

DISTRICT URBANISATION REPORT

ERNAKULAM

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PREFACE >>



PREFACE

Planning is a prerequisite for effective development. Development becomes comprehensive when growth centres are identified considering physical, social and economic variables of an area in an integrated manner. This indicates that planning of villages and towns are to be complementary. Second Administrative Reforms Commission (ARC) while interpreting the article 243 ZD of the Constitution of India states as follows. "This, in other words, means that the development needs of the rural and urban areas should be dealt with in an integrated manner and, therefore, the district plan, which is a plan for a large area consisting of villages and towns, should take into account such factors as 'spatial planning', sharing of 'physical and natural resources', integrated development of infrastructure' and 'environmental conservation'. All these are important, because the relationship between villages and towns is complementary. One needs the other. Many functions that the towns perform as seats of industry, trade and business and as providers of various services, including higher education, specialized health care services, communication etc have an impact on the development and welfare of rural people. Similarly, the **orderly growth of the urban centre** is dependent on the kind of organic linkage it establishes with its rural hinterland". Therefore a move of harmonizing urban and rural centres of an area can be said as a move of planned urbanisation of the area.

In this context, it is relevant to mention the 74th Amendment Act of the Constitution of India, which mandated the District Planning Committee to prepare a **draft development plan** for the district. As per Article 243 ZD of the Constitution, the District Planning Committee (DPC) shall consolidate Panchayat/Municipality Plans in the district and prepare draft development plan for the district as a whole. The Constitution also specifies that while preparing draft development plan due regard shall be given to matters of common interest between panchayats and municipalities including spatial planning, sharing of water and other physical and natural resources, the integrated development of infrastructure and environmental conservation. In this respect, the district of Kollam has conducted an important experiment of preparation of an Integrated District Development Plan (IDDP) for the district. Through preparation of IDDP, the District Planning Committee of Kollam has become the first ever DPC in the country to own a District Development Plan as envisaged by the Constitution. This path-breaking venture has become a model in participatory district planning in a spatial platform. The Plan was released during the international conference on district planning held at Kollam in August 2009. The Plan is now sanctioned by Government of Kerala. As per G.O (Rt) 354/04/LSGD dated 01.02.07, the State Government have extended the project to the remaining districts in the state and the districts of Alappuzha, Thrissur, Idukki, Palakkad and Wayanad were selected for extending the project in the first phase. However, even in these districts, preparation of IDDP is yet to be completed.

Preparation of such a plan will surely need decisions and commitment at various levels due to the multiplicity of agencies involved and the vast spectrum of aspects to be addressed. However, delay in planning shall not affect development. Hence a step by step approach may be adopted in planning. Therefore, the Department of Town and Country Planning evolved a sequence of plan preparation at district level, involving District Urbanisation Report (DUR), District Spatial Plan (DSP) and Integrated District Development Plan (IDDP).

The District Urbanisation Report defines the future spatial structure of a district, which is formulated by integrating hierarchy and activity pattern of urban and rural settlements and the connectivity between them. The spatial structure of a district will act as a frame for the orderly development of urban centres and their rural hinterland subsequently leading to a planned urbanisation.

The District Spatial Plan is a synergistic form of the District Urbanisation Report, since as a plan it is congruent to a single unified physical design for the district through setting development goals and objectives and formulating the development concept of the district. DSP will frame the general policies and strategies and streamline directions of development of the district. The Development Directives of DSP is carved in the spatial platform through the synthesis of findings of the analysis over the spatial structure based on secondary sources of data. But it lacks the resource studies as co-ordination of various agencies remain as an uphill task.

The Integrated District Development Plan can be termed as the highest echelon of this series and manifest all features of the draft district development plan as envisaged in Article 243ZD of the Constitution of India. Democratisation of planning and translation of sectoral policies into spatial plans are the paramount qualities of IDDP as against DSP. IDDP comprises of two components; a Perspective Plan for 15-20 years and an Execution Plan for 5 years.

As said earlier, IDDP for Kollam District is already prepared under the leadership of the District Planning Committee, Kollam with the involvement of all the Local Governments in the district and Special Technical Advisory Committee for IDDP. The Department of Town and Country Planning gave technical support for Plan preparation besides coordinating the entire process in the role of nodal agency.

Now, the Department has prepared District Spatial Plans for the districts of Thrissur and Palakkad and District Urbanisation Reports for the districts of Thiruvananthapuram, Pathanamthitta, Alappuzha, Kottayam, Ernakulam, Idukki, Malappuram, Kozhikkode, Wayanad, Kannur and Kasaragod. The District Urbanisation Report for Ernakulam is one among the series.

I take this opportunity to appreciate the officials of the Ernakulam District Office of the Department, headed by Sri.K.Ramanan, Senior Town Planner in the preparation of this document. The State Project Cell for LDP-IDDP-SPP played anchor role in this regard, right from conceptualisation to shaping the end product. The toolkits and customised computer applications developed by the State Project Cell has enabled the district offices to accomplish the task in a time bound manner. I also appreciate the consistent efforts of Sri. Jacob Easow, Senior Town Planner, Smt.Ushakumari.P.R, Town Planner, Sri. Baiju.K, Deputy Town Planner and other officials of the State Project Cell. I also appreciate the officials of the circle headed by Smt.T.M.Sudha, Senior Town Planner for their efforts in vetting and finalising the District Urbanisation Report for Ernakulam.

This is a first step on the ladder leading to the **draft development plan** for the district as laid down in the Constitution. It is hoped that the district of Ernakulam will further extend the District Urbanisation Report into Integrated District Development Plan for the district.

Certainly, the District Urbanisation Report for Ernakulam will provide a framework for development as well as future planning of the district.

Thiruvananthapuram
11-02-2011

Eapen Varughese
Chief Town Planner

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ACKNOWLEDGEMENTS

The District Urbanisation Report of Ernakulam District presents the analysis and findings of study on urbanisation in the Ernakulam District so as to evolve State Perspective plan for Kerala-2021.

I would like to express my sincere thanks to Sri. S. M. Vijayanand IAS, Additional Chief Secretary, Local Self Government Department for critical review, guidance and monitoring of the work. Sri. Eapen Varughese, Chief Town Planner is specially acknowledged with sincere gratitude for his timely reviews, guidance and all supports during the preparation of DUR.

The efforts of the IDDP project Cell need special mention here without which the time bound preparation of the plan would not have been possible. Their technical assistance has enhanced the capabilities of the District office team in the study on urbanization and preparation of District urbanization report. Their commitment throughout the preparation of the District Urbanisation Report was exemplary. The untiring efforts of Sri. Jacob Easow, Senior Town Planner, of the State Project Cell was really an inspiration. Suggestion from Smt. P.R. Ushakumari, Town Planner, IDDP project cell is also thankfully acknowledged. She has been provided vital support by reviewing and commenting on the drafts of the report. Particular thanks to Sri. K. Baiju, Deputy Town Planner who provided generous assistance, sharing his accumulated experience and knowledge with the Report team. The officials of the IDDP-LDP Project Office took consistent efforts for the DUR preparation among whom Smt. Gayathri, Planning Assistant need special mention.

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The study on urbanization and DUR was prepared through a systematic process, setting up of aim and objectives, analysis of existing facilities in the district and determination of settlement pattern and transportation network. This document is a consolidation and analysis of urbanisation trends over recent years and identified that the urban population and physical expansion of urban area will continue to increase in the foreseeable future.

I would like to express sincere appreciation to the team headed by Smt. P.R.Jayasree, Deputy Town Planner, Smt. M.M.Sheeba, Assistant Town Planner who prepared the District Urbanisation report for Ernakulam district in a time bound manner.

Separate mention must be made to the statistical section of the district office headed by the Research officer, Smt. Sangeetha in the process of gathering data for this report.

The concerted efforts of officers and Staffs of the district office have a significant role in the success of the report. Sri. T.A.Rahim, Ist Gr. Draftsman is hereby acknowledged for his contribution for map preparation and report preparation and Sri. Arun Raj, Planning Assistant is also acknowledged for his contribution in compiling and designing the report.

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Chapter-1

PROFILE OF THE DISTRICT

1.1 INTRODUCTION

Ernakulam district is situated almost at the middle of Kerala State and on the coast of the Arabian Sea. It has credit of being the economic nerve center of the State. It is the most industrially advanced and flourishing District of Kerala compared to the other districts.

This district was formed in 1958 by carving the regions from Thrissur and Kottayam district. The district is named after the erstwhile Ernakulam town, the name of which in turn is said to have been derived from the word Rishinagakulam, a tank in the famous Siva Temple in the town.

The District comprises areas of the erstwhile Travancore, Cochin and Malabar states. Initially the district headquarters was at Ernakulam, which gave the district its name; the headquarters was later shifted to Kakkanad. When Idukki District was formed on January 26, 1977, Thodupuzha Taluk was joined with Idukki and Muvattupuzha Taluk separated to form Kothamangalam Taluk. The present Ernakulam District includes Paravur, Aluva, Kochi, Kanayannoor, Muvattupuzha, Kunnathunadu and Kothamangalam Taluks which come under Fort Kochi and Muvattupuzha revenue divisions. The district is 47.56% urbanised.

Kochi (the new name for Cochin) is the port city and the commercial capital of Kerala State in India, located by the side of Arabian Sea on the southwestern coast of India. The entire region covering Fort Kochi, Mattancherry, Wellington Island, mainland Ernakulam and its suburbia (including Vyttila, Vennala, Edapally) is generally referred to as Kochi (or Cochin) because all these areas were part of the erstwhile kingdom of Kochi in pre-independence India.

About 38 km. from north to south and 48 km. from east to west, the district is bounded by a 46.2 km. coastline of the Arabian Sea on the west, Kottayam and Alappuzha districts on the south, Idukki on the east and Thrissur on the north.

1.2 LOCATION

The district is bounded on the North by Thrissur District, on the east by Idukki District and on the south by Kottayam and Alappuzha Districts. The Arabian Sea lies all along the western boundary of the District.

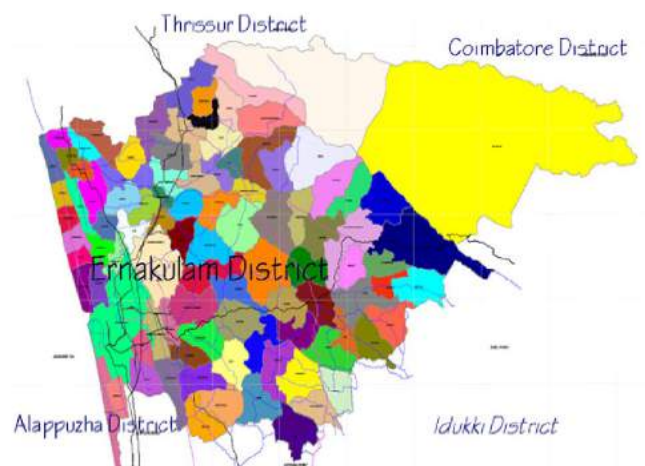


Fig 1.1 Physical setting of Ernakulam District

1.3 ADMINISTRATIVE DIVISIONS

For administrative purpose the district is divided in to two revenue divisions and 7 Taluks. The revenue divisions have the head quarters at Fort Kochi and Muvattupuzha. Kanayannur, Kochi, Parur, Aluva, Kunnathunadu, Muvattupuzha, and Kothamangalam are the 7 taluks of the district. Aluva, Parur, Kochi and

Kanayannur taluks come under Fort Kochi revenue division and Kunnathunad, Muvattupuzha and Kothamangalam taluks come under Muvattupuzha division. There are 124 revenue villages under seven taluks.

The taluks of the district is shown in the Figure 1.2. The name of the Taluk and Taluk head quarters are shown in the table 1.1.

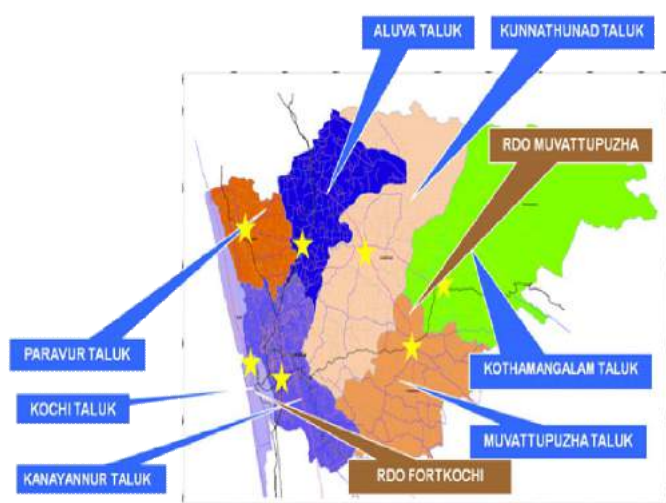


Fig 1.2 Taluks in Ernakulam District

The District has 15 Block Panchayats, eight municipalities and one Municipal Corporation. The names of the Block Panchayats, their head quarters and Block Panchayat wise distribution of population is shown in Table 1.2. The Block Panchayats in Ernakulam District are shown in fig 1.3.

Table 1.1 Taluks and Taluk headquarters

Name of Taluk	Taluk Head Quarters
Kanayanur	Ernakulam
Kochi	Fort Kochi
Paravur	Paravur
Aluva	Aluva
Kunnathunadu	Perumbavur
Muvattupuzha	Muvattupuzha
Kothamangalam	Kothamangalam

Table 1.2 Block Panchayats and their head quarters

Sl. No.	Name of Block panchayat	Population 2001	Block Headquarters	Name of LSG where Block HQ situated
1	Alangad	165563	Alangad	Alangad
2	Angamaly	193929	Angamaly	Angamaly
3	Edappally	108124	Kusumagiri	Thrikkakara
4	Koovappady	146086	Kuruppampady	koovappady
5	Kothamangalam	189808	Kothamangalam	Kothamangalam
6	Mulanthuruthy	139008	Perumbilly	Mulanthuruthy
7	Muvattupuzha	151563	vazhappilly	Muvattupuzha(M)
8	Palluruthy	62870	Palluruthy	Kochi corporation
9	Pambakkuda	141701	Anchalpetty	Pampakkuda
10	Parakkadavu	137519	Kurumassery	Parakkadavu
11	Paravur	146017	Kaitharam	Kottuvally
12	Vadavukode	152199	Kolanchery	Poothrikka
13	Vazhakkulam	205403	South Vazhakkulam	Vazhakkulam
14	Vypeen	197624	Ayyambilly	Kuzhuppilly
15	Vyttila	68561	Maradu	Maradu

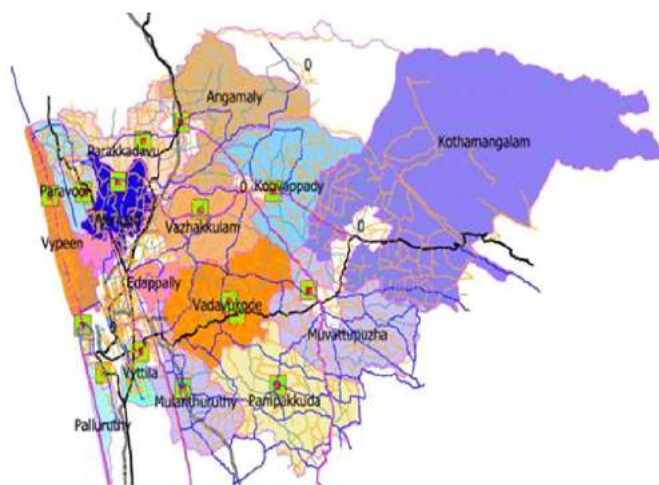


Fig 1.3 Block Panchayats in Ernakulam District

There are 88 Grama Panchayats in the district, the list of which is given in *Annexe 1* and are located in fig 1.4.

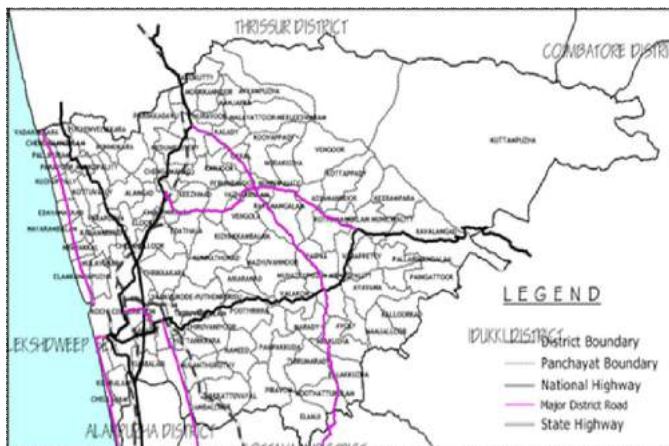


Fig 1.4 Grama Panchayats in Ernakulam District



Misty Highland

1.4 TOPOGRAPHY AND PHYSICAL FEATURES

The district is divided into three well-defined parts-highland, midland and the lowland consisting of hills and forests, plains and the seaboard respectively. 20 percent of the total area is low land region. The mid-land consists mainly of plain land having natural facilities of drainage via backwaters and canals. The hilly or eastern portion is formed by a section of Western Ghats. Aluva, Muvattupuzha, Kothamangalam and the eastern portion of the Kanayannur taluk come under the mid land region. The major part of the Kunnathunadu taluk is in the mid land region and the remaining portion is in the high land region.

1.4.1 PHYSICAL FEATURES

a. Climate:

The region has a tropical humid climate with an oppressive hot season and plentiful seasonal rainfall. The South-West Monsoon season from June to September and the North-East Monsoon from October to November/ mid-December follow the hot season from March to May. The period from December-end to February is generally dry.

b. Mountains:

The hilly tract along Eastern portion is formed by a section of the Western Ghats. Muvattupuzha, Kothamangalam and Aluva can be called the hilly taluks. The Western Ghats which separate the district from the Tamil Nadu consist of several ridges and hill plateaus

which diminish in altitude towards the coast. The Malayattoor reserved forest and northern and northeastern tip of the Muvattupuzha and Kothamangalam taluks formed the high range in the district.

c. Rivers:

Periyar and Moovattupuzha are the main rivers of the district of which the former flows through Thodupuzha, Moovattupuzha, Alwaye, Kunnathunadu and Parur taluks. The Chalakudi River that flows through north of Alwaye also joins Periyar at Alanthikara. The rivers Thodupuzha, Kallai and Kothamangalam join together



Coastal Lowland

to form Moovattupuzha river. During rainy season these rivers are full and heavy floods affect the low-lying areas on the banks, but in the summer season they generally go dry and narrow.

The seacoast in this district falls entirely in Cochin taluk, Cochin harbour which is a major natural harbour is also situated in this taluk. Malippuram and Njarakkal in Vypeen island are open roadstead. The mud bank at Njarakkal extends about 4.5 km along the shore and 6 km out to the sea which helped ships to ride safely and unload cargo in all seasons. But with the rise of the Cochin harbour the importance of Njarakkal and Malippuram became lesser. Many islands can be seen scattered in the backwaters in Cochin and Kanayannur taluks. The main islands are Willingdon Island, Vypeen, Ramanthuruth, Cheriyaadamakkudi, Bolgatty island (Ponjikkara), Vallarpadom, Valiyakadamakkudi, Kumbalam, Panangad, Chellanam, Nettiur, Pizhala, Kankattuthuruth, Korampadam, Cheranellur and Chathannur. Most of these islands are very small in size extending from less than 1 sq. km. to 4 sq. km. There are transport facilities to all these islands.

A portion of the Vembanad Lake falls within the Cochin taluk. On the northern side of the North Paravur Taluk

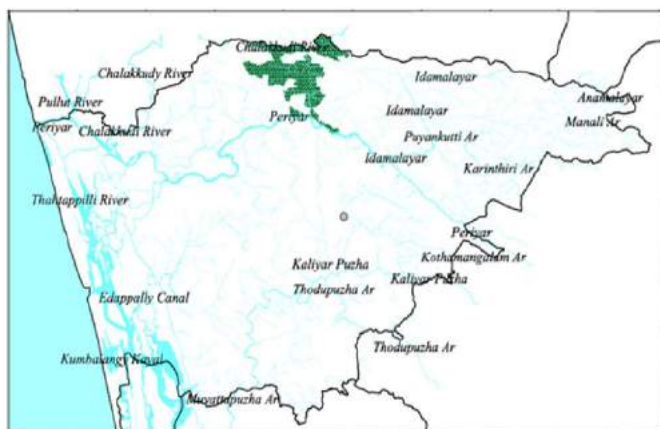


Fig 1.5 Water bodies of Ernakulam District

lies the Kodungallur Kayal, and on the southern side, the Varapuzha Kayal.

1.4.2 LAND UTILISATION

The land utilisation pattern exhibits the characteristics of the district in terms of its growth, development and activity pattern. It also indicates indirectly the amount of land available for future development. The land utilization pattern of Ernakulam district is broadly classified under the categories listed in table 1.3.

1.5 SOCIO-ECONOMIC ASPECTS

In the case of socio-economic aspects the following parameters are analyzed.

- ❑ Literacy rate (1991 and 2001);
- ❑ Share of Work force (1991 and 2001);
- ❑ Net State Domestic Product (1998); and
- ❑ Per capita Income (1998).

a) Literacy Rate:

As per 2001 census, Kerala is the most literate state in India having literacy rate of 90.86%. Inter-district analysis within Kerala reveals that the highest literacy is recorded in Kottayam district (95.9%) and the lowest is in Palakkad district (84.3%). The literacy rate of Ernakulam is 93.20%, which is above state average. It occupies 4th position among the other districts.

b) Share of Workers:

The work participation rate (WPR) in Kerala has increased from 34.75% to 35.93% from 1991 to 2001. Ernakulam district recorded over 35.9% of WPR, which is below the state average and ranked 10th position.

c) Net State Domestic Product (NSDP):

NSDP district wise distribution as factor cost shows that Ernakulam district continues to have highest income at Rs. 17646.7 crores (12.19% of total NSDP of State) in 2008-09 while lowest net domestic product was recorded in Wayanad district.

d) Per Capita Income (PCI):

The per capita income of Ernakulam has increased from Rs. 28090 in 2002-2003 to Rs. 79553 in 2009-10 (Quick Estimate) (Source: Dept. of Economics and Statistics). Compared to state average the PCI is

Table 1.3 Land Utilisation Pattern by Category 2000-2005 (Area in Ha)

Land Utilization	2000-2001		2004-2005	
	Area	%	Area	%
Geographical area (in ha)	235319	100	235319	100
Net sown area (in ha)	169661	72.1	158203	67.2
Fallow land (in ha)	2244	0.95	2984	1.27
Current fallow (in ha)	5987	2.54	6279	2.67
Cultivable waste (in ha)	6646	2.82	7142	3.04
Forest (in ha)	8123	3.45	8123	3.45
Land not available for cultivation	41100	17.5	51133	21.7

Source: Panchayat Level Statistics – 2006,
Dept.of Economics & Statistics

above the state average (i.e., Rs. 52984). With respect to PCI, Ernakulam ranks first in the state.

1.6 INFERENCE

The physiography of the district deserve special mention as it have all the three divisions, namely high land in the eastern part, mid land in the central area and low land on the western side adjacent to the Lakshadweep sea. Kochi U A, the western Ernakulam, the largest agglomeration in the state of Kerala is the nerve centre of all commercial activities in Kerala. Ernakulam is the second largest urbanized District in the state. One of the major ports in Kochi is blessed with connection with other parts of the country through all modes of transport like road, rail, air and water. NH 17, NH 47, and NH 49 pass through Kochi. Kochi port is located on strategic International route. The district has about 3.5% of its geographical area as forest mainly seen in the eastern part of the district.

Chapter-2

HISTORY AND REGIONAL LINKAGES

2.1 HISTORICAL BACKGROUND

In 1102 CE, Kochi became the seat of the Kingdom of Cochin, a princely state which traces its linkage to the Kulasekhara Empire. Heralded as the Queen of Arabian Sea, Kochi was an important spice trading centre on the Arabian Sea coast since the 14th century. Ancient travelers and tradesmen referred to Kochi in their writings, variously alluding to it as Cocym, Cochym, Cochin, and Cochi.

Occupied by the Portuguese in 1503, Kochi was the site of the first European colonial settlement in India. It remained the capital of Portuguese India until 1530, when they opted for Goa as their capital. The city was later occupied by the Dutch, the Mysore and the British. Kochi was the first princely state to willingly join the Indian Union, when India gained independence in 1947.

Kochi entered a period of economic growth after 2000, leading to a spurt in the city's development. A growing centre of information technology, tourism and international trade, Kochi is the commercial hub of Kerala, and one of the fastest growing second-tier metros in India. Like other large cities in the developing world, Kochi continues to struggle with urbanisation problems such as traffic congestion and environmental degradation. Successive waves of migration over the course of several millennia have made Kochi a cultural melting pot. Despite the risk of overdevelopment, the city retains its distinct colonial heritage and a blend of tradition and modernity.

2.2 REGIONAL LINKAGES

Geographically the district is situated between Northern Latitude 9° 47' and 10° 17' and eastern longitude 76° 9' and 76° 47'. It is bounded by Thrissur

district on the north and Alappuzha and Kottayam on the south, Idukki on the east and Lakshadweep Sea on the west.

The capital city Thiruvananthapuram is at the south by a distance of 220 km by road and rail. The Kozhikode city is situated about 200 km north of the district. The district headquarters is at the present Thrikkakara Municipality at a distance of 10 km from Kochi city. The International Airport at Nedumbassery is nearly 25 km away from the city centre of Kochi. The important urban centres in the vicinity of the district are Chalakkudy town on the north, Cherthala and Vaikom towns in the south and Thodupuzha town in the east.

2.3 CONNECTIVITY

The State has total road length of 123889 km including National and State highways. Out of the total road length, Ernakulam district ranks top with a total road length of 2172km. Kochi is one of the few cities of India blessed with connection to other parts by all major modes of transport like road, rail, air and water. Thiruvananthapuram Shoranur railway line and national highways NH-47, NH-49 and NH-17 are the major linkages of the district to connect it to other towns of the state. Also Kochi is well connected to other cities in India via the three national highways pass through or near the city. This allows commercial traffic from both the airport and seaport to connect easily to the national grid. Cochin International Airport (CIAL) is the largest and busiest airport in Kerala, located at Nedumbassery in Ernakulam District. This airport caters to the needs of domestic and international passengers of Kochi and surrounding regions. Another airport located at Wellington Island is under the control of Defense Department.

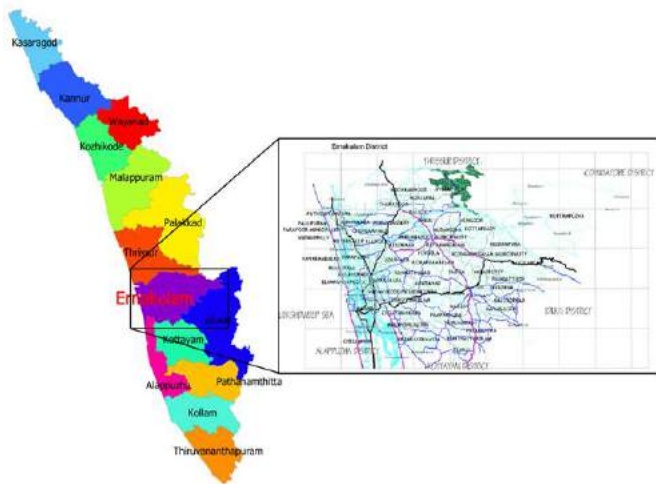


Fig 2.1 Regional setting of Ernakulam District

The District has a good network of inland waterway system consisting of backwaters, canals, lagoons and estuaries. There are about 1100 km of waterways or canals in Kochi city alone. Out of this, about 40km of rivers and canals are navigable by motorized crafts. National waterway No.3 connecting Kollam and Kottapuram pass through this region.

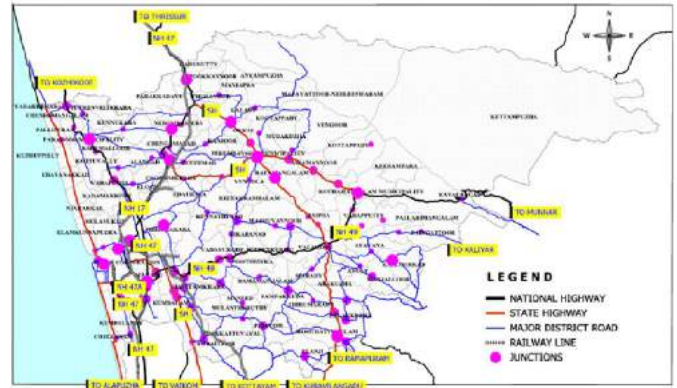


Fig 2.2 District map showing the road and rail network, important junctions etc.

2.4 INFERENCE

Kochi is well connected to other cities of India by all modes of transport namely road, rail, air and waterways. Thiruvananthapuram - Shornur railway line and National Highways NH-47, NH-49 and NH-17 are the major linkages of the District to connect with other towns in the state and major cities in India. The district is well connected to the rest of the country and other parts of the world by air transport through Cochin International Airport located at Nedumbassery.

Chapter-3 POPULATION

The Population parameter serves as the base in all the development endeavors. One of the objectives of all sorts of planning is providing maximum good for the maximum number of people. Hence it is imperative to analyze the population by studying the following parameters - size of population, its growth rate, population density, population concentration pattern migration details and population projection – which is described in this chapter.

3.1 POPULATION SIZE

Total population of Ernakulam District as per 2001 census is 3105798, which is 9.75% of the total population of the State and the District is placed in the 4th position as far as population size is considered. A comparison of total population of the districts surrounding the Ernakulam district is shown in Figure 3.1. The figure shows that when compared to the

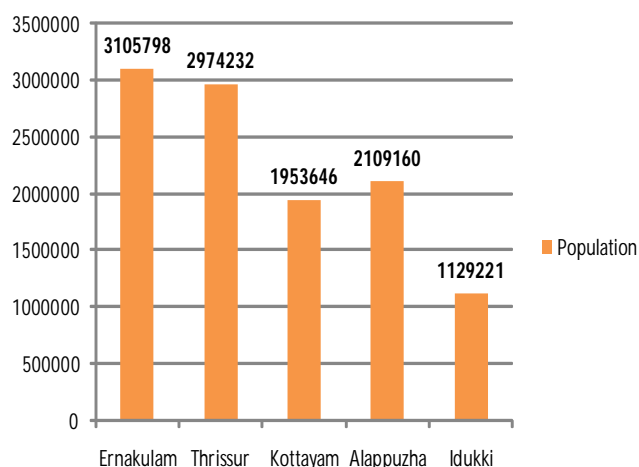


Fig 3.1 Population size – Comparison with surrounding districts

surrounding Districts, Ernakulam is placed in the first position in population.

The decadal variation in the size of population of the District over the last three decades is shown in Figure 3.2. From the figure, it is clear that though there

is an increase of about 1.5 lakhs population from 1971 to 1981, the increase of population over the last two decades is 2.8 lakhs indicating an increase in the population growth of the district.

3.2 GROWTH RATE OF POPULATION

The distribution of the growth rate of population among the districts of Kerala in 1991 and 2001 is shown in Table 3.1. It can be seen that there is decline in the population growth rate of all the districts when compared to the previous decade (1991). The northern districts (Kasargod, Kannur, Wayanad, Kozhikkode, Malappuram and Palakkad) show higher population growth rate in 1991 and 2001. Decadal growth rate of population of Ernakulam District is 10.24% as per 2001 census which is greater than the average growth rate of 9.42% of the State. When compared with the surrounding Districts, Ernakulam shows a higher growth rate (Figure 3.3). The temporal variation of the population growth rate of the district and its

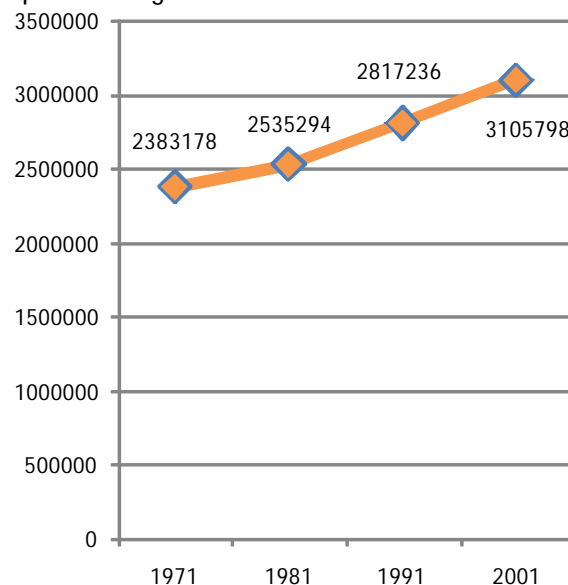


Fig 3.2 Population size – temporal variation

comparison with the State over the last three decades is shown in Figure 3.4. The figure shows that, the population growth rate of the district as well as that of state is declining.

The trend of population growth in the District is visible when we flash through the decadal growth rates from 1901 to the present census. The District had a growth rate of 13.78% during 1901-11, which had declined to 7.35% in the subsequent decade of 1911-21. In the next decade of 1921-31, the growth rate had

witnessed more than threefold increase (24.5%) in relation to the previous decade of 1911-21. In 1931-41 and 1941-51 the growth had again decreased. There was increase in the growth rate during 1951-61 and 1961-71. The growth rate of District shows a steady decline since 1981. The present growth rate of District is 9.35%

Table 3.1 Growth rate of Districts of Kerala

Sl. No.	District	Population		Growth Rate (G.R)	
		1991	2001	1981-91	1991-2001
1	Malappuram	3096330	3625471	28.87	17.22
2	Wayanad	672128	780619	21.32	17.04
3	Kasargod	1071508	1204078	22.78	12.3
4	Kozhikode	2619941	2879131	16.69	9.87
5	Palakkad	2382235	2617482	16.52	9.86
6	Thiruvananthapuram	2946650	3234356	13.5	9.78
7	Ernakulam	2817236	3105798	11.42	9.09
8	Thrissur	2737311	2974232	12.2	8.66
9	Kollam	2407566	2585208	10.68	7.33
10	Kannur	2251727	2408956	16.63	7.13
11	Idukki	1078066	1129221	10.45	6.96
12	Kottayam	1828271	1953646	7.71	6.76
13	Alappuzha	2001217	2109160	7.28	5.21
14	Pathanamthitta	1188332	1234016	5.6	3.72
	Kerala	29098518	31841374	14.32	9.42

Source: Census of India

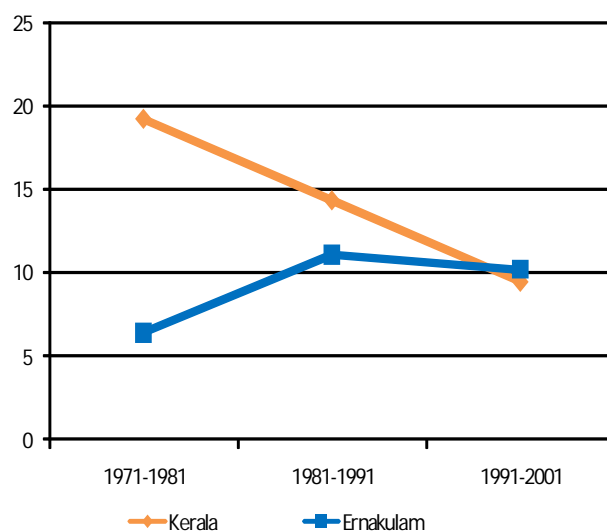


Fig 3.4 Population growth rate of State and Ernakulam District - Temporal variation

which is second lowest growth rate during 1901-2001. The District had witnessed a lowest growth rate of 7.35% during 1911-1921.

In the rural areas of the District the trend of growth rate of population is similar to the general trend. The urban areas of the District are showing a different trend in respect of growth rate.

The spatial distribution of the growth rate of population during last three decades is shown in figure 3.5, figure 3.6 and figure 3.7. From the figures, it is clear that the growth rates of population of most of the local governments of the district are declining from 1981 to 2001 including Kochi Corporation and eight municipalities except Kothamangalam. But the population growth rate of Kothamangalam and the Grama Panchayats of Pothanikad, Chottanikkara and Maneed are showing increasing trend from 1981 to 2001. This may be due to large increase in the population during 1981 - 2001 in that area and also due to the spatial location of these LSGs. They are located

Growth Rate of Population - 2001 Census

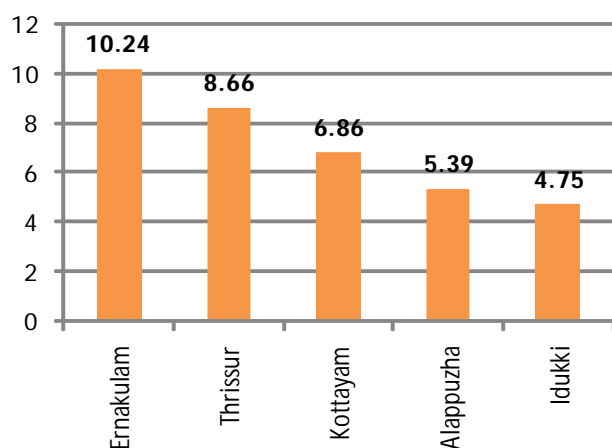


Fig 3.3 Population growth rate comparison with surrounding districts

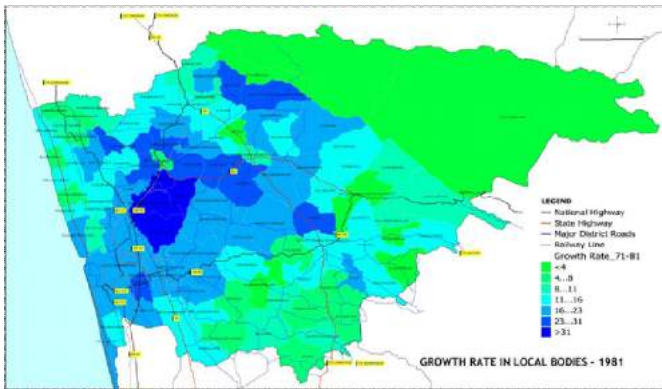


Fig 3.5 Population growth rate 1971-81 Local Govt. Wise

nearby the urban areas. Moreover most of these LSGs are well connected with higher order road network.

During 1971-81, the growth rates of population of most of the local governments of the district were in the range 15-30% (figure 3.5). Kalamassery (M), Thrikkakara and Edathala showed highest growth rate (above 40%) and Kalloorkad (1.8%) showed lowest growth rate.

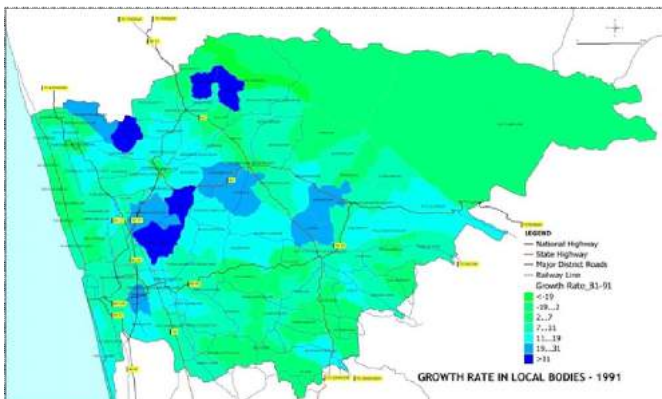


Fig 3.6 Population growth rate 1981-91 Local Govt. Wise

During 1981-91, the growth rate pattern has widely changed. From figure 3.6, we can see a sudden decrease in the pattern of growth rate. Growth rates of population of most of the local governments were in the range 10-15%. The spatial distribution of the growth rate of population during 1991 shows that the growth rate of population in the LSGs adjacent to the urban local governments (Paravur Municipality and Angamaly municipality) and adjacent to the District boundary shows higher growth rate (Figure 3.6). Thrikkakara and Edathala panchayats show increasing tendency of

growth rate at higher percentage. Kunnukara Grama Panchayat located in the northern boundary of the district shows highest growth rate (62.44%) and Kalloorkad Grama Panchayat (1.8%) shows lowest growth rate in 1991.

The spatial distribution of the growth rates of population during 1991-2001 shows a definite spatial pattern and it is shown in Figure 3.7. The coastal region

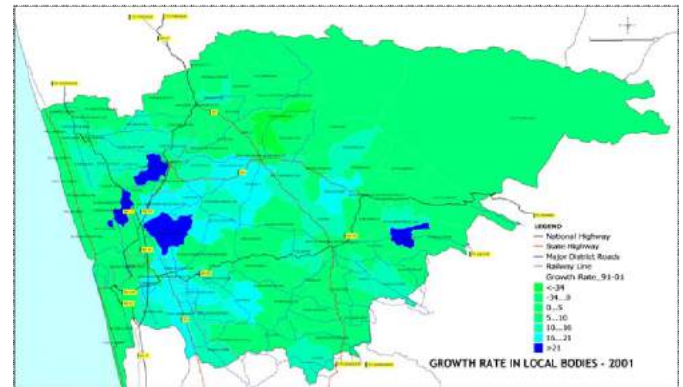


Fig 3.7 Population growth rate 1991-2001 Local Govt. Wise

shows a growth rate of 5-10%, whereas the central region shows a population growth rate of 10 to 15%. Thrikkakara panchayat (presently municipality) shows highest growth rate and Keerampara Panchayat shows lowest growth rate. The growth rate of population in the LSGs adjacent to the urban LSGs (especially Kochi Corporation), shows higher growth rate indicating possibility of out migration from the urban areas to the

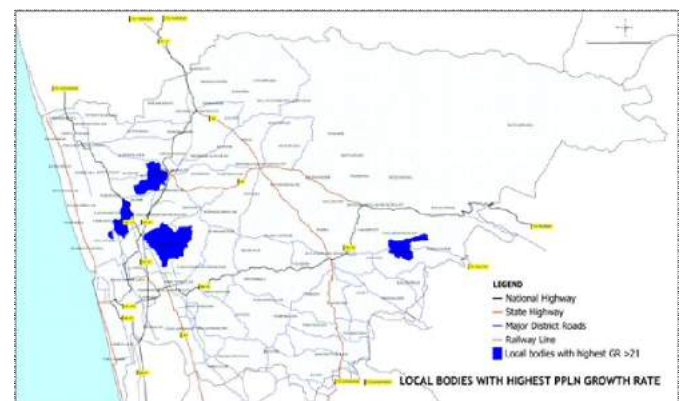


Fig 3.8 LSGs with highest population growth rate

immediate hinter land as well as the possibility of immigrants to the urban areas settle down in these nearby LSGs. Figure 3.8 shows distribution of LSGs with highest growth rate of population.

At the same time LSGs of Aluva, Ayyampuzha and Koovappady show negative population growth rate while comparing the population figures corresponding to 1991 census and 2001 census. But while comparing

Table 3.2 Area and population variation in LSGs showing negative growth

	Population		Difference in Population	Area		Difference in area
	1991	2001		1991	2001	
Aluva(M)	24774	24110	-664	7.18	7.18	0
Ayyampuzha	15620	14902	-718	43.88	43.88	0
Koovappady	50441	33102	-17339	43.98	31.18	-12.8

the area, it can be seen that of the three LSGs, Koovappady shows decrease in area. Hence the total population figure of Koovappady shows a decrease during the period 1991-2001. The area and population variation is given in table 3.2.

3.3 POPULATION DENSITY

Gross population density and net population density of the district are analyzed. Gross population density is calculated by dividing the total population with the geographical area, whereas the net population

density is calculated by taking net area which is calculated by subtracting the un-inhabitable areas like water body, forest, paddy and rubber plantation etc. from the geographical area.

3.3.1 GROSS POPULATION DENSITY

A comparison of the gross population density among the districts in the State in 1991 and 2001 is

Table 3.3 District wise population density 1991, 2001

Sl. No.	District	Density	
		1991	2001
1	Thiruvananthapuram	1344	1476
2	Kollam	967	1037
3	Pathanamthitta	450	467
4	Alappuzha	1415	1489
5	Kottayam	828	884
6	Idukki	236	252
7	Ernakulam	963	1050
8	Thrissur	903	981
9	Palakkad	532	584
10	Malappuram	872	1022
11	Kozhikode	1118	1228
12	Wayanad	315	369
13	Kannur	759	813
14	Kasargod	538	604

Source: Census of India

shown in Figure 3.9 and Table 3.3. It can be seen that, except in the Southern districts the gross population density increases during 1991-2001. The coastal districts

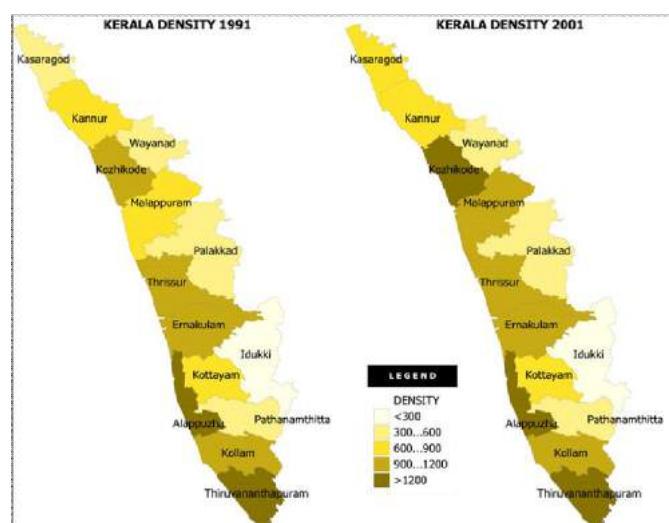


Fig 3.9 District wise distribution of population density 1991, 2001

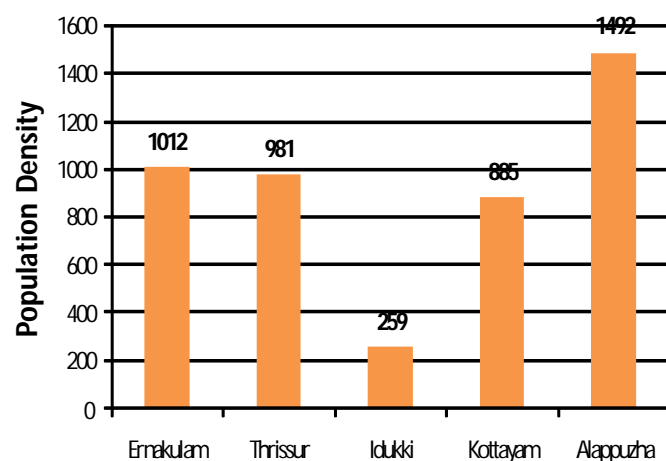
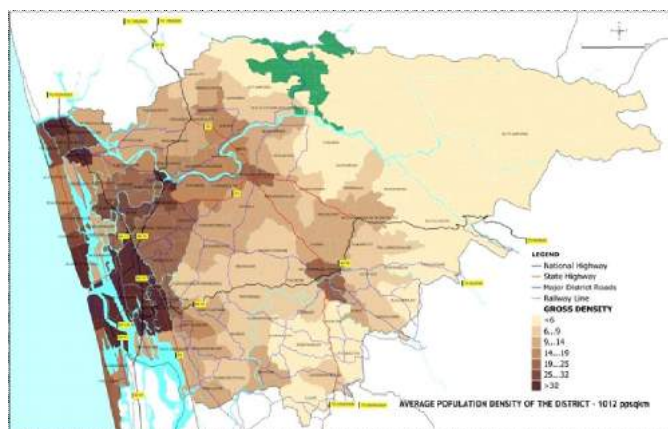


Fig 3.10 Gross population density - Comparison with surrounding districts

show higher gross population density in 1991 as well as in 2001. The gross population density in the three southern districts, Thiruvananthapuram, Kollam and Alappuzha are the maximum.

The average gross population density of Ernakulam is 1012 persons/sq. km which is higher than the state average of 819 persons/sq. km. The comparison of the population density with the surrounding districts is shown in Fig 3.10.

The gross population density of Ernakulam is less than that of Alappuzha and greater than that of other surrounding Districts such as Thrissur, Idukki and Kottayam. The LSG wise distribution of the gross



3.11 Distribution of Gross population density (2001 census) – Local Government wise

population density of Ernakulam District is shown in Figure 3.11.

It shows a clear distinction between the gross population density in the coastal region, central region and the North eastern high land regions of the district. The gross population density of the LSGs in the Coastal Panchayats and Kochi corporation and its contiguous towns are the highest (in the range of 3200-6270pp.sq.km.), whereas the gross population density of the central region and eastern mid land region is in the range of 1500- 3000 and that of the eastern hill region is less than 600 pp.sq.km. Based on the range of population density, LSGs of the district can be grouped into seven as shown in Table 3.4.

The fourteen LSGs in the eastern high land region fall within the lowest density range group with

minimum of 46 in Kuttampuzha Grama Panchayat whereas 44 LSGs including within the population density range of 600-1400 pp.sq.km. The remaining LSGs fall within the range of 1400-3200 pp.sq.km.

3.3.2 NET POPULATION DENSITY

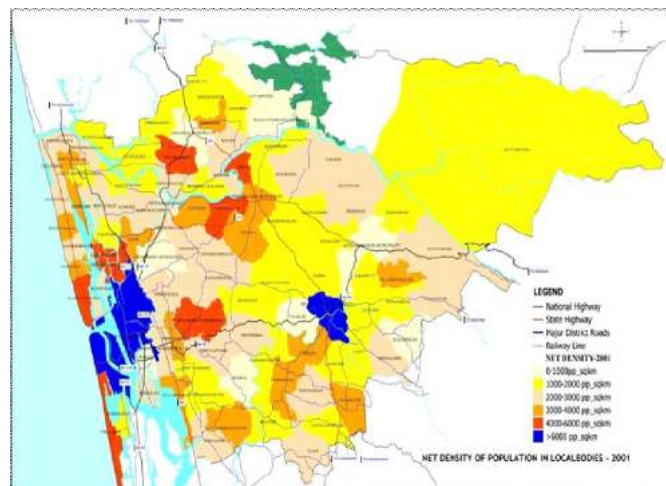


Fig 3.12 Spatial distribution of the net population density

The average net population density of the district is calculated as 2538pp.sq.km. The spatial distribution of the net population density is shown in Figure 3.12.

Highest net population density range is shown (8000-12000) in the coastal plains. Lowest net population density is seen in the north eastern high land region (less than 1000 pp.sq.km.). However the net population density is highest in Mulavukad(11435 persons/sqkm) and in Kochi corporation(8442 persons/sqkm). Net population density of coastal panchayats ranges from 4000-6000 pp.sq.km. Coastal LSGs show comparatively higher net density than other local governments including municipalities. This may due to the low availability of habitable area in some of the coastal LSGs of the district compared to the remaining parts of the district resulting in increased pressure on land at coastal areas of the district.

3.4 SEX RATIO

Kerala has a unique position with regard to sex ratio. In the entire Census, females outnumbered

Table 3.4 Density range of LSGs

Density Range (persons/sqkm)	LSG Name	Density Range (persons/sqkm)	LSG Name
< 600	Kuttampuzha	900 to 1400	Mulavukad
	Vengoor		Vengola
	Ayyampuzha		Parakkadavu
	Kalloorkad		Kadamakkudy
	Keerampara		Ezhikkara
	Kavalangad		Nedumbassery
	Arakuzha		Kumbalam
	Kottappady		Udayamperoor
	Pampakkuda		Puthenvelikkara
	Elanji		Nellikuzhy
	Pothanikkad	1400 to 1900	Kanjoor
	Paingattoor		Chottanikkara
	Palakkuzha		Kuzhuppilly
	Thirumarady		Thuravoor
600 to 900	Pindimana		Karumalloor
	Maneed		Kalady
	Ramamangalam		Sreemoolanagaram
	Mazhuvannoor		Vazhakkulam
	Ayavana		Kumbalangy
	Edakkattuvayal		Okkal
	Manjalloor		Keezhmad
	Marady		Chengamanad
	Vadavukode-puthenkurisu		Kottuvally
	Malayattoor-neeleswaram		Edavanakkad
	Manjapra	1900 to 2500	Alangad
	Valakom		Nayarambalam
	Koothattukulam		Perumbavoor municipality
	Mudakuzha		Kadungalloor
	Aikaranad		Chellanam
	Varappetty		Thiruvankulam
	Poothrikka		Muvattupuzha municipality
	Karukutty		Edathala
	Pallarimangalam		Kalamassery municipality
	Assamannoor		Thrikkakara
900 to 1400	Rayamangalam		Cheranellloor
	Kothamangalam municipality	2500 to 3200	Chendamangalam
	Piravom		Pallipuram
	Avoly		Choornikkara
	Kizhakkambalam		Njarakkal
	Amballoor		Chittattukara
	Kunnukara		Varapuzha
	Koovappady		Eloor
	Mookkannoor	> 3200	Thripoonithura municipality
	Thiruvaniyoor		Maradu
	Mulanthuruthy		Paravoor municipality
	Kunnathunad		Vadakkekara
	Paipra		Aluva Municipality
	Angamaly Municipality		Elamkunnappuzha
			Kochi Corporation

males in Kerala, which is contrary to all India pattern. The sex ratio of Kerala has gradually increased from 1004 in 1901 to 1028 in 1951 and then to 1058 in 2001. The 2001 Census shows that Kerala is the only state in India where sex ratio is above the equality ratio and is a 100-year high with 1058 females per 1000 males. Sex ratio of Ernakulam District is 1019, which is lower than the State value of 1058 and less than that of Thrissur and Alappuzha. In 1991 census, Ernakulam district had a sex ratio of 1000 as against 1036 for the state during the corresponding period. The comparison of sex ratio of Ernakulam district with that of the state in 1991 and 2001 is shown in Fig. 3.13.

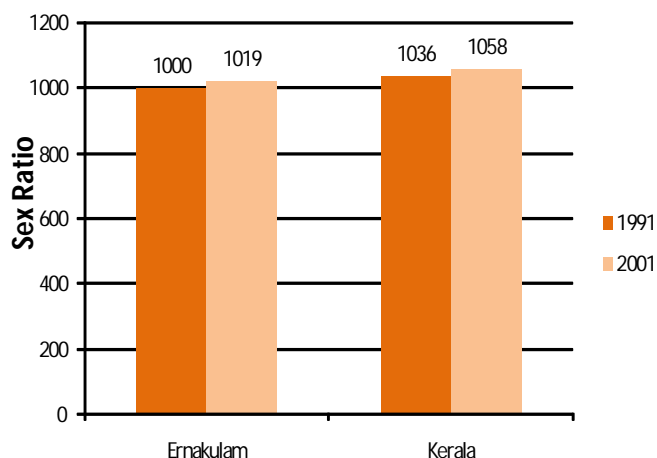


Fig 3.13 Sex Ratio-Comparison with State

The sex ratio in the age group of 0-6 of the district is 954 which is less than that of the average value of the sex ratio of the State (960) in this age group. The change in the sex ratio (0-6 age group) between the maximum and minimum value of the surrounding districts (Fig 3.14) is less (969-954) than the general value of sex ratio (1094-1019), indicating that at birth, the sex ratio is more or less uniform irrespective of the districts, but it changes later due to the migration pattern.

3.5 POPULATION CONCENTRATION PATTERN

The following procedure is adopted to find out the population concentration pattern.

1. Find the population density of each LSG.

2. Arrange the LSGs in the descending order of density.
3. Find the cumulative of the population.
4. Identify the LSG where 1/3rd of the cumulative total population meets.
5. LSGs from top to the LSG identified in step 4 are the LSGs where 1/3rd population is concentrated.

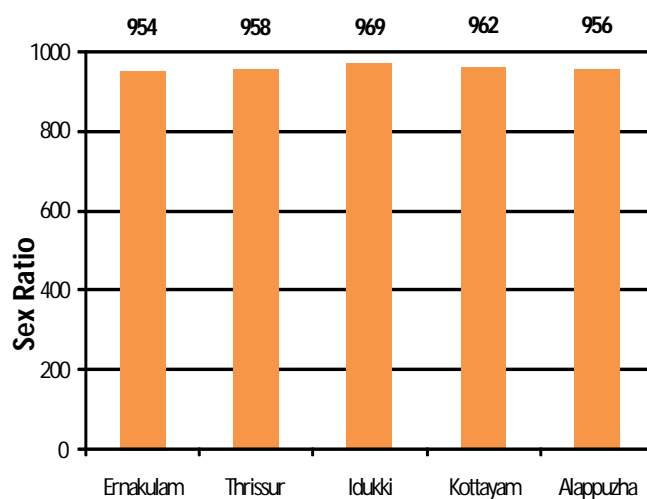


Fig 3.14 Sex Ratio (0-6 Age group) - Comparison with surrounding Districts - 2001 Census

6. Similarly identify the LSGs where 1/2 and 2/3rd population is concentrated.

Considering the population concentration pattern of Ernakulam District in 2001, it is clear that 1/3rd of the cumulative population is distributed in 14 LSGs which include three Municipalities and Kochi

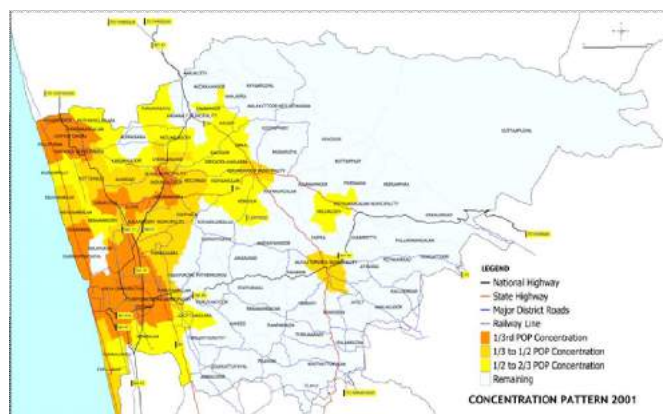


Fig 3.15 Population concentration pattern of Ernakulam District in 2001

Corporation, half of the cumulative population is distributed in 29 LSGs which include Municipalities except Angamaly and Kothamangalam. It shows 2/3rd of the total population of the district is concentrated in 50 % of the area of the district. These LSGs (out of 97 LSGs) are located along coastal areas and the existing

Table 3.5 Statistics on Migrants (by place of birth) from other states/UTs in Kerala

State/Union Territory	Number of Migrants			Share of state/UT in migration to Kerala	Share of Female migrants
	Male	Female	Persons		
Tamil Nadu	148021	131681	279702	67.75	47.08
Karnataka	22037	33648	55685	13.49	60.43
Maharashtra	8820	9648	18468	4.47	52.24
Andhra Pradesh	4970	4472	9442	2.29	47.36
Pondicherry	3612	5157	8769	2.12	58.81
Uttar Pradesh	3331	2556	5887	1.43	43.42
West Bengal	2666	1566	4232	1.03	37
Rajasthan	2150	1526	3676	0.89	41.51
Gujarat	1597	1797	3394	0.82	52.95
Bihar	2045	1292	3337	0.81	38.72
Orissa	2328	999	3327	0.81	30.03
Delhi	1458	1555	3013	0.73	51.61
Madhya Pradesh	1203	1277	2480	0.6	51.49
Punjab	780	789	1569	0.38	50.29
Haryana	667	750	1417	0.34	52.93
Assam	671	508	1179	0.29	43.09
Jharkhand	634	492	1126	0.27	43.69
Chhattisgarh	493	561	1054	0.26	53.23
Lakshadweep	606	262	868	0.21	30.18
Jammu &	375	301	676	0.16	44.53
Goa	291	363	654	0.16	55.5
Uttaranchal	244	276	520	0.13	53.08
A & N Island	261	276	537	0.13	51.4
Himachal	219	249	468	0.11	53.21
Nagaland	162	131	293	0.07	44.71
Manipur	130	101	231	0.06	43.72
Chandigarh	115	101	216	0.05	46.76
Arunachal	115	92	207	0.05	44.44
Meghalaya	72	85	157	0.04	54.14
Sikkim	40	34	74	0.02	45.95
Mizoram	50	40	90	0.02	44.44
Tripura	47	38	85	0.02	44.71
Daman & Diu	5	7	12	0	58.33
Dadra & Nagar	4	0	4	0	0
Total	210219	202630	412849	100	49.08

Source: compiled from Census of India 2001- D Series

statutory urban areas. The population concentration pattern in 2001 of the District is shown in Figure 3.15.

3.6 MIGRATION DETAILS

Kerala is witnessing large inflow of migrant labour from different parts of the country in the recent years. Though labourers from states as far as West Bengal, Bihar, Uttar Pradesh and Orissa now flock to Kerala, those from Tamil Nadu outnumber others by a big margin. Within the state, Ernakulam accounts for the largest number of migrants. While a relatively small section of the migrants from other states are professionals and skilled workers, large majority of them are unskilled or semi skilled workers engaged in construction, road works, pipe laying etc.

According to the Census 2001, 1.3 per cent of the populations of Kerala are migrants (by place of birth) from other states. The largest number of in-migrants in the state is from the neighbouring state of Tamil Nadu. Significant number of migrants also came from Karnataka. While 67.8 per cent of those who have migrated to Kerala from other states had their place of birth in Tamil Nadu, 13.5 per cent had their place of birth in Karnataka. Other regions from where people have migrated to Kerala include Maharashtra (4.5 %), Andhra Pradesh (2.3 %), Pondicherry (2.1%), Uttar Pradesh (1.4 %) and West Bengal (1.0%) (Table 3.5). The Table also indicates that 49.1 per cent of the migrants from other states are female migrants.

According to Census 2001, among the districts, Ernakulam district, where Kochi is located, recorded the highest inflow of migrants from other states (See Table 3.6).

3.7 POPULATION PROJECTION (TREND BASED)

The population projection for 2011 and 2021 of the District and all the local LSGs are made assuming that same trend in the population growth continues. The population is projected by two methods – Decreasing rate method and Apportionment method and average of the two is taken to arrive at the population figures in 2011 and 2021.

Table 3.6 Distribution of Migrants from Other States/UTs in the Districts of Kerala

District	No. of in-migrants	Share of in-migrants
Ernakulam	55977.00	13.56
Idukki	53056.00	12.85
Thiruvananthapuram	48575.00	11.77
Palakkad	47955.00	11.62
Kasargod	31884.00	7.72
Kannur	28115.00	6.81
Thrissur	25358.00	6.14
Kozhikkode	23118.00	5.60
Malappuram	22092.00	5.35
Wayanad	18710.00	4.53
Kollam	16797.00	4.07
Kottayam	16349.00	3.96
Pathanamthitta	13683.00	3.31
Aleppey	11180.00	2.71
Total	412849.00	100.00

Source: compiled from Census of India 2001- D Series

A. DECREASING RATE METHOD:

The population growth rate of 2011 and 2021 are calculated assuming that the same percentage of decrease in population growth prevails as that of 2001 for the succeeding two decades. Based on the population growth rate calculated, the population of the District is projected for 2011 and 2021 and the same is shown in Table 3.7.

B. APPORTIONMENT METHOD:

In the apportionment method the ratio of the District population to the State population is found out and the same is projected to the next two decades assuming the change in the ratio during 2001 -2011 and 2011-2021 is same the value as that during 2001-2011. In order to find out the projected population in 2011 and 2021, the projected population of the State during the same years is needed.

The detail of the population projection of Kerala is elaborated in the *Annexe 3*. The projected population of the District based on the apportionment method is shown in Table 3.8.

Table 3.7 Projected District Population – Decreasing rate method

Year	Population	Growth rate	% Decrease in Population Growth rate
1971	2383178		
1981	2535294	6.38	
1991	2817236	11.12	74.23
2001	3105798	10.24	-7.89
2011	3398802	9.43	-7.89
2021	3694134	8.69	-7.89

The projected total population by the two methods differs slightly. The average of these two is taken as the population figures of Ernakulam District. This is shown in Table 3.9.

So it can be concluded that the total population of Ernakulam District will be 3369163 and 3609670 on 2011 and 2021 respectively based on trend based projection.

Table 3.8 Projected District Population – Apportionment method

Year	Kerala x	Ernakulam y	Ratio y/x	Change in ratio
1971	2198606	2383178	1.084	
1981	2596112	2535294	0.977	-0.107376
1991	2946650	2817236	0.956	-0.020492
2001	3234356	3105798	0.96	0.004171
2011	3462714	3339524	0.964	0.004171
2021	3639503	3525205	0.969	0.004171

Table 3.9 Average population figures

Year	Total population as per decrease rate method	Total population as per apportionment method	Average population figures
2011	3398802	3339524	3369163
2021	3694134	3525205	3609670

3.8 INFERENCE

The population density of Ernakulam District (1012 persons/sqkm) is higher than the state average value of 819 persons/sqkm. But when compared to the surrounding three districts, population density of Ernakulam is less than that of Alappuzha and greater than that of Thrissur, Kottayam and Idukki.

The growth rate of population in the district is not a steady variation. Population growth rate is increasing during 1971-81 and 1981-91 from 6.38% to 11.12% and then declining for the last decade to 9.43% and hence it can be presumed that there won't be much increase in the gross population density of the district in future if the present trend continues.

It can be stated that the population density of Ernakulam is not a high one but one that is placed in the medium level. The population concentration pattern and LSG wise distribution of the gross population density shows that there are concentration of population in some parts of the District. The coastal LSGs show maximum population density and majority of the total population of the district is concentrated in the coastal belt and midland regions adjacent to coastal belt. Three distinct zones can be earmarked based on the distribution of the gross population density. The eastern high land region of the district shows the least gross population density value of less than 450 persons/sqkm. The LSGs in the mid land region is having a gross population density range of 1500-3000 persons/sqkm. The highest population density is seen in the coastal belt of the district which falls in the range of 3000-6000 persons/sqkm. It is projected based on trend that the population of the District will be increased by 1.21 lakhs and 0.78 lakhs in the succeeding decades, 2001-11 and 2011-2021 respectively.

Chapter-4

OCCUPATIONAL STRUCTURE

In this chapter the existing economic base of the District based on the occupational structure of the District as per census 2001 is studied. The change that has happened in the economic base of the district over a period of time is also probed into.

4.1 WORK FORCE OF THE DISTRICT

As per census 2001, the work participation rate of Ernakulam District is 36%. Out of the total population of 31.06 lakhs, 11.17 lakhs populations are workers. The total workers are further divided into the main and marginal workers. Main workers constitute 29.52 % of the total population and marginal workers constitute 6.48 % of the total population. This is shown in fig 4.1 and 4.2.

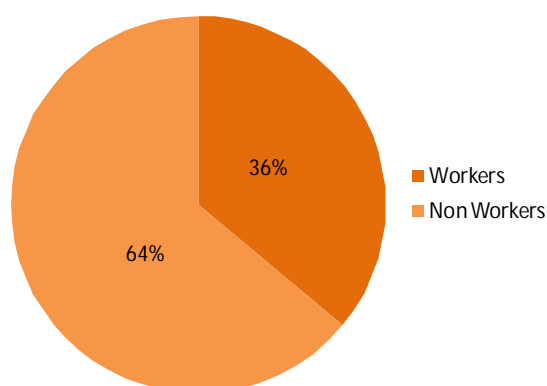


Fig 4.1 Work participation rate of Ernakulam District

The change in the number of total workers and the main workers over a period of time are shown in the fig 4.3. The graph shows that, though the total workers are gradually increasing over last three decades

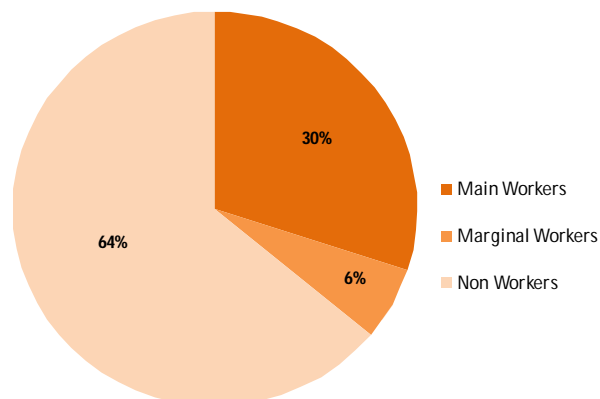


Fig 4.2 Main workers, Marginal workers and Non workers

(from 1981 to 2001), the number of main workers shows increasing trend in between 1981 to 2001, indicating a clear picture about the current economic base of the District. The growth rate of the total workers during this period 1991-2001 (growth rate is 18.57 %) is higher than the growth rate of the total population (Growth rate of total population is 10.24%) of the same period. This indicates that total workers in the district will be far above the projected number. The category of workforce shows that the highest percentage of main workers is other workers category. The employment in the services sector is comparatively more than the other sectors. As this is a Port based city the trade and commerce sector gained predominance. The major Port based developments proposed – The International Transshipment Terminal, Single Buoy Mooring, LNG Project, Special Economic Zone – are sure to boost up the economic base of the District.

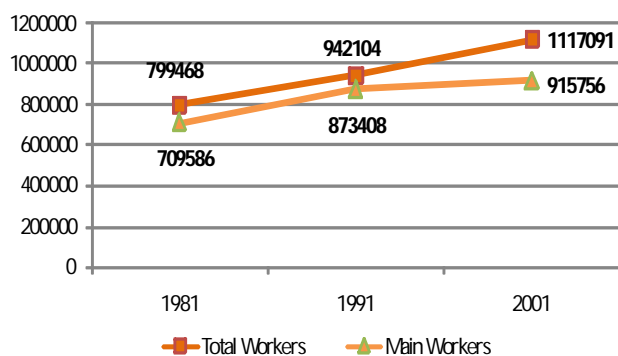


Fig 4.3 Variation of Total workers and Total main workers

4.2 OCCUPATIONAL STRUCTURE

The nine fold classification of workers of Ernakulam district in 1991 is shown in figure 4.4. From the figure it is clear that 25% of workers were engaged in other services. For the purpose of analysis the classification into primary, secondary and tertiary sector is shown in figure 4.5. Primary sector includes agriculture labourers, Cultivators and Livestock, Forestry, Fishing, Hunting, Plantation, Orchards and Allied activities & mining and quarrying. Secondary sector includes Manufacturing, Processing, Servicing and repairs in Household industries and other than household industries. And finally tertiary sector includes Trade and commerce, Transport, storage and Communications & other services. As per the above

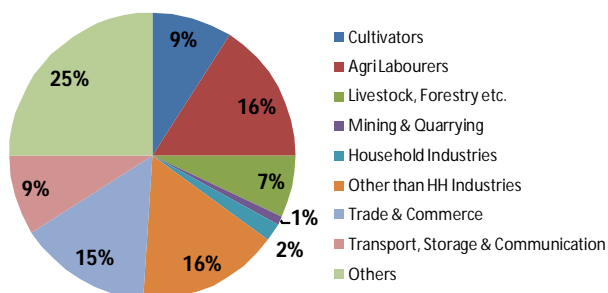


Fig 4.4 Nine Fold Classification of workers – 1991 census

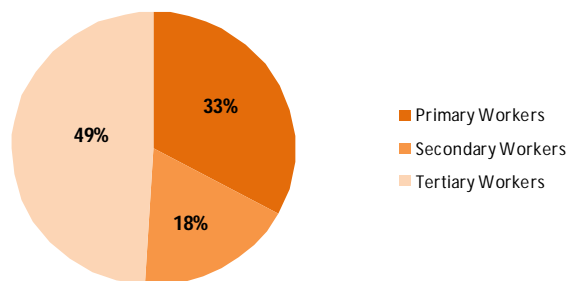


Fig 4.5 Workers Classification – 1991 census

grouping 33% workers were engaged in primary sector, 18% of workers were engaged in secondary sector and 49% of workers were engaged in tertiary sector.

As per the census 2001, the workers are classified in to four categories viz. cultivators, agricultural labourers, household industrial workers and other workers. All the workers other than cultivators, agricultural labourers and house hold industrial workers are treated as 'other workers' in 2001 census. The primary sector includes agriculture labourers and Cultivators. Secondary sector includes only Household industrial workers and tertiary sector

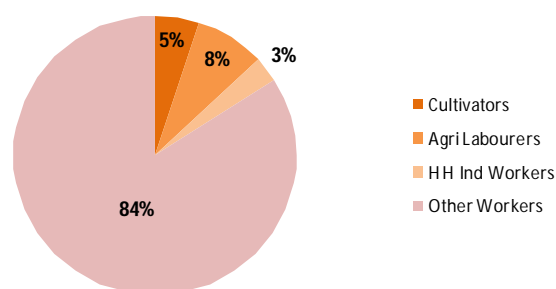


Fig 4.6 Classification of workers – 2001 census

includes other services. As per the above grouping, the primary sector and secondary sector (cultivators, agricultural labourers and household industry workers) constitute only 16 % of the total workers whereas lion

Table 4.1 Fourfold classification of workers – 2001

	Cultivators	Agri laborers	HH industrial workers	Other workers	Total
No.	58700	89056	32219	937146	1117091
Percentage	5	8	3	84	100

share of the workers (84%) belongs to the other workers category (See fig 4.6).

From the table 4.1 it is clear that Cultivators, Agricultural labourers and Household industry workers are comparatively very low in the District. Higher percentage of workers both in urban and rural areas is engaged in other trade such as construction activities,

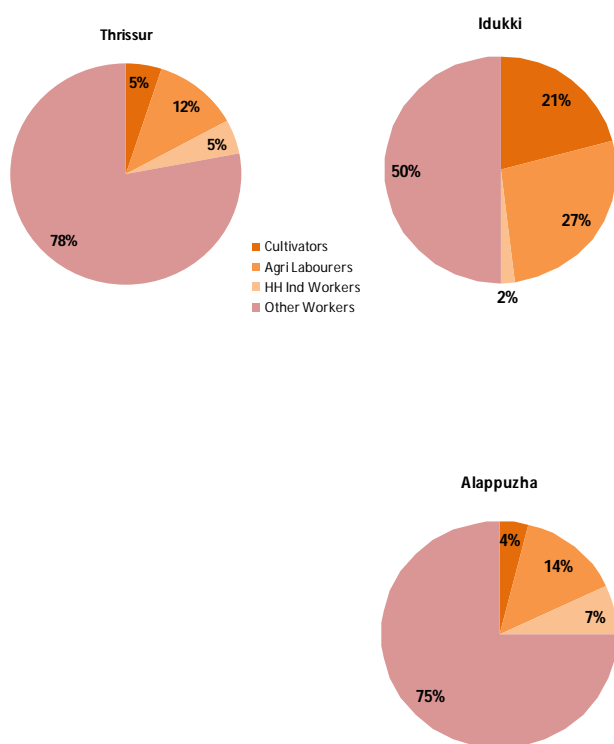


Fig 4.7 Occupational structure of the surrounding districts – 2001

mining and quarrying, trade and commerce, transport, storage and communication, service sector etc. This indicates that more workers are engaged tertiary sectors, which is still higher in urban area than in rural area. There is a decrease of workers in primary sector.

A comparison of the occupational structure of districts surrounding Ernakulam District is shown in Figure 4.7.

The percentage of the agriculture labourers and cultivators together (primary sector) constitute 17%,

Table 4.2 Workers Classification (2001) – Urban and Rural areas

Class of workers	Urban		Rural	
	No. of workers	% to total workers	No. of workers	% to total workers
Cultivators	4027	0.8	54673	8.94
Agricultural laborers	9395	1.85	79631	13.03
HH industrial workers	13431	2.66	187887	3.07
Other workers	478970	94.69	458176	74.96
Total	505823	100	611268	100

48%, 21%, 18% and 13% of the total workers in Thrissur, Idukki, Kottayam, Alappuzha and Ernakulam districts respectively (Fig 4.6 and 4.7). Nearly half of the total workers include in primary sector in the district of Idukki. Ernakulam District has the lowest Percentage of primary sector among the total workers. But among the neighbouring districts the proportion of other workers (Tertiary sector) varies from the highest (84%) in Ernakulam District and the lowest (50%) in Idukki district. In all other neighbouring districts more than 75% of the total workers are engaged in other workers, which are neither agriculture related nor household industry activities.

4.3 OCCUPATIONAL STRUCTURE – VARIATION IN URBAN AND RURAL AREAS

The table number 4.2 shows the four-fold category of workers in the urban and rural areas of the District. The same values are depicted in pie in figure 4.8.

Fig. No. 4.8 shows that the cultivators and agricultural labourers share are 3% and 22% in urban area and rural area respectively. The household industrial workers share is 2% in the urban area and 13% rural areas. This indicates that as far as the workers classification is considered, all most all the workers (95%) in urban area depends on the tertiary sector for

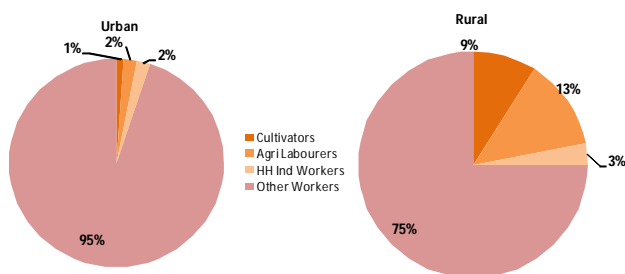


Fig 4.8 Classification of total workers in urban & rural areas of Ernakulam District – 2001

their lively hood. Household industrial sector share in urban compared to rural area is a very low of 2% of the total main workers.

4.4 OCCUPATIONAL STRUCTURE – ESTIMATION OF NINE FOLD CLASSIFICATION OF 2001

Due to the differences in classification of workers in 1991 and 2001, the four fold classification of 2001, is rearranged to nine categories of workers to facilitate comparison and analysis of shifts in sectoral composition of workers.

Based on the total number of workers and work participation rate, the nine fold classification in 2001 is estimated and it is shown in Fig. 4.9.

Through the comparison of 9 fold classification of 1991 and estimated 9 fold classification in 2001 it can be seen that work force in Livestock & Forestry etc, Trade and Commerce, Transport storage and communication, household Industries and other

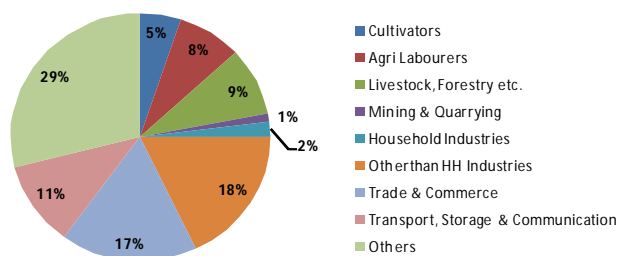


Fig 4.9 Nine fold classification of workers (Estimated) – 2001 census

workers show an increasing trend where as cultivators, agricultural labourers shows declining trend. When grouped into primary, secondary and tertiary sector (Fig

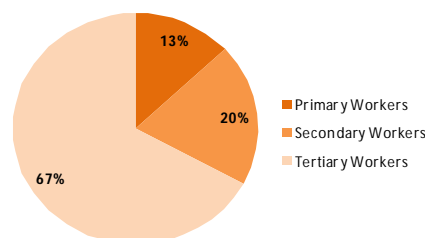


Fig 4.10 Workers Classification – 2001 census (Estimated)

4.10), 13% workers engaged in primary sector, 20% of workers engaged in secondary sector and 67% of workers engaged in tertiary sector.

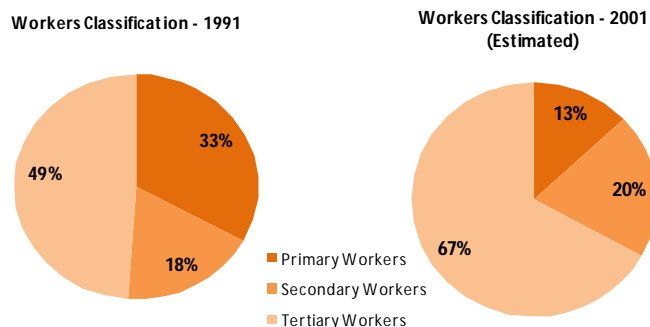


Fig 4.11 Workers Classification – 1991 & 2001 census

When compared with 1991 census, (Fig 4.11) a significant shift in the occupational structure of the District from Primary and Secondary Sector to Tertiary Sector can be observed.

4.5 SPATIAL DISTRIBUTION OF THE MAJOR CLASSES OF WORKERS

The concentration index $[(\text{number of workers of a particular class of workers in a local body} / \text{total number of workers in that local body}) / (\text{number of workers of the same class of workers in the district} / \text{total number of workers in the district})]$ of the four classes of workers viz. cultivators, agricultural

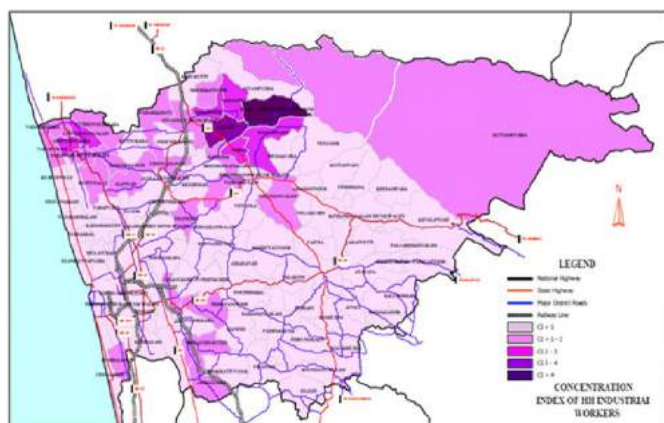


Fig 4.12 Concentration index of HH industrial workers in LSGs, Ernakulam District – 2001

labourers, house hold industrial workers and other workers are calculated for each LSG (See *Annexe 4*) and its spatial variation is analyzed. This gives an idea about where a particular class of workers is concentrated in the district. Figure 4.12 shows the variation of the

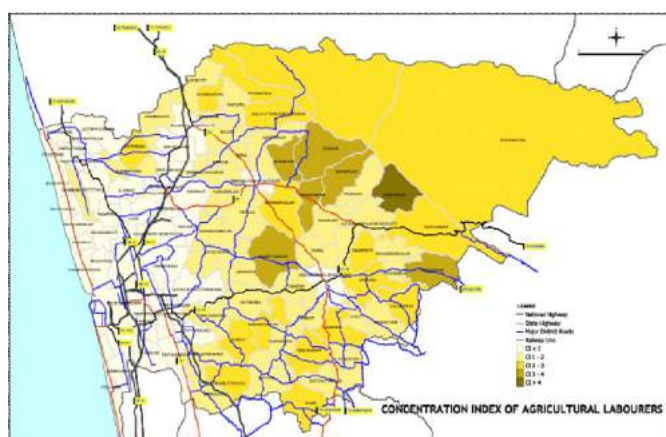


Fig 4.13 Concentration index of Agricultural labourers in LSGs – Ernakulam

concentration index of house hold industrial workers. From the figure it is clear that the house hold industrial workers are concentrated mainly near the forest area and in some coastal LSGs.

The concentration index of household industrial workers is maximum at Malayattoor Neeleswaram which is situated near to the forest area. Concentration index of household industrial workers is less in eastern region of the district. The concentration index of house hold industrial workers

at Kalady and Malayattoor Neeleswaram is more than 4. These LSGs are situated in the north highland region. Bamboo and wooden products, Food products, etc. are the main house hold industries in these regions.

Figure 4.13 shows the variation of the concentration index of agricultural labourers LSG wise. From the figure it is clear that agricultural labourers are concentrated in north eastern part of Ernakulam

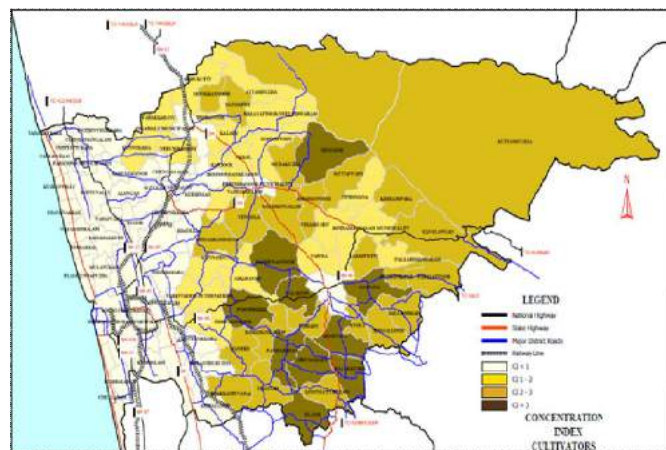


Fig 4.14 Spatial distribution of the concentration index of Cultivators

District. The concentration index of is maximum at Keerampara which is situated in the high land region. The concentration index is more than 3 at Asamannoor, Mudakkuzha, Mazhuvannoor, Paingottur, Vengoor, Kottappady and Keerampara gramapanchayats which are situated in the high land region. Concentration

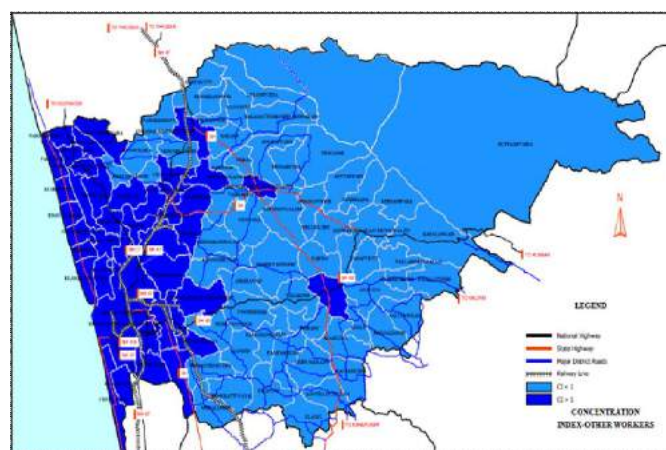


Fig 4.15 Spatial distribution of the concentration index of other workers

Table 4.3 Concentration Pattern of Workers

LSGs where cultivators are concentrated (Con Index > 2)	LSGs where Agri Labourers are concentrated (Con Index > 2)	LSGs where HH industrial workers are concentrated (Con Index > 2)	LSGs where other workers are concentrated (Con Index > 1.05)
Paipra	Keerampara	Malayattoor-Neeleswaram	Mulavukad
Thirumarady	Kottappadi	Kalady	Maradu
Mazhuvannoor	Vengoor	North Paravur (M)	Aluva
Vengoor	Ockal	Thuravoor	Eloor
Valakam	Mazhuvannoor	Chendamangalam	Kochi Corporation
Elanji	Mudakuzha	Chittattukara	Cheranallor
Arakuzha	Asamannoor	Koovappady	Thrippunithura
Pallippuram	Kavalangad		Elamkunnappuzha
Ayavana	Kunnukara		Thrikkakkara
Poothrikka	Thirumarady		Choomikkara
Mudakuzha	Kuttampuzha		Paravur
Ramamangalam	Edakkattuvayal		Muvattupuzha
Kavalangad	Ayyampuzha		Kalamassery
Marady	Malayattoor-Neeleswaram		Kumbalam
Kottappadi	Ayavana		Chellanam
Asamannoor	Mookkannur		Vadakkekkara
Koothattukulam	Elanji		Njarackal
Kuttampuzha	Rayamanglam		Keezhmadu
Kalloorkkade	Kalloorkkade		Pallippuram
Avoly	Varappetty		Edavanakkad
Maneed	Maneed		Varapuzha
Ockal	Arakuzha		Kumbalangi
Edakkattuvayal			Udayamperur
Vengola			Kadamakkudy
Mookkannur			Kuzhupilly
Rayamanglam			Nayarambalam
Manjapra			Kadungallur
Pothanikkade			Chendamangalam
Thiruvaniyoor			Chittattukara
Manjalloor			Chengamanad
Piravam			Edathala
			Perumbavoor (M)
			Alangad
			Kottuvally
			Puthenvelikara

index of agricultural labourers in the coastal LSG is generally less than one.

Figure 4.14 shows LSG wise variation of the concentration index of cultivators and the distribution pattern of it shows that cultivators are concentrated in the mid and high land regions of the district.

The concentration index of cultivators is maximum at Palakkuzha which is situated in the mid land region. The concentration index of cultivators is more than 3 in grama panchayats of Poothrikka, Ayavana, Pambakkuda, Arakkuzha, Elanji, Valakom, Vengoor, Mazhuvannoor, Thirumarady and Palakkuzha. All these LSGs are situated in the high and mid land regions. The concentration index of cultivators in the

coastal region is generally less than one. Most of the LSGs lie in the range of concentration index 1.0 - 3.0.

Figure 4.15 shows LSG wise variation of the concentration index of other workers and the distribution pattern shows concentration of other workers in the mid and coastal regions of the district. The concentration index of other workers is maximum at Aluva Municipality, Maradu and Mulavukad. The concentration index of other workers is more than 1, in the 40 LSGs which include Kochi Municipal Corporation and all other municipalities except Kothamangalam (M).

Other workers are more concentrated in and around urban areas of the District. The concentration index of other workers is less in the north eastern part of the district where cultivators and agricultural labourers are more concentrated.

The result of the analysis is shown in Table 4.3.

4.6 ACTIVITY PATTERN BASED ON OCCUPATIONAL STRUCTURE OF WORKERS

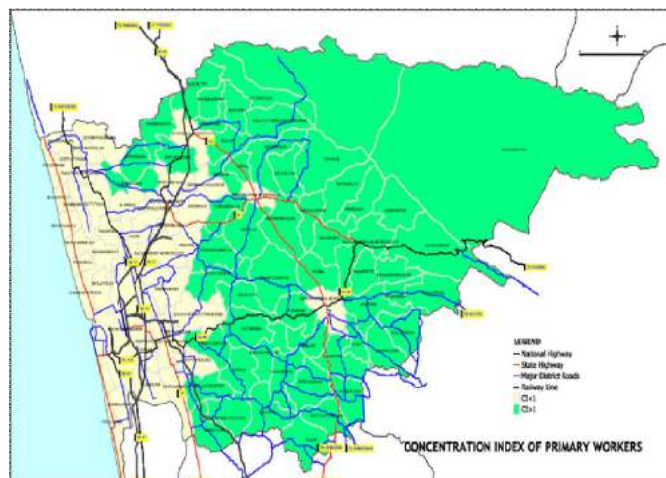


Fig. 4.16a Concentration of workers in Primary sector - LSG wise distribution

For analyzing the activity pattern of the district, the concentration index of Primary sector workers, Secondary sector workers, Tertiary sector workers are calculated for each LSG (see Annex 4A) and its spatial variation is analyzed (figures 4.16a, 4.16b, 4.16c).

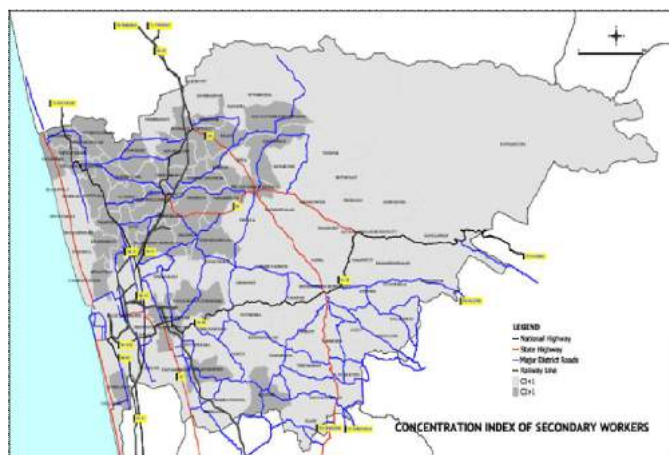


Fig. 4.16b Concentration of workers in Secondary sector - LSG wise distribution

It is clear that primary workers are more concentrated in high land region and some mid land LSGs. Secondary workers are concentrated in the mid land region and some coastal LSGs and the tertiary workers are more concentrated in and around the urban areas.

Overlaying the above concentration pattern of primary, secondary and tertiary workers an activity pattern based on work force can be evolved as below.

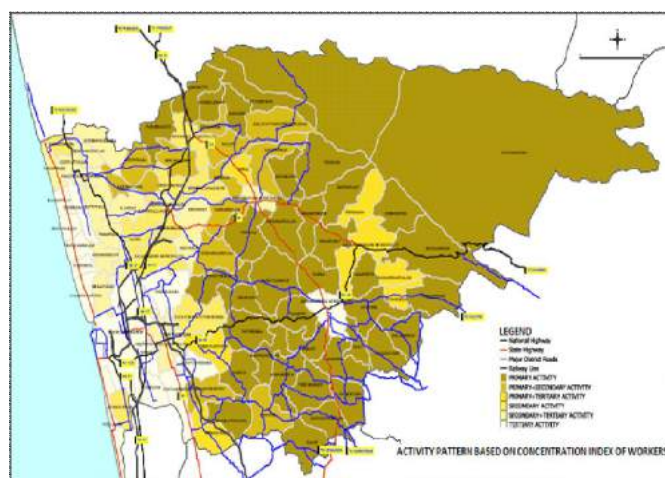
1. Primary Activity
2. Secondary Activity
3. Tertiary Activity
4. Combination of Primary Activity & Secondary Activity



Fig. 4.16c Concentration of workers in Tertiary sector - LSG wise distribution

5. Combination of Primary Activity & Tertiary Activity
6. Combination of Secondary Activity & Tertiary Activity

The activity pattern evolved in this manner is given in figure. 4.17



4.17 Activity Pattern of LSGs evolved based on concentration pattern of workers

From the above analysis, it is seen that activity pattern of 37 LSGs are primary, 10 are secondary, 14 are tertiary, 12 are a combination of primary and secondary activity, 7 a combination of primary and tertiary and 17 a combination of secondary and tertiary activity.

Table 4.4 Fourfold Classification of workers - 1981 to 2001

Sl. No.	Class of workers	1981		1991		2001	
		No. of workers	%	No of workers	%	No of workers	%
1	Cultivators	73915	10.4	81198	9.3	58700	5.25
2	Agricultural labourers	129848	18.3	137921	15.8	89026	7.97
3	Mfr. process of HH industry	23933	3.37	13733	1.57	32219	2.89
4	Others	481886	67.9	640556	73.3	937146	83.9
	Total	709582	100	873408	100	1117091	100

Source: Census of India

4.7 OCCUPATIONAL STRUCTURE – TEMPORAL VARIATION

The number of various categories of workers from 1981 to 2001 in the district is shown in the table 4.4. Cultivators and agricultural labourers show drastic decrease in total numbers (a decrease of approximately 50%) during the period from 1981 to 2001, whereas the other workers show an increase of 81%. This is a clear indication of the weakening of the primary, mainly the agricultural sector, in the district.

Fig 4.18 and table 4.5 show the variation of the number of different category of workers in the urban area from 1981 to 2001. There is significant increase in the category of other workers during this period, meanwhile the category of workers in cultivators and agricultural labourers are in the decline during the same period.

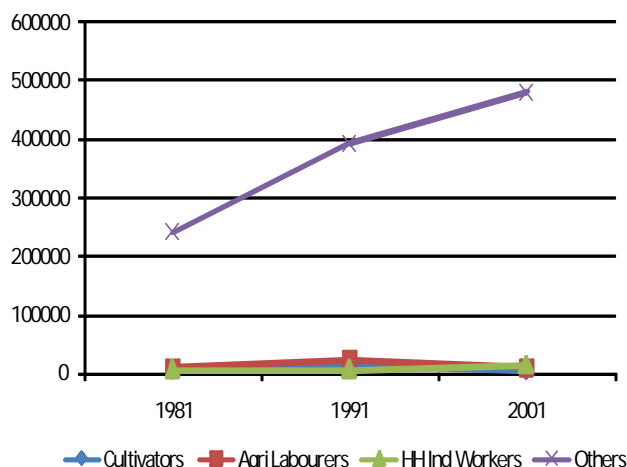


Fig 4.18 Variation in the number of different category of workers in urban areas

Table 4.5 Fourfold classification of urban workers - 1981-2001

Year	Cultivators		Agri Labourers		HH ind workers		Others	
	No.	%	No.	%	No.	%	No.	%
1981	5124	1.96	9946	3.81	5561	2.13	240442	92.1
1991	12291	2.83	23732	5.47	5455	1.26	392588	90.44
2001	4027	0.8	9395	1.86	13431	2.66	478970	94.69

Source: Census of India

Fig 4.19 and table 4.6 show the variation of different category of workers in the rural areas during the period from 1981-2001. The pattern of change in the number of workers in different category show that

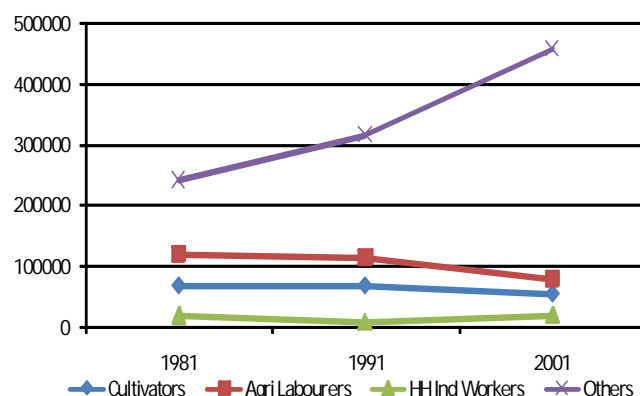


Fig 4.19 Variation in the number of different category of workers in rural area

Table 4.6 Fourfold classification of rural workers - 1981-2001

Year	Cultivators		Agri Labourers		HH ind workers		Others	
	No.	%	No.	%	No.	%	No.	%
1981	68791	15.34	119902	26.73	18372	4.1	241444	53.83
1991	68907	13.56	114189	22.48	8278	1.63	316665	62.33
2001	54673	8.94	79631	13.03	18788	3.07	458176	74.96

Source: Census of India

the rural areas also exhibit the same pattern as that of the urban area. This indicates that the primary sector activity, mainly the agricultural activity is on the decline in the rural area of the District.

4.8 INFERENCE

The backbone of any economy of a region is the production sector. The analysis of the occupational structure of the District shows a very alarming situation about the economic base of the district. The primary sector including the agricultural labourers and cultivators show a declining trend in the district. The sector which shows growth is the service sector/tertiary sector. It is observed that rural areas of the district is also depending more on the service sector.

Chapter-5

LAND USE

Use of a parcel of land is indicated by the predominant activity be it agriculture, residential, commercial, forest etc, for which the land is put to. Hence the analysis of the existing land use is inevitable to understand the predominant economic activities of an area as well as the availability of vacant land for future economic activities. In order to spatially analyze the land use pattern and economic activity as well as linkages between them land use survey in all the 97 LSGs in the district has to be completed. However this will take considerable time period. The source of the data is satellite data from IRS-P6, LISSIV, IC/ID LISS III+ PAN 2003-2004 (India Satellite Data) taken for the analysis. The data forms part of the Natural Resources and Environmental Data Base (NREDB). The data on land use has been procured from Kerala State Land Use Board. The above data base is predominantly agriculture oriented and as such the analysis limited to that extent.

5.1 LAND USE PATTERN OF KERALA STATE

Based on the land use data of the Natural Resources and Environmental Data Base the Land use of Kerala can be categorized under 9 Major categories and the percentage share of these categories is shown in Table 5.1 and Figure 5.1. Accordingly predominant land use of the state is a mix of residential and agricultural which constitute 48.38 % of total Land area. It can be further seen that Forest area of the state contribute nearly 23.18 % of the total area making the forest land use as second highest land use of the state. The Agricultural Land use and plantation land use together constitute 20.18% (Agricultural 10.17% and plantation 10.01%) of total area. The above analysis further support the real to ground peculiar scenario of the state in terms of urban rural continuum, highly

scattered settlement pattern, and traditional homestead type of development individual house surrounded by agricultural land mainly of mixed crop cultivation.

Table 5.1 Land use break-up – Kerala State

Sl. No.	Land use Category	% Of Total Area
1	Forest	23.18
2	Water bodies	2.92
3	Marshy Land	0.28
4	Residential	3.45
5	Agriculture	10.17
6	Plantation	10.01
7	Res/Agr Mix	41.38
8	Other Built up Land Use	0.48
9	Others	8.13

Source: Natural resources and environmental data base of Kerala

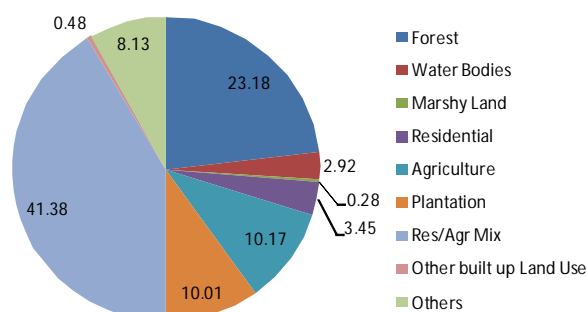


Fig 5.1 Land use breakup – Kerala State

5.2 LAND USE BREAK UP OF ERNAKULAM DISTRICT

Total area of the district is 3062.97 sq.km. The breakup of land use area of the District with its percentage to total area of the District is shown in Table 5.2 and Fig. 5.2. The land use map of the district is shown

in Fig. 5.3 The highest percentage of land use falls under the category Residential/ Agricultural mix, which include mainly dry agriculture lands where in residential developments are coexistent. The district consists of 282.27 sq.km of agricultural land and 173.56 sq.km of land under intense residential land use. Water bodies and forest also has a significant share (174.53 and 709.69 sq.km respectively) in the land use of the district.

From the analysis of land use of the district it is clear that, the major portion of the total land area of the District is coming under three major uses– Residential / Agricultural mix (47.96 %), forest land

Table 5.2 Land use breakup – Ernakulam District

Sl. No.	Land use	Area (Sqkm)	Percentage
1	Forest	709.69	23.17
2	Water bodies	174.53	5.7
3	Marshy/Kole Land	57.14	1.87
4	Residential	173.56	5.67
5	Agriculture	282.27	9.22
6	Plantation	169.04	5.52
7	Res/Agr Mix	1468.85	47.96
8	Other Built up Land Use	4.15	0.14
9	Others	23.76	0.78
Total		3062.97	100

Source: Kerala State Land Use Board

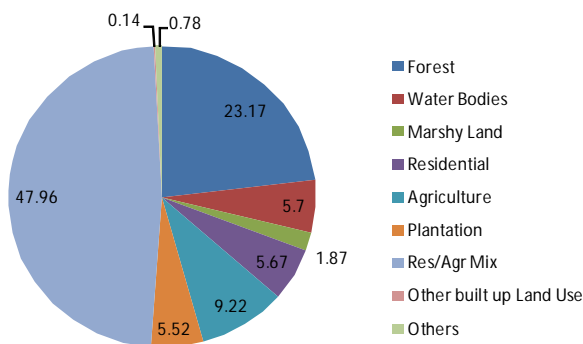


Fig 5.2 Percentage of land use breakup – Ernakulam District

(23.17 %) and agriculture (9.22 %). The glaring aspect of the land use is that the district is blessed with potential resources such as agricultural land and forest.

5.3 REGIONAL LAND USE STUDY

Clearly the process of land use analysis of Ernakulam District shall start with an insight to the whole Kerala state and neighboring Districts (Thrissur, Kottayam, Alappuzha and Idukki). In this section an attempt has been made to compare the land use pattern of Ernakulam District with the state as well as with surrounding districts of Thrissur, Kottayam,

Table 5.3 Comparison of Land use break up of Ernakulam District and Kerala state

Sl. No.	Land use	Area (sqkm)	% of total in the District	Percentage of the corresponding area in the state
1	Forest	709.69	23.17	23.18
2	Water bodies	174.53	5.7	2.92
3	Marshy Land	57.14	1.87	0.28
4	Residential	173.56	5.67	3.45
5	Agriculture	282.27	9.22	10.17
6	Plantation	169.04	5.52	10.01
7	Res/Agr Mix	1468.9	47.96	41.38
8	Other Built up	4.15	0.14	0.48
9	Others	23.76	0.78	8.13

Source: Kerala State Land Use Board

Alappuzha and Idukki. Land use pattern of Ernakulam in comparison with Kerala state is shown in Table 5.3. From the table, it is clear that within the district the predominant land use is mix of residential and agriculture. The comparison of category wise land use with that of Kerala shows that the share of residential area and water bodies is higher compared to the state. The share of Residential / Agricultural land use category is also higher compared to the state.

The comparison of Land use pattern of Ernakulam District with neighbouring Districts (Thrissur, Kottayam, Alappuzha and Idukki), is shown in Table 5.4.

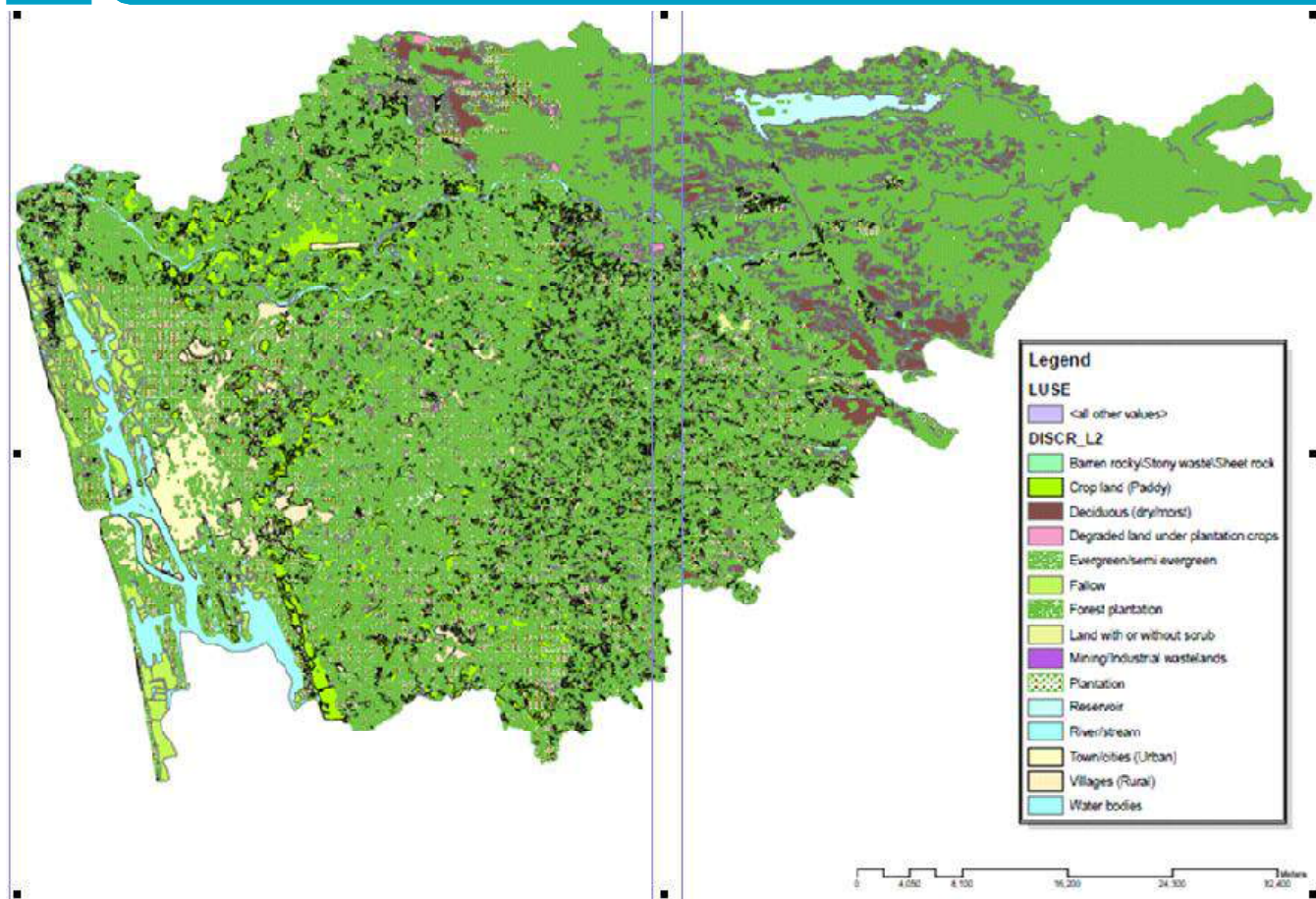


Fig 5.3 Land use map – Ernakulam District

Comparison of the percentage share of forest land use of Ernakulam District and neighbouring three Districts with the state is shown in Figure 5.4. The figure clearly shows that Idukki District has the highest share where as Ernakulam is placed in the third position.

Table 5.4 Land use break - Comparison with Neighbouring Districts

Sl. No.	Land use	Ernakulam	Thrissur	Kottayam	Alappuzha	Idukki
1	Forest	709.69	768.32	19.3	0	1619.7
2	Water bodies	174.53	85.69	80.11	176.69	92.76
3	Marshy/Kole Land	57.14	29.85	14.74	2.97	0
4	Residential	173.56	31.52	207.92	2.19	12.99
5	Agriculture	282.27	299.23	198.15	216.37	42.35
6	Plantation	169.04	213.64	1411.85	0	1249
7	Res/Agr Mx	1468.85	1544.17	5.62	989.52	794.03
8	Other Built up	4.15	18.97	13.71	9.3	0
9	Others	23.76	45.03	243.34	20.49	550.17

Source: Kerala State Land Use Board

The percentage of forest Land Use of each district is shown in Fig.5.5. Idukki district shows highest percentage (37.14%) followed by Thrissur (25.30%). Ernakulam comes in third place (23.17%).

Ernakulam has the highest percentage of marshy land (52.51% of the marshy lands in the state)

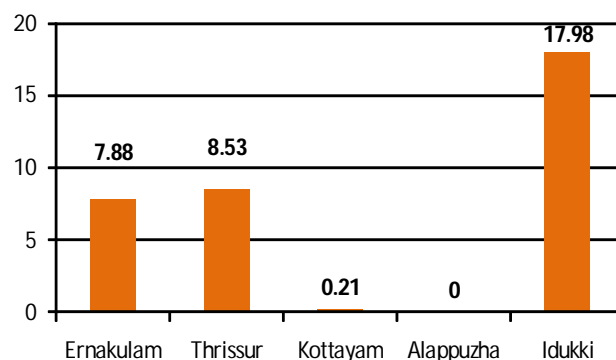


Fig 5.4 Comparison of the percentage share of Forest Land use of the state in Ernakulam and surrounding districts

whereas Thrissur comes second with a contribution of about 27.43% of the total area of marshy lands in the state (see fig 5.6).

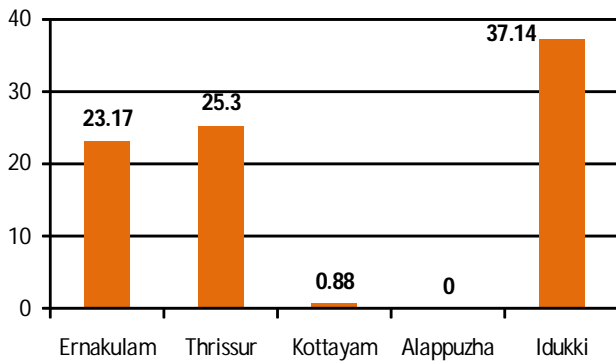


Fig 5.5 Forest Land use comparison with surrounding districts

The percentage of Marshy land of each district is shown in fig. 5.7. The figure shows that Ernakulam district shows highest percentage (1.87 %).

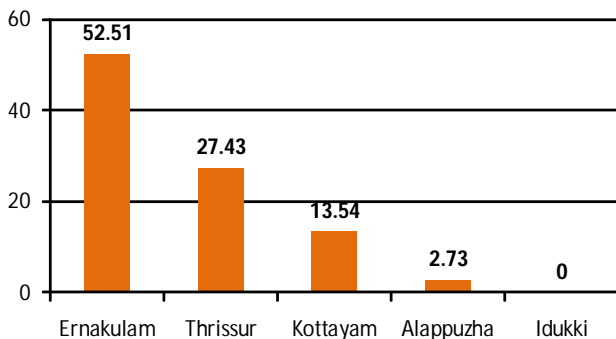


Fig 5.6 Comparison of the percentage share of land Marshy Land of the state in Ernakulam and surrounding districts

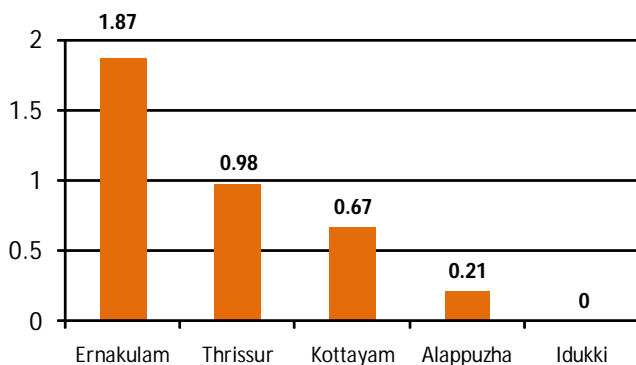


Fig 5.7 Marshy Land - Comparison with surrounding districts

Residential land use which include land use categorized as Mixed Built-up/Mixed Built-up converted from paddy, Residential, and Residential (Converted from Paddy) shows higher concentration in Ernakulam District with 12.94% second to Kottayam (15.51%) of the total area under this category in the state (see fig 5.8).

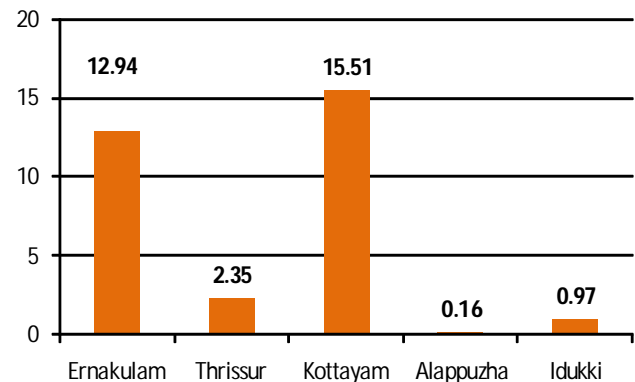


Fig 5.8 Comparison of the percentage share of Residential Land Use in district of Kerala - Ernakulam and Surrounding Districts

The percentage of Residential Land use of Ernakulam & Surrounding Districts is shown in Fig. 5.9. The figure shows that Kottayam district shows highest percentage (9.47%) followed by Ernakulam (5.67%). Thrissur, Alappuzha and Idukki show low percentage.

In case of agriculture land use Thrissur shows dominance (7.57%) over Ernakulam. Ernakulam has a share of 7.14% of agricultural land in the state as shown in fig. 5.10.

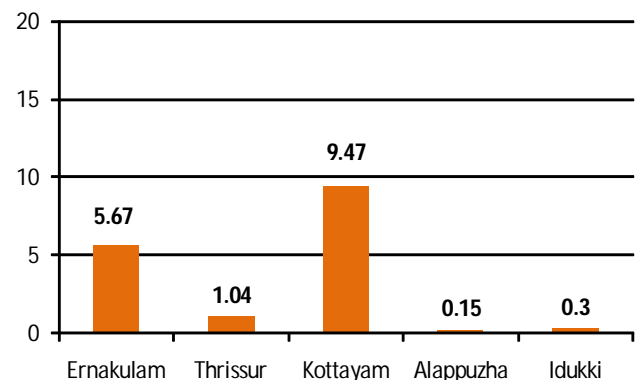


Fig 5.9 Residential land use comparison with surrounding Districts

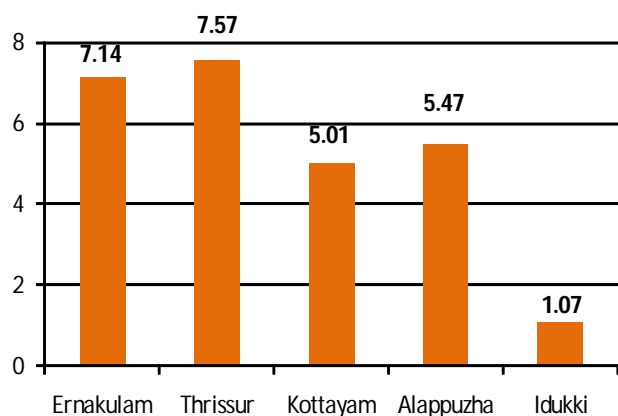


Fig 5.10 Comparison of the percentage share of Agricultural Land use of the State - Ernakulam & surrounding districts

The comparison of percentage of Agriculture Land Use of each district is shown in Fig.5.11. The figure shows that Alappuzha district shows highest percentage (15.26%) and then Thrissur District (9.85%) followed by Ernakulam (9.22%).

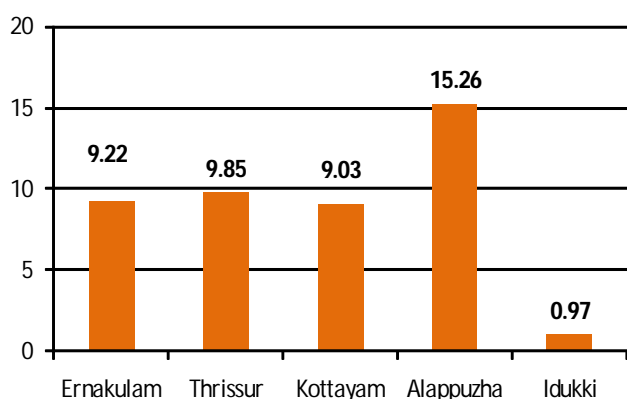


Fig 5.11 Agriculture land use comparison with surrounding Districts

The percentage share of Plantation Land Use in Ernakulam & surrounding districts is shown in Fig.5.12. The figure shows that Kottayam district shows highest percentage (36.29%). Among the nearby district Ernakulam falls under 4th position.

The comparison of percentage of Plantation Land Use of each district is shown in Fig.5.13. The figure shows that Kottayam district shows highest percentage (64.33%). Ernakulam comes in fourth position compared to surrounding districts.

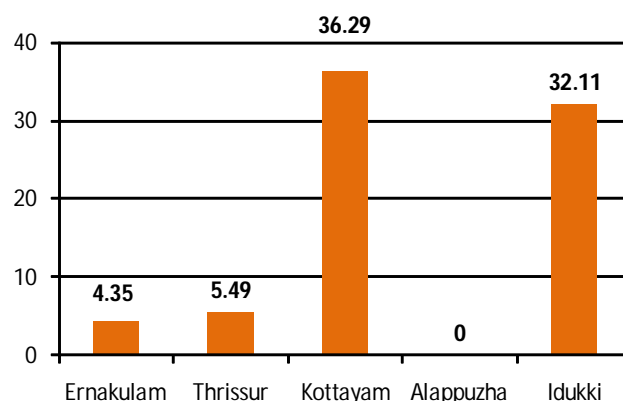


Fig 5.12 Comparison of the percentage share of Plantation Land use of the State in Ernakulam & Surrounding districts

The percentage share of Residential/ Agricultural Mix Land Use of each district is shown in Fig. 5.14. The figure shows that Thrissur district shows highest percentage (9.60%) followed by Ernakulam (9.13%).

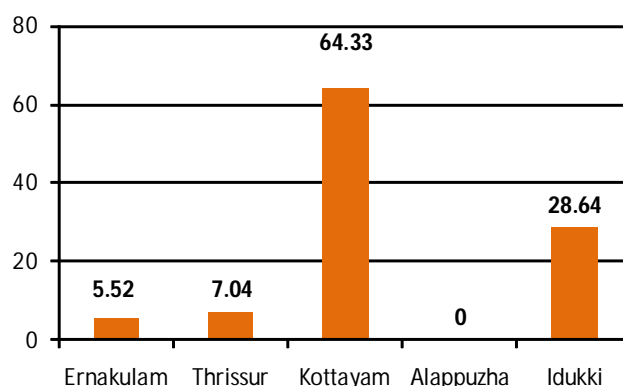


Fig 5.13 Plantation land use comparison with surrounding Districts

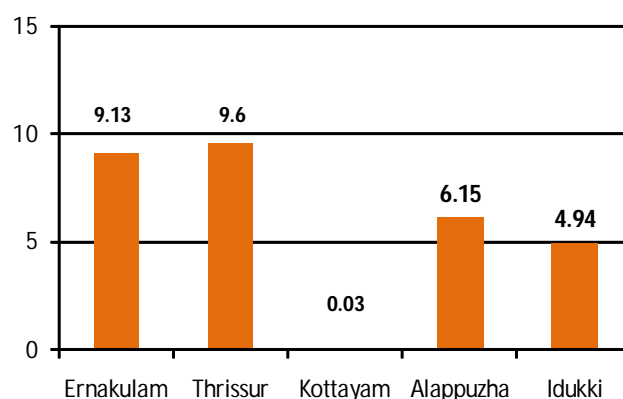


Fig 5.14 Comparison of the percentage share of Res/Agri Mix land use of the state in Ernakulam & Surrounding districts

The percentage share of Res/Agri Mix Land Use in Ernakulam & surrounding districts is shown in Fig.5.15. Ernakulam comes in third position compared to surrounding districts.

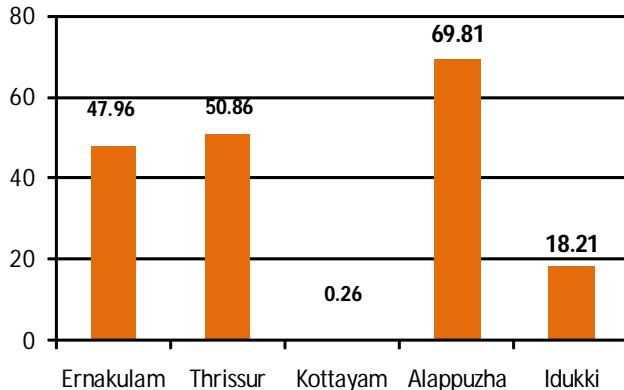


Fig 5.15 Res/Agri Mix land use comparison with surrounding Districts

5.4 CONCENTRATION PATTERN OF LAND USE

The concentration pattern of a land uses gives an idea about where that particular landuse is concentrated within the District. The Concentration Index value may be greater than one, equal to one or less than one. LSGs with concentration index greater than one indicates that the land use under consideration is concentrated more than the other LSGs in the district.

Concentration Index of a land use in a local body = [(Area of that land use in a Local Body) / (Total area of the Local Body)] / [(Area of that land use of the District) / (Total area of the District)]

The Concentration Index value may be greater than one, equal to one or less than one. LSGs with concentration index greater than one indicates that the land use under consideration is concentrated more than the other LSGs in the district.

Using the above method concentration index of 9 categories of Land use (which are Forest, Water Bodies, Marshy Land, Residential, Agriculture, Plantation, Res/Agri Mix, Other built up land use and others) are analysed.

The regional land use study shows a general observation that Ernakulam stands in the second or third position with respect to surrounding district in the case of urban components of landuse (residential, mixed built up, resi/agri mix etc., other built up etc.) and second and fourth in rural components of the landuse (Agriculture, plantation etc.)

5.4.1 AGRICULTURAL LAND USE

The Agricultural land use consists of Cashew/orange/pepper/pineapple, Viruppu (1st Crop)/Mundakan, Land without scrub, Double Crop/Triple crop, Agriculture farm, Agriculture farm (Orchards)/ and Mixed trees categories of land use as demarcated in the landuse map generated out of NREDB. The concentration pattern of agricultural land use (Figure 5.16) shows that agricultural area of the District is mainly concentrated in the central, and some of the up land regions of the District. The pattern also reveals that the concentration pattern of agricultural land use is also influenced by the location of water bodies.

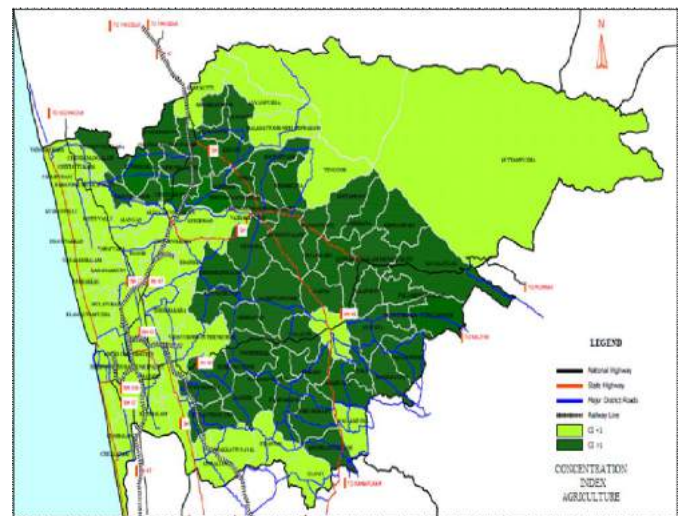


Fig 5.16 The concentration pattern of agricultural land use

The variation of concentration index of Agricultural land use among the LSGs is shown in fig 5.17. The list of LSGs with concentration index of agricultural land use is given in *Annexe 5*. The highest concentration of agricultural land use within the district is seen in Grama Panchayats of

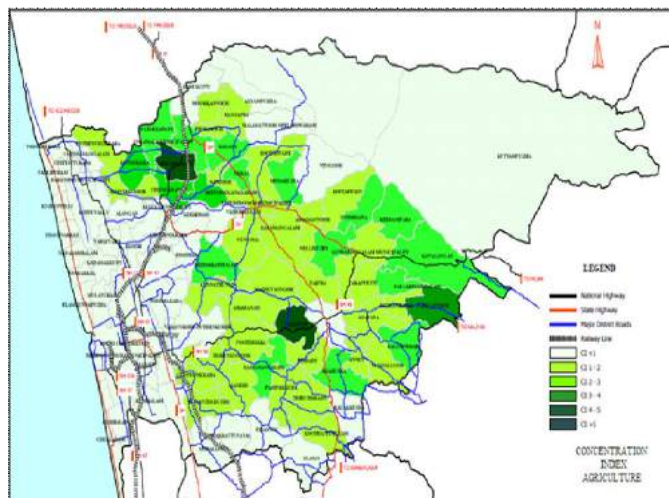


Fig 5.17 The concentration Index of agricultural land use Sreemoolanagaram, Kunnukara, Chengamanad, Paingottur, Valakom and Nedumbassery of the district.

5.4.2 OTHER BUILT UP LAND USE

Other built up land use include Commercial, Industrial / Industrial Park and Educational Institutions. Figure 5.18 shows the distribution of the concentration pattern of the Other Built up Land Use. From the figure it is clear that the concentration index of the Other Built up Land Use in urban LSGs and in those LSGs along the major transport corridors are higher than that in other LSGs. Also it is observed that high land area of the district has lesser concentration of Other Built up Land Uses even in LSGs along main transportation corridors indicating that the economic activity of hill

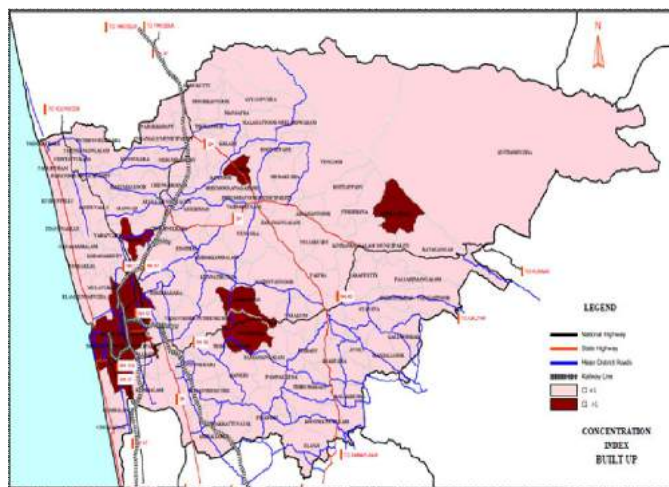


Fig 5.18 Concentration pattern of the Other Built up Land Use

areas is not considerably dependent on secondary / tertiary sectors. The list of LSGs with concentration index of the other Built up Land Use is given in *Annexe 5* and the list of LSGs with high concentration of the Other Built up Land Use (i.e. concentration index of other built up land use greater than one) is shown in *Annexe 6*. The variation of concentration index of other built up land use among the LSGs is shown in Fig 5.19.

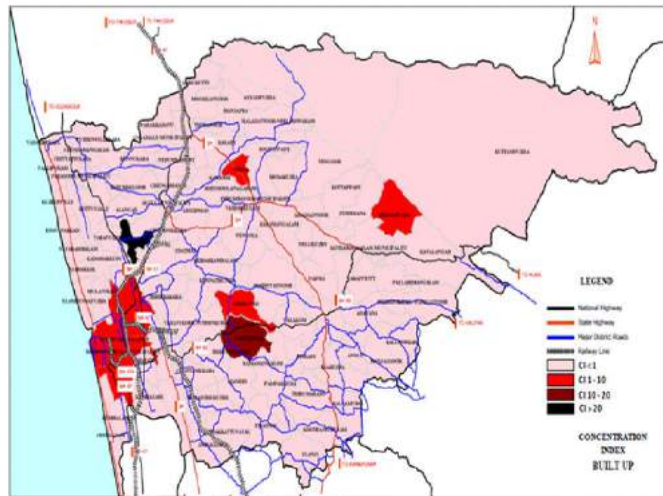


Fig 5.19 The concentration pattern of Other built up land use in LSGs of Ernakulam District

5.4.3 FOREST LAND USE

Forest Land use contains land use categories of Dense Mixed Forest, Dense Mixed Forest (R.F)/ Forest Blank, Dense mixed forest mainly bamboo, Dense mixed forest mainly bamboo & teak (R.F), Dense mixed forest mainly bamboo (R.F), Dense mixed forest mainly teak or cashew, Bamboo (R.F), Barren Rocky/ Stone waste/ sheet rock (RF), Open mixed forest/Open mixed forest (RF), Scrub forest, Degraded grass land (RF), Dense mixed forest mainly rubber, Underutilized / degraded notified forest and Dense Grassland/ Degraded grass land.

The concentration pattern of forest land use shows (Figure 5.20) that forest area of the District is mainly concentrated in the North - Eastern part of the District. Total area of active forest land of the district is 709.69 sq km which is about 23.17% of the total area of the district. The main concentration of forest areas in

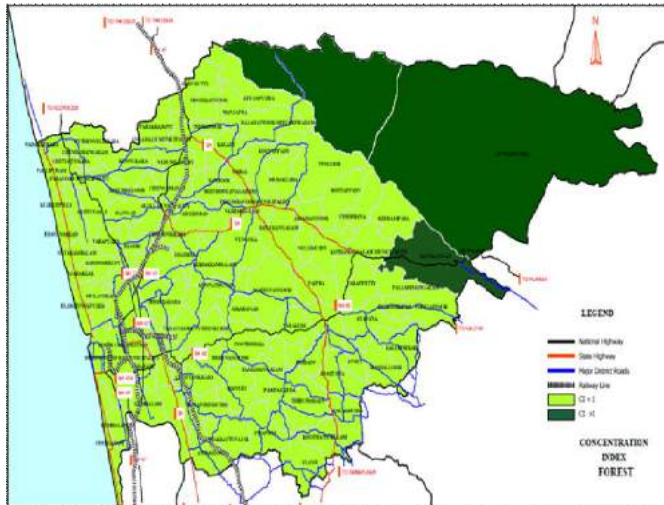


Fig 5.20 Concentration pattern of forest land use in LSGs of Ernakulam District

the district are in Kavalangad and Kuttampuzha having concentration indexes of 1.122 and 3.215 respectively. The concentration indexes of forest land in Ayyampuzha, Malayattoor Neeleswaram and Keerampara are 0.947, 0.869 and 0.548 respectively showing the existence of forest in these LSGs. The forest land is seen in the high land and upland regions of the district. The variation of concentration index of Forest Land use among the LSGs is shown in Fig 5.21. The LSGs wise concentration index of Forest land use is given in *Annexe 5*.

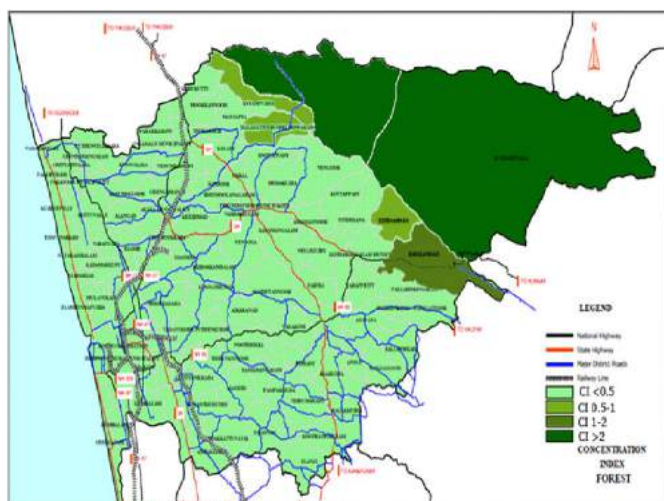


Fig 5.21 Variation of concentration pattern of forest land use among LSGs

5.4.4 RESIDENTIAL LAND USE

The concentration pattern of Residential land use shows (Figure 5.22) that Residential area of the District is mainly concentrated in the peripheral areas of urban LSGs of the district. Aluva Municipality and Kochi Corporation are characterised with the highest concentration index for residential land use with concentration indexes of 7.52 and 7.76 respectively.

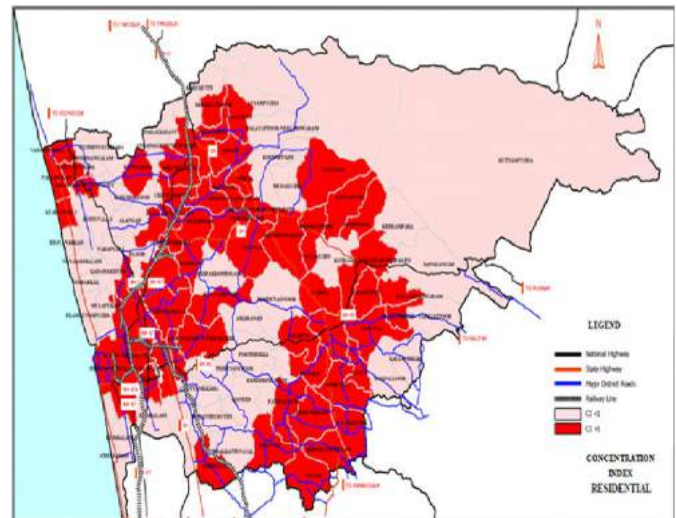


Fig 5.22 Concentration pattern of Residential land use

The LSG wise concentration index of Residential land use and list of LSGs where residential land use is concentrated are given in *Annexe 5* and *6*. The variation of concentration index of Residential land use among the LSGs where concentration index of Residential land use is greater than one is shown in Fig 5.23.

5.4.5 RESIDENTIAL/AGRICULTURE MIX LAND USE

Residential/Agriculture Mix land use consists of land use categories of Arecanut, Banana, Banana & Tapioca, Coconut/coconut & arecanut/coconut & tapioca, Coconut dominant mixed crop, Current fallow, Mixed Crop, Rubber, Mixed and Tapioca as per the land use data of NREDB. The concentration pattern of Res/Agri Mix land use is shown in Fig. 5. 24. The pattern reveals that the concentration of Res/Agri/Land use is in coastal and midland regions of the district.

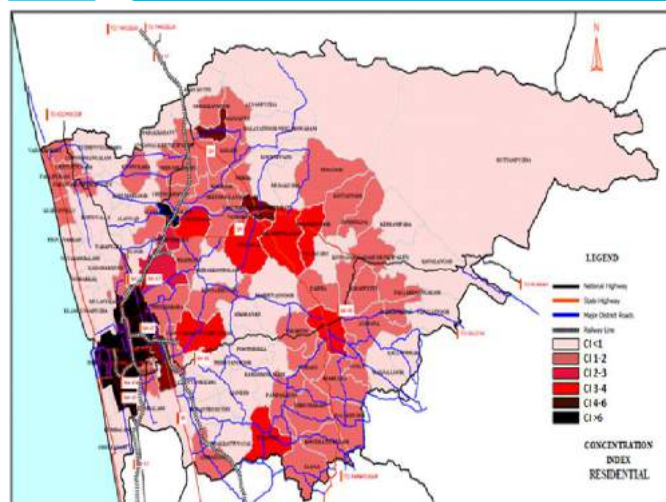


Fig 5.23 Variation of concentration index of Residential landuse

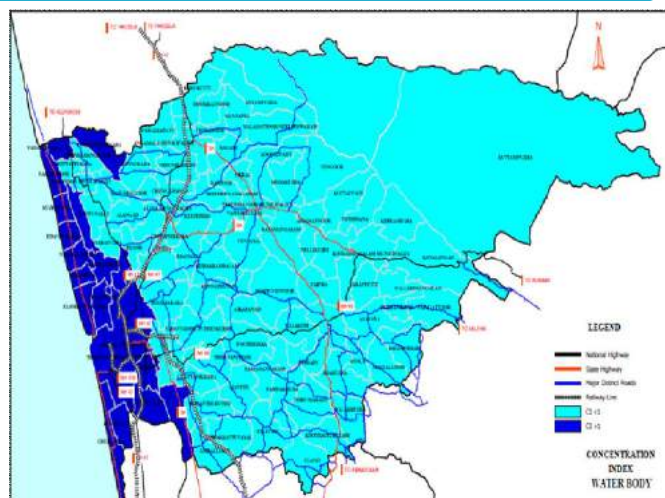


Fig 5.25 Concentration pattern of water body

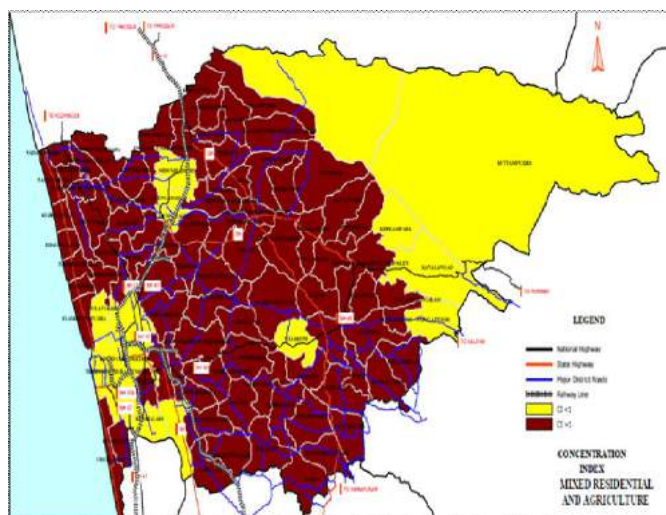


Fig 5.24 Concentration pattern of Res/Agri Mix land use

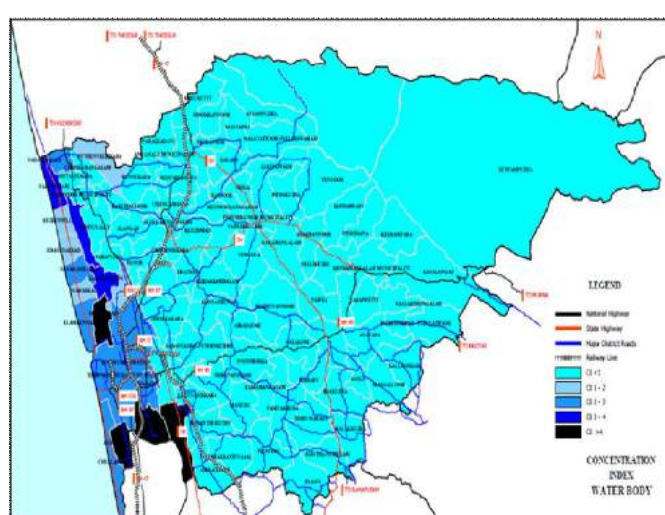


Fig 5.26 Variation of concentration index of water body

5.4.6 WATER BODIES

Water bodies include perennial, Reservoir/ Canal, Reservoir Bed/River island, Water bodies, and Back waters. The land use is concentrated among the major river bases which are Periyar and Moovattupuzha and small portions of Chalakkudyppuzha and a portion of the Vembanad Lake, Kodungallur Kayal and the Varapuzha Kayal. Fig. 5.25 shows concentration index based on extent of land under water bodies in LSGs of Ernakulam. Variation of concentration index of water body is given in figure 5.26.

5.4.7 PLANTATIONS

This category of Land use include land use categories of Rubber (R.F), Tea/Coffee/Cardamom/ Eucalyptus, Tea & Eucalyptus, Tea (R.F)/Coffee (RF)/ Cardamom(RF), Teak, Teak & Softwood (R.F), Teak (R.F)/ Cashew (RF), Eucalyptus (R.F)/ Eucalyptus and soft wood (RF)/Soft wood (silver oak), Oil Palm and Oil Palm (R.F) as per land use data generated from NREDB.

Plantations are spread in most of the north east / south east areas of the district. The concentration pattern of Plantations is shown in Fig.5.27.

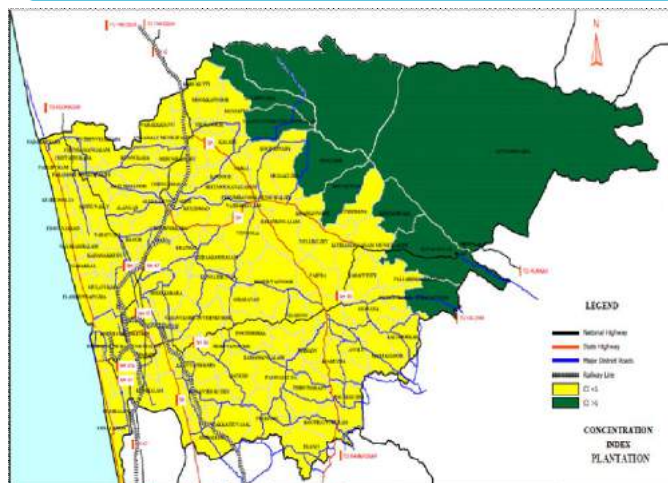


Fig 5.27 Distribution of concentration Index of Plantation land use

5.4.8 MARSHY LAND

Land parcels which are categorized as temporarily marshy land / Marshy land/Permanently Marshy land as per land use data generated from NREDB is included under Marshy land. As per the same Marshy land is concentrated in Kochi corporation area. The concentration pattern of Marshy land is shown in Fig.5.28.

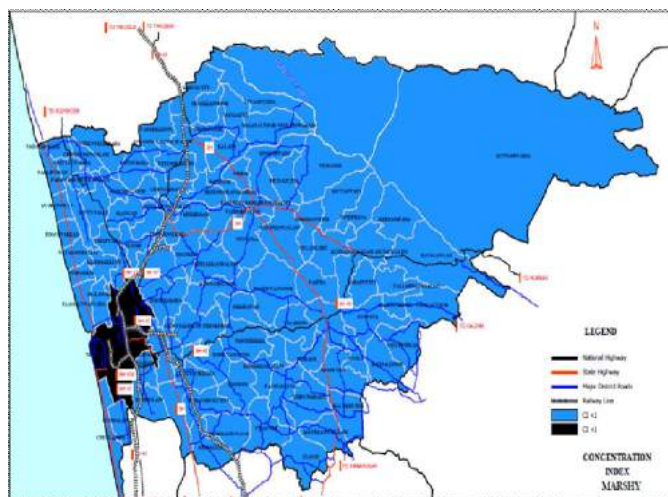


Fig 5.28 Distribution of concentration Index of Marshy land

5.4.9 OTHER LAND USES

Following land use categories are grouped to form the category 'Other Land uses' – Barren Rocky/ Stone waste/ sheet rock, Coastal Sand, Sands/ riverine/ Flood plain, Beaches, Harbour / Port, Mining/Industrial

waste land, Airport, Playground, Dam wall, Mining. Such Land uses are spread nearby coastal areas and in the North and Western region of the district. The concentration pattern of other land use is shown in Fig. 5.29.

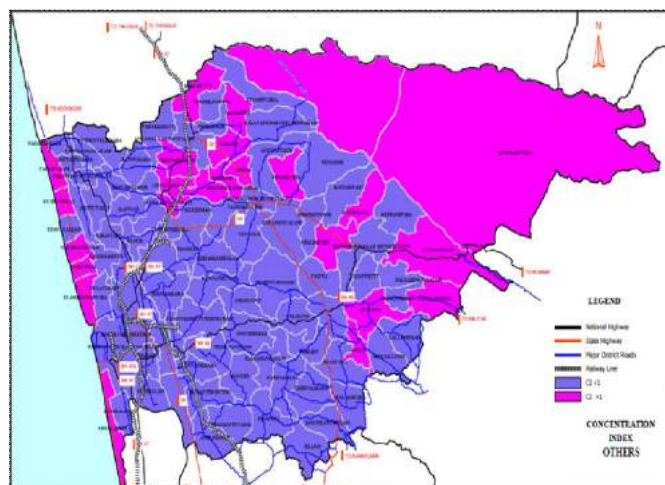


Fig 5.29 Concentration pattern of other land uses

5.5 ACTIVITY ZONES BASED LAND USE CONCENTRATION PATTERN

In the previous sections, the areas of concentration of the major land uses in the District is delineated taking each land uses separately. By combining the concentration pattern of the major land uses spatially and by analyzing the resulting pattern, activity pattern of LSGs (based on the existing land use) can be evolved.

In order to evolve the activity pattern the nine categories of land uses are grouped into 4 categories which are Non agricultural (Urban), Agricultural, Forest and Plantation as given in Table 5.5.

Table 5.5 Grouping of land use classifications

Sl. No.	Major Land Use	Landuse Categories grouped
1	Non Agriculture (Urban land use)	Other builtup + Others+ Residential (Plot size < 50 cents)
2	Agriculture	Agri + Resi / Agri + Residential (Plot size > 50 cents)
3	Forest	All components of Forest land use
4	Plantation	All components of Plantation land use

The concentration index of these major land use categories is shown in *Annexe 7*. The concentration patterns are shown in Fig. 5.30a, 5.30b, 5.30c and 5.30d respectively. Based on the pattern, the activity of the LSGs is evolved as per the criteria shown in Table. 5.6.

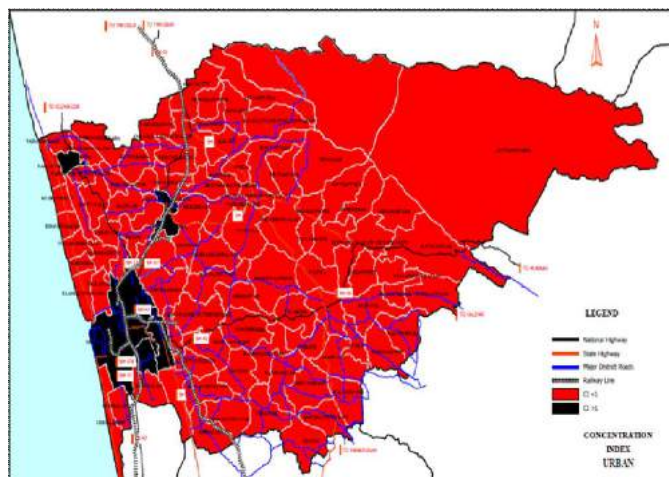


Fig 5.30a The concentration pattern of Non- Agricultural land use

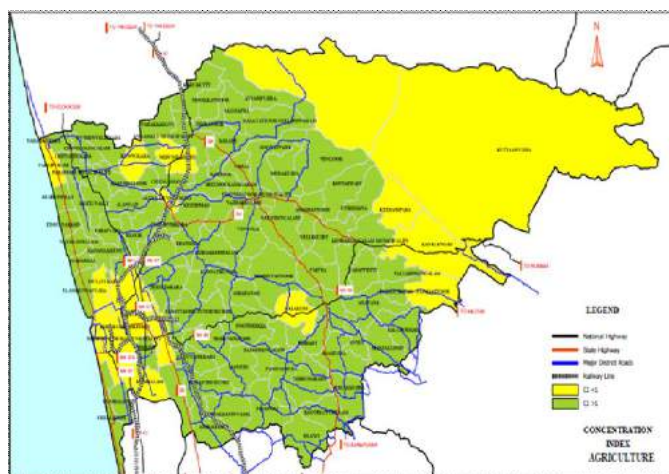


Fig 5.30b The concentration pattern of Agricultural land use

Activity Pattern based on land use, evolved based on the above criteria, for each LSG is shown in *Annexe 7*. The activity pattern based on the land use is shown in figure 5.31.

The analysis of land use concentration pattern shows that most of the plantation / forest activities are concentrated on the highland region of the district. The urban activity is found to be mainly concentrated in coastal regions and along the major transportation

corridors. The agricultural activities are predominantly concentrated in the midland region of the district.

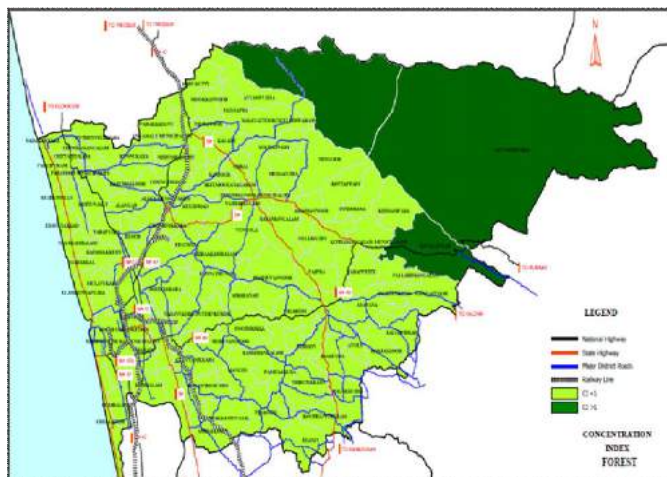


Fig 5.30c The concentration pattern of Forest land use

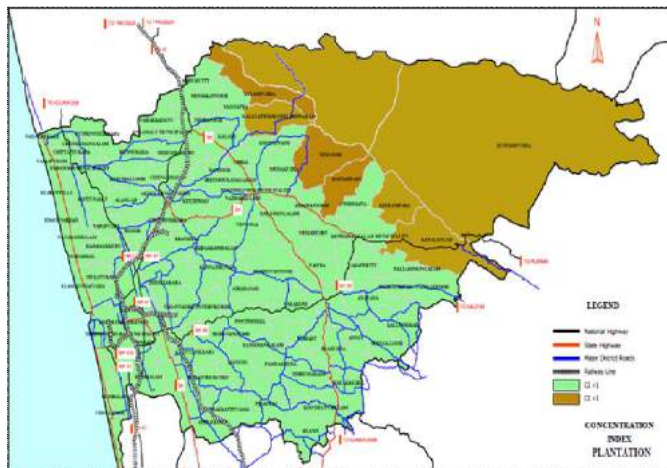


Fig 5.30d The concentration pattern of Plantations

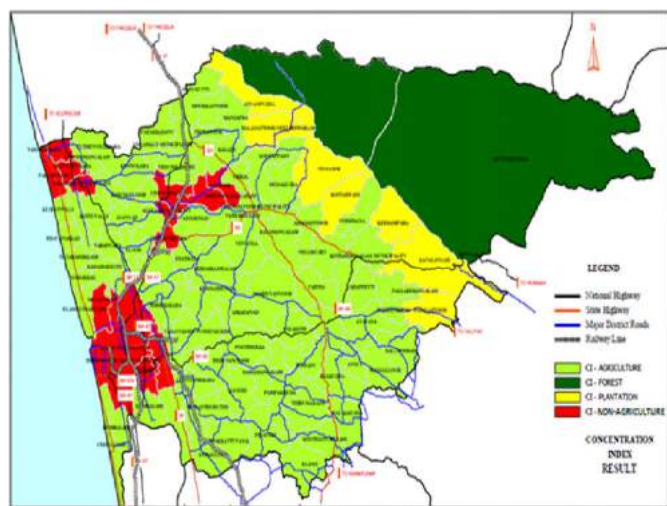


Fig 5.31 Activity pattern of LSGs based on Land Use

Table 5.6 Criteria for determination of activity based on Land use

Sl. No.	Activity based on Land use	Criteria
1	Non Agriculture (Urban land use)	CI* Urban > CI Agri / CI Plantation / CI Forest
2	Agriculture	CI* Agri > CI Urban / CI Plantation
3	Forest	CI* Forest > CI Plantation / CI Urban / CI Agri
4	Plantation	CI* Plantation > CI Forest / CI Urban / CI Agri

* CI - Concentration index of

5.6 INFERENCE

From the above analysis of land use we can conclude that the whole District can be divided into four Activity zones viz. Agricultural, Forest, Plantation and Urban. The analysis of land use concentration pattern shows that most of the plantation / forest activities are concentrated on the highland region of the district. The urban activity is found to be mainly concentrated in coastal regions and along the major transportation corridors. The agricultural activities are predominantly concentrated in the midland region of the district.

Chapter-6

FUNCTIONAL CHARACTER OF SETTLEMENTS

The function of a settlement is the major activity within the settlement, be it primary sector activities (rural), secondary sector / tertiary sector activities (urban activities) or the combination of above. Here an attempt is made to determine the major function of a settlement by studying the major land use and the average plot size within the settlement.

6.1 CHARACTER OF SETTLEMENTS

With the unique settlement pattern existing in Kerala, the function of a settlement cannot be limited to the usual classification of urban or rural. There are settlements exhibiting a combination of the two characters which needs to be explored. Analysis based on land use and average plot size (Methodology already explained in IDDP Kollam report) shows that there exists semi urban and semi rural character in settlements in addition to the urban and rural character. An area can be classified as Semi Urban, if there exists (or it is likely to introduce) both urban and rural activities with predominance to urban activities. If the predominant activity is rural, in an area where both urban and rural activities co-exist; then it is classified as a semi rural area.

Based on the methodology adopted, 62 out of 97 LSGs exhibit rural character. They are concentrated in the mid land and highland regions of the district. Kochi corporation and its contiguous LSGs and some LSGs viz. Vadakkekara, Pallipuram and Chendamangalam which are contiguous to the Kodungallur(M) in the Thrissur district shows urban character. Some coastal LSGs viz. Chengammanad, Kunnukara, Mulavukad, Kumbalangy and Njarakkal shows semi urban character which have the urban

influence of the nearby urban LSGs. Semi rural character is seen in some other LSGs which are in a transition zone between LSGs of urban and rural character. The functional character of 6 out of 8 municipalities is semirural.

The functions of all the settlements of the District derived based on the methodology are shown in Figure 6.1 and Table 6.1.

Table 6.1 Functional Character of LSGs

Sl. No.	LSGs	Character
1	Aikaranad	RURAL
2	Alangad	RURAL
3	Amballur	RURAL
4	Arakuzha	RURAL
5	Asamannoor	RURAL
6	Avoly	RURAL
7	Ayavana	RURAL
8	Ayyampuzha	RURAL
9	Chellanam	RURAL
10	Chittattukara	RURAL
11	Chottanikkara	RURAL
12	Edakkattuvayal	RURAL
13	Edavanakkade	RURAL
14	Elanji	RURAL
15	Ezhikkara	RURAL
16	Kadamakkudy	RURAL
17	Kalloorkkade	RURAL
18	Kanjoor	RURAL
19	Karukutty	RURAL
20	Kavalangad	RURAL
21	Keerampara	RURAL
22	Kizhakkambalam	RURAL
23	Koothattukulam	RURAL
24	Koovappady	RURAL
25	Kottappadi	RURAL

Cont...

Sl. No.	LSGs	Character	Sl. No.	LSGs	Character
26	Kottuvally	RURAL	62	Vengoor	RURAL
27	Kunnathunadu	RURAL	63	Kalady	SEMI RURAL
28	Kuttampuzha	RURAL	64	Angamali (M)	SEMI RURAL
29	Malayattoor-Neeleswaram	RURAL	65	Edathala	SEMI RURAL
30	Maneed	RURAL	66	Kadungallur	SEMI RURAL
31	Manjalloor	RURAL	67	Kalamassery (M)	SEMI RURAL
32	Manjapra	RURAL	68	Karumalloor	SEMI RURAL
33	Marady	RURAL	69	Keezhmad	SEMI RURAL
34	Mazhuvannoor	RURAL	70	Kothamangalam (M)	SEMI RURAL
35	Mookkannur	RURAL	71	Kumbalam	SEMI RURAL
36	Mudakuzha	RURAL	72	Kuzhuppily	SEMI RURAL
37	Mulanthuruthy	RURAL	73	Maradu	SEMI RURAL
38	Nellikuzhi	RURAL	74	Muvattupuzha (M)	SEMI RURAL
39	Ockal	RURAL	75	Nayarambalam	SEMI RURAL
40	Paingottur	RURAL	76	Nedumbassery	SEMI RURAL
41	Paipra	RURAL	77	North Paravoor (M)	SEMI RURAL
42	Palakuzha	RURAL	78	Perumbavoor (M)	SEMI RURAL
43	Pallairmangalam	RURAL	79	Sreemoolanagaram	SEMI RURAL
44	Pampakuda	RURAL	80	Udayamperur	SEMI RURAL
45	Parakkadavu	RURAL	81	Varapuzha	SEMI RURAL
46	Pindimana	RURAL	82	Mulavukade	SEMI URBAN
47	Piravam	RURAL	83	Chengamanad	SEMI URBAN
48	Poothrikka	RURAL	84	Kumbalangy	SEMI URBAN
49	Pothanikkade	RURAL	85	Kunnukara	SEMI URBAN
50	Puthenvelikara	RURAL	86	Njarakkal	SEMI URBAN
51	Ramamangalam	RURAL	87	Aluva (M)	URBAN
52	Rayamanglam	RURAL	88	Chendamangalam	URBAN
53	Thirumarady	RURAL	89	Cheranallur	URBAN
54	Thiruvaniyoor	RURAL	90	Choorannikkara	URBAN
55	Thiruvankulam	RURAL	91	Elamkunnappuzha	URBAN
56	Thuravoor	RURAL	92	Eloor	URBAN
57	Vadavucode-Puthenkurisu	RURAL	93	Kochi corporation	URBAN
58	Valakam	RURAL	94	Pallippuram	URBAN
59	Varappetty	RURAL	95	Thrikkakara	URBAN
60	Vazhakkulam	RURAL	96	Thrippunithura(M)	URBAN
61	Vengola	RURAL	97	Vadakkekara	URBAN

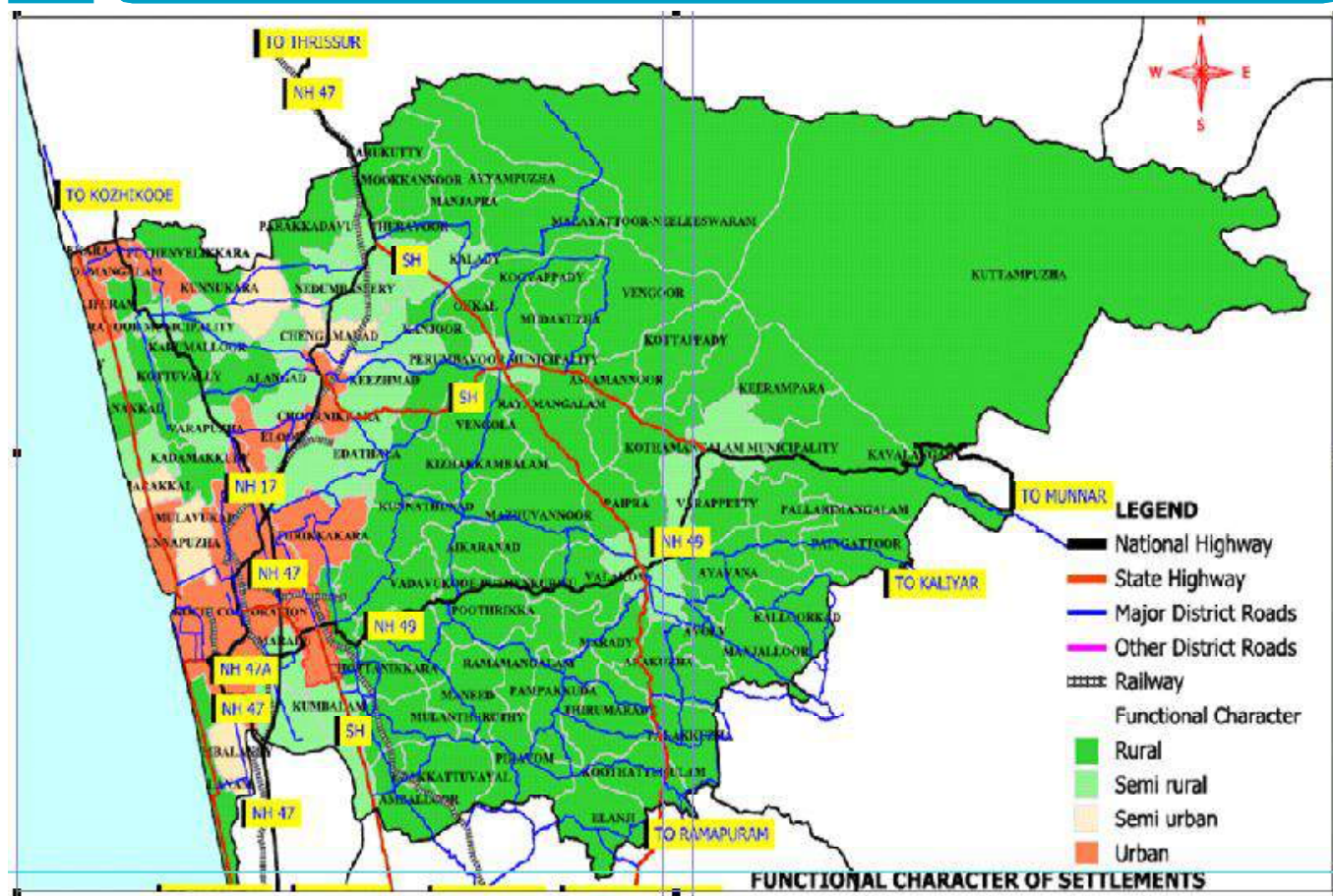


Fig 6.1 Functional Character of settlements

6.2 INFERENCE

The spatial distribution of the settlements based on its character shows a clear demarcation in the pattern of the settlements in four categories viz. Urban, Semi urban, Rural and semi rural. Kochi Corporation, Aluva and Thrippunithura municipalities show the urban character. Some of coastal LSGs and LSGs contiguous to the Kochi Corporation also show urban character. Semi urban character is exhibited by LSGs

that have urban influence like Chengammanad, Kunnukara, Mulavukad, Kumbalangy and Njarakkal (located near to Municipalities). But some Municipalities in midland and highland region shows semirural character. Semi rural character is seen in some other LSGs which are in a transition zone between LSGs of urban and rural character. Most of the LSGs in the midland and high land region of the District exhibit rural character.

Chapter 7

HIERARCHY OF SETTLEMENTS

In this chapter the existing hierarchy of settlements based on the number and order of facilities is assessed and the suggested hierarchy of settlements is identified mainly based on their locational importance.

7.1 EXISTING HIERARCHY OF SETTLEMENTS

Hierarchy value of a settlement is an indication on the extent of concentration of facilities in a region. The spatial distribution of settlement with different hierarchies and its probe in to matching or mismatching with population distribution is issue need to be addressed in any strategic planning.

Cumulative Functional Index (CFI) method is used to find out the hierarchy of settlement. The CFI of a settlement is assessed based on the number and hierarchy of the following types of facilities in the settlement.

1. Educational facilities
2. Health Facilities
3. Markets
4. Physical infrastructure facilities
5. Transportation facilities

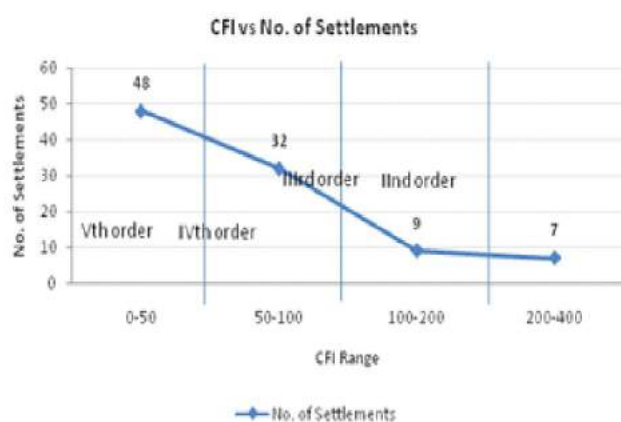


Fig 7.1 CFI Vs No. of settlements

The weightage of each of these facilities in the District and CFI index calculated based on this is given in the *Annexe 8*.

Kochi Corporation with CFI of 1880.31 is invariably the first order settlements in the district. CFI values of remaining settlements are plotted against number of settlements and the graph so obtained is given in fig 7.1.

Graph reveals that there are 7 second order settlements, 9 third order settlements, and 32 fourth order settlements and 48 fifth order settlements in the District.

When Kochi Corporation is taken as the first order settlement, the settlements of the district can be classified in to five orders as follows.

Ist order settlement

Kochi Corporation

IInd order settlement

Kothamangalam (M), Kalamassery (M), Muvattupuzha (M), Aluva (M), Paravur (M), Perumbavur (M)

IIIrd order settlement

Thrikkakara, Angamaly (M), Maradu, Kalady, Eloor, Vadakkekara, Nellikkuzhy, Mulavukad

IVth order settlement

See Table 7.2.

Vth order settlement

See Table 7.2.

The spatial distribution of the settlements is shown in the fig 7.2. The first order settlement is at the meeting point of two National High ways NH-47 and NH-17. Most of all other settlements (up to the fifth order) are situated adjacent to either National highway or State high way or Major District Roads.

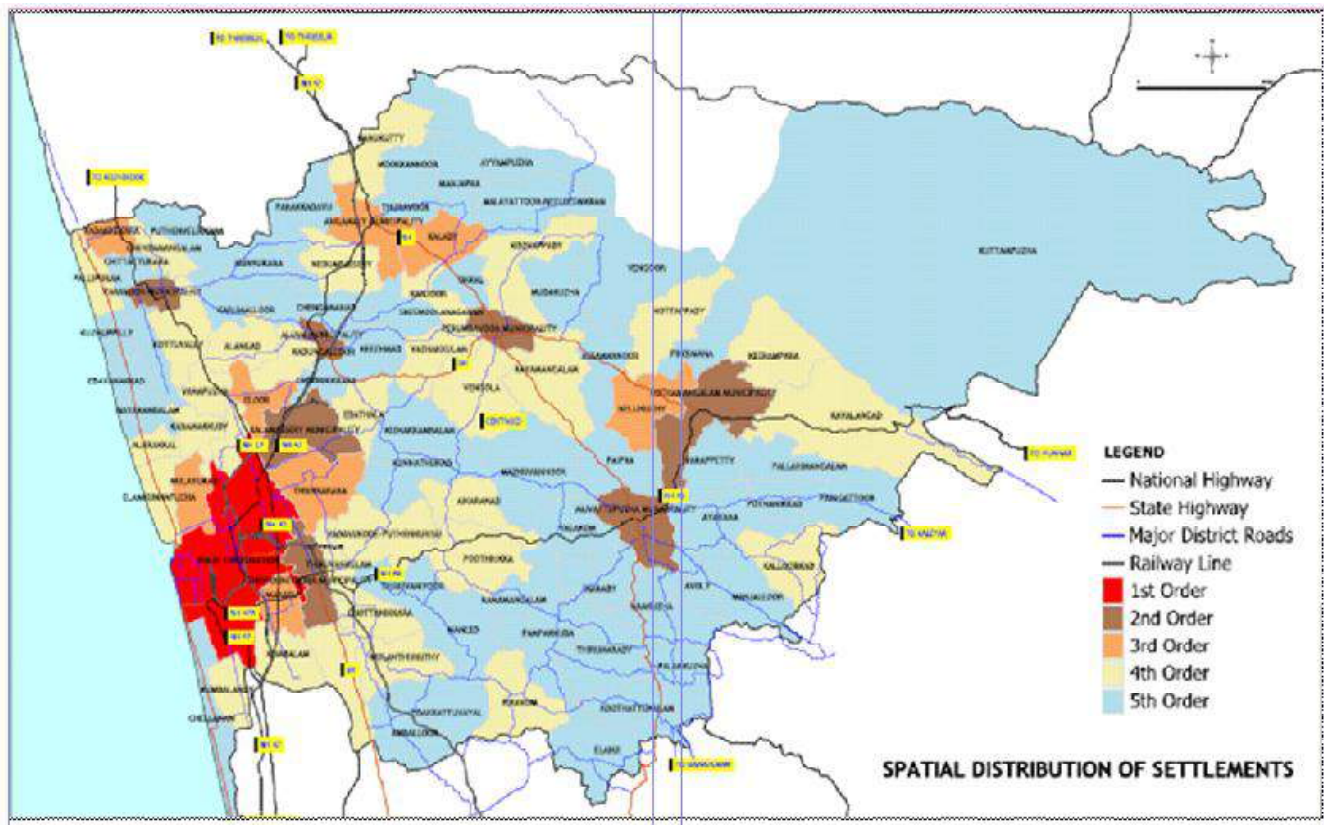


Fig 7.2 Spatial Distribution of settlements of different hierarchies

7.2 SUGGESTED HIERARCHY OF SETTLEMENTS – METHODOLOGY ADOPTED

The hierarchy of settlements of a region is derived based on factors like the trend of physical development, locational importance, administrative status, trend of urbanization etc. Though Crystallor's central place theory was advised for the study at the state level for the districts of the state, the basic assumptions in the theory met with many limitations, as far as this district is concerned. Hence the concept of centrality which was advocated for the rest of the state was not fully adopted for the identification of hierarchy of settlements, this chapter attempts to identify the existing and proposed hierarchy of various settlements of the District.

The methodology adopted to identify the proposed hierarchy is explained here.

The concept as per the Crystallor's Central place theory in identifying the proposed hierarchy of the settlements is that spatial distribution of

settlements of various hierarchies should be centrally located (as far as possible) with respect to the service area or service population to be served. Theoretically speaking, there will be one first order settlement serving the entire region (District). The service area of a settlement is hexagonal in shape as per the Crystallor's theory.

But practically in case of Ernakulam the service area of the first order settlement (Kochi Corporation being the only one) cannot be taken as hexagonal but it is actually the entire district. This limits the identification of the second order settlement by Crystallor's Central Place theory. The Crystallor's Central Place theory stipulates that the lower order settlements are placed at the vertices of the hexagonal shaped service area of the higher order settlement. But here the service area of the first order settlement is the entire district and hence it is assumed that there are at least four second order settlements one from each of the sub regions (North division, South division,

East division and West division) of the District. Drawing the perpendicular bisectors to the straight line connecting the second order settlements delineates the service areas of the second order settlements. This area may form a hexagon or part of hexagon in shape. The vertices of the hexagon determine the location of the next lower settlements i.e. the third order settlement. The service area of the third order settlement can be delineated as hexagonal in shape. The remaining settlements of the District are assumed to be having the lowest order, i.e. the fourth order.

7.3 SUGGESTED HIERARCHY OF SETTLEMENTS – PROCEDURE ADOPTED

Identification of second order settlements:

While assessing the proposed hierarchy of settlements of the District after 20 years (based on the method explained earlier), the existing hierarchy of the settlements, especially of those settlements with higher order, cannot be shuffled altogether. The existing hierarchy of the settlements in Ernakulam District shows that, the settlements here falls under five hierarchies viz. I order settlement, II Order settlements, III order settlements, IV Order settlements and V order settlements. The first order settlement and the second order settlements are marked in the District map and it is shown in the fig 7.3.

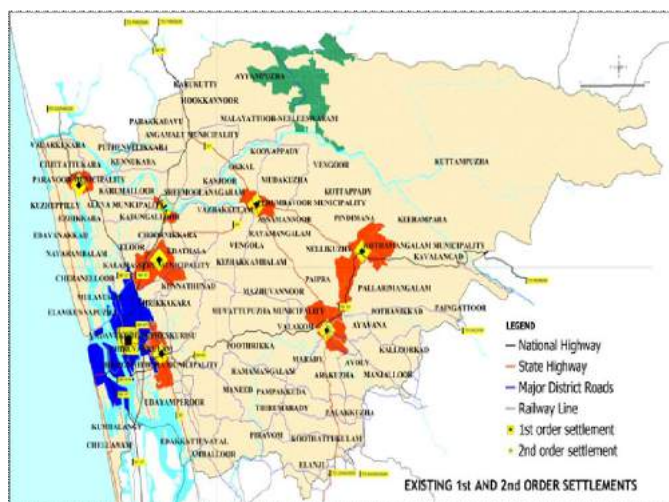


Fig 7.3 Existing 1st and 2nd order settlements of Ernakulam Dist

Those settlements in the first three orders as per the existing hierarchy of settlements are taken as such with a slight modification while identifying the proposed hierarchy of settlements. The modification is that the existing II and III order settlements are combined together and taken as the third order settlements in the proposed hierarchy of settlements because there is less difference between the weightage values of these two settlements. This means that in the proposal also the first order settlement is invariably taken as Kochi Corporation. Aluva Municipality, Kalamassery Municipality, Kothamangalam Municipality and Muvattupuzha Municipality are taken as the II order settlements.

The analysis of the above map clearly reveals the fact that the above four segments are served by at least second order settlements such as N-E zone served by two settlements viz. Perumbavur(M), and Kothamangalam(M), S-E zone served by one settlement viz. Muvattupuzha(M), S-W zone served by two settlements as Kochi Corporation and Thrippoonithura (M) and N-W zone served by three settlements viz. Aluva(M), Kalamassery(M) and Paravur (M).

As per the methodology adopted there is no need of proposing a 2nd order settlement in any quadrant. But considering the regional and unique importance, Angamaly (M) and Thrikkakara can be proposed as second order status. Angamaly (M) and Thrikkakara are proposed as second order settlements in N-W Zone and S-W Zone respectively. Hence the suggested second order settlements are :

1. Kothamangalam Municipality (Existing second order settlement)
2. Kalamassery Municipality (Existing second order settlement)
3. Muvattupuzha Municipality (Existing second order settlement)
4. Aluva Municipality (Existing second order settlement)
5. Paravur Municipality (Existing second order settlement)

6. Perumbavur Municipality (Existing second order settlement)
7. Angamaly Municipality (Proposed second order settlement)
8. Thrikkakara Panchayat (Proposed second order settlement)

The spatial distribution of the existing and proposed second order settlements is given in fig 7.4.

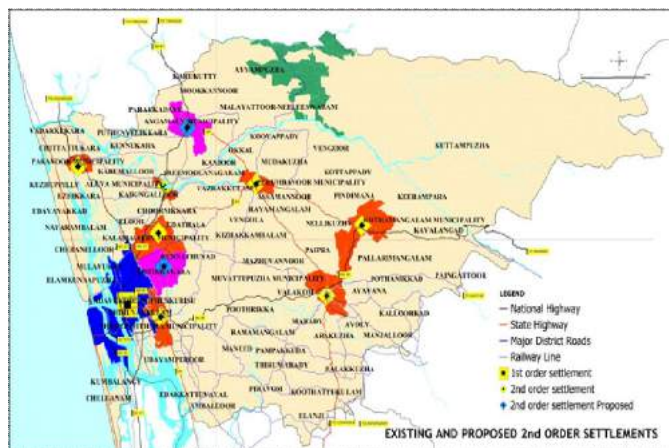


Fig 7.4 Projected 2nd order settlements

In order to identify the service area of each of the second order settlements, perpendicular bisectors are drawn to the line joining nearest second order settlements and the polygon formed with the second order settlement as centre is taken as the service area of the second order settlement under consideration (see fig 7.5).

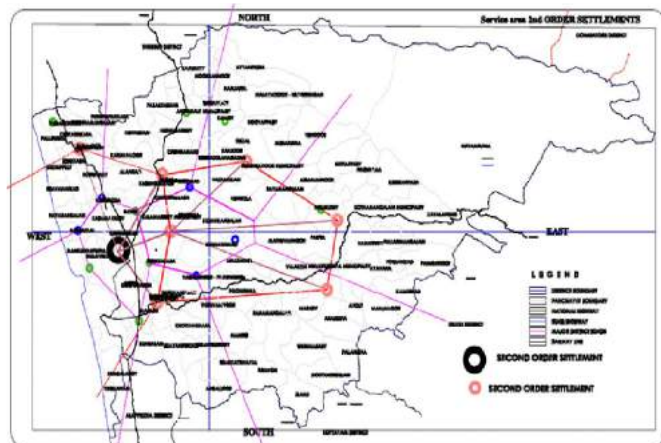


Fig 7.5 Service area of 2nd order settlements

The adjusted service area (service settlements) of the second order settlements is shown in figure 7.6. Also the service settlements of various second order settlements and the population served is given in table 7.1.

Table 7.1 Second order settlements, its service area & service population

2nd order Settlements	Service area	Population		Total Service	
		2001	2021	2001	2021
Kochi Corporation	Kochi Corporation	595575	688260	891241	1029938
	Mulavukad	22842	26397		
	Elamkunnappuzha	50563	58432		
	Kumbalangi	26661	30810		
	Chellanam	36209	41844		
	Maradu	41012	47394		
	Kumbalam	27549	31836		
	Kadamakkudy	15824	18287		
	Njarakkal	24166	27927		
	Varapuzha	24524	28340		
Kothamangalam (M)	Cheranellur	26316	30411	347456	401529
	Kothamangalam(M)	37173	42958		
	Keerampara	13132	15176		
	Kavalangad	29015	33530		
	Pallarimangalam	12784	14773		
	Paingattoor	15121	17474		
	Pothanikkad	9913	11456		
	Kalloorkad	13082	15118		
	Ayavana	19533	22573		
	Assamannur	17947	20740		
	Pindimana	15731	18179		
	Varappetty	16702	19301		
	Mazhuvannur	32184	37193		
	Kottappady	17092	19752		
Kalamassery (M)	Nellikuzhi	35008	40456	196240	226779
	Paipra	37929	43832		
	Kuttampuzha	25110	29018		
	Kalamassery(M)	63116	72938		
	Edathala	36098	41716		
Muvattupuzha (M)	Kunnathunadu	29822	34463	347456	401529
	Eloor	35573	41109		
	Kizhakkambalam	31631	36553		
	Muvattupuzha(M)	29246	33797		
	Valakom	17747	20509		
	Marady	14550	16814		
	Arakkuzha	15233	17604		
	Avoly	17891	20675		
	Manjallor	15598	18025		
	Poothrika	19950	23055		
	Piravom	27263	31506		
	Ramamangalam	15021	17359		
	Maneed	16456	19017		
	Elanji	16995	19640		
	Koothattukulam	17682	20434		
	Thirumarady	17491	20213		
	Pampakkuda	17324	20020		
	Palakkuzha	13469	15565		
	Aikkaranad	19920	23020		

2 nd order Settlements	Service area	Population		Total Service	
		2001	2021	2001	2021
Aluva (M)	Aluva (M)	24110	27862	240263	277653
	Choornikkara	28875	33369		
	Karumallor	33451	38657		
	Kadungalloor	35595	41134		
	Kunnukara	22126	25569		
	Alangad	36420	42088		
	Chengamanad	28030	32392		
	Keezhmad	31656	36582		
Paravoor (M)	Paravoor(M)	30059	34737	303134	350308
	Kottuvally	38037	43956		
	Chendamangalam	28147	32527		
	Puthenvelikkara	27005	31208		
	Nayarambalam	23786	27488		
	Edavanakkad	20624	23834		
	Vadakkekkara	32781	37882		
	Chittattukara	28026	32387		
	Pallipuram	43523	50296		
	Kuzhuppilly	12120	14006		
	Ezhikkara	19026	21987		
Perumbavoor (M)	Perumbavoor (M)	26547	30678	330264	381659
	Mudakkuzha	16767	19376		
	Rayamangalam	33903	39179		
	Okkal	22734	26272		
	Kanjoor	21651	25020		
	Malayattoor-				
	Neeleeswaram	25163	29079		
	Koovappady	33102	38253		
	Vengoor	21633	25000		
	Kalady	27021	31226		
	Sreemoolanagaram	24600	28428		
	Vengola	42866	49537		
Thrippunithura (M)	Vazhakkulam	34277	39611	222505	257132
	Thrippunithura (M)	59884	69203		
	Thiruvankulam	21717	25097		
	Thiruvaniyoor	23613	27288		
	Chottanikkara	19168	22151		
	Udayamperur	33523	38740		
	Edakkatuwayal	17635	20379		
	Amballoor	23350	26984		
Thrikkakara	Mulanthuruthy	23615	27290	92694	107120
	Thrikkakara	65984	76253		
	Vadavukode-Puthencruz	26710	30867		
Angamaly (M)	Angamaly (M)	33409	38608	189261	218713
	Karukutty	26811	30983		
	Mookkannoor	18638	21538		
	Thuravoor	19567	22612		
	Parakkadavu	29997	34665		
	Nedumbassery	30361	35086		
	Ayyanpuzha	14902	17221		
	Manjappra	15576	18000		

Identification of third order settlements:

As per Crystallor's theory, the lower order settlements will fall in the vertices of the hexagonal service area of the higher order settlements. This means that the third order settlements will be those

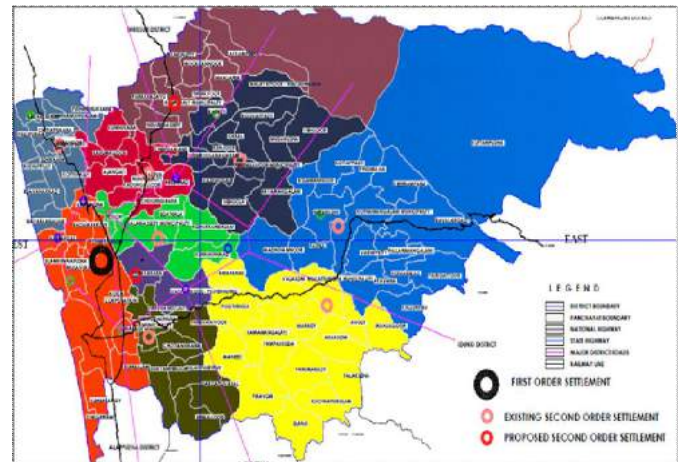


Fig 7.6 Service area (service settlements) of 2nd order settlements (adjusted)

settlements coinciding with the vertices of the hexagonal service area of the second order settlements (Figure 7.7). The settlements falling in the vertices of the service area polygon of the Kochi Corporation are GPS of Maradu, Eloor, Mulavukad and Nayarambalam.

Based on the criteria centrality, existing hierarchy, connectivity and administrative status

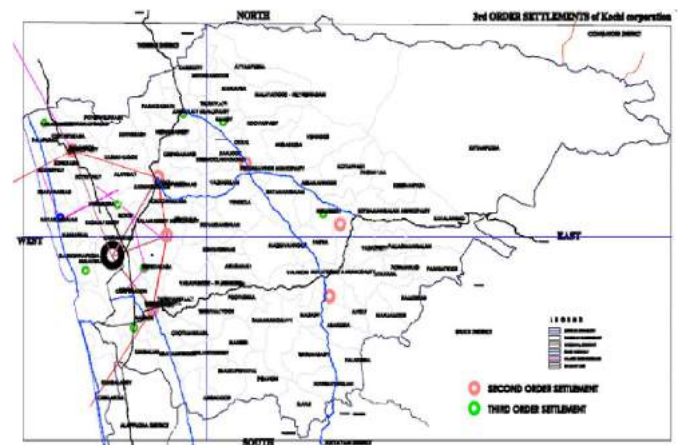


Fig 7.7 3rd order settlements of Kochi Corporation

instead of Nayarambalam, Njarakkal are adjusted as third order settlements of Kochi Corporation. These settlements can invariably be taken as the third order settlements of Kochi Corporation (Figure 7.8).

In the case of Kalamassery, a service area with almost hexagonal in shape is formed (Figure 7.9). Settlements lies in the vertices of service area hexagon of Kalamassery(M) are Poothrikka, Mazhuvannur, Vengola, Vazhakkulam, Eloor. Vengola and

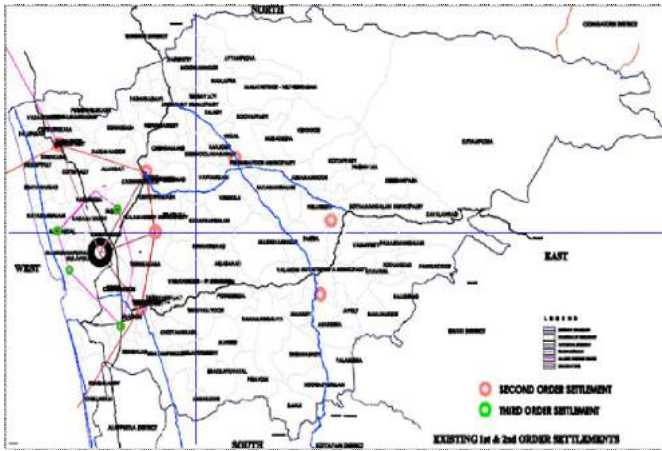


Fig 7.8 3rd order settlements of Kochi Corporation – adjusted

Mazhuvannoor are closely placed LSGs and hence instead of these two settlements, Kunnathunad in between these two is taken as the third order settlement. Based on the criteria of centrality, existing hierarchy, connectivity and administrative status instead of Poothrikka, Vadavukode-Puthenkurusu and instead of Vazhakulam, Keezhmad are adjusted as third order settlements. These settlements can invariably be taken as the third order settlements of Kalamassery Municipality (Figure 7.9).

Theoretically the service area of each of these third order settlements will be uniform and hexagonal

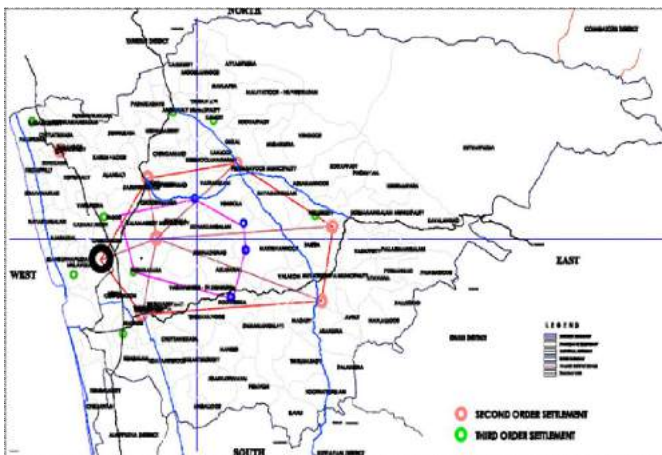


Fig 7.9 3rd order settlements of Kalamassery

in shape. The size of the hexagon defining the Service area of each third order settlements in different parts of the District is arrived at based on the population

density variation. As per Crystallor's theory the higher order settlements will function as the lower order settlements as well. And hence the service area of the higher order (settlements of first order settlements, the second settlements), when it function as the third order settlement also are to be delineated. The service area of these higher order settlements is also hexagonal in shape. The third order settlements (including the higher order settlement) and their service areas so delineated are shown in fig 7.10.

But from the figure 7.10, it is clear that some area within the District which is not served by a third order settlement. Some area of Kochi sub region, Vadavukode – Puthencruz regions are unserved by any

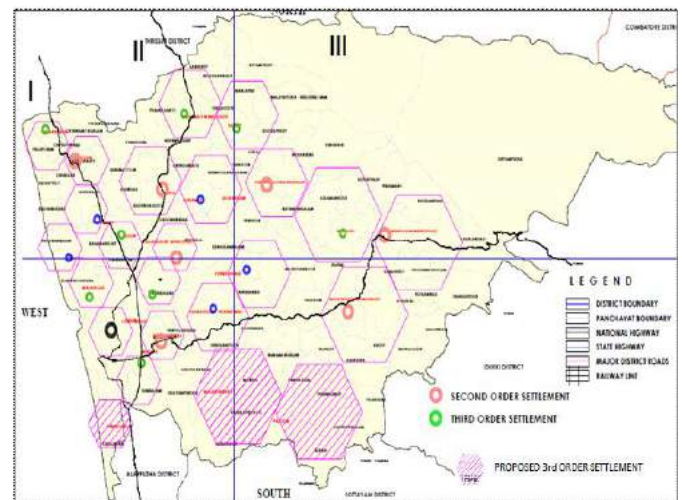


Fig 7.10 Service area of 3rd order settlements (adjusted)

of the third order settlements necessitating the identification of new third order settlements from these sub regions. Hence third order settlement from the missing area are proposed based on the criteria Centrality, Existing hierarchy, Connectivity, Administrative status and also based on the population density. Hence Kumbalangi is selected as 3rd order settlement in the Kochi sub region in the remaining area of the district; Mulamthuruthy and Piravom are proposed in Vadavukode – Puthencruz region. Hence Kumbalangi, Mulamthuruthy and Piravom are the three suggested third order settlements.

The third order settlements are:

- 1) Maradu
- 2) Kalady
- 3) Eloor
- 4) Vadakkekara
- 5) Nellikuzhy
- 6) Mulavukadu
- 7) Kumbalangy
- 8) Vadavukode-Puthencruz
- 9) Piravom
- 10) Mulanthuruthy
- 11) Njarakkal
- 12) Kunnathunadu
- 13) Varappuzha
- 14) Keezhmadu

In order to identify the service settlements, the polygons so formed are adjusted for the administrative boundary of the settlements close to the polygon. The service settlements of the third order settlements are shown in fig 7.11 and listed in *Annexe 13* and the same with the served population is shown table 7.2.

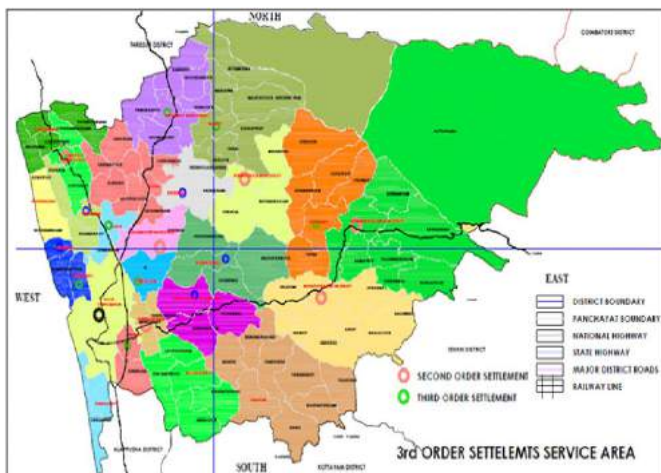


Fig 7.11 Service settlements of 3rd order settlements

Table 7.2 Service settlements of 3rd order settlements

Sl No	Settlement	Service area	2001_ppln	2021_ppln
1	Kochi Corporation	Kochi Corporation	595575	665019
2	Kothamangalam(M)	Kothamangalam(M)	37173	40370
		Keerampara	13132	14174
		Kavalangad	29015	32847
		Pallarimangalam	12784	15213
		Paingattoor	15121	16446
		Pothanikkad	11689	14464
		Varappetty	16702	19460
		Kuttampuzha	25110	30152
3	Kalamassery(M)	Kalamassery(M)	63176	81572
		Edathala	36098	48400
4	Muvattupuzha (M)	Muvattupuzha (M)	29246	32594
		Valakom	17747	19944
		Marady	14550	16370
		Arakkuzha	15233	15790
		Avoly	17891	21575
		Manjallor	15598	18312
		Kalloorkad	13082	13667
		Ayavana	19533	22470
5	Aluva (M)	Aluva (M)	24110	23199
		Choorikkara	28875	33796
		Karumallor	33451	40326
		Kadungalloor	37575	48351
		Kunnukara	22126	29791
		Alangad	36420	43420
		Chengamanad	28030	33342
6	Paravoor(M)	Paravoor(M)	30059	33429
		Kottuvally	38037	44565
		Chendamangalam	28147	30187
		Puthenvelikkara	27005	31192
7	Perumbavoor (M)	Perumbavoor (M)	26547	29651
		Mudakkuzha	16767	19058
		Vengola	42866	54863
		Rayamangalam	33903	39947
8	Thrippunithura (M)	Thrippunithura (M)	59884	74674
		Thiruvankulam	21717	27289
9	Thrikkakara	Thrikkakara	65984	92759
10	Angamaly (M)	Angamaly (M)	33409	38184
		Karukutty	26811	28623
		Mookkannoor	18638	23239
		Thuravoor	19587	22955
		Parakkadavu	29997	34246
		Nedumbassery	30361	35567
11	Maradu	Maradu	41012	52096
		Kumbalam	27549	32971

Sl No	Settlement	Service area	2001_ppln	2021_ppln
12	Kalady	Kalady	27021	30573
		Manjappa	15576	19938
		Okkal	22734	27299
		Kanjoor	21651	24909
		Ayyanpuzha	14902	12196
		Malayattoor-Neeleswaram	25163	28853
13	Eloor	Koovappady	33102	17487
		Eloor	35573	38788
14	Vadakkekara	Cheranellur	26316	33894
		Vadakkekara	32781	35545
		Chittattukara	28026	32636
		Pallipuram	43523	48736
15	Nellikuzhi	Kuzhupilly	12120	13276
		Nellikuzhi	35008	44439
		Assamannur	17947	20862
		Paipra	37929	47734
		Kottappady	17092	19926
		Vengoor	21633	23778
16	Mulavukad	Pindimana	15731	17208
		Mulavukad	22842	24063
17	Kumbalangy	Elamkunnappuzha	50583	56458
		Kumbalangy	26661	30415
18	Vadavukode-Puthencruz	Chellanam	36209	42125
		Vadavukode-Puthencruz	26710	29125
		Thiruvaniyoor	23613	27585
19	Piravom	Poothrika	19950	22505
		Piravom	27263	37419
		Ramamangalam	15021	16147
		Maneed	18458	22336
		Elanji	18995	21983
		Koothattukulam	17682	19734
		Thirumarady	17491	19164
		Pampakkuda	17324	18624
20	Mulanthuruthy	Palakkuzha	13469	14679
		Mulanthuruthy	23615	27151
		Edakkatuvayal	17635	19664
		Amballoor	23350	27134
		Chottanikkara	19168	24108
21	Njarakkal	Udayamperur	33523	40923
		Njarakkal	24166	26373
		Nayarambalam	23786	25373
22	Kunnathunadu	Edavanakkad	20624	22374
		Kunnathunadu	29822	36796
		Kizhakkambalam	31631	38128
		Aikkarana	19920	22993
23	Varapuzha	Mazhuvannur	32184	37746
		Varapuzha	24524	28028
		Kadamakkudy	15824	17783
24	Keezhmad	Ezhikkara	19026	22104
		Keezhmad	31656	39110
		Sreemoolanagaram	24600	29233
		Vazhakkulam	34277	44040

Table 7.3 Suggested hierarchy of settlements

Order of settlement	Sl. No.	Name of LSGI
I st order	1	Kochi Corporation
II nd order	1	Kothamangalam(M)
	2	Kalamassery(M)
	3	Muvattupuzha (M)
	4	Aluva (M)
	5	Paravoor(M)
	6	Perumbavoor (M)
	7	Thrippunithura (M)
	8	Angamaly (M)
	9	Thrikkakara
III rd order	1	Maradu
	2	Kalady
	3	Eloor
	4	Vadakkekara
	5	Nellikuzhi
	6	Mulavukad
	7	Kumbalangi
	8	Vadavucode-Puthencruz
	9	Piravom
	10	Mulanthuruthy
	11	Njarakkal
	12	Varapuzha
	13	Kunnathunadu
	14	Keezhmad
IV th order	1	Kumbalam
	2	Pallippuram
	3	Aikkarana
	4	Vengola
	5	Udayamperur
	6	Elamkunnappuzha
	7	Koovappady
	8	Keerampara
	9	Karukutty
	10	Vazhakkulam
	11	Kadamakkudy
	12	Edathala
	13	Kavalangad
	14	Rayamangalam
	15	Kadungalloor
	16	Kottuvally
	17	Chendamangalam
	18	Cheranallur
	19	Alangad
	20	Kalloorakkad

Order of settlement	Sl. No.	Name of LSGI
IV th order	21	Chottanikkara
	22	Kottappady
	23	Poothrikka
	24	Thiruvankulam
	25	Kanjoor
	26	Nedumbassery
V th order	1	Edakkattuvalayal
	2	Mazhuvannoor
	3	Thiruvaniyoor
	4	Ramamangalam
	5	Sreemoolanagaram
	6	Chellanam
	7	Avoly
	8	Manjalloor
	9	Kunnukara
	10	Chengamanad
	11	Amballur
	12	Ezhikkara
	13	Pambakkuda
	14	Paipra
	15	Malayattoor Neeleshwaram
	16	Kuzhuppilly
	17	Kizhakkambalam
	18	Valakom
	19	Karumalloor
	20	Nayarambalam
	21	Okkal
	22	Elanji
	23	Varappety
	24	Chittattukara
	25	Mudakkuzha
	26	Kuttampuzha
	27	Puthenvelikkara
	28	Thirumarady
	29	Pothanikkad

Order of settlement	Sl. No.	Name of LSGI
V th order	30	Palakkuzha
	31	Mookkannoor
	32	Vengoor
	33	Parakkadavu
	34	Arakkuzha
	35	Pallarimangalam
	36	Thuravoor
	37	Ayavana
	38	Marady
	39	Edavanakkad
	40	Asamannoor
	41	Choorinikkara
	42	Maneed
	43	Paingottur
	44	Pindimana
	45	Manjapra
	46	Ayyampuzha

The suggested hierarchies of settlements are shown in Table 7.3 and in Figure 7.12.

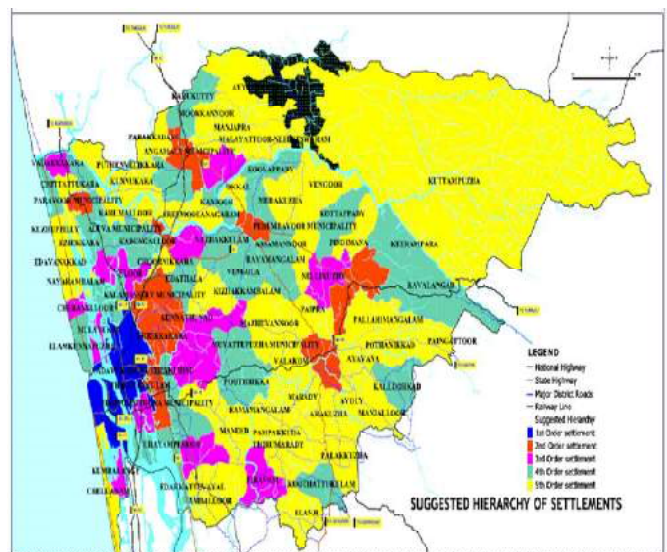


Fig 7.12 Suggested hierarchy of settlements

Table 7.4 Facilities in general to be provided

Order of settlement	SL NO	Name of Settlements	Projected Administrative status	Facilities
I st order	1	Kochi Corporation	Urban LSG	Higher order urban facilities
II nd order	1	Kothamangalam(M)	Urban LSG	Higher order rural facilities and middle order urban facilities
	2	Kalamassery(M)	Urban LSG	Higher order urban and rural facilities
	3	Muvattupuzha (M)	Urban LSG	Higher order rural facilities and middle order urban facilities
	4	Aluva (M)	Urban LSG	Higher order urban and rural facilities
	5	Paravoor(M)	Urban LSG	Higher order rural facilities and middle order urban facilities
	6	Perumbavoor (M)	Urban LSG	Higher order rural facilities and middle order urban facilities
	7	Thrippunithura (M)	Urban LSG	Higher order urban and rural facilities
	8	Angamaly (M)	Urban LSG	Higher order urban and rural facilities
	9	Thrikkakara	Urban LSG	Higher order urban and rural facilities
III rd order	1	Maradu	Urban LSG	Higher order rural facilities and middle order urban facilities
	2	Kalady	Rural LSG	Higher order rural facilities and middle order urban facilities
	3	Eloor	Urban LSG	Higher order rural facilities and middle order urban facilities
	4	Vadakkakara	Rural LSG	Middle order rural facilities and Lower order urban facilities
	5	Nellikuzhi	Rural LSG	Middle order rural facilities and Lower order urban facilities
	6	Mulavukad	Rural LSG	Middle order rural facilities and Lower order urban facilities
	7	Kumbalangi	Rural LSG	Middle order rural facilities and Lower order urban facilities
	8	Vadavucode-Puthencruz	Rural LSG	Middle order rural facilities and Lower order urban facilities
	9	Piravom	Rural LSG	Middle order rural facilities and Lower order urban facilities
	10	Mulanthuruthy	Rural LSG	Middle order rural facilities and Lower order urban facilities
	11	Njarakkal	Rural LSG	Middle order rural facilities and Lower order urban facilities
	12	Varapuzha	Rural LSG	Middle order rural facilities and Lower order urban facilities
	13	Kunnathunadu	Rural LSG	Middle order rural facilities and Lower order urban facilities
	14	Keezhmad	Rural LSG	Middle order rural facilities and Lower order urban facilities

7.4 FUNCTIONS (PROPOSED) TO BE PERFORMED BY VARIOUS HIGHER ORDER SETTLEMENTS

The functions to be performed by various higher order settlements are derived based on their order, administrative status, character of the settlements and the service area. The result is summarized in table 7.4.

7.5 INFERENCE

As per the suggested hierarchy of settlements, there is one first order settlement, 9 second order settlements and 14 third order settlements in the District. The character wise analysis of these higher order settlement shows that, the first order settlement, Kochi Corporation is urban in nature. Out of the nine second order settlements, Kalamassery (M), Muvattupuzha (M), Kothamangalam(M), Aluva(M), Perumbavur (M), Paravur (M), Thrippunithura (M) and Angamaly(M) are existing urban areas, Thrikkakara is proposed to attain urban character by 2011.

Chapter 8

URBAN PROFILE

In this chapter the trend of urbanization of Ernakulam District is assessed and is compared with the level of Urbanization of the State so as to ascertain the position of the District in the State scenario.

8.1 TREND OF URBANIZATION – KERALA

At the turn of the 20th century, Kerala had a population of 63.96 lakhs, of which 59.42 lakhs were in its rural areas as per Census 1901. This constituted 92.89 per cent of the total population of the state. At the end of the 20th century the total population in Kerala has increased to 3.18 crores (31838619) of which rural population is 2.35 crores. This means that the rural population constitutes about 74% of the total population in 2001. The population figures of the State as per census 2001 are shown in the Table 8.1.

Table 8.1 Population (2001) of Kerala at a glance

	Persons	Male	Female	Growth rate
Total	31838619	15468664	16369955	9.42
Rural	23571484	11450785	12120699	10.05
Urban	8267135	4017879	4249256	7.64

There is an increase of about 400% in the total population of Kerala within a century. During this period rural population has increased by 300 %. Rural population content in Kerala has declined from 92.89% to

Table 8.2 Trend of population growth of Kerala - 1981-2001

Year	Total Population	Growth rate of total population	Growth rate of Urban population
1981	25453680	19.24%	37.64%
1991	29098518	14.32%	60.97%
2001	31838619	9.42%	7.64%

74% of the total population within a century. This is an indication on the trend of urbanization in Kerala that has happened in a century. The population figures of the immediate past, i.e. last three decades are analyzed here (see table 8.2).

There is a steady decline in the population growth rate over the last three decades. Population growth rate was 19.24% in 1981 and it reduced to 9.42%

Table 8.3 Trends in urbanization of Kerala - 1981-2001

Year	Population	Urban	Percentage of	Growth rate of total population	Growth rate in urban
		Population	Urban Population		
1981	25453680	4771275	18.74	19.24	37.64
1991	29098518	7680294	26.39	14.32	60.97
2001	31838619	8267135	25.97	9.42	7.64

in 2001. During the period 1981-91 population of 36.45 lakhs were added to the previous decades population, whereas during the period 1991-2001, population of

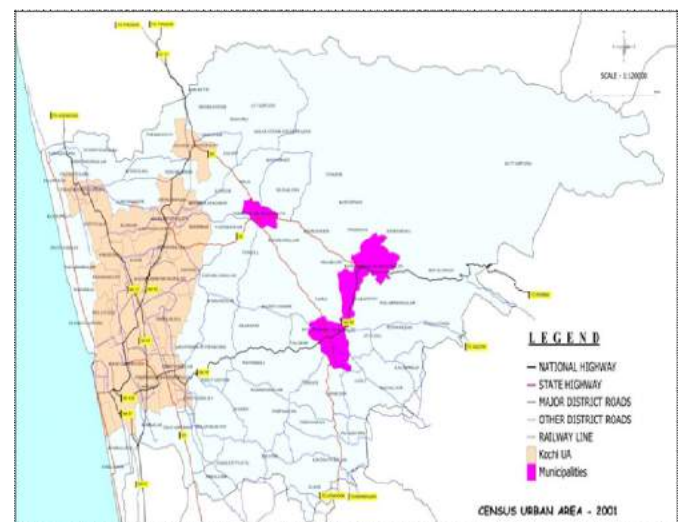


Fig 8.1 Urban areas of Ernakulam District

Table 8.4 Census Towns & Out growths in Ernakulam District – 2001

Sl. No.	Name of Census Town	Name of Grama Panchayat/Municipal council & Wards
1	Kedamangalam CT	Ezhikkara I (Part), II, III, IX (Part) X (P)
		Chittattukara IV, V, VI, VII, VIII, IX
2	Chowwara CT	Sreemoolanagaram I, II, III, IV, V, X(P) XI , XII
3	Cheriyakadavu OG	Chellanam I,II,III,IV(P)
4	Alangad OG	Alangad I to XVI
		Kadungalloor I,II(P), III(P),X(P)
5	Kakkanad OG	Thrikkakkara IV(P), V, VI, VII,VIII IX(P), X(P), XI(P),XII
6	Vazhakkala CT	Thrikkakkara I(P), II, III,IV(P) ,IX(P), X(P), XI(P), XIII to XX
7	Edathala CT	Edathala I to XV
		Keezhmadu I to XV
8	Choornikkara CT	Choornikkara I To XIV
		Kadungalloor III(P), IV(P)
		Karumalloor VIII(P) IX,X(P),XII(P)
9	Chengamanad CT	Chengamanad I To XIV
		Nedumbassery XI(P),XIV(P)
10	Kottuvally CT	Kottuvally 1 to XVII
11	Varappuzha CT	Varappuzha I to XIII
12	Eloor CT	Eloor I to V, VI(P) VII(P) X to XVII
13	Kadungalloor CT	Kadungalloor II(P), III(P), IV(P), V to IX , X(P), XI to XVI, IX
		Eloor VI(P), VII(P),VIII
14	Mulavukad CT	Mulavukad I to XII
15	Kadamakkudy CT	Kadamakkudy 1 to X
16	Cheranallor CT	Cheranallor 1 to XII
17	Maradu CT	Maradu 1 to XVII
18	Kureekkad CT	Chottanikkara I, II, III(P), VIII, IX, X
19	Thiruvamkulam CT	Thiruvamkulam I to XI
20	Kochi Corporation	
21	Aluva Municipality	
22	Angamaly Municipality	
23	Kalamassery Municipality	
24	Paravur Municipality	
25	Thripunithura Municipality	
26	Perumbavur Municipality	
27	Kothamangalam Municipality	

Source: Census of India

only 27.4 lakhs were added within. The growth rate of urban population of Kerala over the last three decades shows that it is in a transition phase. Over the last two decades (1971-81 and 1981-91) growth rate in urban population was on the rise, 37.64% in 1981 and 60.97% in 1991 (see table 8.3).

But the urban population growth rate has drastically declined to 7.64% in 2001 with a decrease of 87.5% over the preceding decadal urban population growth rate. At the same time the growth rate in total population has decreased from 14.32 % to 9.42% only with a decrease rate of 34.2%. This indicates that over the last three decades there is spread effect of population into the rural area. This is an indication to the planners to take the planning of rural areas seriously than before and subsequently address the reasons for the spread effect of population to rural areas.

8.2 CENSUS URBAN AREAS IN ERNAKULAM DISTRICT

As per the 2001 census, the population of Ernakulam District is 3,105,798, which constitutes about 9.75 % of the total population of the State. Urban expansion during the last few decades out grew the limits of Kochi city of the Ernakulam district. Kochi is the largest agglomeration, having the population above 1 million (1355972) in the state. An urban Agglomeration is a continuous urban spread consisting of a Town and its adjoining Urban out growths (OGs) or two or more physically contiguous Towns together and any adjoining Urban Out – Growths of such Towns.

Out of the total population of Ernakulam district, 1,477,085 is urban population comprises of 27 urban areas in the district. That is 47.56% of the total population of the District is in the census urban areas of the District. Kochi UA comprises 25 out of these 27 urban areas other than Kothamangalam Municipality and Perumbavur Municipality. The census urban areas including Kochi UA of Ernakulam District are shown in the figure 8.1. The details of census towns, outgrowths and statutory urban areas of the district are also given in table 8.4.

8.3 URBAN POPULATION CONTENT (EXISTING)

The process of urbanization of an area can be assessed in relation to its urban population content. The urban population content of Kerala state is 26%, whereas that of the District is 47.56% .On comparing the urban content of all the 14 District of the State, it can be seen from the table 8.5 that Ernakulam District is positioned in the 2nd rank. This shows the high level of urbanization in Ernakulam District.

Table 8.5 District wise percentage of urban population in Kerala

District	Population 2001				Urban Content Rank 2001
	Urban	Rural	Total	% Urban	
Kannur	1212898	1196058	2408956	50.3	1
Ernakulam	1477085	1628713	3105798	47.6	2
Kozhikode	1101157	1777974	2879131	38.2	3
Thiruvananthapuram	1091661	2142695	3234356	33.8	4
Alappuzha	621457	1487703	2109160	29.5	5
Thrissur	839433	2134799	2974232	28.2	6
Kasargod	233700	970378	1204078	19.4	7
Kollam	465978	2119230	2585208	18	8
Kottayam	299808	1653838	1953646	15.3	9
Palakkad	356575	2260907	2617482	13.6	10
Pathanamthitta	123798	1110218	1234016	10	11
Malappuram	356170	3269301	3625471	9.8	12
Idukki	57593	1071628	1129221	5.1	13
Wayanad	29612	751007	780619	3.8	14

Source: Census of India

Table 8.6 shows the decadal variation in the urban content of Ernakulam District. Urban content of the population has increased from 29.39% to 47.56%

Table 8.6 Ernakulam District - variation in urban content 1991-2001

Year	Total population	Urban Population	Percent of Urban Population	Urban area in sq.km
1971	2383178	636010	26.69	217.9
1981	2535294	1002892	39.56	377.6
1991	2817236	1373177	48.74	544.1
2001	3105798	1477085	47.56	530.3

Source: Census of India

over a period of 4 decades. It is to be noted that the variation during the decades is not uniform.

Ernakulam district has got maximum urban area than the other districts of the state. The urban population of the district is 6.36 lakhs as per 1971 census. It was increased to 13.73 lakhs in 1991 census and 14.77 lakhs in 2001 census. The urban population is increasing continuously and reached 48.74% during 1991 census. During the period 1991-2001 a slight decrease in urban population is noticed i.e., from 48.74% to 47.56%. This was mainly due to the declassification of towns in 2001 census, e.g. Piravam, Koothattukulam and Eloor.

The increase in urban areas of the District as indicated in the corresponding years census figures is shown in the fig 8.2. In 1971 the extent of urban area in Ernakulam District was 217.90 sqkm, which was increased to 544.21 sq km in 1991. Even though the urban area in the district is continuously varying in each census period, the increase of urban area of the district was almost uniform from 1971 to 1991. During the period 1991-2001 a slight decrease in urban area is

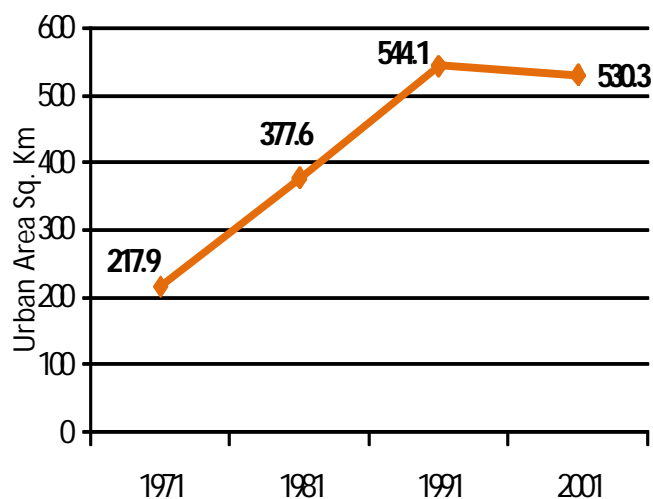


Fig 8.2 Extent of urban area of the District – Temporal variation

noticed i.e., from 544.1 to 530.3 Sq.km. This was mainly due to the declassification of towns during the period as rural areas.

It can be summarized that urban population has increased by 132% against an increment of 143% in the

extent of urban area. This indicates that there is increase in the population in the existing urban areas rather than the additional population of the newly annexed urban areas until 1991. But after that (1991-2001) there is decrease in the urban content of the population as well as in the urban area. This is an indication of the deprivation of the population from the existing urban areas.

8.4 GROWTH RATE OF URBAN POPULATION

The graph (see fig 8.3) shows the decadal variation in the urban population of Ernakulam District from 1971 to 2001. The total urban population of the District has increased from 636010 to 1477085 in a period of four decades. The variation during this period was

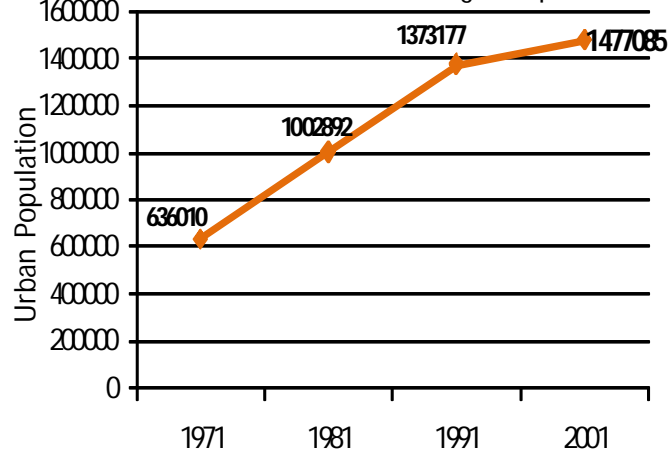


Fig 8.3 Total urban population during various decades

not uniform. A steady increase in the urban population is observed from 1971 to 1991, but during the period from 1991 to 2001 there is comparatively less increase in the urban population.

As per 1981 census the rural area of the district was 2030.40sq.km and urban area was 377.60sq.km and the area of the district was 2408 sq.km. But as per 1991 census the rural area of the district was 1862.79sq.km and thus was an increase in urban area, which was 544.21sq.km. But as per 2001 census the area of the district changed to 2950 sq.km which was due to the inclusion of Kuttampuzha panchayat from Idukki district to Ernakulam district. Koovappady panchayat was also bifurcated resulting the formation of Okkal and Koovappady panchayat. As per 1991 census Piravom and

Koothattukulam were classified as Municipality having an area of 29.36sq.km and 23.18sq.km. These two municipalities were classified as panchayats during 2001 census. Thus the total number of panchayats increased to 88 in the district. There is an increase in rural area and decline in urban area as per 2001 census.

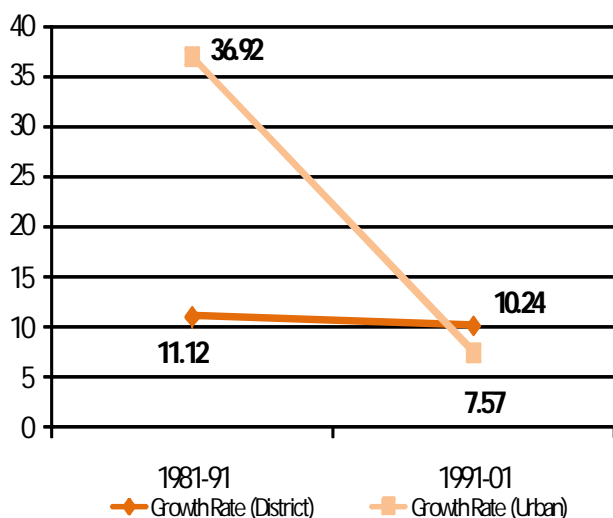


Fig 8.4 Population Growth Rate- Comparison with District

The graph (see fig 8.4) shown below depicts the growth rate of urban population against the growth rate of population over the last two decades in the District. When the population growth rate of the District has declined from 11.12 to 10.24, the urban population growth rate has drastically declined from 36.92 to 7.57 during the same time period (1981 to 2001). Declassification of some of the urban settlements of 1991 and the resultant reduction in urban areas is a major factor leading to this situation.

This is a pattern of urban growth contrary to the popular belief that there is in migration of people in to the urban area. This is not an isolated case of Ernakulam District. The growth of urban population of the State also shows the same pattern of shrinking of urban population growth rate figures during 1981 to 2001.

Table 8.7 compares the growth rate of urban population of the State and the District. This shows that there is a huge decline in the growth rate of urban population of Kerala; also a decline is seen here in

Ernakulam during 1981-2001 as bifurcation affected the district urban population.

Table 8.7 Growth rate of urban population – Comparison with state

	1981 - 91	1991 - 01
Kerala	60.89	7.69
Ernakulam	36.92	7.57

Figure 8.5 depicts the population growth rate of various LSGs of Ernakulam district in the decade 1991-2001. It is clear from the picture that the growth rate of population of the urban area of Ernakulam district (Kochi Corporation, Aluva (M), Perumbavur(M), Angamaly (M), Paravur (M), Muvattupuzha(M and Kothamangalam(M)) is less than that of the surrounding Panchayats because of out migration of people from the urban area to the rural areas or settling of in migrants to the urban area in the peripheral grama panchayats due to various social and economic reasons. Only two urban local governments viz. Kalamassery (M) & Thrippunithura (M) shows higher growth rate, they being situated contiguous to Kochi Corporation.

Taluk wise urban population is shown in table 8.8. The table shows that 44.32 % of the total urban population of the Ernakulam District is concentrated in Kanayannur Taluk. The Kanayannur Taluk has 82.85%

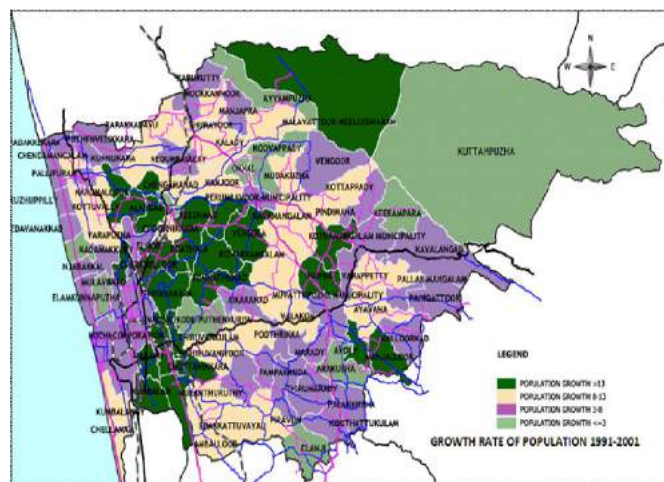


Fig 8.5 Growth rate of population (1991-2001) - Local government wise variation

Table 8.8 Population Details Taluk wise Year – 2001

Sl. No	Name of Taluk	Area	Urban area	Name of urban area	% total area	% to total urban area	Total population	Urban population	% of urban population	% to total Urban population
1	Kunnathunad	658.5	13.61	Perumbavoor(M)	21.5	2.56	433606	26547	6.12	1.8
2	Aluva	341.8	110.6	Angamali(M), Aluva(M), Chengamanad (CT), Chowwara(CT), Choorikkara(CT), Edathala(CT)	11.1	20.86	444607	205677	46.26	13.92
3	Paravur	191.4	104.8	Paravur(M), Kottuvally(CT), Varappuzha(CT) Eloor(CT), Kadungalloor(CT), Chendamangalam(CT) Kedamangalam(OG), Alangad(OG)	6.23	19.77	382628	248540	64.96	16.83
4	Kochi	142.6	45.47	Kochi (C) Part, Cheriya Kadavu (OG)	4.64	8.59	504550	275225	54.55	18.63
5	Kanayannoor	331.7	202.5	Kochi (C) Part, Kalamassery(M), Thripunithura (M) Mulavukad (CT), Kadamakkudy(CT), Cheranallloor(CT) Maradu(CT), Thiruvamkulam(CT), Kureekkad(CT) Vazhakkala(CT), Kakkanad(OG)	10.8	38.19	790212	654677	82.85	44.32
6	Moovattupuzha	430.8	13.18	Moovattupuzha (M)	14	2.48	324644	29246	9.01	1.98
7	Kothamangalam	736.8	40.04	Kothamangalam(M)	24	7.55	225551	37173	16.48	2.52

of its total population as Urban population. The urban area in Kanayannur Taluk constitutes about 38.19 % of the total urban area of Ernakulam District making this Taluk the most urbanized Taluk of Ernakulam District. Kunnathunadu and Muvattupuzha are the least urbanized Taluks in the District.

8.5 URBAN SETTLEMENTS – FROM 1971 TO 2001

The number of urban settlements of the district was increasing from 1971 to 1991 (see table 8.9). Among the districts maximum number of statutory towns is in

Ernakulam. In 2001 census three municipalities viz. Koothattukulam, Piravom and Eloor of 1991 census

Table 8.9 Urban settlements in different period of time

Year	Total number of urban centres	Municipal Corporation	Municipalities	Non municipal towns (Census Towns)	Out Growth	Urban Area (sqkm)
1971	12	1	4	7	0	217.9
1981	16	1	7	8	1	377.6
1991	28	1	11	16	1	544.21
2001	25	1	8	16	4	530.3

were declassified and hence the number of statutory towns reduced to 9 from 12, thus there is decrease in the total number of urban settlements as well as urban area of district compared to the previous decade.

8.6 FUTURE URBANIZATION PROFILE OF THE DISTRICT

The analysis of the occupational structure of the District shows that the agriculture sector shows a declining trend in the district. The sector, which shows growth, is the service sector, industrial sectors and tertiary sectors. Ernakulam is ranking first in per capita income due to production specialization in industrial activities and port induced service sector development. It is observed that rural area of the district is also slowly withdrawing from the primary sector and started depending more on the service sector. Because of this shift in the occupational structure some of the rural areas will be having more than 75% of the male workers in the non-agricultural category in the near future and hence will fall in the category of census urban. Hence there may be significant increase in the urban population well as in the extent of urban areas of the District in the future, though the urban population content of the existing urban areas shows a decreasing trend. Urbanisation with accelerated industrialization in selected settlement of Kerala needs special attention in spatio economic planning. In the following paragraphs, the future urban centres are delineated based on the three fold census classification as per census 2001, and the result are further iterated with the factors like impact of proposed urban development projects, grade of the LSGs and hierarchy of settlements.

Criteria-1: Census urban areas

A study on the existing occupational structure in various settlements of the District will put light on those settlements likely to become census urban shortly. The workers of each settlement which are classified in to four fold classification as per census 2001

are divided in to the following nine categories based on the workers classification in the 1991 census.

1. Main Cultivators
2. Main Agricultural Labourers
3. Livestock, Forestry, Fishing, Hunting, Plantation, Orchards, and allied activities
4. Mining and Quarrying
5. Manufacturing, Processing, Servicing and repairs in Household industries
6. Manufacturing, Processing, servicing and repairs in other than household industries
7. Trade and commerce
8. Transport storage and Communications
9. Others

The methodology adopted for the extrapolation to get the nine fold classification of workers in 2001 based on the workers classification in census 1991 is described briefly here. The only two types of workers included in both 1991 and 2001 census are the cultivators and agricultural labourers. The remaining two types of workers in the 2001 census, House hold industrial workers and other workers are totaled together and this total is divided in to 7 classes of workers in the same proportion as these 7 classes of workers as there in the 1991 census. Then the number of male workers in manufacturing, processing, servicing and repairs in House hold industries, manufacturing, processing, servicing and repairs in other than house hold industries, trade & commerce, transport, storage & communication and others are totaled to calculate the percentage of male workers in non-agricultural activities in each of the LSGs of the District. The details are shown in *Annexe 15*. By the extrapolation of the data on classification of workers based on 1991 census, the local governments with non-agricultural male workers more than 80% instead of 75% is taken for the study. Based on this there are 43 LSGs excluding Corporation and 8 municipalities identifies in this district which are satisfying the 3 fold criteria to be termed as urban. The list of which is given below and the spatial location of these LSGs is shown in fig 8.6.

1 Alangad	16 Puthenvelikkara	31 Karumalloor
2 Kadungallur	17 Chendamangalam	32 Kanjoor
3 Eloor	18 Chittattukara	33 Karukutty
4 Varapuzha	19 Kottuvally	34 Sreemoolanagaram
5 Kalady	20 Vadakkekara	35 Thuravoor
6 Cheranallur	21 Vadavucode-Puthenkurisu	36 Okkal
7 Kadamakkudy	22 Choomnikkara	37 Amballoor
8 Thrikkakara	23 Edathala	38 Chellanam
9 Chottanikkara	24 Keezhmad	39 Ezhikkara
10 Mulanthuruthy	25 Edavanakkadu	40 Vazhakkulam
11 Thiruvankulam	26 Elamkunnappuzha	41 Kuzhuppilly
12 Udayamperur	27 Njarakkal	42 Nayaramabalam
13 Kumbalangy	28 Mulavukadu	43 Pallipuram
14 Chengamanad	29 Kumbalam	
15 Nedumbassery	30 Maradu	

The classification of an area into urban depending upon 9 fold classification of workers obtained out of a mere extrapolation of the census 2001 data based on the previous decades data can't be taken as very accurate. Though it gives a near accurate picture about the trend of urbanization, some other factors like the extent of physical and economic development, future urban development projects and existing hierarchy of settlements need to be considered.

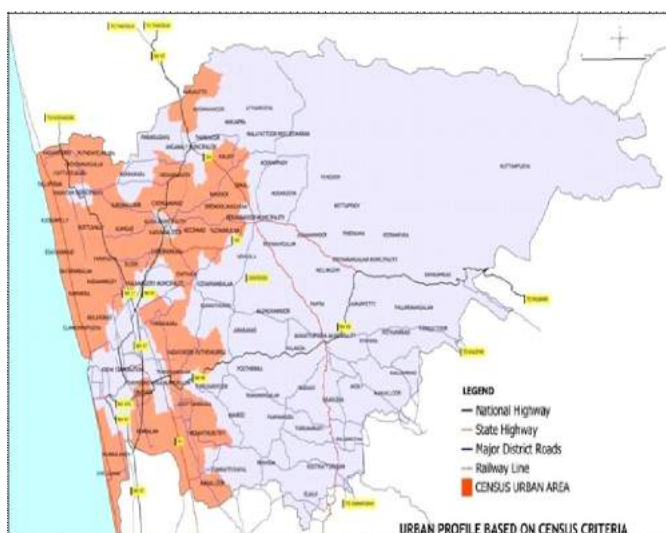


Fig 8.6 Urban Centers based on 3 fold Census Criteria

Criteria-2: Grade of LSGs

The grading of LSGs is done previously comparing their physical and economical development. So, in the absence of direct data to assess the physical and economic development, the grade of Panchayat

so fixed earlier can be taken as a proxy indicator to measure the physical and economic development of the area.

Out of the above 43 panchayats listed based on criteria I, 31 were Special grade Panchayats and 9 were first grade Panchayats. Among these 9 first grade panchayats, Chengamanad, Kottuvally and Edathala panchayats were declared as census towns in 2001 and are part of Kochi UA and Kumbalangy is contiguous to Kochi corporation. So these LSGs can be included in this list. So we get 35 LSGs after exclusion.

1 Alangad (spl)	13 Kumbalangy (spl)	25 Njarakkal (spl)
2 Kadungallur (spl)	14 Chengamanad (1st)	26 Mulavukadu (spl)
3 Eloor (spl)	15 Nedumbassery (spl)	27 Maradu (spl)
4 Varapuzha (spl)	16 Puthenvelikkara (spl)	28 Karumalloor (spl)
5 Kalady (spl)	17 Chendamangalam (spl)	29 Okkal (spl)
6 Cheranallur (spl)	18 Kottuvally (1st)	30 Amballoor (spl)
7 Kadamakkudy (spl)	19 Vadakkekara (spl)	31 Chellanam (spl)
8 Thrikkakara (spl)	20 Vadavucode-Puthenkurisu (spl)	32 Kuzhuppilly (spl)
9 Chottanikkara (spl)	21 Choomnikkara (spl)	33 Nayaramabalam (spl)
10 Mulanthuruthy (spl)	22 Edathala (1st)	34 Pallipuram (spl)
11 Thiruvankulam (spl)	23 Keezhmad (spl)	35 Kumbalam (1st)
12 Udayamperur (spl)	24 Elamkunnappuzha (spl)	

Figure 8.7, shows the spatial location of these 35 LSGs. Before finalizing the future urban profile of the District, the Urban Development Projects of the District and their possible impacts are also to be studied.

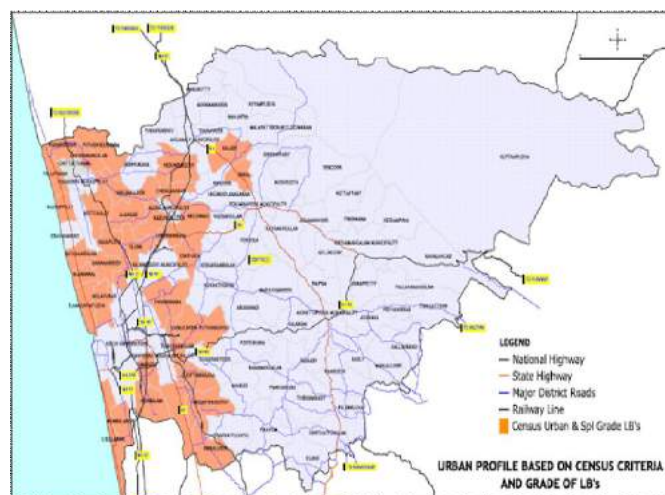


Fig 8.7 Urban Centers Based on Census Criteria & Grade of LSGs

Criteria-3: Perspectives in urban development

Perspectives in Urban Development of the district assess the major urban development projects in the district. On analysing the urbanisation trends and ongoing development projects, it is found that, immediate neighbouring LSGs of Corporation of Kochi have the maximum potential for urban development. Maradu, Thripoonithura, Thiruvankulam, Thrikkakara, Kalamassery, Mulavukad, Elamkunnappuzha, Varappuzha, Kadamakkudy, Edathala, Choornikkara, Keezhmadu, Eloor, Cheranellur, Sreemoolanagaram, Paravoor and Angamaly dominate in the growth potential. Thrikkakara Grama panchayat, the District Head quarter, is divided as Kakkanad OG and Vazhakkala CT. It is an urban outgrowth with vast potential for development. It is the center of IT and ITES development. Mulavukad is an island panchayat closer to the city by the new Vypin Bridge. Goshree' project, which is now a reality, will mark a sea change in all fields of life including solving unemployment problem to a great extent. Inter National Container Transshipment Terminal, Vallarpadam is proposed here. Kadamakkudy is also an island panchayat forming part of UA 2001 and is geographically contiguous to the city. The International Stadium at Kaloor, International Convention Center (Gulfar) at Maradu and innumerable commercial developments in the city have a large impact on the urbanization of the district. Chengammanad panchayat is near to Nedumbassery International Airport. Construction work of International Golf Course is also progressing near to International Airport.

The announced major projects like Smart City, Metro Rail, International Bunkering Terminal, International Ship Repairing Complex, Crude Oil Storage facilities, International Cruise Terminal, Port based Special Economic Zone, Expansion of existing chemical plant, Expansion of aluminum extrusion plant for Kochi International Airport Ltd, Biotechnology Zone, SEZ for Electronics, Industrial Trade and

Exhibition Centre, Academic Zone, Residential and Commercial Developments, IT Township at Info Park, Reclamation for stream lining of flow in the Port channel for reducing Siltation and for future development works, Capital dredging of navigational channels, Petrochemical complex, Water Sports and Tourism related operations of Tourist Vessels, and Tourist Submarines at Kochi will further accelerate urbanization. Major portion of the Smartcity area is in Kunnathunadu panchayat, contiguous to the Thrikkakara panchayat. Doubling of Ernakulam-Kottayam and Ernakulam-Alappuzha Rail Lines, Sabary Railway Line starting from Angamaly are the major other projects proposed. Kumbalangi, lies contiguous to the city, though it does not form part of UA. It has a great potential for tourism and is already developing and lies between the Corporation and the District boundary. Also Kochi is the head quarters of Southern Naval Command. It is to be noted that Kunnathunadu Panchayat (others have already been included in the list) is not included in the list of the probable urban local governments of the District. The smart city in Kunnathunadu panchayat is coming upon a 300-acre land with world class and integrated facility for high technology businesses. The project is expected to generate 90,000 employments in 10yrs. So this Panchayat needs to be considered while listing the future urban centres. After the inclusion of this Grama

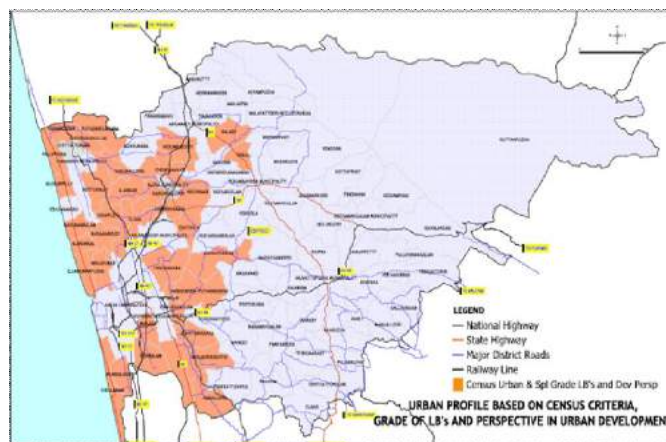


Fig 8.8 Urban Centers Based on Census Criteria, Grade of LSGs & Perspectives in Urban Development

Panchayat, the number of LSGs in the select list is increased to 36 as listed below and also shown in Fig 8.8.

1 Alangad	13 Kumbalangi	25 Njarakkal
2 Kadungallur	14 Chengamanad	26 Mulavukadu
3 Eloor	15 Nedumbassery	27 Maradu
4 Varapuzha	16 Puthenvelikkara	28 Karumalloor
5 Kalady	17 Chendamangalam	29 Okkal
6 Cheranallur	18 Kottuvally	30 Amballoor
7 Kadamakkudy	19 Vadakkekara	31 Chellanam
8 Thrikkakara	20 Vadavucode-Puthenkurisu	32 Kuzhuppilly
9 Chottanikkara	21 Choomnikkara	33 Nayaramabalam
10 Mulanthuruthy	22 Edathala	34 Pallipuram
11 Thiruvankulam	23 Keezhmad	35 Kumbalam
12 Udayamperur	24 Elamkunnappuzha	36 Kunnathunad

Criteria- 4: Existing & Proposed Hierarchy of settlements

The hierarchies of these shortlisted LSGs in the overall context of the District are also to be taken in to account before finalizing the future urban profile, because the hierarchy of settlement is an indicator on the type and number of facilities existing. *Annexe 9* shows the hierarchy of the settlements and according to this out of the 36 LSGs listed above the following are in the category of LSGs having the lowest hierarchy.

1 Puthenvelikkara	5 Chellanam
2 Karumalloor	6 Kuzhuppilly
3 Okkal	7 Nayaramabalam
4 Amballoor	

These LSGs are excluded from the list and Nellikuzhy found to be existing 3rd order settlement is included in the list. Hence a final list of 30 LSGs, which have potential to get urbanized in the near future is arrived at and is given here under. These LSGs are also shown spatially located in fig 8.9.

Clearly the above LSGs and existing urban centres define the future urban profile of the District. The likely future urban profile of the district evolved is

shown in the table 8.10 and the same is shown in fig 8.10.

1 Alangad	16 Chendamangalam
2 Kadungallur	17 Kottuvally
3 Eloor	18 Vadakkekara
4 Varapuzha	19 Vadavucode-Puthenkurisu
5 Kalady	20 Choomnikkara
6 Cheranallur	21 Edathala
7 Kadamakkudy	22 Elamkunnappuzha
8 Thrikkakara	23 Njarakkal
9 Chottanikkara	24 Mulavukadu
10 Mulanthuruthy	25 Maradu
11 Thiruvankulam	26 Keezhmad
12 Udayamperur	27 Pallipuram
13 Kumbalangi	28 Kumbalam
14 Chengamanad	29 Kunnathunad
15 Nedumbassery	30 Nellikuzhy

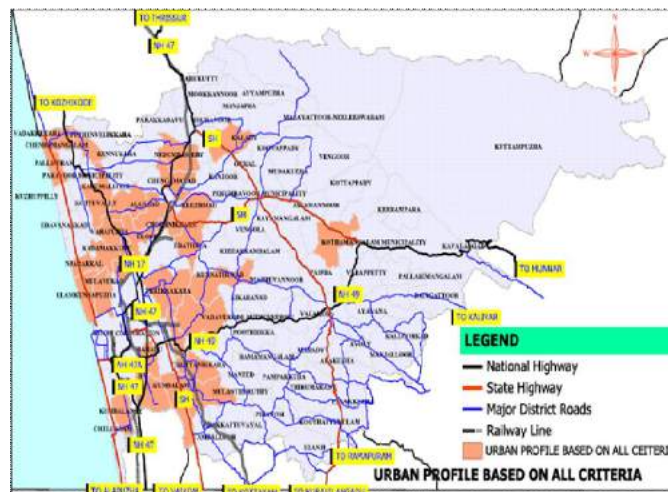


Fig 8.9 Urban Centers based on all criteria

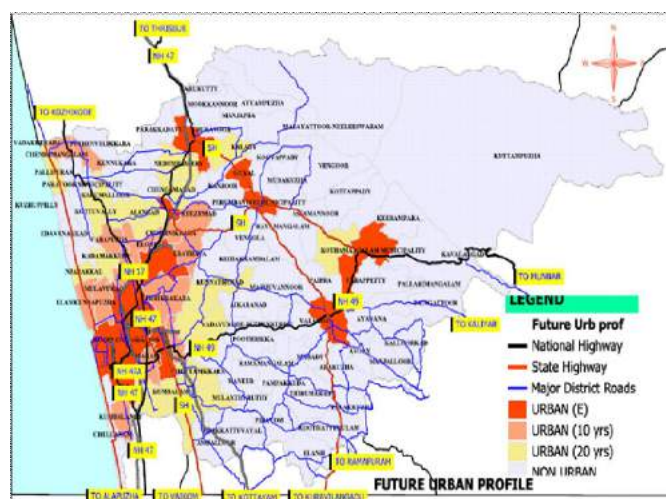


Fig.8.10 Future urban profile of the District

Table 8.10 Future urban profile of the District

Sl.No	Existing Urban areas	Future Urban areas
1	Kochi Corporation	Alangad
2	Aluva Municipality	Kadungallur
3	Angamaly Municipality	Eloor
4	Kalamassery Municipality	Varapuzha
5	Perumbavur Municipality	Kalady
6	Mbovattupuzha Municipality	Cheranallur
7	Kothamangalam Municipality	Kadamakkudy
8	Paravur Municipality	Thrikkakara
9	Thrippunithura Municipality	Chottanikkara
10		Mulanthuruthy
11		Thiruvankulam
12		Udayamperur
13		Kumbalangy
14		Chengamanad
15		Nedumbassery
16		Chendamangalam
17		Kottuvally
18		Vadakkekara
19		Vadavucode-Puthenkurisu
20		Choomnikkara
21		Edathala
22		Elamkunnappuzha
23		Njarakkal
24		Mulavukadu
25		Maradu
26		Keezhmad
27		Pallipuram
28		Kumbalam
29		Kunnathunad
30		Nellikuzhy

8.7 URBAN PROFILE

All the 30 LSGs listed as probable future urban LSGs can't be expected to attain the urban character in next decade, but only some of these will attain urban character by the next decade and the remaining will attain the urban character in the succeeding decades after that. The growth rate of population can be taken

as deciding criteria by how fast an LSG attains urban nature.

The pattern of growth rate of population among the LSGs of the District as per census 2001 shows that the growth rate is the highest among those LSGs adjacent to the Kochi Corporation (refer Chapter 3). And hence it can be presumed that LSGs adjacent to the Kochi Corporation and those along the National high way can be assumed to attain the urban status in the next 10 years and the remaining LSGs to become urban within the next 20 years. In the study of the hierarchy of settlements (refer Chapter 7) Thrikkakara, Maradu and Eloor is positioned next to Kochi corporation and these LSGs have been declared as Municipalities recently. Also Thiruvankulam panchayat merged with Thrippunithura (M). So these changes in status have to be incorporated. It can be assumed that Choomnikkara, Mulavukad, Cheranelloor, Edathala, Keezhmadu, Chendamangalam, Kumbalangy and Elamkunnappuzha will attain the status of urban LSGs in the next 10 years where as all the other 16 LSGs will attain the urban status within the next 20 years. This phasing is shown in Table 8.11 and the same is shown in fig 8.11.

Table 8.11 Urban profile – Phasing

Sl. No.	Existing Urban Centres	Urban centres in the next 10 yrs	Urban centers in the next 20 yrs
1	Angamali (M)	Eloor (M)	Alangad
2	Aluva (M)	Maradu (M)	Kadungallur
3	North Paravoor (M)	Thrikkakara (M)	Kalady
4	Perumbavoor (M)	Varapuzha	Kadamakkudy
5	Kalamassery (M)	Cheranallur	Chottanikkara
6	Thrippunithura (M)	Thiruvankulam	Mulanthuruthy
7	Muvattupuzha (M)	Kumbalangy	Udayamperur
8	Kothamangalam (M)	Chendamangalam	Chengamanad
9	Kochi Corporation	Vadakkekara	Nedumbassery
10		Choomnikkara	Kottuvally
11		Edathala	Vadavucode-Puthenkurisu
12		Elamkunnappuzha	Njarakkal
13		Mulavukadu	Pallipuram
14		Keezhmadu	Kumbalam
15			Kunnathunadu
16			Nellikuzhy

8.8 INFERENCE

Ernakulam District is more urbanized when compared to the State. However the level of urbanization shows an inclining trend within the District. It is projected that there will be 39 urban LSGs by 2021, in place of the present 9 urban LSGs. This increase in the number of urban LSGs is because of the change in the occupational

structure. The Spatial distribution of the 30 LSGs shows that some of these are coastal LSGs and all of them are located along the National Highway. The Kochi Corporation acts as a nucleus of the urbanization of the District, from where the urban character spreads to the nearby LSGs. The Kochi Corporation and surrounding LSGs form an urban agglomeration.

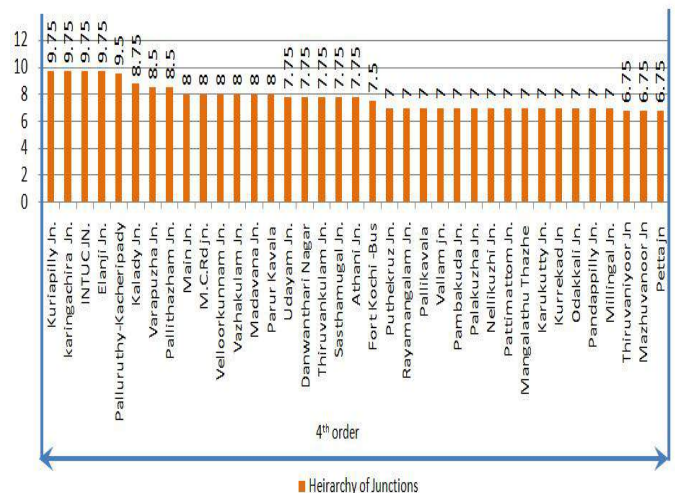
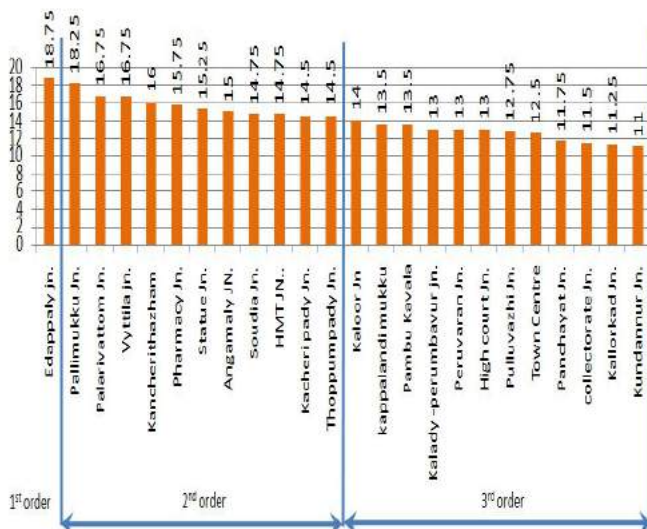
Chapter 9

NODES

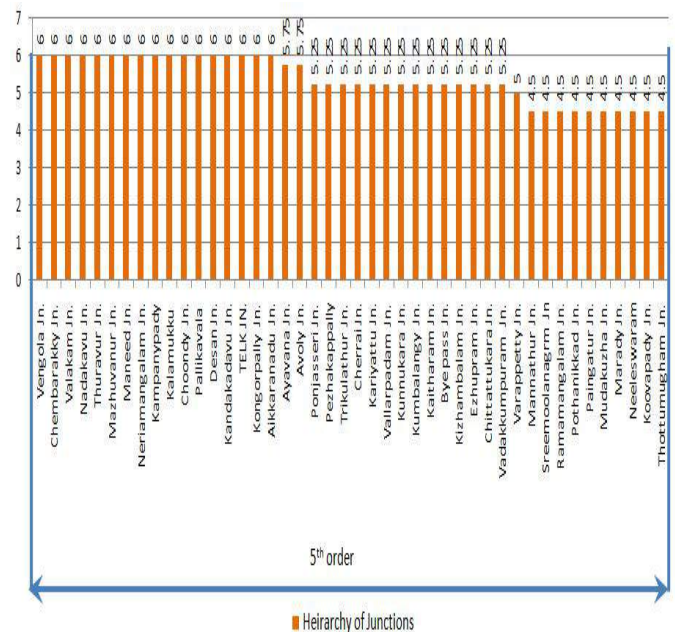
In Kerala context where urban rural continuum persists, each LSG is having at least one node. The agglomeration of activity area around one or more (adjacent) road junctions which act as commercial centre of an LSG is termed here as a node. The node need not be confined fully within an LSG area and in most of the cases its service area goes beyond the boundary of the LSG within which it is located. In certain cases the nodes may be located at the meeting point of the boundary of one or two LSGs. This means that the nodes have an entity independent of the LSG area which necessitates a separate study. In this chapter the hierarchy of nodes and urban rural growth centers of the District are identified.

9.1 EXISTING HIERARCHY OF NODES

The hierarchy of a node is indicated by the extent of activity taking place in the node. The extent of activity is measured by a proxy indicator denoted by the hierarchy of roads meeting at that place (the



■ Hierarchy of Junctions



■ Hierarchy of Junctions

Fig 9.1 Nodes with hierarchy

methodology is explained in *Annexe 14*). A list of the nodes within the Ernakulam District is given in the Table 9.1. The hierarchy of the nodes in the descending order of weightage is shown in Figure 9.1. Accordingly the nodes of the Ernakulam District can be categorized into five.

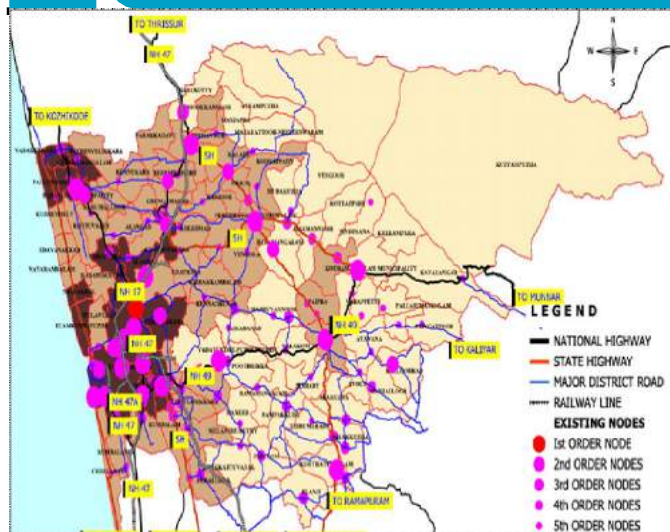


Fig 9.2 Spatial distribution of nodes (Existing)

The spatial distributions of the nodes are shown in Figure 9.2.

9.2 SUGGESTED HIERARCHY OF NODES

The suggested hierarchy of nodes is derived taking into account

- The population distribution
- Centrality with respect to the service area
- Existing hierarchy of the nodes

9.2.1 SUGGESTED IST ORDER NODES

The first order node is invariably taken as Edappally Junction, the node containing the junction connecting NH- 47, Bye pass & NH- 17 which serves the entire district especially the entire Kochi region.

9.2.2 SUGGESTED IIND ORDER NODES

The second order nodes have to fulfill the functions of a city centre mentioned in the Town and Country Planning Organization (TCPO), Govt. of India guidelines for commercial facilities. As per TCPO guidelines, city centre has to cater a population of 3 lakhs. But due to dispersed settlement in the district, the service population of the IInd order nodes is taken as 4.5 lakhs. The service area is assumed to have a hexagonal shape, the area of which is determined by taking into account the population density of the service area and the population to be served. Since the population density in the low land region, mid land

Table 9.1 List of nodes in Ernakulam District

Sl. No.	Name of junctions	Hierarchy of junctions	Weightage	Name of LSGI
1	Edappally Jn.	1 st Order	18.75	Kochi Corporation
2	Pallimukku Jn.	2 nd Order	18.25	Kochi Corporation
3	Palarivattom Jn.		16.75	Kochi Corporation
4	Vyttila Jn.		16.75	Kochi Corporation
5	Kancherithazham		16	Muvattupuzha(M)
6	Pharmacy Jn.		15.75	Kochi Corporation
7	Statue Jn.		15.25	Trippuniithura(M)
8	Angamaly JN.		15	Angamaly(M)
9	Soudia Jn.		14.75	Kochi Corporation
10	HMT JN..		14.75	Kalamassery(M)
11	Kacheri pady Jn.		14.5	Paravur(M)
12	Thoppumpady Jn.		14.5	Kochi Corporation
13	Kaloor Jn	3 rd Order	14	Kochi Corporation
14	kappalandi mukku		13.5	Kochi Corporation
15	Pambu Kavala		13.5	Aluva(M)
16	Kalady - Perumbavur jn.		13	Perumbavoor(M)
17	Peruvaran Jn.		13	Paravur(M)
18	High court Jn.		13	Kochi Corporation
19	Pulluvazhi Jn.		12.75	Rayamangalam
20	Town Centre		12.5	Kothamangalam
21	Panchayat Jn.		11.75	Koothattukulam
22	collectorate Jn.		11.5	Thrikkakara
23	Kallorkad Jn.		11.25	Kalloorkkad
24	Kundannur Jn.		11	Maradu
25	Kuriapilly Jn.	4 th Order	9.75	Vadakkekara
26	karingachira Jn.		9.75	Thiruvankulam
27	INTUC Jn.		9.75	Maradu
28	Elanji Jn.		9.75	Elanji
29	Palluruthy-Kacheripady		9.5	Kochi Corporation
30	Kalady Jn.		8.75	Kalady
31	Varapuzha Jn.		8.5	Varapuzha
32	Pallithazham Jn.		8.5	Mulanthuruthy
33	Main Jn.		8	Poothrikka
34	M.C.Rd Jn.		8	Palakkuzha
35	Velloorkunnam Jn.		8	Muvattupuzha(M)
36	Vazhakulam Jn.		8	Manjalloor
37	Madavana Jn.		8	Kumbalam
38	Parur Kavala		8	Aluva(M)
39	Udayam Jn.		7.75	Udayamperoor
40	Danwanthari Nagar		7.75	Trippuniithura(M)
41	Thiruvankulam Jn.		7.75	Thiruvankulam
42	Sasthamugal Jn.		7.75	Thiruvaniyoor
43	Athani Jn.		7.75	Nedumbassery
44	Fort Kochi - Bus		7.5	Kochi Corporation
45	Puthekruz Jn.		7	Vadavukodu Puthesncruz
46	Rayamangalam Jn.		7	Rayamangalam
47	Pallikavala		7	Piravam

Sl. No.	Name of junctions	Heirarchy of junctions	Weightage	Name of LSGI
48	Vallam Jn.	4 th Order	7	Perumbavoor(M)
49	Pambakuda Jn.		7	Pampakkuda
50	Palakuzha Jn.		7	Palakkuzha
51	Nellikuzhi Jn.		7	Nellikuzhi
52	Pattimattom Jn.		7	Kunnathunadu
53	Mangalathu Thazhe		7	Koothattukulam
54	Karukutty Jn.		7	karukutty
55	Kurrekad Jn		7	Chottanikara
56	Odakkali Jn.		7	Asamanoor
57	Pandappilly Jn.		7	Arakkuzha
58	Millingal Jn.		7	Amballoor
59	Thiruvaniyoor Jn		6.75	Thiruvaniyoor
60	Mazhuvanoor Jn		6.75	Mazhuvanoor
61	Petta Jn		6.75	Kochi Corporation
62	Vengola Jn.	5 th Order	6	Vengola
63	Chembarakky Jn.		6	Vazhakkulam
64	Valakam Jn.		6	Valakom
65	Nadakavu Jn.		6	Udayamperoor
66	Thuravur Jn.		6	Thuravoor
67	Mazhuvanur Jn.		6	Mazhuvanoor
68	Maneed Jn.		6	Maneed
69	Neriamangalam Jn.		6	Kavalangad
70	Kampanypady		6	Eloor
71	Kalamukku		6	Elamkunnappuzha
72	Choondy Jn.		6	Edathala
73	Pallikavala		6	Cheranalloor
74	Desan Jn.		6	Chengamanad
75	Kandakadavu Jn.		6	Chellanam
76	TELK JN.		6	Angamaly(M)
77	Kongorpally Jn.		6	Alangad
78	Aikkaranadu Jn.		6	Aikkaranadu
79	Ayavana Jn.		5.75	Ayavana
80	Avoly Jn.		5.75	Avoly
81	Ponjasser Jn.		5.25	Vengola
82	Pezhakappally		5.25	Payipra
83	Trikulathur Jn.		5.25	Payipra
84	Cherai Jn.		5.25	Pallippuram
85	Kariyattu Jn.		5.25	Nedumbassery
86	Vallarpadam Jn.		5.25	Mulavukkadu
87	Kunnukara Jn.		5.25	Kunnukara
88	Kumbalangy Jn.		5.25	Kumbalangi
89	Kaitharam Jn.		5.25	Kottuvally
90	Bye pass Jn.		5.25	Kothamangalam
91	Kizhambalam Jn.		5.25	Kizhakkambalam
92	Ezhupram Jn.		5.25	Edakkattuvayal
93	Chittattukara Jn.		5.25	Chittattukara
94	Vadakkumpuram Jn.		5.25	Chendamangalam

Sl. No.	Name of junctions	Heirarchy of junctions	Weightage	Name of LSGI
95	Varappetty Jn.	5 th Order	5	Vsrspetty
96	Mannathur Jn.		4.5	Thirumarady
97	Sreemoolanagrm Jn		4.5	Sreemoolanagaram
98	Ramamangalam Jn.		4.5	Ramamangalam
99	Pothanikkad Jn.		4.5	Pothanikkad
100	Paingatur Jn.		4.5	Paingattoor
101	Mudakuzha Jn.		4.5	Mudakkuzha
102	Marady Jn.		4.5	Marady
103	Neeleswaram		4.5	Malayattoor
104	Koovapady Jn.		4.5	Neeleswaram
105	Thottumugham Jn.		4.5	Koovappady
106	Thiruvallur Jn.		4.5	Keezhumadu
107	Malippara Jn.		3.75	Kadungaloor
108	Pallarimangalam Jn.		3.75	Pindimana
			3.75	Pallarimangalam

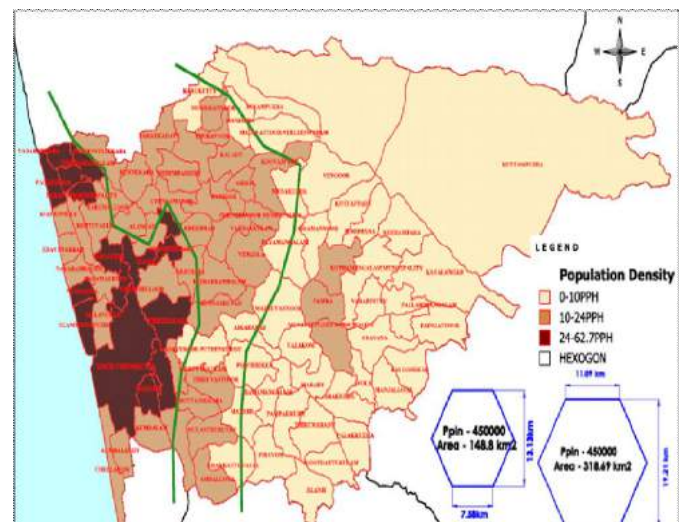


Fig 9.3 Size of service area polygon in different area

region and high land region of the district differs, area of hexagon of these regions varies (Figure 9.3).

However due to the very big size of the hexagon in the high land region because in each of low population density, the hexagon taken for the mid land region is considered in the high land also. The service area of the existing second order nodes are shown in Figure 9.4.

From the figure, the pattern of distribution of the nodes shows that there is at least one comparatively higher order node in most of the LSGs,

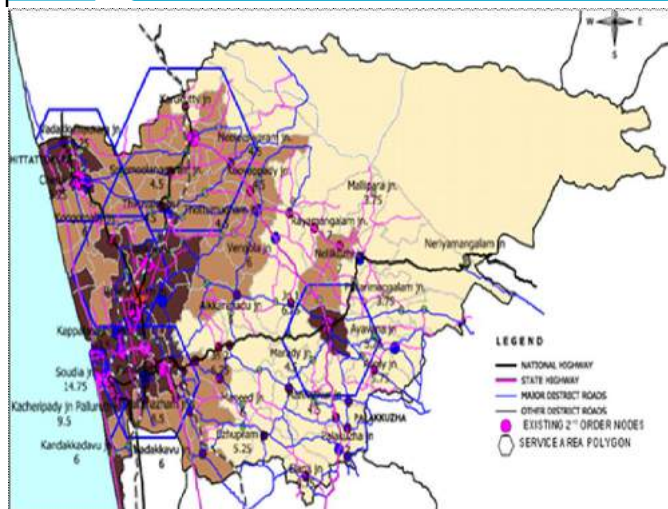


Fig 9.4 Service area of existing second order nodes

which serves the entire LSG except in the eastern region and a number of lower order nodes severing the immediate surroundings. For example, Kochi corporation served by 7 higher order nodes and 6 lower order nodes. Considering the population distribution and Centrality with respect to the service area the suggested nodes from the existing second order nodes are Edappally Jn., Vyttila Jn. and Soudiya Jn. in Kochi corporation, Kacherithazham Jn in Muvattupuzha(M) , Angamaly Jn. in Angamaly(M) and Kacherippady Jn. in Paravur(M). However the eastern and south eastern part of the district is not served by a second order settlement. Kalady Jn.(Perumbavur Municipality), Town centre(Kothamangalam Municipality), Puthencurisu Jn.(Vadavukode- Puthencurisu) and Panchayat Jn.(Koothattukulam) are four important nodes, are

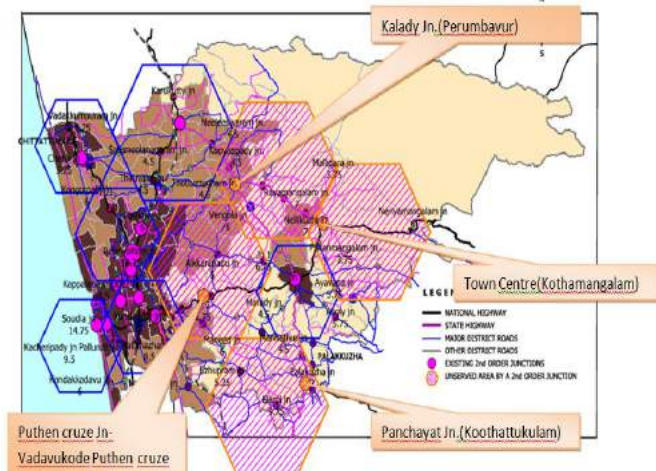


Fig 9.5 Proposed second order nodes

selected as the second order (proposed) nodes for these regions (Figure 9.5).

The suggested second order nodes of the district are Vyttila Jn., Soudiya Jn., Kacherithazham Jn., Angamaly Jn., Kacherippady Jn., Kalady Jn., Town centre, Puthencurisu Jn. and Panchayat Jn. The second

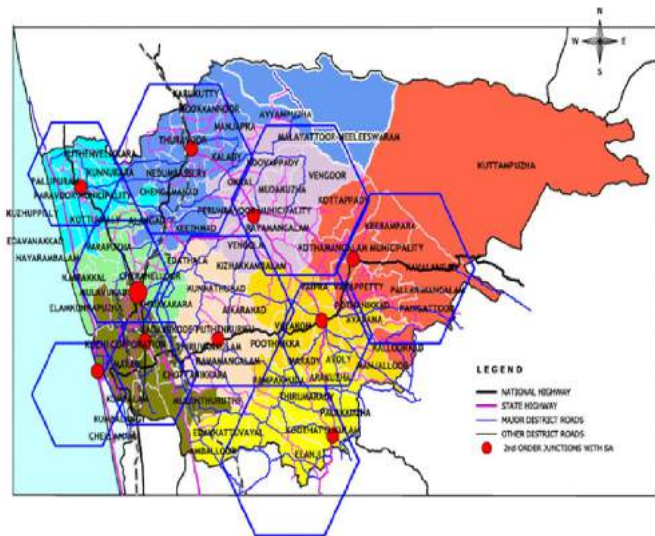


Fig 9.6 Suggested second order nodes with service area

order nodes of the district with service area are shown in (Figure 9.6).

9.2.3 SUGGESTED IIIRD ORDER NODES

The third order nodes have to fulfill the functions of a community centre mentioned in the TCPO

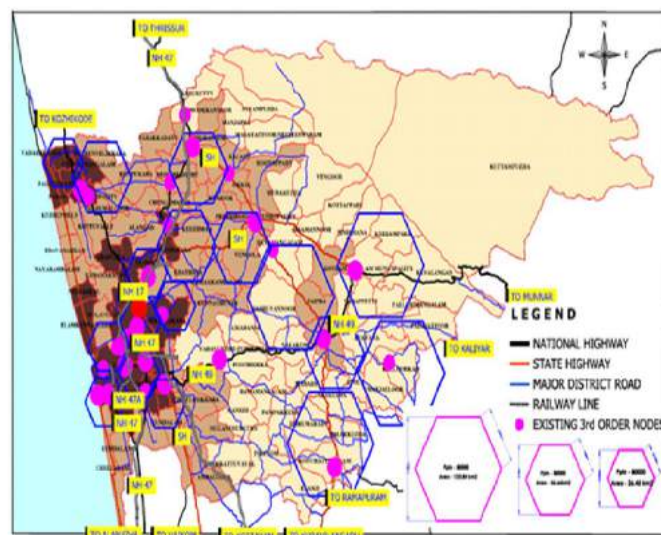


Fig 9.7 Service area of existing third order nodes

guidelines for commercial facilities. As per TCPO guidelines community center has to cater a population of 40000. But due to dispersed settlement in the district, the service population of the III order nodes is taken as approximately 80,000. As explained earlier, service area

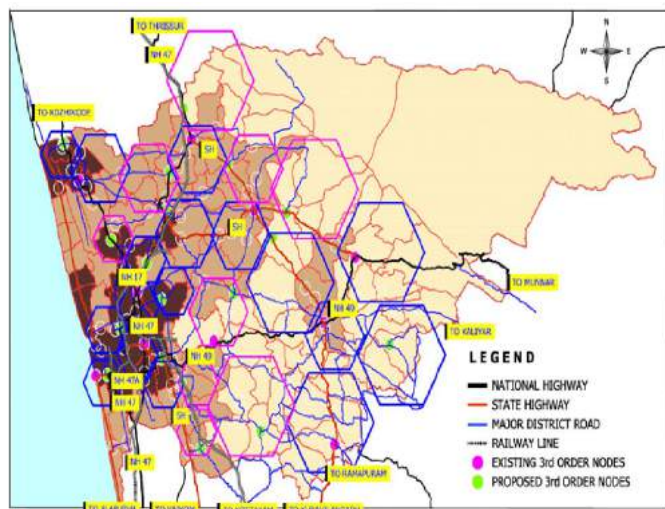


Fig 9.8 Service area of existing and suggested 3rd order nodes

of third order nodes with hexagonal in shape is derived for each region. Collectorate Jn., Pambu Kavala, Kalady-perumbavur jn., Pulluvazhi Jn., Kallorkad Jn., Kuriapilly Jn. are the existing 3rd order nodes other than of the suggested Ist and 2nd order nodes. The existing third order node with their service area is shown in Figure 9.7.

The unserved area shows the necessity of a third order node there and the modified situations with new third order nodes are shown in Figure 9.8.

Varapuzha Jn. (Varapuzha), Athani Jn. (Nedumbassery), Karukutty Jn. (Karukutty), Kalady Jn. (Kalady), Rayamangalam Jn. (Rayamangalam), Pattimattom Jn. (Kunnathunadu), Pallikavala (Piravam), Millingal Jn. (Amballoor) and Kurrekad Jn. (Chottanikara) are the proposed 3rd order nodes.

The suggested hierarchy of nodes is shown in Table 9.2 and Figure 9.9

Table 9.2 Hierarchy of nodes (proposed)

Sl No.	Name of Node	Name of LSGI	Heirarchy of Nodes
1	Edappaly jn.	Kochi Corporation	I st order
2	Vyttila jn.	Kochi Corporation	II nd order
3	Soudiya Jn.	Kochi Corporation	
4	Kacheri pady Jn.	Paravur(M)	
5	Angamaly JN.	Angamaly(M)	
6	Kancherithazham	Muvattupuzha(M)	
7	Kalady -perumbavur jn.	Perumbavoor(M)	
8	Town Centre	Kothamangalam	
9	Panchayat Jn.	Koothattukulam	
10	Puthekruz Jn.	Vadavukodu Puthesncruz	
11	collectorate Jn.	Thrikkakara	III rd order
12	Pambu Kavala	Aluva(M)	
13	Pulluvazhi Jn.	Rayamangalam	
14	Kallorkad Jn.	Kalloorkkad	
15	Kuriapilly Jn.	Vadakkekara	
16	Varapuzha Jn.	Varapuzha	
17	Athani Jn.	Nedumbassery	
18	Karukutty Jn.	karukutty	
19	Kalady Jn.	Kalady	
20	Rayamangalam Jn.	Rayamangalam	
21	Pattimattom Jn.	Kunnathunadu	
22	Pallikavala	Piravam	
23	Millingal Jn.	Amballoor	

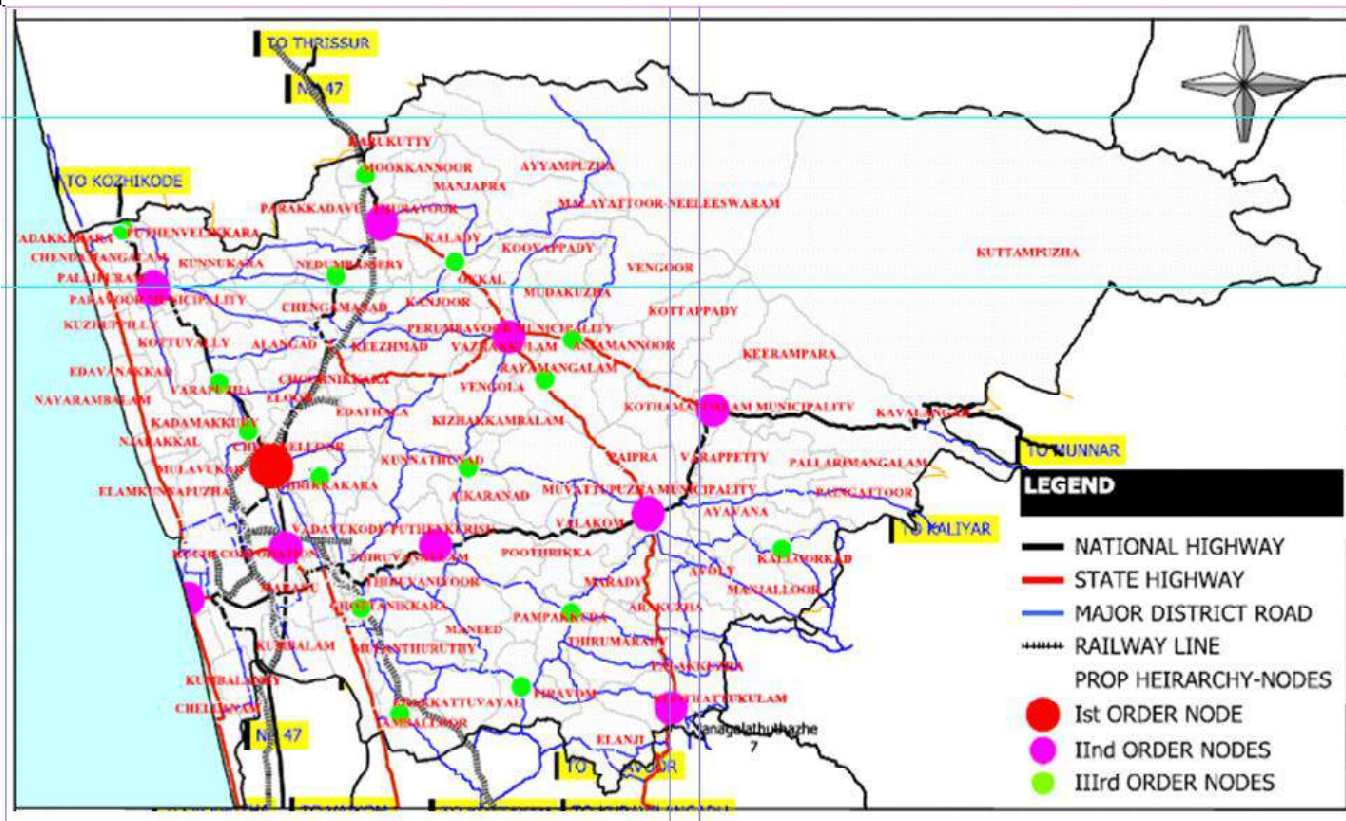


Fig 9.9 Proposed hierarchies of nodes

9.3 INFERENCE

The pattern of distribution of the nodes shows that there is at least one comparatively higher order node in most of the LSGs, which serves the entire LSG and a number of lower order nodes severing the immediate surroundings. The intensity of

development at these nodes in most of the cases is depending upon the hierarchy of roads meeting at these junctions. The study and analysis on nodes shows that, Kochi Corporation and most of the other urban centres in the District are served by higher order nodes. Only the eastern forest regions are not served even by a 3rd order node because of the inaccessibility.

Chapter 10

CONNECTIVITY

10.1 EXISTING CONNECTIVITY

The transportation network system is nervous system controlling the developments of an area. Ernakulam District is blessed with connection to other parts by all major modes of transport like road, rail, air and water. The NH-17, NH-47 and NH-49 pass through this district. The roads in Ernakulam district are considered as the main connecting link between northern and southern part of state. The State has total road length of 123889 km including national and State highways. Out of the total road length, Ernakulam district ranks top with a total road length of 2172 km. Fig 10.1 shows the existing Transportation network system. The hierarchical order of existing road network, rail network, water and air transport are as follows:



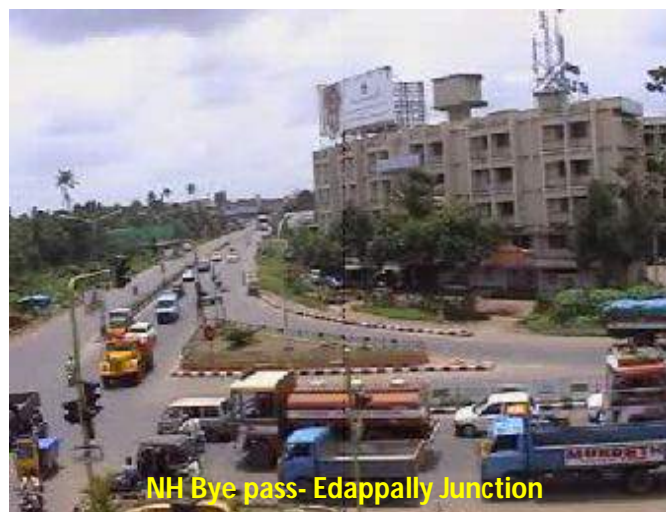
Fig 10.1 Transportation Network- Ernakulam District

A. The National highways passing through the district are:

- 1) NH- 47 passing through the entire length of the district in the north-south direction

towards Salem through Palakkad in north and towards Kanyakumari through Thiruvananthapuram.

- 2) NH -17 starting from Edapally and leads to the north towards Mangalore.
- 3) NH- 49 starting from Kundannur and leads to Madurai in the eastern direction.
- 4) NH- 47A link road starts from Kundannur junction and connects NH-47 to the Cochin Port.



B. The state highways passing through the district are:

- 1) The main central road – starts from Angamaly leads to Thiruvananthapuram via Kalady, Perumbavoor, Muvattupuzha and Kothattukulam towards southern direction.
- 2) Aluva – Munnar road – starts from Aluva and leads to Munnar through Perumbavoor, Kothamangalam and Neriamangalam in the eastern direction.
- 3) Ernakulam – Kottayam road- starting from Ernakulam leads to Kottayam through

- Thripunithura, Udayamperoor and Vaikom in the southern direction.
- 4) Ernakulam - Idukki road – starting from Muvattupuzha it leads to Idukki through Thodupuzha.
 - 5) Kothamangalam – Lower Periyar road – starting from Kothamangalam it passes through Neriya Mangalam, Lower Periyar and leads to Idukki.
 - 6) Aluva – Ernakulam road (Old NH)
 - 7) Moothakunnam to ferry (Old NH)
 - 8) Gothuruth bridge and approach road
 - 9) Moothakunnam jn. To Gothuruth link road jn.
 - 10) Chellanam – Thoppumpady road
 - 11) Pandikkudy – Chellanam road and P.T. Jacob road
 - 12) Vypeen - Pallipuram road



- 12) Kandanadu branch road
- 13) Eroor – Puthankulangara road
- 14) Vyttila – Palarivattom road
- 15) NH deviation road
- 16) Udayamperoor – Kureekkad road
- 17) Vegetable market road
- 18) Mamala - Branch road
- 19) Peppathy branch road
- 20) Mangayil road
- 21) Kettezhathu kadavu road
- 22) Peppathypara road
- 23) Kanjiramattom road
- 24) Vettikkal road
- 25) Thirumarayoor road
- 26) Poothotta - Piravom road
- 27) Perumbavoor - Aluva road
- 28) Chithrappuzha road
- 29) Aluva – Parur road
- 30) Aluva – Varappuzha road
- 31) Airport road
- 32) Kalady – Manjapra road
- 33) Angamaly – Manjapra road
- 34) Angamaly – Parur (Via manjaly)
- 35) Kottappuram – Koonammavu
- 36) Edayar – Panayikulam
- 37) Edayar – Muppathadam
- 38) Kodungalloor – Kongorppilly
- 39) Chennamangalam road
- 40) Kariyad – Mattoor road

C. Important major district roads are listed below:

- 1) Edappally- Moovattupuzha road
- 2) Banerji road
- 3) Broadway road
- 4) Shanmugham road
- 5) Fore shore road
- 6) Devankulangara – Kacherypady road
- 7) Chittoor – Cheranalloor road
- 8) Vaduthala – Chittoor road
- 9) Father Mathew Kothakkattu road
- 10) Sandogopalan road
- 11) Mangayil – Nettoor road

D. Rail Network

Railway Station - Ernakulam Junction

There are three broad gauge lines lying across the district i.e., Shornur- Cochin harbour Terminus line, Ernakulam - Trivandrum line (via) Kottayam and Ernakulam - Alappuzha – Trivandrum line. The important stations are at Angamaly, Aluva, Ernakulam Town, Ernakulam Junction, Cochin Harbour Terminus and Piravom. There is 105 km of rail track in the district. Short link lines to Wellington Island and Irumpanam industrial area also exist. The major railway stations

are Ernakulam junction, Aluva, Angamaly and Harbour Terminus.



Railway Station - Ernakulam Junction

E. Waterways, Ports

Cochin Port Trust

Cochin port, one of the major port of the country blessed with several natural advantages and it lies on the district route to Australia and the far east from Europe. The number of ships carrying goods has increased to 40 – 45 per month. The National waterway no.3 passes through the district through the Vembanad Backwaters. This route provides waterway connection to the Kollam and Kottappuram. Inland waterways are also providing connectivity to different parts of the district and to other districts.



Cochin Port Trust

F. Airports

International Airport- Nedumbassery

There is an International Airport at Nedumbassery near Aluva in the district besides a Naval airport at Wellington Island. The international airport provides air traffic to different parts of the world.



International Airport- Nedumbassery

10.2 DESCRIPTION OF HIERARCHY OF NODES

The study of hierarchy of node shows that, obviously the Kochi Corporation and surrounding areas are the 1st order and 2nd order nodes of the District acting as the commercial centres serving the entire District. Considering the weightage of nodes Ernakulam have one 1st order junction (Edappilly junction and eleven 2nd order junctions (Pallimukku Jn, Palarivattom Jn, Vytila Jn, Kacherithazham, pharmacy Jn, Statue Jn, Angamaly Jn, Soudiya Jn, HMT Jn, Kacherippady Jn, and thoppumpady Jn) Based on the service area of the existing second order nodes, four extra nodes are proposed as second order nodes (Kalady Jn, Town Centre, Pethencruz Jn. and panchayath Jn,) for serving the entire area effectively by considering population distribution, centrality and existing status,. Similarly based on the service area of the existing third order nodes, eight extra nodes are proposed as third order nodes for serving the entire area effectively by considering population distribution, centrality and existing status of the nodes. Finally there are 15 suggested second order nodes and 10 suggested third

order nodes. The suggested hierarchy of nodes is shown in fig 10.2.

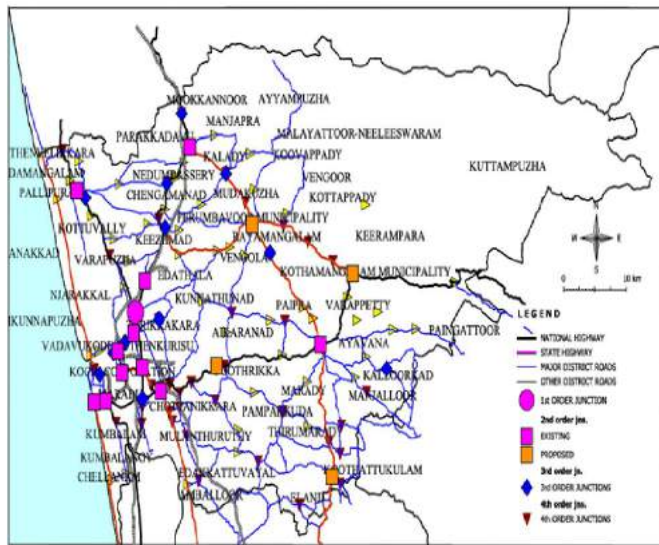


Fig 10.2 Spatial distribution of nodes

10.3 DESCRIPTION OF HIERARCHY OF SETTLEMENTS

As per the settlement analysis, it is found that the settlements in the District can be grouped in to four hierarchies. The future hierarchy of settlement of the district evolved shows that Kochi Corporation is the highest order settlement in the District. Aluva Municipality, Kalamasserry Municipality, Kothamangalam Municipality and Muvattupuzha

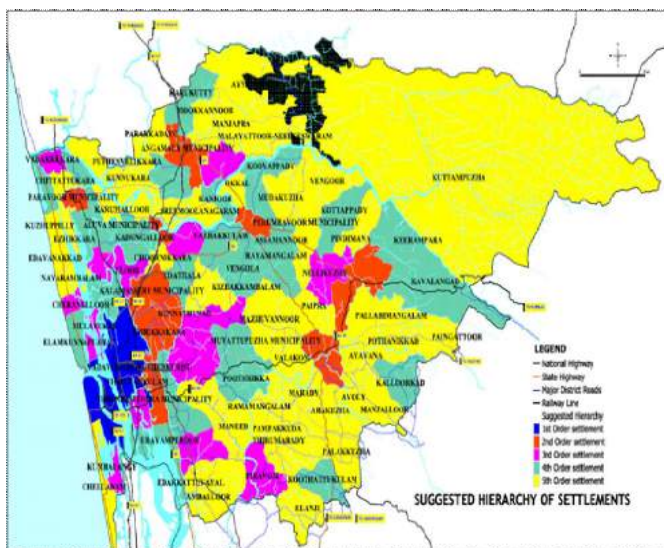


Fig 10.3 Suggested hierarchy of settlement

Municipality are the existing and Angamaly(M) and Thrikkakara are the proposed as second order settlements. Maradu, Kalady, Eloor, Vadakkekara, Nellikuzhy, Mulavukadu, Vadavukode-Puthencruz, Njarakkal, Kunnathunadu, Varappuzha, Keezhmadu are the existing and Kumbalangi, Mulamthuruthy and Piravom are the proposed 3rd order settlements. In general there is one first order, nine 2nd order and fourteen 3rd order settlements in the District as shown in fig 10.3.

10.4 SUGGESTED NETWORK

The road net work should connect the higher order settlements and nodes. Figure 10.4 shows the suggested hierarchy of nodes and settlements together with existing major road network. From the figure, it is clear that most of the suggested 1st, 2nd order nodes and suggested 1st, 2nd and 3rd order settlements are well connected by already existing NH, SH, MDR and ODR. Conceptual road network is prepared based on the existing and proposed hierarchy of settlements.

The analysis of the above map clearly reveals that the entire district depends upon the single first order settlement i.e., Kochi Corporation for higher order facilities and next higher order settlements for lower order facilities. As far as the linkage between the 1st order and 2nd order settlement concerned there already exist a radial pattern of roads.

Incorporating the spatial distribution of settlement in the District, the following conceptual road network can be suggested and it is shown in fig.10.5. Conceptual road network contains mainly four types of proposed roads. They are as follows.

1. Radial Roads (1st order Road) – Connecting 1st order settlement with second order settlement.
2. Loop Roads (2nd order Road) - Connecting all 2nd order settlements
3. Road connecting loop road and 3rd order settlement (3rd order road)
4. By Pass Roads

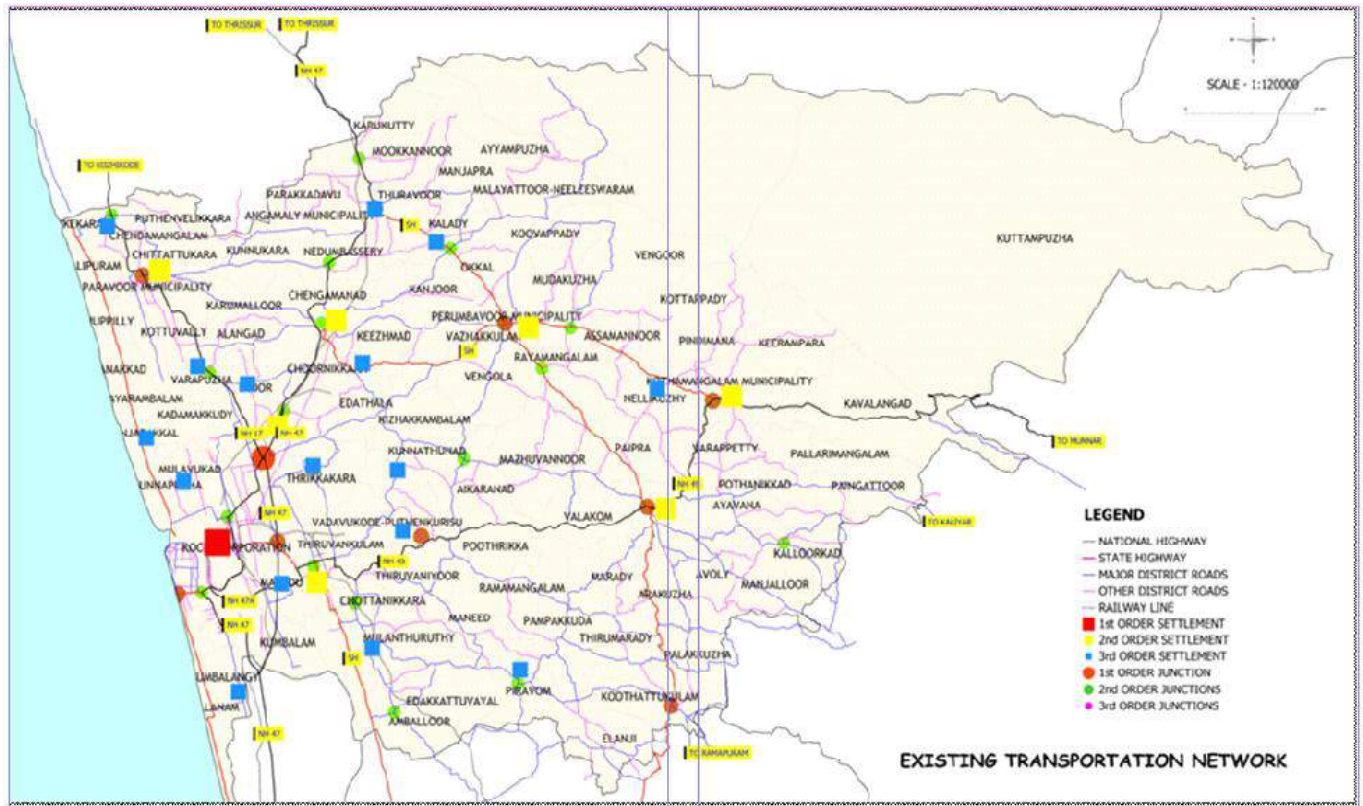


Fig 10.4 Suggested hierarchies of nodes and settlements along with existing road network

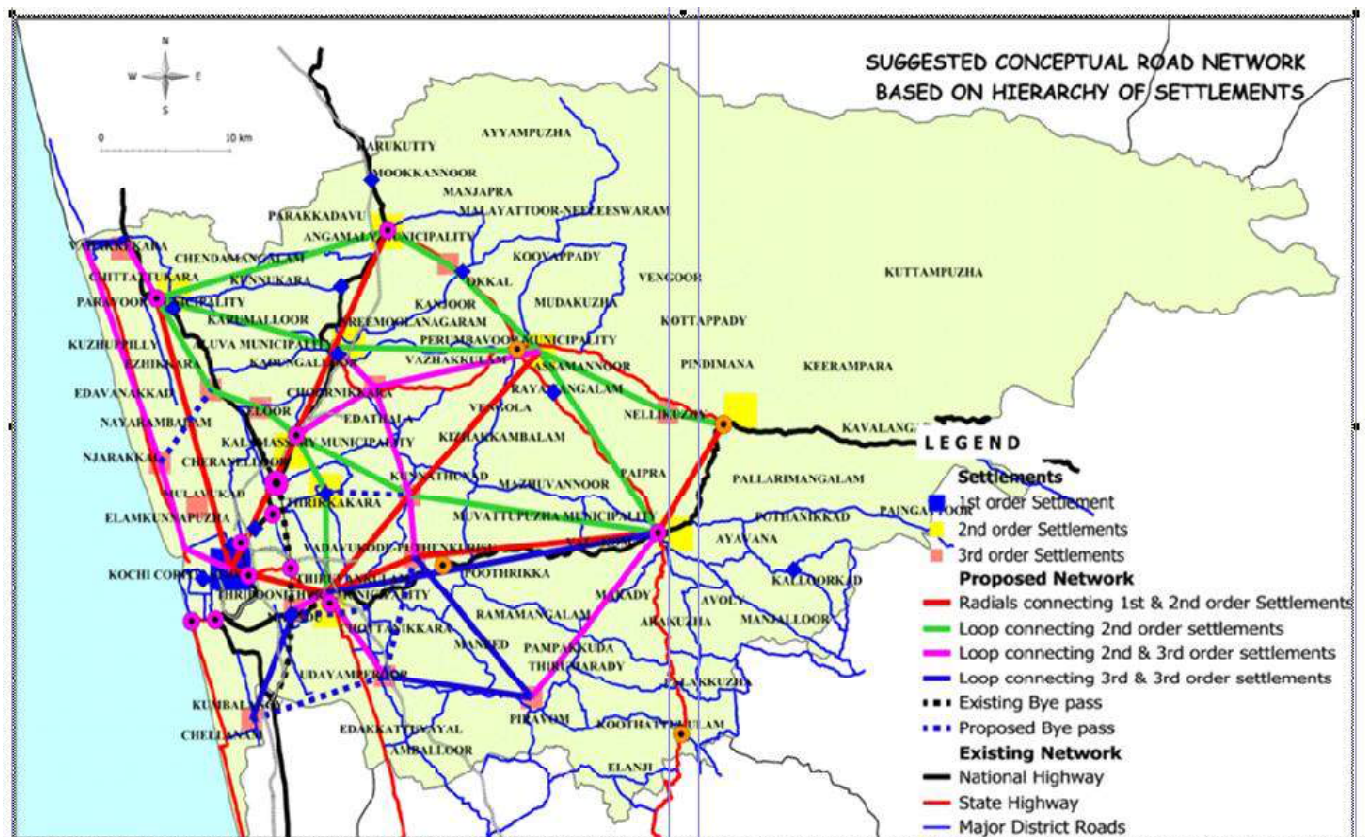


Fig 10.5 Suggested Conceptual Road Network based on hierarchy of settlements

Table 10.1 Modified Conceptual road network

Settlements		Target settlement		Connectivity	Status	
Name	Hierarchy	Name	Hierarchy	Name	Existing	Proposed
Kochi Corporation	1	Kalamassery	2	Ernakulam-Aluva Road	NH 47	NH
		Aluva	2	Ernakulam-Aluva Road	NH 47	NH
		Paravoor(M)	2	1. Edappally-Kodungallur	NH 17	NH
				2. Kochi - Munambam road	SH	SH
		Perumbavoor(M)	2	1. Ernakulam - Aluva and AM road	NH 47 & SH	NH 47 & SH
				2. Edappally - Perumbavoor via Pookkattupady	MDR	MDR
				3. Ernakulam-Thripoonithura - Kizhakkamabalam-Perumbavoor	SH & MDR	SH & MDR
		Kothamangalam (M)	2	1. Ernakulam - Aluva and AM road	NH 47 & SH	NH& SH
				2. Edappally - Perumbavoor - Kothamangalam via Pookkattupady	SH & MDR	SH & MDR
		Thripoonithura (M)	2	Ernakulam - Thripoonithura road	SH	SH
Kalamassery(M)	2	Muvattupuzha (M)	2	Ernakulam - Muvattupuzha via Thirvankulam	NH 49 & SH	NH& SH
		Aluva	2	Ernakulam-Aluva Road	NH 47	NH
		Thrippoonithura	2	IK Road	MDR	SH
		Paravoor(M)	2	Edappally-Kodungallur	NH 17	NH
		Muvattupuzha (M)	2	IK Road, NH 49	MDR & NH	SH & NH
		Kothamangalam (M)	2	1. IK Road, NH 49	MDR & NH	SH & NH
				2. Ernakulam-Aluva Road, AM Road	NH & SH	NH & SH
		Perumbavoor(M)	2	Ernakulam-Aluva Road, AM Road	NH & SH	NH & SH

Aluva(M)	2	Thrippoonithura (M)	2	IK Road	MDR	SH
		Paravoor(M)	2	Aluva - Paravoor road	SH	NH
		Muvattupuzha (M)	2	AMroad, MC road	SH	SH
		Kothamangalam (M)	2	AMroad	SH	SH
		Perumbavoor(M)	2	AMroad	SH	SH
		Kalamassery(M)	2	Auva-Ernakulam road	NH	NH
Paravoor(M)	2	Aluva(M)	2	Aluva - Paravoor road	SH	NH
		Thrippoonithura (M)	2	Aluva - Paravoor road, NH 49 & IK road	SH, MDR	SH
		Muvattupuzha (M)	2	Aluva - Paravoor road, NH 49, IK road & NH 49	SH, MDR & NH	SH, MDR & NH
		Kothamangalam (M)	2	Aluva - Paravoor road & AMroad	SH	SH
		Perumbavoor(M)	2	Aluva - Paravoor road & AMroad	SH	SH
		Kalamassery(M)	2	Auva-Ernakulam road & NH 47	NH & SH	NH & SH
Muvattupuzha(M)	2	Aluva(M)	2	AMroad, MC road	SH	SH
		Thrippoonithura (M)	2	NH 49	NH	NH
		Paravoor(M)	2	MC road, AM road & Aluva - Paravoor road	SH & MDR	SH & MDR
		Kothamangalam (M)	2	NH 49	NH	NH
		Perumbavoor(M)	2	MC road	SH	SH
		Kalamassery(M)	2	NH 49 & IK road	NH & MDR	NH & MDR
Kothamangalam (M)	2	Aluva(M)	2	AMroad	SH	SH
		Thrippoonithura (M)	2	NH 49	NH	NH
		Paravoor(M)	2	Aluva - Paravoor road & AMroad	SH	SH
		Muvattupuzha(M)	2	NH 49	NH	NH
		Perumbavoor(M)	2	AMroad	SH	SH
		Kalamassery(M)	2	NH 49 & IK road	NH & MDR	NH & MDR

Perumbavoor(M)	2	Aluva(M)	2	AM road	SH	SH
		Thrippoonithura(M)	2	PP road	MDR	MDR
		Paravoor(M)	2	Aluva - Paravoor road & AM road	SH	SH
		Muvattupuzha(M)	2	MC road	SH	SH
		Kothamangalam(M)	2	AM road	SH	SH
		Kalamassery(M)	2	Ernakulam-Aluva road & AM road	NH & SH	NH & SH
Thrippoonithura (M)	2	Aluva(M)	2	Thrippoonithura-Aluva road & AM road	MDR & SH	MDR & SH
		Perumbavoor(M)	2	PP road	MDR	MDR
		Paravoor(M)	2	Aluva - Paravoor road, NH 49 & IK road	SH, MDR	SH
		Muvattupuzha(M)	2	NH 49	NH	NH
		Kothamangalam(M)	2	NH 49	NH	NH
		Kalamassery(M)	2	IK Road	MDR	SH
Maradu	3	Thiruvankulam	3	NH 49 Bypass		NH
Varapuzha	3	Njarakkal	3	New link		SH
Thrikkakara	3	Kunnathunad	3	New link		SH
Puthenkurisu	3	Mulamthuruthy	3	New link		SH
Mulamthuruthy	3	Kumbalangi	3	New link		SH

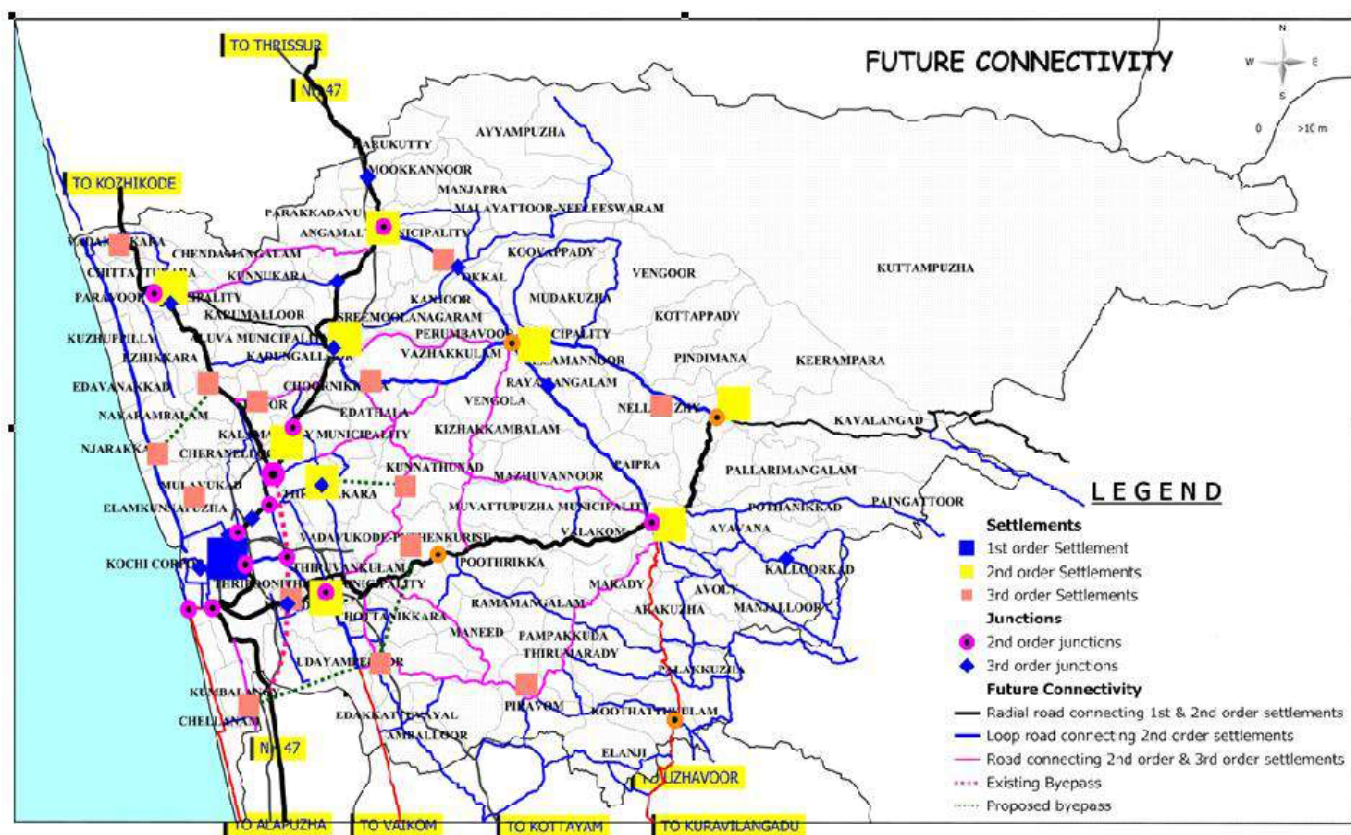


Fig 10.6 Future connectivity network

10.5 FUTURE CONNECTIVITY

Transportation always depends upon the position of nodes and the rank of the nodes. In Kerala scenario where perfect urban – rural continuum exist, nodes play a crucial role in the transportation network. Hence it is highly essential to modify the proposed road network based on proposed hierarchy of nodes. So modification of proposed road network based on the hierarchy of nodes is necessary.

Based on the hierarchy of nodes, Edappally Junction in Kochi Corporation becomes the first order node. And based on the servicing area of the existing eleven second order nodes, four extra nodes are proposed as second order for serving the entire area effectively by considering population distribution, centrality and existing status of the nodes which is described above. Similarly based on the servicing area of the existing third order nodes, eight extra nodes are proposed as third order nodes for serving the entire area effectively by considering population distribution,

centrality and existing status of the nodes which is described above.

By superimposing the proposed conceptual road network with the proposed hierarchy of nodes, it is found that most of the proposed and existing 1st, 2nd, 3rd order nodes are already incorporated in the proposed road network and all other proposed and existing 1st, 2nd and 3rd order nodes are well connected by already existing NH, SH, MDR and ODR.

Future connectivity network contains mainly four types of roads. They are shown in table 10.1 and fig 10.6.

10.6 INFERENCE

As road transportation always depends upon the position of nodes and rank of nodes, it is necessary to modify the proposed road network based on the proposed hierarchy of nodes. A future connectivity network is prepared by superimposing the proposed conceptual road network with the proposed hierarchy of nodes.

Chapter 11

ACTIVITY PATTERN

In this chapter the Activity pattern of Ernakulam District is described based on three aspects namely the land use concentration pattern, functional character and urban profile.

11.1 DESCRIPTION OF LAND USE CONCENTRATION PATTERN

Existing activity pattern within the district is derived based on the study of the spatial distribution of the aspects covered in the settlement studies namely, the land use concentration pattern, functional character and urban profile, (see figure 11.1). These are combined to evolve the activity pattern. Functional character is determined based on population distribution and land use, urban profile is derived taking into account occupational structure and hierarchy of settlements, the land use concentration pattern is studied based on the land use analysis. Along with these the real ground scenario is also take into consideration.

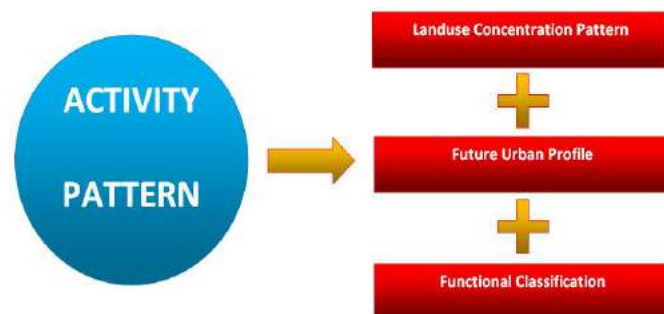


Fig 11.1 Derivation of Activity pattern

Activity pattern based on land use concentration pattern (described in chapter 5) given as (Figure 11.2) shows that most of the plantation/forest activities are concentrated on the highland region of the district. The urban activity is found to be mainly concentrated in coastal regions and along the major transportation corridors. The agricultural activity is predominantly concentrated in the midland region of the district.

Accordingly whole District is divided into four Activity zones namely Forest, Agricultural, Urban/Non Agriculture and Plantation.

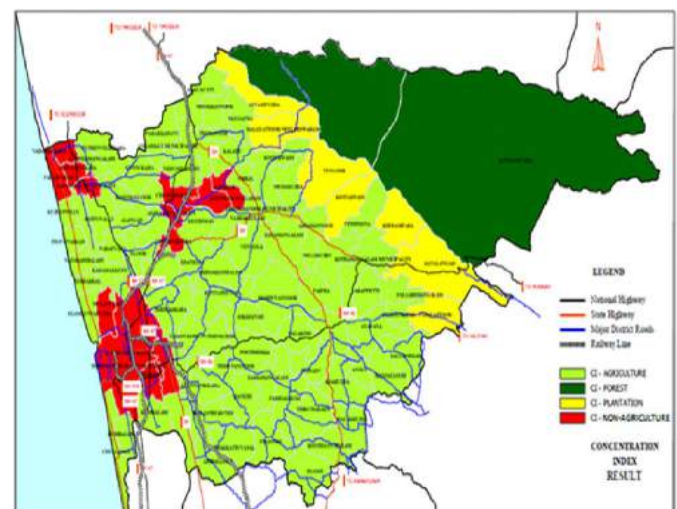


Fig 11.2 Land use concentration pattern

11.2 DESCRIPTION OF FUTURE URBAN PROFILE

The second criterion to derive the activity pattern is future urban profile which is well explained in chapter 8. There are nine existing urban LSGs (one Municipal Corporation and eight Municipal Councils) in the district. Based on the analysis, it is concluded

that 30 LSGs will attain urban character in the next two decades. The future urban profile is shown in figure 11.3.

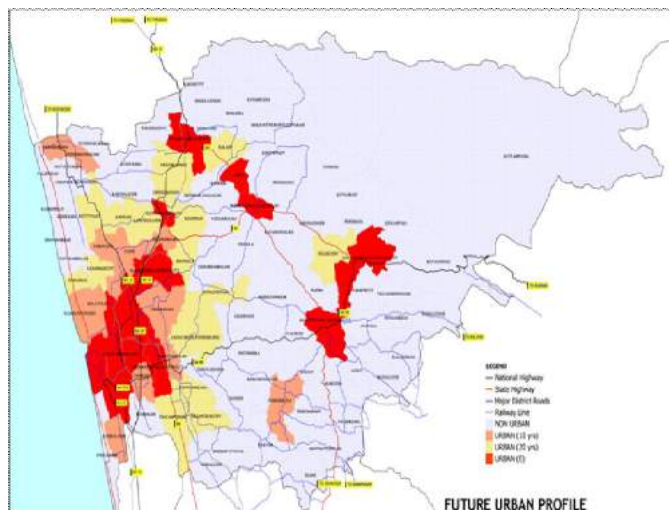


Fig 11.3 Future Urban Profile

11.3 DESCRIPTION OF FUNCTIONAL CLASSIFICATION

The last criterion to derive the activity pattern is functional classification of settlements which is well explained in chapter 6. The spatial distribution of the settlements based on its character shows a clear demarcation in the pattern of the settlements in four categories (figure 11.4). Kochi Corporation, Aluva and Thrippunithura municipalities show the urban character. Some of coastal LSGs and LSGs contiguous to

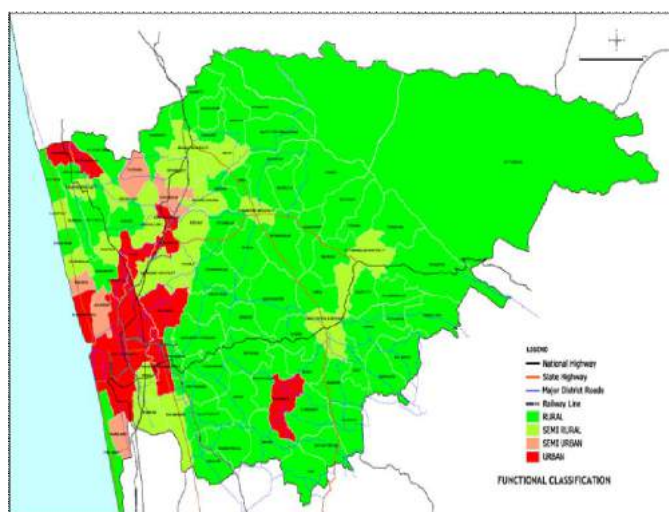


Fig 11.4 Functional Classification

the Kochi Corporation also show urban character. Semi urban character is exhibited by LSGs that have urban influence like Chengammand, Kunnukara, Mulavukad, Kumbalangy and Njarakkal (located near to Municipalities). But some Municipalities in midland and highland region shows semirural character. Semi rural character is seen in some other LSGs which are in a transition zone between LSGs of urban and rural character. Most of the LSGs in the midland and high land region of the District exhibit rural character.

11.4 DETERMINATION OF ACTIVITY PATTERN

The classification of settlements as per the three aspects namely the land use concentration pattern, functional classification and urban profile are given in Table 11.1.

Table 11.1 Classification of Settlements

Urban Profile	Land Use Concentration	Functional Classification
Urban	Non Agricultural	Urban
Non urban	Agricultural	Semi - Urban
	Plantation	Semi - Rural
	Forest	Rural

The activity pattern of LSGs in the district is derived by combining the character under these three aspects.

11.4.1 URBAN ACTIVITY

If the character of a settlement is urban as per urban profile, non agricultural as per land use concentration and urban as per functional classification, then that settlement can be termed as an urban activity area – mainly service sector activities (Table 11.2).

Table 11.2 Urban Activity

Urban Profile	Landuse concentration pattern	Functional Classification	Main Activity
Urban	Non agricultural	Urban	Urban and tertiary activity

In such areas, the work force is predominantly non agricultural as per urban profile LSGs with more than 90% Non agricultural main workers are designated as urban and there is concentration of non agricultural land uses (as per land use concentration pattern). Some LSGs clearly showing non urban character as per urban profile may be having major activity as urban in reality. Besides the plot sizes and major land uses indicate (as per functional classification) the nature of activity as urban such area also delineated as urban activity area.

As per the settlement classification, Eloor, Vadakkekara, Aluva, Choornikkara, Pallipuram, Thrippunithura and Kochi Corporation are the main urban activity area satisfying the criteria. Some LSGs viz. Cheranelloor, Thrikkakara, Maradu, Kalamassery, and Paravur are delineated as urban even though their land use concentration pattern is Agriculture. The urban activity areas so delineated are shown in figure 11.5.

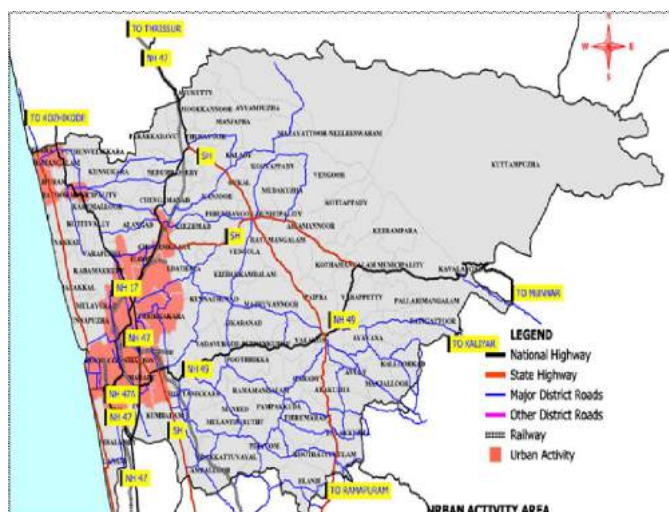


Fig 11.5 Urban Activity Areas

11.4.2 PRIMARY ACTIVITY

If the character of a settlement is agricultural as per land use concentration pattern and rural as per functional classification, the most suitable activity in that settlement can be rural related activities. Agricultural workers plus cultivators are the predominant workers in these areas (as per urban profile this area is designated as non urban) there is concentration of agricultural or plantation land use in

such areas (as per land use concentration pattern) and the plot sizes and major land uses indicate (as per functional classification) the nature of activity as rural. Even if the character of a settlement is urban as per urban profile if the land use concentration pattern is agricultural and the area is rural as per functional classification, that settlement is considered under Primary Activity Areas (table 11.3).

Table 11.3 Primary Activity

Urban Profile	Landuse concentration	Functional classification	Activity
Non urban	Agriculture/ Plantation	Rural	Primary activity

Accordingly, more than 50% of the LSGs in the district are designated as Primary activity areas. The settlements viz. Alangad, Kadamakudy, Mulamthuruthy, Thiruvankulam, Kottuvally, Kunnathunad, Vadavukode, Keezhmadu and Edavanakkadu considered under Primary Activity areas even though the character of settlements is urban as per urban profile and the land use concentration pattern is agricultural. Some urban LSGs of Perumbavur (M), Muvattupuzha (M) and Kothamangalam (M) showing agricultural land use pattern is also considered under primary activity areas. The areas delineated accordingly are shown in figure 11.6.

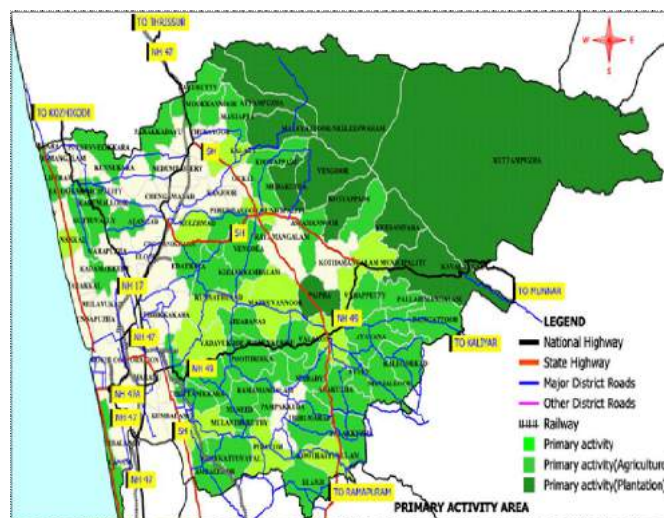


Fig 11.6 Intensive Agricultural Activity areas or primary Activity areas

11.4.3 SECONDARY ACTIVITY

Settlements with land use concentration pattern as non agriculture/urban and functional classification, semi urban have most suitable activity as secondary activities. The work force here is predominantly non agricultural (more than 70%). The secondary activity areas delineated as above is shown in figure 11.7.

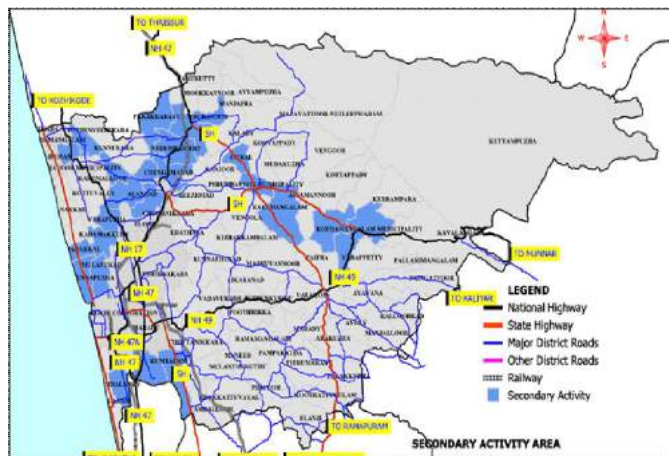


Fig 11.7 Distribution of secondary activity area

There is concentration of non agricultural land use (as per land use concentration pattern) and the major land use is residential. Hence these areas are suitable for secondary activity mainly small scale and cottage industries or service activities.

11.4.4 AGRICULTURAL ACTIVITY NON DETRIMENTAL TO FOREST

If the character of a settlement is non urban as per urban profile, forest as per land use concentration pattern and rural as per functional classification the most suitable activity in that settlement can be rural related activities, mainly agricultural and allied

Table 11.4 Agricultural activity non detrimental to forest

Urban Profile	Land use concentration	Functional classification	Activity
Non urban	Forest	Rural	Agricultural and allied activity non detrimental to forest

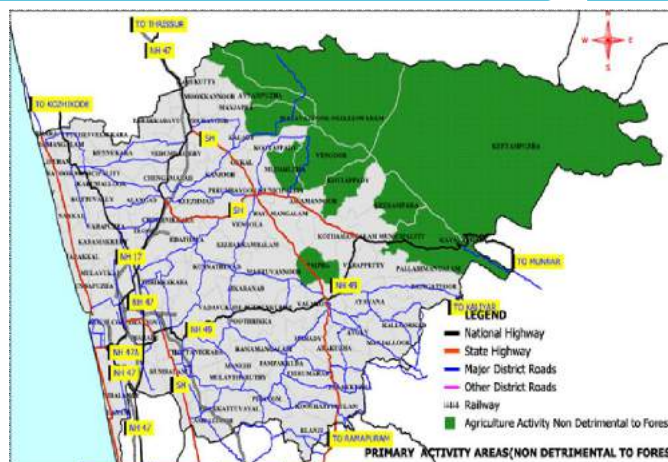


Fig 11.8 Primary activity areas (Agricultural and allied activity) non detrimental to forest

activities which are non detrimental to forests. When the character of a settlement is rural as per functional classification, it indicates the existence of significant extent of agricultural land in the area. Hence agriculture will remain as a significant activity in such settlements (Table 11.4). As per the criterion, in the eastern highland regions the most suitable activity can be rural related activities. The area delineated is depicted in fig 11.8.

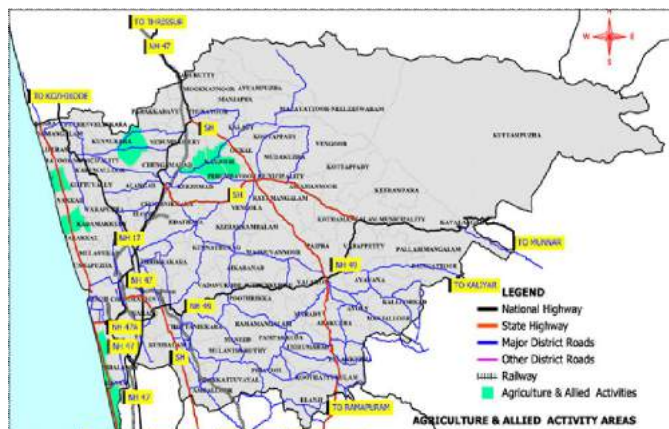
11.4.5 AGRICULTURE AND ALLIED ACTIVITY

Final combination is taken as the settlements with non-urban as per urban profile, agricultural/plantation as per land use concentration pattern and semi rural as per functional classification. This is an area where major land use is residential and the plot size varies from 50 to 75 cents.

Majority of the workers are either cultivators or agricultural labourers (it is a non urban area as per urban profile). This area is suitable for agricultural purpose, but for the limitation of average plot size between 50 to 75 cents imposing restrictions on agricultural operations. The plot size limitation makes the area suitable for small scale or cottage industries and also for animal husbandry activity (Table 11.5). In the LSGs of Chellanam, Nayarambalam and Kuzhuppiilly which are coastal LSGs, Kunnukara and Sreemoolanagaram, the predominant activities are small scale and animal husbandry activities. The area delineated is depicted in fig 11.9.

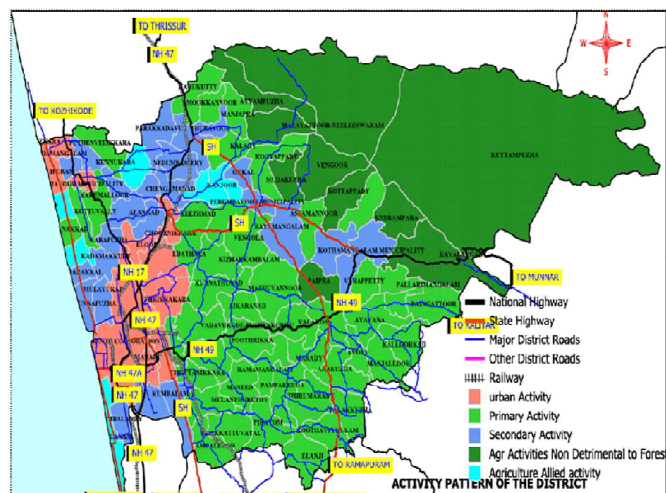
Table 11.5 Agricultural and Allied Activity

Urban Profile	Land use concentration	Functional classification	Activity
Non urban	Agri/ Plantation	Semi Rural	Agricultural and allied activity/ Animal Husbandry

*Fig 11.9 Agricultural and allied activity area*

11.5 ACTIVITY PATTERN OF ERNAKULAM DISTRICT

By superimposing the activity patterns derived for LSGs, the final activity pattern of the district is emerging out as shown in fig 11.10.

*Fig 11.10 Activity Pattern of the District*

11.6 INFERENCE

The activity pattern of Ernakulam District is categorised into Urban/Tertiary activity, Primary activity, Secondary activity, Agriculture activity detrimental to forest and Agriculture allied activity and Tertiary activity. Primary activities are concentrated on midland region secondary activities are concentrated on coastal and near urban areas. Forest activities are concentrated along the eastern region.

Chapter 12

SPATIAL STRUCTURE

In this chapter the spatial pattern of activities, settlement hierarchies, hierarchy of nodes and road network evolving out of the settlement analysis are synergically linked to obtain the spatial structure.

12.1 SPATIAL STRUCTURE OF THE DISTRICT

In settlement analysis, the following aspects pertaining to settlements of the district were studied.

1. Land use distribution
2. Population distribution
3. Occupational structure
4. Functional character
5. Hierarchy of settlements
6. Hierarchy of nodes
7. Urban profile

12.1.1 HIERARCHY OF SETTLEMENTS

The study of hierarchy of settlement is explained in the chapter 7. As per the settlement analysis, it is found that the settlements in the District can be grouped in to five hierarchies. The future hierarchy of settlement of the district evolved shows that Kochi Corporation is the highest order settlement in the District. Kothamangalam (M), Kalamassery (M), Muvattupuzha (M), Aluva (M), Paravur (M),

Perumbavoor (M) are the existing and Angamaly (M) and Thrikkakara are proposed as second order settlements. The gramapanchayats of Maradu, Kalady, Eloor, Vadakkekara, Nellikuzhy, Mulavukadu, Kumbalangi, Vadavukode-Puthencruz, Piravom, Mulanthuruthy, Njarakkal, Kunnathunadu, Varappuzha and Keezhmadu are proposed as third order settlements. In general

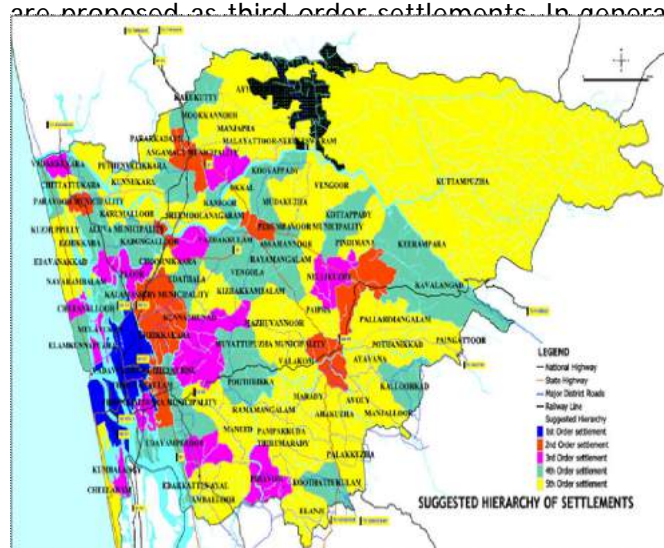


Fig 12.2 Suggested hierarchy of settlements

there is one first order settlement, 9 second order settlements and 14 third order settlements in the District as shown in figure 12.2.

12.1.2 ACTIVITY PATTERN

Activity pattern within the district is derived based on the land use concentration pattern, functional character and future urban profile. The activity pattern of urban, primary sector, secondary sector, Agriculture and allied activity, forest activity are analyzed based on the above data. The aspects taken for the study of settlements are combined in order to evolve the activity pattern (functional character is determined based on population distribution and land use, Urban profile is derived taking in to account occupational

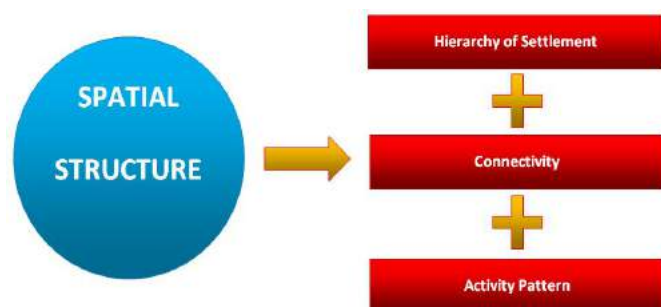


Fig 12.1 Spatial structure evolution

structure and hierarchy of settlements, the land use concentration pattern is studied based on the land use analysis and real ground scenario. The final activity pattern of the district is emerged out is shown in fig 12.3

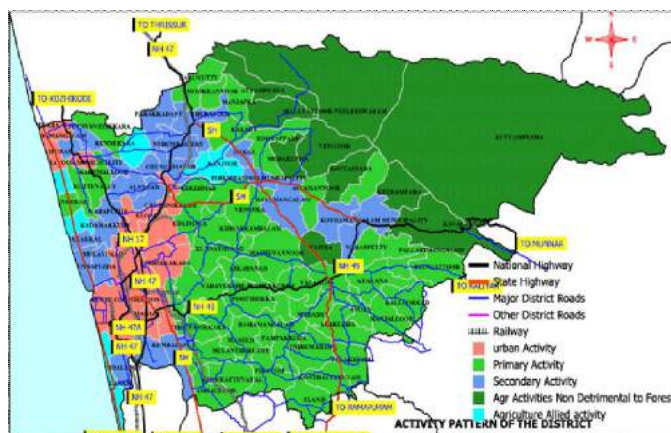


Fig 12.3 Activity Pattern of the District



Fig 12.4 Future connectivity network

12.1.3 CONNECTIVITY

Transportation always depends upon the position of nodes and the rank of the nodes. The road

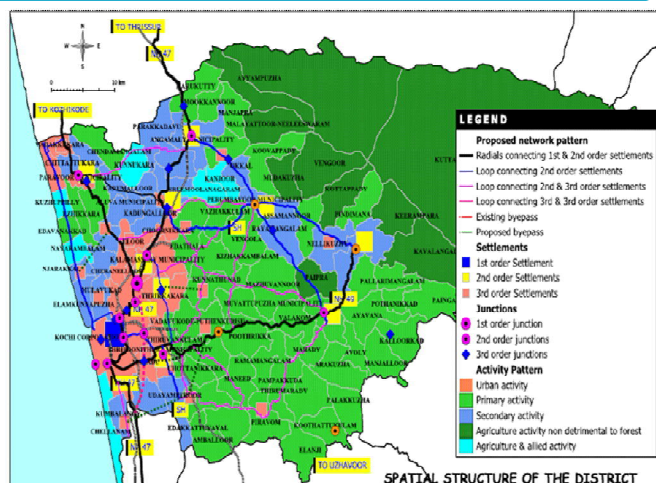


Fig 12.5 Suggested spatial structure of the District

net work should connect the higher order settlements and nodes. The suggested future connectivity of the district is shown in fig 12.4.

12.1.4 SPATIAL STRUCTURE

The spatial structure of the district is obtained by overlaying the activity pattern, road net work and hierarchy of settlements derived. The spatial structure so obtained is shown in figure 12.5.

12.2 INFERENCE

The activity pattern of the district (urban activity, primary activity, secondary activity, Agriculture activity non detrimental to forest agriculture and allied activity) is studied. Based on the hierarchy of settlements, hierarchy of nodes and transportation network, the spatial structure of the district is evolved. The spatial structure provides the development frame work of the District by determining the function and hierarchy of settlements and the connectivity network between them.

Chapter 13

SUMMARY OF FINDINGS

1. Ernakulam district is one of the most developed districts in the Kerala State situated almost at the middle of State and on the coast of the Arabian Sea. It has credit of being the economic nerve center of the State. Kochi, the "Queen of Arabian Sea" is often described as the industrial and commercial capital of Kerala. Ernakulam district is bestowed with all the geographical factors which help the development of industries and it is in the forefront of all other districts in Kerala in the field of industry.
2. Ernakulam district with per capita income per annum of Rs. 79553 (2009-10-Quick Estimate) ranks first among districts of the state.
3. The Sea along the entire coast of the district and the backwaters abound in fish of various kinds offering enormous natural facilities for both marine and inland fisheries. Cochin Port, one of the major ports of the country is blessed with several natural advantages and it lies on the direct route to Australia and the Far East from Europe.
4. Even though significant developments have taken place in industrial and tertiary sectors, the district still have a large number of people engaged in agriculture and allied activities. Dense population, urbanization, land reforms, change in family systems, etc., have resulted in the fragmentation of land. Hence a shift in the economic activity from agriculture to other sectors is taking place.
5. The district has a very good transport and communication network. One of the all season ports of the country is situated at Kochi. There is one international airport at Nedumbassery; there is also one fishing harbor, which can accommodate more than thousand fishing boats. Telephone and Internet facilities are available throughout the district. The district is well connected by road, rail and air with the rest of the state and the whole country.
6. The district is divided into three well defined parts-highland, midland and the lowland consisting of hills and forests, plains and the seaboard respectively. 20 percent of the total area is low land region. The midland consists mainly of plain land having natural facilities of drainage via backwaters and canals. The hilly or eastern portion is formed by a section of Western Ghats. Muvattupuzha, Kothamangalam and eastern part of Aluva can be called the highlands.
7. The Malayattoor high range and northern and northeastern tip of the Muvattupuzha and Kothamangalam Taluk formed the forest area of the district. Area under forest is 709.69 sqkms.
8. The most important rivers in the district are Periyar and Muvattupuzha. The Periyar is the longest river in the district, stretched over with a length of 229km. The river plays a prominent role in the development of agricultural, industrial and commercial sector of the district. Another important river of the district is Muvattupuzha, which is formed by the union of three rivers such as Kaliyar, Thodupuzhayar and Kothamanagalar. The district is blessed with an attractive network of canals and

backwaters such as Vembanad Kayal and Kodungallor Kayal stretch along the western and north eastern coast of the district.

13.2 POPULATION

1. Ernakulam district is comparatively denser than the state with 9.75% of the total population of the state in the district having only 7.9% of the geographical area of the state. In other words the population density of Ernakulam District (1012 persons/sq km) is higher than that of the state (819 persons /sq km) indicating pressure on land.
2. Even though decadal growth rate of population of Ernakulam District is (10.24% as per 2001 census) greater than the average growth rate (9.42%) of the State ,the growth rate of population in the district is not a steady variation .Population growth rate is increasing during 1981-91 from 6.38% to 11.12% and then declining for the last three decades and hence it can be presumed that there won't be much increase in the gross population density of the district in future if the present trend continues. An increase of only 1.21 lakhs and 0.78 lakhs respectively are expected in the succeeding decades of 2001-11 and 2011-21.
3. The LSGs adjacent to the urban LSGs (especially Kochi Corporation), show higher growth rate of population indicating possibility of out migration from the urban areas to the immediate hinter land as well as the possibility of immigrants to the urban areas get settle down in the nearby LSGs. The coastal region shows a growth rate of 5-10%, whereas the central region shows a population growth rate of 10 to 15%. The district ranks 2nd with respect to urban content among the districts in the state.
4. The population concentration pattern and LSG wise distribution of the gross population

density shows that there is concentration of population in some parts of the District. The coastal LSGs and LSGs adjacent to it show maximum population density and majority of the total population of the district is concentrated in the coastal belt and midland regions adjacent to coastal belt.

5. The gross population density of the LSGs in the Coastal Panchayats and Kochi corporation and its contiguous towns are the highest (in the range of 3200- 6270pp.sq.km.), whereas the gross population density of the central region and eastern mid land region is in the range of 1500- 3000 and that of the eastern hill region is less than 600 pp.sq.km.

13.3 WORK PARTICIPATION RATE AND OCCUPATIONAL PATTERN

1. Work participation rate of the district (36%) is more than that of the state (32%). At the same time it is below the desirable WPR of a developed economy. This indicates idling of certain portion of potential work force of the district.
2. The analysis of the occupational structure of the district points to a disturbing situation about the economic base of the district. The number of workers in primary sector of production namely cultivators and agricultural labourers show declining trend. The occupational structure of the district shows that (Refer Chapter 4) more than 75% of the total workers engage in non agricultural pursuits. Even in rural areas of the district, more than 60% of workers belong to non primary sectors, mainly service or tertiary sector. Number of workers in service sectors is on the increase. Number of industrial workers shows a slight increase. It is observed that rural areas of the district are slowly withdrawing from the primary sector and

depends more on service sector and on industrial sector to a certain extent.

3. A shift (mainly towards service sector and secondary/Tertiary sector) in the occupational structure of the district (even in rural areas) resulting in the possible destruction of the rural character of rural areas is taking place. There is dilution in the rural nature of the rural areas of the district as far as the occupational structure is considered. This has resulted in narrowing down of the boundary distinguishing the character of rural and urban areas in terms occupational structure.
4. The growth rate of the total workers during the period 1991-2001 (growth rate is 18.57 %) is higher than the growth rate of the total population (Growth rate of total population is 10.24%) of the same period indicating that work opportunities are increasing in proportion to the increase in population. However, the rate of increase in number of main workers shows a decreasing trend, indicating disturbing picture about employment generation which has reflection in resource utilization and in turn in the economic base and may lead to reduced local economic growth.
5. Among the total workers only 13% of workers constitute agriculture labourers and cultivators which indicate less intensive agriculture activity in the District.
6. Among the total workers, 84% of workers are engaged in other services. Higher percentage of workers both in urban and rural areas is engaged in other trade such as construction activities, mining and quarrying, Trade and commerce, transport, storage and communication, service sector etc. This indicates that more workers are engaged in

secondary and tertiary sectors, which is still higher in urban area than rural area.

7. Based on concentration pattern of workers, LSGs of the district exhibit one of the following six activity patterns i.e. primary, secondary, tertiary, combination of primary and secondary, combination of secondary and tertiary and combination of primary and tertiary (Refer Chapter 4).

13.4 LAND USE

1. When compared to nearby districts Ernakulam shows no major prominence with respect to rural land uses or urban land uses. The highest percentage (47.96%) of land use falls under the category Residential / Agricultural mix, which include mainly dry agriculture lands where in residential developments, are coexistent.
2. The land use analysis shows concentration of forest land use in LSGs located in eastern highland region of the district indicating rich natural resources and environmental sensitiveness of the area.
3. Water bodies and forest also has a significant share (174.58 and 709.69 sq.km respectively) in the land use of the district.
4. Residential land use which include land use categorized as Mixed Built-up/Mixed Built-up converted from paddy, Residential, and Residential (Converted from Paddy) shows higher concentration in Ernakulam District with 12.94% of the total area of the state under this category.

13.5 DEVELOPMENT DIRECTIVES

1. The spatial distribution of the settlements based on its character shows a clear demarcation in the pattern of the settlements in four categories. Kochi Corporation, Aluva and Thrippunithura municipalities show the urban

character. Some of coastal LSGs and LSGs contiguous to the Kochi Corporation also show urban character. Semi urban character is exhibited by LSGs that have urban influence like Chengammanad, Kunnukara, Mulavukad, Kumbalangy and Njarakkal (located near to Municipalities). But some Municipalities in midland and highland region shows semirural character. Semi rural character is seen in some other LSGs which are in a transition zone between LSGs of urban and rural character. Most of the LSGs in the midland and high land region of the District exhibit rural character.

2. Existing hierarchy of settlements based on facilities and the proposed hierarchy of settlements evolved from the analysis show that Kochi Corporation is the single first order settlement. Besides, there are 9 second order settlements and 14 third order settlements in the District to have equitable distribution of facilities that each settlement in a specific hierarchy should cater.
3. The study and analysis of nodes shows that, Kochi Corporation and most of other urban centres in the district are served by higher order nodes. The unserved areas shows the necessity of third order nodes and modified situations with new third order nodes are proposed.
4. Even though Ernakulam district is blessed with all modes of transportation, road transportation always depends upon the position of nodes and the rank of the nodes. So as part of modification of road network based on the hierarchy of nodes, a conceptual road network is prepared based on the suggested hierarchy of nodes and settlements together with existing major road network. A future connectivity network is prepared by superimposing the proposed conceptual road network with the proposed hierarchy of nodes.
5. Ernakulam district is most urbanised when compared to the state. The level of urbanization shows an inclining trend within the district. The Kochi Corporation acts as the nucleus of urbanisation of the District, from where the urban character spreads to the nearby LSGs.
6. Even though there exists Urban-Rural continuum, the activity pattern evolved based on the land use concentration pattern, future urban profile and functional classification shows that there is a clear demarcation of areas of concentration of urban activity, agricultural activity, agriculture and allied activity and agriculture activity non detrimental to forests in the district, making it possible to assign definite development character to each region.
7. The spatial structure provides the development frame work of the District by determining the function and hierarchy of settlements and the connectivity network between them. Based on the hierarchy of settlements, hierarchy of nodes, transportation network, the spatial structure of the district is evolved.

ANNEXE - 1

LIST OF LOCAL GOVERNMENTS IN ERNAKULAM DISTRICT

Sl. No.	Name of LSGs	Sl. No.	Name of LSGs	Sl. No.	Name of LSGs
1	AIKARANAD	34	KEERAMPARA	67	PAIPRA
2	ALANGAD	35	KEEZHMAD	68	PALAKKUZHA
3	ALUVA MUNICIPALITY	36	KIZHAKKAMBALAM	69	PALLARIMANGALAM
4	AMBALLOOR	37	KOCHI CORPORATION	70	PALLIPURAM
5	ANGAMALY MUNICIPALITY	38	KOOTHATTUKULAM	71	PAMPAKKUDA
6	ARAKUZHA	39	KOOVAPPADY	72	PARAKKADAVU
7	ASSAMANNOOR	40	KOTHAMANGALAM MUNICIPALITY	73	PARAVOOR MUNICIPALITY
8	AVOLY	41	KOTTAPPADY	74	PERUMBAVOOR MUNICIPALITY
9	AYAVANA	42	KOTTUVALY	75	PINDIMANA
10	AYYAMPUZHA	43	KUMBALAM	76	PIRAVOM
11	CHELLANAM	44	KUMBALANGY	77	POOTHRIKKA
12	CHENDAMANGALAM	45	KUNNATHUNAD	78	POTHANIKKAD
13	CHENGAMANAD	46	KUNNUKARA	79	PUTHENVELIKKARA
14	CHERANELLOOR	47	KUTTAMPUZHA	80	RAMAMANGALAM
15	CHITTATTUKARA	48	KUZHUPPILLY	81	RAYAMANGALAM
16	CHOORNIKKARA	49	MALAYATTOOR-NEELEESWARAM	82	SREEMOOLANAGARAM
17	CHOTTANIKKARA	50	MANEED	83	THIRUMARADY
18	EDAKKATTUVAYAL	51	MANJALLOOR	84	THIRUVANIYOOR
19	EDATHALA	52	MANJAPRA	85	THIRUVANKULAM
20	EDAVANAKKAD	53	MARADU	86	THRIKKAKARA
21	ELAMKUNNAPUZHA	54	MARADY	87	THRIPOONITHURA MUNICIPALITY
22	ELANJI	55	MAZHUVANNOOR	88	THURAVOOR
23	ELOOR	56	MOOKKANNOOR	89	UDAYAMPEROOR
24	EZHICKARA	57	MUDAKUZHA	90	VADAKKEKARA
25	KADAMAKKUDY	58	MULANTHURUTHY	91	VADAVUKODE-PUTHENKURISU
26	KADUNGALLOOR	59	MULAVUKAD	92	VALAKOM
27	KALADY	60	MUVATTUPUZHA MUNICIPALITY	93	VARAPPETTY
28	KALAMASSERY MUNICIPALITY	61	NAYARAMBALAM	94	VARAPUZHA
29	KALLOORKAD	62	NEDUMBASSERY	95	VAZHAKKULAM
30	KANJOOR	63	NELLIKUZHY	96	VENGOLA
31	KARUKUTTY	64	NJARAKKAL	97	VENGOOR
32	KARUMALLOOR	65	OKKAL		
33	KAVALANGAD	66	PAINGATTOOR		

ANNEXE - 2

**DISTRICT WISE AND SECTOR WISE DISTRIBUTION OF GROSS STATE DOMESTIC PRODUCT
DURING 2008- 2009 AT CONSTANT (1999-2000) PRICES (QUICK ESTIMATE)**

Sl. No.	District	Primary		Secondary		Tertiary	
		GDDP	Annual Growth Rate (%)	GDDP	Annual Growth Rate (%)	GDDP	Annual Growth Rate (%)
1	2	3	4	5	6	7	8
1	Thiruvananthapuram	1280.55	1.44	3964.91	9.94	9696.23	6.8
2	Kollam	1541.07	1.39	2036.08	10.15	6397.27	7.06
3	Pathanamthitta	903.45	0.54	877.1	10.36	3540.86	7.56
4	Alappuzha	876.67	0.8	2072.35	10.04	5806.36	7
5	Kottayam	1602.09	0.46	1860.99	10.09	6031.92	7.31
6	Idukki	1139.26	0.34	812.9	8.7	2401.95	7.04
7	Ernakulam	1587.89	0.72	7599.91	9.97	10751.26	7.57
8	Thrissur	1169.87	0.9	3443.72	10.38	8724.47	7.27
9	Palakkad	1446.3	0.82	2622.44	9.51	6140.34	6.68
10	Malappuram	1380.25	0.92	2201.52	10.94	6721.71	6.47
11	Kozhikode	1197.41	0.97	3040.91	10.94	7699.95	6.81
12	Wayanad	589.19	0.38	350.36	10.66	1500.57	6.78
13	Kannur	1095.67	0.74	2239.47	11.09	6408.23	6.7
14	Kasargod	978.4	0.44	707.14	11.52	2762.5	7.1
	STATE	16788.07	0.81	33829.8	10.25	84584.62	7.02

Source: Department of Economics and Statistics

ANNEXE - 3

POPULATION PROJECTION – KERALA

The population of the State is calculated based on the decreasing rate method since the growth rate of population of the State has been decreasing for the last four decades. The tables below (Table 1) show the population details of Kerala over a century.

Table 1: Population of Kerala

Year	Total Population	Growth rate	% Decrease in Population Growth rate
1901	6396262		
1911	7147673	11.75	
1921	7802127	9.16	-22.06
1931	9507050	21.85	138.66
1941	11031541	16.04	-26.62
1951	13549118	22.82	42.32
1961	16903715	24.76	8.49
1971	21347375	26.29	6.18
1981	25453680	19.24	-26.83
1991	29098518	14.32	-25.56
2001	31841374	9.43	-34.17

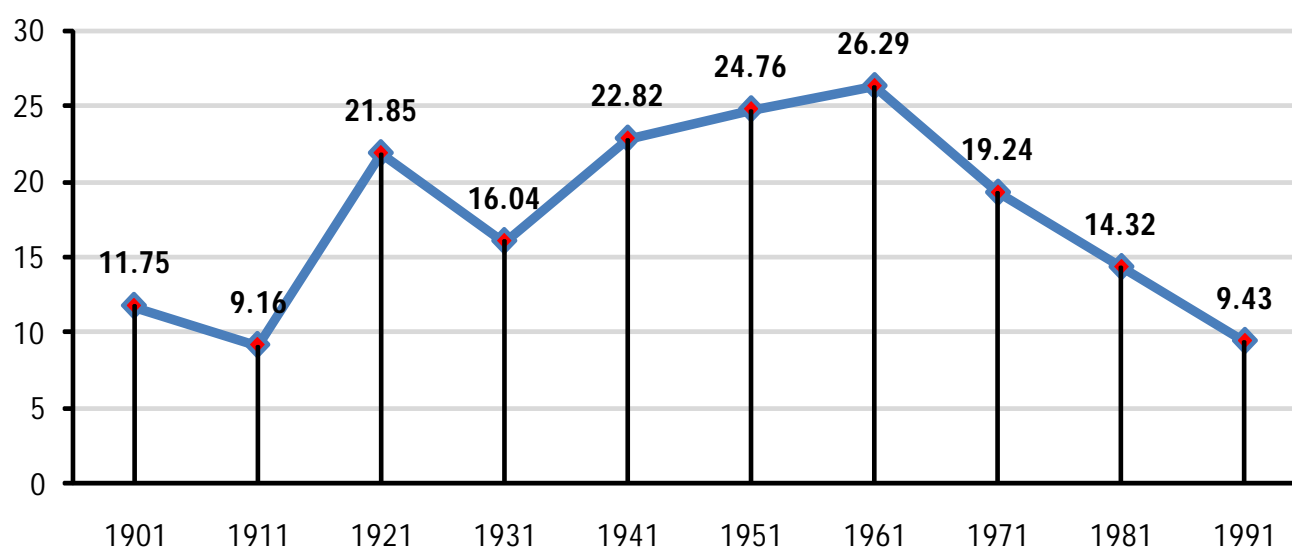


Fig 1 Growth rate of population – Kerala

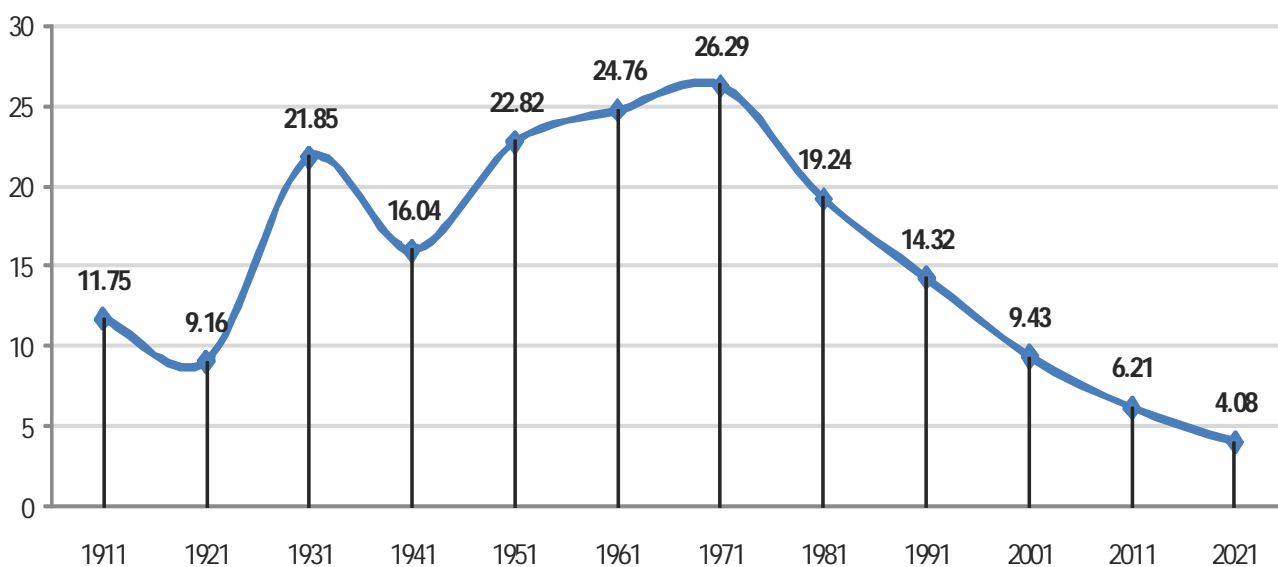


Fig 2 Projected Growth rate of population – Kerala

Table 2 Projected Population of Kerala

Year	Total Population	Growth rate	% Decrease in Population Growth rate
1901	6396262		
1911	7147673	11.75	
1921	7802127	9.16	-22.06
1931	9507050	21.85	138.66
1941	11031541	16.04	-26.62
1951	13549118	22.82	42.32
1961	16903715	24.76	8.49
1971	21347375	26.29	6.18
1981	25453680	19.24	-26.83
1991	29098518	14.32	-25.56
2001	31841374	9.43	-34.17
2011	33817196	6.21	-34.17
2021	35198589	4.08	-34.17

ANNEXE - 4

CONCENTRATION INDEX OF WORKERS

Sl. No.	LSGs	Cultivators	Agriculture Labourers	HH Industrial workers	Other workers
1	Aikkaranad	1.971	1.892	0.814	0.869
2	Alangad	0.247	0.572	1.18	1.091
3	Aluva	0.049	0.047	0.543	1.173
4	Amballur	0.882	1.727	1.373	0.924
5	Angamaly	0.626	0.78	1.154	1.022
6	Arakkuzha	3.23	2.059	0.554	0.782
7	Asamannoor	2.645	3.086	0.717	0.705
8	Avoly	2.503	1.483	0.532	0.859
9	Ayavana	3.08	2.444	0.653	0.742
10	Ayyampuzha	1.745	2.487	0.867	0.833
11	Chellanam	0.245	0.242	0.678	1.146
12	Chendamangalam	0.158	0.133	2.118	1.063
13	Chengamanad	0.375	0.469	1.155	1.099
14	Cheranalloor	0.047	0.037	0.923	1.171
15	Chittattukara	0.109	0.189	2.056	1.12
16	Choornikkara	0.091	0.149	0.942	1.145
17	Chottanikkara	0.552	0.929	0.773	1.042
18	Edakkattuvayal	2.339	2.496	0.565	0.77
19	Edathala	0.309	0.55	1.061	1.098
20	Edavanakkad	0.198	0.425	0.77	1.138
21	Elamkunnappuzha	0.144	0.138	0.706	1.165
22	Elanji	3.344	2.297	0.278	0.748
23	Eloor	0.08	0.055	0.553	1.178
24	Ezhikkara	0.296	1.4	0.661	1.013
25	Kadamakkudy	0.299	0.528	0.614	1.114
26	Kadungalloor	0.41	0.376	0.925	1.117
27	Kalady	1.066	1.013	4.761	1.005
28	Kalamassery	0.119	0.277	0.626	1.143
29	Kalloorkkad	2.505	2.188	0.427	0.815
30	Kanjoor	1.109	1.031	1.86	0.986
31	Karukutty	1.467	1.308	0.95	0.946
32	Karumalloor	0.831	1.575	1.257	0.967
33	Kavalangad	2.723	2.809	0.674	0.738
34	Keerampara	2	4.962	0.291	0.585
35	Keezhmadu	0.201	0.414	0.75	1.117

Cont....

Sl. No.	LSGs	Cultivators	Agriculture Labourers	HH Industrial workers	Other workers
36	Kizhakkambalam	2.025	1.57	0.643	0.893
37	Kochi corporation	0.022	0.023	0.922	1.181
38	Koothattukulam	2.613	1.182	0.582	0.868
39	Koovappady	1.921	1.954	2.055	0.72
40	Kothamangalam	1.29	1.312	0.579	0.966
41	Kottappady	2.658	3.968	0.639	0.63
42	Kottuvally	0.178	0.647	1.59	1.076
43	Kumbalam	0.146	0.247	0.807	1.145
44	Kumbalangi	0.253	0.132	1.545	1.157
45	Kunnathunad	1.798	1.883	0.988	0.881
46	Kunnukara	1.319	2.735	0.478	0.834
47	Kuttampuzha	2.536	2.547	1.993	0.724
48	Kuzhuppilly	0.242	0.643	0.489	1.1
49	Malayattoor-Neeleshwaram	1.23	2.449	5.394	0.857
50	Maneed	2.501	2.122	0.702	0.8
51	Manjalloor	2.052	1.771	0.245	0.882
52	Manjapra	2.161	1.701	2.024	0.837
53	Maradu	0.013	0.006	0.524	1.186
54	Marady	2.694	1.127	0.166	0.901
55	Mazhuvannoor	3.572	3.234	0.511	0.647
56	Mookkannoor	2.214	2.379	1.547	0.806
57	Mudakkuzha	2.945	3.2	0.995	0.684
58	Mulamthuruthy	0.877	1.552	1.259	0.941
59	Mulavukad	0.02	0.079	0.246	1.18
60	Muvattupuzha	0.239	0.273	0.403	1.132
61	Nayarambalam	0.224	0.51	0.891	1.124
62	Nedumbassery	1.339	0.914	0.96	1.003
63	Nellidduzhy	1.336	1.827	0.816	0.886
64	Njarackal	0.185	0.484	0.475	1.132
65	Okkal	1.478	1.003	2.695	0.912
66	Paingottur	2.393	3.446	0.168	0.694
67	Paipra	1.719	1.771	0.633	0.897
68	Palakkuzha	3.705	1.732	0.312	0.773
69	Pallarimangalam	1.886	1.834	0.581	0.873
70	Pallippuram	0.17	0.138	1.585	1.156
71	Pambakkuda	3.144	1.577	0.598	0.821
72	Parakkadavu	1.674	1.95	1.326	0.857
73	Paravur	0.028	0.05	1.351	1.151
74	Perumbavoor	0.476	0.628	0.592	1.087
75	Pindimana	1.938	1.274	0.372	0.92

Cont....

Sl. No.	LSGs	Cultivators	Agriculture Labourers	HH Industrial workers	Other workers
76	Piravom	2.046	1.192	0.71	0.917
77	Poothrikka	3.065	1.31	0.66	0.855
78	Pothanikkad	2.083	1.894	0.25	0.853
79	Puthenvelikkara	0.784	0.563	1.268	1.078
80	Ramamangalam	2.911	2.037	0.38	0.79
81	Rayamangalam	2.199	2.225	1.098	0.823
82	Sreemoolanagaram	0.593	1.236	0.946	1.022
83	Thirumarady	3.606	2.648	0.498	0.689
84	Thiruvaniyoor	2.074	1.68	1.052	0.979
85	Thiruvankulam	0.052	0.164	1.334	1.025
86	Thrikkakkara	0.126	0.229	0.643	1.154
87	Thrippunithura	0.034	0.11	0.863	1.16
88	Thuravoor	1.291	1.451	2.588	0.884
89	Udayamperur	0.217	0.506	0.658	1.108
90	Vadakkekara	0.122	0.125	1.499	1.145
91	Vadavucode-Puthencruz	1.06	0.905	0.363	1.023
92	Valakom	3.4	1.707	0.621	0.787
93	Varappety	2.005	2.133	0.413	0.843
94	Varapuzha	0.178	0.434	0.846	1.12
95	Vazhakkulam	1.089	1.246	1.351	0.967
96	Vengola	2.299	1.711	0.874	0.857
97	Vengoor	3.457	3.959	0.47	0.587

ANNEXE - 4A

ACTIVITY PATTERN OF WORKERS

Sl. No.	Name of LSGs	CI of Primary	CI of Secondary	CI of Tertiary	Activity Pattern
1	Aikkaranad	1.927	0.618	0.932	P
2	Alangad	0.444	1.363	1.002	S+T
3	Aluva	0.048	1.266	1.109	S+T
4	Amballur	1.394	0.674	1.02	P+T
5	Angamaly	0.72	1.377	0.943	S
6	Arakkuzha	2.529	0.483	0.853	P
7	Asamannoor	2.917	0.536	0.761	P
8	Avoly	1.892	0.646	0.93	P
9	Ayavana	2.702	0.384	0.849	P
10	Ayyampuzha	2.196	0.281	0.98	P
11	Chellanam	0.244	0.985	1.155	T
12	Chendamangalam	0.143	1.23	1.101	S+T
13	Chengamanad	0.433	1.99	0.816	S
14	Cheranalloor	0.041	1.28	1.106	S+T
15	Chittattukara	0.157	1.361	1.059	S+T
16	Choornikkara	0.126	1.629	0.985	S
17	Chottanikkara	0.78	0.903	1.073	T
18	Edakkattuvayal	2.439	0.597	0.837	P
19	Edathala	0.455	1.329	1.01	S+T
20	Edavanakkad	0.336	0.568	1.261	T
21	Elamkunnappuzha	0.14	0.868	1.21	T
22	Elanji	2.718	0.356	0.854	P
23	Eloor	0.065	2.701	0.675	S
24	Ezhikkara	0.963	0.71	1.095	T
25	Kadamakkudy	0.438	1.203	1.051	S+T
26	Kadungalloor	0.39	1.679	0.917	S
27	Kalady	1.036	1.875	0.731	P+S
28	Kalamassery	0.215	1.644	0.963	S
29	Kalloorkkad	2.319	0.331	0.94	P
30	Kanjoor	1.064	1.253	0.912	P+S
31	Karukutty	1.374	0.982	0.932	P
32	Karumalloor	1.282	1.145	0.901	P+S
33	Kavalangad	2.78	0.366	0.839	P
34	Keerampara	3.792	0.244	0.675	P
35	Keezhmadu	0.33	1.361	1.024	S+T

Cont....

Sl. No.	Name of LSGs	CI of Primary	CI of Secondary	CI of Tertiary	Activity Pattern
36	Kizhakkambalam	1.754	1.143	0.808	P+S
37	Kochi corporation	0.022	0.929	1.215	T
38	Koothattukulam	1.754	0.699	0.942	P
39	Koovappady	1.944	1.573	0.642	P+S
40	Kothamangalam	1.306	0.625	1.052	P+T
41	Kottappady	3.454	0.334	0.715	P
42	Kottuvally	0.462	1.148	1.062	S+T
43	Kumbalam	0.207	0.685	1.252	T
44	Kumbalangi	0.18	2.151	0.817	S
45	Kunnathunad	1.853	0.842	0.879	P
46	Kunnukara	2.176	1.335	0.667	P+S
47	Kuttampuzha	2.543	0.287	0.909	P
48	Kuzhuppilly	0.485	0.943	1.12	T
49	Malayattoor Neeleshwaram	1.968	1.682	0.604	P+S
50	Maneed	2.277	0.577	0.875	P
51	Manjalloor	1.886	0.561	0.957	P
52	Manjapra	1.887	0.973	0.833	P
53	Maradu	0.009	0.863	1.238	T
54	Marady	1.753	0.509	0.999	P
55	Mazhuvannoor	3.375	0.431	0.702	P
56	Mookkannoor	2.318	0.796	0.801	P
57	Mudakkuzha	3.105	0.786	0.648	P
58	Mulamthuruthy	1.287	1.022	0.937	P+S
59	Mulavukad	0.056	1.274	1.105	S+T
60	Muvattupuzha	0.26	0.668	1.246	T
61	Nayarambalam	0.397	0.727	1.202	T
62	Nedumbassery	1.085	2.003	0.683	P+S
63	Nellikuzhy	1.635	0.8	0.935	P
64	Njarackal	0.366	0.849	1.171	T
65	Okkal	1.191	0.388	1.146	P+T
66	Paingottur	3.033	0.335	0.798	P
67	Paipra	1.754	0.576	0.979	P
68	Palakkuzha	2.521	0.396	0.881	P
69	Pallarimangalam	1.858	0.363	1.022	P+T
70	Pallippuram	0.151	1.202	1.108	S+T
71	Pambakkuda	2.204	0.569	0.892	P
72	Parakkadavu	1.844	0.946	0.85	P

Cont...

Sl. No.	Name of LSGs	CI of Primary	CI of Secondary	CI of Tertiary	Activity Pattern
73	Paravur	0.041	1.005	1.189	S+T
74	Perumbavoor	0.569	1.249	1.011	S+T
75	Pindimana	1.541	0.551	1.028	P+T
76	Piravom	1.534	1.084	0.87	P+S
77	Poothrikka	2.011	0.471	0.959	P
78	Pothanikkad	1.973	0.356	1.001	P+T
79	Puthenvelikkara	0.652	1.095	1.041	S+T
80	Ramamangalam	2.389	0.412	0.902	P
81	Rayamangalam	2.219	0.912	0.786	P
82	Sreemoolanagaram	0.983	2.035	0.693	S
83	Thirumarady	3.035	0.44	0.766	P
84	Thiruvaniyoor	1.837	0.917	1.001	P+T
85	Thiruvankulam	0.12	1.132	1.006	S+T
86	Thrikkakkara	0.188	0.908	1.189	T
87	Thrippunithura	0.08	1.048	1.168	S+T
88	Thuravoor	1.39	1.44	0.791	P+S
89	Udayamperur	0.392	0.642	1.228	T
90	Vadakkekara	0.124	1.725	0.956	S
91	Vadavucode-Puthencruz	0.969	1.546	0.843	S
92	Valakom	2.385	0.694	0.818	P
93	Varappety	2.086	0.478	0.942	P
94	Varapuzha	0.333	1.159	1.085	S+T
95	Vazhakkulam	1.186	1.326	0.866	P+S
96	Vengola	1.949	0.992	0.815	P
97	Vengoor	3.767	0.425	0.626	P

ANNEXE - 5

LSG WISE CONCENTRATION INDICES OF VARIOUS LAND USE

Sl. No.	Name of LSGs	CI Agri area	CI Forest	CI Marshy	CI Water	CI Resi	CI Resi/Agr	CI Builtup	CI Plantation	CI Oth area
1	Aikkaranad	1.176	0.043	0	0.055	0.112	1.791	6.761	0	0.488
2	Alangad	0.379	0	0	0.484	0.373	1.911	0	0	0
3	Aluva	0	0	0	1.657	7.518	0.924	0	0	4.655
4	Amballur	0.364	0	0	0.479	1.942	1.729	0	0	0
5	Angamaly	2.558	0	0	0.037	1.689	1.375	0	0	0.888
6	Arakkuzha	2.619	0.113	0	0.166	1.528	1.322	0	0	0.337
7	Asamannoor	1.631	0.018	0	0.006	3.068	1.394	0	0	0.375
8	Avoly	1.425	0.032	0	0.556	1.735	1.506	0	0	1.132
9	Ayavana	1.82	0.103	0	0.353	1.382	1.443	1.722	0.109	1.269
10	Ayyampuzha	0.642	0.947	0	0.222	0.271	1.143	0	2.583	0.378
11	Chellanam	0	0	0	3.591	0.038	1.637	0	0	1.084
12	Chendamangalam	0	0	0	1.961	0.48	1.796	0	0	0
13	Chengamanad	3.757	0	0	1.744	1.714	0.926	0	0	1.715
14	Cheranalloor	0	0	0	2.956	1.368	1.572	0	0	0
15	Chittattukara	0	0	0	1.486	2.515	1.603	2.926	0	0
16	Choorikkara	0.754	0	0	0.73	4.725	1.295	0	0	0
17	Chottanikkara	1.549	0.042	0	0.072	0.515	1.698	0	0	0
18	Edakkattuvayal	0.525	0	0	0.07	0.719	1.891	0	0	0
19	Edathala	0.99	0.056	0	0.007	2.689	1.55	0	0	0
20	Edavanakkad	0	0	0	2.222	0.734	1.728	0	0	0.378
21	Elamkunnappuzha	0	0	0	3.002	0.129	1.641	0	0	4.462
22	Elanji	0.713	0.05	0	0	1.106	1.793	0	0	0
23	Eloor (M)	0	0	0	1.448	0.495	1.777	27.461	0	0
24	Ezhikkara	0	0	0	6.381	0.064	1.32	0	0	0
25	Kadamakkudy	0	0	0	5.814	0.052	1.388	0	0	0
26	Kadungalloor	0.351	0	0	0.817	2.05	1.679	0	0	0
27	Kalady	2.556	0	0	0.75	1.784	1.269	1.289	0	1.332
28	Kalamassery	0.455	0.17	0	0.143	4.513	1.354	4.26	0	0
29	Kalloorkkad	2.701	0.131	0	0.029	0.499	1.428	4.277	0	0
30	Kanjoor	1.439	0.017	0	1.472	1.638	1.287	1.275	0	8.737
31	Karukutty	0.64	0.091	0	0.06	0.687	1.796	1.019	0	1.93
32	Karumalloor	1.966	0	0	1.296	0.702	1.471	0	0	0
33	Kavalangad	2.054	1.122	0	0.436	0.433	0.671	4.486	2.83	2.221
34	Keerampara	2.474	0.548	0	0.92	0.789	0.861	5.114	2.268	0.357
35	Keezhmadu	0.974	0	0	0.665	3.688	1.383	0	0	0

Cont....

Sl. No.	Name of LSGs	CI Agri area	CI Forest	CI Marshy	CI Water	CI Resi	CI Resi/Agr	CI Builtup	CI Plantation
36	Kizhakkambalam	2.277	0	0	0.137	0.555	1.562	0	0
37	Kochi corporation	0	0.002	31.353	2.033	7.765	0.395	5.632	0
38	Koothattukulam	1.012	0.027	0	0	2.409	1.593	0	0
39	Koovappady	1.705	0.005	0	0.557	0.6	1.568	1.443	0.319
40	Kothamangalam	1.406	0.039	0	0.179	2.941	1.423	0.251	0
41	Kottappady	1.475	0.013	0	0.071	1.729	1.098	0	4.175
42	Kottuvally	0.526	0	0	1.529	0.059	1.795	0	0
43	Kumbalam	0.502	0	0	9.356	0	0.877	0	0
44	Kumbalangi	0	0	0	8.202	0	1.111	0	0
45	Kunnathunad	1.368	0.019	0	0.045	1.28	1.657	0	0
46	Kunnukara	3.733	0	0	1.283	1.12	1.083	0	0
47	Kuttampuzha	0.04	3.215	0	0.847	0.061	0.105	0	2.442
48	Kuzhuppilly	0	0	0	2.487	1.294	1.602	0	0
49	Malayattoor-Neeleshwaram	0.426	0.869	0	0.999	0.427	1.151	0	2.205
50	Maneed	1.103	0.009	0	0.294	0.305	1.791	0	0
51	Manjalloor	1.865	0.127	0	0.176	0.883	1.311	1.891	0
52	Manjapra	1.731	0	0	0	2.393	1.429	0	0.053
53	Maradu	0	0	0	3.694	2.212	1.385	0	0
54	Marady	1.118	0.09	0	0.37	1.564	1.587	3.981	0
55	Mazhuvannoor	1.614	0.064	0	0	0.2	1.721	0	0
56	Mookkannoor	1.393	0	0	0.035	2.743	1.483	0	0
57	Mudakkuzha	2.321	0	0	0.051	0.235	1.555	0	0
58	Mulamthuruthy	1.334	0	0	0.199	0.41	1.757	0	0
59	Mulavukad	0	0	0	9.78	0.887	0.818	0	0
60	Muvattupuzha	0.971	0.009	0	0.512	3.754	1.385	1.968	0
61	Nayarambalam	0	0	0	3.456	0	1.649	0	0
62	Nedumbassery	5.434	0	0	0.136	1.011	0.871	1.54	0
63	Nellikuzhy	2.071	0.022	0	0.034	0.775	1.561	0	0
64	Njarackal	0	0	0	2.818	0.106	1.701	0	0
65	Ockal	2.588	0	0	1.486	1.753	1.134	5.715	0
66	Paingottur	4.547	0.314	0	0.283	0.4	0.787	0	1.028
67	Paipra	1.7	0.134	0	0.047	2.6	1.368	0	0
68	Palakkuzha	0.882	0.178	0	0	1.147	1.686	2.819	0
69	Pallarimangalam	2.784	0.066	0	0.117	1.439	1.335	0	0
70	Pallippuram	0.077	0	0	5.238	1.407	1.251	3.781	0
71	Pambakkuda	1.649	0.01	0	0	1.219	1.615	1.688	0
72	Parakkadavu	2.346	0	0	0.442	0.636	1.498	0	0

Cont....

Sl. No.	Name of LSGs	CI Agri area	CI Forest	CI Marshy	CI Water	CI Resi	CI Resi/Agr	CI Builtup	CI Plantation
73	Paravur	0	0	0	0.174	1.175	1.926	0	0
74	Perumbavoor	1.44	0	0	0.268	5.579	1.113	0.896	0
75	Pindimana	2.776	0.048	0	0.199	1.809	1.241	1.308	0.228
76	Piravom	0.62	0	0	0.753	3.387	1.47	0	0
77	Poothrikka	1.169	0.005	0	0.246	0.299	1.751	15.249	0
78	Pothanikkad	1.658	0.031	0	0.261	1.326	1.564	0	0
79	Puthenvelikkara	1.589	0	0	2.978	0.332	1.382	0	0
80	Ramamangalam	2.275	0.003	0	0.644	0.333	1.531	0	0
81	Rayamangalam	1.4	0.013	0	0.008	3.914	1.345	0	0
82	Sreemoolanagaram	3.292	0.014	0	1.255	1.049	1.092	0	0
83	Thirumarady	1.9	0.06	0	0	1.191	1.551	0	0
84	Thiruvaniyoor	1.888	0.125	0	0	0.709	1.562	0	0
85	Thiruvankulam	0.753	0	0	0.544	1.885	1.653	0	0
86	Thrikkakkara	0.707	0	0	0.526	2.241	1.622	0	0
87	Thrippunithura	0	0	0	1.671	5.901	1.19	0	0
88	Thuravoor	1.381	0	0	0.093	5.296	1.183	0	0
89	Udayamperur	0.063	0	0	8.55	0.695	0.975	0	0
90	Vadakkekkara	0	0	0	3.017	1.646	1.532	0	0
91	Vadavucode-Puthencruz	0.052	0.026	0	0.624	3.972	1.509	0	0
92	Valakom	5.104	0.027	0	0.474	1.395	0.87	0	0
93	Varappety	1.936	0.086	0	0.164	1.99	1.417	0	0
94	Varapuzha	0	0	0	1.596	0.028	1.892	0	0
95	Vazhakkulam	0.981	0.023	0	0.552	1.516	1.627	0.105	0
96	Vengola	1.853	0.032	0	0	3.119	1.344	0.203	0
97	Vengoor	0.889	0.004	0	0.603	1.086	1.078	1.18	5.428

ANNEXE - 6

LSG WISE MAJOR ACTIVITY (AS PER LAND USE ANALYSIS)

Sl. No.	Name of LSGs	Concentration index greater than one			
		Other builtup	Agricultural	Forest	Residential
1	Aikkaranad	P	P		
2	Alangad	No major predominant activity as per landuse			
3	Aluva				P
4	Amballur				P
5	Angamaly		P		P
6	Arakkuzha		P		P
7	Asamannoor		P		P
8	Avoly		P		P
9	Ayavana	P	P		P
10	Ayyampuzha	No major predominant activity as per landuse			
11	Chellanam	No major predominant activity as per landuse			
12	Chendamangalam	No major predominant activity as per landuse			
13	Chengamanad		P		P
14	Cheranalloor				P
15	Chittattukara	P			P
16	Choornikkara				P
17	Chottanikkara		P		
18	Edakkattuvayal	No major predominant activity as per landuse			
19	Edathala				P
20	Edavanakkad	No major predominant activity as per landuse			
21	Elamkunnappuzha	No major predominant activity as per landuse			
22	Elanji				P
23	Eloor (M)	P			
24	Ezhikkara	No major predominant activity as per landuse			
25	Kadamakkudy	No major predominant activity as per landuse			
26	Kadungalloor				P
27	Kalady	P	P		P
28	Kalamassery	P			P
29	Kalloorkkad	P	P		
30	Kanjoor	P	P		P
31	Karukutty	P			
32	Karumalloor		P		
33	Kavalangad	P	P	P	
34	Keerampara	P	P		
35	Keezhmadu				P

Cont....

Sl. No.	Name of LSGs	Concentration index greater than one			
		Other builtup	Agricultural	Forest	Residential
36	Kizhakkambalam		P		
37	Kochi corporation	P			
38	Koothattukulam		P		P
39	Koovappady	P	P		
40	Kothamangalam		P		P
41	Kottappady		P		P
42	Kottuvally	No major predominant activity as per landuse			
43	Kumbalam	No major predominant activity as per landuse			
44	Kumbalangi	No major predominant activity as per landuse			
45	Kunnathunad		P		P
46	Kunnukara		P		P
47	Kuttampuzha			P	
48	Kuzhuppilly				P
49	Malayattoor Neeleshwaram	No major predominant activity as per landuse			
50	Maneed		P		
51	Manjalloor	P	P		
52	Manjapra		P		P
53	Maradu				P
54	Marady	P	P		P
55	Mazhuvannoor		P		
56	Mbokkannoor		P		P
57	Mudakkuzha		P		
58	Mulamthuruthy		P		
59	Mulavukad	No major predominant activity as per landuse			
60	Muvattupuzha	P			P
61	Nayarambalam	No major predominant activity as per landuse			
62	Nedumbassery	P	P		P
63	Nellidduzhy		P		
64	Njarackal	No major predominant activity as per landuse			
65	Ockal	P	P		P
66	Paingottur		P		
67	Paipra		P		P
68	Palakkuzha	P			P
69	Pallarimangalam		P		P
70	Pallippuram	P			P
71	Pambakkuda	P	P		P
72	Parakkadavu		P		

Cont....

Sl. No.	Name of LSGs	Concentration index greater than one			
		Other builtup	Agricultural	Forest	Residential
73	Paravur				P
74	Perumbavoor		P		P
75	Pindimana	P	P		P
76	Piravom				P
77	Poothrikka	P	P		
78	Pothanikkad		P		P
79	Puthenvelikkara		P		
80	Ramamangalam		P		
81	Rayamangalam		P		P
82	Sreemoolanagaram		P		P
83	Thirumarady		P		P
84	Thiruvaniyoor		P		
85	Thiruvankulam				P
86	Thrikkakkara				P
87	Thrippunithura				P
88	Thuravoor		P		P
89	Udayamperur	No major predominant activity as per landuse			
90	Vadakkekara				P
91	Vadavucode-Puthencruz				P
92	Valakom		P		P
93	Varappety		P		P
94	Varapuzha	No major predominant activity as per landuse			
95	Vazhakkulam				P
96	Vengola		P		P
97	Vengoor	P			P

ANNEXE - 7

LSG WISE LAND USE CONCENTRATION PATTERN

Sl. No.	Name of LSGs	CI of Forest	CI of Agri	CI of Plantation	CI of Non-Agri	Result
1	Aikkaranad	0.043	1.8	0	0.48	AGRICULTURE
2	Alangad	0	1.95	0	0	AGRICULTURE
3	Aluva	0	0.72	0	15.64	URBAN
4	Amballur	0	1.64	0	0	AGRICULTURE
5	Angamaly	0	1.23	0	0.25	AGRICULTURE
6	Arakkuzha	0.113	1.45	0	0	AGRICULTURE
7	Asamannoor	0.018	1.38	0	0.11	AGRICULTURE
8	Avoly	0.032	1.72	0	0.32	AGRICULTURE
9	Ayavana	0.103	1.26	0.109	0.18	AGRICULTURE
10	Ayyampuzha	0.947	1.09	2.583	0	PLANTATION
11	Chellanam	0	1.58	0	0	AGRICULTURE
12	Chendamangalam	0	1.45	0	0	AGRICULTURE
13	Chengamanad	0	1.43	0	3.56	URBAN
14	Cheranalloor	0	1.55	0	0	AGRICULTURE
15	Chittattukara	0	1.25	0	5.38	URBAN
16	Choornikkara	0	1.47	0	9.83	URBAN
17	Chottanikkara	0.042	1.87	0	0	AGRICULTURE
18	Edakkattuvayal	0	1.87	0	0	AGRICULTURE
19	Edathala	0.056	2.04	0	0	AGRICULTURE
20	Edavanakkad	0	1.42	0	0	AGRICULTURE
21	Elamkunnappuzha	0	1.28	0	0.27	AGRICULTURE
22	Elanji	0.05	1.71	0	0	AGRICULTURE
23	Eloor	0	3.02	0	1.23	AGRICULTURE
24	Ezhikkara	0	1.05	0	0	AGRICULTURE
25	Kadamakkudy	0	1.44	0	0	AGRICULTURE
26	Kadungalloor	0	1.95	0	0	AGRICULTURE
27	Kalady	0	2.25	0	0.06	AGRICULTURE
28	Kalamassery	0.17	1.47	0	0.21	AGRICULTURE
29	Kalloorkkad	0.131	1.16	0	0.21	AGRICULTURE
30	Kanjoor	0.017	1.74	0	2.44	URBAN
31	Karukutty	0.091	1.81	0	0.11	AGRICULTURE
32	Karumalloor	0	1.53	0	0	AGRICULTURE
33	Kavalangad	1.122	0.62	2.83	0.26	PLANTATION
34	Keerampara	0.548	0.94	2.268	0.26	PLANTATION
35	Keezhmadu	0	1.44	0	0	AGRICULTURE

Cont....

Sl. No.	Name of LSGs	CI of Forest	CI of Agri	CI of Plantation	CI of Non-Agri	Result
36	Kizhakkambalam	0	1.3	0	0.06	AGRICULTURE
37	Kochi corporation	0.002	0.31	0	21.68	URBAN
38	Koothattukulam	0.027	1.79	0	0	AGRICULTURE
39	Koovappady	0.005	1.62	0.319	0.07	AGRICULTURE
40	Kothamangalam	0.039	1.38	0	0.07	AGRICULTURE
41	Kottappady	0.013	1.6	4.175	0.08	PLANTATION
42	Kottuvally	0	1.48	0	0	AGRICULTURE
43	Kumbalam	0	0.69	0	0	AGRICULTURE
44	Kumbalangi	0	1.56	0	0	AGRICULTURE
45	Kunnathunad	0.019	1.41	0	0	AGRICULTURE
46	Kunnukara	0	0.95	0	0	AGRICULTURE
47	Kuttampuzha	3.215	0.1	2.442	0	FOREST
48	Kuzhupilly	0	1.37	0	0	AGRICULTURE
49	Malayattoor-Neeleshwaram	0.869	1.03	2.205	0	PLANTATION
50	Maneed	0.009	1.44	0	0.12	AGRICULTURE
51	Manjalloor	0.127	1.11	0	0.09	AGRICULTURE
52	Manjapra	0	1.63	0.053	0.07	AGRICULTURE
53	Maradu	0	1.08	0	4.6	URBAN
54	Marady	0.09	1.47	0	0.2	AGRICULTURE
55	Mazhuvannoor	0.064	1.39	0	0	AGRICULTURE
56	Mookkannoor	0	1.78	0	0	AGRICULTURE
57	Mudakkuzha	0	1.63	0	0	AGRICULTURE
58	Mulamthuruthy	0	1.77	0	0	AGRICULTURE
59	Mulavukad	0	0.64	0	1.84	URBAN
60	Muvattupuzha	0.009	1.43	0	0.1	AGRICULTURE
61	Nayarambalam	0	1.29	0	0	AGRICULTURE
62	Nedumbassery	0	0.77	0	0.61	AGRICULTURE
63	Nellikuzhy	0.022	1.12	0	0.31	AGRICULTURE
64	Njarackal	0	1.33	0	0.22	AGRICULTURE
65	Ockal	0	1.32	0	0.38	AGRICULTURE
66	Paingottur	0.314	0.66	1.028	0	PLANTATION
67	Paipra	0.134	1.31	0	0.23	AGRICULTURE
68	Palakkuzha	0.178	1.46	0	0.14	AGRICULTURE
69	Pallarimangalam	0.066	1.35	0	0	AGRICULTURE
70	Pallippuram	0	0.98	0	3.12	URBAN
71	Pambakkuda	0.01	1.43	0	0.08	AGRICULTURE
72	Parakkadavu	0	1.24	0	0.07	AGRICULTURE

Cont....

Sl. No.	Name of LSGs	CI of Forest	CI of Agri	CI of Plantation	CI of Non-Agri	Result
73	Paravur	0	1.5	0	2.44	URBAN
74	Perumbavoor	0	1.38	0	0.07	AGRICULTURE
75	Pindimana	0.048	1.29	0.228	0.22	AGRICULTURE
76	Piravom	0	1.55	0	0.11	AGRICULTURE
77	Poothrikka	0.005	1.47	0	0.76	AGRICULTURE
78	Pothanikkad	0.031	1.73	0	0	AGRICULTURE
79	Puthenvelikkara	0	1.11	0	0.08	AGRICULTURE
80	Ramamangalam	0.003	1.64	0	0	AGRICULTURE
81	Rayamangalam	0.013	1.71	0	0.03	AGRICULTURE
82	Sreemoolanagaram	0.014	1.03	0	1.42	URBAN
83	Thirumarady	0.06	1.42	0	0	AGRICULTURE
84	Thiruvaniyoor	0.125	1.56	0	0.32	AGRICULTURE
85	Thiruvankulam	0	2.27	0	0	AGRICULTURE
86	Thrikkakkara	0	1.53	0	0	AGRICULTURE
87	Thrippunithura	0	0.93	0	12.28	URBAN
88	Thuravoor	0	1.74	0	0	AGRICULTURE
89	Udayamperur	0	1.59	0	0	AGRICULTURE
90	Vadakkekara	0	1.2	0	3.42	URBAN
91	Vadavucode-Puthencruz	0.026	1.55	0	0.18	AGRICULTURE
92	Valakom	0.027	0.98	0	0	AGRICULTURE
93	Varappety	0.086	1.47	0	0	AGRICULTURE
94	Varapuzha	0	2.7	0	0	AGRICULTURE
95	Vazhakkulam	0.023	1.41	0	0.24	AGRICULTURE
96	Vengola	0.032	1.34	0	0.01	AGRICULTURE
97	Vengoor	0.004	1.08	5.428	0.07	PLANTATION

ANNEXE - 8

COMPOSITE FUNCTIONAL INDEX (CFI) OF SETTLEMENT

Sl. No.	Name of LSG	CFI VALUE	Sl. No.	Name of LSG	CFI VALUE	Sl. No.	Name of LSG	CFI VALUE
1	Kochi corporation	1880.3	34	Edathala	60.78	67	Kizhakkambalam	39.09
2	Kothamangalam	344.76	35	Kavalangad	59.75	68	Valakom	38.55
3	Kalamassery	267.26	36	Rayamangalam	59.49	69	Karumalloor	38.4
4	Muvattupuzha	258.26	37	Kadungalloor	57.95	70	Nayarambalam	38.33
5	Aluva	256.47	38	Kottuvally	56.3	71	Okkal	37.65
6	Paravur	227.31	39	Chendamangalam	56.14	72	Elanji	36.05
7	Perumbavoor	213.23	40	Cheranallor	55.92	73	Varappety	34.57
8	Thrippunithura	209.58	41	Alangad	54.97	74	Chittattukara	34.52
9	Thrikkakkara	198.24	42	Kalloorkkad	54.92	75	Mudakkuzha	34.19
10	Angamaly	176.64	43	Chottanikkara	54.32	76	Kuttampuzha	34.04
11	Maradu	126.76	44	Njarackal	53.51	77	Puthenvelikkara	32.75
12	Kalady	118.06	45	Kottappady	53.39	78	Thirumarady	32.48
13	Eloor	113.77	46	Poothrikka	51.27	79	Pothanikkad	32.37
14	Vadakkekkara	109.06	47	Thiruvankulam	51.07	80	Palakkuzha	32.05
15	Nellidduzhy	108.62	48	Kanjoor	50.97	81	Mookkannoor	31.65
16	Mulavukad	106.92	49	Nedumbassery	50.26	82	Vengoor	31.65
17	Koothattukulam	101.72	50	Edakkattuvayal	48.28	83	Parakkadavu	30.75
18	Kumbalam	99.09	51	Mazhuvannoor	47.57	84	Arakkuzha	29.48
19	Vadavucode-Puthencruz	98.4	52	Thiruvaniyoor	47.32	85	Pallarimangalam	28.97
20	Pallippuram	93.44	53	Ramamangalam	47.23	86	Keezhmadu	28.86
21	Aikkaranad	88.7	54	Sreemoolanagaram	45.96	87	Thuravoor	28.6
22	Piravom	87.84	55	Chellanam	45.96	88	Ayavana	27.62
23	Varapuzha	85.26	56	Avoly	43.98	89	Marady	27.39
24	Vengola	80.04	57	Manjalloor	42.26	90	Edavanakkad	25.78
25	Udayamperur	73.8	58	Kunnukara	42.25	91	Asamannoor	25.2
26	Elamkunnappuzha	73.15	59	Kunnathunad	41.48	92	Choornikkara	24.09
27	Koovappady	72.94	60	Chengamanad	40.87	93	Maneed	24.03
28	Kumbalangi	70.41	61	Amballur	40.52	94	Paingottur	22.98
29	Mulamthuruthy	70.06	62	Ezhikkara	40.34	95	Pindimana	21.77
30	Keerampara	68.55	63	Pambakkuda	40.12	96	Manjapra	17.62
31	Karukutty	66.67	64	Paipra	40.05	97	Ayyampuzha	15.85
32	Vazhakkulam	66.32	65	Malayattoor-Neeleshwaram	39.49			
33	Kadamakkudy	61.43	66	Kuzhuppilly	39.48			

ANNEXE - 9

HIERARCHY OF SETTLEMENTS (EXISTING)

Order of settlement	Sl. No.	Name of LSG	Order of settlement	Sl. No.	Name of LSG
I st order	1	Kochi Corporation	V th order	1	Edakkattuvayal
II nd order	1	Kothamangalam (M)		2	Mazhuvannoor
	2	Kalamassery (M)		3	Thiruvaniyoor
	3	Muvattupuzha (M)		4	Ramamangalam
	4	Aluva (M)		5	Sreemoolanagaram
	5	Paravoor (M)		6	Chellanam
	6	Perumbavoor (M)		7	Avoly
	7	Thrippunithura (M)		8	Manjalloor
III rd order	1	Angamaly (M)		9	Kunnukara
	2	Thrikkakara		10	Kunnathunad
	3	Maradu		11	Chengamanad
	4	Kalady		12	Amballur
	5	Eloor		13	Ezhikkara
	6	Vadakkekara		14	Pambakkuda
	7	Nellikuzhi		15	Paipra
	8	Mulavukad		16	Malayattoor Neeleshwaram
	9	Koothattukulam		17	Kuzhuppilly
IV th order	1	Kumbalam		18	Kizhakkambalam
	2	Vadavucode-Puthencruz		19	Valakom
	3	Pallipuram		20	Karumalloor
	4	Aikkaranad		21	Nayarambalam
	5	Piravom		22	Okkal
	6	Varapuzha		23	Elanji
	7	Vengola		24	Varappety
	8	Udayamperur		25	Chittattukara
	9	Elamkunnappuzha		26	Mudakkuzha
	10	Koovappady		27	Kuttampuzha
	11	Kumbalangi		28	Puthenvelikkara
	12	Mulanthuruthy		29	Thirumarady
	13	Keerampara		30	Pothanikkad
	14	Karukutty		31	Palakkuzha
	15	Vazhakkulam		32	Mookannoor
	16	Kadamakkudy		33	Vengoor
	17	Edathala		34	Parakkadavu
	18	Kavalangad		35	Arakkuzha
	19	Rayamangalam		36	Pallarimangalam
	20	Kadungalloor		37	Keezhmadu
	21	Kottuvally		38	Thuravoor
	22	Chendamangalam		39	Ayavana
	23	Cheranallor		40	Marady
	24	Alangad		41	Edavanakkad
	25	Kalloorkkad		42	Asamannoor
	26	Chottanikkara		43	Choornikkara
	27	Njarakkal		44	Maneed
	28	Kottappady		45	Paingottur
	29	Poothrikka		46	Pindimana
	30	Thiruvankulam		47	Manjapra
	31	Kanjoor		48	Ayyampuzha
	32	Nedumbassery			

ANNEXE - 10A

CENTRALITY

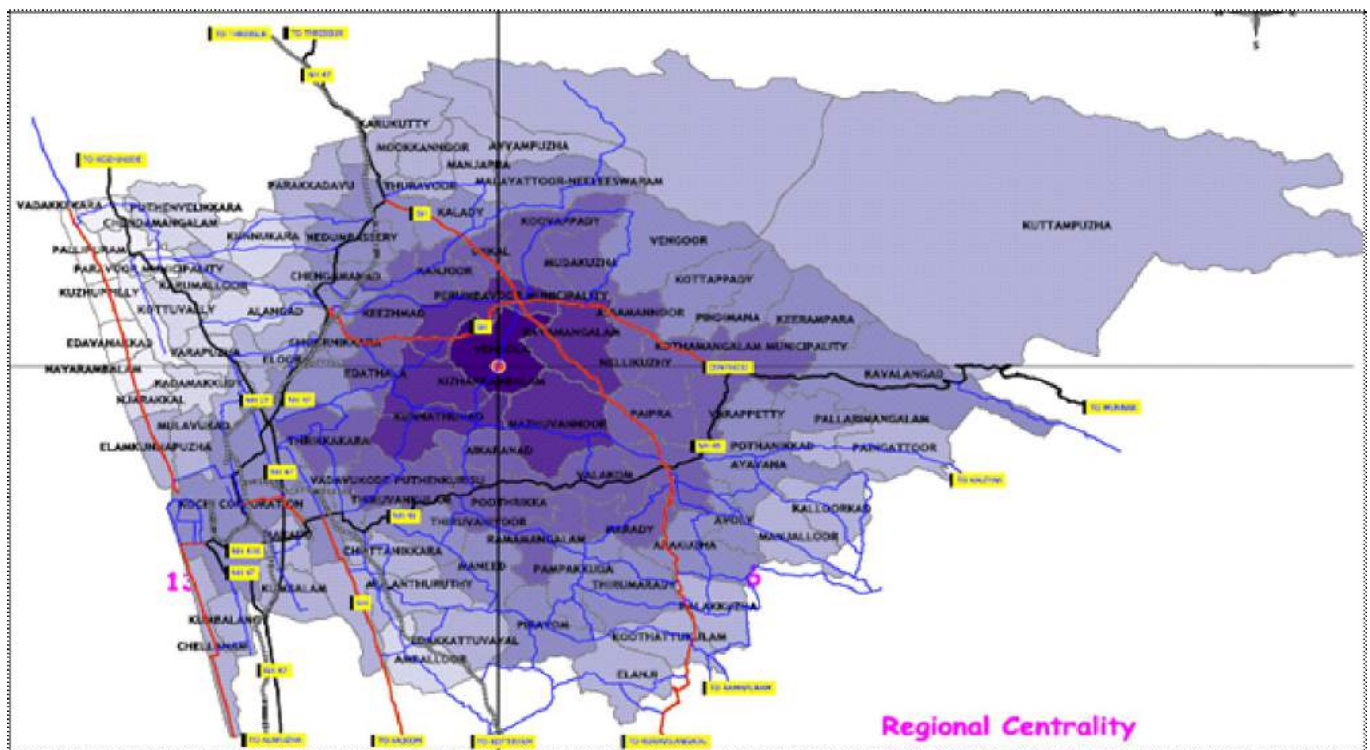
Centrality is the locational importance acquired by an area because of its position in the geographical center or proximity to the geographical center of a region. An area placed in the centre of a region or near to the center possesses the advantage that it is accessible (if there is no physical barrier in between) equally from all parts of the region under consideration. In practical terms a local body located in the centre of a District has a potential deriving out of its central location with respect to the District. For deriving the proposed hierarchy of the settlement, this criterion, the centrality of the settlements are also to be taken into account. An attempt is made here to quantify the centrality of an area to make this value in analysis.

This centrality value is very much useful in identifying the proposed hierarchy of various local bodies. The most important part in the identification of the hierarchy of settlements is assigning various order (1st Order, 2nd Order, 3rd Order etc.) to the

settlement and for of this centrality at different levels are to be calculated. Practically it can be assumed that centrality at three levels are existing. They are Regional centrality, Sub regional centrality and Local Centrality

REGIONAL CENTRALITY

Regional Centrality is the locational importance; a settlement is deriving out of its proximity to the geographical central position of the region. A settlement falling at the centre of the region possesses the maximum regional centrality value of 1 and it can be termed as the central settlement. Those settlements adjacent to the central settlement can be said to possess the regional centrality value of 2. The next layer of settlements adjacent to the settlements having the regional centrality value of 2, possess the regional centrality value of 3. In this way, the regional centrality value of any settlement in a region can be calculated. The figure below shows the variation of the centrality value of various Local bodies of the District.



The Regional centrality values of various local bodies of Ernakulam District are shown in the table below.

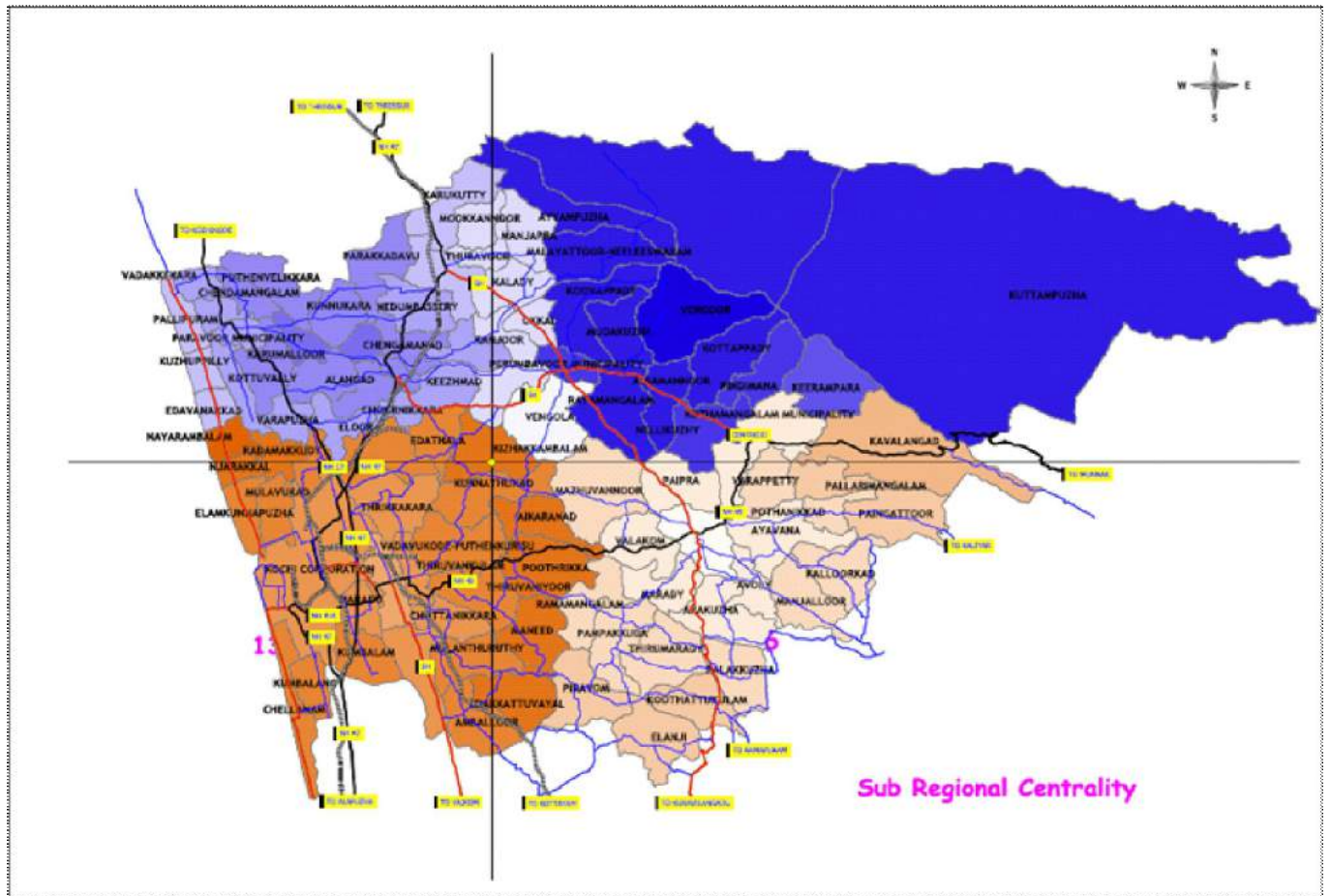
SUB REGIONAL CENTRALITY

Sub Regional centrality is the locational importance; a settlement is deriving out of its proximity

LSG Name	Value of centrality	LSG Name	Value of centrality	LSG Name	Value of centrality
Vengola	1	Varapetty	4	Kalloorkkad	5
Rayamangalam	2	Thiruvamkulam	4	Manjalloor	5
Pindimana	2	Arakkuzha	4	Chellanam	5
Kumbalangi	2	Avoly	4	Elanji	5
Mazhuvanoor	2	Ayavana	4	Palakkuzha	5
Kizhakkambalam	2	Maneed	4	Prakkadavu	5
Vazhakkulam	2	Pampakkuda	4	Kottuvally	5
Kanjoor	3	Piravam	4	Ellamkunnappuzha	5
Sreemoolanagaram	3	Thirumarady	4	Mulavukkadu	5
Thrikkakara	3	Chengamanad	4	Kumbalam	5
Asamanoor	3	Nedumbassery	4	Maradu	5
Koovappady	3	Knnathunadu	4	PARAVUR (M)	5
Okkal	3	Poothrikka	4	TRIPPUNNITHURA (M)	5
Mudakkuzha	3	Thiruvaniyoor	4	KOCHI CORPORATION (C)	5
Nellikuzhi	3	Choomikkara	4	Alangad	6
Pothanikkad	3	ANGAMALY (M)	4	Varapuzha	6
Marady	3	ALUVA (M)	4	Kadamakkudy	6
Paipra	3	KALAMASSERY (M)	4	Kottapady	6
Valakom	3	KOTHAMANGALAM (M)	4	Amballor	6
Koothattukulam	3	Kadungalloor	5	Kunnukara	6
Ramamangalam	3	Eloor	5	Puthenvelikkara	6
Aikkaranadu	3	Karumalloor	5	Chendamangalam	6
Vadavukodu-Puthencruz	3	Ayyampuzha	5	Njarakkal	6
Edathala	3	Karukutty	5	Chittattukara	7
Keezhumadu	3	Manjapra	5	Ezhkkara	7
MUVATTUPUZHA (M)	3	Mookkanoor	5	Vadakkakkara	7
Kalady	4	Cheranalloor	5	Nayarambalm	7
Malayatoor-Neeleeswaram	4	Paingottoor	5	PERUMBAVOOR (M)	7
Thuravoor	4	Kuttampuzha	5	Edavanakkad	8
Vengoor	4	Chottanikkara	5	Kuzhuppilly	8
Kavalangad	4	Edakkattuvalay	5	Pallippuram	8
Keerampara	4	Mulanthuruthy	5		
Pallarimangalam	4	Udayamperoor	5		

to the geographical centre of a sub-region. A region can be divided into four sub-regions, North-East region, North-West region, South-East region and South-West region. A settlement falling in the center of a sub-region will possess the maximum sub regional value of 1 and this settlement can be termed as the sub regional central settlement. Those settlements adjacent to the central settlement can be said to possess the Sub

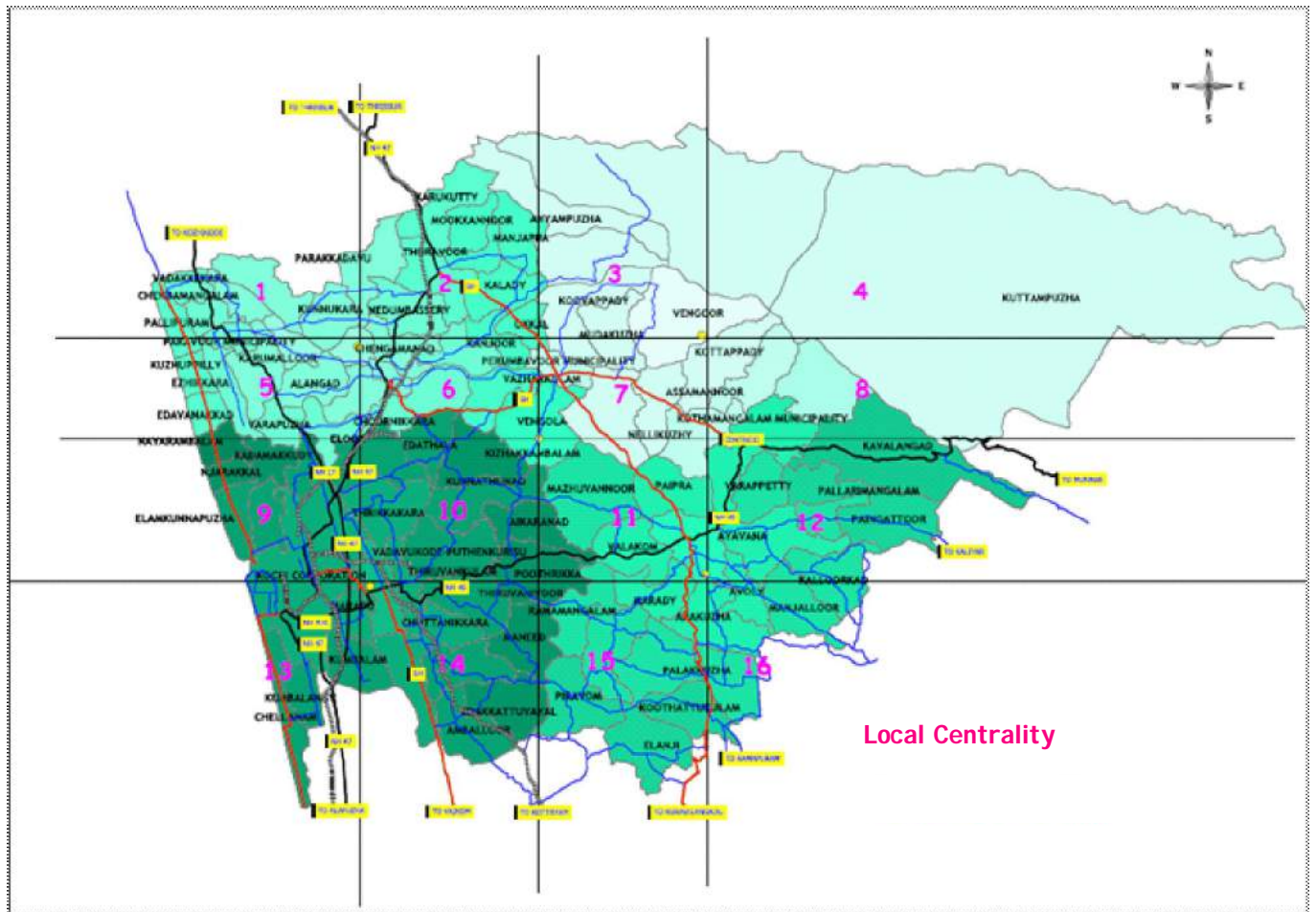
regional centrality value of 2. Similarly, settlements adjacent to the settlements with centrality value of 2 can be said to possess sub-regional centrality value of 3. The sub-regional centrality value of any settlement in sub regional can be assessed like this. The figure and table shows the variation of the sub regional centrality value of various Local bodies of the District.



DIVISION	LSG	CENTRALITY VALUE	DIVISION	LSG	CENTRALITY VALUE	DIVISION	LSG	CENTRALITY VALUE
NORTH	OKKAL	1	2	ARAKKUZHA	4	3	CHENDAMANGALAM	4
1	KALADY	2	2	THIRUMARADY	4	3	CHITTATTUKARA	4
1	KOOVAPPADY	2	2	ELANJI	4	3	PARAVOOR (M)	4
1	KANJOOR	2	2	UDAYAMPERUR	4	3	PALLIPPURAM	4
1	PERUMBAVUR	2	2	AMBALLOOR	4	3	KUZHUPPILLY	4
1	VAZHAKKULAM	3	2	PALAKKUZHA	5	3	EDAVANAKAD	4
1	VENGOLA	3	2	KOOTHATTUKULAM	5	3	NAYARAMBALAM	4
1	MUDAKKUZHA	3	2	KUMBALAM	5	3	NJARAKKAL	4
1	MALAYATTOOR-NELESWARAM	3	2	KUMBALANGY	5	3	ELAMKUNNAPUZHA	4
1	MANJAPRA	3	2	CHELLANAM	6	3	NEDUMBASSERY	5
1	THURAVOOR	3	EAST	ELOOR	1	3	VADAKKEKARA	5
1	ANGAMALY (M)	3	3	ALANGAD	2	WEST	KOTHAMANGAM(M)	1
1	SREEMOOLANAGARAM	3	3	KADUNGALLUR	2	4	VARAPPETTY	2
1	AYYAMPUZHA	4	3	CHOORNIKKARA	2	4	PALLARI MANGALAM	2
1	KARUKUTTY	4	3	KALAMASSERY(M)	2	4	KAVALANGAD	2
1	PARAKKADAVU	4	3	KOCHI CORPORATION	2	4	KEERAMPARA	2
1	MOOKKANNOOR	4	3	CHERANELLOOR	2	4	PINDIMANA	2
SOUTH	POOTHRIKKA	1	3	VARAPPUZHA	2	4	NELLIKKUZHAY	2
2	AIKKARANAD	2	3	THRIKKAKARA	3	4	PAIPRA	2
2	RAMAMANGALAM	2	3	EDATHALA	3	4	MOOVATTUPUZHA	2
2	MANEED	2	3	KEEZHMADU	3	4	AYAVANA	2
2	THIRUVANIYUR	2	3	ALUVA(M)	3	4	AVOLY	3
2	VADAVUKODE-PUTHENCROZ	2	3	KARUMALLOOR	3	4	MANJALLOOR	3
2	KUNNATHUNAD	3	3	KOTTUVALLY	3	4	KALLOORKAD	3
2	MAZHAVANNUR	3	3	EZHICKARA	3	4	PAINGATTOOR	3
2	VALAKOM	3	3	KADAMAKKUDY	3	4	POTHANIKKAD	3
2	MARADY	3	3	MULAVUKAD	3	4	KUTTAMPUZHA	3
2	PAMPAKKUDA	3	3	MARADU	3	4	KOTTAPPADY	3
2	PIRAVOM	3	3	THRIIPPUNITHURA(M)	3	4	ASAMANNNOOR	3
2	EDAKKATTUVAYAL	3	3	KIZHAKKAMBALAM	4	4	RAYAMANGALAM	3
2	MULANTHURUTHY	3	3	CHENGAMMANDU	4	4	VENGOOR	4
2	CHOTTANIKKARA	3	3	KUNNUKARA	4			
2	THIRUVANKULAM	3	3	PUTHENVELIKKARA	4			

LOCAL CENTRALITY

The Sub regions identified earlier can be further divided into four parts (N, S, E, W) and each area can be termed as a local area & the centrality of a settlement deriving out of the proximity of the settlement with the centre of the local area can be termed as the local centrality. Like regional centrality, different settlements can have the local centrality value of 1, 2, 3 etc. The figure below shows the variation of the local centrality value of various Local bodies of the District.



ANNEXE 10B

CONNECTIVITY

Connectivity is a term to denote how well an area is connected to other parts of the region (inter regional) or other regions (intra regional). Two indicators are taken to assess the connectivity of an area under consideration with other areas. First criteria is the existence of a road of the category of NH, SH or

MDR and second is the grade of the rail way station existing (if any) in the area under consideration. The details of the rail way station and the type of roads in each of the local body of Ernakulam District are shown in the table below.

Sl. No.	LSG Name	Grade of railway station	Type of road
1	Alangad		MDR
2	Kadungaloor		SH
3	Eloor		MDR
4	Varapuzha		NH, MDR
5	Karumaloor		MDR
6	Ayyampuzha		MDR
7	Kalady		SH, MDR
8	Kanjoor		MDR
9	Karukutty	F	NH, MDR
10	Malayatoor Neeleeswaram		MDR
11	Manjapra		MDR
12	Mookkanoor		MDR
13	Sreemoolanagaram	F	MDR
14	Thuravoor		SH, MDR
15	Cheranaloor		NH
16	Kadamakkudy		
17	Thrikkakara		SH
18	Asamanoor		SH, MDR
19	Koovappady		SH, MDR
20	Okkal		SH, MDR
21	Mudakkuzha		SH, MDR
22	Rayamangalam		SH, MDR
23	Vengoor		MDR
24	Kavalangad		NH, MDR
25	Keerampara		MDR
26	Kottapady		
27	Nellikuzhi		SH, MDR
28	Paingottoor		MDR

Cont....

Sl.No	LSG Name	Grade of railway station	Type of road
29	Pallarimangalam		MDR
30	Pindimana		MDR
31	Pothanikkad		MDR
32	Varapetty		SH, MDR
33	Kuttampuzha		NH, MDR
34	Amballor		MDR
35	Chottanikkara		MDR
36	Edakkattuvayal	F	MDR
37	Mulanthuruthy	F	MDR
38	Thiruvamkulam		NH, MDR
39	Udayamperoor		SH, MDR
40	Arakkuzha		SH, MDR
41	Avoly		SH, MDR
42	Ayavana		MDR
43	Kalloorkkad		MDR
44	Manjalloor		SH, MDR
45	Marady		SH, MDR
46	Paipra		SH, MDR
47	Valakom		NH, MDR
48	Chellanam		SH, MDR
49	Kumbalngi		MDR
50	Elanji		MDR
51	Koothattukulam		SH, MDR
52	Maneed		MDR
53	Palkkuzha		SH, MDR
54	Pampakkuda		MDR
55	Piravam	F	MDR
56	Ramamangalam		MDR
57	Thirumarady		MDR
58	Chengamanad		NH, MDR
59	Kunnukara		MDR
60	Nedumbassery		NH, MDR

Cont....

Sl.No	LSG Name	Grade of railway station	Type of road
61	Prakkadavu		MDR
62	Puthenvelikkara		MDR
63	Chendamangalam		MDR
64	Chittattukara		NH, MDR
65	Ezhkkara		MDR
66	Kottuvally		NH, MDR
67	Vadakkakkara		NH, MDR
68	Aikkaranadu		NH, MDR
69	Knnathunadu		MDR
70	Mazhuvanoor		SH, MDR
71	Poothrikka		NH, MDR
72	Thiruvaniyoor		NH, MDR
73	Vadavukodu Puthencruz		NH, MDR
74	Choornikkara		NH, SH
75	Edathala		SH, MDR
76	Keezhumadu		MDR
77	Kizhakkambalam		MDR
78	Vazhakkulam		SH, MDR
79	Vengola		SH, MDR
80	Edavanakkad		SH
81	Ellamkunnappuzha		SH
82	Kuzhupilly		SH
83	Njarkkal		SH
84	Nayarambalm		SH
85	Mulavukkadu		MDR
86	Pallippuram		SH, MDR
87	Kumbalam	F	NH, MDR
88	Maradu	F	NH, MDR
89	Angamaly (M)	D	NH, SH, MDR
90	Aluva (M)	A	NH, SH, MDR
91	Paravur (M)		NH, MDR
92	Perumbavoor (M)		NH, SH, MDR
93	Kalamassery (M)	F	NH, MDR
94	Thripunithura (M)	F	NH, SH, MDR
95	Muvattupuzha (M)		NH, SH, MDR
96	Kothamangalam (M)		NH, SH
97	Kochi Corporation (C)	A, A, F, F	NH, SH, MDR

While calculating the proposed hierarchy of the settlements the presence of NH or SH is given a value of 1 and the presence of MDR is given a value of 2. The railway station of A grade is given a value of 1 and the

lower grades B, C, D etc is given values of 2, 3, 4 etc respectively.

ANNEXE 11
THIRD ORDER SETTLEMENTS WITH SERVICE AREA & SERVICE POPULATION

Sl. No.	Settlement	Service area	2001_ppIn	2021_ppIn
1	Kochi Corporation	Kochi Corporation	595575	665019
2	Kothamangalam (M)	Kothamangalam (M)	37173	40370
		Keerampara	13132	14174
		Kavalangad	29015	32847
		Pallarimangalam	12784	15213
		Paingattoor	15121	16446
		Pothanikkad	11689	14464
		Varappetty	16702	19460
		Kuttampuzha	25110	30152
3	Kalamassery (M)	Kalamassery (M)	63176	81572
		Edathala	36098	48400
4	Muvattupuzha (M)	Muvattupuzha (M)	29246	32594
		Valakom	17747	19944
		Marady	14550	16370
		Arakkuzha	15233	15790
		Avoly	17891	21575
		Manjallor	15598	18312
		Kalloorkad	13082	13667
		Ayavana	19533	22470
5	Aluva (M)	Aluva (M)	24110	23199
		Choornikkara	28875	33796
		Karumallor	33451	40326
		Kadungalloor	37575	48351
		Kunnukara	22126	29791
		Alangad	36420	43420
		Chengamanad	28030	33342
6	Paravoor (M)	Paravoor (M)	30059	33429
		Kottuvally	38037	44565
		Chendamangalam	28147	30187
		Puthenvelikkara	27005	31192
7	Perumbavoor (M)	Perumbavoor (M)	26547	29651
		Mudakkuzha	16767	19058
		Vengola	42866	54863
		Rayamangalam	33903	39947
8	Thrippunithura (M)	Thrippunithura (M)	59884	74674
		Thiruvankulam	21717	27289
9	Thrikkakara	Thrikkakara	65984	92759

Cont....

Sl. No.	Settlement	Service area	2001_ppln	2021_ppln
10	Angamaly (M)	Angamaly (M)	33409	38184
		Karukutty	26811	28623
		Mookkannoor	18638	23239
		Thuravoor	19587	22955
		Parakkadavu	29997	34246
		Nedumbassery	30361	35567
11	Maradu	Maradu	41012	52096
		Kumbalam	27549	32971
12	Kalady	Kalady	27021	30573
		Manjappra	15576	19938
		Okkal	22734	27299
		Kanjoor	21651	24909
		Ayyanpuzha	14902	12196
		Malayattoor-Neeleeswaram	25163	28853
		Koovappady	33102	17487
13	Eloor	Eloor	35573	38788
		Cheranellur	26316	33894
14	Vadakkekara	Vadakkekara	32781	35545
		Chittattukara	28026	32636
		Pallipuram	43523	48736
		Kuzhuppilly	12120	13276
15	Nellikuzhi	Nellikuzhi	35008	44439
		Assamannur	17947	20862
		Paipra	37929	47734
		Kottappady	17092	19926
		Vengoor	21633	23778
		Pindimana	15731	17208
16	Mulavukad	Mulavukad	22842	24063
		Elamkunnappuzha	50583	56458
17	Kumbalangy	Kumbalangy	26661	30415
		Chellanam	36209	42125
18	Vadavukode-Puthencruz	Vadavukode-Puthencruz	26710	29125
		Thiruvaniyoor	23613	27585
		Poothrika	19950	22505

Cont....

Sl. No.	Settlement	Service area	2001_ppIn	2021_ppIn
19	Piravom	Piravom	27263	37419
		Ramamangalam	15021	16147
		Maneed	18458	22336
		Elanji	18995	21983
		Koothattukulam	17682	19734
		Thirumarady	17491	19164
		Pampakkuda	17324	18624
		Palakkuzha	13469	14679
20	Mulanthuruthy	Mulanthuruthy	23615	27151
		Edakkatuvayal	17635	19664
		Amballoor	23350	27134
		Chottanikkara	19168	24108
		Udayamperur	33523	40923
21	Njarakkal	Njarakkal	24166	26373
		Nayarambalam	23786	25373
		Edavanakkad	20624	22374
22	Kunnathunadu	Kunnathunadu	29822	36796
		Kizhakkambalam	31631	38128
		Aikkaranad	19920	22993
		Mazhuvannur	32184	37746
23	Varapuzha	Varapuzha	24524	28028
		Kadamakkudy	15824	17783
		Ezhikkara	19026	22104
24	Keezhmad	Keezhmad	31656	39110
		Sreemoolanagaram	24600	29233
		Vazhakkulam	34277	44040

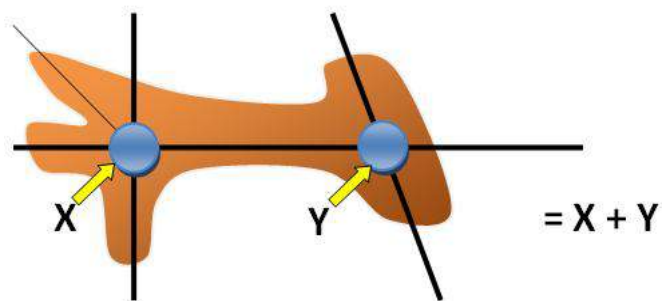
ANNEXE 12

HIERARCHY OF NODES – METHODOLOGY

In Kerala context where urban rural continuum persists, each local body is having at least one node. The agglomeration of activity area around one or more (adjacent) road junctions which acts as commercial centre of a local body is termed here as a node. The node need not be continued fully within a local body area and in most of the cases its service area goes beyond the boundary of the local body within which it locates. In certain cases the nodes may be located at the meeting point of boundary of one or two local bodies. This means that the nodes have an entity independent of the local body area which necessitates a separate study other than the settlement study. The hierarchies of the nodes are determined by the extent of activity taking place there. The number and type of shops, the number of people using the node, the business turnover and the extent of traffic, all determine the extent of activity and hence the hierarchy of nodes. But extensive survey and study are required to assess all these factors of the node. In this chapter the hierarchy of nodes and urban rural growth centres of the District are identified. However the extend of activity in a node can be determined by a proxy indicator denoted by the hierarchy of roads meeting at that place. The concept behind it and the methodology is explained here under.

The concept

1. The hierarchy of the activity nodes is the sum of the hierarchy value of all the junctions containing the node.
2. The hierarchy of a junction is directly proportional to the hierarchy and the number of roads meeting at that junction.



Step - 2:

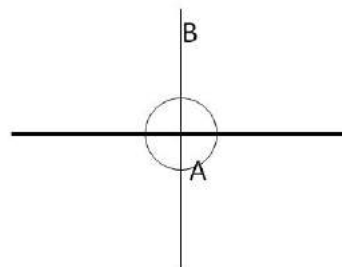
Assign values to meeting of various roads according to the following matrix
This can be termed as junction values.

	A	B	C	D	L
A	9	8	7	6	2
B	8	7	6	5	2
C	7	6	5	4	2
D	6	5	4	3	2
L	2	2	2	2	1

Step - 3:

Find the sum of all the junction values (within the node taken) to get the total weightage of the node.

Example - 1:



Here Junction value is of A meets B i.e., (11), therefore TWJ = 8.

Methodology

Step - 1:

Categorise the roads meeting at a junction

A-NH & SH

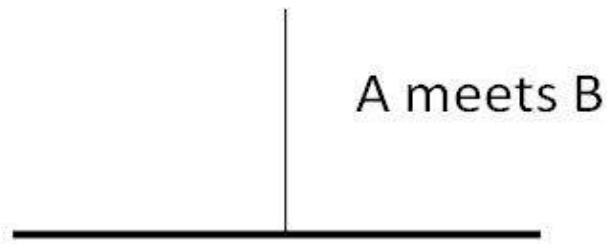
B-Major District roads

C-Major bus routes, Jilla Panchayat roads, Local primary/Block Panchayat roads

D-Sub major Bus routes, Local Secondary roads/ Grama Panchayat roads

L-Lower category roads, minor bus route

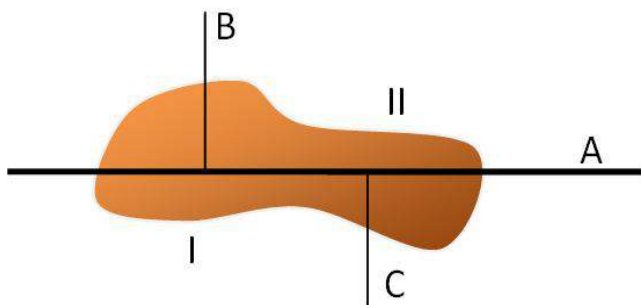
Example - 2:



Weightage = $\frac{3}{4}$ of the weightage of the A meets B =

$$\frac{3}{4} \times 8 = 6$$

Example - 3:



Calculate the weightage of junctions in the order of its hierarchy i.e. calculate the weightage of highest order first.

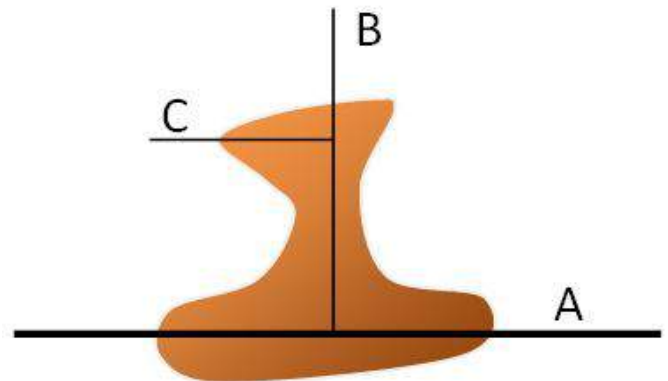
The physical development is so contiguous that it contains two junctions

Weightage of I = $\frac{3}{4}$ of the weightage of A meets B = $\frac{3}{4} \times 8 = 6$

Weightage of II = $\frac{1}{4}$ of the weightage of A meets C = $\frac{1}{4} \times 7 = 1.25$

Total weightage = $6 + 1.25 = 7.25$

Example - 4:

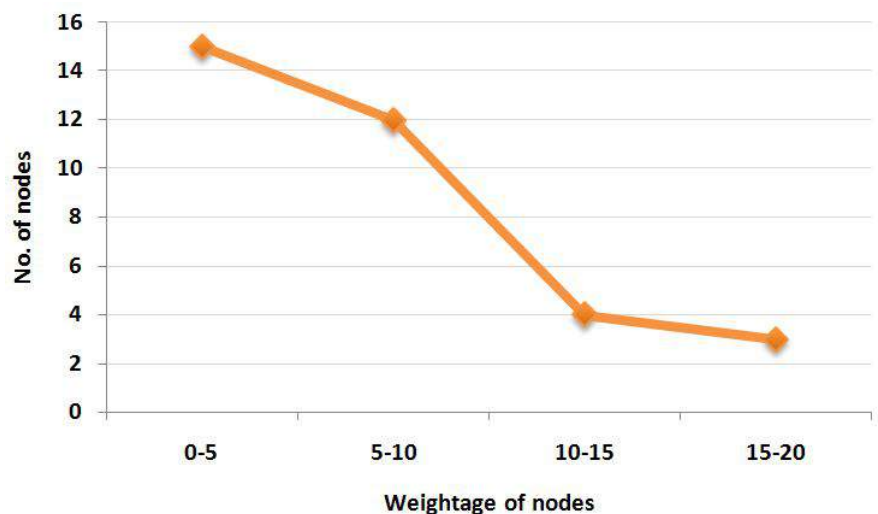


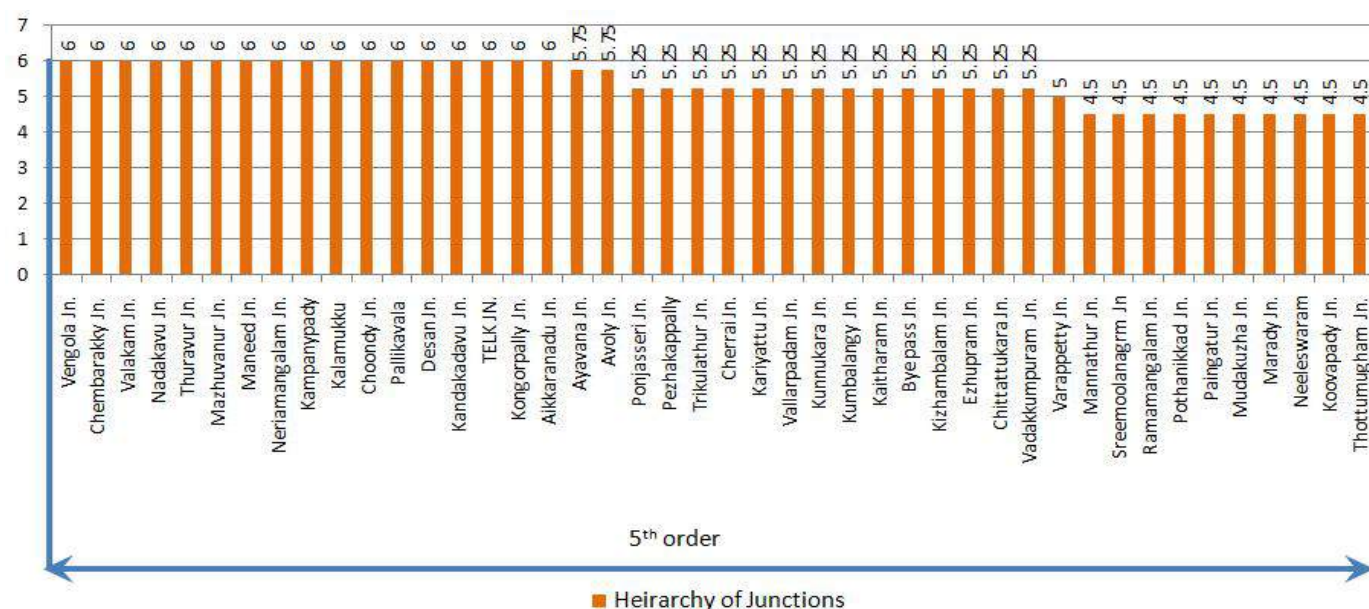
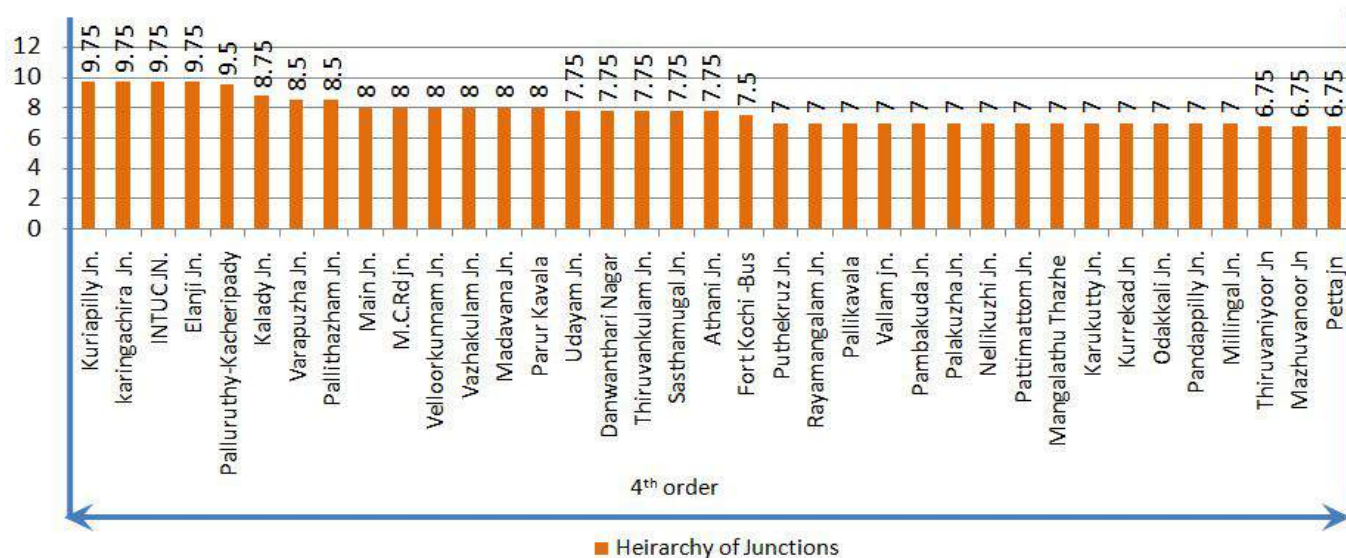
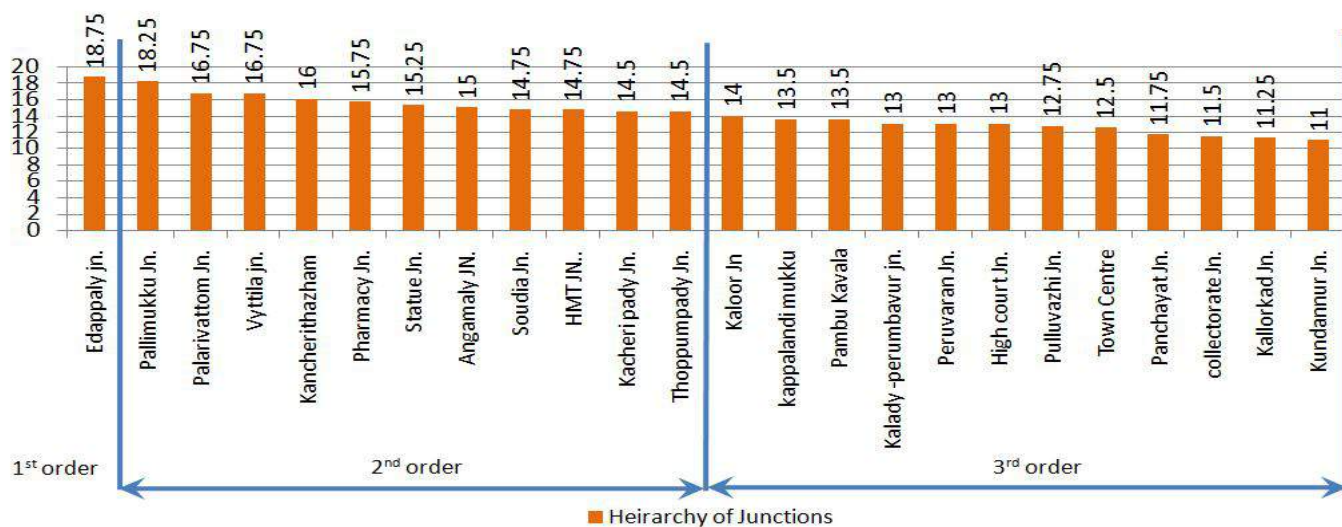
The road makes two junctions one with A and the other with C, but the development due to B is taken only once.

$\frac{3}{4}$ of A meets B + $\frac{1}{4}$ of B meets C

Step - 4:

A graph is plotted with the weightage of nodes in the range 0-5, 5-10, 10-15, 15-20 etc along X axis and the number of nodes in each range along Y axis. The break points in the graph determine the order of the nodes.





ANNEXE 13

PERCENTAGE OF NON AGRICULTURAL MALE WORKERS

Name of LSG	Total main workers calculated	Main Cultivators	Main Agricultural Labourers	Livestock, Forestry etc.	Mining and Quarring	Manufacturing, Processing in HH industries	Manufacturing, Processing, other than HH industries	Trade and commerce	Transport, storage and Communications	others	Total Non Agri male workers	% of Non agr male workers	
Year-2001	Male	Male	Male	Male	Male	Male	Male	Male	Male	Male		2001	1991
Alangad	10396	146	341	798	31	226	2772	2246	1028	2808	9909	95.3	78
Kadungalloor	9795	216	251	198	70	118	3580	2041	1705	1616	9328	95.2	75.7
Eloor	8187	48	38	291	19	25	3670	1228	861	2007	8101	99	95.9
Varapuzha	6949	69	167	975	115	105	1576	1159	609	2174	6713	96.6	91.6
Karumalloor	9511	496	924	805	231	204	2195	2000	957	1699	8091	85.1	69.6
Ayyampuzha	2786	498	751	215	177	63	255	243	188	396	1537	55.2	63.3
Kalady	8533	515	710	298	78	141	3075	1094	923	1699	7308	85.6	71.7
Kanjoor	6279	385	330	301	117	120	1394	1325	607	1700	5564	88.6	65.5
Karukutty	7257	341	631	451	594	170	1512	1143	593	1822	6285	86.6	54
Malayattoor-Neeleshwaram	7969	594	1098	625	361	162	2699	912	382	1136	6277	78.8	60.1
Manjapra	4765	569	560	671	65	166	821	778	309	826	3636	76.3	50.8
Mookkannoor	5257	732	650	700	255	81	722	775	281	1061	3875	73.7	44.9
Sreemoolanagaram	6837	262	845	301	58	49	2116	1201	622	1383	5730	83.8	73.7
Thuravoor	6106	505	641	352	110	405	1326	1009	486	1272	4960	81.2	56.6
Cheranalloor	6571	21	21	452	21	36	1221	1086	826	2887	6529	99.4	93.3
Kadamakkudy	4444	85	159	513	58	35	1186	547	399	1462	4200	94.5	90.7
Thrikkakkara	18466	146	289	798	780	91	3925	3986	3489	4962	18031	97.6	84.9
Asamannoor	5208	788	1107	641	124	56	498	732	449	813	3313	63.6	44.9
Koovappady	9556	1057	1160	525	217	1213	1678	1341	765	1600	7339	76.8	63.2
Okkal	7787	608	463	1705	21	14	1189	1220	803	1764	6716	86.3	
Mudakkuzha	5103	986	885	285	135	76	728	544	354	1110	3232	63.3	39.6
Rayamangalam	11036	1439	1654	410	176	195	1835	1384	1170	2773	7943	72	48.5
Vengoor	6890	1333	1814	768	103	50	624	592	420	1186	3743	54.3	31.7
Kavalangad	9324	1608	1631	1905	78	149	609	1157	630	1557	6085	65.3	41.8
Keerampara	3967	490	1153	645	30	23	191	558	234	643	2324	58.6	33.9

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Name of LSG	Total main workers calculated	Main Cultivators	Main Agricultural Labourers	Livestock, Forestry etc.	Mining and Quarrying	Manufacturing, Processing in HH industries	Manufacturing, Processing, other than HH industries	Trade and commerce	Transport, storage and Communications	others	Total Non Agri male workers	% of Non agr male workers	
Year-2001	Male	Male	Male	Male	Male	Male	Male	Male	Male	Male		2001	1991
Kottappady	5282	913	1282	812	107	83	301	599	322	863	3087	58.4	35.9
Nellikuzhy	8230	725	1060	485	367	111	109	2492	1034	1847	6445	78.3	54.9
Paingottur	5074	727	1087	910	56	91	276	691	288	948	3260	64.3	31.9
Pallarimangalam	3228	357	388	707	42	65	167	529	218	755	2483	76.9	45.2
Pindimana	5344	588	442	1102	41	122	463	883	469	1234	4314	80.7	44.4
Pothanikkad	3348	414	348	495	24	85	154	505	202	1121	2586	77.2	35.3
Varappety	4992	586	704	901	41	80	395	784	345	1156	3702	74.2	51.9
Kuttampuzha	8049	1338	1449	411	94	48	1831	1258	523	1097	5262	65.4	
Amballur	6134	338	858	525	193	280	693	1302	638	1307	4938	80.5	58.5
Chottanikkara	5613	170	398	291	212	119	950	862	666	1945	5045	89.9	67.3
Edakkattuvayal	4917	621	1069	564	78	91	308	585	495	1106	3227	65.6	42
Mulamthuruthy	5932	307	750	501	136	131	793	1115	799	1400	4875	82.2	62
Thiruvankulam	5929	18	85	245	131	18	1573	1100	961	1798	5826	98.3	87.9
Udayamperur	9816	125	287	2359	47	177	1076	2323	1061	2361	9404	95.8	83.5
Arakkuzha	4733	874	671	700	15	22	468	788	283	912	3188	67.4	39.3
Avoly	5049	788	479	325	10	161	566	1045	671	1004	3782	74.9	51.8
Ayavana	6225	1092	917	701	88	144	396	1137	634	1116	4216	67.7	38.4
Kalloorkkad	4758	657	555	950	23	44	308	669	394	1158	3546	74.5	35.8
Manjalloor	5105	529	732	452	16	42	462	930	574	1368	3844	75.3	45.8
Marady	4571	707	330	595	60	24	225	901	544	1185	3534	77.3	49.9
Paipra	10053	1013	956	721	201	53	1080	2554	1361	2114	8084	80.4	51.5
Valakom	5575	1124	551	435	46	102	572	877	491	1377	3900	70	45
Chellanam	10627	161	178	4300	21	68	2048	1141	759	1951	10288	96.8	93.8
Kumbalangi	8118	122	92	1020	8	43	3860	388	848	1737	7904	97.4	97.2
Elanji	5413	1050	792	1102	48	41	355	619	245	1161	3571	66	40.6
Koothattukulam	5985	975	439	652	19	201	607	1206	664	1222	4571	76.4	57.1
Maneed	5367	675	919	804	162	113	416	641	409	1228	3773	70.3	40
Palakkuzha	4325	895	393	715	15	65	278	666	342	956	3037	70.2	42.4
Pambakkuda	5895	906	667	925	31	101	629	605	495	1536	4322	73.3	39.7
Piravom	8880	1018	893	1203	267	181	1525	1708	1506	579	6969	78.5	54

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Year-2001	Male	Male	Male	Male	Male	Male	Male	Male	Male	Male		2001	1991
Ramamangalam	5209	917	738	862	170	106	313	583	367	1153	3554	68.2	48.7
Thirumarady	6662	1337	1081	905	69	117	404	945	786	1018	4244	63.7	37.8
Chengamanad	6007	148	208	356	40	68	1633	1394	960	1200	5651	94.1	78.4
Kunnukara	7296	576	1269	421	103	99	1983	1189	517	1139	5451	74.7	56.2
Nedumbassery	8693	751	536	296	189	155	3391	1294	852	1229	7406	85.2	64
Parakkadavu	8913	911	1268	465	794	287	1469	1590	676	1453	6734	75.6	55
Puthenvelikkara	8185	365	313	1420	353	79	1759	1097	619	2180	7507	91.7	76.3
Chendamangalam	8132	80	72	956	47	703	1364	1659	910	2341	7980	98.1	91.6
Chittattukara	7870	43	127	1320	111	172	1739	1954	1014	1390	7700	97.8	95.3
Ezhikkara	5616	83	612	1600	11	112	638	839	448	1273	4921	87.6	89
Kottuvally	10455	105	434	1452	119	323	2133	1930	1135	2824	9916	94.8	91.5
Vadakkekara	10249	70	76	2301	144	261	3293	1436	870	1798	10103	98.6	98.7
Aikkarand	6109	715	694	545	160	88	742	777	655	1733	4700	76.9	48.9
Kunnathunad	7978	935	1412	795	405	146	1487	58	931	1809	5631	70.6	50.1
Mazhuvannoor	10512	2141	1961	952	373	100	772	842	511	2860	6410	61	38.1
Poothrikka	6725	1172	755	690	107	85	478	850	675	1913	4798	71.4	50.7
Thiruvaniyoor	7109	744	561	565	369	117	1004	945	786	2018	5804	81.6	55.8
Vadavucode- Puthencruz	7379	467	421	400	119	126	2311	715	593	2227	6491	88	75.2
Choornikkara	7571	34	57	105	53	118	2198	1765	1535	1706	7480	98.8	91.5
Edathala	10035	172	348	490	223	136	2654	1961	1562	2489	9515	94.8	76.2
Keezhmadu	8149	88	172	407	201	93	2143	1864	1188	1993	7889	96.8	80.1
Kizhakkambalam	10058	1127	829	798	295	122	2251	1785	920	1931	8102	80.6	52.2
Vazhakkulam	9131	533	615	521	220	164	2131	2018	1290	1639	7983	87.4	70.7
Vengola	13022	1686	1527	695	269	300	2306	2804	1350	2085	9809	75.3	57.9
Edavanakkad	5223	49	117	982	8	6	608	481	343	2629	5057	96.8	90.8
Elamkunnappuzha	14806	122	129	3654	46	60	2522	2301	2128	3844	14555	98.3	97.9
Kuzhuppilly	3659	52	147	950	2	50	707	597	435	719	3460	94.6	88.7
Njarackal	6934	79	264	1500	19	15	1200	1096	757	2004	6591	95.1	96.1
Nayarambalam	6713	85	221	1920	7	24	855	1043	765	1793	6407	95.4	92.7
Mulavukad	5555	7	29	601	6	12	884	1211	1153	1652	5519	99.4	96.6

Cont....

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Year-2001	Male	Male	Male	Male	Male	Male	Male	Male	Male	Male		2001	1991
Pallippuram	12671	97	115	3652	54	97	3091	1885	1140	2540	12459	98.3	98.4
Kumbalam	7942	68	114	1980	16	91	817	1718	912	2226	7760	97.7	91.2
Maradu	10497	8	5	771	38	36	1517	1786	1639	4697	10484	99.9	98.5
Angamaly	9789	366	512	298	153	348	2357	2198	1281	2276	8911	91	68.6
Aluva	6479	19	17	100	1	60	1587	1685	898	2112	6443	99.4	99.2
Paravur	7500	13	29	652	16	185	1093	2014	1388	2110	7458	99.4	97.3
Perumbavoor	6971	189	236	201	41	72	1608	2026	956	1642	6546	93.9	82.8
Kalamassery	17973	124	338	365	102	187	5444	3161	2364	5888	17511	97.4	93.6
Thrippunithura	18158	36	115	652	138	263	3553	5211	3061	5129	18007	99.2	91.1
Muvattupuzha	7270	100	124	200	13	77	504	2871	1402	1979	7046	96.9	87.7
Kothamangalam	11305	863	896	650	66	196	1332	2599	1422	3281	9546	84.4	61.5
Kochi corporation	211307	193	188	51125	78	627	30359	49438	31540	47759	210926	99.8	98.9