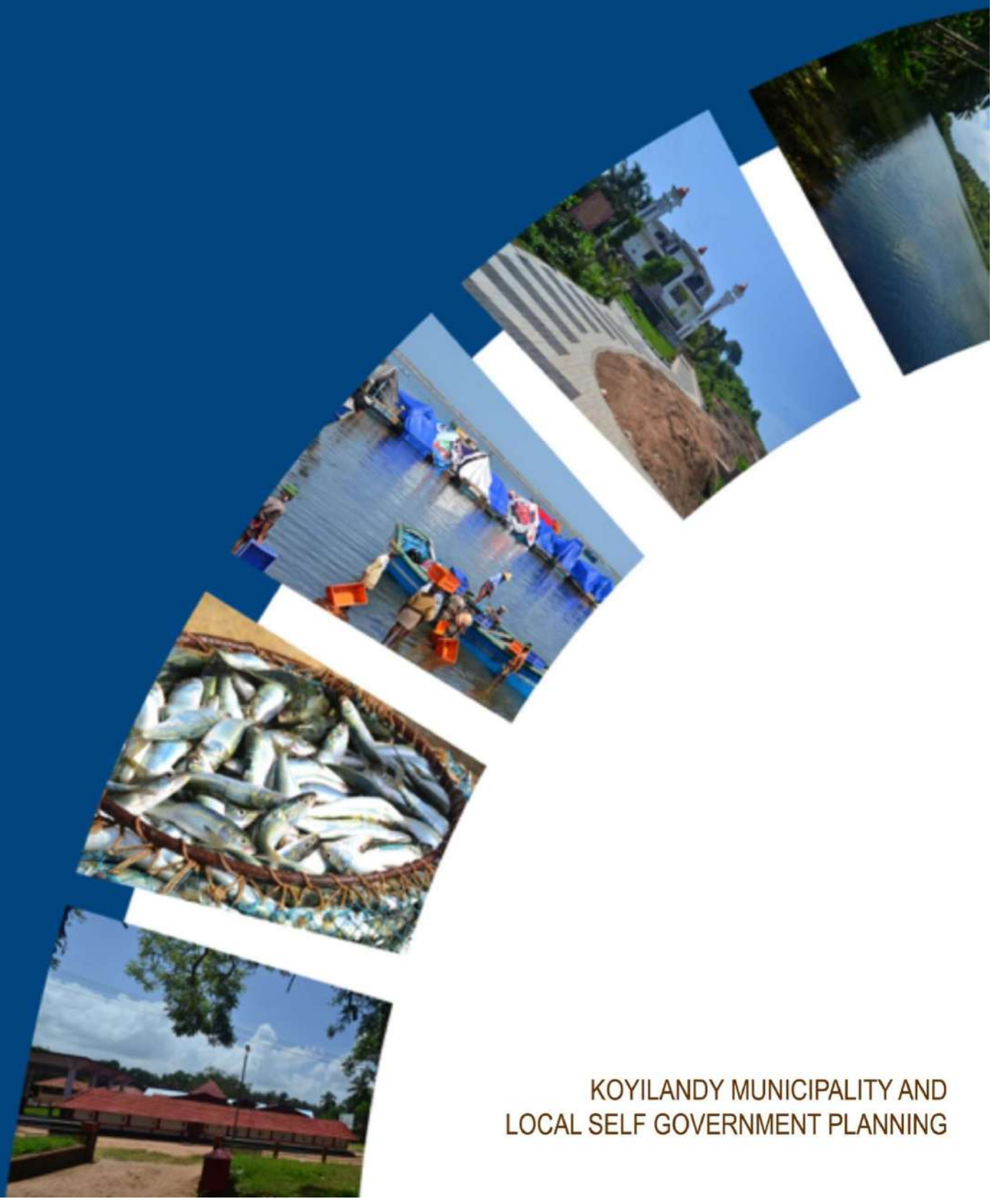
KOYILANDY MASTER PLAN - 2033



KOYILANDY MUNICIPALITY AND
LOCAL SELF GOVERNMENT PLANNING

KOYILANDY MASTER PLAN - 2033

KOYILANDY MUNICIPALITY AND
LOCAL SELF GOVERNMENT PLANNING





FOREWORD

Koyilandy Municipality has a rich and glorious past, an enjoyable present and looks forward to a vibrant future. The town, besides being a taluk headquarters, caters to the urban needs of the surrounding panchayat also. Besides, one of the largest fishing harbours in the country is being built at Koyilandy. This will change the face of Koyilandy by making it a busy hub of fishery industry and commerce.

The town known for its environmental quality and tranquillity is facing threats of environmental decay associated with urban development such as accumulation of solid waste, water pollution and conversion of precarious agricultural land for urban use etc.

In this context a concentrated effort is required to strike a balance between the requirements of urban development and conservation of environmental quality. Special thrust is required to identify and propagate remunerative projects so that the financial health of the local self-government is kept intact. The town so far does not have a master plan.

The town needs an integrated approach to development considering a host of issues like infrastructure development, environmental conservation, service delivery etc. It is in this context, that the Local Self Government Planning has come forward to prepare a comprehensive master plan for Koyilandy town taking the ground realities into consideration. The efforts taken by the entire team of the Local Self Government Planning, is highly appreciated.

I hope this master plan take the town forward to a vibrant future, which we all aspire for.

Adv. K Sathian

Chairman

Koyilandy Municipality

Koyilandy

Date:



PREFACE

Rapid urbanization evident in the state has been mainly due to the increase in the number of statutory urban areas rather than enlargement of production base and the related economic development. Anthropogenic threats to the environment due to this trend of widespread urbanization occupying a large percentage of the State's landed resources are not fully comprehended by the civil society.

Limiting the ecological and physical foot prints of urbanization to an environmentally sustainable level is crucial for the overall development of the state both in terms of environmental quality and economic sustenance.

The 74th Constitutional Amendment and subsequent state legislations have put forward a paradigm shift in the development planning process. The focus has shifted from physical planning to spatial planning for economic development. The inclusiveness of the development process is another important consideration in the nation at present. The Planning Commission, Government of India, in the Approach to 12th Five Year Plan, articulated this view by saying "Urban planning cannot be limited to spatial allocations and engineering solutions: It must encompass and connect various socio technical considerations too". The Master Plan has multiple objectives in the backdrop-to ensure efficiency of built form of the town so as to augment economic development, facilitate inclusive and faster development by the impetus given to various sectors of economy and put in place a regulatory mechanism for limiting the anthropogenic threats to the scarce environmental resources, keeping the demands of development well within the carrying capacity of our precious environment.

I take this opportunity to appreciate the officials of the Kozhikode District Office of the Department, especially Smt.Isha.P.A, Town Planner, Dr.Athira Ravi , Smt.LeeLitty Thomas, , Deputy Town Planners and Sri. Muhammed P, Sri.Rajeev.P.M, Sri. Shameer.K, Assistant Town Planners in the preparation of this document. I also appreciate the consistent efforts of Smt. Asha Ajoy Ghosh, Town Planner, Smt. Raji S, Smt. Oormila Raj .U. Deputy Town Planners and other officials of the State Project Cell.

Certainly the Master Plan for Koyilandy will provide a framework for development of the town for years to come.

Thiruvananthapuram

Date: 10.02.2021.

Girija K.S

Chief Town Planner (Planning)

ACKNOWLEDGEMENT

Koyilandy, a historic town in the coastal Kerala, is poised for a spurt of urban development in the immediate future since one of the biggest fishing harbours in the country is being constructed in the town. Besides this, the town is witnessing a flurry of urbanization due to other natural reasons and growth in population.

Koyilandy became a municipal town during the year 1993. Even after twenty years of existence as a municipal town, the town does not have a master plan. Master plan is an important tool for the orderly development of any town. This is more so in Koyilandy since the town is studded with water bodies, mangroves, paddy fields and other wet lands of immense importance for the environment. So, bringing about urban development and infrastructure without damaging the environmental fabric requires a careful exercise from a planner's perspective.

The encouragement and guidance provided by Sri. Shaji Joseph, Chief Town Planner (Planning) (Rtd.), Sri.K.Ramanan, Chief Town Planner (Rtd.), Smt. Girija K.S, Sri. Gigi George – Chief Town Planners, Smt. Ushakumari P.N and Sri. J. Jayakumar, Sri. C.J Poulose (Rtd.) -Senior Town Planners, Smt. Asha Ajoy Ghosh, Sri. GirishKumar T.K, Town Planners, Smt. Raji S, Smt. Oormila Raj. U, Sri. Denzil Fernandez Deputy Town Planners is highly appreciated. Sri.Sasikumar G (Rtd.), Sri. K.V.Abdul Malik, Town Planners gave leadership to the planning team during their tenure as Regional Town Planners, Kozhikode. Sri.T.K.Girish Kumar, Town Planner gave directions to the preparation of the development plan during his term as Deputy Town Planner in this office. This work would not have been possible without relentless efforts made by Dr.Athira Ravi, Smt. Leelitty Thomas, Sri. Rijesh N.M - Deputy Town Planners, Sri. Muhammed P, Sri.Shameer K, Sri. Rajeev.P.M , Smt. Sheeja Thayyil , Smt. Nisha P.S (Rtd.) and Sri.Gireesh Kumar P, Asst: Town Planners, Sri. Anees Ahmad Adullah and Kum. Sruthi C.S Planning Assistants, Smt. Anusha T.O, Smt. Shiji E.P - Draftsman I[st] Grade, Sri. Syamprasad C (Artist), Sri. Sreejith K, Sri. Anishkumar and Sri. Krishnan (Rtd.) Chainman and all other staffs of this office.

Isha.P.A

Regional Town Planner
Kozhikode

Kozhikode
Date:

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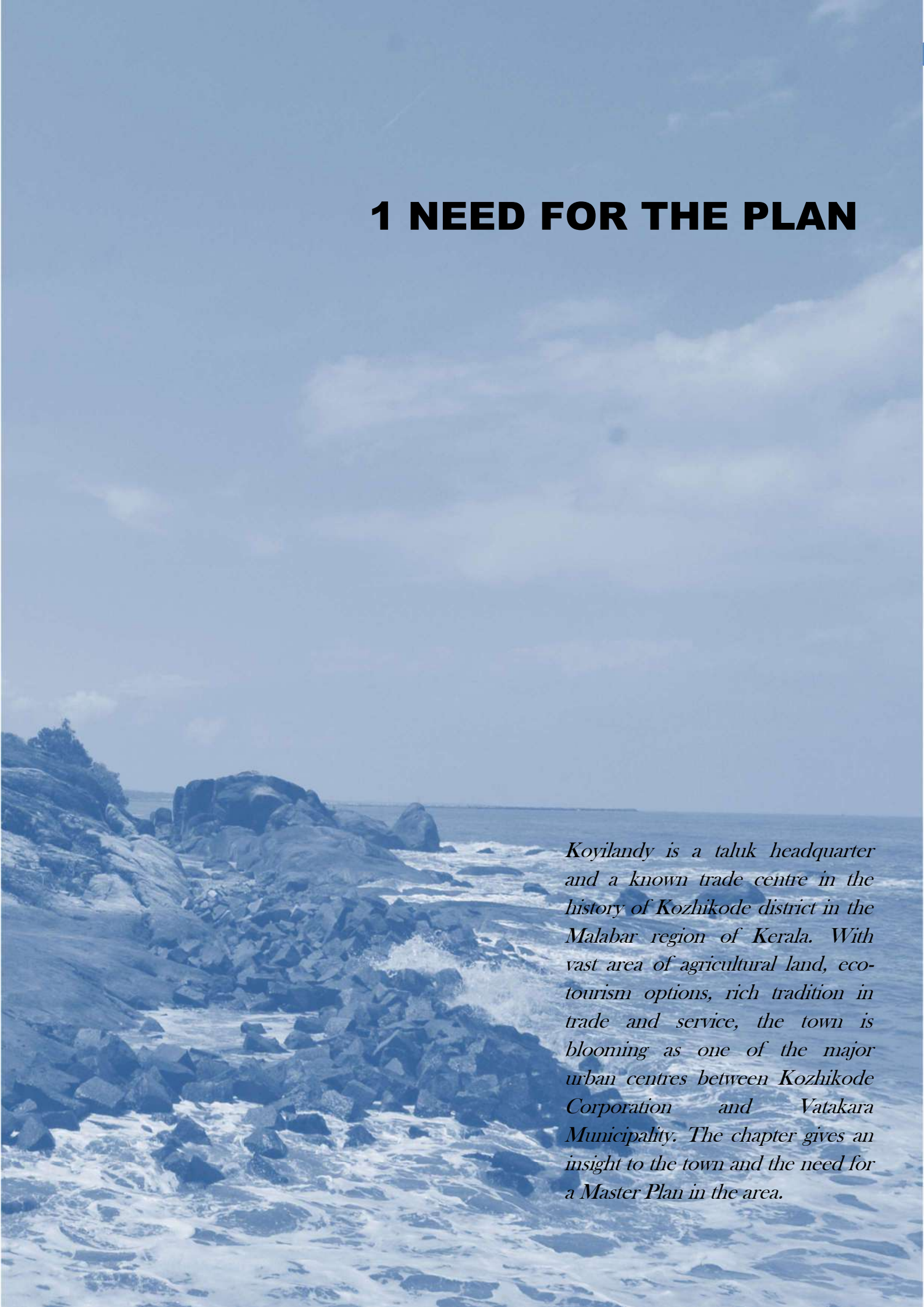
1 NEED FOR THE PLAN



Koyilandy is a taluk headquarter and a known trade centre in the history of Kozhikode district in the Malabar region of Kerala. With vast area of agricultural land, eco-tourism options, rich tradition in trade and service, the town is blooming as one of the major urban centres between Kozhikode Corporation and Vatakara Municipality. The chapter gives an insight to the town and the need for a Master Plan in the area.

1.1 The Town

Koyilandy is a Municipal town, the capital of old Kurumbranadu in the northern part of Kerala, 23 km from Kozhikode on NH 66 (formerly NH 17) towards Mangalore. Koyilandy found a place in the history with the discovery of sea route to India by the Portuguese traveller Vasco Da Gama, who landed at Kappad beach (8 km from town) in 1498. The discovery of this sea route gave a significant advantage of international trade from India especially to the Europe. The town being a coastal town has emerged as a commercial focal point in Kozhikode district with fishing as one of its main commercial activities. The construction work is almost completed on one of the biggest fishing harbours in the country at Koyilandy, the works started by the Government of Kerala in 2007. The place is famous for peculiar marine phenomenon, called 'Chakara' in which a large number of fish and prawns throng together during a particular season as a result of mud bank formations, a boon for the local fisher folk. Ancient Koyilandy had witnessed many trades with Phoenicians, Egyptians, Greeks, Arabs, Chinese, Jews and Romans. One of the important ports of Perumal Era (800 AD-1122 AD) includes Panthalayani Kollam which lies in Koyilandy. Koyilandy Hookah (traditional smoking pipe), made in Koyilandy, which is popular across North India & Gulf region is considered as a pride of Koyilandy. In Gulf countries, Koyilandy Hookahs are still very popular as "Malabar Hookah."

1.2 Need for a master plan

Every growing urban area needs a Master Plan. A Master Plan spells out development strategies and policies in the physical, social and economic aspects suitable for the planning area for the next 15- 20 years. The need for a Master Plan for Koyilandy Municipality arose due to the four main factors,

1. Koyilandy is an emerging centre in Kozhikode district in between Kozhikode Corporation and Vatakara Municipality. As a growing urban centre, Koyilandy faces many of the urban problems like growth of slums, migration, solid and liquid wastes, traffic congestions, environmental degradation etc. Strategic Master Plan will help to mitigate these problems.

2. Koyilandy is the taluk headquarters of Koyilandy Taluk in Kozhikode district. Koyilandy Municipal area should provide the urban amenities and facilities to the service population and at the same time should maintain a give and take relationship with the rural hinterland for self-existence. For this, the land use of Koyilandy should be designed scientifically which can be ensured by an efficient Master Plan.

3. Based on urbanisation studies in Kozhikode District, Koyilandy should be a facilitator which acts as a tertiary activity centre for a service population of 372187 by 2021. About 12 local bodies will depend on Koyilandy for the urban facilities.

4. The construction work of one of the biggest fishing harbours in the country is being carried out in Koyilandy which will readily change the face and growth pace of the

present Municipality. Once the Koyilandy fishing harbour starts functioning, the changes in and around the Municipality is expected to be exponential with increased goods movements, high commercial developments, congested traffic and socio-economic changes. Since the National Highway is in the extreme west side of the Municipality, there will be overcrowded built spaces in the narrow space between the sensitive coastal line and the road network. A Master Plan with proper studies, proposals and development controls can solve this problem very effectively. Apart from these major factors, long term perspectives for development have to be formulated as an urban local body with Municipal status. Also the database of the Municipality should be improved using modern scientific techniques. Therefore a Master Plan should be prepared with an integrated development vision which specifies development suggestions for the comprehensive development of the planning area.

1.3 Inference

As an emerging urban centre which acts as a service provider and facilitator to the nearby local bodies and which looks forward to be the state's biggest fishing harbour, Koyilandy surely needs an integrated Master Plan for a dynamic planned development which conserves the rich heritage, vast area of water bodies and other natural resources.

2 EARLIER PLANNING EFFORTS & STUDIES



A good urban development plan can act as a catalyst for healthy development of an area by channelizing investments and ensuring orderly and efficient land use pattern. Koyilandy Master Plan 2031 is the first Master Plan attempt in the Municipality. Some infrastructure projects were taken up under IDSMT Scheme in the Municipality in 2004.This chapter gives an insight to the earlier planning efforts in the town.

2.1 Earlier Planning efforts

In 1993, Koyilandy became a third grade municipality, comprising of Viyyur and Panthalayani villages. In 1999, a part of Arikkulam village was added to the Municipality making the total area 29.14 sq.km. As of now the town centre is concentrated on both sides of NH 66, in a very limited area. Government offices, trade and commercial establishments, religious centres, burial grounds, schools and hospitals, all are situated in a congested town centre.

Taking into consideration the development needs of the town and to provide sufficient infrastructure facilities for catering to the needs of the people, specific projects were identified to be taken up under the centrally sponsored scheme of Integrated Development of Small and Medium Towns (IDSMT) Scheme in 2004. The projects were selected in such a manner that the capital expenditure on non-remunerative (but highly essential in the town) projects are recouped by the surplus revenue stream from the remunerative projects in the long run so that the capital invested is ploughed back.

Even though Koyilandy is a small town compared to Kozhikode Corporation and Vatakara Municipality in Kozhikode District, the town needs planning intervention for creating and maintaining infrastructure and land use pattern commensurate with its role in the region. This Master Plan is proposed in order to realize this broader vision.

2.2 Plan by the people

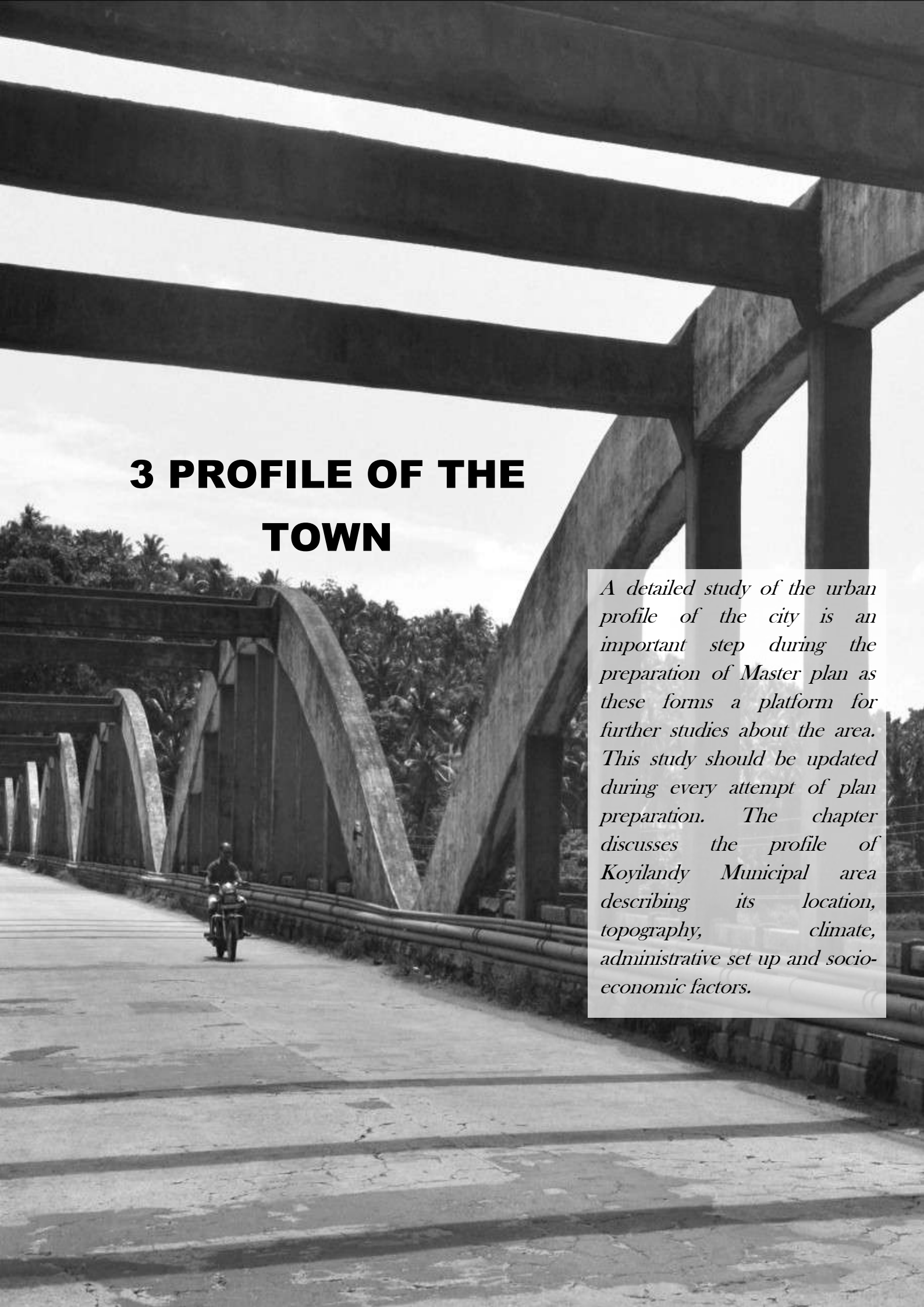
The Koyilandy Municipal council convened on 25-06-2012, decided to prepare detailed master plan for the integrated development of the Municipality, also decided to entrust the State Local Self Government Planning for the same. The administrative sanction for the preparation of Master Plan for Koyilandy Municipality was accorded vide order number GO (Rt) No. 1376/2012/LSGD dated 17-05-2012, and the activities were initiated accordingly. The spatial integration committee (SIC) was constituted on14-08-2012, with Municipal chairperson as the Chairperson of the Committee and the Municipal Secretary as the Convener. The Municipal Engineer was elected as the Joint Convener and the other members of the Committee were District Town Planner, one member from every working group, and resource person. The whole master plan preparation process was steered by the spatial integration committee and the plan was prepared in accordance with the direction provided by the SIC and the State Project Cell from time to time.

The plan preparation process was enriched by the active participation of various stake holders from time to time. The development seminar was conducted on 20-10-2012, presided by the then Chairperson, Smt. K.Santha, and was inaugurated by the Honourable MLA Sri. K.Dasan. Further the various data collected, analysis, sectoral proposals, zoning regulations etc. were discussed with the members of the Municipal council and other stake holders at different occasions, and their comments, suggestions and inputs were incorporated in the plan accordingly. Later the new council Chaired by Adv. K Sathian gave necessary directions for the plan preparation and legal processing.









3 PROFILE OF THE TOWN

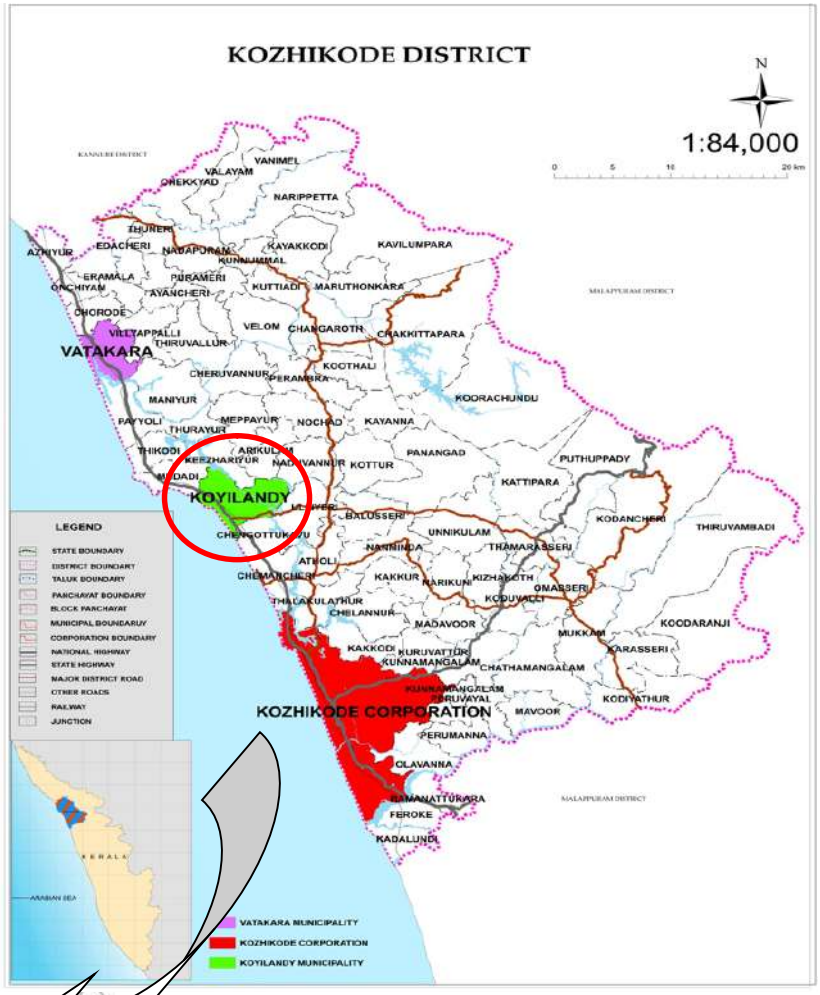
A detailed study of the urban profile of the city is an important step during the preparation of Master plan as these forms a platform for further studies about the area. This study should be updated during every attempt of plan preparation. The chapter discusses the profile of Koyilandy Municipal area describing its location, topography, climate, administrative set up and socio-economic factors.

3.1 Location

Koyilandy is located between North latitudes 11^0 24' 29" and 11^0 29' 16" and East longitudes 75^0 40' 03" and 75^0 41' 05". The town is between Kozhikode and Vatakara and is on NH 66 (previously NH 17) and 23 km from Kozhikode Town. It is bounded by Lakshadweep Sea in the west, Akalapuzha in the east, Mudadi panchayat in the north and Chengottukavu panchayat in the south.

3.2 Topography

On the basis of the physical and geographic features, the topography of the town can be classified into 1) High Land which includes areas like Manjaladkunnu, Areekunnu, Kuniyoramala, and hilly areas of Nateri, and 2) Midland which include areas like Kuruvangad, Kothamangalam and Viyoor. Besides, the town has a considerable coastal stretch. Water is available at a depth of 3m from GL at the mid land and coastal area. Town has 8.25 km of coastal strip. Town is at a level of 1.5m above Mean Sea Level. Akalapuzha, the main tributary of Korapuzha is flowing along the north eastern boundary of the town. It originates from the Kodiyanadumala at an elevation of 2300 ft above MSL.





The river is part of the important west coast inland navigation system.

Major rock type seen is composite gneiss. Bands of charnockite are found in the north-western corner close to the peninsular side. Laterite formation is prominent towards the eastern side of the Municipality. The hilly portion is covered with pebbly gravelly laterite soil and hard ferricrete as cap rock in patches. Clayey soil, rich in organic matter, is seen in

the low-lying areas. The coastal zone is covered with sand and sandy clay soil. In general, soil is fertile and is suitable for any type of cultivation. Figure 3.1 illustrates the topographic details of the Municipality indicating a contour interval of 20 meters.

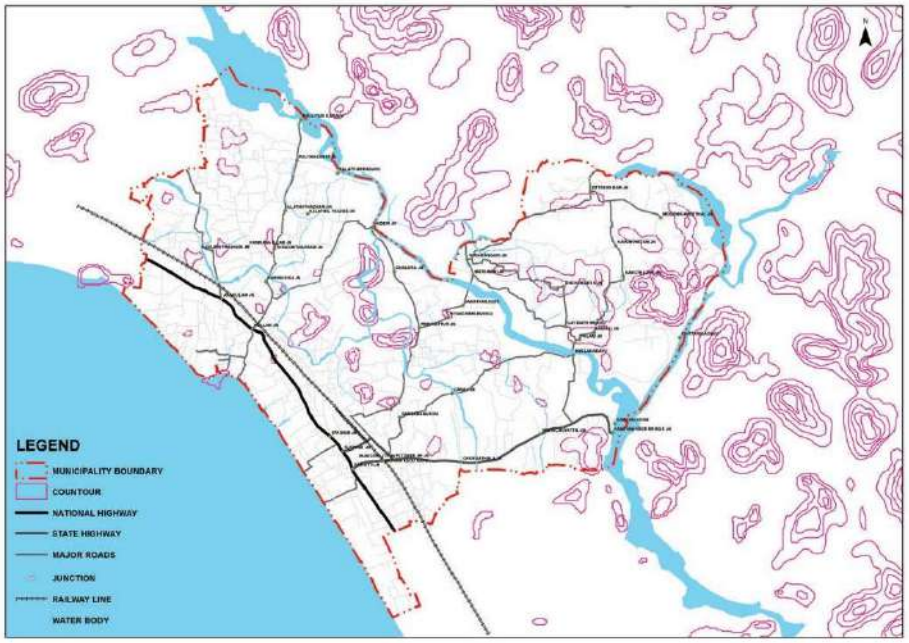


Figure 3-1 Topography of Koyilandy

3.3 Climate

The climate of Koyilandy is tropical humid with good rainfall and an oppressive hot season. The annual average rainfall is 2693 mm. The atmospheric temperature during summer varies from a minimum of 22.6^{0}C to a maximum of 35^{0}C and during winter from 18^{0}C to 34.2^{0}C. The average relative humidity in the area is 82%.

3.4 Administrative Set Up

Koyilandy is a third grade Municipality in Kozhikode District. It has an area of 29.14 sq.km spread in the three villages of Viyur, Panthalayani and Arikkulam. Koyilandy is the headquarters of Koyilandy Taluk and forms part of Vatakara Parliament Constituency. There are 17 desoms in the Municipality. The number of revenue wards in the Municipality is 32 and the number of electoral wards is 44. As per 2011 census the total population is 71893 persons with a density of 2474 persons per sq.km. The Municipality received the following awards in the recent past:

- Kerala State Pollution Control Board Award for initiatives for natural resource management(For the years 2005-2006, 2006-2007, 2007-2008)
- Swaraj Trophy for the best Municipality award during the year 2003-2004
- Award for protecting natural resources and water management, awarded jointly by the Ministry of Agriculture and the State Land Use Board during the years 2004-2005, 2005-06, 2006-07 and 2014.

- CUSAT award for environmental conservation and waste management in 2008.
- Best Kudumbasree award constituted by the State Government during the year 2005.
- Award for activities on poverty eradication, awarded by Osmania University, (South India- Hyderabad) award.
- Bhoomi jal samvardhan puraskar, by the Govt. of India, during the year 2009.
- Haritha Nagaram award by Malayala Manorama during 2016.
- Kerala pollution control board award during the year 2006.
- CK Jeevan memorial award.

3.5 Socio- Economic Aspects

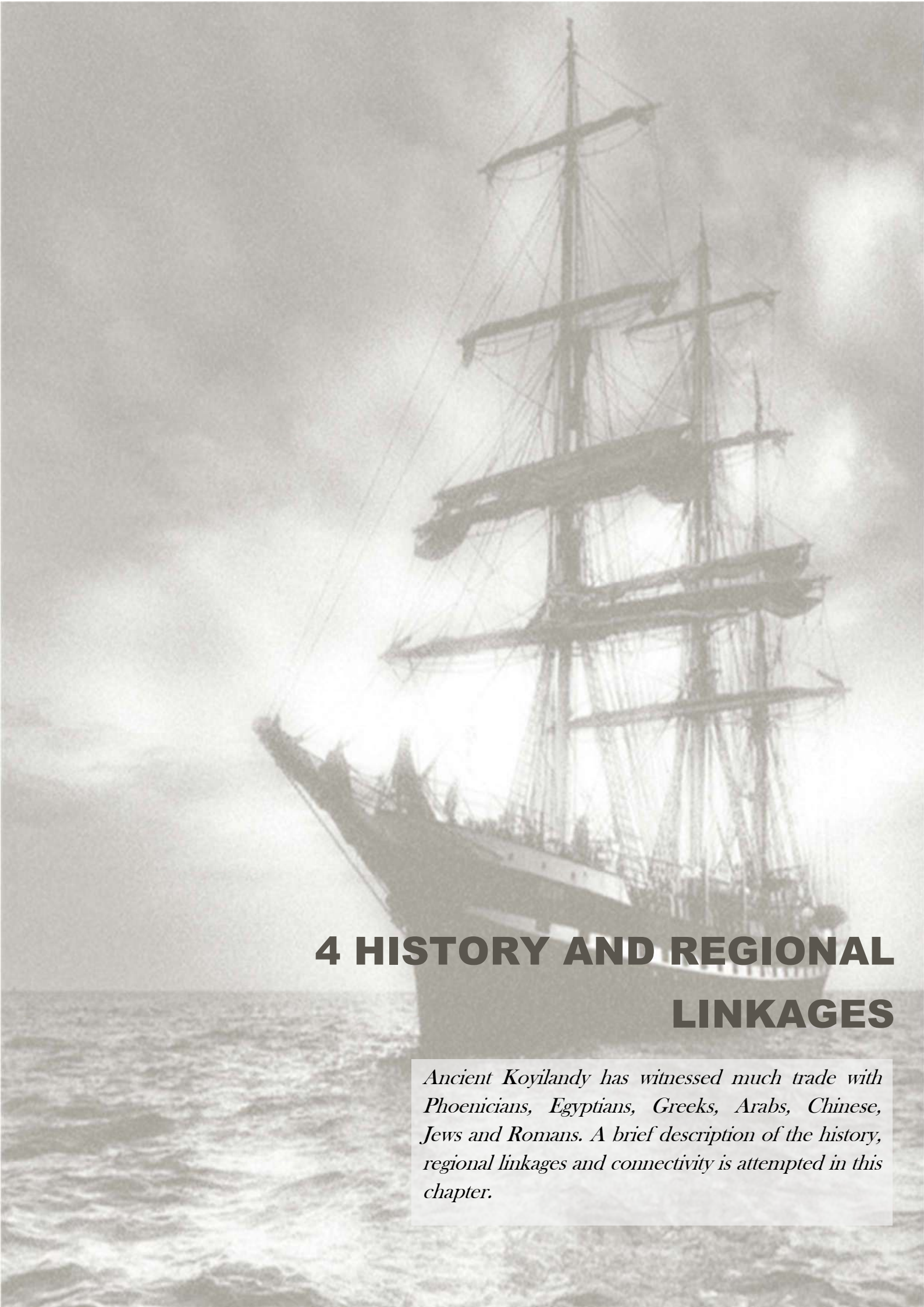
The literacy rate of Koyilandy municipality is 94.46% as per census 2011 which is lesser than the literacy rate of Kozhikode district and higher than that of the state, which is 95.08% and 93.91% respectively. The rate is higher when compared to nearby LSGIs except Chengottukavu Grama Panchayat. This rate is high when compared to that of other municipalities in north Kerala. Literacy rate, both total and female, is lower in the coastal area and in the later added part of Arikkulam.

Even though the sex ratio (1139) is greater than the state average (1084) and district average (1098), the child sex ratio (951) is very low when compared to the State (964) and the District (969).

The economy of Koyilandy revolves around fishing, agriculture, trade and NRI remittance. The work participation rate (29.93 %) is low compared to the District (30.75 %) and the State (34.78 %). But the female work participation rate (10.17 %) is very high in the Municipality when compared to Kozhikode District (6.37 %) and Kerala State (9.48 %).

3.6 Inference

With variety in the terrain, fertile soil and good water bodies like Akalapuzha, the Municipality is well placed to take any initiatives in environmental and natural resource conservation. The Municipality has good social profile and administrative set up.



4 HISTORY AND REGIONAL LINKAGES

Ancient Koyilandy has witnessed much trade with Phoenicians, Egyptians, Greeks, Arabs, Chinese, Jews and Romans. A brief description of the history, regional linkages and connectivity is attempted in this chapter.

4.1 History

Tracing back the history, Koyilandy was known as ‘thundi’ or ‘thondi’. When the headquarters of Chera king was temporarily shifted to Koyilandy, the name was changed to ‘Koyilthundi’ which later became 'KovilKandi' under the regime of Payyanadu Kings. The name has an inseparable relation to the Subramanya Temple situated here. Historians root out a relation between Koilanther -an Arabic word and Koyilandy due to the trade relations which existed. The history of Panthalayani-Kollam is closely linked to Koyilandy as a commercial centre.

Koyilandy found a place in the history with the discovery of sea route to India by the Portuguese traveller Vasco Da Gama, who landed in Kappad beach (8 km from town) in 1498. The discovery of this sea route gave a significant advantage to international trade from India especially to the Europe. It was the spices and wealth of the Malabar that first brought the Arabs, Phoenicians, Greeks, Romans, Portuguese, Dutch and English to Kerala.

Koyilandy is the birth place of national heroes like Kerala Gandhi – K.Kelappan, C.K.Govindan Nair. K.Kelappan (Known as Kerala Gandhi), was born in nearby village Muchukunnu in Koyilandy. Kelappaji was an extreme disciple of Gandhian thoughts, who fought for social reforms on one hand and the British on the other. The “Keezhariyur bomb case” in which 27 persons were charge sheeted for violent attacks against the British Raj during the Quit India movement was one of the significant episodes of freedom struggle in Malabar.

Famous personalities like Sayed Abdul Rahman Bafaki Thangal, Justice V.R.KrishnaIyer, Swami Nithyananda, Guru Kunhiraman Nair (Founder of Cheliya Kathakali Vidyalayam), M.P.Ahmed (Chairman, Malabar Group), Melur Vasudevan (Writer), etc. also hailed from Koyilandy. The place is superbly positioned in the stories of U.A.Khader (‘Thrikotturinte Kadhakaran’) &Thikodian. Sayed Abdulrahiman Bafaki Thangal born in Koyilandy (1905-1973), had provided amazing spiritual and political leadership to the Muslims of Kerala.

Cheliya Kathakali Vidyalam, the Kathakali training center is situated in Koyilandy under Guru Kunhiraman Nair, which is known as ‘Northern Kalamandalam’ of Kerala. An international Sports School – ‘Usha School of Athletics’ is situated near Koyilandy for grooming young talents as per the vision of P.T Usha, the Queen of Indian Athletics, who is also nicknamed ‘Payyoli Express’.

4.2 Regional setting

The regional setting of a town is depicted by its hierarchy in the District, the activity the town has to perform in the district scenario and its connectivity with different settlements. The town falls under the second order settlement category as per the District Urbanisation Report 2011. The town is bounded by Mudadi and Keezhariyur Grama Panchayat in the North, Chengottukavu Gramapanchayat in the South, Arikkulam, Ulliyeri and Naduvannur Gramapanchayats in the East and Lakshadweep Sea in the West. The major towns near Koyilandy are shown in Figure 4.1.



Figure 4-1Major Towns near Koyilandy Town and the connectivity details

With reference to the district urbanisation report for Kozhikode 2011, Koyilandy Municipality currently serves an immediate service population of 3,36,778 numbers. The town is expected to serve a total population of 3, 72,187 by the year 2021. The local bodies which depend on Koyilandy for its activities include Chemancheri, Chengottukavu, Atholi, Balusseri, Ulliyeri, Mudadi, Keezhariyur, Thikkodi, Thurayur, Thalakkulathur and Arikkulam, as illustrated in figure 4.2. The total area of this influence zone of Koyilandy Municipality registered as per DUR Kozhikode is 228 km^2.

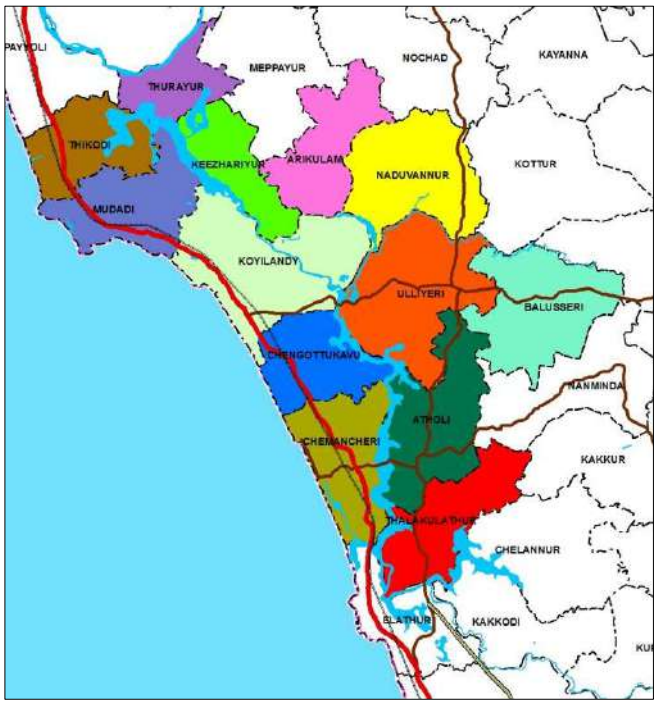


Figure 4-2Local bodies depending of Koyilandy Municipality for its various activities
Source DUR Kozhikode 2011

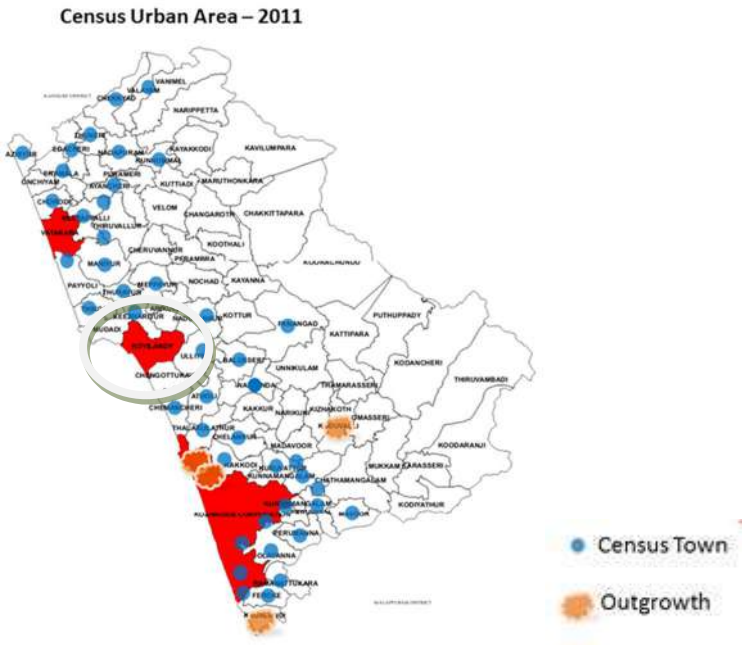


Figure 4-3Urban agglomerations and outgrowth of Kozhikode based on Census 2011
Source DUR Kozhikode 2011

4.3 Connectivity

National Highway 66 (about 6km) and State Highway 34 passing through Koyilandy link this place to other parts of the state. The railway station is situated near the bus stand. The distance by rail to Thiruvananthapuram, Chennai and Mangalore are 411 km, 683 km and 221 km respectively. The nearest airport is the Karipur International Airport, 50 km from the town. The proposed Kannur airport is 60 km from the town. Years back there was heavy navigation through the Akalapuzha (part of west coast canal system) connecting all important industrial towns lying in the coastal areas such as Vadakara, Kozhikode, Kallayi, Beypore, Tirur etc.

4.4 Inference

The Koyilandy town holds an important role in the history of Malabar. Koyilandy played major roles in the freedom fighting moments and left back rich heritage and resources. The trade linkages to the town were in existence even during the ancient times. A good Master plan can retrieve the old glory of the town while dealing with modern issues.

5 DEMOGRAPHY

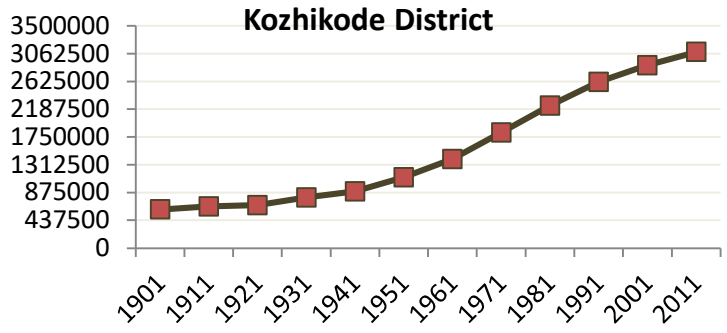


Figure 5-1Change in Population growth in Kozhikode district for the past century

(Source: Census of India)

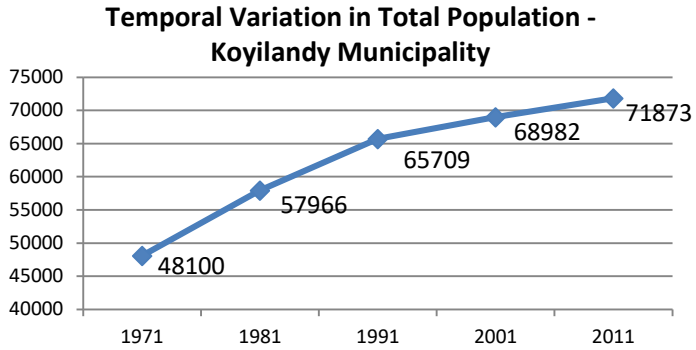


Figure 5-2Temporal variation in total population in Koyilandy Municipality

(Source: Census of India)

Table 5-1Temporal variation in total population. Comparison of Koyilandy Municipality with Kozhikode district and Kerala state

NAME	1971	1981	1991	2001	2011
Kozhikode	2106249	2245265	2619941	2879131	3086293
Kerala	21347375	25453680	29098518	31841374	33406061
Koyilandy	48100	57966	65709	68982	71873

(Source: Census of India)

5.1 Population and its growth pattern

Kozhikode district remains in the fifth position in the State in population size with 30, 86,293 persons, as per Census 2011. It was keeping the same position in previous decade as well. The district registers a continuous increase in overall population for the last century. The population growth was much prominent during sixties, and there after exhibited a slow down. The growth of total population in Kozhikode district and its urban areas during the last century is illustrated in Figure 5.1.

The total population in Koyilandy Municipality also followed a similar trend during the decades starting from 1971. As per the census 2011 the total population registered in Koyilandy Municipality is 71873 which is 2.33% of the population in Kozhikode district and 0.22% of the population in Kerala state. The temporal variation of population growth for Koyilandy Municipality is given in figure 5.2, and the corresponding population figures for the Kozhikode district and Kerala state is illustrated in table 5.1. The population in Koyilandy, Kozhikode district and Kerala state has increased during the last decades, but exhibit a trend towards stabilisation.

Among the various urban local bodies, the population of Kozhikode Municipal Corporation remains at the peak with a total population of 4,77,137 as per Census 2011. Koyilandy Municipality fits in to third place with a population of 71,873 after Vadakara

Municipality which is having a population of 75,295 persons. Among the other urban local bodies Koduvally registers the lowest population with a total population of 30787. The comparison of total population with the population of other local bodies in the district is illustrated in figure 5.3.

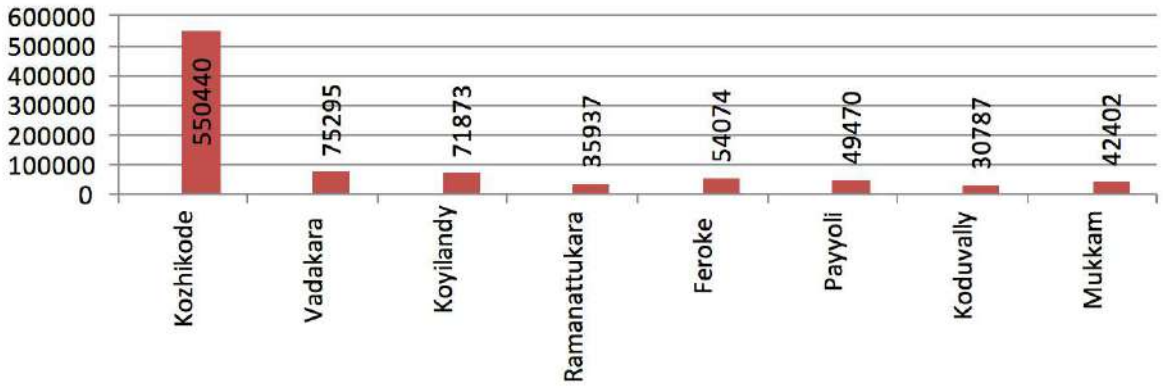


Figure 5-3Total population of Koyilandy Municipality- Comparison with the other urban local bodies in the district
(Source: Census of India 2011)

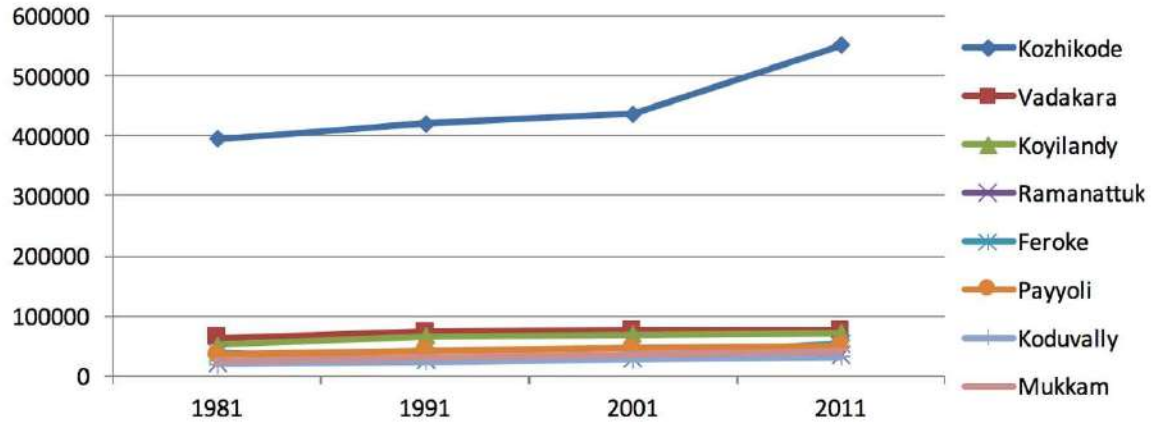


Figure 5-4Temporal variation in total population – Comparison with other urban local bodies in the district
(Source: Census of India)

Comparison of decadal variation of total population of Koyilandy Municipality, to that of the other urban local bodies is illustrated in Figure 5.4. It can be observed from the figure that, the decadal variation of population exhibits an increasing trend in all the urban local bodies of the district, although the rates of change in population are varying.

Comparison of total population of Koyilandy Municipality with that of the surrounding local bodies is given in Figure 5.5. It can be seen that, in comparison with the nearby local bodies, the population of Koyilandy Municipality is the highest, and population of Mudadi panchayat comes next, at 30,170. The change in population exhibits an increasing trend in all the surrounding local bodies as well.

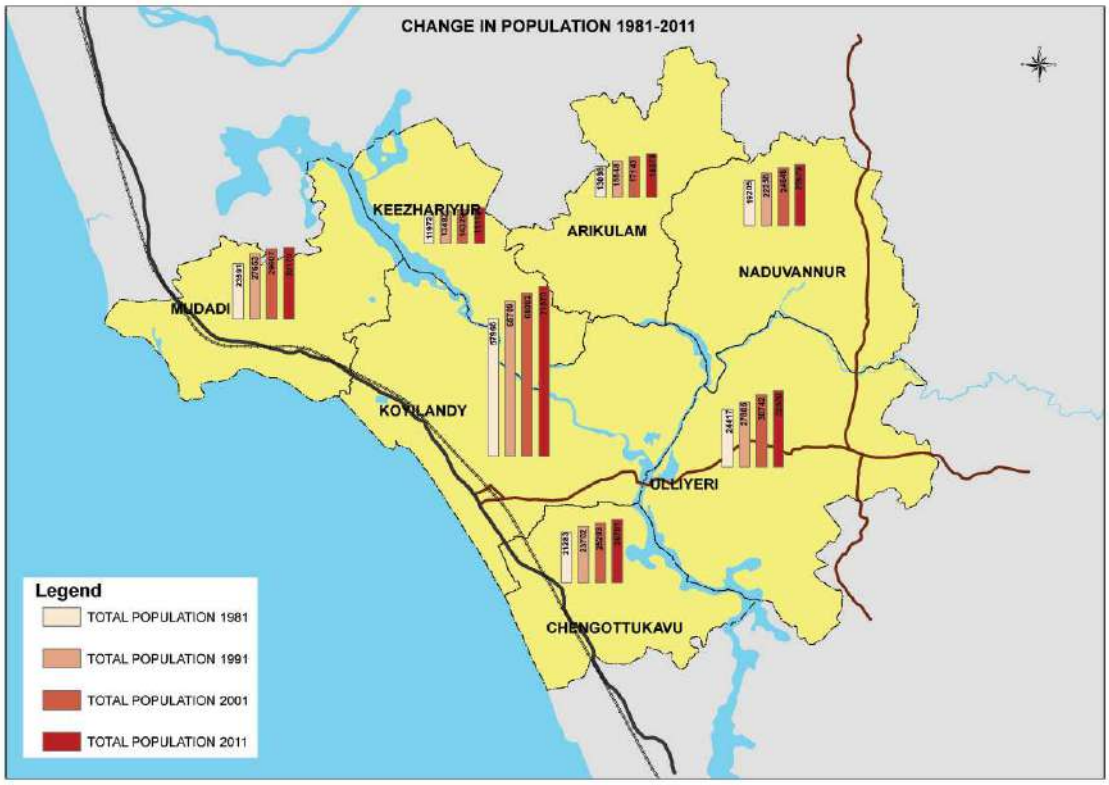


Figure 5-5Temporal variation in total population – Comparison of Koyilandy Municipality with nearby local bodies
(Source: Census of India)

As per the socio economic survey results, no migration to the town and from the town has been reported.

5.2 Population Growth Rate

The population growth rate of Kerala state started to exhibit a declining trend from the 1981 Census onwards. The net increase in population was being on the declining side and still continuing the same trend. The population growth rate of the state in the last decade (2001-2011) was 4.91%, less than the growth rate during the decade 1991-2001 which was 9.43 %.

The growth rate of population during 2001-2011 has declined in all the districts of the State including Kozhikode, when compared to the growth rate in 1991-2001. Kozhikode district is among those districts having population growth rate higher than the State average during 2001-2011, together with Kasaragod, Malappuram, Palakkad and Ernakulam, all of which fall in the middle and North Kerala. The growth rate of Kozhikode district has fallen to 7.20% during 2001-2011, where as the growth rate was at 9.89% during the decade 1991-2001 (Source: Census data).

Following a similar pattern, the population growth rate of Koyilandy Municipality also was decreasing ever since 1971. The growth rate observed during 2001-2011 was 4.19%; whereas the same during 1991-2001 was 4.98%. The rate of growth has decreased during the decade 2001- 2011, although the percentage change in growth rate is not that

much acute when compared to that of the district and the state. The temporal variation in population growth rate of Koyilandy Municipality along with the comparison in growth rate for Kozhikode district and Kerala state is given in Figure 5.6.

The population growth rate of other urban local bodies in the district also exhibits a decreasing tendency. The temporal variation in growth rate of other urban local bodies in the district is shown in Figure 5.7. All the local bodies exhibit a decreasing trend in the population growth rate similar to that of the Koyilandy Municipality although the pattern and extent of decrease considerably varies.

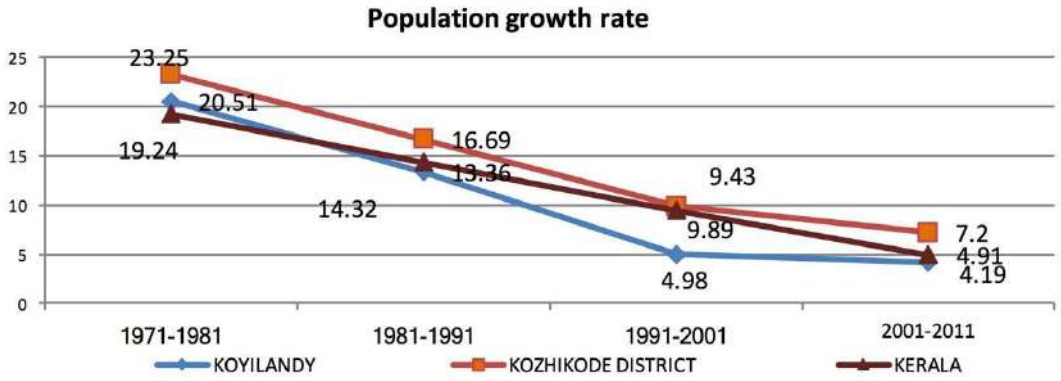


Figure 5-6Temporal variation in population growth rate of Koyilandy Municipality, Kozhikode district and Kerala state

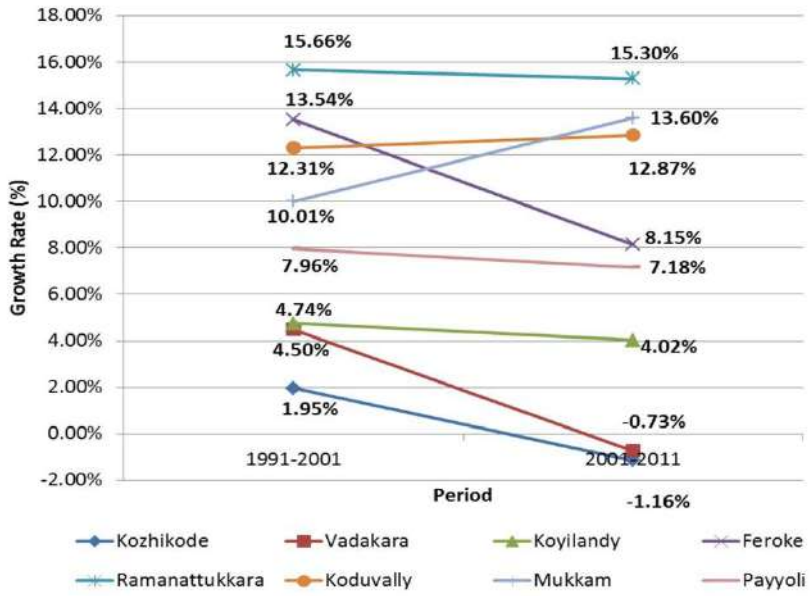


Figure 5-7Temporal variation in population growth rate – Comparison of Koyilandy Municipality with other urban local bodies in the district

The population growth rate of nearby local bodies also exhibited a decreasing trend. The population growth rate of Mudadi panchayat decreased from 7.07% to 1.90% is the most significant fall in percentage observed. Growth rate of Keezhariyur declined from 6.20% to 5.49% that of Arikkulam Panchayat has fallen to 7.20 % from 10.26%. The population growth rate of Naduvannur changed from 10.74% to 5.40%, that of Ulliyeri from

10.76% to 5.50%, and Chengottukavu from 6.91% to 5.92%, all exhibiting a decreasing trend during the decade 2001-2011. The changes in population growth rate of nearby local bodies are illustrated in figure 5.8.

5.3 Spatial Distribution of Population

The population of Koyilandy Municipal area (71,873) accounts for 2.33% of the district's population, as per census 2011.

The average gross density in the Koyilandy Municipal area is 2474 persons/sq.km, and the net density is 2633 persons/sq.km whereas the gross density of Kozhikode district and Kerala state are 1317 persons/sq.km and 860 persons/sq.km respectively. It can be seen that, the Koyilandy Municipality exhibits a higher gross population density when compared with the gross densities of the district and the state, as illustrated in figure 5.9.

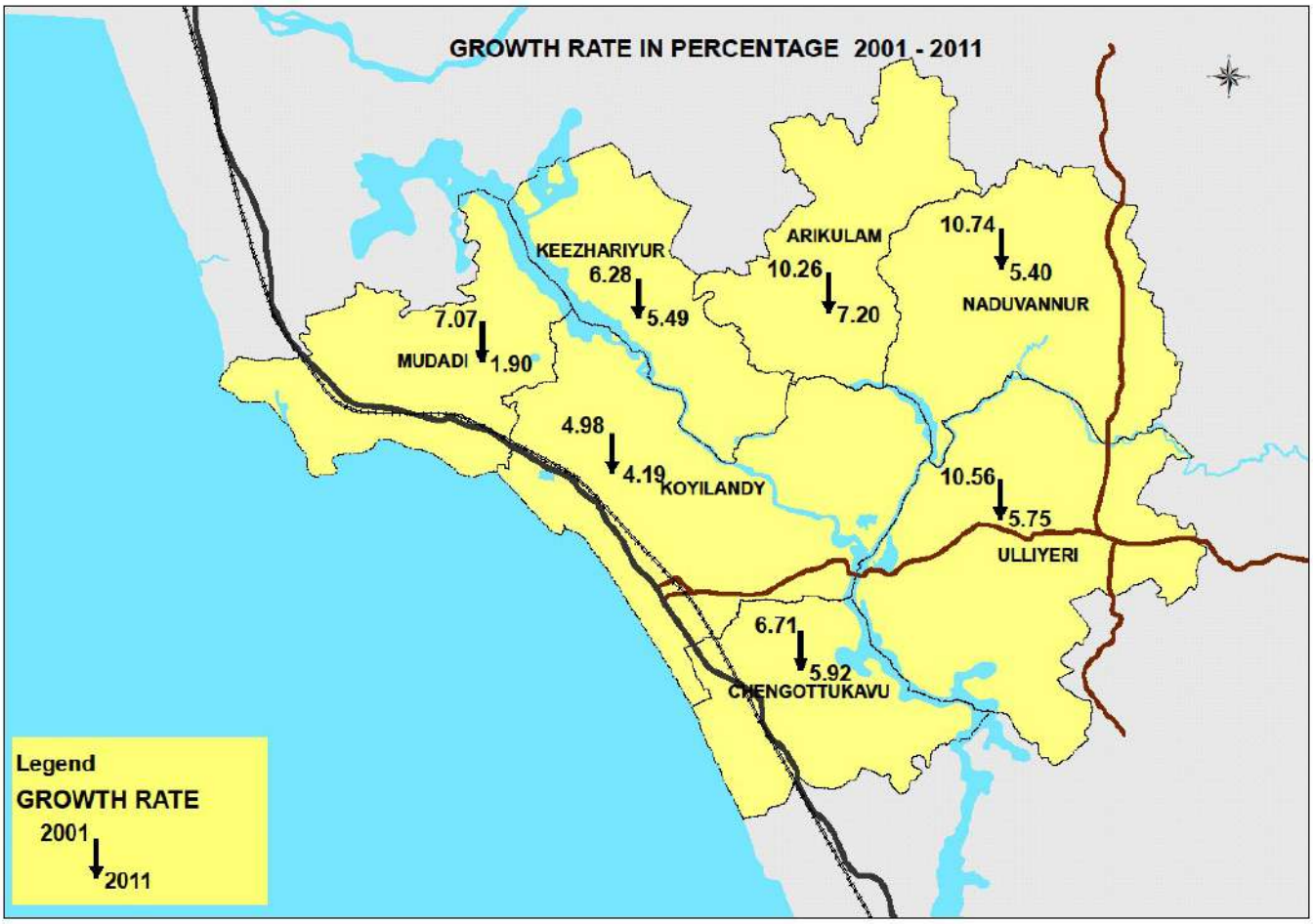


Figure 5-8Change in population growth rate of nearby local bodies during the decade 2001-2011
(Source: Census of India)

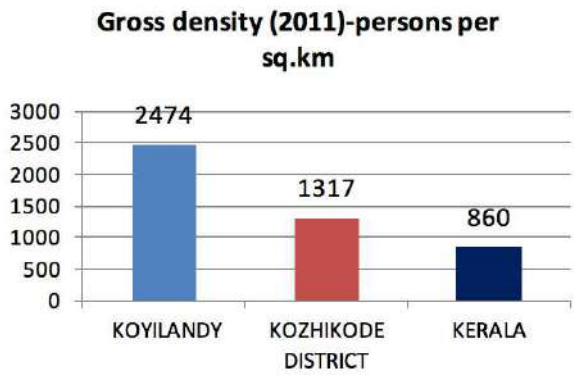


Figure 5-9Gross density values - Comparison with Kozhikode district and Kerala state
(Source: Census of India2011)

The temporal variation in gross and net densities of Koyilandy Municipality, in comparison with the same of other urban local bodies in the districts is illustrated in figure 5.10. The net and gross densities of the Kozhikode corporation is found to be the highest at 5317 persons/ sq.km and 5126 persons/ sq.km respectively. The densities of Vadakara Municipal area come second (Gross density at 3532, net density 3778), followed by the densities of Koyilandy Municipal area (gross density 2474, net density 2633). It can be seen that, the gross and net densities of Koyilandy Municipal area were exhibiting an increasing trend from 1971 onwards. For the decade 2001-2011, the gross density increased from 2375 to 2475 and the net density increased from 2527 to 2633. On the contrary, the density values of Kozhikode Corporation and Vadakara Municipalities showed a slightly declining trend. Gross density of Kozhikode Corporation declined to 5126 in 2011 from the previous value of 5179 during 2001. The net density also showed a decline from 5372 to 5317. Gross density of Vadakara Municipality has reduced from 3558 to 3532 and the net density has reduced from 3806 to 3778 during the decade 2001-2011.

(** Net area is derived by deducting the environmentally sensitive area and water bodies from the gross area, and the net area values of recently formed Municipalities -Koduvally, Payyoli and Mukkam are yet to be arrived at)*

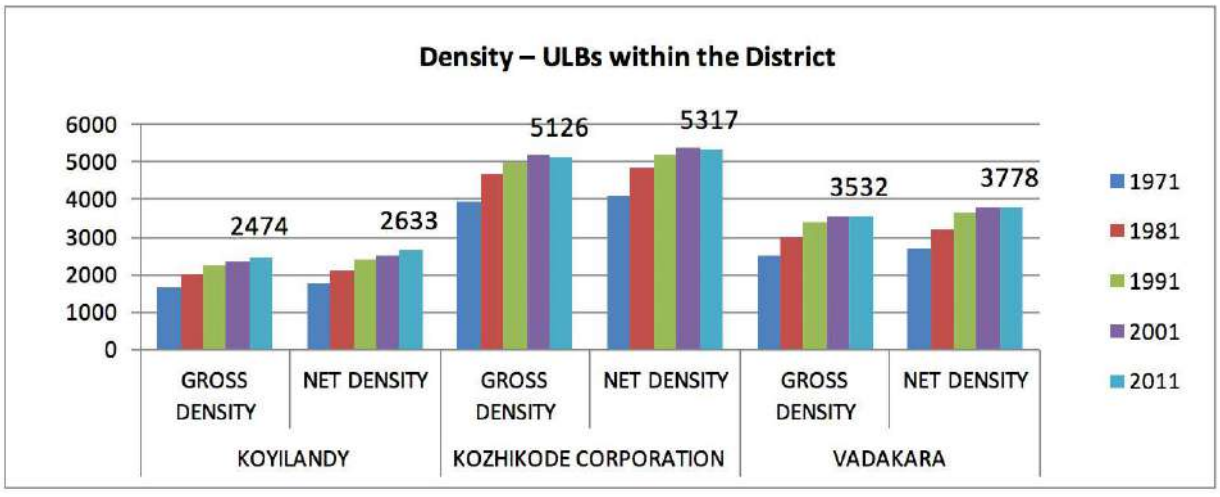


Figure 5-10Temporal variation in gross and net density values- Comparison with Vadakara municipality and Kozhikode corporation

(Source: Census of India)

The gross density values of nearby local bodies and its temporal variation are illustrated in Figure 5.11. It can be seen that, the gross density values of all the nearby local bodies were exhibiting an increasing trend, right from the year 1981. Based on 2011 census, the gross density of Koyilandy Municipality is the highest, followed by Chengottukavu Grama Panchayat at 1970 persons/sq. km. The gross density of Arikkulam Grama Panchayat is at the lowest with 795 persons/sq. km.

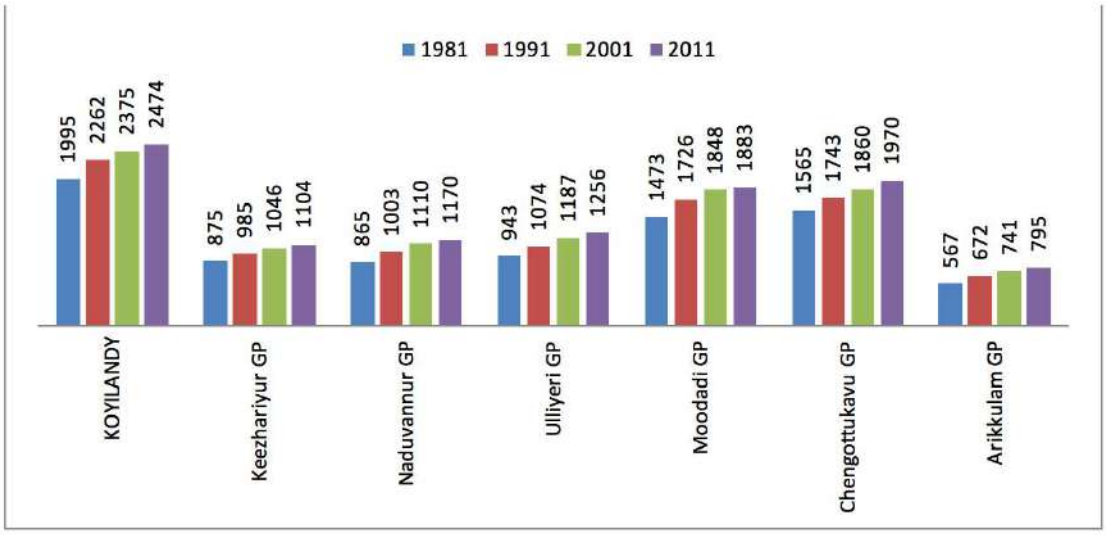


Figure 5-11Temporal variation in gross density values- Comparison with nearby local bodies
(Source: Census of India)

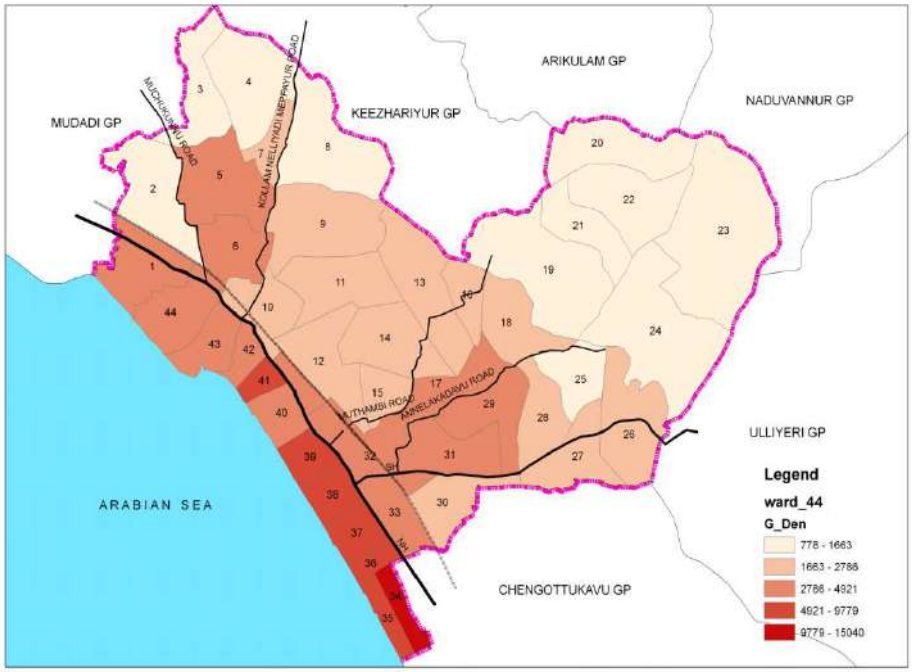


Figure 5-12 Spatial distribution of gross population density values within the Municipal area
(Source: Census of India2011)

Figure 5.12 illustrates the distribution of gross population density within the Municipality. It can be observed that, the coastal wards along the western belt of the municipal area are heavily dense, in line with the general trend in the whole state, and the

eastern parts of the Municipality are relatively less dense in nature. As illustrated in the figure the highest gross density of population is observed in ward 34, with a density of 15,040 persons/sq.km and the lowest in ward 23, with a gross population density value of 78 persons/sq.km.

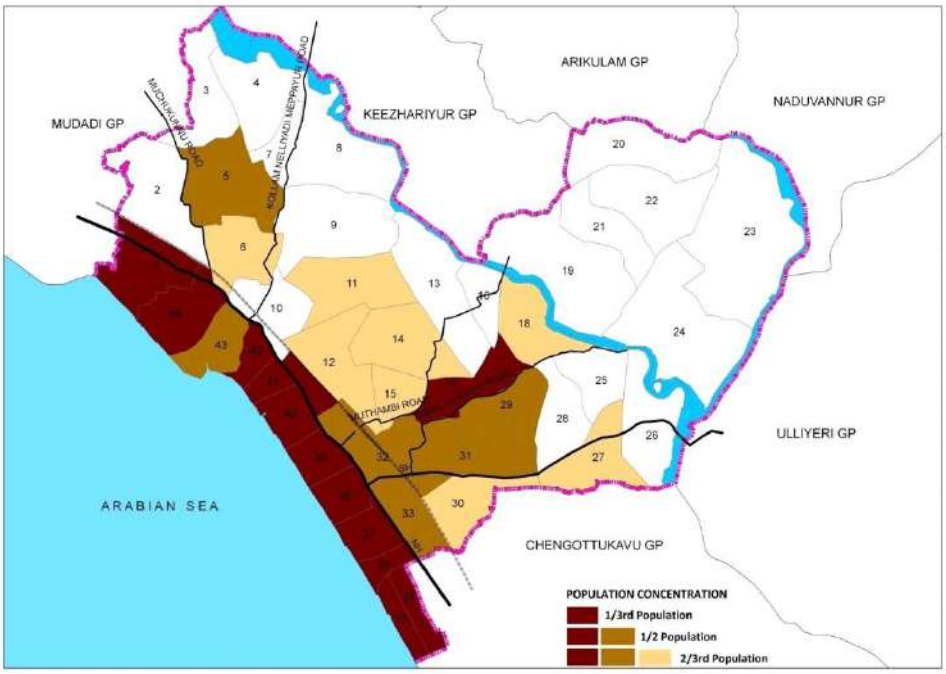


Figure 5-13Pattern of distribution total population within the Municipal area
(Source: Census of India2011)

One third of the total population is concentrated in 12 wards, situated mainly along the coastal belt and towards western side of the National Highway. Half of the total population is concentrated in a total of 18 wards, and 2/3rd of the population is concentrated in a total of 26 wards. Eastern half portion of the Municipality generally exhibits lesser density.

5.4 Sex Ratio

Sex Ratio is considered to be one among the key pointer of the social welfare and women friendliness of a society. It gives an indication towards the extent of excess or deficient women/ men population in the society. In Kerala as per records the women friendliness has got a better track record. The sex ratio of Kerala is 1084 as per census 2011 and is considered to be the highest among the states of the Nation. The urban Kerala exhibits a higher sex ratio of 1091 when compared to rural areas (1077). All the districts of Kerala have a positive sex ratio as per census 2011.

The sex ratio of Kozhikode district is 1098, which is above the average sex ratio of the state. The sex ratio has improved by 78 points in Kozhikode district between 1981 and 2011, whereas the same is 52 points while the entire state is considered. These indicate that the improvement in health and education of the women in the district, when compared to that of the state, is at a higher side.

The sex ratio of Koyilandy municipal area is 1138 which is higher than the average sex ratio of the Kozhikode district and the Kerala state as illustrated in Figure 5.14.

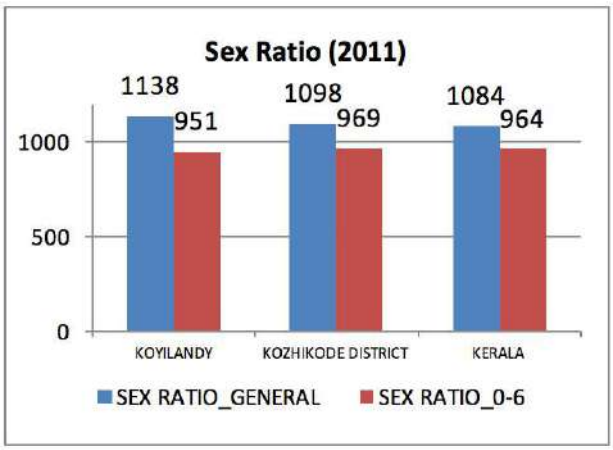


Figure 5-14Sex ratio, comparison with the district and state
(Source: Census of India2011)

The temporal variation in sex ratio in comparison with that of the other urban local bodies is illustrated in figure 5.15. It can be seen that, the sex ratio in the entire urban local bodies exhibit an increasing trend. The sex ratio of Koyilandy was increased to a value of 1138 in 2011, from the previous value of 1093 recorded in 2001.

The change in sex ratio of Koyilandy Municipality in comparison with the nearby local bodies during the decade 2001-2011 is given in figure 5.16. It can be seen that, the nearby local bodies also exhibited a similar change in sex ratio during the decade, and have registered an increased value in 2011 in comparison to that of 2001. The sex ratios of Chengottukavu and Keezhariyur Grama panchayat have registered a higher value when compared to that of the Koyilandy Municipality.

The sex ratio of Koyilandy Municipality is compared with other coastal municipalities having similar population density characteristics and the values are represented in figure 5.17. The sex ratios of Varkkala and Mavelikkara Municipalities are on a higher side than that of Koyilandy Municipality, as per Census 2011.

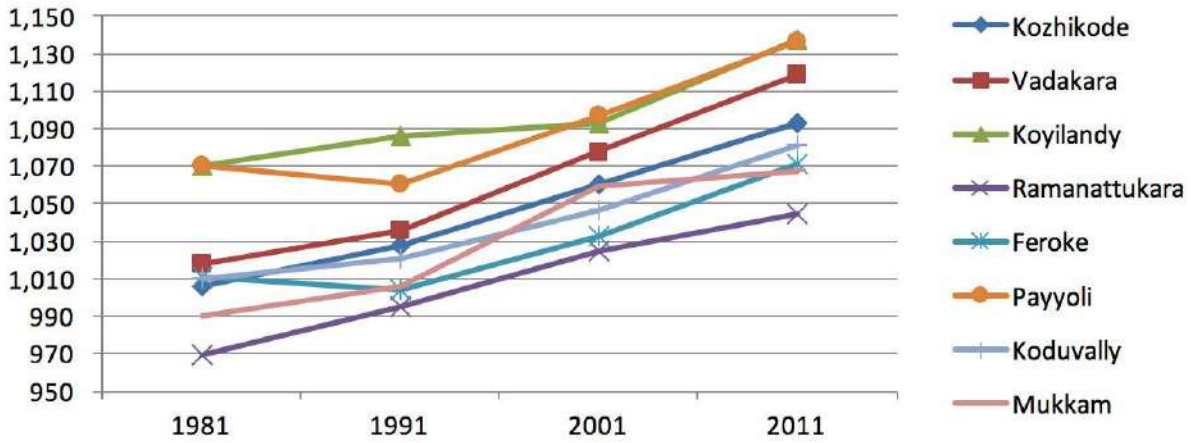


Figure 5-15Sex ratio, Temporal variation, comparison with other local bodies in the district
(Source: Census of India)

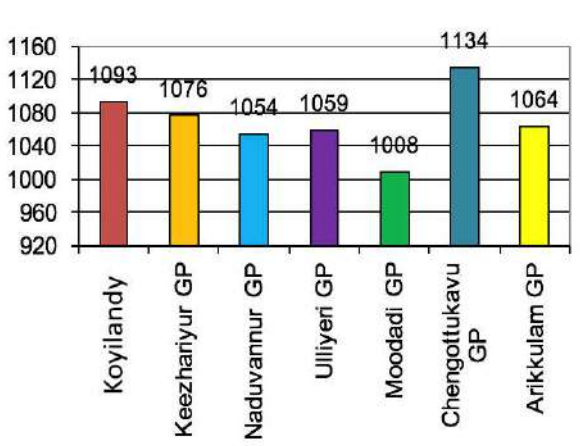


Figure 5-16Sex ratio, Comparison with nearby local bodies during the decade 2001-2011
(Source: Census of India)

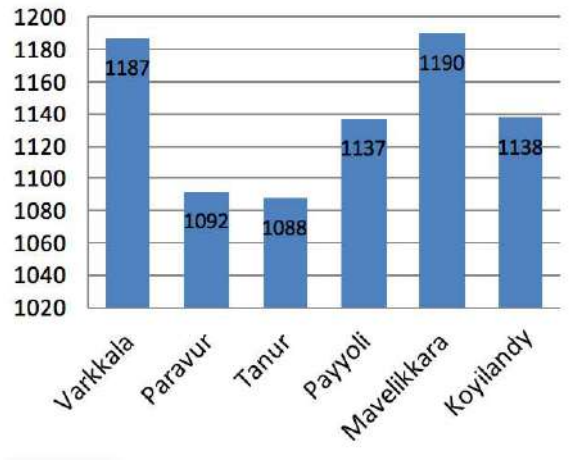


Figure 5-17Sex ratio, Comparison with similar urban local bodies
(Source: Census of India2011)

While the sex ratio analysis presents an overall pleasing picture in general, it also puts forth challenges in terms of creating more employment opportunities, especially women friendly ones, to reduce the economic dependency. It also reminds the necessity of women friendly measures in all sectors and services, like education, health, water supply, sanitation, transportation, and particularly in safety and security.

5.5 Child Population

5.5.1 Population in 0-6 Age Group

The child population is a measure of prevailing rate of child birth in the study area. The child population in the group 0-6 year gives a picture of the child birth during the past six years from the study year. The child population which was 37.93 lakhs in Kerala as per 2001 Census has declined to 33.22 lakhs during 2001-2011. That is, there is a net decline of about 4.71 lakhs in the state. The State has thus registered a decline of 12.41% during 2001-2011 in child population in the 0-6 age-group. Corresponding decline in 1991- 2001 was 0.43 lakhs, which shows a reduction of more than 10 times, indicating a drastic fall in rate of child birth. In Kozhikode District the child population decrease by 6.81% i.e., from 3.47 lakhs to 3.23 lakhs. This forms 2364 children per year on an average, between 2001 and 2011.

The details of child population of the age group 0-6, in Koyilandy Municipal area along with the comparison with the other urban local bodies are given in Table 5.2.

Table 5-2Child population and population growth rates of Koyilandy Municipal area and other urban local bodies

Local body	0_6 Population in	0_6 Population in	0_6 Population in	Growth rate of 0_6 population during	Growth rate of 0_6 population during
	1991	2001	2011	1991-2001	2001-2011
Kozhikode corp.	51105	51753	43067	1.27	-16.78
Vadakara	9791	8968	7823	-8.41	-12.77
Koyilandy	7925	7458	7095	-5.89	-4.87
Ramanattukara	3784	3826	4118	1.11	7.63
Payyoli	5667	5171	5252	-8.75	1.57
Koduvally	3832	3740	4278	-2.40	14.39
Mukkam	6268	4759	4809	-24.07	1.05
Feroke	2722	2565	2956	-5.7	3.17

(Source: Census of India)

It is observed that population in 0-6 age group decreased by 5.89% during the decade 1991-2001, and it further reduced by 4.87% during 2001-2011. Kozhikode corporation and Vadakara Municipalities registered a considerable decrease in child population during the 2001-2011 where as the in the newly formed Municipalities namely Payyoli, Mukkam, Feroke and Koduvally the major decrease in child population was observed during the decade 1991-2011. These new Municipalities registered an increase in child population during the decade 2001-2011.

5.5.2 Child Sex Ratio

The sex ratio of population of 0-6 years of age has high relevance from social as well as demographic point of view. An adverse child sex ratio shows that fewer girls are being born compared to boys and indicates chances of pre-birth sex selection measures and pre and post birth discrimination against the female child. A negative 0-6 sex ratio also exposes the possibility of socio-cultural factors which determines the survival chances of the female children.

When the trends in sex ratio of the state favour women, the child sex ratio generally presents a reverse scenario. The child sex ratio of the state is negative since 1991, and constantly decreasing. The child sex ratio in the state is 959 as per 2011 Census and has reduced by a point when compared to that in 2001. It's worth reflection that the state which fare well on social and human development indicators has a low 0-6 sex ratio. The temporal variation in child sex ratio is illustrated in Figure 5.18. It is observed that, the child sex ratio in all the urban local bodies in the district are on the negative side as per census 2011. Koyilandy registers a slight increase in child sex ratio during the period from 1991 to 2011.

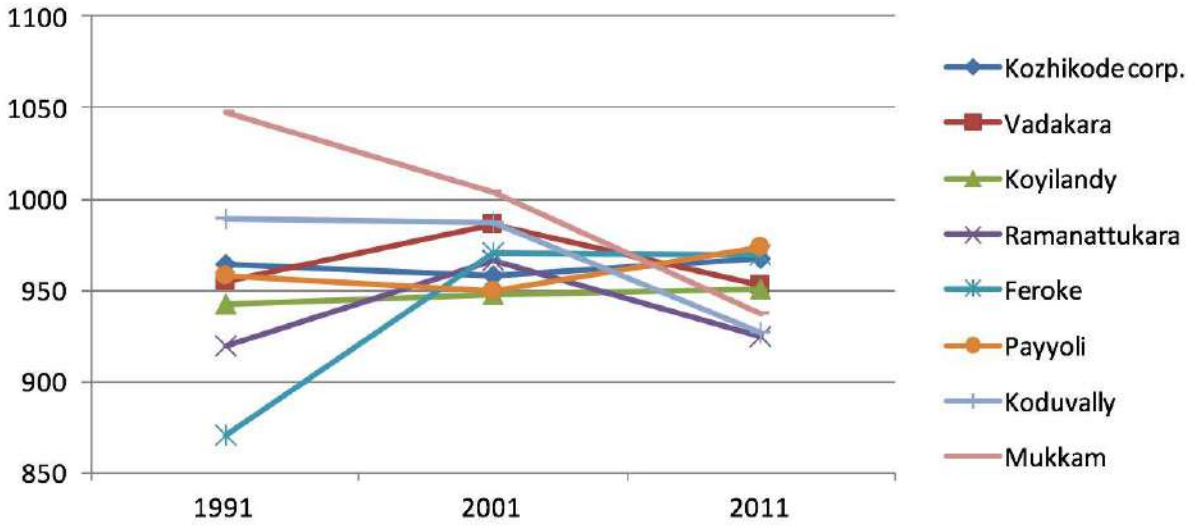


Figure 5-18Child Sex Ratio – Comparison with the other urban local bodies
(Source: Census of India)

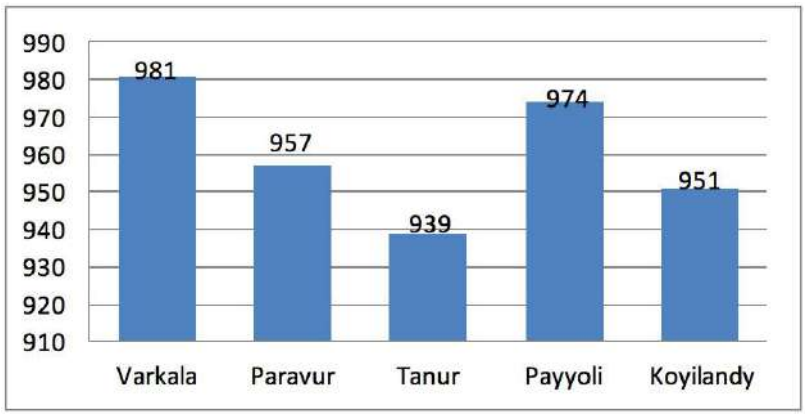


Figure 5-19Child Sex Ratio – Comparison with similar towns
(Source: Census of India 2011)

The child sex ratio of coastal municipalities having similar population density characteristics are shown in figure 5.19. It is observed that, the child sex ratios of all similar municipalities except for Tanur are having higher child sex ratio values than Koyilandy.

5.6 Age-Sex Pyramid

Age sex pyramid is a graphical illustration which gives the distribution of various age groups in a given area. The percentage population of male and female in various age groups are represented along the vertical axis, to form the shape of a pyramid. The age sex pyramid for Kozhikode Corporation, Kozhikode district and Kerala state is illustrated in Figure 5.19, and the same for Koyilandy Municipality is illustrated in Figure 5.20.

It is observed that, the age sex pyramids of Koyilandy Municipality, Kozhikode Corporation, Kozhikode district and Kerala state currently assumes the typical onion shape. In Koyilandy Municipality, the maximum percentage of population is in the age group of 25-30 years, which indicates a strong presence of working population at present. It can also be seen that, the percentage of population in the range of 40 to 60 remains more or less uniform. This indicates that a higher share of aged population is to be anticipated during the

horizon years of the plan. The percentage of child population is on the mid region capable of healthy replacement of the elder population.

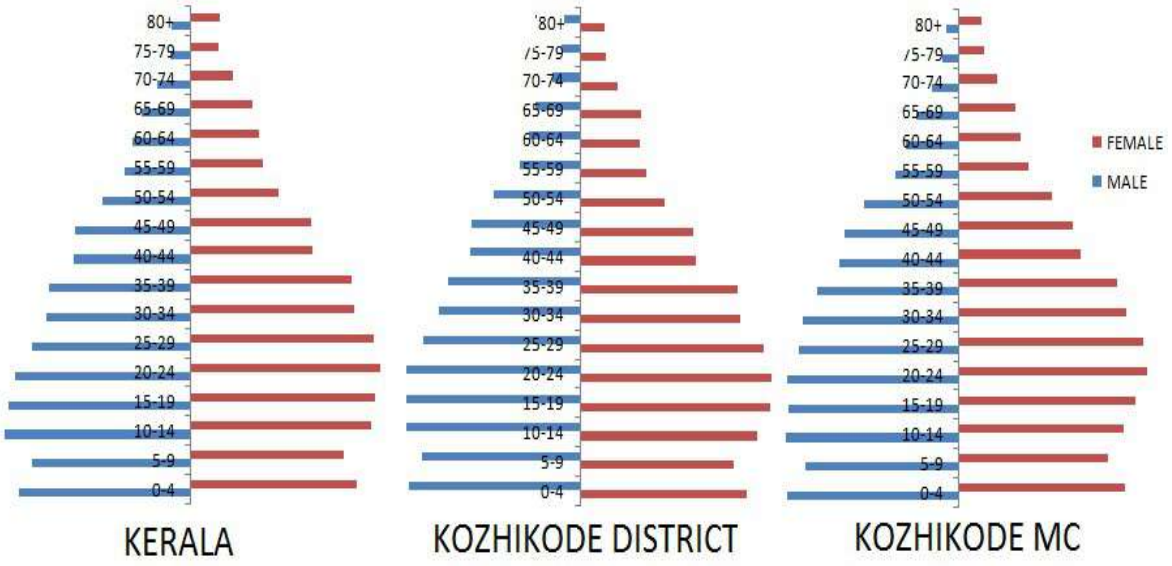


Figure 5-20Age sex pyramid for Kozhikode corporation, Kozhikode district and Kerala state
(Source: Census of India 2011)

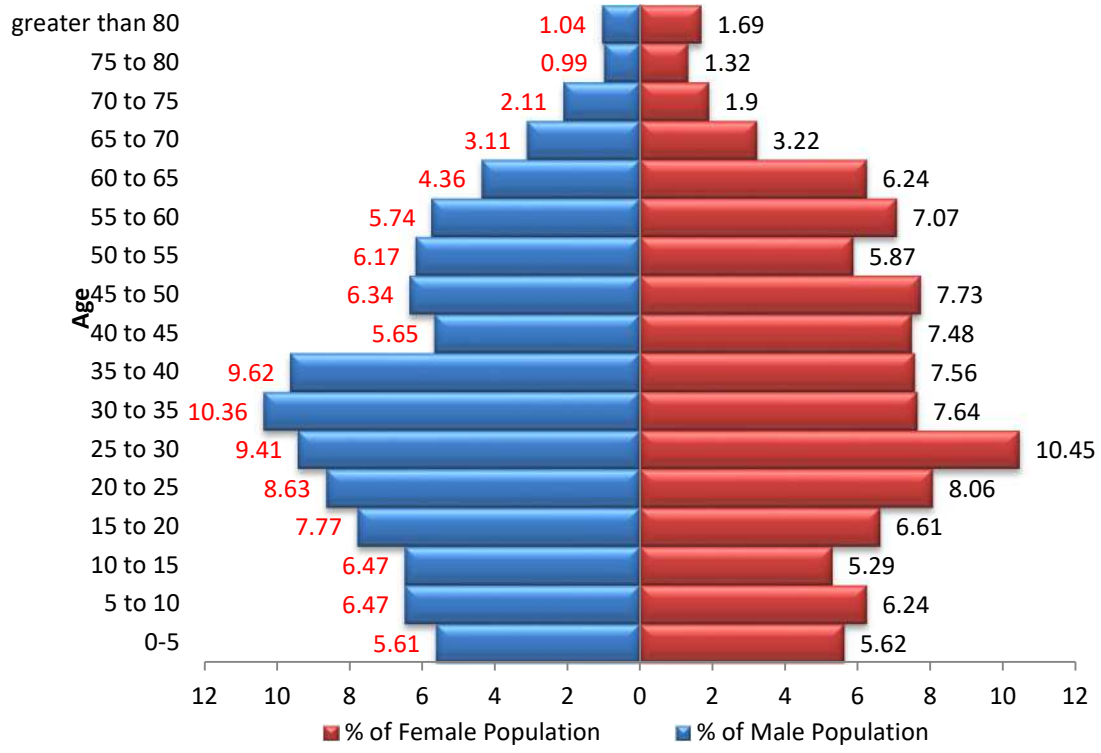


Figure 5-21Age sex pyramid Koyilandy Municipality
(Source: Census of India 2011)

5.7 Literacy

Kerala is the most literate state in India and maintains its position for the past few decades. As per Census 2011; the effective literacy rate of the state is 93.91% against 74.04% of India. The male literacy is 96.02% while that of females is 91.98%. Kozhikode district has an effective literacy rate higher than the state average, of 95.08%. In tune with the general scenario in the state, the male literacy rate (97.42%) is higher than the female literacy rate (92.99%) in Kozhikode district as well.

The Koyilandy Municipality registers an effective literacy rate of 95.11% during 2011, which is higher than the district and state average, as illustrated in figure 5.21. The effective literacy value of Koyilandy Municipality is lesser than that observed for Kozhikode Corporation, Ramanattukara and Feroke, as illustrated in figure 5.22. The value is again compared with the values of coastal municipalities having similar population density characteristics and is illustrated in figure 5.24. The effective literacy values of Paravur are higher than that of the effective literacy rate of Koyilandy Municipality.

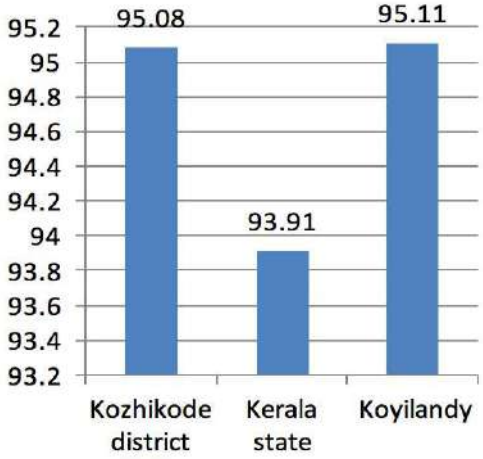


Figure 5-22 Effective literacy rate – comparison with the district and state value
(Source: Census of India 2011)

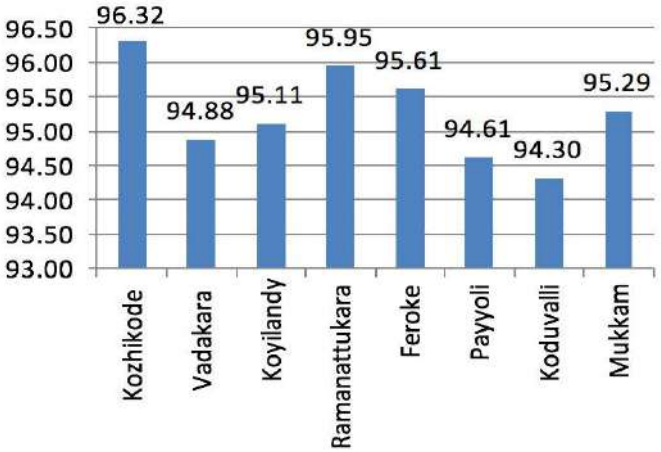


Figure 5-23 Effective literacy rate – comparison with the district and state values
(Source: Census of India 2011)

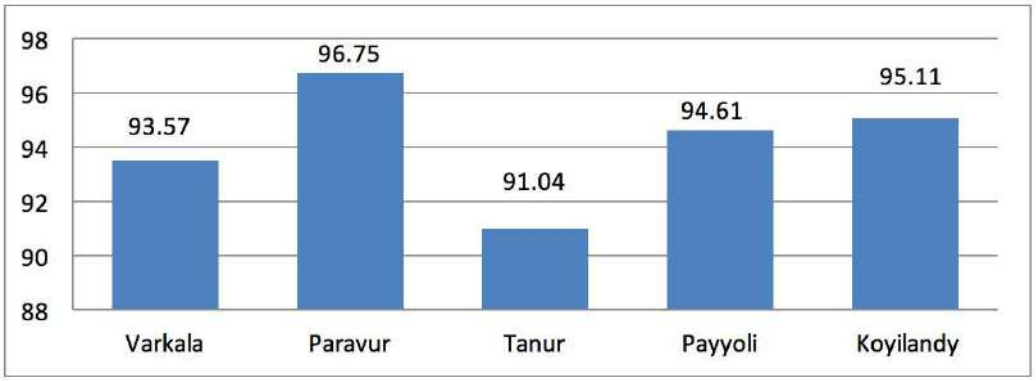


Figure 5-24 Effective literacy rate – comparison with the district and state values
(Source: Census of India 2011)

The temporal variation in effective literacy rates in comparison with the other urban local bodies is illustrated in figure 5.25. It can be observed that, the effective literacy rate of all the urban local bodies in the district is indicating an increasing trend, although the rate of increase varies considerably among the local bodies.

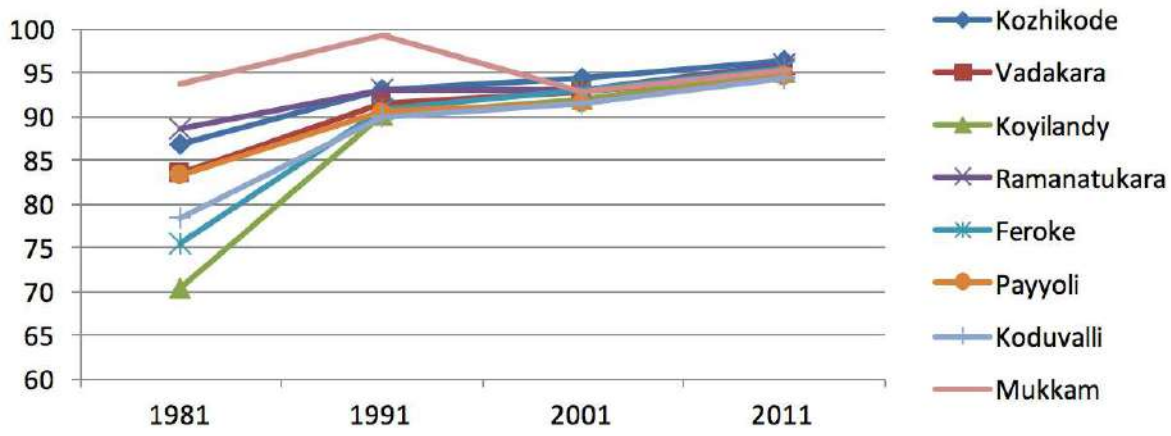


Figure 5-25 Effective literacy rate – Temporal variation – Comparison with other urban local bodies
(Source: Census of India)

The effective literacy rate of male population is found to be dominating in all the urban local bodies of the district. Comparison of male and female effective literacy rates are illustrated in figure 5.26, and the temporal variation male and female effective literacy rates are illustrated in table 5.3. The effective gender-gap in literacy in Koyilandy Municipality observed during 2011 is 4.23%, which was at 7.96% during 2001. All urban local bodies except Vadakara have registered a decrease in gender-gap during the decade 2001-2011.

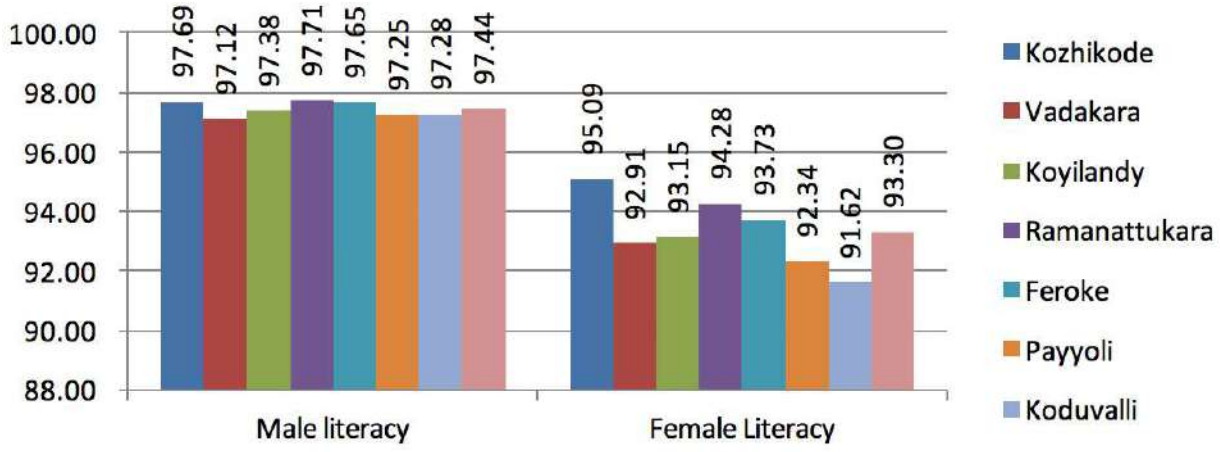


Figure 5-26Effective literacy rates – Comparison between male and female effective literacy rates among the urban local bodies of the district
(Source: Census of India2011)

Table 5-3 Effective literacy rate – Temporal variation in effective male and female literacy rates among the urban local bodies in Kozhikode district

Local body	1991			2001			2011		
	Male literacy %	Female Literacy %	Gender Gap	Male literacy %	Female Literacy %	Gender Gap	Male literacy %	Female Literacy %	Gender Gap
Kozhikode	96.43	90.00	6.43	96.71	92.21	4.49	97.69	95.09	2.60
Vadakara	95.56	87.48	8.09	95.56	95.77	(0.21)	97.12	92.91	4.20
Koyilandy	90.25	90.25	-	96.07	88.11	7.96	97.38	93.15	4.23
Ramanattukara	96.48	89.51	6.97	96.68	89.64	7.03	97.71	94.28	3.43
Feroke	95.79	86.07	9.72	96.43	89.76	6.67	97.65	93.73	3.92
Payyoli	95.57	85.82	9.75	96.03	87.44	8.59	97.25	92.34	4.91
Koduvally	95.23	84.70	10.54	96.23	87.11	9.12	97.28	91.62	5.66
Mukkam	112.15	88.41	23.74	96.51	89.60	6.91	97.44	93.30	4.14

(Source: Census of India)

5.8 Household Size

The average household size in an area gives indications of the social and family structure in an area and changes in them. The temporal variation in average household size is illustrated in figure 5.27. It can be observed that the average household sizes of various urban local bodies are on a decreasing trend during the past few decades.

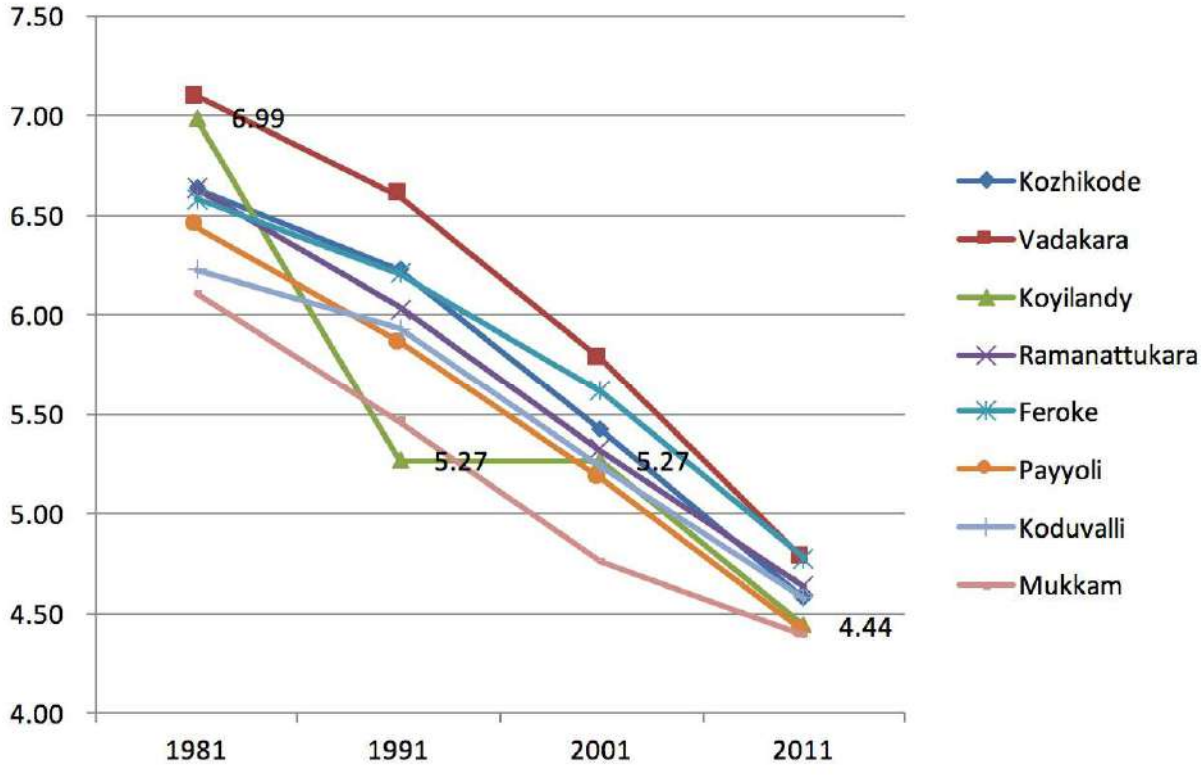


Figure 5-27Temporal variation in average household size- Comparison among urban local bodies in Kozhikode district
(Source: Census of India)

The average household size of Koyilandy Municipality recorded during 2011 was at 4.44, which was decreased from a value of 5.28 during the period 2001-2011. The value is on the lower side next to Mukkam and Payyoli, when compared among the other urban local bodies in the district.

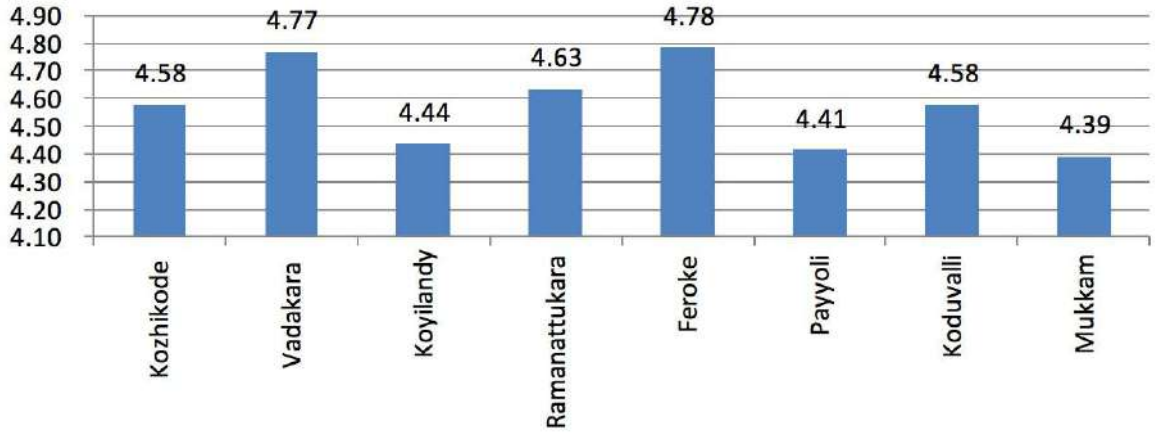


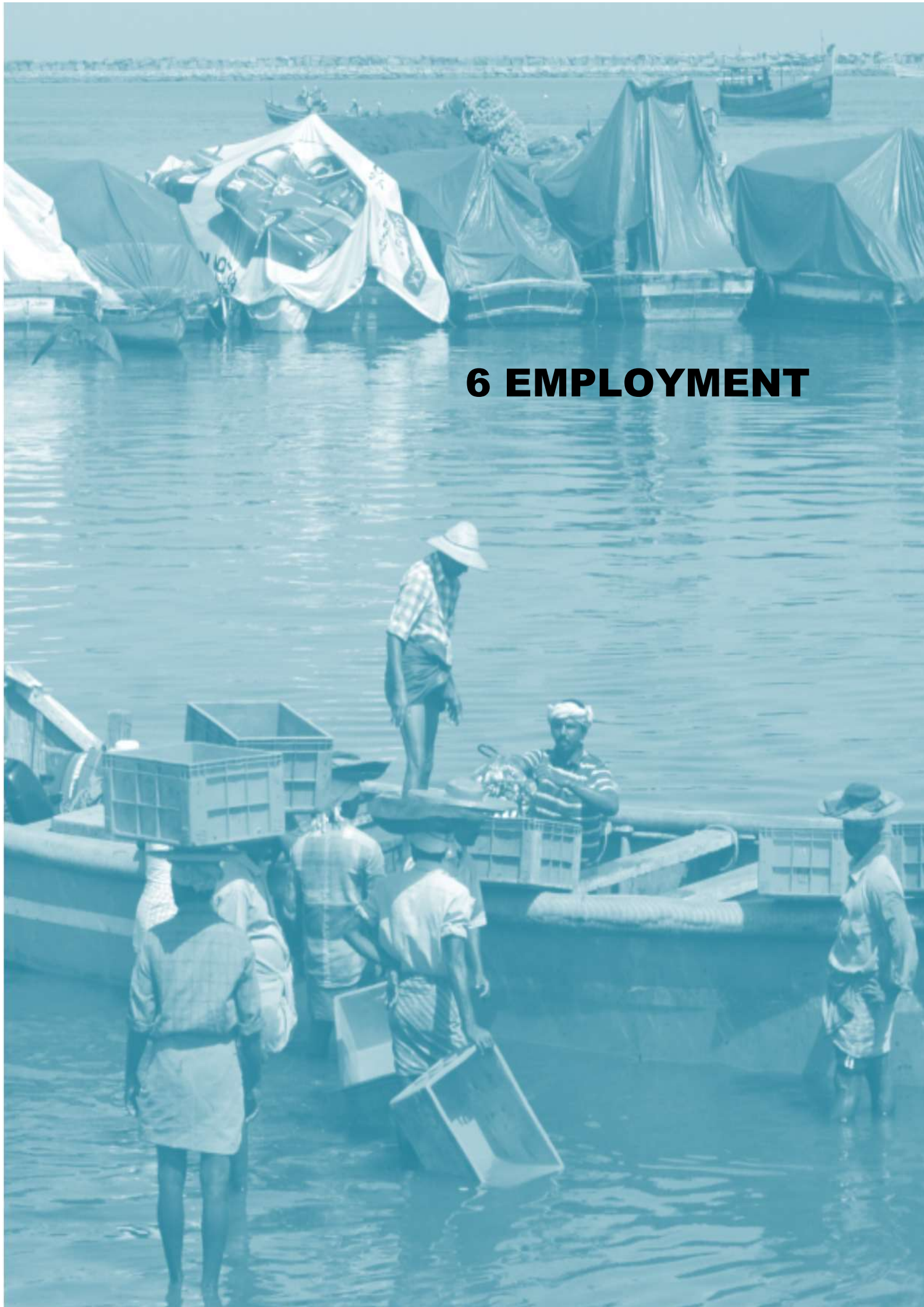
Figure 5-28Average household sizes- Comparison with other urban local bodies in the district
(Source: Census of India2011)

5.9 Migration

The socio economic survey does not register any considerable migration of population to and from the town. As per records from Koyilandy police station there are 494 numbers of workers from other states in the town of which majority (195) are from the state of West Bengal.

5.10Inference

The analysis of temporal changes and spatial distribution of population, and population growth rate reveals that the urban content of the district is increasing due to the population accumulation in smaller towns and the fringe areas of the major urban centres of the district, than due to the growth in the already established urban local governments. However increase in growth rate in peri-urban area compared to the town is not evident in Koyilandy town as elsewhere in the state. Analysis of the trends in demographic parameters like proportion of 0-6 age group and age-sex pyramid indicates an aging population in the study region, pointing towards a greater demand for medical and other geriatric services in near future. However, the decline in fertility in the district is very low, compared to the decline in the state. When the trends in sex ratio of the state favour women, the child sex ratio generally presents a reverse scenario. However the child sex ratio of the Koyilandy Municipality on the increasing trend during the past decades, depicting a favourable picture. The declining trend in average household size indicates the change from joint family system to nuclear family system. Increasing literacy rates and decreasing gender gap in literacy etc. indicates favourable social changes in general.



6 EMPLOYMENT

Employment opportunities are directly linked with the social and economic wellbeing of any society. Thus the study on occupational structure, its distribution and various other characteristics play a major role in master plan studies, and the same has been dealt with in this chapter.

6.1 Workers and Workers Participation Ratio

As per Census 2011 figures, 30.7% of the total population in Kozhikode district fall under working population. In the district 9,48,981 persons are engaged in various types of employment related activities. In the state, the total working population recorded is about 11,625,309 persons which are 34.80% of the population of the state. In Koyilandy Municipal area the working population falls around 21,430 persons (29.82%) as per 2011 census and is illustrated in figure 6.1. It can be seen that, the percentage of working population is less when compared with the values of Kozhikode district and Kerala state.

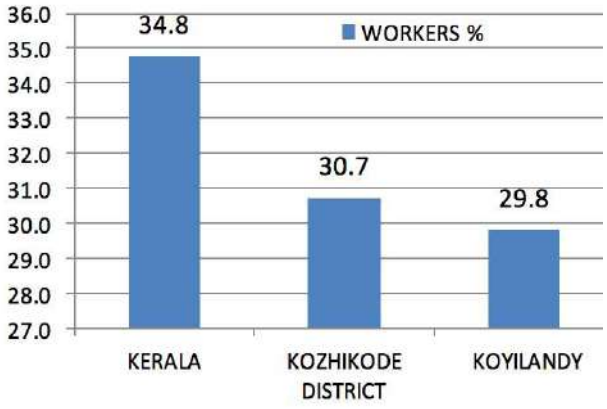


Figure 6-1 : Percentage of working population, Comparison with district and state values

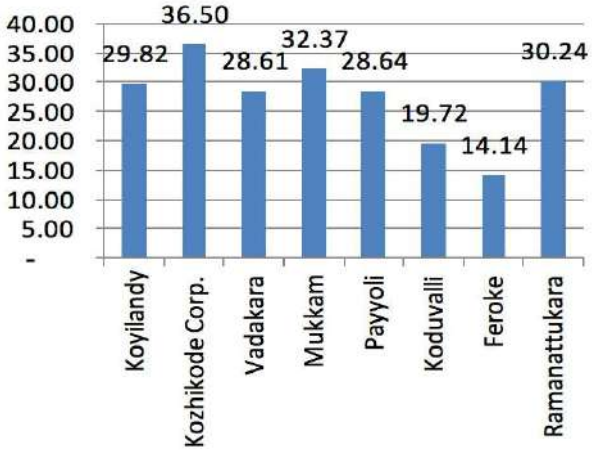


Figure 6-2Percentage of working population, Comparison with other urban local bodies in the Municipality

(Source: Census of India, 2011)

The figure 6.2 illustrates the variation in percentage of working population, in comparison with the other urban local bodies in the district based on 2011 Census. It can be seen that, the percentage of working population of Koyilandy Municipality falls behind the values of Ramanattukara, Mukkam municipalities and Kozhikode Corporation. Kozhikode Corporation exhibits the highest value of workers participation ratio (WPR) at 36.50%.

The workers participation ratio in comparison with the values observed for the nearby local bodies are illustrated in Figure 6.3. It can be observed that, the Koyilandy Municipality records the lowest value of WPR among the nearby local bodies. WPR value of Keezhariyur Grama panchayat is at the highest and the Arikkulam Panchayat falls second.

The variation of WPR of Koyilandy Municipality along with the variations observed in other urban local bodies during the decade 2001-2011 is illustrated in Figure 6.4. The WPR value of Koyilandy Municipality has increased from 26.97% to 29.82% during the decade.

Also, the WPR values of other local bodies in the district and that of the Kozhikode district as a whole also showed an increasing trend during the decade 2001-2011.

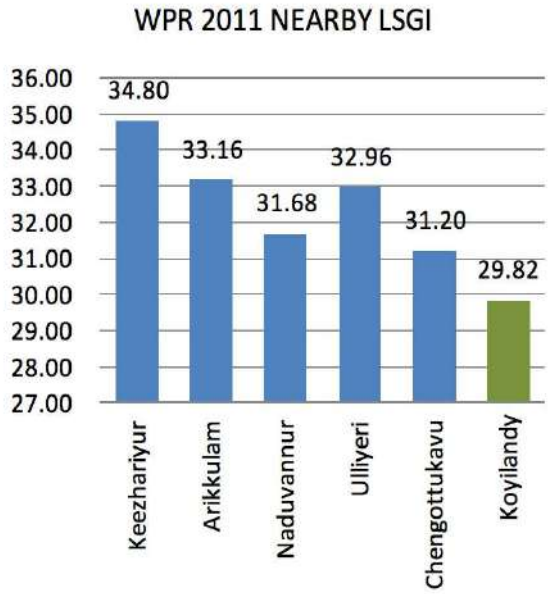


Figure6-3Workers Participation Ratio, Comparison with nearby local bodies

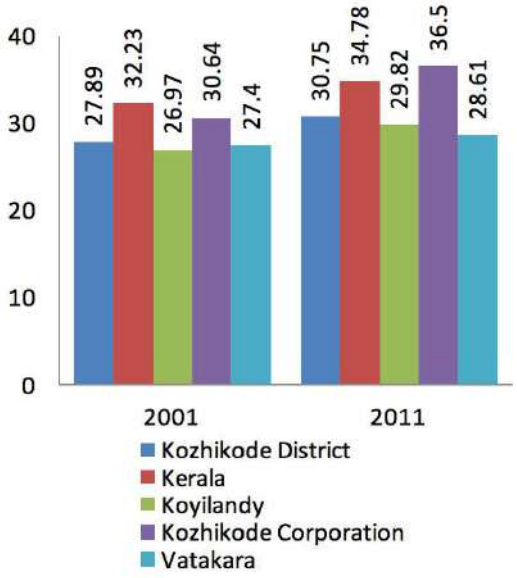


Figure 6-4Workers Participation Ratio, change during the decade 2001-2011, Comparison with other urban local bodies

(Source: Census of India, 2011)

The percentage of working population is compared with the values of other coastal municipalities having similar population densities, and is illustrated in figure 6.5. It can be seen that, among the similar municipalities, Tanur has got the highest value of workers participation ratio with 39.39%. Varkkala registers a WPR value of 32.88% and Paravur being the lowest at 24.14%.

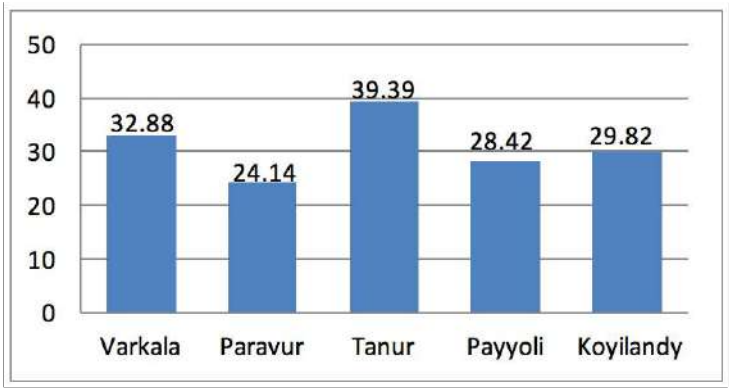


Figure 6-5Workers Participation Ratio, Comparison with similar municipalities

(Source: Census of India, 2011)

Further, the total workers are again classified into main and marginal workers, with a classification as to those who are availing works for a period not less than 6 months a year are termed main workers and others as marginal workers. Accordingly, 82% of the total workers in the Municipality fall under main workers and 18% under marginal category. Percentage share of main and marginal workers in Koyilandy Municipality based on census 2011 in comparison to the share of other urban local bodies in the Municipality are illustrated in figure 6.6 and the comparison of the same with the values of coastal municipalities having comparable population densities are tabulated in figure 6.7.

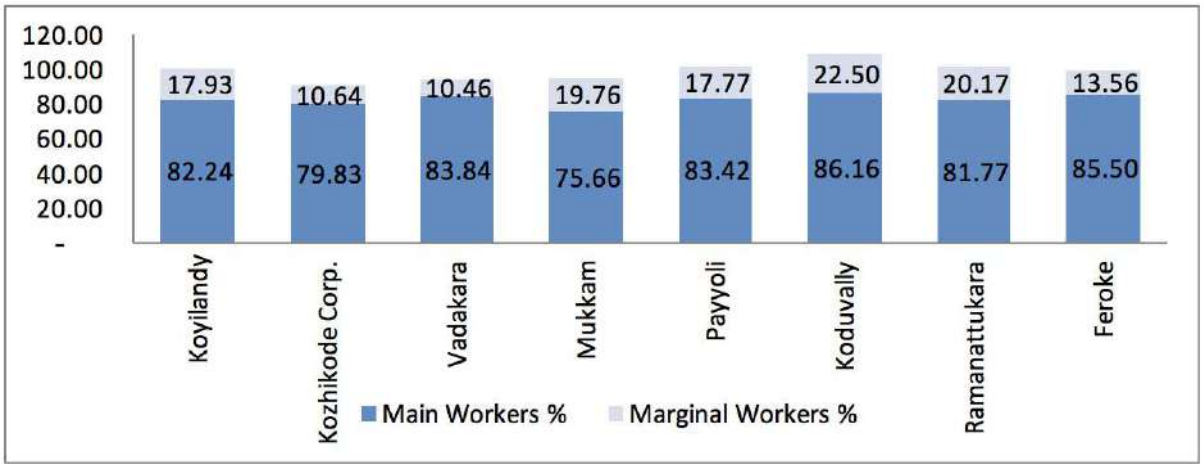


Figure 6-6Percentage of main and marginal workers, Comparison with other urban local bodies in the district
(Source: Census of India, 2011)



Figure 6-7Percentage of main and marginal workers, Comparison with similar municipalities
(Source: Census of India, 2011)

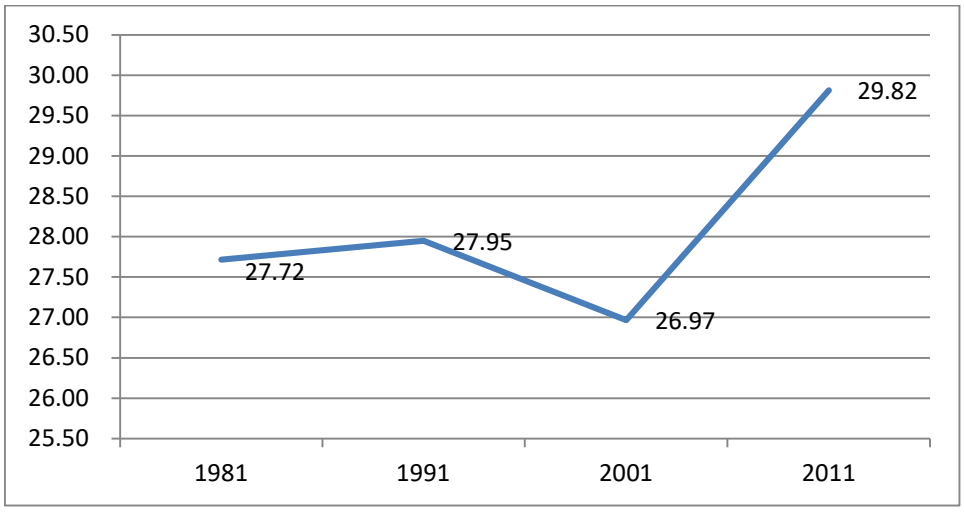


Figure 6-8Workers Participation Ratio, Temporal variation
(Source: Census of India)

The change in percentage of working population in Koyilandy Municipal area over decades from 1981 onwards is illustrated in Figure 6.8. During the decade 1991-2001 the value decreased by 1% but again during the decade 2001-2011 it has registered an increase in value by 2%.

The temporal variation in WPR in comparison with the WPR registered for other urban local bodies in the district is illustrated in figure 6.9. During the year 1991, majority of the urban local bodies except the Koyilandy registered a higher value of WPR, but decreased

during 2001 and started an increasing trend again during the decade 2001-2011.

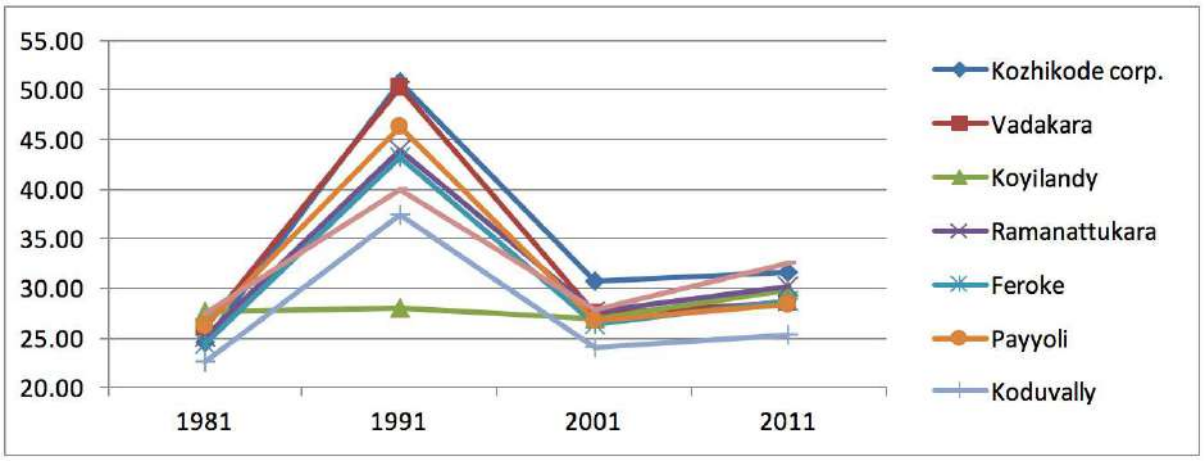


Figure 6-9Workers Participation Ratio, Temporal variation, comparison with other urban local bodies in the district
(Source: Census of India)

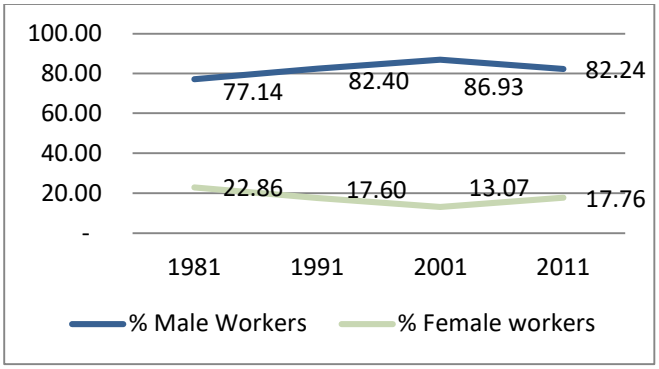


Figure 6-10Male and female workers, Temporal variation
(Source: Census of India)

The figure 6.10 gives the temporal variation of male and female workers participation ratio during the decades 1981 to 2011. The percentage of male and female workers within a given working population remains almost comparable during the said decades except for the year 1981. As per 2011 census the percentage of male population comes around 82.24% of the total working population, which showed a decrease from 86.93% recorded during 2001, or registering an increase in percentage of female working population to 17.76% from 13.07% recorded in 2001.

Based on socio economic survey it is observed that, 20.98% of the people are unemployed and are trying for employment, and 20.45% of the people are unemployed and are not trying for employment.

6.2 Occupational Structure

Total working population can be further classified as cultivators, agricultural labourers, house hold industrial workers and other labourers based on the census data. The occupational structure of Koyilandy Municipality in comparison with Kozhikode district and Kerala state is illustrated in Figure 6.11. It can be seen that, workers other than cultivators, agricultural labourers and household industrial workers constitute 95.1% of the total

workers population of the Municipality. The percentage share of other workers for Kozhikode district is 89.0% and that of the state is 80.5%, both much lower than the value observed for Koyilandy Municipality.

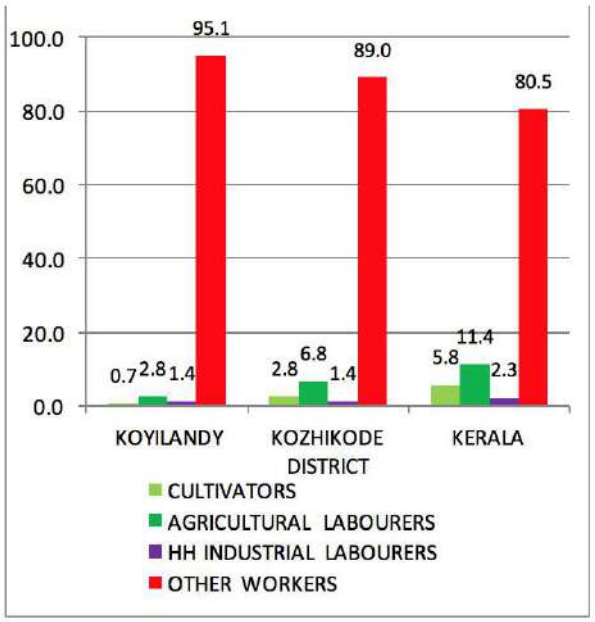


Figure 6-11Occupational structure Koyilandy Municipality, Comparison with Kozhikode district and State

(Source: Census of India)

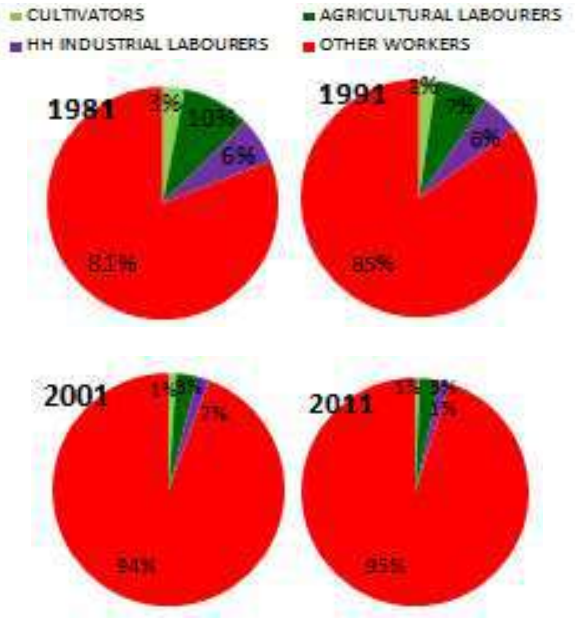


Figure 6-12Temporal variation in occupational structure of Koyilandy Municipality

(Source: Census of India)

The temporal variation in occupational structure of Koyilandy Municipality is illustrated in Figure 6.12. It can be seen that the Municipality exhibits a continuous increase in the number of workers in other workers category from 1981 onwards. Percentage of other workers changed from 81% to 85 % during the decade 1981-1991, 85% to 94% during 1991-2001 and 94% to 95 % during 2001-2011. The significant decrease in share was observed in the case of percentage of agricultural labourers, which decreased from 10% to 7% during 1981-1991, further decreased to 3% during 1991-2001 and remained at 3% during the decade 2001-2011. The percentage of cultivators and household industrial workers also registered a continuous decrease in percentage during the period aforementioned.

6.3 Distribution of major classes of workers

The spatial distribution of various classes of workers within the Municipal area is illustrated in figure 6.13. It can be seen from the figure that, majority of the working population is concentrated in coastal and central wards of the Municipality. The spatial distribution of main workers within the municipality is illustrated in figure 6.14 and the spatial distribution of marginal workers is illustrated in figure 6.15. The main workers are mainly distributed along the central and coastal areas of the Municipality, and the marginal workers along the northern areas.

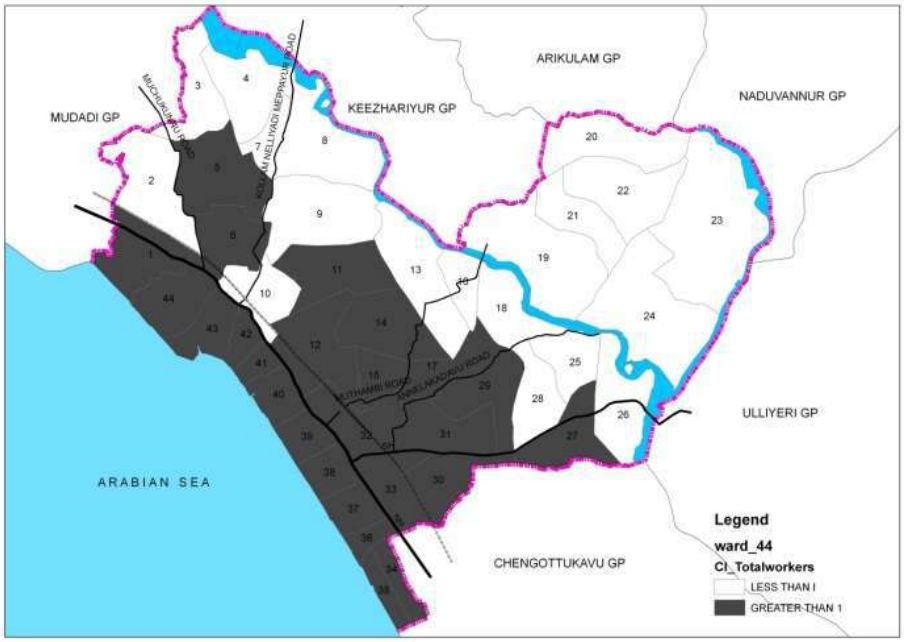


Figure 6-13Spatial distribution of total workers within the Municipality
(Source: Census of India, 2011)



Figure 6-14Spatial distribution of main workers within the Municipality
(Source: Census of India, 2011)

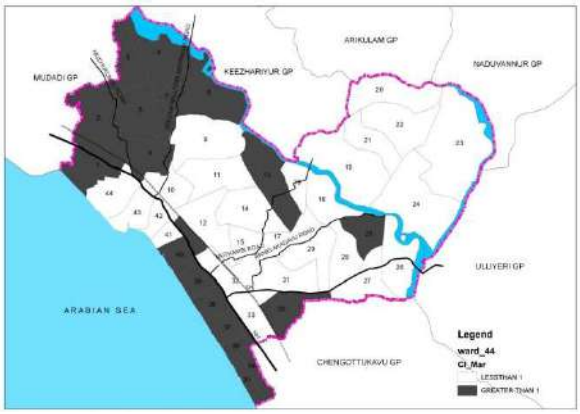


Figure 6-15Spatial distribution of marginal workers within the Municipality
(Source: Census of India, 2011)



Figure 6-16Spatial distribution of Cultivators within the Municipality
(Source: Census of India, 2011)

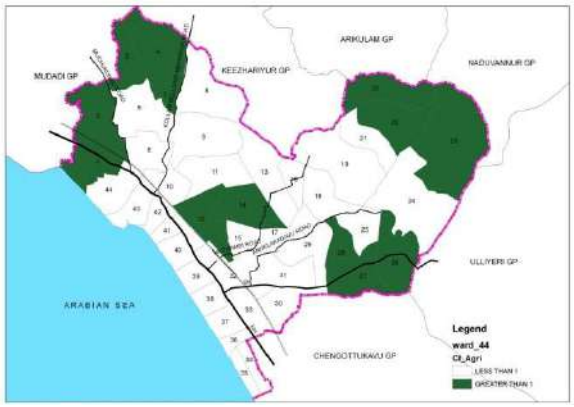


Figure 6-17Spatial distribution of agricultural labourers

(Source: Census of India, 2011)

The spatial distribution of cultivators is illustrated in figure 6.16 and that of the agricultural labourers in figure 6.17. Cultivators and agricultural labourers concentration is more in the northern and eastern parts of the municipality. The figure 6.18 shows the ward wise distribution of occupational structure. The figure 6.18 indicates that in all the wards the other workers categories are predominant. The classification of employment based on socio economic survey is given is illustrated in figure 6-19. Accordingly, majority of the employed population are working as self employed and in private sector. Socio economic survey results illustrate an overall 41.43% of the population as unemployed. The table showing details of occupational structure is given in Annexure III.

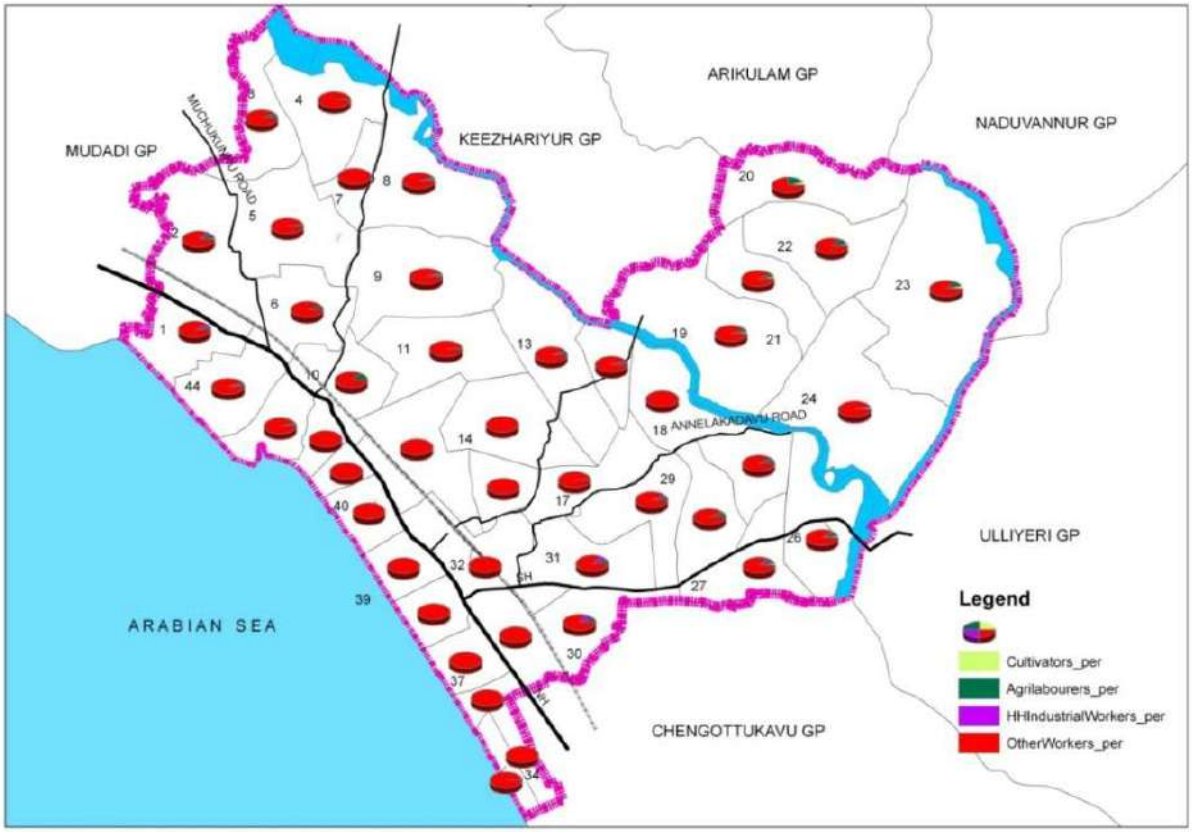


Figure 6-18Ward wise distribution of occupational structure

(Source: Census of India, 2011)

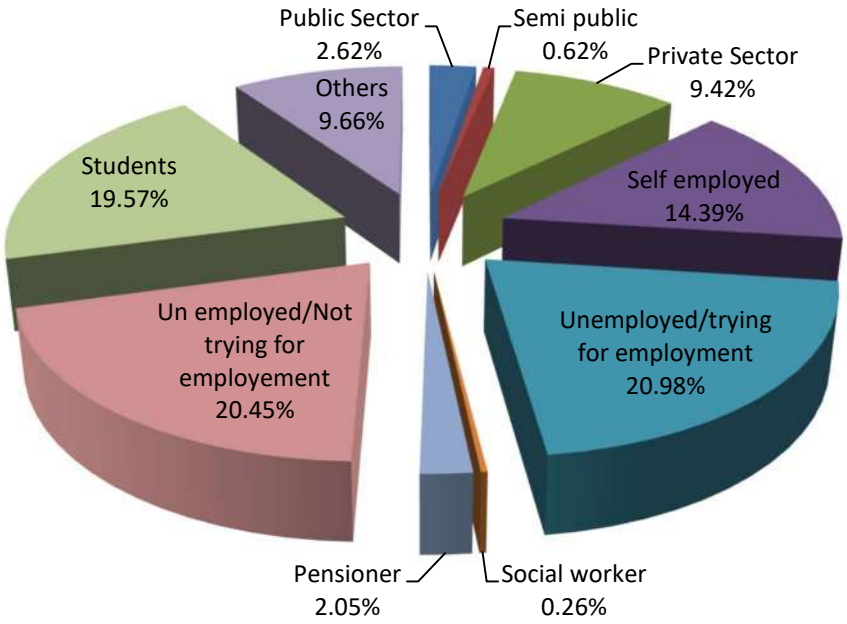


Figure 6-19Classification of employment

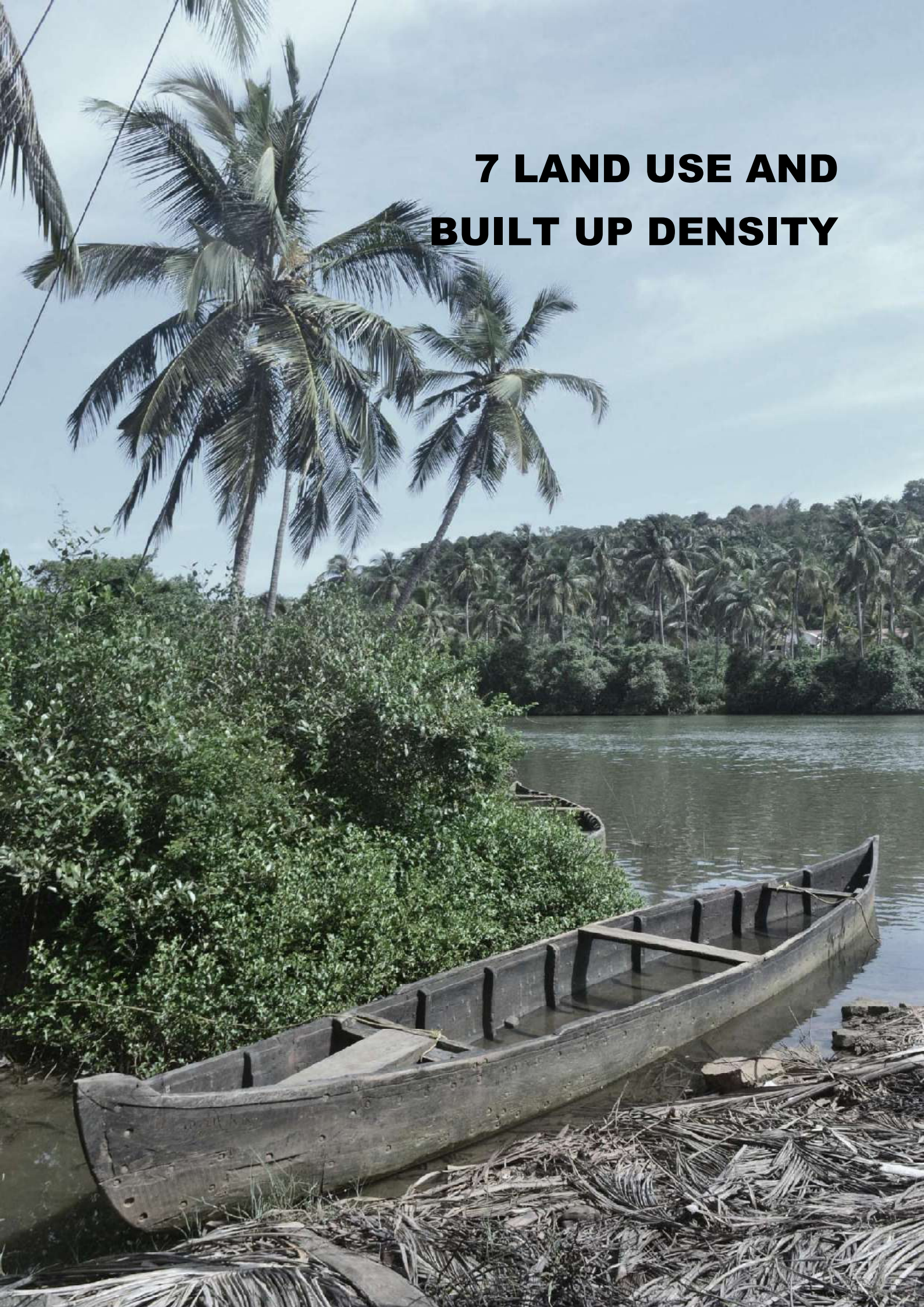
(Source: Socio economic survey)

6.4 Distribution of major classes of workers

Fisheries sector is considered to be a major provider of employment in Koyilandy town. Koyilandy harbour is one among the major fishing harbours of the state. The annual catch arrives the harbour is in the tune of 3,22,0000 Kg per annum. The sector has been further detailed out in chapter 9.

6.5 Inference

The WPR values observed for the Municipal area is lower when compared to that of the district and state, but shows an increasing trend. The share of workers in agricultural and related areas has reduced drastically there by increasing the percentage share of workers in other category of workers. Participation of female workers has increased during the decade 2001-2011 indicating more female population entering in the working class segment. The urban nature of the planning area is determined mainly by the activities in central and western parts of the Municipality where in the majority of the main workers are concentrated. The agricultural labourers and cultivators are mainly concentrated in the relatively rural areas of the Municipalities in eastern and northern parts which still keep a certain degree of rural characteristics. A gradual shift in the structure of economy towards being urban can be inferred. As per socio economic survey the unemployed people who are trying for employment and unemployed people who are not trying for employment form around two fifth of the overall municipal population.



7 LAND USE AND BUILT UP DENSITY

7.1 General Analysis of Land Use

The existing land use in an area in general indicates the use for which the various parcels of land are currently being utilised. As per the land use data of the Natural resources and Environmental Data Base prepared by Kerala State Land use Board, the land use of Kerala can be categorized under 9 Major categories and the percentage share of these categories is shown in Table 7.1. Accordingly the predominant land use of the State is a mix of residential and agricultural land use which constitutes 41.38% of total land area. It can be further seen that forest area of the State contributes nearly 23.18% of the total area with the forest land use as second highest land use of the State. The agricultural land use and plantation land use together constitute 20.18% of total area. The above analysis further support the real 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.

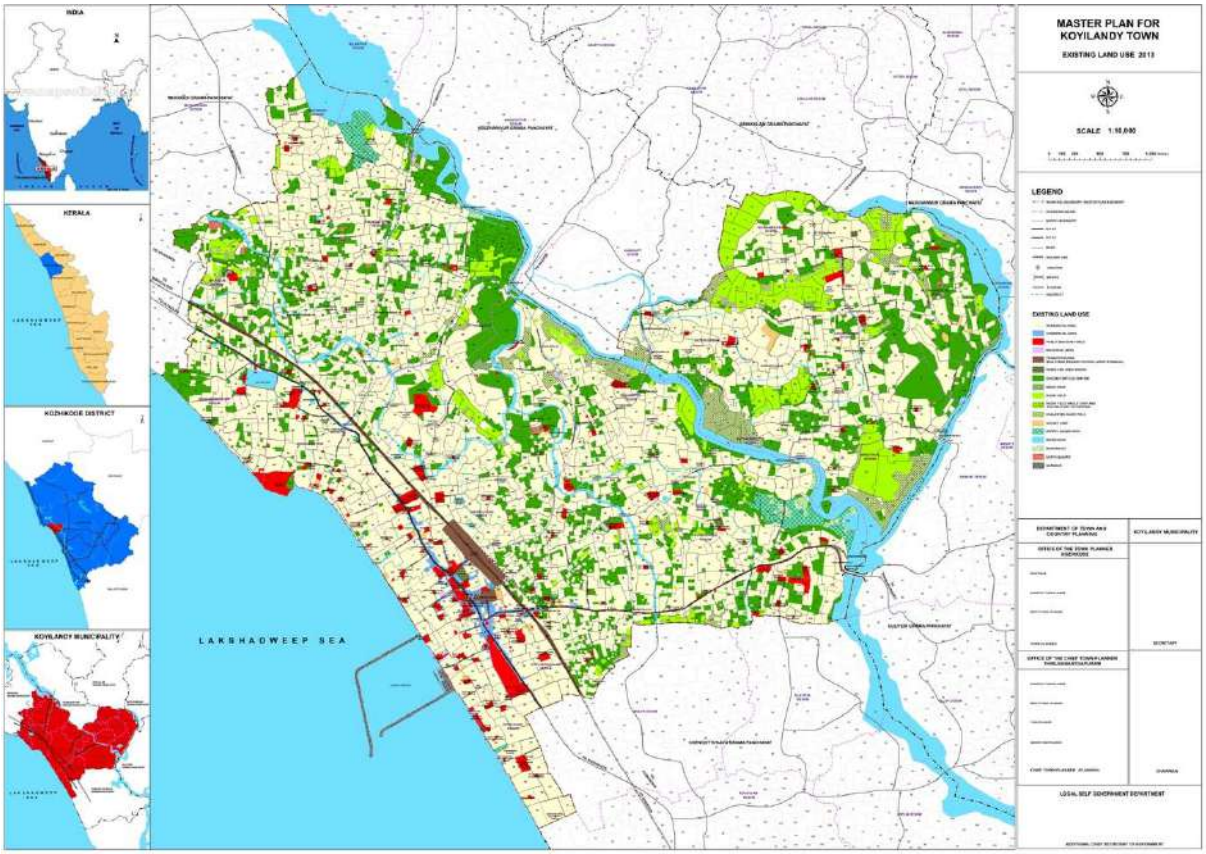


Figure 7-1 Existing land use in Koyilandy Municipal area

(Source: Existing land use survey 2013)

In Kozhikode district as well the majority of the area has been used for residential and agricultural mix pattern, extending to 64.28% of the total area. Forest land use registers to 20.35% as per land use break up by state land use board, break up as tabulated in table 7.1.

Table 7-1Land use breakup of Kerala State

Sl.No	Land use category	% of Total area
1	Forest	23.18
2	Water	2.92
3	Marshy	0.28
4	Residential	3.45
5	Agriculture	10.17
6	Plantation	10.01
7	Res/Agri	41.38
8	Other built	0.48
9	Others	8.13
	Total	100

(Source: Kerala State Land use Board, TVM-2010)

Table 7-2Land use breakup of Kozhikode district

Sl.No	Land use category	% of Total area
1	Forest	20.35
2	Water bodies	2.57
3	Marshy Land	0.18
4	Residential	0.78
5	Agriculture	5.47
6	Plantation	0.2
7	Res/Agri Mix	64.28
8	Other built up	2.83
9	Others	3.34
	Total	100

(Source: Kerala State Land use Board, TVM-2010)

In Koyilandy Municipality 16.73 km^2 of the land parcels are made use for residential and allied activities (57.41%). The land under agricultural land use is 7.89 km^2 (27.08%). 0.72 km^2 (2.47%) of the land is utilised for public and semi-public activities. Area under commercial land use is 0.22 km^2 (0.75%), industrial land use is at 0.05 km^2 (0.17%), parks and open spaces constitute 0.04 km^2 (0.14%). Transportation and communication land use which constitute 1.36 km^2 (4.67%) and water bodies at 1.73 km^2 (5.94%) are two other major land uses in the Municipality. The existing land use scenario of Koyilandy Municipality is illustrated in the existing land use map, given in Figure 7.1. The existing land use breakup is illustrated in figure 7.2 and table 7.3.

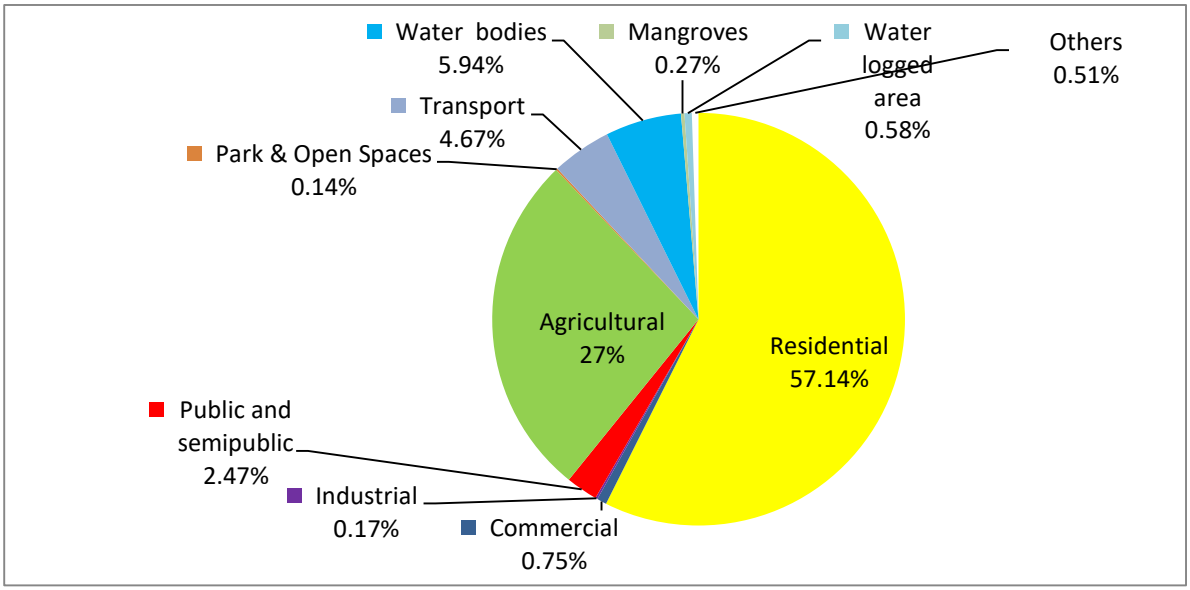


Figure 7-2Land use breakup of Koyilandy Municipality
(Source: Existing land use survey 2013)

Table 7-3Land use breakup of Koyilandy Municipality

Type of land use	Percentage Land use	Area in km²
Residential	57.45	16.74
Commercial	0.75	0.22
Industrial	0.17	0.05
Public and semi-public	2.51	0.73
Agricultural	27.08	7.89
Park & Open Spaces	0.07	0.02
Transport	4.67	1.36
Water bodies	5.94	1.73
Mangroves	0.27	0.08
Water logged area	0.58	0.17
Others	0.51	0.15
Total	100	29.14

(Source: Existing land use survey 2013)

The existing land use pattern of Koyilandy Municipality is compared with the land use breakup of other urban local bodies of the district, for which the land use data are available. The comparison of existing land use breakups of Koyilandy, Vadakara Municipalities and the Kozhikode Corporation are tabulated in table 7.4, and are illustrated in figure 7.3. It is observed that, the residential land use is the predominant land use in all three urban local bodies, and the agricultural land use comes second.

Table 7-4Land use breakup of Koyilandy Municipality- Comparison with Vadakara Municipality and Kozhikode Corporation

Land use	Vadakara Municipality (Source: Existing Land Use survey 2011)	Koyilandy municipality (Source: Existing Land Use survey 2013)	Kozhikode Corporation (Existing land use survey 2011)
	% of Total area		
Residential	68.62	57.45	71.06
Commercial	1.70	0.75	2.92
Industrial	0.23	0.17	1.25
Public and semi public	3.33	2.51	7.37
Agricultural	9.33	27.08	6.29
Park & Open Spaces	0.10	0.07	0.88
Transport	6.75	4.67	6.36
Water bodies	6.52	5.94	1.87
Others	3.42	1.36	2.00
Total	100	100	100

7.2 Analysis of Land Use

7.2.1 Residential

As depicted in Figure 7.1, 7.2 and table 7.3 the majority of the land use in Koyilandy Municipality fall under residential land use category. A total of 16.74 km^2 (57.45%) of the municipal area are utilised for residential purpose. The residential land uses are mainly concentrated along the coastal wards, and also along the major transport corridors through the central parts of the Municipality. The concentration of residential land use is relatively lesser in the eastern parts of the Municipality. Figure 7.4 illustrates the residential land use concentration index; figure 7.5 the variation in land use concentration and the figure 7.6 the spatial distribution of residential land use in Koyilandy Municipality.

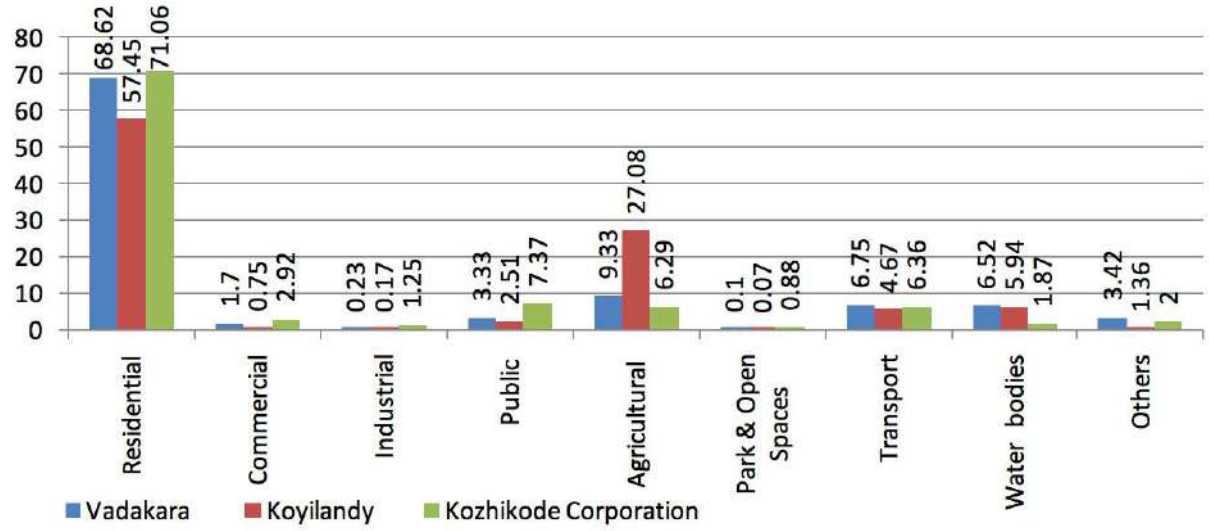


Figure 7-3Land use breakup of Koyilandy Municipality- Comparison with Vadakara Municipality and Kozhikode corporation
(Source: Existing land use survey 2011)



Figure 7-4Residential land use concentration in Koyilandy municipality

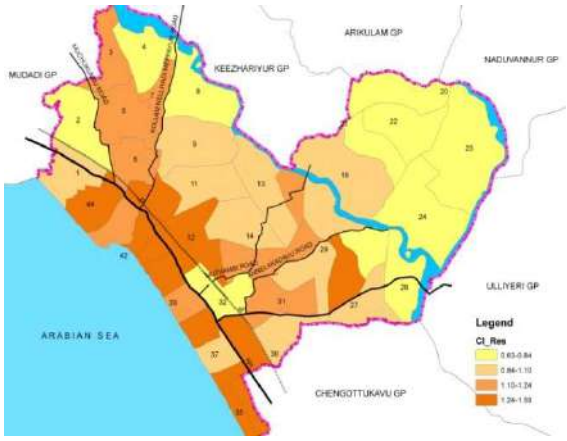


Figure 7-5Variation in residential land use concentration in Koyilandy municipality

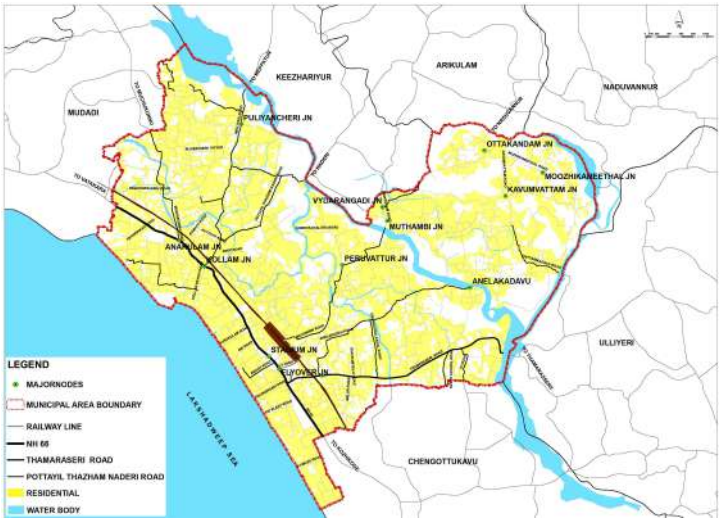


Figure 7-6Spatial distribution of residential land use

7.2.2 Commercial

Commercial activities in the Municipality are mainly concentrated along the major transportation corridors and the surrounding areas of the Municipality. Accordingly in the town centre and areas along the National High way and the State Highway 34 (near to the town centre) are having the highest concentration of commercial activities. The spatial distribution of commercial land use in the Municipality is illustrated in figure 7.7. The concentration index and the variation in concentration of commercial activities are illustrated in figures 7.8 and 7.9 respectively.



Figure 7-7Spatial distribution of Commercial land use

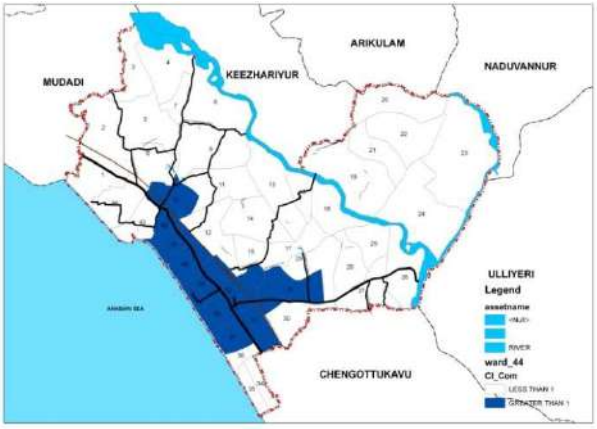


Figure 7-8Concentration index of commercial land use

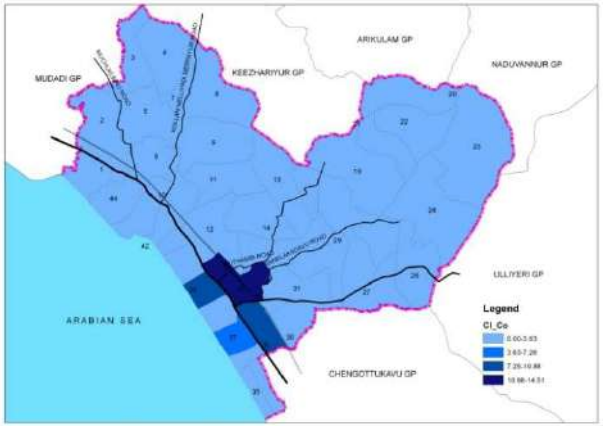


Figure 7-9Variation in concentration of commercial activities.

7.2.3 Industrial

Industrial land use in the Municipality constitutes 0.17% of the total area, being a small fraction of the total area. There are no large or medium industries in the Municipality. The concentration index of industrial land use is illustrated in figure 7.10.

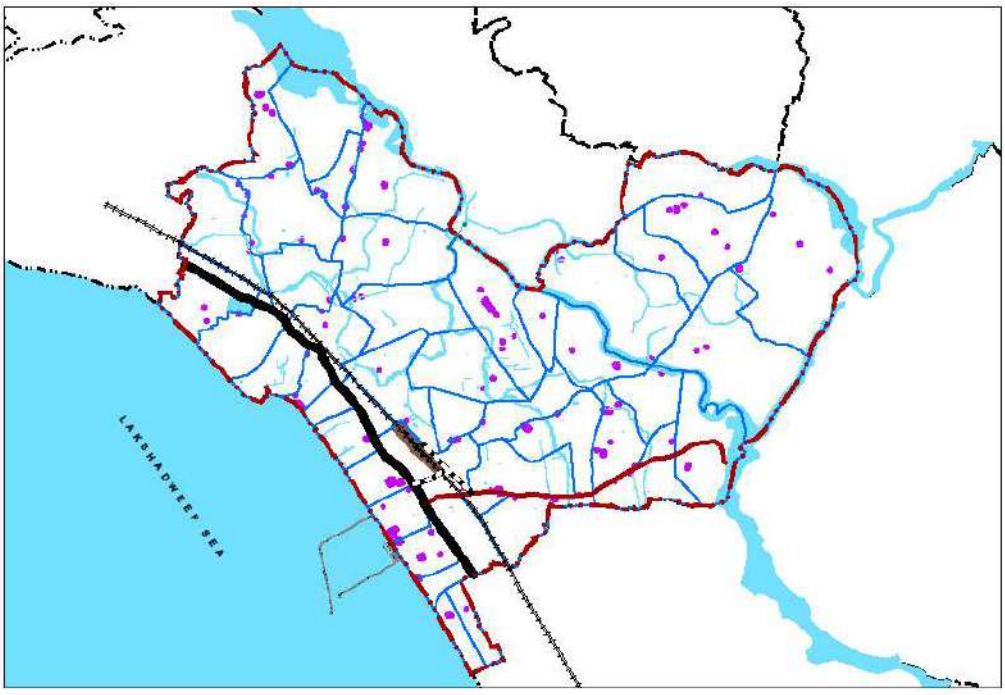


Figure 7-10Spatial distribution of industrial land use

7.2.4 Public and semi-public land use

Public and semi-public land use include the parcels of the land which are being utilised for public functionaries which generally include uses such as educational, health, governance institutions, religious institutions and the like. In Koyilandy Municipality land use for these listed uses forms 2.51% of the total area. The spatial distribution of public and

semi-public category of land uses is illustrated in figure 7.11 and the concentration index in figure 7.12, and the variation in concentration in figure 7.13.

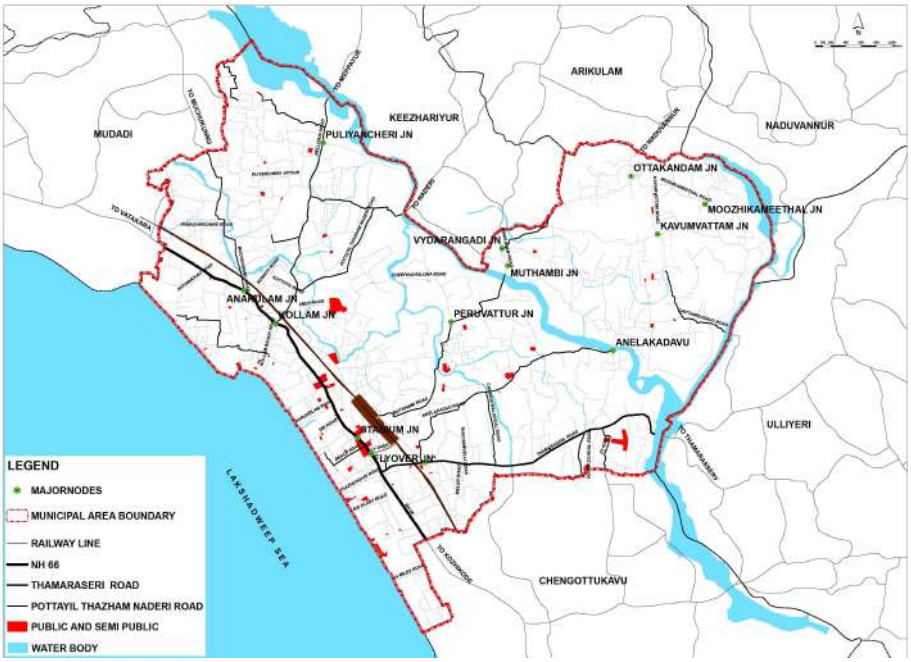


Figure 7-11Spatial distribution of public and semi-public land use

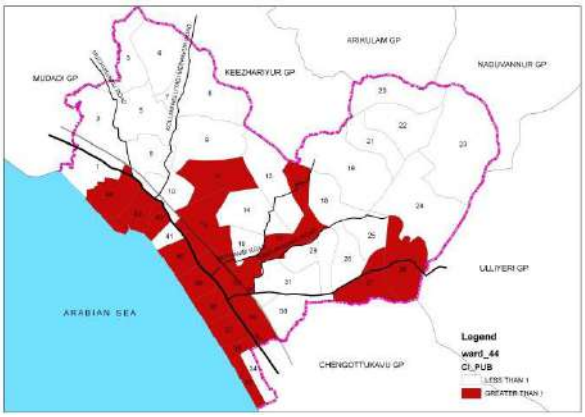


Figure 7-12Concentration index of public and semi-public land use

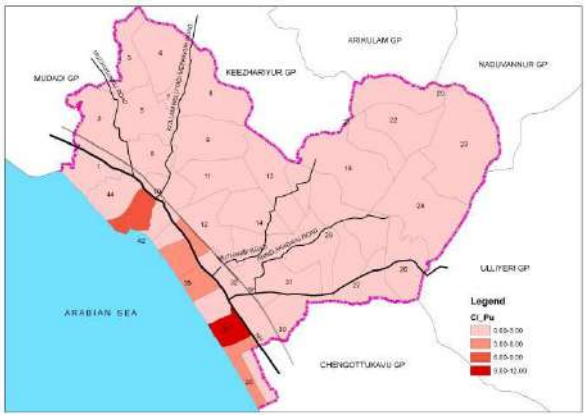


Figure 7-13Variation in concentration of public and semi-public land use

The public and semi-public land uses also are concentrated mainly along the major transportation corridors, especially around city centres.

7.2.5 Agricultural

The land under agricultural land use constitutes 27.08% of the total municipal area and is the second most predominant land use in Koyilandy. The agricultural land use of Vadakara Municipality is 9.33% and that of Kozhikode Corporation is 6.29%. This underlines the fact that, the Koyilandy Municipality still exhibits a distinct incline towards rural character in certain areas of the Municipality in comparison with Vadakara Municipality and Kozhikode Corporation. Figure 7.14 represents the spatial distribution of coconut cultivation land use and figure 7.15 represents the paddy land use in the municipal area. The paddy

land also exhibit as an effective means for natural water retention basins, which help the percolation of water to the soil there by replenishing the ground water table.

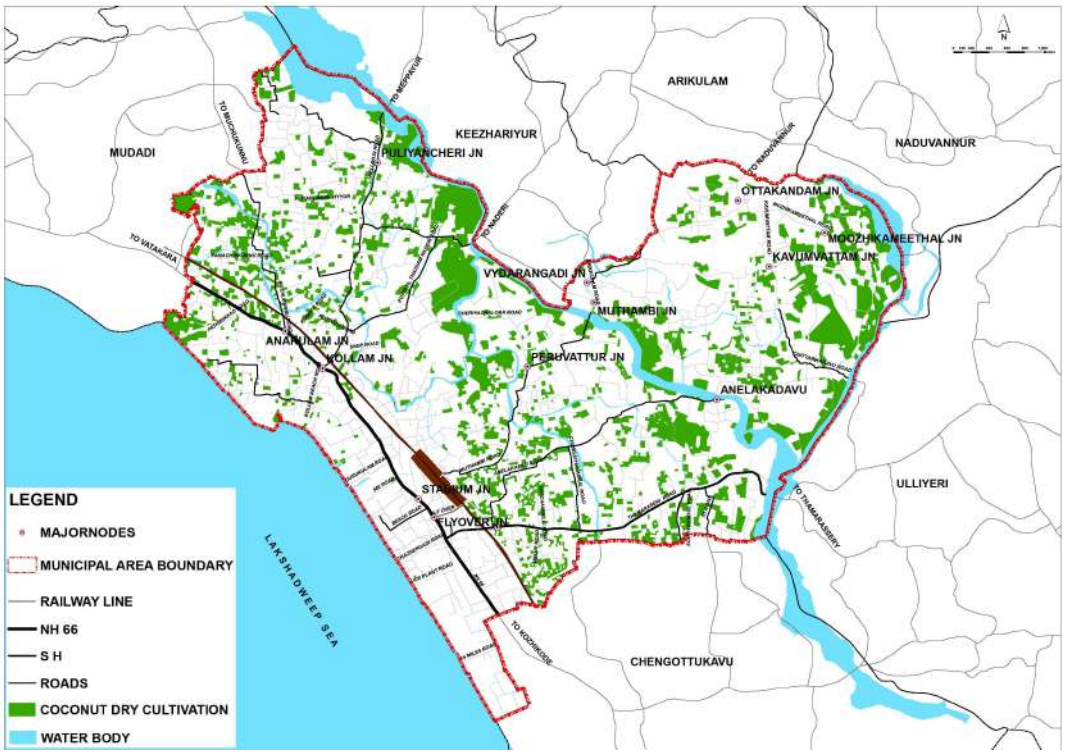


Figure 7-14Spatial distribution of coconut cultivation land use



Figure 7-15Spatial distribution of paddy cultivation land use

Figure 7.16 and figure 7.17 represents the variation in concentration index and the concentration index of agricultural land uses respectively.

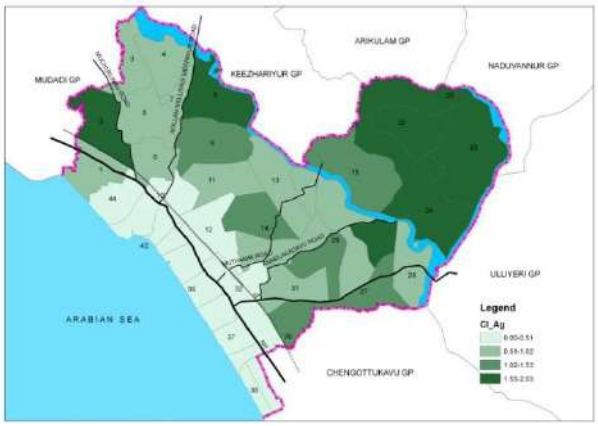


Figure 7-16variation in agricultural concentration

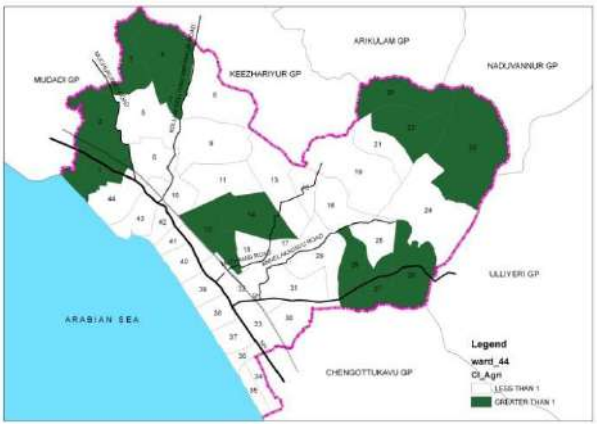


Figure 7-17Concentration index of agricultural land use

It can be observed that, the agricultural land use concentration is predominantly towards the eastern parts of the Municipality, especially in the added parts towards the eastern sides of Akalapuzha. The concentration exhibits a gradual decrease towards the western side.

7.2.6 Water bodies

Koyilandy Municipality has a rich stock of water bodies and fresh water resources. The Akalapuzha which divides the Municipality in eastern and western parts and Chittaripuzha traverses through the eastern boundary of the Municipality. There are 17

ponds attached to religious institutions and 51 ponds under private ownership in the Municipality, details of which are tabulated in table 7.5 and 7.6 respectively.

Table 7-5Ponds under religious institution's ownership

Sl. No.	Name of Pond	Temple/ Church/ Mosque to which attached
1	Maraloor	Temple
2	SankthamKulangara	Temple
3	Manakulam	Temple
4	Kothamanangalam	Mosque
5	Mammaka	Mosque
6	Chenam	Mosque
7	Cheriya	Mosque
8	Thottumugath	Mosque
9	Jamath	Mosque
10	Chingam	Mosque
11	Kadappna	Mosque
12	MoideenPallikulam	Mosque
13	CheekkamPallikulam	Mosque
14	Puthiyapallikulam	Mosque
15	Para Pallikkulam	Mosque
16	Kollam chira	Temple
17	Narikkuni	Temple

(Source Pan Fish Book, Kozhikode district, 2011)

Table 7-6Ponds under private ownership

Sl. No.	Name of Water body	Name and Address of the Owner	Area		Type of Water body
			Acre	Cent	
1	PuliyancheriKulam	DasanPuliyancheri	0.02	2	Brackish water
2	Chathothkulam	BalanChathoth	0.08	8	Brackish water
3	Arattakandikulam	Dhamodharan	0.06	6	Brackish water
4	AthyotKulam	Sivadasan	0.03	3	Brackish water
5	MaadathilKulam	Krishnan Madathil	0.25	25	Fresh water
6	Povathikunnath	GopinathanKunnath	0.04	4	Fresh water
7	Kuroolikulam	Govindhan	0.17	17	Fresh water
8	KanmanatazhaKulam	Muhammed	0.02	2	Fresh water
9	Nambikulam	Ammedkoya	0.25	25	Brackish water
10	Vallithurathkulam	SekharanVallithuruth	0.1	10	Brackish water
11	Kunnathkulam	BarathanKunnath	0.15	15	Brackish water
12	ArakkalKulam	Vamadevan	0.14	14	Brackish water
13	Korothkulam	UnniKoroth	0.11	11	Brackish water
14	Manakulam	Faisal	0.02	2	Brackish water
15	NamiChira	KunjikannanNampichira	0.03	3	Brackish water

16	Thettamchira	Sasi	0.06	6	Brackish water
17	Koyatikulam	Krishnan	0.09	9	Brackish water
18	NarampiveetilKulam	Gopalan	0.08	8	Brackish water
19	Kuniyadikulam	Narayanan	0.07	7	Brackish water
20	Kakkulam	Rajan Kakkulath	0.01	1	Brackish water
21	Puthukkulam	RaghavanPuthukulam	0.1	10	Brackish water
22	PuthalathKulam	Velayudhan	0.14	14	Brackish water
23	VelathoorKulam	Bhaskaran	0.02	2	Brackish water
24	Arikulam	MadhavanArikulam	0.05	5	Brackish water
25	Esawanchira	UnnikrishnanNamboot	0.08	8	Brackish water
26	Vattakandikulam	FathimaVattakandi	0.07	7	Brackish water
27	Karakulam	Narayanan	0.04	4	Brackish water
28	Chirigalakulam	Barathan	0.03	3	Brackish water
29	Puthiyattikulam	DasanPuthiyottil	0.06	6	Brackish water
30	Cheriyapparath	Ramadasan	0.09	9	Fresh water
31	Chatorakulam	Velayudhan	0.05	5	Brackish water
32	VatanampathIlla	Sekharan	0.08	8	Brackish water
33	ThullnothKulam	Kannan	0.12	12	Brackish water
34	ThullnothKulam	Krishanan	0.13	13	Brackish water
35	Puzhekkarakula	Radhakrishnan	0.15	15	Brackish water
36	KonginiPurathThazhekulam	Gopalan	0.15	15	Fresh water
37	Koopmpurath	Kunjiramzan	0.1	10	Fresh water
38	NaririnniEstmanaIllakulam	Sankaran	0.4	40	Fresh water
39	ChamariKulam	SurendhranChameri	0.02	2	Fresh water
40	PatenheritathKulam	Moitheen	0.08	8	Fresh water
41	ChelothThazhekulam	SubairChelothThaazhe	0.08	8	Fresh water
42	PaklariKulam	IbhrahimkuttyPaklari	0.09	9	Fresh water
43	Charipathkulam	HamsaCharipath	0.06	6	Fresh water
44	KavamKulam	Babu	0.07	7	Fresh water
45	EdavannaKandiKulam	Prabakaran	0.03	3	Fresh water
46	VayakarKulam	Kanaran	0.04	4	Fresh water
47	KuruvangadKulam	Prakasan	0.06	6	Fresh water
48	ManathamkanduThazhekul	Kelukutty	0.09	9	Fresh water
49	Ayalam Kandy Thazhekulam	Moosa	0.08	8	Fresh water
50	ThruthiyilThazheKulam	Khadar	0.02	2	Fresh water
51	ThachanValliThazheKulam	NA	0.03	3	Fresh water

(Source Pan Fish Book, Kozhikode district, 2011)

As per existing land use survey, water bodies constitute 5.94% in the Municipality, comparable to 6.52% in Vadakara Municipality, higher value when compared with the 1.87% in Kozhikode corporation area. The spatial distribution of water bodies is illustrated in figure 7.17 and the concentration index in figure 7.18.



Figure 7-18Spatial distribution of water bodies

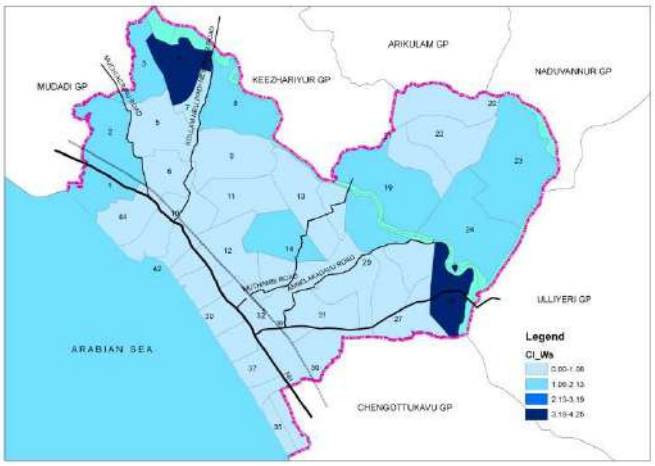


Figure 7-19Variation in concentration of water body land use

7.2.7 Transportation and communication

Transportation and communication land use constitutes land parcels used under roads, bus terminals, railways lines, parking areas and the like. In Koyilandy Municipality 4.67% of the land is used under this category. The percentage land uses under transportation and communication category are lesser than that for Vadakara Municipality and Kozhikode Corporation, which are at 6.75% and 6.36% respectively. The figure 7.19 represents the concentration index of transportation and communication land use in Koyilandy Municipality. The transportation land use is having a higher concentration at the city centre area, as the transportation terminals including bus stand and railway station are situated in this area.

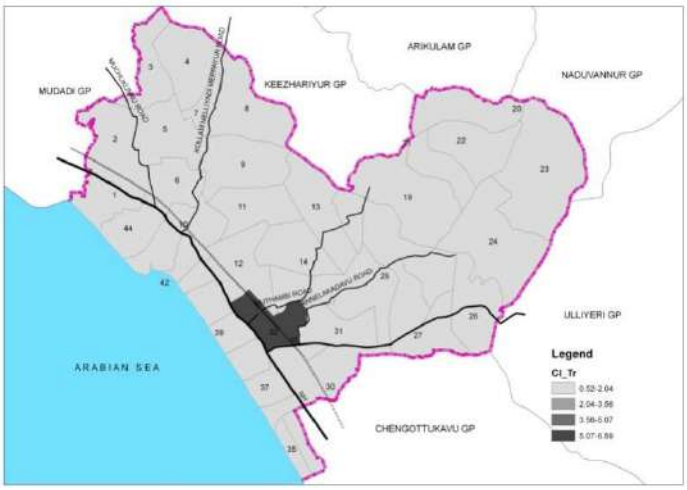


Figure 7-20Concentration index of Transportation and communication land use

7.3 Comparison with standards

The percentage of various types of land uses are compared with the desired values stipulated in Urban and Regional Plan Formulation and Implementation (URDPFI) guide lines issued by Govt. of India and the comparison is given in table 7.7.

It can be observed that the residential and agricultural land use percentages are higher that required as per URDPFI guidelines and all other land uses fall below the requirements. Residential land use being the major land use in the Municipality over runs by 7.45 % from the maximum value limit stipulated in the guide line. The land use under water bodies, agriculture and other related activities forms 28.44%, which is 11.44% higher than the maximum limit stipulated in the guidelines. Acute shortage is observed in industrial land use where the minimum desired value is 8% and the value in Koyilandy is as low as 0.17%. Commercial land use is 0.75% in the Municipality whereas the requirement is 2-3%. 12-14% of the land need to be under parks and open spaces but the current availability is only 0.14%. Transportation land use stay at 4.67% against the desired 10-12% value.

Table 7-7Existing land use in Koyilandy Municipality- Comparison with URDPFI guidelines values

Type of land use	Percentage Land use (%)	Desired percentage as per URDPFI guidelines (%)
Residential	57.45	45-50
Commercial	0.75	2-3
Industrial	0.17	8-10
Public and semi public	2.51	6-8
Park & Open Spaces	0.07	12-14
Transport	4.67	10-12
Water bodies, Agricultural and others	34.38	10.02
Total	100	

7.4 Functional Character

The functional character exhibited by the wards of the local bodies in Kerala can be classified in to rural, urban or its combinations. The Functional Character of a ward denotes the major activity being carried out within the settlement. The Functional Character of the ward can be Pucca Rural (Agriculture and allied activities), Pucca Urban (secondary sector

and tertiary sector activities) or a Combination of Both (Semi Rural or Semi Urban), as detailed in table 7.8. The area under each of these categories of land use, population concentration pattern, % of workers engaged in non-agricultural pursuits and the average plot size in the Residential- Agriculture Mix zone are integrated to categorize the wards in to Urban, Semi-Urban, Semi-Rural and Rural. The Functional Character of wards in the Municipality is shown in Figure 7.21.

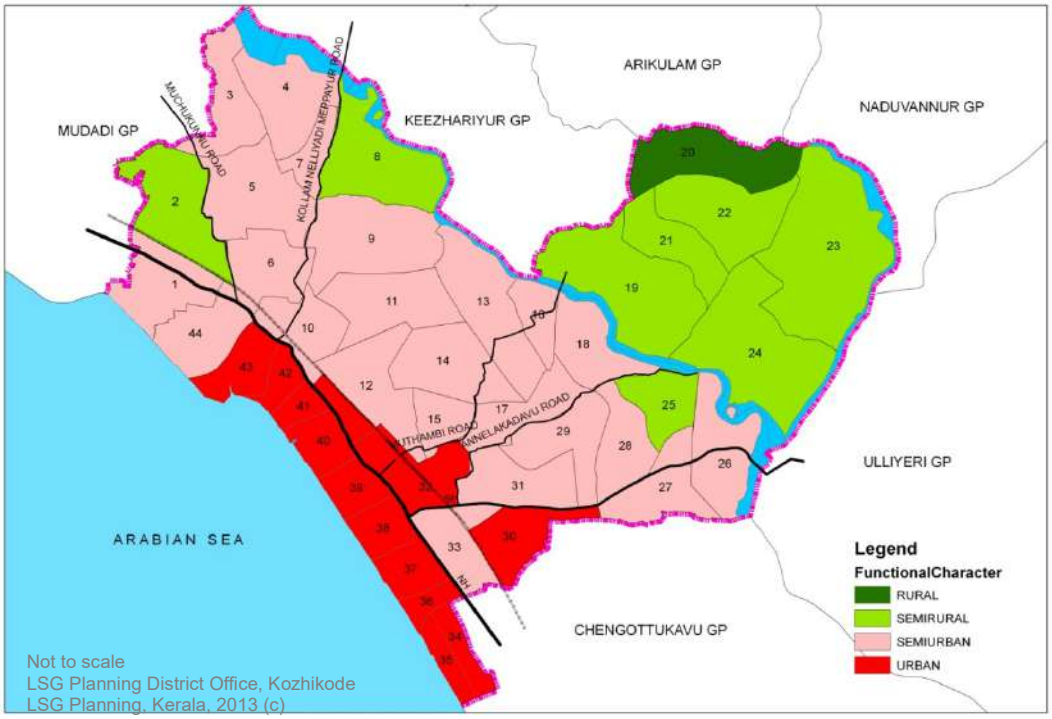


Figure 7-21Functional character of wards

The figure illustrates that, the wards showing urban character are concentrated in the south western part along the coastal line. All the coastal wards except ward 1 and 44 exhibit urban character.

Table 7-8Functional character and its functions

Activity	Compatible/ Confirming Activities
Urban	Mainly Service sector activities with limited industrial activity
Semi Urban	Predominantly service sector and secondary sector activities together with limited agriculture activities
Semi-Rural	Predominantly agriculture activities together with limited service sector and industrial activities
Rural	Predominantly agriculture activities

7.5 Activity zones based on land use character

The activity zones are derived by overlaying the land use concentration index details considering land use concentration index values above 1 for various land uses. Highest weight age among various land uses is assigned to commercial land use, followed by

agricultural, public and semi-public, residential and industrial land uses. Figure 7.22 shows the activity pattern thus arrived at for the Municipality.

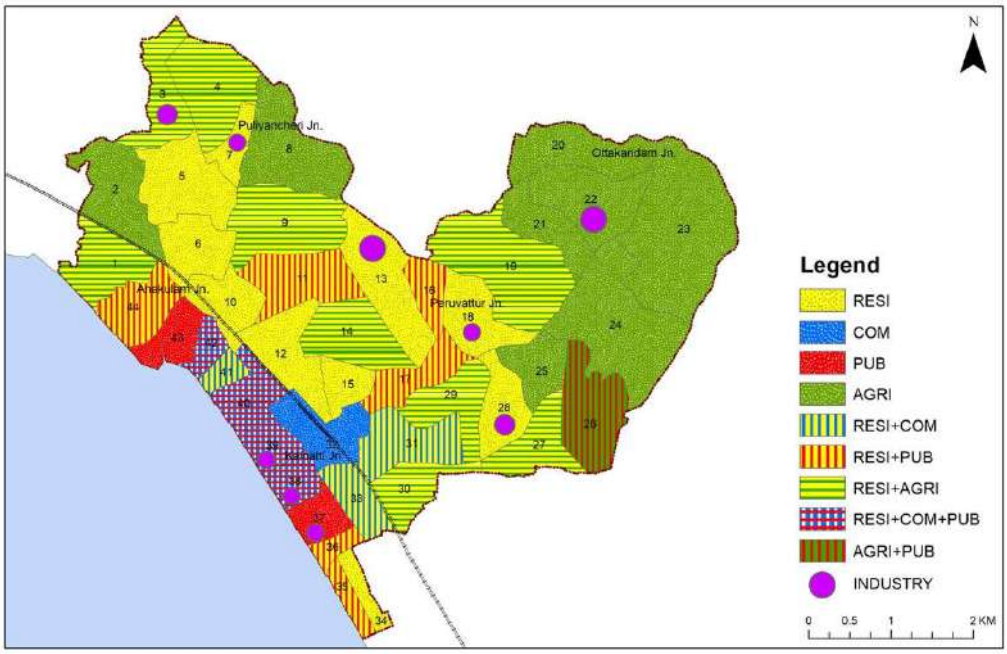


Figure 7-22Activity zones based on land use concentration

From the figure it can be seen that the commercial concentration is more in wards west of the railway line. These wards also exhibit higher residential, public and semi-public activities as well. The public and semi-public activities are concentrated in the central and the coastal parts of the Municipality. Agricultural concentration is towards the eastern side of Akalapuzha along with predominance in residential land use also. Industrial land use activities are scattered in the coastal and river side areas, which are mainly related with fishing activities.

7.6 Built up density

The built up density distribution indicates the pattern in which the built environment is distributed in the Municipality and is illustrated in figure 7.23. The higher built up densities are observed near the city centre and also along the periphery of the National Highway passing through the town. The coastal belt of the town is also built up with moderate density.

7.7 Problems and potentials

Koyilandy Municipality is one among the few urban local bodies in the state which still preserves its environmental serenity. Agricultural lands and lands with relatively lesser built foot prints are still occupying a considerable portion of the Municipality, but are facing development pressure similar to other parts of the state. Also, the existing land use characteristics doesn't meet with the various land use requirements stipulated as per URDPFI guidelines. The town is in its early stages of heavy development for which correct planning interventions can bring the town to the preferred standards.

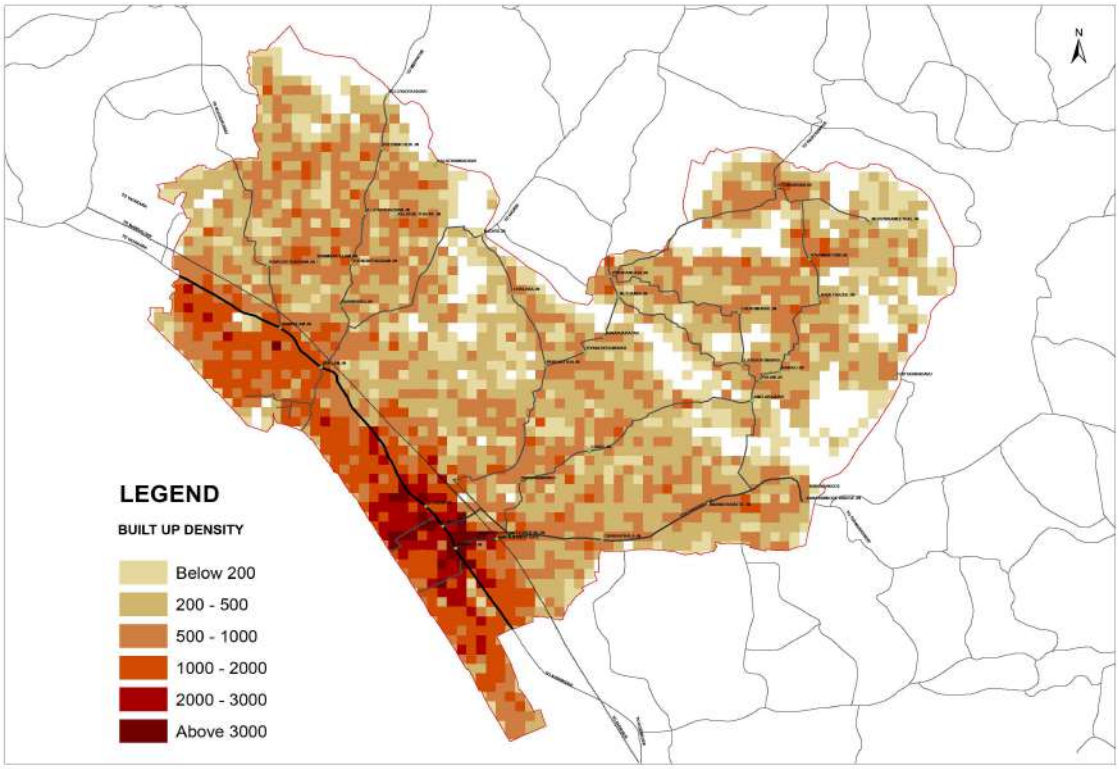


Figure 7-23Built up Density

7.8 Inferences

Natural diversities and topographical specialities are among the unique identity for Koyilandy municipality. The Municipal area has plenty of coastal stretches, hilly terrains, laterite and gravel terrains, marshy lands, mangroves, rivers, ponds, sacred groves and so on. The livelihood needs of the common people need to be carefully interwoven through these precious resources, and the land use planning need to concentrate towards this direction.

8 TRADE AND COMMERCE

8.1 Trade and Commerce

The history of Kozhikode related with the trade and commerce sector traces back to time immemorial. On May 20th 1498, Vasco da Gama landed in Kappad, the mile stone incident which paved ways of establishing trade route with the western world. Arabs were having trade links with Kozhikode from as early as 7th Century. The major commodities of spices include pepper and cardamom and the Kozhikode region later came to be known as 'Land of spices'. The rich tradition of Kozhikode in trade and commercial activities are closely interrelated with the Koyilandy Municipality as well. The Koyilandy which was historically once known as Panthalayani Kollam was the opted landing area for merchant boats as the topography allowed to anchor the boats in a calm portion of the water where the sea area had grown inwards to the landward side in a curved plan.

Kozhikode Corporation is the single first order commercial node in the district as per the hierarchy of nodes proposed by the District Urbanisation Report. Koyilandy town forms a second order settlement with respect to trade and commerce activities, as illustrated in figure 8.1.



Figure 8-1: Hierarchy of Commercial Nodes in the District

(Source DUR 2011)

8.2 Major Commercial Centres

The commercial activities in the town are mainly concentrated along the major transportation corridors, National high way 66 and State high way 34 passing through the town and relatively smaller scales of commercial activities are practiced in Muthambi area as well. The various locations where the commercial activities are concentrated include locations like, old bus stand, new bus stand, municipal shopping complex (annex building), market road, Ice plant road, Customs road, Civil station to RT office, Krishna theatre road, East road, Muthambi to Vaidyarangadi, Kollam Town, Anakulam Junction, Old market road and Stadium complex areas.

The spatial distribution of commercial activities in the town is illustrated in figure 8.2.

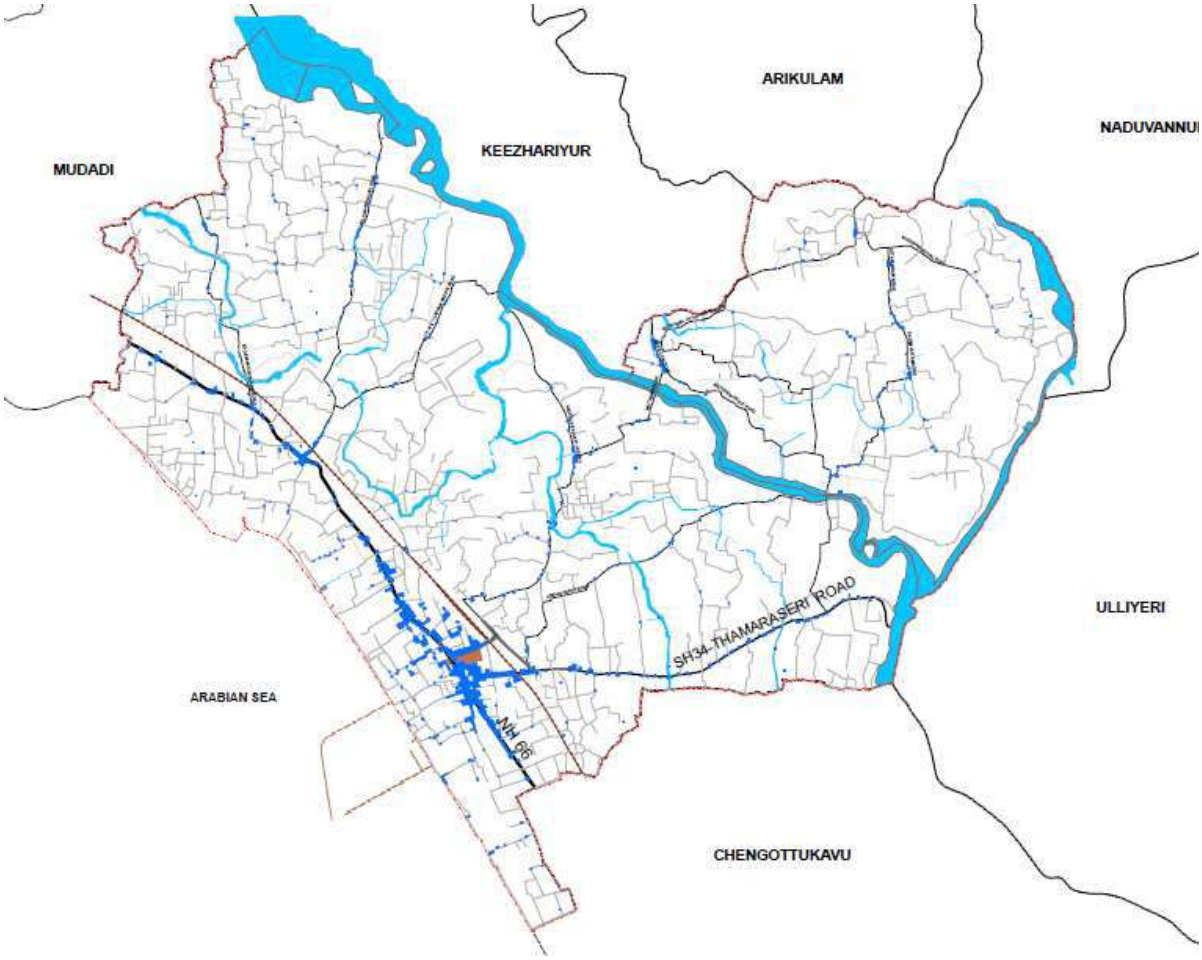


Figure 8-2Spatial distribution of commercial centres

The hierarchy of various commercial nodes in the Municipality is illustrated in figure 8.3. Though there are a number of clusters, the sizes of the clusters are very small compared to other urban areas. A commercial cluster may contain one or more junctions which are closer and has contiguous development of commercial establishments. The existing hierarchy of commercial clusters are derived or identified from the existing land use. Central business district of the town is formed by major junctions such as fly over junction, fly over-State High way junction and the stadium junction and it constitutes the first order node. Kollam junction and the Muthambi area are the second order nodes and third order nodes include, areas like Puliyancheri, Ottakkandam, Moozhikkamethal, Kavumvattam, Anelakkadavu, Peruvathur etc.

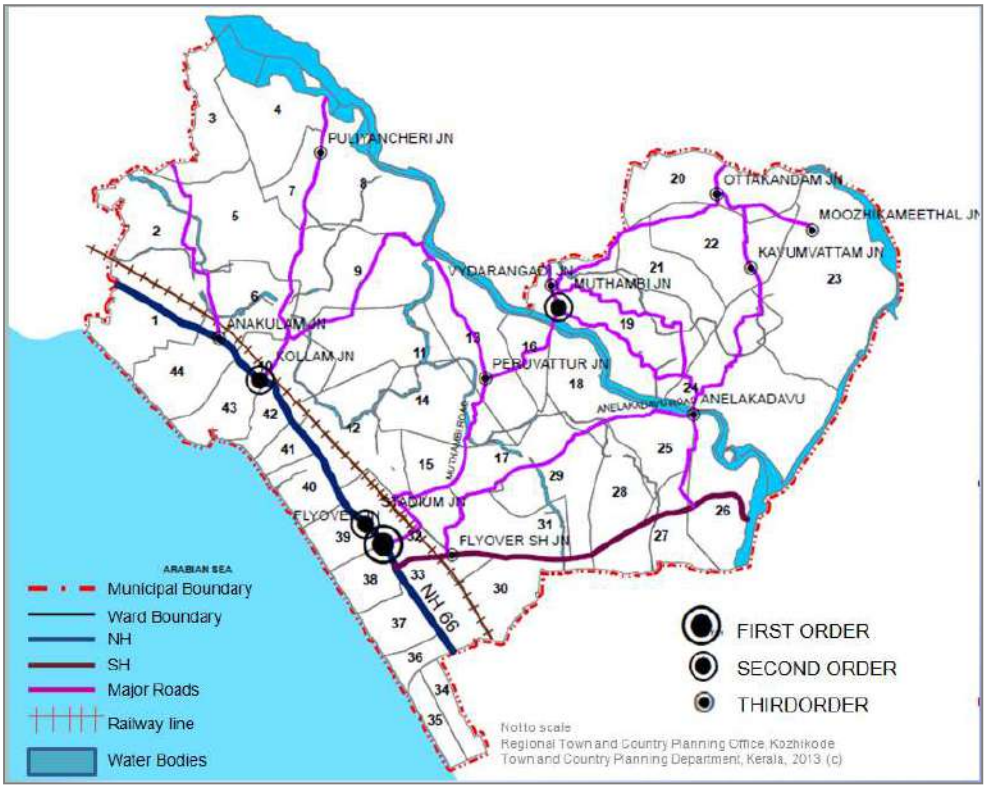


Figure 8-3Major Commercial nodes

8.3 Types of commercial activities

As per municipal records, there are a total of 1330 commercial units registered in the municipality spread across the planning area. It can be seen that the highest number of shops are dealing with textiles and dress material items with 143 units engaged in this category. 117 numbers of shops are dealing with food stuffs and grocery items. The various categories and number of shops under different categories are tabulated in table 8.1 and figure 8.4.

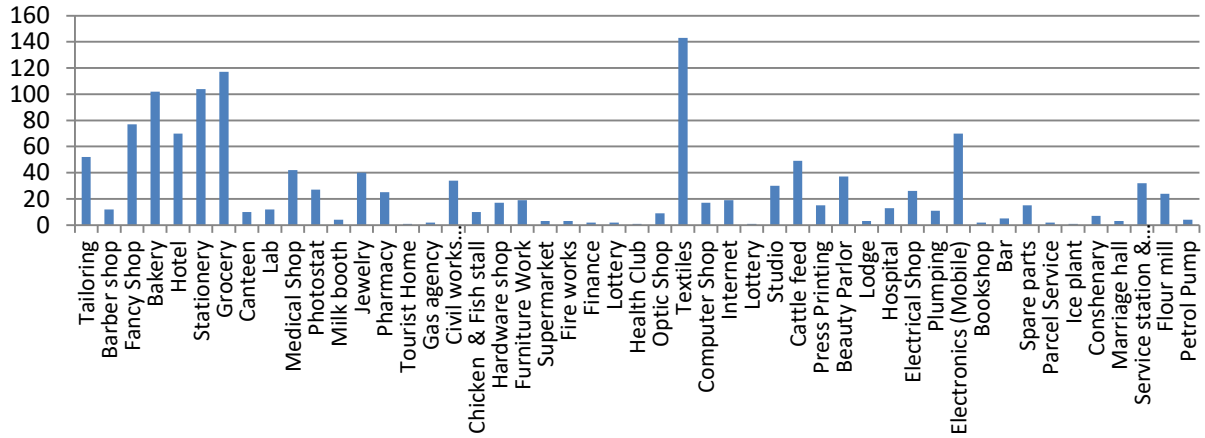


Figure 8-4Categories of shops in Koyilandy Municipality
(Source: Koyilandy Municipality)

Table 8-1Categories of shops in Koyilandy Municipality

TYPE OF SHOP	NUMBERS	TYPE OF SHOP	NUMBERS
Tailoring	52	Optic Shop	9
Barbershop	12	Textiles	143
Fancy Shop	77	Computer Shop	17
Bakery	102	Internet	19
Hotel	70	Lottery	1
Stationary	104	Studio	30
Grocery	117	Cattle feed	49
Canteen	10	Press Printing	15
Lab	12	Beauty Parlor	37
Medical Shop	42	Lodge	3
Photostat	27	Hospital	13
Milk booth	4	Electrical Shop	26
Jewelry	40	Plumping	11
Pharmacy	25	Electronics (Mobile)	70
Tourist Home	1	Bookshop	2
Gas agency	2	Bar	5
Civil works (cement, steel, Gypsum, Tile etc)	34	Spare parts	15
Chicken & Fish stall	10	Parcel Service	2
Hardware shop	17	Ice plant	1
Furniture Work	19	Cutleries	7
Supermarket	3	Marriage hall	3
Fire works	3	Service station & workshops	32
Finance	2	Flour mill	24
Lottery	2	Petrol Pump	4
Health Club	1		

(Source: Koyilandy Municipality)

8.4 Street Vendors / Informal Sector

The informal sectors of vendors need to be considered as an integral part of any town. In general street vendors make goods and commodities available to the common public at a relatively lower price. The informal sellers earn their bread by selling vegetables, fish and fruits mostly carrying them in pushcarts to specific locations by the side of important road margins. Other vendors bring baskets of vegetables, fish and fruits and squat on the road margins to form tiny informal clusters doing brisk business.

In Koyilandy town, the number of informal vendors is relatively smaller, and the numbers and types are illustrated in Figure 8.5. There are 34 numbers of street vendors in the town out of which 31 are in CBD area and 3 are in Kollam Town. The spatial distribution is illustrated in figure 8.6. No infrastructure facilities in particular are provided yet for the street vendors of the town.

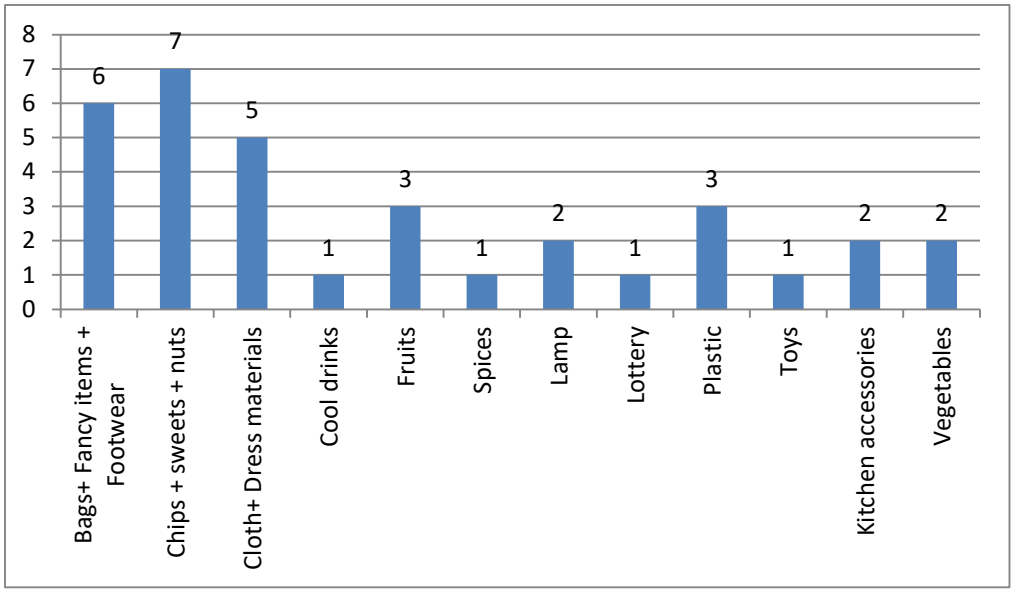


Figure 8-5Categories of street vendors in Koyilandy Municipality
(Source: Primary survey 2016)

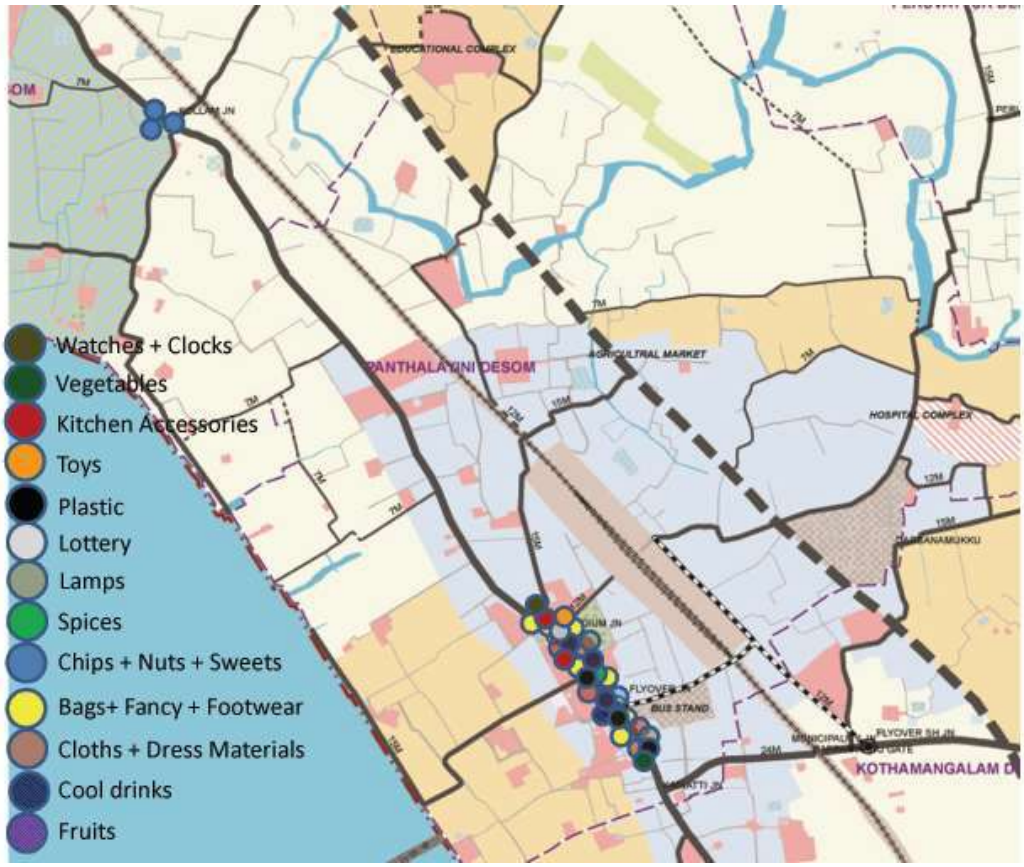


Figure 8-6Spatial distributions of street vendors
(Source: Primary survey 2016)

8.5 Problems and potentials

Majority of the commercial units in the town suffers from minimal parking facilities and heavy traffic congestions. Commercial units on the immediate vicinity of the National highways are functioning in old dilapidated structures. The town is yet to have an elaborate

market place, incorporating all the associated facilities and functionaries including parking facilities, proper space for loading/ unloading, proper arrangements for waste disposal etc.

8.6 Inference

The trade and commerce sector of the town boasts its rich tradition dating back to centuries. With the on-going expansion works on the fishing harbour in the town, the trade activities especially on marine commodities are expected to receive a fresh boost. Basic facilities and amenities related are required to be improved further. As the street vendors are concentrated along the major transportation corridors and junctions, their accommodation and facilities need to be catered to. The town also need to establish an improved market place for the trade of agricultural and related commodities.

9 FISHERIES



Kozhikode district registers the third longest coastal line among the districts of Kerala. It has a coastal length of 71 km, 34 marine fishing villages and 8 inland fishing villages. The total fisher folk population in the district is 4,80,524 of which 2,44,988 are female. The total number of active fishermen in the district is 1,07,875 of which marine fishermen constitute 96,075 and 11,803 engage in inland fishing. Total number of fisheries allied workers in the district is 8,400. *(Based on data as per Pan fish book, Kozhikode district, Department of fisheries, 2011).*

In Koyilandy Municipality the total length of coastal line is about 8.25 km. The Akalapuzha, the river which divide the Municipality to eastern and western segments and the Chittaripuzha flowing through the eastern corner of the Municipality are the two major rivers in the Municipality. Majority of the inland fishing activities are centered on these two rivers. The fishermen population in the Koyilandy Municipal area is 19808 of which accounts to 4.12% of district population. 8884 are female and 10924 are male. Number of active fishermen in the planning area is 3729 which is 3.45% of district population. Total of 586 persons are engaged in fish selling activities *(Source: Panfish book 2011*).

9.1 Production

Based on the data published in PAN Fish book 2011 for Kozhikode district, various types of fishes available in the district are given in Table 9.1. Total of 10 types of fresh water

fishes, 7 types of brackish water fishes and 19 types of sea water fishes are presently available in Kozhikode district and along its coastal peripheries.

Table 9-1 Types of fish available in the district

Type of water	Local Name of the fish	Scientific name
Fresh water	Bral	Channa Striatus
	Kadu	Heteropneustes fossilis
	Muzhu	Clarius batrachus
	Cerumeen	Channa marulius
	Nettiyappottan	Aplochelius
	Nedumchoori	Rasbora daniconius
	Paral	Puntius Sp
	Chakkaparachi	Macropodus cupanus
	Tilapia	Oreochromis mossambica
	Pallathi	Etroplus maculates
Brackish water	Karimeen	Etroplus suratensis
	Valatha	Megalops cyprinoides
	Manja Etta	Mystus aor
	Thirutha	Mugil cephalus
	Malan	Mugil parisia
	Kanambu	Mugil corsula
	Puzha Chemmeen	Macrobrachium rosenbergii
Sea Water	Nalla Mathi	Sardinella longiceps
	Ayala	Rastrelliger kanagurta
	Puthiyapla Kora	Upeneus vittatus
	Chemballi	Lutjanus malabaricus
	Thalayan	Trichyurus sp.
	Varipara	Acanthurus triostegud
	Ayakora	Scombromorous commersonni
	Veluthavoli	Pampus argenteus
	Karuthavoli	Pampus chinensis
	Manthal	Cynoglossus senifaciatus
	Kora	Terapon jarbua
	Chemban	Alepes mate
	Chemballi	Lutjanus malabaricus
	Kalava	Epinephelus Sp.
	Chemmeen	Penaeus Sp.
	Kadukka	Perna viridis

(Source: Panfish book 2011)

In Koyilandy Municipality, the average annual fish catch brought in through Koyilandy fishing harbour is around 3,22,0000 Kg. Indian Mackerel and Indian oil sardine are the two species registering highest quantities of catch in Koyilandy harbour. Figure 9.1 illustrates the various types of fishes and the average annual quantities of fish catches registered in Koyilandy harbour.

The fish catch yield higher quantities during the months from August to November. During this season various species of fishes locally known as Ayala, Mathi, Natholi, Chemmeen, Chala, Chooda, Kora etc yield high quantities of catch (based on the local enquiry at Koyilandy harbour).

The fresh water/ brackish water fish cultivation is practised mainly in fourteen ponds, measuring 105 cents in total, spread out all over the Municipal area, in addition to the inland fish catches from Akalapuzha and Chittaripuzha. The major species of fish type include fishes locally known as bral, kadu, muzhu, paral, tilapia, karimeen, puzha chemmeen etc.

9.2 Facilities and infrastructure

Various types of boats and related facilities present in the Municipality are tabulated in Table 9.2 (Source: Pan fish book 2011). It can be observed that, the largest type of fishing crafts are of fiber coated plywood type- motorised, capable of accommodating 3 to 4 working people, and 200 numbers of such boats are present in the Municipal area.

There are six major merchants who buy the fish from Koyilandy and distribute in to other markets, the details are tabulated in Table 9.3. The daily catches received at the Koyilandy harbour are directly sold out within the Municipal area and nearby LSG's. The harbour at present meets no major issues related with the lack of storage facilities as the catch being received are on a minimal range capable of being sold out without much delay.

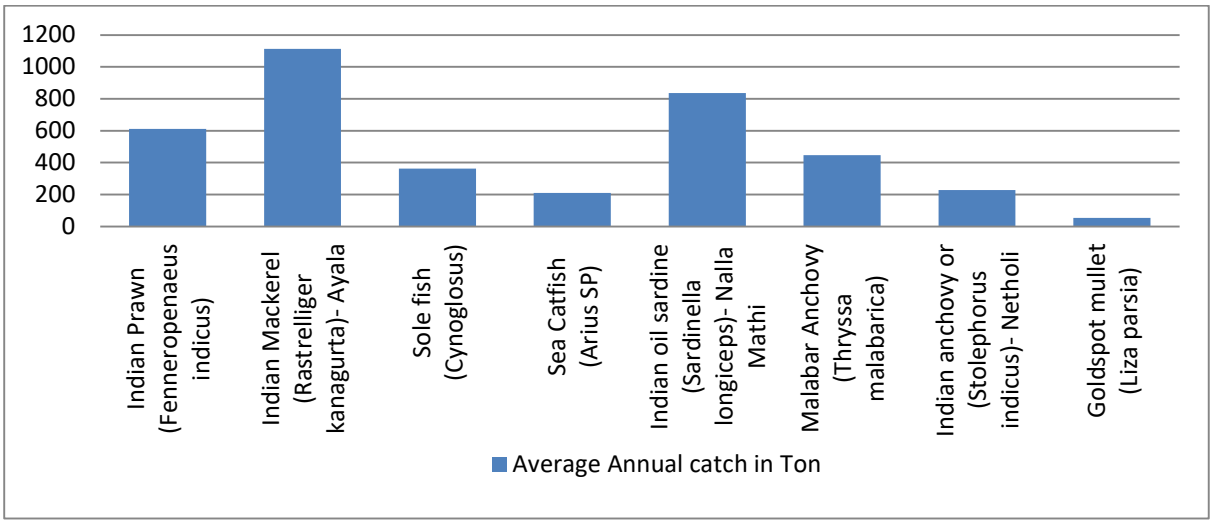


Figure 9-1Average annual quantities of fish catch at Koyilandy Municipality
(Source: Panfish book 2011)

Table 9-2Details of boats and related facilities

Sl. No	Type of Crafts	Name	No.	Remarks
1	Non mechanized	Dugout nonmechanised	30	
2	Motorised (OBM fitted)	Mech Fiber coated plywood	44	35 persons working
3	Motorised (OBM fitted)	Fiber coated plywood	200	3 or 4 persons working

4	Motorised (OBM fitted)	dugout	50	4 or 4 persons working
5	Mechanised	Mechanised (small) Trawl Boats (up to 40)	10	
	Mechanised	Mechanised (large) Trawl Boats (above 40)	80	
	Mechanised	Grill Net boats	20	
	Mechanised	Deep sea Trawl boats	10	
6	Mechanised	Mechanised (small) Trawl Boats (up to 40)	18	
	Mechanised	Mechanised (large) Trawl Boats (above 40)	4	
	Mechanised	Grill Net boats	6	
	Mechanised	Deep sea Trawl boats	_	

(Source: Panfish book 2011)

The major fish market within the Municipal area is situated in Koyilandy Town, which is functioning from 6.00 AM to 8.00 PM. Presently there are 20 male and 5 female vendors in this market. There are three government establishments functioning in the Municipal area, serving the needs of fishermen community as tabulated in Table 9.4. Besides the Koyilandy HSS for girls focusing on the uplift of the fishermen is being run by the fisheries department in the Municipality. There are six cooperative establishments functioning in the sector, the details of which are tabulated in Table 9.5.

Table 9-3Details of Major Fish Merchants

Sl. No	Name of the unit	Types of Fishes sold	Where from fish is purchased	To where fish is sold
1	Sea Diamond	All kinds	Koyilandy	Other Markets
2	Manjula	All kinds	Koyilandy	Other Markets
3	Layi	All kinds	Koyilandy	Other Markets
4	Sagar Fishers	All kinds	Koyilandy	Other Markets
5	We four	All kinds	Koyilandy	Other Markets
6	Goa Fisheries	All kinds	Koyilandy	Other Markets

(Source: Panfish book 2011)

Table 9-4Details of Major Fisheries institutions

Sl. No.	Name & address of the institution/ office	Department	Major Activities	Year of Est.
1	Officers of the Inspector of Fisheries	Fisheries Department	Welfare	-
2	Office of Project Officer, Matsyafed	Matsyafed	Giving loans	1998
3	Matsya Bhavan	Fisheries Department		-

(Source: Panfish book 2011)

Table 9-5Co operative establishments in fisheries sector

Sl. No.	Name & address of the Fish cooperatives	Year of est.	Affiliated if any
1	Virunnu Kandy Matsya Thozhilali Kshema Sahakarana	1993	Matsyafed

	sangam Ltd.		
2	Kollam Matsya Thozhilali Kshema Sahakarana Sangam	1993	Matsyafed
3	Valiyamangad Matsya Thozhilali Vikasana Kshema Samrakshana Sangam Ltd. DFC 168//93	1993	Matsyafed
4	Cheriyamangad Matsya Thozhilali Vikasana Kshema Sahakarana Sangam	1993	Matsyafed
5	Valiyamangad Vikasana Kshema Sahakarana Sangam Ltd. FK 17	1997	Matsyafed
6	Koyilandy Fisherman Kshema Sahakarana Sangam	1993	Matsyafed

(Source: Panfish book 2011)

9.3 Fishermen settlements

The majority of people engaged in fisheries and allied activities live in the coastal belt of the town which include wards 34,35,36,37,38,39,40,41 and 42. These wards also exhibit relatively higher population density as per Census 2011.

9.4 Ongoing Projects

9.4.1 Koyilandy Harbour

Government of India have accorded administrative approval for the Fishing Harbour Project at Koyilandy, vide order No: 33013-7/2002-Fy (H) dated 22-12-2005 for an amount of Rs. 3545.00 Lakhs. The administrative sanction from the State Government was issued vide GO (Rt) No.322/2006/F&PD Dated 11-07-2006. The period of completion for the project as per the sanction was 3 years which ended by February 2009. Later this was extended up to 31.03.2011, by Government of India. But the work was not completed within this period as well, except for a few major components of the project such as construction of break waters. The construction of wharf and auction hall are nearing completion. But the reclamation work is considerably delayed due to resistance from the local people. Due to the same reason construction of shore based structures such as internal roads and parking area, construction of canteen building, gate and gate house, compound wall, drainage and sewage, toilet block, water supply arrangements, electrification and lighting etc. are yet to be started, as these are proposed to be located in the reclaimed land.

9.5 Problems and potentials

The infrastructure in the sector is very weak and the delayed reclamation works of the harbour. Improper yield management affects the turnover. The completion of the harbour project shall give impetus to growth in this sector.

9.6 Inference

Fisheries sector is considered to be one of the major sectors of economy in the Municipality with potential for employment to a larger population of the town. Once the ongoing expansion works of Koyilandy harbour are completed, higher quantities of fish

handling need to be anticipated through the town and the associated infrastructure especially roads; drainage, processing units etc. need to be thoroughly revamped. Presently the catches that are being received in the harbour are sold out on a daily basis. The number of labourers working in the fisheries sector is decreasing day by day and modernization of the sector with increased volume due to the harbour project shall reverse the trend.



10 AGRICULTURE

10.1 Agriculture

The history of Kozhikode is strongly related with agriculture and the city was a major point of export of various spices to different parts of the world, right from the ancient eras. The region was famous for trade of pepper, cardamom and other spices. The total geographical area of the district is 2,33,330 hectares of which the net area cultivated is 1,63,932 hectares (70%). Cultivation of paddy is relatively minimal in the district with a production of 3814 MT cultivated in an area of only 3004 hectares (1.3%). Other major crops cultivated include crops like coconut, areca nut, banana and other spices and tree crops.

In Koyilandy Municipality also, similar to the other parts of the state, historically majority of the agricultural lands were under the ownership of feudal land lords popularly known as Janmis. Few of the major landlords include Samoothiri kovilakam padinjare kettuthavazhi, Kalooru, Idavalam Narikkuni, Chaalora, Naderi Devaswom, Brahmadyam, Vazhiyannur Devaswom, Keserri illam, Kaaliyambathu, Ambramoli, Chakyadathu etc. On a later stage, various interventions by the government through land reforms resulted in transferring the ownership of the land to local people, which made a huge impact on the pattern and tradition of agricultural activities that were being followed till then. Due to the development pressure, increase in population and due to the non-profitability of agricultural activities, vast extent of paddy land had given way to plotted developments, there by the vast extent of paddy lands was converted to build surroundings. However the Koyilandy Municipality still manages to keep the serenity of agricultural land to a considerable extent.

The major agricultural produce in Koyilandy Municipality includes coconut, areca nut, paddy, pepper, plantain, vegetables, betel leaves, tapioca and other spice species. The extent of various crops cultivated is given in Table 10.1.

Table 10-1Extent of agricultural produce

Crop	Area in hectares	Production/ Ha
Coconut	1650	12,000 Kg
Paddy	73	2,500 Kg
Areca nut	21	9,600 Kg
Pepper	12	1,500 Kg
Plantain	70	25,000 Kg
Vegetables	32	5 Ton
Betel leaves	1	NA
Tapioca	5	NA
Other spices	3	NA

(Source: Krishibhavan, Koyilandy, 2014)

Table 10.2 gives the temporal variation in extent of crops cultivated during the years from 2008 to 2012. It can be observed that there is no significant variation in the extent of

crops cultivated during the study years. The extent of paddy cultivated decreased to 73 hectares during the year 2012 from the previous 75 hectares registered during 2011. The table also shows that all the crops except coconut, pepper and vegetable show a decrease in crop area over the years. The details on various spices cultivated in the Municipal area are given in table 10.3. Pepper is cultivated in 20 Ha and ginger, turmeric in 5 Ha each. Nutmeg is another spice which is being cultivated in 0.2 ha area of the Municipality. There are two major floriculture nurseries functioning in the Municipality, namely Kalyani agro at kollam area and Garden corner at Kuruvangad. In both these nurseries various plants including orchids, rose, anthurium and various medicinal plants are mainly nurtured. There are three fertilizer depots functioning in the Municipality namely Thayyil traders, Chulliyil traders at Koyilandy and Agricultural welfare society at Muthambi. Agro service society at Arikkulam provides tractor service for agricultural activities.

Table 10-2Temporal variation in agricultural produce

Crop Name	Area in hectares				
	2008	2009	2010	2011	2012
Coconut	1650	1650	1650	1600	1650
Paddy	75	75	75	75	73
Areca nut	21	21	24	24	21
Plantain	70	70	72	73	70
Vegetables	30	31	31	33	32
Betel leaves	3	2.5	1	1	1
Pepper	12	8	10	12	12
Tapioca	6	4	5	6	5
Spices	5	5	4	5	3

(Source: Krishibhavan, Koyilandy, 2014)

Table 10-3 Details of spices cultivated

Sl.No	Spices Cultivated	Area of Cultivation (km^2/Ha)
1	Pepper	20 ha
2	Turmeric	5ha
3	Ginger	5ha
4	Nutmeg	0.2ha

(Source: Krishibhavan, Koyilandy, 2016)

10.2 Productivity

Crop productivity is a quantitative measure of crop yield in given measured area of field. Though there is a fall in the crop area in Kerala, the productivity remains same or improved by new innovative techniques with the active participation of Krishi Bhavans. The variation in productivity of important crops during the years 2008 to 2012 are tabulated in table 10.4. The productivity of coconut has increased over the years and reached 80 T/ year during the year 2012. The productivity of vegetables also increased to 10 T / year during

2012 from the previously recorded 8 T/year. Productivities of other crops recorded are the same over the study years.

10.3 Spatial distribution

In Koyilandy Municipality, the eastern parts of the Municipality towards the eastern side of the Akalapuzha still exhibit more agrarian character and the agrarian character gradually get reduced towards the west. The spatial distribution of agricultural land use is illustrated in figure 10.1 and the concentration index of agricultural land use and the variation in concentration index of the agricultural land uses are illustrated in figures 10.2 and 10.3 respectively.

Table 10-4 Changes in crop productivity

Crop Name	2008	2009	2010	2011	2012
Coconut (T/Year)	65	70	80	80	80
Paddy(T/ha)	2.5	2.5	2.5	2.5	2.5
Vegetables (T/ha)	8	8	8	10	10
Pepper(T/ha)	1.5	1.5	1.5	1.5	1.5
Tapioca(T/ha)	7	7	7	7	7
Spices(T/ha)	3	3	3	3	3

(Source: Krishi Bhavan, Koyilandy, 2014)

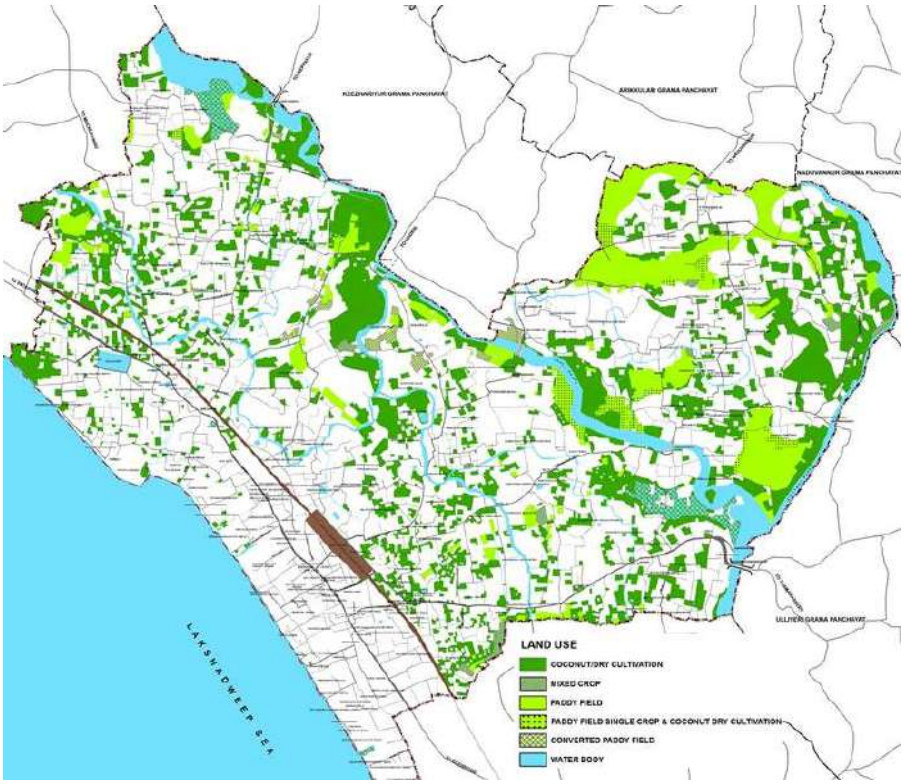


Figure 10-1 Spatial distribution of agricultural land use

(Source: Existing land use survey 2013)

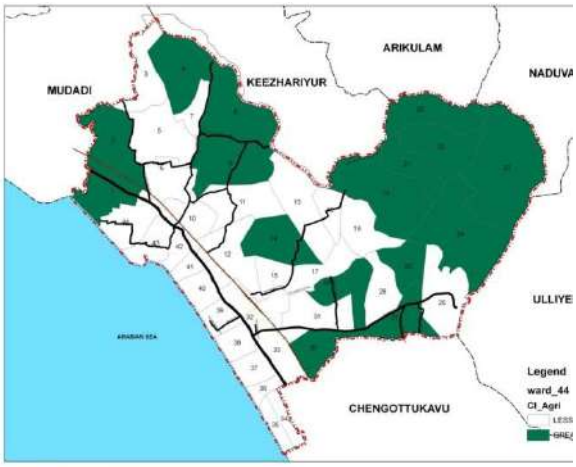


Figure 10-2 Concentration index of agricultural land use
(Source: Census 2011)

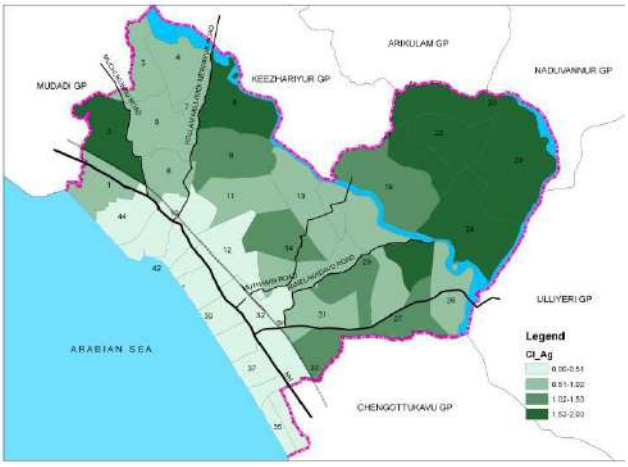


Figure 10-3 Variation in concentration of agricultural land use
(Source: Census 2011)

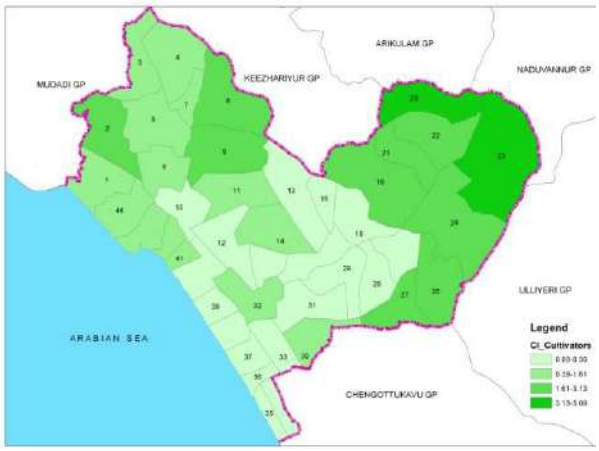


Figure 10-4 Variation in concentration of cultivators
(Source: Census 2011)

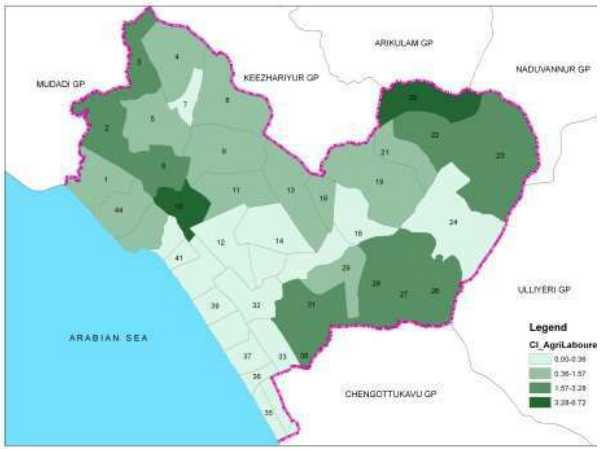


Figure 10-5 Variation in concentration of agricultural labourers
(Source: Census 2011)



Figure 10-6 Spatial distribution of land under paddy cultivation
(Source: Existing land use survey 2013)

As per Census 2011, the cultivators and the agricultural labourers are also concentrated towards the eastern parts of the municipality and the variation in concentration of the same are illustrated in figures 10.4 and 10.5 respectively.

Paddy cultivation is being practiced mainly in the lands situated in eastern parts of the Municipality. The extent of paddy land and cultivable paddy in which isolated coconut trees also present constitutes 6.87% of the total Municipal land. Various paddy types including the species locally known as Vellapunaran, Ceruchitteni, Aanakkodan, Palliayral etc. were being cultivated in these fields. There are nine paddy clusters (padasekharasamithi) registered in the Municipality, and are listed in table 10.6.

Table 10-5Paddy clusters (Padasekharasamithikal) in Koyilandy

Sl No	Name of the paddy cluster	Ward Number
1	Maraloor	6
2	Kakkulam	7
3	Udayasree	8
4	Peruvattoor	9
5	Kuruvangad	10
6	Ottakkandam	20
7	Kavumvattam	22
8	Kuthirakkuda	19, 21
9	Maruthur	23

(Source: Koyilandy Municipality, 2015)

10.4 On-going projects

10.4.1 Nellum Meenum Project

Nellum menum project, (paddy and fish project) is intended to promote fish farming along with the paddy cultivation on an alternative basis. The project is a venture of Agency for Development of Aquaculture, Kerala (ADAK) and the Fisheries Department, Govt. of Kerala. As per this project the paddy land in Valiyannur paddy area is proposed to be cultivated in such a way that, paddy is cultivated in the first half of the year and aqua culture in the remaining half. The project site extents to 100 acres of paddy land which belongs to the Koyilandy Municipality and private owners. The project mainly aims at the following

- Developing a sustainable aquaculture through alternative farming of rice and fish.
- Reducing the cost in paddy farming.
- Increasing the productivity of paddy fields.
- Strengthening the water retaining structures along the periphery of the of paddy clusters.

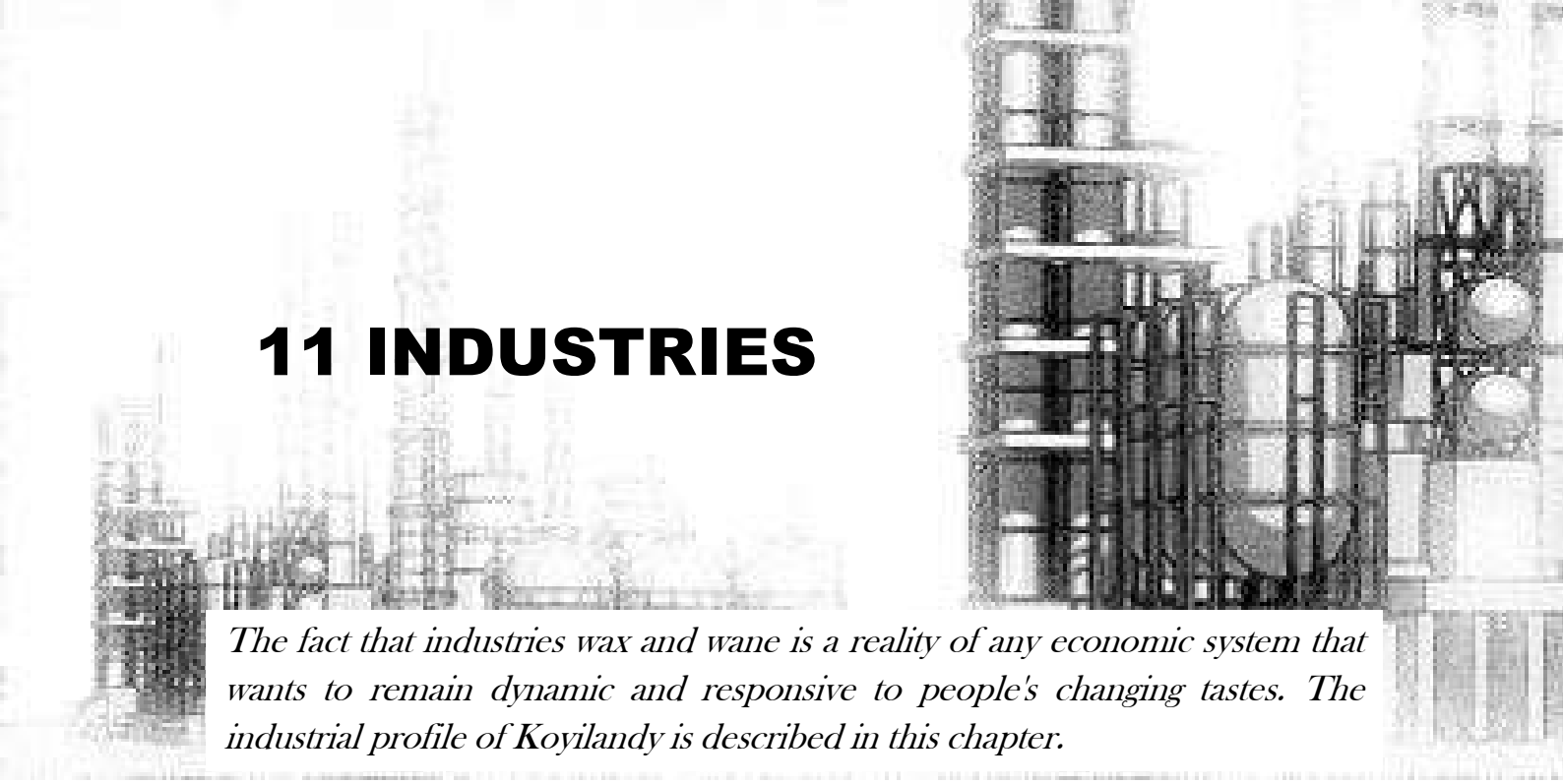
10.5 Problems and Potentials

The agricultural land and the agricultural activities in total are reducing at a rapid pace in the Municipal area. The agricultural activities are often vulnerable to various uncertainties including the seasonal rain fall, climatic variations, and attack from diseases and so on and may incur considerable financial loss. Increased price of fertilizers and pesticides adds to the misery further. Double, triple season paddy cultivation activities are slowly getting confined to single crop cultivation activities. Fragmentation and plotted developments of vast agricultural fields further reduces the volume of agricultural practices. The acute shortage in the availability of labour and the increasing wages of the casual labourers make the agricultural activities non profitable. Natural drains are disturbed and are getting filled up in many areas there by affecting the drainage and irrigation facilities of the terrains. Also various other factors including difficulties in availing loan facilities from bank, financial exploitation by the intermediaries etc. adds to the enormous problems being faced by the agricultural sector of the Municipality.

However, the Municipality is yet to cross the barrier of crude urbanisation and is within the limits of regaining back its tranquillity towards primary sector activities. Large parcels of lands with favourable conditions for intense agricultural activities including fertile land, suitable topography, and nearness to water bodies for irrigation etc. are still available in the Municipality, and need to be properly planned for achieving better yield.

10.6 Inference

Resources suitable for agricultural activities within an urban premise accessible to urban functionaries is indeed something divine with which the Koyilandy Municipality has been blessed with. The production of paddy has considerably reduced in recent times due to non profitability of cultivation, owing to the various factors including high labour cost, unpredictable weather conditions, various diseases etc. The vast chunks of fertile land in the Municipality need to be properly made use of to fetch the maximum yield from it.



11 INDUSTRIES

The fact that industries wax and wane is a reality of any economic system that wants to remain dynamic and responsive to people's changing tastes. The industrial profile of Koyilandy is described in this chapter.

11.1Existing Scenario

In general, the industrial sector is considered to be the largest employment generating sector next to the agricultural, but not in the case of Koyilandy. There are no large or medium scale industries in Koyilandy Municipality. The traditional type of industrial units in Koyilandy includes handloom, coir products, handicrafts, mat weaving, clay pot making, basket weaving etc.

11.1.1 Coir Industry

Coir industries are the earliest industrial units established on a collective basis in Koyilandy. Coir products from Koyilandy, including the product under the brand name 'Koyilandy choodi' once dominated the entire coir products sector of the state. Major coir weaving units functioning in Koyilandy include, Kuruvangad Coir industry Co-operative society No: D-605 and Arikkulam Coir industry Co-operative society No: D 609, both functioning under co-operative sector. Kuruvangad society provides employment for 84 persons and the Arikkulam society employs 173 persons. The minimum wage of employees in the sector is arrived to be 210-285 rupees under the income support scheme.

The increase in the cost of raw materials is the major problem being faced by the coir industry sector at present. It is estimated that, 1000 numbers of raw coconut for retting costs 680 rupees. Comparison between the cost of production and the price fixed by the coirfed is given in table 11.1. It can be seen that the margin of production is comparatively small for all the types of coir products being produced.

Table 11-1Comparison between Cost of production and selling price of coir products

Sl No	Type of product	Cost of production / 120 runnage	Selling price fixed by coirfed
1	Koyilandy (Retted)	5300	6500
2	Koyilandy (Un retted)	4000	4350
3	Rotta Koyilandy	3400	3450

(Source: Koyilandy Municipality Development data 2012-2017)

The major problem currently associated with the sector is that of high cost of raw materials and it is getting increased day by day. Also, the lack of competent entrepreneurship affects the proper economic and business management aspects resulting in failure of the sector. The modern times literally calls for the use of environmentally friendly products back on main stream and the coir products can find a major place among these categories of products.

11.1.2 Handloom Industry

It is believed that, during old times weavers from various parts of the country were brought in to the land of Koyilandy for weaving royal dresses for Samoothiri Maharaja, and these experts were settled in different parts of the district. The history of Korayangadu Street and Maramuttam Street traces back to these weavers, and these areas were once the major production units of Panthalayani hand weave co operative society.

There are two hand weave co operative societies functioning in the Municipal limits. The Panthalayani hand weave co-operative society and the Mahatma Gandhi hand weave cooperative society; both were formed as part of the National freedom struggle movements.

The Panthalayani hand weave co-operative society is having 400 members at present. The society owns around 1 acre of land in Koyilandy Municipal limits, and another parcel of land in Muchukunnu area as well. Presently the major product of the society include mosquito nets, bath towel, dhotis, lunges and bed sheets and employs 30 persons. The society also supplies thread raw material and promotes weaving on a household level as well. The Mahatma Gandhi hand weave society was formed mainly for the development of scheduled cast categories of people and currently functioning at Kuruvangad. The society owns 72 cents of land, and is having strength of 105 members at present. It is also giving training for weaving bath towel, floor carpets, dhoti etc.

The lack of diversification in products range and the general affinity of the common people towards synthetic materials etc. cause problems in the development of this sector. Also, no new employees are getting attracted to this traditional sector of employment.

11.1.3 Khadi

"Akhila bharatha Charkka Sangham" was established by Mahatma Gandhi during the year 1925 and in 1935 the same was transformed in to Sarvva Seva Sangham, which later in 1958 became Sarvvodaya Sanghams in every satate, accordingly Kannur Sarvodaya Sangham was formed in Kerala. Kelappa sadan, Koyilandy is one of the major production units of Kannur Sarvodaya Sangham, which was formed in 1955 by Sri. K. Kelappan aiming at the overall uplift of rural people through generating better employment opportunities, later was absorbed by Kannur Sarvvodaya Sangham. At present the sangham employs around 700 weavers and is having around 80 numbers of permanent workers.

11.1.4 Coconut Processing

Extraction of coconut oil through manually powered machines locally known as 'Chakku', was being practised from old times as a cottage industry. These products were marketed at various locations of the district transported through bullock carts, bicycle and head loads. Coconut processing units using modern techniques are being practised at present. The voltage fluctuations and shortage creates problems in this sector. The major agricultural activities of the area are related to this sector and the same need to be developed and enhanced further.

11.1.5 Clay Pottery

This industry was prevailing in Kuruvangad, Kodakkadu areas of the Municipality. Also, due to the availability of raw materials the 26 cents of paddy land in Anakulam, Muchu kunnu area was taken over by the Municipality and the clay raw material is being supplied to the units. Flower pots, terracotta sculptures are being mainly produced in this sector.

11.1.6 Koyilandy Hookah

Koyilandy hookah was one of the unique products which fetched international fame and foreign money to the land of Koyilandy on major scale. The product which was once the proud fame of Koyilandy is now slowly disappearing from the scenario mainly owing to the following reasons,

1. The uncontrollable escalation in prices of the raw materials.
2. Lack of skilled labourers in the sector.
3. Non-availability of labour on a reasonable wage base.
4. Non availability of regional markets for the product.
5. Diminishing demand for the product in foreign market.

The Kozhikode District Handicrafts Artisans Co-operative Society number F-1026, Koyilandy, is the only organisation which produces Koyilandy Hookah at least on a minimal level now. The hookah industry was once a flourishing activity at various locations of the Municipality including Anakulam, Peruvattoor, and Kavumvattam. At these places, the

Hookah industry had slowly given way to general industries and allied activities. The Kozhikode District Handicrafts Artisans Cooperative Society aforesaid also has diversified their production to various sculptures production using coconut shell and similar materials.

11.2Types of Industries

About 149 small scale industries and 422 industrial units which are registered in the industries department are functioning in the Municipality. Figure 11.1 gives the number of industries based on types, functioning in Koyilandy. The primary investment amount of, 80% of the industrial units are less than 5 lakhs.

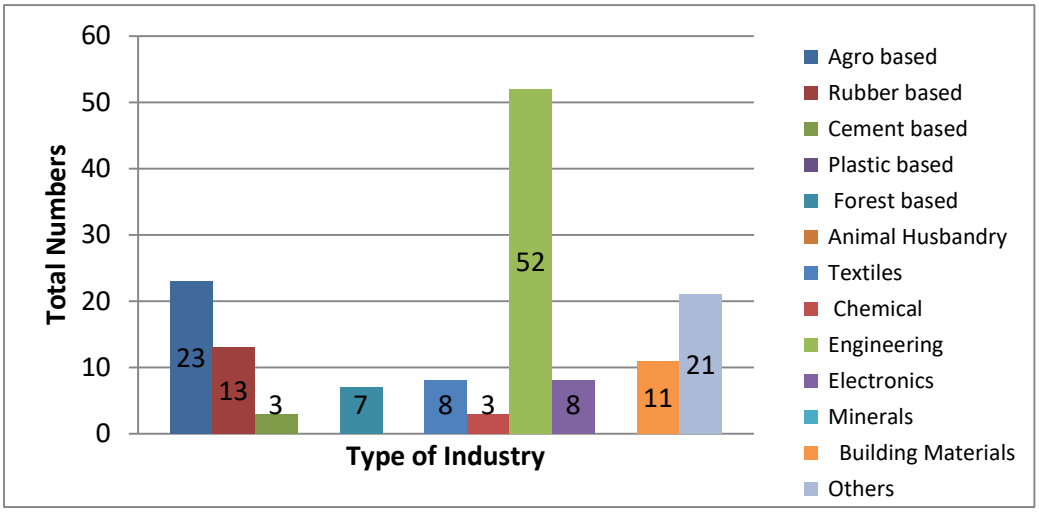


Figure 11-1Industries in Koyilandy
(Source: District Industries centre)

The detail of various personals engaged in micro industrial ventures during the last decades has been detailed out in Table 11.2. Accordingly, during the year 2011, there are 744 male and 485 female entrepreneurs engaged in micro industrial activities in the Municipality.

Although the Municipality is having a higher potential for fish and related industries at present there are no industrial units worth mentioning within the Municipal limits. The daily catches are being transported to various places without undertaking any special treatment process. There are few treatment units functioning outside the Municipal limits. There are four numbers of ice plants functioning in the Municipality which include three plants at Koyilandy and one at Kollam.

Table 11-2Decadal Variation in Micro industrial venture

l No	Category	Year		
		1991	2001	2011
1	Male	635	890	744
2	Female	183	335	485
	Total	**818**	**1225**	**1229**

(Source: Koyilandy Municipality Development data 2012-2017)

11.3Spatial Distribution

The concentration index of industrial land uses is shown in figure11.2. It can be seen that, the industrial land uses are mainly concentrated along the eastern and southern wards of the Municipality in general.

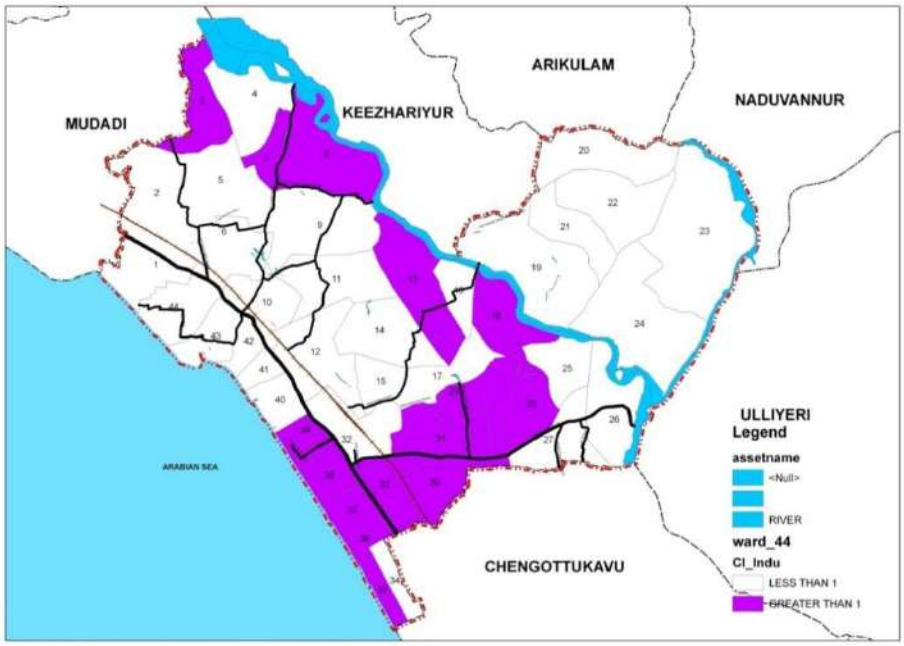


Figure 11-2CI of industrial land use
(Source Existing land use survey 2013)

11.4On-going Projects and initiatives

Various projects and programs in order to develop the industrial sector of the Municipality in total include the following,

11.4.1 Entrepreneurship training programs

Various classes and training sessions are being conducted meant for young entrepreneurs, in order to make them capable of establishing successful industry units.

11.4.2 Single window clearance board/ Green Channel counters

Single window clearance board addresses the approval process in order to get the required certifications for units with investments up to 2 lakhs and the green channel counter facilitates the approvals of the units having more than 2 lakhs investments.

11.4.3 Entrepreneurship development clubs

Clubs are established with an aim to promote entrepreneurships culture among students at school and college levels, with technical and financial aid from the industrial department.

11.4.4 Handholding

The hand holding and helps being extended through the industrial department, provides help, to get timely approval from various departments and agencies is proven to be an essential support for the new entrepreneurs.

11.5Problems

Various problems being associated with the industrial sector include the following,

- Non availability of land at reasonable price.
- Intrusion of low cost, low quality Chinese products.
- Lack of industries
- Lack of entrepreneur culture of people
- Lack of modern facilities.
- Lack of scientific facilities to improve the quality and productivity of existing industrial products.
- Lack of training programs.
- Poor supply of electricity.
- Lack of marketing facilities.
- Difficulty in getting bank credit.
- Quality and demand issues for regional products.
- Lack of market study and research facilities.
- Un-healthy competitions.
- Concerns on labour issues once the units are on track

11.6Potentials

The following are the potentials in this sector in Koyilandy Municipality

- Hookah making industries can be rejuvenated giving due respect of being a unique antique product.
- Industries for coconut shell products can be further enhanced and improved.
- Koyilandy coir products can find better markets.
- Handloom industries have got scope for further improvement.
- Industries based on agricultural and fisheries resources have large scope due to the availability of resources.
- Scope for setting up industrial estate at valiyamala in 6.43 acres of land available.

11.7Inference

Although the present industries sector scenarios are not having scope for much satisfaction, the Municipality still possess the potential for improvements in industries related to agriculture and allied sectors. The problems associated with coir industries need to be resolved and the unique brand names of the ‘Koyilandy choodi’ need to be revived back. The Hookah can be promoted as a regional decorative element, and need to be made available at relatively smaller costs. The hand weave, coir and Khadi sectors are

related to environmental friendly products and the on-going 'back to nature' trend need to be properly tapped towards the benefits of these industries in Koyilandy Municipality.



12 TOURISM

12.1Major tourist attraction

The major tourism attractions inside the Municipal limits include Pisharikavu Temple, Parapalli Makham, Mangrove area in Anelakkadavu and other coastal and river side areas.

12.1.1 Kollam Pisharikavu temple

The Pisharikavu Temple is situated 2.50 Km North West of Koyilandy town, on the western side of NH 66 at Anakulam junction, and is one of the major religious destinations in Northern region of the state, accessible from the National highway 966. According to myths related to the temple members of the eight families after a failed conspiracy against Marthanda Varma settled down in the village named 'Kollam'. The settlers of Southern Kollam became very rich and they were getting more regard and respect than the ruler of Venad from the people. They renovated the whole temple complex giving importance to the shrine of Goddess. The temple has a rectangular Chira (pond) with an area of 10.5 Acres (L=920 ft and B=502 ft); The structures in the temple complex are sreekovil of Lord Siva and Goddess, Bhadrakaali, Subshrinechuttambalam, Gurithipura and a well in addition to Kaavu. The main sreekovil facing east is of Lord Siva. This is shaped as square dwi-thala of saandhaara type.



The annual festival of Sree Pisharikavu temple is celebrated in the Malayalam month of Meenam. The festival is celebrated with ceremonies for 8 days. The 7th day is celebrated as "Valiya Vilaku", and the 8th day is celebrated as "Kaliyattom", the divine Nandhakam sword is brought in procession around the temple on 7th and 8th day on a fully decorated female elephant along with traditional art forms. The Navarathri festival is also being celebrated in an elaborate manner in the temple.

The details of visitors to Pisharikavu temple is given in table 12.1

Table 12-1Details of average number of visitors to Pisharikavu temple

Type of the day	Approximate No of visitors
Normal week days	2,000 per day
Tuesdays, Fridays	5,000 per day
Sundays	10,000 per day
Tuesdays, Fridays (If holidays)	5,000~10,000 per day
On festival season	1.5 ~ 2 lakhs (In 8 days)

(Source: Temple office)

12.1.2 Parappalli Makham

The Parappalli Makham is situated on an elevated terrain adjacent to Parappalli beach area. The hillocks spread across 18 acres of land in this campus are called Mayyathukunnu and Kaulamala. 14 persons who were close disciples of the Prophet Muhammad are believed to be interred here. Many rock formations are lying in the sea in

this area. The site is in between Kappad Beach and Iringal craft Village, other two major tourist destinations on the peripheral local bodies. Parapalli is an important tourist location although the transportation infrastructures to the area need to be improved further on a large scale.

The details of visitors to Parappalli is given in table 12.2

Table 12-2Details of average number of visitors to Parappalli

Type of the day	Approximate No of visitors
Normal week days	100 ~ 200 per day
Holidays	800~1000 per day
Special occasions during the month	1500~ 2000 per day
Festive season (Aandu Nercha-5 days in a year)	10,000~ 15,000 per day

(Source: Makham Committee)



12.1.3 Anelakkadavu Mangrove area

Mangroves in general are the shrubs or small trees that grow in saline or brackish water. In Koyilandy Municipal area the mangroves are located about 3 Km east of Koyilandy Town near the Anelakkadavu. Mangroves can be identified as an abundant resource for a variety of aquatic life. Keeping this in view Koyilandy municipality has proposed a project at Anelakkadavu in order to protect and enhance the mangrove areas of the Municipality. The extent of the mangrove land in the project is about 14 Acres. The project includes the preservation of existing mangroves and also replenishing the eco system through planting of 14 varieties of mangroves in a scientific manner. A reference library is in function, near the Anela Bridge area. In future the entire area between Kanayamkode Bridge and Anelakkadavu also is proposed to be included in the project.



12.1.4 Coastal areas

The coastal lines of the Municipality in many places are also combined with rocky terrains, giving spectacular scenic views attracting the tourists. The Koyilandy harbour, a major fishing harbour in the region also attracts visitors of various categories.









12.1.5 River based tourism

The geography of the Koyilandy town has been blessed with the divine presence of rivers, namely Akalapuzha, Nayadan Puzha and Cherol puzha. These rivers flow leaving behind scenic serene landscapes having high potential to be developed as major tourist destinations. These rivers are perennial in nature and were used for inland water transportation during old times. Various water and riverfront based tourist activities can be initiated along the coasts of these rivers and its river banks.






12.2 Tourism Infrastructures

Although the Municipality is having a high potential for increased tourism activities, the tourism infrastructure available in the Municipality is very minimal. Two numbers of three star hotels, with total 26 no of rooms are functioning in the Town and the rest of the lodging facilities available can be grouped in to budget accommodation category. Although the town poses immense scope for river based tourism there are no house boats or similar initiatives operational in the municipality.

12.3 Problems and potentials

The major problems associated with the tourism sector in the Municipality are that of the short falls in infrastructure facilities. The road infrastructure to the major tourist destinations including Pisharikavu and Parappalli are narrow and are in a zig zag pattern. Tourism infrastructure facilities including facilities for accommodation, restaurants etc. need to be enhanced further on a considerable scale in the Municipality.

The tourism potential of the Municipality is presently tapped to a very minimal level. River and harbour based tourism possess high potential for further improvements. The diverse topography of the Municipal area is paving ways for attracting the visitors in an elaborate manner and need to be properly aligned in terms of providing adequate infrastructure and related facilities.

12.4Inference

The tourism potential of the Municipal area is grossly underutilised. The tourism potential of Akalapuzha, the long coastal belts, religious and cultural destinations, mangrove parks etc. need to be made use for the betterment of the local and regional economy. Various conservation measures towards protecting the built heritage, also the environmental sensitive area along with the positive promotions in tourism sector, need to be initiated.



13 HERITAGE

The magnificent Temples, Mosques, Cathedrals and Forts are the living examples of the rich historic and cultural heritage of our state. Kerala is also notable for its fragile ecological equilibrium. The frequent and indiscriminate intervention of human beings disturbs and destroys this balance. Hence the preservation of heritage monuments and natural heritage becomes the imperative demand for future generation. The chapter lists the heritage areas in the Master Plan area.

13.1 Heritage Types

Koyilandy Taluk is famous for many heritage locations in Kozhikode District. As per the heritage study conducted by the Local Self Government Planning, the heritage locations are classified into built heritage, cultural heritage and natural heritage.

13.1.1 Built Heritage

Built heritage means those buildings, artifacts, structures, areas and precincts that are of historic, aesthetic, architectural or cultural significance and also include natural features within such areas or precincts of environmental significance or scenic beauty such as sacred groves, hills, hillocks, water bodies, open areas, wooded areas etc. The heritage buildings in this category identified are the Pisharikkavu temple in Kollam and the Parappalli Makham. Panthalayani desom which contains the town center has a significant presence of historic buildings such as BEM school. The details of this temple are explained in the previous chapter under 12.1.1.

13.1.2 Social / Cultural Heritage

Cultural heritage is the legacy of physical artifacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations. Social heritage refers to the history and cultural identities of people in a particular region. It includes physical elements such as monuments, documents, and artifacts. It also includes oral traditions, customs, folklore, languages, music, dance, celebrations, and special skills.

Koyilandy hookahs, traditional smoking pipes, of Kozhikode made in Koyilandy were famous across North India, the Gulf and Pakistan. These Hookahs were once considered a pride of Koyilandy. In Gulf countries, Koyilandy hookahs are still very popular as "Malabar Hookah". The craft owes it origin to a group of Yemeni merchants who had taken up residence at Koyilandy about 500 years ago. They commissioned the local craftsmen to make hookah, an object of oriental culture. Made by local craftsmen, the Hookah impressed Yemeni traders and soon came to be known as Koyilandy Hookah. Besides being ornately designed with attractive motifs, the Koyilandy Hookahs have a coconut shell as the water holder. Even today, these hookahs are exported to gulf countries.

13.1.3 Natural Heritage

Natural heritage refers to the sum total of the elements of biodiversity, including flora and fauna and ecosystem types, together with associated geological structures and formations (geodiversity). Geological heritage centres like Parapalli beach and Akalapuzha, Nayadan puzha, Cherol puzha and the vast areas of mangroves are the natural heritage sites within the town. Besides, the municipality houses about 6.06 acres of sacred groves with major trees like Njaval, Kanjiram, Nelli, Aal , Kunni, Pana, Poovam, Manjadi, Chooral, Kottamaram, Ayaniplavu, Chandanam and Pine.

13.2 Problems

Waste disposal is a major problem affecting the heritage sites. About 48% of the sacred groves are under private ownership and hence are at a risk of destruction. The increased interventions in the river banks and beach front and the destructive activities have resulted in the loss of vast stretches of mangroves.

13.3 Potentials

The Koyilandy Hookahs, which were fetching the fame and legacy of the Koyilandy across the borders are now on the verge of extinction, but still can regain its glory and splendour through proper interventions. The mangrove areas of the Municipality are already being protected through various programs taken up by the governments. A detailed program needs to be coined out to prevent the further destruction of other monumental remnants of the Municipality.

13.4 Inference

Proper planning interventions are called for the preservation of heritage sites and buildings of the area. Adequate weight age has to be given to the regulations for ensuring and promoting conservation or preservation of buildings, artifacts, structures, areas, and precincts of historic, aesthetic, architectural and cultural significance, natural and other manmade features of environmental significance or ecological significance, scenic beauty etc.



14 WATER SUPPLY

14.1 Existing Water Sources

The sandy ridges in the coastal zone and lateritic formations are good aquifers and are tapped using open wells. However, scarcity of drinking water is significant during summer due to saline water intrusion along the coastal stretch and river banks, especially in levy formation of river Akalapuzha. The water from open wells in the valley formations is turbid, especially in summer due to clayey intercalations in the aquifer. The existing water supply sources in the Municipality are the following.

- River
  - Chittaripuzha
  - Nayadan puzha
  - Nelliyadipuzha
  - Akalapuzha
- Open well
  - Rural Water Supply Scheme, Koyilandy
  - Rural Water Supply Scheme, Kollam
- Bore well
  - Rural Water Supply Scheme, Varakkunnu
- Open well and bore well
  - Rural Water Supply Scheme, Kamothkara
  - Rural Water Supply Scheme, Kakrattukunnu
  - Rural Water Supply Scheme, Muzhikalmeethal
  - WSS Kaloorkunnu
  - Valiyanhattil Water Supply Scheme
- Potential sources
  - Kollam chira
  - Veliyannurchalli

14.2 Municipal Water Supply

Municipality operates 20 water supply schemes and the Kerala Water Authority operates six main water supply schemes. But less than 20% of the Municipal area is covered by these schemes. Total municipal water supply is 1,39,600 litres per day and 1830 numbers of households are connected through public taps. 675 households are provided with hand pumps. About 1346 households have no accessibility to water. There is no water treatment plant in the Municipality and chlorination is the only treatment given. There are no storage reservoirs inside the Municipal limits. Only few schemes have overhead tanks.

Areas not covered with any public sector water supply scheme include Perumkuni Colony, Kuttathukunnummal, Pazhamkavil colony, Kannankandykunnu and Ottakandam. Gaps in the existing water supply are noted in Cheenampalli, Chalilparamba, Koyantevalappil, Cheriyamangad and Koprapandikasala.

14.3 Water Scarcity

The nature and extent of water scarcity has been described in Figure 14.1. It can be seen that 92.45% of the population has no scarcity and 2.09% is having scarcity of more than 6 months in a year. 2.18% persons are facing scarcity for 1 to 2 months, 2.45% for 2 to 3 months and 0.73% for a period of 3 to 6 months.

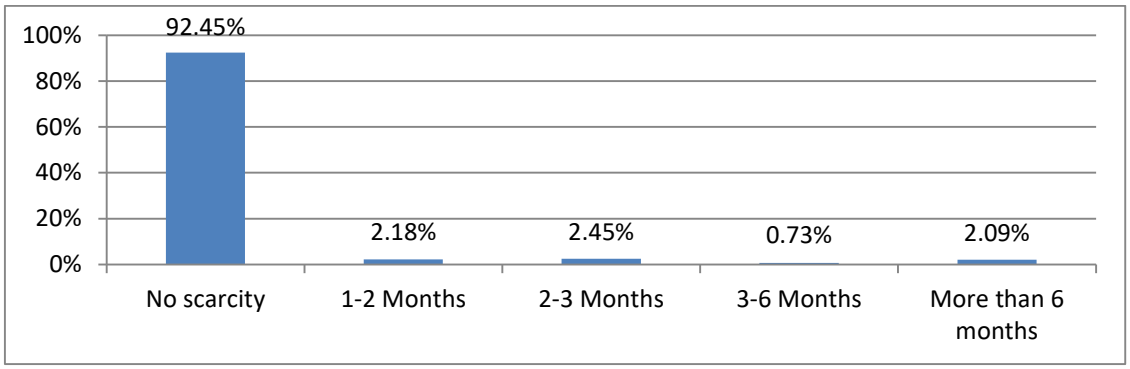


Figure 14-1Water scarcity details
(Source: Socio economic survey 2013)

The locations of drinking water shortage during summer are given in Table 14.1, and the spatial distribution of water scarcity locations are shown in Figure 14.2.

Table 14-1Water scarcity locations

Ward no.	Location	Major problem leading to scarcity
1	Puttanilkunnu, Kolerakunnu, Nalucent Colony, Valiyanjathilbhagam	Deep water table or dry groundwater patches
2	Perukkuni	Saline water intrusion
3	Panachikkunnu, Orerikkunu	Deep water table or dry groundwater patches
4	Kannakandikunnu , Thattarikunnu , KalurkunnuLakshmiveedu colony	Deep water table or dry groundwater patches
5	Kottakunnu	Deep water table or dry groundwater patches
6	Pootherikunnu, Chathothukunnu	Deep water table or dry groundwater patches
7	Kottathukunnu	Deep water table or dry groundwater patches
8	Kottakunnu,Kunnyoramala,Kuzhichalilmethal colony, Mundakunnu, Arekunnu	Deep water table or dry groundwater patches
9	Nellikodukunnu, Puthalathkunnu, Koyarikunnu	Deep water table or dry groundwater patches
10	Arekunnu Lakshamveedu colony, Thunnathumethal Kunnathuthazha Bhagam, Padikkal Vayal	Saline water intrusion
11	Parattukunnu, Manaval	Contaminated water
12	Kakrathukunnu, Aruvayal	Saline water intrusion
13	Kuppanipurathu Thazha, Padanappuram Bhagam, Chamarikunnu, Vattakunnu, Aarathukunnu	Deep water table or dry groundwater patches
14	Varakunnu, Kanayamkodu	Saline water intrusion
15	Kayalakandi Thazha, Nalupuraykkal Thazha, Pavuvayal Thazha, Varanakkadi thazha	Drying up of wells during summer months
16	Komathukara	Drying up of wells during summer months
19	Amachankaudi, Kothamangalam , Korangadu	Drying up of wells during summer months
28	Coastal areas	Saline and contaminated water
29	Urankunnu	Contaminated water
30	Kaniyankunnu, Pallikandi, Chulliyil	Saline water intrusion
31	Kaniyamkunnubhagam	Drying up of wells during summer months
32	Kaniyamkunnu Nalu cent colony	Drying up of wells during summer months

(Source: Socio economic survey 2013)

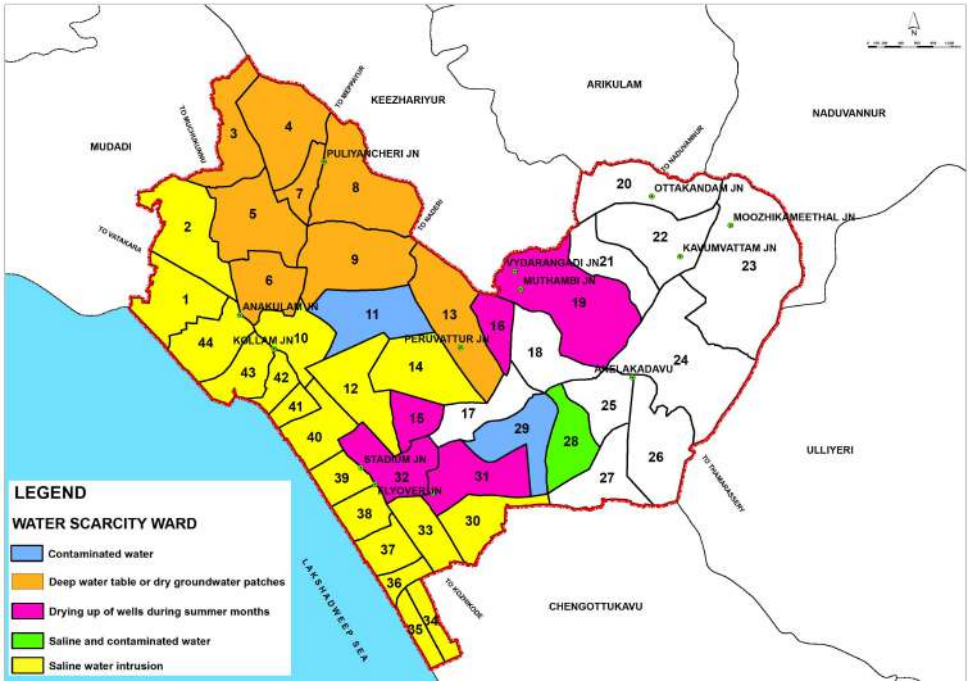


Figure 14-2Spatial distribution of water scarcity areas
(Source: Socio economic survey 2013)

14.4Source of water

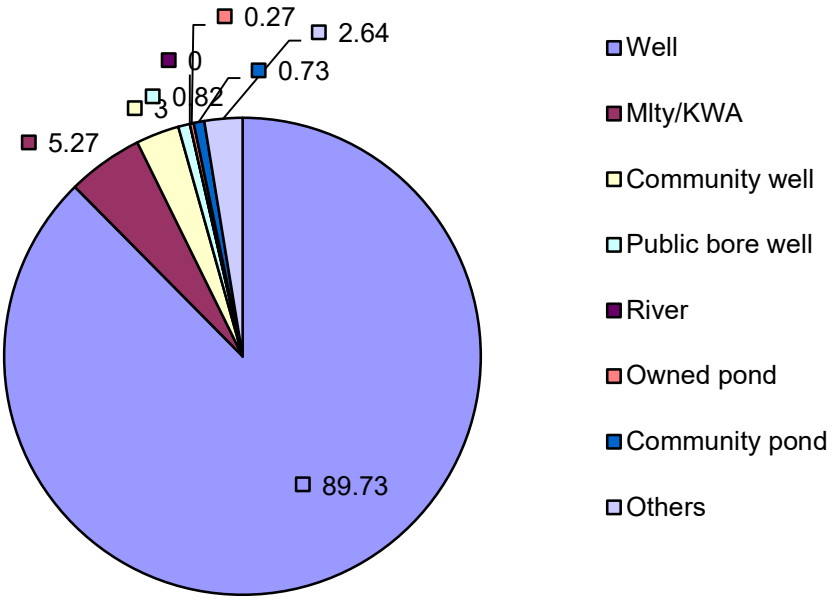


Figure 14-3Source of water
(Source: Socio economic survey 2013)

As per socio economic survey, it can be seen that, 89.73% of the people in Koyilandy town use open well as the source of water and 5.27% Municipality/ KWA supplied water. 3% of the people use community well as the water resource. The distribution of percentage usage of various water resources is illustrated in Figure 14.3.

14.5 Problems

- River water is mostly saline and is not potable.
- Less than 20% of the Municipal area is covered by the water supply schemes.
- The water from open wells in the valley formations is turbid, especially in summer due to clayey intercalations in the aquifer.
- Summer scarcity of drinking water is appreciable due to saline water intrusion along the coastal stretch and river banks, especially in levy formation of River Akalapuzha.
- Increasing saline intrusion.
- The well water, especially in the coastal regions, is found to be bacteriologically contaminated.

14.6 Potentials

There are many potential sources of groundwater in the Municipality. It does not indicate any significant lowering of ground water table over the years except for the water table during post-monsoon period. The local information, however, points towards increasing saline water intrusion. Proper treatment of water and proper quality monitoring should be assured.

14.7 Inference

There are adequate water resources in the Municipality. Most of the areas are supplied with sufficient water, but are facing problems related with saline water intrusion. Majority of the people use open well as the source of water and the quality of the water from open well proves poor due to bacteriological contaminations. Proper quality control and continuous monitoring will assure good water supply to the inhabitants of the Municipality.



15 DRAINAGE AND SEWERAGE

Sewerage and drainage system is an essential component for the development of any urban system. Absence of proper sewerage and drainage in the urban system will lead to various adverse effects in the area. The status of sewerage and drainage system of the town is explained in this chapter.

15.1Existing Network

The Municipal area does not have a sewerage system. Most of the households have only single leach pit latrines. The water table in the coastal zone is shallow. The permeability of the sand, sandy clay and silty clay aquifers in the zone, particularly in beach area and sandy ridges, runnels and levy formations on the river banks is of the order of 1-15 md facilitating the contaminant movement. Water sample from all the 20 wells selected at random were tested positive for e-coli contamination. Open defecation is also practiced, especially in the beach area. The surface drains carry appreciable quantity of waste load to the surface water bodies. The waste from the hospitals, bus stations and most of the restaurants are let out to the surface drains. No waste water treatment facility is available for any of the establishments. Saline water intrusion to ground aquifers as well as surface water regime worsens the situation.

The details of existing storm water drainage system in the town are given in table 15.1.

Table 15-1Details of drains in Koyilandy

Sl No	Road	Length of drain in meters	Type of drain
1	NH Kollam Anakulam, LHS	100	RCC with cover slab
2	NH Kollam Anakulam, RHS	100	RCC with cover slab
3	NH Kollam Anakulam, LHS	300	RCC open drain

4	NH Kollam Anakulam, LHS	100	Earthen drain with side protection
5	NH Kollam Anakulam, RHS	100	Earthen drain with side protection
6	NH Koyilandy bus stand- Towards Kozhikode LHS	1350	RCC with cover slab
7	NH Koyilandy bus stand- Towards Kozhikode RHS	650	RCC with cover slab
8	NH Koyilandy bus stand- Towards Kozhikode LHS	250	RCC open drain
9	NH Koyilandy bus stand- Towards Kozhikode RHS	500	Earthen drain with side protection
10	Koyilandy Bus Stand-Pappangad railway gate RHS	300	RCC with cover slab
11	Koyilandy Bus Stand-Pappangad railway gate LHS	300	RCC with cover slab
12	Koyilandy Bus stand -Harbour road RHS	400	RCC open drain
13	Koyilandy- Mubarak road, RHS	350	RCC open drain
14	Koyilandy Boy's High school - Railway Station RHS	200	RCC with cover slab
15	Koyilandy Boy's High school - Railway Station LHS	200	RCC with cover slab
16	Koyilandy Boy's High school - Railway Station RHS	200	RCC with cover slab
17	Krishna Theatre road, LHS	50	RCC with cover slab
18	Old Police Station road RHS	500	RCC with cover slab
19	Old Police Station road LHS	500	RCC with cover slab

(Source- Primary Survey 2016)

15.2 Natural Drains

The major natural drainage channels in the town include, Vayanarithodu, Cheriyathodu, Kulamthodu and Valiathodu. The wayside drains are constructed to collect storm water and drain it to these four major drains, but the performance efficiency of the drains are poor due to siltation of the streams and chocking of drainage lines due to solid waste materials including silt. The drains are not continuous at many locations causing flooding during rainy seasons.

The coastal zone of the Municipality originally had ridge topography parallel to the coast and the river stretch. The natural land formations were capable enough to drain the water to water bodies. But, due to the blockage of this natural storm water drain channels, water logging problems are severe during the entire rainy season, and also during times of high tide.

15.3 Problems and potentials

The interventions in the form of National Highway, railway line and various parallel and perpendicular roads have blocked the natural drains. The reclamation of low land for residential purposes, conversion of paddy fields for various commercial activities, cultivation of cash crops etc. have curtailed the natural drainage system to a large extent.

The rejuvenation of Vayanarithodu, Cheriyathodu, Kulamthodu and Valiathodu can solve many of the problems in this sector. RCC cover has to be laid above all drains and can be converted into pedestrian pathways and the space can be effectively utilized. The drainage and storm water can be treated and effectively utilized for agricultural activities and fish culture.

15.4 Inference

Absence of a planned drainage network causes flooding in many areas of Koyilandy Town during monsoon seasons. Drainage system of the town has to be properly designed to accommodate present and the future drainage demand of the town.



16 SOLID WASTE MANAGEMENT

The problems with solid waste management are increasing day by day in many areas of urban India. It is an important aspect neglected in several Indian cities. The urban centres of Kerala also face similar problems. An efficient solid waste management system is essential for the sustainable growth of an urban centre. The characteristics of solid waste and the existing system and its problems are analysed in this chapter.

16.1 Solid Waste Characteristics

The waste generated in the outskirts of the Municipality gets managed by the producers themselves as the average plot size is high. Waste generated in the town centre, institutions and coastal stretches reaches the Municipal stream. The average solid waste generation in the Municipality is 10 T/day. This includes about 50% of the domestic waste. 72% of the waste is biodegradable. The carbon – nitrogen ratio (C/N ratio) is 35 which are higher than the ideal ratio for composting. The ideal ratio for composting is 26-32. Removing the high carbon wastes like paper will allow the composting process. The solid waste characterization of Koyilandy Municipality is given in Table 16.1. Table 16.2 shows the waste generation in the town.

Table 16-1Solid waste characterization

Constituent (excluding hospital waste)	Percentage
Bio-degradable	72
Recyclable – Paper, plastic, metal,rubber,glass	15
Inert and others	13
Total	100

Source: Koyilandy Municipality 2013

Table 16-2Waste generation per day– Koyilandy town

Sources of waste generation	Weight in kilograms	% of the total
Residential	5000	50
Commercial	1000	10
Restaurants	300	3
Hospitals	300	3
Hotels & Lodges	400	4
Market	1000	10
Street sweeping	2000	20
Total	10000	100

Source: Koyilandy Municipality 2013

16.2 Existing System

The Municipality owns a vermi composting plant in Varakkunnu. About 5 tonnes of waste is collected and transported to the disposal site. The vermi compost plant at Varakunnu has a maximum capacity of about 1.5 tpd. Only selected biodegradable waste is used in the vermi composting plant. The rest of the waste, after removing plastic, is dumped in the masonry pit. The leach ate diluted with water is spread all around the pit during rainy season. The site does not have enough space to manage the waste that comes to the Municipal stream. There is significant public protest. Therefore at present the plant is not functioning effectively. The municipality now owns biogas plants of which one is located in the new bus stand area. The plant is now handling half of the waste generated in the town. There are five thumboormuzhi model bio degradable waste treatment units are installed and are effectively functioning within the Municipal office premises. The fertilizers thus produced are effectively handed over to the cultivators under the direct initiative of the Municipality. The use of disposable plastic items, including straws, plastic plates, plastic cups and plastic carry bags were banned in the Municipality on a step by step basis. This initiative has helped to reduce the quantity of plastic wastes from 5 tonnes to 1 tonne during the period 2011~2016. Presently 24 permanent employees and 7 employees on daily wages are engaged in waste collection/ handling activities.

16.3 Bio-Medical Waste

As per the CWRDM study report, there are 24 institutions in the Municipality that generates biomedical waste. The total generation is estimated to be 0.4 tpd. Two hospitals

use their own facility for waste disposal and 6 hospitals transfer the waste to common facility established by Indian Medical Association at Palakkad.

16.4 On-going and Committed Projects

There is a central government scheme for solid waste treatment at Valiyamala. The project site has 6 acres extent. Even though, Rs. 208 lakhs was sanctioned, the project has not started yet due to significant public protest.

16.4.1 Haritha Kerala Mission

Haritha Kerala is an Umbrella Mission integrating the components of Waste Management, Organic Farming, and Water Resources Management. The mission aims to integrate the 3 most important and inter-related sectors through linking the following

1) Household level segregation and safe disposal of organic waste through feasible options like composting, biogas, arrangements for institutional waste disposal, re-use, recycling and safe disposal of non-degradable and electronic waste are given priorities.

2) Rejuvenation of tanks, ponds, streams and rivers.

3) Promoting organic agriculture to produce safe to eat vegetables and fruits to make the state self-sufficient within the next 5 years.

The mission envisages 1) Pollution-free water sources 2) Revival of water sources 3) Water conservation with the help of people 4) Eco-friendly and sustainable waste management and 5) Enhancing organic farming.

The mission finds particularly important in Koyilandy due to the presence of wide diverse nature of environment and ecologically sensitive terrains within the relatively small extent of geographical area. However, the mission is yet to gain its full momentum in the town. Presently preliminary activities including household surveys are completed and the projects are in its formulation stage.

16.5 Problems

The present system has the following defects

- Partial system for segregation of waste at source
- System for primary collection not proper
- Temporary storage is in open site
- Uncontrolled littering
- Mixing up of waste from hospitals and industries
- Community participation is almost absent
- Inadequate trained staff
- Public protest

16.6Potentials

The Municipality currently advocates possibilities of decentralized treatment systems, where in the waste supposed to be treated at its point of origin. This method have the potential of effectively solving the waste treatment problems to a large extent, as majority of the Municipal areas apart from town centres are having vacant lands available in the immediate vicinity of residential units. NGO support can be utilized for organizing residential associations, neighbourhood groups etc. in this regard, not only in elite areas, but in other parts of the town.

16.7 Inference

An elaborate integrated solid and liquid waste management system need to be in place so as to ensure an effective and healthy treatment of wastes generated. Solid waste management is an activity in which public participation is the key to success. It is not the technology alone, but public attitude and behaviour and the efficiency and effectiveness of the systems and practices that determine the success of a solid waste management system. Proper awareness campaigns need to be conducted so that public will realize the necessities of treatment plants in an urban context, thereby reducing the public protest to a large extent.

17 EDUCATION



17.1 Existing Scenario

In Malabar area, educational institutions were established in the last decades of the 19th century and in the early decades of the 20th century. Individuals with the help of government aid raised those institutions. Many Christian missionary schools were also established. In Koyilandy area also, the educational institutions were established in the same period. Govt. LP school, Peruvattoor LP, Puliyancheri South LP and Kuruvangad South LP were established during this period.

According to socio economic survey 2013, 34.21 % of the total populations have secondary level of education and 33.97% are with primary education. Pre-degree and degree level educated people are in the tune of 13.26% and 9.13% respectively. 1.67% of the population are post graduates and 1.17% is professional graduates.

The percentage distribution of educational status pattern is given figure 17.1.

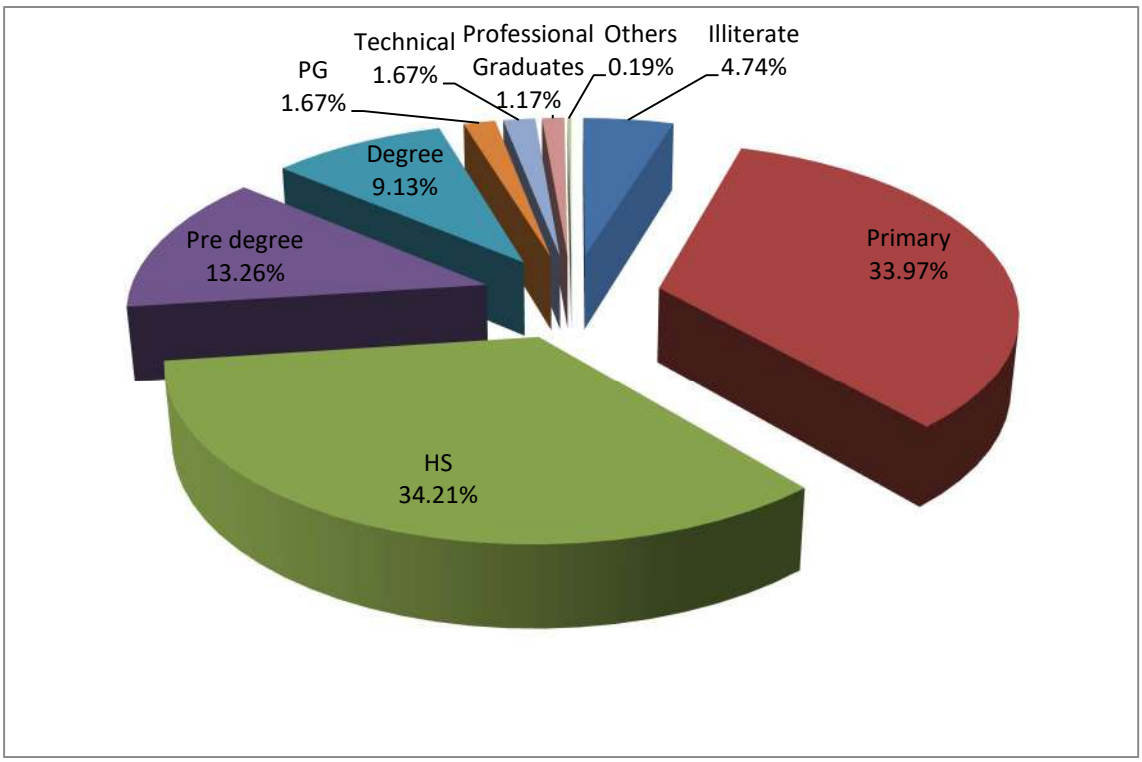


Figure 17-1Educational status
(Source: Socio economic survey 2013)

17.1.1 School Education

The existing schools in the Municipality area are

1. Govt.Boys Vocational Higher Secondary School
2. Govt.Girls Higher Secondary School
3. Govt. Pre primary School
4. Markaz Public school
5. Kuruvangad South UP School
6. Chanayeri Mappila L P School
7. Kothamangalam Govt. U P School.
8. Kothamangalam South L P School.
9. M E S Central School
10. Markaz Khalfan Islamic Centre
11. Markaz public school
12. ICS Secondary School, Koyilandy
13. Jee Cee Montesorie school
14. Peruvattoor L P School
15. Amritha Vidyalayam,Koyilandy
16. Kuruvangadu Central U P School
17. Kavumvattam Mappila UPS Kavumvattam.
18. Kavumvattam UP School.
19. Marathoor Govt.L P School.

20. Govt. Mappila L P School, Panthalayani.
21. Eden school, Koyilandy
22. Indian Public School, Koyilandy
23. Yahiya English School
24. Panthalayani U P School
25. Wisdom Public school, Kollam, Koyilandy
26. Kollam U P School, Kollam, Koyilandy
27. Kollam L P School, Kollam, Koyilandy
28. Puliyancheri South LP school
29. Puliyancheri U P School, Puliyancheri
30. Viyyur L P School, Viyyur
31. Govt. Mappila Vocational Higher Secondary School
32. G R F T H S Koyilandy
33. Govt.Fisheries U P School, Koyilandy.
34. Sri. Guruji Vidyanikethan school
35. Irshad central school
36. Kelappaji Memorial NSS School, Koyilandy.
37. Sri Vedavyasa Vidyanikethan Gurukulam, Koyilandy.
38. Kollam Govt. Mappila L P School
39. Sri Sri Ravi Sankar Vidya Mandir

Out of the 39 schools in the Municipality, 10 schools are under government ownership, 16 are in un-aided and 13 are in aided sector. The percentage distribution of school ownership is shown in figure 17.2

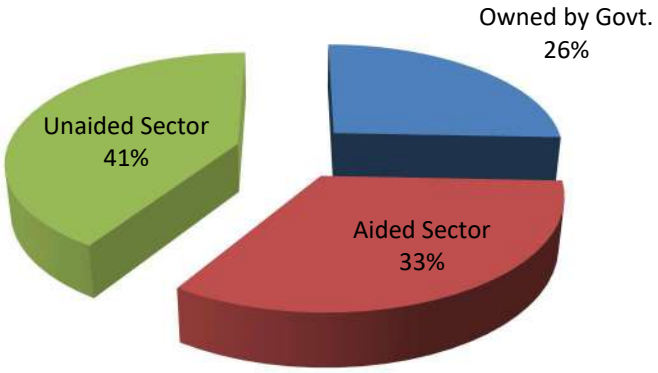


Figure 17-2Nature of ownership of schools in Municipality
(Source Secondary data 2013)

The total number of school students in the Municipality is 14,442 of which 6,481 are studying in govt. owned institutions, 2875 are in aided sector and 5,086 studying in institutions of un aided sector.

Percentage distributions of number of students studying under various sectors of schools are given in Figure 17.3.

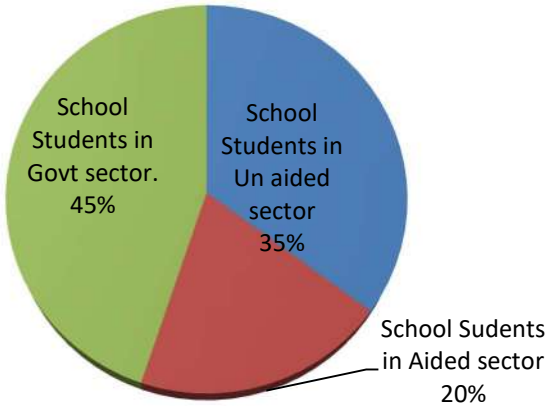


Figure 17-3Percentage distribution of number of students, studying in various types of schools
(Source Secondary data 2013)

17.1.2 Higher and Professional Education

17.1.2.1 Arts and science colleges

There are four arts and science colleges in the Municipality which are under the private sector. They are,

1. R.Sankar Memorial SNDP Yogam college
2. Inshad Arts and Arabic College
3. Arts college, Koyilandy
4. M.G College ,Koyilandy

17.1.2.2 Professional education institutions

The educational institutions under these include

1. Govt.I T I Kothamangalam
2. Govt. Commercial Institute (Korayangadutheru) NH
3. Govt. I T I (SCDD) Kuruvangad
4. Prom Tech ITI
5. National Institute of Medical Technology

17.1.2.3 Other institutions

The other institutions include

1. BSM College
2. Brilliance college
3. G.Tech computer education
4. Global Academy

5. Universal college
6. New Direction Arts & Science college
7. Jayasurya Academy (PSC Coaching centre)
8. College of commerce
9. C.Dit (Centre for Development of Imaging Technology)
10. Sreechakra Centre for Music Studies
11. G.Devarajan Master music academy

Details on number of students, number of teachers and the student-teacher ratio are given in table 17.1. It can be seen that, four schools are exhibiting a ratio higher than 40. Figure 17.4 gives the spatial distribution of educational institutions in the Municipality

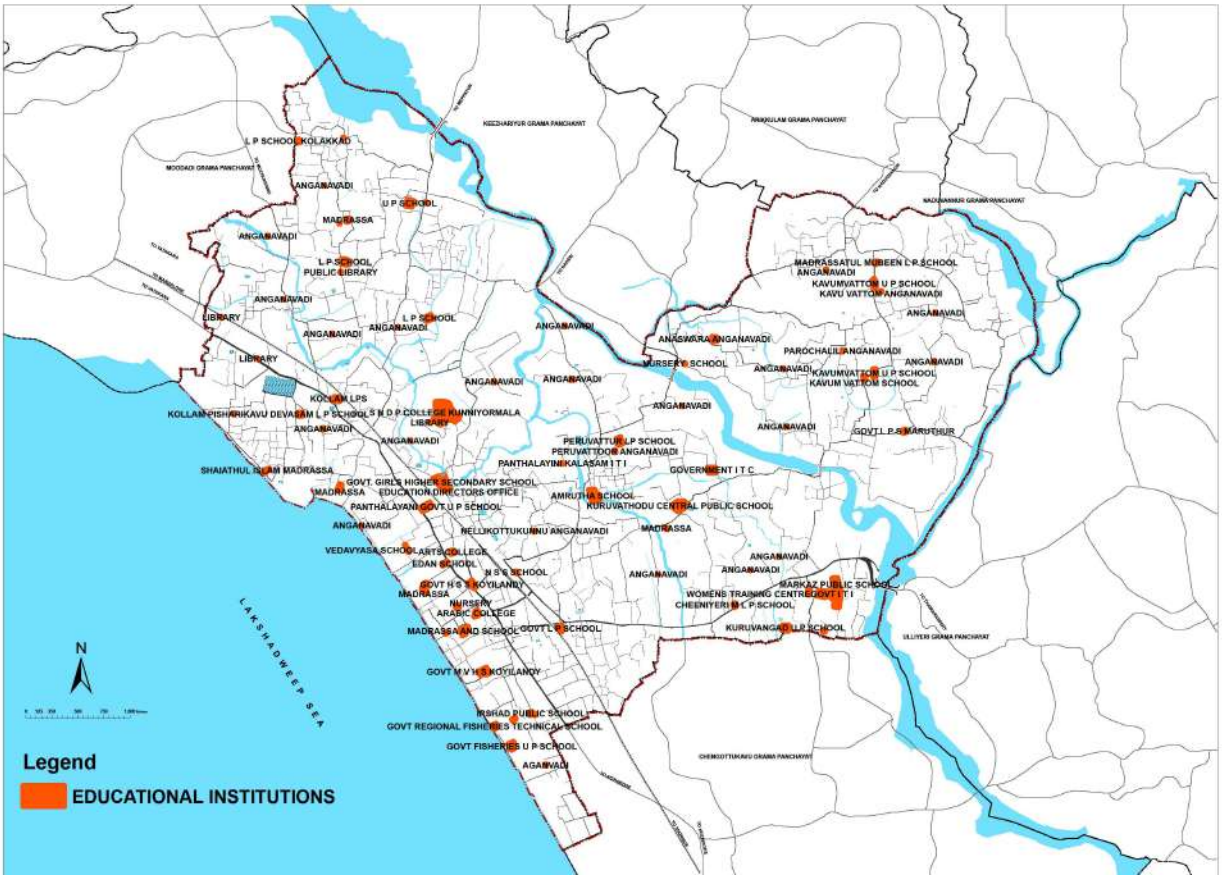


Figure 17-4Spatial distribution of educational institutions in the Municipality

Table 17-1Details on number of students, number of teachers and student-teacher ratio

SL No	School	Category	No of stuents	No of teachers	Students/ Teachers ratio
1	Govt.Boys Vocational Higher Secondary School(2.8Hector), Near stadium (Railway station road)	VHS	162	16	10.13
		Primary(Boys)	57	3	19.00
		High School	905	38	23.82
		Higher Secondary	360	14	25.71
2	Govt.Girls Higher Secondary School, Near Railway station	Primary	419	10	41.90
		High School	1774	46	38.57
		Higher Secondary	480	19	25.26
3	Govt. Preprimary School, Near Railway	Primary	30	1	30.00
4	Markaz Public school, Near ITI Koyilandy	Primary	364	9	40.44
		High School	72	11	6.55
5	Kuruvangadu South UP School	Pre Primary	18	2	9.00
		Primary	194	17	11.41
6	Chanayeri Mappila L P School	Pre Primary	65	5	13.00
7	Kothamangalam Govt. U P School.	Pre Primary	113	1	113.00
		Primary	153	4	38.25
8	Kothamangalam South L P School.	Pre Primary	11	1	11.00
		Primary	40	5	8.00
9	M E S Central School	Pre Primary	59	3	19.67
		Primary	159	15	10.60
10	Markaz Khalfan Islamic Centre	Pre Primary	123	8	15.38
11	Markaz public school	Pre Primary	254	10	25.40
		Primary	234	11	21.27
12	ICS Secondary School,Koyilandy, Police station -Beach road	Primary	178	6	29.67
		High School	583	24	24.29
		Higher Secondary	176	10	17.60
13	Jee Cee Montesorie school, Police station - Beach road	Pre Primary	44	3	14.67
		Primary	78	4	19.50
14	Peruvattur L P School	Pre Primary	194	9	21.56
15	Amritha Vidyalayam,Koyilandy	Pre Primary	190	7	27.14
		Primary	730	28	26.07
		High School	181	7	25.86
		Higher Secondary	15	3	5.00
16	Kuruvangadu Central U P School	Pre Primary	70	2	35.00
		Primary	425	24	17.71
17	Kavumvattam Mappila UPS Kavumvattam.	Pre Primary	54	2	27.00
		Primary	358	19	18.84
18	Kavumvattam UP School.	Pre Primary	32	1	32.00
		Primary	252	14	18.00
19	Marathoor Govt.L P School.	Pre Primary	21	1	21.00
		Primary	72	4	18.00
20	Govt. Mappila L P School,Panthalayani.	Pre Primary	0	0	
		Primary	68	6	11.33
21	Eden school,Koyilandy	Pre Primary	85	2	42.50
		Primary	103	9	11.44
22	Indian Public School,Koyilandy	Pre Primary	49	2	24.50
		Primary	195	9	21.67
23	Ilahiya English School	Pre Primary	122	5	24.40
		Primary	244	12	20.33
24	Panthalayani U P School	Pre Primary			
		Primary	195	15	13.00
25	Wisdom Public school,Kollam,Koyilandy	Pre Primary	35	2	17.50
		Primary	25	4	6.25
26	Kollam U P School,Kollam,Koyilandy	Pre Primary	15	1	15.00
		Primary	220	12	18.33
27	Kollam L P School,Kollam,Koyilandy	Pre Primary	29	2	14.50
		Primary	66	5	13.20
28	Puliyanchery south L P School,Puliyanchery	Pre Primary	44	2	22.00
		Primary	195	10	19.50
29	Puliyanchery U P School,Puliyanchery	Pre Primary	14	2	7.00
		Primary	303	15	20.20
30	Viyyur L P School,Viyyur	Pre Primary			
		Primary	81	4	20.25
31	Govt. Mappila Vocational Higher Secondary School	Pre Primary			
		Primary	378	14	27.00
		High school	538	21	25.62
		VHSS	230	13	17.69
		HSS	365	16	22.81
32	G R F T H S Koyilandy	High school	101	8	12.63
33	Govt.Fisheries U P School,Koyilandy.	Primary	186	12	15.50
34	Sri Guruji Vidyanikethan school	Pre Primary	50	2	25.00
		Primary	112	13	8.62
35	Irshad central school	Pre Primary	58	4	14.50
		Primary	150	10	15.00
36	Kelappaji Memorial NSS School, Koyilandy.	Pre Primary	47	2	23.50
		Primary	75	6	12.50
37	Sri Vedavyasa Vidyanikethan Gurukulam,Koyilandy.	Pre Primary	71	2	35.50
		Primary	126	12	10.50
38	Kollam Govt. Mappila L P School	Pre Primary			
		Primary	69	5	13.80
39	Sri Sri Ravi Sankar Vidya Mandir	Pre Primary	22	2	11.00
		Primary	77	6	12.83

17.2 Comparison with standards

The existing facilities in the educational sector in the Municipality have been compared with the facilities required as per URDPFI guidelines, and is tabulated in table 17.2. It can be seen that, the numbers of high schools and higher secondary schools fall below than that of required as per the URDPFI guidelines. Average distances to facilities from various educational institutions are tabulated in Table 17.3.

Table 17-2Koyilandy Municipality, Comparison with standards

Category	Requirement as per URDPFI guidelines	Existing
Pre Primary School	30	64
Primary School (500 students each)	20	32
High School + Higher Secondary (1000 students each)	10	7
Special Schools (400 students each)	2	0
Colleges (1500 students each)	1	7
Integrated Schools (1-12 std) without hostels (1500 students each)	1	7
Integrated Schools (1-12 std) with hostels (1000 students each)	1	0

Table 17-3Koyilandy Municipality, Average distance to facilities

Average distance to facilities	Pre - Primary School	to LP School	to UP School	to HS School
	1.05 Km	1.13Km	1.29Km	2.36Km

(Source Socio economic survey)

17.3 Comprehensive Educational Rejuvenation Program

The comprehensive educational rejuvenation program is a massive program by the State Government, whereby it has been proposed to rejuvenate around 1000 of schools in Govt. sector to be elevated to International standards. This to include providing high tech facilities to all class rooms from 9 to 12, developing standards 1 to 8 in tune with the times by engaging the teachers, parents and alumni to recapture the relevance of public schools in general. Special packages will be introduced for renovation of schools which have completed 50 and 100 years. Also more focus and encouragements will be given for English learning.

The activities with regards to the mission in Koyilandy town are at its early stages.

17.4 Problems and Potentials

The educational sector faces the following problems

- One College is sanctioned under Agricultural University, and a regional centre of Sanskrit university is also allotted to Koyilandy. However, these institutions are functioning in the nearby panchayat due to non-availability of land under public ownership within the Municipality for the purpose.
- There are no Government Arts and Science Colleges in the plan area.
- In schools under govt. ownership 100% schools have connectivity to motor able roads and water availability. 47% of the schools have play grounds, 73% have separate toilets for girls and 87% have computer labs.

17.5 Inference

Higher education facilities in the Municipality need to be improved further in order to meet the requirements stipulated. The infrastructure facilities in the educational institutions owned by the government are calling for further improvements. However, in general the status of educational institutions in the planning area registers a relatively satisfactory picture altogether.



18 HEALTH

18.1 Existing Development Scenario

The existing taluk hospital has been established in 1921 under the Madras District Board. The existing institutions and details under this sector are given in Table 18.1, 18.2 and 18.3.

18.2 Diseases

Koyilandy had high rate of filariasis, a condition caused by mosquito-borne parasite leading to extreme swelling of the legs. The Municipality had been rated to be second to Cherthala, in the number of filaria patients reported in Kerala. According to a survey conducted in 1993 by WHO, 1,400 to 1,500 persons (about 2% of the population) suffers from filaria and another 4% (2,800 to 3,000) are carriers. Malaria, Japanese encephalitis, Acute Bronchitis and Acute Rheumatism are also noticed in this municipality. Municipality introduced programs for clean Koyilandy, anti-mosquito campaign etc. to reduce the problem. Now the epidemic rate is low when compared to the previous years. The epidemic rate in the recent years is shown in Table 18.4.

Table 18-1Details of allopathic hospitals in Koyilandy

Name of Hospital	Location	Category	No. of beds	No. of Doctors	Ownership
Govt.Taluk Head Quarters Hospital	Opposite stadium - NH	4	188	18	Govt.
Co-operative Hospital, Koyilandy	Near NH	2	20	6	Co-operative
Saradha Hospital	Near LIC Office	2	16	1	Private
M M Hospital Koyilandy	Railway station road	3	13	2	Private
Santhi Physiotheraphy	Near LIC Office	2	5	2	Private
Koyilandy Dental Hospital	New bus stand	1	_	1	Private
Hygeia Dental Clinic	Old Bus stand Building	1	_	2	Private
Orbit Dental Clinic	Near court-NH	1	_	2	Private
Rakesh Hospital Koyilandy	Bappangadu gate - NH	1	-	2	Private
Lakshmi Dental Hospital	Police station-Beach road	1	_	1	Private
Govt.Health Sub Centre	Kuruvangad	2	_	_	Govt.
Family Welfare centre , Naderi	Thettikunnu	1	_	1	Govt.
Unity Dental clinic	Near SBI - NH	1	_	_	Private
Aswini Hospital, Kollam, Koyilandy	NH-Kollam	1	_	1	Private
Govt.Health Sub Centre , Puliyancheri	Puliyancheri-Ellathuthazha	2	_	_	Govt.
Signature Cosmetic Dental Clinic, Kollam	Kollam Railway gate	1	_	1	Private

Category 1 – Clinics only OP	Category 4 – Hospitals with more than one OT
Category 2– Hospitals with 24 hrs service	Category 5 – Hospitals with advanced diagnostic facilities like CT scan, EEG
Category 3 – Hospitals with single Operation theatre [Specify no. of operation theatres and category i.e. major/minor]	Category 6 – Super specialty hospitals
	Category 7 – Referral Hospital (Govt. Sector)

(Source: Primary Survey 2012)

Table 18-2Details of homeo hospitals in Koyilandy

Name of Hospital	Location	No. of beds	No. of Doctors	Ownership
Dr.Mohan's Homeo clinic	Old bus stand	_	1	Private
Govt.Taluk Homeo Hospital,	Panthalayani	25	4	Govt.
MINHANS Multi-Specialty Homeopathic Clinic and Research Center.	Markaz Building, Near New Bus Stand	-	3	Private

(Source: Primary Survey 2012)

Table 18-3Details of Ayruvedic hospitals in Koyilandy

Name of Hospital	Location	No. of beds	No .of Doctors	Ownership
Sakalya Ayurvedic Hospital	Near Municipal office	11	4	Private
Nithyananda Marma Ayurveda Hospital	Near Kothamangalam Hospital	30	3	Private
Perachakutty Smaraka Chikilsalayam	Gurukulam road-Near NH	10	1	Private
(National Rural Health Mission) Ayurveda Dispensary	Near Puliyancheri road	_	1	Govt.

(Source: Primary Survey 2012)

Table 18-4Details of epidemics in Koyilandy Municipality

Name of the disease	Number of persons affected			% of Curing		
	2008	2009	2010	2008	2009	2010
Cholera	0	0	0	0	0	0
Typhoid	4	4	17	100	100	100
Jaundice	32	44	118	100	100	100
Diarrhoea	839	941	894	100	100	100

(Source DMO Kozhikode)

Malabar Medical College, Modakkallur Kozhikode, is the multi speciality hospital situated nearest to Koyilandy Town and is situated at a distance of 13 km. People of Koyilandy also seek service from various multi speciality hospitals under private and public sector located in Kozhikode and Vadakara Towns which include Kozhikode Govt. Medical College, Co operative hospital Vadakara, Baby Memorial Hospital Kozhikode, MIMS Hospital Kozhikode etc.

In patient/ Outpatient details of two major hospitals of the town are as given in table 18.5. It can be seen that, the number of outpatients got increased during the year 2013 to 2016 in both the hospitals.

Table 18-5Details of IP/OP patients in two major hospitals in Koyilandy town

Co Operative Hospital, Koyilandy		
Year	No. of IP	No. of OP
2013-2014	952	63,000
2014-2015	850	66,100
2015-2016	870	75,083
Koyilandy Govt. Taluk Hospital		
2013-2014	56,178	5,67,707
2014-2015	45,067	5,77,909
2015-2016	45,410	6,05,863

(Source: Direct enquiry)

18.3Aardram mission

AARDRAM mission, Govt. of Kerala mission, aims at creating "People Friendly" Health Delivery System in the state, based on a need based approach treating every patient with 'dignity'. It is proposed to introduce latest facilities and health care amenities through which, all Primary Health Centers are to be transformed in to into Family Health Centres as a first level Health delivery point. The mission envisages ensuring quality care in Primary Health Centres. The services to include web based appointment system, virtual queues, patient reception at registration centres, waiting rooms with Wi-Fi facilities and so on. The objectives of Aardram include

1. Transform PHCs into FHCs
2. Avail the best service of the best doctors and Para medical staff
3. Reform out-patient management procedures with state-of-the-art facilities
4. Facilitate with hygienic and spacious wards, rooms, beds and toilets
5. Avail Life Saving Medicines from the hospital concerned on moderate rates

The Government aims at making public health care institutions especially government hospitals at primary, secondary and tertiary care sector, people friendly by improving their basic infrastructure. The focus would be on ensuring availability of medical check-up and other investigations at the out-patient and in-patient wings.

In Koyilandy the overall up gradation and enhancement of the Govt. Taluk hospital has been envisaged through this mission.

18.4Problems and potentials

– No super specialty hospitals functioning in the planning area.

- There are no hospitals available in the planning area that has advanced diagnostic facilities such as CT scanning, ECG diagnostic facilities etc.
- Only one hospital in private sector is having operation theatre facility.
- Waste management in Govt. Taluk Hospital faces problems.
- 50% of the biomedical waste reaches the Municipal streams
- Infrastructure facilities inadequate

Physical and infrastructure development in Govt. Taluk Hospital will improve the health sector in Koyilandy. The Mother and Child hospital may be shifted as a separate unit. Land is available for this purpose within the Municipality. Ayurveda dispensary can be enhanced further to become an Ayurveda Hospital.

18.5 Inference

Although health care is an important service sector to be properly attended, the Municipality faces acute shortages in health care infrastructure in all categories of medical science branches. The town is yet to have a multi-specialty hospital at its service. Bio medical waste disposal systems are not up to the mark and need to be revamped. Infrastructure facilities especially in Govt. Taluk hospital need to be improved further. Considering the increase in the population share of the elderly by the end of plan period, it is also important to develop adequate health infrastructure such as geriatric care centers and palliative care units throughout the planning area.



19 ENVIRONMENT

19.1 Physical Environment

19.1.1 Land and topography

As explained in Chapter 3, on the basis of the physical and geographic features, the Municipal area can be classified into High Land (Manjaladkunnu, Areekunnu, Kuniyoramala, and hilly areas of Nateri region falls in the category), Middle Land (Kuruvangad, Kothamangalam, Viyoor areas falls in this category). Soil texture is clay/ loamy clay/ sandy clay/ silty clay type with moderate to high productivity range (Source: Natural resources and environmental atlas of Kerala, Center for earth science studies). sandy and red earth. Water is available at 3m from G.L at this area and Coastal Area. Town is having 8.25 km of coastal strip. Town is at a level of 1.5m above mean Sea Level and the soil is sandy in nature. Major rock type seen is composite gneiss. Bands of charnockite are found in the north western corner close to the peninsular side. Laterite formation is prominent towards the eastern side of the Municipality. The hilly portion is covered with pebbly gravelly laterite soil and hard ferricrete as cap rock in patches. Clayey

soil, rich in organic matter, is seen in the low-lying areas. The coastal zone is covered with sand and sandy clay soil. In general, soil is fertile and is suitable for all types of cultivation.

19.1.2 Wetlands and Mangroves

The wet lands are seen along the banks of Akalapuzha and in the eastern part of the Municipality. Rapid development interventions in the form of construction of houses, building of infrastructure, reclamation of wetlands particularly mangrove along the banks of Akalapuzha etc. are adversely affecting the environment.

Mangrove vegetation is relatively abundant in the region especially on the banks of Chittaripuzha and Akalapuzha. The area occupied by mangrove vegetation is 0.16 km^2, and is at the tune of 0.53% of the total Municipal area. Dominant Mangroves include species like – Avicenna officinal is, Bruguiera gymnorrhiza, Exoecariaagallocha, Kandeliacandel, Acanthus ilicifolius and Aegicerascorniculatum. (Upooti, Pranthankanni, KaayalKandal, Pookandal, Chakkarakandal, Kannampotti, Ayaba, Puzhayuli, Pichalakandal). High population density on the coast has reduced the coastal vegetation. Koyilandy Municipal wards 4,8,9,13,16,18,19,21,24,25,26,27 have mangroves. Anelakkadavu area, which falls in ward number 19, has the highest concentration of mangroves and the whole river stretch is favourable for mangrove growth.

19.1.3 Sacred groves

As per the primary survey there are about 6.06 acres of land in the category of sacred groves (Kavu). Major trees are Njaval, Kanjiram, Nelli, Aal, Kunni, Pana, Poovam, Manjadi, Pine, Kottamaram, Ayaniplavu, Chooral, Chandanam and Mahagani. About 48% of the sacred grooves are under private ownership and hence at the risk of destruction. Mangroves and sacred groves in the municipal area are listed in Table 19.1.

19.1.4 Coastal lands

The coastal zone of Koyilandy Municipality has both sandy and narrow beaches and lateritic head lands. Most of the sandy shoreline is protected by sea walls. Land near shore area is generally rocky and muddy. The high density of population along the coastal stretch exerts severe development pressure on land. The settlements along the coast are too close to the sea, strong waves can cause loss of life and property. Six small streams (thodu) flow into the sea in this coastal stretch. During monsoons, sea enters the land area through these streams and cause active erosion along their banks. Tsunami waves that struck India in December 26, 2004 had hit this region with a run up of 8 m, but no loss of life or property occurred. Most of the coastal stretch is protected with sea wall. The coast at Chungam area experiences severe erosion.

Table 19-1Details of Mangroves and sacred groves in Koyilandy Municipal area

Sl No	Name and Type	Area	Species Wise Flora (major)
1	Mangrove park 3.5 km on the banks of Anela puzha	23 cents	NA
2	Nagareswaram kavu, Kollam	13 cents	Njaval, Kanjiram, Nelli
3	Pisharikavu, Kollam	1 acre 80 cents	Kanjiram, Aal
4	Naagathankotta, Kurichikkara	18 cents	Kanjiram,Kumkumam
5	Naagamullakandi, Kurichikkara	7 cents	Kunni, Kanjiram
6	Vengolikaavu, Kurichikkara	13 cents	Naagamaram,pana,kottamaram
7	Naagakaavu, Moozhikkamethal	7 cents	Eranji, pana
8	Veliyannur, Kavumvattam	3 cents	Kaanjiram,Eranji
9	Paarochaalil,Kuthirakutta	2 cents	Kaanjiram,pana,eranji
10	Kuthirakuttakaavu, Kuthirakutta	2 cents	Eranji
11	Keezhattupurathu,Kaavumvattam	10 cents	Naagamaram,Eranji
12	Maariyamma,Kuruvangad	1.5 cents	Aal,eranji
13	Padinjaaredathukaavu, South Kuruvangad	35 cents	Kanjiram, Aal
14	Chetyattuvayalkuni, Kuruvangad	5 cents	Aal, Elanji
15	Anelakadavukaavu,Kuruvangad	5 cents	Elanji, Poovam
16	Muthappan Kaavu Bhagavathi Kaavu,Kuruvangad	15 cents	Manjadi,Aal,Kanjiram
17	Naalupurakkal naagakali kavu, Naalupurakkal	50 cents	Kanjiram, Manjadi
18	Kaanothkaavu,Peruvattur	10 cents	Pine, Aal
19	Nabratthukuttiaavu,Peruvattur	14 cents	Aal, Pana
20	Puthiyakaavil naaga kavu, Anela Road	25 cents	Kanjiram, Elanji
21	Shree Kolarambathu Devi Kshethram Kaavu	10 cents	Kanjiram
22	Kanmalaillam Kaavu, Kanmanathaazham	5 cents	Ayaniplaavu,Pine,Chooral
23	Naagakaali Kaavu,Narimukku	30 cents	Aal, Kanjiram
24	Kaiprathukaavu, Kothamangalam	30 cent	Kanjiram,Elanji,Mahagani,Manjadi
25	Naduvilerikaavu, Kothamangalam	24 cents	Pana, Manjadi
26	Kandothukaavu,Kothamangalam	10 cent	Ayani,pine,manjadi
27	Naagakottakaavu, Muthiraparamba	10 cents	Kaanjiram,pine
28	Vazheandiyilkaavu, Maruthur	5 cents	Kaanjiram,Poovam
29	Kaaliyarambathukaavu	50 cents	Kaanjiram,Elanji,pine,Chandanam

(Source: Koyilandy Municipality)

19.1.5 Water bodies

The sandy ridges in the coastal zone and lateritic formations are good aquifers and are tapped using open wells. However, scarcity of drinking water during summer is

appreciable due to saline water intrusion along the coastal stretch and river banks, especially in levy formations of River Akalapuzha. The water from open wells in the valley formations is turbid, especially in summer due to clayey intercalations in the aquifer. River water is mostly saline and is not potable in all seasons. Akalapuzha, the main tributary of Korapuzha is flowing along the north eastern boundary of the town. It originates from the Kodiyanadumala at the elevation of 2300 ft above MSL. It also forms a part of the important west coast inland navigation system. The Municipality has 68 ponds to collect rainwater and provide cushion for flood water. This also facilitates recharge of groundwater and subsurface flushing.

Details of ponds in the Municipal area are described in table 7.5 and table 7.6 in chapter 7 (land use and built-up density).

19.2 Pollution Aspects

19.2.1 Water Pollution

Most of the ponds are poorly maintained, silted and subjected to eutrophication. The town has two major drainage systems namely Vayanarithodu and Valiyathodu and two minor drainage systems namely Cheriyathodu and Kulamthodu. The Vayanarithodu, a natural drain on the eastern side of the railway track, gather water from the northern and western side of the new Bus Station, a low lying area, through a network of drains. This drainage network receives waste water from hotels, commercial establishments and comfort station of the bus station. It is the largest drainage network of the Municipality responsible for the drainage of south-eastern portion of the Municipality to river Akalapuzha at various points. The network is not very effective now due to blockage at various points and poor contiguity as a result of encroachment, constructions due to bank failure, siltation due to poor maintenance and clogging due to solid waste dumping.

Agriculture, coir retting, wood stacking, timber sale and sawing are activities of the people living along the riverbanks. It also pollutes the surface water body. Husk retting and coir making along the banks of Akalapuzha pollutes the river water due to discharge of hazardous dyes and bleaching agents. The increased interventions in the river banks and beach front and the destructive activities have resulted in the loss of vast stretches of mangroves. The water pollution due to coir retting, increased presence of motor boats, waste discharge from urban area etc. has adversely affected the aquatic habitat.

The water in Akalapuzha is marginally polluted as indicated by low DO and presence of sulphide due to retting activity. This will cause large scale depletion of living resources such as plankton and nekton in due course.

The clearing of mangroves along the banks of Akalapuzha adversely affects the stability of the riverbanks. It also replaces or depletes the specially adapted flora & fauna and degrades the habitat. It may lead to invasion of weeds, increased growth of pest and pathogenic organism and reduces water cleansing property.

19.2.2 Air Pollution

The quality of the air is affected mainly from the emissions from vehicles. These aspects are mainly predominant in the CBD area of the Municipality.

19.2.3 Noise Pollution

Noise pollution is more in the CBD area and also prominent in places were regular public gathering happens.

19.3 Environmentally/ Ecologically Fragile Locations

The environmentally and ecologically fragile areas, requiring special attention for protection in the Municipality are shown in Figure 19.1.



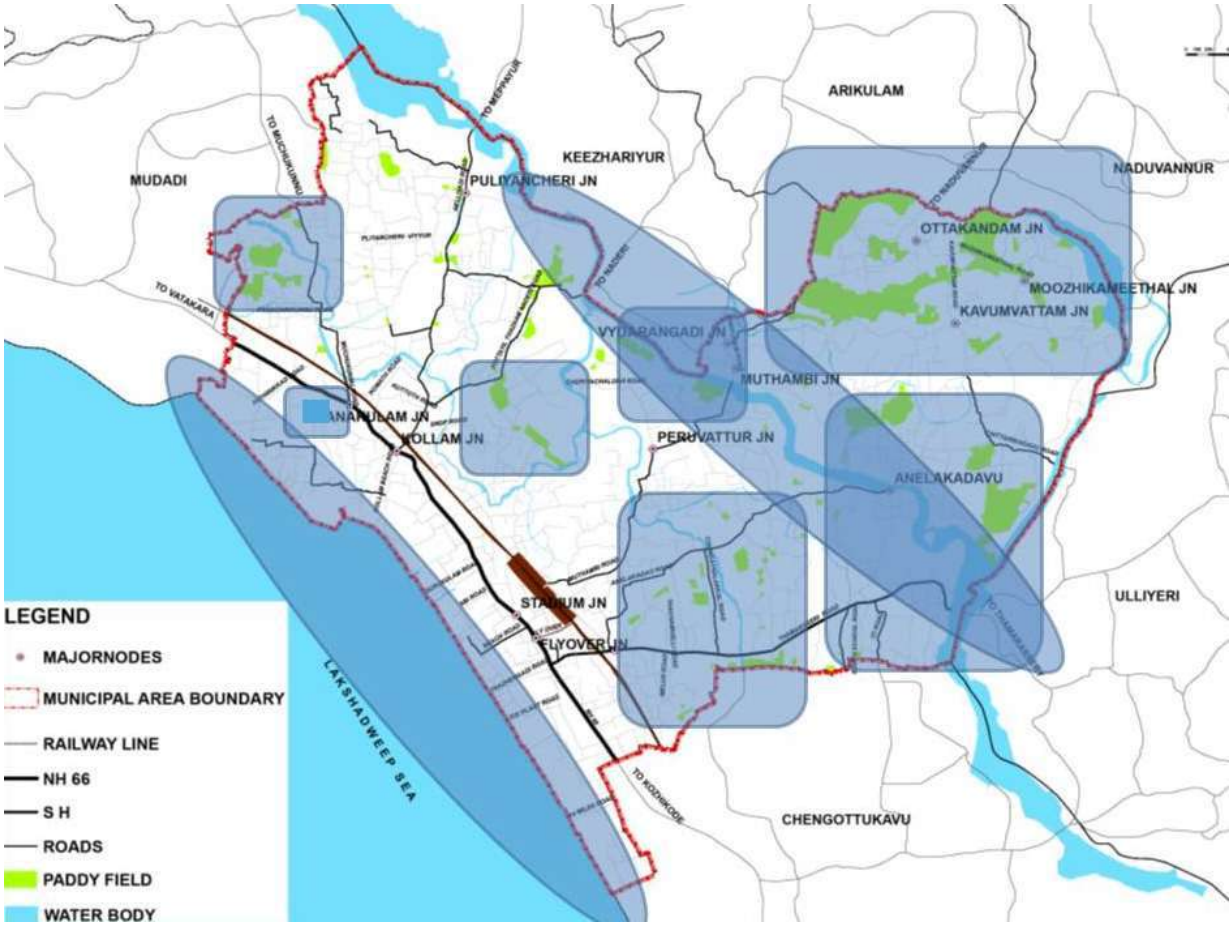


Figure 19-1Environmentally/ ecologically fragile areas
(Source: Existing land use survey 2013)

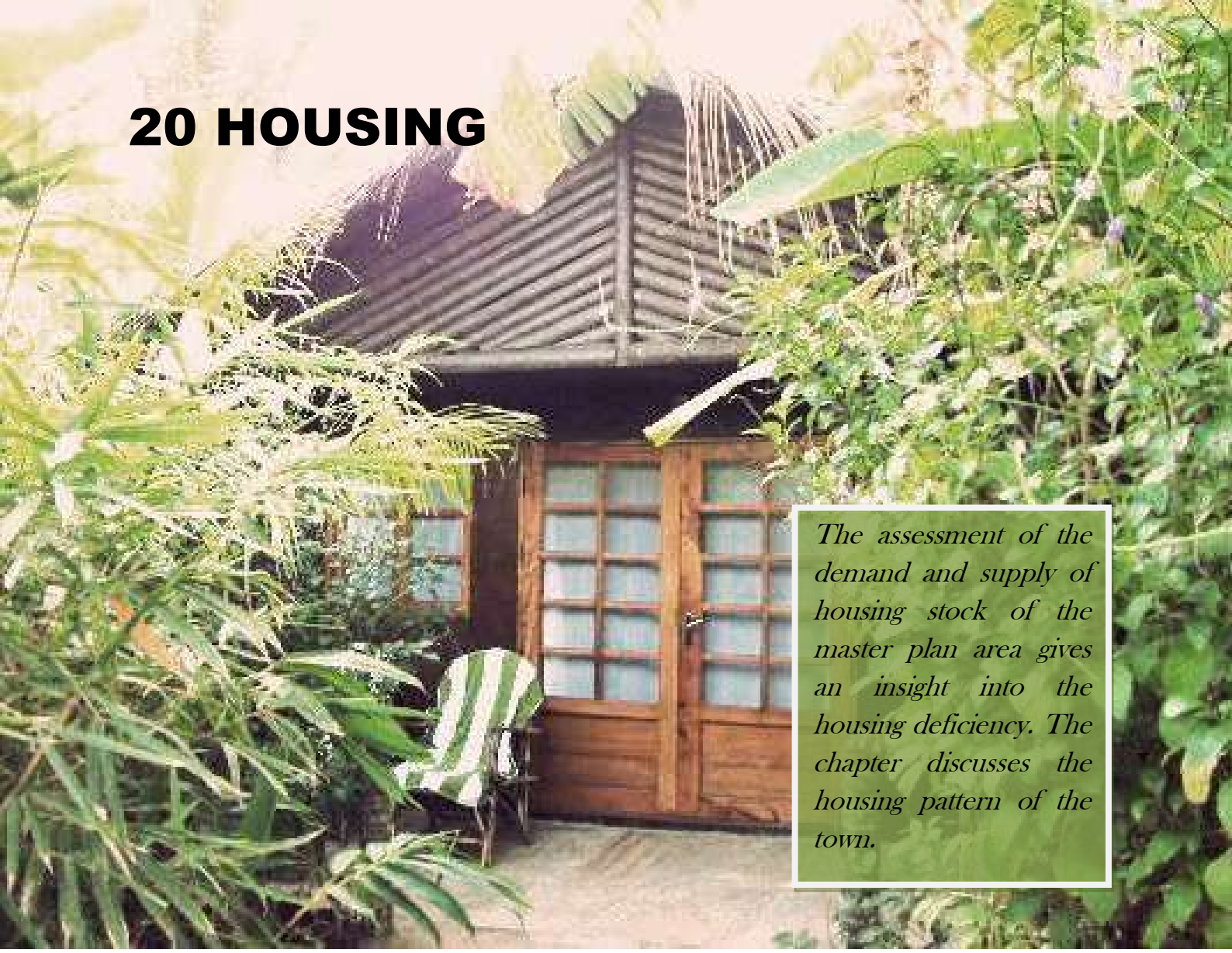
19.4Problems and potential

Municipality yet keeps its tranquil nature of environmental factors and still are within the limits of its restoration capabilities, although the development pressure has started to decay out the environmental serenity of the area. Pollution of water bodies from various sources, filling up of wetlands etc. posing threats to the environment and need to be tackled with due importance.

19.5Inference

The bacteriological contamination of water bodies, both surface and ground, is indicative of poor sanitation conditions. Though the household latrine coverage is about 90%; the use of single-leach pit latrine leads to direct disposal of sewage into the groundwater aquifer, especially in the coastal zone where the porosity and permeability is high. Biological protection measures to the extent possible have to be adopted for protecting the natural streams and river banks in the Municipality. More vigil has to be exercised to conserve the existing mangrove belt. Mangroves or other coastal vegetation has to be popularized all along the coastal stretch and river banks for the protection of the zone based on a master plan and with active participation of people.

20 HOUSING



The assessment of the demand and supply of housing stock of the master plan area gives an insight into the housing deficiency. The chapter discusses the housing pattern of the town.

20.1 Existing Housing Condition

Residential areas are located over almost all parts of the town. About 57% of the total developed area is under residential use. Coastal area of the town is thickly populated compared to the eastern part. Non-residential uses are comparatively meagre in this part. As per the survey done in 2012, there are about 10,950 houses in the Municipality. The typology of houses in the town is given in Figure 20.1. As per the figure, 62% of the houses are Pucca houses. Still there are 10% of houses which are Kutcha. Housing finance is provided by agencies like HUDCO, LIC etc. The percentage variation in various quality elements of the houses in the Municipality is illustrated in figure 20.2, 20.3 and 20.4. Accordingly, majority of the houses are with ordinary tiles and cement flooring, walls are made up of bricks with plastered finish and with concrete roofing.

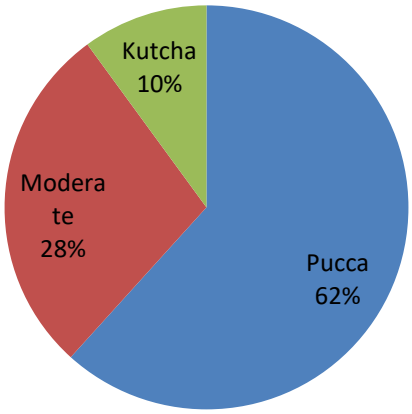


Figure 20-1Typology of houses
(Source: socio economic survey 2013)

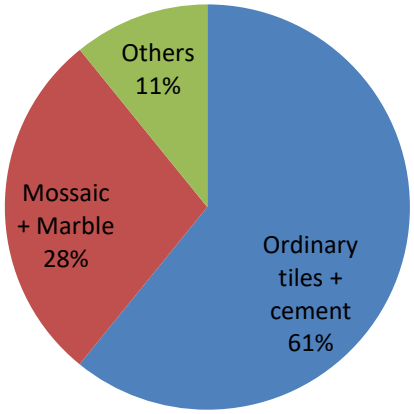


Figure 20-2Percentage Variation for different types of floor
(Source: socio economic survey 2013)

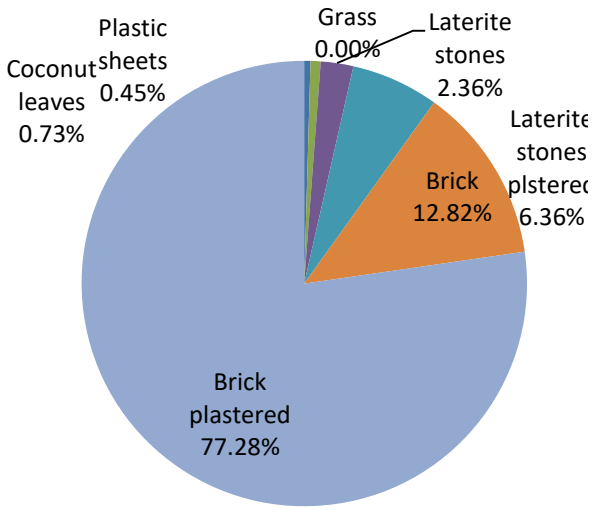


Figure 20-3Percentage Variation for different types of wall
(Source: socio economic survey 2013)

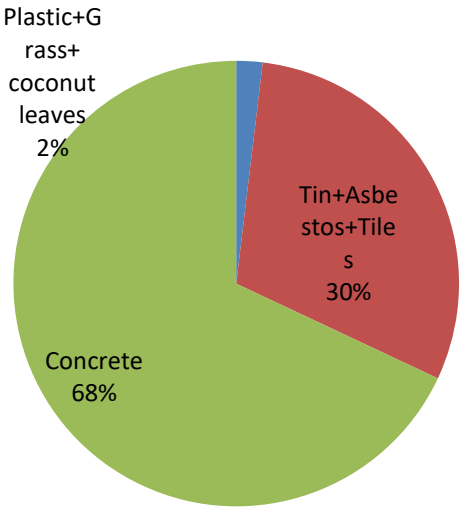


Figure 20-4Percentage Variation for different types of roof
(Source: socio economic survey 2013)

20.2Slums and other sub standard housing

According to the survey done by municipality there are 124 slum clusters in Koyilandy Municipality. The sources of water in these areas are public tap, open well and bore well. Pit latrines, leach pits are used for sanitary waste disposal. Street lights are partially provided in these slums. Among the 124 clusters, the main ones are shown in Figure 20.1. In addition, the presence of beggars, though in a very small number, was observed during primary survey especially near the bus stand area.

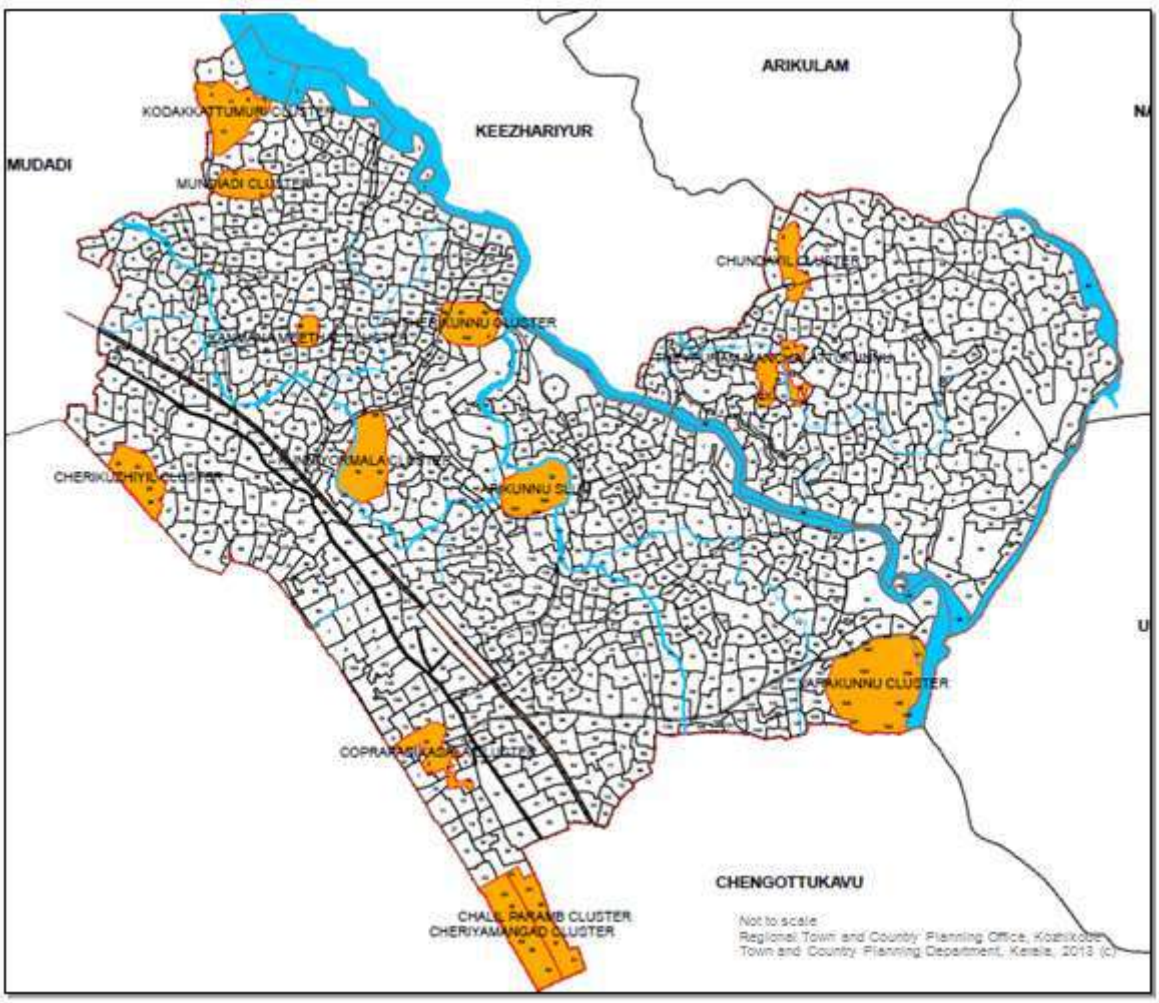


Figure 20-5Major slums settlements in Koyilandy Municipality
(Source: Koyilandy Municipality)

20.3Slum Improvement Programmes

20.3.1 Integrated housing and slum development programme (IHSDP)

IHSDP is a centrally sponsored scheme formulated by Ministry of Urban Employment and Poverty Alleviation, Government of India that aims at up gradation of the housing and infrastructure facilities of slum dwellers and the improvement of their socio-economic status. 13 slums are selected in the first phase of the scheme. Details of the slum clusters included in the first phase are given in Table 20.1 below. Accordingly the scheme covers a total of 1220 households spread across 14.414 hectares, covering a total population of 3216.

Also, during the first phase, the scheme proposes the construction of 284 numbers of new houses, 151 numbers of up gradation of existing houses, installation of 150 units of street lights, 16 numbers of roads and footpaths and 1 solid waste disposal unit. Out of the 284 numbers of sanctioned new houses, the works of 198 numbers of houses have been completed, and the works of 63 numbers are under progress. Works of 17 units are curtailed and 6 beneficiaries had withdrawn from the project in total. In up gradation

scheme of the total 151 sanctioned, 146 are completed, and the works of 5 units were curtailed. The fund flow pattern of the scheme from different sources is given in table 20.2.

Table 20-1Details of clusters included in IHSDP phase one program

Sl.No	Name of Cluster	Area (in Ha)	Population	Total No of families	No of BPL families	% of BPL families	SC Population	ST population
1	Cherikuzhiyil	1.26	162	40	37	92	0	0
2	Kodakkattum muri	1.733	252	60	50	83	40	0
3	Mundiyadi	1.457	176	45	24	53	176	5
4	Kanamana Meethal	0.534	210	46	46	100	70	0
5	Pootheri kunnummal	0.68	75	21	21	100	24	0
6	Kunniyoramala	1.3	494	153	148	97	61	0
7	Areekunnu	0.43	78	24	22	92	8	
8	Theyipuram-manhalattu	0.67	269	67	66	99	35	0
9	Chundayil	0.52	227	62	62	100	8	0
10	Varakunnu	2.65	301	72	66	92	43	0
11	Cheriyamangad	0.96	607	152	149	98	0	0
12	Chalilparamba	1.5	200	34	34	100	0	0
13	Koprapandikasala	0.72	165	43	40	93	0	0
TOTAL		14.414	3216	819	765	1199	465	5

(Source IHSDP Survey)

Table 20-2Table 20.2 Fund flow pattern of IHSDP scheme

Sl.No	Source of Fund	Amount in (Rs)
1	Govt. Of India Grand	2,46,62,400
2	State Share	16,12,500
3	ULB share	16,12,500
4	Beneficiary contribution	29,23,100
Total		**3,01,80,500**

As per IHSDP Survey 2006, it can be seen that, SC 14.46% of the population in these 13 slums considered belong to Scheduled Caste and 0.16% belongs to Scheduled Tribe categories as illustrated in Figure 20.2. Also 93% of the families fall under BPL category, illustrated in Figure-20.3.

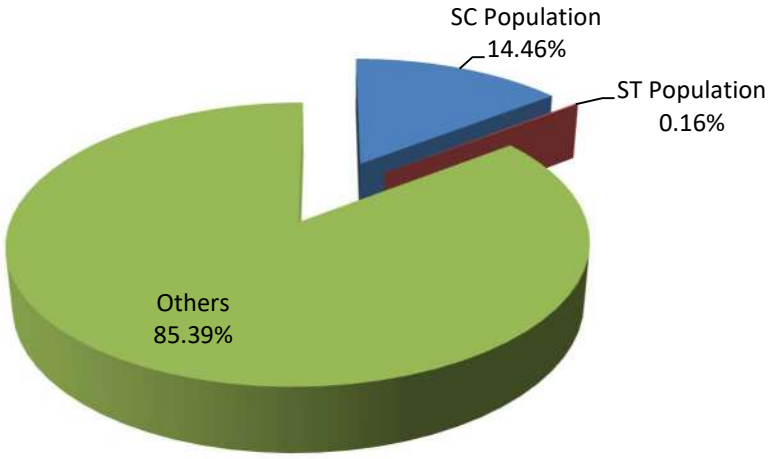


Figure 20-6Details of SC/ST categories of people in slums selected for IHSDP program
(Source IHSDP Survey)

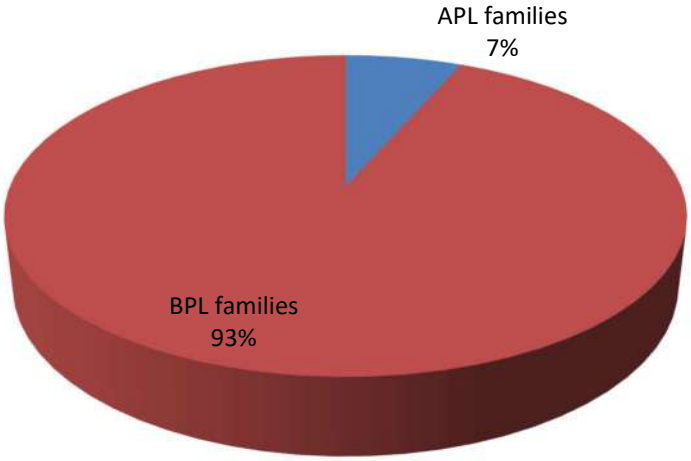


Figure 20-7Details of SC/ST categories of people in slums selected for IHSDP program
(Source IHSDP Survey)

Also, the town has got large scale presence of labourers from other states, and ensuring the proper accommodation for this group of people is getting slowly in to an un-healthy situation. Currently these persons look for and find shelters in cheaply available locations and are spread throughout the Municipal area. Sanitation facilities are getting inefficient due to the overcrowding of the people in their place of stay. These often cause health hazards to the inhabitants and the nearby public.

20.4Housing Shortage

The housing shortage is worked out by adding the difference between the number of households and number of houses with the number of houses that need replacement. So, the present and the projected housing shortage are worked out. Considering the service life of a normal residential building to be 40 years, it is presumed that 25% of the housing stock shall need replacement in a decade.

Table 20-3Housing shortage, existing and projected

Year	Difference between houses and households	Replacement	Shortage
2011	5247	2738	7985
2021	5387	2810	8197
2031	5518	2879	8397

From the table it can be seen that currently there is a shortage of 7985 numbers of housing units, which is projected to rise to a value of 8397 in 2031, considering an increase in number of households, and number of houses similar to the anticipated population increase rate.

20.5Life Mission

Life mission is massive housing mission envisaged by the Govt. of Kerala, in order to provide quality housing to houseless, land less people. Housing complexes are proposed and it is estimated to rehabilitate around 2 lakhs of people within a spell of 5 years. The mission also emphasis on financial empowerment and providing livelihood for the people concerned.

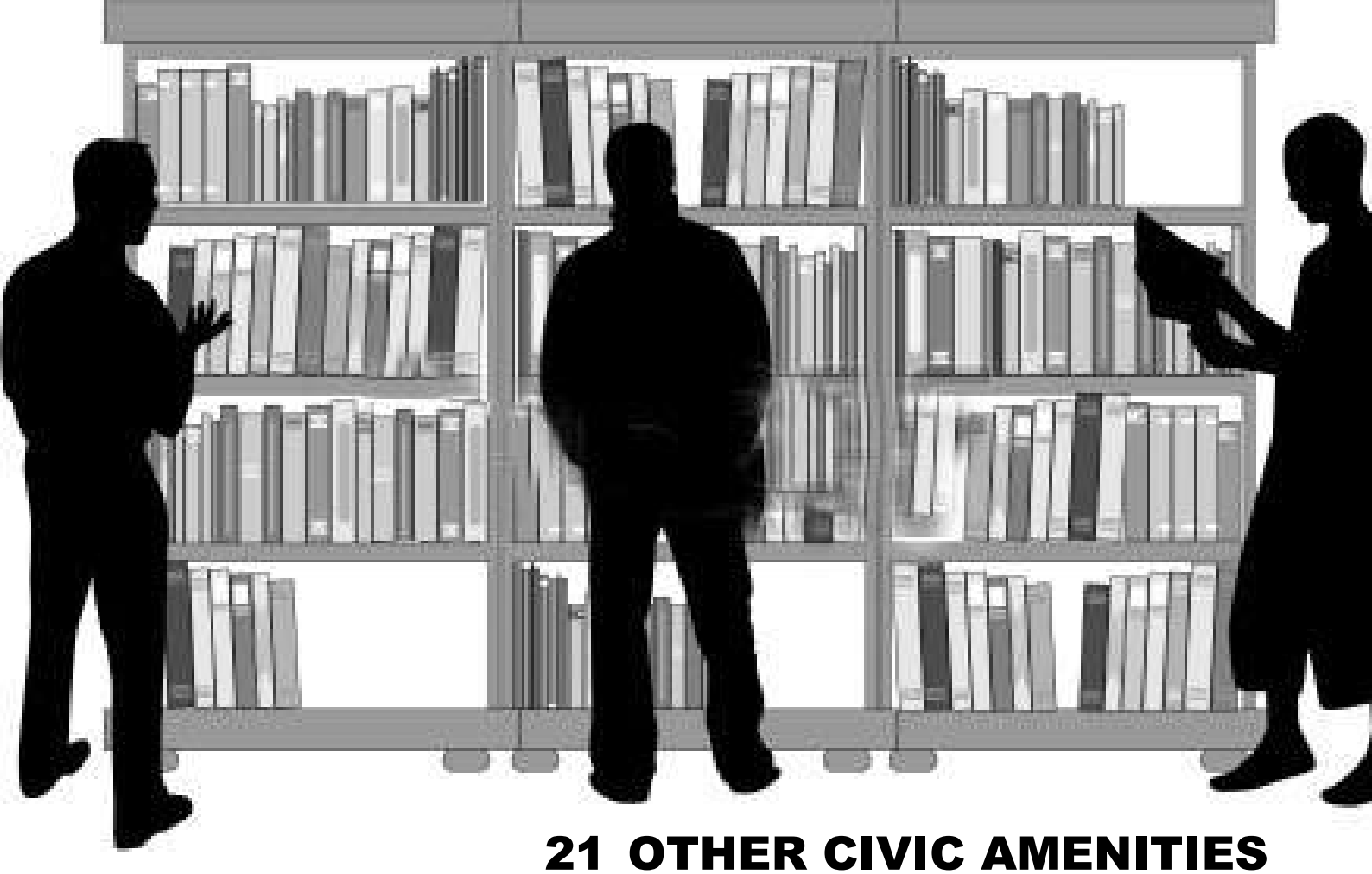
In Koyilandy, the detailed survey of beneficiaries proposed to be covered by the scheme has been completed. The further proceedings of the mission have been affected due to the final allocation of suitable land for the project.

20.6Problems and potentials

The housing shortage figure of 7985 units is an alarming figure which requires elaborate planned intervention to cope up with. Providing proper affordable housing for the large number of workers from other states is becoming another prominent issue in Koyilandy Town as well. Besides, the relatively lesser dense premises in majority of the portions of the Municipality allows better potential for provision of more affordable housing schemes.

20.7Inference

The Integrated Housing and Slum Development Program (IHSDP) is the major program in the Municipality which addresses the housing problems of the area. However large scale in migration of casual labourers from other states makes programs on affordable housing to be the need of the time. Exact number, duration of stay at one particular location of these floating population need to be surveyed by suitable agencies and their housing requirements need to be addressed giving utmost importance. It is also to be ensured that the beggars in the planning area are rehabilitated and provided with livelihood opportunities.



21 OTHER CIVIC AMENITIES

21.1 Community Halls

There are seven community halls in the Municipality. The details of the community halls are given in Table 21.1.

21.2 Reading Rooms and Libraries

The details of public libraries and reading rooms in the Municipality are given in Table 21.2.

21.3 Crematoria and Burial Grounds

There is no public crematorium in the Municipality; the existing crematoriums are under religious ownership.

21.4 Parks and Play Grounds

The number of organized recreation space in the town is minimal. One children's park has recently got functional in the Kollam area near the Kollam Chira. The only space available for organized games and sports is the Sports Council Stadium. The Municipality is having a large extent of beach front which can be developed further with proper recreational amenities.

21.5Others

The other civic facilities inside the Municipalities include three cinemas, one heritage museum and a police station. Proposals are on for starting up one fire station within the town area, on rented premises.

Table 21-1Details of community hall

Name of the Hall	Location	Capacity
Town hall	Ward 18	500 persons
Kodakkattumuri Community Hall	Ward 3	50 people
Devi vilasam auditorium	Near Bus stand	200 persons
KDC. Bank Auditorium	Town NH North	500 persons
ViaparaBhavan Auditorium	Market road	200 persons
CH. Auditorium	Town NH Rd.	180 persons
Devi Jivathi Guptha Memorial Hall	Kothamangalam	300 persons

(Source: URIS 2006, Koyilandy Municipality)

Table 21-2Details of public libraries and reading rooms

Name of the Hall	Location	No of books
SamskarikaNilayam	Ward 25	NA
Priyadharsini	Ward 17	NA
SamsaKuruvangad	Ward 15	5036
O P Kanaran Memorial Kalasamithi	Ward 19	1071
Vallathole Smaraka Vayanasala	Arikulam-3	NA
N S Smaraka Vayanasala Muthambi	Arikulam-2	NA
Islamic Library	Ward 24	NA
Islamic Library	Ward 25	NA
K.T. SreedharanSmaraka Library	Puliyancheri	2105
Viyyur Library	Viyyur	4550
Janasakthi Library	Kollam	2800
Sakthi Library	Kuruvangad	2204
Public Library, Koyilandy	Market road	6555
Red star Library and Kalasamithi	Peruvattoor	2112
A.K.G. Smaraka Library	Puliyancheri	2625
Yuvjana Library and reading room	Panthalayani	2715
Desiya Vayanasala	Mannamangalam	6310
Krishnan Nambisan Smaraka Library	Kavumvattam	1890
R.K. Smaraka Grandlayam	Naderi	6462

(Source: URIS 2006, Koyilandy Municipality)

21.6Inference

Even though Koyilandy is a coastal town, there is not even a beach recreation centre worth mentioning. The civic amenities in the town do not commensurate with the present population. Serious efforts are needed from the municipality to ensure adequate civic amenities to its inhabitants considering the projected population also.



22 TRAFFIC AND TRANSPORTATION

"Transportation networks are the nerves of every town and once it get clogged in a location, all activities in that area will get paralyzed; and at the end of the day the town will get ruined"

22.1 Existing Transportation Network

Koyilandy town is well connected by road and rail. NH 66 and SH 34 passes through the town. The town is also connected by Shornur-Mangalapuram broad gauge railway line.

22.1.1 Road network

The primary and the major transportation corridor of Koyilandy Municipality are NH 66 which connects Kozhikode in the south and Vadakara in the north. Other major road of the Municipality is the State Highway which is designated as SH 34. The secondary roads which are of prime importance are Kollam-Nelliadi Road, Muthambi Road and Naderi Road. Road network map of Koyilandy municipality is given in figure 22.1.

National Highway 66

It is the primary route of the area which links Kozhikode and Vadakara. The length of the road through the planning area is about 6km.The road has a poor level of service at certain locations. It is extremely congested throughout the day in the CBD area. The location

is not provided with any traffic signals for smooth traffic flow. The intersection is police controlled. Centre-line marking is provided throughout the road length but no other road markings are provided. At certain locations medians are provided. Traffic signs are inadequate. A number of street vendors/ hawkers have encroached upon the shoulder area. Proper footpath is not provided. The surface quality of the road is generally good. The undulations and unevenness are less facilitating comfortable and jerk free driving.

State Highway 34

SH 34 which is commonly known as Koyilandy - Thamarassery Road is the second major road in the Municipality. It also runs about 6 km through the planning area and connects Koyilandy to Balussery and Thamarassery in the east. The width of the road is insufficient. The section of SH near the railway crossing is highly congested. The road is of intermediate lane at certain places and two-lane at other locations. There are no foot paths, traffic signs, road markings and other road accessories.

Major District Roads

The major district roads are Kollam-Nelliadi Road, Muthambi Road and Naderi Road. Kollam-Nelliadi Road starts from NH at Kollam junction. Naderi road starts from the Nelliadi road at Naderi to link it with Peruvattoor. The Koyilandy- Muthambi road links Muthambi area with Koyilandy town via Municipal Office Road. The Muthambi Road diverts from Vaidyarangadi Junction to Muthambi in the north and Perambra and Naduvannur in the east. It has its origin in the SH 34. These roads have got a number of turns and bends which make the journey uncomfortable. The longitudinal profile of the road has got very high undulations. Major portion of these roads are either single lane or intermediate lane with low traffic with occasional buses.

Other District Roads

Other district roads include Municipal office Road, Ice-plant Road, Customs road, Chittarikadavu- Kavumvattam Road, ITI- Anela Road and Maruthur- Ottakandam Road. All these roads are single lane road with low volume traffic. These roads have frequent bends and turns. Heavy truck volume is observed in the Ice-plant and Customs road. These roads carry huge traffic many times beyond its capacity.

Transport Terminals

There are two bus stands in the town, by the side of NH 66 in Kainatti area. Old bus stand, the small one was holding the local buses which traverse through the inner areas in the Municipality. All long route buses, both inter zonal and intra zonal, are operated from the new bus stand, which is situated just opposite to the old one. Nowadays, after the opening of new railway over bridge at this area, all the local buses from old bus stand were shifted to new bus stand and old bus stand functions as a bus bay for long route buses. The study area is served by public transport system consisting of both State owned Kerala State Road Transport Corporation (KSRTC) and private buses.

Major intersections

For studying intersection turning movements, the following junctions are identified.

1. Kainatti (Junction of NH66 and SH 34)
2. Municipal office junction (Junction of SH 34 and Municipality - Muthambi road)
3. Muthambi Junction (Junction Municipality - Muthambi road and Naderi Road)

Pavement surface characteristics

The pavement surface characteristics of these roads were evaluated using Visual Rating Method. From the rating survey it was observed that the NH 66 and SH 34 are two-lane two-way roads. The capacity of SH is sufficient to meet the increasing demand of vehicle population. But during the peak hours it seems to be very difficult to control the traffic intensity. The condition of NH is quite satisfactory. Roads are maintained under good condition.



Figure 22-1 Existing transportation network

The main problems faced by the traffic at NH and SH are as follows:

- Width of the road section at SH is rated to be very small affecting the smooth running of vehicles during peak- hours.
- Absence of proper shoulders, road markings, lane lines, objects markings.
- Lack of on-street parking facilities.
- Absence of sidewalks at many places and where it is provided the sidewalks are encroached by shops and street vendors.
- The intersection at Kainatti is police controlled. It is often very difficult to control the rampant increase in traffic population during peak hours.
- The increase in vehicle population will soon result in traffic congestion.

The Major Districts Roads carry less traffic compared to NH and SH. Roads are highly zigzag. The existing roads have not been properly maintained. Some of the roads have outdated standards and specifications.

Accident data

145 accidents and 6 death cases due to road accidents were reported in the year 2015. Major accident prone junctions are Kainatti Junction and Kollam Junction.

22.1.2 Rail network

The town occupies the Koyilandy Railway Station in its heart which was established in 1901. The station is of regular category in the Palakkad division of Southern railway zone. The elevation recorded is 17m and occupies three platforms. The tracks are double electrified broad gauge ones and 40 halting trains passes through the station.

22.1.3 Waterway network

Even though the Akalapuzha River passes through the town, there exists no waterway network for the town.

22.1.4 Air transport network

Calicut international airport at Karipur in Malappuram District is the nearest airport to the town and is at a distance of 47 km away from the town. The proposed Kannur airport is at a distance of 70 km from the Town.

22.2 Methodology for the existing traffic characteristics study

For every planning activity, the details regarding existing situation and trends are needed. For understanding the traffic characteristics of Koyilandy town, the following procedure is adopted.

- Reconnaissance survey was conducted. All major and minor roads were inspected. Traffic survey locations and Major land uses were identified during this survey.
- All major traffic surveys like Volume count, Turning movement, O-D, parking, pedestrian surveys, etc. were conducted.
- Intra zonal trip characteristics were collected by household interview survey (10% HH were surveyed)

Note: Surveying Agency

Local Self Government Planning, District Office, Kozhikode

- *With the help of post graduate trainees in Traffic and Transportation appointed from RIT Kottayam as a part of their Industrial Training.*
- *Persons on daily wage basis were appointed for volume count, O-D Survey, Turning movement, etc.*
- *Students from Malabar Christian College for household interview.*

Keeping in mind the general objectives of the study, a detailed methodology for undertaking the study was proposed which consists of a set of tasks as given below;

- Start-up activities, site appreciation and reconnaissance survey;
- Data from review of past study reports/development proposals;
- Collection of data from secondary sources;
- Design and conduct of primary surveys covering road inventory, traffic volume count, turning movements, O-D survey, parking studies at major transport terminals, speed & delay studies etc.
- Compilation, analysis and interpretation of data to prepare a data-base of the city, its traffic and transportation scenario and to elicit traffic and travel characteristics of the study area;

22.3 Traffic volume study

22.3.1 Traffic volume at outer cordon point

Volume count of all the vehicles entering/leaving the study region was conducted at all the five major outer cordon points of the study region. The locations are shown in figure 22.2 and are listed below.

1. Kainatti
2. Anakulam
3. Nelliadi
4. Muthambi
5. Kanayamkode

Classified volume count of vehicles was recorded according to their direction of travel. Direction-wise distribution of vehicles at the five outer cordon points in Koyilandy town is given in Table 22.1.Continuous 24 hour surveys were conducted on NH and SH for four days. For other locations, 12 hour volume counts were conducted for 3 days. The survey results were recorded and Average Daily Traffic (ADT) was calculated for all locations. From this, Annual Average Daily Traffic (AADT) was derived by applying seasonal factor to ADT. The obtained AADT is used for all further analysis.

The maximum daily traffic volume of 18461 vehicles (23888 PCU) was observed at Kainatti near Andatta survey point in Kozhikode-Kannur direction of National Highway -66, followed by 18099 vehicles (23408 PCU) at same survey point in Kannur-Kozhikode direction. Anakulam survey point on NH-66 witnessed 13158 vehicles (18421 PCU) in Kozhikode direction and 12903 vehicles (17589 PCU) in Kannur direction. Average daily traffic of 5879 vehicles (6340 PCU) was obtained at Kanayamkode survey station on State Highway 34 and at Nelliadi survey station, the average daily traffic was found to be 3687 vehicles (4188 PCU). On Muthambi cordon point, daily volume was observed as 4770 vehicles (4693 PCU).

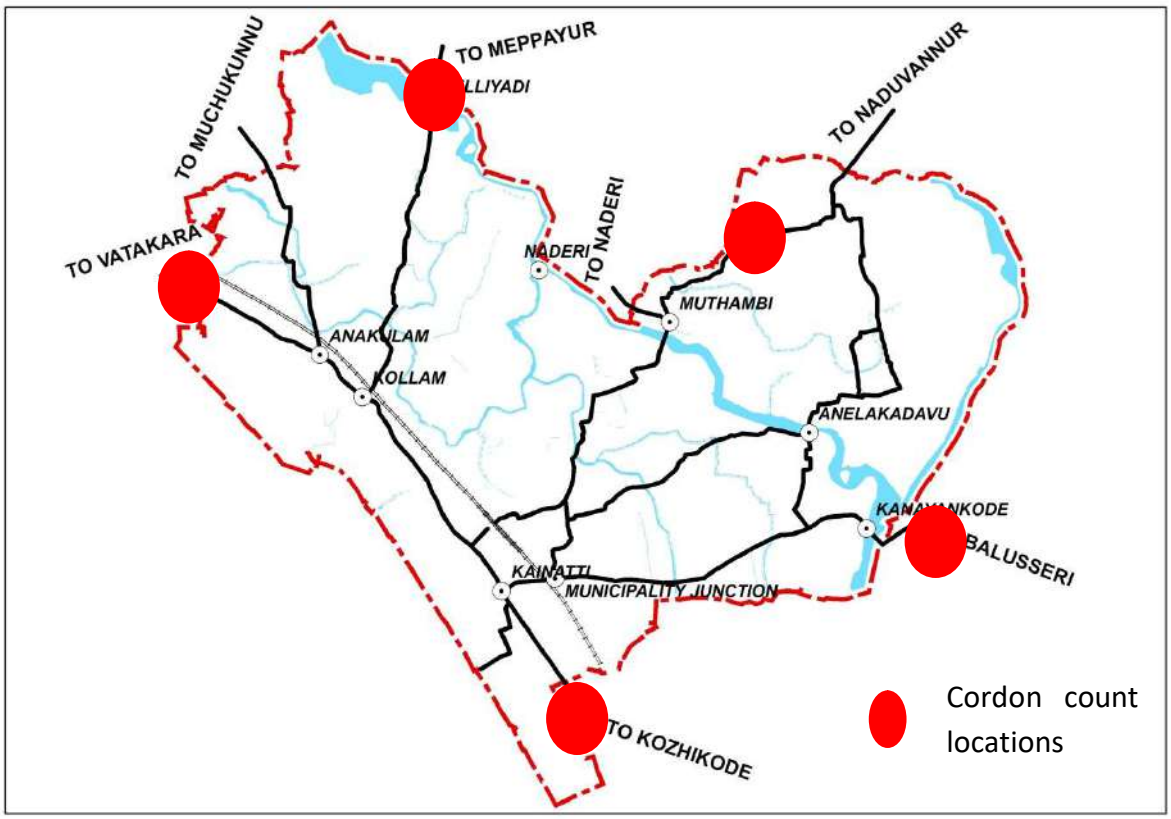


Figure 22-2Cordon count locations



Figure 22-3 Flyover at Koyilandy town

Table 22-1Traffic volume details at different locations

Sl No.	Road Section	Direction	Two Wheeler	Auto (Passenger)	Car, Jeep, Van	Mini Bus	Bus	Other Passenger	Auto (Goods)	Light Commercial	Truck (2 & 3 Axle)	Truck (More than 3 Axle)	Other Goods	Total	
														Number	PCU
1	Anakulam NH66	Kannur to Kozhikode	3643	1133	4642	98	641	6	316	1073	1506	96	4	13158	18421
		Kozhikode to Kannur	3865	980	4695	60	693	0	222	934	1385	70	1	12903	17589
2	Kainatti NH66	Kannur to Kozhikode	5276	3651	5031	237	594	8	494	1334	1375	97	3	18099	23408
		Kozhikode to Kannur	5961	3472	5081	175	675	0	472	948	1635	42	0	18461	23888
3	Kanayamkode SH34	Koyilandy to Balussery	1524	326	491	32	145	0	85	278	46	5	0	2932	3152
		Balussery to Koyilandy	1525	341	509	21	162	0	54	276	53	5	1	2947	3188
4	Muthambi	Koyilandy to Muthambi	1181	341	201	14	73	0	53	88	21	6	0	1978	1993
		Muthambi to Koyilandy	1626	538	317	39	42	0	98	127	5	0	0	2792	2700
5	Nelliadi Bridge	Koyilandy to Meppayoor	1116	247	263	18	43	0	42	111	9	0	0	1849	2233
		Meppayoor to Koyilandy	955	318	239	80	80	0	40	119	8	0	0	1838	1955

Source: Traffic and Transportation survey, 2013

22.3.2 Traffic volume at mid block sections

Data pertaining to traffic volume and its composition was collected for all major roads through volume survey. On National Highway 66, the daily traffic volume was observed to be 36010 PCU at Anakulam and 47295 PCU at Kainatti. The maximum volume was observed at Kainatti and Anakulam on NH, followed by 18475 PCU on State Highway 34 near municipality junction. The volume count locations are given in figure 22.4 and the volume of daily traffic in Koyilandy town is given in the table 22.2.

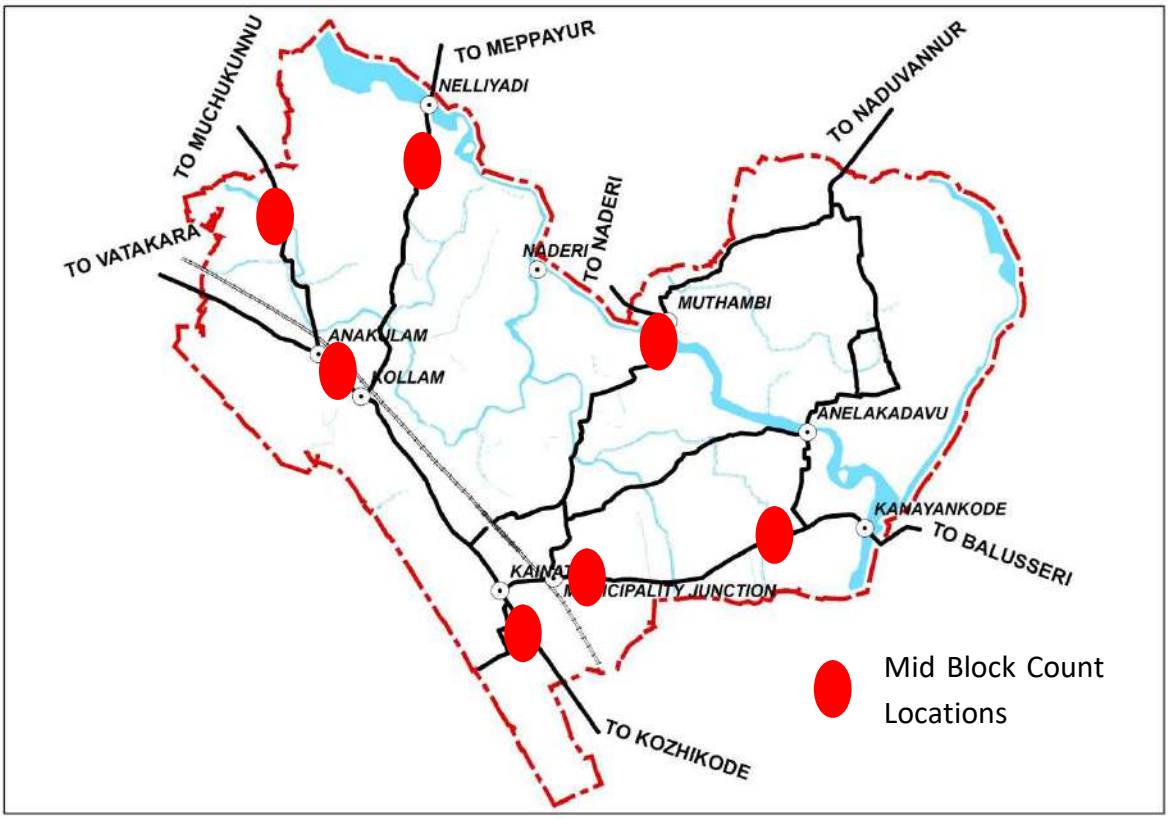


Figure 22-4Mid Block Count Locations

Table 22-2Volume of Daily Vehicular Traffic on mid block sections of Koyilandy

Sl No.	Road Section	Direction	Two Wheeler	Auto Passenger	Car, Jeep, Van	Mini Bus	Bus	Other Passenger	Auto (Goods)	Light Commercial	Truck (2 & 3 Axle)	Truck (More than 3 Axle)	Other Goods	Total	
														Number	PCU
1	Anakulam	Kannur to Kozhikode	3643	1133	4642	98	641	6	316	1073	1506	96	4	13158	18421
		Kozhikode to Kannur	3865	980	4695	60	693	0	222	934	1385	70	1	12903	17589
2	Kainatti	Kannur to Kozhikode	5276	3651	5031	237	594	8	494	1334	1375	97	3	18099	23408
		Kozhikode to Kannur	5961	3472	5081	175	675	0	472	948	1635	42	0	18461	23888
3	Kanayamkode	Koyilandy to Balussery	1524	326	491	32	145	0	85	278	46	5	0	2932	3152
		Balussery to Koyilandy	1525	341	509	21	162	0	54	276	53	5	1	2947	3188
4	Mujkunnu	Koyilandy to Mujkunnu	843	349	215	32	51	0	57	91	12	5	0	1655	1727
		Mujkunnu To Koyilandy	825	410	219	37	45	0	64	59	31	4	1	1695	1813
5	Muthambi	Koyilandy to Muthambi	1181	341	201	14	73	0	53	88	21	6	0	1978	1993
		Muthambi To Koyilandy	1626	538	317	39	42	0	98	127	5	0	0	2792	2700
6	Nelliadi Bridge	Koyilandy to Meppayoor	1116	247	263	18	43	0	42	111	9	0	0	1849	2233
		Meppayoor to Koyilandy	955	318	239	80	80	0	40	119	8	0	0	1838	1955
7	Municipality	Koyilandy to Balussery	4848	1717	1050	570	567	7	202	317	264	36	0	9650	11199
		Balussery to Koyilandy	3828	1301	1085	4	150	0	286	402	75	39	2	7171	7277

(Source: Traffic and Transportation survey, 2013)

Two wheelers constituted highest composition of 38.14% among the total vehicles plying on the selected sections. The cars and auto (Passenger) constituted 24.77% and 15.58% respectively, whereas the bus and mini buses together comprised of only 5.54% of the total vehicle composition. The vehicle composition is shown in figure 22.5. Peak hour vehicle volume is estimated from the average daily traffic and is given in table 22.3. The highest volume obtained is at NH 66 near Kainatti Junction.

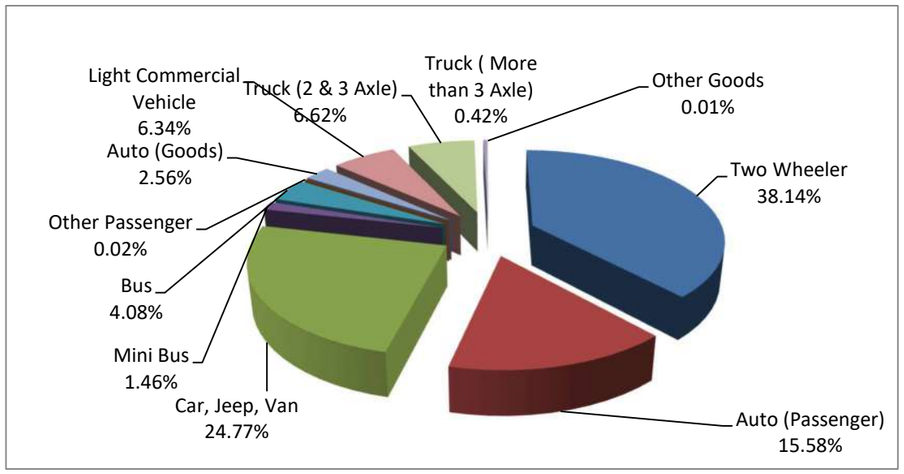


Figure 22-5Composition of vehicles in Municipality

(Source: Traffic and Transportation survey, 2013)

Table 22-3Peak Hour Volume of Traffic on Major Roads of Koyilandy (PCU)

SI	Road Section	Two Wheeler	Auto (Passenger	Car, Jeep, Van	Mini Bus	Bus	Auto (Goods)	Light Commercial Vehicle	Truck (2 & 3 Axle)	Truck (More than 3 Axle)	Total
1	Anakulam	515.25	266.40	581.00	68.20	184.80	63.60	173.60	666.00	26.00	**2544.85**
2	Kainatti	658.50	386.60	694.83	69.67	249.70	91.01	296.27	846.71	9.32	**3302.62**
3	Kanayamkode	276.75	90.00	126.00	2.20	77.00	12.00	72.00	25.90	8.00	**689.85**
4	Mujkunnu	154.50	98.40	64.00	13.20	19.80	10.80	17.60	33.30	0.00	**411.60**
5	Muthambi	217.50	138.00	52.00	17.60	26.40	18.00	44.80	3.70	0.00	**518.00**
6	Nelliadi Bridge	187.50	73.20	67.00	11.00	22.00	7.20	27.20	3.70	0.00	**398.80**
7	Municipality	1004.71	349.55	247.23	66.45	83.04	56.40	83.25	39.30	8.69	**1938.62**

(Source: Traffic and Transportation survey, 2013)

22.4Capacity utilization

Capacity utilization of road stretches was measured by volume-to-capacity ratio (V/C ratio). It is the ratio of volume of traffic plying on the road section to the capacity of the road stretch.

For working out the capacity of different road sections, the information compiled during the road inventory survey was compared with the specifications of IRC-106- 1990 (guidelines for capacity on urban roads). While working out the capacities, due consideration was given to carriage way width, junctions, parking, lateral clearance, shoulders, surface conditions etc.

The traffic volume observed at different road stretches were compared with the capacity of road sections to calculate the volume-capacity ratio (V/C ratio) of this road sections within the study area. The V /C ratio of major roads within the town is presented in Table 22.4.The major road sections within the study area were found to be over utilized. The V/C ratio of NH-66 (near Kainatti) was found to be 1.83 which is very high. V/C ratio of NH is found to be more than one at different locations. The NH stretch in Koyilandy area, SH stretch from NH to Municipality Junction, Nelliadi Bridge area were also found to be over utilized.

Table 22-4Volume-Capacity Ratio on Major Road Links within Koyilandy

Sl No.	Road Section	Capacity (PCU/Hr)	Volume (PCU/Hr)	Volume - Capacity Ratio
1	Anakulam (NH 66)	1800	2544.85	1.41
2	Kainatti (NH 66)	1800	3302.62	1.83
3	Kanayamkode (SH 34)	1500	689.85	0.46
4	Mujkunnu	1200	411.60	0.34
5	Muthambi	1200	518.00	0.43
6	Nelliadi Bridge	1200	398.80	0.33
7	Municipality Jn (SH 34)	1500	1938.62	1.29

22.5Intersection volume counts

Based on reconnaissance survey, turning movement surveys at 3 major intersections in the study area was conducted to ascertain peak hour demands. Major intersections selected for volume survey along with its peak hour flow is given in Table 22.5.

22.5.1 Kainatti junction

This is a three arm intersection on NH-66. SH 34 join this intersection. The peak hour traffic in this intersection is about 4500 PCU. There are some business centres and market located very near to this junction. The junction therefore has to carry the burden of a high parking demand. This junction caters to heavy traffic load, consisting of personal modes to bus stand from all links. The traffic is being controlled by police. The turning radius at this intersection is small and therefore it increases congestion and hinders the smooth flow of traffic.

22.5.2 Municipality junction

This is a three arm intersection on SH-34. Municipality road joins this intersection and it carries peak hour traffic flow of 1928 PCU. This road is a small road without adequate width and the pavement surface characteristics is poor resulting in low speed and traffic congestion. The sight distance is inadequate which causes accident risks. (After the introduction of railway over bridge at this area, the junction has become unimportant).

22.5.3 Muthambi junction

Muthambi Junction is a three armed intersection. One arm leads to Koyilandy, second arm leads to Naduvannur and the third to Keezhariyur. The peak flow is between 5:15 to 6:15 with 743.25 PCU. Maximum flow is found in Koyilandy - Naduvannur arm. The other arms have low traffic flow.

Table 22-5Peak Hour Volume of Traffic on Major Junctions of Koyilandy (PCU)

Sl. No.	Road Section	Two Wheeler	Auto (Passenger)	Car, Jeep, Van	Mini Bus	Bus	Other Passenger	Auto (Goods)	Light Commercial	Truck (2 & 3 Axle)	Truck (More than 3 Axle)	Other Goods	Total PCU
Kainatti Junction	Kannur to Kozhikode	237	136	327	37	193	0	67	158	424	24	0	1602.03
	Kannur to Balussery	74	93	68	20	21	0	38	61	57	0	0	432.50
	Kozhikode to Kannur	296	376	438	26	73	0	46	105	245	3	0	1607.13
	Kozhikode to Balussery	26	119	13	79	13	0	5	6	0	0	0	260.85
	Balussery to Kannur	118	126	66	11	2	0	9	34	24	0	0	389.10
	Balussery to Kozhikode	75	58	23	14	3	1	11	17	2	0	0	203.53
	Total												**4495.13**
Municipality Junction	Koyilandy to Balussery	182	129	88	29	84	7	11	26	59	4	0	617.78
	Koyilandy to Municipality	80	79	19	75	17	1	9	3	59	2	0	342.90
	Balussery to Koyilandy	287	138	71	11	31	0	22	43	19	16	0	637.35
	Balussery to Municipality	44	14	9	0	0	0	5	2	0	0	0	74.05
	Municipality to Koyilandy	111	18	7	0	4	0	5	0	11	8	0	164.30
	Municipality to Balussery	62	11	12	0	0	0	1	6	0	0	0	91.90

	Total												**1928**
Muthambi Junction	Koyilandy to Naduvannur	131	40	28	2	13	0	10	6	0	0	0	230.25
	Koyilandy To Keezhariyur	25	12	2	0	2	0	4	2	0	0	0	46.15
	Naduvannur to Koyilandy	118	56	45	9	9	0	6	13	4	0	0	259.25
	Naduvannur to Keezhariyur	20	12	4	2	0	0	0	2	0	0	0	39.30
	Keezhariyur to Koyilandy	42	23	11	0	2	0	11	10	0	0	0	98.40
	Keezhariyur to Naduvannur	36	6	9	0	0	0	7	8	4	0	0	69.90
	Total												**743.25**

(Source: Traffic and Transportation survey, 2013)

22.6Origin destination characteristics

Roadside Interview method, as detailed in IRC: 102-1988, and household interview method were used for O-D survey to find the origin destination travel characteristics of Koyilandy study area. The roadside interview survey was carried out for both passenger and goods vehicles for 24 hours (in both directions). Trained enumerators under the supervision of Transport Planner collected the trip characteristics. The O-D survey elicited passenger mode characteristics like origin and destination, occupancy, trip purpose and length of trip by mode type. For goods modes, the survey elicited characteristics like origin and destination, commodity type and length of trip. A sample number of motor vehicles passing through five major outer cordon locations of Koyilandy Town were taken. The locations of the survey points are shown in Figure 22.6 and are,

1. Andatta
2. Muthambi
3. Nelliadi Bridge
4. Kanayamkode

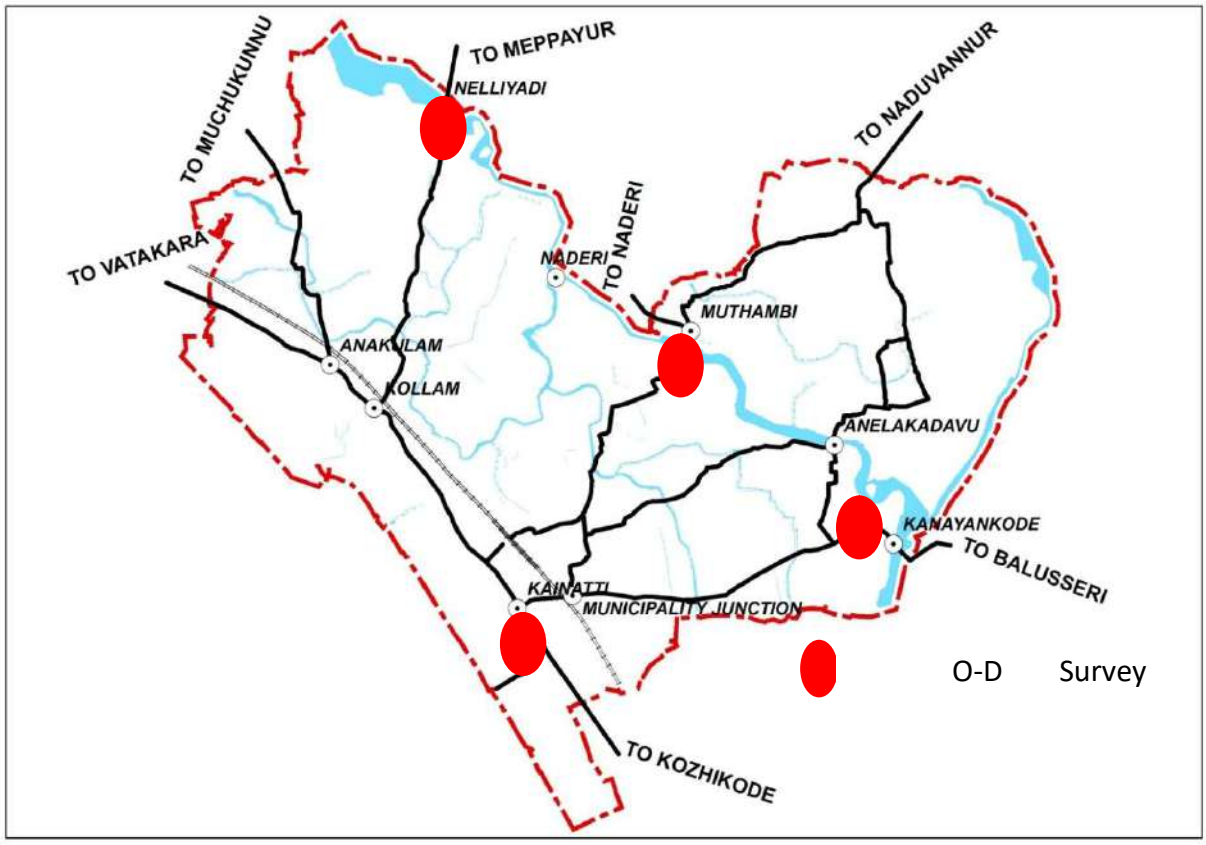


Figure 22-6Location of Origin Destination Surveys in Koyilandy Town

For the purpose of analyzing the data, a total of 18 zones, designated as Traffic Analysis Zones have been identified. The zoning system has been developed based on network

connectivity and importance of places with respect to Koyilandy. Of this, 6 zones have been demarcated within the study area as internal zones. Apart from these, 12 zones are identified as external zones which spread over different districts and neighbouring states.

22.6.1 Socio economic survey

For understanding the socio economic as well as base year intra zonal travel characteristics of persons in Koyilandy municipality, a household survey in a sample of 10% houses were conducted.

22.6.1.1 Conduct of the survey

A 10% sample of households was drawn for each of the wards in Koyilandy Municipality. Just prior to undertaking the survey, residents were notified that they might be contacted and asked to participate via an announcement in the local TV channels. Households were visited between the hours of 9:00 a.m. and 5:00 p.m. Household members were queried on the trips they and their family members had made the day before.

Table 22-6Traffic Analysis Zones

Sl No.	Zone Number	Locations
1	Zone 1	Wards 32,33,34,35,36,37,38,39
2	Zone 2	Wards 25,26,27,28,29,30,31
3	Zone 3	Wards 9,11,12,13,14,15,16,17,18
4	Zone 4	Wards 1,40,41,42,43,44
5	Zone 5	Wards 19,20,21,22,23,24
6	Zone 6	Wards 2,3,4,5,6,7,8,10
7	Zone 7	Places in Koyilandy Taluk on Southern side
8	Zone 8	Places in Koyilandy Taluk on eastern side
9	Zone 9	Places in Koyilandy Taluk on northern side
10	Zone 10	Places in Kozhikode district on Southern side
11	Zone 11	Places in Kozhikode district on eastern side
12	Zone 12	Places in Kozhikode district on northern side
13	Zone 13	Places in Kerala state on Southern side
14	Zone 14	Places in Kerala state on eastern side
15	Zone 15	Places in Kerala state on northern side
16	Zone 16	Places outside Kerala state on Southern side
17	Zone 17	Places outside Kerala state on eastern side
18	Zone 18	Places outside Kerala state on northern side

22.6.1.2 Intra zonal travel characteristics from household survey

To develop a better understanding of current travel patterns in Koyilandy Municipality, a household survey was undertaken. Approximately 10% of the households in Koyilandy Municipality were contacted and information regarding the travel patterns of all household members was collected. The information included household type, start time of each trip, the

mode of travel used for each trip, the purpose of each trip, the length of time for each trip, and the origin and destination of each trip. The trip origin and destination information took the form of an address, a major intersection, or the name of a major place. The information collected from the survey was used to calibrate and validate the travel demand forecasting model. The survey was conducted by students of Malabar Christian College.

22.6.1.3 Overall study results

With respect to trip purpose, the primary trip purpose for an entire day is work. About 63% trips correspond to work trips. School trips represent more than the 28% share of total trips.

Proportions of other trip purposes like shopping, family visits and religious trips are negligible.

The primary mode of travel is bus which contribute about 50% share. It is observed that walking is a major mode of travel in the municipality. The figure 22.8 shows the share of each mode of travel in the municipal area.

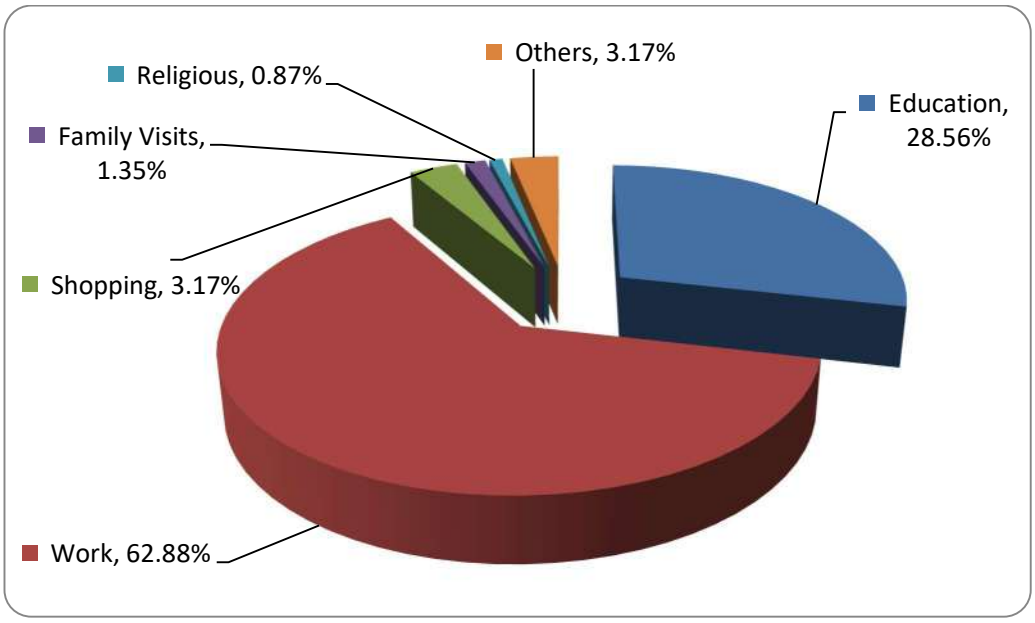


Figure 22-7Primary Purpose of Trip

The details of trips the household members had made the day before the date of surveying was collected during the survey and used for estimating intra zonal origin destination trip characteristics of the area. 1019 trips were obtained in the survey. These trips were classified according to the mode used for travel. The sample vehicle trips were multiplied with suitable factor for obtaining the total internal trips. These vehicle trips were multiplied with PCU equivalents as per IRC and were then added up together for obtaining the total internal trips. The result obtained is given in table 22.7.

Road side Origin destination (O-D) survey was carried out to identify the travel pattern of vehicles through the study area. The zoning system adopted for the study is discussed earlier in this section.

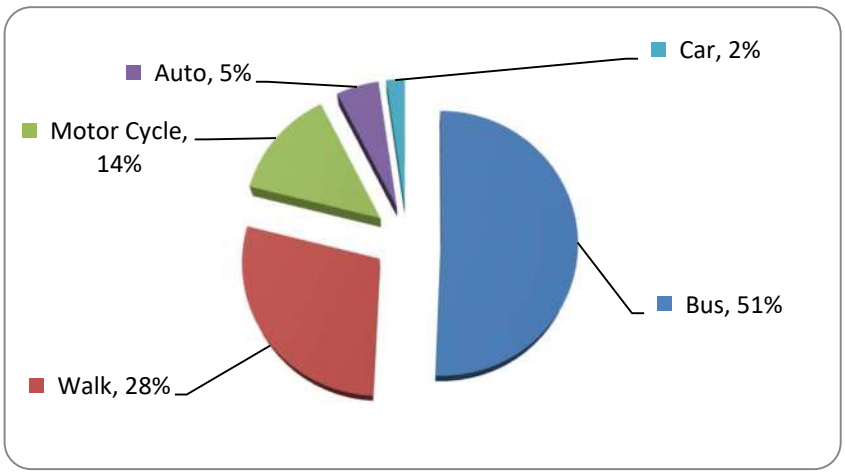


Figure 22-8Mode of Travel

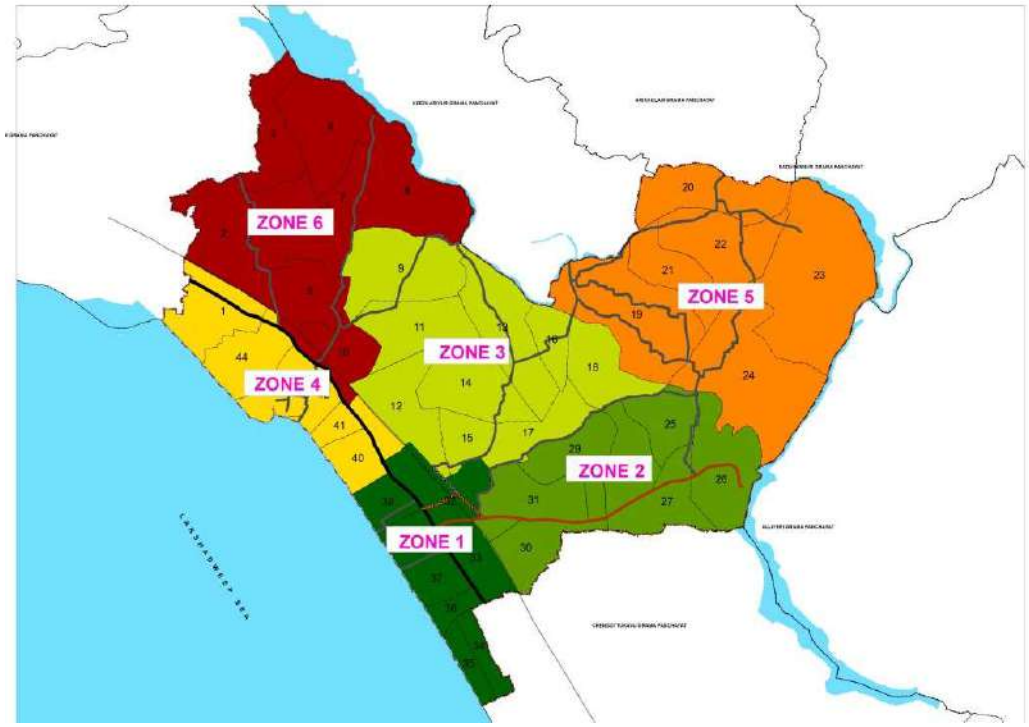


Figure 22-9Traffic Zones

Table 22-7Origin destination matrix for internal passenger trips (in PCU) from socio economic survey

O/D	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	Total
1	140	7	7	14	3	0	7	3	0	20	4	10	3	0	0	0	0	0	**218**
2	133	3	0	10	0	6	3	0	0	35	14	10	0	0	0	0	0	0	**214**
3	85	3	0	10	3	4	4	0	4	12	0	0	0	0	0	9	0	0	**134**
4	96	0	11	3	0	0	3	0	0	14	4	3	0	0	0	0	0	0	**134**
5	223	8	27	41	45	9	3	7	0	35	19	7	0	0	0	0	0	0	**424**
6	128	0	4	13	8	20	3	8	0	28	4	6	3	0	0	0	0	0	**225**
7																			
8																			
9																			
10																			
11																			
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18																			
Total	**805**	**21**	**49**	**91**	**59**	**39**	**23**	**18**	**4**	**144**	**45**	**36**	**6**	**0**	**0**	**9**	**0**	**0**	**1349**

22.6.1.4 Sample size of passenger vehicles

The sample size of vehicles interviewed at both the points in NH varied from 3.43% to 22.77% for different category of vehicles at different locations. Distribution of vehicles interviewed at outer cordon points in Koyilandy town is given in Table 22.8.

Modal split

About 1.88 lakh passengers interacted with the town through the five cordon points of Koyilandy in a day by road using different modes. 50% of the people use public transport buses which include both private and KSRTC buses and other mini bus service. This means that about 0.94 lakh people rely on public mode of travel. This was followed by car and jeep which carried nearly 53000 passengers, accounting for 28.01%. Passengers travelling by two wheeler and three wheelers were found to be 19.85% and 7.6% respectively.

Table 22-8Distribution of Passenger Vehicles Interviewed at Outer Cordon Locations in Koyilandy Town

Location		Two Wheeler	Auto	Car, Jeep, Van	Mini Bus	Bus	Total
NH	Total	11231	7072	10198	1166	1862	31529
	Sample	992	544	1200	40	424	2792
	%	**8.83**	**7.7**	**11.77**	**3.43**	**22.77**	**8.86**
SH	Total	3049	667	1000	53	307	5076
	Sample	330	40	90	7	75	542
	%	**10.82**	**6.00**	**9.00**	**13.21**	**24.43**	**10.68**
Nelliadi	Total	2071	565	502	98	123	3358
	Sample	215	65	59	18	56	413
	%	**10.38**	**11.50**	**11.76**	**18.45**	**45.69**	**12.30**
Muthambi	Total	2807	879	518	53	115	4372
	Sample	330	130	47	4	24	535
	%	**11.76**	**14.79**	**9.07**	**7.55**	**20.87**	**12.24**

(Source: Traffic and Transportation survey, 2013)

Table 22-9Modal Split of Passenger Traffic in Koyilandy

Mode of Travel	Number of Vehicle Trips	% of Mode wise Vehicles	Number of Passengers	% of Mode wise passengers carried.
Two wheeler	23405	43.86	37451	19.85
Auto	9747	18.27	14422	7.64
Car	16941	31.75	52848	28.01
Mini Bus	696	1.30	9403	4.98
Bus	2571	4.82	74559	39.52
Total	**53360**	**100**	**188683**	**100**

(Source: Traffic and Transportation survey, 2013)

22.6.1.5Pattern of passenger traffic

From household survey and roadside interview, the origin-destination pattern of the passenger traffic commuting in Koyilandy was obtained.

Table 22-10Pattern of Passenger Trips in Koyilandy

Travel Pattern	Persons Trips	Percentage
Internal to Internal	48023	**25.45**
Internal to External	52557	**27.85**
External to Internal	23303	**12.35**
External to External	64800	**34.34**
Total	**188683**	**100.00**

(Source: Traffic and Transportation survey, 2013)

The study reveals that about 25% of the trips originate and terminate within the study area. 34% of the trips are through traffic which has neither its origin nor destination within the study area. The desire line diagram as per the origin and destination studies conducted is shown in figure 22.10. Traffic in North-South direction (Kannur – Kozhikode) is very high compared to other directions. Higher movement is also identified from Kozhikode side to Eastern sides of municipality.

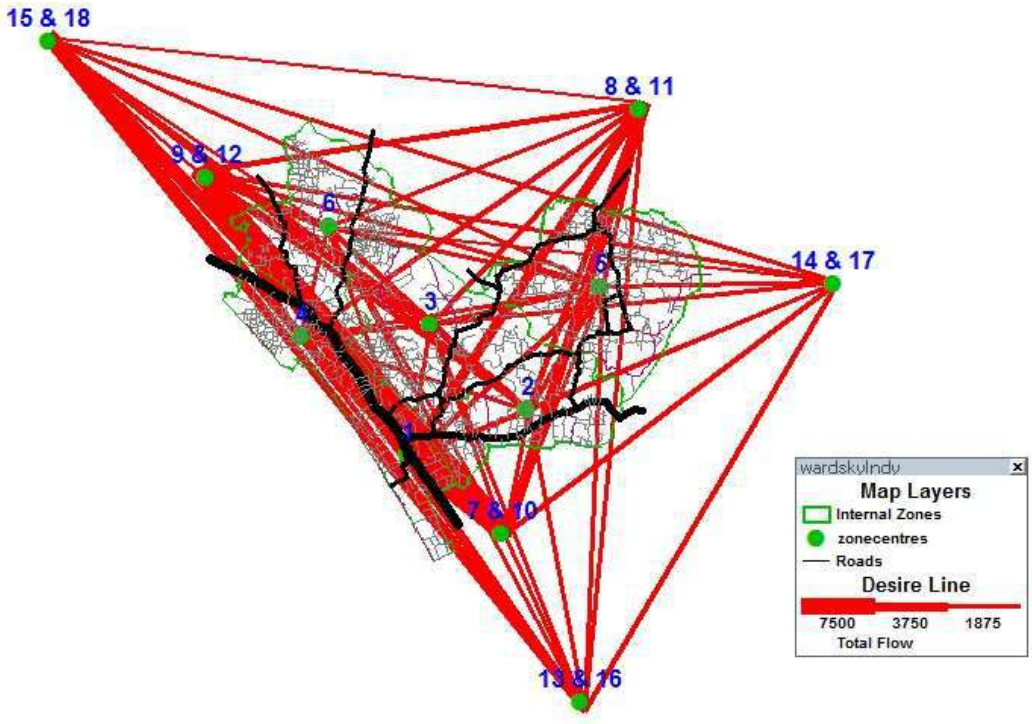


Figure 22-10Desire line diagram

22.7Speed and delay characteristics

22.7.1 Speed and delay characteristics of national highway 66

The speed and delay study was carried out for the identified stretches of NH 66 in Koyilandy by the moving observer method. The speed and flow can be obtained by travelling in a car against and with the flow, and noting down the journey time, the number of vehicles met with from the opposite direction, and number of vehicles overtaking the test vehicle. Based on the test runs made during the peak and off-peak period during the day, the average travel speed of traffic with and without delay were worked out.

22.7.2 Speed and delay characteristics of off-peak hour traffic flow

The speed and delay characteristic of off peak traffic flow is shown in Table 22.11and Table 22.12 when the test vehicle is travelling in North and South direction respectively.

22.7.3 Speed and delay characteristics of peak hour traffic flow

The peak flow speed and delay characteristics are as shown in Table 22.13 and Table 22.14.

22.7.4 Average journey speed

On NH-66 during off peak hour, a maximum of 34 kmph journey speed was noted between Kollam to Anakulam on a normal working day. The lowest journey speed 13 kmph experienced along the NH-66 was along Andatta – Kainatti stretch. The main reason behind this variation in the journey speed could be due to the parking on the roadside, which mainly constitute two wheelers and autoriskhaws, the dangerous driving behaviour of bus and auto drivers and the halting of buses at the junction while turning to the roadway for collecting passengers. The heavy lateral and cross pedestrian movements could also have led to the interference with the smooth flow of traffic.

During peak hour flow, the maximum journey speed observed was 19kmph. The level of service of the road was very poor and the traffic moved in forced flow pattern. The drivers of the vehicle had little freedom to manoeuvre. For short period of time, these conditions can be tolerated.

22.7.5 Causes of delay

From the analysis of the speed and delay studies, the main reasons for delay along the identified stretches of the Koyilandy could be noted as those caused due to the traffic congestion, the reduced width of road and the heavy pedestrian movement. It was observed that main points of delay along the NH 66 section in Koyilandy Municipality are Kainatti Junction and Kollam Junction. Kainatti Junction is the most delaying point in this stretch. It is because of the presence of market and bus stand near to the junction. The

bus flow from the bus stand hinders the smooth movement of through traffic. The hindrance to the free flow of traffic could be generalized as the lack of roadway capacity, presence of pedestrians, parking, unsafe driving behaviour of the auto drivers, delay due to the acceleration and deceleration of vehicles etc.

Table 22-11Moving Observer Travelling North during Off-Peak Hour

Sl No	Name of the section	Distance (km)	Mean Journey Time (Sec)	Stopped time (Sec)	Journey Speed (kmph)	Running Speed (kmph)
1	Andatta to Kainatti	1.3	179	23	27	31
2	Kainatti to Kollam	2	242	4	30	35
3	Kollam to Anakulam	1	105	0	34	34

(Source: Traffic and Transportation survey, 2013)

Table 22-12Moving Observer Travelling South during Off-Peak Hour

Sl No	Name of the section	Distance (Kms)	Mean Journey Time (Sec)	Stopped time (Sec)	Journey Speed (kmph)	Running Speed (kmph)
1	Kainatti to Andatta	1.3	111	0	32	32
2	Kollam to Kainatti	2	277	28	30	34
3	Anakulam to Kollam	1	111	6	32	41

(Source: Traffic and Transportation survey, 2013)

Table 22-13Moving Observer Travelling North during Peak Hour

Sl No	Name of the section	Distance (Kms)	Mean Journey Time (Sec)	Stopped time (Sec)	Journey Speed (kmph)	Running Speed (kmph)
1	Andatta to Kainatti	1.3	251	47	19	43
2	Kainatti to Kollam	2	432	44	17	28
3	Kollam to Anakulam	1	238	9	15	17

(Source: Traffic and Transportation survey, 2013)

Table 22-14Moving Observer Travelling South during Peak Hour

Sl No	Name of the section	Distance (Kms)	Mean Journey Time (Sec)	Stopped time (Sec)	Journey Speed (kmph)	Running Speed (kmph)
1	Kainatti to Andatta	1.3	269	11	13	15
2	Kollam to Kainatti	2	494	61	17	27
3	Anakulam to Kollam	1	198	13	18	62

(Source: Traffic and Transportation survey, 2013)

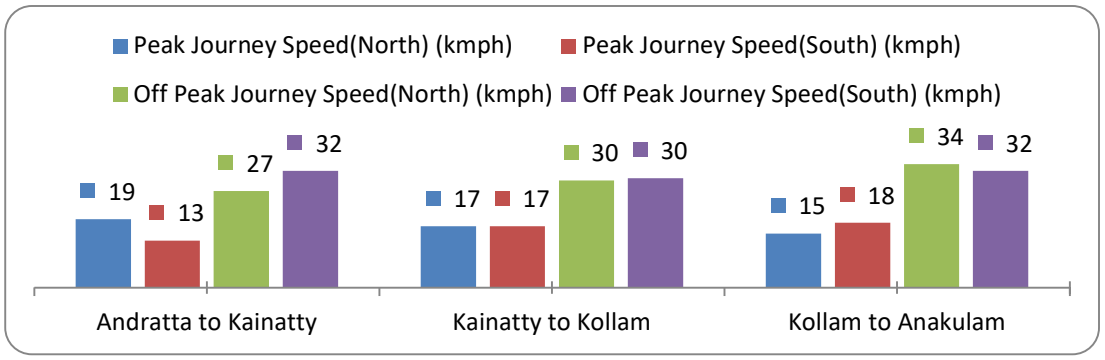


Figure 22-11Journey Speed
(Source: Traffic and Transportation survey, 2013)

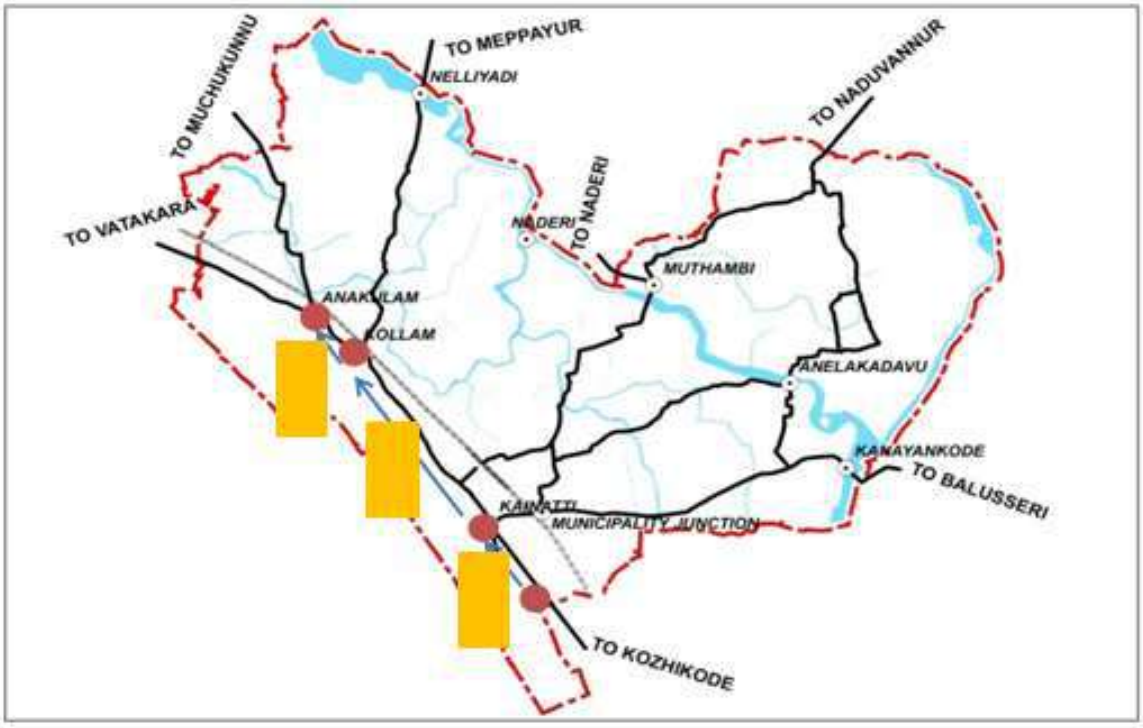


Figure 22-12Speed and Delay Study Sections
(Source: Traffic and Transportation survey, 2013)

22.8Parking survey

22.8.1 Parking characteristics

Parking accumulation and duration survey was carried out at all the major road stretches where the parking accumulations are found to be high. The survey was carried out for a period of three hours during the peak periods. The registration plate method was used to collect data on parking duration and accumulation of all categories of vehicles. Municipal Bus Stand area and SH stretch near market area are the major concentrations of parking in the city.

22.8.2 Parking accumulation

The total number of vehicles parked in an area at a specified moment is determined. From the studies, it was found that the highest parking accumulation was found in the Municipal Bus Stand Complex, Old Bus Stand area, and along the NH 66 near Kainatti Junction and along the SH34 from Kainatti to railway cross.

22.8.2.1 Parking near the Municipal Bus Stand Area

Table 22-15Parking Vehicle Hours for Car

Parking Vehicle Hours For Car												
Time (Minute)	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**	**135**	**150**	**165**	**180**
No. Of parked vehicles	6	5	5	5	7	8	11	9	8	6	6	6
Parking vehicle hours	1.5	2.5	3.75	5.0	8.75	12.0	19.25	18.0	18.0	15.0	16.5	18.0
Total vehicle hours	138.25											

(Source: Traffic and Transportation survey, 2013)

Table 22-16Parking Vehicle Hours for Two-Wheelers

Parking Vehicle Hours For Two-Wheelers												
Time (Minute)	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**	**135**	**150**	**165**	**180**
No. Of parked vehicles	64	77	81	96	94	97	119	113	83	81	74	71
Parking vehicle hours	16.0	38.5	60.75	96.0	117.5	145.5	208.2	226	186.75	202.5	203.5	213.0
Total vehicle hours	1714.25											

(Source: Traffic and Transportation survey, 2013)

Table 22-17Parking Vehicle Hours for Mini truck

Parking Vehicle Hours For Mini Truck												
Time (Minute)	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**	**135**	**150**	**165**	**180**
No. Of parked vehicles	1	1	2	2	3	1	4	3	3	2	2	2
Parking vehicle hours	0.25	0.5	1.5	2.0	3.75	1.5	7.0	6.0	6.75	5.0	5.5	6.0
Total vehicle hours	45.75											

(Source: Traffic and Transportation survey, 2013)

Table 22-18Parking Vehicle Hours for Three Wheelers

Parking Vehicle Hours For Three-Wheelers												
Time (Minute)	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**	**135**	**150**	**165**	**180**
No. Of parked vehicles	0	3	2	3	2	5	6	5	3	2	2	2
Parking vehicle hours	0.0	1.5	1.5	3.0	2.5	7.5	10.5	10.0	6.75	5.0	5.5	6.0
Total vehicle hours	59.75											

(Source: Traffic and Transportation survey, 2013)

22.8.2.2 Parking near SH stretch

Table 22-19Parking Vehicle Hours for Car

Parking Vehicle Hours For Car												
Time (Minute)	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**	**135**	**150**	**165**	**180**
No. Of parked vehicles	1	1	1	1	1	1	1	1	1	1	1	1
Parking vehicle hours	0.25	0.5	0.75	1.0	1.25	1.5	1.75	2.0	2.25	2.5	2.75	3.0
Total vehicle hours	19.5											

(Source: Traffic and Transportation survey, 2013)

Table 22-20Parking Vehicle Hours for Two- Wheelers

Parking Vehicle Hours For Two-Wheelers												
Time (Minute)	15	30	45	60	75	90	105	120	135	150	165	180
No. Of parked vehicles	79	77	78	82	83	81	81	84	84	83	84	85
Parking vehicle hours	19.8	38.5	58.5	820	103.8	121.5	141.8	168	189	207.5	231	255
Total vehicle hours	1616.25											

(Source: Traffic and Transportation survey, 2013)

Table 22-21Parking Vehicle Hours for Mini truck

Parking Vehicle Hours For Mini Truck												
Time (Minute)	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**	**135**	**150**	**165**	**180**
No. Of parked vehicles	1	1	2	2	2	2	2	2	2	1	1	1
Parking vehicle hours	0.25	0.5	1.5	2.0	2.5	3.0	3.5	4.0	4.5	2.5	2.75	3.0
Total vehicle hours	30											

(Source: Traffic and Transportation survey, 2013)

Table 22-22Parking Vehicle Hours for Three wheelers

Parking Vehicle Hours For Three-Wheelers												
Time (Minute)	**15**	**30**	**45**	**60**	**75**	**90**	**105**	**120**	**135**	**150**	**165**	**180**
No. Of parked vehicles	9	9	9	9	8	8	8	7	6	6	7	7
Parking vehicle hours	2.25	4.5	6.75	9.0	10.0	12.0	14.0	14.0	13.5	15.0	19.25	21.0
Total vehicle hours	141.25											

(Source: Traffic and Transportation survey, 2013)

22.8.2.3 Duration of parking

Majority of the vehicles parked along the roads were found to be parked for a short duration of less than 15 minutes. But in the bus stand area, more than 80% of vehicles were parked for longer duration.

22.8.2.4 Study results

Off street parking is available in the municipal complex area and old bus stand area. At times this becomes congested and many park their vehicles along the road side. This reduces the effective width of the road and capacity of the road is reduced leading to congestion in the NH. Off street parking near the old bus stand site belongs to the revenue department and it is being closed by the construction of compound wall by the revenue office. Therefore parking problem has become one of the main issues in the place.

Parking study reveals that the problem of parking is acute in the area compared to other similar towns in Kerala. The major share of parked vehicles is contributed by two wheelers.

During the study, local people and drivers of parked vehicles were interviewed. The objective of the interview was to find the difficulties faced by the pedestrians due to parked vehicles along the road and to find the problems of drivers for parking. It was concluded from the interview that pedestrian movement is hindered by the parked vehicles. The drivers find shortage of place for parking.

22.9Vehicle occupancy

Average vehicle occupancy (AVO) for a link is simply estimated as the number of persons observed divided by the number of vehicles observed (i.e., P/V). An un weighted estimate of AVO for a collection of links can be derived by dividing the total number of persons counted by the total number of vehicles counted:

$$AVO = \frac{\sum_i P_i}{\sum_i V_i},$$

Where Pi equals the number of persons observed on link i, Vi equals the number of vehicles observed on link i. For obtaining the vehicle occupancy values, surveys were conducted at peak and off peak periods at NH, SH, Nelliadi Road and Muthambi Road. The results are shown in the table 22.23.

Table 22-23Vehicle Occupancy

	Two wheeler	Auto	Car/Jeep/Van	Mini bus	Bus
Total Number of Vehicles counted	214	399	463	178	324
Total Number of Passengers counted	342	591	1445	2403	9396
Vehicle Occupancy	**1.6**	**1.48**	**3.12**	**13.5**	**29**

22.10 Pedestrian volume

Pedestrian surveys were conducted in the Bus stand area, Kainatti Junction, Municipality Junction and Kollam junction where pedestrian cross movements were found to be high. Location wise distribution of peak hour pedestrian volume is presented in Table 22.24.

Table 22-24Peak hour pedestrian crossings at major road sections

Sl No	Road / Intersection	L-R	R-L	Remark
1	Bus Stand area	520	340	L – Old Bus Stand Side
				R - Opposite side
2	Kainatti Junction			
	NH 66 Kozhikode Side	240	125	L - Old Bus Stand Side
				R - Opposite side
	NH 66 Kannur Side	180	137	L - Old Bus Stand Side
				R - Opposite side
	SH 34	124	115	L – New Bus Stand Side
				R - Opposite side
3	Municipality Junction			
	SH Koyilandy Side	168	314	L – Municipality Office Side
				R - Opposite side

	SH Balussery Side	104	148	L – Municipality Office Side
				R - Opposite side
	Municipality road	75	64	L - Municipality Office Side
				R - Opposite side
4	Kollam Junction			
	NH 66 Kozhikode Side	210	88	L - West side
				R – East Side
	NH 66 Kannur Side	148	96	L – West Side
				R – East Side
	Nelliadi Road	67	49	L – North Side
				R – South Side

(Source: Traffic and Transportation survey, 2013)

22.11 Problems in transport sector

The transportation should be integrated in the planning process and it is one of the many aspects of total planning in which all aspects interact, influence and aggregate. Transport development plan for Koyilandy is prepared taking into account the existing traffic scenario and based on an evaluation of the future traffic on the base year network. Transport development schemes cover all the available modes of travel and are formulated so as to reduce the severe strain put on the existing road network. All committed development schemes were taken into account while formulating the transport development plan. Like any urban centre in the State, Koyilandy also faces problems in traffic and transportation system like:

- Lack of proper hierarchy of roads
- The inter-mixing of intra-city and inter-city traffic in the absence of adequate bypasses
- Poor surface conditions
- Increasing number of personalized vehicles
- Inadequate width of roads in the central part of the city
- Lack of pedestrian facilities
- Unorganized on-street parking in the absence of proper parking lots
- Movement of inter-city bus traffic on congested urban roads due to the location of inter city-bus stands within the central area of the city
- Encroachment of right-of-way and Idle parking
- Uncontrolled loading/unloading operation of trucks near god owns and wholesale markets within the central city area

- Noise and Air pollution
- Inadequacies in Mass Transport System
- Absence of proper traffic signs and markings

22.12 Traffic projections

The fundamental principle of urban transportation planning is to formulate a long-term transportation plan serving the community in the future. Thus it becomes necessary to forecast the future travel pattern for the horizon year. Traffic projections help in evaluating the shortfall in the road network and accordingly plan the road network improvements, augment the facilities such as providing new roads, developing missing links, bypass road etc. This section gives an overview of various techniques available for traffic projections and the methodology adopted for this study.

22.12.1 Methods of traffic projection

For projecting the future demand, various methods of traffic projection including statistical, econometrical and mathematical models are available. These could be judiciously utilized depending upon the level of accuracy warranted and the extent of database available. Various methods of traffic projection employed in the transport planning include;

- Interpolation method based on past trend in traffic growth rates
- Growth factor methods
- Regression method based on economic indicators like population, per-capita income growth rate and growth rate in industrial sector and land use parameter

The relationship established between the various economic indicators for passenger and goods traffic movement can be used to estimate the future demand in an area. Also the growth rate of vehicular population in the area over the years will give a good estimate of the future trips. The traffic volume on links from the past years can be used to establish a growth rate for prediction of the future volume on links.

Techniques Adopted for Projection are

- ***Trend Based Analysis as per IRC: 108-1996*** *(Using Vehicle Registration data)*
- ***Econometric Model****(Using Trends in the Growth of Economy (Gross Domestic Product))*

- ***Trip End Factor Model****(Using Net State Domestic Product and Per-capita Income)*

22.12.2 Growth rate adopted for projection

While formulating the traffic demand growth rate for future, all the above issues relevant to the project studies have been considered. Improved and congestion free road conditions would lead to reduction in cost of travel because of savings in vehicle operating costs and travel time. Due to the technological up gradation the availability of quality and comfort in vehicles-cars or buses especially for long or intra-city movement more traffic on the roads is likely to be induced. Similarly, with economical development, the per capita income would continue to increase, in turn, leading to a simultaneous increase in propensity towards travel in general. A comparison of growth rates of vehicles is given in the table 22.25

Table 22-25Comparison of growth rates

Vehicle	Method	Growth rate	Average
Car	Past trends (vehicle registration data)	15.302	14.546
	Econometric model	14.358	
	Trip end factor model	13.978	
Two wheeler	Past trends (vehicle registration data)	12.126	11.982
	Econometric model	12.048	
	Trip end factor model	11.772	
Three Wheelers	Past trends (vehicle registration data)	8.354	8.434
	Econometric model	8.591	
	Trip end factor model	8.358	
Bus	Past trends (vehicle registration data)	5.514	5.743
	Econometric model	5.934	
	Trip end factor model	5.780	
Mini Bus	Past trends (vehicle registration data)	12.648	10.528
	Econometric model	9.512	
	Trip end factor model	9.425	
Truck	Past trends (vehicle registration data)	9.274	9.13
	Econometric model	9.18	
	Trip end factor model	8.943	
LCV	Past trends (vehicle registration data)	11.573	11.55
	Econometric model	11.656	

	Trip end factor model	11.429	
MAT	Past trends (vehicle registration data)	2.63	2.154
	Econometric model	1.917	
	Trip end factor model	1.916	

The growth rate obtained above is by considering the characteristics of the State and the Nation. Koyilandy is a third grade municipality and the inner parts of the town show rural characteristics. Therefore, the obtained growth rate is speculative. By considering the growth rates of similar towns in Kerala and from experience, a smaller growth rate shall be adopted for forecasting the passenger and freight traffic in Koyilandy Municipality. But NH 66 and SH34, the two major arteries of Koyilandy carry intercity as well as intra city traffic. Hence the traffic growth in these corridors will be near to the State growth rate. So a growth rate, which is less than that obtained from different models was adopted for traffic through NH and SH and lesser growth rate adopted for all other inner roads in Koyilandy. The mode choice behaviours of persons are highly probabilistic and it shows changes from private mode to public mode and vice versa. In future, introduction of new public transport facilities will attract more persons from private mode to public and this in turn will reduce the vehicle growth rate. Hence a small reduction in the growth rates of vehicles is expected after 2020. The resultant growth rates adopted are presented in table 22.26.

Table 22-26Adopted Growth Rates

Vehicle Category	Annual traffic growth rate (%)				
	Average growth rate obtained	Adopted up to 2020 (Arterial Roads)	Adopted beyond 2020 (Arterial Roads)	Adopted up to 2020 (Other Roads)	Adopted beyond 2020 (Other Roads)
Truck	9.13	7.00	6.00	5.00	4.00
LCV	11.55	8.50	7.50	6.00	5.00
MAT	2.15	2.00	1.50	1.50	1.00
Bus	5.74	4.00	3.50	3.00	2.00
Mini Bus	10.53	8.00	7.00	3.00	2.00
Car	14.55	11.00	9.50	6.00	4.00
Three Wheeler	8.43	6.50	5.50	5.00	4.00
Two wheeler	11.98	9.00	8.00	5.00	4.00

22.12.3 Observation of projected traffic

The future traffic through all the major roads in Koyilandy were estimated by multiplying the present PCU value with the obtained growth rates. Other than this, few corrections were made to the link volumes considering the following land use and transportation characteristic of municipality in mind.

1. Chances of increase in the traffic through NH 66 is high since it is the major road connecting Kozhikode corporation, the higher order service provider in the district with Vatakara municipality and the panchayat located in the northern areas of the district.

2. Trend of developments in Koyilandy Harbour and surrounding area shows that in future, the harbour will be a traffic attracting zone, especially for goods traffic.

3. Introduction of railway flyover at municipality junction will increase the trip attraction potential of existing Koyilandy town from eastern areas of the district. Now the service trips from eastern areas of town are distributed to various nearby towns in the Kozhikode Corporation due to the railway gate closing problem and resulting congestion.

4. New commercial developments at Koyilandy town area in future will attract more trips to the town.

The traffic through each links was projected to 2031 using the obtained growth rates and considering the above mentioned parameters. The projected traffic volumes for 2031 are provided for the comparison with the traffic counts collected from the field in the table below. Volume-Capacity ratio of the horizon year is also given. From the projected traffic and its V-C ratio, it is clear that by 2031; almost all major roads of the municipality will be congested if no improvement measures are taken.

Table 22-27Projected Traffic Volume and V/C Ratio on Major Roads

Sl No.	Road section	Capacity (PCU/Hr)	Volume (PCU/Hr) 2031	Volume - Capacity Ratio 2031
1	Anakulam (NH)	1800	7995.97	4.44
2	Kainatti (NH)	1800	11375.10	6.32
3	Kanayamkode (SH)	1500	2418.16	1.61
4	Mujkunnu	1200	950.42	0.79
5	Muthambi	1200	1220.98	1.02
6	Nelliadi	1200	923.30	0.77
7	Municipality (SH)	1500	5055.27	3.37

It is clear from the table 22.27 that, the projected traffic on the existing network could not be handled in the horizon year without proper up gradation of the network and facilities. It is seen from the projection that Mujkunnu and Nelliadi roads have volumes less than capacities in 2031 also. But traffic assignment to road links will take place only according to capacity restrained manner. Once capacity of one link reaches its maximum, the traffic volume will be diverted to the nearest link and it will become congested and the process will go on. Hence in future, all the major links in Koyilandy will get overcrowded.

22.13 Inference

Even though Koyilandy municipality is provided with sufficient road connectivity, it suffers from the well known ill-effects of urbanization. All major roads in Koyilandy municipality are currently serving the traffic volume more than their holding capacity. Collector and local roads have poor surface and geometric conditions, and this in turn increase the congestion in the major roads. The existing network cannot handle traffic in future decades without proper up gradation of the network and facilities.



23 ANIMAL HUSBANDRY

23.1 Population

The table 23.1 below gives the livestock population in the town. From the population (compared to the size of the town and extent of non-developed area in the town) it is evident that animal husbandry is not practiced in the town on a commercial basis.

The overall livestock population in the Municipality is summarised in table 23.1 and the ward wise details on livestock population across various wards of the Municipality as per the 19th livestock census 2012, conducted by the department of Animal husbandry Govt. of Kerala are given table 23.2. Accordingly the town has 1580 numbers of cattle, 36 buffalos, 449 goats, 10,691 poultries, 698 dogs, 92 rabbits and 2 elephants as registered during the time of the survey.

Table 23-1Livestock population

Name of Ward / Place	Livestock population						
	Cattle	Buffalo	Goat	poultry	Dog	Rabbit	Elephant
Koyilandy Municipality	1580	36	449	10,691	698	92	2

(Source: district veterinary hospital, Kozhikode, 2012)

Table 23-2Ward wise details on Livestock population

Sl.No	Ward No.	Cattle	Buffalo	Goat	Dog	Rabbit	Poultry
1	1	21	1	4	12	0	301
2	2	60	0	2	23	0	244
3	3	54	0	10	8	0	235
4	4	72	0	14	8	0	542
5	5	63	0	24	6	0	215
6	6	37	3	2	19	3	318
7	7	34	1	1	10	3	829
8	8	72	0	16	20	22	329
9	9	68	0	15	23	0	305
10	10	31	0	4	28	1	147
11	11	26	1	7	25	6	249
12	12	23	0	2	17	1	123
13	13	42	0	17	23	0	180
14	14	37	0	11	38	11	138
15	15	11	0	0	26	0	90
16	16	60	0	14	10	0	158
17	17	21	1	1	11	0	301
18	18	43	0	6	17	0	419
19	19	88	0	17	15	0	158
20	20	132	0	24	7	2	200
21	21	40	0	0	6	0	155
22	22	70	1	12	14	0	145
23	23	109	8	58	11	0	399
24	24	55	1	25	16	3	188
25	25	41	3	2	14	0	300
26	26	36	1	19	15	0	115
27	27	28	0	10	7	0	60
28	28	39	3	24	22	3	205
29	29	22	1	13	25	0	98
30	30	21	2	15	19	27	201
31	31	16	0	15	34	3	95
32	32	9	0	3	39	0	212
33	33	8	0	0	18	1	184
34	34	13	0	8	20	0	270
35	35	1	0	4	5	0	177
36	36	9	0	0	17	0	258
37	37	1	0	0	5	2	710
38	38	0	2	3	0	0	107
39	39	30	7	6	1	0	295
40	40	8	0	0	23	0	178
41	41	5	0	14	10	2	324
42	42	6	0	7	2	0	142
43	43	13	0	12	18	0	184
44	44	5	0	8	11	2	208

(Source: Livestock census 2012)

23.2 Production

The town has two poultry farms, which produces 5000 Kg chicken per month and the details are given in table 23.3. There are no dairy farms in the Municipal area. There are two milk co-operative societies and six other milk collection centres as detailed in table 23.3 below. The town has no proper scientific slaughter house in place. It is estimated that, (Source: local enquiry) an average of 18,000 Kg of chicken and 22,500 Kg of red meat has been sold out through selling outlets per month which is far higher than the produced quantity. The shortage of 13,000 Kg chicken is being met from various suppliers including supply from nearby states. Hence it can be seen that there exist a considerable gap between the demand and supply of chicken, red meat and milk which in turn make it a viable sector of creating employment opportunities.

Table 23-3Outlet details

Name of Ward/Place	Poultry Farm/broiler farms/selling outlet	
	Farm within the GP/Mpty	Quantity of production per month (kg)
Puliyancheri	Othiyoth Poultry Farm	3000
Puliyancheri	Deep Poultry farm	2000
Market	A.S.R.chicken stall	NA
Market	M.P. Traders	NA
Market	Eldo chicken stall	NA
Market	V.K.chicken stall	NA
Market Rd.	C.P.R.chicken centre	NA
Market Rd.	A.S.R.chicken stall	NA
Market Rd.	Chicken stall, Koyilandy	NA
Market Rd.	Chicken stall, Koyilandy	NA
Market road	A.P.Chicken centre	NA
Market Rd.	T.V.chicken centre	NA
Town Kollam	Deepak traders	NA
Town Kollam	Chicken stall, Kollam	NA

(Source: primary survey data)

Table 23-4Milk cooperative societies and collection centers

Milk Co-Operative Societies		Other Collection Centres	
Name of Ward/ Place	Average Qty collected per Day (Ltrs)	Name of unit	Name of Ward/Place
Panthalayani	300 litres	Thanal Dairy, Koyilandy	Bappenkod road
		Sree Murughan Dairy farm	East road,Koyilandy
		Milma milk parlour, Koyilandy	Taluk Hospital compound
		Ambadi Milk unit, Koyilandy	Peruvattoor town
		Panthalayani Milk Supply Unit	Koyilandy Bus stand
Ooralur	100 litres	Ampadi Milk Unit	Market

(Source: primary survey data)

23.3 Problems and Potentials

Even though the municipality has a vast extent of undeveloped land favourable for animal husbandry activities, sector is yet to gain its momentum, owing mainly to the following reasons.

23.3.1 Shrinkage in grazing land

The availability of grazing land is diminishing in a rapid pace. Various factors including filling up of paddy land, rapid urbanization causing building footprints to cover up the green areas and population pressure which prompts people to privatize vacant land there by reducing the area available for free grazing land. The reduction in availability of free grazing land will force the farmers to opt for readymade cattle feed which in turn shoots up the overall cost of the operations.

23.3.2 Diseases

Various diseases adversely affect the sector. The major one is the Foot and Mouth Disease. It is a fatal viral disease highly infectious, and can be spread by infected animals through aerosols, through contact with infected farming equipment, vehicles, clothing, feed etc.

23.3.3 Shortage in labour force

The availability of skilled labour is minimal when compared to the demand. Farmers often are forced to make use of less trained people especially labourers from other states.

23.3.4 Lack of awareness

Although various projects and programs have been undertaken by the Govt. most of the time the details are not effectively passed on to the user end. This creates a lack of professional knowledge regarding various aspects of the sector.

23.4 Inference

The animal husbandry sector in Koyilandy Town can be revived effectively owing to the favourable conditions on the availability of vast agrarian lands. Research and development initiatives with a special focus on the planning area can further enhance the effectiveness of the sector. Stages of production of meat and related products need scientific enhancement with modern facilities for slaughtering and waste disposal, under direct supervision of veterinary specialists. There is a big gap existing between the production and consumption of poultry products. Various projects and policies need to be incorporated in view of making the Municipality self-sufficient in the sector.



24 ENERGY

24.1 Electricity Distribution Network and Consumption

There are no facilities at present in the Municipality through which electricity generation has been practiced on large scale basis. One 110 KV substation exists in the Municipality. Non-conventional sources of energy are not tapped in the town to notable levels. The sector wise breakup of number of connections and power consumption is shown in the Table 24.1. Changes in number of total and domestic connections over the years from 2011 are shown in figure 24.1. The numbers of connections as well as consumption are found to be increasing over the past few years.

Table 24-1Power connection and consumption details

Category wise break up– Number of connections (March 2014)						
Type	**Domestic**	**Industrial**	**Commercial**	**Agricultural**	**Others**	**Total**
Number	15615	196	4557	213	18	20599
Percentage	75.80	0.95	22.12	1.03	0.09	100.00
Category wise breakup – Power consumption (KWH) (March 2014)						
Type	**Domestic**	**Industrial**	**Commercial**	**Agricultural**	**Others**	**Total**
Power	2430630	128512	665603	4470	94510	3323725
Percentage	73.13	3.87	20.03	0.13	2.84	100.00

(Source: KSEB Koyilandy)

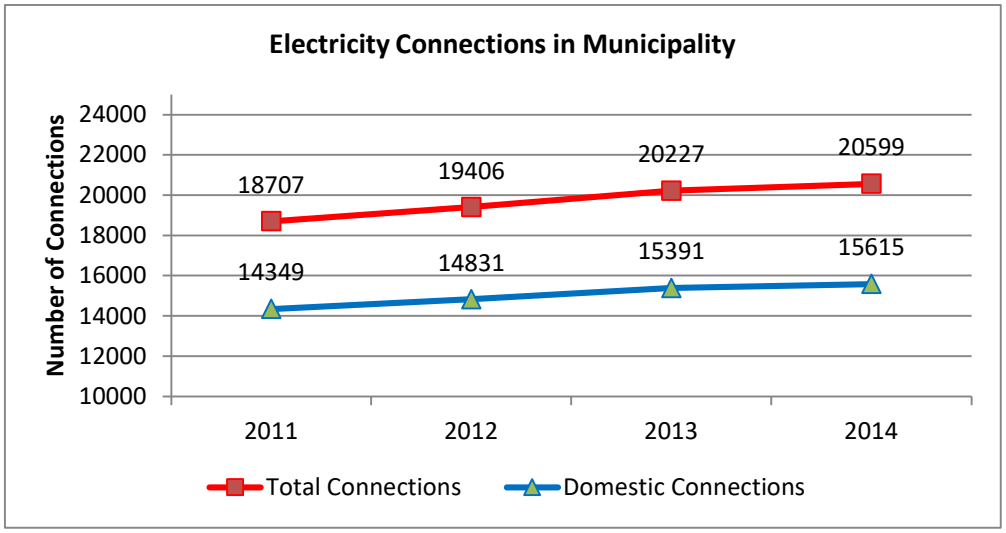


Figure 24-1Electric connections in municipality (Average per year)
(Source: KSEB, Koyilandy)

Major ongoing and committed projects under power sector are projects under Restructured Accelerated Power Development and Reforms Programme (RAPDRP), Voltage improvement works and 100 % electrification program etc. Transformer installation at 5 places, namely Anchumukku, Kalarikandy Mukku, Gurukulam, Nellikode kunnu and Stadium is another major on-going program. The major issue in energy sector is the low voltage problem at Koomanthode, Pathyeri Thazhe and Payattuvalappil.

24.2 Domestic Fuel

It is revealed from socioeconomic survey that, there are only 1.73 percentages of non-electrified houses in the municipality. 99.27% of households use fire wood as their domestic fuel. 69.07% use LPG as fuel for domestic use along with the use of firewood.

24.3 Fossil Fuel

There are five fuel filling stations in the municipality. Approximately 8,000KL of petrol and 14,500KL of diesel sold in the town annually. The monthly variation of sale in the town is analysed and the results are shown in the figure 24.2. Accordingly the annual per capita consumption of fossil fuel will turn out to be 111 litres of petrol and 202 litres of diesel, assuming that the fuel dispatched out from outlets situated in the Municipality are entirely consumed locally. It can be seen that the usage of fuel is more in the summer season than winter season. Since there are a number of fuel filling stations in the nearby LSGs, the sale can be taken as almost equal to the consumption of the town. Approximately the per capita fossil fuel consumption works out to be 0.9 L per day.

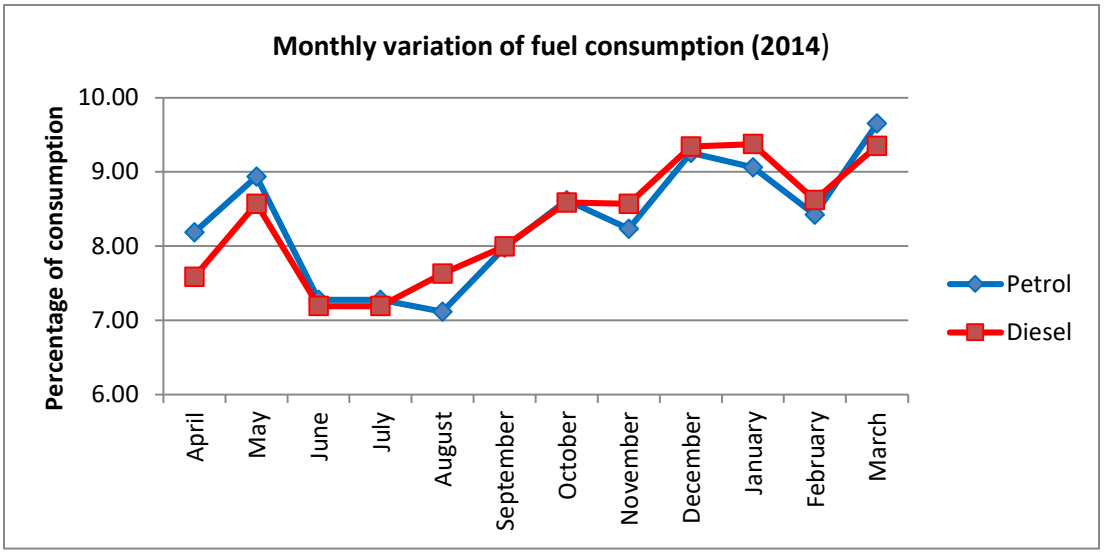


Figure 24-2Monthly variation of fuel consumption
(Source: Primary survey, 2015)

24.4Inference

Number of connection and consumption of electricity is increasing every year, but there is no facility for energy production in the municipality. This necessitates more inventions in the field on non-conventional energy production. Usage of LPG along with fire wood as domestic fuel is a common practice in the municipality. There is an immediate need to tap solar power and other non-conventional energy to reduce the use of fossil fuels.



25 SPECIAL CONCERN AREAS

25.1 BPL Status

According to the BPL survey conducted by the Municipality in the year 2009, there are 7,450 persons in the Municipality (i.e., 10.80% of total population) who falls below the poverty line standards. The community wise break up of BPL status is shown in the Figure 25.1. It can be seen that 68.24% of the BPL population belong to general. According to the survey, ward 3 is having the highest BPL population of 367 persons, followed by ward 28 (215 persons) and ward 16 (289 persons). The lowest number of BPL population is in ward 35 (59Persons).

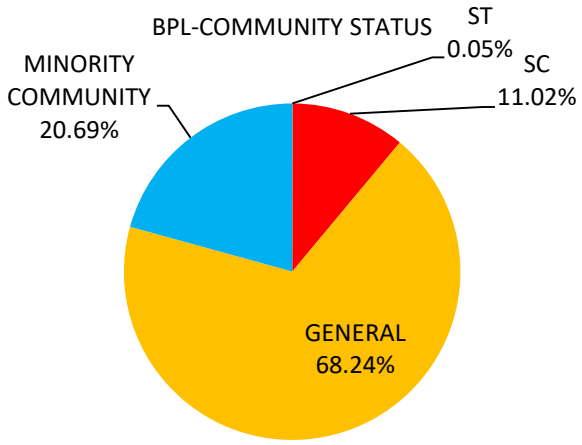


Figure 25-1BPL family percentage
(Source: Koyilandy Municipality, 2013)

BPL survey data were analysed ward wise and the result is shown in figure 25.2. It can be seen that, Minority BPL concentration is higher in coastal wards and BPL concentration of SC families are higher in the eastern wards of municipality.

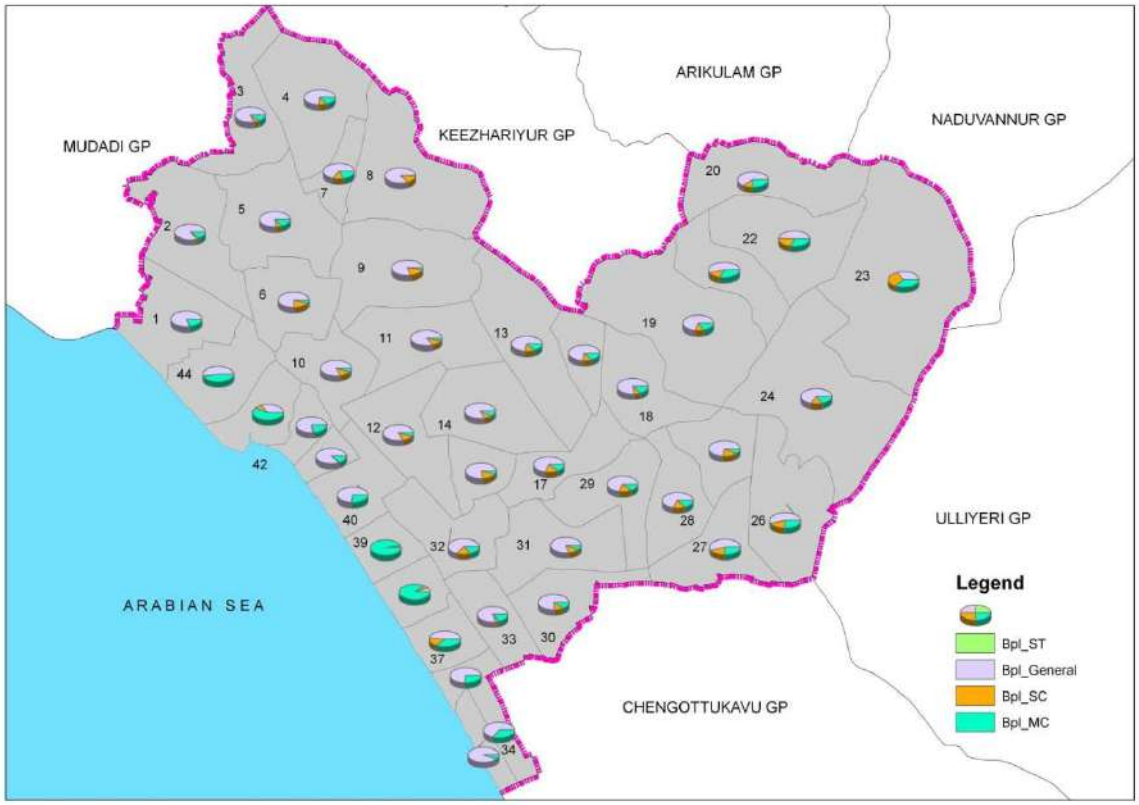


Figure 25-2Ward wise distribution of BPL families
(Source: Koyilandy Municipality, 2013)

25.2 Scheduled Castes and Tribes

The SC population in the town as per 2011 Census is 4550 persons and ST population is 80 persons. The percentage variation of SC/ST population in Koyilandy Municipality is compared with that of other municipal local bodies in the district and shown in figure 25.3. It is observed that the percentage of SC population in Koyilandy is on the sixth position when compared with the other Municipalities. Mukkam Municipality exhibits the highest value of SC percentage population among the various urban local bodies in the district.

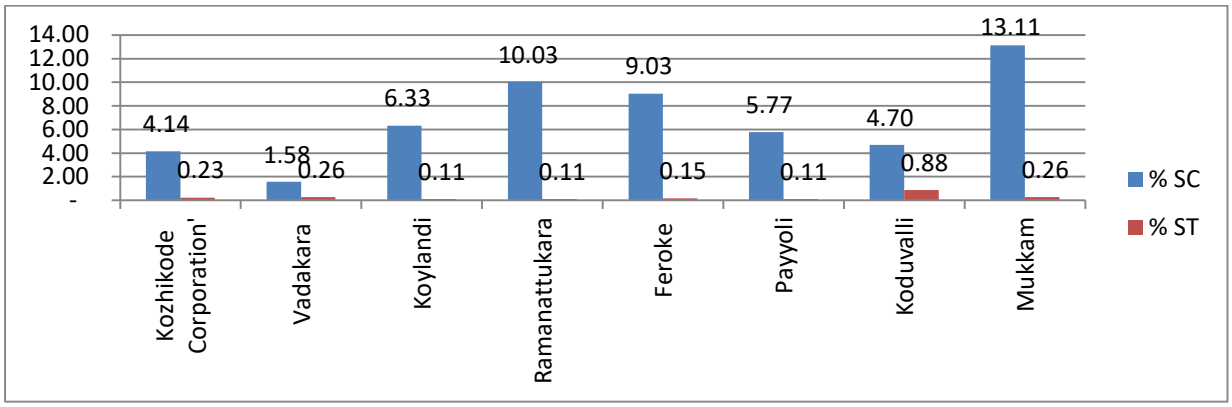


Figure 25-3SC / ST population in Urban local Governments in Kozhikode District
(Source: Census 2011)

Concentration index of SC population is generated and is shown in figure 25.4. It can be seen that SC families are mainly concentrated at the central area of the municipality.

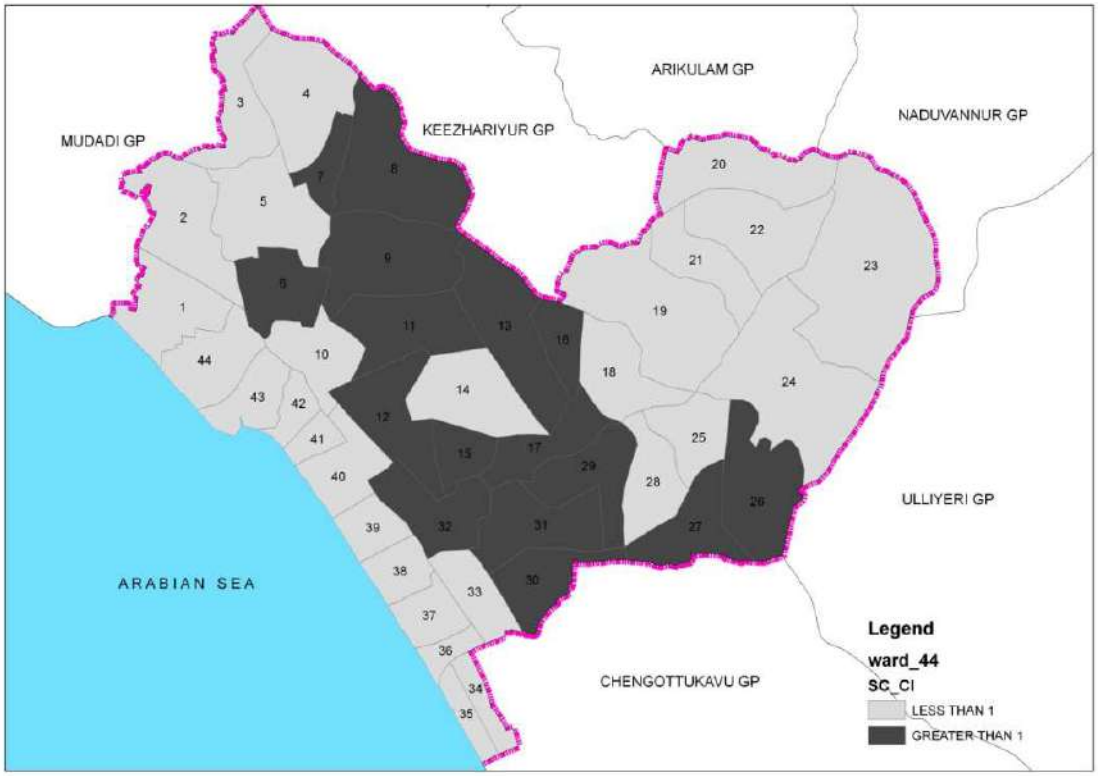


Figure 25-4Concentration index of SC population
(Source: Census 2011)

25.3 Living Standards

As per Socio economic survey the average family income is about Rs 6818/month. The concentration index map of average family income is shown in the figure 25.5.

Expenditure pattern of persons in the municipality as well as some measures for living standard were collected in socioeconomic survey. Figure 25.6 shows the expenditure pattern and table 25.1 gives the percentage of people owning some gadgets which are indicative of living standards. It is observed that about 50% of money is been spend for food. Expenditure for health, travel and education comes in next places.

88 percentages of households in the municipality is having television and 92 percentages is having mobile phones. 42 percentages of houses have refrigerator. The details on various living standard characteristics of people in the Municipality is given in table 25.1.

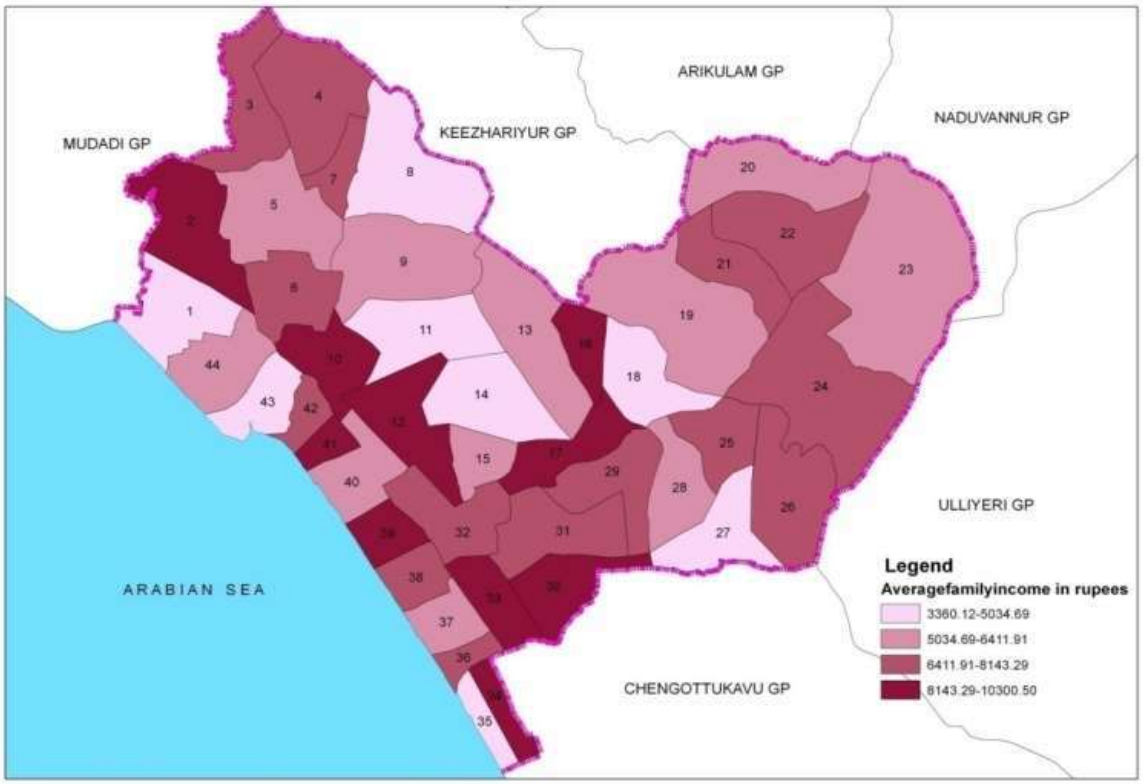


Figure 25-5CI of monthly income
(Source: Socio economic survey 2013)

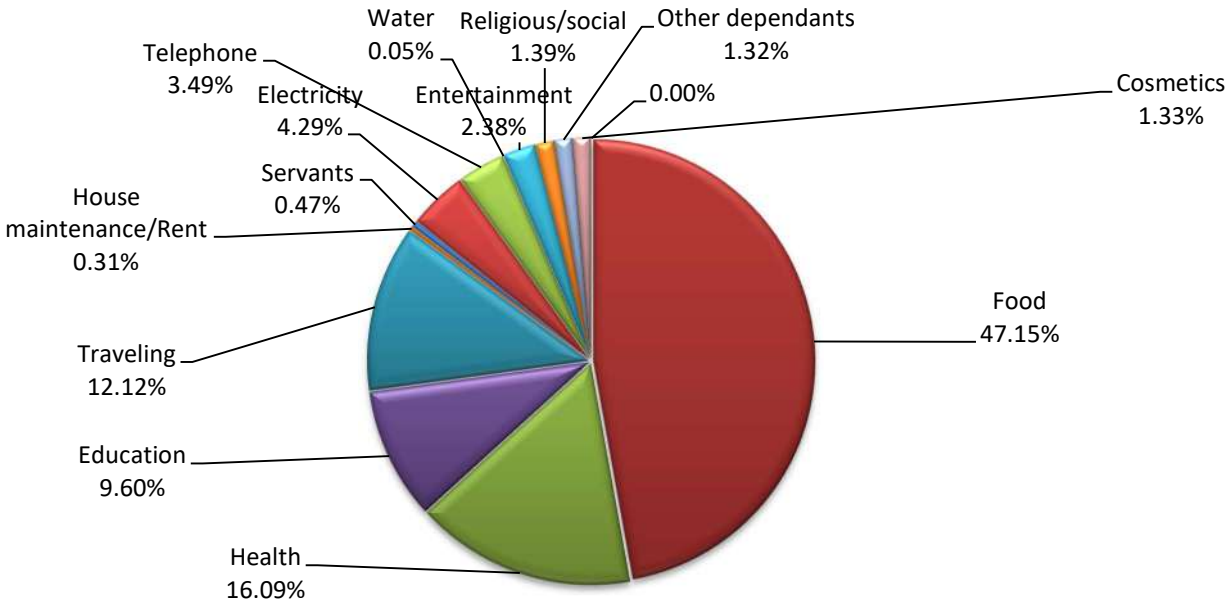


Figure 25-6Expenditure Pattern
(Source: Socio economic survey 2013)

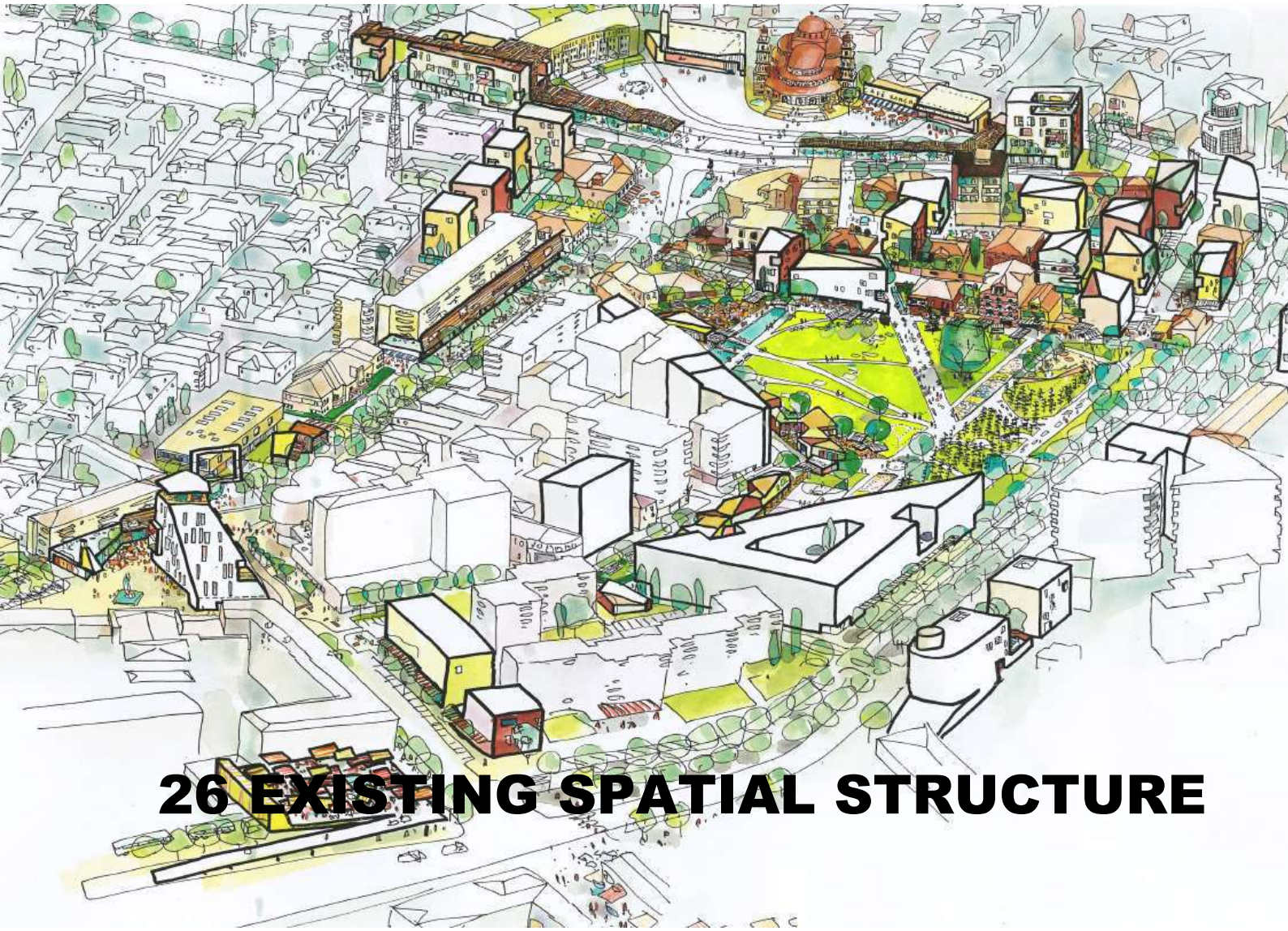
Table 25-1Living Standard

Sl No	Gadget	Percentage of Household
1	Air Conditioner	2.64
2	Refrigerator	42.36
3	Television	87.73
4	Washing Machine	13.18
5	Mobile	91.82
6	Computer	8.36
7	Telephone	24.09
8	Internet	3.36
9	LPG Connection	75.36

(Source: Socio economic survey 2013)

25.4 Inference

There are no over concentration of SC/ST families anywhere in the Town. It can be observed that the living standards of the people under special concern groups need to be improved further. Majority of the families are having mobile phones, LPG connections and television facilities indicating better standard of living conditions in general.



26 EXISTING SPATIAL STRUCTURE

26.1 Functional Character of the Wards

As explained in Chapter 7 the functional character of wards is as shown in Figure 26.1.Almost all the coastal wards show urban character whereas the wards in the eastern side of Nelliadi river shows semi rural and rural characteristics.

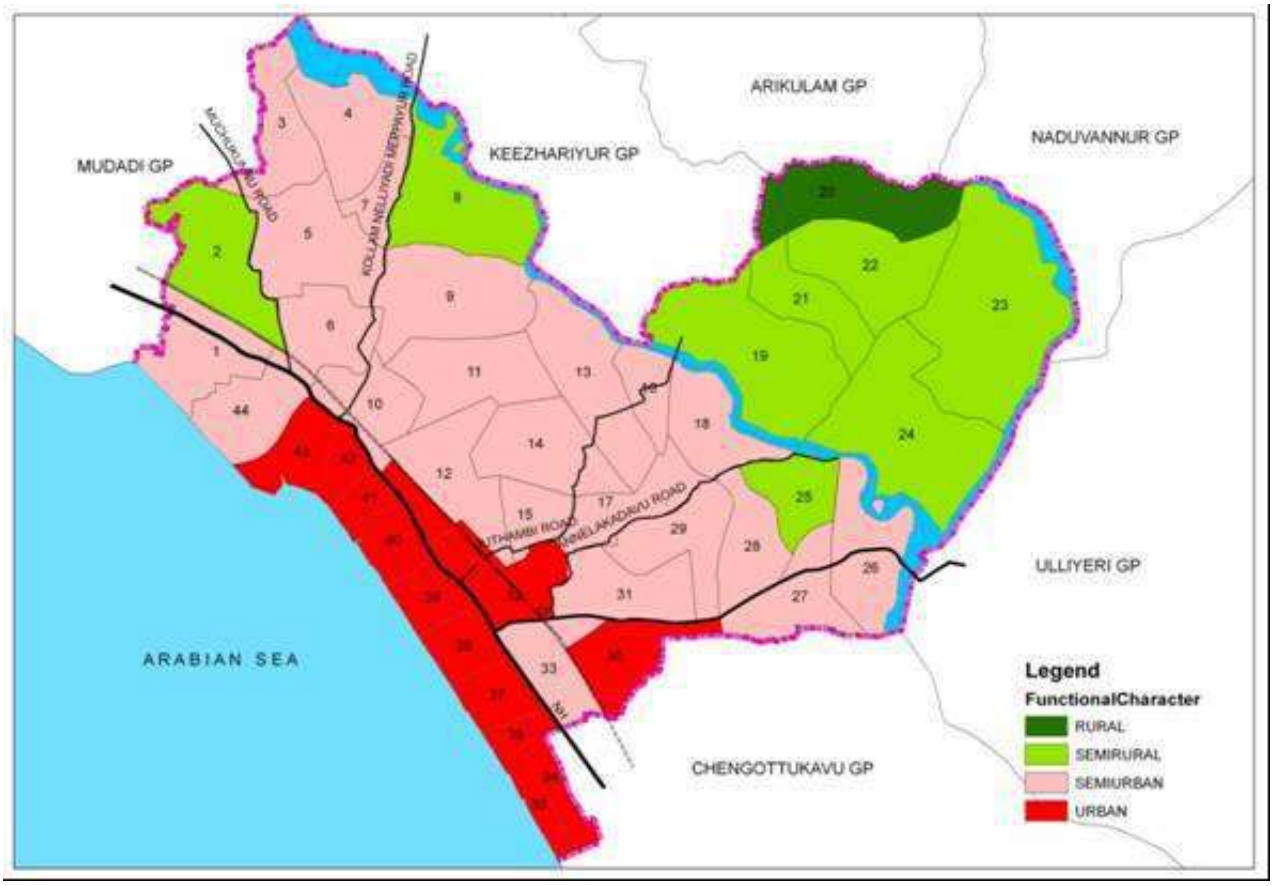


Figure 26-1 Functional character

26.2 Activity pattern based on land use concentration

The activity pattern based on land use concentration is shown in Figure 26.2.

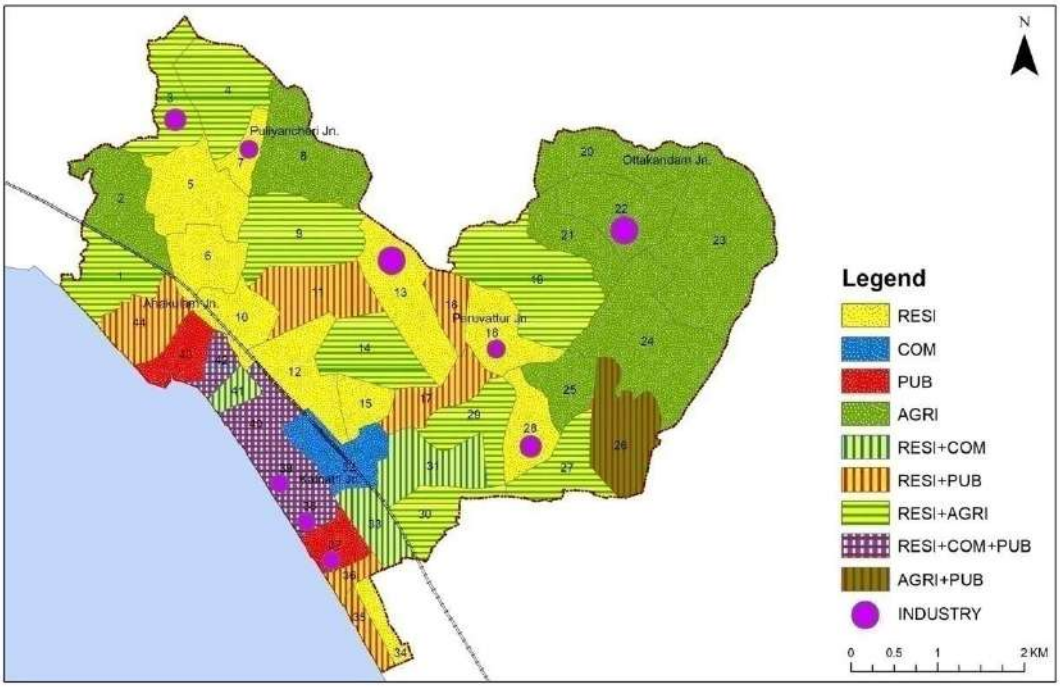


Figure 26-2Activity pattern

The commercial concentration is more in the wards west of the railway line. High residential concentration and public and semi public activities are seen towards north & east of railway line. The public and semi-public activities show concentration in the central and the coastal part. Agricultural concentration is towards the eastern side of Akalapuzha which shows residential activities also. Industrial concentration is scattered along the coastal and river side which are related to fishing activities.

26.3 Existing connectivity pattern

The existing connectivity pattern showing the NH, SH, major roads and other roads are given in Figure 26.3.

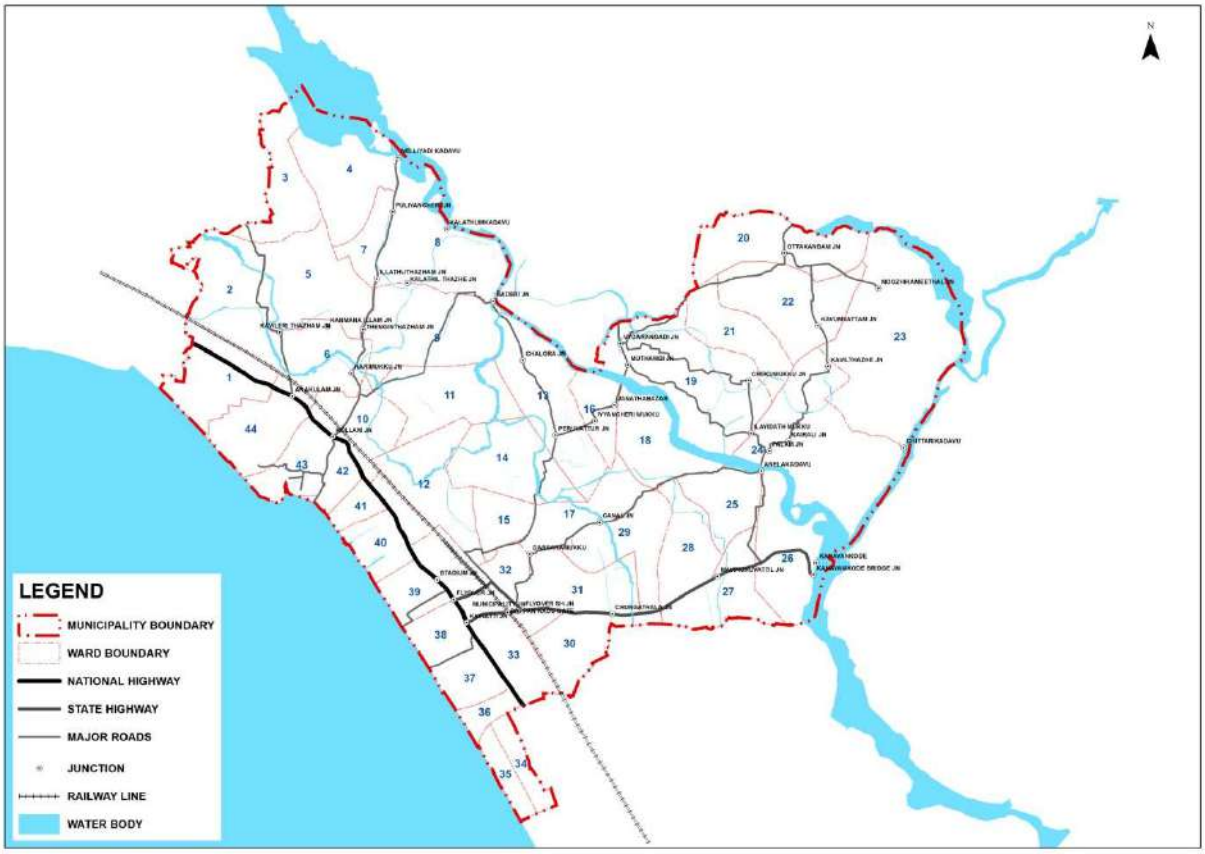


Figure 26-3 Existing connectivity pattern

26.4 Existing hierarchy of nodes

In the Kerala context where urban rural continuum persists, each local government is having at least one node. The agglomeration of activity area around one or more (adjacent) road junctions which act as commercial centre of a local government is termed here as a node. The node need not be confined fully within a local body area and in most of the cases its service area goes beyond the boundary of the local government within which it is located. In certain cases the nodes may be located at the meeting point of the boundary of one or two local governments. This means that the nodes have an entity independent of the local government area and necessitates a separate study other than the settlement study. The hierarchy of the nodes is determined by the extent of activity

taking place there. The number and type of shops, the number of people using the node, the business turn over, the extent of traffic all determines the extent of activity taking place there and hence the hierarchy of nodes. But extensive survey and study are required to assess all these factors. Whereas it can be seen that the extent of development in a node is directly proportional to the hierarchy of the roads meeting at a node. The hierarchy of the nodes based on the hierarchy of roads meeting at the node is determined and shown in Figure 26.4.

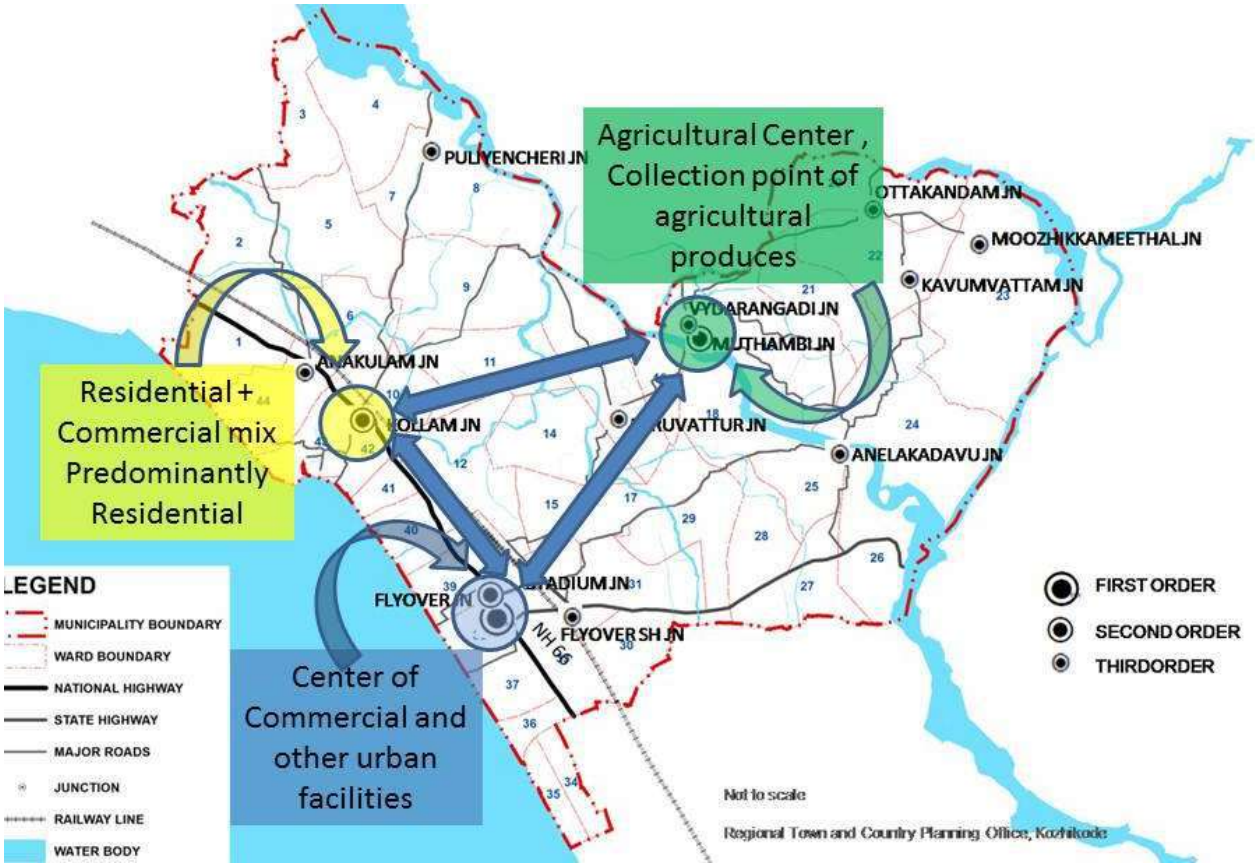


Figure 26-4Existing hierarchy of nodes
(Source: District Urbanisation Report Kozhikode)

It can be observed that, Koyilandy town centre essentially provides the various urban amenities and facilities required for the Town and the node is predominantly commercial in nature. The Kollam junction is a mix of residential and commercial activities, although the predominant land use falls under residential category. Muthambi area acts as a centre for agricultural activities facilitating the collection of agricultural produces and its transportation to various other parts of the town.

26.5 Environmentally/ Ecologically Fragile Areas

The main environmentally fragile areas in Koyilandy are coastal stretch, river side, the other existing water bodies and the mangrove area in Anelakkadavu. The sensitive areas are shown in figure 26.5.

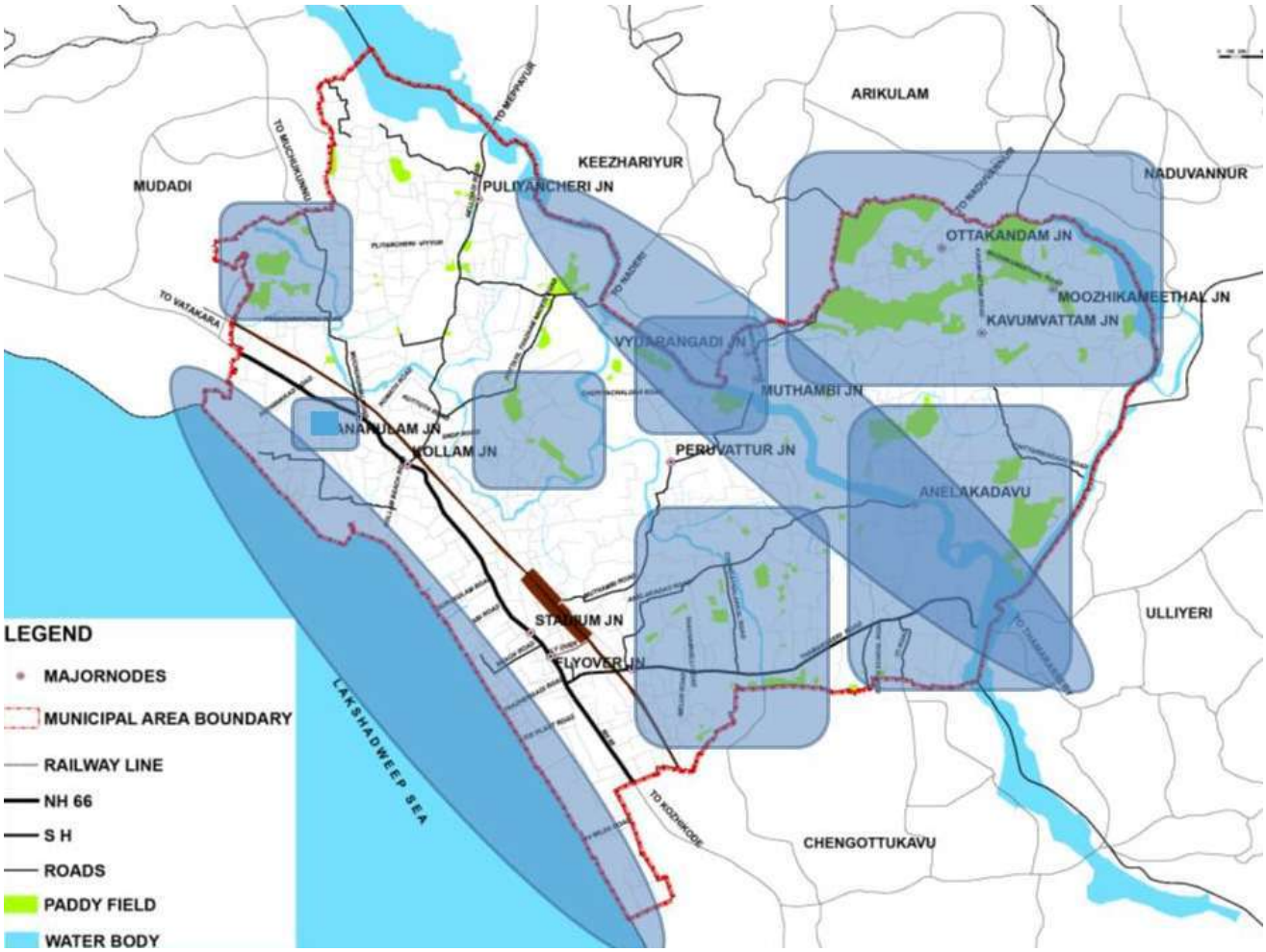


Figure 26-5Environmentally/ Ecologically fragile areas

26.6 Existing Spatial Structure

The spatial structure of the town was evolved considering the activity pattern, functional character of settlements, existing connectivity pattern, existing hierarchy of nodes and the environmentally sensitive areas in the Municipality.

The population density distribution of Koyilandy town can be arranged in to in to three distinct groups. The high density wards, with an average ward wise density of 4000 persons / km2 and above include wards 41, 42, 38,37, 36, 39, 35, and 34. Wards which are situated in the eastern and northern potions of the town are with relatively lesser population densities in the tune of less than 2000 persons per km^2 and include wards, 23, 22, 20, 21, 08, 02, 03, 24, 25, 19, 04 and 10. The remaining wards on the central parts of the Municipal area exhibit a medium density from 200 to 4000 persons per km^2. The distribution of population densities of various wards is illustrated in figure 26.6.

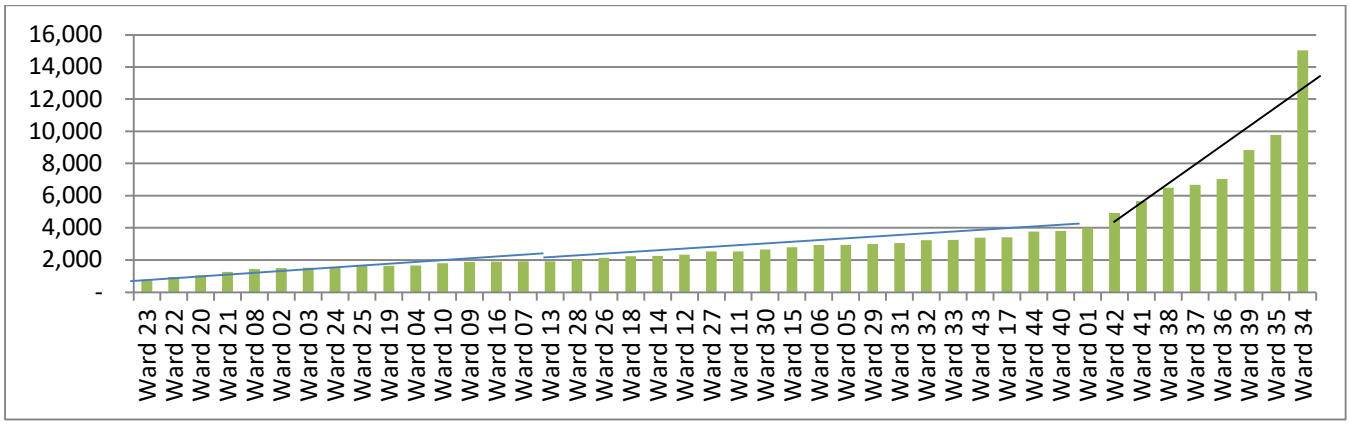


Figure 26-6Distribution of population density across the town (Persons per Sq km)

26.6.1 Overlay analysis

STAGE 1.

According to the distribution of population densities across the Municipal area, three distinct categories of low, medium and high densities of areas are identified, illustrated in Figure 26.7.

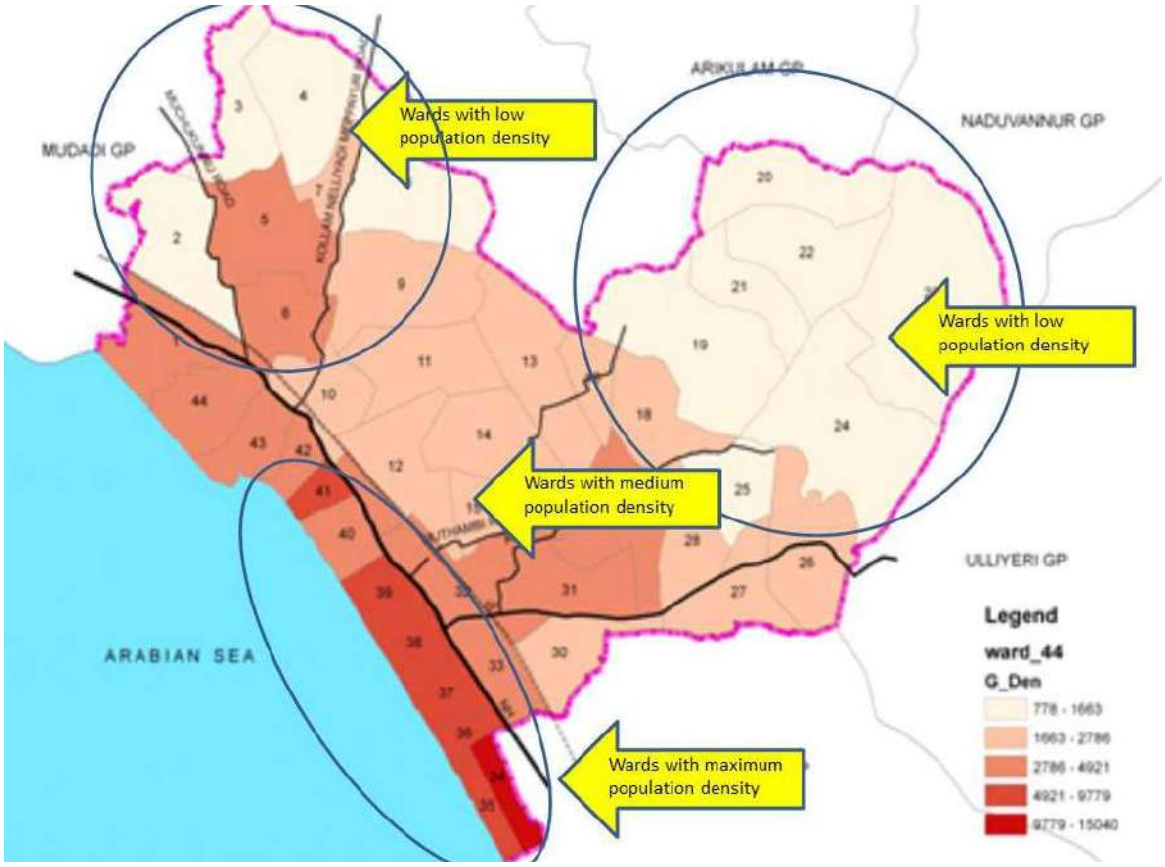


Figure 26-7Distribution of population density across the town (Persons per Sq km)

STAGE 2.

In this stage, the spatial distribution of commercial land use is overlaid on the density distribution map. It can be seen that, the locations with maximum commercial densities also are located where the residential density is also high, illustrated in figure 26.8.

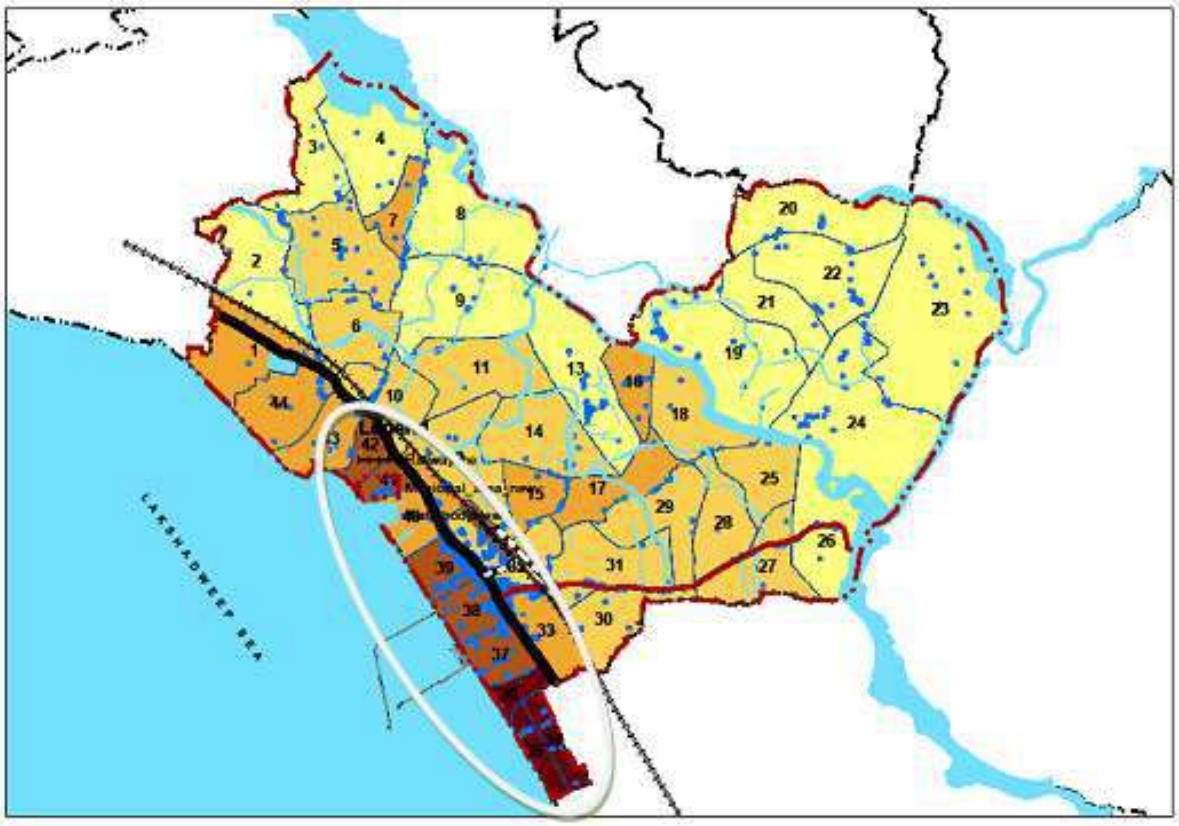


Figure 26-8Distribution of population density and commercial land use across the town

STAGE 3.

In this stage, the spatial distribution of public and semi public land use is overlaid on the density distribution map. The locations with maximum density of activities remain unchanged, in figure 26.9.

STAGE 4.

In this stage, major junctions, institutions and nodes etc. are overlaid. It can be seen that, the figure 26.10 illustrates an agricultural predominant eastern portion, a high density coastal area and commercial + residential mix zone along the transportation corridors. The environmentally sensitive zones constitute in the eastern part and the tourism areas are located in the western side.

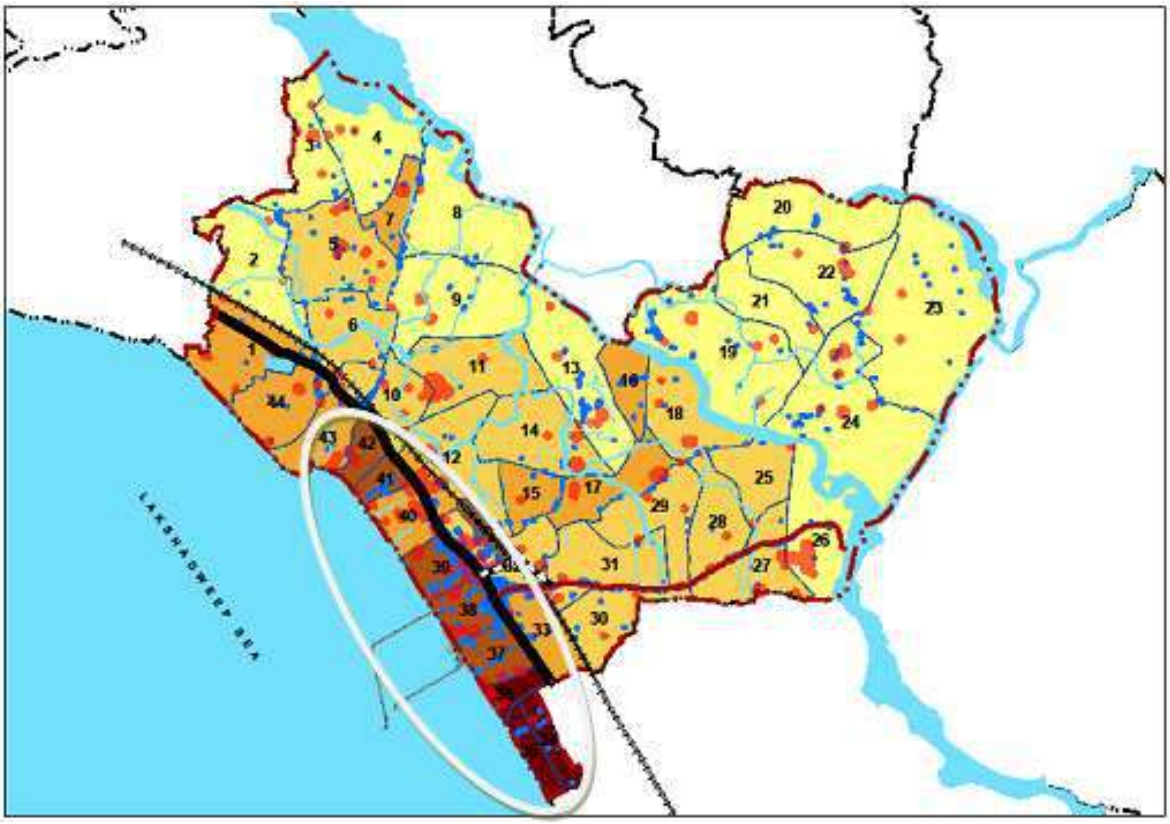


Figure 26-9Distribution of residential density, Commercial and public and semi public land uses

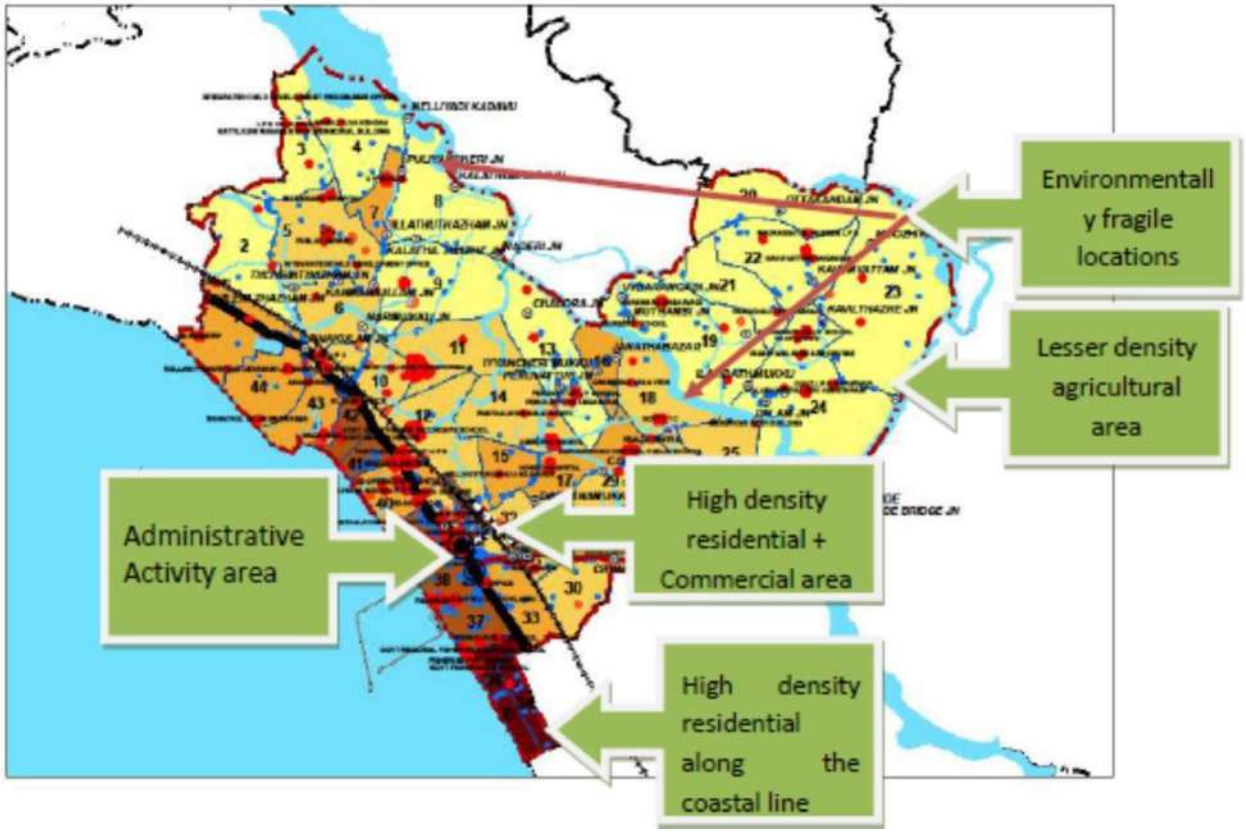


Figure 26-10Interpretation of Existing spatial structure of Koyilandy Town



27 DISASTER MANAGEMENT

27.1 Introduction

According to National Institute of Disaster Management (NIDM), Kozhikode is a multi hazard prone district. The whole part of the district is prone to cyclone. The low lying areas of the district traditionally undergo seasonal floods. The landslides and mudflows are a common phenomenon at the high ranges of Kozhikode district. Also the entire district comes under seismic zone III, which means a possibility for earthquakes up to 6.5 magnitudes on Ritcher scale. The density of population is very high in the district and this will increase the vulnerability. In addition to this, there is much possibility for manmade disasters like industrial and road accidents, fire incidents etc.

27.2 Disaster proneness

As per the disaster management plan for Kozhikode district – 2010, the local bodies in the Koyilandy taluk, in which the Koyilandy municipal area falls, are prone to many disasters. The proneness of the Koyilandy town to the coastal hazards and other hazards; and the responsibility and capability of the town to ensure the disaster management needs of the taluk population is to be considered seriously. The disaster proneness of various villages in Koyilandy taluk is as in the following tables.

The town has recorded no major disasters which had caused major loss to life or properties in the past. Although being a coastal town the tsunami occurred on December 26, 2004 has caused no mahor damages to the town.

Table 27-1Flood prone villages in Koyilandy Taluk

Sl.No.	Name of village	Prone areas
1	Iringal	Banks of Murat River and broad bottom valleys (paddy fields), Ayinikkad
2	Payyoli	Banks of Murat River and broad bottom valleys (paddy fields), Payyoli
3	Thikkodi	Banks of Akalapuzha
4	Moodadi	Banks of Akalapuzha and broad bottom valleys (paddy fields), Mudadi, Elambilad, Purakkal, Virayancheri
5	Viyyur	Banks of Akalapuzha and broad bottom valleys (paddy fields), Marallur, Puliyancheri
6	Panthalayani	Banks of Akalapuzha and broad bottom valleys (paddy fields),Panthalayani
7	Chengottukavu	Banks of Akalapuzha and broad bottom valleys (paddy fields), Elatteri, Elakualm, Chengottukavu
8	Chemancheri	Banks of Korapuzha and broad bottom valleys (paddy fields), Vengulam, Chemancheri, Thiruvannur
9	Atholi	Banks of Korapuzha and broad bottom valleys (paddy fields), Atholi, Kalakkad
10	Ulliyeri	Banks of Korapuzha & Broad flat bottom valleys (paddy fields) Atholi, Kalakkad
11	Naduvannur	Banks of Korapuzha & Broad flat bottom valleys (paddy fields) Kavil, Naduvannur, Mannankavu, Elangamal
12	Arikkulam	Banks of Korapuzha, Akalapuzha & Broad flat bottom valleys (Paddy fields) Kurichikkara, Arikkulam, Vagmoli, Karayad, Nochad
13	Keezhariyur	Banks of Akalapuzha
14	Thurayur	Banks of MuratRiver &Akalapuzha
15	Kozhukallur	Broad flat bottom valleys (Paddy fields) Kuttipra, kayalad, Kozhukallur
16	Meppayoor	Broad flat bottom valleys (Paddy fields) Meppayoor, Kuzhippayur, Changaramvalli
17	Cheruvannur	Banks of MuratRiver & Broad flat bottom valleys (Paddy fields) Avala, Kuttottu
18	Eravattur	Banks of MuratRiver & Broad flat bottom valleys (Paddy fields) Eravattur, Kallod,
19	Nochad	Broad flat bottom valleys (Paddy fields) Meppayoor, Valliyakkod, Nochad, Kaipattur, Velliyur
20	Kottur	Broad flat bottom valleys (Paddy fields) Kottur, Thiruvod
21	Avittanallur	Banks of Korapuzha
22	Balusseri	Banks of Korapuzha & Broad flat bottom valleys (Paddy fields)

		Balusseri, panai, Eramankulam
23	Panangad	Banks of Korapuzha
24	Sivapuram	Broad flat bottom valleys (Paddy fields) Viriambram, Malur, Sivapuram, Mangod
25	Unnikulam	Banks of Talayattupuzha
26	Kinalur	Banks of Korapuzha &Broad flat bottom valleys (Paddy fields) Mundakara, Puvamboyi
27	Kanthalad	Banks of CheruPuzha
28	Chakkittapara	Banks of Kuttiyadi River &Broad flat bottom valleys (Paddy fields) Sankaravayal, Kalangali
29	Kayanna	Banks of Cherupuzha & Broad flat bottom valleys (Paddy fields) Attiyod, Cherukad, Kayanna
30	Menjanyam	Banks of CheruPuzha & Broad flat bottom valleys(Paddy fields) Perambra, Marutari
31	Perambra	Banks of CheruPuzha & Broad flat bottom valleys (Paddy fields) Puliper uvanna, Perambra
32	Koothali	Banks of Cherupuzha & Broad flat bottom valleys (Paddy fields) Kuttali, Payittot
33	Paleri	Banks of Murat River, Cherupuzha & Broad flat bottom valleys (Paddy fields)Valiyakumbalam,
34	Changaroth	Banks of Niduvanpuzha, Kadiyangad puzha and Broad flat bottom valleys (Paddy fields)Changattur, Kadiyangad

(Source: District Disaster Management Plan Kozhikode,2015)

Heavy rains in some of these areas can result in flood condition and at times flooding in such areas may be very severe and can create problem. According to the BMTPC Vulnerability Atlas, the Probable Maximum Precipitation (PMP) in 24hrs for Kozhikode District is 600mm. The design of the drainage should consider the PMP value, the catchment areas of the drain and the characteristics of the catchment to avoid flooding. The probable maximum sea surge height is 3.5 metres.

Table 27-2Areas prone to coastal erosion in Koyilandy Taluk

Sl.No.	Name of village	Prone areas	Magnitude
1	Iringal	Coastal area (with sea wall)	High
2	Moodadi	Coastal area (with sea wall)	High
3	Viyyur	Coastal area (with sea wall)	High
4	Panthalayani	Coastal area (with sea wall)	High
5	Chengottukavu	Coastal area (with sea wall)	High

(Source: District Disaster Management Plan Kozhikode,2015)

Table 27-3Landslide prone villages in Koyilandy Taluk

Sl.No.	Name of village	Prone areas	Magnitude
1	Kottur	Chengottumala	Low
2	Balusseri	MannanPoyil	Low
3	Koorachundu Talayat,	Manikcherimala,N.kinalur	High
		Kavullamala	Low
4	Kanthalad	Killikudukki,Kakkayam)	High
		Kallnod	Low
5	Kayanna	Puvattumkunnu	Low
6	Chembanoda	PuzhithodEstate,Forest	High
7		Alapara, Ekkal	Low

(Source: District Disaster Management Plan Kozhikode,2015)

The lightning prone villages in Koyilandy taluk are Meppayur, Cheruvannur, Eravattur, Nochad, Menjanyam, Koothali, Paleri and Changaroth. Earthquake prone area in the taluk is Panthalayani and the approximate magnitude of occurrence is <3 (source: CESS).



28 SUMMARY OF FINDINGS

The findings obtained from the analysis of existing condition of different sectors are given in this chapter.

28.1 Findings Based On District Urbanisation Report

Based on urbanisation studies in Kozhikode District, Koyilandy should be a facilitator which acts as a tertiary activity centre for a service population of 372187 by 2021. About 12 local bodies will depend on Koyilandy for the urban facilities.

28.2 Population and Land Use Analysis

The demographic studies in the Municipality show that the total population is increasing, but the increase is not that much significant when compared to other urban areas in the District. The population density is more in the coastal wards and low in the eastern parts of the Municipality. The sex ratio of Koyilandy Municipality has increased from 1093 to 1138 but the sex ratio 0-6 has drastically decreased from 1060 in 2001 to 951 in 2011. The scenario calls for attention. Based on the trend based growth rate of population in the perspective year 2031 the population will rise to the figure 75590 and the density shift will be noticed in the added part of the Municipality that includes wards 19,20,21,22,23 and 24.

Studies carried out reveal that there is decrease in work force participation rate in primary and secondary sector and increase in work force participation in tertiary sector activities. As per the socioeconomic survey 20.98% are unemployed/ trying for employment. The age sex pyramid indicates that, the percentage of population in the

range of 40 to 60 remains more or less uniform. This indicates a higher share of aged population is to be anticipated during the horizon years of the plan. The percentage of child population is on the mid region capable of healthy replacement of the elder population.

From the land use studies it is clear that Koyilandy is one of the Municipalities which maintain the rural outlook preserving the agricultural land and water bodies. The land use distribution shows that the commercial land use is in the central part and along the sides of the major roads. The eastern part of Akalapuzha shows rural and semi rural/ activities and almost all the coastal wards show urban character.

28.3 Industrial Sector

There are no large/medium scale industries in Koyilandy Municipality. The traditional type of industrial units are mainly producing handloom and coir products, handicrafts, mat weaving etc. Industrial land use concentration is more along the major roads and near river side. Household industrial labourers are seen decreasing. Industries based on agriculture and fisheries products may be initiated. Traditional industries including hookah manufacturing also need to be revitalised.

28.4 Commercial Sector

The commercial centres are developed mainly as a ribbon development along the main transit corridors. Though Koyilandy was once a historic trade location, it was not able to maintain its pride as such. Many of the trade centres declined. Koyilandy has a good potential for trade in fisheries and agricultural sector. This will boom with the functioning of harbour. So land use should be proposed in such a manner to accommodate such trade centres. Although few in numbers, the plan should address to inclusively accommodate the informal sectors of vendors as well. The commercial centres are lacking facilities for adequate parking, and proper drainage systems.

28.5 Tourism Sector

The major tourisms spots inside the Municipal limits are Parapalli, Pisharikavu Temple, Mangrove area in Anelakkadavu and the coastal and river side areas. Koyilandy is a place where there are opportunities for natural, religious and cultural tourism. A socio cultural tourism attraction center in Parapalli, Pisharikavu and Kollam Chira area will add the tourist potential in these areas. The eco tourism in the Mangrove park should be utilized and also river and harbour based tourism should be initiated.

28.6 Agricultural Sector

The agriculture sector of the Municipality is facing glitches related with the various aspects including low return from agricultural produces, lack of mechanized facilities and product varieties, diseases affecting coconut, inadequate irrigation facilities, less productive paddy fields, sub division of plots for construction etc. Both agricultural

labourers and cultivators show a declining trend. Many new projects like Nellum Meenum Project are trying to attract farmers back to paddy cultivation. Also Kudumbasree and Krishibhavan are taking active participation in maintaining the agricultural lands and trying new methods of cultivation.

28.7 Animal Husbandry & Fisheries Sector

Koyilandy's economy is largely based on the fisheries sector. When the proposed development of Koyilandy harbour is completed and operational in full swing, the same will create a boom in this sector, which will demand more physical infrastructure facilities. The future land use should be proposed in such a way that the fisheries sector, especially in the coastal area, is attended in depth. Initiatives should be there to attract more people to this field. More poultry/ dairy farms need to come up in the Municipality so as to make it self-sufficient in the sector.

28.8 Transportation Sector

Even though Koyilandy municipality is provided with sufficient road connectivity, it suffers from the ill-effects of rapid urbanization and the traffic networks are not efficient enough to meet up with the existing traffic demand. Traffic tailbacks are developed along the major sectors of the Municipality during rush hours. All major roads in Koyilandy municipality are currently serving the traffic volume more than their holding capacity. Collector and local roads have poor surface and geometric conditions, and this in turn increase the congestion in the major roads. The existing network could not handle traffic in future decades without proper up gradation of the network and facilities.

28.9 Waste Management

Drainage system of the town has to be properly designed to accommodate present and the future demand of the town. Absence of a planned drainage network causes flooding in many areas of Koyilandy Town during monsoon seasons. Solid waste management is an activity in which public participation is the key to success. It is not the technology alone, but public attitude and behaviour and the efficiency and effectiveness of the systems and practices that determine the success of a solid waste management system. A system demanding segregation and storage of waste at source would require a very high degree of human behaviour change. The paddy and wet land areas function as an effective means for water sinks and ground water recharge, and need to be conserved.

28.10 Water Supply Sector

The efficient use of available water resources along with the proper measures to regulate the salt water intrusion will resolve the problems in water supply sector to a great extent. The fresh water resources in the Municipality need to be properly protected and maintained. The coastal area need to have an elaborate water supply scheme, with sufficient capacity capable enough to meet up with the requirements of the area.

28.11 Educational Sector

The Municipality is yet to establish higher education facilities including arts and science colleges, professional institutions of higher order etc. Most of the present institutions only offer conventional courses. Although the literacy rates are at par with the district and state average, the existing educational institutions need to have improved infrastructure facilities.

28.12 Health Sector

Municipality faces acute shortages in health care infrastructure in all classes of medical science branches. The town is yet to have a multi-specialty hospital at its service. Bio medical waste disposal systems are not up to the mark and need to be revamped. Infrastructure facilities especially in Govt. Taluk hospital need to be improved, being the only secondary level hospital in the town under Govt. sector. Additional care centers have to be introduced in the planning area for elderly population also.

28.13 Heritage Sector

Proper planning techniques should be applied for the preservation of heritage sites and buildings. Adequate weight age has to be given for regulations for ensuring and promoting conservation or preservation of buildings, artifacts, structures, areas and precincts of historic, aesthetic, architectural and cultural significance, natural and other manmade features of environmental significance or ecological significance, scenic beauty etc.

28.14 Environment Sector

The use of single-leach pit latrine leads to direct disposal of sewage into the groundwater aquifer, especially in the coastal zone where the porosity and permeability is high, causing bacteriological contamination problems. Biological protection measure to the extent possible has to be adopted for protecting the natural streams and river banks in the Municipality. More vigil has to be exercised to conserve the existing mangrove belt. Mangroves or other coastal vegetation has to be popularized all along the coastal stretch and river banks for the protection of the zone based on the master plan and with active participation of people. The proper maintenance of water resources and water sinks in the area will reduce the water scarcity and water logging problems to considerable extent. Sacred groves abundant in the Municipality also need to be preserved and protected.

28.15 Housing Sector

Large scale in migration of casual labourers from other states makes programs on affordable housing to be the need of the time. Exact number, duration of stay at one particular location of this floating population need to be surveyed out by suitable agencies and their housing requirements need to be addressed giving utmost importance. Infrastructure facilities in the slum settlement areas also need to be improved.

28.16 Drainage and Sewerage

The Town is yet to establish an elaborate network for handling drainage and sewerage. The storm water sewerage has lost continuity in many places due to siltation and need to be revived. Scientific means and methods need to come up for sewage disposal with an intention to make the water bodies e coli pollution free.

28.17 Energy

The energy resources in the Municipality mainly depend on the non-conventional type of resources. The use of renewable energy methods as a source of energy is on a minimal scale. The percentage of houses with no electric connections is less than two percentages. The number of connections and the energy consumptions are found increasing every year. Few areas are affected with low voltage issues and the same need to be rectified.

28.18 Special concern areas

There are no over concentration of SC/ST families anywhere in the Town. It can be observed that the living standards of the people under special concern groups need to be improved further. Majority of the families are having mobile phones, LPG connections and television facilities indicating better standard of living conditions in general.

28.19 Civic amenities and recreational facilities

The civic amenities in the town do not commensurate with the present population. The recreation facilities are on a minimal level although much of favourable factors are available in order to establish recreational facilities on a large scale basis. Serious efforts are needed from the municipality to ensure adequate civic amenities toots inhabitants considering the projected population also.



29 SWOT ANALYSIS

29.1Strength

- Koyilandy is a growing urban centre.
- Koyilandy Municipality has good connectivity by road, railway, waterways and the nearest airport is only 50 kilometers away and the Kannur International Airport is situated at 68 Kilometers away.
- There are plenty of ponds, kavu, vacant lands and agricultural fields in the area when compared to other similar towns.
- The area has a diverse topography which remains undisturbed towards the interiors with lush green vegetation spreading over the undulating terrain along with water bodies such as sea, river, canals etc.
- The existence of mangroves along the river side.
- Tourism potential for Koyilandy Municipality is good enough due to the existence of Pisharikavu Temple, Parappalli Mosque and Kollam chira.
- The development of Fishing Harbour (One of the biggest fishing harbour in the state) plays a major role in the economic development of the town.
- The town has a vast area of water bodies.

29.2Weakness

- Lack of recreational spaces such as public gathering spaces other than temple/mosque especially along the beachside.
- Industrial base of the city is very low. Trade and commercial activities are less and lack a good quality spacious commercial building.
- The transport corridors are very narrow, lacks parking facilities and the town centre suffers from traffic congestion.

- Inadequate health and sanitation facilities.
- Drainage and water supply problems in the coastal wards and wards near the CBD.
- The internal accessibility is very poor.
- Saline water intrusion at certain locations causing water scarcity.
- Physical barriers mainly in the form of rail line and highway restrict the uniform development.
- Coastal areas are prone to disasters including tsunami.

29.3 Opportunities

- The availability of vacant lands and agricultural fields can be further utilized for the development of agriculture and its allied activities.
- The good connectivity with other cities nearby and the accessibility by different means of transport plays a vital role in its future development.
- The potential for economic development is high due to the presence of coastal area, agricultural lands & fishing harbour and also other vernacular products such as Koyilandy Hookah (Malabar Hookah) and handloom.
- The other opportunities for the development are existence of rivers and mangroves which promotes eco-tourism along with seashore development & its protection.
- By preserving and promoting the cultural heritage, vernacular products etc. the economic momentum of the area can be further improved.
- It also has the potential to convert itself into an important trade centre for the hill produces from the nearby rural areas.
- The town is having a vast area as water front.

29.4 Threats

- The major threat faced by the transport corridor is its inadequate width which is made worse with the encroachment along the roadside by vendors and parked vehicles.
- Unemployment of people poses a major threat.
- The productivity of paddy land is getting reduced at a rapid pace.
- Some of the mangroves are under private ownership which causes its destruction than preservation.
- The large percentage of housing shortage and the proper housing for casual labourers from other states are factors to be immediately addressed.
- Land reclamation which turns the agricultural land to residential plots can lead to a major environmental threat for the area.

30 DEVELOPMENT ISSUES



30.1 Development Priorities

The development priorities of the public were collected during the socio economic survey conducted in the Municipality in 2013. Figure 30.1, 30.2 and 30.3 shows the neighbourhood level, ward level and Municipality level priority of development.

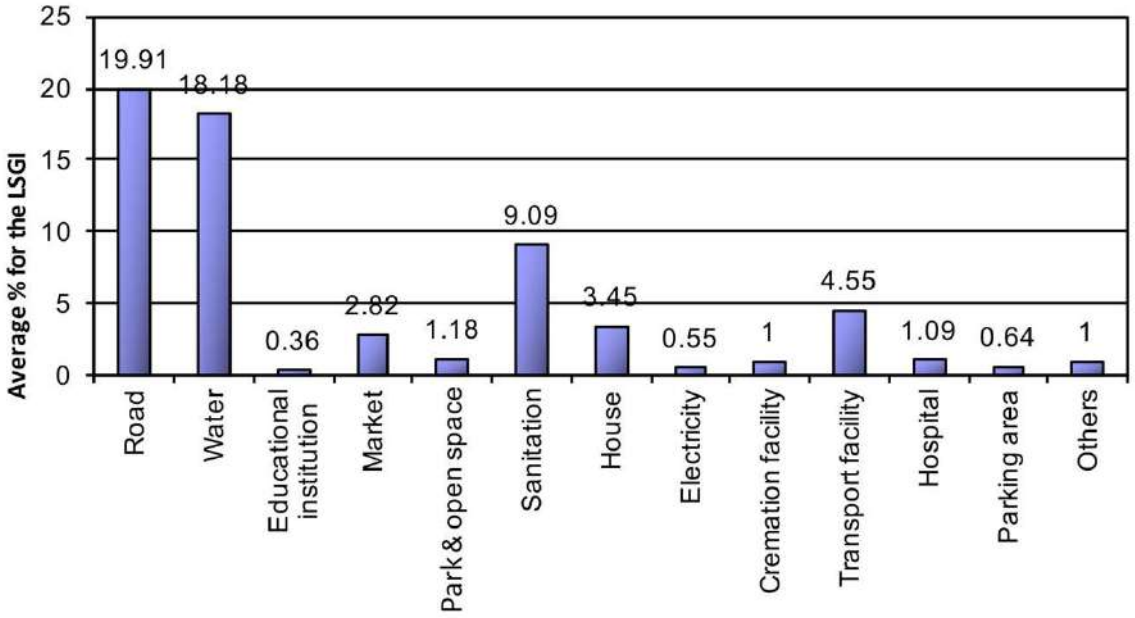


Figure 30.1 HH/Neighborhood level priority of development

(Source: Socio-economic survey 2013)

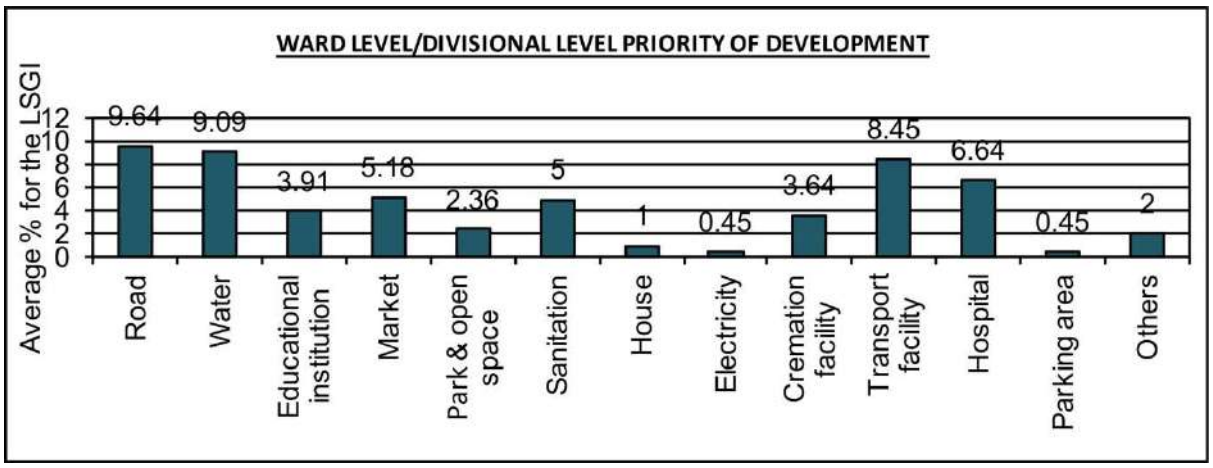


Figure 30-2 Ward level/Divisional level priority of development

(Source: Socio-economic survey 2013)

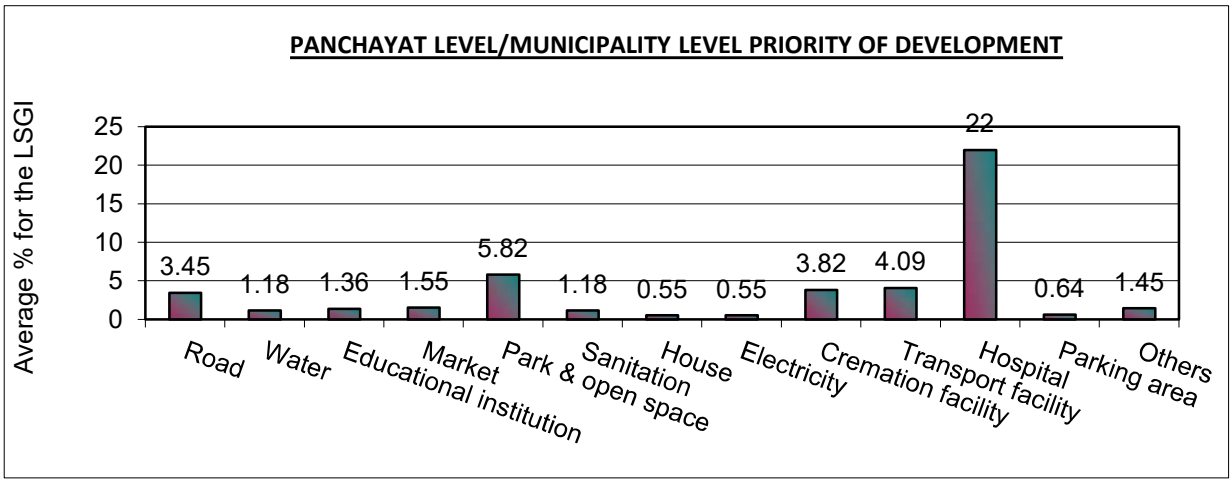


Figure 30-3Municipality level priority of development

(Source: Socio-economic survey 2013)

Table 30.1 consolidates the development priorities at the three levels. The table shows that proper road network and water are the development priorities at the neighbourhood level and ward level. At the Municipality level people demands a hospital, park, adequate transport facility and cremation facility.

Table 30-1Development Priorities - Summary

Level	Priority 1	Priority 2	Priority 3	Priority 4
Neighbourhood Level	Road	Water	Sanitation	Transport facility
Ward Level	Road	Water	Transport facility	Hospital
Municipality Level	Hospital	Park	Transport facility	Cremation Facility

(Source: Socio-economic survey 2013)

30.2 Development Issues

Major development issues identified in the Municipal area include,

- The location of NH and railway line is towards one side of the municipality, without uniformly serving the whole Municipal area. This aspect confines the development activities in a particular area there by restricting its growth potential.
- Location of bus stand and railway station in an area which is not easily accessible from all parts of the municipality.
- Narrow and dilapidated road networks.
- Lack of technological advancement in fishing & agricultural sector.
- Traffic congestion and lack of parking facility.
- Linear or ribbon type of development.
- Lack of recreational spaces along the sea shore which can explore the potential of the area both environmentally and economically.
- The division of the total area by natural and manmade barriers.
- No adequate facilities for hassle free pedestrian movement.
- Underutilized natural resources.
- Poor health and sanitation facilities.
- Improper solid waste management.
- Drainage and water supply problems.
- Non-conventional energy sources are not utilized.
- Inadequate cremation facility
- Shortage of agricultural labourers
- Inadequate higher education facility
- Lack of a route to bypass the NH
- Ill formed junctions along the NH
- Issues in protecting the environmentally/ ecologically fragile areas.



31 VISION

31 Vision

Vision of this master plan is to bring about an integrated development of all the aspects of the system such as physical, social, economic, ecological, environmental, infrastructural and institutional in Koyilandy Town.

"Sustainable development of Koyilandy as a harbour based center for trade and commerce, catering to the secondary level needs of the hinterland, while promoting responsible tourism anchoring on the rich tradition and serene environment and ensuring quality of life at all levels."



32 GOALS AND OBJECTIVES

32.1 Development Goals

In line with the development vision as envisaged for Koyilandy Town, the following development goals have been framed, which include,

- To develop Koyilandy in a sustainable manner as a trade centre and a service provider for nearby local bodies.
- To strengthen the economic base of the town by promoting harbour based activities and reviving traditional sector.
- To conserve environmentally sensitive areas.
- To promote tourism and to protect the cultural heritage.
- To make Koyilandy a Clean/Green City
- To ensure equitable distribution of basic facilities

32.2 Development Objectives

In order to achieve these development goals the various objectives have been formulated as below.

1. To develop Koyilandy in a sustainable manner as a trade centre and a service provider for nearby local bodies.
    1. Develop the existing service sector.
    2. Develop an efficient intra – intercity transport network
    3. Improve the infrastructure facilities in the municipal area

2. To strengthen the economic base of the town by promoting harbour based activities and reviving traditional sector.
    1. Development of Koyilandy fishing harbour and related industries.
    2. Development of fisheries, agricultural and animal husbandry sectors
    3. Emphasis to small scale industries and revival of traditional industries
3. To conserve environmentally sensitive areas.
    1. Conserve the mangroves and aquatic eco system
    2. To protect the existing sacred grooves and ponds
    3. Management of environmentally sensitive wet agriculture land.
4. To promote tourism and protection of cultural heritage.
    1. Develop a harbour based tourism village
    2. Improve the eco-tourism facilities in the municipal area
    3. Promote pilgrim tourism by enhancing facilities at the religious locations
    4. Make Koyilandy part of the regional tourism circuit.
5. To make Koyilandy a Clean/Green City
    1. Introduction of integrated sewerage and solid waste management
    2. Strengthening of drainage network
    3. Introduction and proper management of public comfort stations
    4. Promotion of social forestry activities
    5. Introduction of silence zones.
    6. Proper disposal of bio medical wastes.
6. To ensure access to basic facilities for all
    1. Upgrading hospitals, schools and other social infrastructure
    2. Improved housing facilities for all
    3. Promote disabled and old age friendliness
    4. Connectivity to public transport system.
    5. Creation of public recreation spaces.
    6. Water supply schemes aiming at good quality water to all.



33 DEVELOPMENT CONCEPT

The development concept of the town is derived based on the topography of the area, activity pattern of the town, development vision, goals and objectives and the existing connectivity pattern.

33.1Topography

The topography of the area is so undulating that it has a low lying coastal area, mid land and high land.

33.2Activity Pattern

The activity of the area can be categorized based on manmade and natural barriers such as road & rail, sea shore, river etc. Based on this division the whole area can be considered as 3 zones which consist of a head (zone1), body (zone 2) &foot/ base (zone 3). The wards 19, 20, 21, 22, 23, 24 can be grouped under the head portion and is made isolated from the other region by the river and the municipal boundary. Then the body/ middle portion consists of ward numbers 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 25, 29, 27, 28, 29, 30, 31. This area is made isolated from the other 2 portions by the river on one side, railway line & NH on the other side and the municipal boundaries. The

ward numbers 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44 and 1 constitutes the foot/ base. This portion extends from the railway line till the sea shore.

The activities can be divided based on the environment as over the coastal belt which has thickly populated residential areas, fishing is the major activity. This area is the most active one which concentrates tourist spots, transport corridors, major public and semi public buildings, bus stand, railway station etc. In the middle portion we have some public and semi public buildings, few commercial activity centers, other residential and agricultural lands. Along the river we have low lying areas which have agriculture fields and mangroves. The highlands in this portion mainly accommodate institutional buildings and residential buildings. The head portion mainly consists of agricultural lands along with few thickly populated residential areas. The major activity other than the residential in the 3 zones can thus be classified as agriculture for zone 1, industrial for zone 2 and trade & commerce for zone 3.

Thus we can infer from the above facts that the existing alignment of the transport corridor is acting as a manmade barrier which confines the developments within zone 3. The internal accessibility is not given much importance so the spread of development towards zone 1 and zone 2 from zone 3 is very poor. Industrial base is very low for the whole area. The gradation of activity from urban to rural can be observed from zone 3 towards zone 1.

33.3 Population

The population of the municipality is distributed in such a way that the density is high in zone 3 than the other 2 zones. Agriculture lands and vacant lands are more in zone 1 and zone 2. The coastal area is very much congested and the CBD of the city is also very near to the coastal area in zone 3.

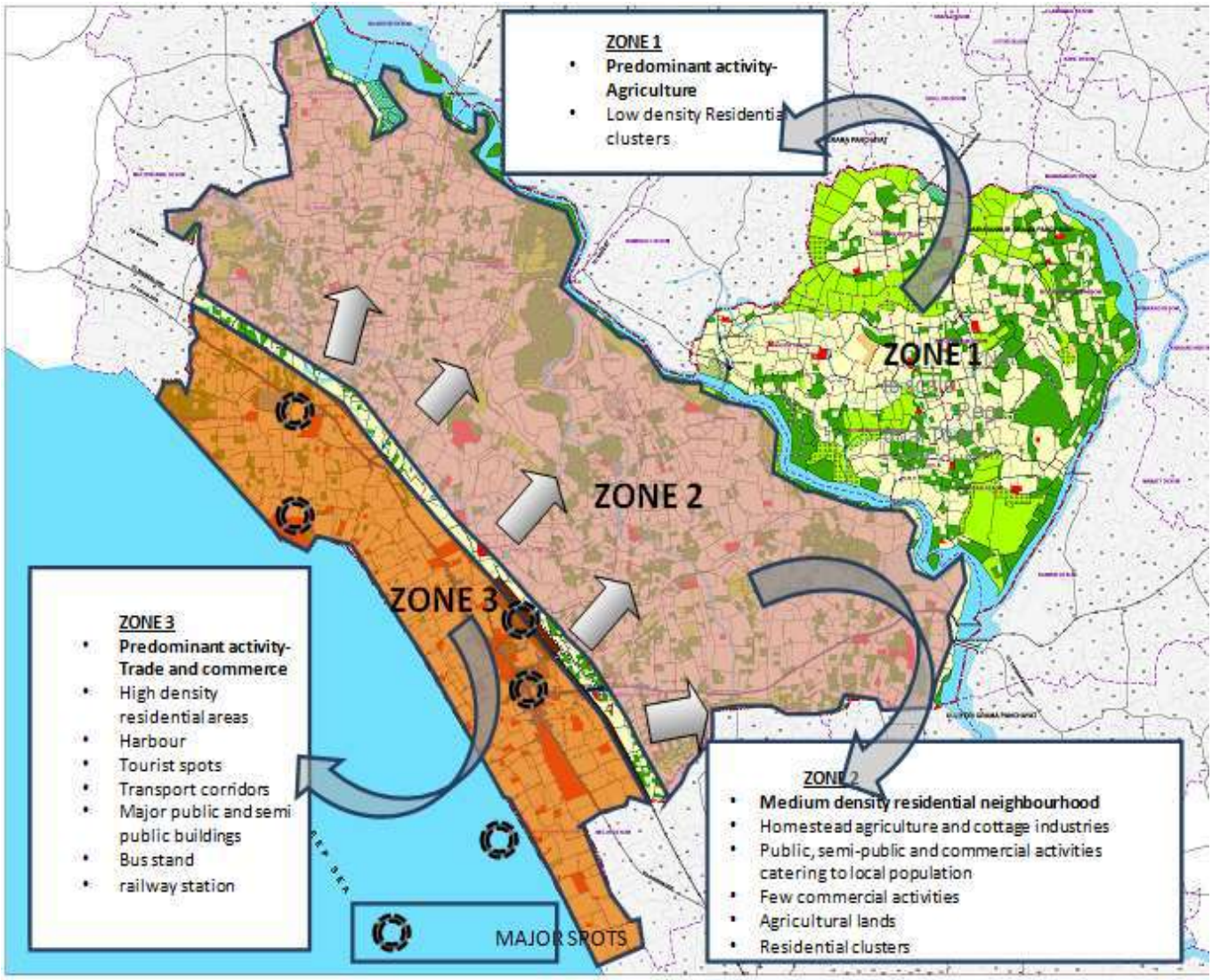


Figure 33-1Development Concept- Zones
(Source Based on existing land use survey 2013 and other data)

33.4Connectivity

Connectivity is the most important factor for the development of any area. As already mentioned here the internal connectivity is very poor and so the development is stagnant and concentrated in a particular area alone. Due to the linear nature of the transport corridor parallel to the sea shore the development is also linear along the road.

The development concept can be explained as to improve and extend the urban facilities from zone 3 towards the other two zones and establishing the town as an important trade centre and utilizing its tourism potential in an eco friendly manner without disturbing its diverse topography and by providing proper connectivity/ linkages.

33.5 Suggested Road Connectivity

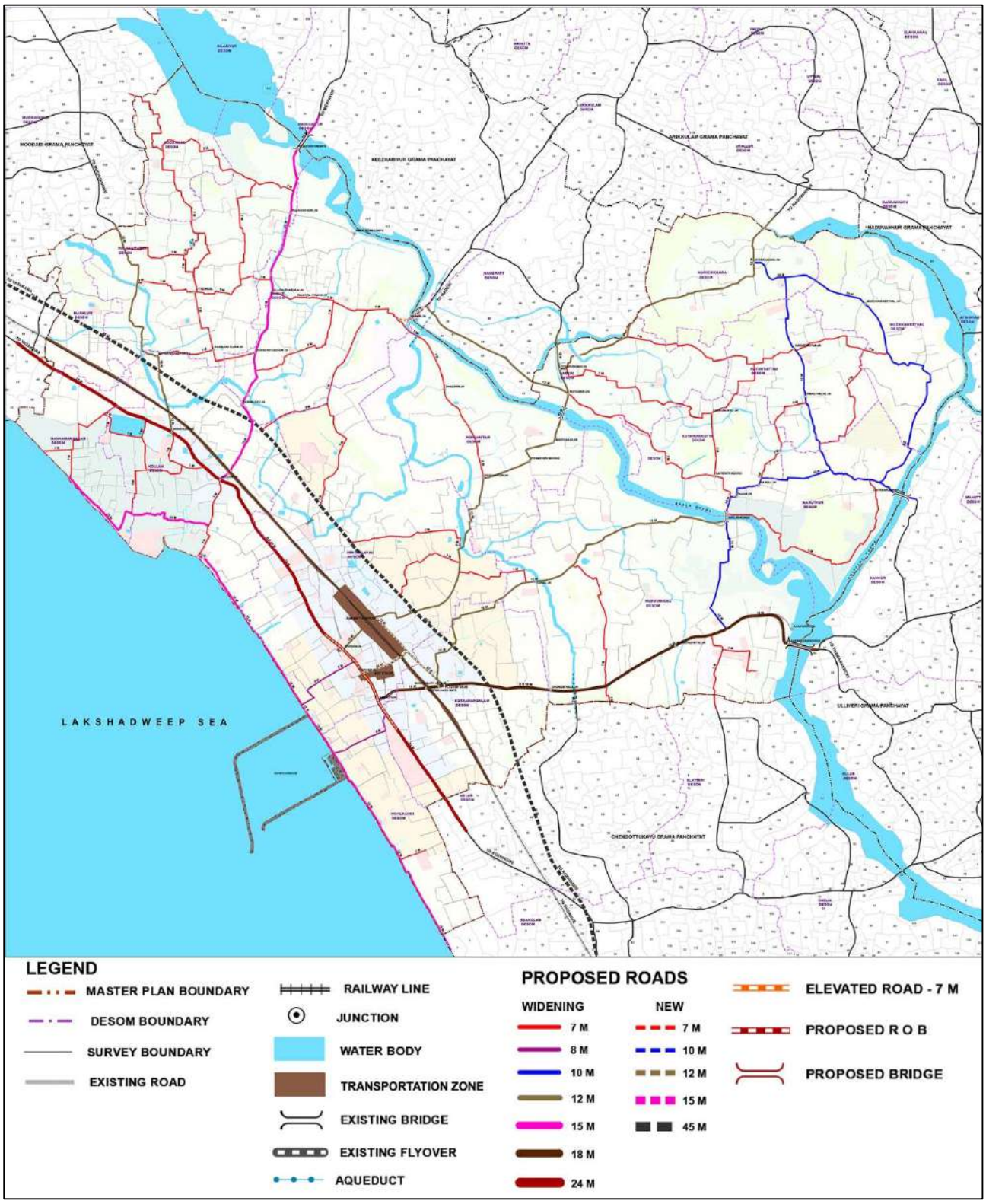


Figure 33-2Suggested Road Connectivity

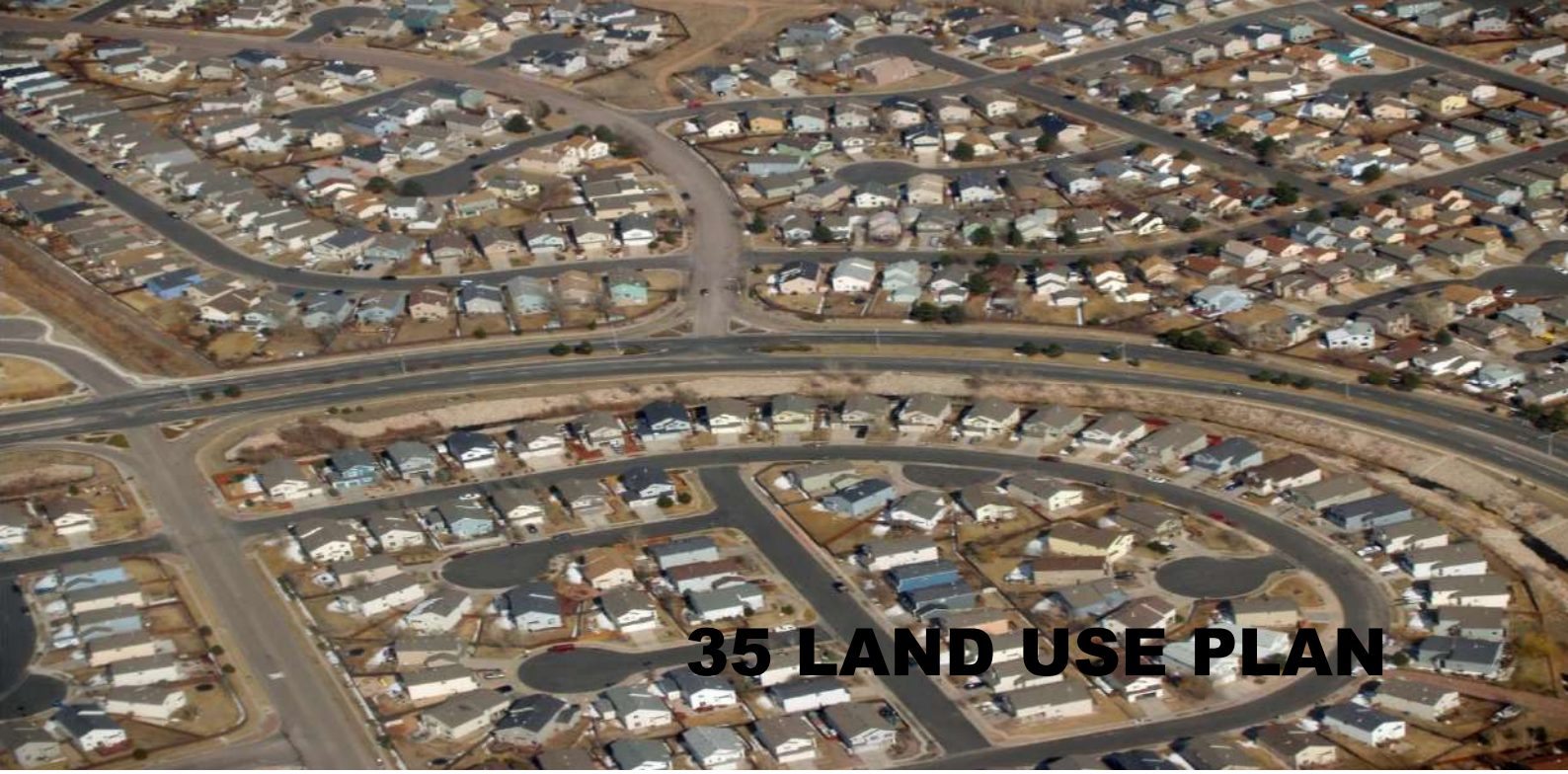


34 GENERAL POLICIES AND STRATEGIES

The general policies and strategies are framed as a measure to ensure that the development goals are achieved without conflicts of interests among various development proposals. The policies and strategies are intended to bring in synergy to the development process by considering various aspects of the development potential, development demands and the need to conserve certain values and features. The following policies and strategies are considered to be essential from this view point.

- The plan needs to look into various measures to ensure improved quality of life of people at all levels of the society.
- The plan needs to address different aspects required for the proper functioning of the Koyilandy fishing harbour, one key developmental factor of the Municipality.
- The development activities are required to be in an environmentally, economically and socially sustainable manner.
- Improved infrastructural facilities are to be provided for developing the commercial potential of the town.
- The town requires improved facilities to be provided for recreational, amusement and leisure activities. Potential of the various natural tourism resources to be tapped properly.

- The plan needs to facilitate affordable housing, having required quality, accessible especially to the low/medium income group, including special provisions for proper accommodation for migrant labourers from other states.
- Integrated scientific systems for drainage, sewage, sanitary and solid waste management, including detailed drainage network are to be in place.
- Transportation infrastructure facilities to be improved to ensure seamless connectivity by providing/developing bypass/ring roads, fly overs, scientifically designed junctions, widened roads, parking plazas, diverting through traffic from the core town through bypass roads etc. Development and enforcement of an integrated traffic and transportation plan is also needed. Facilities and safety requirements of pedestrians also should be addressed in the plan.
- The street vendors are to be properly accommodated.
- Environmentally fragile areas including paddy fields, ponds, streams, mangroves, marshy lands and natural drains etc. are to be preserved/protected/restored. Various measures for eco restoration of environmentally fragile areas are to be adopted.
- Public-private partnership has to be encouraged in the development activities.
- The plan should address inclusive growth, taking into consideration the needs of all people of the society especially of the economically weaker groups.



35 LAND USE PLAN

35.1Land Use Plan

The land use plan is formulated considering the spatial structure of the town, inter linkages between various human activities on land, efficiency of transport network, trip generation characteristics of various land uses and the projected demand for land for various economic activities during the plan period.

According to the residential and commercial density, availability of existing physical infrastructure, easiness in expansion of physical infrastructure and topography, the proposed land use of the Koyilandy Town has the following land use divisions as given in table 35.1 and figure 35.1. The proposed land use plan for Koyilandy is computed as explained in the following sections

35.1.1 Residential Zone

Based on the guidelines of UDPFI, Koyilandy town is classified as small town as it has population below 50000. As per the guidelines, share of residential area shall be 45-50% in plain areas and 50-55% in hilly areas.

Keeping in view the major trend and growth potential of residential areas as well as accessibility of area, potential residential areas have been identified contiguous to the existing residential areas which are likely to remain or develop as residential areas and which are most suitable to be developed as residential areas. The total residential area identified for the town is classified into two types, one is residential and other is residential/agricultural mix zone. Proposed residential areas are located adjacent or contiguous to the already developed residential areas and areas which are ideally to be retained/converted as core residential areas. This area is zoned as “Residential Zone” and the same constitutes for about 37.50% of the total area of the town as per the proposed land use plan.

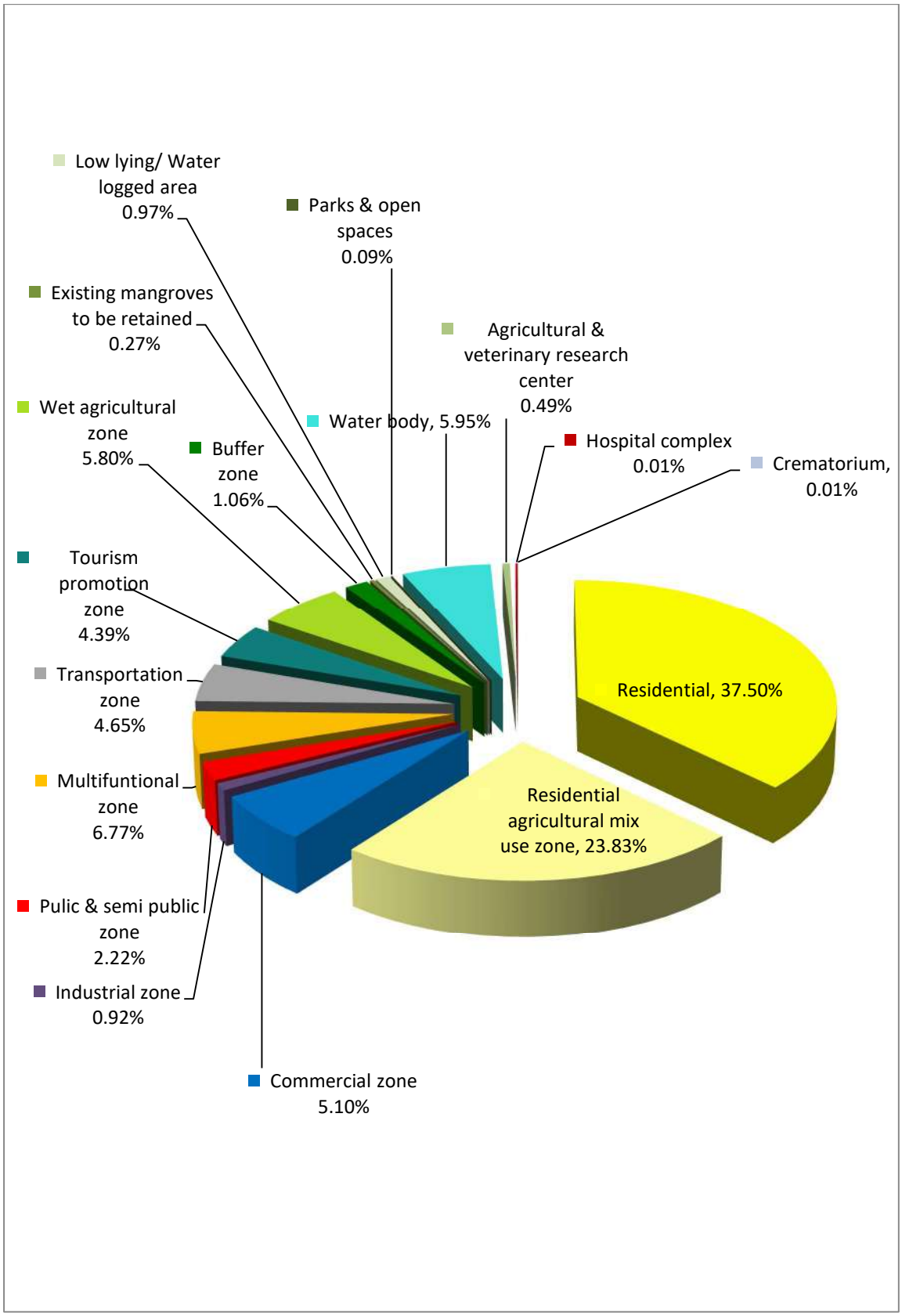


Figure 35-1Proposed land use breakup

Table 35-1Proposed land use breakup

Land use	Area (sq.km)	% Area
Residential	10.92	37.50
Residential agricultural mix use zone	6.94	23.83
Commercial zone	1.49	5.10
Industrial zone	0.27	0.92
Public & semi public zone	0.65	2.22
Multifunctional zone	1.97	6.77
Transportation zone	1.35	4.65
Tourism promotion zone	1.28	4.39
Wet agricultural zone	1.69	5.80
Buffer zone	0.31	1.06
Existing mangroves to be retained	0.08	0.27
Low lying/ Water logged area	0.28	0.97
Parks & open spaces	0.02	0.09
Water body	1.73	5.95
Agricultural & veterinary research center	0.14	0.49
Hospital complex	0.003	0.01
Crematorium	0.002	0.01
Total	**29.14**	**100**

35.1.2 Residential - Agricultural Mix Use Zone

Area towards the northern side of the town and by the side of Akalapuzha, are proposed for low intensity development along with agricultural activities.

Such areas are zoned as “Residential/Agricultural Mix Zone” and this constitutes for about 23.83% of the total area of the town as per the proposed land use plan. Agricultural and allied activities, residential, commercial and other community needs of low intense nature are normally permitted in this zone. Uses of higher order are permitted with certain restrictions.

35.1.3 Commercial Zone

Percentage of commercial area required for small town as per UDPFI guidelines is 2 to 3%. Koyilandy still depends on Kozhikode City for the higher order commercial needs, where as adjacent local bodies depend on Koyilandy for better facilities. Though there is an evident external dependency, the central portion of the town is seen to have good commercial opportunity and growth. The major commercial land uses are presently located close to the National Highway and Railway Station, mainly between the rail and the existing Highway and at close proximity to the Railway Station. However, the presence

of the newly constructed flyover and the proposed NH-Bye Pass through the eastern side of the rail is likely to create further commercial potential to the eastern side of the rail. Hence, the commercial zone is proposed to be expanded to these areas in order to serve the additional population and to meet the expanding commercial need of the town.

Such areas which are most suitable for commercial development around major transport terminals are zoned as “Commercial Zone” and this constitutes for about 5.10% of the total area of the town as per the proposed land use plan.

35.1.4 Industrial Zone

Industrial sector is found as one of the key sectors as far as the socio-economic development of the planning area is concerned. At present, the level of industrial development is not that significant. But however, it is expected that well planned measures can take the industrial sector of the town to better levels so as to render more support to the social and economic well being of the town. Two major industrial areas are proposed, one near Naderi and other near Varakkunnu. These areas are zoned as “Industrial Zone” in the proposed land use map and this constitutes for about 0.92% of the total area of the town as per the proposed land use plan. The zoning regulation of this zone is framed as to promote industrial uses and to permit allied uses and other essential activities which does not hinder the functioning of the industrial sector.

35.1.5 Public and Semi Public Zone

This zone accommodates all government and private owned buildings, which includes educational institutions, health related institutions, offices and other similar institutions. In the proposed land use plan no additional land for public and semi public use is earmarked. Specific requirements of land for any public/semi public use will be met at the time of project implementation through locating within other permissible zones. Priority is to be given for accommodating additional facilities like new buildings for hospitals, schools, community hall etc in the existing public and semi public zones by utilizing the land optimally. Accordingly, the land zoned as “Public and Semi Public Zone” as per the proposed land use zone for the town of Koyilandy works out as approximately 2.22%. The zone is intended for retention and expansion of the existing public and semi-public buildings.

35.1.6 Multi-Functional Zone

There are areas which are part of the town where the usage of land can either be residential or commercial or a mix of both of these uses. This zone is proposed towards the land contiguous to the commercial zone, and at those areas where minor commercial developments (secondary commercial centers of the town) are suitable to be developed. In this zone, a mixed land use of uses permitted in residential and commercial zones is proposed with certain additional conditions. An area of approximately 6.77% of the town is proposed to be included under this zone.

35.1.7 Transportation Zone

The locations which are being used and intended to be used for transportation and related activities are zoned under this head. The transportation zones are mainly used for functions including roads, railways, bus stations, auto taxi bays and the like. Approximately, an area of 4.65% of the Koyilandy Town is included under this zone. The zoning regulations for this zone are so formulated that the activities and constructions related to the transport use and other activities which are likely to be an essential or integral part of the transportation use are allowable under this zone.

35.1.8 Tourism Promotion Zone

Tourism is identified as one of the key prospective sectors for the social and economic development of the town. The town boasts a long shore line and houses very prominent places of scenic beauty which are likely to be very much prospective for the growth of tourism sector of the town. Hence, suitable areas ideal for promoting the tourism related activities is identified in Koyilandy town. Further, the zoning regulation for this area is proposed to promote and attract tourism related activities and uses and at the same time care is to be taken such that the prominent existing uses and justifiable expansion of existing uses are also permitted. An area of approximately 4.39% of the town is proposed to be included under this zone.

35.1.9 Parks and Open Spaces

The well-being of the town is directly connected to the well-being of the inhabitants of the towns, and hence it is essential to ensure that the inhabitants of the town maintain good physical and mental health. Recreation of the inhabitants, especially exterior facilities for relaxation plays an important role in this area. Presently the town does not seem to have enough of recreational spaces and hence importance is given to provide more open spaces that relieve mental tiredness of inmates. Hence, around 0.09% of the town is proposed as parks and open spaces essentially serving the permanent inhabitants of the town. Further care is also to be taken for good maintenance and up keeping of the parks and open spaces of the town.

35.1.10 Water body

All water bodies like river, canals, ponds etc. are included in this zone. All these areas are essentially to be conserved. This zone constitutes for about 5.95% of the total area of Koyilandy town.

35.1.11 Wet Agricultural Zone

The Master Plan aims at the conservation of the existing paddy land and paddy land single crop with coconut cultivation. So as to conserve these areas, active paddy cultivation needs to be promoted and also strict control on conversion of paddy / wet agriculture lands need to be exercised with the help of legal tools and with the support of

people. Hence, it is proposed that only those activities which merge with the nature of the area which is likely to be essential for the conservation of the area and those which are permitted as part of the Kerala Paddy Land and Wet Land Conservation Act may be allowed in these zones. Accordingly, 5.80% of area of Koyilandy town is zoned under the "Wet Agricultural Zone" under the proposed land use.

35.1.12 Existing mangroves to be retained

This zone constitutes the areas which are currently mangroves and the intention of this zone is to completely conserve the existing mangrove areas and stretches. Accordingly, it is identified that approximately 0.27% of the area of Koyilandy town is presently mangroves and the same is included under this zone with the intention of conserving the same.

35.1.13 Buffer Zone

A buffer zone to a depth of 15 meters towards the inland side of the rivers and streams is proposed in the proposed land use plan, with strict regulation in construction activities. The buffer zone is proposed as a measure for conservation and protection to the existing major water body (river) and mangroves. Accordingly 1.06% of the area of the town is zoned as buffer zone. Only minimum activities which do not directly harm the existence and environment of the river/ mangroves are to be permitted inside the buffer zone.

35.1.14 Low Lying/ Waterlogged Area

The marshy lands and water logged lands are included under this zone and the same is proposed to be conserved so as to maintain the collection basins (for ground water recharge) of the Koyilandy Town. This zone constitutes an area of approximately 0.97% of the total area of the town.

35.1.15 Harbour Development

The land for development of fishing harbour is proposed in the reclaimed land which is presently outside the Municipal limits. But the development of harbour has huge impact in the development of the town and hence this reclaimed land area is zoned as 'harbour development zone'. All constructions essential and incidental to the development of harbour are permitted in this zone.

35.1.16 Special Zones

Special zones are those zones which are identified for specific projects and are proposed to be reserved for those specific requirements only. A total of 0.51% of land of Koyilandy town is included under the special zone. The following special zones are proposed.

i) Agricultural and Veterinary Research Centre

ii) Hospital Complex
iii) Crematorium

The zoning regulations for the special zones are formulated so that those specific activities alone may be permitted under these zones and the land shall be reserved for these specific activities for a definite period of time. Further, in case the activity is not initiated / procedures for initiating the activity is not initialized, that the reservation of land may be seized after the designated period of time and the land may be reverted to a suitable zone after this period, with the concurrence of the Chief Town Planner concerned

The proposed land use map is given in figure 35.2.

35.2Zoning and zoning regulations

Land use zoning for sustainable development has been proposed and for proper enforcement of zoning, zoning regulations are framed.

The CBD area of the town is considered to be the major commercial center of the Municipality and large scale commercial activities need to be permitted in this area. The CBD area has been utilized for isolated residential units as well; hence residential activities also need to be properly accommodated in this area. The peripheral areas of the Municipality still keep its serene environmental qualities and need to be protected. Accordingly two types of residential zones are categorized allowing comparatively higher residential densities near to the CBD and lower densities towards the Municipal outskirts.

The developments proposed in this plan will add few more people to Municipality. For accounting the housing need of the future population, a high density residential zone is proposed in this plan. Major Industrial and hazardous uses are restricted at commercial and residential zones. So an area in the Municipality shall be demarcated for this purpose and hence regulation is made such that all these activities are permitted in Multi-Functional zone. All special zones are controlled with appropriate regulation for proper activity distribution at those areas. Zoning regulations are included in chapter 40.

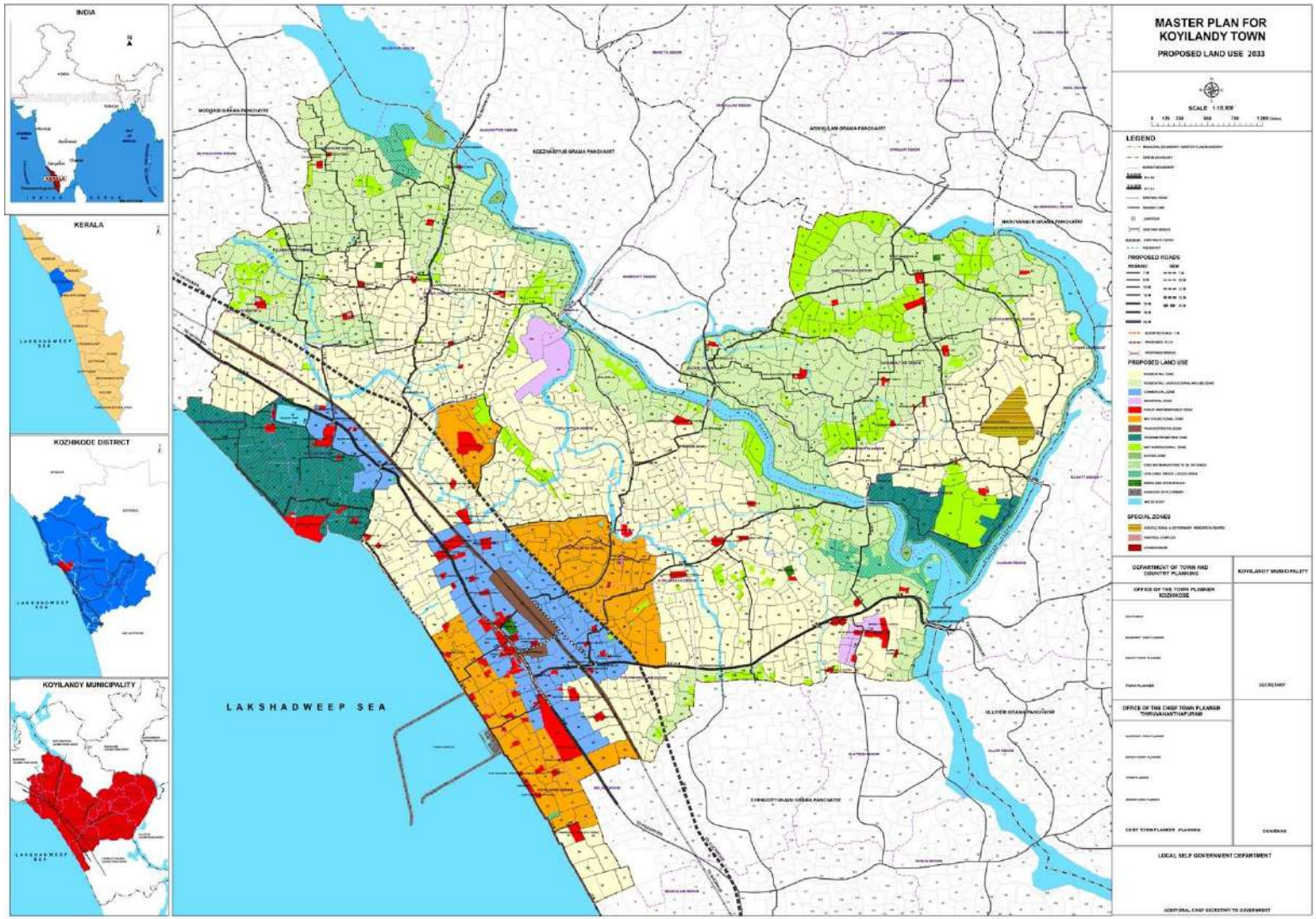


Figure 35-2Proposed land use plan



36 TRANSPORTATION PLAN

The transportation should be integrated in the planning process and it is one of the many aspects of total planning in which all aspects interact, influence and aggregate. Transport development plan for Koyilandy is prepared taking into account the existing traffic scenario and based on an evaluation of the future traffic on the base year network. Transport development schemes cover all the available modes of travel and are formulated so as to reduce the severe strain put on the existing road network. All committed development schemes were taken into account while formulating the transport development plan.

Even though Koyilandy is provided with sufficient road connectivity, it suffers from the well-known ill-effects of urbanization. In order to counteract these ill effects as an immediate measure, short term traffic management measures seem to be an ideal option.

36.1 Traffic Management Measures

Traffic management is a major concern for cities around the world. The problem of the existing traffic congestion is due to the inadequate road capacity including the lack of a well-developed traffic management system. Traffic management is the planning, monitoring and control or influencing of traffic. It aims to:

- Maximise the effectiveness of the use of existing infrastructure;
- Ensure reliable and safe operation of transport; and

- Ensure fair allocation of infrastructure space (road space, rail slots etc.) among competing users.

An appropriate, systematic traffic management plan is essential for the safe and smooth flow of the increasing motor traffic on roads. Traffic management plans are relatively time and cost effective. It is possible to carry out a trial and error method while observing the effects on the traffic flow and other factors. It is necessary to introduce the improvement measures that respond to the changing requirements at different times into the system.

The traffic management plan is composed of Short-Term and Long-Term Plans. The short-term plan is an immediate action plan focused on issues in the selected traffic congested area, and does not comprehensively result from a study of the whole area on a unified theme, whilst the long term plans are focused only on specific issues in certain areas.

36.2 Short Term Plans

36.2.1 Engineering Level

- Provide suitable facilities for parking, allocation of recovery vans to the traffic control police, provision of handrails and barricade for pedestrian safety.
- Provision of necessary road signs and road markings.
- Adequate maintenance and coverage of drainage.
- Provide proper signage indicating school ahead, for the safety of the school going children
- Proper sign boards limiting the speeds have to be installed.
- Proper lighting system to promote road user safety during night.
- Stop sign boards for both cross roads meeting at the main road.
- Mirrors to be installed at the curve which will reflect the opposing vehicles.
- Proper maintenance of pocket roads would ensure that a major proportion of the vehicles would travel through these routes and prevent the vehicles from entering the city centre.
- Provision of dedicated bus bays shall be ensured to avoid the traffic congestion caused by the stoppage of buses during their course of services.

36.2.2 Enforcement Level

- Maintain proper lane discipline; restrict unauthorized and excess taxi and auto parking.
- Restricting encroachment of shopkeepers and street vendors.
- Proper enforcement of traffic safety rules such as making seat belt and helmet provision mandatory.
- Proper enforcement to ensure that the buses stop adjacent to the stop and not on the carriageway. A regular check on the unauthorized on-street parking.
- Restrict display of goods beyond the provided space of the roadside facing shops.
- Provide adequate number of traffic police for the regulation of traffic.
- Introduction of orange coloured auto rickshaws for late night travels.

36.2.3 Education Level

- Safety education measures shall be introduced to increase the road user awareness. Details about the already occurred accidents should be indicated at the site so that the people will be more alert.Methods to instil traffic obedience in the road users and allocation of adequate funds for the maintenance of the existing infrastructure are some other safety techniques.

Thus in order to take into account the overall traffic safety, the implementation of the 3 Es (Engineering, Enforcement, Education) through the 3Cs (Coordination, Cooperation, Control) is one of the most effective measures.

36.3 Long Term Traffic Management Measures

Long term plan is proposed for the next 20 years. It shall be followed by the implementation of other sectors long term plan in the Master Plan. The objective of this plan is to increase the level of service and induce commuters to shift from private vehicles to public transportation, and to mitigate traffic congestion at bottlenecks.

36.3.1 Road Development Plan

In order to cater the increasing traffic volume, large scale improvement measures including widening and strengthening of pavements, enhancing speed and safety of traffic movement and railway over bridges at level crossings are proposed as a long term measure. From the projected traffic, it is clear that without the up gradation of the road network and transportation facilities, almost all major roads will be choked by 2033. The following are the road development proposals for Koyilandy Town.

1. The widening of NH 66 is the most important road development plan. The width of NH at present is not up to the standards. Therefore, the up gradation of NH to the standards specified by IRC is important for the smooth movement of traffic. Proper road markings, signs, sufficient shoulder, kerbs and other street furniture must be provided. Medians of sufficient width should be provided to separate the directional traffic and to reduce accidents. Street lightings must be provided throughout the stretch. Solar powered street lights can be used for the purpose and to save energy.

2. A bypass in the NH to divert the through traffic is proposed. The volume of NH has already exceeded the capacity at many locations. At present about 30% of traffic is through traffic. By diverting the through traffic, a significant reduction in the volume of traffic using the NH can be obtained. Moreover, the through traffic can move at a greater speed in the bypass as they are devoid of bottlenecks and congestion.

   Just before entering to Koyilandy municipality from Kozhikode side, NH crosses railway line from east side to west side, and just after leaving the municipality, NH again crosses railway line from west to east. Hence the proposed bypass should start from the NH portion at east side of rail before entering to Municipality and end at again east side of rail after leaving Municipality. This will remove the necessity of two railway flyovers at entry and exit points of the Bypass.

3. The proposed Coastal road which runs parallel to the NH on the west would divert a significant volume of traffic from the NH, especially the trips related to harbour and allied activities. Once completed, this will also act as an arterial road for the western wards of the municipality that are thickly populated.

4. The development of harbour necessitates the perpendicular connections to the NH to be widened for handling increased traffic. Now small collector roads like Market Road and Ice Plant Road serves the need. But it is unable to carry the increasing pressure of heavy wheel loads of goods vehicles. Therefore, a scheme for the development of Roads to cater the needs of the harbour is proposed.

5. The State Highway should be widened and that must be designed as per the standards for ensuring the smooth flow of traffic.

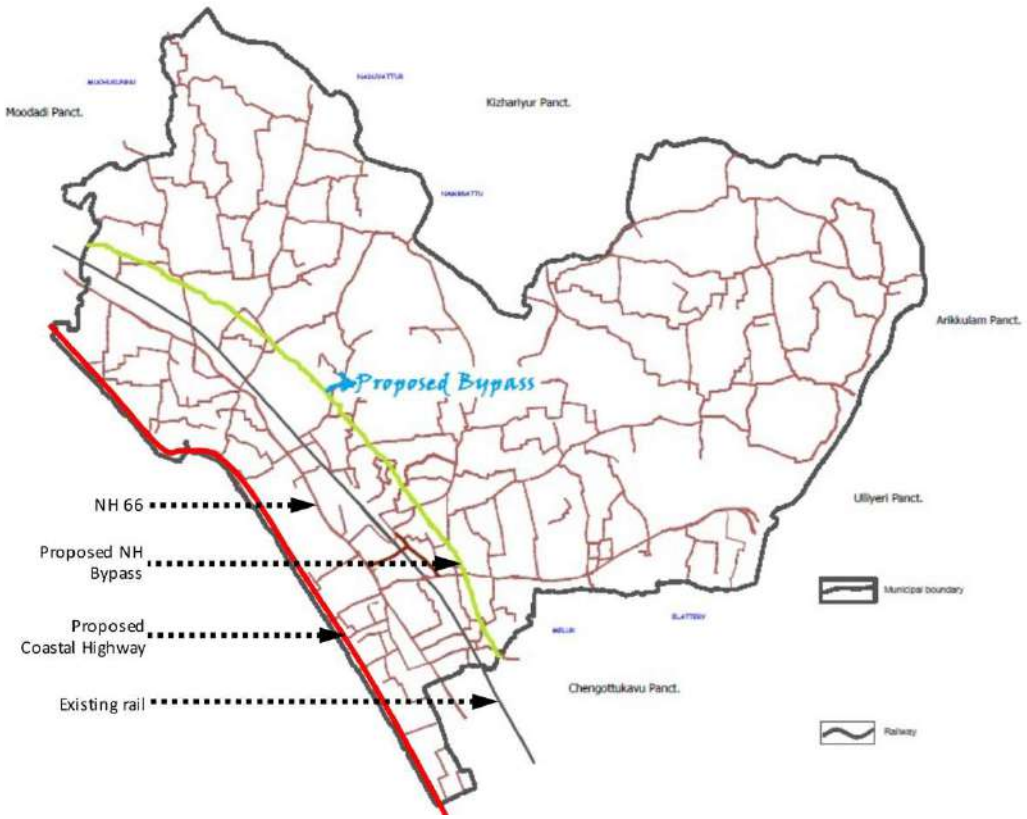


Figure 36-1Proposed bypass and coastal highway

The projected traffic from base year data using growth rates and considering the future land use and transportation factors on the major links is given in the table 36.1.

Table 36-1V-C ratios on major road sections in 2031

Sl No.	Road Section	Volume (PCU/Hr)	Volume - Capacity Ratio
1	Anakulam	7995.97	4.44
2	Kainatti	11375.10	6.32
3	Kanayamkode	2418.16	1.61
4	Mujkunnu	950.42	0.79
5	Muthambi	1220.98	1.02
6	Nelliadi Bridge	923.30	0.77
7	Municipality	5055.27	3.37

The capacities of most of the sections are far below the future volume. The road widths cannot be increased to eternity for accommodating the increased vehicle volume. Hence road widening as well as new roads shall be proposed together for accommodating the increased flow. And for increasing the internal accessibility, bypass roads shall be constructed utilising the existing roads. For this purpose following new road alignments are proposed.

1. NH Bypass (6 Lane)

2. Coastal road

3. Outer bypass road connecting NH, SH, Muthambi Road and Nelliadi Road

The road improvements are proposed in such a way that, all roads with a right of way of more than 12 meters are proposed to have footpaths 1.50 meters wide on both side of the road. These alignments are proposed and the projected traffic is assigned to the proposed road network. The volume capacity ratios are estimated and are shown in the table 35.2. For the assignment, following assumptions are made:

a. 50 to 60 percentage of NH 66 traffic will shift to NH Bypass and 20 to 30 percentages to Coastal road.

b. 20 percentage of traffic coming to SH will be shifted to Muthambi road and Anelakkadavu road in future.

c. Traffic coming to Kainatti junction through SH will shift to new ROB at municipality area.

The obtained V-C ratios after considering all these traffic movements are given in table 36.2 and it can be seen that most of the major roads are less than unity and hence better level of service (LoS).

Table 36-2 V/C ratio on proposed transportation network

Sl	Road Section	Proposed Section	Capacity (PCU/Hr)	Volume (PCU/Hr)	Volume - Capacity Ratio
1	Anakulam (NH)	4 lane Undivided (Arterial)	3000	2398.79	0.80
2	Kainatti (NH)	4 lane Undivided (Arterial)	3000	2843.78	0.95
3	NH Bypass	6 lane Divided (Arterial)	5400	4842.77	0.90
4	Kanayamkode (SH)	4 Lane Undivided (Arterial)	3000	2418.16	0.80
5	Mujkunnu Road	2 lane Undivided	1200	950.42	0.79
6	Muthambi Road	2 lane Undivided	1200	1957.47	1.63
7	Nelliadi Road	2 lane Undivided	1200	923.30	0.77
8	Anelakkadavu Road	2 lane Undivided	1200	1367.67	1.14
9	Coastal road	4 lane Undivided (Arterial)	3000	2843.78	0.95
10	Bypass Road	2 lane Undivided (Sub Arterial)	Meant for internal accessibility		

The major road widening proposals are given in table 36.3, below. The table shows the list of road widening up to 8m. The details of other roads can be referred from the proposed land use plan annexed (Annexure VII) or figure 36.3.

Table 36-3 Road widening proposals

Sl. No	Road	From	To	Existing Width	Proposed Width
1	NH 66 Bypass	Throughout Municipality		New road	45M
2	N.H 66 (Old)	Throughout Municipality		12.5M to 17.5M	24M
3	SH 34	Kainatti Jn	Kanayamkodu Bridge Jn	12.3 TO 14.8M	18M
4	Coastal road	KovilKandi Desom	Mannamangalam Desom	New road	15M
5	Anakulam to Muchukunnu Road	Anakulam Jn	Puliyancheri Desom	7.6M to 7.4M	12M
6	Kollam to Nelliyadikadavu	Kollam Jn	Nelliyadikadavu	8.2 - 7.6 - 4.9M	15M
7	Peruvattoor to Flyover Jn	Peruvattoor Jn	Flyover Jn	11 M	12M
8	Flyover SH Jn to Anelakkadavu	Flyover SH Jn	Anelakkadavu	6.7M-9.1M	12M
9	Naderi to Muthambi	Naderi Jn	Muthambi Jn	5M-8.1M	12M
10	Vaidyarangadi to Naduvannur	Vaidyarangadi Jn	Kurichikkara Desom	8.6M-4.7	12M
11	Peruvattoor Jn to Nayadan puzha	Peruvattoor Jn	Nayadan puzha (Naderi Desom)	8M-7.5	12M
12	Railway Station to Stadium Jn	Railway Station	Stadium Jn	9.5M-10M	12M
13	ITI bus stop to Chittarikadavu	ITI bus stop	Chittarikadavu	7M-8.5M	10M
14	Ottakandam-Kavumvatam-Kavilthazhe-Chittarikadavu	Ottakandam Jn	Chittarikadavu	5.1M - 8.1M	10M
15	Ottakandam-Moozhikkameethal-Chittarikadavu	Ottakandam Jn	Chittarikadavu	5.9M-7.4M	10M
16	Valiyamala road	Near Chittarikadavu	Near proposed Agricultural Research Center	New road	10M
17	Beach road	NH 66 (Near Taluk Hospital)	Koyilandy beach (Near Harbour)	3.2M-7.7M	8M
18	Customs road	NH 66 (Near Block Panchayat office)	Koyilandy beach (Near Harbour)	7M	8M

36.3.2 Proposed Road Network

In the future proposed network, the major artery in North-South Direction is NH 66 Bypass (45 meters wide). Other than this NH 66 (24 meters wide), Coastal road (15 meters wide) and Mujkunnu road will serve for north south movements. In East- West Direction, the major arterial road is SH 34 (18meters wide). Other than this, Muthambi road (12meters wide) and Nelliadi road (15 meters wide) will serve the purpose. Outer bypass road connecting Muchukunnu road and Muthambi road will improve the accessibility of the eastern wards of the Municipality. Further, for increasing the internal accessibility, a few internal roads are also proposed to upgrade to the standards of Sub-arterial road. Proposed major roads are shown in the figure 36.3.

36.4Intersection Improvement Plans

The intersection includes the areas needed for all modes of travel: pedestrian, bicycle, motor vehicle, and transit. Thus, the intersection includes not only the pavement area, but typically the adjacent sidewalks. The intersections requiring immediate improvement measure include, in its priority order 1) Kainatti Junction, 2) main junction (near bus stand) and 3) Kollam junction, 4) Muthambi junction. Kainatti intersection of the study area is a typical T- junction. The junction is unsignalised and the traffic is controlled with the help of traffic police. Various measures can be adopted for the improvement of the junction. Some of the measures include the following:

- Reduction in the frequency of intersection conflicts can be achieved by separating through and turning movements
- Restrict or eliminate some turns during peak period, or totally
- Providing signalised intersection
- Install pavement markings
- Provide lane assignment signing or marking
- Improve visibility of intersections by providing enhanced signing and delineation
- Provide continuous sidewalks, pedestrian signs, signals and markings for the protection of pedestrian traffic
- Foot over bridge need to be provided at the main junction (Bus stand junction)

The new junctions created in future due to the construction of beach road and NH 66 bypass shall be provided with the above mentioned measures at the time of construction itself.

36.5 Bus bays

Bus bays in general can be referred to be a space on the side of the main carriage way where in buses can be pulled over from the main route so that the passengers can get in and off the buses without hindering the flow of traffic behind. Bus bays can be attached with bus waiting shelters, but not necessarily. The main function of the bus bays are to ensure that no traffic in the route is affected while buses are stopped on their course of service.



Figure 36-2 Typical layout of a bus bay (representational image)

Currently, the buses stop right over the carriage way blocking one entire lane. This prompts the long trail of traffic behind to fall in queue behind the buses and the entire traffic movements in the lane are stopped until the buses start to move further. To address this issue, it is suggested to carry out a detailed study on the status of bus shelters in the planning area. The study should also aim to identify potential land parcels which can be acquired for the provision of proper bus bays which in turn would help the smooth traffic flow within the town.

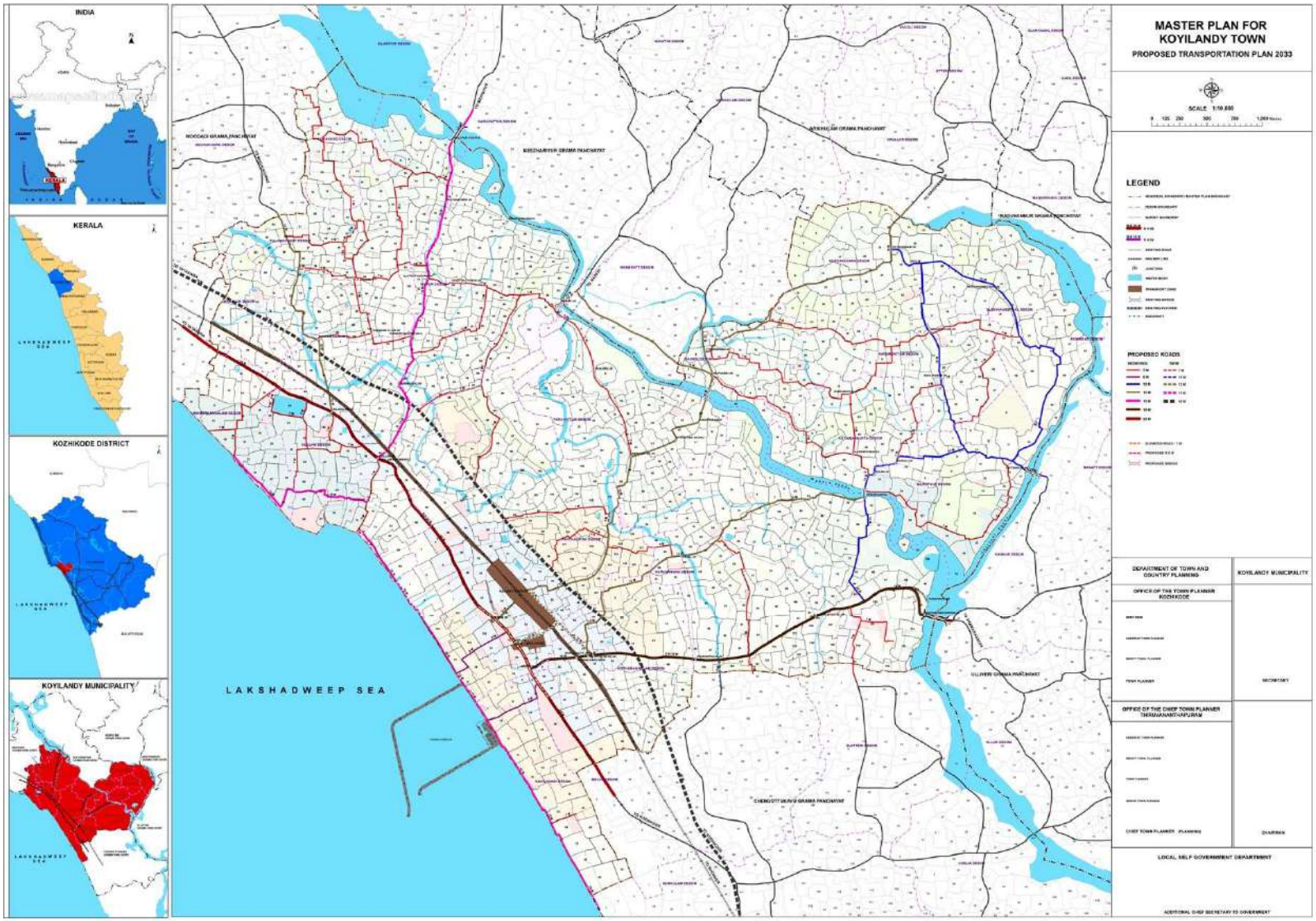


Figure 36-3 Proposed Road Network 2033

36.6 Parking Control Measures

The main parking areas in Koyilandy are old bus stand area and municipal bus stand area. Long duration parking is observed on these locations. In addition to this, short duration parking is observed on the road sides. The traffic flow is hindered by unauthorized parking on the road sides. Therefore parking control is necessary to facilitate smooth flow of traffic. A multi-level parking is to be provided in the municipal complex area for long duration parking. Strict inspection must be done to avoid unauthorized parking on pavement sides.

36.7 Mass Transit Measures

It is inferred from the mode split analysis that, the share of public transport is about 50%. When compared to national average, it is high. But in the case of Koyilandy, city's public transport sector still needs improvement. Congestion in buses at peak hour is very high. Average occupancy of buses at peak hour is about 75 persons in main corridors. For making public transport more attractive, Bus Rapid Transit (BRT), some dedicated bus lanes and circular bus routes shall be provided in future in the major traffic corridors. Low floor energy efficient buses or electric green buses can be used as circular buses.

36.8 Flyovers and Rail and River Over Bridges

A fly over/Elevated road has been proposed at the town centre area which starts near Block office and ends near Govt. H S S Koyilandy and stretch over a length of 1.05km. To increase the accessibility to the eastern sides of the town, a railway over bridge has been proposed at the Kollam area on Kollam- Meppayur Road.

A bridge is proposed at Naderi to connect the Town to eastern hinterlands. The bridge which is about to be commissioned at Chittarikadavu would further improve the connectivity to panchayat on eastern areas.

The present study analysed the nature of traffic and transportation system of Koyilandy Municipality. Based on the results of the traffic analysis described in this report, it appears that most or all of the proposed development can be built while maintaining an acceptable LoS and safe conditions at the study area.

Once the various development proposals in traffic and transportation sector are implemented, it is anticipated that the travel time across the Municipality can be reduced considerably, fulfilling one of the prime criteria for being a smart city.

The base line data provided in this report contains characteristics of transport network in the study area, volume- capacity ratio on major roads, parking and pedestrian volume and characteristics of intra and inter-city passenger and goods traffic movements. In addition, projection of traffic on major roads has been carried out for various horizon years considering the growth potentials of the study area. The growth of traffic system

along with the town's development is very rapid and accordingly, a long-term transport development plan is proposed for Koyilandy Municipality.

37 SECTORAL PROPOSALS

Based on the studies and analysis, discussions made with stake holders and considering the future requirements, the following sectoral proposals are identified to tackle the existing problems and to cater to the future demands. The requirements in transportation sector is dealt in separate chapter and hence not included in this chapter. These proposals may be considered for inclusion in the Annual plans / Five year plans by the Municipality.

37.1 Trade and Commerce

- Commercial Sector holds an important role in the development of Koyilandy Town. Considering the existing commercial development and the proximity of railway station and bus stands, the town centre is proposed as commercial zone. Another commercial zone is proposed near Kollam junction. The Multi-functional zones proposed also promote commercial development.
- Street vendors are to be properly accommodated including the implementation of recognitions, rehabilitation procedure envisaged in Kerala Street vendors (Protection of livelihood, regulation of street vending & licensing) scheme 2016. Considering the

higher concentration of street vendors in the bus stand area, a land patch of adequate width shall be allocated for street vending activities below the fly over, provided that it does not hamper the pedestrian movement in and around the bus stand.

37.2 Agriculture

- **Conservation of existing paddy fields:**

  Paddy fields in Veliyannurchalli and Maruthur Challi, which are areas located in the eastern part of the town are connected with Akalapuzha and Chittaripuzha and its various tributaries. These areas having abundant availability of water as well as all existing paddy fields within the town are proposed to be conserved for the enhancement of paddy crop production.

- **Agricultural research centre**

  To revive the agriculture sector and for conducting research to generate continuous flow of technologies that help to increase productivity and reduce production cost, it is proposed to set up an Agricultural Research Centre along with Agricultural University Centre at Valiyamala. At present, the land is predominantly used for dry agricultural and related activities.

37.3 Industry

- **Industrial estate at Kottakkunnu**

  Industrial estates are effective instruments for promoting development of manufacturing industries especially in the medium and small scale sector. An industrial estate is proposed at Kottakunnu in Viyyur Desom, in the area reserved under industrial land use zone near the proposed life mission flats.

- **Reviving traditional industries**

  Various programs/ projects for the revival and promotion of existing traditional industries like coir, handloom and Hookah making as well as for the promotion of industries based on agricultural and fisheries resources need to be framed. Considering the improved market conditions for coir products such as geotextiles, a coir village can be established at Naderi with the cooperation of existing coir societies. Apart from improving manufacturing facilities, the coir village shall also incorporate an emporium for the display and sale of coir products. In similar manner, the clay pottery units in Kuruvangadu and Kodakkadu can cooperate to form a craft cluster, upgrading to the manufacturing of clay craft products such as home décor materials. This can be clubbed together with the coir emporium which would help it to brand as a craft village. In addition, training and skill development programs

should be formulated for improving productivity through mechanisation and value addition of products.

37.4Fisheries

- **Koyilandy fishing harbour**

  The presence of Koyilandy fishing harbour is a major strength of the town and various projects and schemes by making use of the harbour and its allied facilities need to be established, aiming at the overall development and welfare of the fishing sector.

- **Higher education facilities in Marine Technology**

  This is to be established in Govt. Regional Fisheries Technical Girl's High School, Koyilandy. Currently the school is having 101 students and 8 teachers, and is situated in a location easily accessible from the coastal areas.

- **Projects for improving the infrastructure facilities in the coastal area**:

  The Municipality has an overall 8.25 km of coastal belt, which covers the complete western boundary of the area. Various infrastructure including facilities for drainage, water supply and roads are to be improved in this area.

- **Establishment of a fisheries dispensary**:

  The intense population and the various communicable diseases arising due to the general non hygienic, water logged situations of the coastal area demand for the set up a dispensary exclusively for the use of fishermen community. During rainy seasons various diseases spread across the area and it is of utmost importance to get timely treatment so as to avoid deadly situations. Hence it is proposed to set up a fisheries dispensary in ward 42, in Kollam area.

- **Inland fish landing centre** in Ward 4, ward 24 and ward 25:

  Akalapuzha offers high potential for inland fishing activities that can generate new livelihood opportunities for the local population. Considering this, fish landing centers shall be developed in ward 4 (Puliyancheri desom) near Nelliyadikakadavu Bridge and in wards 24 (Kuruvangad desom) and 25 (Maruthur desom) near Anelakkadavu Bridge.

- **Setting up a fishing village**:

  It is proposed to set up a model fishing village in ward 02 (Kollam desom) of the Municipality. The concept of a model fishing village envisages the various facilities of the area so aligned that, it provides an efficient, well established and self-sustaining

community living to the people. The model fishing village needs to have various facilities including adequate water supply, sanitation, housing, health facilities, marketing facilities etc.

- **Projects to enhance the marketing facilities** of fish and related products:

  One of the most important requirements of the fishermen community is to have a proper market place so as to sell their catch in a more profitable manner. Lack of proper market/ storage places forces the people to sell off their catch at much lower prices. Hence it is proposed that the Municipality may setup a retail outlet with modern facilities and lease out to fishermen. A market promoting inland and coastal fish produces to be established in Kollam area in survey number 40/2.

37.5 Animal Husbandry

- Projects are to be framed for the overall physical and infrastructure **enhancement of the existing veterinary hospital**, which is currently located near the bus stand area of the Municipality.
- Most **modern slaughter house** is to be established in established in Valiyamala area, along with the proposed Agricultural and Veterinary Research Institute. The slaughter house needs to have all modern facilities attached with the full time supervision of a veterinary doctor. The proposed land is currently being utilized for dry agriculture purpose.
- One **veterinary research institute** is proposed in Valiyamala, along with the proposed agricultural research center. The land proposed for these activities constitutes to 22.39 Ha, and being currently used for dry agricultural activities. The proposed land is near Chittarikadavu.
- **Market facilities** for various veterinary and allied products need to be established in Kollam area of the Municipality. Milk cooperative societies need to be established along with these markets.

37.6 Tourism

- **Various Beach front and harbour based tourism projects** are to be set up in the Municipality. The town has a high potential for beach tourism due to the presence of a long coastal line.
- Adequate **transportation facilities and other infrastructure facilities to be established to Parapalli and Pisharikavu** areas:

  Both Parapalli and Pisharikavu are major destinations which attract large number of visitors every year. Presently the visitors need to traverse through narrow roads and also are to compromise on basic facilities. A tourism promotion zone has been proposed which covers the Parappalli and Pisharikavu areas and its surroundings.

Infrastructure facilities including roads, drainage facilities, water supply system etc. are proposed to have a thorough revamp in these areas.

- **Utilization of the waterway network through Akalapuzha**:

  Akalapuzha River divides the Municipal area in to two parts. The land towards the eastern side of Akalapuzha is predominantly of rural nature with vast agricultural land and paddy fields. Akalapuzha, a perennial river having availability of abundant water throughout the year flows further southwards to join with Korapuzha. This river can be used as an effective means for inland water transportation as it passes through the inner areas of the Municipality connecting the northern boundary with the rest of the region. The waterway traverse through scenic landscapes, thus boosting further the tourism potential of the area.

- **Initiate river based tourism** in the eastern side of the municipality:

  Akalapuzha and Chittaripppuzha which flow in the eastern parts of the Municipality forms beautiful waterfront spots ideal for river based tourism activities, especially near Nelliadi area where the small island formation can be explored for tourism purpose. Boating, river cruising activities and other eco-tourism initiatives can be proposed in these areas.

37.7Water Supply

- **Water supply schemes and ground water recharging arrangements** to ensure 24x7 availability of fresh water to the entire Municipal area:

  The existing ground water resources need to be replenished by adopting appropriate measures to allow percolation of rain water to ground. The ground water recharging arrangements need to be adopted in higher altitude area of the Municipality so that it can replenish the water table of vast area of land which forms the catchment area of the tributaries below.

- Elaborate **water supply scheme to cater the coastal area.** The problems associated with the water supply sector in the coastal areas are acute in nature. Saline water intrusion and the lack of proper fresh water resources and the general backwardness of the area make water supply issues a severe one in the coastal regions. An elaborate water supply scheme for the exclusive reach of the coastal area can solve the issue.

- **Extension of MWS** for the needy. The existing water supply schemes at various locations need to be extended further to reach out the needy. Various infrastructure facilities of the existing schemes need to be improved further towards this. One acre of land available in Valiyamala under water authority can be utilized for setting up the treatment plant.

- **Regulator cum bridge** in Chittarikadavu- Regulator cum bridge will help to regulate the flow of water through river and use as bridge providing easy transportation

facility. During dry season the water levels in the Chittaripuzha can be maintained to a required level which will further enhance the fresh water availability of the entire area.

- Setting up a **laboratory** for regular inspection of water from the wells and other water sources and executing adequate treatment methods.

37.8Sewerage

- **Toilet facilities:**

  Projects to ensure well-built good quality toilet facilities for 100 % of households of the planning area.1.6% of the total households are deprived of any of the types of sanitary disposal facilities. Schemes are to be coined out to provide toilet facilities for 100% of the households.

- **Septic Tanks:**

  Presently, as per the socio economic survey results, nearly 53.73% of the households use septic tank and 44.55% of the households use pit latrine. It can also be seen that 89.73% of the household use open well as drink water source and the water consumed in raw without any treatment applied. Waste water from pit latrine would easily reach the water table there by increasing the percentage of bacteriological contaminations in these open well. Septic tanks are the simpler and proven alternative method to sort out this issue. Projects for the promotion of septic tanks shall be framed.

- **Sewage treatment facilities at Taluk hospital and Harbour:**

  Taluk hospital which is located in the densely populated area of the Town presently lack proper waste treatment facilities. Facilities to treat various wastes from the hospitals especially bio medical wastes need to be provided in the Taluk hospital. Sewage treatment facilities shall be provided in the Taluk Hospital.In addition, a waste water treatment facility shall be set up in the Harbor area to ensure that untreated water is not discharged to the sea.

- **Comfort station and Public toilets:**

  These shall be established in important places where public gather. These are to include state of the art facilities, with provisions for proper cleaning and maintenance works. Apart from the comfort stations in the bus stand including the woman-friendly comfort station, it should be provided in more locations in the planning area. Comfort stations shall be developed in the Taxi stand near Telephone Exchange, Taluk Hospital, Kollam Fish Market and other busy areas of the town.

- **Integrated Solid and liquid waste treatment plan**

  The town needs to have an elaborate integrated solid and liquid waste management plan in place. The detailed plan to be prepared needs to address the whole aspects of the waste management, right from its production and till the treatment, performed in an efficient, effective and sustainable manner, including detailed drainage and sewage network system and the details on treatment facilities.

37.9 Solid Waste Management

- **Solid waste treatment Plant :**

  The existing bio-waste treatment facility is at Varakunnu is not functioning properly at present. Considering the protests from nearby residents regarding the water contamination due to the leakage of leachate, it is suggested to adopt scientific measures for the treatment of biodegradable waste. The Municipality should also aim for identifying suitable land for establishing a holistic 'waste to energy' plant in the near future.

- **Promotion of waste management through bio degradable techniques**:

  Decentralised techniques for effective biodegradable solid waste disposal methods are to be encouraged through proper waste management techniques. Methods like pipe composting need to be promoted and solid wastes from households to be properly disposed of within the plot itself; this will reduce the load on centralized treatment plants.

- **Waste recycling unit** in Varakunnu.

  The non-bio degradable wastes need to be separated out, and the materials are to be recycled wherever possible. The concept of Reduce, Recycle and Reuse need to be the guiding principle of the whole waste management process.

- **Awareness program:**

  An awareness program has to be initiated to educate the people about the scientific methods of solid waste management. Thrust should be given to concepts such as segregation at source and decentralized waste management.

37.10 Education

- **Agricultural University and regional centre of the Sanskrit University:**

  Agricultural university is proposed at Valiyamala along with the proposed agricultural and veterinary research centre campus. Plot for the regional centre of Sanskrit University, Kalady is already at the final stage of its possession. Both these plots are currently being used for dry agricultural activities.

- **Projects for the improvement of Infrastructure development** in the existing education institutions including anganwadis:

  Among the various schools under government ownership, only 47% of the schools have play grounds, 73% have separate toilets for girls and 87% have computer labs. Although the schools are well connected with motor able roads, various schemes need to come up for the enhancement of infrastructure facilities in various schools in the Town.Considering the role of sports in the overall physical and mental development of the students, it is highly recommended to develop playgrounds in the schools where such facility is presently lacking and improve the quality of sports infrastructure in all the educational institutions in the planning area.

37.11 Health

- **Projects and schemes for Infrastructure development in the Govt. Taluk Hospital and Govt. Homeo hospital**:

  Taluk hospital is currently having a total number of 188 beds and 18 doctors to serve them. But due to the fact that there are no multi-speciality hospitals within the town the Taluk hospital often gets overcrowded and need improved facilities to cater its patient load. The Govt. Homeo hospital also requires improved facilities due to similar reasons. Mother and child hospital need to be detached and suitably relocated as a separate institution.

- **Enhancement of Ayurveda Dispensary to Ayurveda Hospital:**

  Currently the dispensary is functioning near Puliyancheri road, and is having one doctor to serve, and is having the potential to be developed as a Hospital.

- **Expansion of 'Pakalveedu' care centers**

  The geriatric care centers called 'Pakalveedu' are already functioning in the municipality presently at Kothamangalam Desom in Panthalayani Village, Puliyancheri Desom in Viyyur Village and Kuthirakutta Desom in Arikkulam village. Such care centers have to be introduced at various places in the municipality in order to cater to the growing elderly population.

- **Establishment of Health Centers**

  Considering the higher population density in the coastal wards, it shall be suggested to establish a Primary Health Center near the fishermen colony in Ward 34 (Kovilkandi desom). Suitable location shall be identified in Ward 42 (Kollam desom) also to set up a health center.

- **Projects to promote proper waste management in the health institutions**:

  Wastes from various health care institutions, especially bio medical wastes need to be properly treated and disposed of, and projects and schemes need to be formulated accordingly.

- **De-addiction centre in Taluk hospital**:

  Presently the there are no such facilities available in the town. The de addiction centre can be established as part of the Taluk hospital.

37.12 Environment

- **Protection of natural streams and rivers:**

  Akalapuzha and Chittaripuzha are the two main rivers in the area. A buffer zone to a depth of 15 meters towards the inland side of the rivers and streams is proposed in the proposed land use plan, with strict regulation in construction activities. Various other protection measures are to be adopted for protecting the natural streams and river banks in the town. The blockage of Vayanarithodu at several places has hampered the natural drainage system in the planning area. For the sustainable development of natural systems in the planning area, it is vital to rejuvenate Vayanarithodu. Apart from bank protection and removing encroachments, regular de-siltation has to be carried out. It is also important to maintain proper connection to Akalapuzha so that the natural storm water discharge system functions efficiently. The smaller water streams in the planning area shall also be protected against encroachment and reclamation.

- **Conservation of the existing mangrove belt**:

  Mangroves form 7.7 Ha in area which is around 0.27% of the total municipal area. Existing mangrove belt in the Anelakkadavu area and along the banks of Akalapuzha and coastal belt are proposed to be conserved.

- **Mangrove park in the Anelakkadavu area**:

  A Mangrove park is proposed at Anelakkadavu area. This park should ensure that the functioning of the same enhances the protection of existing mangroves and also creates awareness towards the need of protecting precious ecological resources.

- **Protection of Kavus' (sacred groves)**
  The kavus' (sacred groves) in the area are to be protected and preserved. Detailed inventory of the Kavu need to be prepared and an implementation plan need to be established for the protection of these sacred groves.

- **Projects for the Conservation of Kollam Chira, Anakulam, Nayadan puzha and Cherol puzha**:
  The protection measures shall include proper side protection works, and various ways and means to avoid the contaminated substances reaching into these water bodies.

- **Construction of sea walls, and river protection side walls to beach and river belts:**
  The long coastal belts are susceptible to sea turbulence and the river banks get

flooded especially during monsoon seasons. Side protection walls shall be constructed along beach and river belts.

37.13 Civic Amenities

- **Site for rescue centres in the flood season**:
  Coastal and low lying areas of the Town are susceptible to flooding during monsoon seasons. Disaster Management plan with a well-defined rescue centre, evacuation and emergency routes etc. are to be in place.

- **Infrastructural improvement in anganwadis**:
  There shall be a minimum of one anganwadi in each ward of the Town that need to be developed in such a way that anganwadis can act as a single point destination of child and women welfare. In addition to various facilities meant for women and children, the anganwadis need to have various facilities including basic health care, reading rooms, libraries, meeting place for senior citizens etc.

- **Crematorium** is proposed in R.S No. 133 of Kuruvangad Desom in an area of 40 cent land acquired by the municipality for the same purpose.In addition, there is a proposal to establish another crematorium near Valiyamala in 17 cents land which is under the possession of the Municipality.

- **Parks and Playgrounds**

  Recreational facilities such as parks and playgrounds has significant role in the well-being of the inhabitants of the town as it helps the people to maintain good physical and mental health. Considering this, it is proposed to develop playgrounds at Manjaladkunnu in Arikkulam village (ward 21), Manakulangara in Panthalayani village (ward 25) and Puliyancheri desom in Viyyur village. A park shall be developed at Mannamangalam desom in Viyyur village.

- **Swimming Pool and Training center**
  A swimming pool and training center shall be set up by the municipality in the land identified near Puliyancheri Ayurveda Dispensary. The training center shall have dedicated staff for professional swimming training. In addition, the municipality should take necessary initiatives to conduct free swimming training camps for school children during vacations.

- **Public gathering space**
  A public gathering space shall be set up near Anela Mangrove Museum to facilitate public programs and events. This can be developed as a state of the art public realm which can be a good recreational space for the residents of the town. The municipality shall also initiate a project to identify the unused land parcels in the town area to establish vibrant public spaces based on the principles of landscape urbanism.

- **Fire Station**

  A fire station shall be established as part of/near the hospital complex to cater to the requirements of the town.

37.14 Energy

- **A 110 KV new substation** in the eastern or northern side and a new substation near the harbour are proposed. Eastern area faces low voltage issues at present and new substations and subsequent installations can sort out the issue.

- Programs to ensure **100% of the houses in the Municipality to have electric connection,** having proper supply of electricity have to be framed.

- **Promotion of non-conventional renewable** energy resources and green building norms to be adhered to in all possible sectors. The use of non-conventional, renewable energy sources is to be promoted to maximum as an effective alternative to resolve the energy issues of the time.

- **Common underground cable ducting** system for all service cables distribution is to be introduced. The design need to be such that, multiple service cables can be driven through the same duct. The ducts can be installed by public agencies and can then be rented out to various service providers. The median space in wide roads can be effectively utilized for this purpose and can result in considerable saving in cost of damage to road infrastructure.

37.15 Governance

- To improve efficiency of functioning and for providing better services to the Public, GIS based smart governance system need to be introduced. Procedure for the various day to day activities of the Municipality including but not limited to collection of tax, building application process, issuing of various certificates etc. are to be automated using GIS based software solutions.

- Municipal office currently functions in a converted auditorium building and the existing infrastructure falls extremely short of the requirement. It is proposed that the area around Municipal office area may acquire and a modern administrative head quarters for the Municipality may be developed.

37.16 Heritage

- **Pisharikavu, Parappalli as major heritage centers**:

  Pisharikavu and Parappalli are situated in the North West quadrant of the Municipal area and possess immense religious and heritage values. In addition, there are buildings of historical value situated in Panthalayani desom, such as BEM School. These need to be protected and developed without compromising its cultural identity and heritage values. Detailed project reports are be prepared for this purpose.

37.17 Housing

Detailed Projects must be framed to ensure effective housing and shelter options, focusing the poor, marginalised and disadvantaged in the town as well as for the migrant labourers by creation of adequate housing stock on either rental or ownership basis and delivery of serviced land, through Public Private Partnership. Development of multi storey apartments need to opted for to kurb down the effects due to higher land values and to minimise spread of urban land use to fragile agricultural land. At present, the state government programme for housing, LIFE Mission, is being implemented in the municipality. Land is identified at Valiyamala and the beneficiary selection is ongoing. Rehabilitation of the beggars should also be an integral part of the project with due focus given to improving livelihood opportunities. Adequate interventions by the Government to ensure housing for all need to be initiated.

37.18 Disaster Management

37.18.1 Mitigation measures

Disasters can neither prevent a disaster nor divert it to any other place, but can only minimize its damage. A better disaster management with minimum vulnerability quotient is possible only by means of preparedness and mitigation measures. Maximum the disaster preparedness, minimum is the vulnerability. The disaster management committees constituted at local level shall play active role in this matter.

For reducing the risk of a region to floods, the primary step involved is to map the flood prone areas. The problem of flood management can be resolved into two aspects- structural measures and non-structural measures. Structural measures are in the nature of physical measures and help in “modifying the floods” while non- structural measures are in the nature of planning and help in “modifying losses due to floods”. Long-term measures are execution of watershed management, major flood control structures, land use regulations, strengthening of forecasting, monitoring and warning systems, and public awareness. Medium term measures are bank protection; river draining and flood control works. Short term measures are assessment of the vulnerability of the flood control structures, cleaning, desilting, flood plain zoning mapping etc. Community participation is of utmost importance, in prevention, mitigation and preparedness measures against flood.

The main mitigation strategies for cyclone include building engineering structures to withstand wind forces, incorporating wind safety requirements for non- structural elements, planting of wind breaks and provision of cyclone resistant community shelters in vulnerable areas. Hazard maps can be prepared and critical activities can be marked in vulnerable areas. Location of settlements in flood prone areas is at highest risk. Coastal shelter belt plantations can be developed to break severe wind speeds. Flooding can result from a cyclonic storm. Flood mitigation measures should be incorporated. Drought monitoring is the continuous observation of rainfall situation, water availability in reservoirs, lakes, rivers,

and comparing with the existing water needs of various sectors of the society. Drought mitigation can be done through water rationing, watershed management practices, construction of irrigation structures, conserving soil and reducing erosion rates through soil conservation practices, introduction of flexible farming and cropping patterns etc.

Coastal erosion is a major problem in the coastal areas. The mitigation measures for the hazard are offshore breakwaters, sea walls, flood walls, revetments etc. The soft engineering approaches towards coastal erosion mitigation include sand fills to build up beach areas, sand fences to inhibit natural migration of sand dunes along the coast line, beach grasses, vegetations and other vegetation to reduce the movement of sand etc. The non-structural mitigation measures include land use zoning regulations, adherence to CRZ regulations, compulsory acquisition of land in high risk areas to prevent development and construction practices to reduce vulnerability of the building to flooding and wind hazard.

Earthquake is a sudden onset hazard and gives no warning at all. But the damages due to earthquake can be reduced through preparedness, prevention and mitigation measures. For new constructions, analyze soil type before construction and ensure earth quake resistant features. To accommodate on soft soil, take all the safety precautions. Existing weak structures can be retrofitted. Other long term strategies include initiatives in techno legal regime like insurance schemes etc.

For landslide prevention, possible interventions are, use of natural fiber grids such as jute or coir, use of synthetic grids, surface and subsurface drainage systems, retaining walls, rock bolts, pre-stressed anchors, regrading slope, afforestation, and land use control.

Vulnerability to epidemics is high among those who are poorly nourished, people living in unhygienic sanitary conditions, poor water supply, individuals who do not have access to health services, or those who have weak immune systems. The outbreak of an epidemic situation where already a natural calamity has struck will cause life threatening situations. Organizational preparedness and the coordination mechanism is required right from the state level up to the village level PHCs. Personal protection through vaccination of people at risk is an effective mitigation measure. Vector control through improvement of sanitary conditions, drive to check and fumigate breeding places of vectors, improving disposal methods of waste, disinfecting the water source etc are the other mitigation strategies.

37.18.2 Planning measures

Detailed disaster management plan need to be prepared and made ready. This plan has to analyse in detail the various disaster prone areas, preventive measures, mitigations, assembly points, evacuation routes, the various agencies involved etc. Mock drills and trainings need to be conducted on a periodic basis and general public need to be made aware of the immediate dos and don’ts to be taken care in case of occurrence of a possible disaster.

Table 37-1 Projects identified under various sectors

Sector name	No.	Project Name	Project details/ status	Agencies involved
Traffic and Transportation	1	Widening of NH 66	a. Widening of NH 66, providing proper road markings, signs, sufficient shoulder, kerbs and street furniture. b. Provision of medians to separate directional traffic thus to reduce accidents. c. Installation of solar powered street lights throughout the stretch, to reduce dependency on conventional energy sources	PWD/ NHA/ Revenue Dept.
	2	Bypass to NH 66	The proposed bypass should start from the NH portion at east side of rail before entering to Municipality and end at again east side of rail after leaving Municipality. This will remove the necessity of two railway flyovers at entry and exit points of the Bypass.	PWD/ NHA/ Revenue Dept.
	3	Roads to Harbor	Development of Roads to cater the needs of the emerging harbor	PWD/Municipality/ Revenue Dept.
	4	New coastal road	Linking the small roads along the beach, a new Beach Road can be introduced for the movement of goods vehicles from the harbor thus reduces heavy truck movement in the arterial.	PWD/Municipality/ Revenue Dept.
	5	Widening of SH	To ensure smooth flow of traffic in the Municipality.	PWD/ Revenue Dept.
	6	Bypass road	Bypass road connecting NH, SH, Muthambi road and Nelliadi road.	PWD/ Revenue Dept.
	7	Foot path and bicycle track	a. All roads with a right of way 12 meters are proposed to have footpaths 1.5 meters wide on both side of the road b. All roads with a right of way 24 meters and above are proposed to have footpath cum bicycle track, 2.5 meters wide on minimum one side of the road	PWD/Municipality

	8	Intersection improvement plan	Improvement of Kainatti intersection (T junction), Muthambi junction, Municipality junction, Kollam junction, Market road junction and the emerging junctions due to the construction of Beach road and NH 66 Bypass by providing signalized intersection, installing pavement markings and proper signing and sidewalks	PWD/ NHA
	9	Multi level parking	A multi-level parking is to be provided in the municipal complex area for long duration parking. Parking plaza to be provided in ward 39 in Panthalayani village where the existing Lorry stand functions.	PWD/Municipality
	10	Bus Rapid Transist system	a. Adoption of BRT System to improve the public transportation system in the Municipality providing dedicated bus lanes and circular bus routes in future in the major traffic corridors. b. Low floor energy efficient buses or electric green buses can be used as circular buses.	PWD/ Municipality/ PPP
	11	Flyovers and Rail and River Over Bridges	a. Elevated road at town centre. b. A railway over bridge shall be at the Kollam area on Kollam- Meppayur road to increase the accessibility to Nelliadi area in municipality c. A bridge shall be constructed at Chittarikadavu for better connectivity to panchayat and eastern areas	PWD/ NHA
Trade and Commerce	1	Vending zone	Vending zones shall be established below the flyover near bus stand area.	Municipality
Fisheries	1	Fisheries dispensary	To provide health facilities for the Fisher man community, with the existing health center in Sy. No:75 of Kollam Desom	Department of Health/ Municipality/ Fisheries Dept.
	2	Inland Fish landing center	Inland Fish Landing Centers near Nelliyadikadavu in ward 4 (Puliyancheri desom), near Anelakkadavu in ward 24 (Kuruvangad desom) and ward 25 (Maruthur desom) to	Municipality

			enhance the inland fishing and related activities of the area.	
	3	Fishing Village	a. Model fishing village in ward 2 (Kollam desom) provides an efficient, well established and self-sustaining community living to the people. b. The model fishing village needs to have various facilities including adequate water supply, sanitation, housing, health facilities, marketing facilities etc	Municipality/ Fisheries Dept.
	4	Higher education facilities in Marine Technology	To be established in Govt. Regional Fisheries Technical Girl's High School, Koyilandy	Education Dept./ District panchayat
	5	Fish Market	A market promoting inland and coastal fish produces, in Kollam area in survey number 40/2.	Municipality
Agriculture	1	Conservation of existing paddy fields	Conservation of paddy fields in Veliyannurchalli and Maruthur Challi for the enhancement of crop production in the Municipality	Municipality
	2	Agricultural Research center	Agricultural Research Centre along with Agricultural University Centre at Valiyamala	Municipality/ Agriculture Dept.
Industries	1	Industrial Estate	An industrial estate is proposed at Kottakunnu in Viyyur desom in the area reserved under industrial land use zone.	Municipality/ Dept. of Industries
Animal Husbandry	1	Modern Slaughter house	A most modern slaughter house at Valiyamala area along with the proposed Agricultural and Veterinary Research Institute.	Municipality
	2	Veterinary research institute	Veterinary research institute is proposed in Valiyamala, along with the proposed agricultural research center. The land proposed for these activities constitutes to 22.39 Ha	Veterinary Dept.
	3	Market	Market facilities for various veterinary and allied products need to be established in Kollam area of the Municipality. Milk cooperative societies need to be established along	Municipality/ Kerala Livestock Development Board/

			with these markets.	Kerala Co-operative Milk Marketing Federation
Tourism	1	Beach front and Harbor based tourism	DPRs to be prepared.	Municipality/ Tourism Dept./ Harbor Engineering Dept.
	2	Transportation and infrastructure facilities	Infrastructure facilities including roads, drainage facilities, water supply system to Parappalli and Pisharikavu areas and its surroundings	PWD/ Municipality
	3	Inland water transportation	Water way transportation network through Akalappuzha	Municipality/ PPP
	4	River based Tourism	a. The island formed by Akalapuzha and Chittaripuzha near Nelliadi can be explored for river based tourism. B. Boating and river cruising activities	Municipality/ PPP/ Tourism Dept.
Water supply	1	Water supply schemes and ground water recharging arrangements		Municipality/ KWA
	2	water supply scheme to cater the coastal area		Municipality/ KWA
	3	Extension of MWS	One acre of land available in Valiyamala under water authority can be utilized for setting up the treatment plant	Municipality/ KWA
	4	Regulator cum bridge	A Regulator cum bridge in Chittarikadavu will help to regulate the flow of water through river and use as bridge providing easy transportation facility and enhance the fresh water availability of the entire area.	Irrigation Dept. /PWD
	5	Laboratory	Mobile laboratories to check water quality	Municipality
Sewerage	1	Sewage treatment facilities in Taluk Hospital and Harbour		Health Dept./ KWA

	2	Integrated solid and liquid waste treatment plan		Municipality/ KWA
	3	Comfort stations and Public toilets	Comfort stations shall be developed in the Taxi stand near Telephone Exchange, Taluk Hospital, Kollam Fish Market and other busy areas of the town.	Municipality
Solid waste management	1	Promotion of biodegradable waste management	Pipe composting need to be promoted and solid wastes from households to be properly disposed of within the plot itself; this will reduce the load on centralized treatment plants.	Municipality/ Residents Associations
	2	Waste recycling Unit	A waste recycling unit at Varakkunnu	Municipality/ Residents Associations
Education	1	Agricultural University and regional centre of the Sanskrit University	a. Agricultural university at Valiyamala along with the proposed agricultural and veterinary research centre campus. b. Plot for the regional centre of Sanskrit University, Kalady is already at the final stage of its possession.	Municipality/ Agriculture Dept./ Veterinary Dept
Health	1	Projects and schemes for Infrastructure development in the Govt. Taluk Hospital and Govt. Homeo hospital		Health Dept.
	2	Enhancement of Ayurveda Dispensary to Ayurveda Hospital		Health Dept./ Municipality
	3	Projects to promote proper waste management in the health institutions		Municipality
	4	Establishment of ‘Pakalveedu’ care centers		Municipality

	5	Establishment of Health centers	Establishment of Health centers in Ward 34 (Kovilkandi desom) and Ward 42 (Kollam desom)	Health Dept./ Municipality
Environment	1	Protection of natural streams and rivers	A buffer zone to a depth of 15 meters towards the inland side of the rivers and streams with strict regulation in construction activities	Municipality/ Residents Associations
	2	Conservation of the existing mangrove belt	Existing mangrove belt in the Anelakkadavu area and along the banks of Akalapuzha and coastal belt are proposed to be conserved	Municipality/ Irrigation Dept./ Residents Associations
	3	Mangrove park	A Mangrove park at Anelakkadavu area to ensure that the functioning of the same enhances the protection of existing mangroves and also creates awareness towards the need of protecting precious ecological resources.	Municipality
	4	Protection of Kavus' (sacred groves)		Municipality/ Residents Associations
	5	Projects for the Conservation of Kollam Chira, Anakulam, Nayadanpuzha and Cherol puzha		Municipality/ PPP/ Residents Associations
	6	Construction of sea walls, and river protection side walls to beach and river belts		Irrigation Dept. /PWD/ Harbor Engineering Dept.
Amenities	1	Infrastructural improvement in anganwadis		Municipality
	2	Crematorium	Crematorium is proposed in 40 cent of land in R.S No. 133 of Kuruvangad Desom.	Municipality
	3	Parks and Playgrounds	To develop playgrounds in Arikkulam, Panthalayani and	Municipality

			Viyyur villages	
	4	Swimming pool and Training center	Near Puliyancheri Ayurveda Dispensary	Municipality
	5	Public gathering space near Anela museum		Municipality
	6	Fire station	Fire station near/as part of Hospital Complex	Kerala Fire and Rescue Services
Energy	1	110 KV substation	a. 110 KV substation in the eastern or northern side b. New substation near the Harbor	KSEB
	2	Promotion of non-conventional renewable energy resources		KSEB/ Municipality
	3	Common underground cable ducting system		KSEB
Governance	1	Adoption of GIS based software solutions		Municipality/ PPP
	2	Modern administrative Headquarters for Municipality		Municipality/PPP
Heritage	1	DPR for conservation of heritage and cultural values of Pisharikavu and Parapalli		Municipality/ PPP
Housing	1	Affordable housing for all		Municipality/ PPP/ Kerala State Housing Board/ LIFE Mission
Disaster Management	1	A detailed disaster management plan for the Town		Municipality/ District Disaster Management Authority



38 TOWARDS BEING SMART CITY

Cities need to be equipped with basic essential infrastructure and services for its citizens to live, and the concept of smart cities brings together the latest technologies, government and the society as a whole in a smart way to ensure better standard of living. This chapter outlines how smart city concepts are incorporated in the Koyilandy Master Plan.

Even though the urban population of the nation is only 31%, 60% of the GDP is being generated from urban areas in the country. This share is further considered to increase to 75% in the next 10-15 years – cities being true engines of economic growth. Our cities are in the threshold of a rapid urbanisation since experience across the world shows that reaching 30% urbanisation is a slow process, while getting ahead is a rapid process till an urban conduct of 60-65% is reached.

As the population continues to grow at a steady pace, more and more people are moving to cities every single day. Accordingly there is a crying need for the cities to get smarter to handle this large-scale urbanization and finding new ways to manage complexity, increase efficiency, reduce expenses, and improve quality of life. The smart cities should be able to provide good infrastructure such as water, sanitation, reliable utility services, health care; attract investments; transparent processes that make it easy to run; simple and on line processes for obtaining approvals, and various citizen centric services to make citizens feel safe and happy.

The smart cities are expected to make optimal use of resources like electricity and water, clean air, better traffic, inclusion of citizen facing ICT enabled services, improved productivity and reduced carbon emissions, with smart traffic management systems despite significant increase in the number of vehicles over the period of time, effective use of information analysis for making transport service profitable and convenient. Smart cities can be identified (and ranked) along six main axes or dimensions. These axes are: smart economy; smart mobility; smart environment; smart people; smart living; and, finally, smart governance.

The draft concept paper on smart city scheme published by the Ministry of Urban Development, Government of India defines smart cities as follows:-

"Smart cities are those cities which have smart (intelligent) physical, social, institutional and economic infrastructure, while ensuring centrality of citizens in a sustainable environment."

The smart cities are expected to provide ample employment opportunities for the rapidly increasing urban populations, ensure quality of life and present investment opportunities for economic development.

The key components of a Smart City and their integration in the planning process of Koyilandy town are discussed below:

38.1Smart Economy

- Koyilandy Town offer economic activities and employment opportunities to a wide section of its residents. Koyilandy has a potential for the development of industrial sector and hence an industrial zone is proposed for the promotion of industries.

- Due to better connectivity in terms of roadways and railways, trade and commerce sector holds an important role in the development of Koyilandy town. The major proposals for developing commercial sector include development of commercial centres in the town centre. In addition, more commercial developments are permitted in the proposed Multi function zone.

- For the effective utilization of the available tourism potentials within Koyilandy town, two distinct zones are identified as tourism promotion zone.

- Developments envisaged in the sectors of industry, trade and commerce and tourism will definitely aid in the economic development of the town.

38.2 Smart Mobility

- Urbanisation is accelerating at such a pace, placing intense pressures on city resources and infrastructure. Urban Mobility will be one of the toughest challenges for cities around the globe.
- Mobility and transport are essential for the proper functioning of a city. A smart city should be easily accessible to visitors and residents, and travel across the city should be problem-free. The Master Plan aims to provide a multifaceted, efficient, safe and comfortable traffic and transport system in the town.
- The traffic and transportation plan for Koyilandy town envisages a well connected town that encourages public transport. Emphasis has been given to new road construction as well as improvement of the existing road network.
- Adopting smart solutions such as GPS enabled buses, wifi facilitated bus stops and online updation of bus schedules through mobile applications can improve the efficiency of public transport as well as increase the modal share of bus trips.
- Proper traffic management measures are to be framed to improve functioning of transport system. Pedestrianisation should be encouraged and parking of private vehicles along roads should be discouraged. Adequate parking plazas are to be developed. Programmes are to be designed to produce significant reductions in traffic fatalities.

38.3 Smart Environment

Today's cities can barely handle the burden of their current populations. Core services like energy, water, communications, transportation, and public safety are wasteful, inefficient and decrepit. Even though cities only occupy 2% of the landmass of the Earth, they consume over 75% of the Earth's resources. The zoning regulations of Koyilandy Town are designed in such a way as to encourage the preservation of the town's agricultural lands, water bodies and other environmentally sensitive areas.

38.4 Smart People and Smart Living

Instead of striving for physical growth, a city's success should be measured by how wisely it uses energy, water, and other resources, how well it maintains a high quality of life for its people, and how smart it is in building prosperity on a sustainable foundation. In short, cities have to become much smarter about how they use existing capacity and resources.

- It is proposed to develop Koyilandy town in a smarter and a sustainable way. Parks and recreation areas are proposed to enhance the quality of life. Existing infrastructure are to be improved and maintained. Provisions are made to protect wetlands, recreation and open space, natural, cultural, and historic resources.

- Koyilandy town should provide a very high quality of life i.e. good quality but affordable housing, cost efficient physical infrastructure such as 24 x 7 water supply, sanitation, 24 x 7 electric supply, clean air, quality education, health care, security, entertainment, sports, robust and high speed interconnectivity, fast & efficient urban mobility etc.
- The Municipality is already having various health facilities including dispensary, nursing home, general hospital, family welfare center, diagnostic centers and veterinary hospital.
- The Municipality is already having educational facilities to the tune of 1 primary school for every 5,000 residents and one college per lakh of population.
- Programmes are to be framed for the following:
    - Water supply schemes, ground water recharging arrangements to ensure 24x7 availability of fresh water to the entire Municipal area.
    - An efficient and integrated waste management system.
    - Projects to ensure toilet facilities for 100 % of households of the planning area.
    - Programs to ensure 100% of the houses in the Municipality to have electric connection, having proper supply of electricity.
    - 100% of the households to have telephone connection.
    - Promotion of non-conventional renewable energy resources and green building norms
    - Common underground cable ducting system for all service cables distribution.

38.5 Smart Governance

Effective development can only be achieved through the application of good urban governance to the administration of Town. Good Urban Governance implies that city governments respond to and are accountable to all residents, including the poor. It implies inclusive and participatory approaches in which each group and stakeholder has adequate representation. Good Governance is consensus oriented, transparent, effective and efficient, equitable. It assures that corruption is minimized, the views of minorities are taken into account and that the voices of the most vulnerable in society are heard in decision-making.

- It is proposed to develop Koyilandy Town as a role model of e-governance through GIS support. GIS based smart governance system need to be introduced in functional service areas of local body including registration and issue of birth & death certificate , payment of property tax & utility bills , management of utilities that come under the control of ULBs , citizen grievances & suggestions , Building plan approvals , procurement and monitoring of projects , health, accounting system and personal information system.

An illustration with regards to Smart Solutions is given in Figure- 38.1 below.



Figure 38-1Smart Solutions
(Source: Smart City Mission statement and guidelines- Govt. of India, June 2015)



39 MONITORING AND REVIEW

Monitoring and review of the plan during specified intervals are essential for the sustainable implementation of the plan. Implementation of the Master Plan is equally or more important than preparation of the master plan. In order to ensure timely implementation of the Master Plan, a permanent system for monitoring and review is envisaged

39.1Monitoring

A monitoring committee shall be set up as follows.

Municipal Chairman	Chairman
-Chairpersons of all standing committees -Town Planner of the Local Self Government Planning having jurisdiction in the area	Members
Municipal Secretary	Convener

The monitoring committee shall meet as and when required. The committee shall also scrutinize the annual plan proposals of the municipality for compatibility with the Master Plan and also make suggestions regarding projects listed in the Master Plan that may be included in the annual plan proposals to the concerned working groups.

39.2 Review

The sanctioned Master Plan shall be reviewed in ten year and subsequently in every five year afterwards (in phases co-terminus with the five year plans). A committee shall be constituted for the review of the Master Plan as follows.

Municipal Chairman	Chairman
Municipal Vice Chairman, Chairperson, Standing Committee for Public works	Members
Town Planner of the Local Self Government Planning having jurisdiction in the area	Convener

The committee shall review the implementation of the Master Plan, direction of growth, new major investments that have come up in the municipality, financial position of the municipality, adherence to development regulation etc. and shall advice the council regarding maintaining status quo, making minor variations or revision in to.

40 ZONING REGULATIONS

40 Zoning regulations

1. All future developments shall be in conformity with the provisions of the Master plan for Koyilandy Municipality.
2. For the implementation and enforcement of the proposals envisaged in this Master Plan, areas have been zoned under various categories such as residential, residential agricultural mix use, commercial, multifunctional, buffer, special use zones etc. Details regarding the nature of uses ' permitted', uses 'restricted' and uses 'prohibited' in each zone are given in table 40.1. These regulations shall be enforced in conjunction with other specific provisions, if any, mentioned elsewhere in this scheme.

   Uses 'permitted' in a zone cover the uses that can be normally accommodated in the relevant zone. Such uses may be permitted by the Secretary Koyilandy Municipality, hereinafter referred to as the Secretary. In some cases it may be possible to permit some other uses also, which are not likely to affect the quality and environment in a zone specified for a particular use. Such cases have to be individually studied based on their performance characteristics and special locational factors. Such cases which come under this category are classified as "Uses Restricted". Restricted-1 category deals with the uses that shall be restricted by the Secretary with the concurrence of the Town Planner of the District office of the Local Self Government Planning Restricted -2 category deals with the uses that shall be restricted by the Secretary with the concurrence of the Chief Town Planner concerned of the Local Self Government Planning.

   Uses 'prohibited' enlists the various objectionable uses in each zone which shall not be permitted under normal circumstances.

3. If any space in a zone is put to a "Use Prohibited" as stated in Para 2, before the sanctioning of the scheme, such use shall be termed as nonconforming use. A non-conforming use may be allowed to continue in its existing location and essential repairs and maintenance for the structure may be permitted by the Secretary, provided that the said use create no adverse environmental influence in the zone. Addition, alteration or reconstruction, if found necessary as part of any mitigation measures may be permitted for such uses by the Secretary with the concurrence of the Chief Town Planner concerned.
4. Existing areas and structures of archaeological importance, agriculture uses and religious uses may be permitted to continue in all the zones and shall not constitute non-conforming uses.

5. Regulation of constructions and/or land developments on the sides of new roads/roads proposed for widening as per the Plan shall be governed by the distance from the centerline of the road unless otherwise specified in the Plan or in any detailed road alignment approved by the Chief Town Planner or agency concerned.

   Provided also that after implementation of National Highway/Coastal Highway in specified width as mentioned in the master plan if any, remaining land may be changed to adjacent land use zone with the concurrence of Town Planner concerned.

6. Constructions and/or land developments, if any, in paddy lands and in wet lands, shall be in conformity with the Paddy land and Wet Land Act in force in the state.

7. The Government shall have the power to issue clarifications in respect of technical interpretations, if any, required in any of the provisions of the scheme in consultation with the Chief Town Planner concerned.

8. Any use not specified either in the 'uses permitted' or 'uses restricted' category of a particular use zone, but which is of a similar nature to any use permitted or restricted in that particular use zone, can be considered by the Secretary, with the concurrence of the Chief Town Planner concerned.

9. All places of heritage importance including Kavu, Temples etc. have to be conserved with due regard to the historical significance and architectural character of the area.

10. Zoning regulations are not intended to prohibit existing uses that have been lawfully established prior to the enforcement of these regulations, unless otherwise specifically mentioned in this scheme. All existing uses in every zone shall be permitted to continue. In case of addition/extension/alteration of the existing building is proposed, the total area shall not exceed 1.5 times the existing floor area.

11. Expansion of existing public and semipublic institutions to adjacent plots shall be permissible without any regard to the land use in which such adjacent plot is zoned and the development regulation imposed by such zoning.

12. Subject to the provisions as applicable to the Kerala Conservation of Paddy land and Wet land Act, 2008, CRZ notification 2011 and their subsequent amendments, other applicable Acts, Rules and Government Orders in force in the State, , the Secretary, Koyilandy Municipality with the concurrence of the District Officer of the Local Self Government Planning having jurisdiction over the area, shall

    a. permit in privately owned land which is zoned for Public and Semipublic Use, such uses that are permissible in adjacent land use zone, if there is no records available with the Local Self Government Institution concerned regarding any proposal for acquiring that particular privately owned land for any public use at the time of application for building construction or land development.

    b. permit in wet agriculture or water body, such uses that are permissible in adjacent land use zone, if that particular land in the wet agriculture or water body is not classified as Paddy land or wet land as per revenue records.

13. Coverage and floor area ratio (FAR) of all constructions shall be the values prescribed in the prevailing Kerala Municipality Building Rules and time to time amendments shall be adhered to.

14. The various conditions and restrictions stipulated in CRZ notification and related amendments from time to time shall be adhered to all development activities in the town.
15. In case the proposed new roads or road widening as per the master plan abuts/affects a water body, regulation of constructions and or land developments on the side of such roads shall be governed by the distance from the nearest boundary of the water body unless otherwise specified in detailed town planning schemes or any detailed road alignments approve by Chief Town Planner or agency concerned.

GENERAL GUIDELINES

1. Irrespective of zoning regulations, government schemes/ projects can be implemented anywhere in the municipality.
2. Uses permitted in residential zone shall be permitted in all plots in residential agricultural mix use zone, having a minimum frontage of 10 meters and having direct access from roads of existing or proposed width of 12 meters or more.
3. Provisions of the Noise Pollution (Regulation and control) Rules, 2000 under the (Environment Protection) Act, 1986 and its subsequent Amendments shall be applicable to the Planning Area.
4. Uses permitted in multi-functional zones shall be permitted on plots up to a depth of 100 meters, in plots abutting National High way and State Highway and for plots abutting road having an existing or proposed road width of 15 meters or above as per this master plan.
5. The areas specially demarcated as special zone are to be acquired by Koyilandy Municipality within a period of 10 years from the sanctioning of the Master Plan. If the land is not made under possession within this stipulated period, the land may be released and returned back to that land use zone which may be deemed appropriate based on the surrounding land uses and developments, with the concurrence of Chief Town Planner concerned.
6. Large scale development proposals in area not less than 2 ha, exceeding an investment of Rs. 50 Crores, which provide direct employment (after commissioning) of not less than 500 may be permitted in zones other than wet agriculture, buffer, mangrove subject to the recommendation of committee to be constituted by the Government for this purpose, under the Chairmanship of the Secretary, LSG Department, consisting of the Chief Town Planner concerned of Local Self Government Planning and the Secretary, Koyilandy Municipality as members and the District Town Planner, Kozhikode district as convener satisfying the following conditions;

   (a) The developer shall produce project-cum-feasibility report and Environmental Impact Assessment Report, if required, of the Project to the Convener of the Committee, 15 days in advance of the committee meeting.

(b) The developer shall produce before the committee all required clearances from the State and Central Government agencies concerned.

(c) Adequate provision shall be made for supporting infrastructure such as water supply, sewerage, solid waste management etc. Separate sewage treatment plant and solid waste management measures shall be provided and maintained by the developer at his own cost. Adequate Memorandum of Understanding between the developer and the Secretary of the local body concerned shall be undertaken to bring this into effect.

(d) Minimum Access Width shall be 12 meter.

(e) The project shall be completed within a period of 3 years, if not specified otherwise.

Table 40-1 Zoning regulation for Koyilandy Master Plan

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
1	**RESIDENTIAL ZONE**			
1.1	Residential buildings consisting of single or multifamily dwellings, residential flats / apartments, residential quarters, night shelters, orphanages, old age homes.	Ashram, Mutt, Madrasa.		Any other uses not specified under (2), (3) and (4).
1.2	Shops, professional offices, banks & other financial institutions, restaurants, hotels, Canteen, all with a total built up area up to 200 m^2	Places of Worship.		
1.3	Cottage Industries, Service Industries of non-nuisance Nature (Green category industries as listed by the state government), with power limited to 30 HP.	Expansion of existing industrial buildings		
1.4	Educational institutions essentially serving the needs of residential community such as, day cares, kindergartens and schools offering general education (up to high school level)	Fuel filling stations		
1.5	Health institutions essentially serving the needs of residential community such as dispensaries, palliative and physiotherapy centers, clinics, nursing homes etc. and all with a total built up area not more than 500 m^2.	Cremation Ground/Crematorium, Burial Ground/ Common Vault.		
1.6	Community facilities such as community halls, recreational clubs, social welfare centers, gymnasium/yoga centers, libraries etc. all with a total a built up area not more than 500 m^2.	Public utility areas and Public Utility buildings other than those included in the permitted category.		

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
1.7	Utility installations and civic amenities essentially serving the needs of residential community such as post office, police station, telephone exchange, electric substation, fire station, tot lots, parks, play grounds, transmission towers, telecommunication towers and wireless stations, water treatment plants below 5 MLD.			
1.8	Plant nurseries, pump house, wells and irrigation ponds incidental to community needs.			
	Provided that the access road has an existing width of 5m minimum			
1.9	Automobile workshops for two/ three wheelers – all with a total floor area up to 200 m^2	Government (Local/ State/ Central), Public sector offices.		Any other uses not specified under (2), (3) and (4).
	Provided that the access road has an existing width of 8 m minimum			
1.10	Shops/ professional offices/ commercial offices/ banking and financial institutions - all with a total floor area up to 1000 m^2, higher secondary schools.	LPG distribution centres (excluding bottling plants and bulk storage) limiting the floor area to 50 sq. m.		Any other uses not specified under (2), (3) and (4).
1.11	Hospitals ,convention centres/ auditorium/ wedding halls/ community halls/exhibition centers and art gallery- all with a total floor area up to 1000 m^2			
1.12	Poultry farm, diary and kennel –all with a total floor area up to 200 m^2			
	Provided that the access road has an existing width of 12m minimum			
1.13	Hospitals up to 2000 m^2 of floor area.			Any other uses not specified

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
1.14	Auditorium / wedding halls / community halls- all with a total floor area up to 2500 m^2	Social Welfare centers, Museum, Movie halls, Auditorium, Wedding hall, Community hall, Convention center - All built up area above 2500 m^2.		under (2), (3) and (4).
2	**RESIDENTIAL -AGRICULTURAL MIX USE ZONE**			
2.1	Agriculture, horticulture and fodder cultivation, pastures, grazing ground, and other types of cultivation including social forestry. Dairy Farms, Fish farms, Seed farms, Poultry farms, Plant nursery, pump house, wells and irrigation ponds. Single Family Residential Buildings floor area up to 300 Sq.m. Orphanages, old age homes, Dharmasala, ashrams, mutts, madrassa. Clinics (Outpatient), diagnostic centres, palliative and physiotherapy centers - all with total floor area limited to 100 m^2. Shops, professional offices, commercial offices and establishments, banking and financial institutions,	Cremation ground / crematorium, burial ground, common vault Slaughter Houses, Swimming Pools Places of worship Dumping Yard, Gas Godowns, Fish/ Meat processing centres Timber yards, Sewage treatment plants Expansion of existing industrial buildings	Storage of explosive and fireworks	Any other uses not specified under (2), (3) and (4).

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
	Gymnasium, Yoga Centres, restaurants, canteens – all with total floor area limited to 200 m^2. Police Post/Police Station, Post and Telegraph office, Fire Post / Fire station, Telephone Exchange, wireless stations and Telecommunication towers, Transmission towers. Day Care and Crèches, Nursery / Kindergarten / Primary & Upper primary schools. Library and Reading Rooms, Godowns/ warehouses/ Storage (non-hazardous) – all with total floor area limited to 100 m^2. Storage of Agricultural produces and seeds, Green houses.Cottage industries, Service industries of non-nuisance Nature (Green category buildings as listed by the state government) with power limited to 30 HP, Automobile workshops for 2/3 WheelersTot Lots/Parks/Play Grounds, Saw mills, Weigh Bridge. Public utility areas and buildings up to floor area limited to 300m^2			
2.2	**Provided that the access road has a width of 8m minimum.**			
	Shops, professional offices, commercial offices and establishments, banking andfinancial institutions, Gymnasium, Yoga Centres, restaurants, canteens, Library and Reading Rooms, Social welfare centres Godowns/ warehouses/ Storage (non-hazardous) – all			Any other uses not specified under (2), (3) and (4).

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
	with total floor area limited to 200 m^2. Auditorium/Wedding Halls/Community halls all with total floor area limited to 500 m^2.Clinics (Outpatient) and diagnostic centres, Hospitals & Health Centres with floor area limited to 300 m^2			
2.3	**Provided that the access road has a width of 12 m minimum**			
	All residential buildings including residential flats / apartments, residential quarters. Educational institutions of higher order. Shops, Offices, Markets. Hospitals & health centers, Godowns / warehouses/ Storage (non-hazardous) - all with total floor area limited to 500 m^2.	Bus terminals, Lorry stands. Godowns / warehouses/ Storage (non-hazardous) - Floor area above 500 m^2. Automobile workshops/ Automobile service stations for heavy vehicles/ floor area limited to 1000 m^2.		Any other uses not specified under (2), (3) and (4).
2.4	**Provided that the access road has a width of 15 m minimum**			
		Hospitals and health centers with total built-up area above 500m^2. Movie halls/ Auditorium/ Wedding	Container Terminals	Any other uses not specified under (2), (3) and (4).

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
		halls/ Community halls - all with total floor area above 500 m^2, and having parking at 1.2 times that of the KMBR.		
3	**COMMERCIAL ZONE**			
3.1	All Shops including shopping Complexes, Shopping malls, Multiplex, Hypermarkets, Restaurants, Hotels, Professional offices, Commercial Offices & Establishments, Banking and financial institutions, IT Software units, Social Welfare centers, Museum, Movie halls, Auditorium, Wedding hall, Community hall- all with total built up area up to 800 m^2.	Places of Worship. Fuel Filling Stations Social Welfare centers, Museum, Movie halls, Auditorium, Wedding hall, Community hall, Convention centers		Any other uses not specified under (2), (3) and (4).
3.2	Cottage Industries, Automobile workshops, Automobile Service Stations, Cold storage, Service Industries of non-nuisance Nature (Green category industries as listed by the state government) all with total built up area up to 300 Sq.m , with power limited to 100 HP), weigh bridges, Printing Press, IT Hardware/Electronic industries, marble/ granite storage/ cutting centers, Gymnasiums/ Yoga centers, Dairy and Dairy farm, Poultry farms	Saw mills and timber yards, slaughter houses.		
3.3	Godowns/Warehouse/Storage of non-hazardous	Expansion of existing		

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
	materials, stacking yards.	industrial buildings		
3.4	Expansion of existing residential buildings, Residential apartments having number of units limited to 30 units and at least two lower floors for commercial use, night shelters, orphanages, old age homes, Dharmasala, hostels and boarding houses, lodges and guest houses, ashram/mutts/madrassa, Single/multi family residences with built up area up to 300 m^2			
3.5	Clinics, diagnostic centres and hospitals all with total built up area up to 500m^2			
3.6	Govt. or Public sector offices, Expansion of existing educational institutions, Day care and crèche, Nursery/Kindergarten, schools up to higher secondary level.			
3.7	Transmission towers and Wireless Stations			
3.8	Public utility areas and public utility buildings, Parking Plazas, Bus terminals, Transport terminals, Plant Nursery, storage of agricultural produces and seeds, Fair Grounds, Markets, Parks & playgrounds, Open air Theatre			
	Provided that the access road has a width of 8 m minimum			
3.9	Higher educational institutions			Any other uses not specified under (2), (3) and (4).
	Provided that the access road has a width of 12 m minimum			
3.10	Outdoor games stadium, Hospitals and Health centers.			Any other uses not specified under (2), (3) and (4).

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
4	**INDUSTRIAL ZONE**			
4.1	All industries listed in Annexure I (Green category industries as listed by the state government), Automobile workshops, automobile service stations, service garages with repairing facilities, welding workshops, spray painting workshops, saw mills, timber yards, ice factory, cold storage, printing press, Water treatment plants, Fish and meat processing units, Warehouses/ Godowns, weigh bridges, Marble and granite storage and cutting centers, Ice Factory. Dry Cleaning plants, Power plants, Sub stations. Government or public sector offices, Transport terminals incidental to industrial use, Transmission and Tele Communication towers, Wireless stations.	Other public utility areas and public buildings, cremation ground/ crematorium, burial grounds, common vaults, storage of explosives and fireworks, gas go downs, stone crushers, Sewage Treatment Plants, dumping yards, Slaughter houses, Container terminals		Any other uses not specified under (2), (3) and (4).
4.2	Industrial estates & industrial parks, IT software units	Fuel filling stations, obnoxious & nuisance type industries as listed in Annexure II.		
4.3	Residential uses incidental to the industrial use with floor area limited up to 300m^2 and Single family residential buildings up to 150 m^2	Any other activity incidental to industrial use		
4.4	Tot lots, parks, play grounds attached to incidental residential use.	Container terminal where minimum access width of 18 m is available.		

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
5	**PUBLIC & SEMI PUBLIC ZONE**			
5.1	Local/ state/ central government offices, public sector offices, and other public buildings including Schools, Hospitals, Religious Institutions. Residential quarters incidental to public and semi-public use. Public utility areas and buildings. Additions and alterations to the existing public and semi-public buildings including addition of new blocks without altering the use. Buildings for incidental uses with floor area limited to 100 m^2	Cremation ground/ Crematorium, burial ground, common vault.		Any other uses not specified under (2), (3) and (4).
6	**MULTI FUNCTIONAL ZONE**			
6.1	All uses that are permitted in column 2 in residential and commercial zones above. Parking Plaza, Taxi Stand, civil defence and home guard.	All uses those are restricted in column 3 in residential and commercial zones above. Museum, Exhibition centres and art gallery, outdoor games stadium		Any other uses not specified under (2), (3) and (4).

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
	Provided that the access road has a width of 5.0 m minimum			
6.2	Diagnostic Centres, Clinics (Out Patient) – all with total floor area limited to 1500 m^2.	Hospitals and health centres with floor area above 1500 m^2Automobile service stations- heavy vehicles, Sewage treatment plants (below 5MLD) Fuel filling stations		Any other uses not specified under (2), (3) and (4).
	Provided that the access road has a width of 8.0 m minimum			
6.3	Marble and granite Industrial estates and industrial parks, automobile workshops/ automobile service stations for light motor vehicles.	Bus Terminals, Lorry Stands		Any other uses not specified under (2), (3) and (4).
	Provided that the access road has a width of 18.0 m minimum			
6.4			Container Terminal	
7	**TRANSPORTATION ZONE**			
7.1	Transport terminals including constructions that form an integral or essential part of the terminal. Any incidental uses to the transport terminals such as Retail Shops (built up area limited to 25% of the covered area on ground level), Restaurants, Canteen etc. which are an integral or essential part of a transport terminal- all with maximum percentage of coverage permissible for the project as a whole shall be limited to 30% and Floor Area Ratio shall be limited to 1.	Public utility areas and buildings. Fuel filling stations.	Container terminals provided that access has a width of 18 m minimum.	Any other uses not specified under (2), (3) and (4).

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
	Parking plazas, transmission towers and wireless stations.			
8	**TOURISM PROMOTION ZONE**			
8.1	Residences, Residential apartments, Hostels and Boarding Houses, Restaurants / Canteen/ Resorts/ Hotels, Orphanages / Old Age Homes / Dharmasala, Night Shelters, Guest Houses, Lodges and dormitory.	Fuel Filling Stations		Any other uses not specified under (2), (3) and (4).
8.2	Retail Shops/Professional offices and other offices, Travel and Tourism Institutions- all with total floor area up to 500 sq m	Shops/ Professional Offices/ Banking and Financial institutions - floor area above 500 Sq.m		
8.3	Movie Halls, Convention Centre Ashram / mutt/ Madrassa, Museum, Exhibition Centres and Art Gallery Open air Theatre, Amusement Parks, Stadium, Fair Ground, Gymnasium / Yoga Centers, Tot Lots/Parks/Play Grounds, Swimming Pools	Expansion of existing industrial buildings		Any other uses not specified under (2), (3) and (4).
8.4	Zoological and Botanical Gardens / Bird Sanctuary, Camping Site, Eco tourism projects			
8.5	Bakeries and Confectionaries, Commercial Offices / Establishments, Banking and Financial Institutions - all with total floor area up to 200 sq m			
8.6	Cottage Industries			
8.7	Day Care and crèche, Nursery / Kindergarten, Primary/Upper Primary School			
8.8	Police Post/Police Station, Post and Telegraph office, Fire Post/Fire Station, Telephone Exchange, Library			

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
	and Reading Rooms			
8.9	Clinics (Outpatient) and Diagnostic centres - all with total floor area up to 200 sq m, Hospitals up to 50 beds& Health Centers, Social Welfare centers, Public Utility Areas & Buildings with floor area limited to 500 m^2			
8.10.	Automobile workshops for 2/ 3 Wheelers, Taxi Stand floor area up to 200 m^2			
8.11	Transmission towers, Telecommunication towers and Wireless Station			
9	**WET AGRICULTURAL ZONE**			
9.1	Paddy Cultivation, Agriculture, Horticulture, Fodder cultivation, Fish Farms, Seed Farms, Pump House (with maximum built up area of 25 m^2). Wells and Irrigation Ponds without any building construction.	Storage of Agricultural produces and seeds area up to 100 m^2.		Any other uses not specified under (2), (3) and (4).
9.2	All constructions permitted as per the provisions of the Paddy land and Wet land Conservation Act in force in the State.	Public Utility areas & public buildings up all with total floor area up to 200 m^2, which will not affect the character of the area		
10	**BUFFER ZONE (15 meters wide as shown in Proposed land use map)**			
10.1	Zoological and Botanical gardens, Bird sanctuary, Horticulture, Fish Farms, Seed Farms, Fish landing center, Bathing places, Check dams, Retaining walls, boat jetty.	Maintenance / Repair works of existing buildings / Structures, without increasing the		Any other uses not specified under (2), (3) and (4).

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
		floor area, any other activities which essentially require water frontage.		
11	**LOW LYING / WATER LOGGED AREA**			
11.1	Bathing places, Check dams, Retaining walls, Zoological and Botanical gardens, Bird sanctuary, Horticulture, Fish Farms, Seed Farms, Fish landing centers, boat jetty . All constructions permitted as per the provisions of the Paddy land and Wet land Conservation Act in force in the State.	Repair works of existing structures without increasing the floor area.		Any other uses not specified under (2), (3) and (4).
12	**PARKS AND OPEN SPACES**			
12.1	Any construction, land development essential for development/ improvement of open area recreational facilities. Fish landings, Boat Jetties, Guided boat rides, Watch towers, Eco walk ways, water sports facilities, fair grounds etc. Tot Lots, Pump House up to 20 Sq.m of floor area, wells and irrigation ponds, ATM	Incidental buildings such as Club, Swimming pool, Open Air Theatre, Reading Room, Cafeteria (up to 100sqm) etc. and Water Treatment Plant below 5 MLD, Parking Plazas, Public utility areas and public utility buildings with total up to 300 m^2 of floor area which will not affect the		Any other uses not specified under (2), (3) and (4).

Sl. No	Uses permitted	Uses restricted-1	Uses restricted-2	Uses prohibited
(1)	(2)	(3)	(4)	(5)
		character of the area.		
13	**WATER BODY**			
13.1	All ponds shall be conserved			Any other uses not specified under (2), (3) and (4).
13.2	Bridges, side protection walls, fish landing centers, boat jetty and water transport			
14	**HARBOUR DEVELOPMENT**			
14.1	All constructions essential and incidental to harbour development			Any other uses not specified under (2), (3) and (4).
15	**EXISTING MANGROVE ZONE TO BE RETAINED**			
	All works incidental and essential for the overall protection and enrichment of mangroves without affecting the mangrove plants in any manner.			
16	**SPECIAL ZONES** (The Secretary, Koyilandy Municipality may permit constructions in the Special Zones as specified hereunder and subject to the provisions of the Paddy Land And Wet Land Conservation Act in force in the State)			
16.1	**AGRICULTURAL AND VETERINARY RESEARCH CENTRE**(Survey No. 9 of Maruthur Desom and Survey No. 35 Moozhikkameethal Desom)			
	Agricultural and Veterinary research centre			Any other uses not specified under (2), (3) and (4).
16.4	**HOSPITAL COMPLEX** (Survey Nos. 124/p, of Panthalayani Desom)			
	Allopathic, Ayruvedic and Homeopathic hospitals, research centers, uses incidental to hospitals such as residential quarters, hostels and the like.			Any other uses not specified under (2), (3) and (4).
16.5	**CREMATORIUM** (Resurvey No. 133 of Kuruvangad desom)			
	Burial grounds/ cemeteries/ crematoriums/ graveyards/ cremation grounds/ common vaults are permitted in these areas, complying with the provisions of the Kerala Municipality Building Rules in force.			Any other uses not specified under (2), (3) and (4).

	GENERAL NOTES
1	Zoning Regulations shall prevail over the layout approval provisions in KMBR and its amendments
2	Subject to zoning regulations of the respective use zones, more than one use may be combined in a building, provided that the total floor area of such a building shall not exceed the maximum floor area permitted for any of such use permitted in that use zone.
3	For the purpose of these regulations, floor area means the total floor area of the building on all floors.

Annexure

I- List of non-obnoxious and non-nuisance type of service or light industries permissible in various zones

1	Production of copra
2	Processing of arecanut
3	Rice and flour mills
4	Production of rice, flour etc., by hand pounding
5	processing of cardamom, ginger, pepper etc.
6	Production of Khandsari from sugar cane
7	Carrying and preservation of fruits and production of jam, jelly etc.
8	Processing and preservation of cashew nuts
9	Bakeries
10	Production of dairy products
11	oil mills(vegetables)
12	Extraction of oil by ghani
13	Manufacture of hydrogenated oil
14	Manufacture of aval (Beaten rice) appam
15	Production of vinegar
16	Manufacture of soda, water, lemonade etc
17	Manufacture of ice
18	Manufacture of ice cream
19	Processing, packing and distribution of tea
20	Processing , grinding, packing and distribution of coffee
21	Manufacture of syrup
22	Manufacture of beedi
23	Manufacture of cigar
24	Manufacture of tobacco snuff
25	Manufacture of chewing tobacco
26	Cotton ginning, clearing, pressing etc.
27	Cotton spinning other than in mills
28	Cotton spinning and weaving in mills
29	Cotton weaving in handloom
30	Cotton weaving in power looms
31	Handloom weaving
32	Khadi weaving in handloom
33	Printing of cotton textiles
34	Manufacture of cotton thread, rope twine etc

35	Jute spinning
36	Manufacture of jute products including repairing of gunny bags
37	Weaving of silk by handloom
38	Manufacture of hosiery goods
39	Making of embroidery products
40	Tailoring
41	Manufacture of quilts and mattresses
42	Manufacture of coir and coir products
43	Manufacture and assembling of umbrellas and production of spare parts of umbrellas
44	Repairing of umbrellas
45	Manufacture of wooden furniture and fixtures
46	Manufacture of structural wooden goods such as doors, beams etc
47	Manufacture of wooden industrial goods such as parts of handloom ambarcharka, bobbirs etc
48	Manufacture of wooden utensils, photo frames, toys, etc., and photo framing
49	Cane industry including baskets, weaving etc
50	Manufacture of miscellaneous wooden articles such as sticks, sandals, rules etc.
51	Manufacture of paperboard and paper hand
52	Making of paper boxes, bags, envelopes etc
53	Printing and publishing of newspapers and periodicals
54	Printing and publishing of books
55	Miscellaneous printing works including type cutting, book binding
56	Manufacture and repairing of leather shoes and chappals
57	Manufacture of leather products such as suitcase, bag etc
58	Vulcanizing and repairing of tyres and tubes
59	Manufacture of rubber gloves
60	Manufacture of rubber products such as rubber sheets, nipples and rubber shoes including smoke-rubber
61	Manufacture of pharmaceuticals, chemicals, Ayurvedic medicine etc
62	Manufacture of agarbathi and other cosmetics
63	Manufacture of plastic products such as name plates etc
64	Manufacture of lemon grass oil, candles etc
65	Manufacture of cement products such as well kerbs, tube, closets etc
66	Manufacture of structural stone goods, stone crushing, stone carving, stone dressing marble carving etc
67	Manufacture of stone wares
68	Manufacture of stone images
69	Manufacture of chinaware's and crockery

70	Manufacture of large containers and chinaware
71	Manufacture of glass and glass products
72	Manufacture of clay models
73	Manufacture of iron and steel furniture
74	Manufacture and repairing of brass and bell metal products
75	Manufacture of aluminium utensils and other products
76	Manufacture of tin cars and copper vessels
77	Electroplating, tinplating, welding etc
78	Manufacture of agricultural implements, screws etc (blacksmith and foundry)
79	Manufacturing assembling and repairing of machinery such as water pumps, oil mill chuck etc
80	Manufacture of small machine tools and machine parts
81	Manufacture of sewing machine parts and assembling and repairing of sewing machine
82	Manufacture of electrical machinery and repairing of electrical motors armature winding etc.
83	Manufacture and repairing of electric fans
84	Charging and repairing of batteries
85	Repairing of radios, microphones etc
86	Manufacture of electric meters, production of electric and allied products, repairing and servicing of electrical appliances
87	Body building of motor vehicles
88	Manufacture and repairing of motor engine parts and accessories
89	servicing and repairing of motor vehicle
90	Manufacture of cycles, parts and accessories
91	Manufacture and repair of boats and barges
92	Manufacture and repairing of animal drawn and hand drawn vehicles
93	Repairing of photographic equipment, spectacles etc
94	Manufacturing of medical instruments
95	Repairing of watches and clocks
96	Manufacture of jewellery
97	Manufacture, repair and tuning of musical instruments
98	Manufacture of sports goods, balloons etc
99	Ivory carving and ivory works
100	All industries which are categorised are “green” or non hazardous by the central or state governments.

II- List of obnoxious or nuisance industries subject to objectionable odours, fumes effluents or processors to be located in various zones

(Grouped under Indian Standard Industrial Classification)

I	Manufacture of food stuffs
1	Slaughtering, preservation of meat and fish and canning of fish
II	Manufacture of Beverages
2	Production of distilled spirits, wines, liquor etc., from alcoholic malt, fruits and malts in distillery and brewery
3	Production of country liquor and indigenous liquor such as toddy, liquor form mahua, palm juice
III	Manufacture of Textiles
4	Dyeing and bleaching of cotton
IV	Manufacture of wood and wooden products
5	Sawing and planning of wood
6	Wood seasoning and creosoting
7	Manufacture of veneer and plywood
8	Paper, pulp and straw board
V	Manufacture of leather and leather products
9	Currying, tanning and finishing of hides and skims and preparation of finished leather
VI	Manufacture of rubber, petroleum and coal products
10	Manufacture of tyres and tubes
11	Manufacture of industrial and synthetic rubber
12	Reclamation of rubber
13	Production of petroleum, kerosene and other petroleum products in refineries
14	Production of chemicals and chemical products
VII	Manufacture of chemicals and chemical products
15	Manufacture of basic industrial chemicals such as acids, alkali and their salts not elsewhere specified (especially sulphurous, sulphuric, nitric, hydrochloric acids etc.)

	ammonia and chlorine
16	Manufacture of dyes, paint, colours and varnishes, printing ink
17	Manufacture of fertilizers (specially from organic materials)
18	Manufacture of disinfectants and insecticides
19	Manufacture of ammunition, explosive
20	Manufacture of matches
VIII	Manufacture of non-metallic mineral products other than petroleum and coal
21	Manufacture of cement and cement products
22	Manufacture of lime
23	Manufacture of plaster of Paris
IX	Manufacture of basic metals and their products:
24	Manufacture of iron and steel including smelting, refining, rolling and conversion in to basic forms
25	Manufacture including smelting, refining etc., or nonferrous metals and alloys in basic forms
26	Manufacture of armaments
X	Manufacture of machinery (other than transport) and electrical equipment
27	Manufacture of all kinds of battery
XI	Miscellaneous items not covered above
28	Incineration, reduction or dumping of offal, dead animals garbage or refuse
29	Manufacture of gelatine and glue
30	fat, tallow, grease or lard refining of manufacture
31	Bone meal, bone grist and bone powder
32	Manufacture of cashew nut shell oil
33	Other similar types of nuisance industries

III- Table showing details of occupational structure of the town

Ward No	Total workers	Main workers	Marginal workers	Cultivators	Agricultural labourers	HH industrial workers	Other workers
1	530	486	44	3	15	22	424
2	443	388	56	8	26	21	298
3	387	316	71	5	16	3	224
4	519	435	85	3	7	1	340
5	596	516	80	6	11	4	419
6	456	430	26	2	25	2	377
7	135	114	21	0	0	0	93
8	454	388	67	12	7	4	302
9	560	496	64	12	8	9	412
10	283	269	13	1	33	2	222
11	465	428	37	2	5	2	384
12	474	406	68	2	2	2	334
13	462	373	91	1	11	6	270
14	371	323	46	2	1	3	274
15	248	176	72	0	0	0	104
16	157	124	35	0	4	2	85
17	301	242	58	1	1	2	182
18	348	269	79	0	1	3	189
19	486	427	59	12	17	1	339
20	222	159	63	9	29	1	58
21	210	161	49	5	6	1	101
22	298	206	92	7	15	2	92
23	505	304	201	20	7	2	76
24	461	345	117	9	2	1	217
25	176	136	40	0	6	3	90
26	462	310	152	2	15	7	141
27	379	252	127	3	12	13	110
28	274	231	43	1	12	4	175
29	393	328	65	1	9	14	253

Ward No	Total workers	Main workers	Marginal workers	Cultivators	Agricultural labourers	HH industrial workers	Other workers
30	440	351	89	3	14	41	245
31	507	439	59	1	12	39	367
32	395	347	46	3	0	3	298
33	453	426	27	2	1	0	396
34	599	574	26	0	0	2	548
35	597	562	34	0	0	5	528
36	507	474	32	0	0	2	442
37	729	665	65	0	1	4	599
38	616	560	56	0	0	2	504
39	564	513	52	1	0	0	460
40	802	727	76	1	0	2	650
41	210	194	15	0	0	0	179
42	248	231	19	0	1	0	211
43	361	315	45	2	3	3	265
44	520	479	41	3	10	10	425

IV- Housing amenities details as per census 2011

The following figures illustrate various aspects of housing in Koyilandy town, as depicted in Census 2011 data.

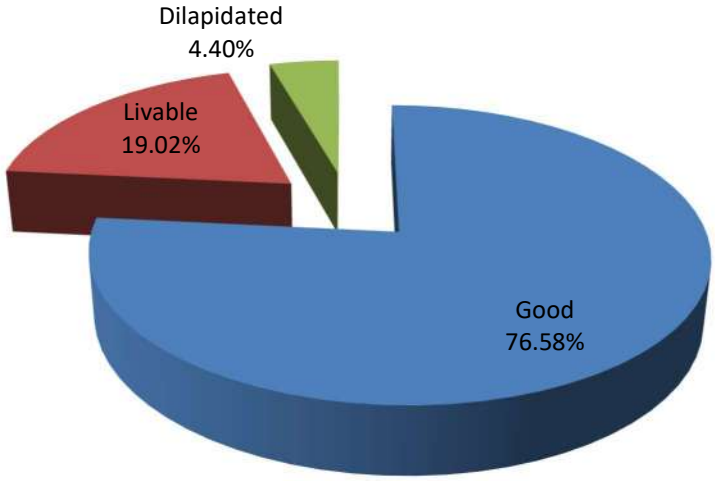


Figure Annexure 4. 1Number of households with conditions of Census houses

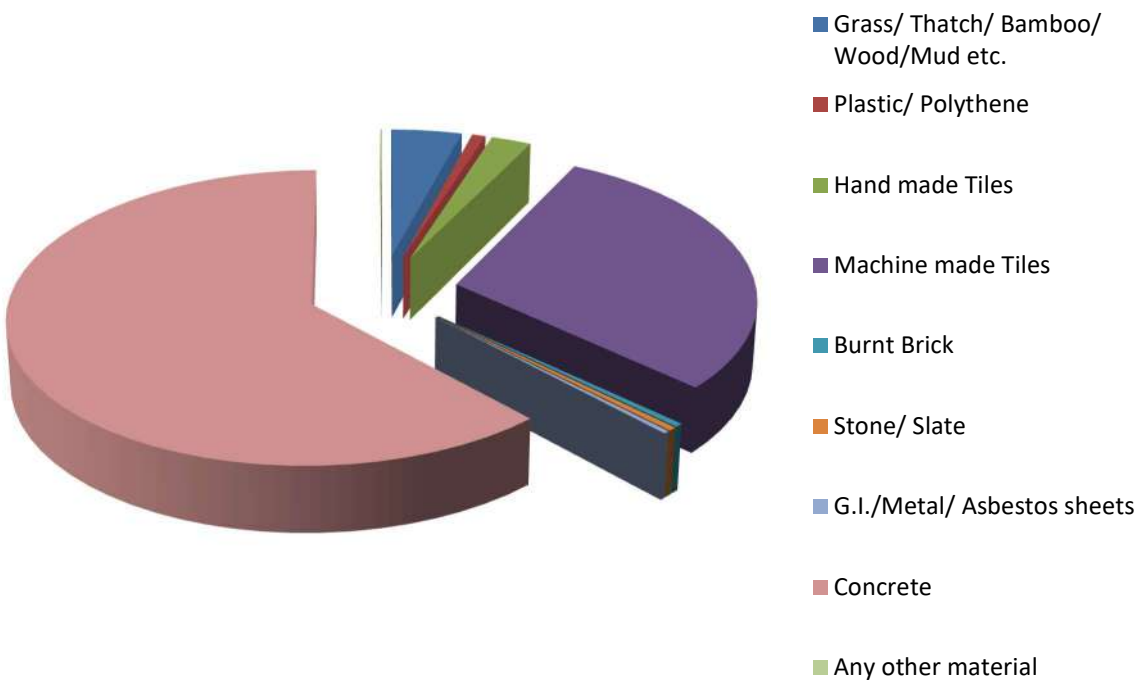


Figure Annexure 4. 2 Material of roof

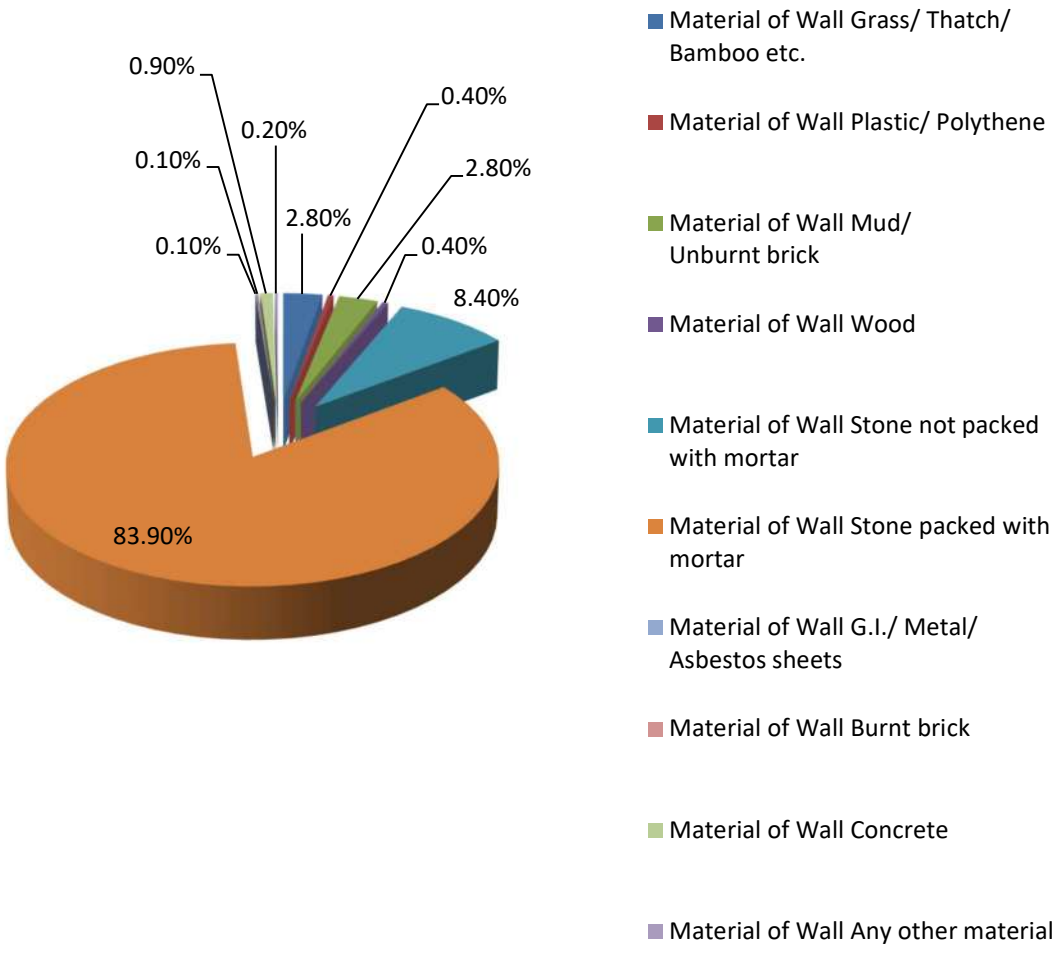


Figure Annexure 4. 3 Material of walls

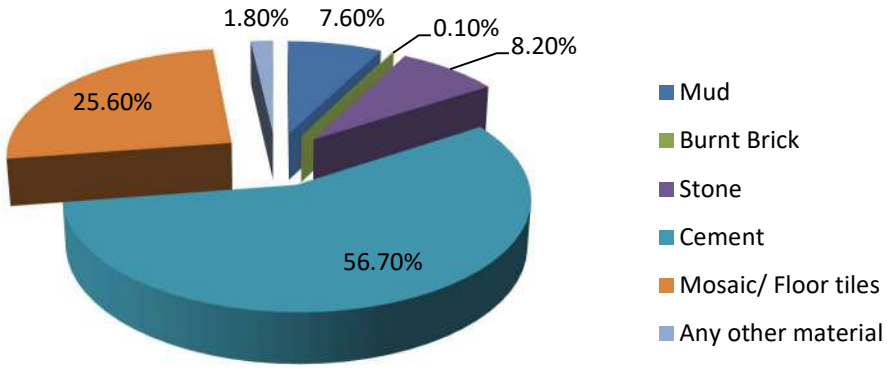


Figure Annexure 4. 4 Material of floors

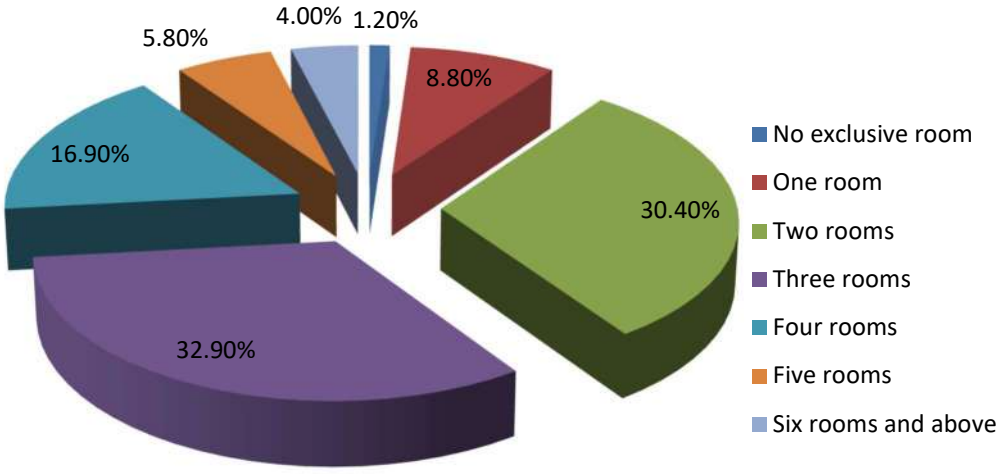


Figure Annexure 4. 5Number of dwelling rooms

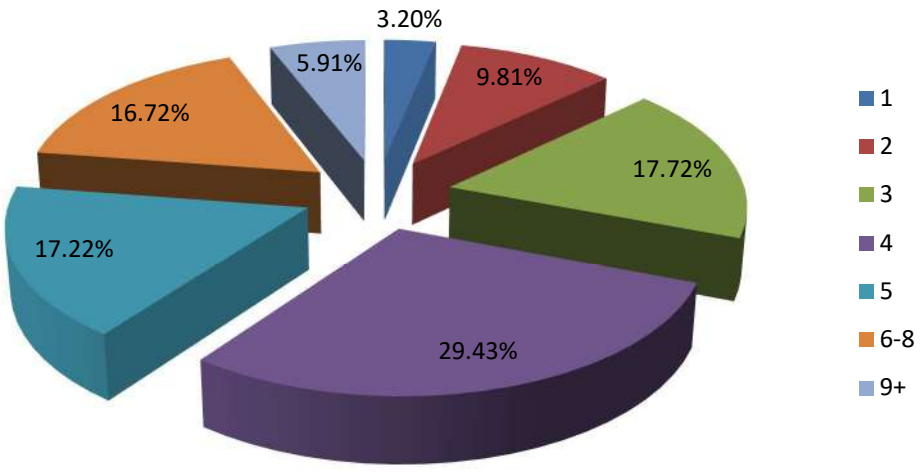


Figure Annexure 4. 6House hold size

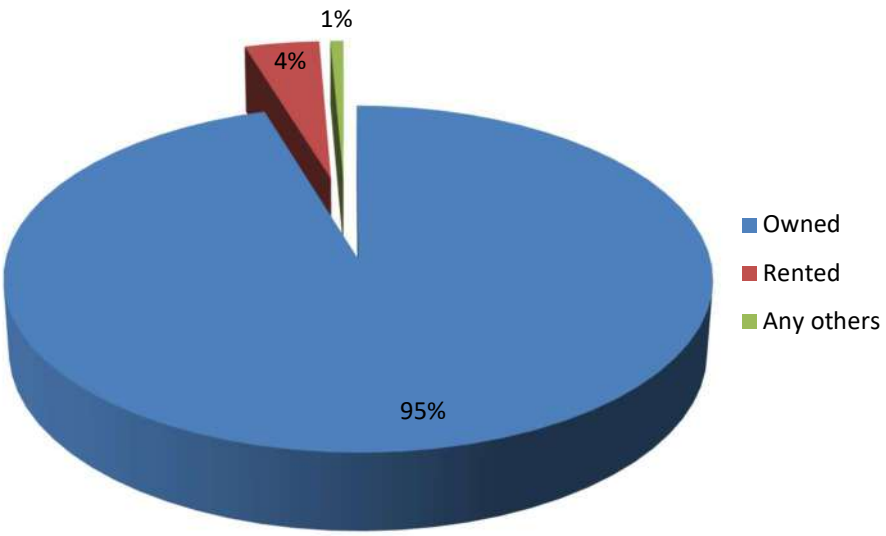


Figure Annexure 4. 7Ownership Status

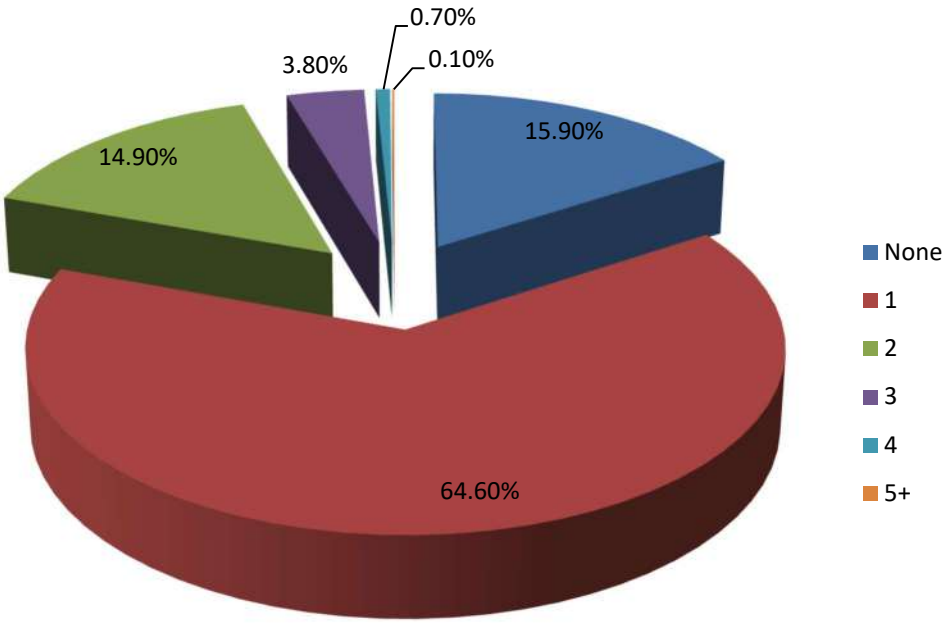


Figure Annexure 4. 8Married Couple per dwelling units

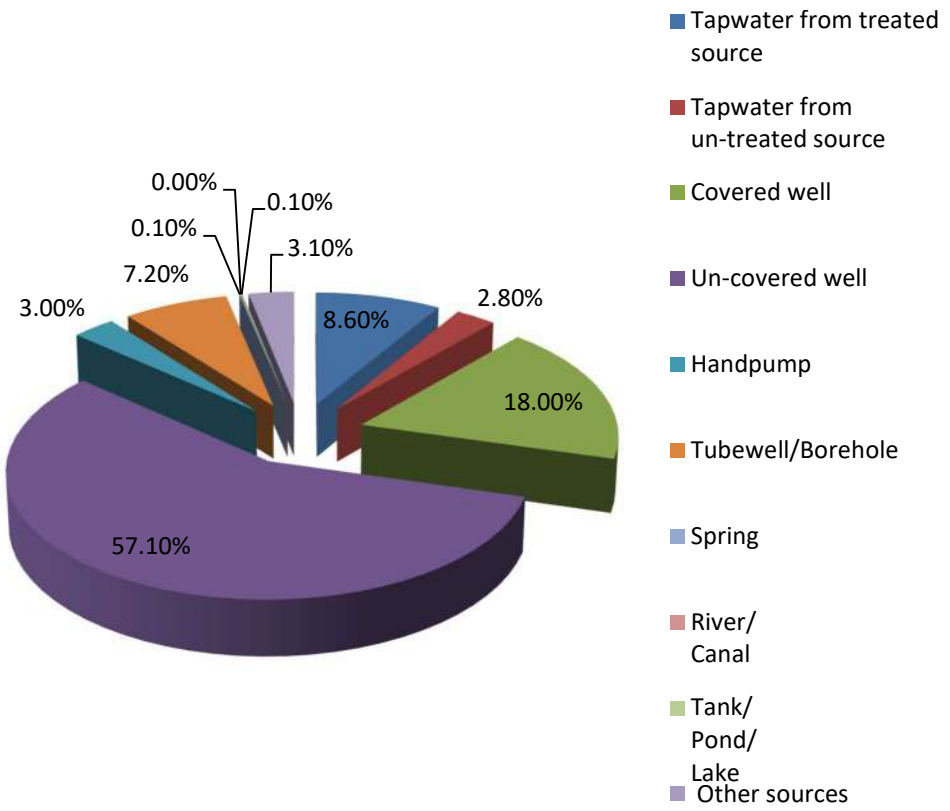


Figure Annexure 4. 9Main source of drinking water

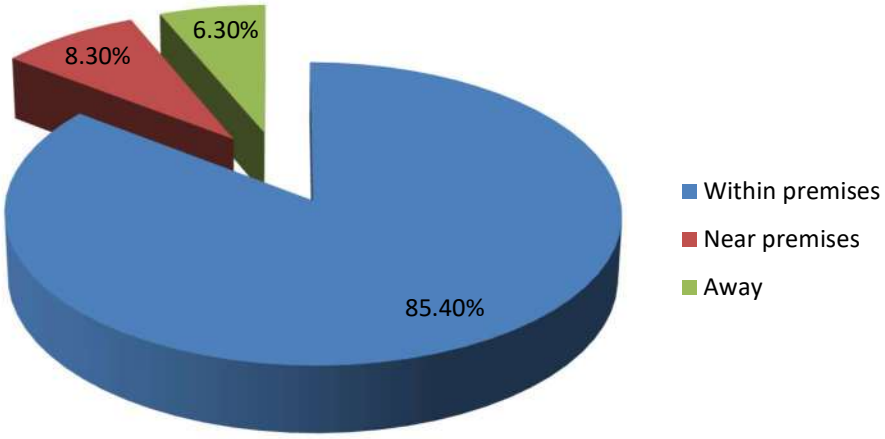


Figure Annexure 4. 10Location of drinking water

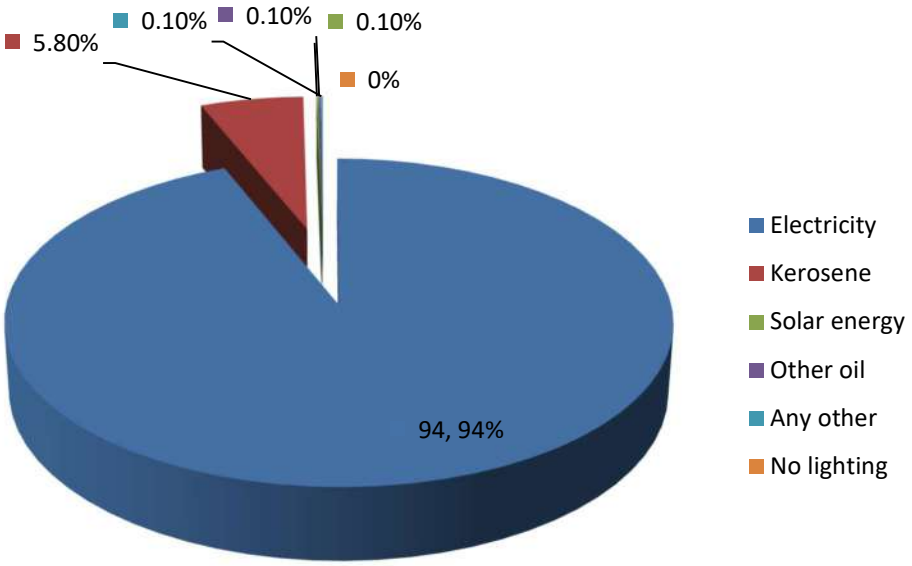


Figure Annexure 4. 11Main source of lighting

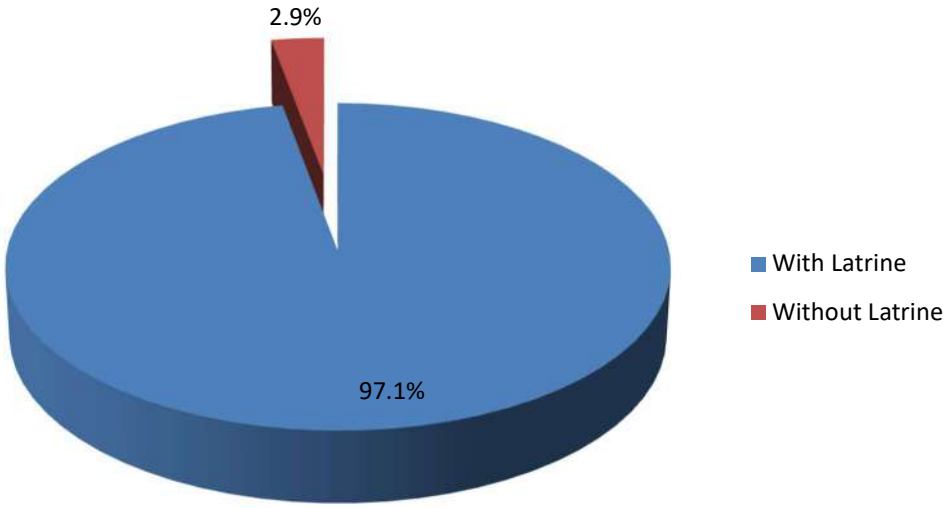


Figure Annexure 4. 12Latrine facilities

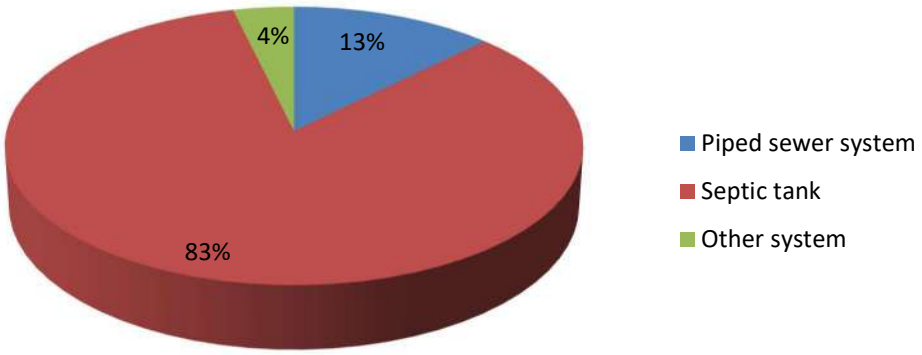


Figure Annexure 4. 13Pour/ pour flush latrine type

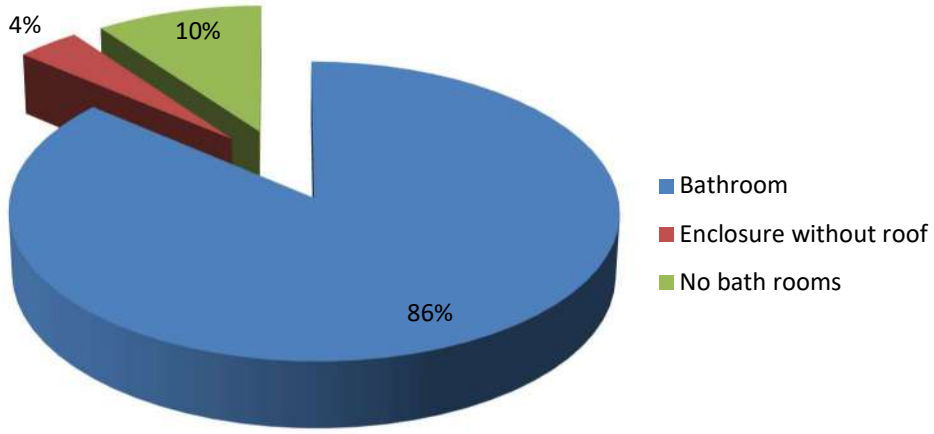


Figure Annexure 4. 14Details of bathing facilities

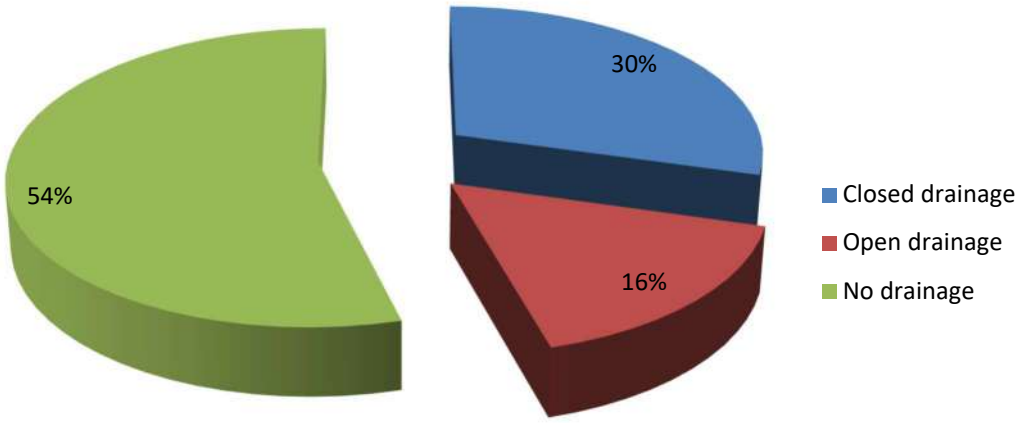


Figure Annexure 4. 15Waste water outlet details

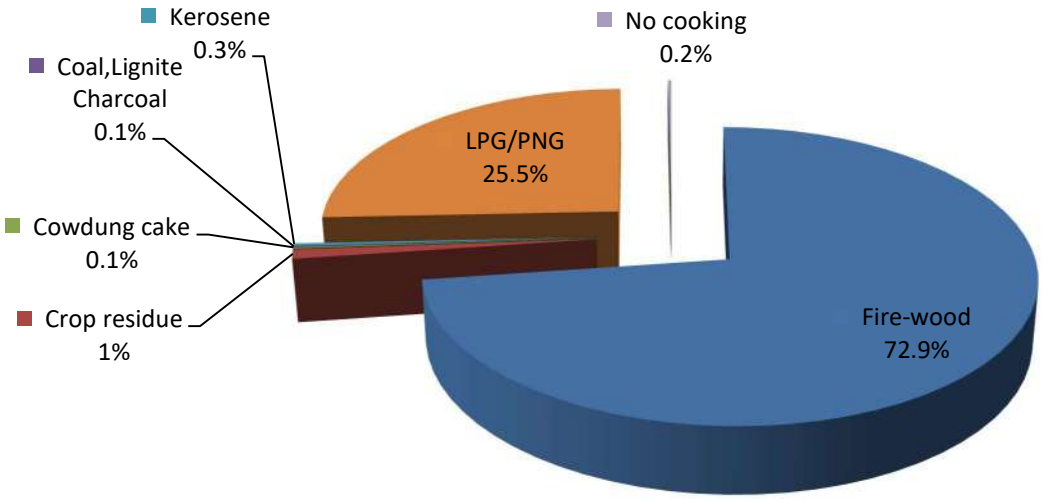


Figure Annexure 4. 16Fuel used for cooking

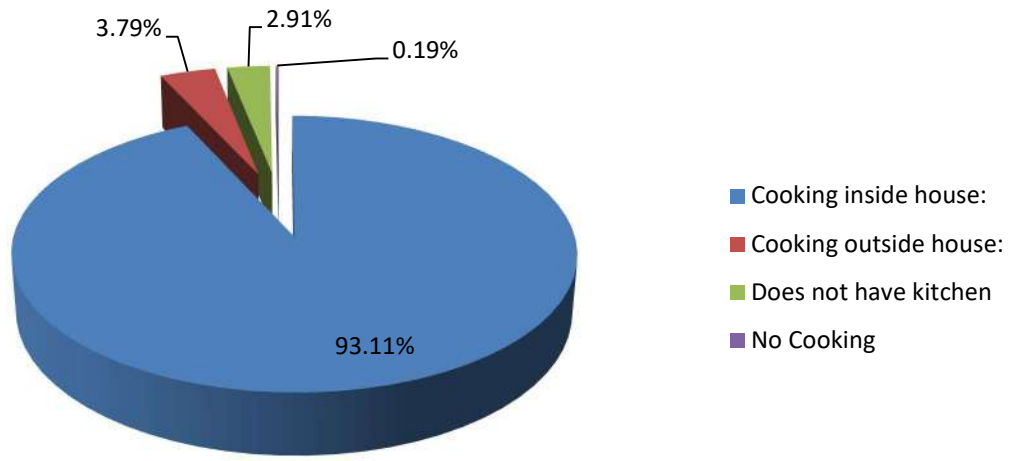


Figure Annexure 4. 17Types of kitchen/ Cooking method

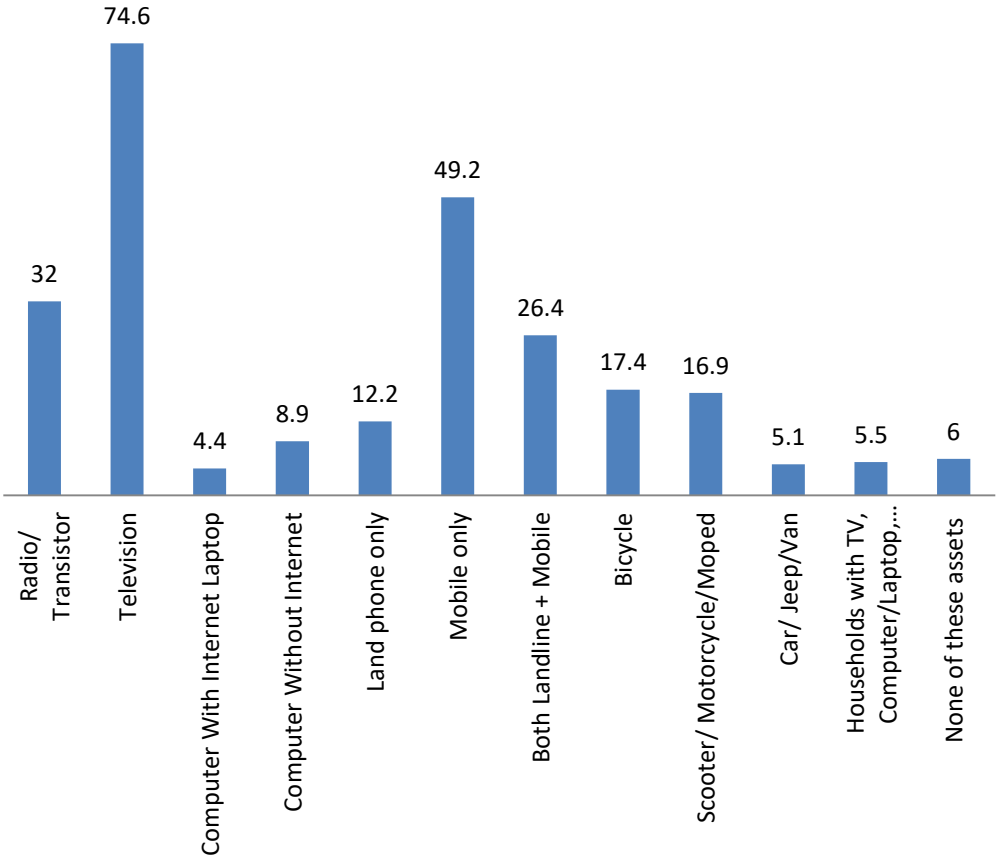


Figure Annexure 4. 18Assets and facilities

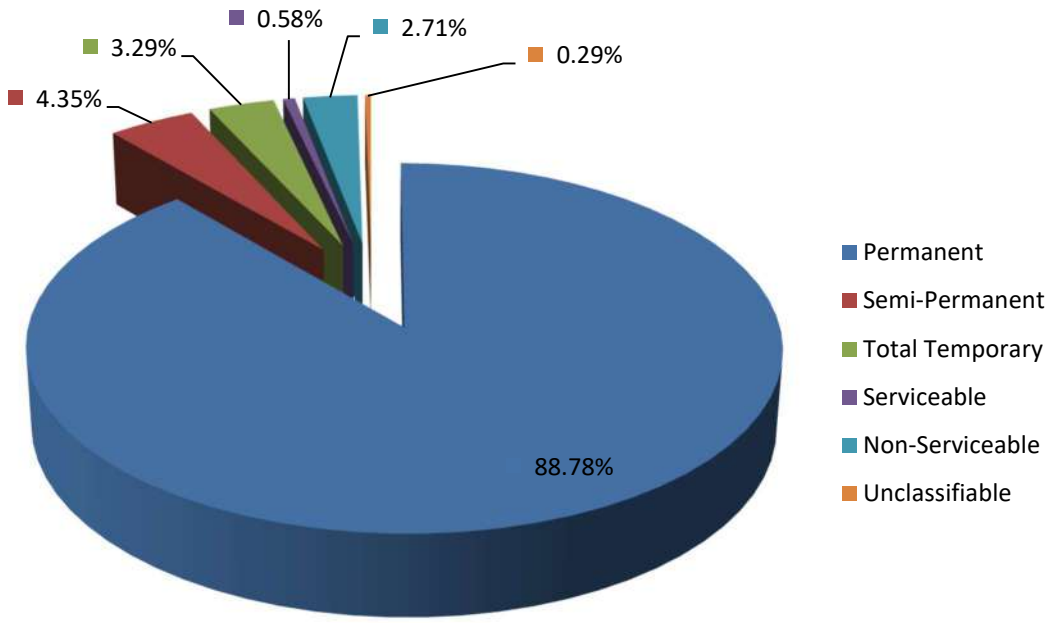
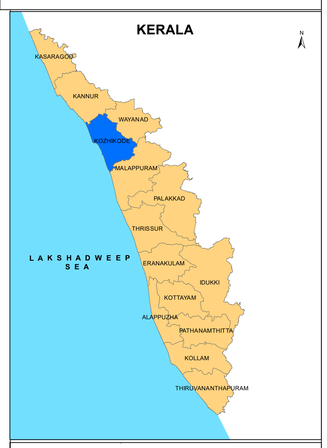


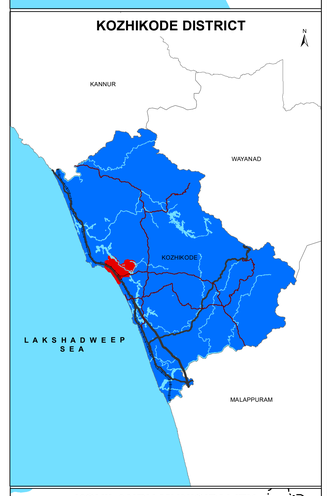
Figure Annexure 4. 19Households by type of houses

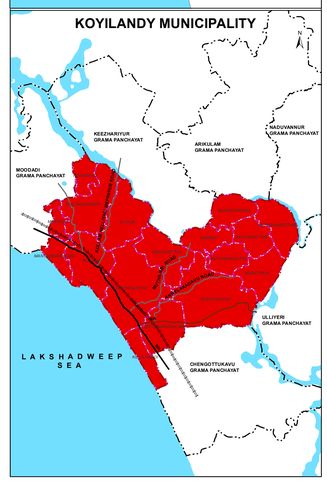
MASTER PLAN FOR KOYILANDY TOWN

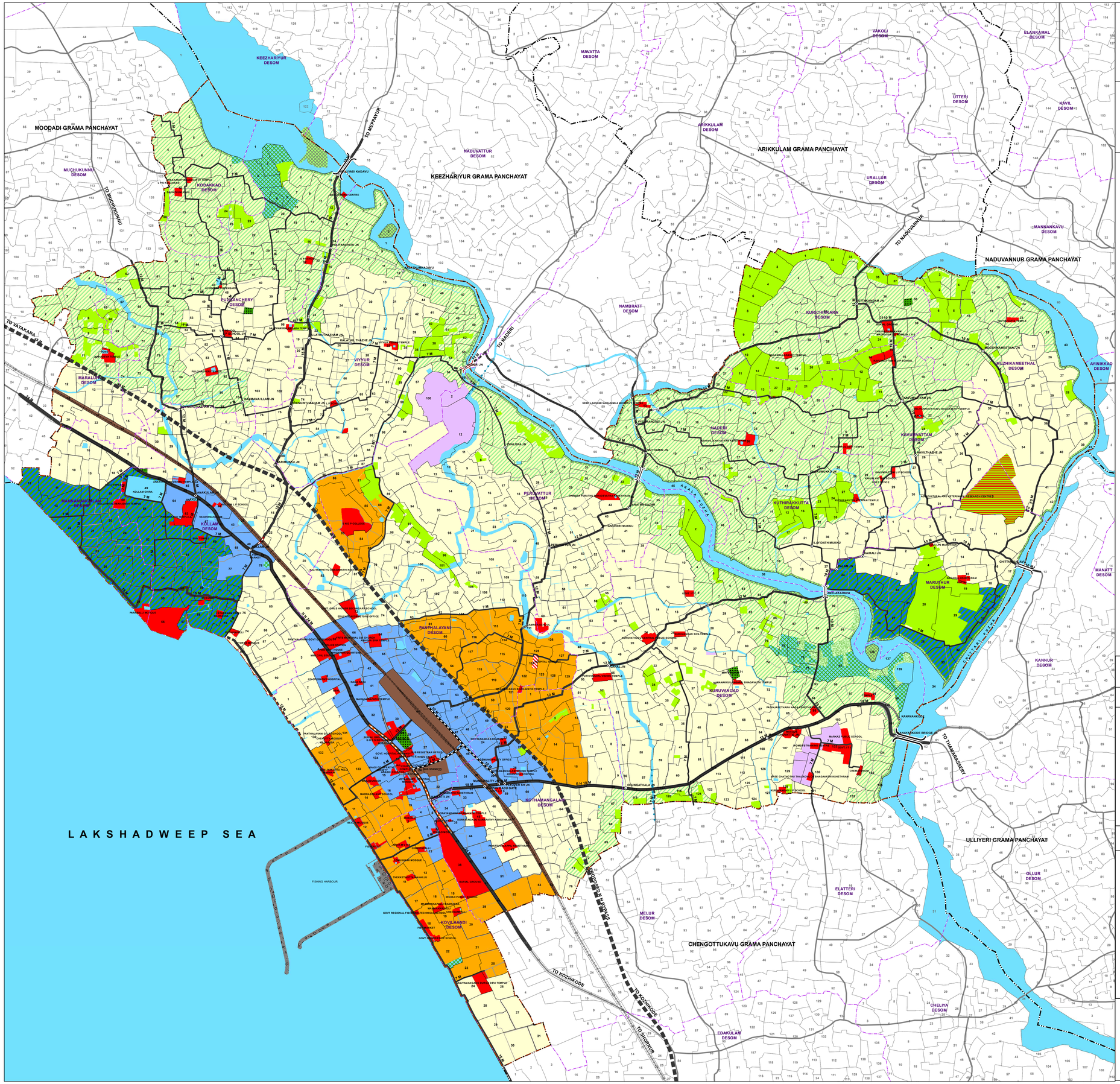
PROPOSED LAND USE 2033










MOODADI GRAMA PANCHAYAT
KEEZHARIYUR GRAMA PANCHAYAT
ARIKKULAM GRAMA PANCHAYAT
NADUVANNUR GRAMA PANCHAYAT
ULLIYERI GRAMA PANCHAYAT
CHENGOTTUKAVU GRAMA PANCHAYAT
LAKSHADWEEP SEA
KEEZHARIYUR DESOM
MAVATTA DESOM
VAKOLI DESOM
ELANKAMAL DESOM
UTTERI DESOM
KAVIL DESOM
ARIKKULAM DESOM
NADUVATTUR DESOM
URALLUR DESOM
MANNANKAVU DESOM
MUCHUKUNNU DESOM
KODAKKAD DESOM
PUNCHERY DESOM
NAMBRATT DESOM
KURICHIKKARA DESOM
MUZHIKAMEETHAL DESOM
AYINIKKAD DESOM
MARALUR DESOM
VIYYUR DESOM
NADERI DESOM
KAVURVATTAM DESOM
KOLLAM DESOM
PERUVATTUR DESOM
KUTHIRAKKUTTA DESOM
MANATT DESOM
PANTHALAYANI DESOM
KURUVANGAD DESOM
MARUTHUR DESOM
KANNUR DESOM
KOTHAMANGALAM DESOM
KOYILANDI DESOM
MELUR DESOM
ELATTERI DESOM
OLLUR DESOM
CHELIYA DESOM
EDAKULAM DESOM
TO MEPPAYUR
TO MUCHUKUNNU
TO VATAKARA
TO NADERI
TO NADUVANNUR
TO THAMARASSERY
TO KOZHIKODE
TO BYPASS
TO BYPASS
TO KOZHIKODE
TO BYPASS
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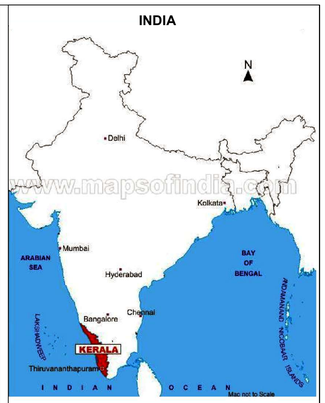
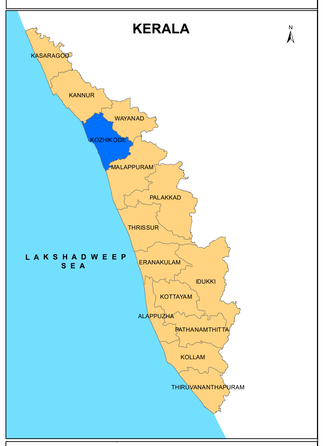
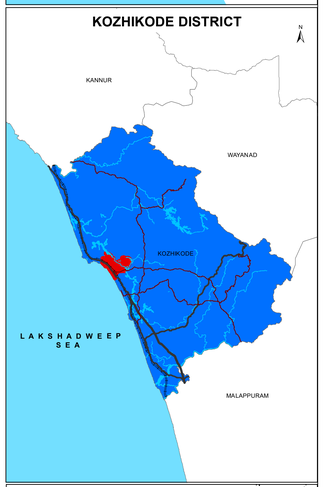
TO BYPASS
TO KOZHIKODE

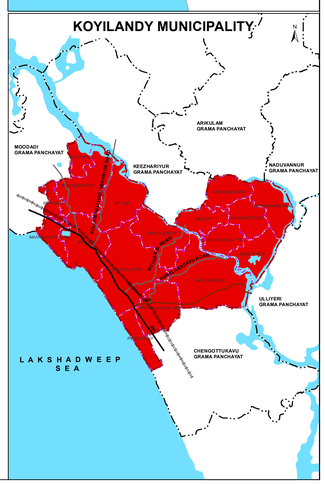
MASTER PLAN FOR KOYILANDY TOWN

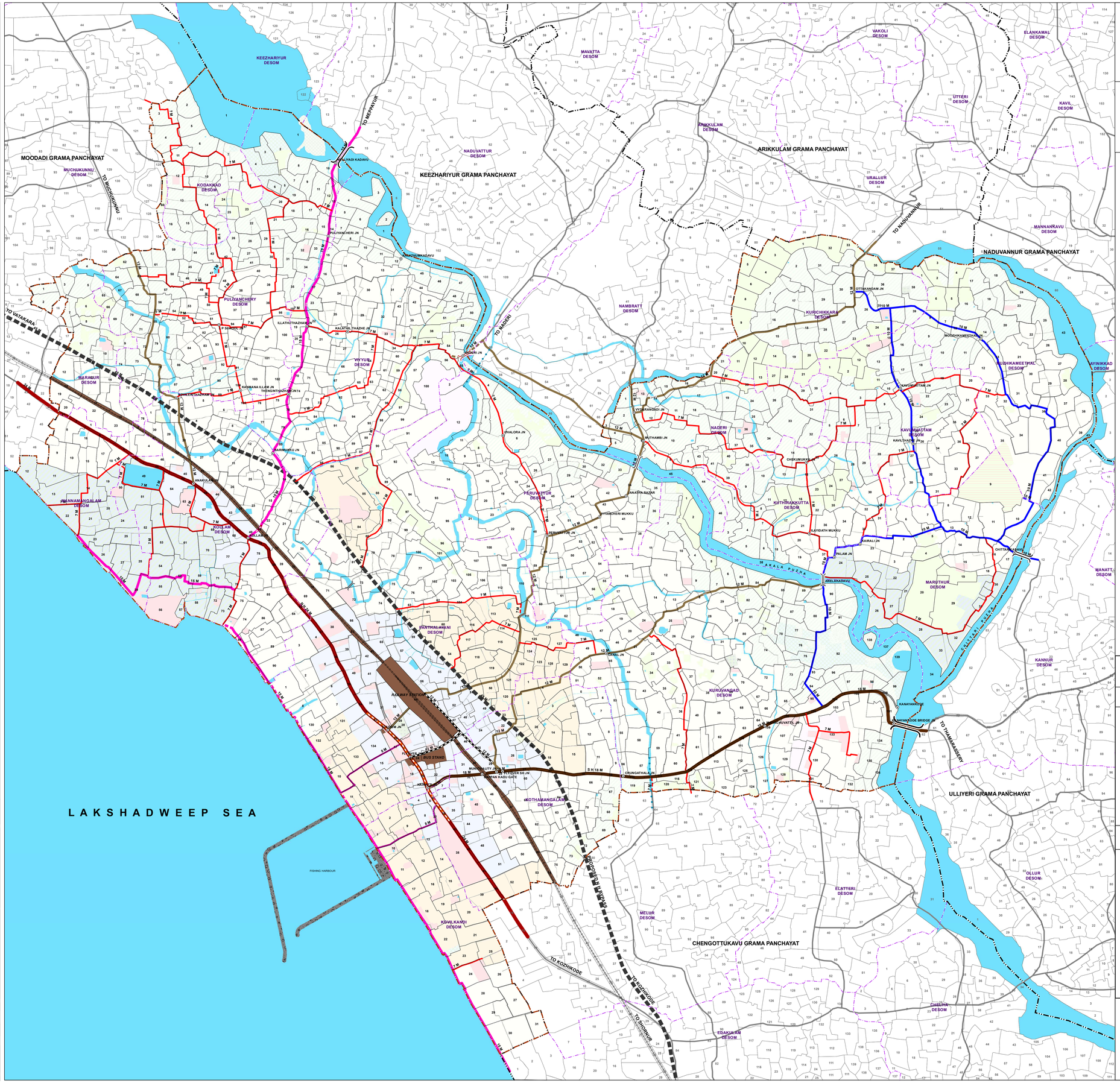
PROPOSED TRANSPORTATION PLAN 2033











SCALE 1:10,000

0 125 250 500 750 1,000 Metres

ANNEXURE VII

LEGEND

- MUNICIPAL BOUNDARY / MASTER PLAN BOUNDARY
- DESOM BOUNDARY
- SURVEY BOUNDARY
- N H 66
- S H 34
- EXISTING ROAD
- RAILWAY LINE
- JUNCTION
- WATER BODY
- TRANSPORTATION ZONE
- EXISTING BRIDGE
- EXISTING FLYOVER
- AQUEDUCT

PROPOSED ROADS

WIDENING	NEW
7 M	7 M
8 M	10 M
10 M	12 M
12 M	15 M
15 M	45 M
18 M	
24 M	

- ELEVATED ROAD - 7 M
- PROPOSED R O B
- PROPOSED BRIDGE

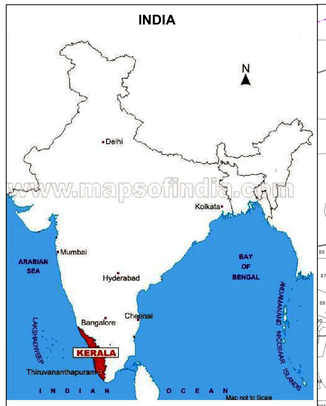
LOCAL SELF GOVERNMENT PLANNING	KOYILANDY MUNICIPALITY
OFFICE OF THE TOWN PLANNER KOZHIKODE DRAFTSMAN ASSISTANT TOWN PLANNER DEPUTY TOWN PLANNER TOWN PLANNER	SECRETARY
OFFICE OF THE CHIEF TOWN PLANNER THIRUVANANTHAPURAM ASSISTANT TOWN PLANNER DEPUTY TOWN PLANNER TOWN PLANNER SENIOR TOWN PLANNER CHIEF TOWN PLANNER (PLANNING)	CHAIRMAN

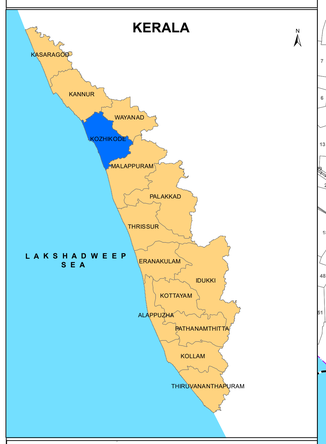
LOCAL SELF GOVERNMENT DEPARTMENT

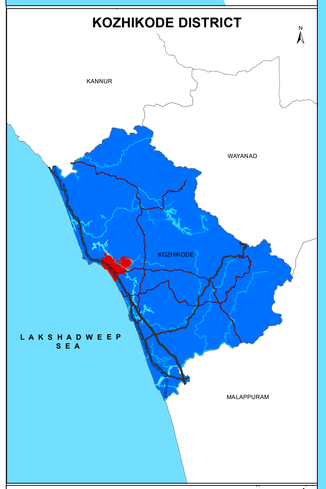
PRINCIPAL SECRETARY TO GOVERNMENT

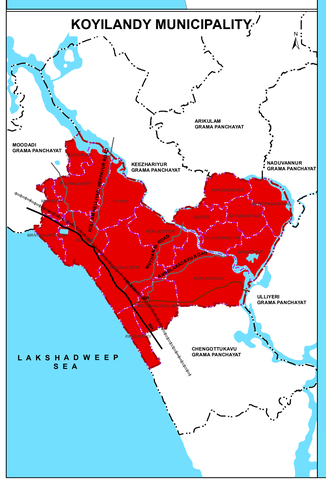
MASTER PLAN FOR KOYILANDY TOWN

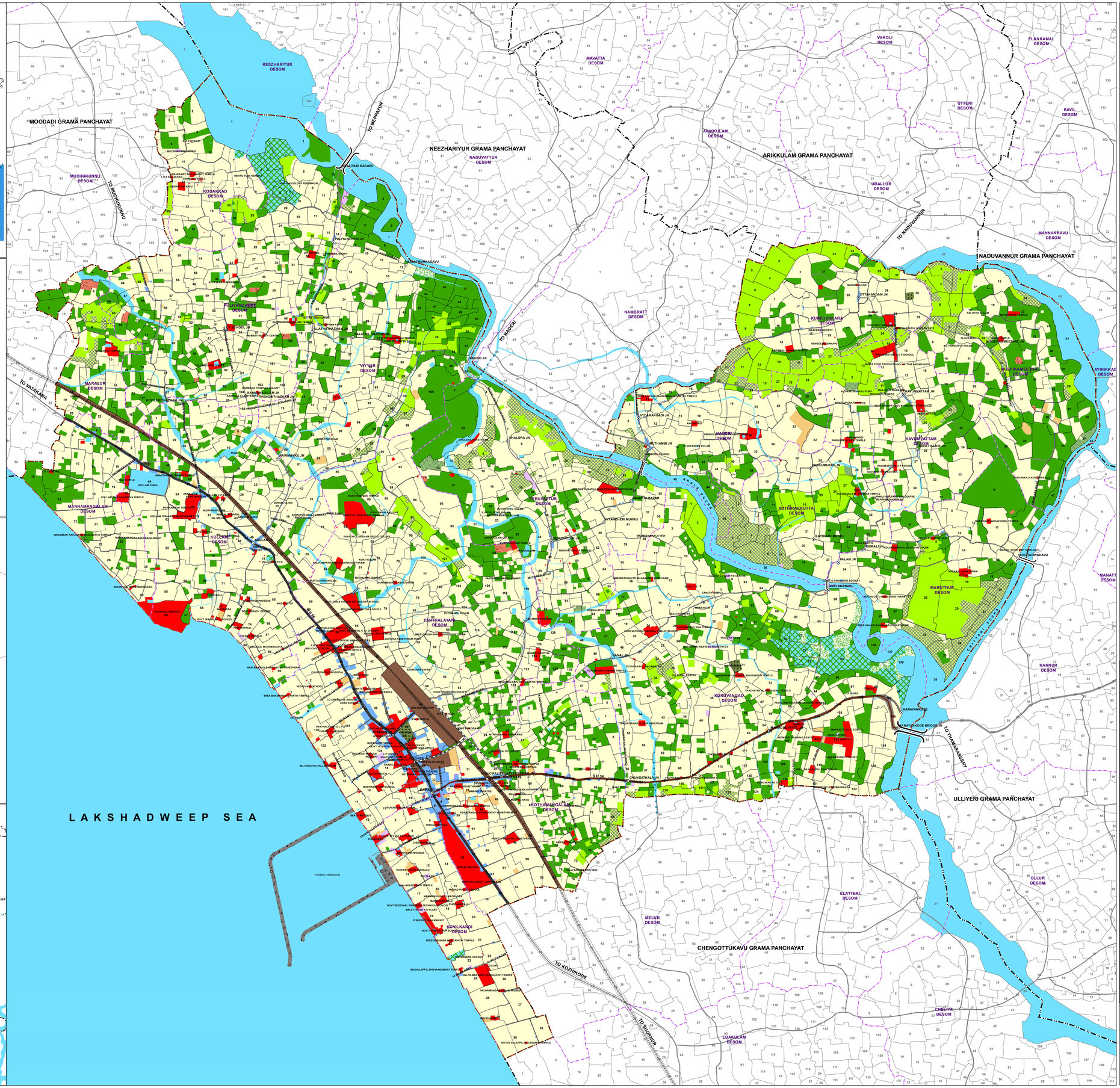
EXISTING LAND USE 2013










MOODADI GRAMA PANCHAYAT
KEEZHARIYUR GRAMA PANCHAYAT
KEEZHARIYUR DESOM
MAVATTA DESOM
VAKOLI DESOM
ELANKAMAL DESOM
UTTERI DESOM
KAVIL DESOM
ARIKKULAM DESOM
ARIKKULAM GRAMA PANCHAYAT
NADUVATTUR DESOM
URALLUR DESOM
MUCHUKUNNU DESOM
KODAKKAD DESOM
TO MEPPAYUR
TO MUCHUKUNNU
TO NADUVANNUR
MANNANKAVU DESOM
NADUVANNUR GRAMA PANCHAYAT
NAMBRATT DESOM
KUDIKKARA DESOM
TO VATAKARA
TO MADERI
MARAKUR DESOM
VIYYUR DESOM
AYINIKKAD DESOM
VYDEHI HOSPITAL
KAKKADAMPOYIL
KAVUVAYATTAM DESOM
KAVUVAYATTAM JN
VYDEHI JN
VYDEHI SCHOOL
KOTTAKANDAM JN
KOTTAKANDAM
MUTHAMBI JN
WAGERI/CHERUVATTUR DESOM
KAKKADAMPOYIL
KAKKADAMPOYIL JN
KAKKADAMPOYIL SCHOOL
KAKKADAMPOYIL TEMPLE
KAKKADAMPOYIL P.O
KAKKADAMPOYIL BAZAAR
KAKKADAMPOYIL MOSQUE
KAKKADAMPOYIL HEALTH CENTRE

KOYILANDY MUNICIPALITY AND
LOCAL SELF GOVERNMENT PLANNING