI Guidelines, Ministry of Urban Development (2014) i.e., 70lpcd piped water supply for community without sewerage system (Table 7.3)

Table 7.3 Water Supply Requirement

YEAR	POPULATION	REQUIREMENT OF WATER QUANTITY (in Litres)
2021	5695	398650
2031	6480	453600
2041	7345	514150
2051	8304	581280

7.8.2 ELECTRICITY

All hamlets provided with continuous (more than 12 hours) domestic supply. Electrical Connections need to be provided for few kutcha houses under the State Govt. scheme (Free). Subsidies/ Grants may be provided for use of roof top solar panels for producing electricity to meet their requirements (Pucca houses).

7.8.3 SANITATION/ DRAINAGE

Most houses have individual toilets, constructed on their own funding or using subsidies given through Govt. schemes. Public Toilets are provided at select locations. However open defecation is practiced in very few locations. In short term more public toilets need to be provided in certain identified (selected) areas (Figure 7.2). In the long – term, houses without toilets may be identified through household surveys and construction of individual toilets in all houses may be encouraged using Govt. scheme. People may be advised to use waste water such as kitchen waste for watering plants.
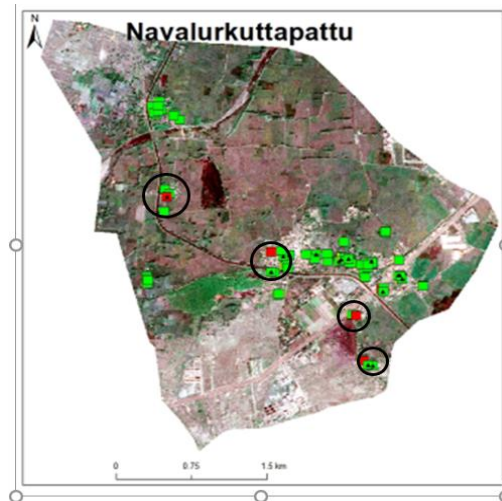
Figure 7.2 Public Toilets - Locations

7.8.4 STORM WATER DRAINAGE

The details of road stretches/ length with and without storm water drains are given in section 6.5 and Table 6.1. The constructed drains are open drains and also faced with water stagnation and breeding of mosquitoes. The short-term proposals include cleaning and covering the existing open drains and connecting them to the natural drainage channels leading to agricultural fields and water bodies. In the long term, drains may be constructed in all streets and connecting them to the natural drainage channels leading to agricultural fields and water bodies.

7.8.5 SOLID WASTE DISPOSAL

The minor issues faced in this GP is practice of open dumping by few households, segregation at source and economic sustainability. The strategies include

- Educating the people to segregate the waste at the household level
- Production of manure from compost yard to increase the revenue with the involvement of SHGs
- Allocation of more funds – for efficient door to door collection of solid waste
- To avoid open dumping, community bins can be placed for the people to dispose the waste that can be collected at periodic intervals for processing and disposal.

7.8.6 TRANSPORTATION

Bus is the mode of public transportation available for the people. State Transport Corporation/ private operators may provide more frequent services connecting all hamlets to Tiruchirappalli. Alternatively, mini bus & Shared Auto (private) services may be explored.

7.8.7 HEALTH

Primary Health Centres need to be provided for every 30000 population and sub-centre for every 5000 population (Guidelines for Rurban clusters, SPA, Delhi, 2019). As there is sub-centre already located in this GP, it is proposed to make the services of health sub centre as 24 x 7 facility and also providing free ambulance facilities.

7.8.8 EDUCATION

The number of secondary and higher secondary schools can accommodate the future requirements (URDPFI Guidelines, Ministry of Urban Development, 2014). However, Anganwadis/ Pre-primary schools and primary schools is proposed in all hamlets to adhere to the standard that primary schools need to be placed within 1 km distance from every habitation (Guidelines for Rurban clusters, SPA, Delhi, 2019).

7.8.9 BANKS

As the distance is more between the ATMs and the interior villages, additional ATMs may be placed in the central village of the GP. At present there is no Agricultural Cooperative Society/ Bank (loan assistance) in GP. One such cooperative society/ Bank may be established in the long term.

7.8.10 COMMUNITY SPACES

Community open spaces, parks and Play fields are not existent in this village except one community gathering space near GP office. The proposals include small multi-purpose community spaces in all hamlets (Residential unit play area) with a land area of 5000sq.m and proper play fields in the central village with an extent of 1.50 hectares (URDPFI Guidelines, Ministry of Urban Development, 2014). Authorities need to ensure that the new housing layouts provide open spaces and play ground as per development control guidelines.

7.9 ENVIRONMENTAL ISSUES

The issues noticed are lack of greenery and effective implementation of rain water harvesting/ Ground water recharging. The proposals include the following:
- Green cover proposal: Tree Plantation on either sides of highways and all major roads, greening of closed mine sites, afforesting the scrub lands in public property and providing green buffer at the edges of all water bodies (Figure 7.3)
- Rain water harvesting/ Ground water recharging structures in individual buildings

- Rain water harvesting at community level- storm water drains need to be connected to open natural drains leading to agricultural fields and water bodies.
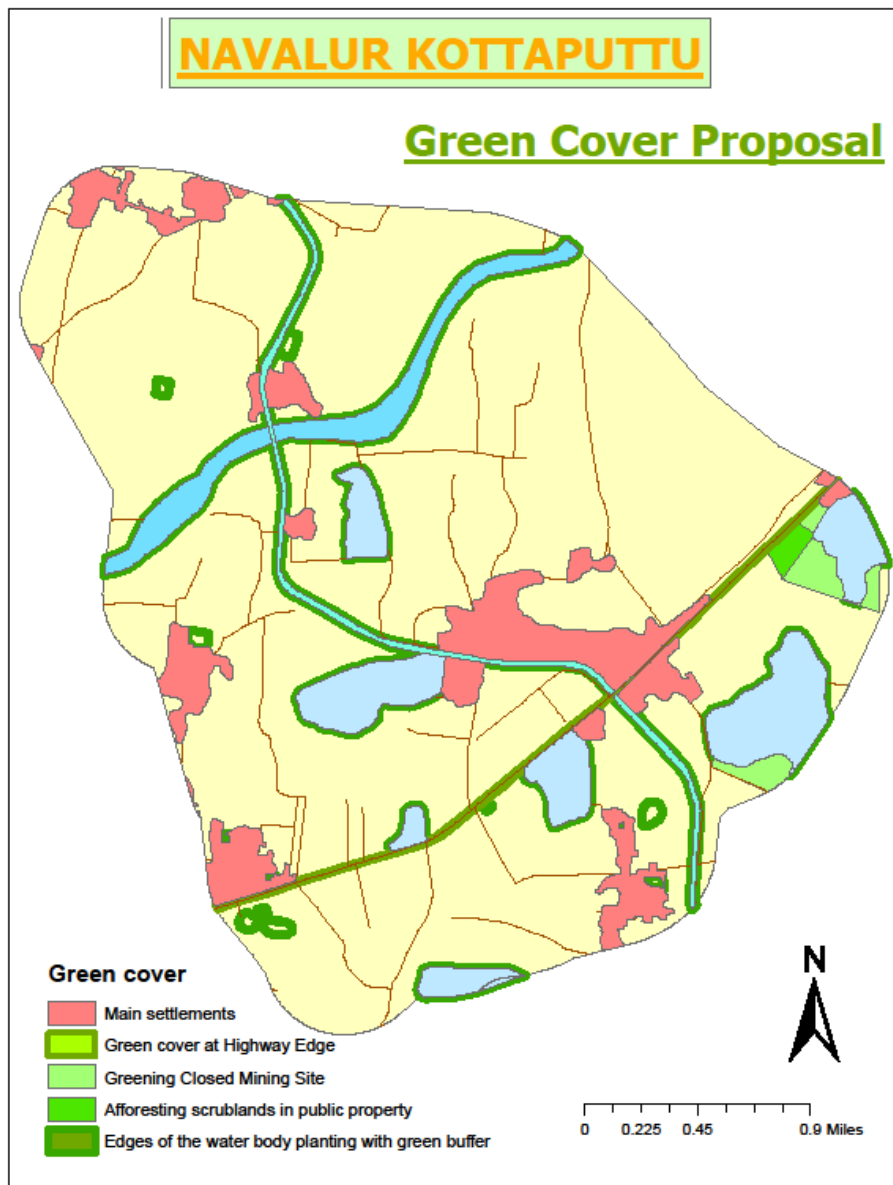
Figure 7.3 Green Cover Proposals

7.10 OVERALL DEVELOPMENT (LANDUSE/ LAND COVER) PROPOSALS

The overall strategies include:

- Protection all water Bodies by proposing suitable green cover around water bodies;
- Wet (Agricultural) lands and Plantation areas to be protected;
- Interior Villages: Green cover, Tree Plantation in fallow lands;

- Identified areas for future residential, industrial and commercial establishments;

- Development of Community open spaces;

- Residential Development: Areas close to NH and the areas near main access road to main village to be developed on the principles of sites and services scheme;

- All small water bodies and natural drainage channels are to be preserved for effective storm water drainage and rain water harvesting (Figure 7.4).
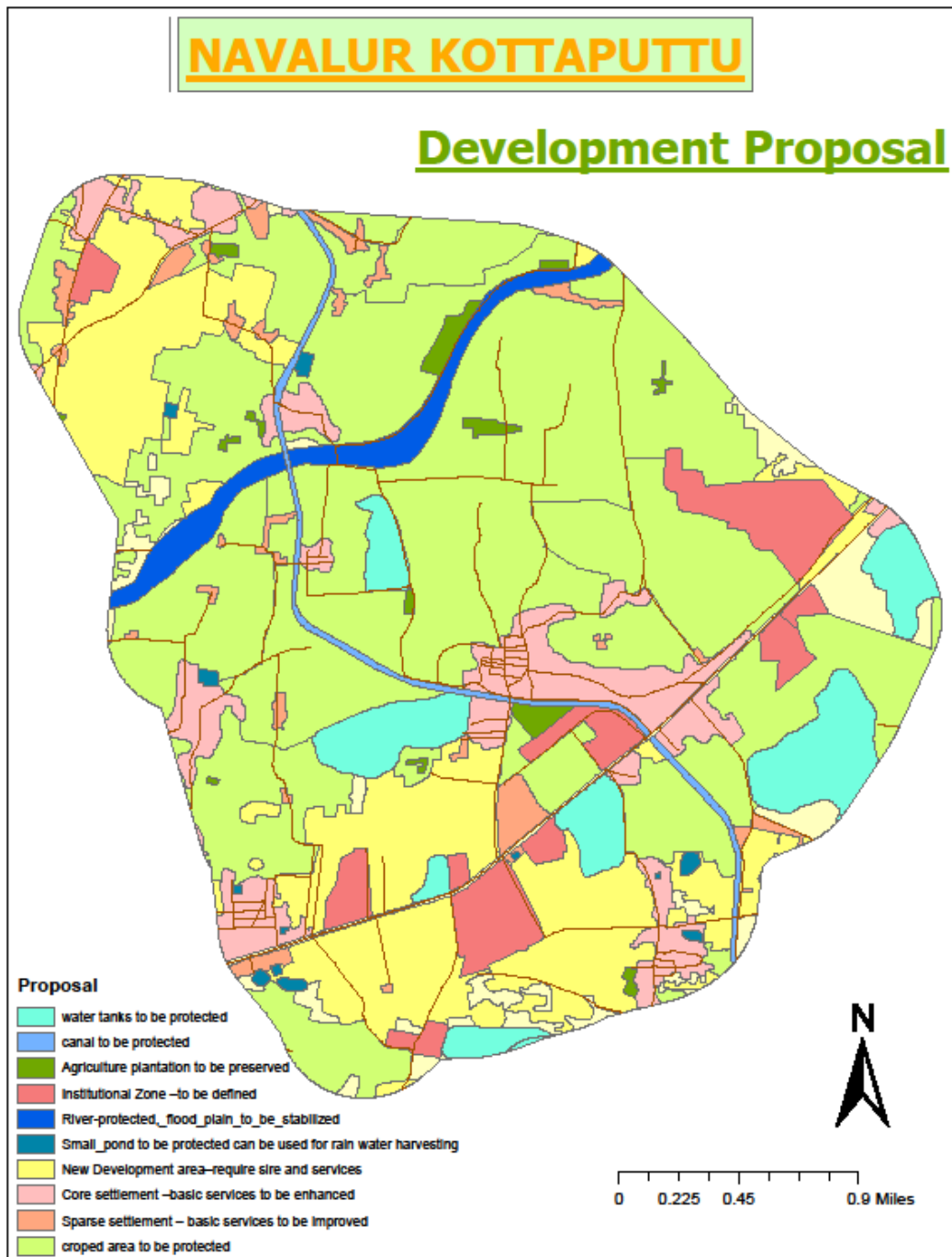
Figure 7.4 Development Proposal

7.11 GENERATION OF COMPREHENSIVE DEVELOPMENT PLAN FOR GP

(*Regional Remote Sensing Centre - South, NRSC/ISRO, Govt. of India, Bengaluru*)

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.

7.11.1 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). Implementation strategies of some of the recommendations for improving water resources are given in detail. The water resource development is shown in Figure 7.5.

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.

a) **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.

b) **Groundwater Recharging through rain water harvested**:

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

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

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.

3)   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 systems 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)   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 / desiltation of tanks and lakes in the Gram-Panchayat will definitely build up ground water resources.

5)   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 <u>80 percent</u> more water than conventional irrigation, and can even contribute to increased crop yields.

6)   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.
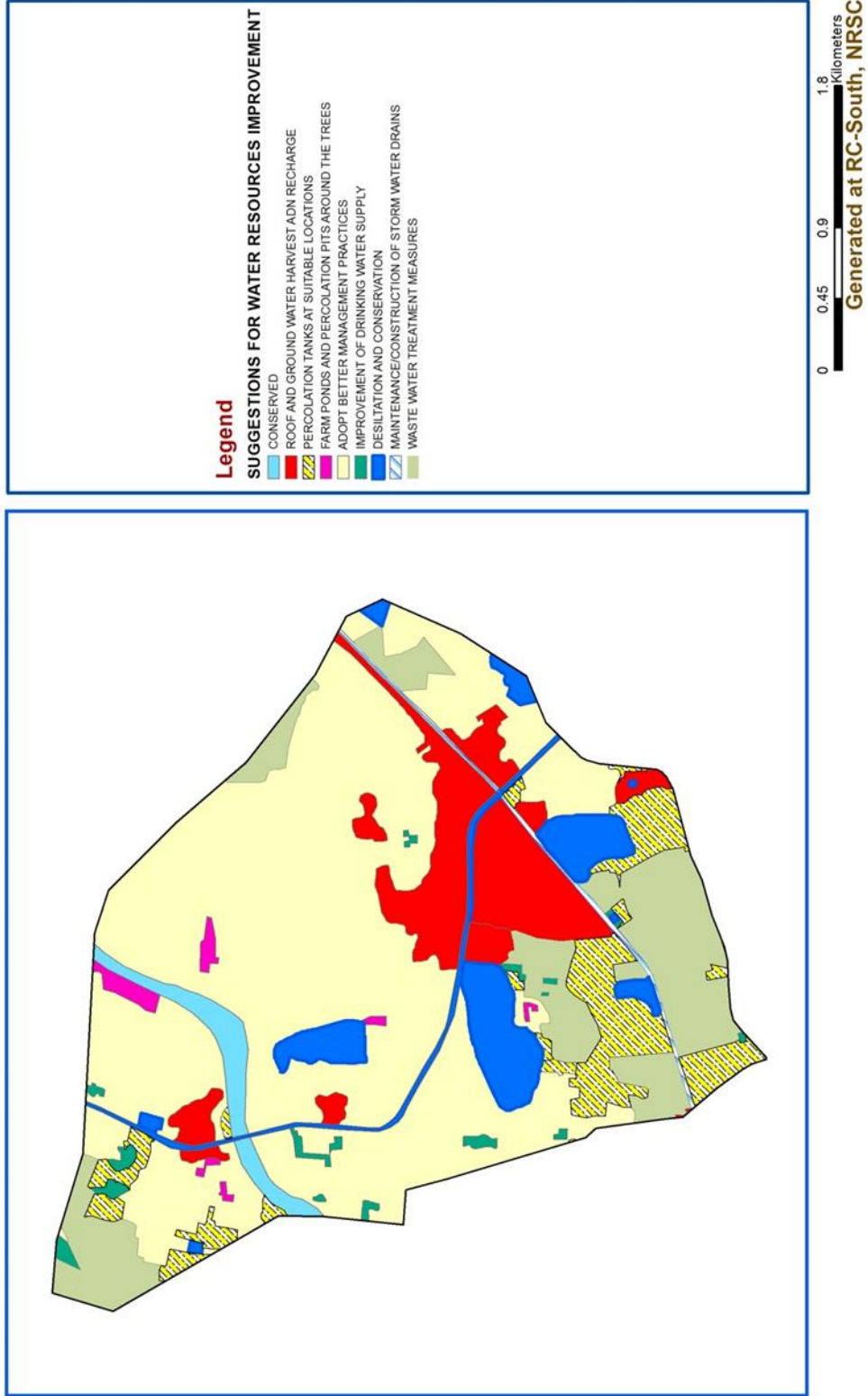
Figure 7.5: Water resources development plan for Navalurkuttapattu GP

7.11.2 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 landuse plans. Methodology adopted from the GIS based land use planning project initiated in India entitled 'Integrated Mission for Sustainable Development', which generates, analyzes 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 Figure 7.6.

Land Resources Development Plan

Some of the general recommendations for LRDP are given below.

1) Improved Agro-horticulture / Agro-forestry practices (Horticulture Forestry plantations with interspaced cultivation) to bring better returns than the field crops.

2) **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.

3) **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, 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.

4) **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.

5) **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.

6) **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.

7) **Crop cultivation based on soil texture:** Here clay soils are dominant and based on this Rice based cropping system suggested.

8) **Setting up of Industry:** Rice processing units and Market facility

Gram Panchayat Spatial Development Planning - SISDP Update

Navalurkottapattu (GP), SrirangamTaluk, Tiruchirappalli District, Tamilnadu

Land Resources Development Plan Map
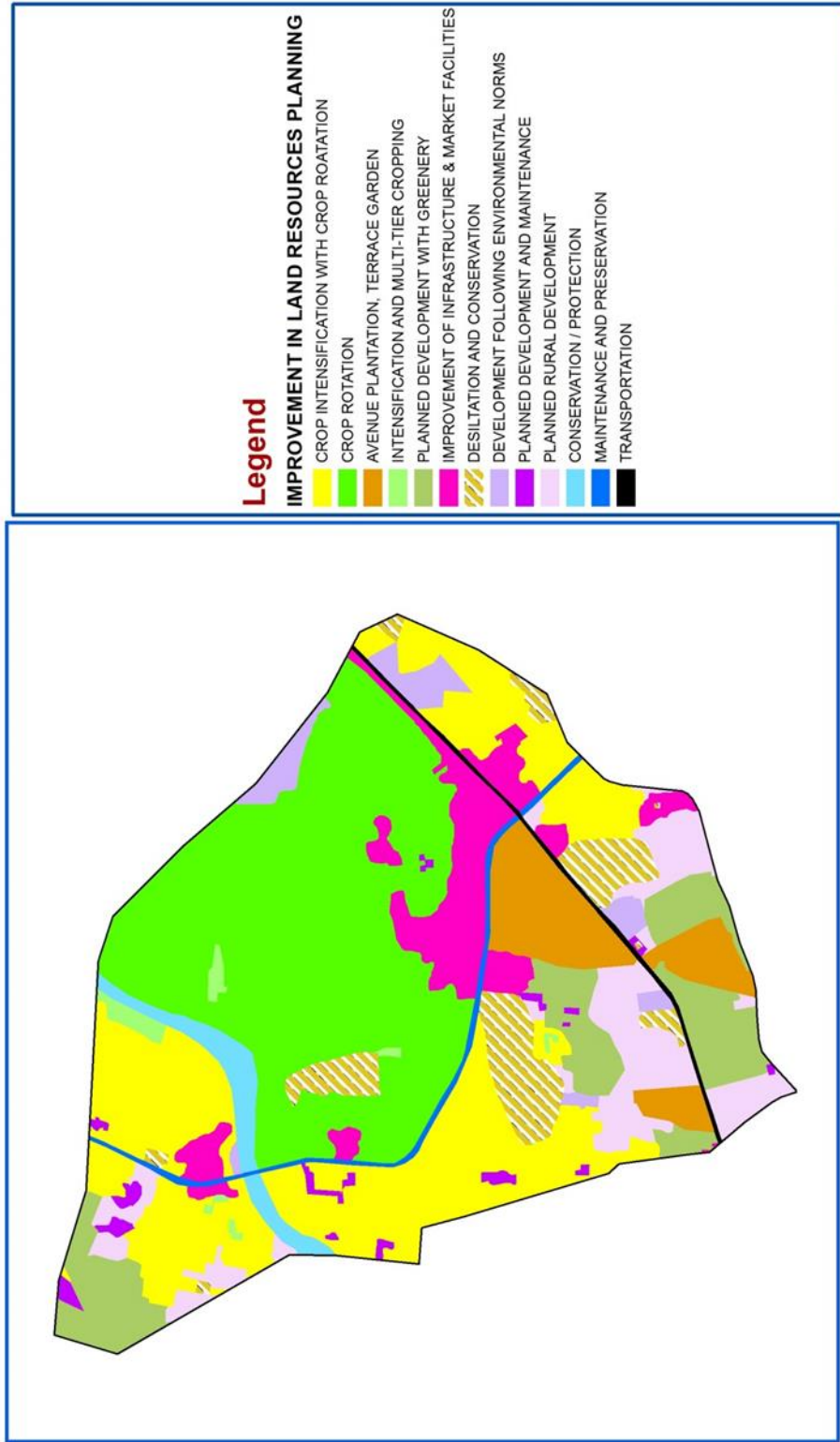
Legend

IMPROVEMENT IN LAND RESOURCES PLANNING

- CROP INTENSIFICATION WITH CROP ROATATION
- CROP ROTATION
- AVENUE PLANTATION, TERRACE GARDEN
- INTENSIFICATION AND MULTI-TIER CROPPING
- PLANNED DEVELOPMENT WITH GREENERY
- IMPROVEMENT OF INFRASTRUCTURE & MARKET FACILITIES
- DESILTATION AND CONSERVATION
- DEVELOPMENT FOLLOWING ENVIRONMENTAL NORMS
- PLANNED DEVELOPMENT AND MAINTENANCE
- PLANNED RURAL DEVELOPMENT
- CONSERVATION / PROTECTION
- MAINTENANCE AND PRESERVATION
- TRANSPORTATION

0   0.45   0.9   1.8
Kilometers

Generated at RC-South, NRSC

Source :
RESOURCESAT2 LISS IV MX (5m)

Figure 7.6: Land resources development plan for Navalurkuttapattu GP

7.11.3 Recommendations & Suggestions for improving natural resources in Navalurkuttapattu GP

Navalurkuttapattu GP is in close proximity to Trichy city. It is basically an agricultural predominant GP with nearly 56% area under crop land which includes both cropped areas and fallow lands. The GP has dominantly clay soil with paddy as the dominant crop grown in two seasons with canal irrigation from Cauvery river. Some of the recommendations are to have crop intensification with crop rotation with pulses. In plantation areas it is suggested to go for intensification and multi-tier cropping. The farm advisory and the Agricultural college can provide advisory to the farmers in their day to day agricultural activities, supply of quality seeds, monitoring and making available quality chemical fertilizers, bio fertilizers, bio pesticides besides making available the latest technologies from research institutions with a view to increase the food production and raw material production to cater to the growing needs of the food for the population and raw materials for the industries.

The GP needs to maintain and protect the rivers, canals and tanks. Desiltation of tanks needs to be taken up to protect the fragile tank eco system. The institutional areas need to have more greenery and follow recycling of water. Industries need to follow environmental norms.

The GP needs improvement of infrastructure and market facilities. Agro based industries like Rice processing related industries can be set up. Sodic soil dominated areas proper reclamation process (Gypsum application), green manure viz., Daincha and Manila Agathi cultivation is recommended.

Drinking water supply to the core village needs to be strengthened. In the core village, the pucca houses can follow roof water harvesting measures to recharge the ground water. Due to close proximity to Trichy the GP has more than 8% area under layout and open land categories. These areas can have a proper planned development in terms of green avenues, storm water drains, waste water recycling etc. in place before actual residential development happens. Storm water drains need to be provided alongside of the transportation network.

The farmers in the GP should be made aware of the various developmental schemes available viz. National Agriculture Development Programme, Pradhan Mantri Krishi Sinchayee Yojana , Collective Farming Seed Village Scheme, National Food Security Mission , National Mission

On Sustainable Agriculture, Soil Health Card Mission, Soil health improvement through Bio-fertiliser including Green Manuring, adoption of Integrated Nutrient Management (INM) and Integrated Pest Management (IPM) technologies to achieve better return and value addition to agricultural produce which in turn improve the economic status of the farming community.

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 hierarchical 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.

For successful implementation of land and water resource development plan in the study GP, suitable working scale needs to be identified for data analysis and implementation within the GIS framework. Most of the implementation by the implementing authorities of the government is being carried out with cadastral maps. The large-scale cadastral maps overlaid on the action plan details would be the best format for implementation.

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