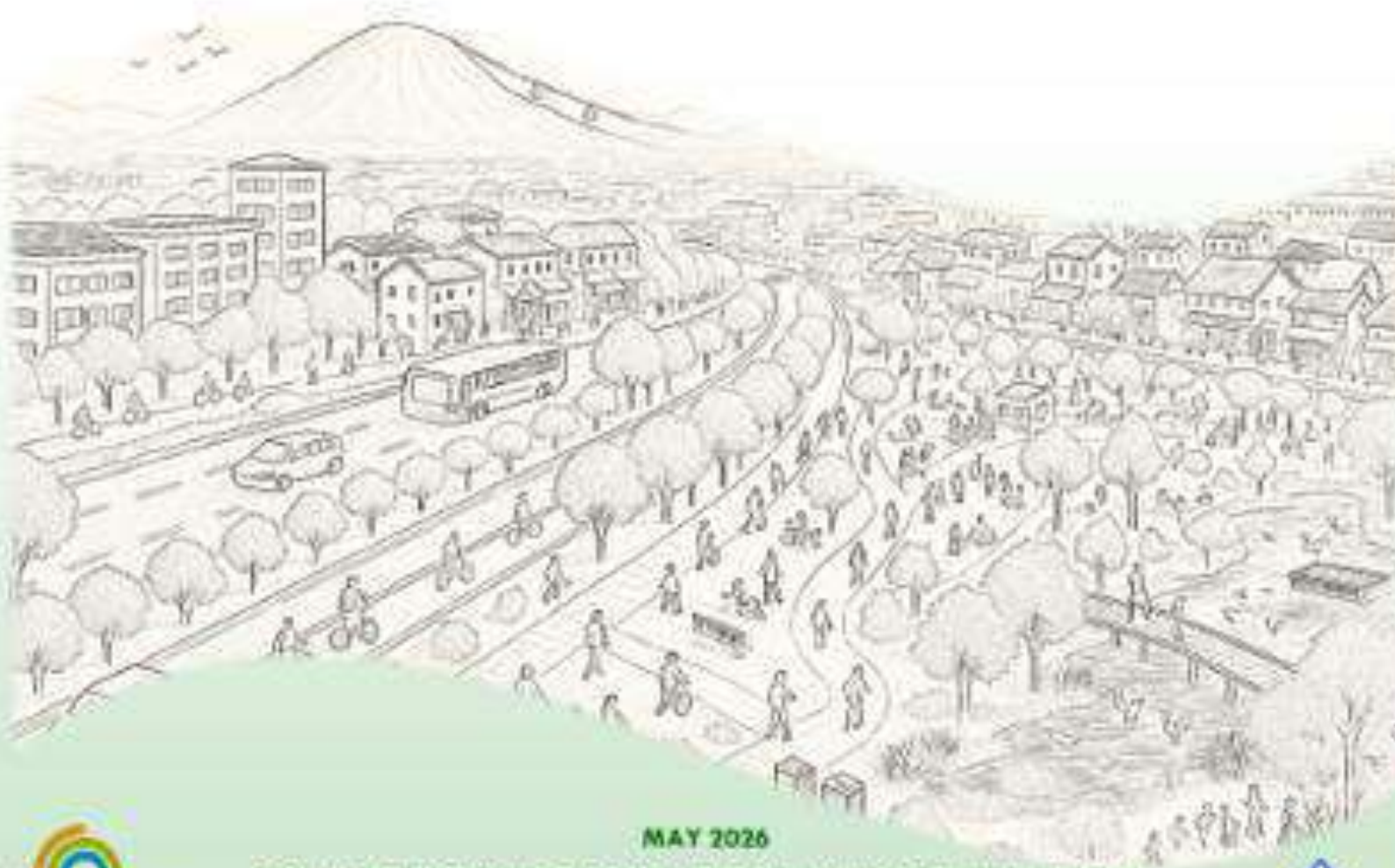
MASTER PLAN FOR PATHANAMTHITTA TOWN 2045

VOLUME I



MAY 2026

LOCAL SELF GOVERNMENT DEPARTMENT PLANNING, PATHANAMTHITTA

&

PATHANAMTHITTA MUNICIPALITY

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LOCAL SELF GOVERNMENT DEPARTMENT PLANNING, PATHANAMTHITTA
&
PATHANAMTHITTA MUNICIPALITY

FOREWARD

It is with great satisfaction that I share the Master Plan for Pathanamthitta Town, a comprehensive vision intended to guide the town toward sustainable growth and long-term progress. More than a planning document, this initiative reflects our shared responsibility to create a healthier, safer and more inclusive urban environment for future generations.

Known for its distinctive landscape, cultural significance, and active community life, Pathanamthitta requires a planning approach that respects its character while preparing it for future challenges and opportunities. This plan has been carefully prepared to improve overall living standards through integrated strategies covering social welfare, environmental protection, economic development, infrastructure, and governance. While grounded in the needs of the local population, it also embraces broader principles of sustainable and responsible urban development.

An important highlight of the proposal is the priority given to climate resilience and disaster preparedness. Considering the recurring threats of floods and landslides in the region, the plan introduces practical measures aimed at reducing risk, protecting communities, and strengthening the town's capacity to respond to natural hazards.

The Master Plan also presents a wide range of achievable projects that can directly improve everyday life in Pathanamthitta. These include better transport systems, upgraded public infrastructure, improved civic amenities, conservation of natural resources, enhancement of public spaces, and initiatives to stimulate local economic activity. Together, these proposals aim to create a more connected, vibrant, and sustainable town.

I sincerely acknowledge the efforts of the LSGD Planning team, technical experts, stakeholders, and residents whose valuable inputs shaped this plan. The success of this vision now depends on our collective commitment to implementing these ideas with determination, cooperation, and a shared sense of purpose.

Pathanamthitta

Date: 8.6.2026

MUNICIPAL OFFICE PATHANAMTHITTA

Sindhu Anil

Smt. Sindhu Anil

SINDHU ANIL
CHAIRPERSON
Pathanamthitta Municipality

Chairperson

Pathanamthitta Municipality

PREFACE

The Master Plan for Pathanamthitta is structured around the core principle of enhancing liveability in Pathanamthitta town through integrated proposals across five key pillars such as social, environmental, economic, physical, and institutional. Each component of the plan is designed to reinforce the other, ensuring holistic urban growth while preserving the town's natural heritage.

What truly makes this Master Plan unique is the large numbers of implementable projects it proposes — projects that are not only visionary but also grounded in practicality, fiscal realism, and local relevance. From improved mobility and vibrant public spaces to strengthened infrastructure and economic diversification, the plan outlines a clear roadmap for the town's transformation.

A strong emphasis is placed on disaster risk reduction, particularly in relation to floods and landslides, which are pressing concerns in Pathanamthitta's hilly and riverine terrain. The plan incorporates nature-based solutions, conservation of green-blue network, improved drainage systems and development regulations to make the town more resilient and adaptive to climate-related risks.

I hope this Master Plan serves as a valuable tool for all stakeholders such as policymakers, citizens, and institutions to work collectively towards a safer, smarter, and more liveable Pathanamthitta. Let this plan be a blueprint for progress that blends development with responsibility and growth with sustainability.

The master plan was prepared through a systematic process of Primary Surveys, Data collection and Analysis, Identification of development constraints and potentials, envisioning, and Formulation of development concept, land use proposals, zoning and model projects. Community involvement is ensured in all stages of preparation of the plan. The successful preparation of the Master Plan is the result of combined efforts of Pathanamthitta Municipality and LSGD Planning, Pathanamthitta.

I would like to appreciate the leadership provided by the Pathanamthitta Municipality for this endeavour under the leadership Smt. Sindhu Anil, Municipal Chairperson and Adv.T Zakir Husain, Former Chairperson. The Master Plan committees constituted for the preparation of Risk Informed Master Plan for Pathanamthitta town have made significant contributions.

I take opportunity to appreciate all the officials of LSGD Planning Pathanamthitta under the leadership of Sri. Arun G, Town Planner and Smt. Nimmy Kurian, Deputy Town Planner in the preparation of this document. I would also like to appreciate the team members of the Project Implementation Unit of Program for Results of Rebuild Kerala Initiative by the Kerala Government under the leadership of Sri. P.N. Rajesh, Former Additional Chief Town Planner, for the efforts put forward by them to incorporate risk information in this Master Plan.

I also appreciate Smt. Salini KM, Town Planner and the team of officials in the office of the Chief Town Planner for their efforts in coordinating and finalising the Risk Informed Master Plan for Pathanamthitta town.

Certainly, the Risk Informed Master Plan for Pathanamthitta town will provide guidance for all stakeholders with an interest in the future development of the town.

OFFICE OF THE CHIEF TOWN PLANNER * THIRUVANANTHAPURAM *

Thiruvananthapuram

Date: 11.6.2026

Smt. Asha Ajoy Ghosh

Chief Town Planner (Planning)

ACKNOWLEDGEMENT

Master Plan for Pathanamthitta Town is a comprehensive and forward-looking planning document that envisions a safer, greener, and more liveable town that reflects building a resilient, inclusive, and vibrant urban future. This plan has been prepared through a participatory and consultative process, aligning with the vision of sustainable urban development and addressing the unique needs and aspirations of the people of Pathanamthitta. It is with a deep sense of gratitude and fulfilment that I acknowledge the collective efforts behind the preparation of the Master Plan for Pathanamthitta Town.

This plan is the outcome of extensive teamwork, dedication, and continuous engagement with multiple stakeholders. I express my heartfelt appreciation to the enthusiasm shown by Smt. Sindhu Anil, Municipal Chairperson and Adv. T Zakir Husain and Former Chairperson of Pathanamthitta Municipality who took the helm of the plan preparation and actively participated in every stage of the discussions. Also the Councillors of Pathanamthitta Municipality for their active involvement, valuable inputs, and encouragement in shaping the proposals. Without their constant support, timely advice and valuable suggestion, this plan would not have reached at this stage. The sincere efforts put in by the Secretary and Municipal Engineer also needs special mention here.

I sincerely acknowledge the unique leadership provided by Smt. Asha Ajoy Ghosh Chief Town Planner (Planning)i/c, Smt. Sheeba Rani.Y (Former Chief Town Planner (Planning)), Smt. Salini K.M Town Planner and other staff members of the Office of the Chief Town Planner (Planning) for their guidance, leadership, and constant support throughout the process.

I sincerely thank all the team members of Project Implementation unit of Program for results of Rebuild Kerala Initiative by the Kerala Government headed by Team leader Sri. P N Rajesh, Former Additional Chief Town Planner, LSGD Planning. The timely advice and efforts of Sri. Ramachandran A, Retired Senior Town Planner & Consultant Town Planner and Sri. Baiju K, Retired Senior Town Planner & Consultant Town Planner of the Project Implementation Unit is also remembered with gratitude. I take this opportunity to appreciate the officials of the Project Implementation Unit for their enthusiastic approach and dedicated effort to complete the work in a time bound manner, especially Smt. Rahana H, Town Planner.

We have also relied on statistical data from various line Departments. Their readiness to share the data is gratefully acknowledged. Special thanks are also due to various line departments, officials, experts, and field staff, whose coordination and technical inputs were critical in refining the proposals.

The preparation of this plan would not have been complete without the active participation of the local community. Their voices, aspirations, and suggestions were integral in making the proposals grounded and people-centric.

This Master Plan stands out for its comprehensive approach to improving liveability across multiple dimensions — social, economic, environmental, physical, and institutional — and for its strong emphasis on risk reduction. The large number of practical and implementable projects proposed is a reflection of our commitment to action-oriented planning.

I sincerely appreciate the unwavering dedication, efforts and commitment to ensure timely completion of the work by Smt. Nimmy Kurian, Deputy Town Planner who led the planning team during each of their tenure to shape the plan. I also acknowledge Sri. Sharon W G Former Planner Associate who were involved in the plan preparation. The dedication and hardwork of Kum. Ranjusha.V, Geospatial Analyst not only in the meticulous preparation of maps but also in contributing significantly to the planning process and all the staff members of LSGD Planning, Pathanamthitta need to be specially acknowledged for their keen participation at various stages, without which this work would not have been successfully completed.

I thank every member of the planning team for their hard work, perseverance, and collaborative spirit. Let this Master Plan be a meaningful step forward in transforming Pathanamthitta into a resilient and thriving urban centre.

Pathanamthitta
Date: 8.6.2026

Sri Arun G
Town Planner
Pathanamthitta

ARUN. G, B.Tech, M. Plan
Town Planner
LSGD Planning
Govt. of Kerala

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PART I
STUDY & ANALYSIS



I . GENERAL

1. Introduction
2. Profile of the Town
3. Regional Linkages
4. Hazard Profile & Climate Change
5. Demography
6. Employment
7. Land Use & Built Up Density



1. INTRODUCTION

Master Plan is a spatial planning document that guides the growth and spatial development of a town. It serves as a strategic blueprint, outlining the vision, goals, and policies for land use, infrastructure, transportation, environment and other critical aspects of urban development. Master Plan is designed to ensure that growth and development are orderly, sustainable and responsive to the needs of the community, while also preserving cultural, environmental, and historical values.

The purpose of this Master Plan is to provide a clear framework for guiding the economic, physical, social, environmental development of Pathanamthitta town over an extended period 20 years. The plan integrates various components of urban planning, from zoning and land use regulations to infrastructure design, transportation networks and environmental sustainability aligned with its goals for economic prosperity, social well-being and environmental protection of Pathanamthitta town.

Contents

1. Area & Location
2. Evolution & History
3. Earlier Planning Efforts
4. Need of the Masterplan
5. Master Plan – A Legal document
6. Methodology

1.1 Area & Location

Pathanamthitta town situated in between 9° 14' 38.30" and 9° 18.06' 09" North latitude and 76° 45' 40.24" and 76° 49' 34.35" East longitudes. Pathanamthitta town is bounded by Mylapra and Naranganam Panchayats in the North, Malayalappuzha Panchayat in the East, Pramadom & Omallor Panchayts in South and Elanthoor Panchayat in the West. Major portion of Pathanamthitta town is coming under Pathanamthitta village of Kozhencherry Taluk and a very small portion in the Eastern part is coming under Malayalappuzha village and Konnithazham village of Konni Taluk. The town possess a total area of 23.43 sq.km which is 0.89 % of the total area of the district and located in the central part of Pathanamthitta district. (Figure 1.1)

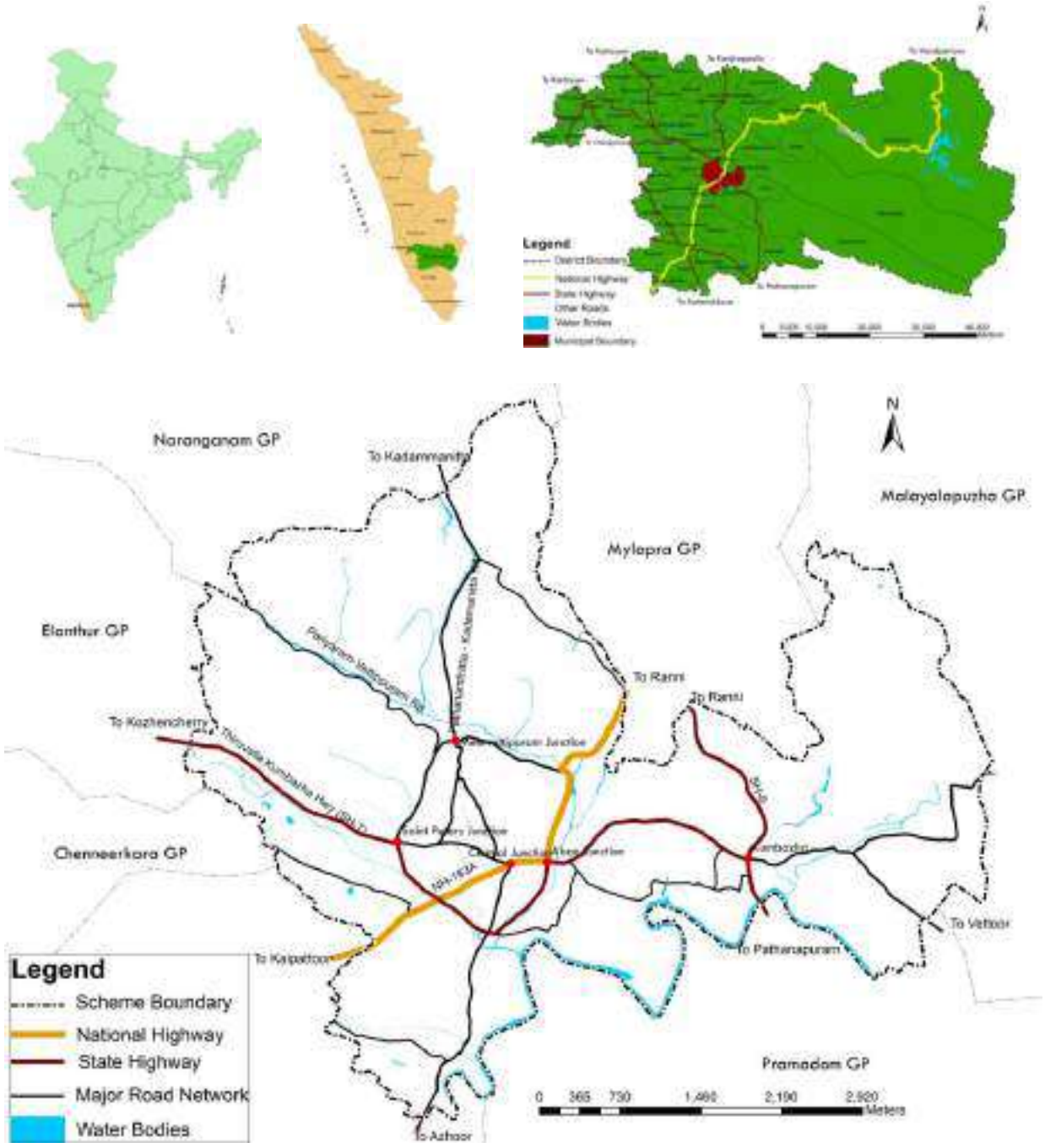


Figure 1.1 Location Map - Pathanamthitta town

1.2 Evolution & History

In ancient times, there was a belief that the name "ten varieties (pathu enam thitta)" in the sense of "Janapadam" which is inhabited by the ten caste people of different races has been called up and renamed Pathanamthitta. The second belief is that there was a famous merchant who supplied the required goods to the Darma Raja in Travancore and as a reward the king had given a place which is well for him and his group for the residential purposes. This palce is known as “Pattani thitta” latter it reduced to the name Pathanamthitta. The third belief is that the land is filled with beautiful houses (“Pathanam”) on the river banks (“thitta“) and the name Pathanamthitta Considering the administrative history, the town has the status of a Municipal town during the pre-independence period which was later declassified as Panchayat in 1952 and continued in the status for 26 years.

In 1978 the Panchayat has been upgraded to the status of Municipality and the Municipal town of Pathanamthitta came into existence on 1.10.1978. Pathanamthitta municipal town became the district head quarter town when the Government of Kerala formed its 13th district in the State viz. Pathanamthitta on 1.11.1982 by carving out areas from Kollam, Alappuzha and Idukki districts. Pathanamthitta town was formerly under the Pandalam reign which had connections with the old Pandya kingdom.

1.3 Earlier Planning Efforts

Earlier spatial planning efforts of Pathanamthitta town includes Development Plan and Detailed Town Planning (DTP) Schemes. Attempts for preparation of Development Plan for Pathanamthitta town were started way back in 1984. The draft Development Plan for Pathanamthitta was published in 1995. In addition to that, there were five published Detailed Town Planning (DTP) Scheme for different parts of the town.

1.3.1 Development Plan for Pathanamthitta Town 1995

The concept (Figure 1.2) of Development Plan for Pathanamthitta town 1995 is intended to provide a frame work for the integrated and comprehensive development of Pathanamthitta town.

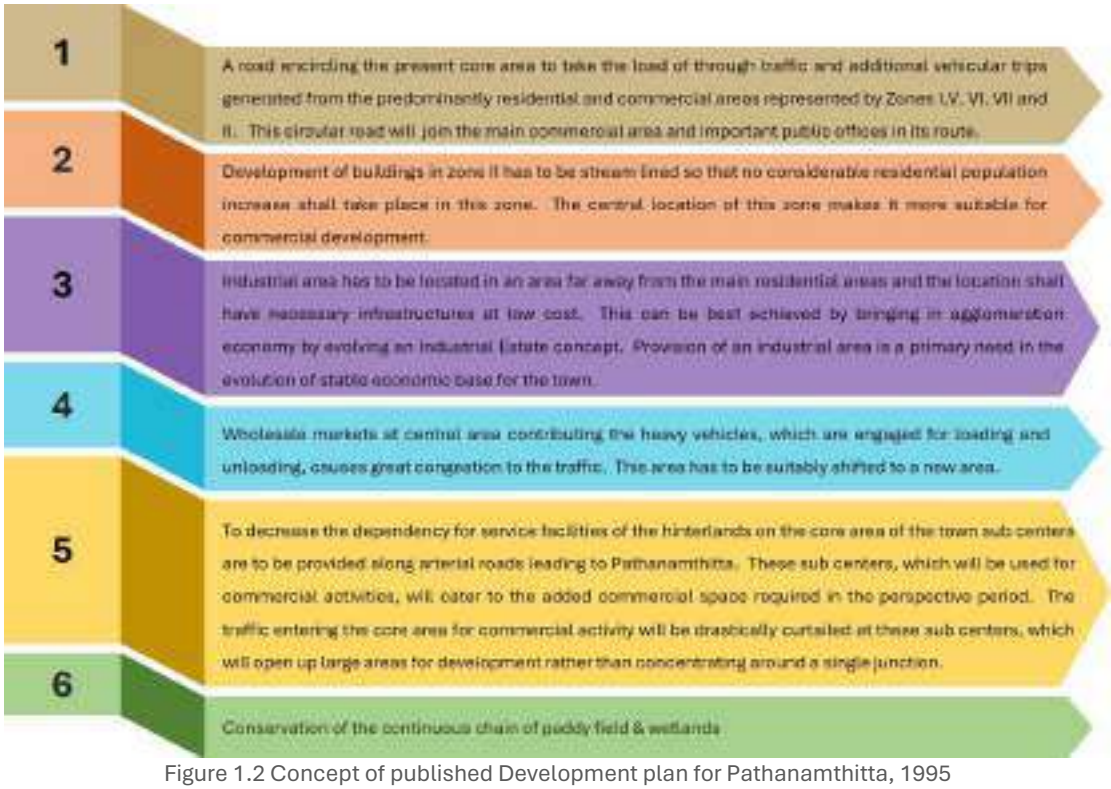


Figure 1.2 Concept of published Development plan for Pathanamthitta, 1995

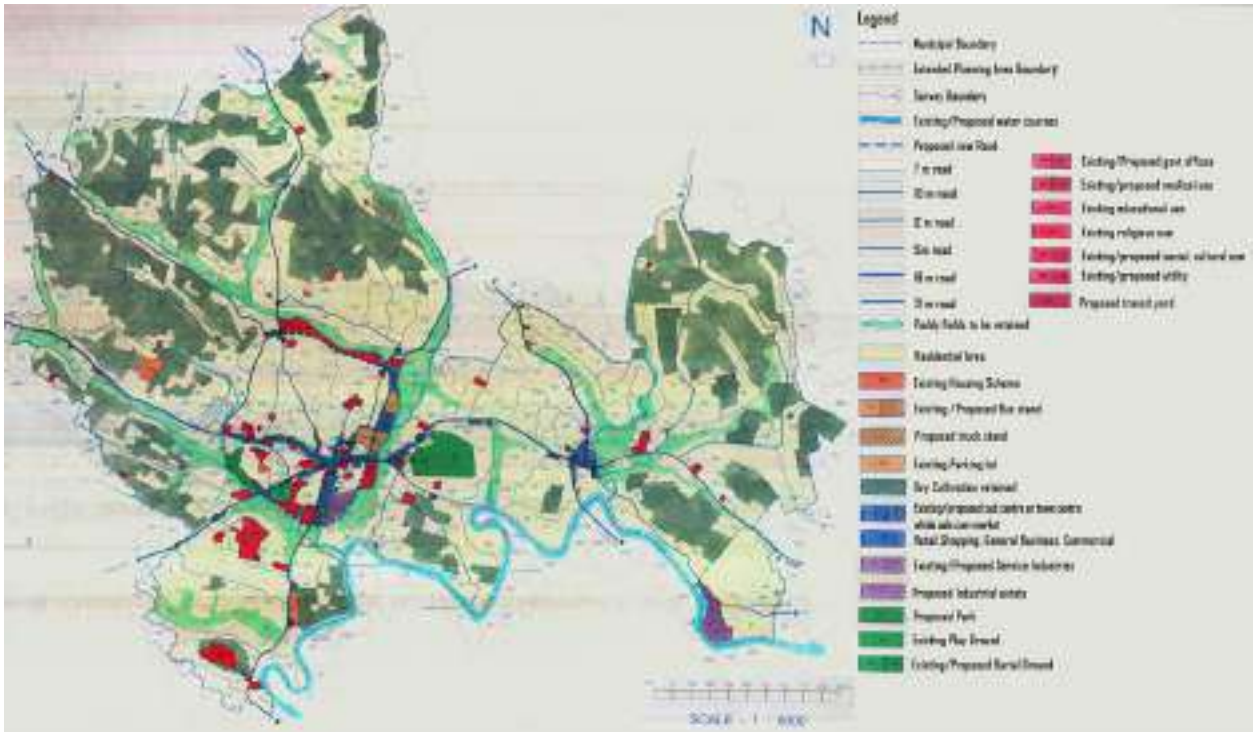


Figure 1.3 Development plan for Pathanamthitta Town 1995 (published) - Proposed land use 2011

Government accorded sanction for publishing the plan vide G.O. (Rt) 878/95/LAD dated 21.02.1995. Figure 1.3 shows the proposed land use plan, 2011 from the published Development plan for Pathanamthitta town.

1.3.1.1 Level of implementation of the published Development Plan

Proposals of the published Development Plan which are implemented includes, Ring road, other Roads, Bus Terminal, Edathavalam, SP office and Stadium. The developments of the town have been controlled as per the proposals of the published Development plan. New buildings were constructed with adequate set back from the road boundary, which enable future road widening more easily. Also the continuous network of wetlands have got conserved to a great extent as per the regulations in the plan.

1.3.2 Detailed Town Planning Schemes

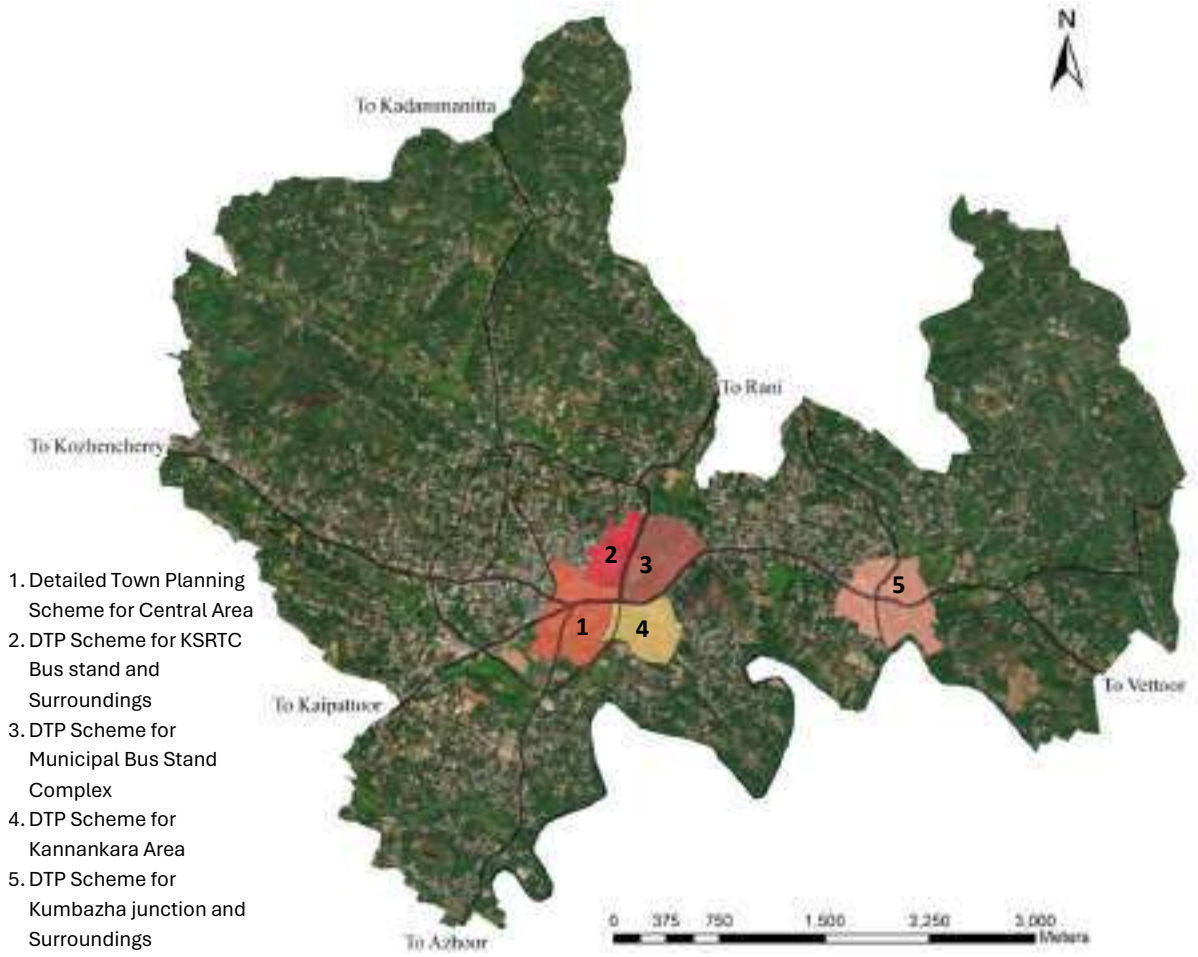
Five Detailed Town Planning Schemes were prepared and published in early 1984 and 1992 for the priority areas of Pathanamthitta town. But all these plans were in published stage and the final sanction of the Government has not been obtained. Recently in 2024, all these plans are republished in tune with the new development trends. Location map of five DTP schemes are shown in Figure 1.4.

1.3.2.1 Detailed Town Planning Scheme for Central Area, Pathanamthitta

The scheme covers an area of 30.59 Ha. The scheme was first published on 10/03/1992. With evolving land use patterns and emerging infrastructure needs and the changing requirements of the urban areas in the Central Area, the scheme was republished on 28/10/2024. The scheme covers area around the Central junction. Municipal office, Mini Civil Station, market etc. are covered in the scheme. The proposal of the scheme includes Municipal Complex and shopping complex, new roads and Junction improvement and mixed use areas.

1.3.2.2 DTP Scheme for KSRTC Bus stand and Surroundings, Pathanamthitta

The scheme covers an area of 12.11 Ha. The scheme was published on 10/03/1992 and republished on 6/11/2024. The scheme covers the area around KSRTC bus station.



1. Detailed Town Planning Scheme for Central Area
2. DTP Scheme for KSRTC Bus stand and Surroundings
3. DTP Scheme for Municipal Bus Stand Complex
4. DTP Scheme for Kannankara Area
5. DTP Scheme for Kumbazha junction and Surroundings

Figure 1.4 Location of five DTP schemes of Pathanamthitta town

Source: Generated from google earth

The proposals in the scheme include KSRTC bus stand, new roads, and parking, Commercial, Residential and Mixed use areas.

1.3.2.3 DTP Scheme for Municipal Bus Stand Complex, Pathanamthitta

The scheme covers an area of 24.8 Ha of the eastern part of Central area of the town. The scheme was published on 12/08/1984 and republished on 4/11/2024. The scheme covers an area around the Municipal Bus station. The proposals in the scheme include new roads, Municipal bus stand, Taxi stand, roads widening, Commercial and residential mixed use areas.

1.3.2.4 DTP Scheme for Kannankara Area, Pathanamthitta

The scheme covers an area of 18.1 Ha. The scheme was published on 12/08/1984 and republished on 02/11/2024. The scheme covers Kannankara area located on the south east part of Kannankara Junction. The proposals in the scheme include New roads and Mixed use (Residential, commercial cum public and semi-public) areas.

1.3.2.5 DTP Scheme for Kumbazha junction and Surroundings

The scheme covers an area of 35.04 Ha. The scheme was published on 30/03/1985 and republished on 19/02/2024. The scheme covers area around Kumbazha Junction, a major commercial node of the town where T.K.Road and Punalur Muvattupuzha road meets. The proposals in the scheme include New roads, Residential area, Commercial area, Public and semi-public use, mixed use (Residential and Commercial) and Green strip.

1.4 Need of Master Plan

The Kerala Town and Country Planning Act 2016 provide specific guide line for preparation of Master plan and emphasis the need for preparation of plan with people's participation and their requirements need to get more importance. As per the District Urbanisation report Pathanamthitta (2011), Pathanamthitta town is proposed as a first order settlement in the district. Even though many proposals of the published Development plan have been implemented, the present development is not fully in accordance with the development concept of that plan. Hence the Municipal council, Pathanamthitta vide resolution dated 09/07/2018 decided to prepare a new master plan for Pathanamthitta town.

The floods of 2018 and the massive damages it inflicted, made Government of Kerala to decide that Disaster Risk Reduction should be mainstreamed in development planning and projects. Accordingly, amendments have been effected in Section 34 of Kerala Town and Country Planning Act, 2016.

Kerala Town and Country Planning Act, 2016 section 34 subsection (3) (vii) stipulates that Master Plan, prepared under it, shall provide for current issues, prospects and proposals regarding aspects listed thereunder including natural hazard prone areas. The Kerala Town and Country Planning (Amendment) Act, 2021 specifically suggests to include situational analysis in respect of hazard, vulnerability, risk and proposals for mitigation and resilience in the master plan for a local planning area. As town is prone to some natural hazards and climate changes, a Risk Informed Master plan is required at this time for this growing administrative town considering the changed development scenario, hazard profile, mitigation strategies, resilience and future needs of the town.

1.5 Master Plan - A Legal Document

Master Plans are statutory documents, prepared by Local Self Governments (LSGs) for guiding future development in a sustainable manner with focus on spatial and land use planning. A Master Plan giving overall development guidance of a town over a period of 20 years. The Master Plan preparation, implementation and variation in Kerala are based on the provisions of the Town and Country Planning Act, 2016 of the State. Hence the Master Plan is a legally enforceable document. So, it is binding upon officials when they are making specific land use decisions since the content of a Master plan serve as a guide to future development of a town based on a vision.

Risk Informed Master Plans are integrating risk information with land use planning to reduce impact of hazards on life, property and environment in a community. Disaster Risk Reduction strategies based on the existing conditions help to strive lowers the risk aspects in existing developments and preventing exposure of new developments to Hazards.

Risk informed Master Plan is a Master Plan defined under Section 2(r) of the Kerala Town and Country Planning Act, 2016. Guidelines for preparation of Risk Informed Master Plan for the State has been approved by the State Government in 2022. This guideline aims at supporting Local Self Governments across the State to prepare Risk Informed Master Plans (RIMPs) in a structured manner and give sufficient guiding principle and directions for mainstreaming Disaster Risk information in the Master Plan.

1.6 Methodology

Process of preparation of Master Plan involves mainly four stages i.e. data collection, analysis, envisioning process and formulation of development proposals. It involves enormous works in collection, compilation, analysis of various primary and secondary data to identify issues and potentials to arrive at formulation of proposals for the horizon period. People participation is also involved in the all four stages of master plan preparation in the form of

questionnaire surveys, field visits, stakeholders meeting, Community Participation, Cluster / Ward level Meetings, Focus groups, Discussions with Various Department Officials and conducting Development Seminar.

1.6.1 Data Collection

The primary data required for the preparation of Master Plan was collected by various surveys such as Land use survey, Socio-Economic survey, Traffic & Transportation survey, Vulnerability Assessment survey and LiDAR Survey. The land use survey was conducted under the supervision of officers of the LSGD Planning Pathanamthitta by collecting cadastral/ survey number details and digitized in GIS software to make cadastral map of the Town. Ground truthing and field checking were carried out by surveyors and the geo database has been updated and existing land use map of Pathanamthitta town is generated.

Socioeconomic survey was conducted at household, Institutions and community level and in Anganwadis and Schools of the town by questionnaire survey. The traffic & Transportation survey and studies were conducted by National Transportation Planning and Research Centre (NATPAC), Thiruvananthapuram in 2010 and updated by the LSGD Planning in 2018-2019. 100% Socio Economic survey of Households/ buildings in hazard prone area was conducted to understand the socio-economic and environmental vulnerabilities of the town. Drainage study is carried by Lidar Survey.



Figure 1.5 Risk assessment survey (Landslide prone areas)



Figure 1.6 Door to door risk assessment survey in flood prone areas of the town.



Figure 1.7 Lidar Survey for drainage study

The Secondary data is collected from Municipality, Focus group discussions, Stakeholders Consultations, Public Seminars, Discussion with various line departments, Expert level discussions etc. The details of public participation in the preparation of this master plan are provided in Chapter 27. In addition, secondary data was collected through various sources, including government websites, published documents, and online platforms.

1.6.2 Data Analysis

The analysis is done in four stages i.e. Spatial Analysis, Local Level Analysis, Vulnerability Analysis and Risk assessment. The Spatial analysis is done to analyse settlement patterns, population, land use, infrastructure network, problems and potentials of each sector within the town which will act as an input for development vision formulation and to fix sectoral objectives.

Local level analysis focuses on the development trend; its potential and development problems associated with each sector sensitive and priority areas in local context. This includes development aspirations of the people also.

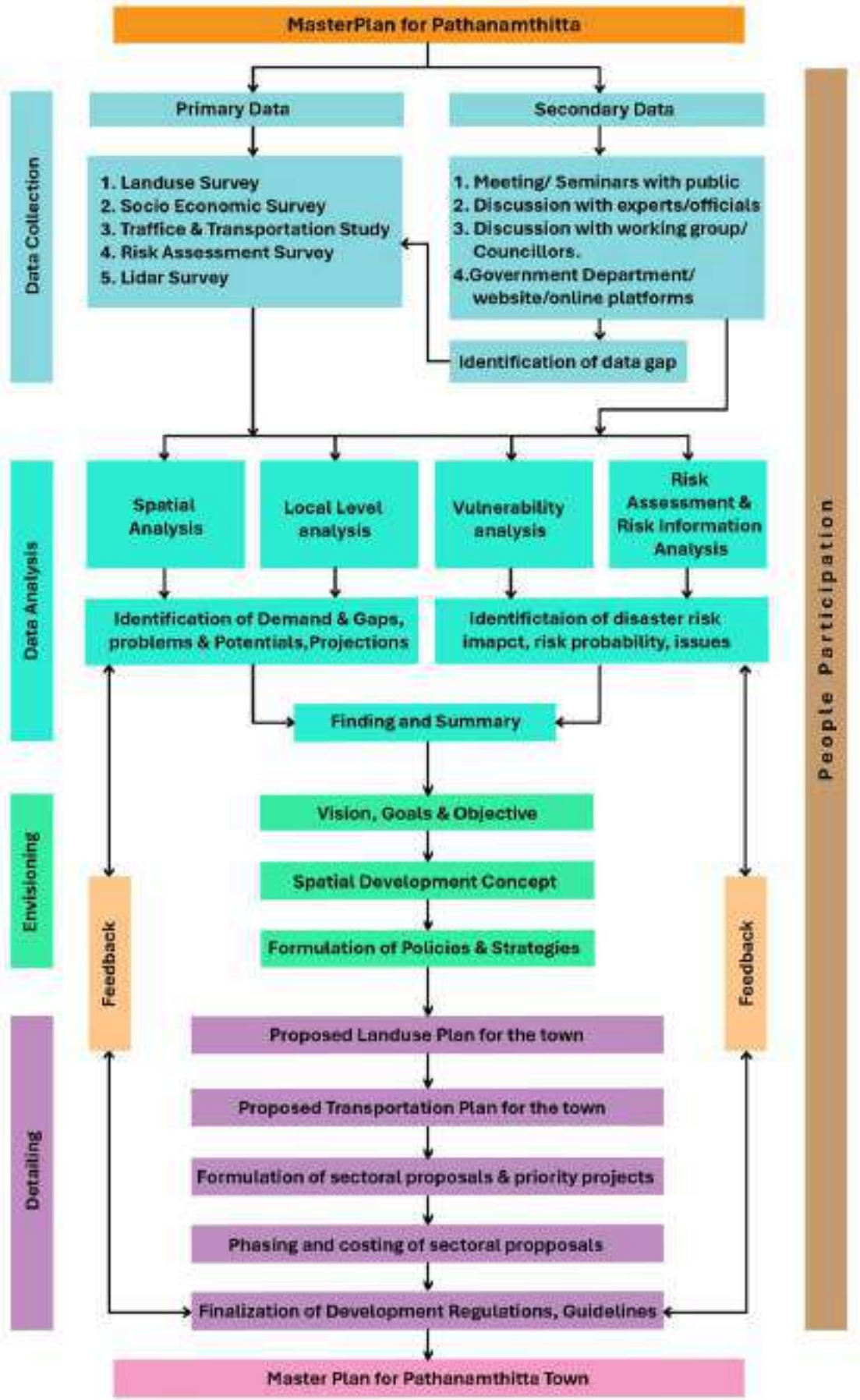


Figure 1.8 Methodology adopted for Pathanamthitta Master Plan

Local level analysis is done by the department with the help of the Special Committee and working group constituted in the Municipality.

Vulnerability analysis assess the vulnerability of the community to different types of hazards. Risk assessment is done based on hazard exposure and vulnerability risk of the area based on the vulnerability assessment survey carried in the hazard prone area identified by KSDMA. Hazard and effect of Climate change on each sectors of the town is analysed separately as part of this Master Plan. Using these survey details, hazard exposure of a town has been identified spatially through ArcGIS platform. All these findings of data analysis serve as the base for envisioning process and concept formulation.

1.6.3 Envisioning Process

The envisioning process starts with the identification of development issues from the consolidated findings of the study and proceeds with formulation of development goals and objectives for the town. Once the objectives are identified, development policies and strategies for fulfilling the objectives, be it in the form of land use policy or specific projects for addressing the issues identified, are developed.

1.6.4 Detailing

The detailing stage includes preparation of sector level proposals to be taken up during the plan period, a detailed land use plan giving out the land use policy for the town during the plan period, zoning regulations for regulating the land use, costing and phasing of the projects proposed in the development plan and details of implementation and monitoring including the provisions for monitoring of the development plan. The methodology adopted for preparation of the Master plan is shown in Figure 1.8.



2. PROFILE OF THE TOWN

Pathanamthitta town is located at the centre of the district and is the headquarters of Pathanamthitta district. It is a major administrative centre of the settlements spread over Pathanamthitta district and functions as a service centre to the surrounding settlements. The temple of Lord Dharmasastha- Sabarimala, the world-famous forest pilgrim centre, is situated in the Western Ghats in the Pathanamthitta district and hence Pathanamthitta is known as the 'Pilgrim Capital of Kerala' and Pathanamthitta town is the gateway to Sabarimala. Pathanamthitta is one of the fast-developing town and service centre of the region.

Part I of this master plan deals with the Study & Analysis of different sectors of the town. There are 30 chapters (1 to 30) in the Part I, Chapter 2 deals with “Profile of the town”. It includes description of a Pathanamthitta town that includes administrative setup and Physical & geographical features.

Contents

1 Administrative Setup

2 Urban Profile of town

3 Meteorology

4 Physiography

5 Inference

2.1 Administrative setup

Based on the Local Self Government Institutions (LSGIs) administration division, there are 4 Municipalities (Thiruvalla, Pathanamthitta, Adoor & Pandalam) and 53 Grama Panchayaths in the Pathanamthitta District (Figure 2.1). Pathanamthitta District is divided into Six Revenue Taluks and 70 Villages for land and revenue administration. The taluks in Pathanamthitta district are Thiruvalla, Mallapally, Ranni, Kozhencherry, Adoor and Konni. Pathanamthitta town is coming under Pathanamthitta revenue village of Kozhencherry Taluk, Malayalappuzha and Konnithazham revenue villages of Konni Taluk (Figure 2.2).

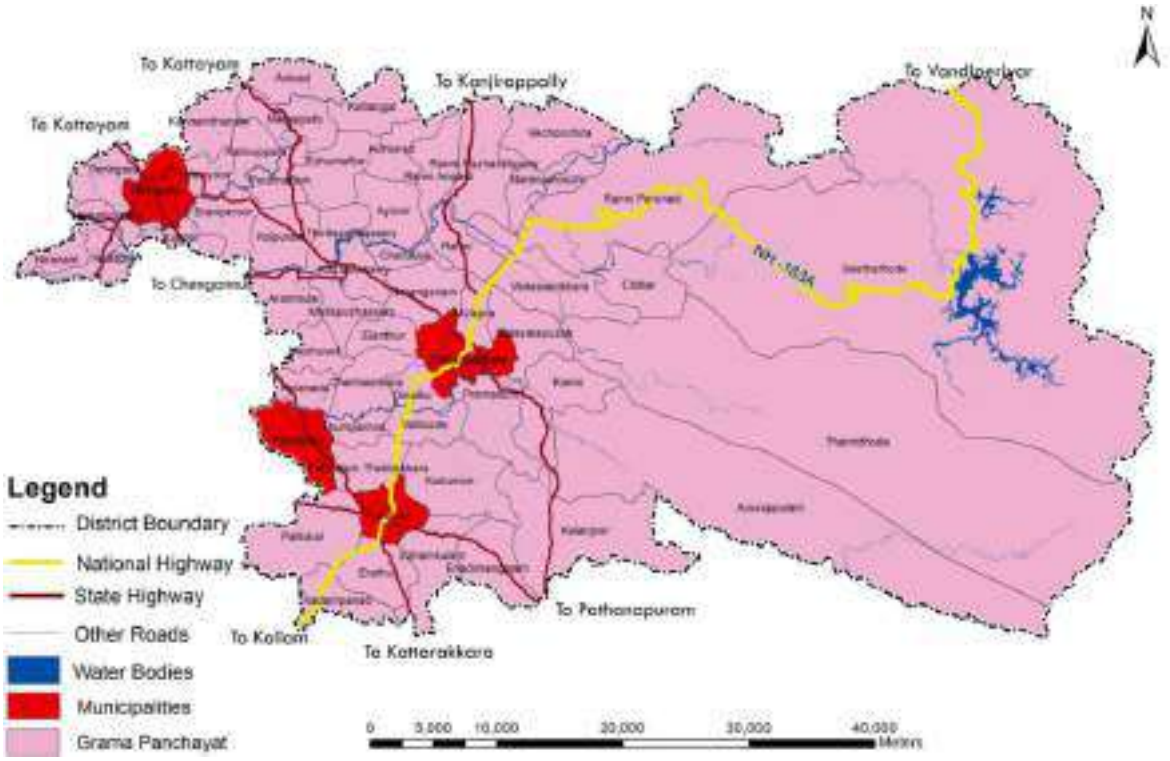


Figure 2.1 Local Self Government Institution (LSGIs) in Pathanamthitta District

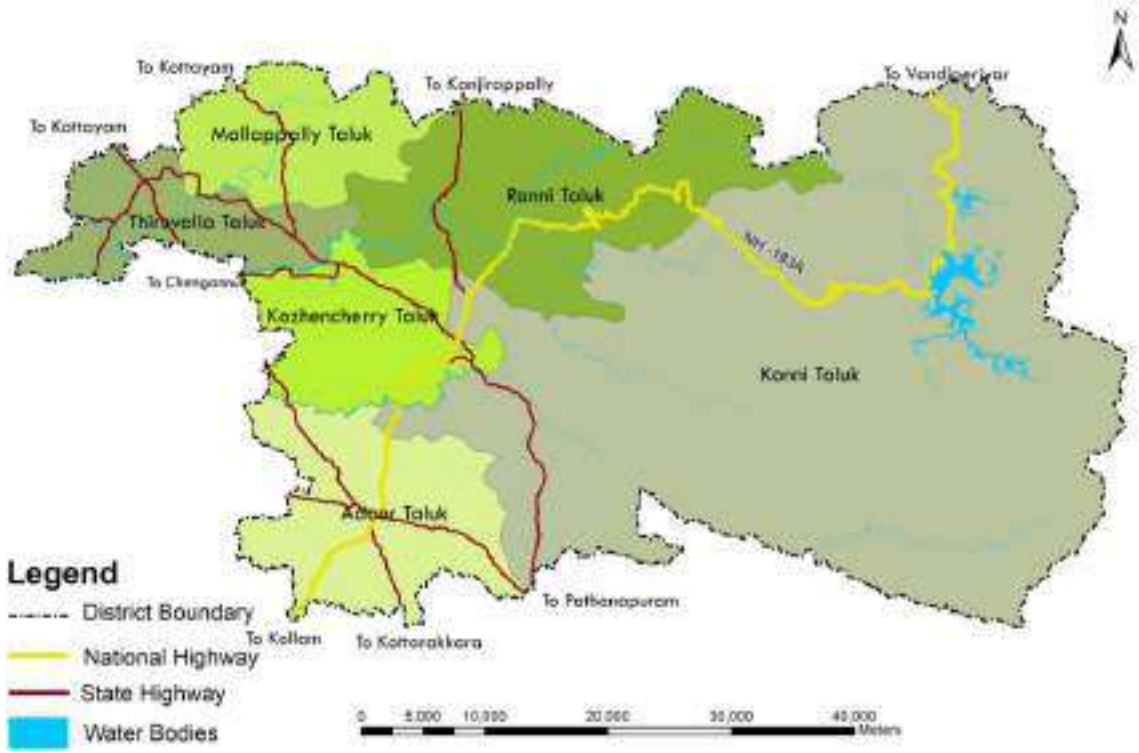


Figure 2.2 Taluks (Revenue divisions) in Pathanamthitta District

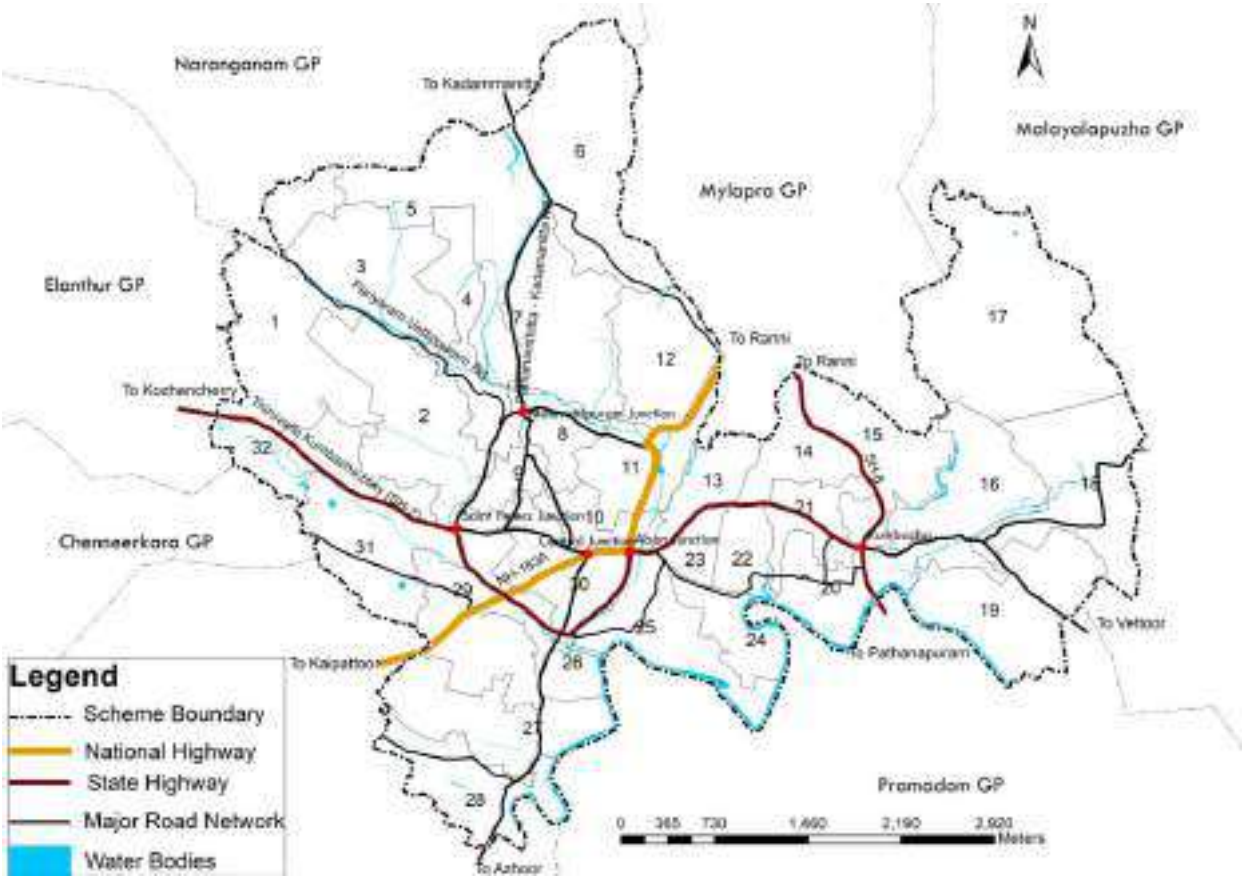


Figure 2.3 Administrative Division (ward wise) map of Pathanamthitta town

At present the town consists of 32 wards, (Figure 2.3) but during the 2011 census, there were only 29 wards. But there is no change in total area of the town.

2.2 Urban Profile of town

Based on Census 2011, the urban population of the district is distributed in three statutory towns and one Census Town. Among the statutory Towns, Thiruvalla with 52883 persons is the most populous town in the district. Pathanamthitta town with 37538 persons is the second while Adoor town takes the third place with 29171 persons. Kozhencherry is the only one Census Town (CT) newly formed in 2011 Census with Population 12021. Thiruvalla is the sole Class II town (population 50,000 to 99,999) in the district in 2001 as well as in 2011. The other towns of district were Class III towns (20,000 to 49,999 population) in 2001 and remained same in 2011 Census.

2.3 Meteorology

Pathanamthitta Town has a tropical humid climate with a hot summer and a fairly assured seasonal rainfall. The town experiences South-West monsoon from June to September, North-East monsoon during October and November, hot season from March to May and cold season from December to February. The average annual rainfall of town is 2604 mm and average humidity is 60%. Konni area receives the highest rainfall and Adoor area receives the lowest. Humidity is higher during the monsoon period that is from June to September. The maximum temperature ranges from 28.5^{0}C to 39^{0}C whereas the minimum temperature from 25.5^{0}C to 22.6^{0}C. Winds are generally light to moderate with acceleration during the monsoon season. In the south-west monsoon the winds are mainly in the west or north-west direction.

2.4 Physiography

Pathanamthitta is a land locked district. Pathanamthitta ranks 7th in the State in area.

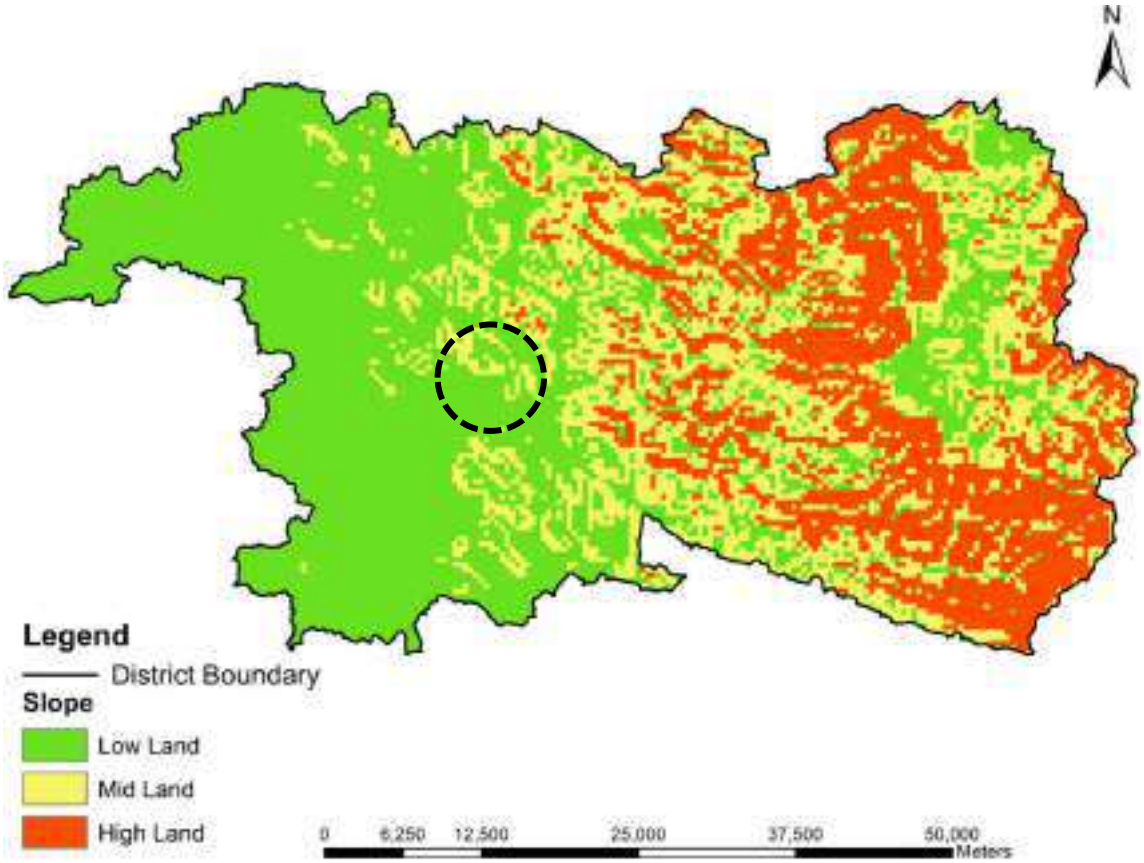


Figure 2.4 Physiography- Pathanamthitta District

Source: District Urbanisation Report-Pathanamthitta 2011

The total area of the district is 2654.99 sq.km of this, 1203.73 sq.km (45.34%) of area come under forest (Figure 2.4). The district, with 6.8 per cent of the total geographical area of the state, accommodates 3.6 per cent of the total population of the state. The details of physiological features are mentioned below.

2.4.1 Geology

Geologically, the district forms part of the Precambrian metamorphic shield comprising:

(i) Charnockite Group, Khondalite Group and Megmatite Complex of Archaean age
(ii) Acid intrusive of Proterozoic age
(iii) Rocks of Cenozoic age (basic intrusive, Neogene and Quaternary).

Figure 2.5 shows the geology of the district and town. Pathanamthitta town and surrounding areas rests on crystalline rocks, which has undergone intense weathering. The main rock types encountered in this area are charnokites and quartzo felspathic geniuses. Exposures of basement rock are prevalent in the elevated parts. In many places crystallites are moderately jointed. It is capped by weathered mantle of laterite and soil.

2.4.2 Geomorphology

Broadly the district is divided into three physiographic zones viz., the coastal plain in the northwest, the midland region and the high hills to the east. The coastal plain is characterized by fluvial landforms, which extend further west to Alappuzha district. The midland region has elevations ranging from 30 to 300m where Pathanamthitta town is located. It is characterized by undulating topography with moderate to gentle slope, intervened by narrow valleys. The majority of the town comes under lower Plateau (Laterite) with Residual mount and Flood plain. The hilly region to the east is relatively wide and occupies a major part of the district. Some of the peaks in the east are more than 1500m high and form part of the Western Ghats. (Figure 2.6)

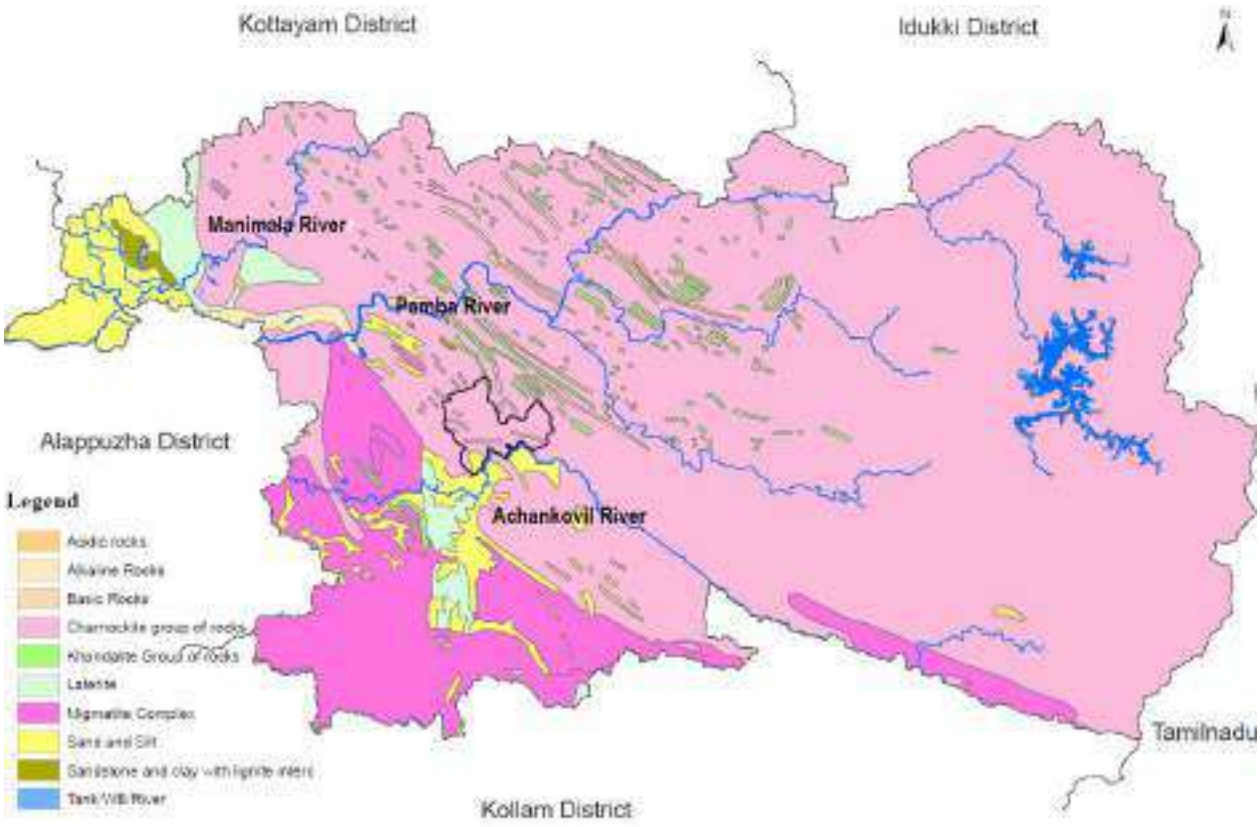


Figure 2.5 Geology - District and Pathanamthitta town

Source: Kerala State Land use Board

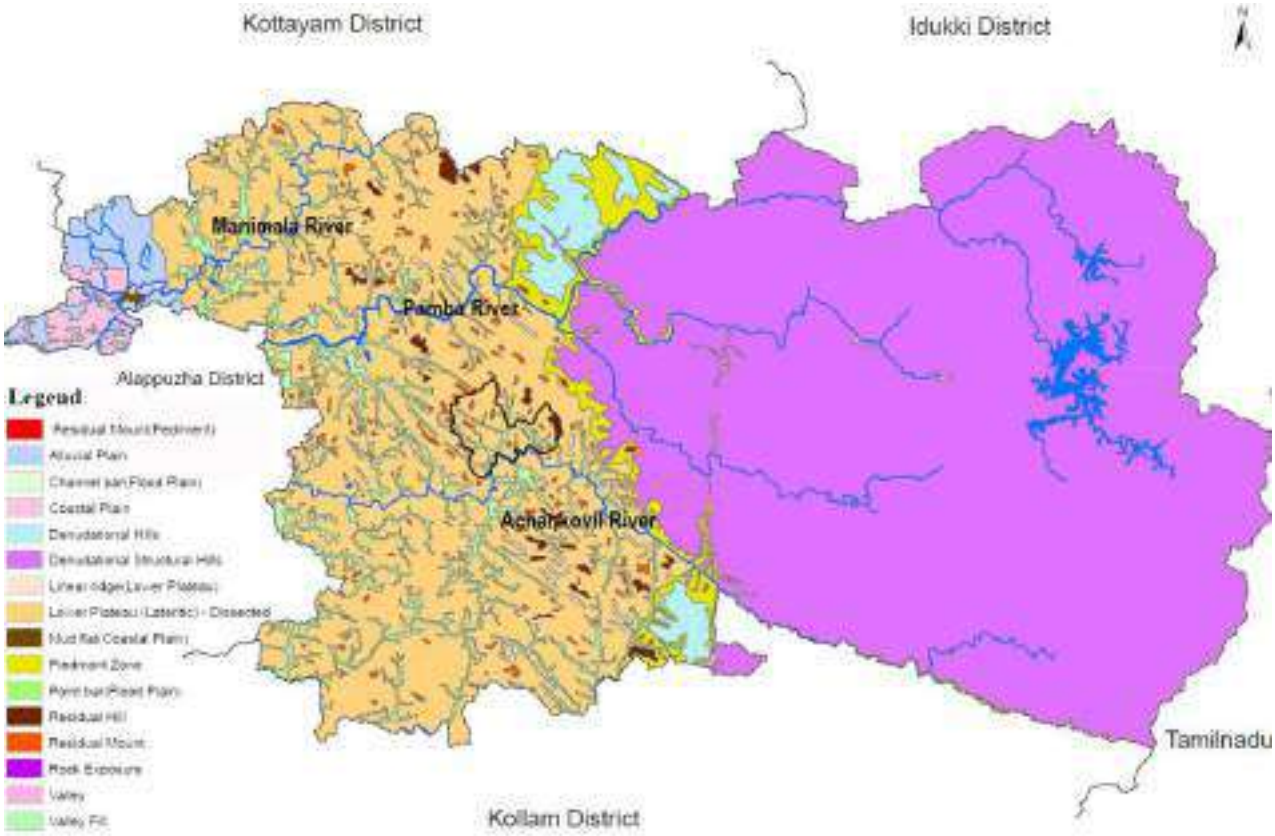


Figure 2.6 Geomorphology - District and Pathanamthitta town

Source: Kerala State Land use Board

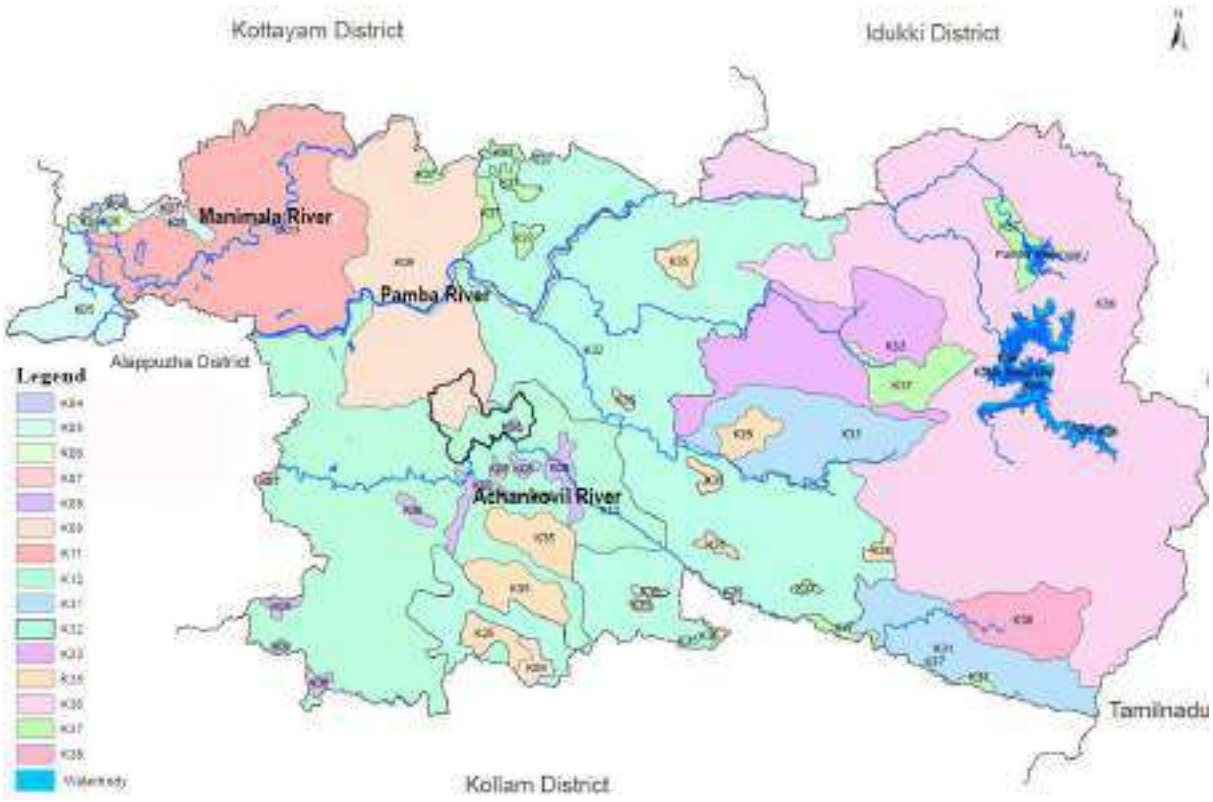


Figure 2.7 Soil type -District and Pathanamthitta town

Source: Kerala State Land use Board

2.4.3 Soil Conditions

Based on morphology, physical and chemical properties, the soils of the district are classified as Forest Loam, Lateritic, Brown hydromorphic, Riverine alluvium and Greyish Onattukara soils. Forest loam is the product of weathering of the country rock under forest cover. Forest loamy soil is encountered in the eastern parts of the district, in major parts of Ranni and Konni blocks. Lateritic soil is the most widely occurring soil type in the district. This soil is the product of lateralization of the crystallines and sedimentaries under humid tropical conditions. Brown hydromorphic soil occurs mostly in valley portions in the midland area of the district. The soil is formed as a result of transportation and deposition of material from the adjoining hill slopes under impeded drainage conditions. Riverine alluvium occurs mostly along the banks of rivers and their tributaries. Greyish Onattukara soil is having very limited occurrence in the district (Figure 2.7)

2.4.4 Drainage

The district is drained mainly by two rivers viz. Pamba and Kallada. The major tributaries of the Pamba River are Achankovil, Manimala, Kakki, Arudai, Kakkad and the Kallar that drains through major part of the district. The small portion of Kallada River flows through the southern border of the district. Pamba and Achankovil rivers together drain more than 70% of the total area of Pathanamthitta. Figure 2.8 shows the location of Pathanamthitta town in the district drainage map. The River Achankovil forms the southern boundary of Pathanamthitta town.

2.4.5 Topography

The town has an undulated terrain with lots of hills and rocks. It is one of the main hurdles in development of the area. The ground level varies from 15 m to 180 m above the mean sea level (MSL) (Figure 2.9). The general slope and the consequent flow of drainage water is mainly tend towards the Achankovil River.

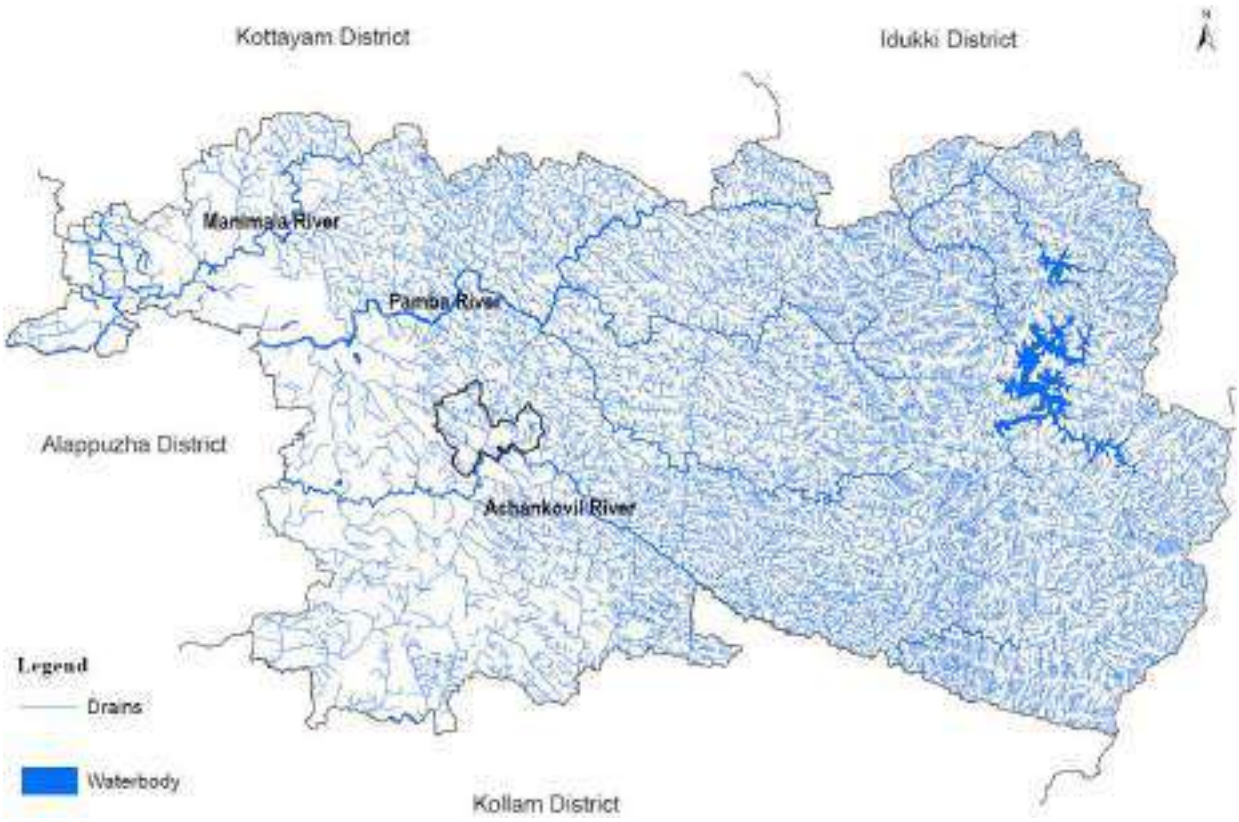


Figure 2.8 Drainage -District and Pathanamthitta town

Source: Kerala State Land use Board

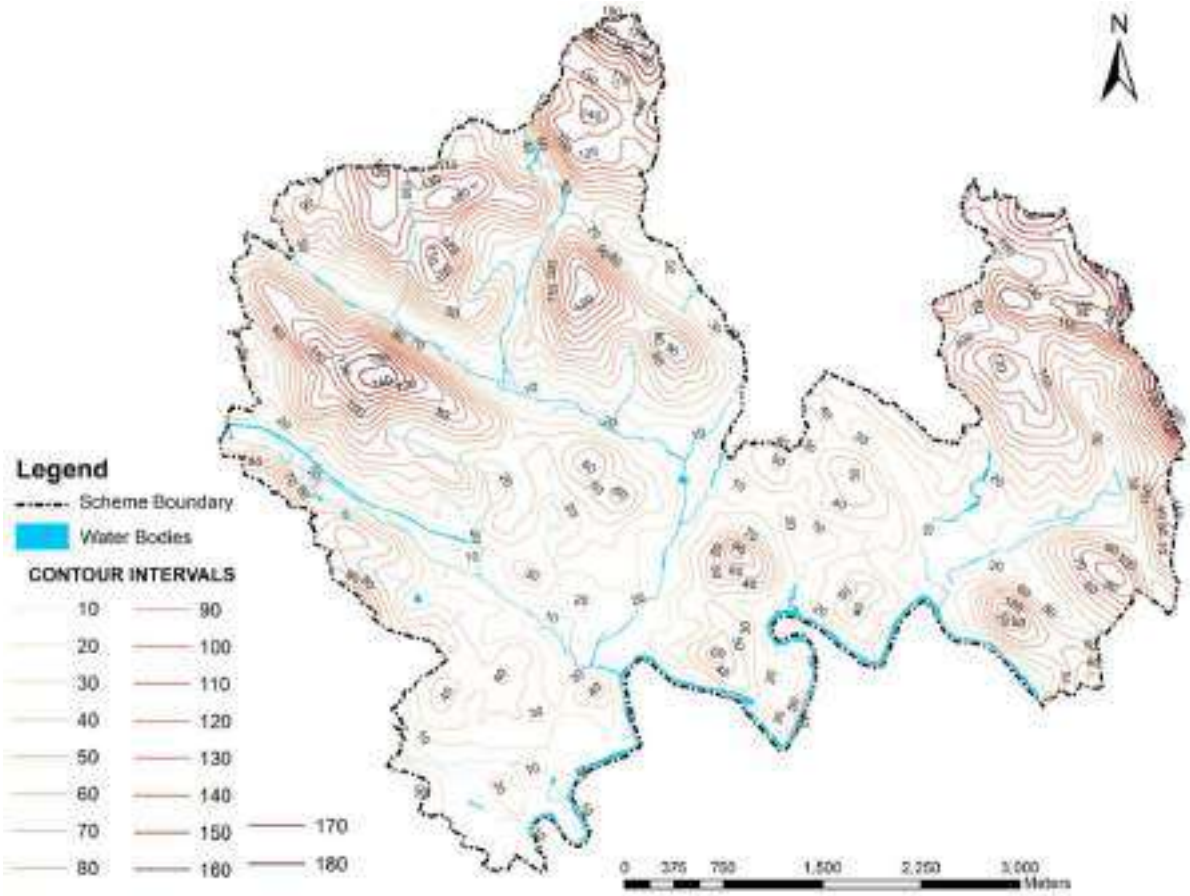


Figure 2.9 Contour Map of Pathanamthitta town

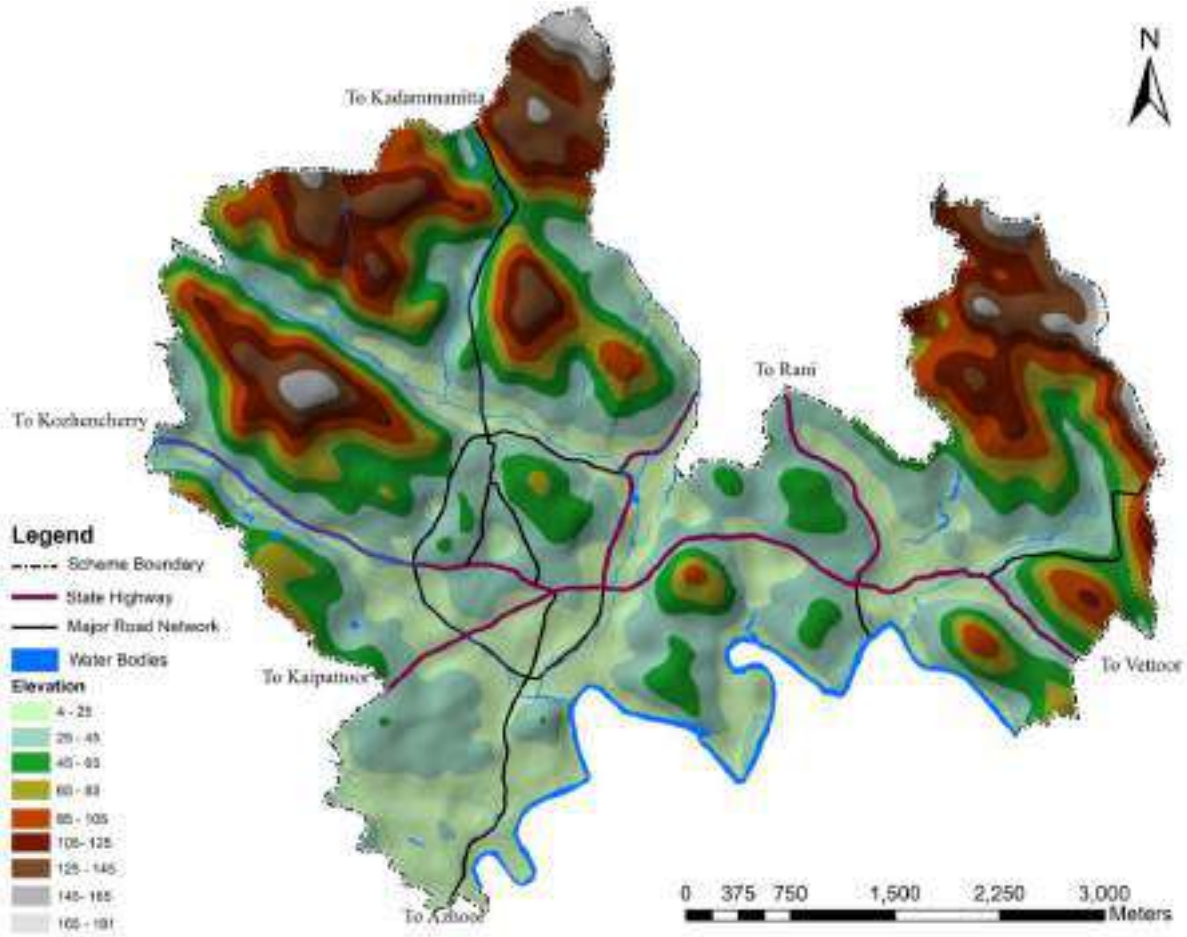


Figure 2.10 Topography of Pathanamthitta town

There are numerous rivulets, which drain water from the northern uplands to Achankovil River (Figure 2.10). The urban development has been taken mainly in the low-lying area of the town between hills.

2.4.6 Groundwater scenario

On the basis of groundwater potential, the district is divisible into five zones: They are from east to west

(i) Coastal alluvium: suitable for medium type tube wells, yield is up to 2 lps, occasionally the water is brackish;

(ii) Midland: this area is underlain by thick laterite; it is suitable for dug wells; however, bore wells are feasible along fractures, the yield up to 3 lps;

(iii) Area underlain by thin laterite/weathered zone: good for open wells, bore wells are feasible along fracture planes;

(iv) Foothills and highly undulating terrain; valleys can sustain domestic wells; fractures are potential but they are site specific.

(v) Mountainous area: it is generally unsuitable for water development. Valleys where thick alluvium is seen can sustain dug wells for domestic use.

Ground water availability depends on the water table conditions in the laterite and under lying lithomarge layers of the area. Most of the wells in the low-lying areas of the Pathanamthitta town are perennial and maintains a water column of 1-3 m even during acute summer. The depth range of these wells is 6-12 m except in hilly areas.

2.5 Inference

Pathanamthitta town is situated almost at the heart of Pathanamthitta district. It is the headquarters of the district. The town possess a total area of 23.43 Sq.Kms which is 0.89 % of the total area of the district. The River Achancovil forms the southern boundary of Pathanamthitta town. The area covered by the town itself is an undulating & plain terrain characterized by broken topography. These includes rocky hills, vacant land, low lying areas. Some hilly areas are rubber plantation and others are rocky structure. There is probability of occurring landsl ide due to plantation on hill side. Considering the topography, adequate land for urban development is available in the town. Moderate climate is experiencing in the town. Considering the diversity in the soil type, suitable area for different agricultural activities is available in the town.



3. REGIONAL LINKAGES

Regional linkages play a crucial role in development of social and economic conditions of a town. A town with good regional connectivity to surrounding towns and cities have very much potential for economic generation and job creation. Physical accessibility of a town is generally determined based on the connectivity and linkages by road, rail, air and sea. A unique topography of Kerala limit the connectivity of Pathanamthitta town to other settlements of the region by roads only.

The extensive regional setting study of Pathanamthitta district has been carried out and the study was documented as District Urbanization Report (DUR) of Pathanamthitta 2011. The District Urbanisation report defines the spatial structure of the district which is arrived by integration of hierarchy of urban and rural settlements, function of settlements and the connectivity between settlements. This chapter look into the regional linkages of various elements of Pathanamthitta town with surrounding region.

Contents

1 Regional Connectivity

2 Regional Setting

3 Adjacent Settlement of the Town

4 Influence area of the Town

5 Facilities & Resource of the region

6 Urban Corridor

7 Inference

3.1 Regional Connectivity

Pathanamthitta district is bounded by Kottayam and Idukki District in the North, Alappuzha district in the West, Kollam district in the South and Western Ghats bordering Tamil Nadu State in the East. Pathanamthitta district is connected to other places in Kerala by roadways and railways. Pathanamthitta town is the headquarters of the district having a good connectivity to neighbouring districts and major cities through roads only at a connecting distance of 110 km to Thiruvananthapuram and 130 km to Kochi. Figure 3.1 shows the regional connectivity of Pathanamthitta town.



Figure 3.1 Regional connectivity of Pathanamthitta town

The National Highway NH 183 (from Kollam towards Kottayam) & NH 183A (from Chavara Kollam District, to Vandiperiyar via Adoor and Pathanamthitta) and the State Highway Main Central Road (MC Road- SH-1), Kayamkulam – Adoor - Punalur Road (SH-5), Thiruvalla - Kayamkulam Road (SH-6), Thiruvalla - Kumbazha Road (SH-7), Kozhenchery (Pullad) – Kottayam Road (SH-9), Kozhenchery (Thekkemala)-Chengannur Mavelikkara Road (SH-10), Nedumpuram (Podiyadi)- Edathva-Alappuzha (SH-12), Muvattupuzha- Punalur (SH-8) and Adoor - Sasthamkotta (SH-37) are passing through this district. Multiple buses, including private and Kerala State Road Transport Corporation (KSRTC) buses, are available to connect Pathanamthitta town to surrounding places through public mode of transportation. There are interstate buses that travel to Bangalore, Coimbatore, Chennai and Mumbai. The main Bus Stations around Pathanamthitta town are Adoor, Mallappally, Pandalam and Thiruvalla. Figure 3.2 shows the regional road connectivity of the town.

The National Highway 183A and State Highway 7 & 8 passes through Pathanamthitta town. Town is also well connected by district roads to nearby places. But there are no rail, Air, water way mode of transportation in the town to connect nearby places.

Rail connectivity within the district is poor since Thiruvalla railway station (North West part of the district) is the only railway station in this district. However train services from Thiruvalla connect to most major cities across the country. But major share of people use Chengannur railway station (Western side of the district) in Alappuzha district, which is nearer to most of the places in this district and also Chengannur acts as gate way of Sabarimala Pilgrims from other states.

There is no airport in Pathanamthitta. The nearest airport is the Thiruvananthapuram International Airport at a distance of 113 kms. The Cochin International Airport is at a distance of 142 kms from Pathanamthitta. Plans have been put forward for a new airport in Cheruvally, area, Erumeli which is just 27 km from the Pathanamthitta town. There is no waterway mode of transportation in the district.

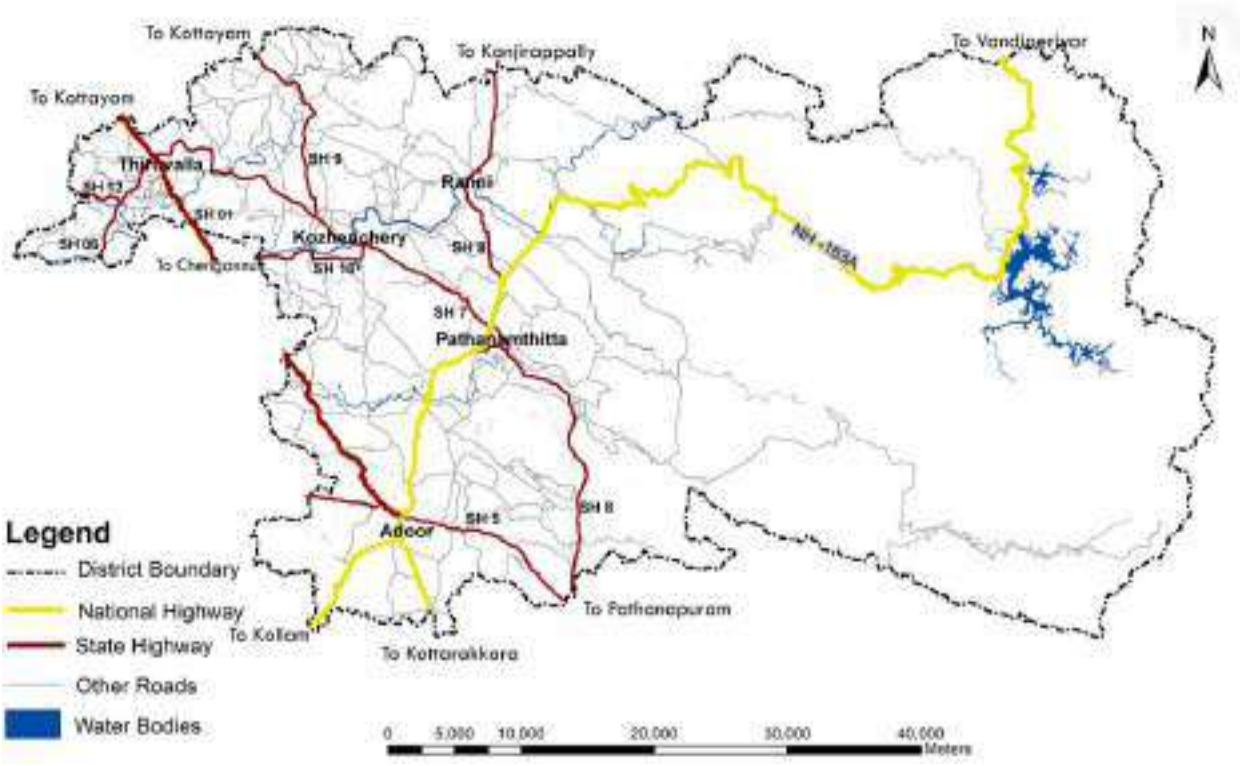


Figure 3.2 Road Connectivity - Pathanamthitta District



Figure 3.3 Regional connectivity - Pathanamthitta town

Source: Generated from google map

The regional road network, settlements, different pilgrimage tourist spots and other major tourist spots within 15km, 30km and 45km radius of Pathanamthitta town are shown in Figure 3.3. Adoor, Thiruvalla, Chengannur, Ranni, Mavelikkara and Pathanapuram falls

within 20 km radius and Punalur, Kottarakkara and Kanjirappally falls within 30 km radius of Pathanamthitta town. Famous Sabarimala temple fall within 40Km radius of Pathanamthitta town. A tourism-based development through better tourism circuit both in terms of pilgrimage and recreational tourism has greater potential in the regional context of Pathanamthitta town.

3.2 Regional Setting

The spatial structure of a region will act as a framework for the orderly development of urban centres and their rural areas subsequently leading to a planned urbanisation. The existing and future spatial structure of the region including Pathanamthitta town, which is formulated by integrating hierarchy of nodes, activity pattern of urban & rural settlements and the connectivity between them has been delineated in District Urbanization Report 2011.

3.2.1 Activity Pattern

The concentration pattern of land uses gives an idea about where that particular land use is concentrated within the District. In order to evolve the activity pattern of LSGIs, nine categories of land uses of District is grouped into 4 categories which are Non-agricultural (Urban), Agricultural, Forest and Plantation. The Local Self Government (LSGIs) wise concentration index of these major land use categories- Urban land use, Agriculture, Forest and Plantation is identified. Based on this, activity of the each LSGIs in the District has been identified. Most of the plantation activities are concentrated on the highland region of the district. The urban activity is confined to one settlement which is Thiruvalla. The agricultural activities are predominantly concentrated in the midland and lowland regions of the district. The Activity Pattern of Pathanamthitta town is identified as Agriculture (Figure 3.4).

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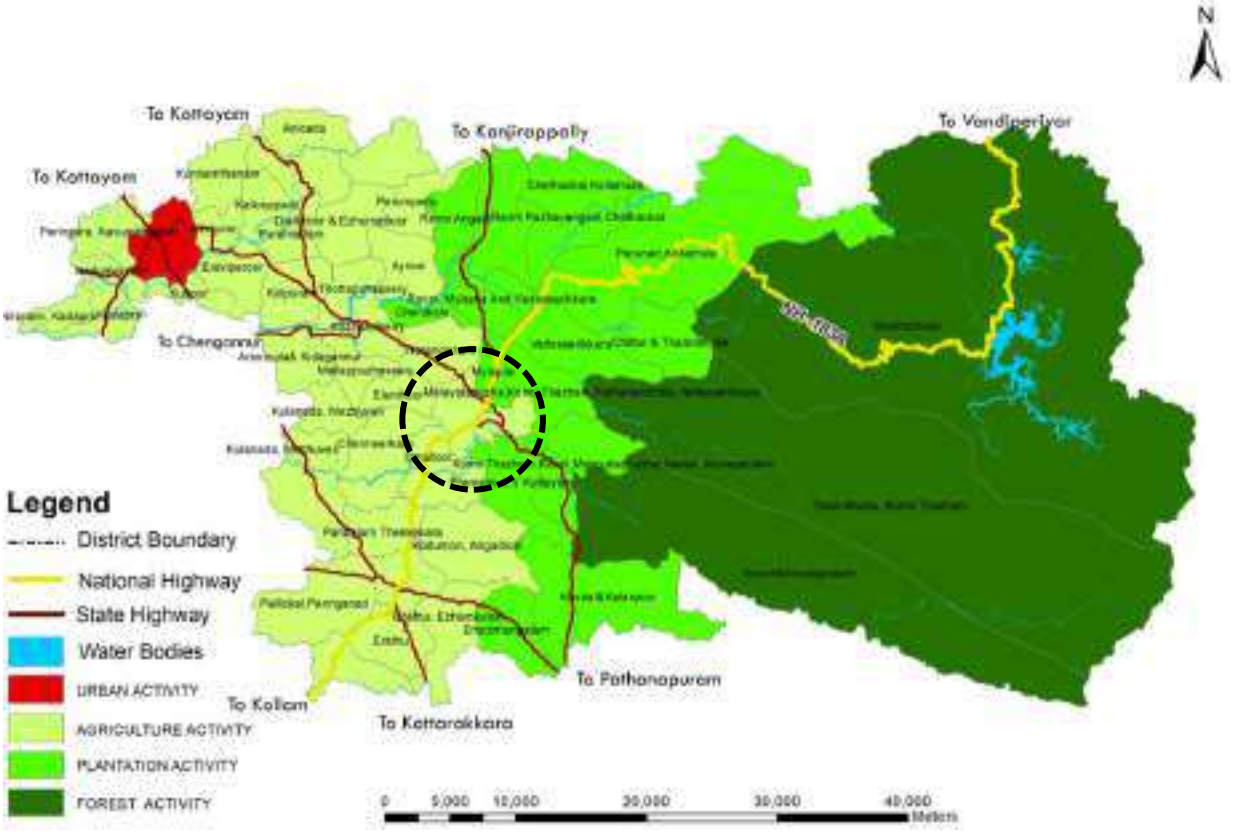

Figure 3.4 LSGIs wise Activity Pattern of the district

Source: District Urbanisation Report Pathanamthitta 2011

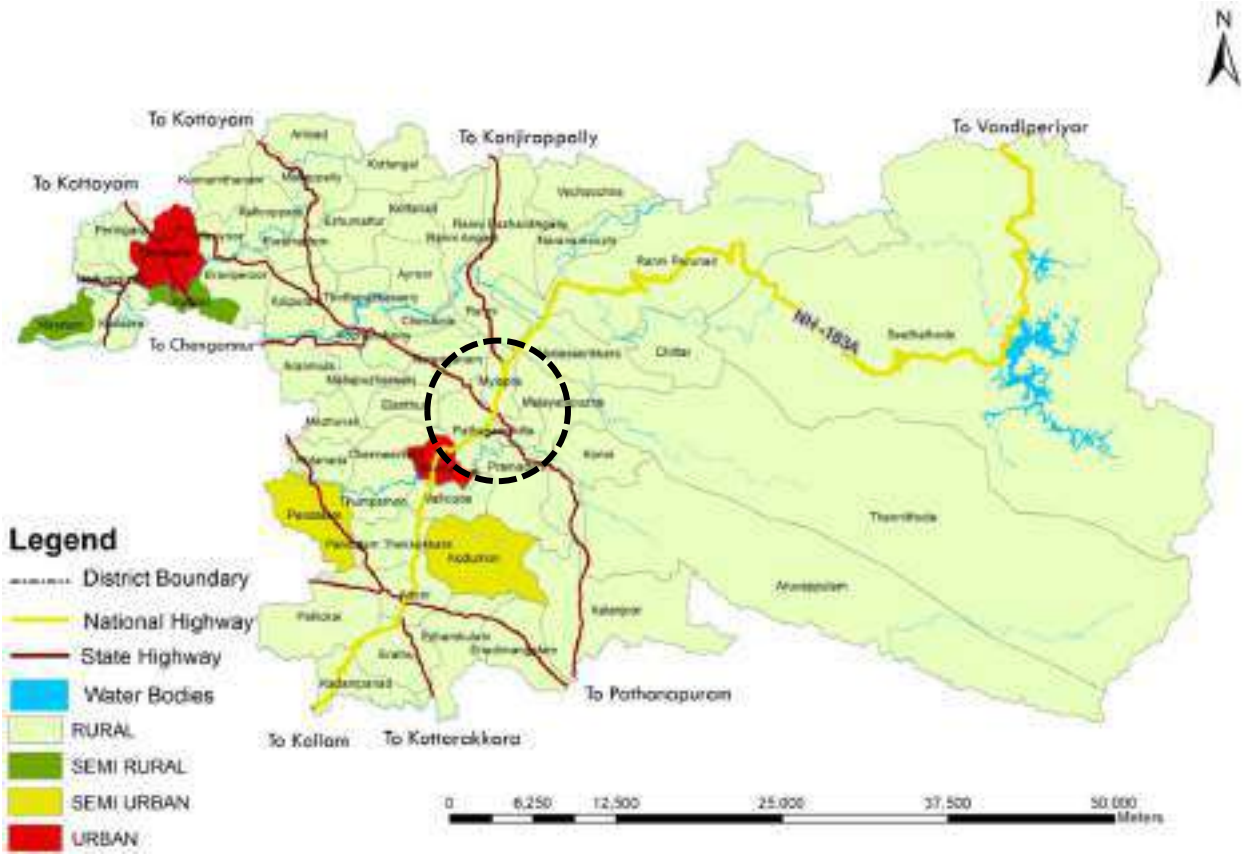

Figure 3.5 LSGIs wise functional Character of settlement in the district

Source: District Urbanisation Report Pathanamthitta 2011

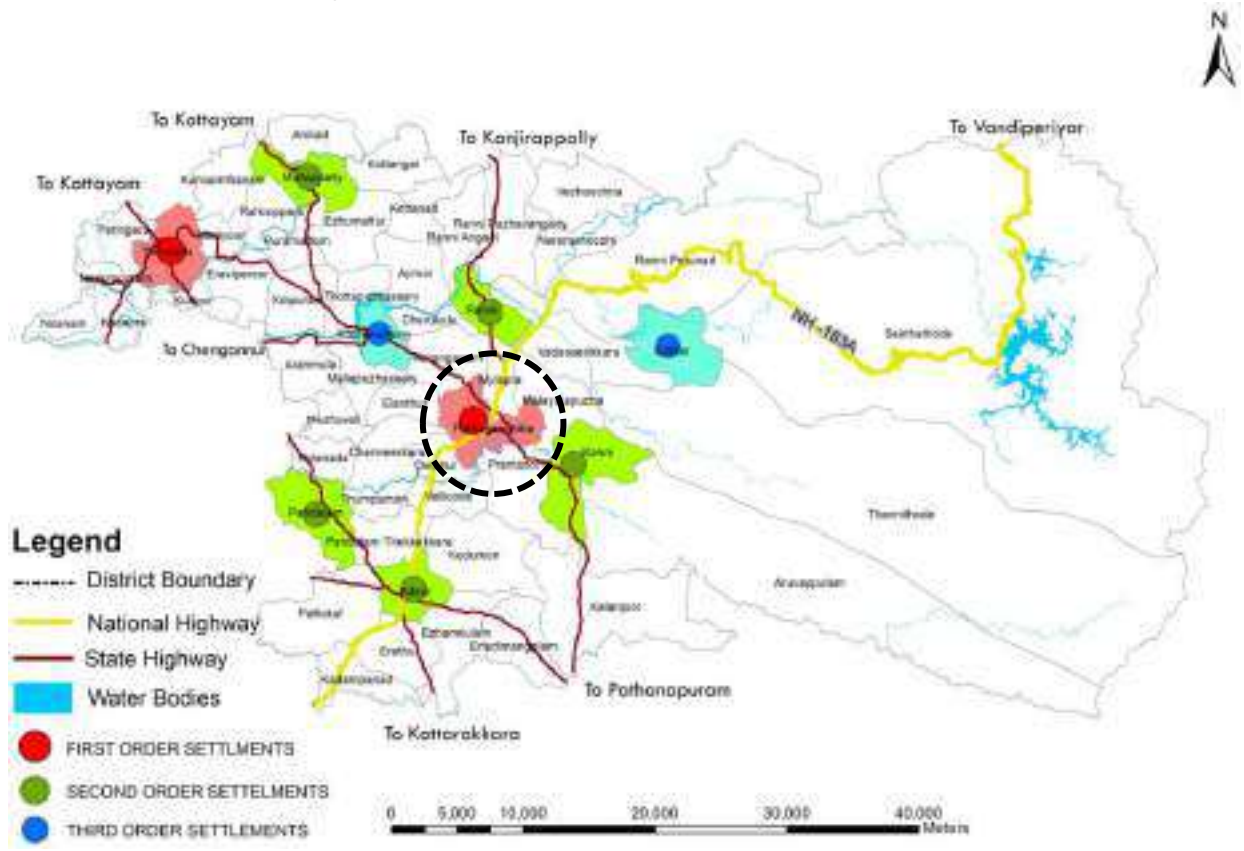

Figure 3.6 Proposed hierarchy of settlements in Pathanamthitta District

Source: District Urbanisation Report Pathanamthitta 2011

3.2.2 Functional Character of Settlements

Determination of the functional character of an area is essential to find out the desirable function of an area, be it urban or non-urban. The urban-rural continuum in Kerala makes it difficult to delineate an area as urban or rural. So the functional character of an area may be urban, rural, semi urban or semi-rural in the Kerala context.

Only two settlements in the district, Thiruvalla and Omallur has urban character. Pandalam municipality and Kodumon Grama Panchayat come under the category Semi urban and Niranam and Kuttur come under Semi rural category. These six semi-rural character settlements of the district are in the western part of the district. Majority of the settlements in the district –51 out of 57 are with rural character. The two urban local bodies of the district- Pathanamthitta and Adoor come under the classification as rural (Figure 3.5).

3.2.3 Hierarchy of Settlements

LSGIs wise hierarchy of settlements in the district has been found out based on the number and orders of facilities available in the settlements. Facilities like Educational, Health, Market, Agriculture and allied sector, Physical infrastructure, Transportation available in the settlements has been considered for identifying the hierarchy. Based on this, order of the settlement of the district in 2011 is identified. The first order settlement, viz, Thiruvalla municipality is located in the North West corner of the district. The second order settlements are located towards the centre of the habituated area of the district which are also along the two major State Highways of the district, M.C.Road and Thiruvalla Kumbazha Road.

The third order settlements are almost equally distributed in the entire area of the district except in the southern tip, where there is a concentration of three third order settlements adjacent to the Adoor second order settlement.

Thiruvalla performs the higher order functions of the district even though Pathanamthitta is administrative headquarters of the district. Considering the prominent role to act as the administrative headquarters of the district and potential for commercial facilities. Pathanamthitta and Thiruvalla are the first order settlements of the district. (Figure 3.6) The service area of both the first order settlements spreads over the entire district.

Pathanamthitta town is a proposed first order settlement for the year 2031 with major land use concentration is agriculture and rural functional character.

3.3 Adjacent settlements of the Town

Pathanamthitta town is surrounded by seven grama panchayats. All the surrounding settlements are showing predominantly Non-urban profile (Table 3.1). But certain wards of the neighbouring local governments outside the municipal limit exhibits a continuum of physical development with the character of Pathanamthitta town.

Table 3.1 Character of adjacent settlement of Pathanamthitta town

Name of Settlements	Urban Profile	Functional Character	Land use concentration
Naranganam	Non-Urban	Rural	Plantation
Mylapra	Non-Urban	Rural	Plantation
Elanthoor	Non-Urban	Rural	Plantation
Malayalappuzha	Non-Urban	Rural	Plantation
Pramadom	Non-Urban	Rural	Plantation
Omallur	Non-Urban	Urban	Agriculture
Chenneerkkara	Non-Urban	Rural	Agriculture

Source: District Urbanisation Report Pathanamthitta, 2011

3.4 Influence Area of the Town

Pathanamthitta influences surrounding Grama Panchayats in many ways.

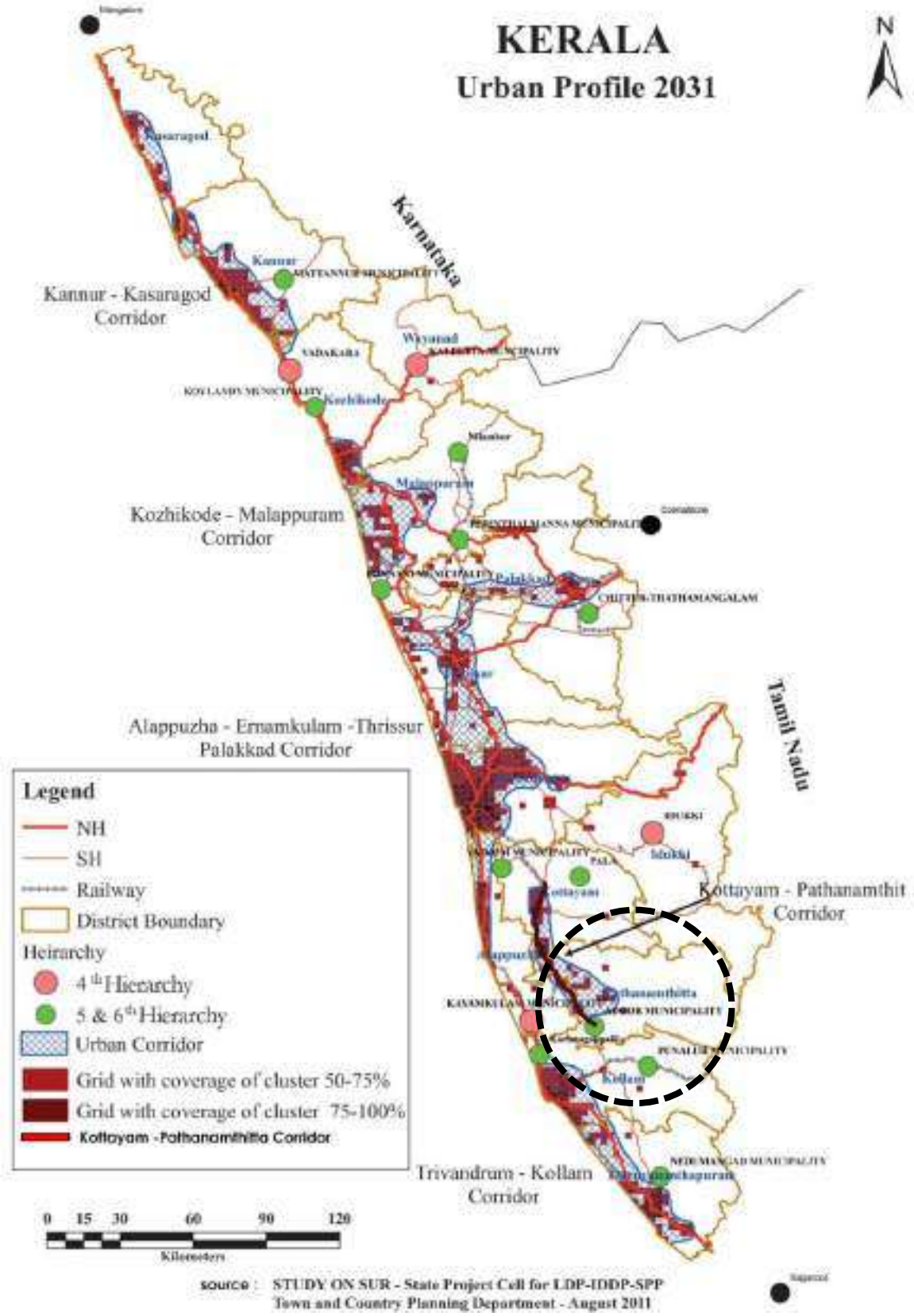

Figure 3.7 Identifed Kottayam- Pathanamthitta Urban Corridor

Source: State Urbanisation Report 2011, Kerala.

Being the headquarters of Pathanamthitta district, the town attracts the whole district population for their administrative needs. Most of the district level Government offices are functioning in the town. The people of surrounding Grama Panchayats depend Pathanamthitta for various services.

The town acts as a transportation node due to availability of KSRTC and Private Bus services to different destinations. Pathanamthitta act as a major node of transport facilities for the population in the eastern hilly areas of the district. This attracts people to Pathanamthitta town for their travel needs. The institutions in the town attracts students from the surrounding areas and even from other districts to Pathanamthitta for higher education. General Hospital, Ayurvedic Hospital, Veterinary hospital and many major hospitals in private sector are available in Pathanamthitta town. The residents of the surrounding area rely on Pathanamthitta town for their medical needs. Being a major base station of Sabarimala, the town also attracts a large number of pilgrims to this place especially during the Mandalakalam and Makara Vilakku festival of Sabarimala. Considering the above aspects, and being the district headquarters, the entire Pathanamthitta district is to be considered as the influence area of the town.

The connectivity proposals like Sabari Rail (Angamaly to Erumeli), Sabari Elevated Rail (Pamba to Chengannur), Green field Highway (Thiruvananthapuram to Angamaly passing through Konni and Ranni taluks of Pathanamthitta district), NH 183 A re alignment (passing through Pathanamthitta town) Sabarimala Airport at Cheruvally Estate etc. will highly influence the future development of the town.

3.5 Facilities & Resources of the Region

Facilities are almost distributed in all constituent LSGIs with more concentration in Pathanamthitta town. Facilities like Primary Health Centre, Ayurvedic and Homeo medical centers and educational facilities like L.P.School, U.P.School, and High School etc. are available in all constituent LSGIs of the region. Markets and banking facilities are also available.

Most of the higher order facilities are available in Pathanamthitta town. Being the administrative headquarters of the district, the town have more dependency of entire district. But higher order facilities are more in Thiruvalla town in the district. The resources mainly available in the region are the Agro based products. Huge deposit of good quality granite is also available in the area. Forest products are available in plenty in the local bodies in eastern part of the district.

3.6 Urban Corridor

The Urban profile of Kerala State in 2031 has been identified in State Urbanisation Report 2012. Five urban corridors are delineated in urban profile of Kerala and Kottayam Cluster (Kottayam-Pathanamthitta urban corridor) is one of the identified urban corridor with urban centres of Pathanamthitta and Kottayam Districts. Physical development as well as proximity of urban clusters and other urban areas are taken in to account while delineating the urban corridors. Pathanamthitta Town comes under this urban corridor. Thus, the Pathanamthitta town has a potential for Kerala's future urban environment. Figure 3.7 shows the Kottayam - Pathanamthitta urban corridor in urban profile of Kerala 2031.

3.7 Inference

In the regional context of the district, Pathanamthitta is proposed as a First order settlement. Combination of Agriculture, Plantation and tertiary activity has been identified as the activity of Pathanamthitta town. Entire Pathanamthitta district is treated as the influence area of

Pathanamthitta town and most of the constituent local bodies of the district have significant dependency on Pathanamthitta town. Pathanamthitta town is well connected by district roads. But there is no rail, Air, water way mode of transportation in the town. The regional connectivity proposals like Sabari Rail (Angamaly to Erumeli), Sabari Elevated Rail (Pumba to Chengannur), Green field Highway (Thiruvananthapuram to Angamaly passing through Konni and Ranni taluks of Pathanamthitta district), NH 183A re-alignment (passing through Pathanamthitta town) Sabarimala Greenfield Airport at Cheruvally Estate will highly influence the future development of the town. For administrative facilities LSGs depend more on Pathanamthitta town along with Thiruvalla. The economy of the region is agriculture oriented and primary sector activity is the character of the region. The agro based and forest products are the major resources of the region and the level of industrialization is very low.



4.HAZARD PROFILE & CLIMATE CHANGE

In the background of the recurring disasters and changing climate impacts, Government of Kerala have decided to instil resilience through strengthening of transversal system and Risk Informed Urban Planning was identified as one among the various sectors for systemic improvement. In this context 'Guideline for the preparation of risk informed master plan' was notified in Kerala.

The most important aspect in developing a risk informed master plan is assessing the risks and hazards involved in the area of concern. The content of this chapter includes understanding the types of hazards and climate changes that are impacted in the State, Pathanamthitta District and Town. Also determining the current hazard profile and the areas that are impacted in Pathanamthitta town and assessing its risk. This chapter will act as a guide while contemplating the risk informed planning of Pathanamthitta town.

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2 District Profile

3 Town Profile

4 Past Disaster Events

5 Climate Change Impacts

6 Risk Assessment

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8 Existing Disaster Response System

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4.1 Kerala Profile

Kerala State, nestled in the South-Western tip of India, showcases a unique hazard vulnerability profile owing to its diverse geographical features and climatic patterns. Blessed with lush greenery, expansive coastlines, and towering Western Ghats, Kerala is prone to a myriad of hazards ranging from floods and landslides to cyclones and tsunamis. The State's monsoon season, characterized by heavy rainfall, often leads to devastating floods, exacerbating vulnerabilities in its densely populated regions. Additionally, Kerala's unique socio-economic fabric, with a significant population dependent on agriculture and tourism, amplifies the impacts of these hazards, making comprehensive risk management strategies imperative for resilience and sustainable development in the region.

Kerala is a multi-hazard prone state. As per Kerala State Disaster Management Plan (KDSMP) 2016 report, KSDMP identifies thirty nine (39) phenomena with potential to cause disasters requiring L2 level attention (the disaster situations that require assistance and active mobilization of resources at the state level and deployment of state level agencies for disaster management. The central agencies must remain vigilant for immediate deployment if required by the state). All of these hazards are generally not turn into disasters unless it affects the life, property and environment in a community.

The State is frequently damaged by hazard events of coastal erosion, lightning, landslides, floods, drought and petro-chemical transportation related accidents. Other relatively less frequent but significant phenomenon capable of causing disastrous consequences are windfall of trees, earthquakes, intense rainfall, pest attack, forest fire etc. Figure 4.1 shows the Hazard Seasonality Matrix of Kerala State. Figure 4.2 shows the multi hazard zonation map of Kerala.

Disaster Risk of Kerala at glance:

8th most densely populated State in the country. 14.5% of the State is flood prone. 14.4% of the State is landslide prone. 55.5% of the coastline prone to coastal hazards. The State falls in Zone 3 in the national seismic zonation map. About 70 people die of lightning every year. 65 out of 10,000 vehicles prone to accidents in the State (National Average is 42.3/10,000). Variability of weather patterns due to global warming is evident in the State.



Figure 4.1 Hazard Seasonality Matrix of Kerala

Source: Kerala State Disaster Management Plan 2016.

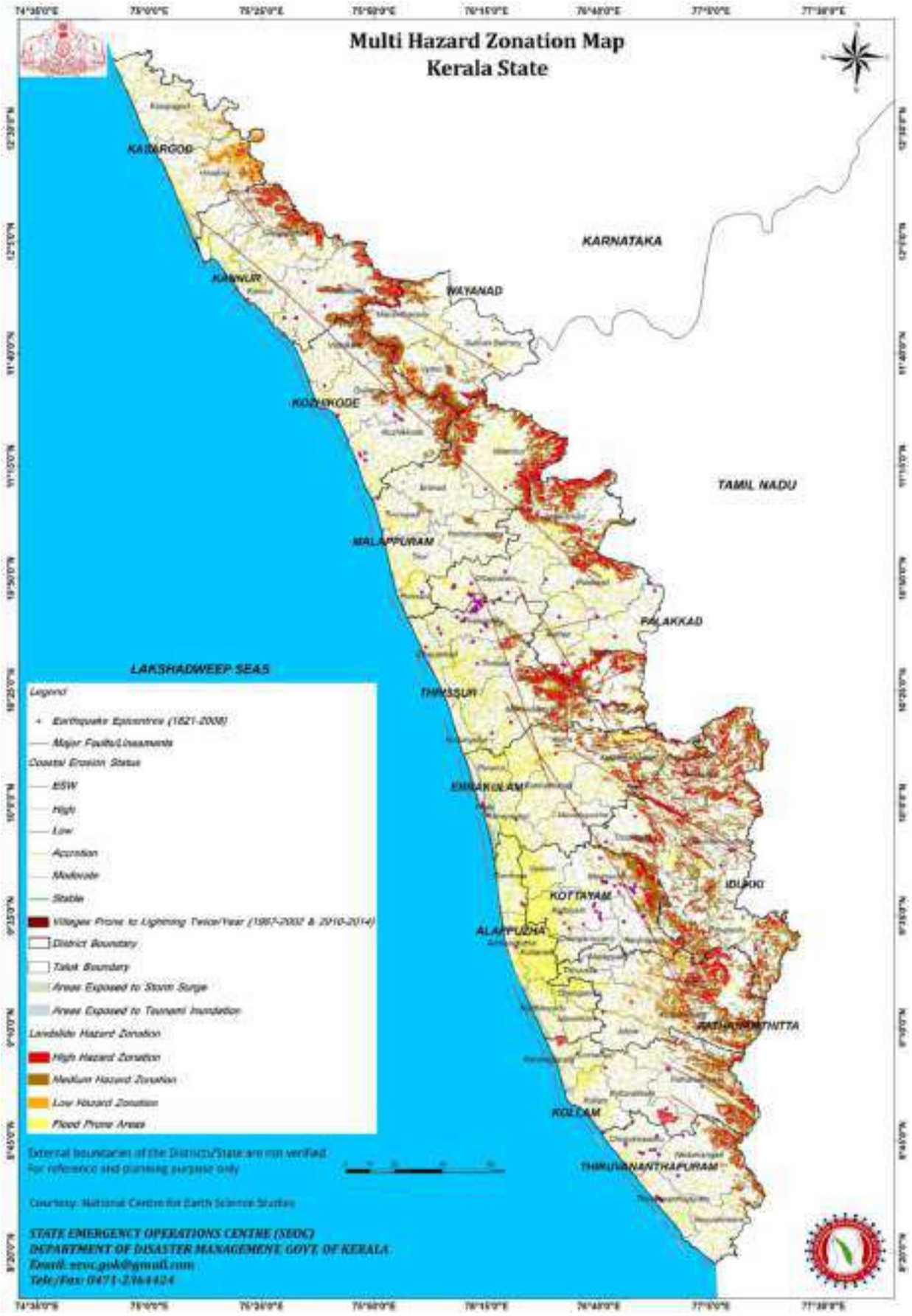


Figure 4.2 Multiple Hazard Zonation Map of Kerala

Source: KSDMA

4.1.1 Kerala State Disaster Management Plan (KSDMP)

The Kerala State Disaster Management Plan is an ever-evolving document formulated under the Disaster Management Act, 2005 (DM Act, 2005) which establishes a multi-stakeholder framework for the partnership of governmental entities, non-government agencies, private sector enterprises and individuals for Disaster Risk Reduction in the State.

KSDMP (2016) is a comprehensive framework aimed at enhancing the state's preparedness and response to various disasters. The plan outlines strategies for effective disaster risk reduction, incorporating hazard identification, vulnerability assessment, and risk analysis. It emphasizes the importance of a multi-hazard approach, addressing natural and man-made disasters such as floods, cyclones, earthquakes, landslides, and industrial accidents. The KSDMP focuses on integrating disaster management into development planning, promoting community-based disaster risk management, and strengthening institutional mechanisms at all levels. It includes detailed guidelines for preparedness, mitigation, response, and recovery activities, ensuring a coordinated and efficient approach to disaster management.

Key components of the KSDMP include the Hazard Vulnerability and Risk Assessment (HVRA) of the state along with the preparedness, mitigation, response and relief strategies. The plan also highlights the importance of capacity building, public awareness, and education to foster a culture of safety and resilience. It stresses the need for robust communication systems, early warning mechanisms, and efficient resource mobilization during emergencies. Additionally, the KSDMP outlines financial arrangements for disaster management activities and emphasizes the significance of regular monitoring, evaluation, and updating of the plan to adapt to changing circumstances and incorporate lessons learned from past experiences.

4.1.2 Kerala State Action Plan on Climate Change (SAPCC)

The Kerala State Action Plan on Climate Change (SAPCC) outlines several long-term impacts of climate change on the State including sea level rise, extreme weather events, rising temperatures, changes in precipitation patterns & threats to water resource, biodiversity Loss agriculture & food security, health risk, coastal erosion, flooding, saltwater intrusion and economic impact including damage to infrastructure and loss of livelihoods etc.

While rising temperature and extrema rainfall affect agriculture and increase health risk. Biodiversity loss and economic disruption particularly in tourism and farming are also key concern. To address these challenges, the SAPCC promotes mitigation through emission reduction and renewable energy, adaptation through resilient infrastructure, disaster preparedness, natural resource conservation and climate smart agriculture, emphasizing the need for coordinated action among government, communities and stakeholders.

4.2 Pathanamthitta District Profile

KSDMA has prepared Pathanamthitta District Disaster Management Plan (DDMP) in 2015. The multi hazard zonation map (Figure 4.3) of each natural hazard has been taken from DDMP for understanding. The district is prone to six type of natural hazards called floods, landslides, lightning, drought, earth quake & Heat waves. The intensity of each of these hazards varies from low to high. The flood is the major natural disaster of the district affecting the major towns of the district. Pamba, Achankovil, Manimala, Kakki, Arudai, Kakkad and the Kallar rivers drains through major part of the district. Pamba and Achankovil rivers together drain more than 70% of the total area of Pathanamthitta and western part of the district come under the flood prone area.

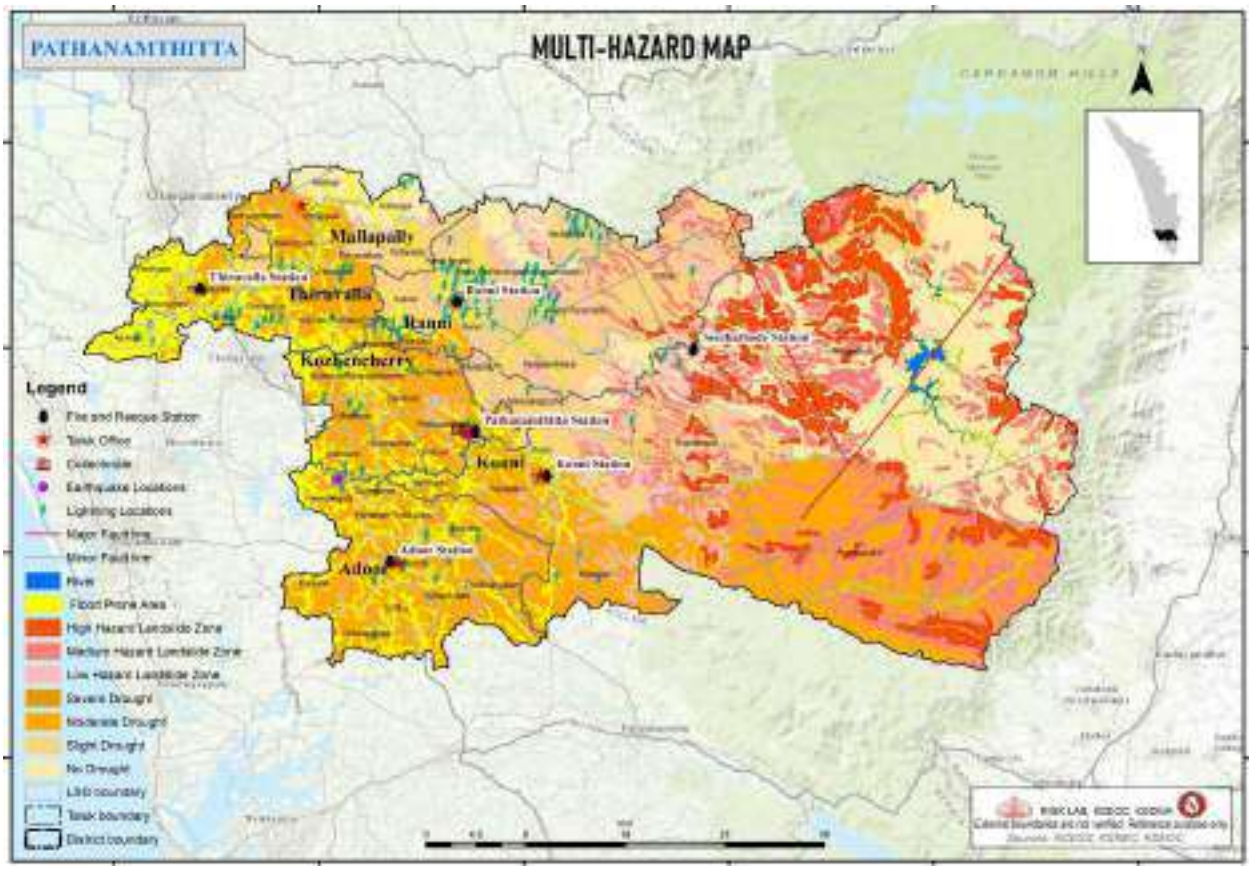


Figure 4.3 Multi hazard zonation map of Pathanamthitta District

Source: KSDMA

Eastern part of the district shows the land slide vulnerable areas. Almost half the district is prone to moderate intensity drought area. The lighting and earth quake is comparatively vulnerable by low intensities. Floods, landslides (debris flows), heat related disasters and lightning are the most commonly occurring natural disasters. Drought and minor earth tremors also occur occasionally.

4.2.1 Past Disasters in the District

Pathanamthitta district, situated in the southern part of Kerala, has a history marked by various disasters, both natural and man-made. One of the most notable disasters in recent memory was the devastating floods of August 2018, triggered by unprecedented rainfall during the monsoon season. The floods wreaked havoc across the district, causing widespread destruction of property, infrastructure, and agricultural land. Hundreds lost their lives, and thousands were displaced, requiring massive relief and rehabilitation efforts. Apart from floods, Pathanamthitta has also experienced landslides, particularly in its hilly terrains, posing significant risks to residents and infrastructure. The district's proximity to the Western Ghats renders it susceptible to such events, especially during periods of heavy rainfall. In addition to natural disasters, Pathanamthitta has faced challenges from man-made disasters such as industrial accidents and fires. These incidents have underscored the importance of stringent safety regulations and emergency preparedness measures in the district.

Floods 2018 had a profound impact on Pathanamthitta district, leaving a trail of devastation in its wake. Triggered by exceptionally heavy rainfall during the monsoon season, the floods submerged vast areas of the district, causing widespread destruction of property, infrastructure and agricultural land. In the aftermath of the floods, Pathanamthitta district faced immense challenges in terms of rehabilitation and reconstruction. Thousands of

Table 4.1 Impact of disasters in Pathanamthitta District

	Flood	Windfall	Drought
No. of affected villages		21	5
Population affected	1053143		10000
Cultivated area affected in Ha	3338.651		2364.54
Estimated cost of crop loss in Rs	1041.44609 L		18.7926 Cr
Number of Houses damaged	4366	1792	
Estimated cost of houses damaged	37887947	8402820	
No of causality	19	11	

Source: Pathanamthitta District Planning Office

displaced families were accommodated in relief camps, where they received shelter, food, and medical care. Details and impact of past disasters is provided in the Table 4.1. The 2018 floods served as a stark reminder of the vulnerability of Pathanamthitta district to extreme weather events and underscored the importance of disaster preparedness, early warning systems, and sustainable development practices to mitigate future risks and build resilience in the face of climate change.

4.2.2 District Disaster Management Plan (DDMP)

The DDMP is a strategic framework designed to enhance the district's resilience against various natural and man-made disasters. It encompasses comprehensive hazard identification, vulnerability assessment, risk analysis to inform preparedness, mitigation, response, and recovery strategies. The plan outlines the roles and responsibilities of the District Disaster Management Authority (DDMA), Emergency Operations Centre (EOC), and other key stakeholders, ensuring coordinated and efficient disaster management. It emphasizes community involvement, capacity building, and public awareness to foster a culture of safety and preparedness.

Regular drills, resource inventories, and robust communication systems are integral components, enabling timely and effective disaster response and recovery efforts. The district is facing a variety of natural hazards such as flood, landslide, earthquake, thunder and lightning, epidemics, drought, heat related stress and anthropogenic hazards such as fire/ road accidents, stampede etc. The need analysis for pre and post disaster scenarios are also worked out in the plan.

4.3 Pathanamthitta Town Profile

Pathanamthitta town is no different from the district as it also possesses numerous hazards which if not properly managed or addressed can cause immense damage to life and property. The hazard profile of the town is analysed by using the hazard zonation maps prepared by the KSDMA, Disaster Management Plan (Nammal Namukkai) for Pathanamthitta Town and Local Action Plan on Climate Change (LAPCC) for Pathanamthitta Town.

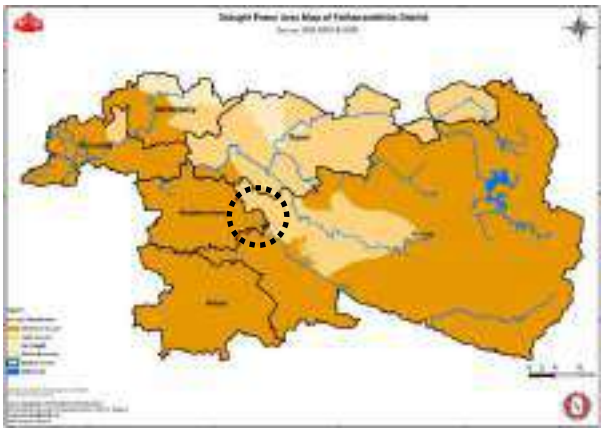


Figure 4.4 Pathanamthitta town in drought intensity map of Pathanamthitta District based on rainfall data

Source: DDMP Pathanamthitta 2015

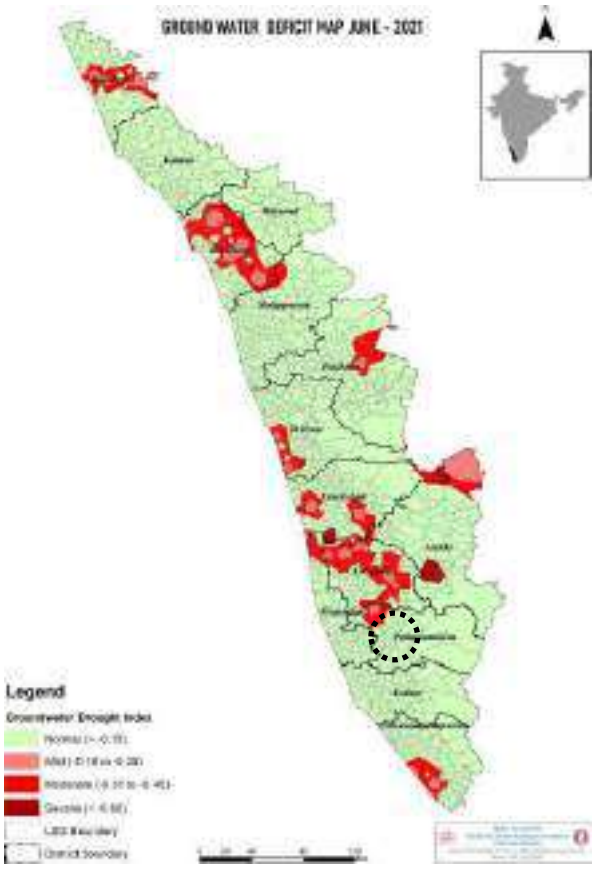


Figure 4.5 Pathanamthitta town in drought intensity map of Kerala based on ground water scenario.

Source: Drought Situation Assessment June – July 2021, KSDMA.



Figure 4.6 Pathanamthitta town in lighting frequency map of Kerala State

Source: KSDMA website

The entire municipal area is prone to moderate intensity of drought (26-50% deficient from long period average) based on rainfall data and normal deficiency intensity in groundwater drought index (Figure 4.4 & 4.5).

As per KSDMA report on Lighting and Coastal Erosion, it is evident that no district of the State is devoid of lightning fatalities or injuries. As per village wise frequency of fatal/injury causing lightning events/year map, the frequency per year in the Pathanamthitta town is once (Figure 4.6) and it shows that Pathanamthitta town is also susceptible to lighting events. Drought and minor earth tremor also occur occasionally.

Flood is the major natural disaster of the district affecting the major towns of the district. Pamba and Achankovil rivers together drain more than 70% of the total area of Pathanamthitta and western part of the district is come under the flood prone area (Figure 4.7). River Achankovil is the southern boundary of Pathanamthitta town. KSDMA published taluk wise flood inundation level map (Flood return probability over different years (10, 25, 50, 100, 200 and 500)) based on historic data. As per Guideline for Risk Informed Master Plan Kerala 2022, 1in 50-year return probability is considered as design event for flood hazard exposure calculation and risk assessment of a town. Figure 4.8 shows the flood inundation map of Kozhenchery Taluk (1 in 50-year probability).

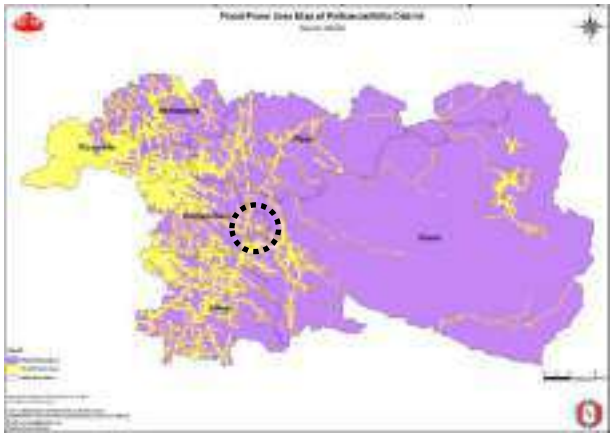


Figure 4.7 Pathanamthitta town in flood prone area map of Pathanamthitta District.

Source: DDMP Pathanamthitta 2015

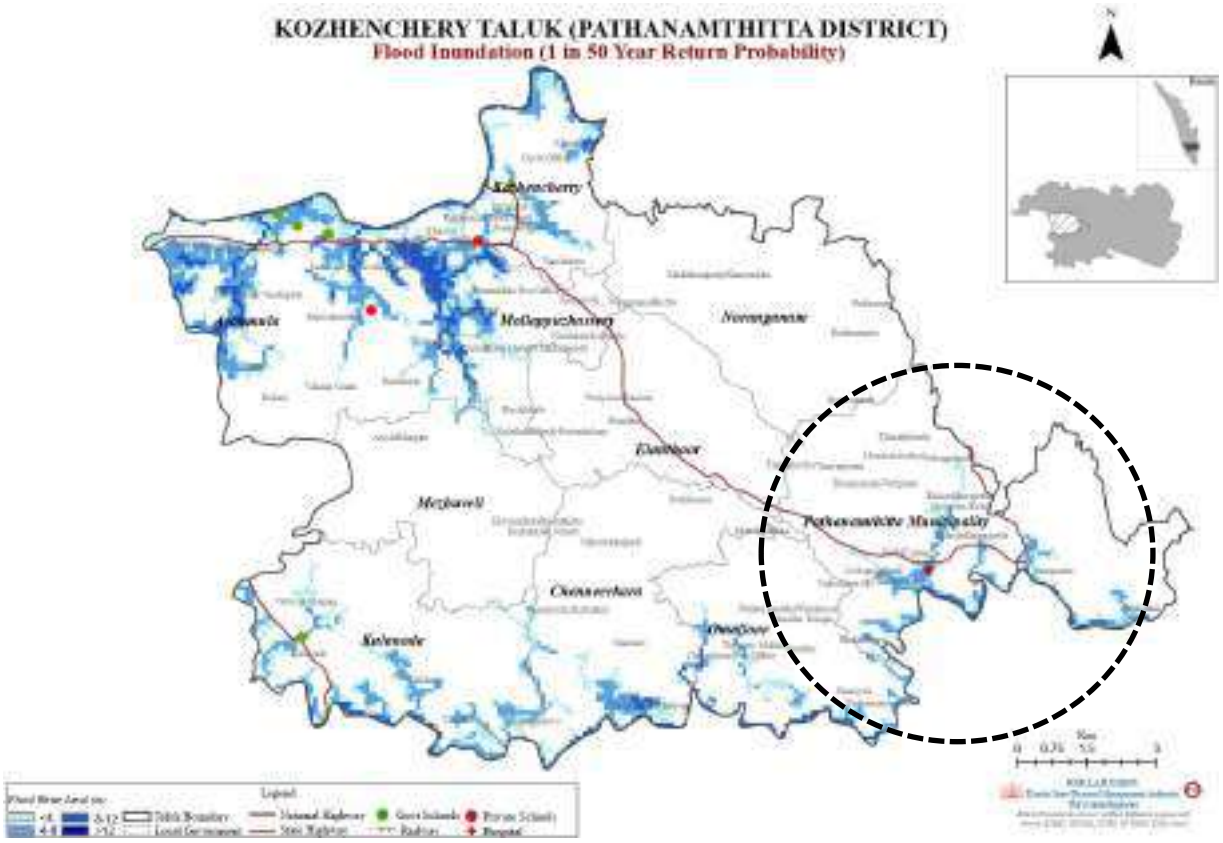


Figure 4.8 Pathanamthitta Municipality in Flood inundation map of Kozhenchery Taluk of Pathanamthitta district (1 in 50-year probability)

Source: KSDMA

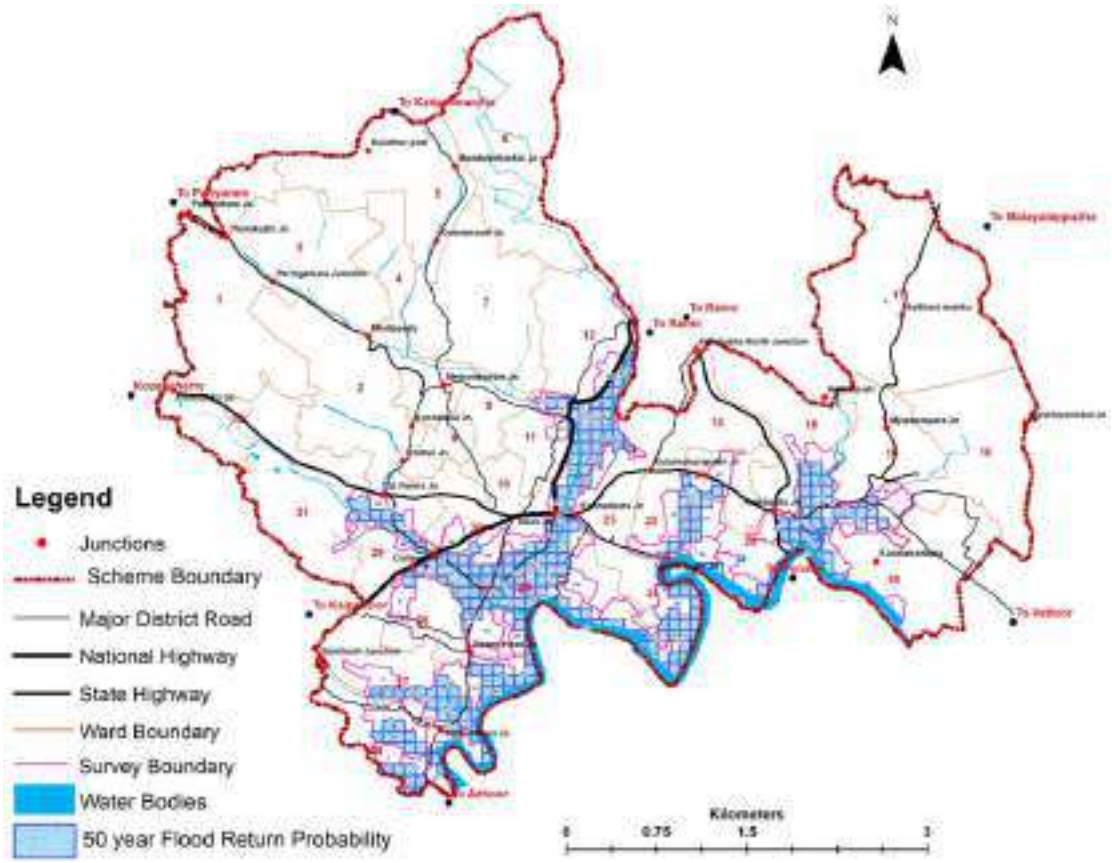


Figure 4.9 ward wise flood inundation map of Pathanamthitta town (1 in 50-year probability)

Source: Generated from 1 in 50-year probability map of KSDMA

1 in 50-year probability flood inundation map of Pathanamthitta town is generated from flood inundation map of Kozhenchery Taluk map. (Figure 4.9). From the flood inundation map, it is understood that the flood inundation area of Pathanamthitta town is 2.3 sq.km (10% of the total municipal area) and Maximum Flood Level is around 7m. The southern side of the town comes under the flood inundation area. Out of 32 wards in the town, around 20 wards come under the flood inundation areas.

From landslide susceptibility map of Pathanamthitta district (Figure 4.10), the intensity of landslide in the Pathanamthitta town is low as the high intensity landslide prone areas of the district is in the northern part of the district. Some hilly region of northern part of the town comes under the low intensity landslide prone areas (Figure 4.11).

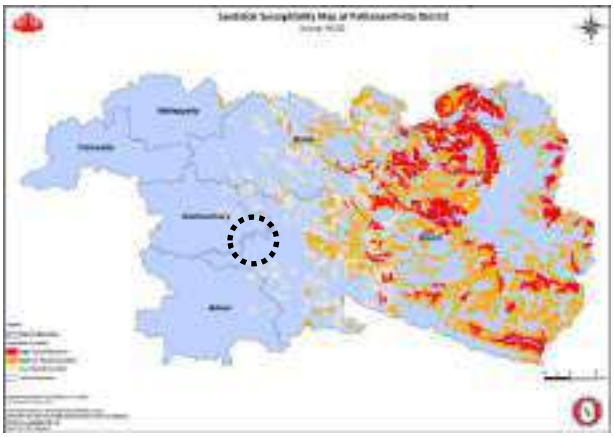


Figure 4.10 Pathanamthitta town in landslide susceptibility map of Pathanamthitta District

Source: DDMP Pathanamthitta 2015

It was learned through the Local Action Plan on Climate Change 2023 for Pathanamthitta town and focus group discussion with people that there have been changes in the climate in the town over the past 30 years. Pathanamthitta town is one of the areas in Pathanamthitta district that receives the highest annual rainfall.

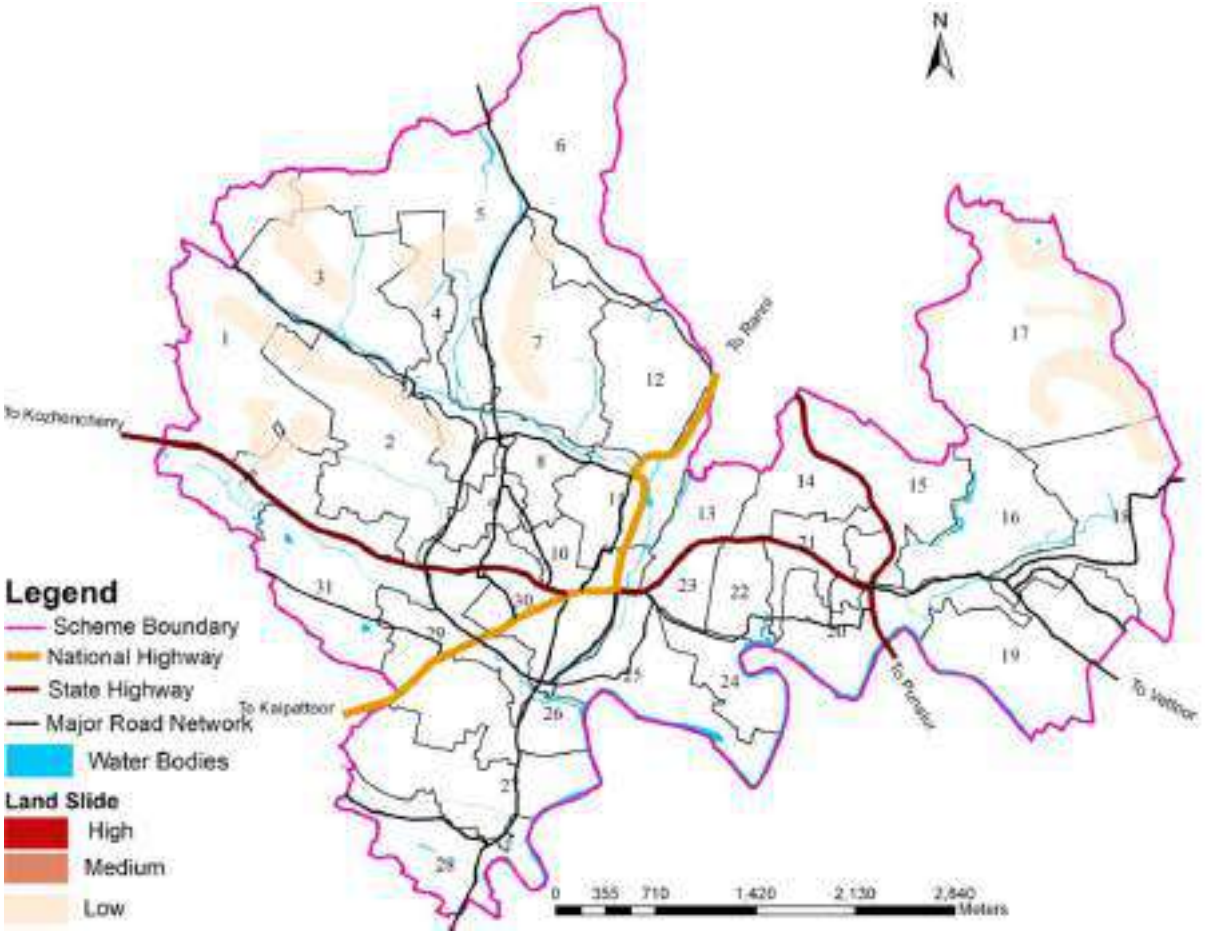


Figure 4.11 Ward wise landslide susceptibility map of Pathanamthitta town

Source: Generated from landslide susceptibility map of KSDMA

Usually, the south west monsoon season lasts from the first week of June to mid-September, the north east monsoon lasts from October to November and the intense heat in summer season of March, April, and May. However, it became clear through the discussion that there have been changes in the seasonal and summer rainfall patterns and that the intensity of rain and wind has increased. Although no significant changes in rainfall were observed, extremely heavy rains occur on rainy days, causing damage to crops. There is a difference in the perception of heat due to the increase in humidity in the atmosphere, and the heat has increased compared to the past. In the past, December and January were cold, but the intensity of cold has changed as a result of global warming.

4.3.1 Hazard Seasonality Diagram

According to the Hazard Seasonality Diagram shown in Table 4.2, the town is vulnerable to drought during the months from February to May. Heat related disasters such as heat stroke, Sun burn/ sun stroke is also highly possible during this period of time. There is high chance for lightning in the district during the months from August to December. The flood prone landslide period is from June to September in the rainy season.

4.3.2 Pathanamthitta Municipality Disaster Management Plan 2023

The Disaster Management (DM) plan prepared by Pathanamthitta Municipality as part of the 'Nammal Namukkai' programme under Government of Kerala aimed at bringing stakeholders together for building a resilient Kerala. Technical support to local bodies for the preparation of the DM plan was provided by KILA.

The DM plan consists of hazard identification and analysis in the town. Flood, Landslide, heat related disasters, Lightning etc are said to be the biggest threat in the town followed by strong winds and human-wildlife conflict. However, it is also mentioned that there is no prior history of any notified disasters in the area. This report also discusses the impact of climate change in disasters, environment and livelihood of people. The details of vulnerable population with gender wise numbers, list of critical infrastructure in hazard prone area and susceptibility maps of various hazards are also provided.

Disaster response system with list and details of ERTs. EWDS, volunteers, shelter management team, first aid team etc and the preparedness, mitigation measures and capacity building measures, human resources, heavy machinery, communication devices, waste disposal centres, medical shops etc. are listed out along with the climate specific disaster risk reduction proposals at the local level. A number of proposals which can be generally classified into bank stabilization, bund construction, disaster management awareness programmes etc. are included.

Table 4.2 Hazard Seasonality Diagram -Pathanamthitta town

Disaster/Month	J	F	M	A	M	J	J	A	S	O	N	D
Drought		■	■	■	■							
Heat Stroke/ Sun burn		■	■	■	■							
Lightning			■	■	■					■	■	
Flood						■	■	■	■			
Landslide						■	■	■	■			

Source: KSDMA, DDMP and LSGDMP, Pathanamthitta Municipality

4.3.3 Local Action Plan on Climate Change (LAPCC)

The LAPCC is a document prepared by the Pathanamthitta Municipality with technical assistance from KILA. The document provides general information about impact of climate change in the town, environment, biodiversity, livelihood and natural disasters. The prediction of maximum and minimum temperatures, rainfall etc throughout the twenty first century is done. Local intervention strategies to mitigate long term effects of climate change are listed in the last chapter. Interventions aimed at water conservation, improving agriculture efficiency, waste disposal, energy conservation, landslide prevention, biodiversity and health protection are included. Table 4.3 shows the type of hazard in the town and its intensity as per LAPCC report.

Implementing a local area action plan on climate change involves engaging a diverse range of stakeholders at the community level to ensure effective planning, implementation, and monitoring. The key stakeholders involved are Local Government Authorities, Community-Based Organizations (CBOs), including non-governmental organizations, local businesses and industries, academic and research institutions and local communities. Effective implementation of local area action plans on climate change requires collaborative efforts and partnerships among diverse stakeholders as mentioned above. By working together, sharing responsibilities, and leveraging collective strengths, stakeholders can enhance resilience, sustainability, and prosperity at the local level in the face of climate change.

4.4 Past Hazard Events

In 2018, the town's 13 wards were impacted by the flood, and have suffered significant losses. Apart from 2018 flood, there is no recognised disaster happened in the town in the past as per records. Disaster Management Plan of Pathanamthitta Municipality is prepared as a mitigation measure based on past events for the preparedness of town from natural hazard.

4.4.1 Mitigation measures undertaken based on past events

Structural and non-structural flood mitigation measures are adopted in the town as part of flood 2018. Non-structural mitigation measures adopted at municipal level are Formation of Rapid Response Team at Municipal level, working group formation at ward level for flood mitigation programs, Allocation of fund in municipal budget for flood relief programs, Preparation of Disaster Management Plan for Pathanamthitta Municipality and Preparation of Local Action Plan for Climate Change for Pathanamthitta Municipality. Agricultural department adopted climate resilient methods of farming. Incorporation of sponge parks, wetland parks in the DTP scheme of the town as room for river to prevent flooding are other measures undertaken.

Table 4.3 Type of hazard and its intensity in the Pathanamthitta town

Hazard	No Risk	Low Risk	Moderate Risk	High Risk	Opinion of Pathanamthitta Municipality
Flood			✓		Areas adjacent to the River Achankoil in town have also been affected, posing a moderate threat.
Landslide		✓			There are 18 hills within the town limits. Most of these mountains are low prone to landslides.
Drought			✓		
Heat				✓	
Lightning		✓			

Source: LAPCC 2023, Pathanamthitta Municipality.

As structural mitigation measure, widening/deepening of a river (such as widening or deepening) to increase its capacity to carry water and prevent flooding, construction of river bank protections, protection of ponds, construction of Flood Gates and Barriers are done by concerned line departments. The existing stadium and municipal bus stand are under construction by adopting flood mitigation strategies, a transformer has been relocated to prevent from flooding by electricity board. Some private commercial buildings are constructed in stilt based on flood level as the result of awareness programs conducted by government and municipality.

4.5 Climate Change impact

The KSDMA has made projections in regard to climatic variables. The deviation from long term average for parameters in Pathanamthitta town is provided in the Table 4.4. As per the downscaled climate data deviations in precipitation during south-west monsoon can possibly create extreme rainfall events leading to floods and landslides. Increase in temperatures and precipitation during summers indicates the possibility of drought also. This can also lead to increase in number of heat related stress diseases. The potential deviation of climatic variables from long term average can create disasters and they can lead to various impacts. Table 4.5 shows such impacts of climate change. Climate change is predicted to make the scenario of natural disasters worse. The IPCC report on Climate change is predicting drastic changes in the maximum and minimum mean temperature and rainfall in the State. Pathanamthitta won't be any different in this regard.

Table 4.4 Climate Change projections for Pathanamthitta town (RCP 8.5 Scenario)

Climate variables	Seasonal deviation from daily average in near term (2021-2040)				Seasonal deviation from daily average in medium term (2041-2060)				Seasonal deviation from daily average in long term (2061-2099)			
	JF	MAM	JJAS	OND	JF	MAM	JJAS	OND	JF	MAM	JJAS	OND
Maximum temperature (°C)	1.2	0.9	0.7	1.1	1.6	1.6	1.6	1.6	2.5	3.1	3.1	2.7
Minimum temperature (°C)	0.8	0.9	0.9	1.1	1.7	1.6	1.4	1.7	3.3	3.1	2.5	2.9
Precipitation (mm/day)	0	-0.3	1.1	0.1	0	0.2	2.3	0.9	0	0.9	4	2.5

*JF – January- February *MAM- March-April-May *JJASS – June-July-August- September *OND- October-November December

Source: KSDMA

Table 4.5 Summary of Climate Change Variables

Climate Change Variables	Change in variables	Climate Change effects	Climate Change impacts
Temperature	Increase	Longer period of droughts	Decline in crop production
		Warmer days and nights	Heat related stresses on health
Seasonal rainfall	Increase	Frequent flooding	Damage to agriculture, livelihood etc.
	Decrease	Drought	Decline in water supply, crop production etc.
Climate extremes	Increase in extreme rainfall events	Potential changes in frequency and severity of flooding events	
		Potential changes in frequency of rain induced landslide events	

Source: KSDMA

Table 4.6 Summary of Climate Change effects and impacts in various systems in town

System	Climate Variables	Change in variables	Climate Change effects	Climate Change impacts
Health	Temperature	Increase	Hotter days	• Heat related stress among vulnerable population
	Rainfall	Increase	Flooding	• Increase in vector borne diseases
Agriculture	Temperature	Increase	Drought	• Increased demand for irrigation • Disruption of cropping cycle • Decrease in product quality
	Rainfall	• Too little rain • Too much rain • Early onset of monsoon • Late onset of monsoon	• Drought • Flooding • Rain induced landslides	• Wilting of crops • Decrease in crop yields • Reduction in farmer's income • Increased risk of pest outbreak
Water Resources	Rainfall	Decreases	Drought	• Increased competition for Water • Changes in water quality
	Extreme rainfall	More events	Flooding	• Changes in water quality
Infrastructure	Extreme rainfall	More events	• Flooding • Rain induced landslides	• Damages to roads, bridges, public buildings etc.

Source: LAPCC 2023, Pathanamthitta Municipality

4.5.1 Impact of Climate change in key sectors

Climate change has profound impacts across various sectors. Table 4.6 shows the summary of climate change effects and impacts in various systems in the town.

4.6 Risk Assessment

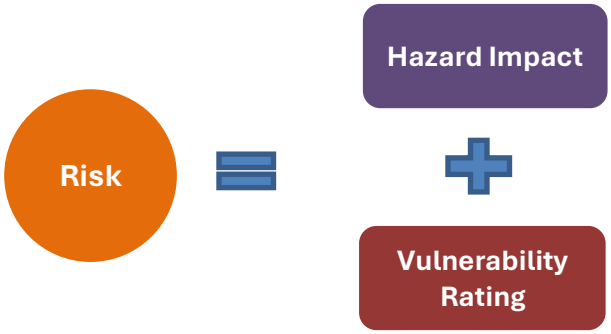
The development of a Risk-Informed Master Plan requires a thorough assessment of risks and hazards in the town. As a first step towards the risk assessment of the town, list of potential hazards that could affect the town is identified in the previous sections. The detailed impact of identified hazard and climate change on each sectors of the town is studied and vulnerability rating is spatially identified in the concerned following chapters. This chapter focuses on evaluating the total impact and vulnerability of identified existing hazards in Pathanamthitta town. It also examines how these hazards may influence various sectors in the context of the undeniable challenges posed by climate change. The vulnerability and risk assessment for the town, based on hazard susceptibility maps published by KSDMA, forms a critical foundation for effective risk-informed planning in Pathanamthitta town. Flood, Landslide, Drought, Lightening, and heatwave are the hazards identified in the town.

As per Government Order (Ms.) No. 120/2022/LSGD, Guidelines for the Preparation of Risk Informed Master Plans were issued by the Local Self Government (EWB) Department, with the express purpose of supporting Local Self Governments across the State to prepare Risk Informed Master Plans (RIMPs) in a structured manner. Though hazards cannot be completely controlled, the vulnerability of people and assets to various hazards can be substantially and sustainably reduced through planned prevention, mitigation and preparedness measures.

The focus is on risk reduction at the interface between societies and the natural environment, and integrating risk reduction into the land use planning process.

4.6.1 Methodology

As per the Guidelines for preparation of Risk-Informed Master Plans, Risk Assessment of a hazard consists of two major components: Hazard Impact Assessment & Vulnerability Rating. Since hazard risk is a product of hazard impact and vulnerability of the exposed population, hazard impact and vulnerability rating are done separately and a risk matrix is generated with hazard impact index and vulnerability index in two axis and their combined matrix will give the risk grading of the particular area. The methodology adopted for risk assessment is done at cadastral level.



The hazard impact rating is a measure of the potential damage or destruction that a hazard (such as a flood, landslide) can cause in a particular area. This rating involves assessing the severity of the hazard and its potential consequences on life, property, the environment, and the economy. Key factors generally influencing hazard impact rating are Severity of the Hazard, Frequency of Occurrence, Exposure and Duration.

Vulnerability rating refers to the susceptibility of people, infrastructure, and systems to the effects of a hazard. A vulnerability rating evaluates how likely an area, community, or asset is to be affected by a hazard and how severe the effects will be. Generally, vulnerability ratings are based on types of vulnerabilities like Physical Vulnerability, Social Vulnerability, Economic Vulnerability and Environmental Vulnerability

To assess the overall risk, it's important to combine the hazard impact and vulnerability rating for a given area. This combination of hazard impact and vulnerability ratings helps to prioritize and develop targeted strategies to reduce disaster risks effectively.

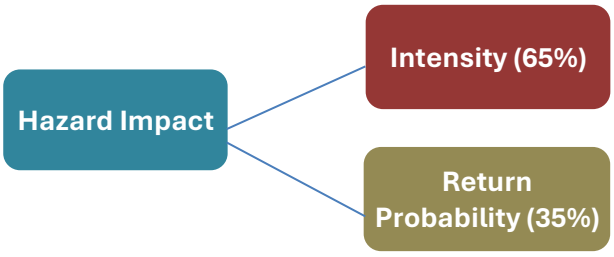
Since floods and landslides are the primary among the five identified hazards in the town, risk assessments have been conducted specifically for these hazards in accordance with the guidelines. To address heat stress, a study was carried out to analyse temperature variations over time and to identify heat hotspots. However, mitigation measures have been developed for all identified hazards to ensure a comprehensive approach to risk management.

4.6.2 Flood Risk Assessment

Flood hazard impact assessment is done based on return probability map published by KSDMA and vulnerability rating is carried out by the 100% socio economic survey in the flood prone areas of the town as per return probability map.

4.6.2.1 Hazard Impact Assessment

As per guidelines, the methodology assigns values to three sub-components, namely, Hazard Intensity, Hazard Return Probability, and Hazard Duration. However, in the case of Pathanamthitta, data for Hazard Duration was unavailable. Consequently, this sub-component was excluded, and its weightage was redistributed between the remaining two sub-components to maintain the assessment's accuracy and balance.



4.6.2.1.1 Flood Return Probability

The return period (also known as the recurrence interval) is the average time between events of a certain magnitude or greater. For example:

- A 100-year flood has a 1% chance of occurring in any given year.
- A 50-year flood has a 2% chance of occurring in any given year.
- A 10-year flood has a 10% chance of occurring in any given year.

A Flood Return Probability Map is a visual representation that shows the probability of a flood occurring in a particular area over a given period of time. This map is used to assess flood risk by showing the spatial distribution of flood-prone areas. A return period probability map provides the estimated time interval between events of a similar size or intensity. Data for the return probability was taken from maps prepared by the Kerala State Disaster Management Authority (KSDMA), which takes historical rainfall trends into consideration. Return probabilities have been calculated for 10, 25, 50, 100, 200, and 500-year return periods, with 10-year return being assigned the highest value and 500-year return the least. For Kerala context, section 5.1.1 of Guidelines for preparation of Risk-Informed Master Plans mentioned to consider 1 in 50-year return probability map for flood hazard assessment.

For the analysis purpose of spatial distribution of flood-prone areas, ward wise cadastral data of Pathanamthitta town is overlaid with 1 in 50-year return period maps. Flood return probability score has been identified for 10, 25, 50 years as per guideline at cadastral level and the flood return probability map for Pathanamthitta town has been prepared (Figure 4.12). Currently the town has around 114 cadastral units in the flood prone area (which comes in 20 wards). The area of this flood prone is 2.3 sq.km out of total municipal area of 23.43sqkm.

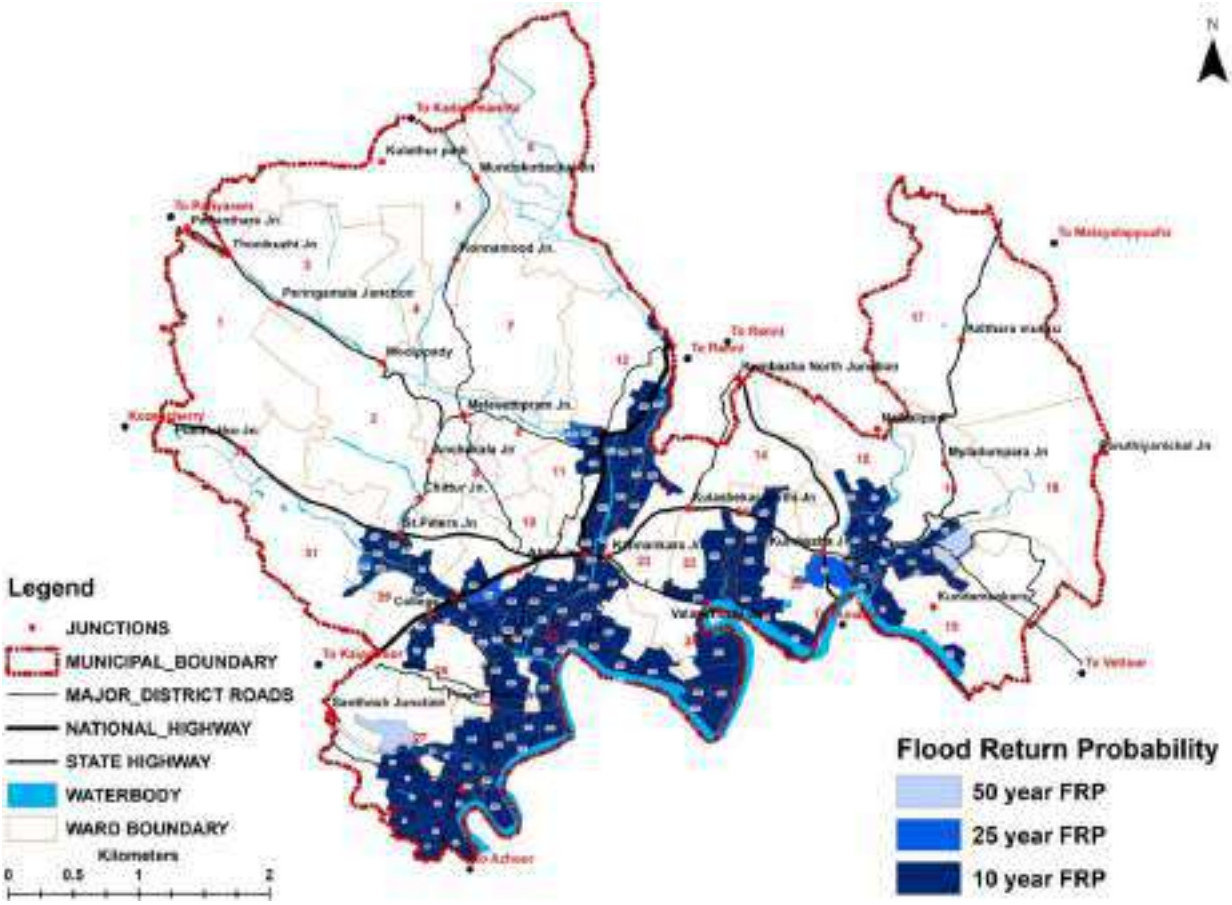


Figure 4.12 Flood return probability of Pathanamthitta town

From the Figure 4.12, 94% of the cadastral units (92% of flood probable area) are having 10 year flood return probability. If an area is located within the 10-year flood zone, it has a 10% chance of flooding every year. Over time, this means the area is relatively at risk for flooding in comparison to areas further away from flood zones. Ie. almost 92 % of the flood prone area of Pathanamthitta town has a 10% chance of flooding every year.

4.6.2.1.2 Flood Intensity

The flood hazard intensity refers to the severity or magnitude of the flood event in terms of its extent, depth (inundation) and duration. The depth of flood inundation was used as an indicator of hazard intensity analysis. Flood inundation was classified into three categories based on depth: areas with inundation depths above 1.5m is considered as high intensity, 0.6m to 1.5m is moderate intensity and below 0.6m low intensity.

Ward-by-ward cadastral data of Pathanamthitta town is superimposed on 1 in 50-year return period map in order to analyse the spatial distribution of flood intensity. Cadastral level flood intensity score has been identified and flood intensity map is prepared. Map illustrating flood intensity based on these classifications is presented in Figure 4.13.

Pathanamthitta town experiences a predominantly high flood hazard in its vulnerable areas, with 75% of the flood-prone zone subject to inundation depths exceeding 1.5 meters, based on a 50-year return period. However, a significant portion of this high-intensity flood zone comprises ecologically sensitive or low-density use areas, including 56.39 % of water bodies and wetlands, and 22.26% of agricultural or open land. These collectively account for over 78% of the high-risk area, limiting the potential impact on human settlements.

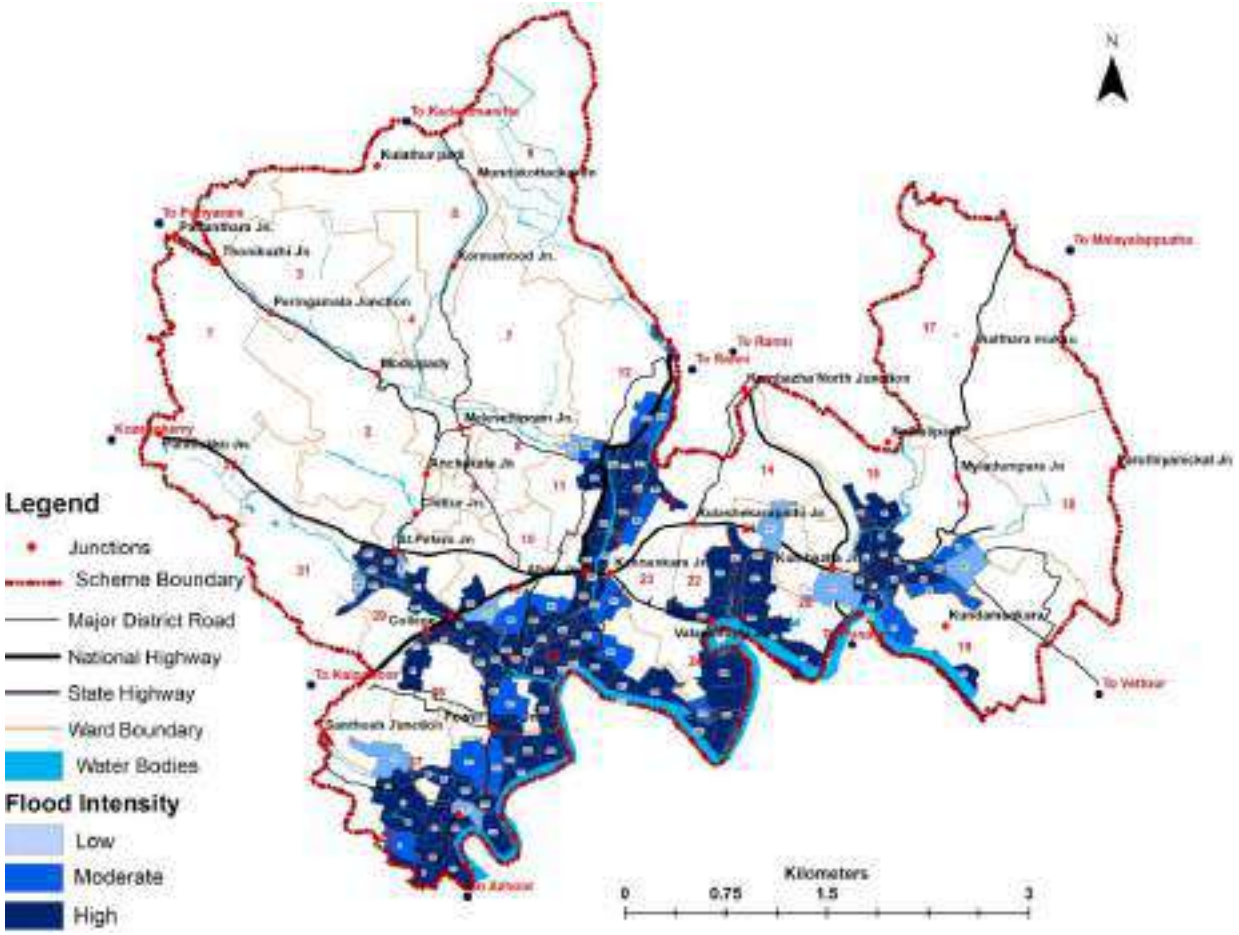


Figure 4.13 Flood intensity of Pathanamthitta town

Only 14% of residential land and 7.23% of other developed areas—such as commercial, public, or transportation-related uses—fall within the high-intensity flood zone, representing a relatively small share (15.9%) of the total flood-prone area. Thus, while the extent of high-intensity flood hazard is considerable in terms of land area, the exposure of inhabited or critical built-up zones remains limited.

Nevertheless, the areas experiencing flood depths above 1.5 meters—especially floodplains along the Achankovil River and wetlands in the town's central region—pose serious risks to infrastructure and property. Strategic flood management interventions, land use planning, and early warning systems are crucial to protect both ecological zones and the limited developed areas at risk.

4.6.2.2 Hazard Impact

The term hazard impact refers to the consequences or effects of a hazard event on people, property, infrastructure, and the environment. It is a measure of how severe the hazard event is going to affect an area. By adding cadastral level score of Return Probability and Hazard Intensity, cadastral level Hazard Impact was assessed in accordance with the prescribed guidelines. Hazard impact score at cadastral level start from Very Low (score of 0-2) to Very High (Score of 8-10). A map depicting the hazard zones, based on this assessment, is presented in Figure 4.14.

When assessing the hazard impact of a flood in Pathanamthitta town at the cadastral level, the intensity of the flood hazard is categorized into different levels. These categories reflect the potential damage the area faces based on the flood hazard it is exposed to. The levels range from moderate to very high, each indicating the severity of the impact that flooding can have on the land parcel, infrastructure, and inhabitants. The 90% of the flood prone area of the town comes under very high hazard impact.

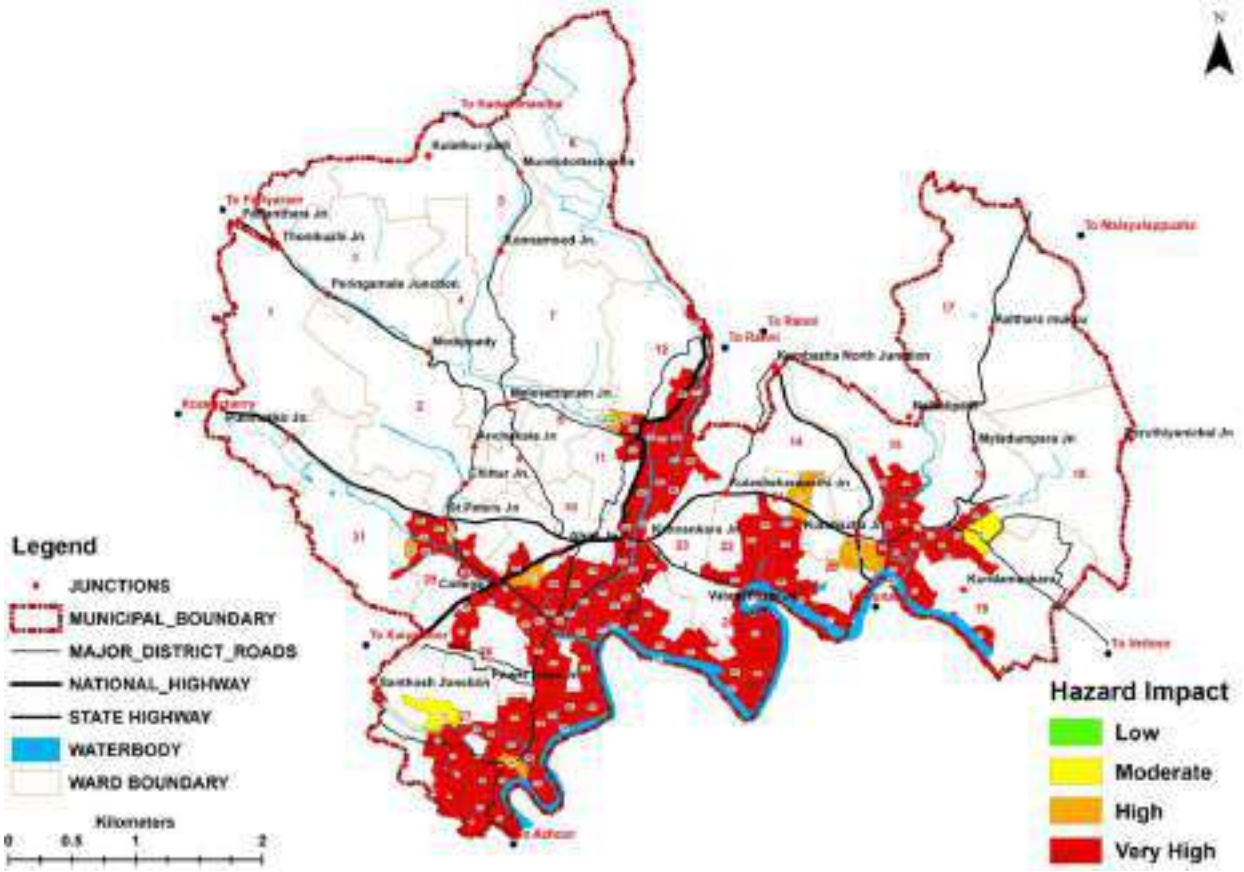
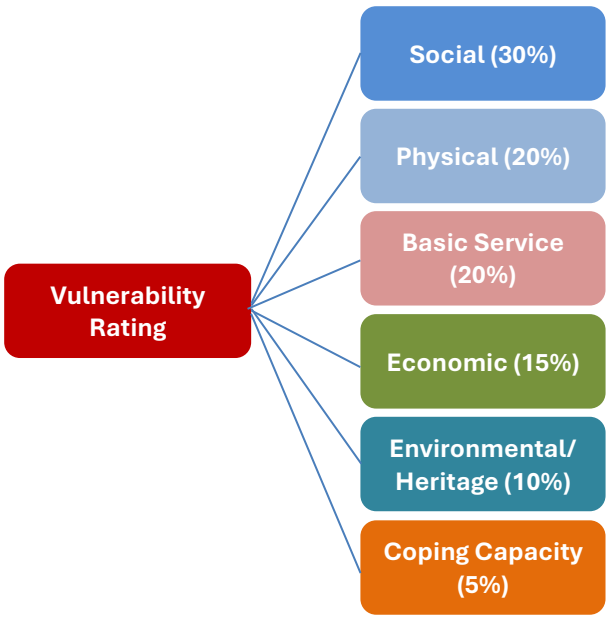


Figure 4.14 Hazard impact of flood in Pathanamthitta town

These areas may experience the severe flooding with deep inundation causing extensive damage to homes, infrastructure and the local economy. Residential, commercial, low-lying areas and transportation are the major land uses comes under high flood hazard zones. Immediate evacuation, long-term recovery, and comprehensive mitigation strategies are essential to minimize the impact and rebuild the community in these areas.

4.6.2.3 Vulnerability Assessment

This component was developed using data gathered from primary surveys conducted in flood hazard-prone areas (with an additional buffer area), supplemented by secondary sources, and analysed using GIS. Vulnerability was categorized into six sub-components: Social Vulnerability, Physical Vulnerability, Vulnerability of Basic Services, Economic Vulnerability, Environmental Sensitivity, and Coping Capacity. Weightage of each sub components is shown below. Each sub-component was evaluated using specific parameters, which were tabulated at the ward or cadastral level to provide a detailed and localized assessment.



4.6.2.3.1 Social Vulnerability

Social vulnerability refers to the ability of individuals, households, and communities to prepare for, respond to, and recover from floods based on their social characteristics. Here social vulnerability evaluates the demographic vulnerabilities within flood prone area of Pathanamthitta town, contributing 30% to the overall vulnerability rating. It is further divided into eight sub-components, with sub-parameters focusing on the demographic characteristics of the affected population. These include data on affected population including women-headed households, as well as vulnerable groups such as senior citizens, children under six years of age, transgender individuals, and people with disabilities.

The vulnerability analysis of these eight components is separately studied by sector wise in concerned chapters of this master plan based on section 5.3.2.1 of Guidelines for preparation of Risk-Informed Master Plans. Total social vulnerability map is generated at cadastral level by adding each vulnerability scoring of these eight sub components (Figure 4.15).

Almost 70 % of the flood prone area is low socially vulnerable and the presence of low and moderate social vulnerability, with no high vulnerability. With adequate resources, infrastructure, and social systems in place to reduce the impacts of floods on its residents. Social vulnerability demographic factors, such as age and income structure are generally favourable, with some moderate vulnerabilities being present in pockets but not in a way that would significantly hinder recovery or flood resilience. This could be certain age groups, such as elderly individuals or families with young children, physical disabilities who might need more assistance during a flood event, though this group would not be large.

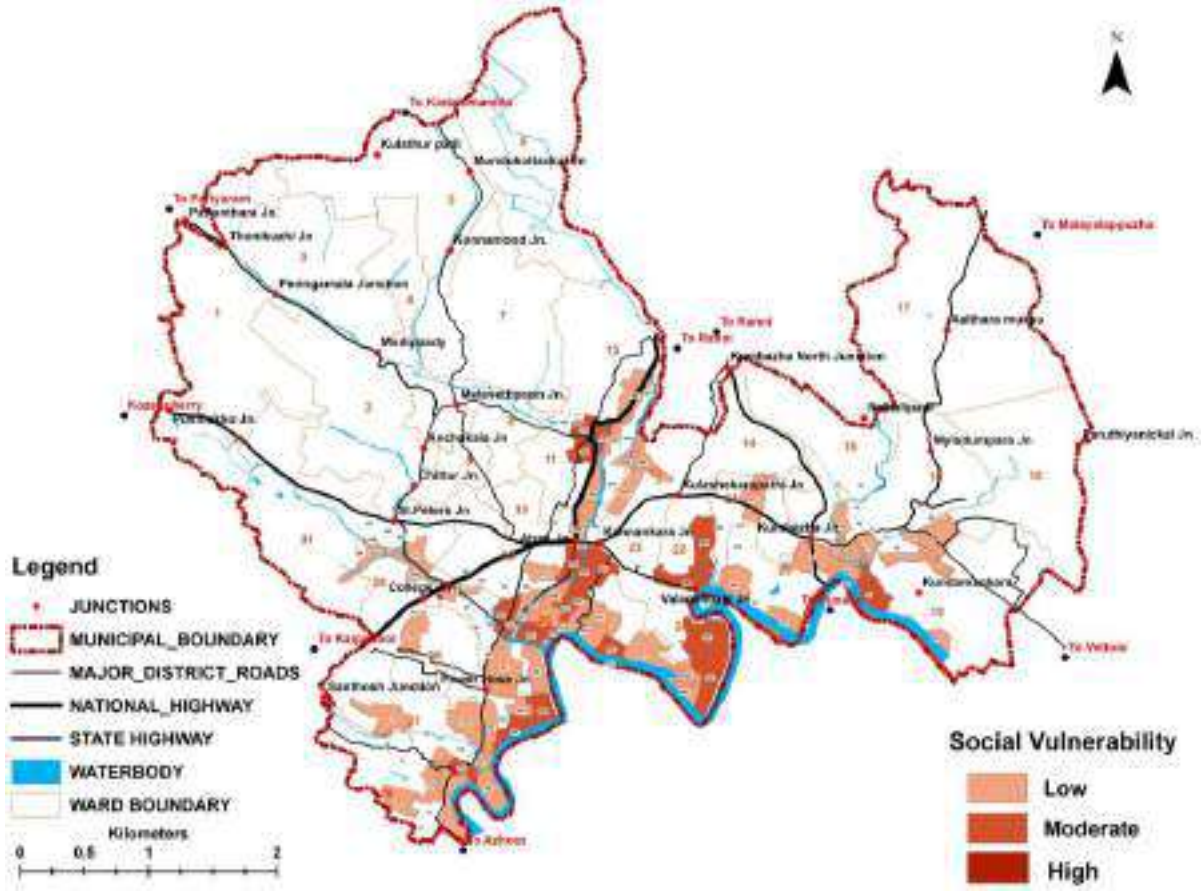


Figure 4.15 Social vulnerability in flood prone area of the town

4.6.2.3.2 Physical Vulnerability

Physical Vulnerability examines the susceptibility of the built environment, transportation infrastructure, and land cover within Pathanamthitta town, contributing 20% to the overall vulnerability rating. It is divided into three sub-components: Buildings (50%), Transportation (35%), and Land Cover (15%), each with its own specific sub-parameters. Data for this component is collected and analysed at both the ward and cadastral levels, ensuring a detailed and localized assessment of physical vulnerabilities.

The vulnerability analysis of these three sub components is separately studied by sector wise in concerned chapters of this master plan based on section 5.3.2.2 of Guidelines for preparation of Risk-Informed Master Plans. Total physical vulnerability map is generated at cadastral level by adding each vulnerability scoring of these three sub components (Figure 4.16). Vulnerability of buildings was assessed at the cadastral level, in which highest rating has been assigned to single-story kutcha buildings with no road access; lowest building vulnerability has been assigned to multi-storeyed pucca buildings that have access road width of 7 m or more. 65% of the flood prone area of Pathanamthitta town comes under moderate physical vulnerability which means that these areas of the town might face challenges in flood events (due to age of infrastructure, road connectivity, and low-lying areas). The overall vulnerability in the town is low and moderate physical vulnerability**,** with no high physical vulnerability.

4.6.2.3.3 Vulnerability of Basic Services

Basic Services and Critical Infrastructure are essential assets for disaster response, mitigation, and recovery. Basic Service Vulnerability contributes 20% to the total vulnerability rating and focuses on the susceptibility of critical infrastructure, water supply, and sanitation facilities.

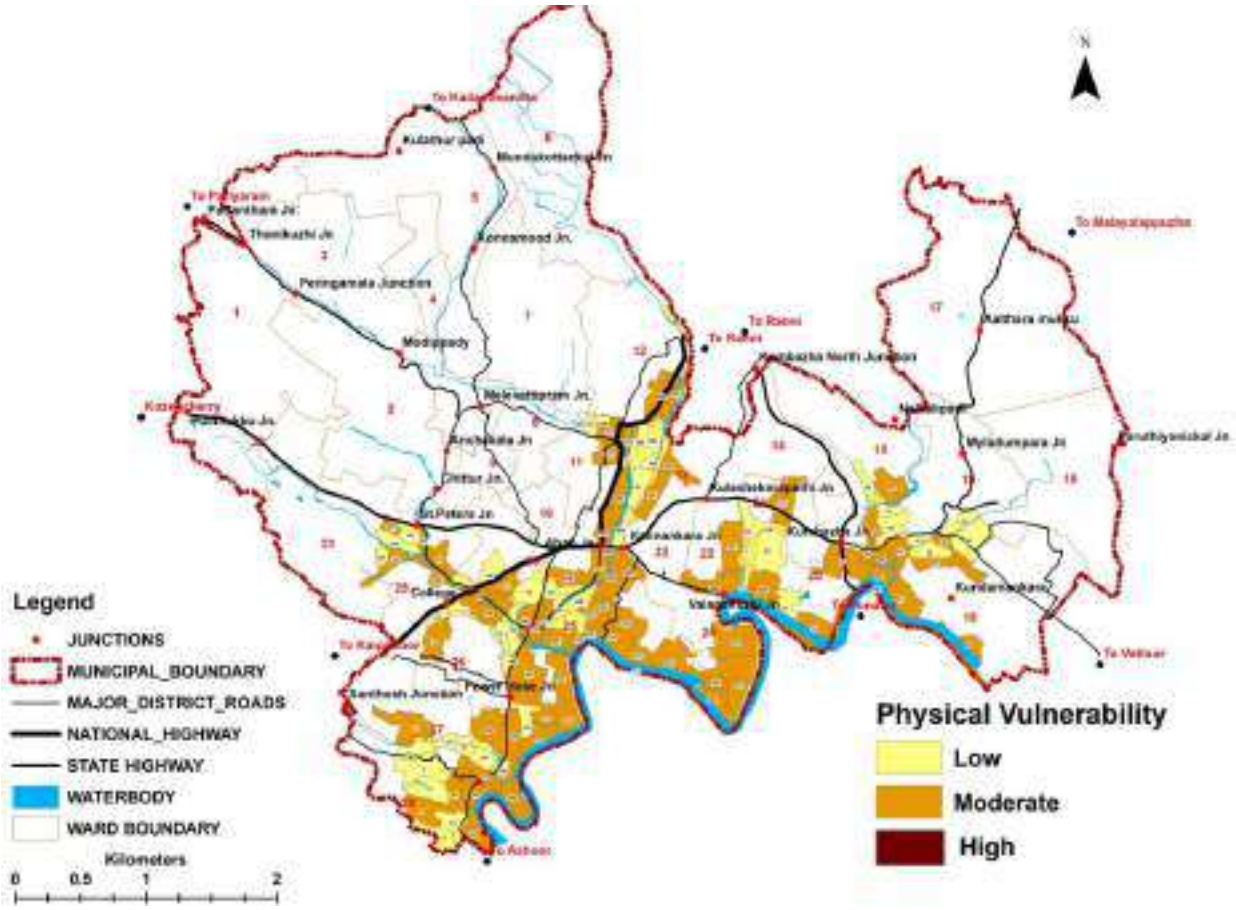


Figure 4.16 Physical vulnerability in flood prone area of the town.

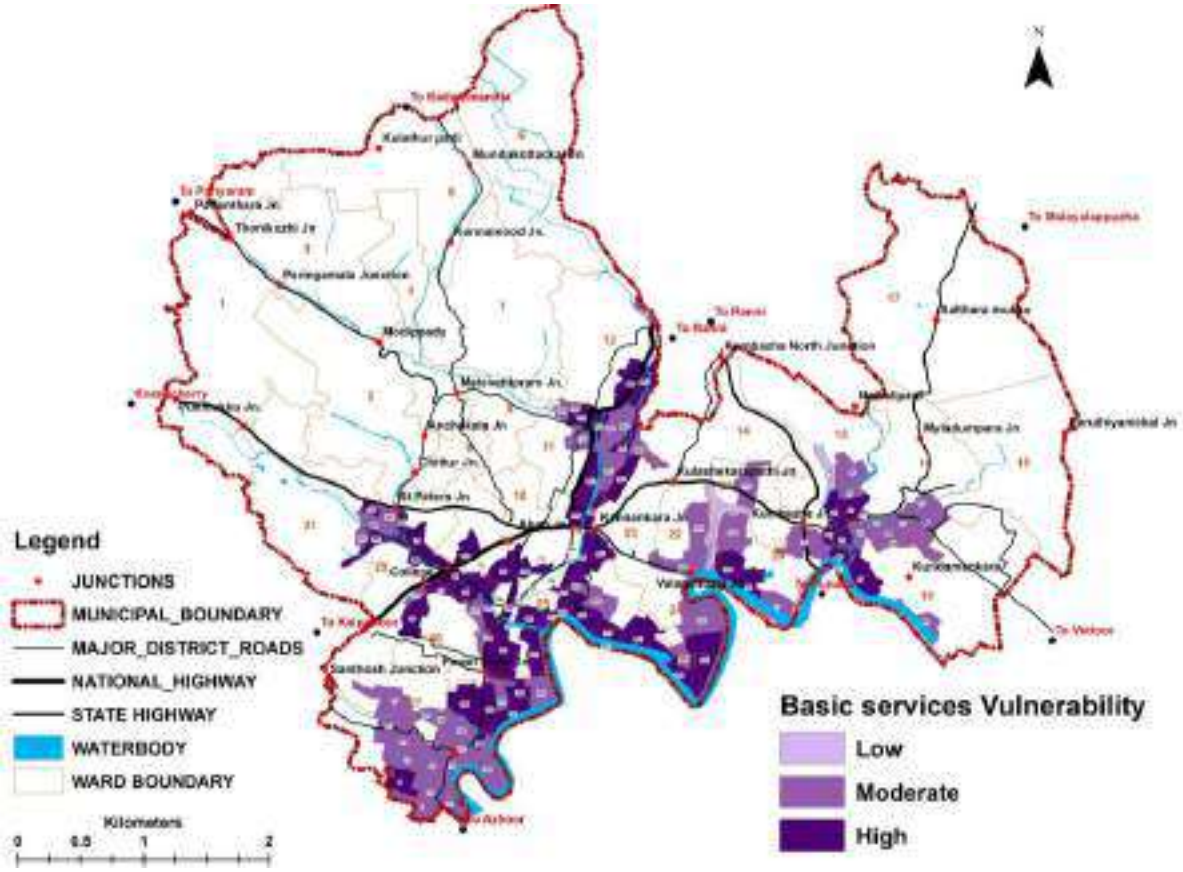


Figure 4.17 Basic services vulnerability in flood prone area of the town

This assessment highlights the potential risks these vital services face during disasters and their capacity to support effective response and recovery efforts.

Data on water supply and sanitation was collected through field surveys. In the assessment, groundwater-dependent sources like dug wells are considered vulnerable, as they are more likely to be affected during floods. On the other hand, piped water supply is regarded as not affected during floods, as it is less susceptible to inundation or contamination in such events. The vulnerability analysis of these three sub components is separately studied by sector wise in concerned chapters of this master plan based on section 5.3.2.3 of Guidelines for preparation of Risk-Informed Master Plans.

Total basic services vulnerability map is generated at cadastral level by adding each vulnerability scoring of these three sub components (Figure 4.17). More than 90% of the flood prone area of the town comes under moderate to high vulnerable to basic services like sanitation, water supply and other critical infrastructure. Out of this almost 50% of the area comes under high vulnerable areas of basic services which these areas could lead to more severe, long-lasting impacts on functioning during and after a flood event. But basic services in the moderate vulnerable areas might face temporary disruptions, but overall, recovery and continued access would be possible.

4.6.2.3.4 Economic Vulnerability

Economic diversification plays a vital role in disaster resilience, and it contributes 15% to the overall vulnerability rating. This assessment is based on two sub-parameters: percentage of local-level employment and the area of the economic zone likely to be inundated. Local-level employment is primarily considered as the population working in the informal sector or on daily wages.

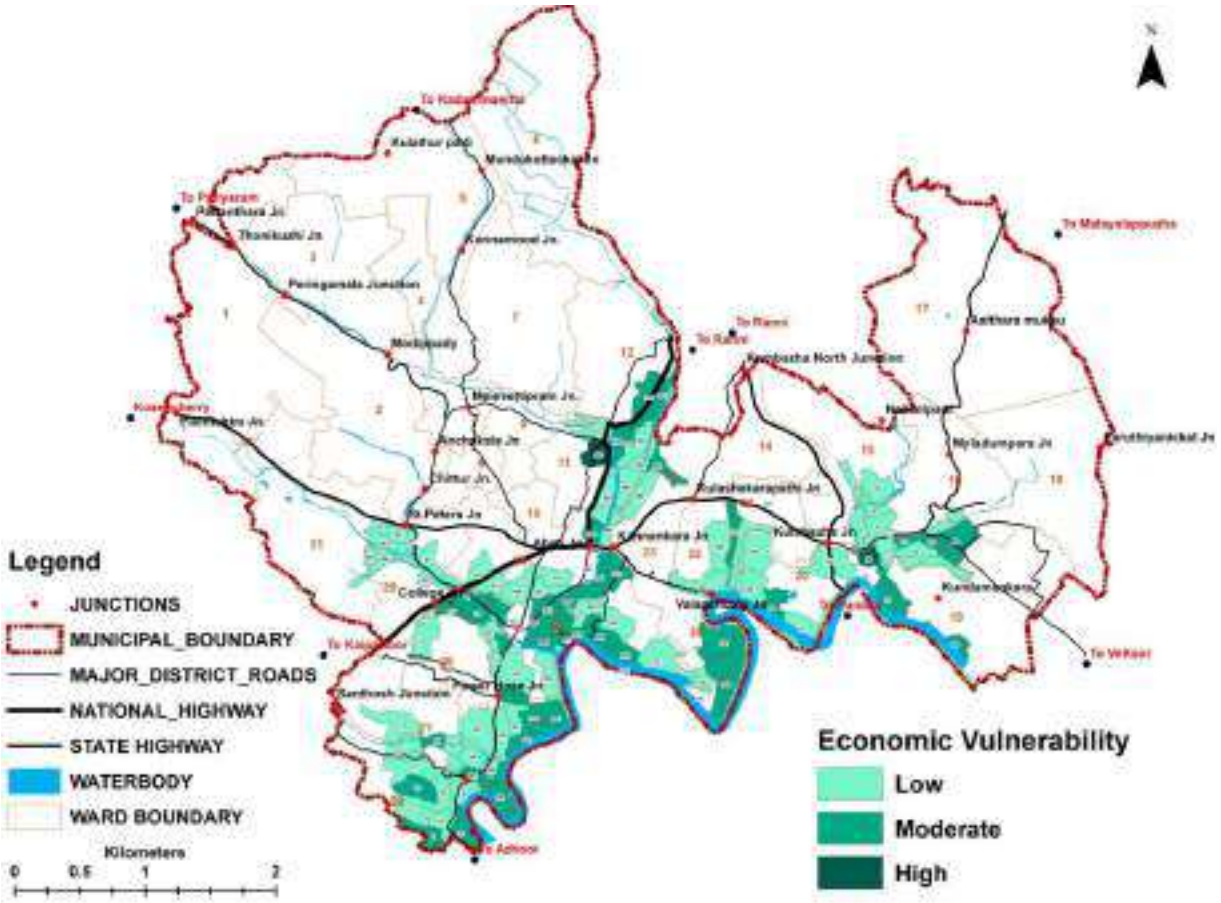


Figure 4.18 Economic vulnerability in flood prone area of the tow



Figure 4.19 Environmental vulnerability in flood prone area of the town

The economic zone includes land used for tourism, commercial, industrial, agricultural, fisheries, animal husbandry, or other primary/tertiary activities. Data for these sub-components were gathered at the cadastral level through socio-economic surveys and geospatial analysis, providing a detailed understanding of the economic vulnerabilities.

The economic vulnerability analysis of two sub parameters is separately studied by sector wise in concerned chapters of this master plan based on section 5.3.2.4 of Guidelines for preparation of Risk-Informed Master Plans. Total economic vulnerability map is generated at cadastral level by adding each vulnerability scoring of these two sub components (Figure 4.18). 97% of the flood prone areas is low to moderate economically vulnerable. Spatial distribution shows that the low economic vulnerable area is more which means the town has economic resilience, with most households and businesses capable of withstanding moderate flood impacts. While there might be temporary disruptions in certain sectors (agriculture, retail, tourism), the overall economy is well-positioned to recover quickly from floods. Moderate economic vulnerabilities exist. However, these vulnerabilities are not widespread, and the town's economic systems are generally stable. In this case, the town experiences low to moderate economic vulnerability.

4.6.2.3.5 Environmental Vulnerability

Environmentally-sensitive areas were identified based on land use and included paddy fields and wetlands, which are crucial for maintaining ecological balance. Data for these environmental resources was estimated at the cadastral level, providing a precise understanding of the vulnerability of these areas to flood. The vulnerability analysis of environmentally sensitive areas separately studied by sector wise in concerned chapters of this master plan based on section 5.3.2.5 of Guidelines for preparation of Risk-Informed Master Plans.

Total environmental vulnerability map is generated at cadastral level by vulnerability scoring (Figure 4.19). This analysis focuses on how different parcels of land are susceptible to flooding. The cadastral level analysis showing moderate to high environmental vulnerability in a flood-prone area in a town. 90% of the flood prone areas comes under high vulnerability. High Vulnerability refers to areas with significant exposure to environmental hazards, such as frequent or severe flooding, soil erosion or high susceptibility to environmental damage. This is because these areas are located in floodplains, low-lying areas, and natural drains of the town.

4.6.2.3.6 Coping Capacity

The coping capacity factor evaluates the ability of organizations and systems to manage adverse conditions, risks, or disasters using available skills and resources. Key elements include an updated Local Disaster Management Plan (LDMP) at the town level, a well-structured evacuation plan, active committees to guide LDMP implementation, and the status of various Disaster Risk Reduction (DRR) activities. Unlike other factors, vulnerability is inversely proportional to coping capacity—greater coping capacity reduces vulnerability. As such, the availability of any sub-parameter was assigned a null value, reflecting its role in minimizing overall vulnerability. The values for the coping capacity parameters were derived from data provided by the municipal office.

In Pathanamthitta, an updated Local Disaster Management Plan (LDMP) is available, along with a well-defined evacuation plan, active committees to guide LDMP implementation, and identified Disaster Risk Reduction (DRR) activities, for which funding has been allocated. However, these DRR activities have not yet been implemented, which is the primary source of vulnerability in terms of coping capacity (Figure 4.20).

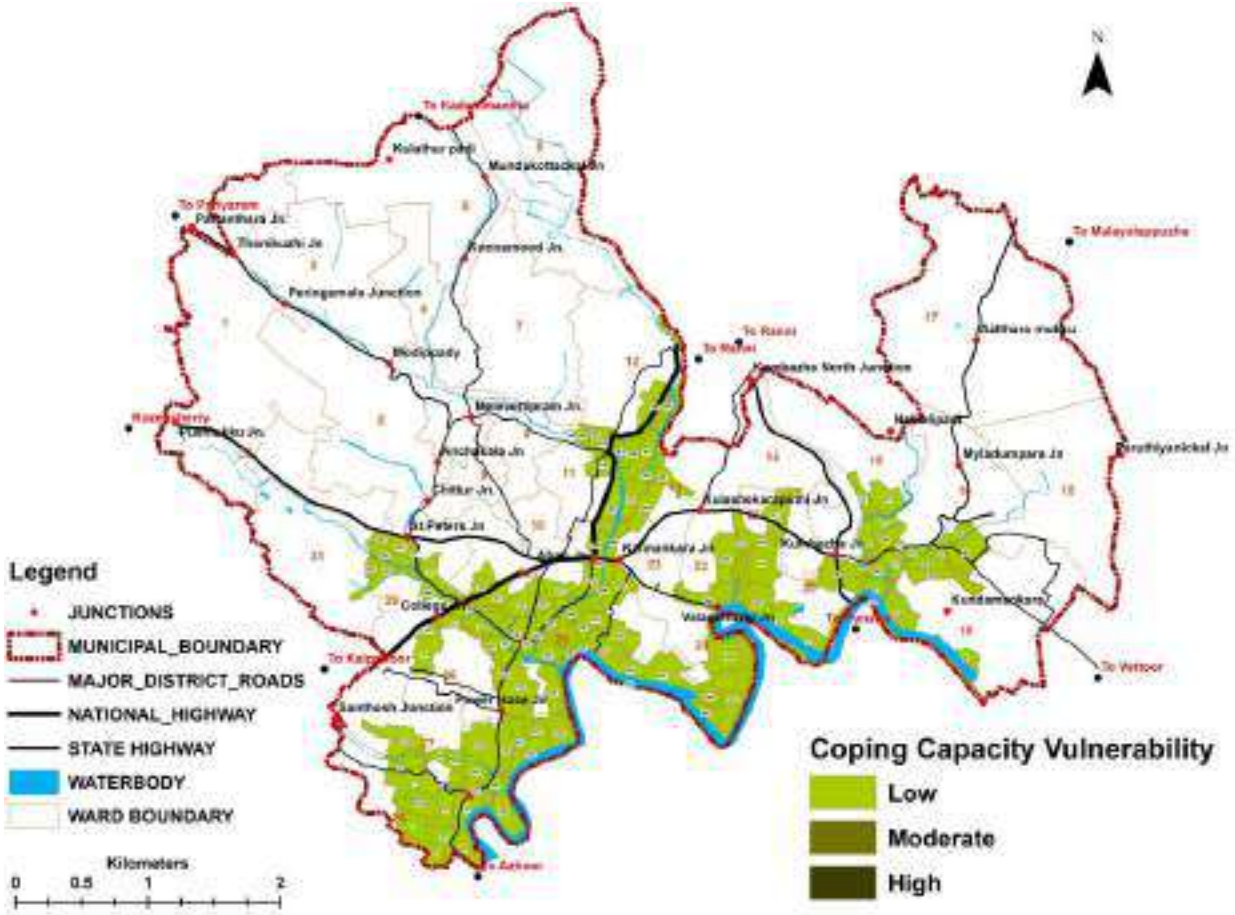


Figure 4.20 Coping capacity vulnerability in flood prone area of the town

Low coping capacity vulnerability in a flood prone area means that the community or region is less capable of dealing with the impacts of flooding due to not implementation of sufficient infrastructure, resources, planning, and preparedness. This leads to greater risk and harm during flood events and makes recovery more difficult. Addressing this vulnerability requires improving resilience through better infrastructure, resources, education, and governance.

4.6.2.4 Total Vulnerability

Cadastral level total vulnerability in a flood-prone area refers to an assessment that evaluates the overall vulnerability of cadastral units to flood-related risks in a specific area. The goal is to identify which land areas are most vulnerable to flooding, taking into account of 6 vulnerability factors analysed above. Total vulnerability map is generated at cadastral level by adding each vulnerability scoring of these six components (Figure 4.21). A significant portion of the flood prone area of the town (60%) is moderately vulnerable to flooding. These areas may experience some flood risks, but they are not as exposed to catastrophic damage as high-vulnerability areas. While the impacts of flooding are more likely to be localized and manageable, this large area still faces substantial risk**,** which means proactive flood management strategies are crucial.

35% of the flood prone area of the town is at low vulnerable to flooding. Although flood risks are minimal in these areas, they should still be monitored to ensure flood resilience and infrastructure maintenance. 5% of the flood prone area of the town shows high vulnerability and faces significant exposure to flooding. These areas are more at risk, and even moderate flood events could cause severe damage to infrastructure, property, and human life. These areas require immediate and focused intervention to prevent or mitigate the impact of floods.

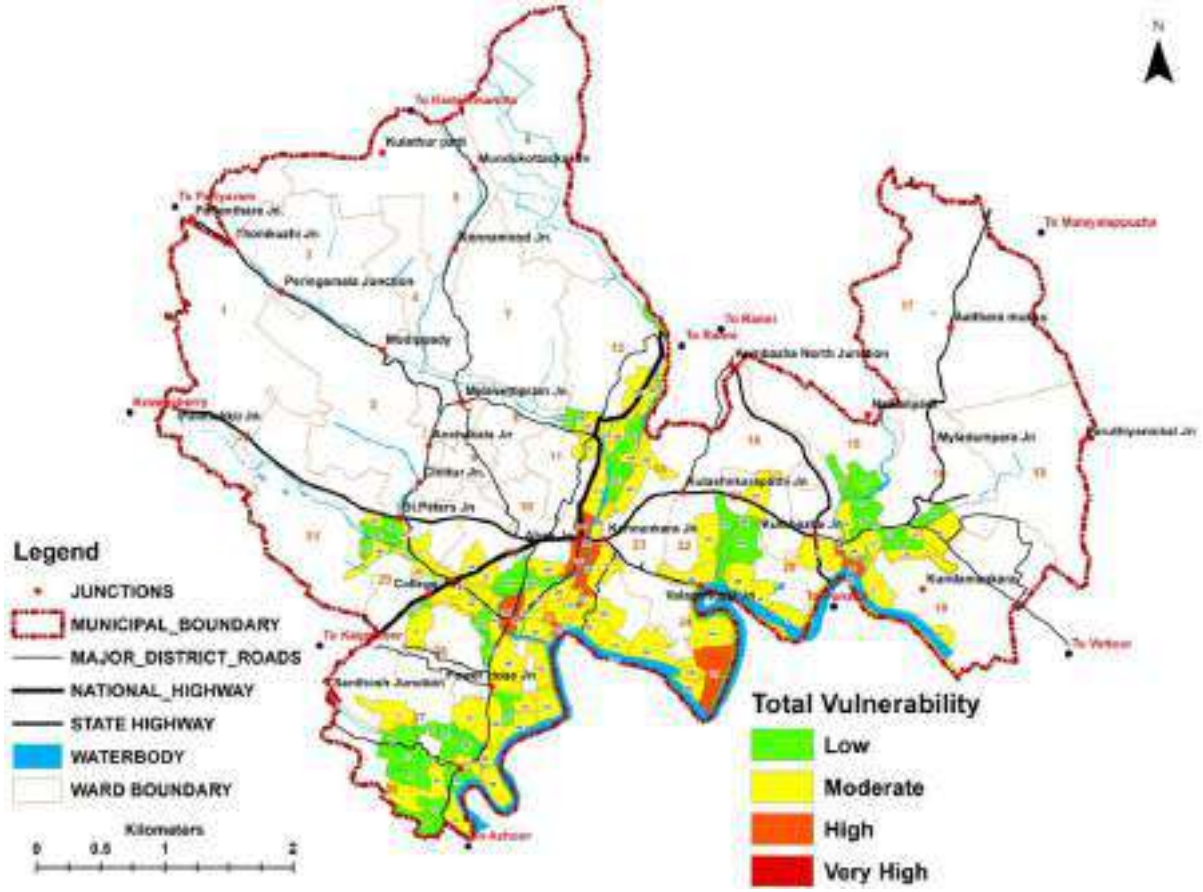


Figure 4.21 Total vulnerability in flood prone area of the town

4.6.2.5 Flood Risk

Risk is defined as “a measure of the probability [likelihood] and severity of an adverse effect to health, property, the environment, or other things of value” (EMBC, 2004). The risk analysis is, thus, not a definitive measure of damage; instead it primarily meant to convey the exposure of various cadastral plots to a future flood inundation event. It is a tool for citizen awareness, and meant to serve as a guide for individual plot-level actions to manage flood inundation in Pathanamthitta.

			Hazard Impact			
			Low	Moderate	High	Very High
			0 - 2.5	2.5-5	5-7.5	7.5-10
Vulnerability	Low	0-25	L1	L2	M3	M4
	Moderate	25 - 50	L2	M3	M4	H5
	High	50 - 75	M3	M4	H5	H6
	Very High	75 - 100	M4	H5	H6	VH7

Figure 4.22 Risk Matrix as per Guideline

Source: Guideline for the preparation of Risk Informed Master Plan, Kerala.

Final flood risk is calculated as per the risk matrix provided in the section 5.4.3 of guideline for the preparation of Risk Informed Master Plan (Figure 4.22). Cumulative index of the Hazard impact and cumulative index of 6 parameters of vulnerability index is calculated and Low, Moderate, High, and Very High grading is given. This hazard index grading and vulnerability index grading is plotted in a matrix and flood risk mapping has been done for flood prone area of the town (Figure 4.23). The true value of such a map lies in its capacity to disseminate risk information and raise awareness among citizens about their potential exposure to flooding events. This tool holds immense significance, as it can inspire individual plot-level mitigation measures, guide future investments, support economic diversification, and facilitate the development of contextual, locally tailored solutions when utilized effectively.

30% of the area is classified as moderate flood risk and 70% of the area is classified as high flood risk in a flood-prone area, the inference highlights a severe flood risk for the majority of the flood prone areas of the town and the risk of flooding in flood-prone areas of Pathanamthitta is primarily influenced by hazard impact.

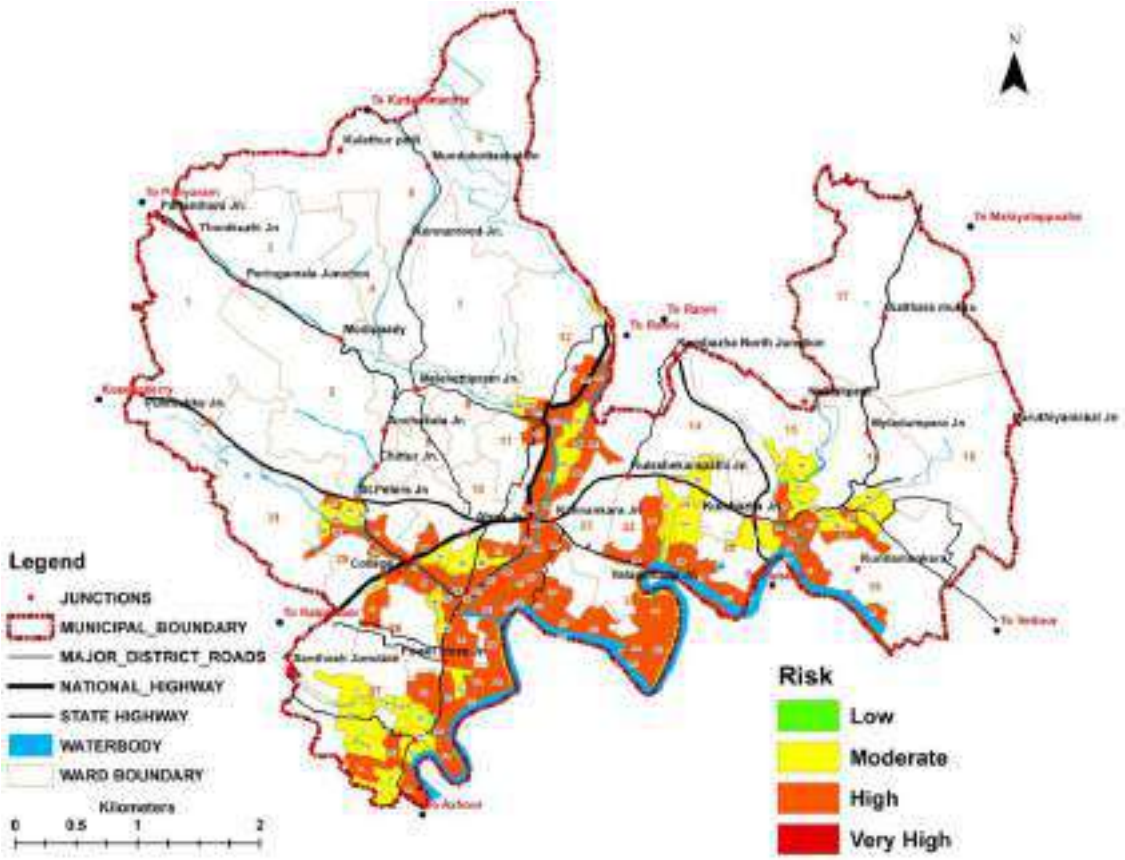


Figure 4.23 Flood risk area of the town.

Only smaller portion (30%) of the flood prone areas of the town lies in areas that face moderate flood risk. These areas may experience frequent or moderate floods, leading to localized disruptions such as road flooding, property damage, and waterlogging.

While the impact is not typically catastrophic, it can still affect the town's infrastructure and daily operations. People living in moderate flood-risk areas may have to deal with temporary evacuations and flood-induced inconveniences, but overall, these areas are somewhat resilient if proper flood risk management strategies are in place.

A significant portion of the flood prone area of the town (70%) lies in high-risk flood zones, which are most vulnerable to flooding. These areas face the highest exposure to flooding, with the potential for severe flooding events during even moderate storms. Catastrophic damage is possible, including displacement of residents, destruction of homes, damage to critical infrastructure, and long-lasting economic disruption. Recovery in high-risk areas could take much longer compared to moderate risk areas, and the long-term impacts could create social and economic challenges for the town and their vulnerability must be addressed with urgent attention. While there are no areas in the town classified as very high risk, a significant portion falls under high-risk flood zones primarily due to hazard impacts. To effectively reduce this risk, implementing targeted hazard mitigation measures in these areas is essential.

4.6.3 Landslide Risk Assessment

As per the Guidelines for preparation of Risk-Informed Master Plans, Risk Assessment consists of two major components: Hazard Impact Assessment & Vulnerability Rating. Landslide hazard impact assessment is done based on the landslide susceptibility map created by KSDMA and vulnerability rating is carried out by the 100% socio economic survey in the landslide prone areas of the town as per landslide susceptibility map.

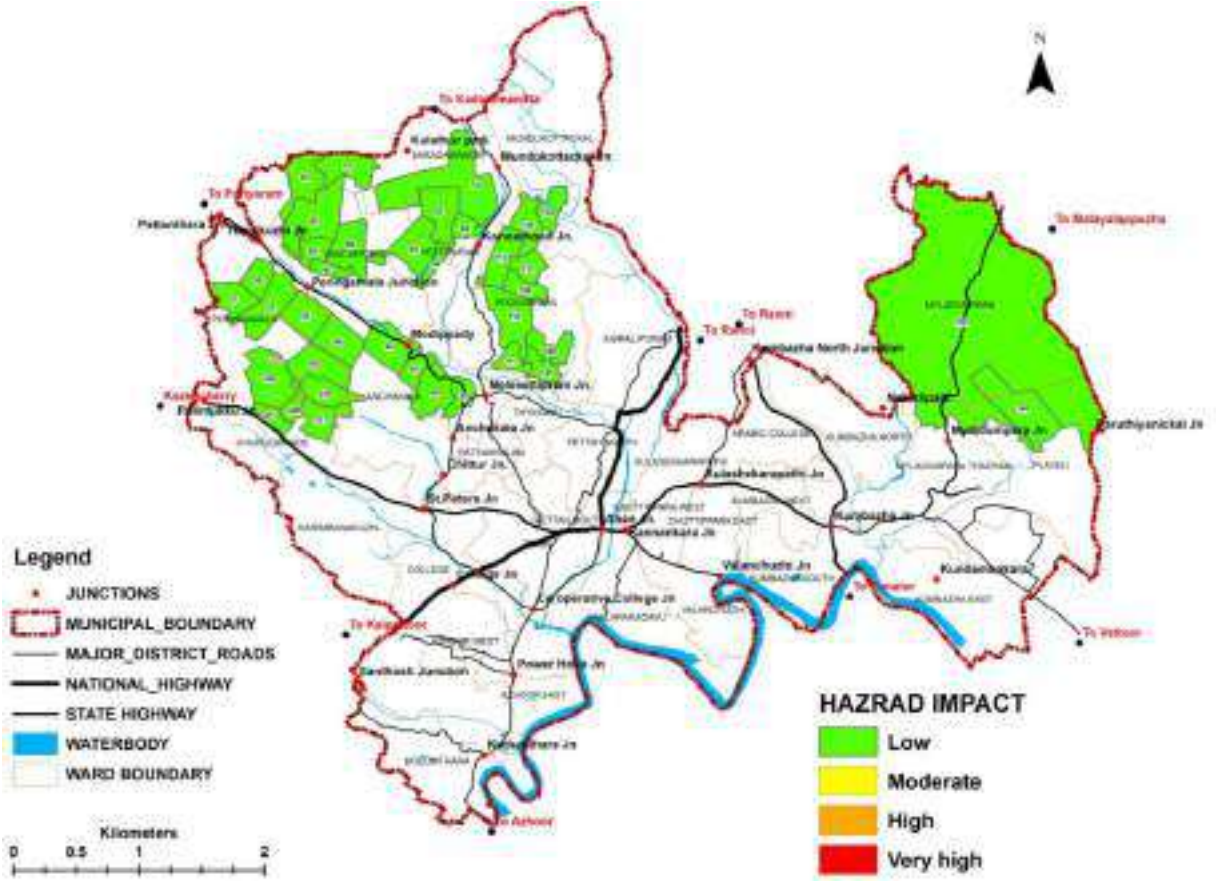


Figure 4.24 Landslide hazard impact of Pathanamthitta town

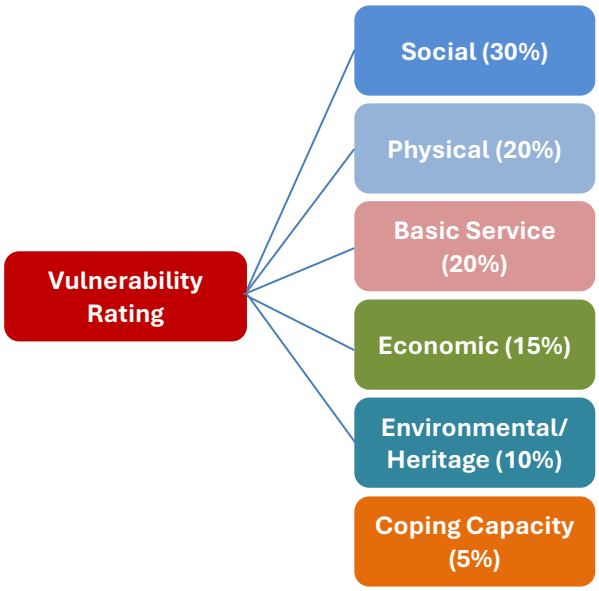
4.6.3.1 Hazard Impact Assessment

This component is assessed based on the Landslide Susceptibility Map, which provides information on the intensity of the hazard. As this is the only available data, it was solely used to calculate the hazard impact for the exposed area. A map illustrating the identified landslide hazard zones (with a suitable buffer), derived from this assessment, is presented in Figure 4.24.

As the Landslide Susceptibility Map shows the low hazard impact in the landslide prone area, all the cadastral in these landslide prone area comes under low hazard impact. This shows that the landslide prone areas of the town are relatively safe from the adverse effects of landslides. These zones will serve as a critical tool to guide and prioritize government investments in disaster reduction measures, ensuring the efficient allocation of resources for effective risk mitigation.

4.6.3.2 Vulnerability Assessment

This component was developed using data from primary surveys conducted in landslide prone areas, complemented by secondary sources, and analysis using GIS. Vulnerability is classified into six key sub-components:



Social Vulnerability, Physical Vulnerability, Vulnerability of Basic Services, Economic Vulnerability, Environmental vulnerability, and Coping Capacity. Each sub-component is assessed using specific parameters, which were tabulated at the ward or cadastral level, ensuring a detailed and localized vulnerability assessment.

4.6.3.2.1 Social Vulnerability

Social Vulnerability assesses the demographic vulnerabilities within the landslide-prone areas of Pathanamthitta town, accounting for 30% of the overall vulnerability rating. It is further divided into eight sub-components, with parameters focusing on the demographic profile of the affected population. These parameters include data on the affected population, such as women-headed households, as well as vulnerable groups like senior citizens, children under six years of age, transgender individuals, and people with disabilities.

The vulnerability analysis of these eight components is separately studied by sector wise in concerned chapters of this mater plan based on section 5.3.2.1 of Guidelines for preparation of Risk-Informed Master Plans. Total social vulnerability map is generated at cadastral level by adding each vulnerability scoring of these eight sub components (Figure 4.25).

The inference of a cadastral-level analysis shows that 20% of the area is with low socially vulnerable and 80% of the area is with moderate socially vulnerable, with no high social vulnerability, in a landslide-prone area of a town. A large proportion of the landslide prone area (80%) is classified as having moderate social vulnerability. This suggests that most of the population in this landslide prone area may have some level of exposure to the impacts of landslides, but they are not in the most extreme or at-risk category. A smaller portion (20%) faces low social vulnerability.

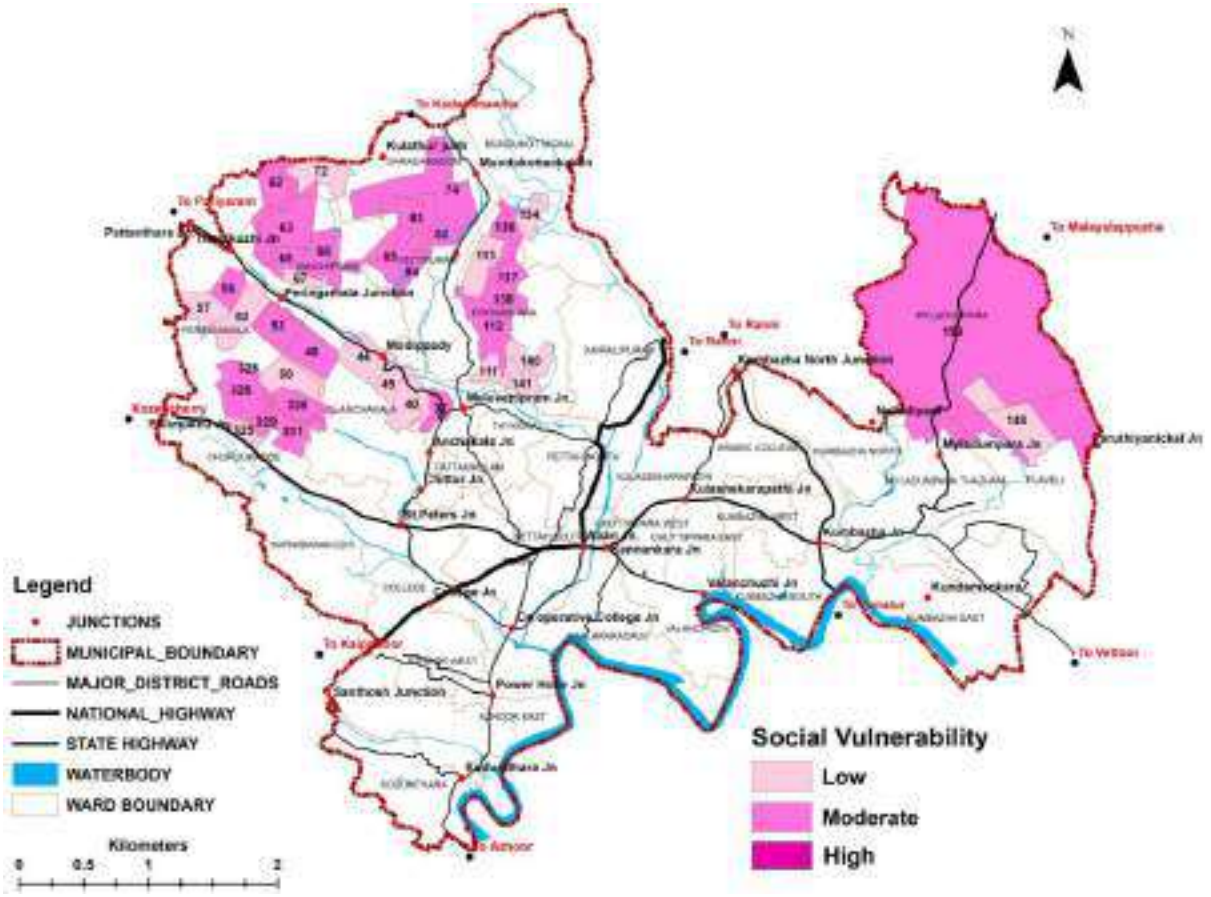


Figure 4.25 Social vulnerability of landslide prone areas of Pathanamthitta town

4.6.3.2.2 Physical Vulnerability

Physical Vulnerability evaluates the susceptibility of the built environment, transportation infrastructure, and land cover within the landslide-prone areas of Pathanamthitta town, contributing 20% to the overall vulnerability rating. It is categorized into three sub-components: Buildings (50%), Transportation (35%), and Land Cover (15%), each assessed using specific parameters. Data for this component is collected and analysed at both the ward and cadastral levels, providing a comprehensive and localized assessment of physical vulnerabilities.

The vulnerability analysis of these three sub components is separately studied sector wise in concerned chapters of this master plan based on section 5.3.2.2 of Guidelines for preparation of Risk-Informed Master Plans. Total physical vulnerability map is generated at cadastral level by adding each vulnerability scoring of these three sub components (Figure 4.26). Vulnerability of buildings was assessed at the cadastral level, in which highest rating has been assigned to single-story kutcha buildings with no road access; lowest building vulnerability has been assigned to multi-storeyed pucca buildings that have access road width of 7 m or more. The cadastral-level analysis shows that the whole landslide prone area is moderately vulnerable in the case of physical parameters. There is no high physical vulnerability in the landslide-prone area of a town. The absence of high physical vulnerability means the overall risk of catastrophic landslides is minimal, allowing for focused, strategic interventions in the moderate vulnerable areas.

4.6.3.2.3 Vulnerability of Basic Services

Basic Services and Critical Infrastructure are vital assets for disaster response, mitigation, and recovery. Basic Service Vulnerability accounts for 20% of the total vulnerability rating, focusing on the susceptibility of critical infrastructure.

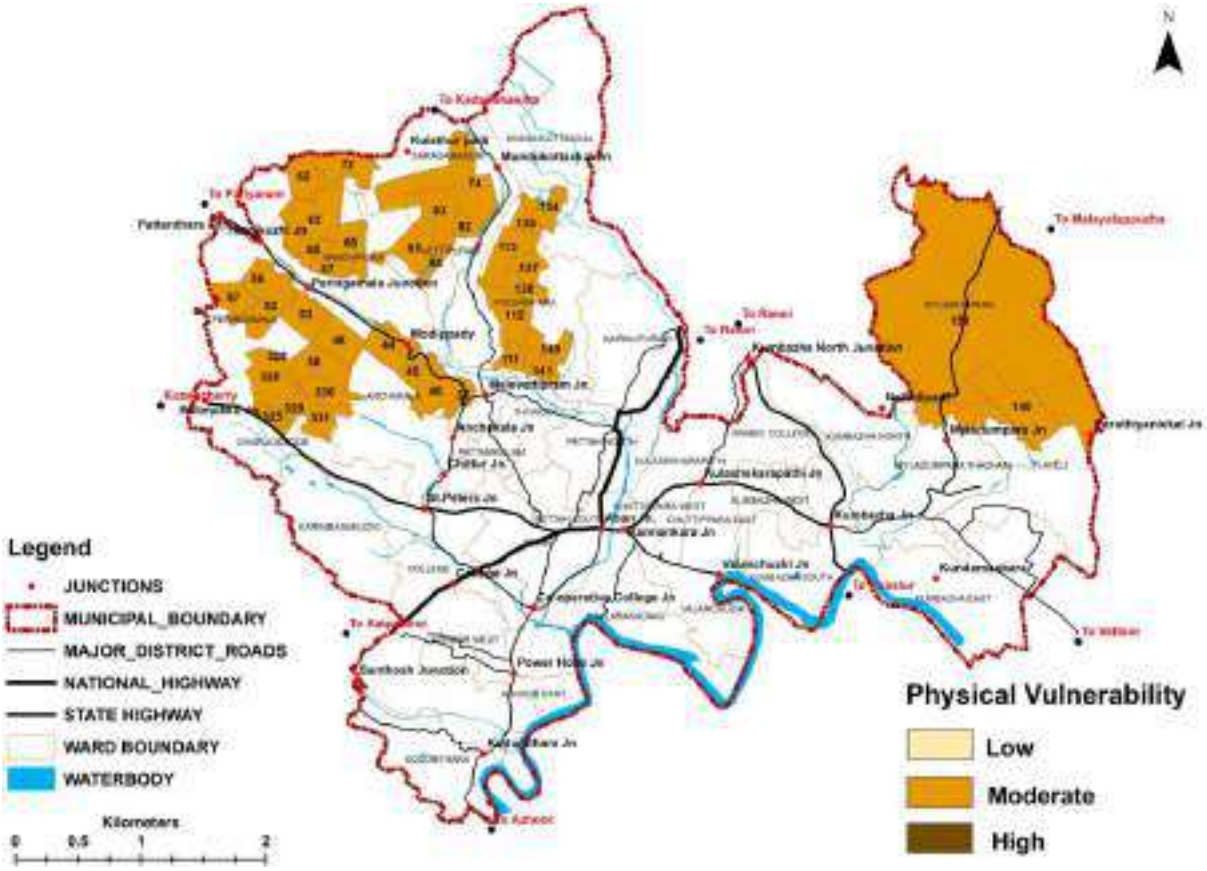


Figure 4.26 Physical vulnerability of landslide prone areas of Pathanamthitta town

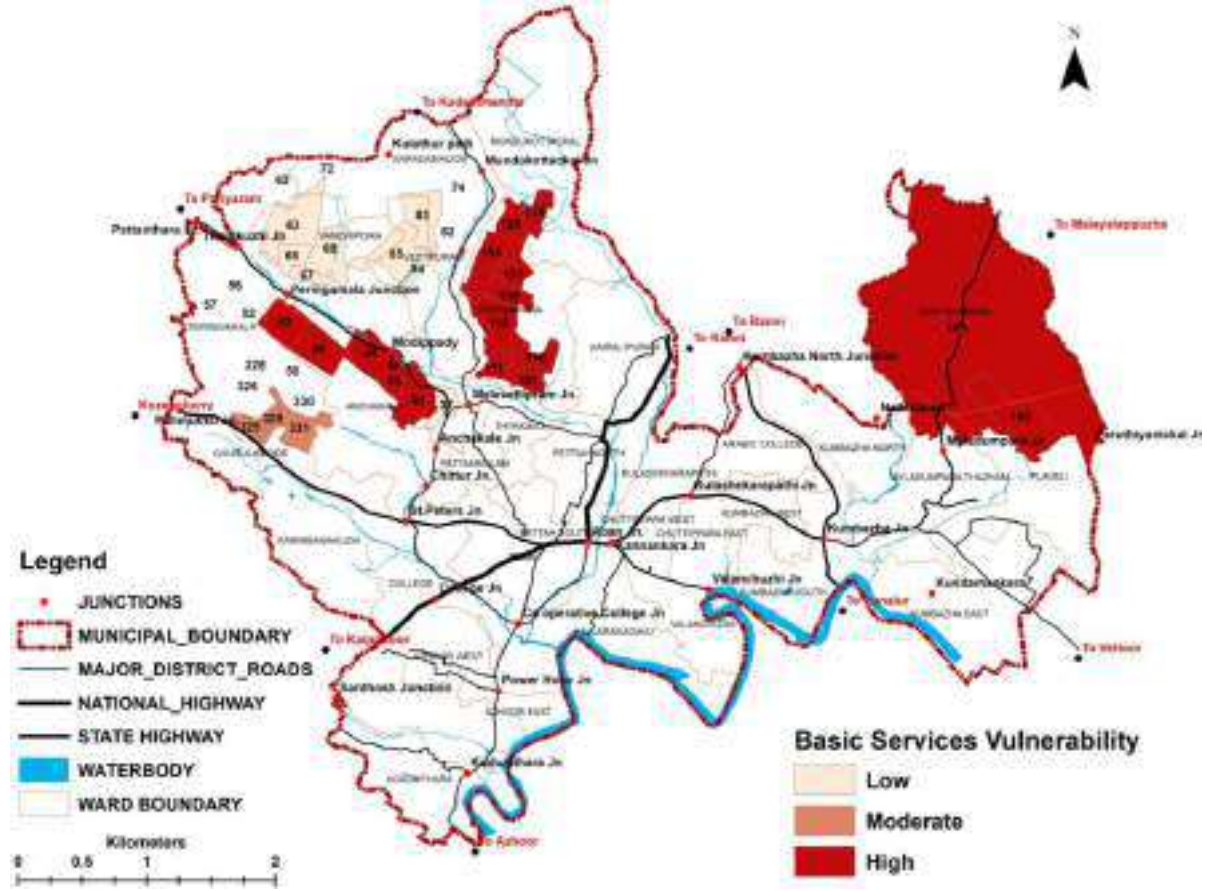


Figure 4.27 Basic service vulnerability of landslide prone areas of Pathanamthitta town

This assessment highlights the potential risks these essential services face during disasters and their role in supporting effective response and recovery efforts.The vulnerability analysis is studied sector wise in concerned chapters of this master plan based on section 5.3.2.3 of Guidelines for preparation of Risk-Informed Master Plans. Total basic services vulnerability map is generated at cadastral level (Figure 4.27).

Almost 60% of the landslide prone area of the town comes under highly vulnerable to basic services and other critical infrastructure. The infrastructure in these areas unable to withstand the forces of a landslide. The high vulnerability suggests that these areas already suffer from poor infrastructure, and landslides may completely destroy infrastructure or cause significant damage, making recovery time longer and more expensive. Basic services in moderate vulnerable areas will likely be more robust than in high vulnerability zones, but localized damage may still occur. Critical infrastructure will need to be reinforced to increase resilience to landslides and minimize service disruptions.

4.6.3.2.4 Economic Vulnerability

Economic diversification is crucial for disaster resilience and contributes 15% to the overall vulnerability rating. The assessment is based on two sub-parameters: the percentage of local-level employment and the extent of the economic zone likely to be impacted. Local-level employment primarily refers to those working in the informal sector or on daily wages.

The economic zone encompasses land used for tourism, commercial, industrial, agricultural, fisheries, animal husbandry, and other primary/tertiary activities. Data for these sub-components was collected at the cadastral level through socio-economic surveys and geospatial analysis, offering a detailed understanding of the area's economic vulnerabilities

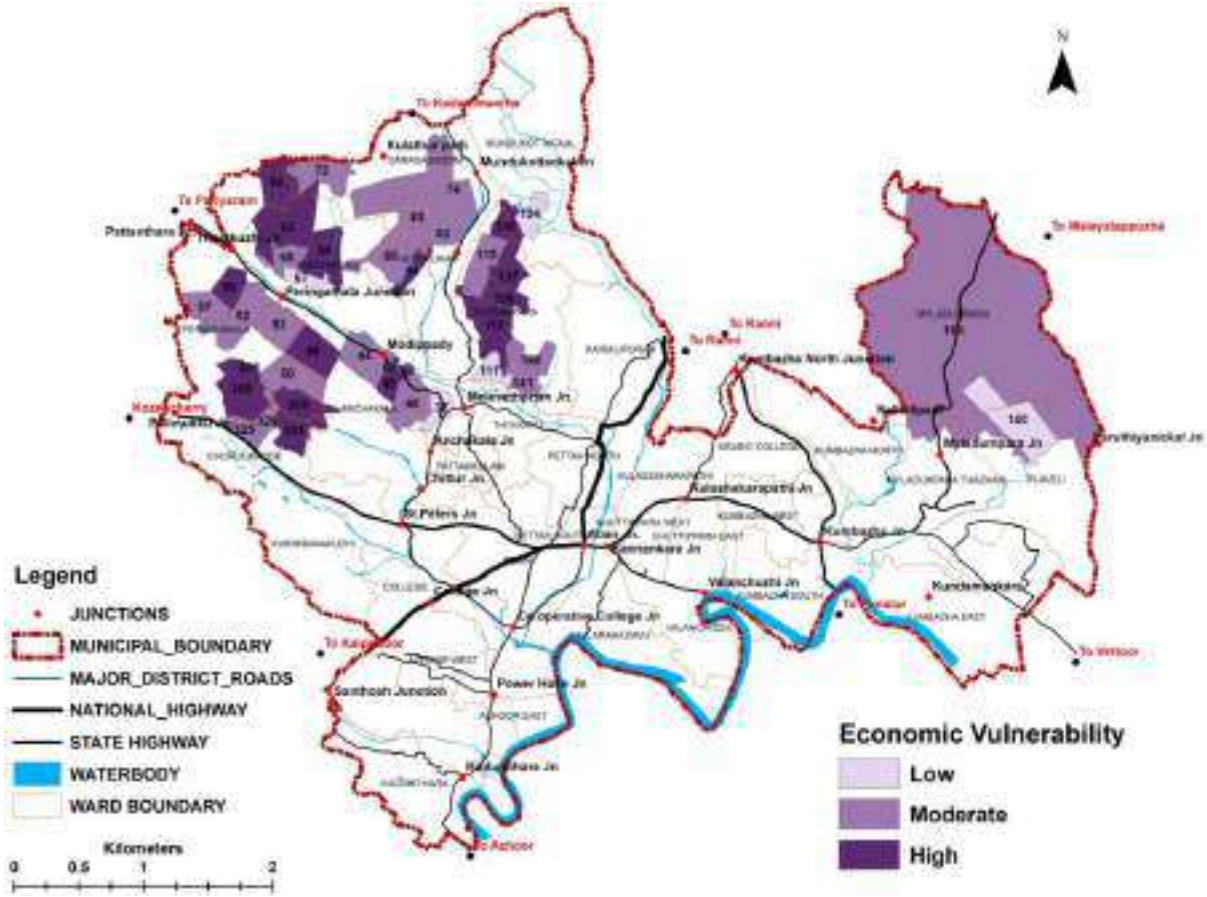


Figure 4.28 Economic vulnerability of landslide prone areas of Pathanamthitta town

The economic vulnerability analysis of two sub parameters is separately studied by sector wise in concerned chapters of this master plan based on section 5.3.2.4 of Guidelines for preparation of Risk-Informed Master Plans. Total economic vulnerability map is generated at cadastral level by adding each vulnerability scoring of these two sub components (Figure 4.28). 65% of the landslide prone areas is highly economic vulnerable and 30% is moderately economic vulnerable.

Areas faces high economic vulnerability, which means they are already experiencing economic hardships. Landslides would exacerbate these challenges by potentially destroying homes, disrupting local businesses. This could lead to job losses, income reductions and further deepening economic inequality. While not as economically vulnerable as the high-risk areas, moderate economic vulnerability will still experience economic disruptions in the event of a landslide. They may not suffer to the same extent as the high vulnerability areas, but their businesses, jobs, and livelihoods will still be impacted.

4.6.3.2.5 Environment Vulnerability

Environmentally-sensitive areas were identified based on land use, including paddy fields, wetlands, and rocky areas, all of which are vital for maintaining ecological balance. Data on these environmental resources was gathered at the cadastral level, offering a detailed understanding of the vulnerability of these areas to landslides.

The vulnerability analysis of environmentally sensitive areas separately studied by sector wise in concerned chapters of this master plan based on section 5.3.2.5 of Guidelines for preparation of Risk-Informed Master Plans. Total environmental vulnerability map is generated at cadastral level by vulnerability scoring (Figure 4.29).

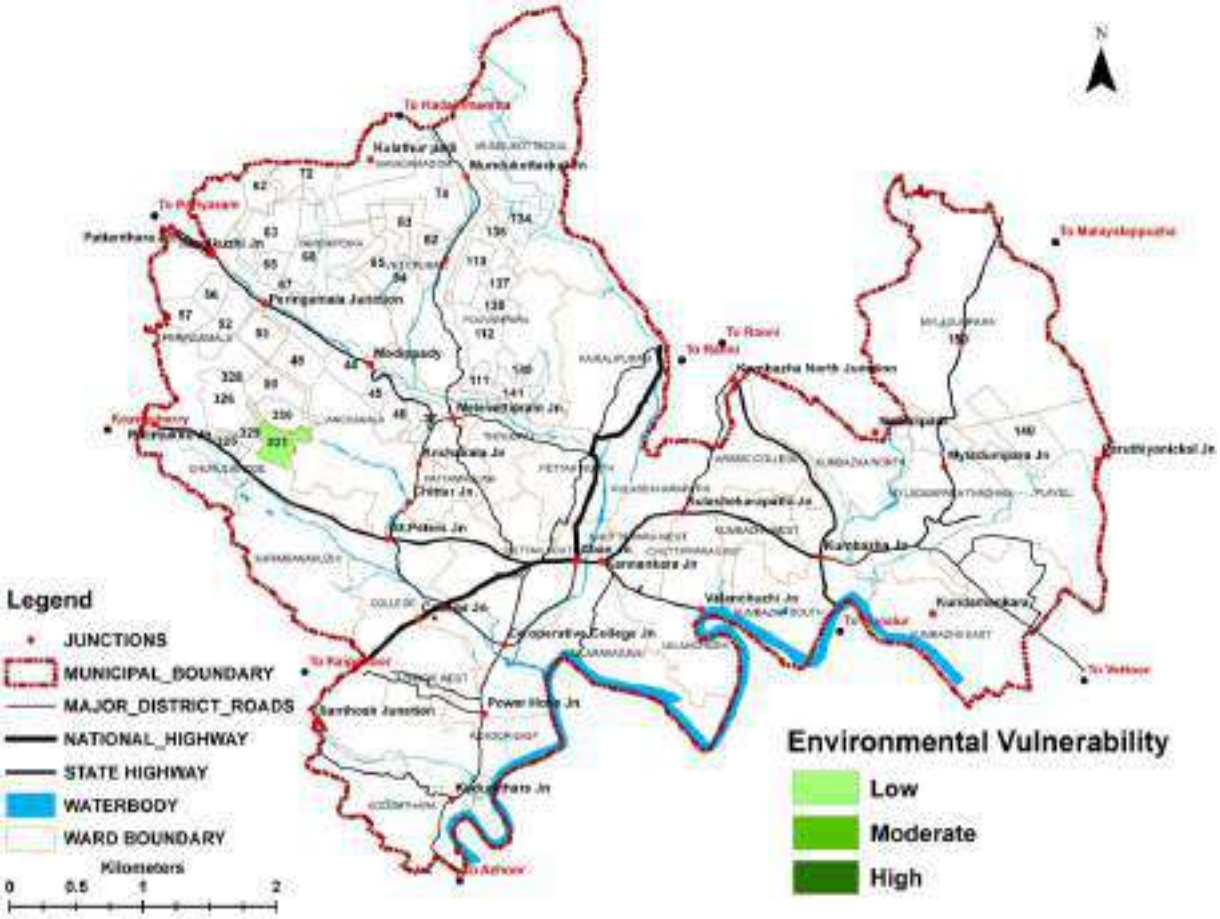


Figure 4.29 Environment vulnerability of landslide prone areas of Pathanamthitta town.

The cadastral level analysis shows that 98% of landslide prone area in the town is no environmentally vulnerable means that the landscape, ecosystems, and natural resources in the area are not significantly at risk from landslides or other environmental hazards typically associated with landslides.

Even in areas with no current environmental vulnerabilities, it's important to continue monitoring environmental conditions and anticipate potential future impacts, particularly in the context of climate change and urban growth.

4.6.3.2.6 Coping Capacity

The coping capacity factor assesses how effectively organizations and systems can manage adverse conditions, risks, or disasters by utilizing available resources and skills. Key components include having an updated Local Disaster Management Plan (LDMP) at the town level, a structured evacuation plan, active committees overseeing LDMP implementation, and the progress of various Disaster Risk Reduction (DRR) activities. In contrast to other factors, vulnerability is inversely related to coping capacity—higher coping capacity leads to lower vulnerability. Consequently, the presence of any sub-parameter was assigned a null value, emphasizing its contribution to reducing overall vulnerability.

The values for the coping capacity parameters were derived from data provided by the municipal office. In Pathanamthitta, an updated Local Disaster Management Plan (LDMP) is in place, along with a well-defined evacuation plan, active committees overseeing LDMP implementation, and identified Disaster Risk Reduction (DRR) activities, for which funding has been allocated.

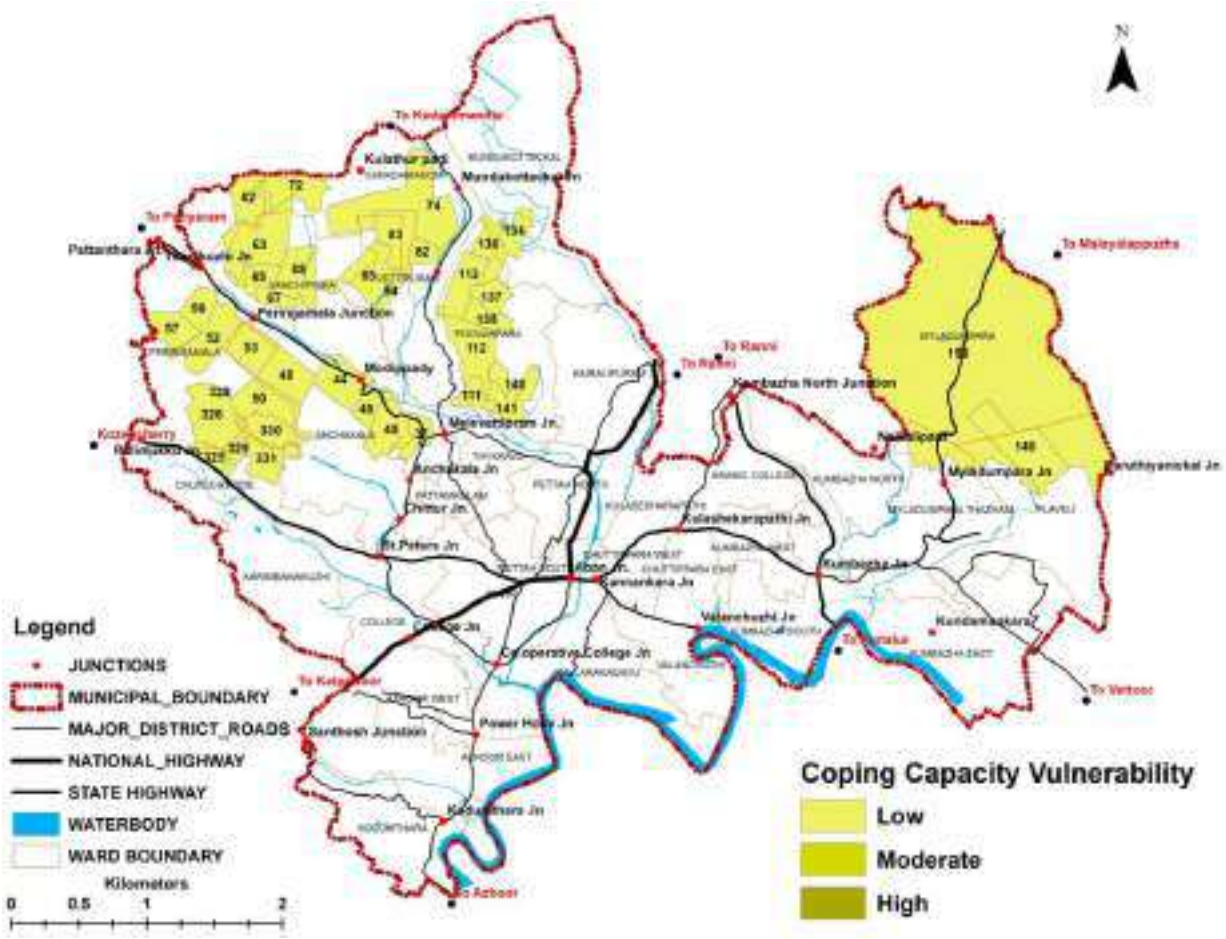


Figure 4.30 Coping capacity vulnerability of landslide prone areas of Pathanamthitta town

However, the DRR activities have not yet been implemented, which the primary factor is contributing to vulnerability in terms of coping capacity. Despite the town's readiness in other aspects, the overall low vulnerability is mainly due to the non-implementation of these DRR activities (Figure 4.30).

Low coping capacity vulnerability in a landslide-prone area of town refers to the inability or limited ability of a community, household, or infrastructure to respond to, adapt to, or recover from the impacts of landslides. Coping capacity is a critical concept in disaster risk management, referring to the resources, strategies, and mechanisms available to people or systems to handle adverse situations like landslides. When an area has low coping capacity vulnerability, it means that the community or region has coping capacity in effectively managing and mitigating the risks and consequences of landslides, even though they may be exposed to such hazards.

4.6.3.3 Total Vulnerability

Cadastral level total vulnerability in a landslide prone area refers to an assessment that evaluates the overall vulnerability of cadastral units to landslide-related risks in a specific area. The goal is to identify which land areas are most vulnerable to landlside, taking into account of 6 vulnerability factors analysed above.

Total vulnerability map is generated at cadastral level by adding each vulnerability scoring of these six components (Figure 4.31). 80% of landslide-prone areas in the town come under high total vulnerability and 20% comes under moderate total vulnerability, it means that the majority of the area at risk of landslides in the town is highly vulnerable, while a smaller portion of the area experiences a moderate level of vulnerability.

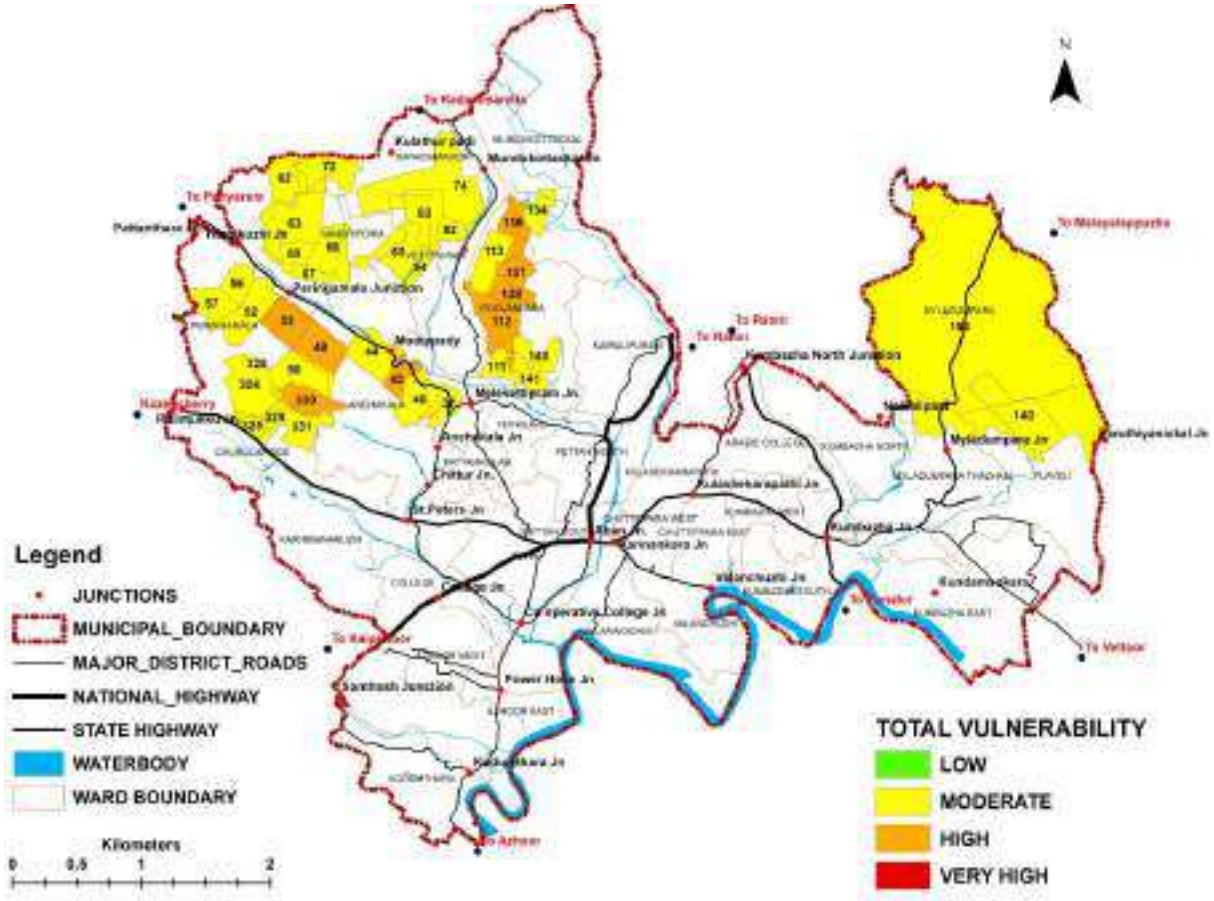


Figure 4.31 Total vulnerability of landslide prone areas of Pathanamthitta town.

High total vulnerability refers to areas that face high levels of risk due to a combination of factors, making them more susceptible to severe consequences from landslides. These areas may face severe damage to infrastructure, property, and human life. Also, long recovery periods due to higher economic losses, particularly in sectors like housing, businesses, and agriculture. These areas need for focused mitigation measures, such as land-use planning, reinforced infrastructure, early warning systems, and disaster preparedness programs.

4.6.3.4 Landslide Risk

Landslide risk is calculated as per the risk matrix provided in the section 5.4.3 of guideline for the preparation of Risk Informed Master Plan (Figure 4.32). Cumulative index of the Hazard impact and cumulative index of 6 parameters of vulnerability index is calculated and Low, Moderate, High, and Very High grading is given. This hazard index grading and vulnerability index grading is plotted in a matrix and landslide risk mapping has been done for landslide prone area of the town (Figure 4.33).

			Hazard Impact			
			Low	Moderate	High	Very High
			0 - 2.5	2.5-5	5-7.5	7.5-10
Vulnerability	Low	0- 25	L1	L2	M3	M4
	Moderate	25 - 50	L2	M3	M4	H5
	High	51 - 75	M3	M4	H5	H6
	Very High	76 - 100	M4	H5	H6	VH7

Figure 4.32 Risk Matrix as per Guideline

Source: Guideline for the preparation of Risk Informed Master Plan, Kerala.

The true value of such a map lies in its capacity to disseminate risk information and raise awareness among citizens about their potential exposure to flooding events. This tool holds immense significance, as it can inspire individual plot-level mitigation measures, guide future investments, support economic diversification, and facilitate the development of contextual, locally tailored solutions when utilized effectively.

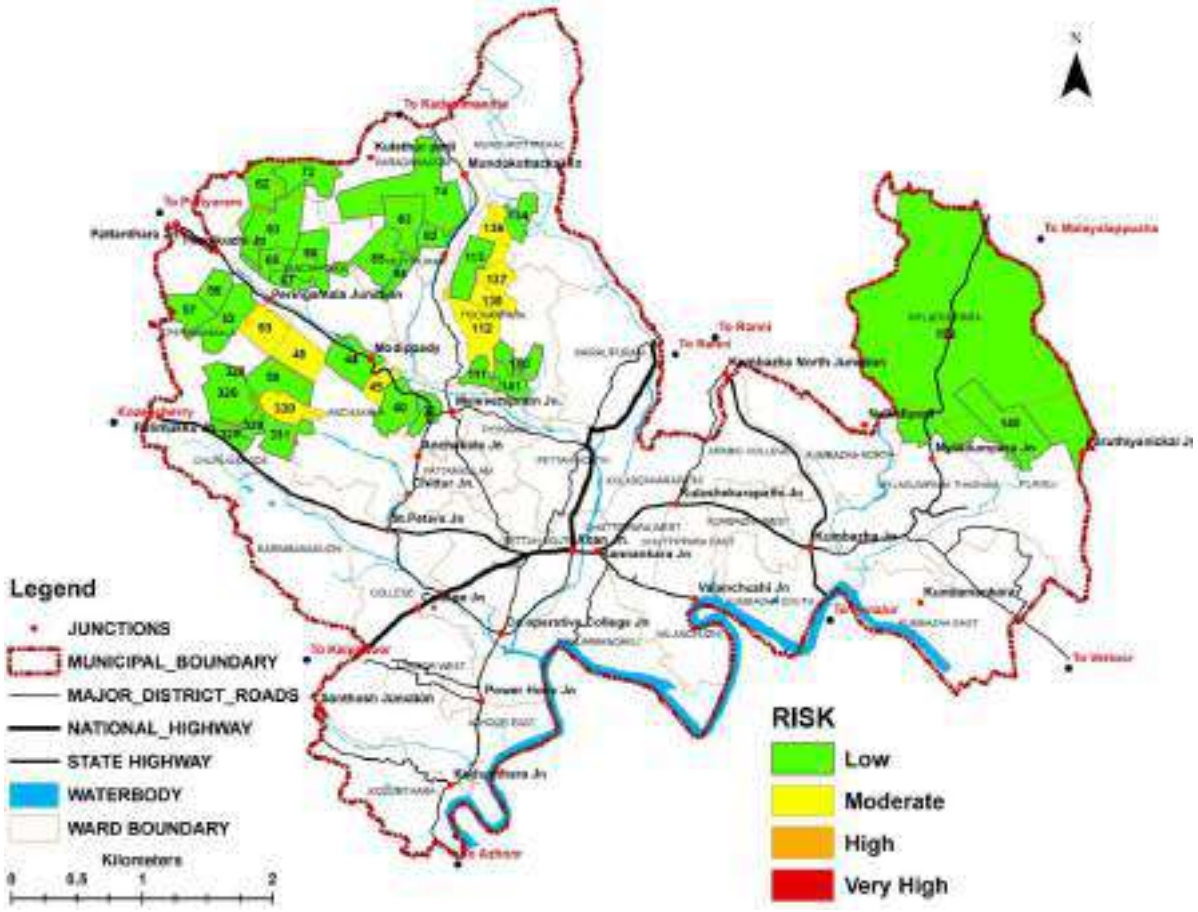


Figure 4.33 Landslide risk area of the Pathanamthitta town

80% of the landslide prone area falling under the low risk zone suggests that most of the landslide-prone areas face a low degree of landslide risk. This indicates that landslides could cause less damage, and their impact would be less severe compared to high-risk zones. Moderate risk zones may not be immediately life-threatening or catastrophic unless conditions change (e.g., heavy rainfall or ground shaking). Since the majority of the landslide-prone area (80%) is under low risk, areas should still be monitored for changes, especially in the context of urbanization and climate change. Though the risk is low, these areas should maintain adequate drainage systems and be kept under periodic review to ensure that conditions do not worsen (e.g., through land degradation or uncontrolled development). These areas should ensure land-use practices do not inadvertently increase vulnerability in these areas. The 20% of area is moderate risk, urban planning and risk mitigation efforts should be focused on these areas. Actions to reduce the risk might include slope stabilization (e.g., terracing, retaining walls, vegetation reinforcement), improved drainage systems to prevent water accumulation that could trigger landslides, zoning regulations to limit the types of construction or human activity in areas with moderate risk and public awareness campaigns to educate the population about the risks and emergency procedures.

4.7 Heat stress

The Disaster Management (DM) Plan and the Local Action Plan for Climate Change (LAPCC) report of Pathanamthitta town has identified heat stress as a critical environmental hazard affecting urban sustainability. With increasing temperatures, deforestation, rapid urbanization and climatic variations, cities are experiencing worsening thermal conditions, largely driven by the Urban Heat Island (UHI) effect. Given the ongoing global warming scenario and future climate projections, addressing this issue is crucial in urban planning. Reducing atmospheric temperatures through microclimate creation and integrating green techniques across sectors such as transport, construction, and urban design can significantly reduce the impact of heat stress on human health and well-being. To identify the areas for intervention, a study on urban heat island effects in the town has been carried out.

4.7.1 Urban Heat Island

The UHI phenomenon is characterized by elevated air and land surface temperatures in urbanized regions compared to their rural surroundings. Over the past several decades, this temperature disparity has intensified, driven by increased human activities, the expansion of built-up areas, and the decline of natural landscapes such as vegetation and water bodies. Understanding these changes is essential for developing effective mitigation strategies.

To address this challenge, a study on the Urban Heat Island effect in Pathanamthitta town has been undertaken to analyse historical and current temperature trends and assess their contributing factors. The study focuses on:

1. Assessment of Land Surface Temperature (LST): Analysing summer-time LST trends for the years 2014, 2019, and 2024 to understand historical and present-day temperature variations.
2. Analysis of NDBI and NDVI: Examining the Normalized Difference Built-up Index (NDBI) and Normalized Difference Vegetation Index (NDVI) to quantify urban expansion and vegetation loss.
3. Correlation Analysis: Assessing the relationship between LST, NDBI, and NDVI to determine the key drivers of rising urban temperatures.
4. Land Use and Land Cover (LULC) Changes (2019–2024): Evaluating changes in

urbanization, vegetation, and water bodies over the past five years.

5. Urban Heat Hotspots (UHS): Identifying areas experiencing higher temperatures compared to their surroundings.

4.7.2 Methodology

To ensure the accuracy and reliability of this study, high-resolution satellite imagery from LANDSAT 8 TIR OLI and LANDSAT 9 TIR OLI sensors was utilized. These datasets were sourced from the United States Geological Survey (USGS) Earth Explorer platform. To validate the findings, temperature data recorded by the India Meteorological Department (IMD) for the same years were incorporated.

4.7.3 Land Surface Temperature (LST) Analysis

Table 4.7 and Figure 4.34, 4.35 and 4.36 shows the land surface temperature profile of Pathanamthitta town in the years 2014, 2019 and 2024. The maximum LST increased by 4.28°C between 2014 and 2024, while the minimum LST rose by 1.23°C during the same period.

Table 4.7 Year wise Land Surface Temperature trends of Pathanamthitta Town

LST Trends (°C)		
Year	Maximum LST	Minimum LST
2014	35.12	27.42
2019	37.04	27.75
2024	39.4	28.65

Source: Satellite Data

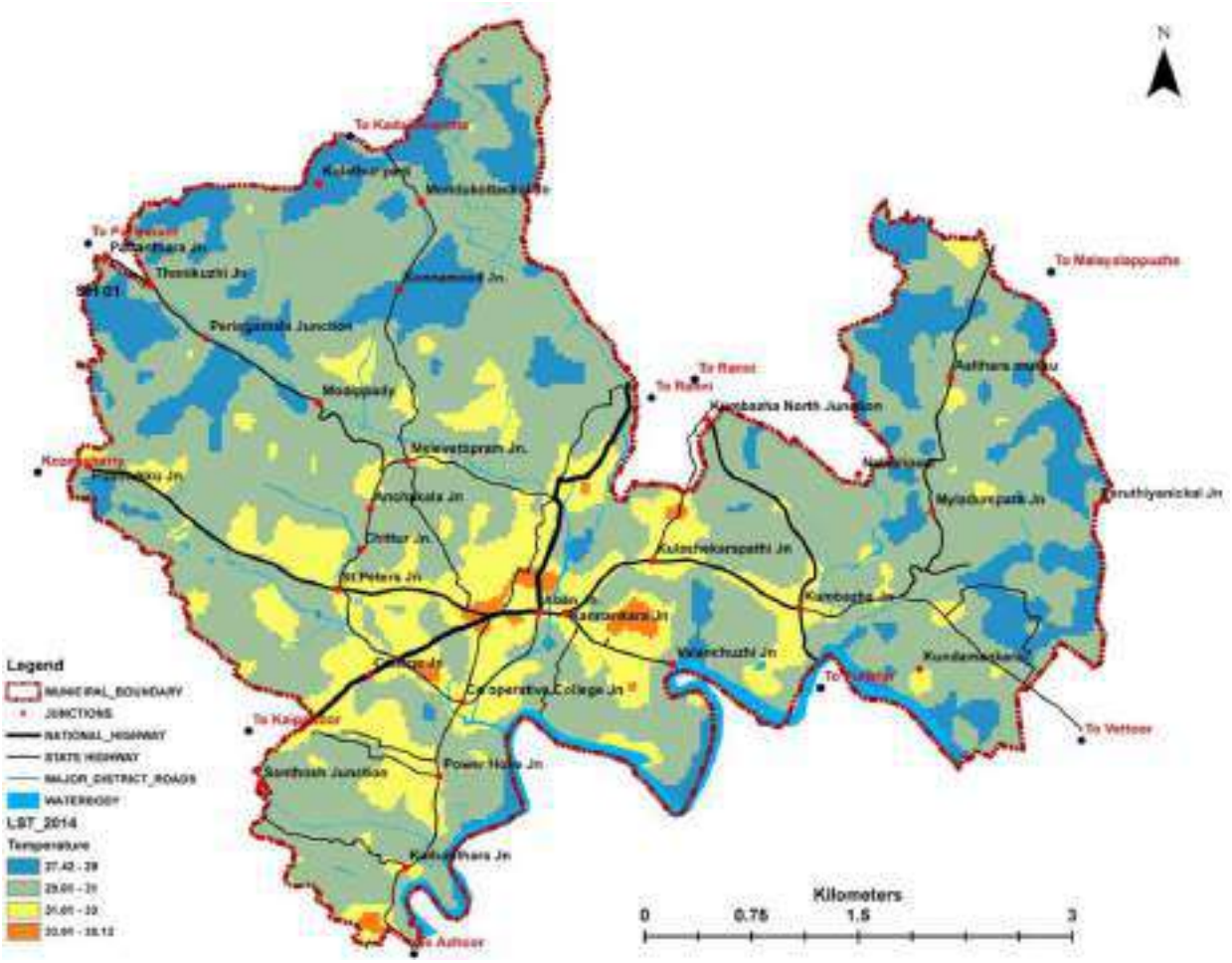


Figure 4.34 Land Surface Temperature profile of Pathanamthitta town during February 2014

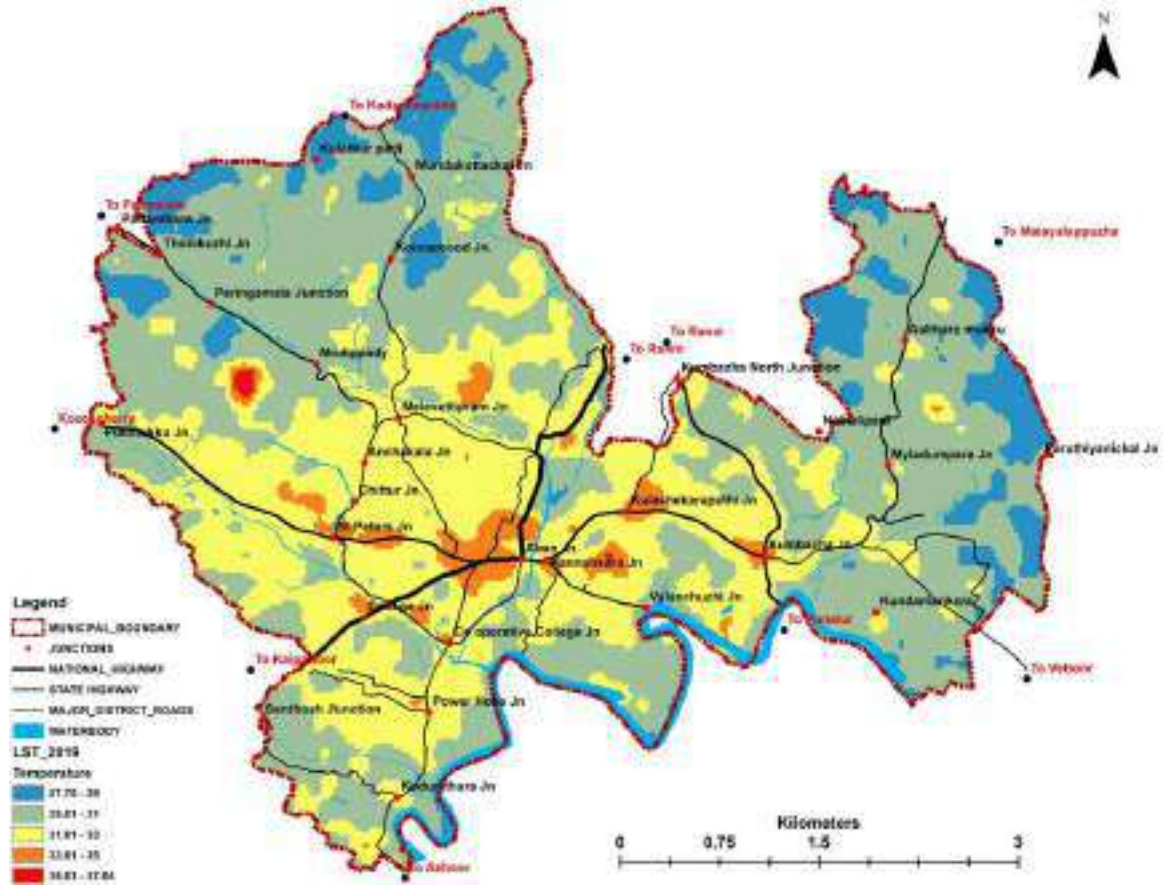


Figure 4.35 Land Surface Temperature profile of Pathanamthitta town during March 2019

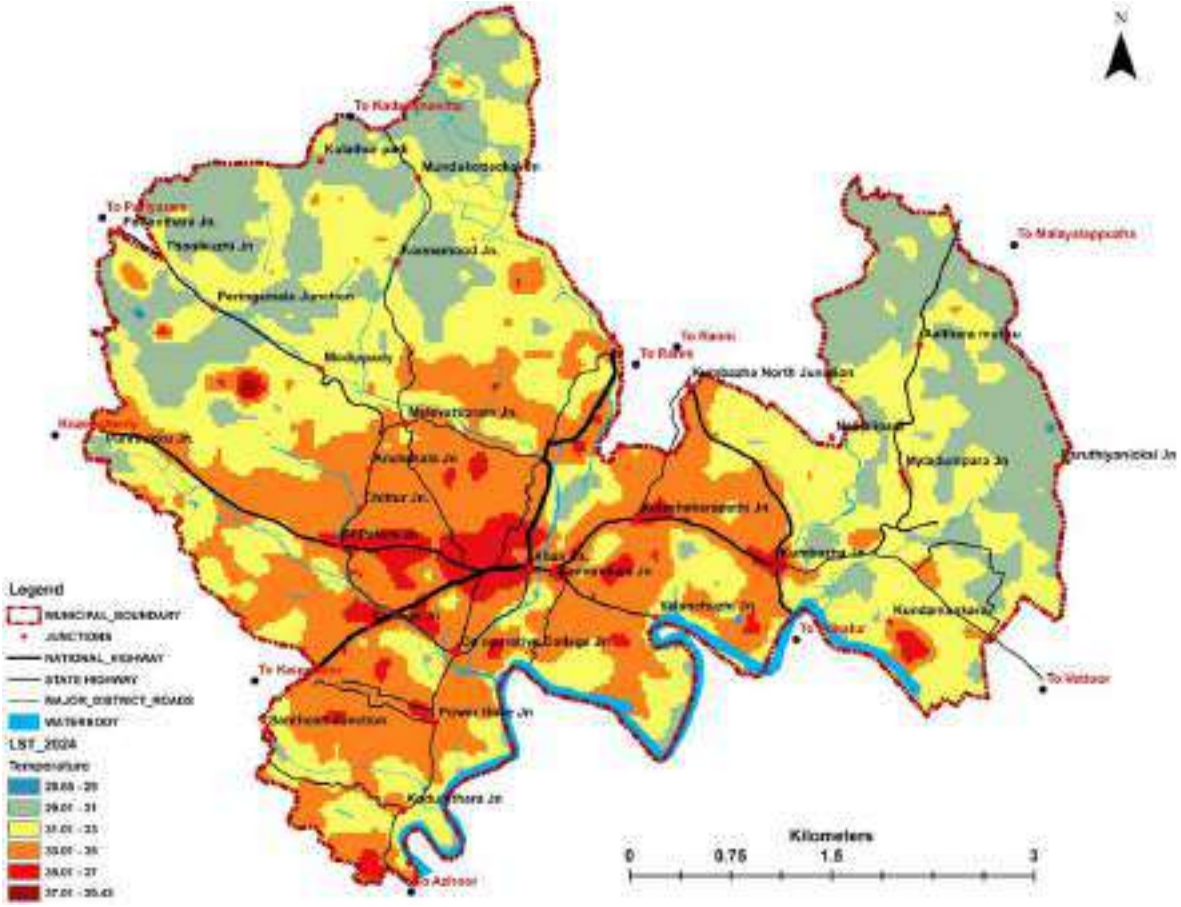


Figure 4.36 Land Surface Temperature profile of Pathanamthitta town during March 2024

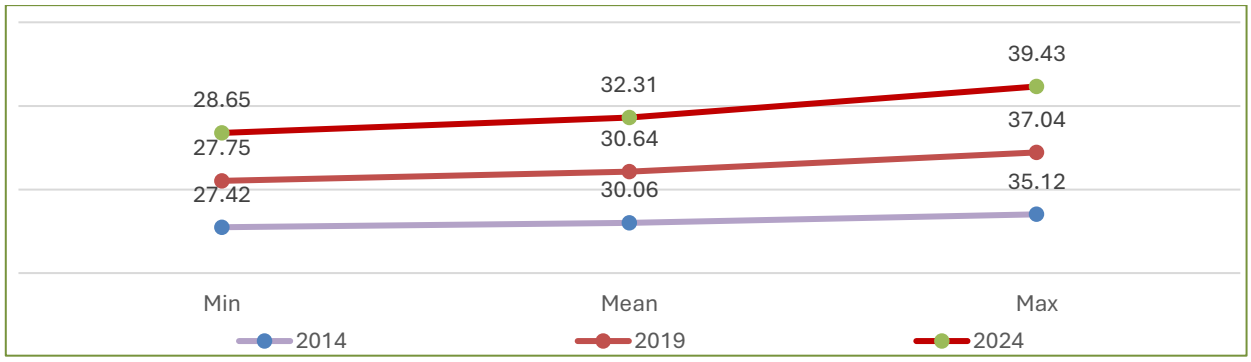


Figure 4.37 Temporal changes in Land Surface Temperature of Pathanamthitta town

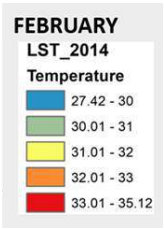
Source: Satellite Data

The temperature range between the highest and lowest LST widened from 7.7°C (2014) to 11°C (2024), indicating intensifying thermal conditions. The mean LST increased from 30.06°C (2014) to 32.31°C (2024), showing a decade-long warming trend of 2.25°C (Figure 4.37). The rising temperatures are primarily attributed to urban expansion, vegetation loss, conversion of water bodies, and increase in impervious surfaces.

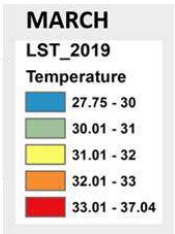
4.7.3.1 Validation of LST with IMD Data

To ensure the reliability of LST values, they were compared with temperature records from the India Meteorological Department (IMD). The validation process involved assessing the consistency between remotely sensed LST values and ground-recorded IMD temperatures for the same years (2014, 2019, and 2024). The comparison, as illustrated in the Figure 4.38, demonstrates a strong correlation between the two datasets, reinforcing the accuracy of the satellite-derived LST values. Minor variations were observed due to differences in measurement techniques—satellite imagery captures surface temperatures, whereas IMD weather stations measure atmospheric temperatures. The consistency between the datasets reinforces the accuracy of the LST analysis and its suitability for further evaluation.

2014	Temp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Punalur	Max	33.63	**35.53**	36.57	36.05	33.66	32.23	31.10	30.70	32.02	32.71	31.42	31.97
	Min	20.53	**20.37**	21.49	23.00	23.15	22.90	22.27	21.87	21.76	22.19	21.27	21.25



2019	Temp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Punalur	Max	33.83	35.88	**37.07**	37.10	35.15	32.72	31.84	30.86	31.68	31.90	33.55	32.33
	Min	18.59	21.73	**22.61**	23.70	24.18	23.76	23.28	22.65	22.96	22.63	22.03	21.48



2024	Temp	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Punalur	Max	34.98	36.77	**38.32**	37.74	33.87	32.47	31.54	32.47	33.27	32.80	32.88	32.98
	Min	19.07	19.31	**19.87**	23.65	25.22	24.77	24.37	24.40	24.17	24.20	23.54	22.75



Figure 4.38 Comparison of Monthly Average temperature data from IMD Punalur station and Land Surface Temperature from satellite data processing.

Source: IMD Punalur station, satellite data

4.7.4 NDVI and NDBI Trends

4.7.4.1 NDVI (Normalized Difference Vegetation Index):

The Normalized Difference Vegetation Index (NDVI) is a widely used remote sensing index that measures vegetation health and density using satellite imagery. It helps in monitoring plant growth, assessing drought conditions, and analysing land cover changes.

- High NDVI (> 0.5) → Dense, healthy vegetation.
- Moderate NDVI (0.2 – 0.5) → Sparse or stressed vegetation.
- Low NDVI (< 0.2) → Bare soil, urban areas, or water bodies.

Table 4.8 Year wise Normalised Difference vegetation Index (NDVI) of Pathanamthitta Town

Year	NDVI Value
2014	0.34
2019	0.36
2024	0.35

Source: Satellite Data

Moderate vegetation cover was observed throughout the study period (Table 4.8). There is a negative correlation between NDVI and LST. The weak correlation observed between Land Surface Temperature (LST) and Normalized Difference Vegetation Index (NDVI) can be attributed to various factors, including seasonal temperature variations and limitations in satellite image clarity. LST is influenced by a combination of atmospheric and ecological factors, making it challenging to establish a direct correlation with NDVI. Additionally, NDVI itself depends on several variables, such as vegetation canopy type, colour, and density, all of which fluctuate seasonally and impact its relationship with temperature.

These complexities highlight the limitations of relying solely on vegetation indices to assess temperature changes. To enhance the accuracy of analysis, LISS 4 data with a higher spatial resolution of 5.8 meters for the same period (2014, 2019, and 2024) have been integrated. Additionally, other key parameters, such as the Normalized Difference Built-up Index (NDBI) and land use/land cover changes (LULC) have been considered. This comprehensive approach aims to provide a more detailed and reliable assessment of the interactions between land surface temperature and urban environmental factors.

4.7.4.2 NDVI (Normalized Difference Vegetation Index) using LISS 4 data

The study incorporated high-resolution LISS 4 (Linear Imaging Self-Scanning Sensor 4) data to enhance the accuracy of the assessment. LISS 4 (Linear Imaging Self-Scanning Sensor 4) is a high-resolution multispectral sensor on board India's Resourcesat-2 and Resourcesat-2A satellites, developed by ISRO. It provides 5.8-meter spatial resolution imagery in three spectral bands—Green, Red, and Near-Infrared (NIR). This high-resolution data is widely used for applications such as vegetation monitoring (NDVI), land use/land cover (LULC) analysis, and urban planning. Its ability to capture detailed surface features makes it valuable for environmental studies, agriculture, and disaster management.

To assess changes in vegetation density over the past decade, Vegetation changes over the past decade were assessed using bar charts and spatial maps. The Normalized Difference Vegetation Index (NDVI) serves as a crucial metric for evaluating vegetation health and density. Higher NDVI values indicate dense, healthy vegetation, while lower values reflect sparse or degraded greenery. These variations are largely driven by urban expansion, deforestation, and climatic factors. By examining these visual representations, we can better understand the impact of land cover transformations on urban thermal dynamics and identify areas requiring green infrastructure interventions.

4.7.4.3 Observations on Vegetation Density

An analysis of Normalized Difference Vegetation Index (NDVI) values over the past decade reveals a progressive decline in vegetation density (Figure 4.39) highlighting the impact of urban expansion, deforestation, and land-use changes in Pathanamthitta town. Figure 4.40, 4.41 and 4.42 shows the NDVI profile of Pathanamthitta town in the years 2014, 2019 and 2024.

1. **Year 2014 (Blue):** This year recorded the highest vegetation density, with a maximum NDVI of 0.90, indicating the presence of dense and healthy green cover.

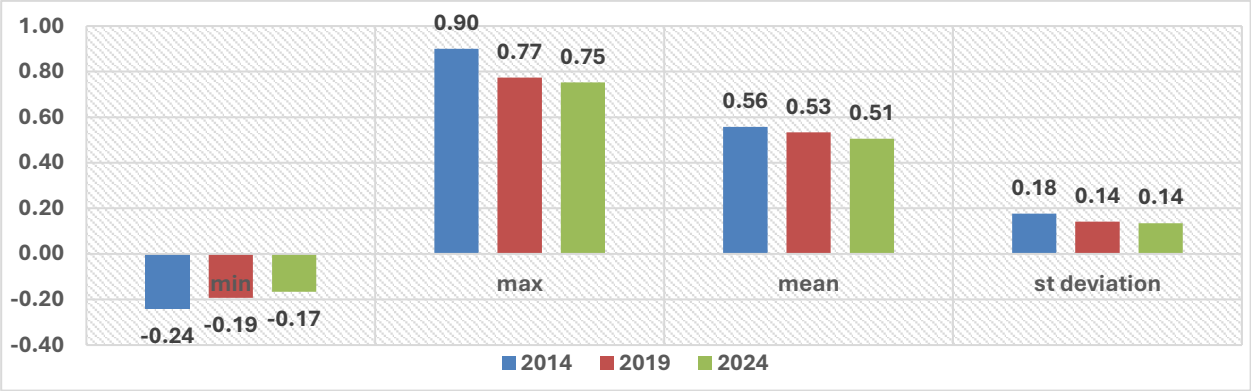


Figure 4.39 Temporal Changes in the NDVI profile of Pathanamthitta Town for 2014, 2019, 2024

Source: Satellite data

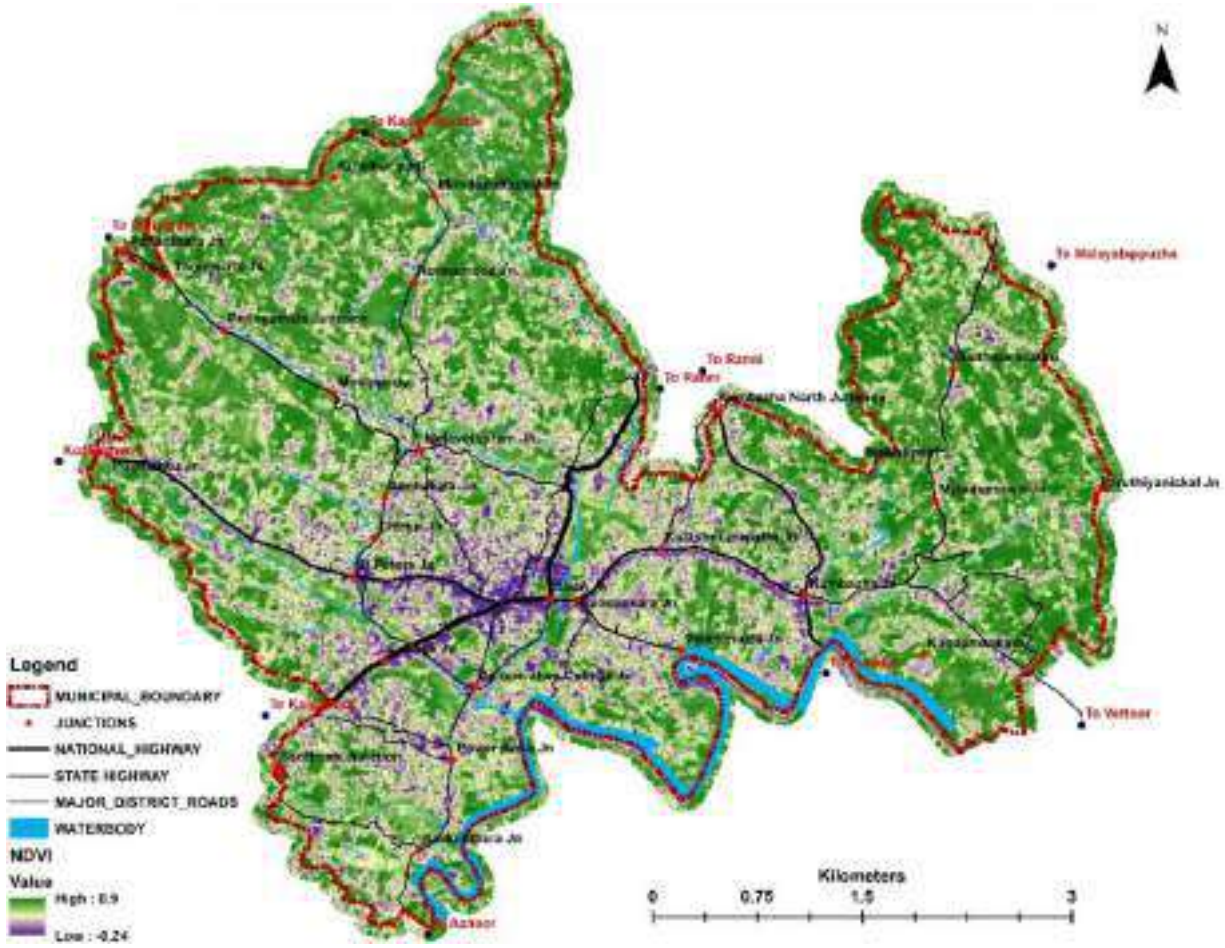


Figure 4.40 NDVI profile of Pathanamthitta town during April 2014

Source: Satellite data



Figure 4.41 NDVI profile of Pathanamthitta town during April 2019

Source: Satellite data



Figure 4.42 NDVI profile of Pathanamthitta town during April 2024

Source: Satellite data

However, the minimum NDVI of -0.24 suggests that certain areas experienced sparse or degraded vegetation, likely due to urban expansion or deforestation. The mean NDVI of 0.56 reflects moderately dense vegetation across the town, with noticeable variations as indicated by the standard deviation of 0.18.

2. **Year 2019 (Orange):** A decline in vegetation density is evident, with the maximum NDVI decreasing to 0.77, signalling a reduction in highly vegetated zones. The minimum NDVI improved slightly to -0.19, suggesting that extremely degraded areas may have stabilized or recovered slightly. However, the mean NDVI dropped to 0.53, confirming a reduction in overall green cover. The standard deviation decreased to 0.14, indicating that vegetation distribution became more uniform, possibly due to continued urbanization and land-use changes.
3. **2024 (Grey):** The downward trend in vegetation density continues, with the maximum NDVI further decreasing to 0.75, pointing toward a progressive decline in high vegetation cover. The minimum NDVI improved marginally to -0.17, indicating a slight recovery in the least vegetated areas. However, the mean NDVI dropped further to 0.51, reinforcing the overall reduction in greenery. The standard deviation remains at 0.14, suggesting stability in the spatial distribution of vegetation loss over time.

These findings highlight the gradual depletion of vegetation cover over the past decade and reinforce the need for targeted urban greening interventions to mitigate the urban heat island effect and enhance climate resilience in Pathanamthitta Town. The analysis reveals a consistent decline in vegetation density from 2014 to 2024, with maximum and mean NDVI values steadily decreasing, indicating the impact of urbanization, deforestation, and land-use changes. However, the less negative minimum NDVI values suggest a marginal improvement or stabilization in previously degraded areas. These trends emphasize the urgent need for sustainable urban planning, reforestation efforts, and green infrastructure to counteract vegetation loss and promote ecological balance in the region.

4.7.4.4 NDBI (Normalized Difference Built-up Index):

It is a remote sensing index used to detect and analyze built-up areas in satellite imagery. It is derived from the Near-Infrared (NIR) and Shortwave Infrared (SWIR) bands, commonly obtained from sensors like Landsat. A higher NDBI value indicates more built-up areas, while lower values suggest vegetation or water bodies. It is often used alongside NDVI (Normalized Difference Vegetation Index) to differentiate urban and vegetated regions.

4.7.4.4.1 Calculating Built-Up Area from NDBI Analysis

By extracting built-up pixels from NDBI raster data, we can estimate the total built-up area within a specific region. NDBI values range from -1 to +1, with positive values typically indicating built-up areas, while negative values represent vegetation, water bodies, or bare soil. To classify built-up areas, a suitable NDBI threshold must be chosen. Table 4.9 shows the year wise total Built-up area of Pathanamthitta Town. Common threshold: NDBI > 0 is a widely used baseline for detecting urban surfaces.

Table 4.9 Year wise total built-up area of Pathanamthitta Town

Year	Built-up Area (sq. km)
2014	0.9315
2019	1.29
2024	1.46

Source: Satellite data

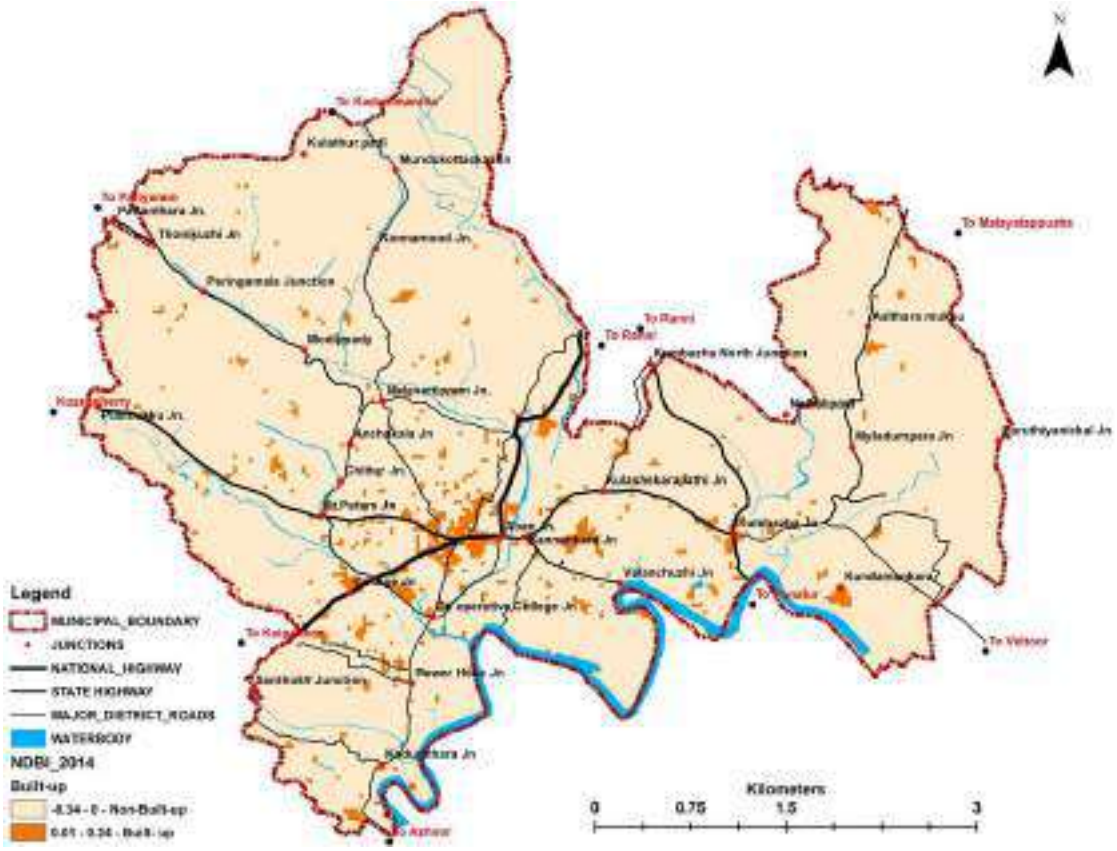


Figure 4.43 NDBI profile of Pathanamthitta town during February 2014

Source: Satellite data



Figure 4.44 NDBI profile of Pathanamthitta town during March 2019

Source: Satellite data



Figure 4.45 NDBI profile of Pathanamthitta town during March 2024

Source: Satellite data

NDBI profile of Pathanamthitta town during the years 2014, 2019 and 2024 is shown in the Figures 4.43, 4.44 and 4.45. A consistent increase in built-up areas was observed over the study period. The correlation coefficient (0.63) between NDBI and LST indicates a strong positive relationship between urbanization and temperature rise. As impervious surfaces expand, they trap and retain heat, contributing significantly to the Urban Heat Island (UHI) effect.

4.7.4.5 Land Use and Land Cover (LULC) Changes (2019-2024)

Land Use and Land Cover (LULC) transformations significantly influence the urban thermal environment, contributing to the intensification of the Urban Heat Island (UHI) effect in Pathanamthitta town. Analysis, conducted using true-color satellite images from Google Earth, has revealed notable changes in LULC patterns between 2019 (Figure 4.46) and 2024 (Figure 4.47), directly affecting temperature dynamics.

Key Observed Changes:

1. Decline in Mixed Tree Cover: A reduction of 1.37 sq. km in mixed tree cover has resulted in decreased cooling effects from vegetation, leading to an overall increase in land surface temperature (LST).
2. Loss of Fallow Paddy Fields: A decrease of 0.05 sq. km in fallow paddy fields indicates shifts in land use patterns, reducing the natural capacity for temperature regulation.
3. Expansion of Built-up Areas: The built-up area increased by 0.03 sq. km, reinforcing the trend of urbanization and associated heat accumulation.

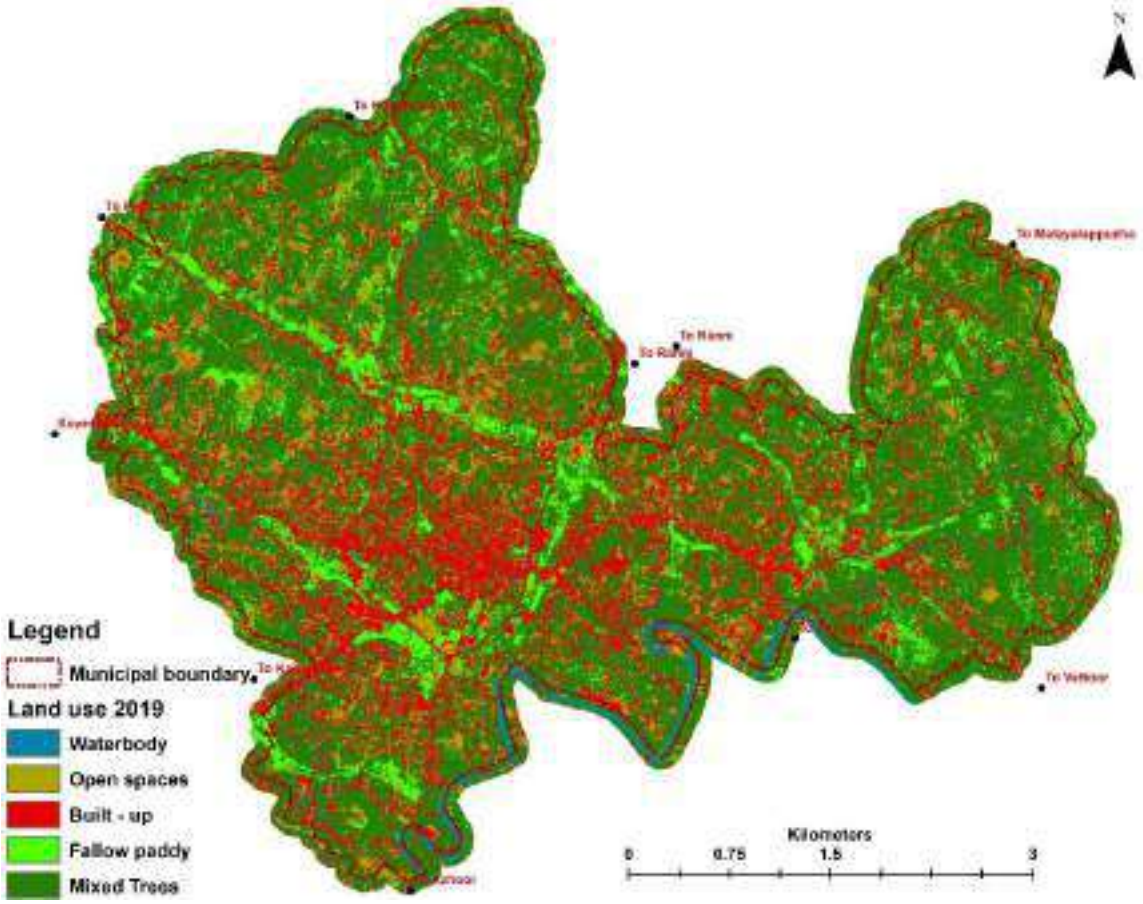


Figure 4.46 Land use and Landover profile of Pathanamthitta town during March 2019

Source: Satellite data

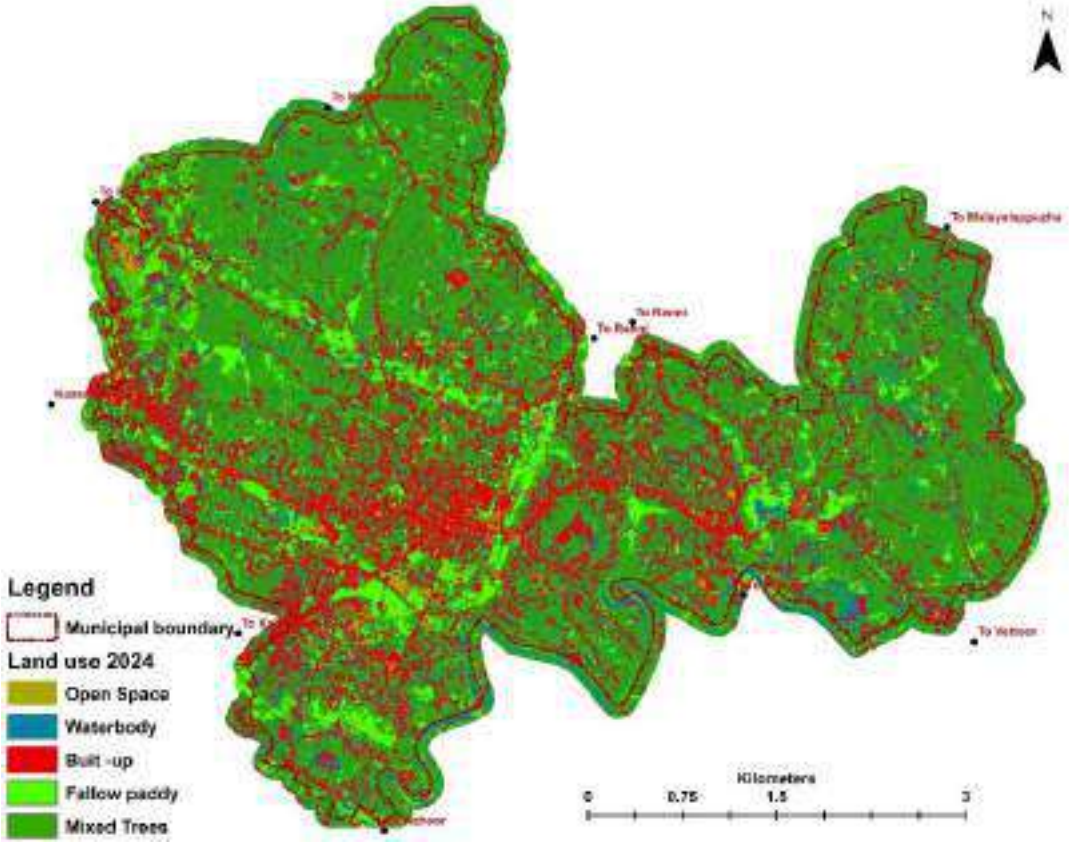


Figure 4.47 Land use and Landover profile of Pathanamthitta town during March 2024

Source: Satellite data

These transformations strongly correlate with the observed increase in maximum LST from 37.04°C in 2019 to 39.4°C in 2024, emphasizing the role of LULC changes in exacerbating urban heat conditions. The loss of natural landscapes, particularly vegetative cover and water-retaining surfaces, has amplified heat retention in the urban environment, accelerating the UHI effect in Pathanamthitta town.

This analysis underscores the urgent need for sustainable urban planning interventions, including green infrastructure development, urban forestry programs, and climate-sensitive land use policies, to mitigate rising temperatures and enhance urban resilience.

4.7.5 Urban Heat Island (UHI) Effect

The findings of this study confirm a rising temperature trend in Pathanamthitta town, driven by vegetation loss, land use changes, and expanding built-up areas. These factors contribute to an increased heat stress effect, intensifying the Urban Heat Island (UHI) phenomenon.

To effectively address this issue, the UHI effect in the town was mapped, providing spatial insights into temperature variations across different urban zones. Additionally, to facilitate prioritization of interventions, urban heat hotspots (UHS) were identified. These hotspots represent areas experiencing the highest thermal stress, making them critical zones for targeted mitigation efforts.

By mapping UHI and pinpointing heat hotspots, this study enables a data-driven approach to urban climate adaptation. The results will support decision-making for green infrastructure planning, urban greening initiatives, and sustainable land use strategies to reduce the impact of rising temperatures and improve overall urban resilience.

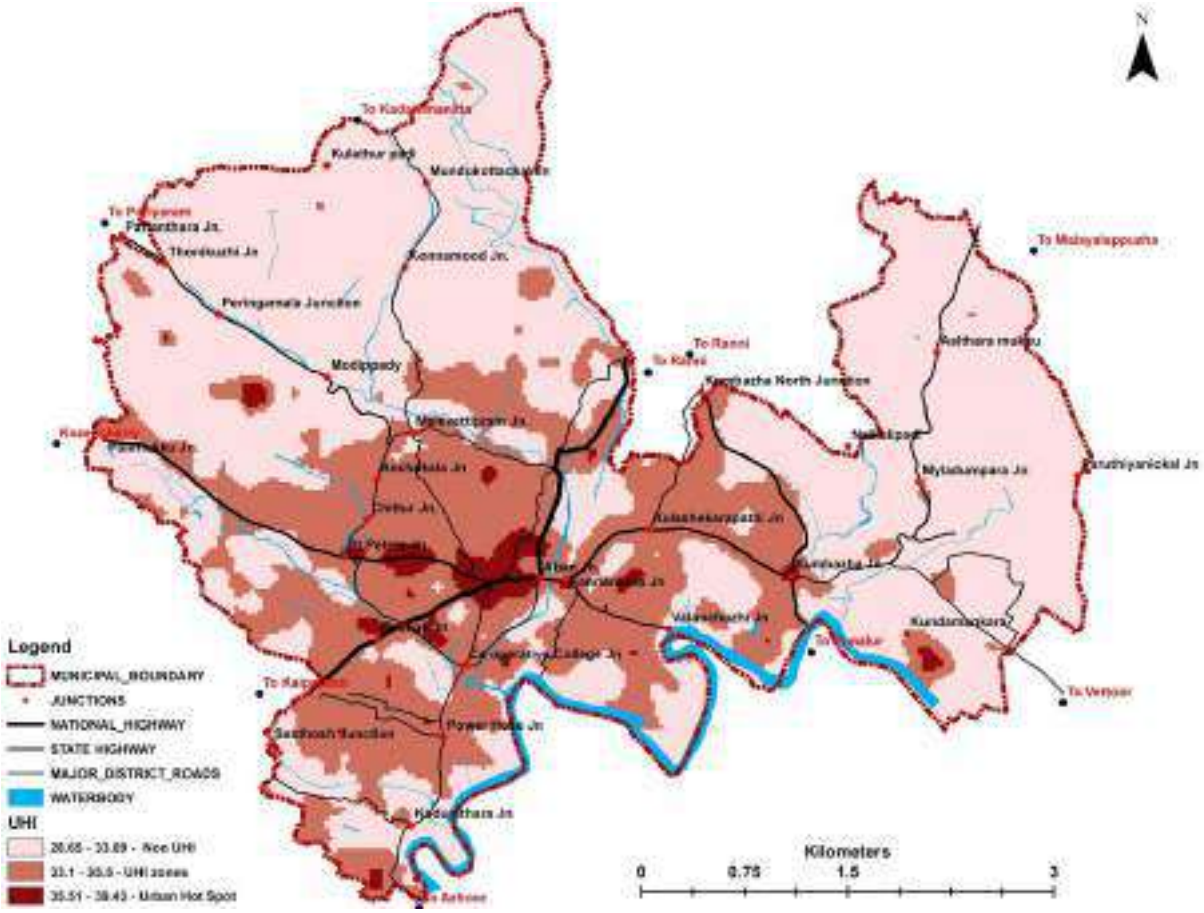


Figure 4.48 Urban Heat profile of Pathanamthitta town during March 2024

To assess the Urban Heat Island (UHI) effect in Pathanamthitta town, UHI zones were computed (Figure 4.48) using Land Surface Temperature (LST) data. The classification was based on statistical parameters, including the mean LST and its standard deviation (SD), allowing for the identification of distinct temperature zones.

$$\text{UHI zones} = LST > LST_{Mean} + 0.5 \times LST_{SD}$$

$$\text{Non UHI zones} = 0 < LST \leq LST_{Mean} + 0.5 \times LST_{SD}$$

Where UHI = Urban Heat Island; LST = Land Surface Temperature; LST mean = Mean of LST; LST SD = Standard Deviation of LST

4.7.5.1 UHI Zones (March 2024):

Temperature range: 33.01°C to 35.45°C
Coverage area: 7.57 sq. km

4.7.5.2 Non-UHI Zones:

Temperature range: 28.65°C to 33°C
Coverage area: 15.4 sq. km

4.7.6 Identification of Urban Heat Hotspots (UHS)

To further pinpoint areas experiencing severe heat stress, Urban Heat Hotspots (UHS) were identified (Figure 4.49) using an additional computational approach. These hotspots represent localized zones with extreme thermal conditions, making them high-priority areas for intervention.

$$UHS = LST > LST_{Mean} + 2 \times LST_{SD}$$

Areas experiencing extreme heat stress were classified as UHS.

Two primary types of UHS were identified:

1. Dense Built-Up Areas: These regions exhibit high population density, extensive road networks, and minimal vegetation, contributing to excessive heat retention.
2. Bare Earth Regions: Open lands, rocky surfaces, and cleared agricultural fields were also identified as heat-prone zones. These areas lack significant vegetation cover, exacerbating surface temperature rise.

Some of the detailed views of hot spots are provided here (Figure 4.50). A closer analysis of these hotspots provides insights into the most heat-stressed areas, guiding targeted mitigation measures.



Figure 4.49 Urban Hot Spot areas in the Pathanamathitta town

A) Bare Rock Surfaces

1. High Heat Absorption: Exposed rock surfaces have low albedo (reflectivity) and absorb large amounts of solar radiation, leading to increased land surface temperatures (LST).
2. Limited Evapotranspiration: Unlike vegetation-covered areas, bare rock lacks moisture, reducing cooling through evapotranspiration.
3. Thermal Retention: Rock surfaces store heat during the day and release it slowly at night, contributing to higher night time temperatures.

B) Dense Built-up Areas (Concrete, Asphalt, Infrastructure)

1. Urban Heat Island Effect: Dense built-up areas are major contributors to urban hotspots due to their high thermal mass and low reflectivity.
2. Reduced Green Cover: Limited vegetation decreases the cooling effects through evapotranspiration.
3. Heat Retention: Materials like concrete and asphalt absorb heat throughout the day and release it slowly at night, prolonging elevated temperatures.
4. Anthropogenic Heat: Human activities, such as vehicular emissions, air conditioning, and industrial operations, add to localized heat accumulation.

C & D) Open Area (Barren Land, Non-Vegetated Spaces)

1. Direct Solar Exposure: Bare soil and cleared land absorb heat, leading to higher surface temperatures.
2. Low Shading Effect: The absence of trees or built structures results in unfiltered solar radiation, enhancing heat accumulation.
3. Wind Influence: While open areas may have better air circulation, in the absence of greenery, they still contribute to localized heating.

(E) Combination of Open Areas & Built Spaces

1. Heat Amplification: Open areas with sparse vegetation combined with built-up surfaces create mixed heating patterns, intensifying localized temperature variations.
2. Fragmented Green Spaces: Isolated patches of greenery provide minimal cooling, allowing heat hotspots to persist.
3. Complex Microclimates: Depending on the ratio of open land to built-up areas, localized temperature variations can range from moderate to extreme, influencing urban thermal comfort.

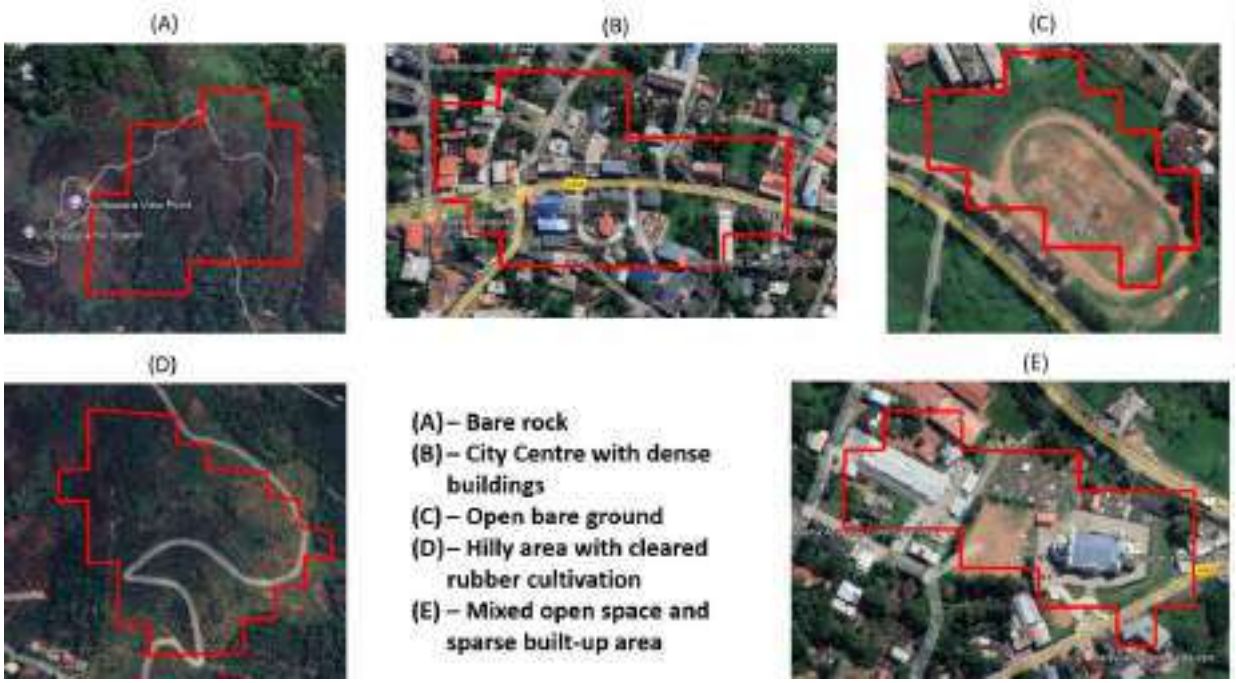


Figure 4.50 Some of the detailed views of urban heat hot spots of Pathanamthitta town.

4.8 Existing Disaster response system

Pathanamthitta municipality has developed a comprehensive disaster response framework that emphasizes community participation and efficient local governance. The disaster management plan aligns with the guidelines of the Kerala State Disaster Management Authority, incorporating hazard analysis, resource mapping, and institutional frameworks. A critical component of this system is the network of ward-level volunteers who play a key role in disseminating early warnings, assisting in evacuation, and providing first aid during emergencies. These volunteers work closely with local authorities, ensuring that preparedness measures reach all sections of the community.

The municipality employs a decentralized approach to disaster management, ensuring resources and facilities are accessible across all wards. Key locations, such as primary health centres and schools, are identified to serve as emergency shelters and treatment hubs. Collaboration with private and public institutions enhances the resource base, including ambulances, rescue units, and medical supplies, which are vital during crisis situations. This integration of infrastructure and resources strengthens the municipality's capacity to respond effectively to disasters.

Coordination and communication are integral to Pathanamthitta's disaster response system. The disaster management team comprises trained personnel, including medical staff, rescue teams, and logistics coordinators, who operate within a well-defined communication network. Responsibilities are clearly assigned to officials and ward-level coordinators, facilitating swift action during emergencies. Public awareness campaigns are regularly conducted to educate residents on disaster risks and preparedness measures, fostering a culture of resilience within the community.

4.9 Findings

Pathanamthitta town is exposed to effect of different types of risk such as flooding, landslide, urban heat spots, drought (drinking water scarcity) and lighting. But the major risk that can affect the town is flooding, landslide and urban heat spots.

The town has areas at risk from flooding, with some parts facing moderate to high risks. This increases the potential for property damage, loss of life, and disruption of services. Flooding could affect critical infrastructure (roads and utilities), residential and commercial properties, and public spaces. The population may be exposed to health risks like waterborne diseases. The town must implement flood mitigation measures such as flood control infrastructure, including connected drainage systems, zoning regulations in flood-prone areas, early warning systems, and flood evacuation plans. Green infrastructure (e.g., permeable pavements, floodplain restoration) might also be emphasized to reduce flood risks.

The landslide risk is relatively lower but still a concern in certain areas, especially in steep terrain or locations with weak soils. Urban development in these zones may exacerbate the risk. Landslides could disrupt transport networks, damage homes, and lead to injuries or fatalities. The economic impact could also be significant if key infrastructure or residential areas are affected. The town need to implement landslide mitigation measures like Slope stabilization, proper land-use planning (limiting construction in high-risk areas) and monitoring systems could be integrated into the spatial plan.

The presence of urban heat islands (UHI) indicates that certain parts of the town experience higher temperatures than surrounding areas. This is due to the concentration of buildings, roads, and other impervious surfaces that trap heat. UHIs can worsen air quality, exacerbate heat-related

illnesses (especially for vulnerable populations), increase energy demand (especially for cooling), and reduce overall liveability. The town need to implement urban heat island mitigation measures like Urban greening initiatives (e.g., green roofs, parks, tree planting), implementing energy efficiency building codes, reflective surfaces to reduce heat absorption, and enhancing ventilation in urban spaces. Urban design projects of the town should aim to increase green spaces and reduce heat-trapping materials.

Drought is supplementary to summers with high temperature. The drought mentioned and felt in the area of concern is mainly hydrological drought which is a deficit in available water for drinking and irrigation purposes. Such droughts can be managed scientifically by various methods like ground water recharging, reducing wastage of water, modern root zone irrigation techniques, creation of water retention ponds etc. The master plan may work on proposals to ensure piped water supply to all households to reduce the impact of hydrological drought to an extent.

Given the overlapping nature of these risks, an integrated risk management approach should be emphasized. For example, flood prevention measures can also help with landslide risk management (through soil stabilization), while increasing green spaces for UHI mitigation can also aid in reducing drought effects (by improving water retention). Public awareness campaigns, disaster preparedness, and community participation in planning and risk mitigation are crucial for ensuring the success of risk management strategies.

4.10 Inference

Pathanamthitta town is characterized by its undulating terrain, small hills, and the presence of streams and tributaries of the Pamba River, which contribute to its vulnerability to natural hazards. The town faces significant risks of landslides, floods, droughts, lightning and urban heat island effects. Landslides are triggered by steep slopes, deforestation, and unplanned construction, particularly during heavy monsoons, while flooding is caused by the overflow of the Pamba River, inadequate drainage systems, and encroachments on natural drainage pathways. Droughts, though occasional, arise due to erratic rainfall and groundwater depletion, impacting agriculture and drinking water availability. Additionally, urbanization and loss of vegetation have contributed to localized heat island effects, intensifying the challenges posed by rising temperatures.

To address the challenges due to climate change, the Kerala State Action Plan on Climate Change (KSAPCC) emphasizes the importance of mitigation measures such as reducing greenhouse gas emissions and promoting renewable energy, as well as adaptation strategies such as strengthening infrastructure, enhancing disaster preparedness, conserving natural resources, and promoting climate-resilient agriculture and livelihoods. Collaboration between government agencies, communities, civil society organizations, and other stakeholders is crucial for implementing these measures effectively and building resilience to the impacts of climate change in the long term.



5. DEMOGRAPHY

Demographic analysis refers to the study of population data, which includes the structure, distribution, and dynamics of a population over time. This analysis provides insights into various factors such as age, gender, ethnicity, income levels, household sizes, migration patterns, birth and death rates and population growth trends. The data collected through demographic analysis helps to understand the needs, behaviours and challenges faced by different population groups of town.

Demographic analysis is essential in Master plan because it enables to create town that are well-equipped to handle the needs of their populations and assess the environmental impact of a growing population. The goal of this chapter is to comprehend the town's population growth trend in comparison to the district, state, and other local bodies; the prevalent variation in this regard in both spatial and social contexts; and the reasons that contribute to such patterns.

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1 Population and its Growth Pattern

2 Population Growth rate

3 Population Density

4 Age Group Distribution

5 Sex Ratio

6 Literacy rate

7 Household size

8 Social Composition

9 Migration

10 Hazard & Climate Change

11 Inference

5.1 Population and its Growth Pattern

According to the 2011 Census of India, the population of Pathanamthitta district is 1,197,412, which includes 53 percent are women and 47 percent are men making it the third least populous district in Kerala after Wayanad and Idukki. Pathanamthitta district ranks 7th in land area in the State with land area of 2637 sq.km and accounts for approximately 3.58% of Kerala's total population.

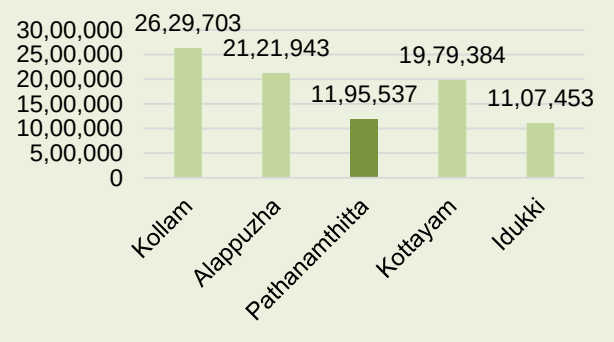


Figure 5.1 Surrounding district wise population
Source: Census 2011

Figure 5.1 shows that districts in eastern side are less populated having population of around 11 lakhs and other surrounding district in the north western and southern side crosses population of 19 lakhs. Pathanamthitta town has population of 37,538 of which 17,744 are males (47.26%) while 19,794 (52.74%) are females as per Census of India 2011.

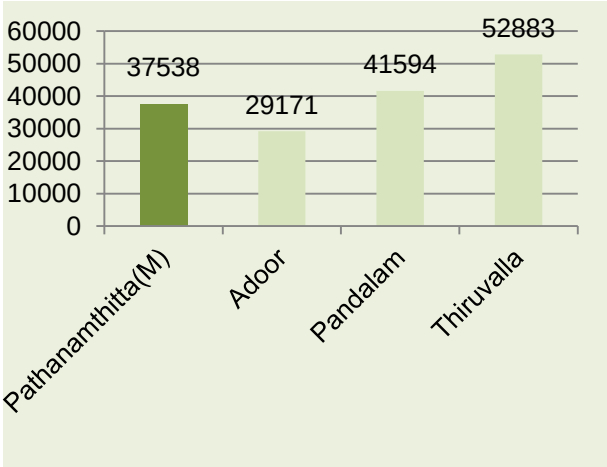


Figure 5.2 Population size comparison of urban centres in District
Source: Census 2011

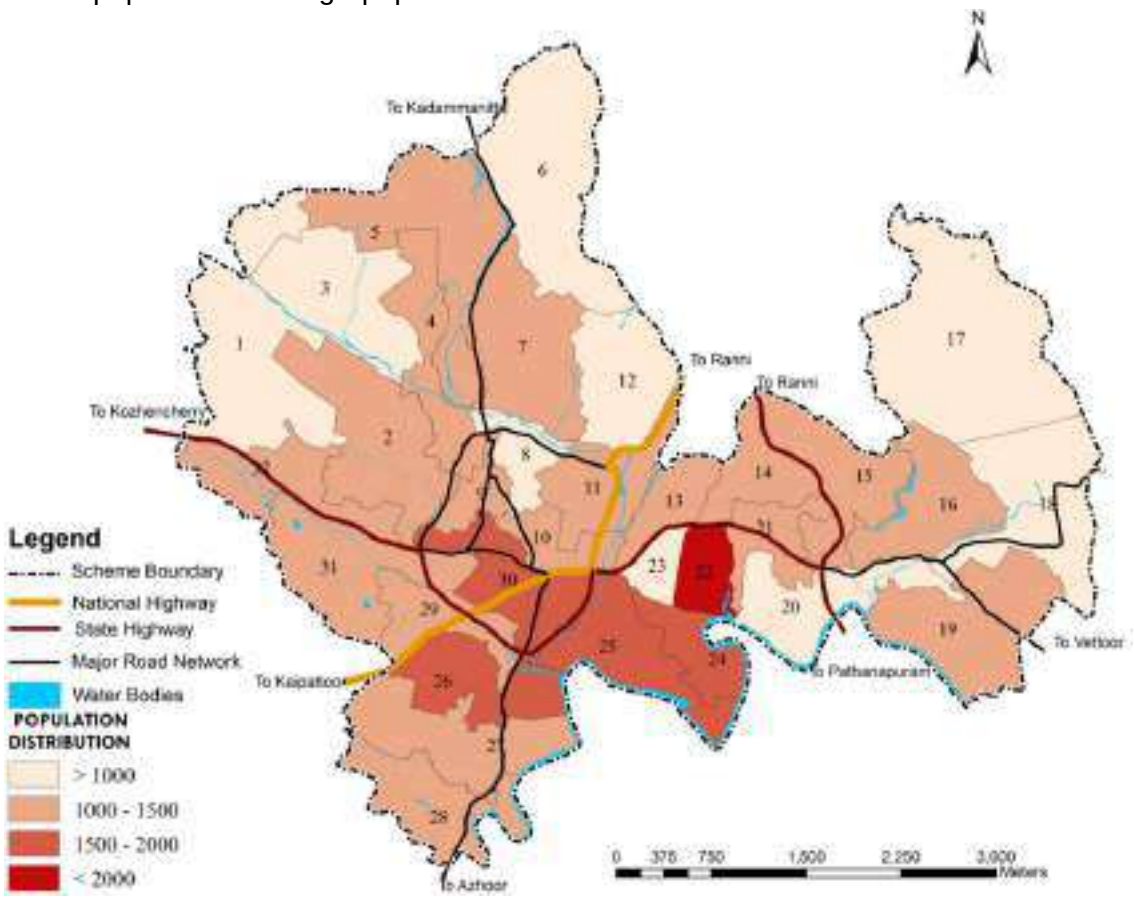


Figure 5.3 Ward wise population distribution in Pathanamthitta town

The land area of Pathanamthitta town is 23.43 sq.km which accounts 0.89% of total land area of the district. No of households in the town is 9813 and household size is 3.82. When comparing the population size of Pathanamthitta town with other three towns of the district ie, Thiruvalla, Pandalam and Adoor which have population size of 52,883, 41,594 and 29,171 respectively, Pathanamthitta town comes in third position among the urban centres (Figure 5.2).

The Municipal area is divided to 32 wards as on 2015. Annexure 5.1 shows ward wise population of Pathanamthitta town and the variation of ward wise population is shown in Figure 5.3. Chuttippara East (Ward 22) has the highest population followed by Kallarakkadavu (ward 25) and Valamchuzhi (ward 24). Mundukottakkal (Ward 6) has the lowest Population.

5.2 Population Growth Rate

The percentage decadal growth rate of Kerala's population during 2001-2011 was 4.9 percent. Among the Districts of the State, Malappuram has the highest growth rate (13.4 per cent), and Pathanamthitta has the lowest growth rate (-3.0 per cent). The surrounding district Idukki also has seen a decline in population with a negative growth rate (-1.8 per cent). The growth rate of population is lower in six southern Districts (Idukki, Kottayam, Alappuzha, Kollam, Pathanamthitta and Thiruvananthapuram) than in other Districts of the State. The decadal growth rate of Pathanamthitta district shows a decreasing trend (Figure 5.4).



Figure 5.4 Decadal population variation of Pathanamthitta District

Source: Census 2011

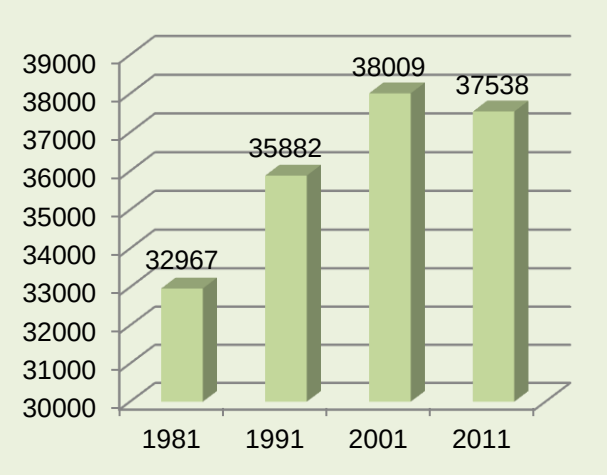


Figure 5.5 Decadal population variation of Pathanamthitta town

Source: Census 2011

Decadal population variation of Pathanamthitta town shows in Figure 5.5. The growth rate of Pathanamthitta town during 1981-91 was 8.84 % and then it reduced to 5.93% during 1991-2001 and it is again reduced to -1.24% during 2001-2011. The population growth rate shows decreasing trend.

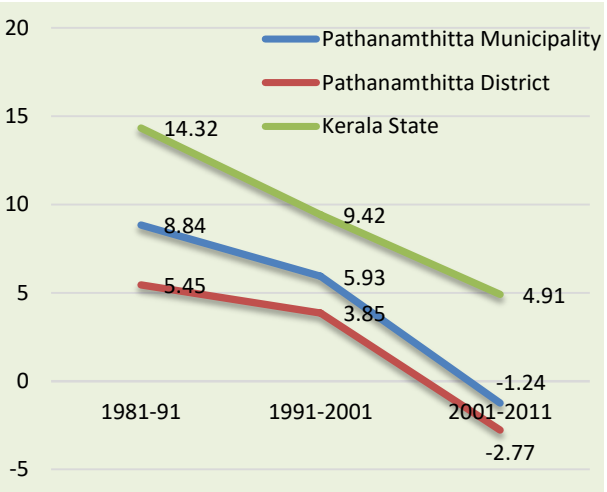


Figure 5.6 Population growth rate comparison of Pathanamthitta Municipality with District and State

Source: Census 2011

Comparison of growth rate of Pathanamthitta town with the district and State reveals that all show a declining trend (Figure 5.6). The growth rate of Pathanamthitta town is greater than the district growth rate and is far below the State growth rate. Figure 5.7 shows the population growth rate- comparison with other towns (Urban centres) in the district. The population growth rate of Pathanamthitta town

is greater than the growth rate of Thiruvalla, Adoor and Pandalam during 1981-1991 decade. This was immediately after getting the status of District headquarters.

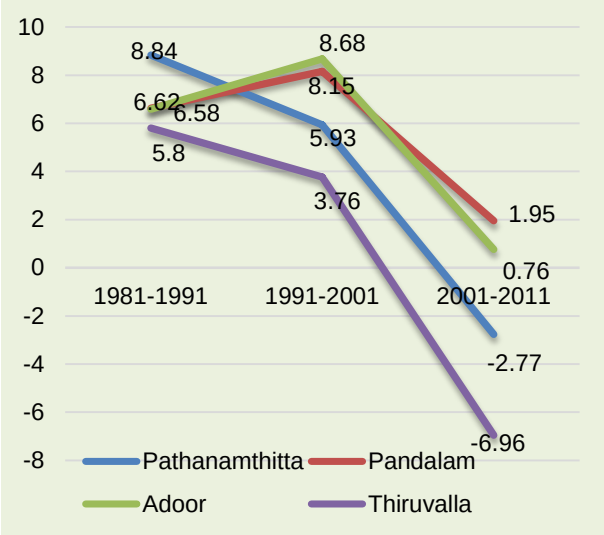


Figure 5.7 Population growth rate comparison of Pathanamthitta town with other urban centres of the district.

Source: Census 2011

During the period 1991-2001, the population growth rate of Pathanamthitta and Thiruvalla have decreased, while the growth rate of Pandalam, Adoor has increased. During the period 2001-2011, Pathanamthitta (-2.77) and Thiruvalla (-6.96) recorded negative growth rate, while Pandalam and Adoor town recorded positive growth rate but shows declining trend.

Considering the growth rate of population of LSGIs in the district during the decade 2001-2011, out of 57 LSGIs (including 4 four urban LSGs) only 9 LSGIs - Adoor (M), Kadampanad (GP), Konni (GP), Kunnamthanam (GP), Mylapra (GP), Omallur (GP), Pallikkal (GP), Pandalam (M). Pandalam Thekkekkara (GP) recorded positive growth rate of population. Mylapra and Omallur Grama Panchayats are neighbouring Grama Panchayats of Pathanamthitta town. It can be observed that the population growth rate is higher in the south-western part of the district (Figure 5.8).

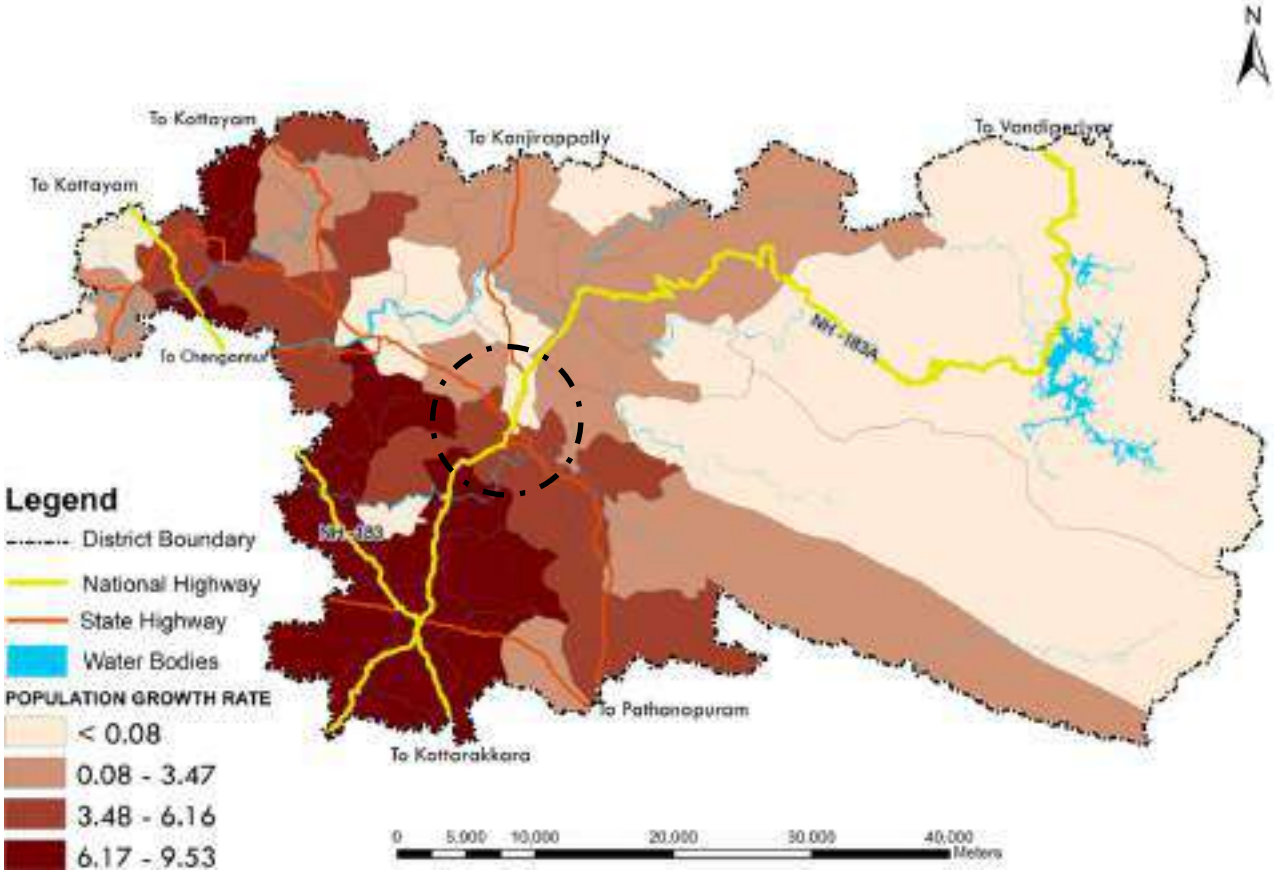


Figure 5.8 Population growth rate of Pathanamthitta Municipality among LSGs in the district

5.3 Population Density

Kerala's density of population as per 2011 census is 860 persons per square kilometre. Density of population has increased in all Districts compared to 2001 census except for Pathanamthitta and Idukki. The density of Pathanamthitta town is 1597 persons per square kilometre in 2011, which is higher than the district and State (Figure 5.9).

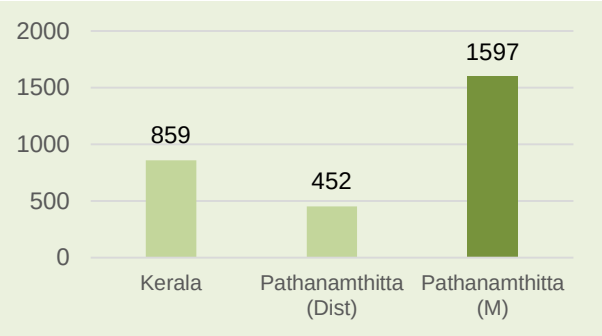


Figure 5.9 Population Density comparison of Pathanamthitta town with State and District

Source: Census 2011.

District has a population density of 452 persons per sqkm. Comparison of population density of Pathanamthitta town with surrounding towns are shown in Figure 5.10.

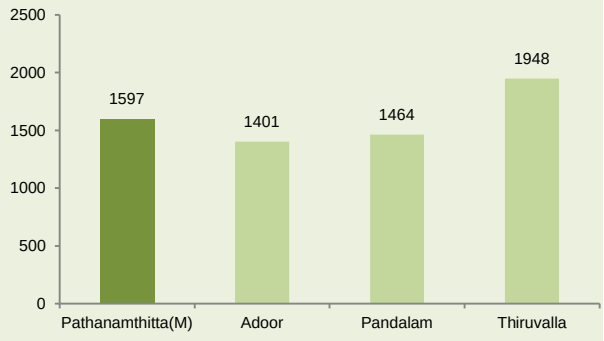


Figure 5.10 Comparison of population density of Pathanamthitta town with other towns

Source: Census 2011

The population density of Pathanamthitta town is lower than that of Thiruvalla town but higher than Adoor and Pandalam towns. Pathanamthitta town possess the second position in terms of population density when compared with that of other town within the district. The change in population density of Pathanamthitta town over decades is shown in Figure 5.11. The population density (in persons/sq.km) have increased from 1403 to 1609 from1981 to 2001 and later declined to 1597 in 2011. Since there is no change in the town area, the decrease in population leads to the decline in density.

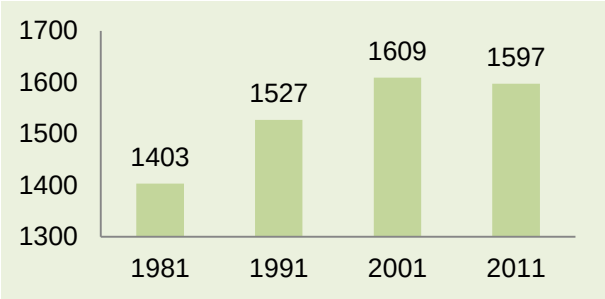


Figure 5.11 The change in population density of Pathanamthitta town over decades

Source: Census 2011

5.3.1 Ward wise population Density

There is large variation in density of population among different wards of the town. To study the variation, an analysis of ward wise population density has been done and it is shown in Annexure 5.1 and Figure 5.12. The population density of wards in the town varies from 516 persons/sq.km to 7245persons/sq.km and the average population density is 2317 person/ sq.km. The wards Chuttippara East (7245 persons/ sq.km.), Pattamkulam (6412 persons/ sq.km.), Chuttippara (4887 persons/sq.km.) have higher population density, while Mundukottakkal (516 persons /sq.km.), Myladumpara (521 persons/sq.km.) has lower Population density due to hilly terrain.

5.3.2 Population Concentration Pattern

The population concentration pattern is derived by calculating the cumulative population after arriving the wards in the descending order of density. The population concentration pattern of Pathanamthitta town is presented in Figure 5.13. It can be seen that one third of the population is concentrated in 12%, half of the population is concentrated in 23%, and two – third of the population is concentrated in 38% of the geographical area in the town and it spatial distributed in centre and southern side of the town.

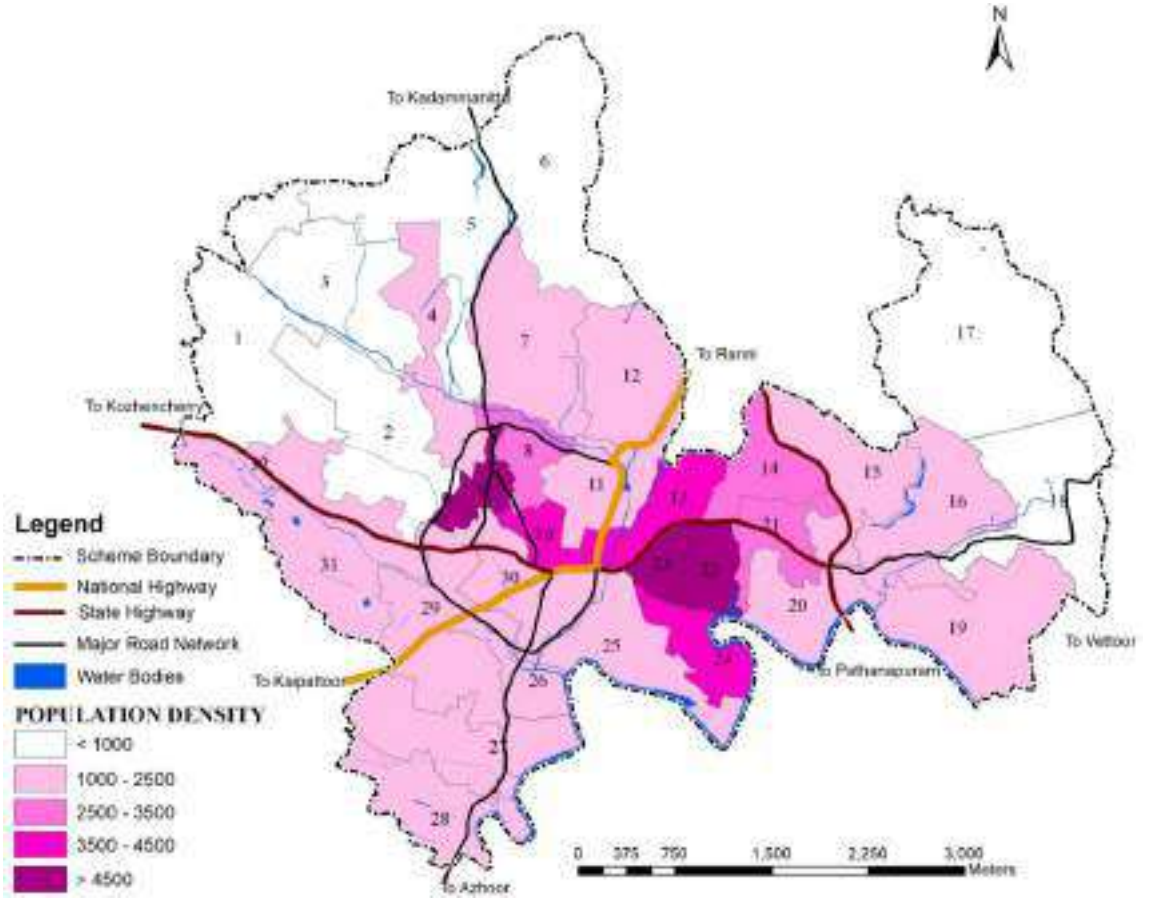


Figure 5.12 Ward wise population density of town

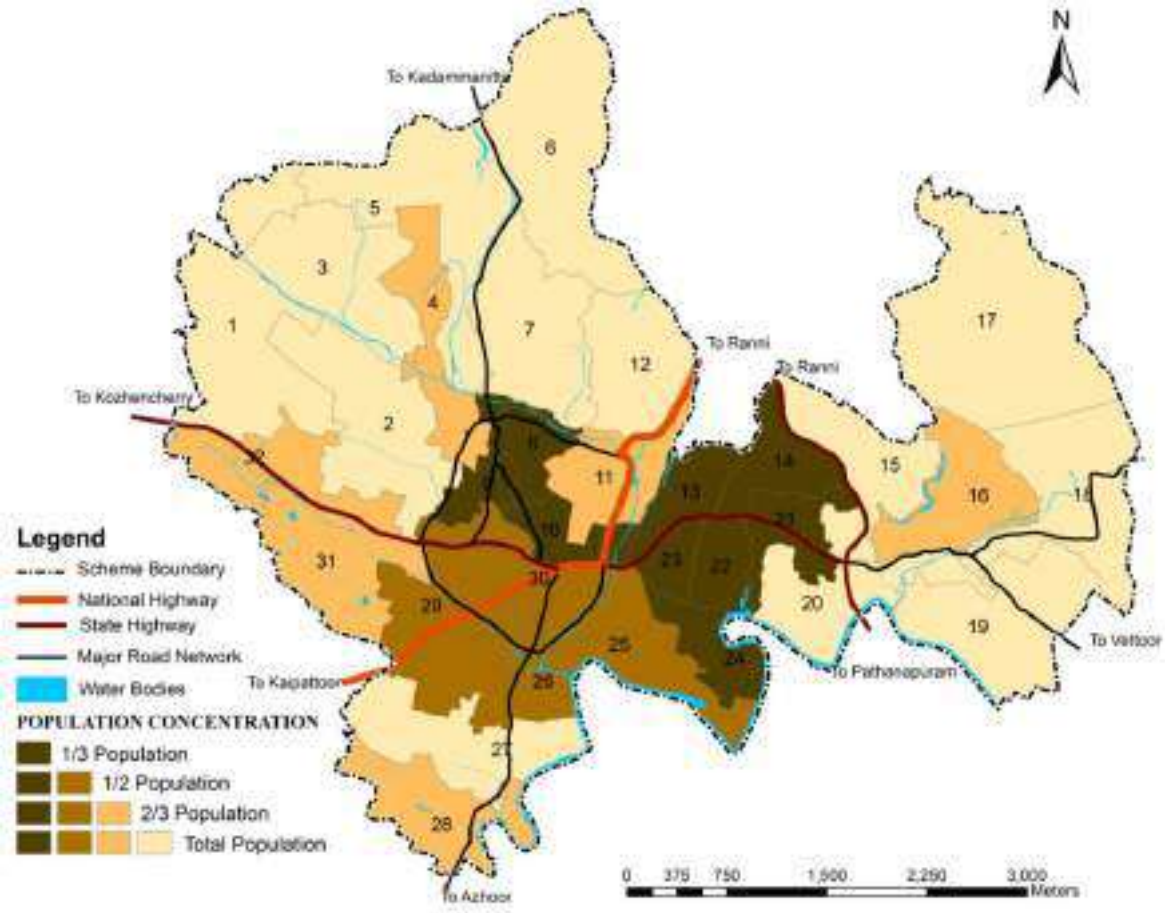


Figure 5.13 Ward wise population concentration of the town

5.4 Age Group Distribution

In Kerala during the last fifty years, it is observed that the proportion of population in the age group of (0-14 years), has declined from 43 per cent in 1961 to 23.4 per cent in 2011. Due to increasing life expectancy and availability of health facilities, the proportion of the population in the old age group (60 years and above) has increased from 5 per cent in 1961 to 12.7 per cent in 2011. If this trend continues, the addition to the working age group of population (15-59) will decrease in the near future, as the proportion of the population in the age group of 0-14 is declining. The increasing proportion of the old age group (60 and above) would place higher social security obligations on the Government. (Economic Review 2021, Government of Kerala)

The State has 63.9 per cent of its population in the working age group of 15-59, 23.4 per cent and 12.7 per cent in 0-14 age and 60 and above age groups respectively. In the age group of 60 and above, Pathanamthitta district has the highest per cent (18 per cent), at the same time, in the 0-14 group at 30.2 per cent, Pathanamthitta has the lowest (19.4 per cent).

The Age–sex pyramid of Pathanamthitta town was derived from the Census 2011 and the data is shown in Figure 5.14. The narrowing down of the base of the pyramid shows that there is decrease in the birth rate. The child population (0-6 years) in Pathanamthitta town is decreasing continuously from 1991 to 2011. Similar trend is found in other towns in the district also. Percentage of old age population is higher in the town, 19.7% of the population in the town is above 60 years of age where it is 18% in Pathanamthitta district and 12.6% in Kerala. The percentage of female population is less among children and it is higher for aged group above 75.

The shape of age sex pyramid is Constrictive Pyramid which shows a narrower base with a wider middle section, indicating lower birth rates and a more stable or slowly growing population. This type of pyramid typical found in developed countries. When considered the demographic profile with social parameters of Kerala State, Pathanamthitta town also showing the demographic profile of developed countries.

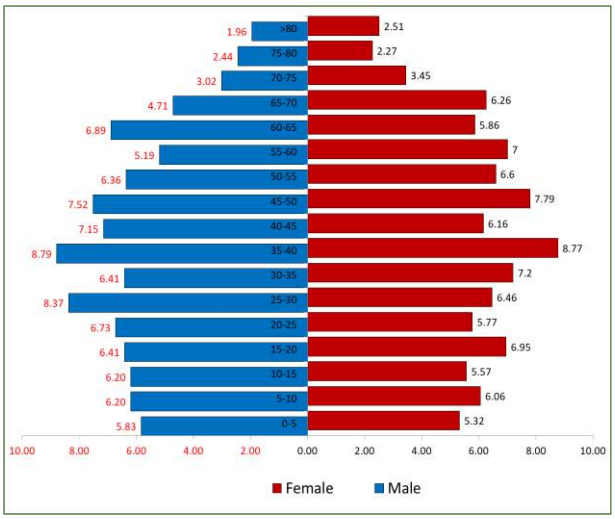


Figure 5.14 Age – Sex Pyramid of Pathanamthitta town
Source: Census 2011

5.5 Sex ratio

The sex ratio of the district and State are 1132 and 1084 respectively and the sex ratio of Pathanamthitta town (1116) is lower than the district at the same time higher than the State. Figure 5.15 shows the sex – ratio comparison of Pathanamthitta town with State and District.

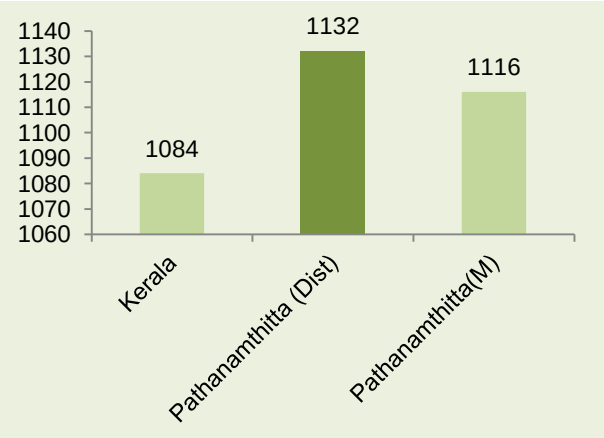


Figure 5.15 Sex Ratio– comparison of Pathanamthitta Municipality with State and district
Source: Census 2011

The total male and female population of Pathanamthitta town as per 2011 census is 17,744 and 19,794 respectively and the sex ratio of the town is 1116. Temporal variation in sex ratio of the town from 1991-2011 is shown

in Figure 5.16. It shows that, the sex ratio of the town has gradually increased from 1019 in1991 to 1116 in 2011.

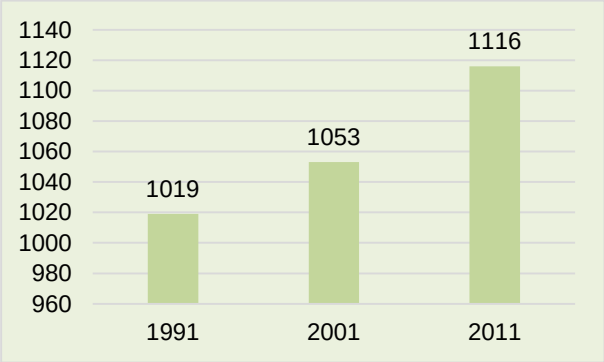


Figure 5.16 Temporal variation in sex ratio of the town
Source: Census 2011.

5.6 Literacy Rate

The literacy rate of Pathanamthitta town as per 2011 census is 96.4 %. The literacy rate of Pathanamthitta District and Kerala State are 96.5 % and 93.91% respectively. The literacy rate of Pathanamthitta town is slightly less than the district and higher than the State literacy rate.

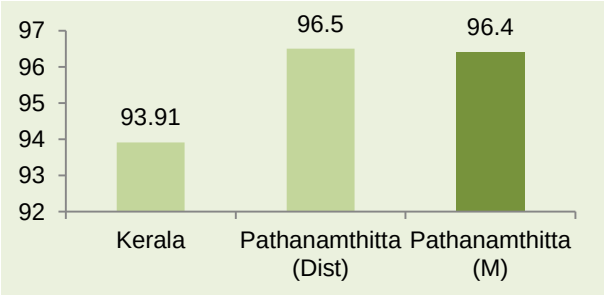


Figure 5.17 Percentage of literacy rate compare with district and State
Source: Census 2011.

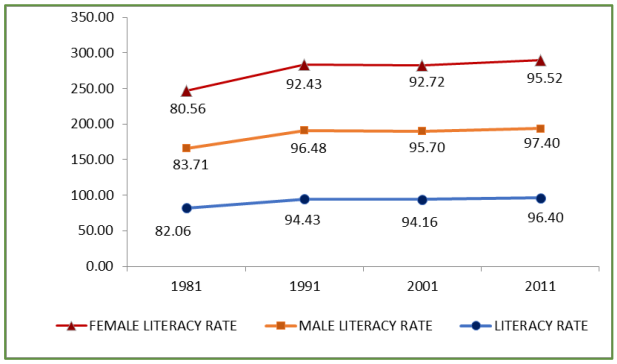


Figure 5.18 The variations in Male and Female literacy rate in Pathanamthitta town
Source: Census 2011.

Figure 5.17 shows the literacy rate comparison with State and district. The variations in Male and Female literacy rate in Pathanamthitta town over last few decades are shown in Figure 5.18. Male literacy rate is more than female literacy rate in all years. The trend in growth of both male and female literacy rate follows similar pattern.

5.7 Household Size

As per Census 2011, household size of Pathanamthitta town is 3.83 and the value is higher when compared to the Pathanamthitta district (3.71) and lower than the State (4.25). Household size in Pathanamthitta town is compared with district and state and its graphical representation is shown in Figure.5.19. The variation in Household size in the town from 1981 to 2011 is shown in Figure 5.20. It is clear that the house hold size is decreasing continuously from 5.4 in 1981 to 3.8 in 2011.

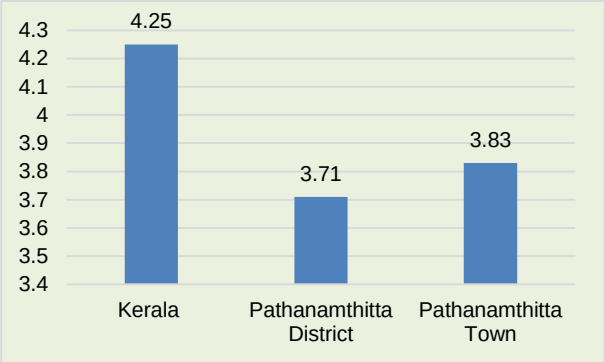


Figure 5.19 Household size comparison with district and state
Source: Census 2011

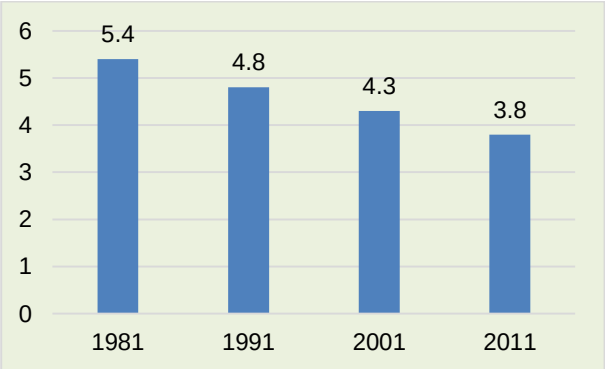


Figure 5.20 Decadal Household size comparison in town

Source: Census 2011.

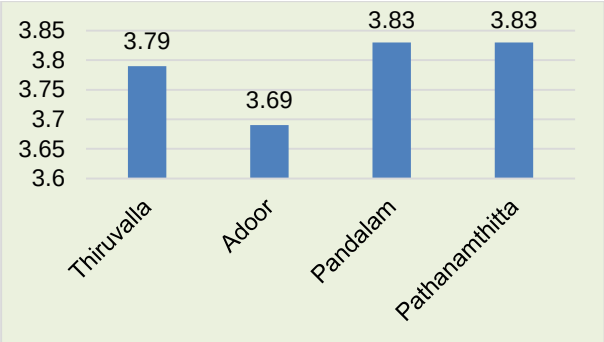


Figure 5.21 HH size comparison with towns

Source: Census 2011.

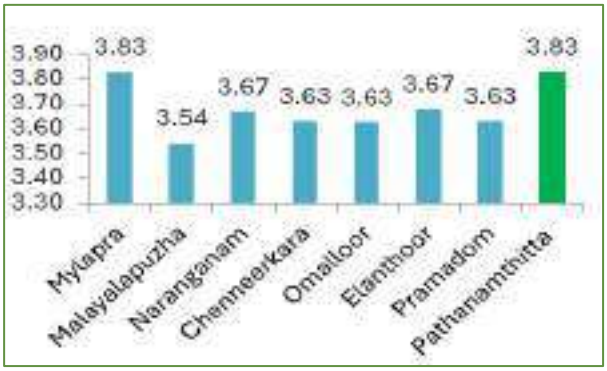


Figure 5.22 HH size comparison nearby LSGs

Source: Census 2011.

Figure 5.21 shows the HH size comparison with the other town in Pathanamthitta district as per 2011 census. It can be seen that the towns Pathanamthitta and Pandalam have the same household size of 3.8 and Thiruvalla and Adoor has 3.79 and 3.69 respectively. Figure 5.22 shows the HH size comparison with nearby LSGIs. As per 2011 census Pathanamthitta and Mylapra have the same highest household size of 3.83.

Ward wise average household size in town is shown in Figure 5.23. Vanchipoyka (ward24), Myladumpara (ward17) Kumbazha South (ward-20), etc. have average HH size of less than 2. Household size is above 6 in wards are Thykkavu (8), Chuttippara east (22), Valanchuzhy (24), Kallarakkadavu(25), Azhoor West(26), College ward(29) and Karimbanakuzhy(31).

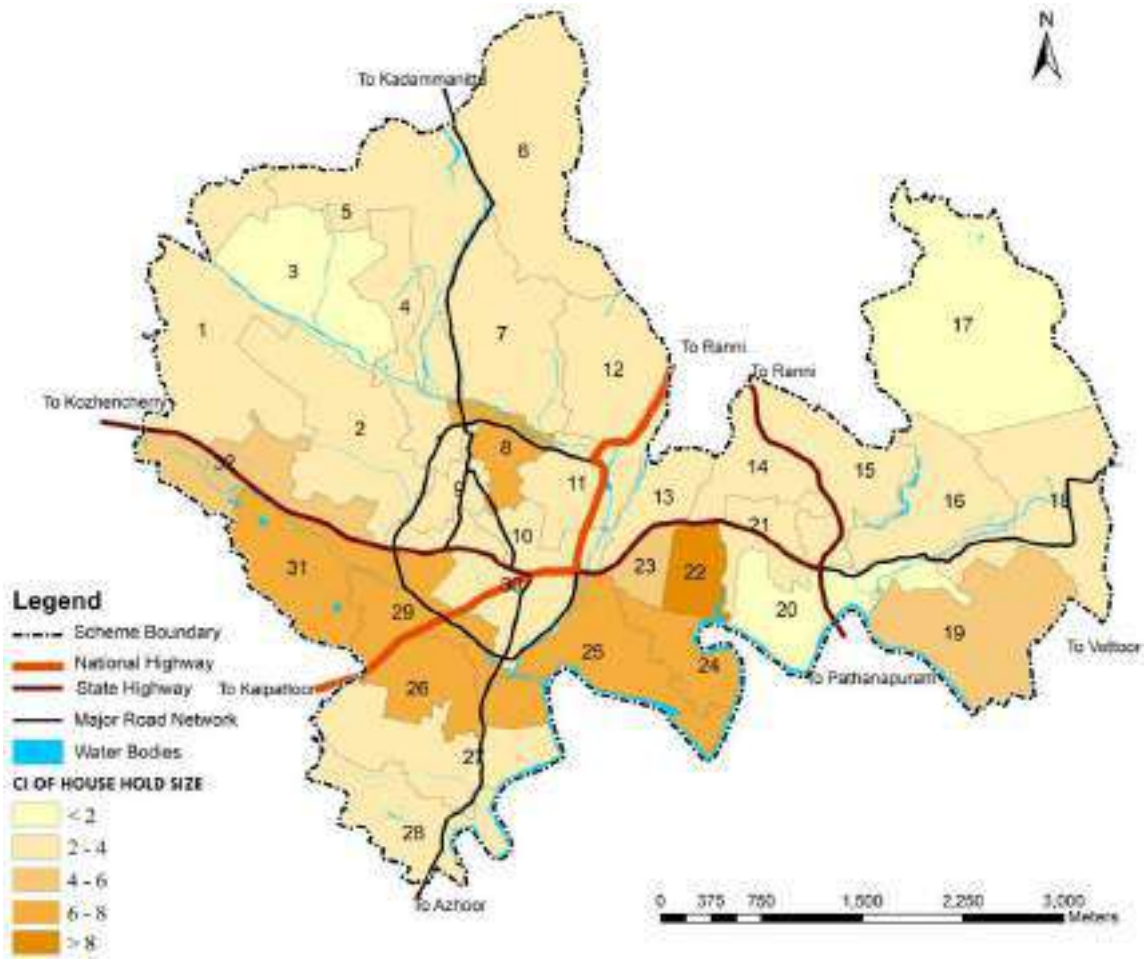


Figure 5.23 Ward wise Household size in town

5.8 Social Composition

Social composition refers to the structure and characteristics of the population based on various social factors Socioeconomic Status, Religion and Beliefs. There are 3710 households comes under below poverty line index (BPL). As per census 2011, Schedule Caste (SC) constitutes 8.77 % while Schedule Tribe (ST) were 0.35 % of total population in Pathanamthitta town. The religion wise population shows that nearly 45.13% of the total population are Hindus, 24.28% Muslims and 30.03 % Christians.

5.9 Migration

Pathanamthitta town has a dynamic and diverse demographic profile, shaped significantly by both outbound and inbound migration trends. A notable portion of the town's native population migrates abroad for higher education and employment opportunities, contributing to a pattern of international migration. At the same time, the town attracts a steady influx of people from neighbouring towns and districts due to its status as the district headquarters, its concentration of public and semi-public institutions, and its vibrant commercial activities. The town also serves as a temporary halting point for thousands of Sabarimala pilgrims during the pilgrimage season, further adding to its transient population.

In parallel, Pathanamthitta has emerged as a key hub for migrant laborers from other Indian states, similar to nearby towns like Thiruvalla, Kozhencherry, Ranni, and Konni. A large segment of these migrant workers—nearly 47%—hail from West Bengal, followed by others from Tamil Nadu, Karnataka, and Assam. These workers are primarily settled in areas such as Kannamkara, the central town area, Valanchuzhy, and Kumbazha. Their presence plays a crucial role in supporting the town's informal and construction sectors, while also bringing cultural diversity and contributing to the local economy.

5.9.1 Non-Resident Indian Population

As per the Norka Pravasi Survey conducted by Department of Economics and Statistics in 2013, the Non-resident population of the town is 2293.ie, 6.1% of the population in the town are NRIs. Age wise classification of NRI population in the town is given in Figure 5.24. It is clear that people of age between 25 to 45 are more in number of NRIs. Male NRIs are more than female. Most of the people are moved to Gulf Countries, Canada and Australia and European Countries. Highest share of NRIs of 31% are working in nursing sector.

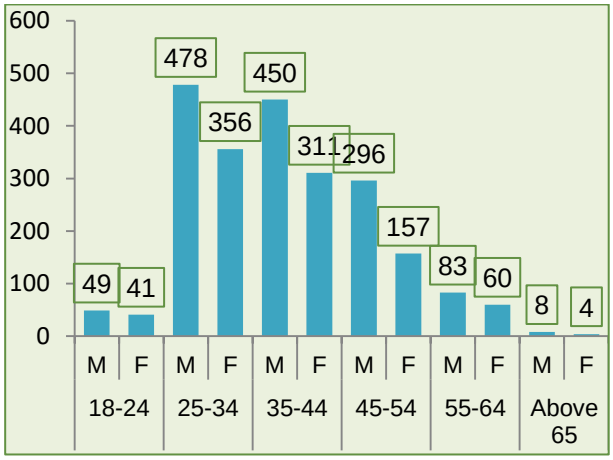


Figure 5.24 Age wise classification of NRI in the town
Source: Department of Economics and Statistics

5.10 Hazard & Climate Change

As per guideline for preparation of risk informed master plan for a town, assessing demographic vulnerabilities of the town is included in the category of social vulnerability. 30% weightage is given to social vulnerability and following are the sub parameters and its weightage included:

1. Population likely to be affected (25%)
2. Economically backward population (20%)
3. Women headed family (10%)
4. Children below 6 years (10%)
5. Senior citizen (10%)
6. Differently abled / population with severe illness (10%)
7. Transgender population (10%)
8. Socially backward population (5%).

Out of these eight sub parameters, effect of hazard on population is analysed here and the

inference of the analysis is used in the chapter 4 to find out the total risk of the town. Remaining seven sub parameters are analysed in chapter 24 'Special Concern Areas'.

Population likely to be affected by flood and landslide hazard in the town is analysed based on the data collected by 100% door to door socio economic survey in the flood prone and landslide prone areas of the town and analysed in GIS software. Varying degrees of population vulnerability **(**low**,** moderate, and very high vulnerable areas) has been identified in each cadastral based on value assigned as per guidelines of risk informed master plan. Table 5.1 shows the criteria and its value adopted for the analysis of population likely to be affected at cadastral level.

Table 5.1 Vulnerability analysis of Population

Criteria	Value
> 75% population likely to be affected	7.5
51 – 75% population likely to be affected	5.62
26-50 % population likely to be affected	3.75
<26% population likely to be affected	1.87

Source: Guidelines for Risk Informed Master Plan

5.10.1 Flood Vulnerability

From section 5.3.2 of this chapter, it is identified that the population is more concentrated towards centre and southern part of the town which are low laying areas and flood plains of river Achankovil. So 1 in 50 year Flood return probability map published by KSDMA is overlaid with ward wise population concentration map of town to understand the population size which are prone to flooding (Figure 5.25).

The wards with one third population of town is residing directly and half of the population indirectly is in the risk of flooding as the flood prone areas are covering around 20 wards of the town out of 32 wards.

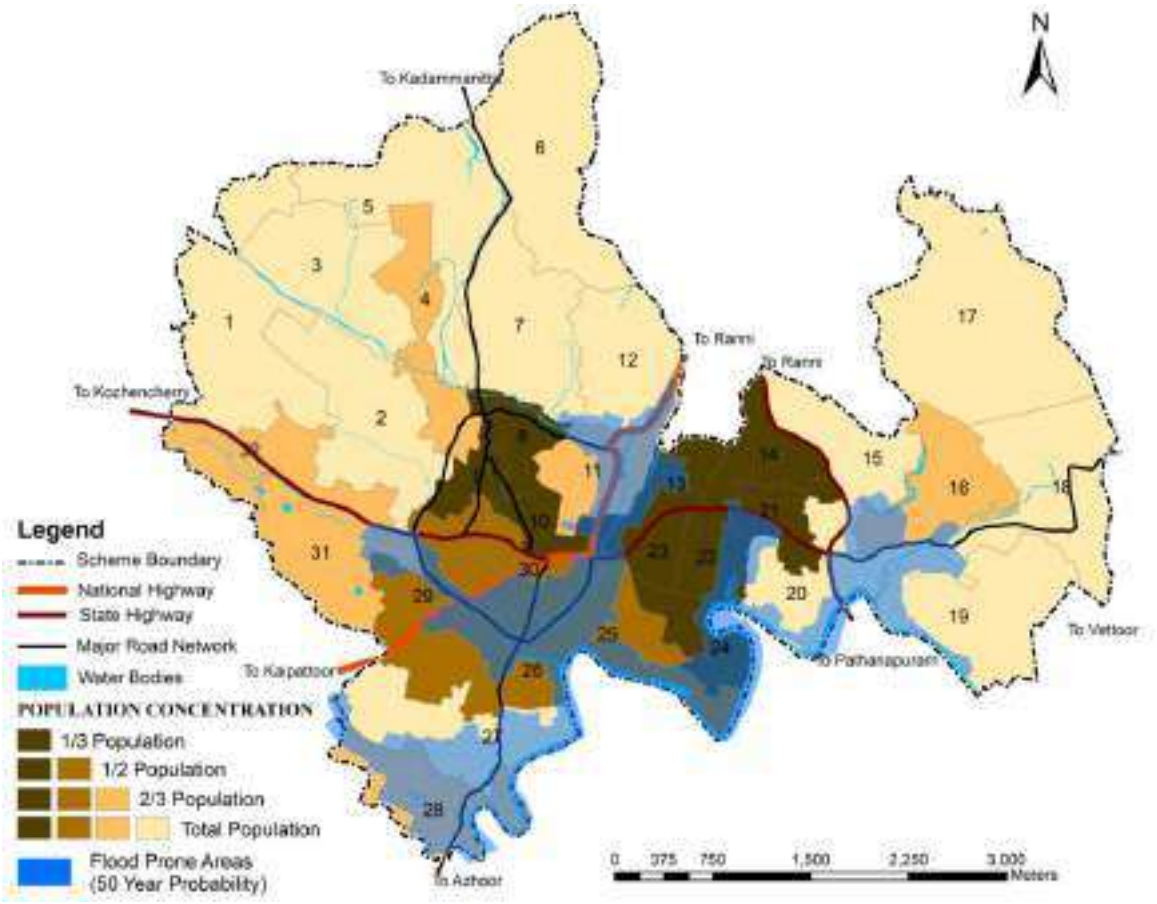


Figure 5.25 1 in 50 year Flood return probability map published by KSDMA is overlaid with ward wise population concentration.

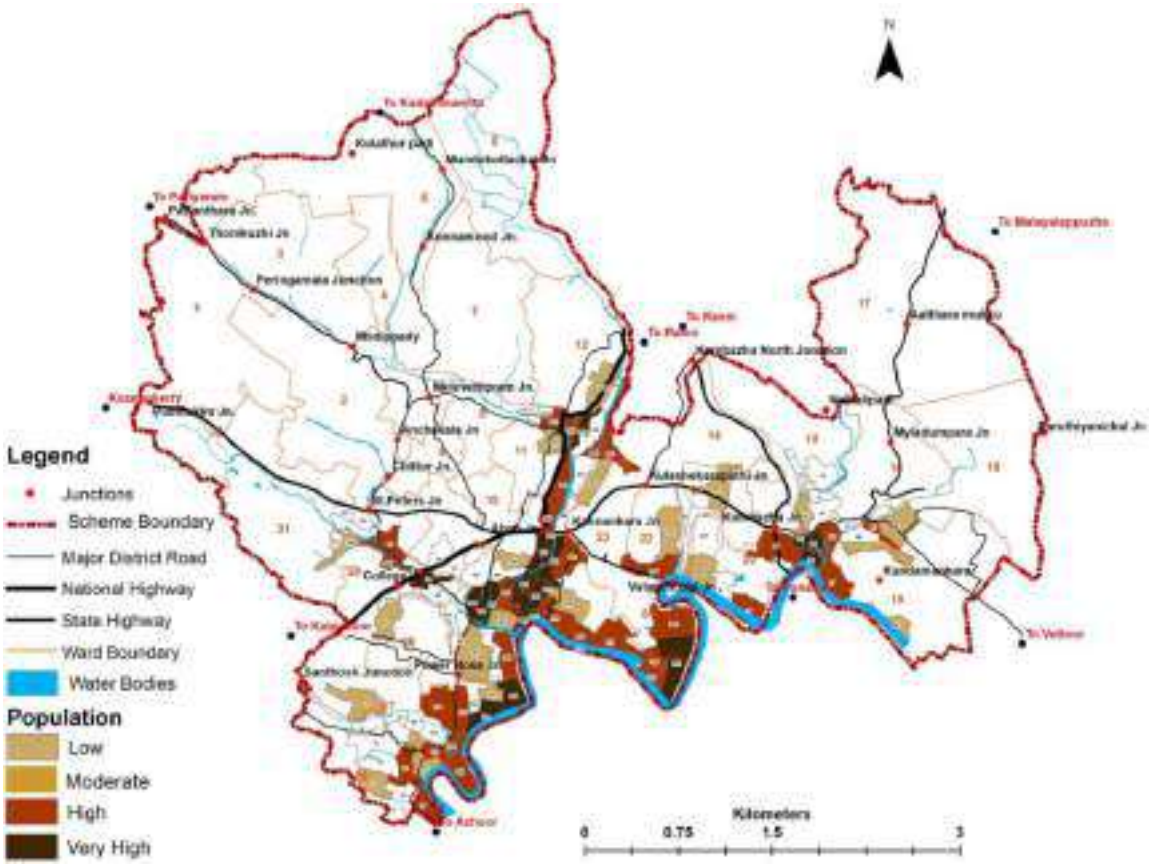


Figure 5.26 Cadastral level degree of vulnerability in terms of population likely to be affected in flood prone area of the town

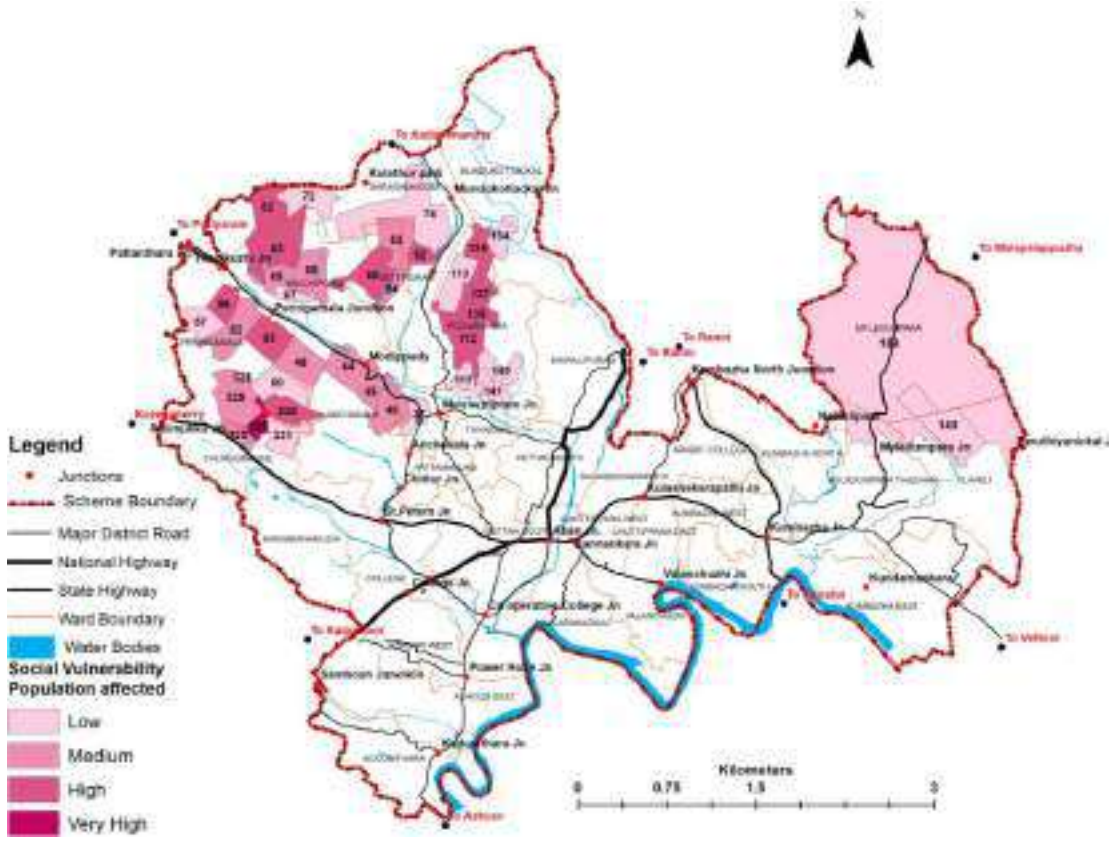


Figure 5.27 Cadastral level degree of vulnerability in terms of population likely to be affected in landslide prone area of the town

Based on the 100% socio economic survey conducted in flood prone area, 419 households with 1745 population are residing in the flood prone area of the town. It is 4.64% of the total population (37538) of the town. Number of population residing in each cadastral has been identified and cadastral level vulnerability of the population likely to be affected has been analysed as per Table 5.1 and map has been prepared (Figure 5.26).

Figure 5.26 shows the cadastral level degree of vulnerability in terms of population likely to be affected in flood prone area of the town. The existing population vulnerability shows low, high and very high degree of vulnerability. To identify this vulnerability of existing population in terms of inundation basis, flood intensity map has been prepared. That analysis is incorporated in the chapter 4 to find out the total hazard impact and risk of the town. Out of 1745 population in the flood prone area of the town, 1183 (68%) of the population is residing in the areas under inundation level above 1.5m. 562 (32%) of the population is residing in the areas under inundation level below 0.6m.

5.10.2 Landslide vulnerability

Based on the 100% socio economic survey conducted in landslide prone area, there are 618 houses with 1784 population are residing in the landslide prone area of the town. It is 4.75% of the total population (37538) of the town. Number of population residing at each cadastral has been identified and cadastral level degree of vulnerability has been analysed based on the population likely to be affected as per Table 5.1 and map has been prepared and shows low to very high vulnerability (Figure 5.27).

Out of 38 cadastral in landslide prone area, 15 shows low vulnerability as the chances of affecting population in these cadastral is less than 25%. 11 cadastral shows moderate and high population vulnerability each as the chances of affecting population in the cadastrals are more than 25% & 50%. One cadastral are shows very high population vulnerability as the chances of affecting population in these cadastral is more than 75%.

5.11 Inference

In Pathanamthitta district, Pathanamthitta town possess the third position in terms of population size and second position as far as population density is concerned. Even though the town recorded comparatively high growth rate during the decade 1981-91 and 1991-01, it recorded negative population growth rate during the decade 2001-11. While analysing the trend of population growth and the child population growth, there is every chance for decrease in further natural growth rate. More population are concentrated towards centre and southern part of the town which are low lying areas and flood plains of river Achankovil. The shape of age sex pyramid is Constrictive Pyramid which shows a narrower base with a wider middle section, indicating lower birth rates and a more stable or slowly growing population. This type of pyramid typical found in developed countries. Town has to be developed as an elderly friendly city in future since Pathanamthitta district and town possess highest percentage of old age population. 9.4% of the total population of the town ~~is~~ directly comes under flood prone and landslide prone areas of the town. Special attention needs to be given to flood and landslide resilience. This may include flood-resistant construction, early warning systems, relocation plans, and ensuring that emergency services are readily available. Zoning regulations may limit high-density development or encourage the relocation of vulnerable populations in high vulnerable areas. Development may be regulated in these areas to prevent further population exposure



6.EMPLOYMENT

Occupation is a major indicator of financial well-being of an area and its residents. The share of the population engaged in economic activities and the nature of these activities give an insight to economic development and the nature of economy in the region. The analysis of the temporal changes, gender participation, duration of employment etc. reveals the economic welfare of a society.

Understanding employment patterns helps identify where people work and the type of employment distributed across a town. it also provides insights into how people work, where economic activities are concentrated, and how the town's development can best accommodate its workforce. This understanding helps optimize land use, infrastructure, and services, promotes balanced development, improves access to opportunities, and fosters a sustainable, inclusive, and resilient economy.

Contents

1. Workers
2. Work Force Participation Ratio
3. Segregation of Workforce- Sex wise
4. Occupational Structure
5. Spatial Distribution of workers
6. Other Socio-Economic Dimensions
7. Government Programs
8. Hazard & Climate Change
9. Inference

6.1 Workers

The total population of Pathanamthitta town is 37538 out of which 12,253 (32.64%) are workers. It forms 3.12 % of the total workers in the district and 0.11 % of the total workers in the State. It shows that the trend of number of total workers is almost uniform in and the town also adheres to the district and State's overall total workers percentages. Table 6.1 shows the number of total workers in Kerala state, Pathanamthitta district and Pathanamthitta town over the years 2011.

Table 6-1 Number & Percentage of total workers

	Total Workers	%
Kerala	1,16,25,309	34.78
Pathanamthitta District	3,92,794	32.8
Pathanamthitta Town	12,253	32.64

Source: Census 2011

Among 12253 workers of the town, 9811 are main workers which constitute about 26% of total population and 2442 are marginal workers which constitute 7% of total population. The remaining 25285 persons are non-workers which is 67 % of total population which is also almost similar to percentage share of District and State (Figure 6.1).

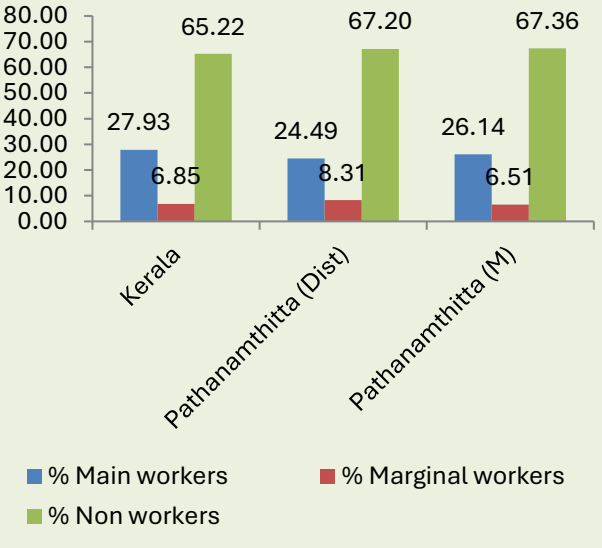


Figure 6.1 Comparison of workers in town with in District and State

Source: Census 2011

6.2 Work Force Participation Ratio

Workforce Participation Ratio (WPR) of Pathanamthitta town as per census 2011 is 32.64%. Temporal variation of WPR in the town showing increasing (Figure 6.2). The work participation rate shows a decreasing trend up to 2001 and after 2011 it shows an increasing trend. The work participation rate of Pathanamthitta was 28.16 % in 1991, then reduced to 27.15 % in 2001 and increased to 32.64% in 2011. The ward wise work participation rate of Pathanamthitta town is shown in Figure 6.3. The highest work participation shows in northern part of the Municipality as people are working with agricultural activity.

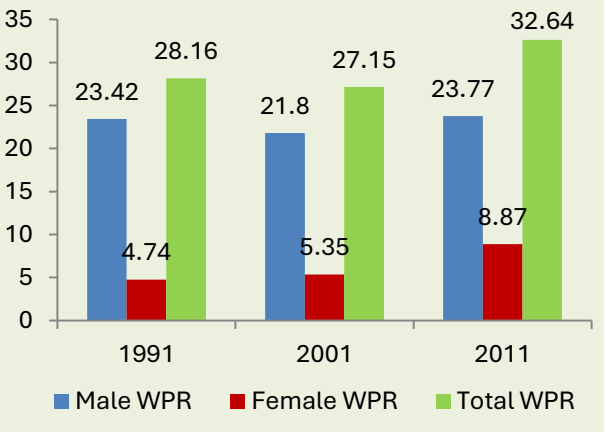


Figure 6.2 Temporal variation of male and female WPR in the Town

Source: Census 1991, 2001, 2011

6.3 Segregation of work force – sex wise

The male and female work participation rate of Pathanamthitta town as per census 2011 is 50.28% and 16.83% respectively. Male and Female work participation rate in Pathanamthitta district are 50.18% and 17.45% respectively, while the State average is 52.73% and 18.23% respectively. Though Pathanamthitta has almost identical Male and Female work participation rate with the district and State, it has a weaker Female Work Participation Rate (Figure 6.4).

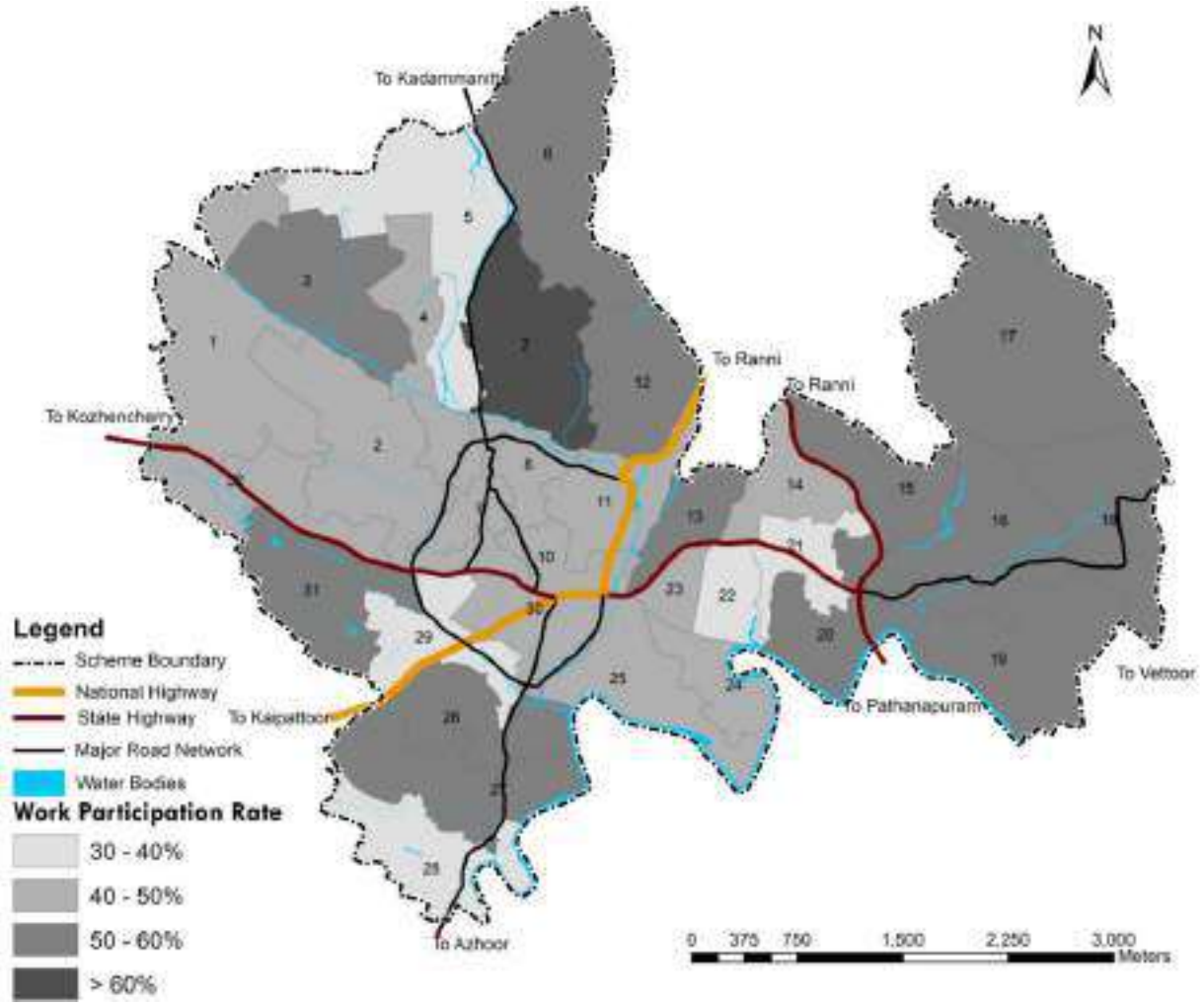


Figure 6.3 Ward Wise WPR of Pathanamthitta municipality

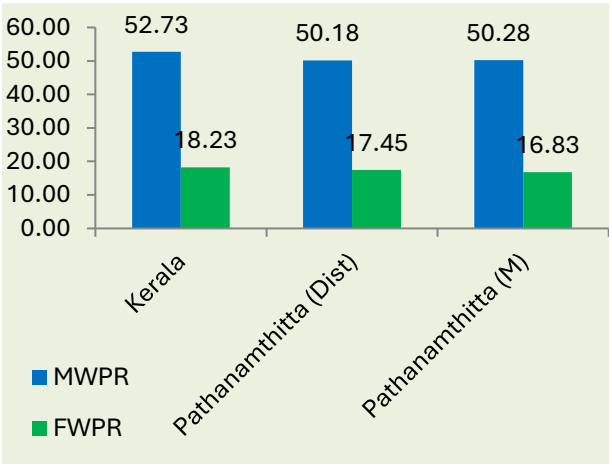


Figure 6.4 Male & female WPR of town compared with District and State

Source: Census 2011

When compared to the other towns in the district, Pathanamthitta town falls among high MWPR in the district. Pandalam also has the highest Female Work Participation Rate among its counterparts in the district.

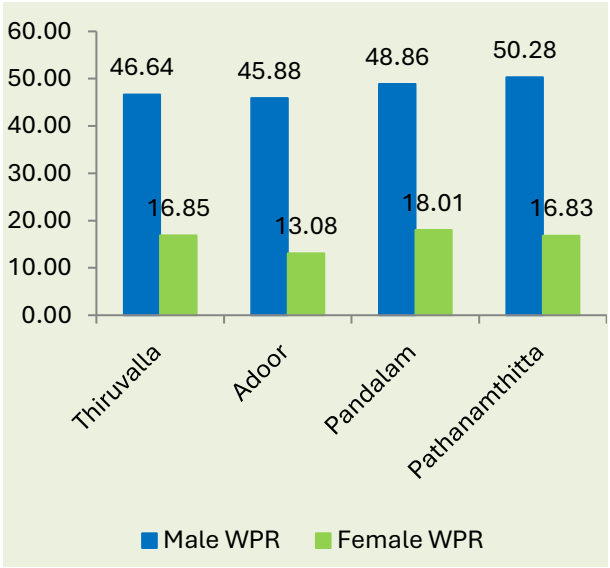


Figure 6.5 Male & Female WPR compared to other municipalities of the district

Source: Census 2011

Figure 6.5 shows the comparison of MWPR and FWPR among other towns in the district. Women's participation in the public sector employment in Pathanamthitta District is less compared to other district as per Statistics of Economic review 2023. The male work participation rate of the Pathanamthitta town remains almost steady over years.

> സ്ത്രീകളുടെ തൊഴിൽ പങ്കാളിത്ത നിരക്ക് ഉയർത്തുവാൻ തക്കവിധം സ്വയം തൊഴിൽ പരിശീലനങ്ങൾ, സംരംഭക വായ്പകൾ, തൊഴിലവസരങ്ങൾ, വീട്ടിലിരുന്നു ജോലി ചെയ്യുന്നതിനുള്ള അവസരങ്ങൾ എന്നിവ ഒരുക്കുക. *[Provide self-employment trainings, entrepreneurial loans, job opportunities, and work-from-home opportunities to increase women's labor force participation rate.]* - Public Opinion

6.3.1 Growth Rate of Workers

The population growth rate and the growth rate of workers in Pathanamthitta town are shown in Table 6.2. The growth rate of workers is less than the population growth rate up to 2001. It indicates that employment opportunities were not increased in proportion to growth of population. But during the period 2001-2011, the growth rate of workers is much more than the negative population growth rate and it is a good indication as far as economic growth is concerned.

Table 6-2 Comparison of decadal growth rate of population and workers in Pathanamthitta town

Growth Rate	1991-2001	2001-2011
Growth rate of population	5.93	-2.77
Growth rate of workers	2.14	18.72

Source: Census 2011

6.4 Occupational Structure

Figure 6.6 shows the comparison of occupational structure in the State, District and Municipality as per Census, 2011. The share of cultivators, agricultural labourers and HHI workers in Pathanamthitta town is lower than the State and district and the share of other workers is higher than the State and district.

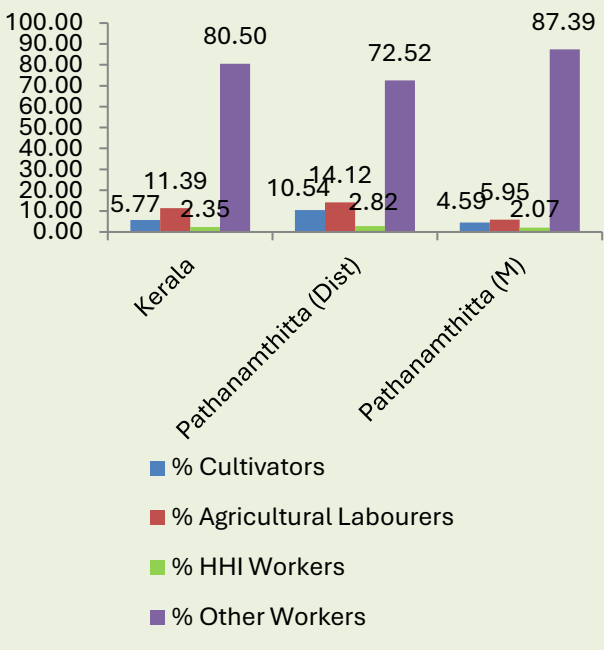


Figure 6.6 Percentage of Occupational Structure- Comparison with state and district

Source: Census 2011



Figure 6.7 Occupational structures compared to other towns in the district

Source: Census 2011

When compared to the other towns in the District, Pathanamthitta has the 3rd lowest share of cultivators, Agriculture labours and House Hold Industrial workers in the district.

Pathanamthitta town having the highest share of other workers. Figure 6.7 shows the occupational structure comparison of other towns in the district.

Occupational structure of Pathanamthitta Municipality is shown in Figure 6.8. It shows that number of labourers engaged in primary sector (cultivators and agriculture labourers) is showing a decreasing trend over the years and there is corresponding increase in other workers and household industrial workers category. This shows that there is an occupational shift from primary sector to other sectors. The number of cultivators, agricultural labourers and Household industrial Workers are drastically reducing from 1991 to 2011 and the number of other workers are increasing. There is a slight increase in the number of female house hold industrial workers. There is a huge shift in occupational structure from primary sector to tertiary sector. The number of female workers is also increasing in all sectors over years (Table 6.3).

6.5 Spatial Distribution of Workers

Details of occupation of the town is also collected through socio economic survey 2019. As per the Census 2011, percentage of other workers was 89%. It has been increased to 90.69% in 2019 as per SE survey (Figure 6.9) and more workers are engaged in Government jobs, drivers, non-resident workers and other works. Majority of workers are coming under other workers classification. It shows the decline in agriculture sector. Therefore, the trend of shifting from primary sector to tertiary sector is still continuing. Figure 6.10 shows the ward wise percentage of spatial distribution of primary workers. The northern wards of the town show the highest percentage of primary workers.

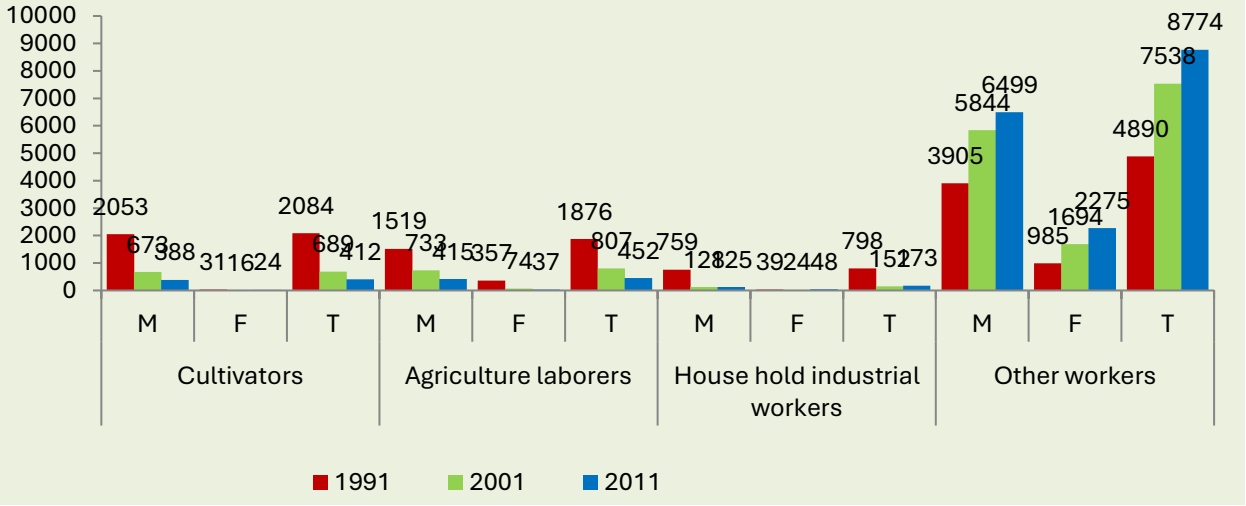


Figure 6.8 Temporal variation- occupational structure of Pathanamthitta Municipality

Source: Census 2011

Table 6-3 Temporal variation- Occupational structure of Pathanamthitta town

Year	Cultivators			Agriculture Labourers			House hold Industrial Workers			Other Workers		
	M	F	T	M	F	T	M	F	T	M	F	T
1991	2053	31	2084	1519	357	1876	759	39	798	3905	985	4890
2001	673	16	689	733	74	807	128	24	152	5844	1694	7538
2011	388	24	412	415	37	452	125	48	173	6499	2275	8774

Source: Census 2011

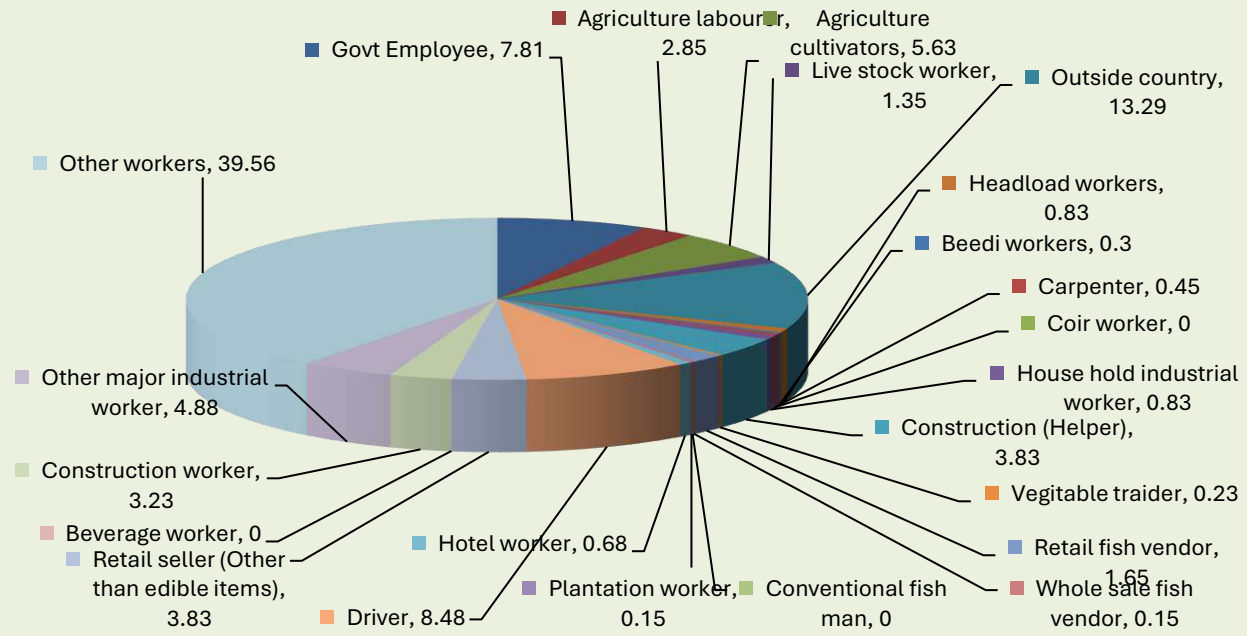


Figure 6.9 Percentage of workers of the town in each category

Source: Socio Economic Survey 2019

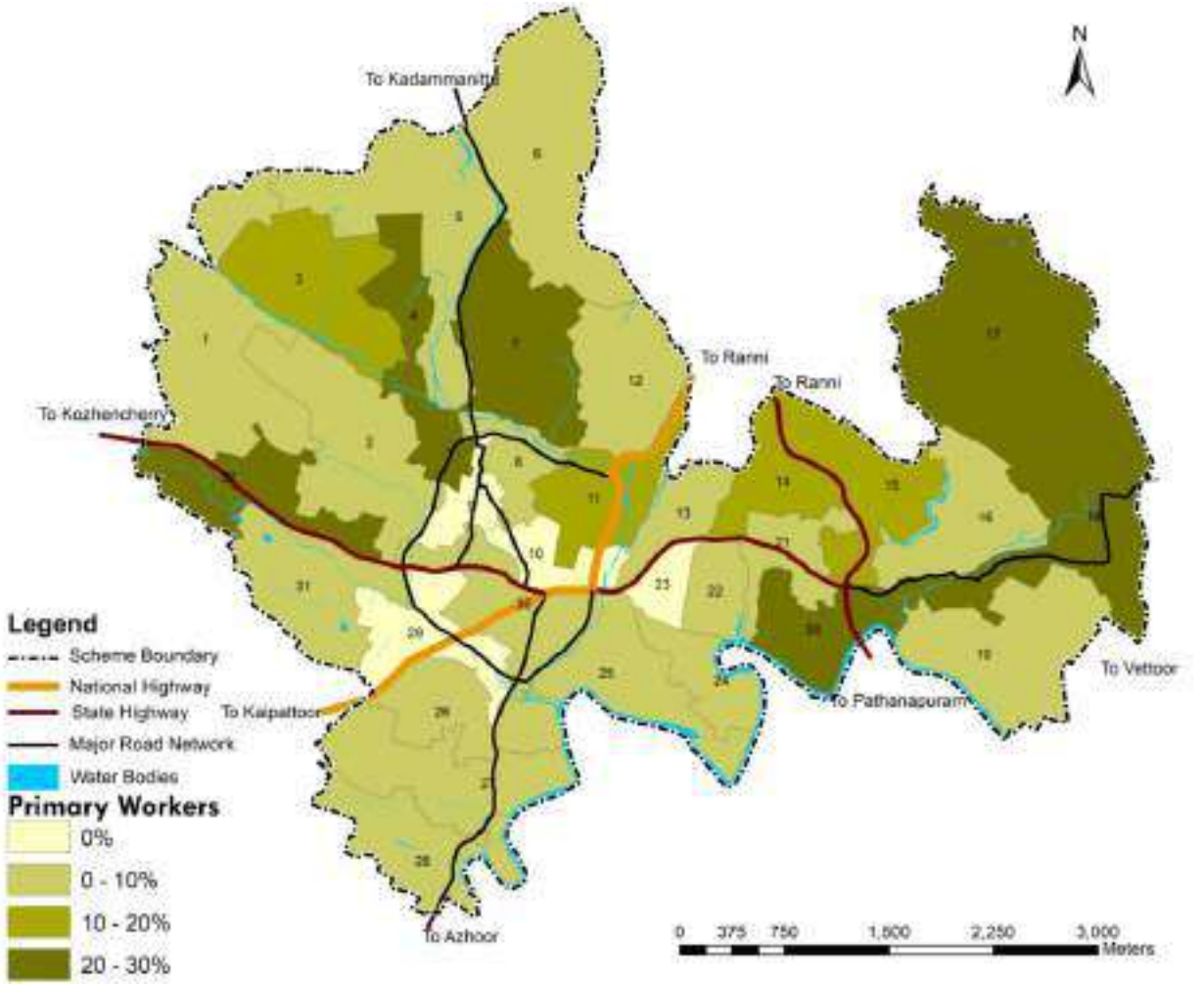


Figure 6.10 ward wise percentage of spatial distribution of primary workers in the town.

6.6 Other Socio-Economic Dimensions

The other socio-economic dimensions in the employment sector of the town addresses the migrant labours from the other state and the non-resident Indians of the town.

6.6.1 Migrant labours

Pathanamthitta town is a centre of migrant labours from other States similar to other centres such as Thiruvalla, Kozhencherry, Ranni and Konni (Figure 6.11). Most of these labours in Pathanamthitta are from West Bengal followed by Tamil Nadu, Karnataka and Assam. Till 2001, migrants to Kerala were primarily from the neighbouring States of Tamil Nadu, Karnataka, and Maharashtra. However, in recent years, migrants are mostly from West Bengal, Assam, Odisha, and Bihar. The construction sector has the largest number of migrant workers in the State followed by manufacturing sector. Ward wise percentage concentration of migrant labours in the towns is shown in Figure 6.12. Migrant workers are concentrated at Kannamkara, Pathanamthitta town central area, Valanchuzhy and Kumbazha.

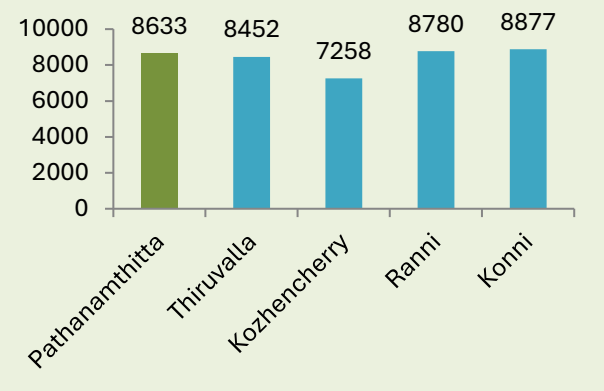


Figure 6.11 Number of migrant labours nearby areas
Source: Labour office 2019

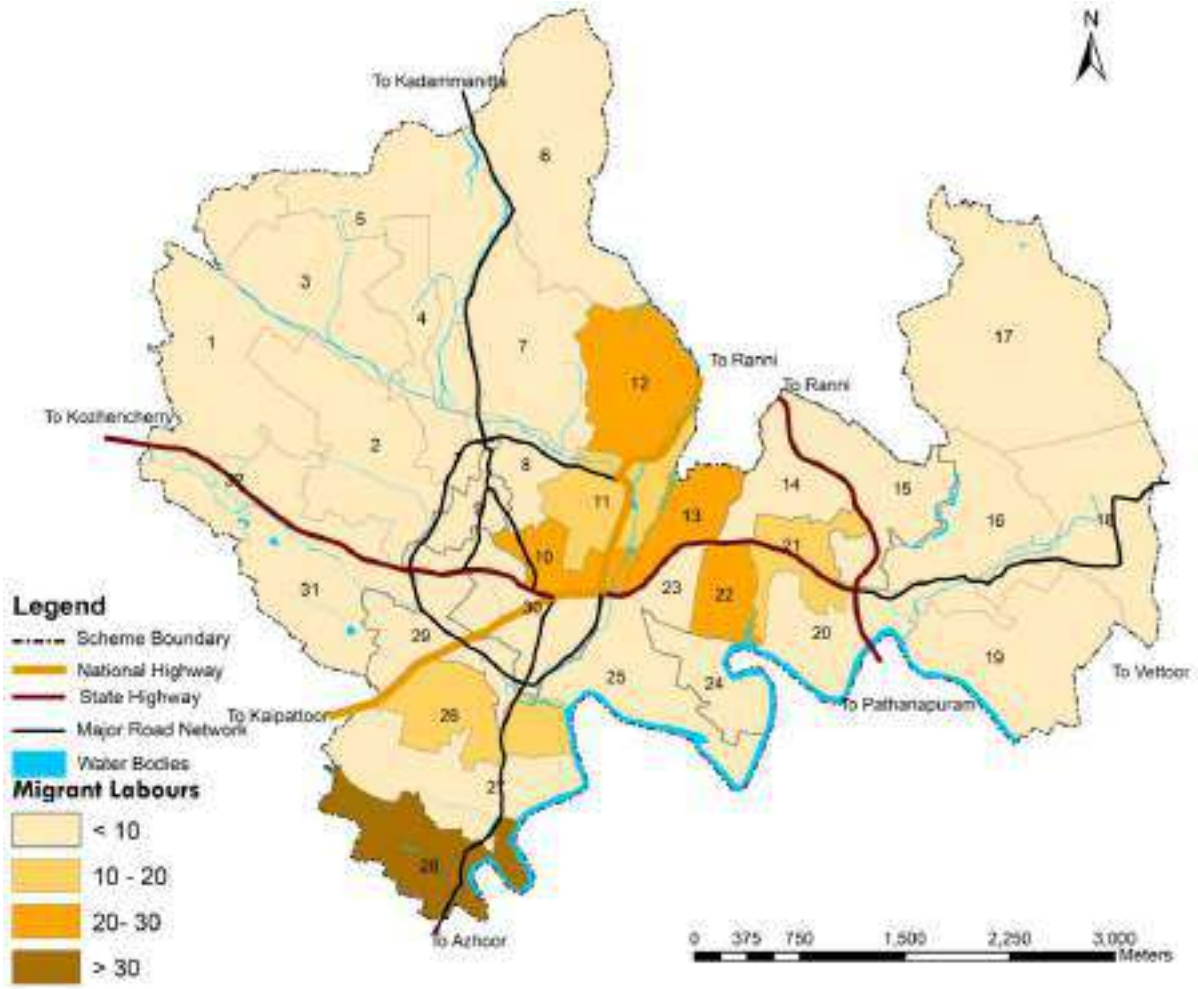


Figure 6.12 Ward wise percentage of concentration of migrant workers in the town

പത്തനംതിട്ട നഗരത്തിലും പരിസര പ്രദേശങ്ങളിലുമുള്ള പ്രസിദ്ധമായ കാർഷിക വിഭവങ്ങൾ വലിയ തോതിൽ സംഭരിച്ചു മൂല്യ വർധിത ഉൽപ്പന്നങ്ങൾ നിർമ്മിക്കുന്നതിനും, നാടൻ ഭക്ഷണ വിഭവങ്ങൾ വിദേശ രാജ്യങ്ങളിലെ മലയാളീകൾക്ക് ലഭ്യമാകത്തക്ക വിധത്തിൽ കയറ്റുമതി ചെയ്യുന്നതിനുമുള്ള സംവിധാനം ജില്ലാതലത്തിൽ നടപ്പാക്കണം. ആയത് നഗരത്തിൽ തൊഴിലവസരങ്ങൾ വർധിപ്പിക്കുന്നതിനും വിദേശ മലയാളികൾക്ക് സുലഭമായി നാടൻ വിഭവങ്ങൾ ലഭ്യമാക്കുന്നതിനും സഹായകരമാവും. *[To produce value-added products by utilizing the famous agricultural resources of Pathanamthitta town and surrounding areas on a large scale, a system should be implemented at the district level to export local food products in a way that makes them available to people of Kerala in foreign countries. This will help to increase employment opportunities in the town and make local foods easily available to overseas people of Kerala].*

- Public Opinion

6.7 Government Programs

The Government of Kerala has set up Kerala Academy for Skills Excellence (KASE) with the objective of skilling the young workforce of Kerala and elevating their skills to global standards for employment in India and abroad. Government of Kerala has also initiated an ambitious Programme, the Additional Skill Acquisition Programme (ASAP) with the objective of tackling the issue of growing unemployment in the State. ICT Academy of Kerala is a Social Enterprise created in a Public Private Partnership model (PPP) for imparting ICT skills to the youths of Kerala and improves their employability opportunities in the industry.

The Craftsman Training is another Scheme introduced by government of India in 1950 to ensure a steady flow of skill workers in different trades for the domestic Industries, to raise quantitatively and qualitatively the Industrial production by systematic training, to reduce unemployment among the educated youth by providing them employable training, to cultivate and nurture a technical and industrial attitude in the minds of younger generation.

The Kerala Start-up Mission (KSUM) is the nodal agency of the government of Kerala for promoting entrepreneurship in the state. It is also the implementing body for the Kerala Technology Start-up Policy that supports the state's start up ecosystem through the various schemes and support programs. KSUM was founded in 2006, with the goal to promote technology-based entrepreneurship activities and to create the infrastructure and ecosystem required to support high-end technology-based start-up businesses. KSUM acts as a springboard for budding entrepreneurs who wish to launch themselves into the world of technology-based careers and has helped develop several innovative products and solutions.

Young minds who come up with innovative solutions now have the support of various incubators and government schemes as highlighted earlier, which not only help bring in funding but also provide mentorship and expansion opportunities at different stages. This approach of the government enables start-ups to entrepreneurs to get ample opportunities to collaborate with the support infrastructure to develop impactful technology solutions. (Kerala Government Websites). 458 people have been included in Ayyankali Urban Employment Guarantee Scheme by Government and 30,280 working days have been given together to 300 beneficiaries at minimum 100days job in a year and 77, 64,770 rupees have been allocated in the year 2023.

> നഗരത്തിൽ വിനോദ സഞ്ചാര മേഖലയിൽ സാധ്യതയുള്ള അനേകം സ്ഥലങ്ങളുണ്ട്. ആയവ കേന്ദ്രീകരിച്ച വിനോദ സഞ്ചാര മേഖല ഉണർത്തിയെടുത്താൽ ആയതിലൂടെ പ്രദേശ വാസികൾക്ക് അനേകം തൊഴിലവസരങ്ങൾ സൃഷ്ടിക്കപ്പെടും. നഗരസഭയിൽ ഒഴിഞ്ഞു കിടക്കുന്ന വലിയ പുറമ്പോക്ക് സ്ഥലങ്ങളിൽ വ്യവസായ സംരംഭങ്ങൾ, IT PARK ആരംഭിക്കുക. ആയത് പുതിയ തൊഴിലവസരങ്ങൾ സൃഷ്ടിക്കും. [*There are many places in the city with potential for tourism. If the tourism sector is developed by focusing on these, many job opportunities will be created for the local residents. Industrial enterprises and IT parks should be started in the large vacant land in the municipality. This will create new job opportunities*]. -Public Opinion

6.8 Hazard & Climate Change

Hazard and climate change impact in the occupation / economic activity of the peoples in the town is analysed as per guidelines of risk informed master plan and through public participation.

6.8.1 Analysis as per guidelines

100% door to door socio economic survey is conducted in flood and landslide prone areas of the town. This data is used to analyse the vulnerability rating assessment as per guidelines for risk informed master plan. Out of six vulnerability rating analysis according to the guideline for preparation of risk informed master plan for the town, assessing employment/ economic related vulnerabilities of the town is included in the category of Economic vulnerability. 15% weightage is given to economic vulnerability out of all six-vulnerability assessment and following are the sub parameters and its weightage included:

1. Local Level Employment (60%)
2. Economic Zone likely to be affected (40%)

Table 6.4 Criteria and its value adopted for vulnerability analysis of local level employment affected by a hazard

Criteria	Value
> 20% of population employed in above sectors	9
10-20% of population employed in above sectors	6.75
5-10% of population employed in above sectors	4.5
<5% of population employed in above sectors	2.25

Source: Guidelines for Risk Informed Master Plan

Vulnerability of these two sub parameters in flood and landslide hazard prone area of the town is analysed in this chapter. The varying degrees of vulnerability (low, moderate, high, and very high vulnerable areas) has been identified in each cadastral based on value assigned as per guidelines of risk informed master plan. For Local level employment vulnerability in flood and landslide prone area, cadastral level percentage of population employed in informal sector/ daily wages/ local level economic sector/ agriculture is analysed. Table 6.4 shows the criteria and its value adopted for this analysis.

Table 6.5 Criteria and its value adopted for vulnerability analysis of local level employment affected by a hazard

Criteria	Value
> 20% area of economic zone likely to be affected	6
10-20% area of economic zone likely to be affected	4.5
5-10% area of economic zone likely to be affected	3
<5% area of economic zone likely to be affected	1.5

Source: Guidelines for Risk Informed Master Plan

For analysing economic zone likely to be affected in flood and landslide prone area of the town, cadastral level percentage of area of economic activities (Tourism, Commercial, Industrial, Agriculture, Fisheries, Animal Husbandry etc.) likely to be affected is analysed.

Table 6.5 shows the criteria and its value adopted for this analysis. The inference of this analysis is incorporated in the economic sector related chapters of this report (Trade & Commerce, Agriculture, Animal Husbandry, Industry and Tourism) as the economic vulnerability analysis is done together. Also, it is incorporated in the chapter 4 to find out the total economic vulnerability and risk of the town.

6.8.1.1 Flood vulnerability

The vulnerability of above mentioned two sub components (Local level employment vulnerability and economic zone vulnerability) in the flood prone area of the town at cadastral level is analysed here. From the socio-economic survey, it is identified that 84 cadastral units out of 114 in the flood prone do not come under local level employment vulnerability as the people in these cadastral are not employed in informal sector/ daily wages/ local level economic sector/ agriculture sector (Figure 6.13).

Around 48 people are employed in informal sector/ daily wages/ local level economic sector/ agriculture in flood prone area. It is 2.75% of the total population in the flood prone area. 11 cadastral shows moderate to very high vulnerability as more than 10% of the people in these cadastral are employed in informal sector/ daily wages/ local level economic sector/ agriculture activities.

For economic zone vulnerability analysis, percentage of economic zone area in a cadastral has been identified and degree of vulnerability has been analysed as per Table 6.5 and economic zone vulnerability map in the flood prone area is prepared (Figure 6.14).

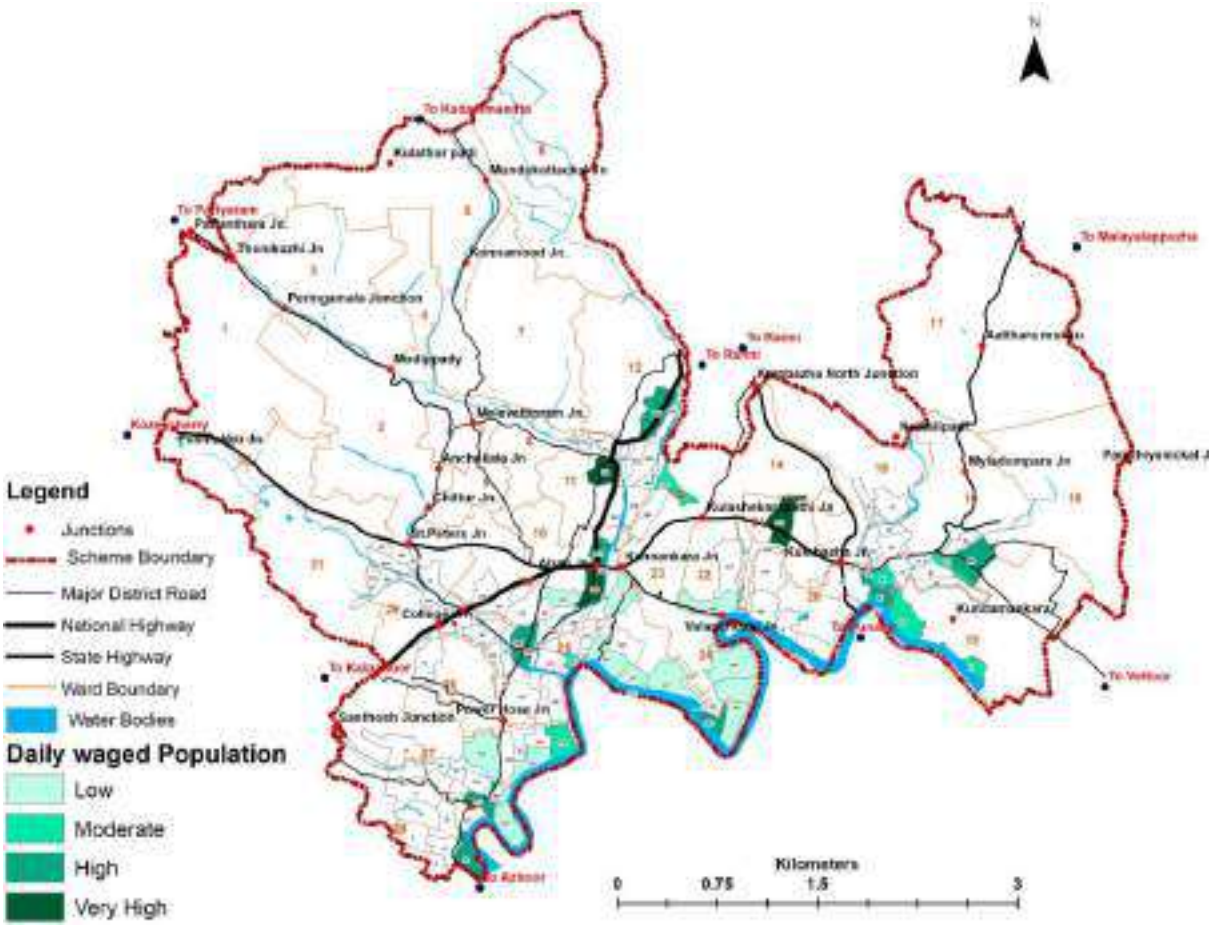


Figure 6.13 Local level employment vulnerability in flood prone area

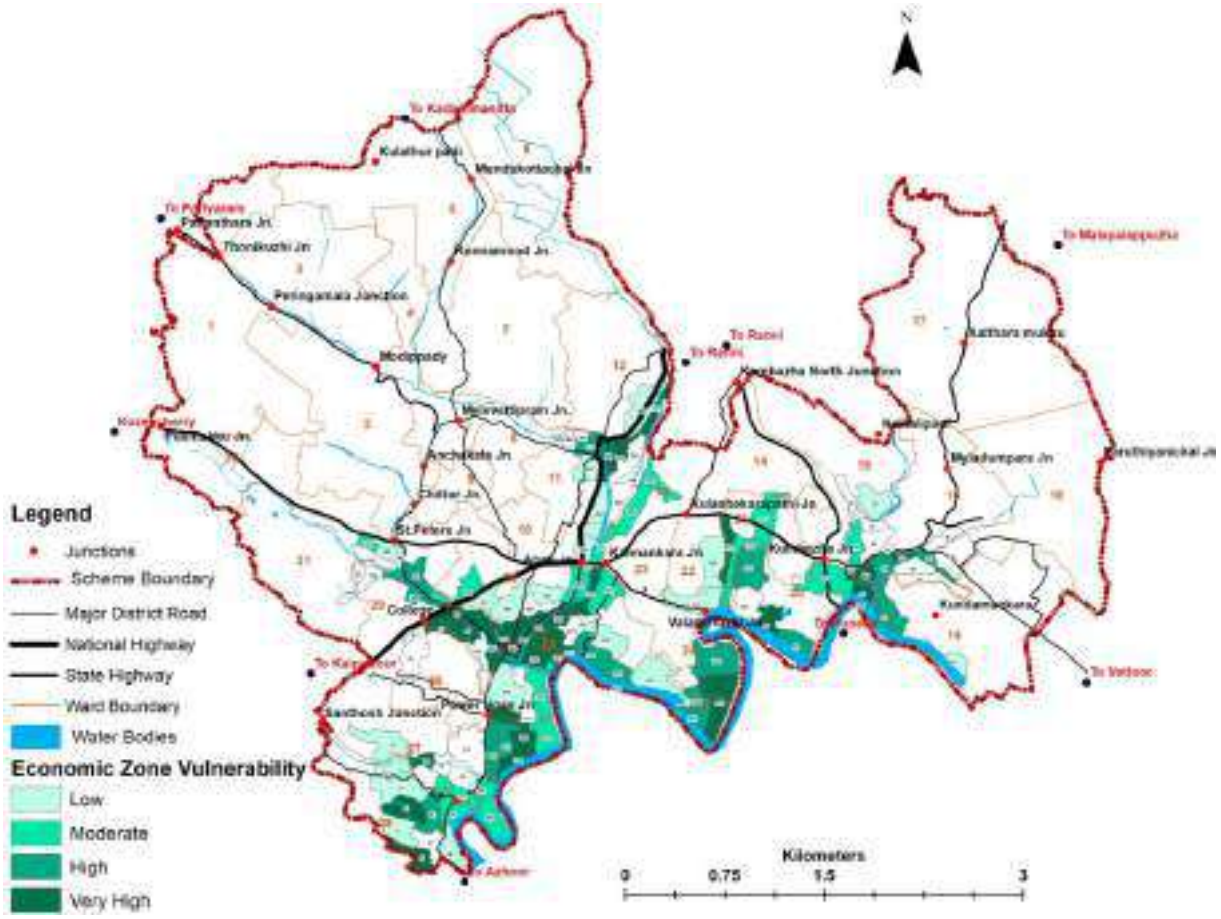


Figure 6.14 Economic zone vulnerability in flood prone area

Total cadastral area under flood probability is 4.46 sq.km and area of economic activities (Tourism, Commercial, Industrial, Agriculture, Fisheries, and Animal Husbandry etc.) in this cadastral area is 1.02 sq.km (22.86%). Out of 114 cadastral in the flood prone area, 44 cadastral (38.56%) shows the high and very high economic zone vulnerability as the percentage of economic area of these cadastral likely to be affected by flood is more than 10% as per Table 6.5.

6.8.1.2 Landslide Vulnerability

The local level employment vulnerability and economic zone vulnerability in the landslide prone area of the town is analysed at cadastral level here. From the socio-economic survey for risk assessment, it is identified that 262 people are employed in informal sector/ daily wages/ local level economic sector/ agriculture in landslide prone area. It is 14.69 % of the total population in the landslide prone area. 3 cadastral units out of 38 in the landslide prone area do not come under local level employment vulnerability as the people in these areas are not employed in informal sector/ daily wages/ local level economic sector/ agriculture sector (Figure 6.15).

Around 33 cadastral (86.84%) i.e. (225 people (85.87%)) in the landslide prone area shows moderate to very high vulnerability as more than 5% of population in these cadastral are employed in informal sector/ daily wages/ local level economic sector/ agriculture per Table 6.4. But the intensity of landslide hazard in the entire town is low as per risk assessment chapter 4.

For economic zone vulnerability analysis, percentage of economic zone area in a cadastral has been identified and degree of vulnerability has been analysed as per Table 6.5 and economic zone vulnerability map in the landslide prone area is prepared (Figure 6.16).

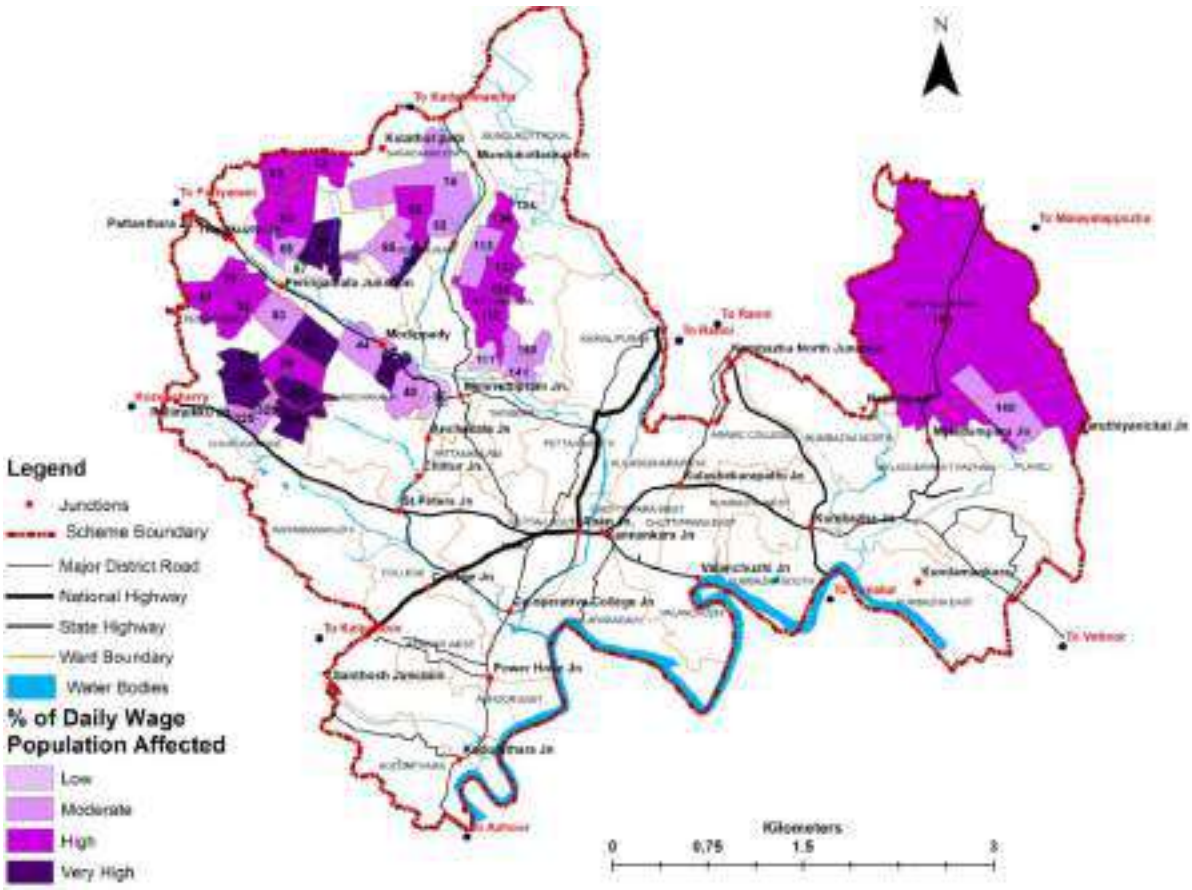


Figure 6.15 Local level employment vulnerability in landslide prone area

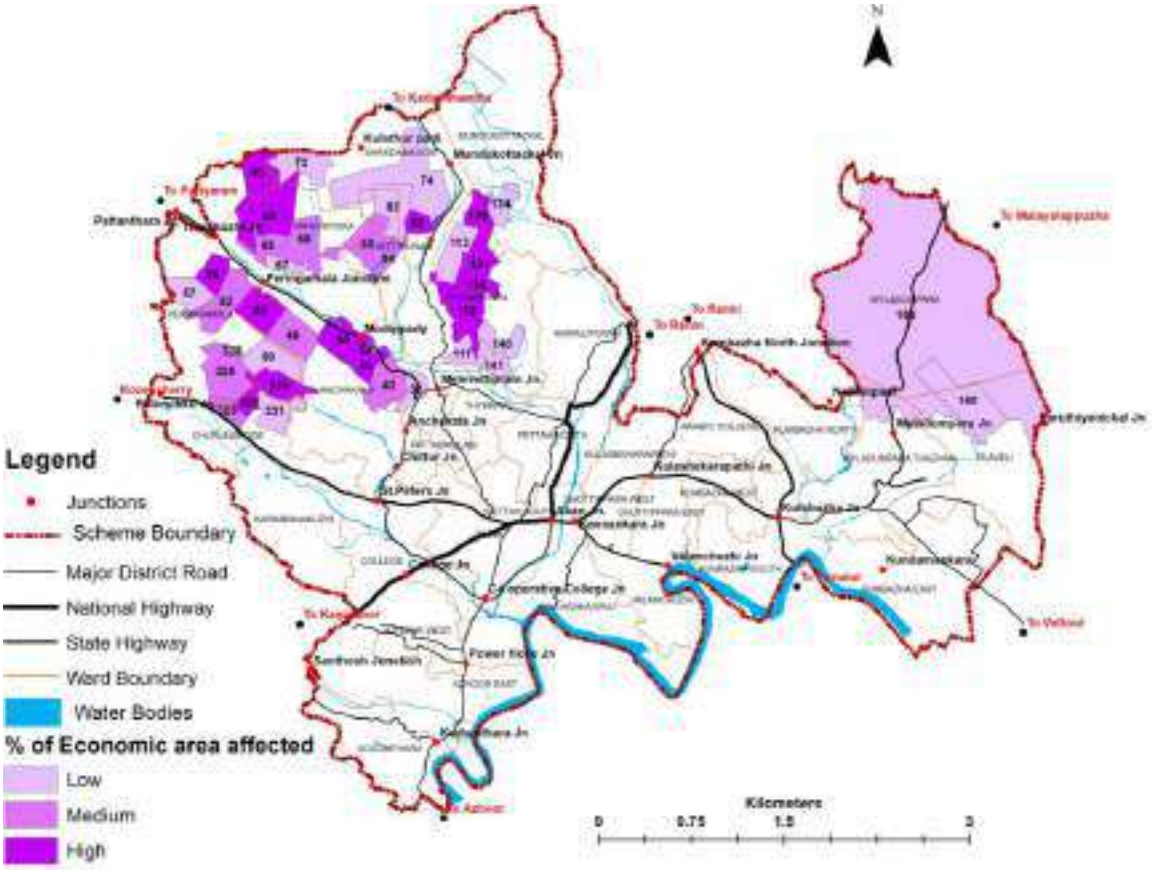


Figure 6.16 Economic zone vulnerability in flood prone area

വെള്ളപ്പൊക്കം, സൂര്യഘാതം മുതലായവ ദിവസക്കൂലിക്ക് പണിയെടുക്കുന്നവരുടെ തൊഴിൽ ദിനങ്ങൾ കുറയ്ക്കുന്നു. പെയിന്റിംഗ്/ നിർമ്മാണ തൊഴിലാളികൾ മുതലായവർ മഴക്കാലത്തും, റബ്ബർ ടാപ്പിംഗ്/ തുറസായ സ്ഥലത്തു ജോലി ചെയ്യുന്നവർ മുതലായവർ വേനൽക്കാലത്തും തൊഴിൽ രഹിതരാണ്. ആയതിനാൽ പ്രസ്തുത കാലയളവിൽ മറ്റൊരു ഉപജീവന മാർഗം കണ്ടെത്താനുതകുന്ന രീതിയിൽ ടൂറിസം / വ്യവസായം /വാണിജ്യ മേഖലയിൽ പ്രൊജെക്ടുകൾ നടപ്പിലാക്കി പുതിയ തൊഴിലവസരങ്ങൾ സൃഷ്ടിക്കുക. [*Floods, sunstroke, etc. reduce the working days of daily wage earners. Painting/ construction workers etc. are unemployed during the rainy season, and rubber tapping/ open-air workers, etc. are unemployed during the summer. Therefore, create new job opportunities by implementing projects in the tourism/ industrial/ commercial sectors in a way that will enable people to find another source of livelihood during this period].* *- Public opinion*

Total cadastral area in the landslide prone area is 5.33 sq.km and area of economic activities (Tourism, Commercial, Industrial, Agriculture, Fisheries, and Animal Husbandry etc.) in this cadastral area is 4.3 sq.km (80.62%). Around 42% of the economic zone in landslide prone area of the town is low vulnerable as the area of economic zone likely to be affected by landslide in each cadastral area is less than 5%. 58% of the economic area in landslide prone area shows moderate to high vulnerability as the area of economic zone likely to be affected by landslide in each cadastral area is more than 10%. But the intensity of landslide hazard in the entire municipality is low as per risk assessment chapter 4.

6.8.2 Analysis from Public Participation

This analysis is based on information gathered from focus groups discussions, public seminars, public interactions and Disaster Management Plan of Pathanamthitta Municipality on the effects of climate change and hazards on the town's/ resident's economic activity and occupation. Drought and unexpectedly high rainfall are harming agriculture. For the majority of the year, the town receives good rainfall. Rainfall is necessary to grow various kinds of tubers. In the town, paddy and sugarcane farming were common practices, and there has been a noticeable decline in their cultivation. On these fields, bananas, fruits, and tubers are grown. Because of the 2018 flood, the soil structure has changed, causing the tuber species to crumble inside the soil. Unseasonable rains, rising temperatures, and agricultural practices that lower crop yields. As heat rises, milk production is also decreasing and immunity of cattle also decreasing which leads to the various diseases in livestock. Farmers are being impacted by numerous forest animal assaults as a result of habitat loss in the forest. The municipality has had a pig infestation for ten years, but no long-term remedy has been discovered. The 2018 flood caused the town's commercial stores to close for a shorter time, and the floodwaters weakened or destroyed buildings' foundations, walls, and roofs, particularly those that weren't constructed to withstand flooding. Power outages and short circuits happened, and the refrigeration, heating, cooling, and lighting systems were harmed. It was common for electrical machines and appliances to malfunction for a shorter period and causing loss of money. Many daily wage workers, such as construction workers, domestic helpers, and small-scale vendors, are unable to work during and after a flood because the sites where they work flooded, businesses might closed, or their employers may not be able to afford to pay them. The unpredictable nature of 2018 flood damaged various type of occupation of the town and leads to long periods where workers have no income, making it difficult to meet basic needs like food and housing.

6.9 Inference

The percentage share of workers of the town to the district is showing an increasing trend. 33% of the population are workers and remaining 67% are non-workers. Even though the work participation rate is showing an increasing trend, the work participation of the town is lower than the State and district average. The growth rate of workers of the town is more than the growth rate of population. The temporal variation of occupational structure shows that number of cultivators, agricultural labours and household industrial workers are showing a decreasing trend and there is corresponding increase in number of other workers. The number of migrant labours in the town is high when compared to the resident workers. Pathanamthitta Municipality have large number of expats, and are the major income generating group also. 2.75% & 85.87% population of the total population in the flood prone and landslide prone area is facing employment vulnerability respectively as they are employed in informal sector/ daily wages/ local level economic sector/ agriculture activities. 1.02 sq.km and 4.3 sq.km economic zone area of the town comes under flood prone and landslide prone area. A comprehensive approach is needed to be implemented in the town to mitigate these economic areas of the town from flood and landslide impact. Diversification of livelihoods is crucial in the face of climate change and its impacts.



7. LANDUSE & BUILTUP DENSITY

Land use represents areas utilised for specific activities. The major categories on the basis of activities include residential, commercial, transportation, public, and semi-public use, agriculture, Recreational, Paddy land, wetland, water bodies etc. The analysis of the existing land use is necessary to understand the predominant economic activities of an area as well as the availability of vacant land for future economic activities. The spatial distribution and concentration index of the different land uses, functional character and activity pattern of the town, the urban growth direction, potential of town etc can be assessed with the analysis of land use.

Land use planning is also one of the best measures to reduce the impact of natural hazard like flood. Understanding the interaction between hazard prone areas and existing land use inform about the exposure of people, infrastructure and activities to probable hazards.

Contents

1. District land use
2. Land use of Pathanamthitta Town
3. Spatial distribution & concentration pattern
4. Temporal Changes in Land use
5. Built Density
6. Comparison with planning Standards
7. Impact of hazard & Climate Change
8. Inference

7.1 District Land use

Total area of the Pathanamthitta district is 2654.99 Sq.km. The breakup of land use area of the Pathanamthitta District with its percentage to total area of the district is shown in Table 7.1. & Figure 7.1.

Table 7.1 Land use breakup of Pathanamthitta District

Sl No	Land Use	Area (Sq.km)	Percentage
1	Forest	1203.73	45.34
2	Residential/ Agricultural Mix	497.69	18.75
3	Plantation	493.75	18.60
4	Residential	200.20	07.54
5	Agriculture	90.25	03.40
6	Other Built-up Land	0.01	00.001
7	Water bodies	31.60	01.19
8	Marshy Land	31.51	01.18
9	Others	106.27	04.00
	Total	2654.99	100.00

Source: District Urbanization Report, Pathanamthitta 2011

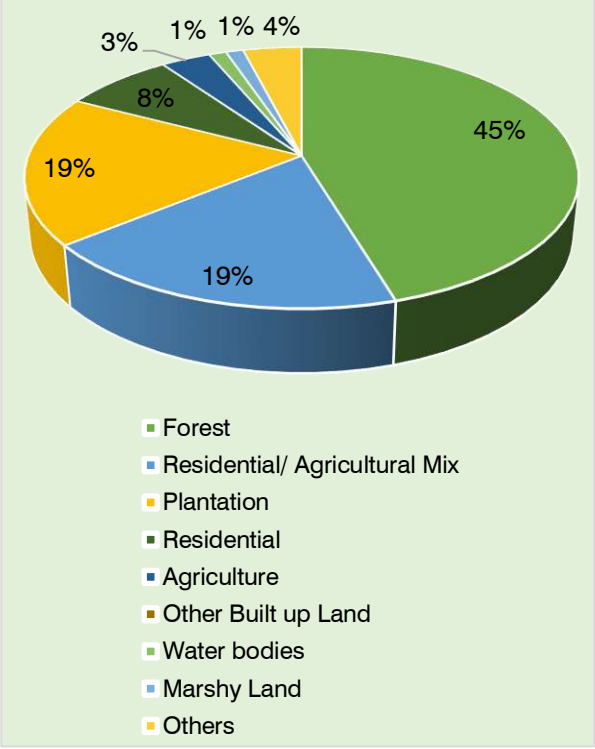


Figure 7.1 Land use breakup of Pathanamthitta district

Major portion of land which is 45.34% of total area (1203.73 Sq.Km) falls under forest land. This percentage is high among the 14 districts of the State and in area wise only Idukki district has more area of land under forest than Pathanamthitta district. Major land use is under residential / Agriculture mix (18.75%) (which include mainly dry agriculture lands where in residential developments co-exist) and Plantation (18.60%) comes after forest land. The district consists of 8% of land under intense residential use, 3.40% Pucca agricultural land, 1.19% of water bodies and 1.18% of marshy land. The analysis reveals that the district is blessed with agriculture, plantation and forest resources.

Pathanamthitta district is basically divided into three basic zones. Zone 1 consists of forest area which is concentrated on the eastern side of the district. The forest area lies in Kozhencherry, Konni and Ranni Taluks. Zone 2 consists of plantation which is concentrated on the central part of the district where Pathanamthitta town located. Zone 3 consists of both dry agriculture and residential/agriculture mix which is concentrated on the western part of the district.

Figure 7.2 shows the land use map of Pathanamthitta district. The map clearly indicates that residential development is scattered and both urban and rural residential development can be seen. Most of the built-up land use other than commercial land use are generally scattered. Topography is a major factor in the development of these zones as other regions are eco-sensitive with high degree of flora and fauna and are almost impossible to access; since they are demarcated under forest area. Areas which are difficult to access due to steep slope and hills, but still have fertile soil are developed into plantation areas. Areas which are low lying and easily accessible, compared to the other two zones are developed into agriculture and residential area.

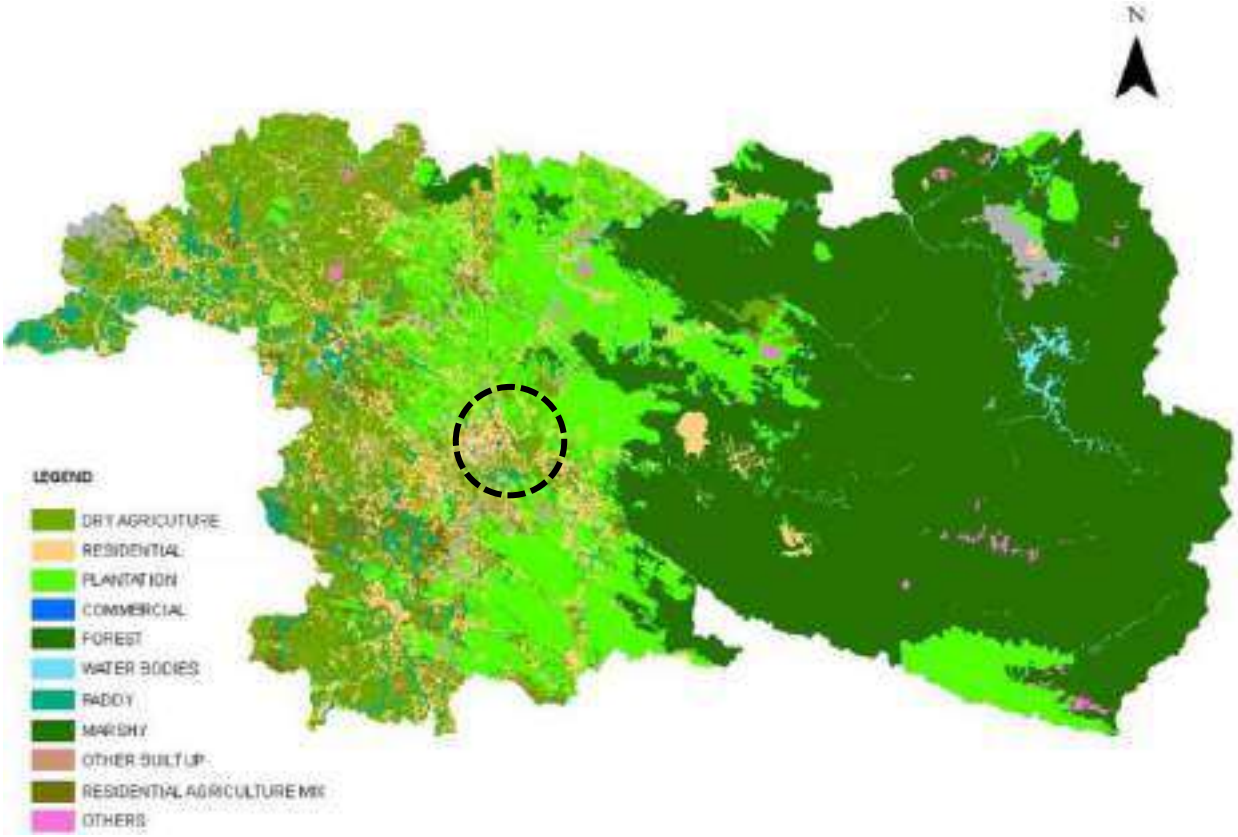


Figure 7.2 Pathanmathitta town in Land use Map of Pathanamthitta District 2003-2004

Source: District Urbanization Report, Pathanamthitta

7.2 Land use of Pathanamthitta Town

Total area of Pathanamthitta Municipality is 23.43 Sq.km. The breakup of existing land use in 2023 of Pathanamthitta Municipality with its percentage is shown in Figure 7.3 and Table 7.2. Major land use of the Municipality is Dry Agriculture having area of 8.93 sqkm which is 43.44 % of the total town area. The Residential use having 8.48 Sq.Km which is 36.20% of total area comes after Dry Agriculture. The town consists of 0.47 Sq.Km (2.00%) under commercial use, 2.21 Sq.Km (9.42%) of land under public semi-public use, which are mainly religious institutions, 0.03 Sq.Km (0.13%) under industrial use, 0.06 Sq.Km of open spaces, 0.26 Sq.Km of water body, 0.59Sq.Km of vacant land. 8.32% (1.95sqkm) of the town area comes under /Low Lying Wetland / Environmentally Sensitive Zone. The Land use pattern of Pathanamthitta town is predominantly residential & agriculture use (Figure 7.4)

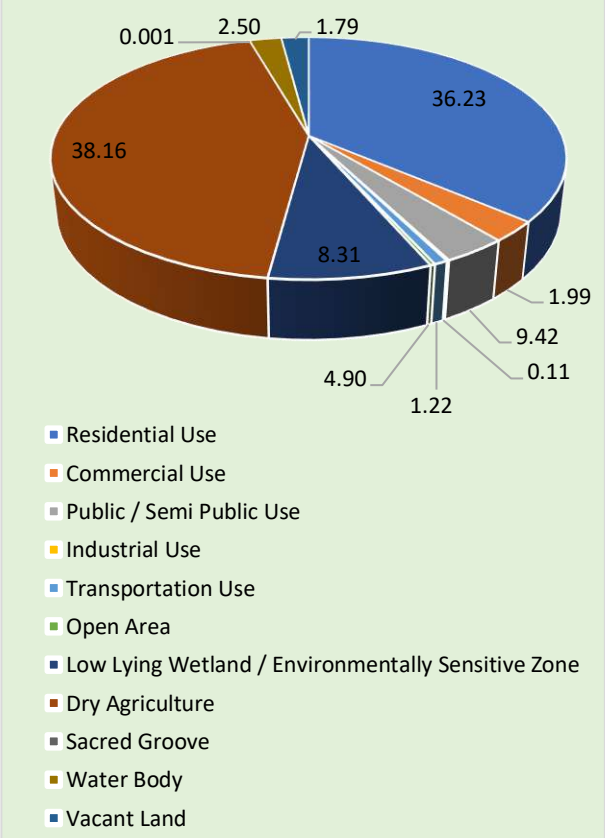


Figure 7.3 Land use breakup of Pathanamthitta Municipality 2023

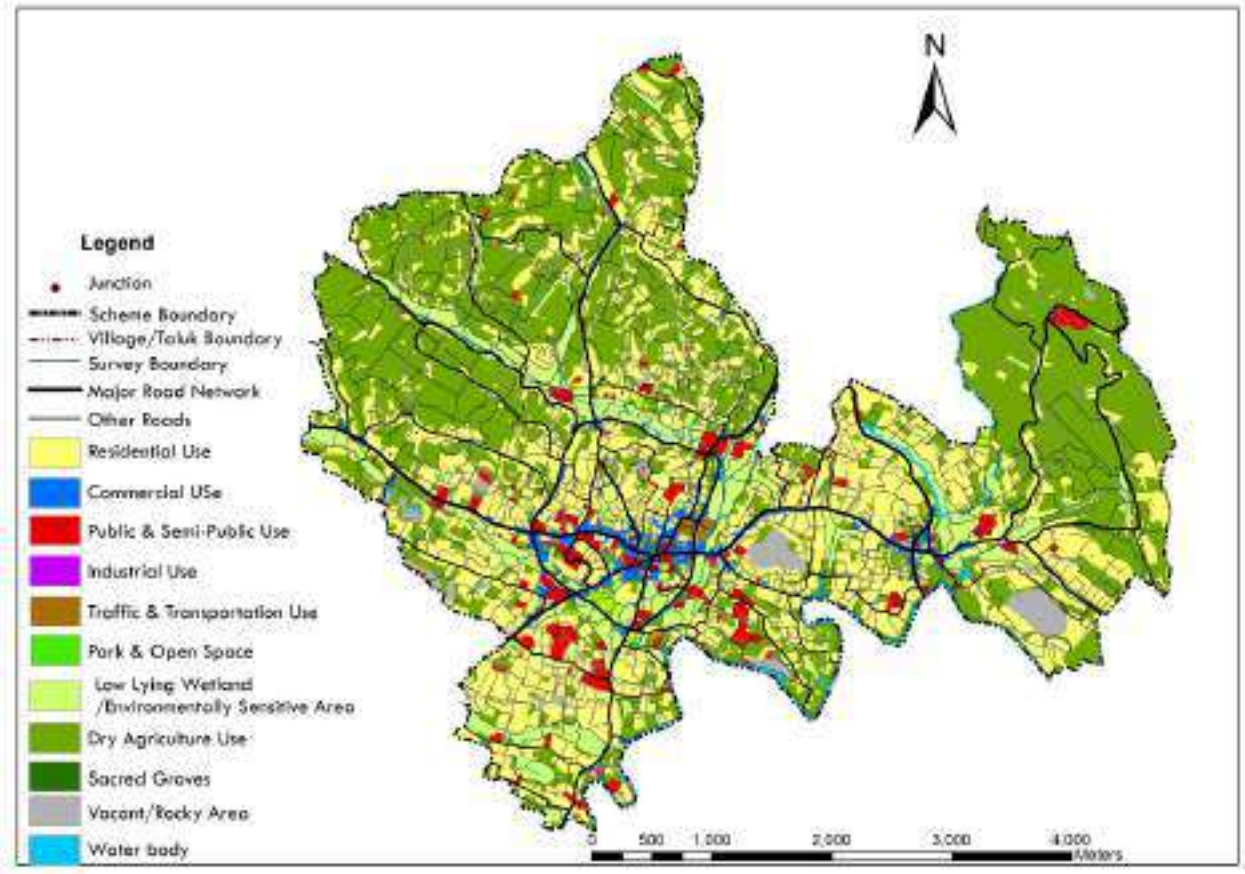


Figure 7.4 Existing land use of Pathanamthitta town 2023

Table 7.2 Land use breakup of Pathanamthitta Municipality

Sl. No	Land Use	Area (Sq.km)	%
1	Residential Use	8.48	36.20
2	Commercial Use	0.47	2.00
3	Public / Semi Public Use	2.21	9.42
4	Industrial Use	0.03	0.13
5	Transportation Use	0.29	1.24
6	Open Area	0.06	0.26
7	Low Lying Wetland / Environmentally Sensitive Zone	1.95	8.32
8	Dry Agriculture	8.93	38.12
9	Sacred Groove	0.0003	0.001
10	Water Body	0.59	2.50
11	Vacant Land	0.42	1.79
	Total	23.43	100

7.3 Spatial Distribution & Concentration Pattern

The concentration pattern of a particular land use gives an idea about where that particular land use is concentrated within the town. The concentration pattern of a land use can be ascertained by the concentration index (CI) of that land use. The concentration index (CI) of a particular land use = ((Area of that land use in a ward) / (Total area of the ward)) / ((Area of that land use in the town) / (Total area of the town)). The concentration index of various land use is shown in the Annexure7.1.

7.3.1 Residential land use

Spatial Distribution map of residential land use is shown in Figure 7.5. Residential area is scattered in all parts of the town and the high-density residential development is mostly found in the southern and eastern area of Pathanamthitta Municipality which is mainly around Azhoor and Kumbazha Junction and inside the Ring Road.

The concentration pattern of residential land use is shown in Figure 7.6. The wards with higher values of concentration indices are in Pattamkulam (ward 9) and Arabic College (Ward 14). These wards are located along major travel corridors, and adjacent to commercial areas. The concentration is also observed in the plain terrains and near the Achancovil river.

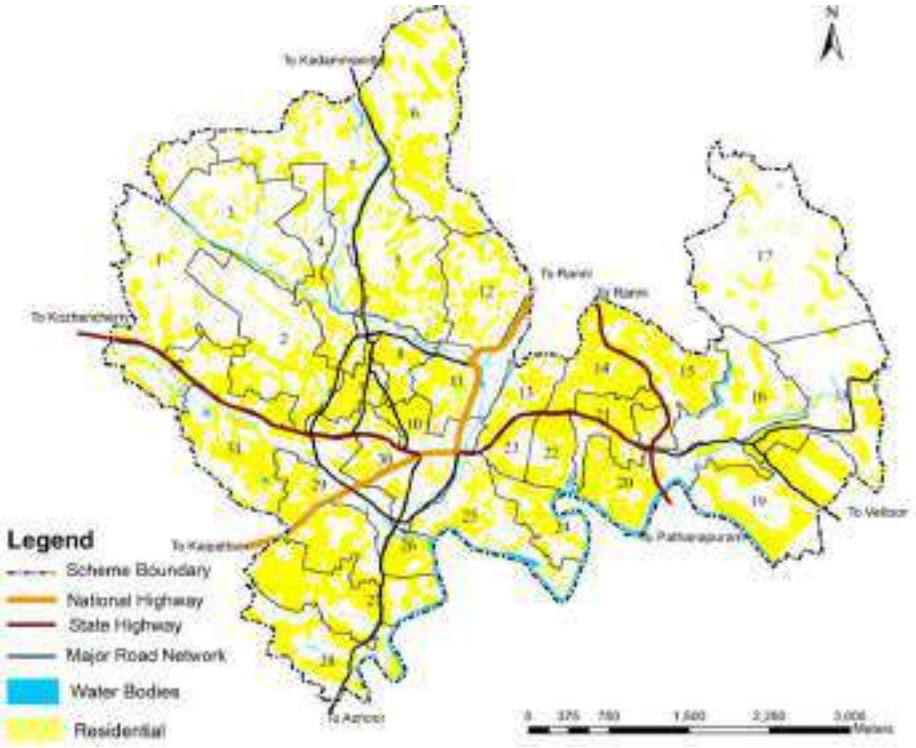
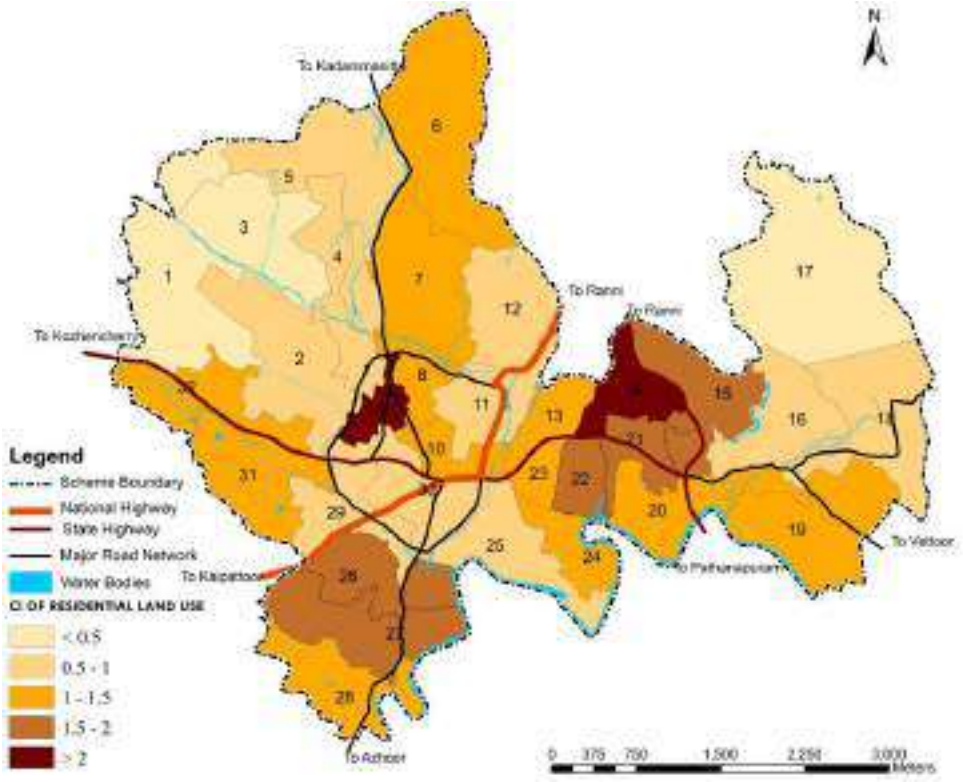


Figure 7.5 Spatial Distribution of residential land use

The wards with low value of concentration index of residential land use are Peringamala (ward 1), Vanchippoika (ward 3) and Myladumpara (ward 17). These wards are primarily situated in the Northern and North Western parts of the town, characterized by hilly terrain and their location away from major corridors. This geographical factor contributes to lower residential density and limited urban development in these areas.



Topography is a major factor in the growth of residential land use since it is directly connected with the availability of drinking water, accessibility and other natural hurdles for construction activities. Low lying and easily accessible areas which are mostly located in the southern part of Pathanamthitta town have a higher density, when compared with the hilly areas which are located in the North)

Figure 7.6 Ward wise Residential land use concentration Index

7.3.2 Commercial land use

Commercial Land use is concentrated in the central part of the town. Corridor development is observed along major transport corridors. (Figure 7.7)

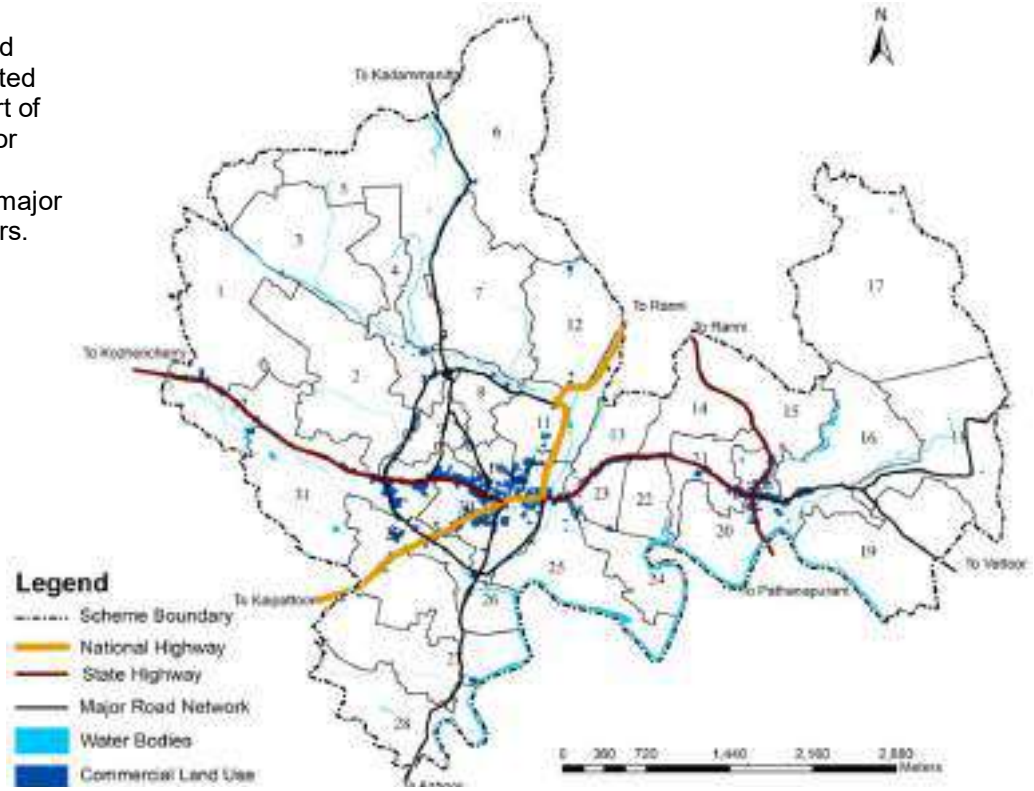
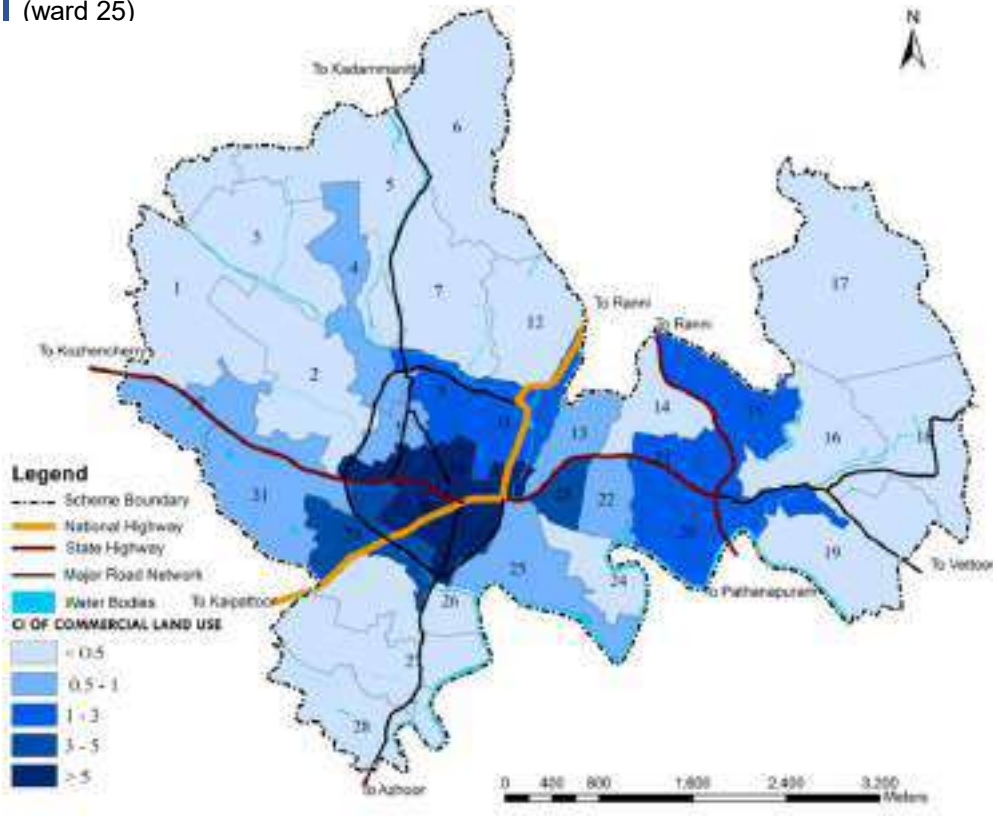


Figure 7.7 Spatial distribution of commercial land use

Highest value of concentration index for commercial land use is obtained for Pettah South (Ward 10), Town (wards 30) and Kallarakadavu (ward 25)



Concentration is gradually reducing towards the outer parts of the town. Commercial centres are developed at Kumbazha, St. Peters Junction, Churulikode, Thazhevettipram, Melevettipram, Kannamkara etc

Figure 7.8 Ward wise commercial concentration index

7.3.3 Public and Semi-Public land use

Public and Semi-public areas include land having Government and semi- Government establishments, religious centres, educational institutions, health institutions etc.

Even though it is distributed in almost all wards of the town (Figure 7.9) there is more concentration around the central area of the town.

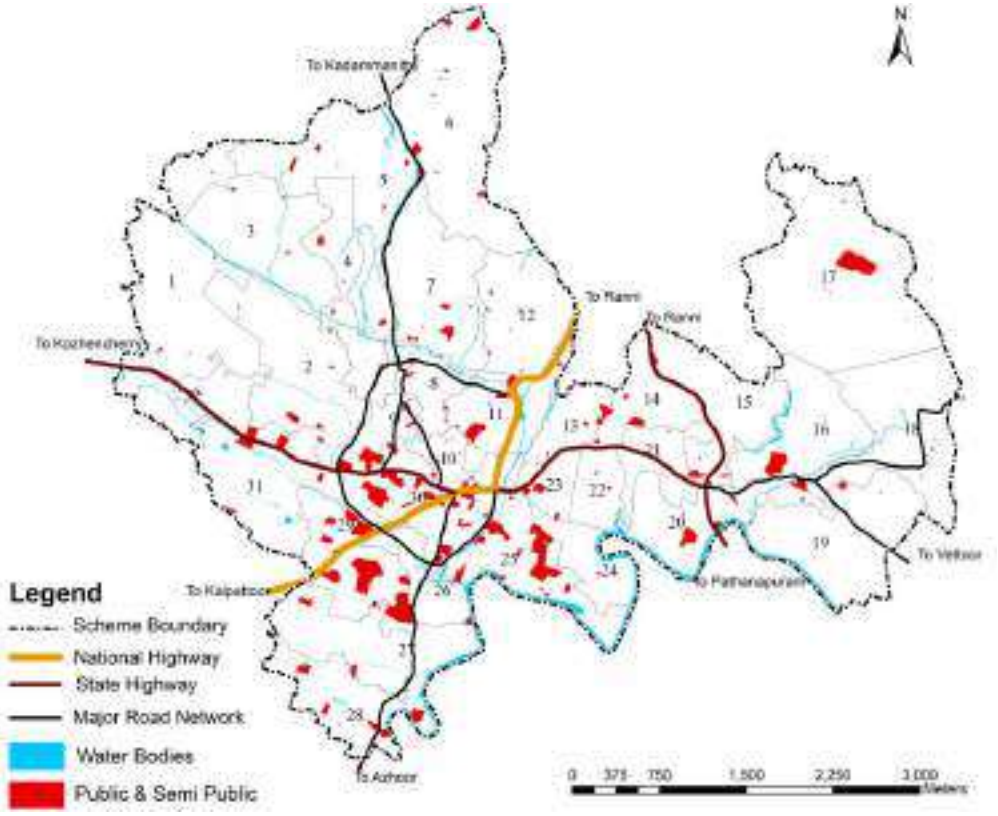
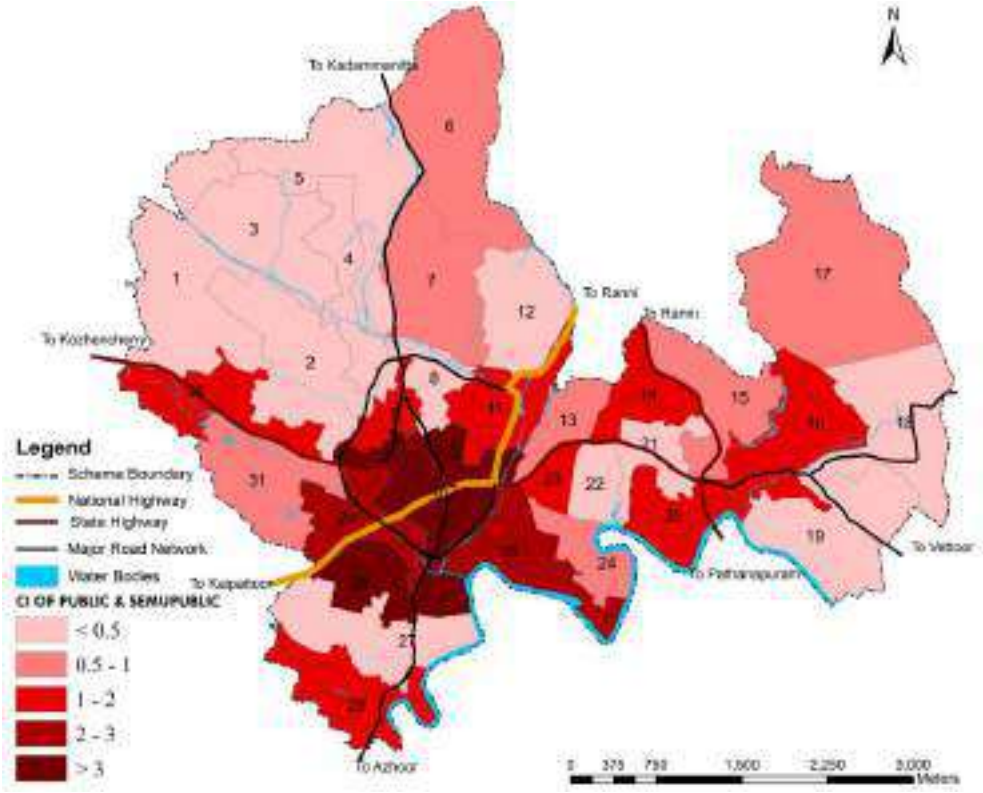


Figure 7.9 Spatial distribution of public and semi-public land use



The pattern shows that more concentration of public land use is near the town centre. Highest value of concentration index for public & semi-public land use is obtained for Pettah South (10), Kallarakadavu(26) and Town (30) wards (Figure 7.10)

Figure 7.10 Ward wise public & semi-public land use concentration index

7.3.4 Industrial land use

No major industries are functioning in the town under industrial use.

The available MSME industries are scattered in the town. (Figure 7.11)

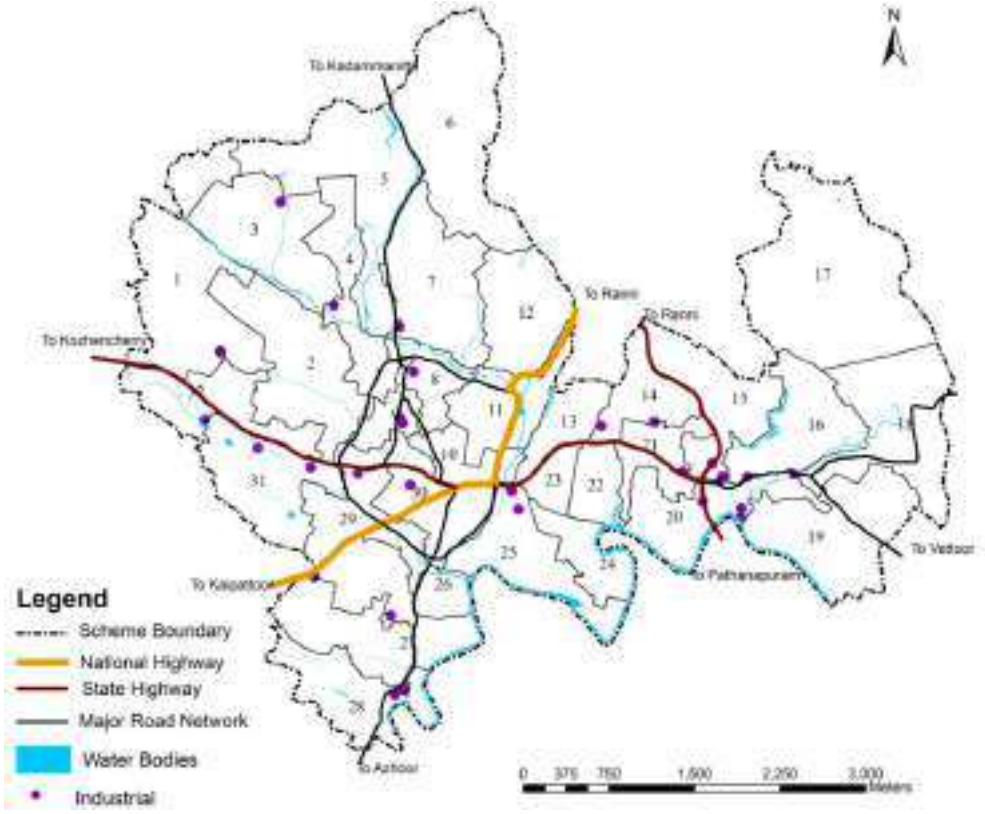
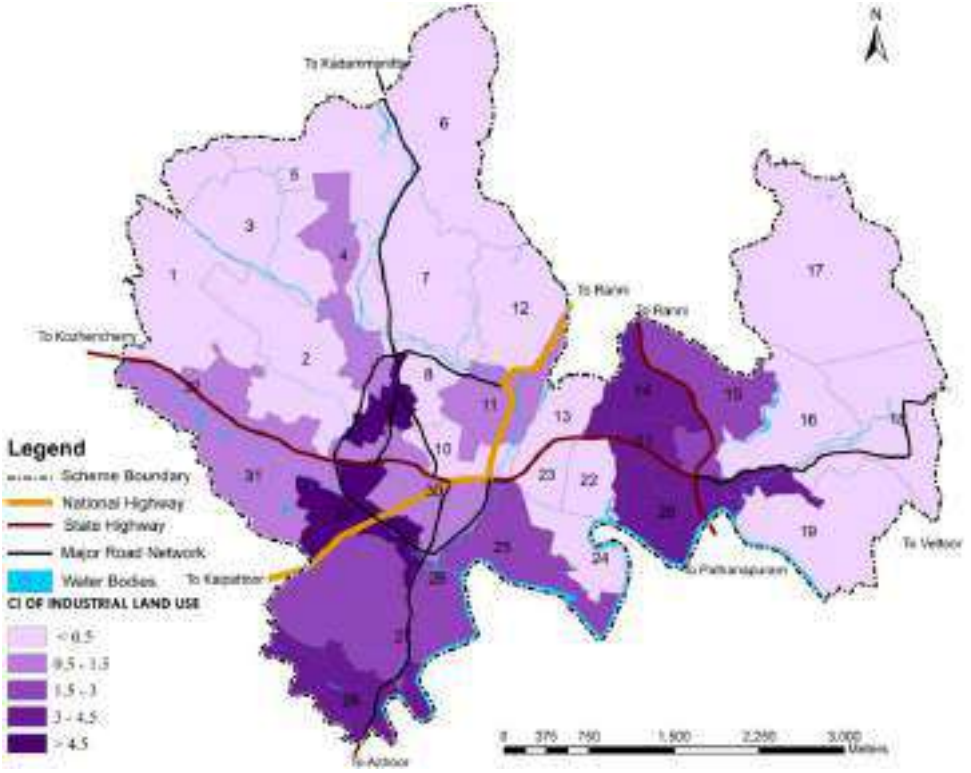


Figure 7.11 Spatial distribution of industrial land use



The concentration index of industrial land use is maximum in Pattamkulam (9) and College (29) wards. (Figure 7.12)

Figure 7.12 Ward wise industrial concentration index

7.3.5 Dry Agriculture land use

Dry agriculture is the major land use of Pathanamthitta town and 38.16% of land area of total town area coming under Dry Agriculture land use.

The concentration index of dry agriculture land use is high in the wards of Peringamala (1) Vanchippoika(3) Myladumpara(17) and Plaveli (18) Wards.

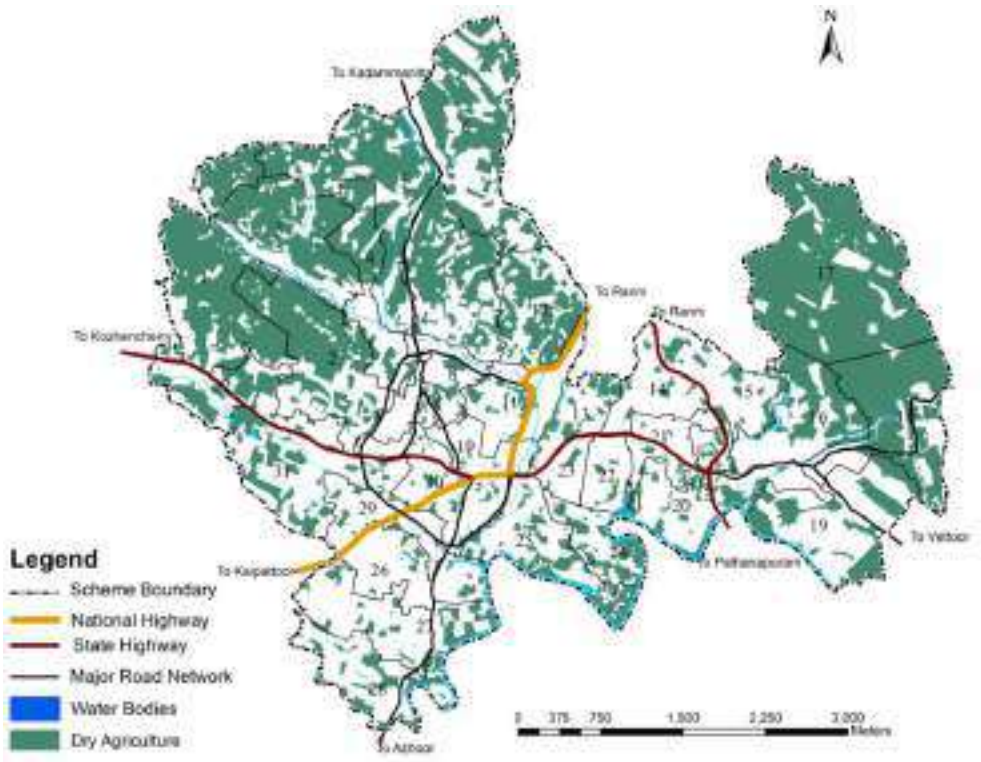


Figure 7.13 Spatial distribution of Dry agriculture

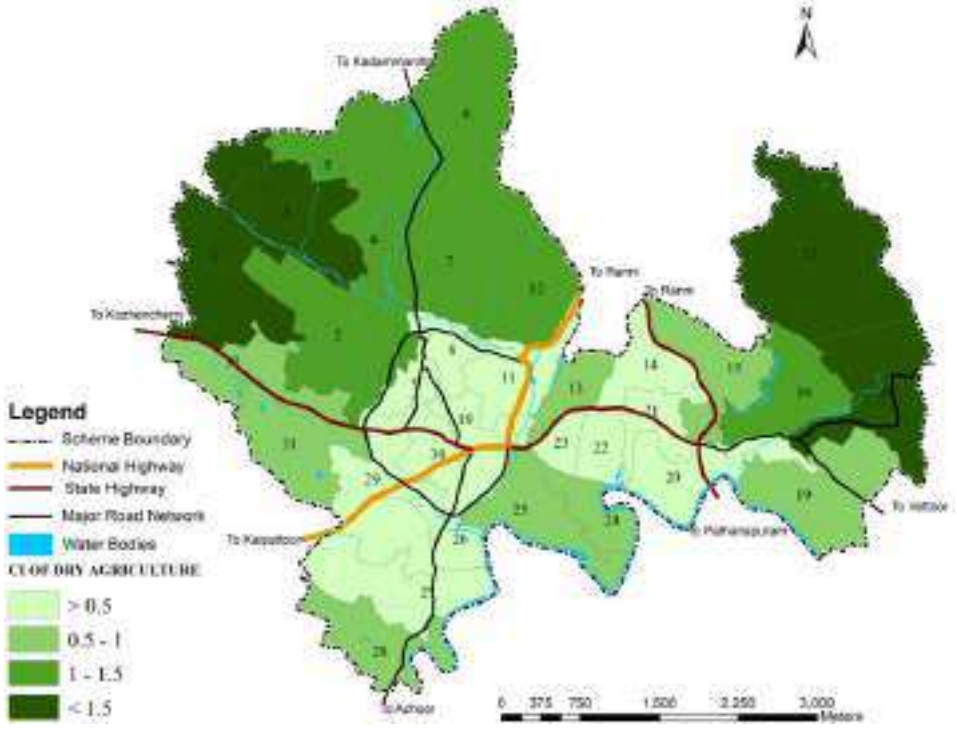


Figure 7.14 ward wise agriculture concentration index

Dry Agriculture land is distributed in all wards of the municipality. (Figure 7.13). More concentrated wards are located in the hilly peripheral areas in the northern part of the town (Figure 7.14) and these are mainly rubber plantations.

7.3.6 Low lying/ Wetland / Environmentally Sensitive Zone

Pathanamthitta Municipality has chains of paddy lands and is mainly concentrated around Kumbazha, Azhoor, Kodumthara, ring road and areas adjoining Achankovil River. (Figure 7.15)

8.31% of the total geographical area of the town is Low lying/wetland. The concentration index is high in the wards of Thykkavu (8) and Pettah North (11) wards (Figure 7.16)

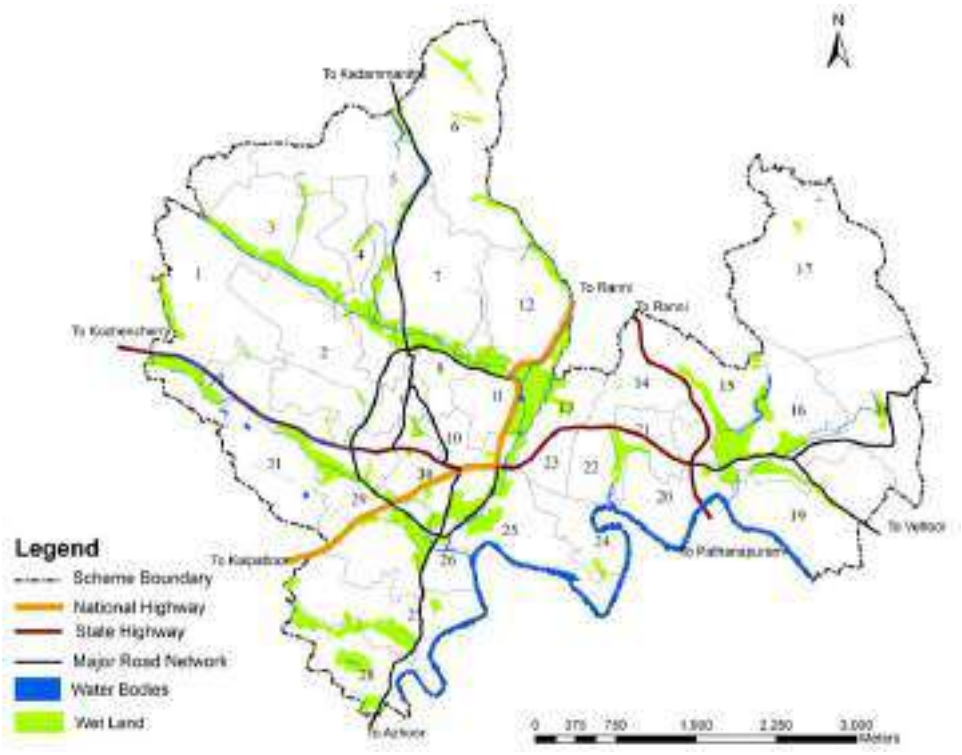
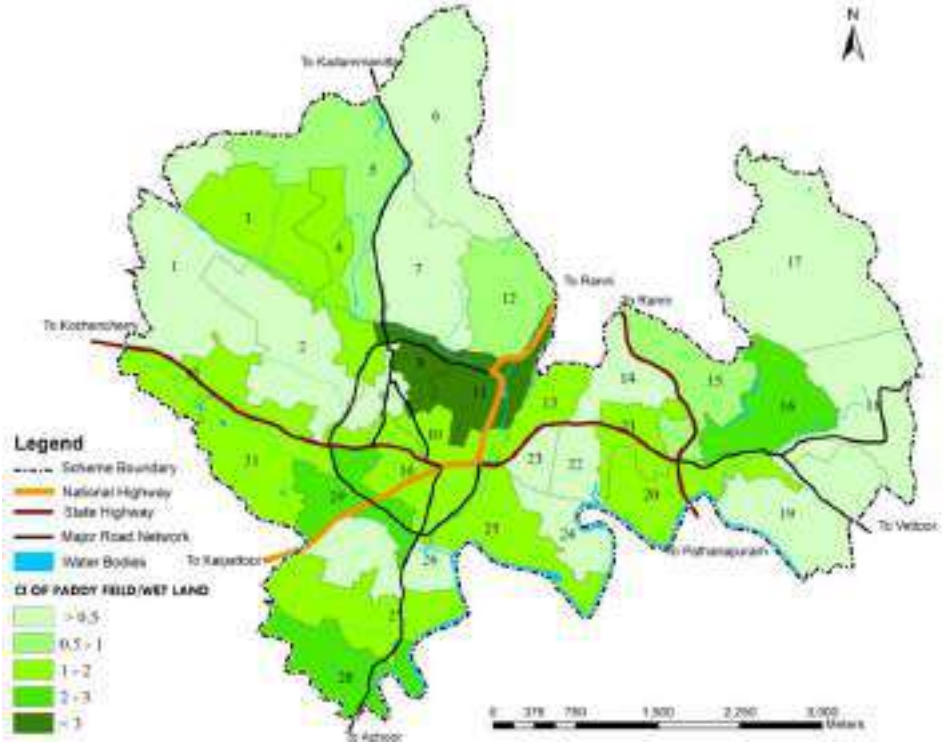


Figure 7.15 Spatial Distribution of low lying/wet land



Low-lying wetlands are mainly concentrated in the central part of Pathanamthitta Municipality due to the topographical features of the town. Presently there is no paddy cultivation in the town.

Figure 7.16 Ward wise low lying /wet land concentration index

7.3.7 Transportation

The Traffic and Transportation use of the town mainly consists of roads, KSRTC and private bus terminal areas and an old private bus stand which is now used as public parking area.

The land coming under Transportation use are mainly roads and it is distributed in all wards. (Figure 7.17)

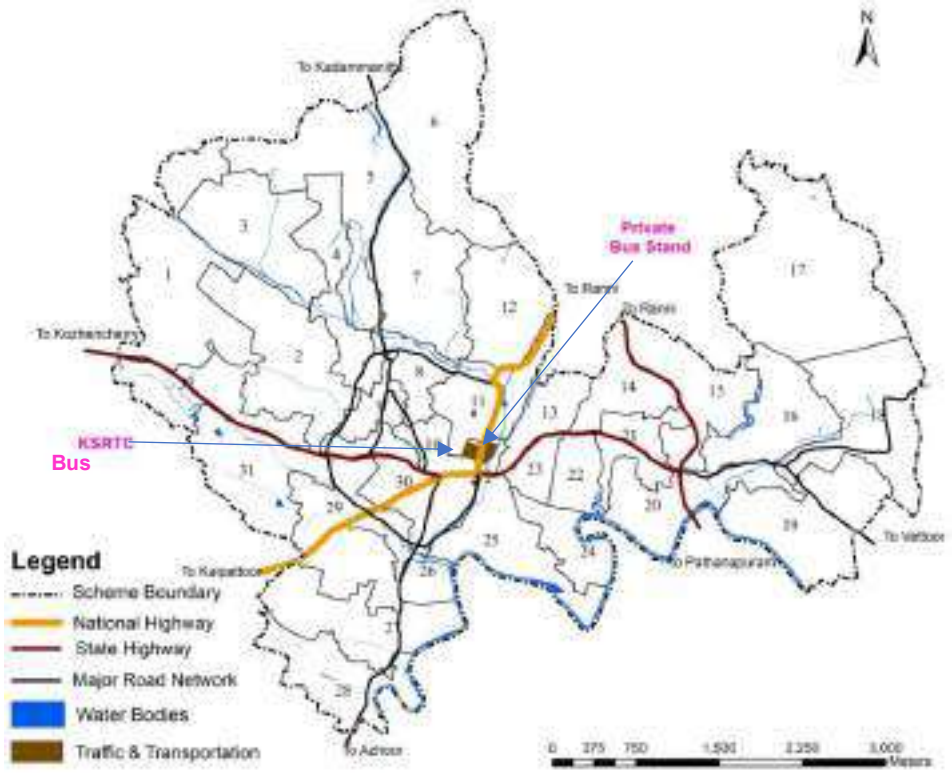
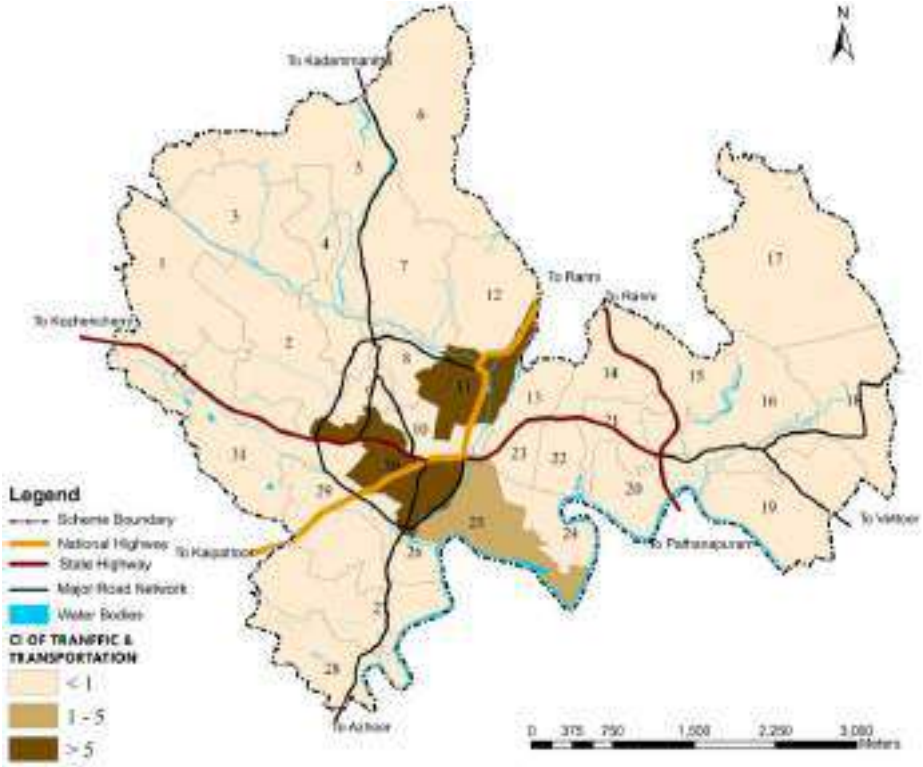


Figure 7.17 spatial distribution of transportation land use



The Traffic and Transportation use of the town is mainly concentrated in wards with in the central area of the town as the bus stands are situated here. (Figure 7.18)

Figure 7.18 ward wise transportation concentration index

7.3.8 Other land use

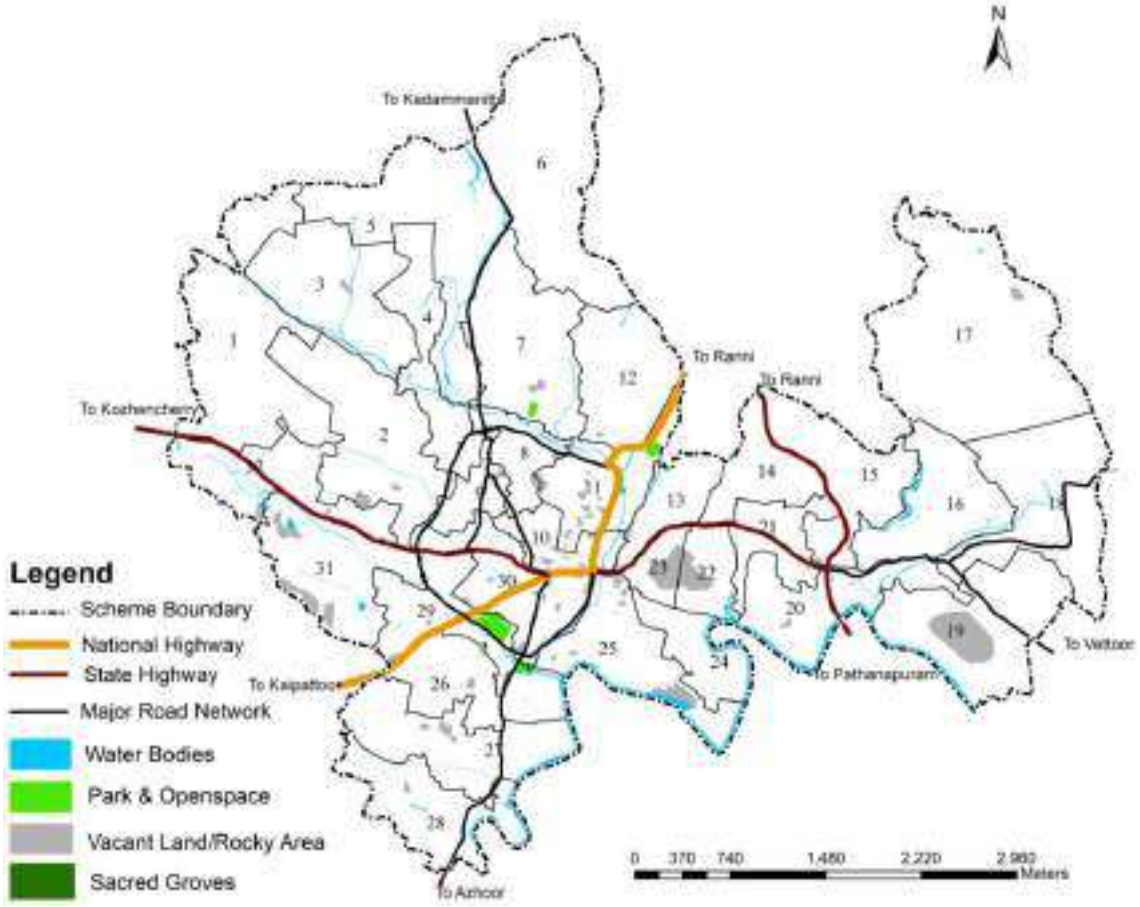


Figure 7.19 Spatial distribution of other land use

In addition to the major land uses mentioned in sub-paragraphs 7.3.1 to 7.3.7, Sacred Groves, Vacant Land/ Rocky Area, Parks & open spaces and Water bodies are the other remaining land uses of the town. The spatial distribution of other land uses is shown in the Figure 7.19. Achankovil River blows along the southern boundary of Pathanamthitta town. Land coming under water bodies mainly consists of Achankovil river, natural drains and ponds. Land coming under Parks and open spaces consist of a Stadium, a park and open grounds. The land shown in Wards 22, 23, and 19 in Figure 7.19 consists of rocky hill areas. Area of sacred groves in the town is too small.

7.3.9 Land use activity pattern

Land use activities identified for Pathanamthitta town is Agriculture. The activity pattern of Pathanamthitta town is analysed ward wise based on land use concentration index. Four major categories of land uses, viz residential, commercial, agriculture, public & semi-public and the combinations of these are considered for the analysis. Those activity (land use) with higher concentration index has been assigned as the activity of the particular ward. The activity pattern of the town based on the land use is shown in Figure7.20.

Low lying wetland/ Environmentally sensitive area is separately overlayed to activity pattern map. The commercial activity is concentrated at the central area of the town. Wards around the ring road have public & semi-public and mix of public & semi-public with commercial activity. Highest residential concentration is seen in wards 9 & 14. Low lying and easily accessible areas, which are mostly located in the southern part of Pathanamthitta town, have a higher residential density than hilly areas which are located in the North.

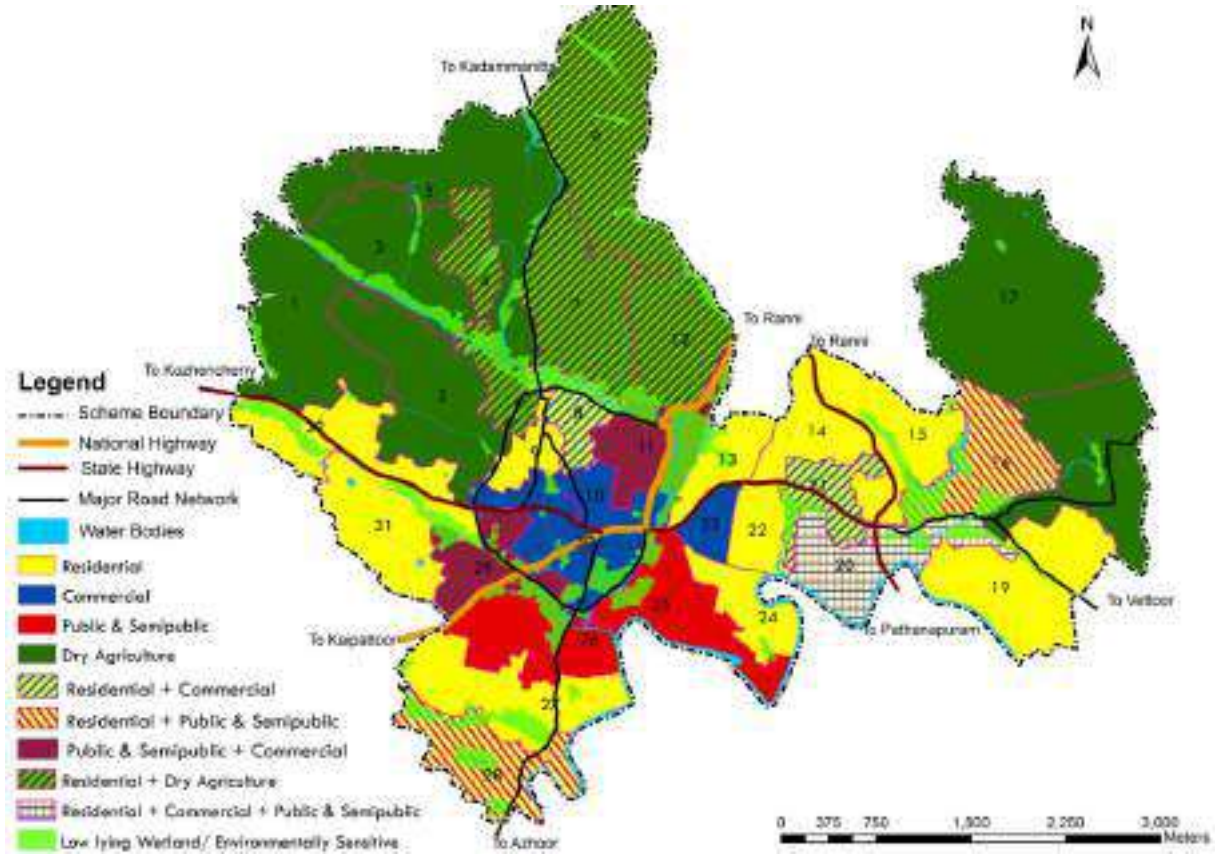


Figure 7.20 Ward wise Activity pattern of Pathanamthitta town

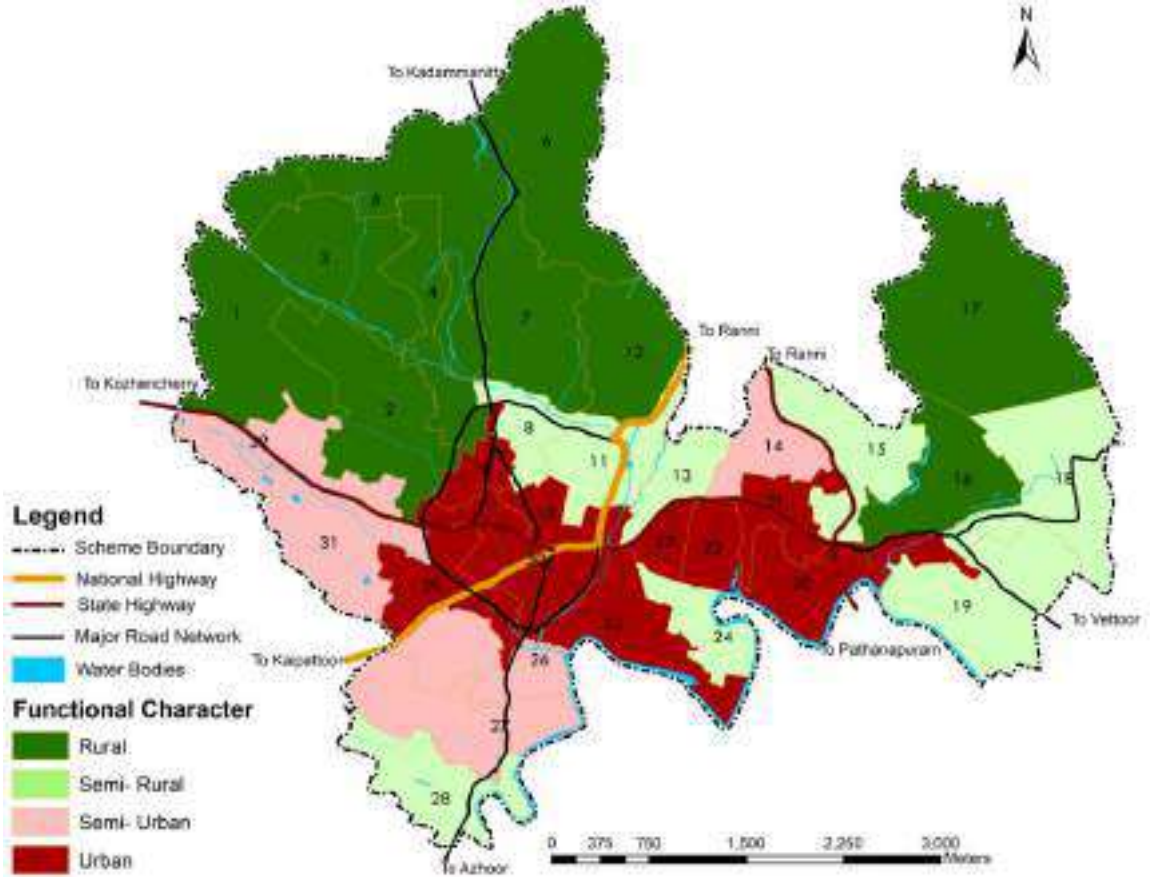


Figure 7.21 Ward wise functional character of Pathanamthitta town

The agricultural activity is concentrated in wards along the northern periphery of the town.

7.3.10 Functional character of the town

The functional character is determined based on population distribution, average plot size and land use. Pathanamthitta has rural character as per the District Urbanisation Report 2011. The functional character of different wards of Pathanamthitta municipality has been determined and it is shown in Figure 7.21. Wards along the roads passing through the central part of the town and Southern part of the ring road have urban character as these areas are easily accessible. Other wards located near the major roads shows semi urban and semi-rural character. The northern side of the wards shows the rural character.

7.4 Temporal Changes in Land use

Temporal changes of land use refer to the changes in the way land in a particular area is used over time. This can involve shifts in the types of activities or developments taking place on the land. These changes are typically driven by a variety of factors such as population growth, economic development, technological advances and social needs.

7.4.1 Comparison of Existing Land use with Development plan for Pathanamthitta published in 1995

Land use proposals for 2011 in published Development plan for Pathanamthitta 1995 (Figure 7.22) and Existing land use in 2023 of the town (Figure 7.4) is compared. In 1995, the total residential area was 12.43 sq.km and was proposed to 13.26sq.km in 2011. But it not achieved even in 2023. But this reduced to 8.49 sq.km. The commercial area, in 1995 was 0.22 Sq.Km and was proposed to 0.32sq.km in 2011 which is increased to 0.63 Sq.Km in 2023 (area increased). The Public and semi-public area was proposed to 0.62 sq.km which is increased to 2.21 Sq.Km in 2023 (area increased). Industrial area in 1995 was 0.06 sq.km and was proposed to 0.024 sq.km in 2011 which is reduced to 0.03sq.km in 2023 (area decreased).

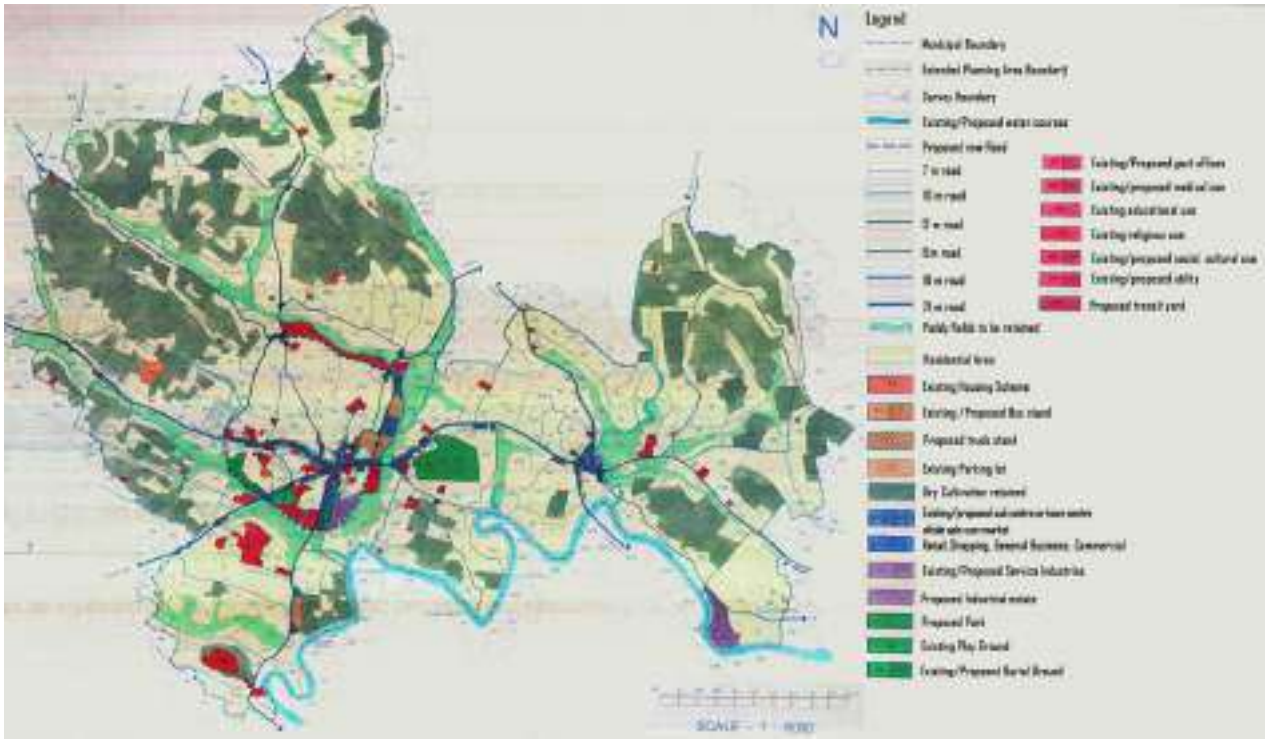


Figure 7.22 Proposed land use of Pathanamthitta Development Plan 1995

Table 7.3 level of achievement of existing land use with proposed land use for 2011 of development plan 1995

Land Use	land use proposed for 2011 in 1995		Existing Land use (2023)		Level of achievement
	Area (Sq.Km)	%	Area (Sq.Km)	%	%
Residential	13.26	55.02	8.48	36.20	63.95
Commercial	0.32	1.33	0.47	2.00	146.87
Public and Semi-Public	0.62	2.57	2.21	9.42	356.45
Transportation	0.92	3.82	0.29	1.24	31.52
Industrial	0.24	1.0	0.03	0.13	12.5
Agriculture	8.13	33.73	8.93	38.12	109.84
Park	0.2	0.83	0.06	0.26	30
Water bodies	0.41	1.70	0.59	2.50	143.90
Others**	-	-	2.37	10.11	-
Total	24.1*	100	23.43	100	

Note : *Total area of the proposed land use in 2011 is slightly higher than the existing total area of the municipality in 2023 as the planning boundary of the development plan 1995 was more than the present municipal area.
**Land use category 'others' in the above table includes low laying/wet land, sacred grove and vacant/rocky area.

The total agricultural area increased to 10.18 Sq.Km. Table 7.3 shows the percentage level of achievement of existing land use with proposed land use in 2011 of development plan 1995. It can be found that all land uses are not achieved as envisaged in the published plan. The major proposal of ring road and retaining of paddy field outside the ring road has been achieved. The proposal of industrial estate and public and semi-public use in the Northern side of ring road has not been yet achieved. No major change is observed in the land use of town.

7.4.2 Comparison with similar towns

Comparison of land use of Pathanamthitta town is made with other towns in the district like Adoor, Pandalam, Thiruvalla. The split up of different land use in these towns are shown in Table 7.4. The percentage of Commercial land use is highest in Pathanamthitta and followed by Thiruvalla. The percentage of public & semi-public land use and Industrial land use is high in Thiruvalla town. Industrial land use is least in Pathanamthitta town (0.13%) and public and semi-public use is also less (3.45%).

Table 7.4 Year wise Land use breakup comparison of Pathanamthitta town with similar towns in the district

Towns / Land use (%)	Pathanamthitta (2023)	Pandalam (2013)	Adoor (2019)	Thiruvalla (2010)
Residential	36.20	33.82	33.13	45.45
Commercial	2.00	0.83	1.5	0.97
Public & Semi public	9.42	2.96	1.92	16.39
Transportation	1.24	1.06	6.9	5.8
Industrial	0.13	0.41	0.18	0.54
Agriculture (Dry & Wet)	46.44	57.21	50.05	24.55
Water Body/canal/Other landuse	4.55	3.29	4.08	3.94
Total Area (sqkm)	23.43	28.42	20.75	13.06

7.5 Built Density

The grid-wise built-up density map (Figure 7.23) of Pathanamthitta town reveals a concentration of high urban density in the central areas of the town, particularly within the boundary formed by the ring road. This centralization is typical of urban cores where commercial, institutional, and residential developments are clustered. Additionally, there is a noticeable growth in density on the eastern side of the town. This pattern appears to be influenced by the presence of a State Highway, which likely acts as a major arterial corridor, promoting linear urban expansion and attracting development along its route due to improved accessibility and connectivity.

7.5.1 Built-up temporal changes

The built-up area analysis for Pathanamthitta town from 2010 to 2020, based on data sourced from the Scientific Information Systems and Databases report by the Joint Research Centre (JRC) of the European Commission, using the Global Human Settlement Layer (GHSL) Data Package 2023, reveals significant urban growth trends.

The temporal changes of built-up area in Pathanamthitta town for the years 2010, 2015, and 2020 highlights a clear trend of increasing urbanization and densification. The built-up area is assessed based on pixel counts, where each pixel represents an area of 100m × 100m (1 hectare or 10,000 sqm).

In 2010, a significant portion of the town, about 35% of the pixel count, was categorized as non-built-up (830 pixels). Over the decade, this non-built-up area steadily decreased to 25% in 2015 (600 pixels) and further to just 18% in 2020 (422 pixels), indicating a rapid conversion of open or vacant land into built-up areas.

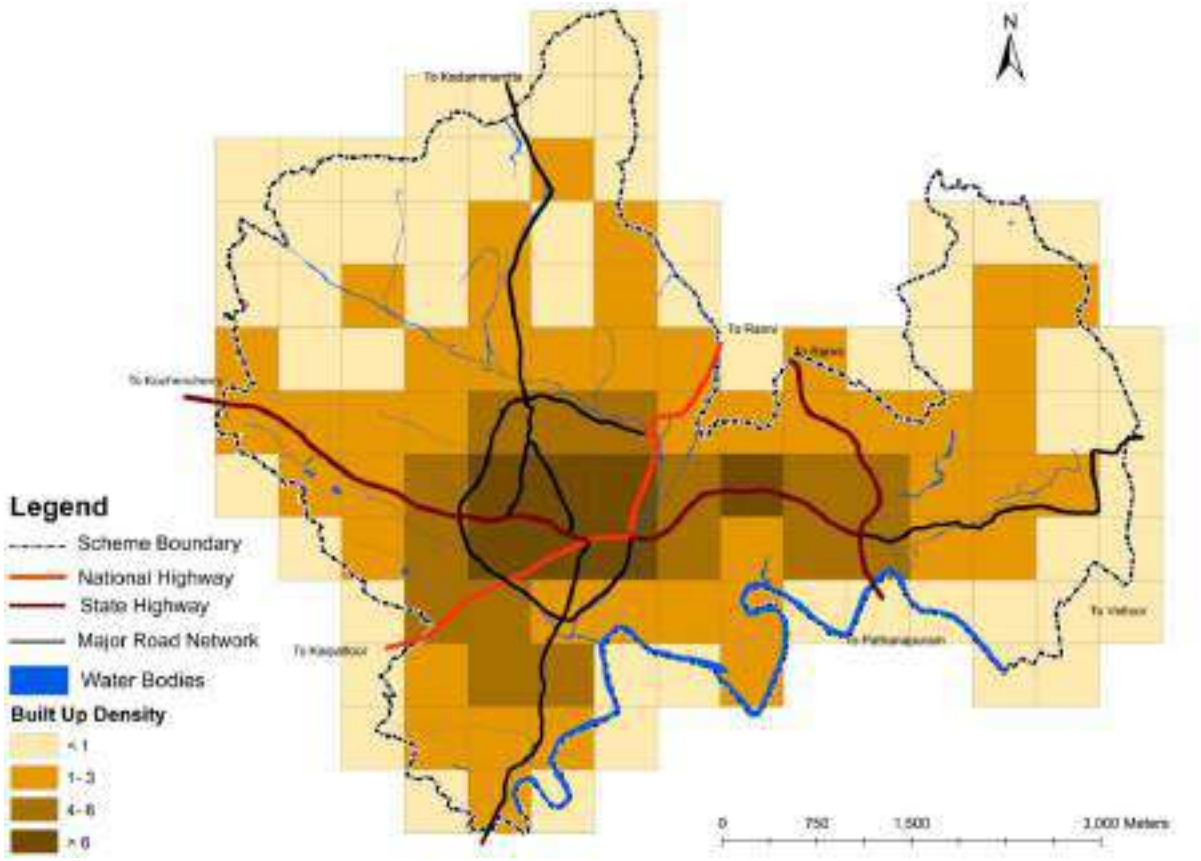


Figure 7.23 Built-up density of Pathanamthitta town 2023

Source: Land use Survey 2023

Built-up categories show an increasing trend across all size ranges. The number of pixels with less than 500 sqm built-up area increased from 690 pixels in 2010 to 819 pixels in 2015, and further to 927 pixels in 2020, indicating a 34% growth over the decade. Mid-range built-up areas, particularly in the 501–1000 sqm and 1001–1500 sqm categories, also recorded growth. The 501–1000 sqm category increased from 311 pixels in 2010 to 388 pixels in 2020, while the 1001–1500 sqm category rose from 209 pixels to 228 pixels during the same period.

Higher built-up area categories, including 1501–2000 sqm, 2001–2500 sqm, and areas above 3000 sqm, also expanded but at a relatively moderate rate. Notably, pixels with more than 3000 sqm built-up area rose from 92 pixels in 2010 to 114 pixels in 2020. Overall, the total built-up footprint increased from around 65% of the mapped area in 2010 to 75% in 2015, and further to 82% in 2020. This reflects a strong urbanization trend and significant land-use transformation in Pathanamthitta town over the past decade. The rapid decline of non-built-up land and the rise across all built-up area categories point to increasing pressures on land and infrastructure, necessitating strategic planning interventions to ensure sustainable urban growth, environmental protection, and service delivery in the future.

The spatial-temporal analysis of Pathanamthitta Town's built-up area from 2010 to 2020 (Figures 7.24, 7.25 & 7.26 respectively) shows a clear trend of urban expansion and densification. In 2010, the built-up areas were mainly concentrated around the core town center, with dense clusters near major junctions like Aban and Cooperative College Junction. Development at that time was largely linear, following major transport corridors, while peripheral areas remained sparsely built-up. By 2015, expansion became more pronounced with new clusters forming around key roads and junctions, indicating the beginning of suburbanization.

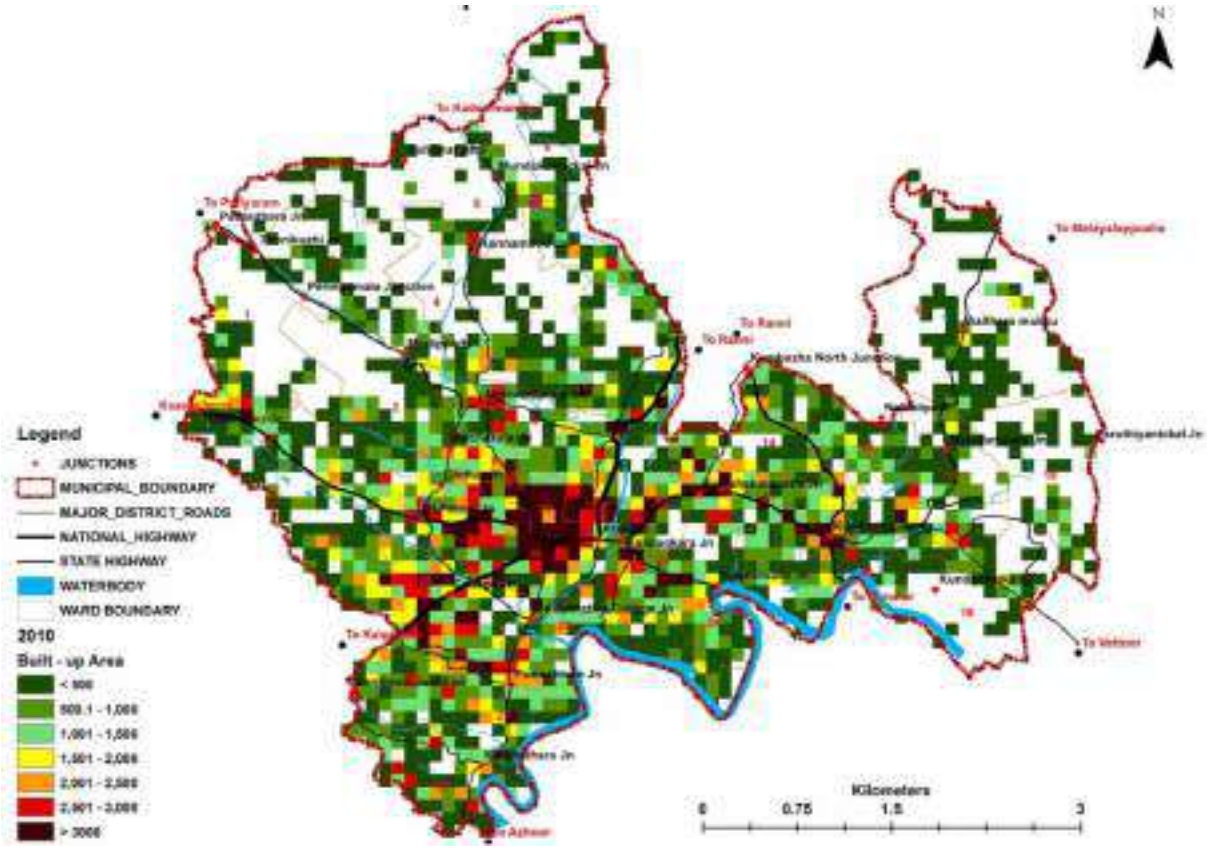


Figure 7.24 Built-up Area of Pathanamthitta town, 2010

Source: Generated using GHSL/Data Package 2023

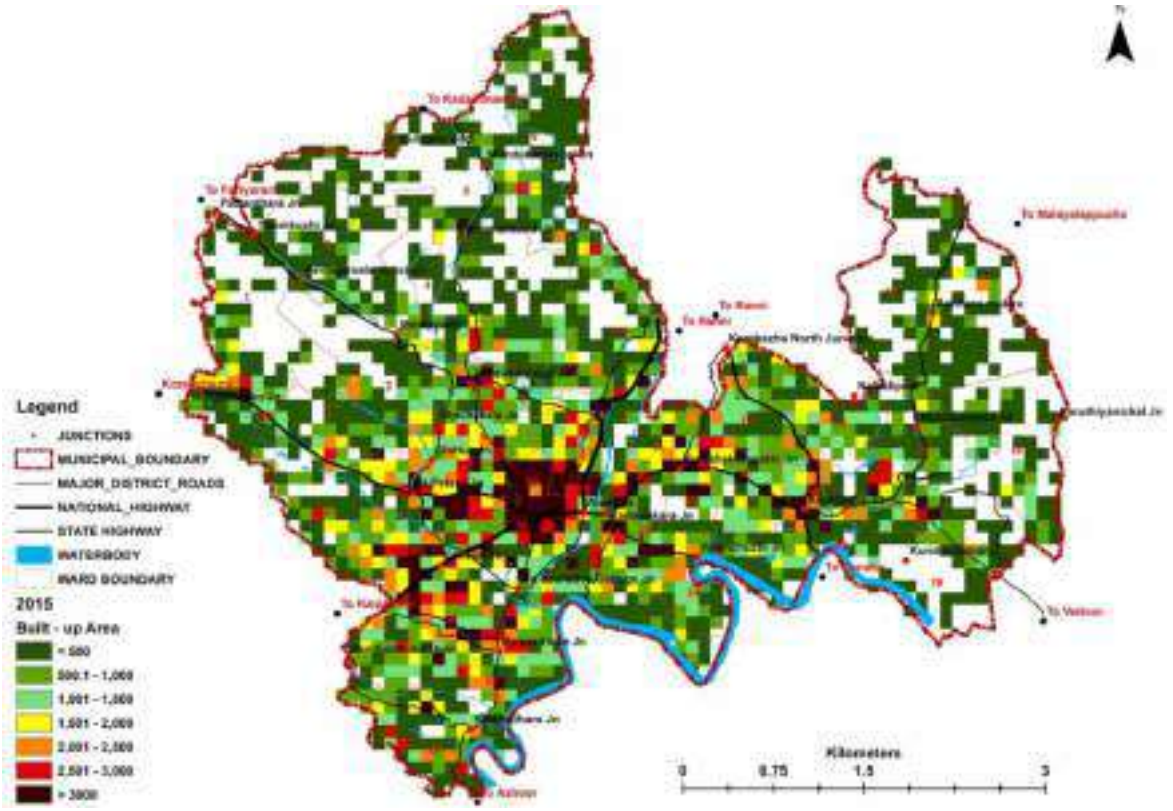


Figure 7.25 Built-up Area of Pathanamthitta town, 2015

Source: Generated using GHSL/ Data Package 2023

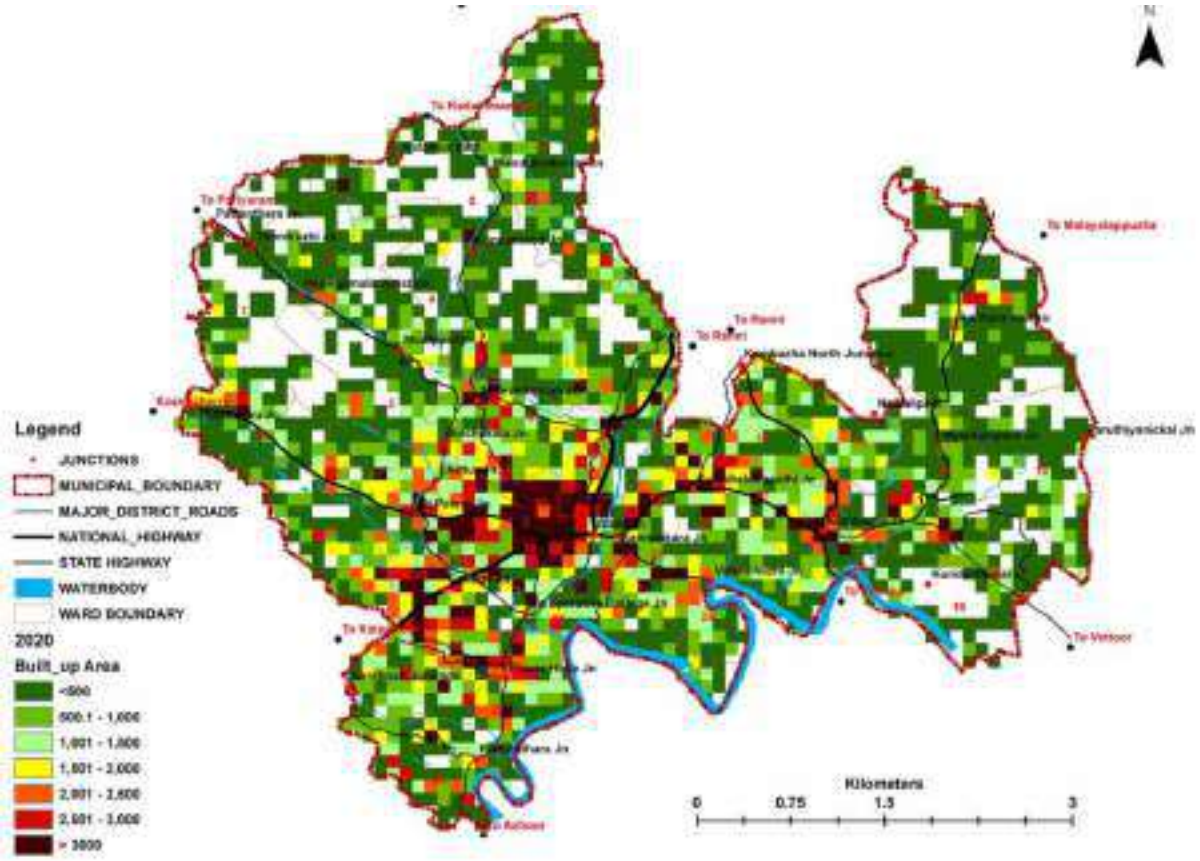


Figure 7.26 Built-up Area of Pathanamthitta town, 2020

Source: Generated using GHSL Data Package 2023

Peripheral wards showed a noticeable increase in built-up density, while the town core continued to consolidate. By 2020, the built-up area had expanded significantly in a radial pattern, connecting formerly isolated clusters into a more continuous urban fabric. There was substantial infill development, with many low-density areas transitioning to medium and high-density built-up zones. The spread followed major roads toward neighbouring towns. This pattern suggests a combination of core densification and peri-urban sprawl, driven largely by transport accessibility and population pressures. However, this expansion near rivers, hilly areas and ecologically sensitive zones highlights the need for careful planning to manage environmental risks.

7.6 Comparison with Planning Standards

As per URDPFI standards, Pathanamthitta town comes under the category of small towns, Sub Category – Small Town II with population range 20,000 to 50,000. The existing land use of Pathanamthitta town is compared with the suggested land use structure for small town II as per URDPFI Guide line (Table 7.5). Residential use is far above the suggested standard as per URDPFI guide lines. The percentage of Public and Semi-public area and commercial use are also higher than the URDPFI standard. Transportation, industrial and recreational use is far below standards.

7.7 Impact of Hazard & Climate Change

Hazard vulnerability on land use/land cover refers to the susceptibility of different types of land uses or land covers to the impacts of natural hazards. The way land is used or covered (whether it's urban, agricultural, forested, etc.) significantly influences how vulnerable it is to these hazards. Different land uses or land cover types may have varying levels of exposure and sensitivity to the impacts of hazards.

Urban areas with extensive impermeable surfaces (like concrete roads, buildings, and pavements) can lead to increased surface runoff during heavy rains, which may lead to flash flooding. Urban sprawl also reduces natural floodplains, leading to a higher vulnerability to flooding. Urban areas often experience higher temperatures than surrounding rural areas due to the "urban heat island" effect. This makes cities more vulnerable to heatwaves, leading to health risks, especially for vulnerable populations. Agricultural lands, especially those that are poorly managed or located in flood-prone areas, may face soil erosion and crop damage during heavy rains or floods.

Table 7.5 Comparison of Land use with URDPFI Guide lines

Sl: No	Land use	Pathanamthitta Town		URDPFI Guide lines (for small towns)
		Area of existing land use (in Ha)	% of total (existing)	% of Developed area
A	Developed Area			
1	Residential	848	83.21	45.00-50.00
2	Commercial	47	4.61	02.00-03.00
3	Public and Semi public	221	21.68	06.00-08.00
4	Transportation	29	2.84	10.00-12.00
5	Industrial	3	0.29	08.00-10.00
6	Recreational	6	0.58	12.00-14.00
	Total Developed Area	1019		
B	Agriculture Land, Water bodies and others	13.24		Balance land

Excessive deforestation or poor farming practices can exacerbate these vulnerabilities. Agriculture relies heavily on consistent weather patterns. Droughts can lead to crop failure, especially in areas with high dependence on irrigation from rivers or groundwater. Changes in land use (e.g., converting forests into croplands) can increase the area's exposure to droughts. On hilly agricultural lands, the removal of vegetation for farming may reduce soil stability, making the land more prone to landslides during heavy rainfall.

As per the guideline for preparation of risk informed master plan for a town, assessing landcover vulnerabilities of the town is included in the category of physical vulnerability. 20% weightage is given to physical vulnerability and following are the sub parameters and its weightage included:

1. Buildings (50%)
2. Transportation (35%)
3. Landcover (15%)

Out of these three sub parameters, landcover vulnerability of the town is analysed in this chapter and remain two sub parameters are analysed in chapter 21 & chapter 14.

Table 7.6 Criteria and its value adopted for landcover vulnerability

Criteria	Value
Built	3
Unbuilt	1.5
Undevelopable areas	0

Source: Guidelines for Risk Informed Master Plan

To understand the landcover vulnerability in the town, category of land use affected by flood and landslide is analysed. Table 7.6 shows the criteria and its value adopted for the analysis of percentage of roads likely to be affected by the hazard at cadastral level. The data is collected by 100% door to door socio economic survey in the flood prone and landslide prone areas of the town and analysed in GIS software.

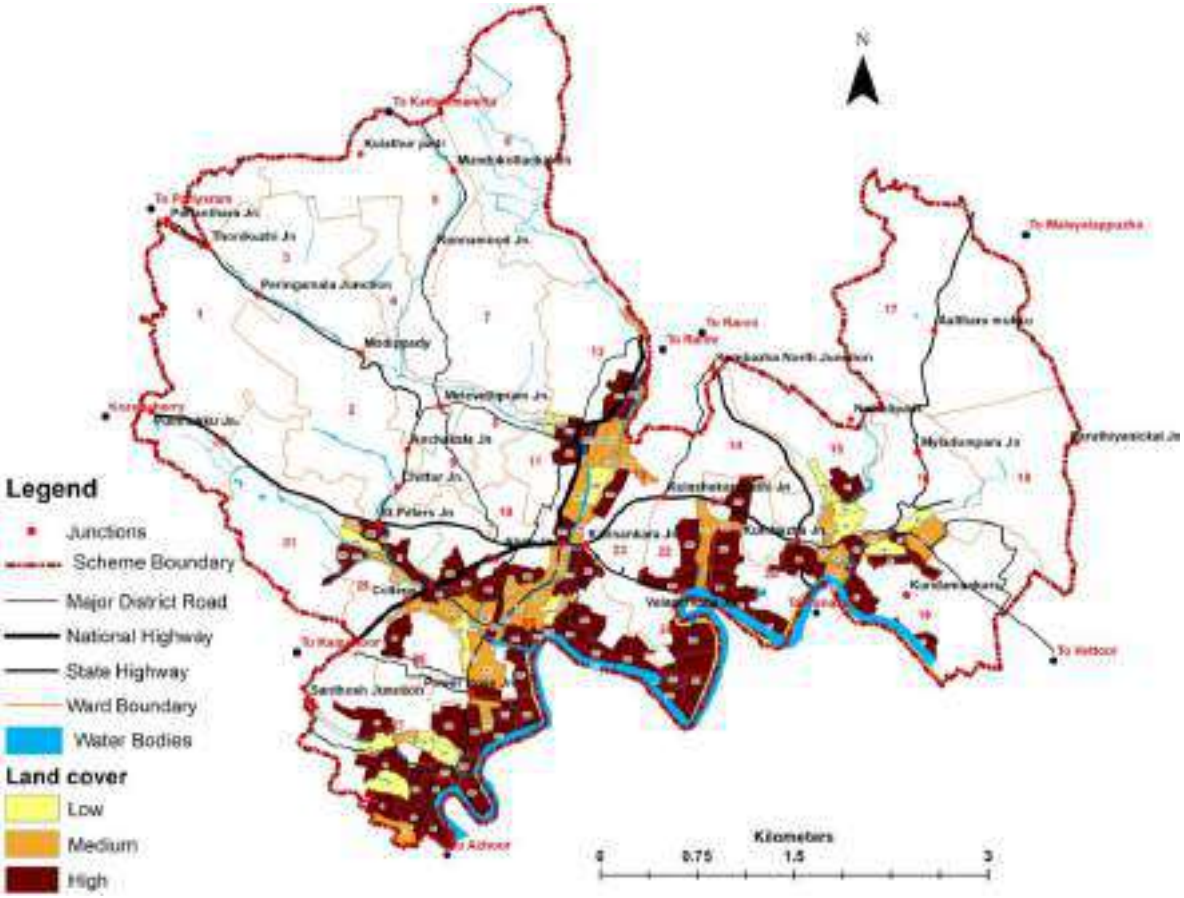


Figure 7.27 Landcover vulnerability in flood prone area

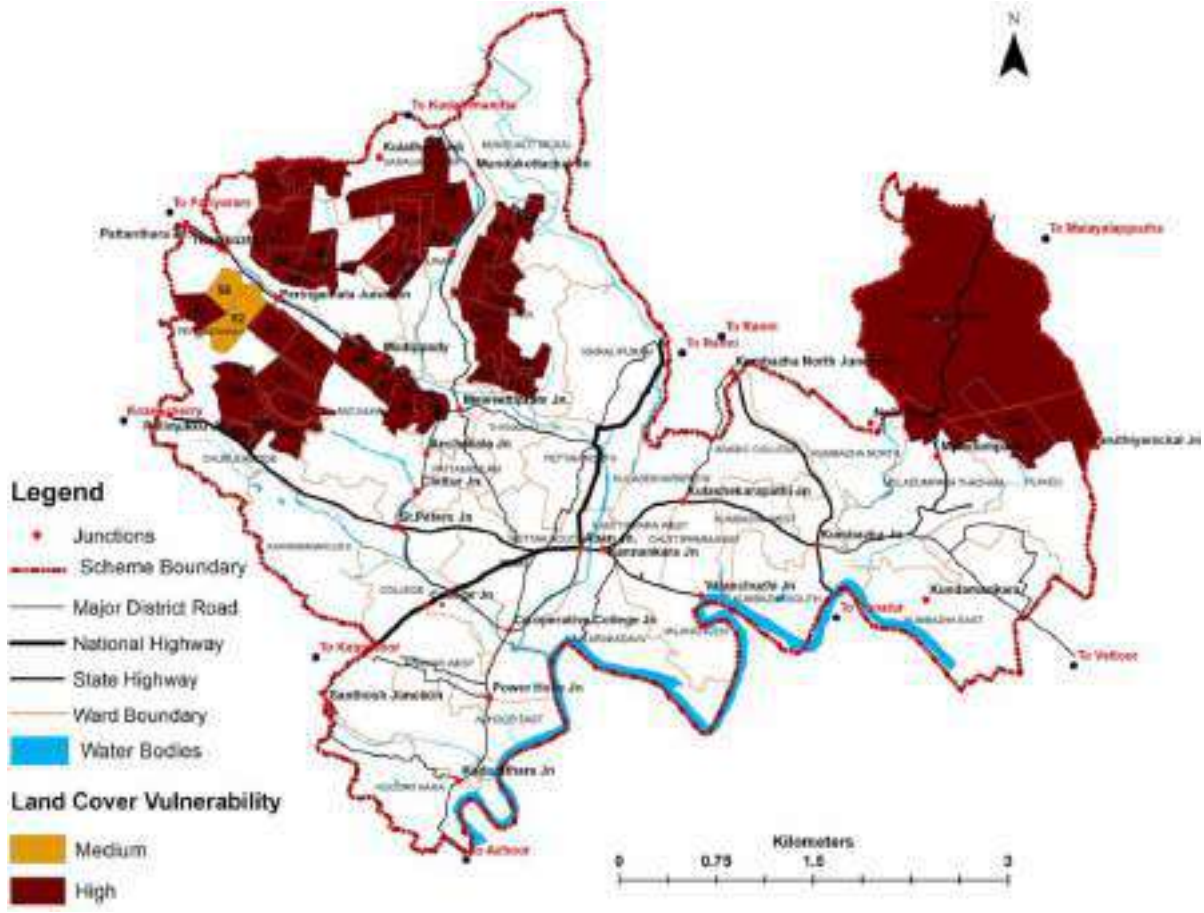


Figure 7.28 Landcover vulnerability in landslide prone area of the town

Varying degrees of vulnerability (low, moderate, and highly vulnerable areas) has been identified in each cadastral based on value assigned as per guidelines of risk informed master plan. Inference of this analysis is used in the chapter 4 to find out the total risk of the town.

7.7.1 Flood vulnerability

The landcover vulnerability in the flood prone area of the town based on category of land use is analyzed here. 57 cadastrals (50%) out of 114 are built land use and shows high vulnerability. The remaining areas, consisting of unbuilt or undevelopable land, demonstrate low land cover vulnerability. These are located in the central area of the town and around the ring road and the low vulnerability is attributed to the presence of low-lying lands. (Figure 7.27).

7.7.2 Landslide vulnerability

While analyzing the landcover vulnerability in the landslide prone area of the town based on category of land use, 95% of the cadastral shows high vulnerability as land use category is built. (Figure 7.28).

7.8 Inference

The Land use pattern of Pathanamthitta Municipality is predominantly mixed in nature with residential/agriculture land use. The major land use is Dry Agriculture (43.44%) followed by Residential (36.24%), low lying wetland/environmentally sensitive areas (8.61%) and water bodies (2.41%). There is land under Public and Semi-Public use (3.45%) and mostly the public land is under religious use. Commercial land use (2.67%) is concentrated around major junctions which includes Central Junction, Kumbazha, bus terminals and along ring road. There is an increasing trend of development of commercial activities along the major transport corridors and state highways especially along Thiruvalla-Kumbazha Highway. Another feature of land use

pattern is comparatively large extent of rocky/barren and open areas (2.06%) and which is to be put to the right use according to the topography and existing use. The town is blessed with Plantation, Wet and Dry agriculture, good quality water sources and unique geographical features. The main water source is from Achankovil River and also from minor streams.

Even though Pathanamthitta town serves as the district headquarters and is centrally located within the district, new commercial establishments and public buildings are increasingly concentrated toward the Thiruvalla region. This is mainly due to the topography and connectivity of the town. The high-end commercial services, textile shop, malls etc are not in the town. People depend other towns for these services.

The spatial expansion of Pathanamthitta Town from 2010 to 2020 reflects rapid urban growth, driven by transport corridors and population pressure, with increasing densification in the core and suburban sprawl in peripheral areas. However, this expansion near environmentally sensitive zones calls for careful urban planning to mitigate ecological risks.
The town was completely isolated during the 2018 mega flood due to flooding across all connecting roads. Analyzing the flood profile reveals that flood-prone areas align precisely with low-lying lands. This highlights the critical need to preserve these areas while considering future development. To enhance resilience and mitigate risks, appropriate regulations should be implemented to safeguard these vulnerable zones.

PART I
STUDY & ANALYSIS



II. SECTORS OF ECONOMY

8. Trade and Commerce
9. Agriculture
10. Animal Husbandry
11. Industry
12. Tourism, Heritage & Aesthetics



8.TRADE & COMMERCE

Trade and commerce plays a pivotal role in shaping the development of any city's economy by making a significant contribution in terms of tax revenues and providing gainful employment. It attracts the public to the city the overall economic growth. Town grows as its trade and commerce flourish.

This chapter deals with the various commercial activities taking place within the Municipality and existing trade centres. It also examines the hierarchy of commercial clusters, the economic profile, key drivers influencing the spatial distribution of economic activity, an overview of informal sectors, and the challenges and opportunities within the town.

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1 Present Scenario

2 Spatial Distribution

3 Commercial Nodes

4 Informal Sectors

5 Wholesale Shops

6 Markets

7 Financial Institutions

8 Impact of Hazard & Climate Change

9 Problems & Potentials

10 Inference

8.1 Present Scenario

As per the Pathanamthitta District Urbanization Report 2011, Pathanmathitta town is classified as second order settlement. First order settlement Thiruvalla is located in the North West corner of the district while Pathanamthitta located towards the centre of the habituated area of the district which are also along the two major National and State Highways of the district. Thiruvalla acts as the commercial hub of the district. Pathanamthitta town has commercial facilities, though not to the extent available in Thiruvalla. The service area of Pathanamthitta town spreads over the entire district as its primary role is to serve as the administrative headquarters of the district.

8.2 Spatial Distribution

Pathanamthitta town has a diverse commercial scenario with a mix of traditional market, wholesale shops, modern retail outlets, and emerging businesses. The town is known for its vibrant marketplaces. The market area and commercial development have emerged along the main roads, with trade and commerce forming a key economic base of the town.

The commercial area of the town was developed with Central junction and Kumbazha junction as nuclei. Also commercial activities are developed at road junctions like St. Peters Junction, Thazhevettippuram Junction, Stadium Junction, Melevettippuram Junction, Kannankara Junction, and College Junction, Churulikkodu Junction and Azhoor Junction. Now the areas between these junctions are also developing with potential of commercial activities (Figure 8.1). Commercial land use covers 0.63 sq. km, accounting for 2.67% of the town's total land area.

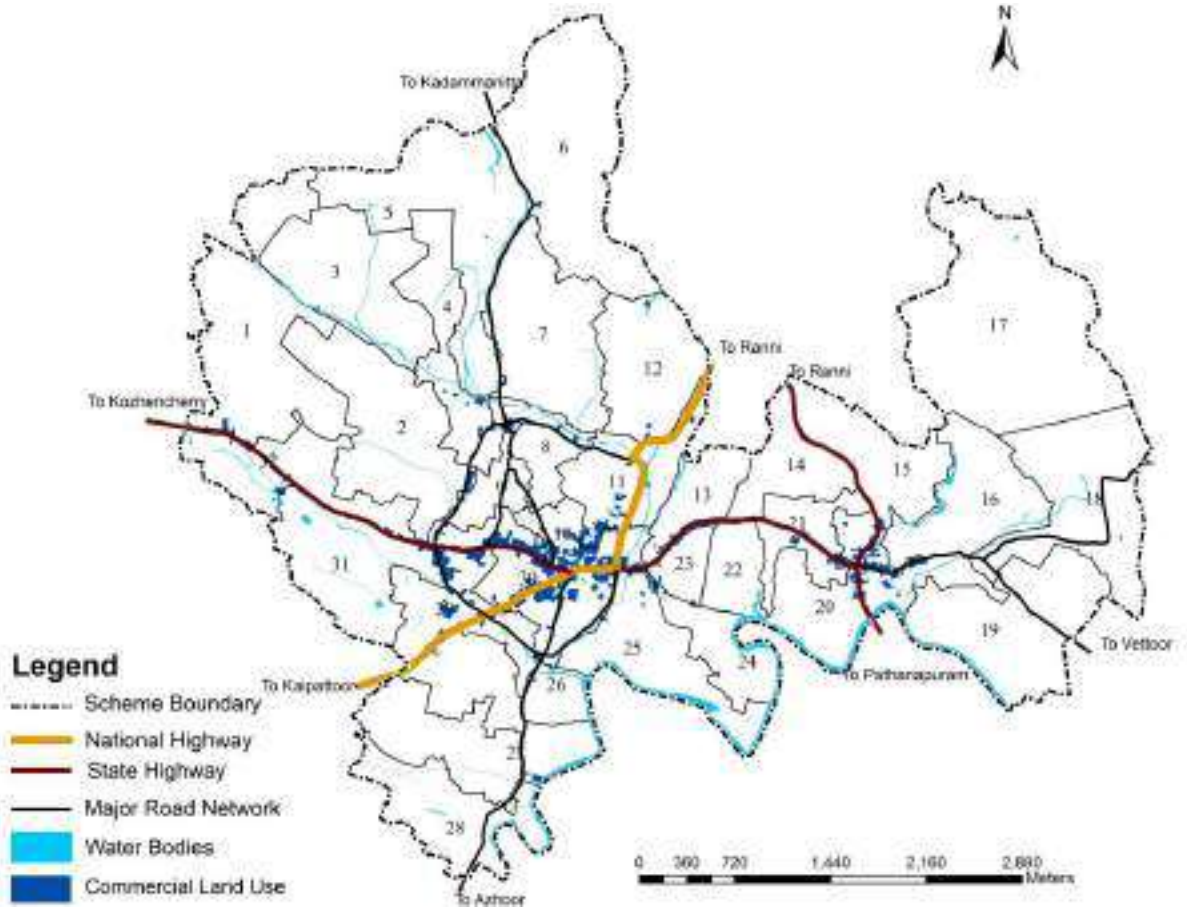

Figure 8.1 Spatial distribution of commercial land use

Commercial development is primarily concentrated in the town center, with limited expansion into outer areas. Contiguous ribbon commercial development is evident along major transport routes. However, no independent, planned commercial area has emerged in the town.

The highest concentration of commercial land use is seen in Town ward (30) and Petta South (10) wards which are located at the central part of the municipality followed by College (29) and Chuttippara (23) West Wards (Figure 8.2). Another commercial concentration is also seen in Kumbazha North, Kumbazha South and Kumbazha West wards around Kumbazha junction. Kumbazha junction is one of the main road intersections at eastern side of the Municipality and act as a gateway to the town of Pathanamthitta. It can be seen that commercial activities are concentrated to the central area, around the CBD, because of the accessibility due to the presence of major roads like NH, SH and Ring road.

> ഓഫീസുകൾ / കച്ചവട സ്ഥാപനങ്ങൾ മുതലയാവ ഒന്നോ രണ്ടോ വാർഡുകളിൽ കേന്ദ്രീകരിക്കുന്നതിനു പകരം മറ്റ് വാർഡുകളിലും റിംഗ് റോഡിന്റെ ബാക്കി ഭാഗങ്ങളിലും വികസനം എത്തിക്കണം. *[Instead of concentrating offices/ commercial establishments in one or two wards, development should be spread to other wards and the rest of the Ring Road.]* - Public Opinion

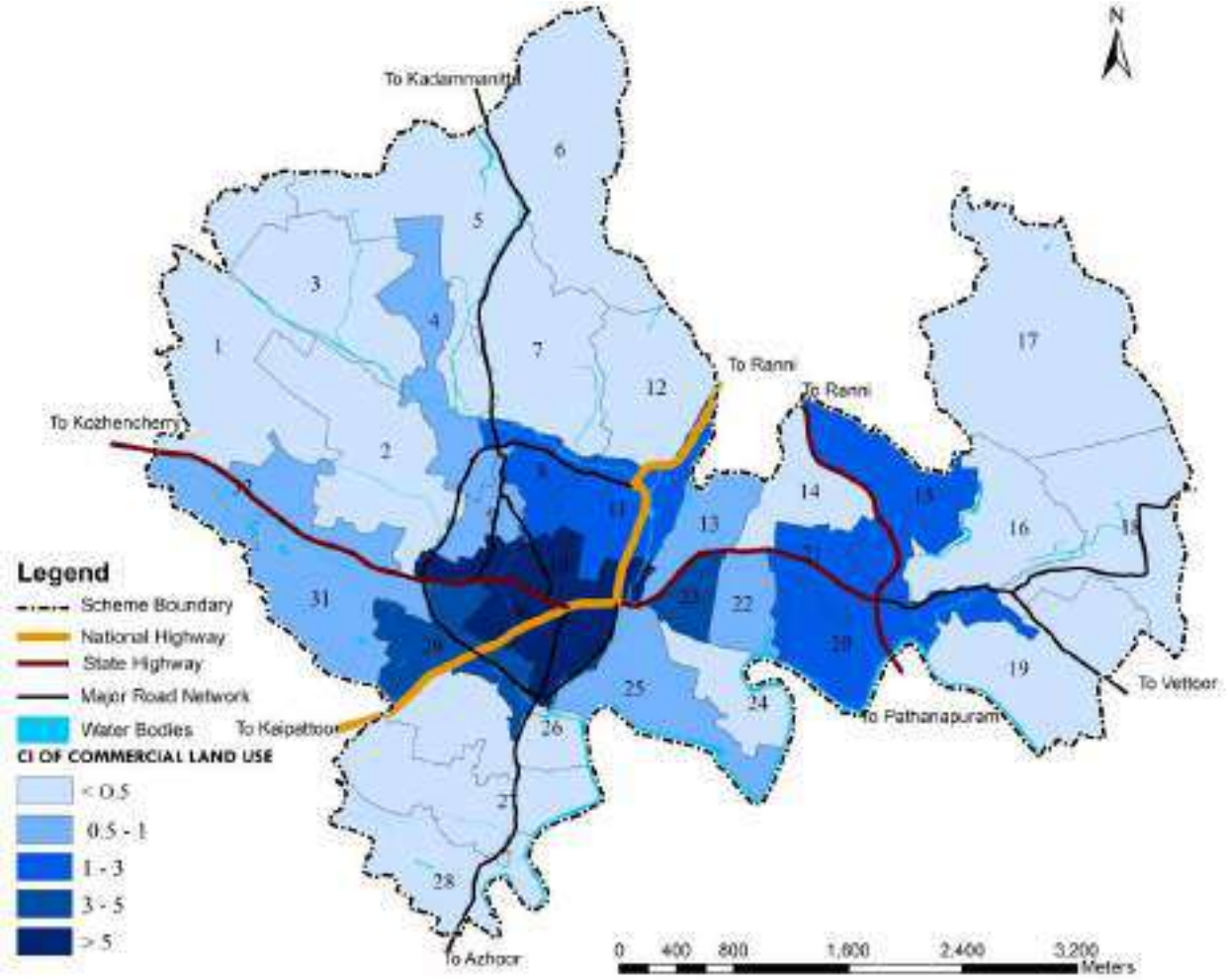

Figure 8.2 ward wise concentration index of commercial activity land use in the town

According to the comparison of the commercial concentration with that of similar nearby towns having sanctioned master plan, Pandalam, Thiruvalla, Chengannur, and Changanassery have respective percentages of commercial area to total area of 0.79%, 0.97%, 0.29%, and 2.74% (Figure 8.3). This analysis indicates that Pathanamthitta town ranks second after Changanassery (Kottayam district) in terms of commercial land use percentage, followed by Thiruvalla, Pandalam, and Chengannur.

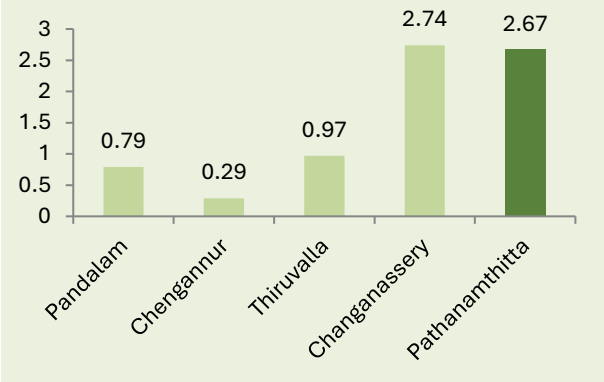

Figure 8.3 Comparison of percentage of commercial land use in surrounding towns

Comparing with the commercial land use in other surrounding towns, Pathanamthitta has highest area of commercial land use. Even though the extent of commercial land use in Thiruvalla is comparatively lesser than that of Pathanamthitta, Thiruvalla functions as the primary commercial hub of the district due to the diversity and intensity of its commercial activities. Pathanamthitta town lacks High-rise commercial complexes, shopping malls, wedding centers etc.







Figure 8.4 Various types of commercial activities of the town

The local level analysis revealed that, people in Pathanamthitta depend on Adoor and Thiruvalla towns for high end shopping facilities. Figure 8.4 (above three images) shows various type commercial activities in the town.

8.3 Commercial Nodes

The commercial development in Pathanamthitta town is characterized by clusters of commercial activity or commercial nodes at the road junctions and contiguous ribbon development along main roads, like other parts of the State.

A detailed survey regarding the commercial nodes in the town has been conducted. Based on the preliminary survey, 12 commercial nodes in the town have been identified for the detailed study. The facilities at various nodes has been generally grouped into Retail shops, Whole sale shops, Commercial Offices, Small Scale Industries, Other facilities and higher order facilities. The number of shops per units of different categories coming under these general groups were counted. Total scores for each node

were calculated after assigning weightage to each facility (Figure 8.5).

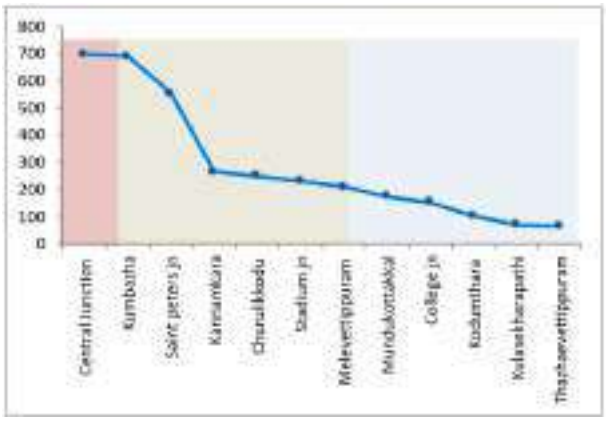

Figure 8.5 Number of commercial shops in each junction

Also conducted a study based on the hierarchy of roads and number of roads passing through each selected node. The road meeting at the junction are categorised into NH, SH, Major district road, Panchayat road, other road etc. The total score obtained for each node is given in the Figure 8.6. The existing hierarchy of these commercial nodes is derived from the above study and from the existing land use on the basis of their share in the commercial land use of the town. (The percentage area of commercial land use nodes with respect to total commercial area in the town). Higher the share, the higher the order in the hierarchy.

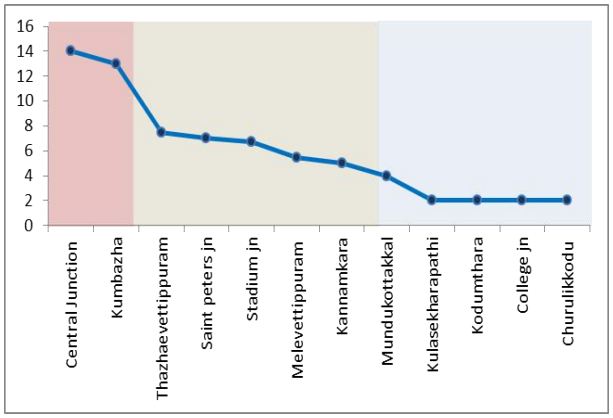

Figure 8.6 Hierarchy of nodes based on the road

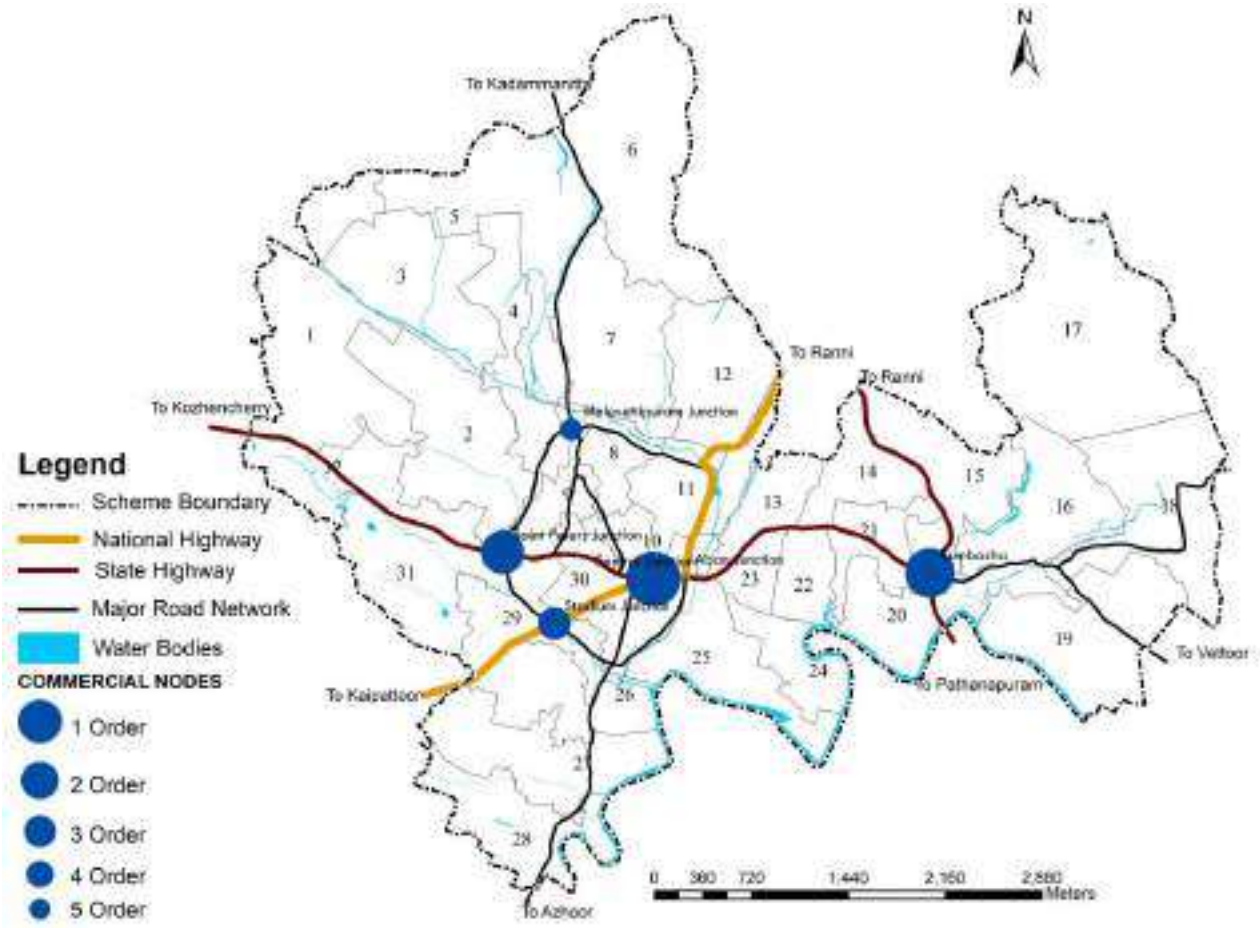

Figure 8.7 Location of hierarchy of commercial nodes of the town

> ലാന്റ് വാല്യു വളരെ കൂടുതലുള്ള നഗര മധ്യത്തിലെ വലിയ ഒറ്റ നിലവാസഗൃഹങ്ങൾ നിർമ്മിക്കുന്നത് നിരുത്സാഹപ്പെടുത്തുകയും, പ്രസ്തുത സ്ഥലങ്ങളിൽ വാണിജ്യപരമായ ഉയർന്ന വരുമാനം ലഭിക്കുന്നഉപയോഗങ്ങൾ പ്രോത്സാഹിപ്പിക്കുയും ചെയ്യുക. *[Discourage the construction of large single-story residential buildings in urban centers where land values are very high, and encourage high-income commercial uses in these locations.]* - Public Opinion

From this study, the first five higher-order commercial nodes of the town (Figure 8.7) have been identified in order to understand the key commercial activity areas and their spatial significance within the town. The first three major nodes are along the TK Road (SH-8), the main corridor. Central Junction is a first order node, Kumbazha Junction is a second order node, Saint peters Junction is a third order node, Stadium Junction is a fourth order node and Melevettippuram Junction is fifth order node in Pathanamthitta town. Figure 8.8 shows the first three higher order commercial centres of town.







Figure 8.8 Above three images shows the 1st, 2nd and 3rd order commercial node of the town

8.4 Informal Sector

In town, the informal sector mainly comprises of street vendors who offer goods or services for sale to the public without having a permanent built-up structure but with a temporary static structure or mobile stall (or carried as head load) occupying footpath and road side of the town (Figure 8.9). The most of the informal sectors are concentrated in both side of Thiruvalla Kumbazha road (SH-7) and Ring roads (Figure 8.10). Large number of vegetable shops are concentrated in market and police station area.





Figure 8.9 Informal activities of the town

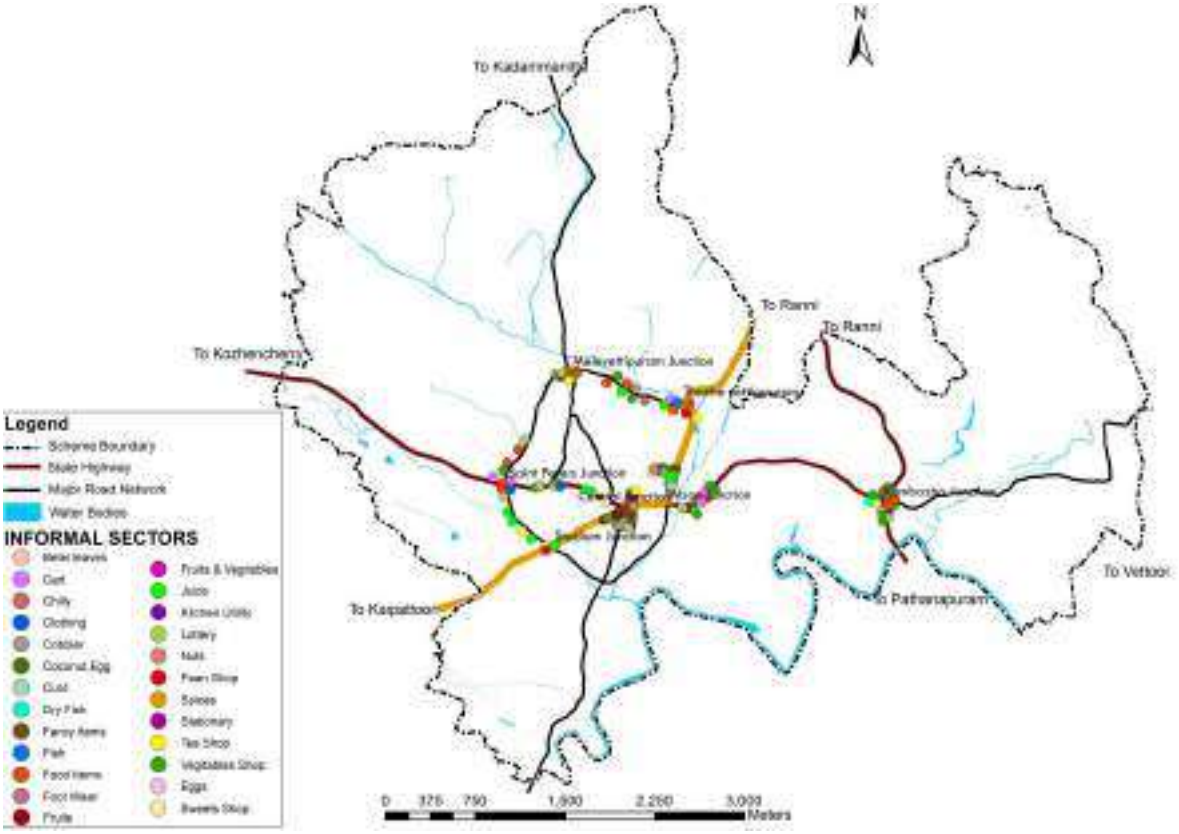

Figure 8.10 Location of informal activities in the town

Food items, vegetable shops, lottery and tea stall are the commodities traded by the hawkers in these areas. This unplanned growth affects the urban order and cleanliness of the city. Details of informal sectors are given in Annexure 8.1.

8.5 Wholesale shops

A detailed wholesale commercial survey is conducted in the municipality to study the wholesale commercial activities of Pathanamthitta.

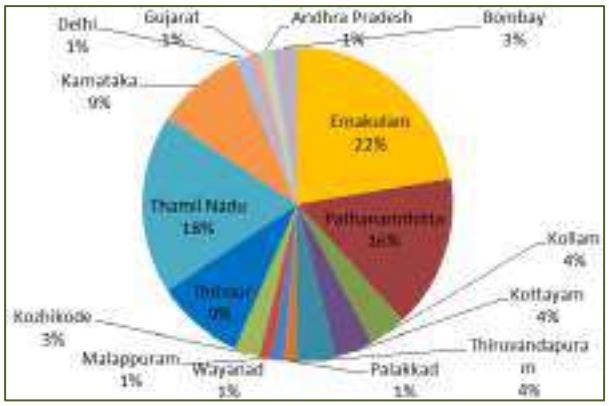

Figure 8.11 Wholesale goods importing regions

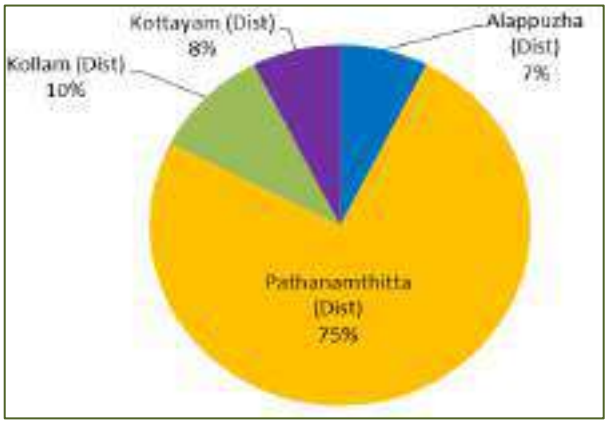

Figure 8.12 Wholesale shops service area

Wholesale activities in the town are dispersed alongside retail businesses, with major wholesale shops concentrated around the old private bus stand area. These establishments primarily trade in vegetables, fruits, and rice. Notably, 30% of wholesale goods originate from Ernakulam (Figure 8.11), while the remaining 70% are sourced from within the district (Figure 8.12). Wholesale shops are distributed across key areas, with 28% located in the old bus stand area, 13% in the market area, 12% in Kumbazha, and 10% near the Press Club. The major wholesale activities include trading in

vegetables, fruits, and rice, along with provision stores and stationery shops, accounting for 9%, 8%, and 6%, respectively. Figure 8.13 and 8.14 shows the wholesale shops location and product details in the town.

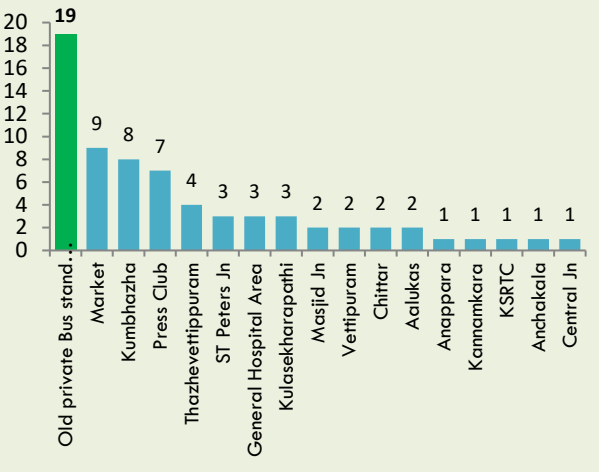

Figure 8.13 Locations of wholesale shops

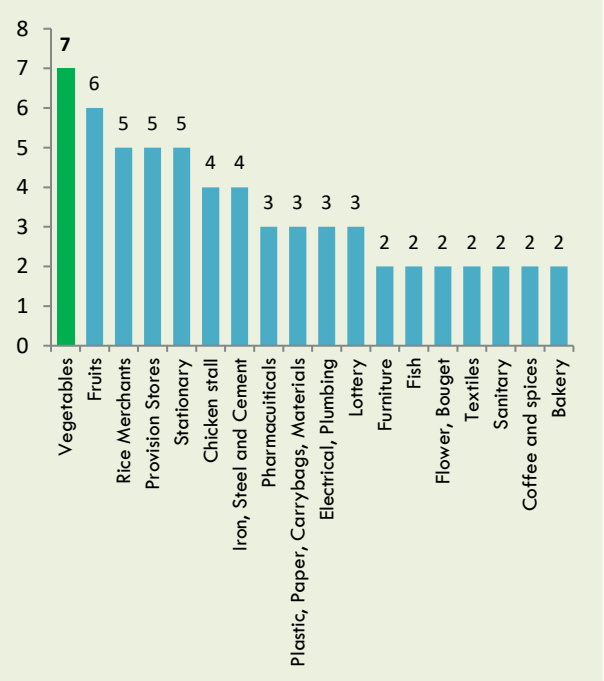

Figure 8.14 wholesale product details

Kumbazha houses the largest wholesale fish market in the town, operating primarily during night time. Kumbazha market is the primary source of fish for Pathanamthitta market and the surrounding areas. Facilities for the purchase and sale of regional goods are also offered by this market. Parking facilities for the commercial establishments are insufficient, and is available for only the business institutions including the major textile and jewellery shops. The common mode of transportation for trade and business is road. Major wholesale and retail shops categories in the town are detailed in Annexure 8.2.

8.6 Markets

Two markets are Functioning at Pathanamthitta Municipality - Pathanamthitta town market and Kumbazha Market. Figure 8.15 shows the locations of market in the Municipality.

8.6.1 Pathanamthitta town Market

Pathanamthitta town market located near Municipal office is having an area of 0.607 Ha covers area of regional influence. The market functions twice in a week and fish, vegetables, meat, fruits etc. are the main commodities exchanged here. Commodities are brought to the market from local area as well as from nearby State Tamil Nadu. Goods from the market are then distributed to various locations across Kerala. Annual income from the market to Municipality is around one million per year. Goods transacted through the market per year are around 1500 Tonnes. About 90 stalls for vegetable, fruits, stationary, provisional, species, chicken centre, collection centres, fish stalls, slaughter house etc. are functioning in the market. Permanent as well as temporary stalls are also there in market.

Figure 8.16 shows the town market Pathanamthitta. The access to market is a 3.00m wide tarred road from the TK road; it can be accessible from other two sides by narrow lanes. Access to the stall is through 2.00m wide internal roads. Enough parking spaces are not available in and around the market area. Traffic congestion is the one of the major issue near market especially during the market days. The wastes are sorted and collected by the private agencies engaged by the Municipality thrice in every week.

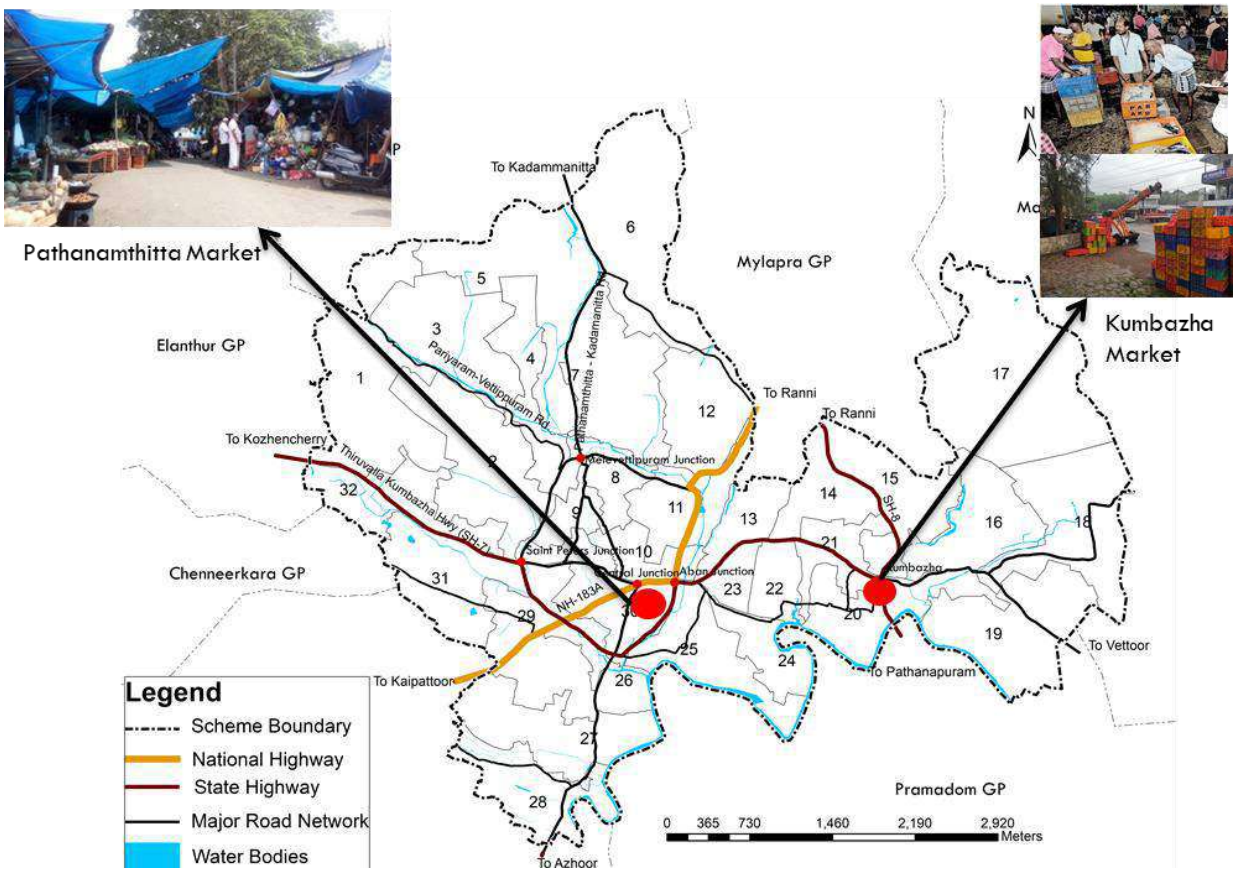

Figure 8.15 Location of markets in the town



Figure 8.16 Town market Pathanamthitta

Although a biogas plant operates within the market, the existing waste treatment facilities are inadequate. Additionally, the lack of proper drainage systems contributes to foul odours, leading to pollution in the market and surrounding areas.

> നഗരത്തിൽ ഉത്പാദിപ്പിക്കുന്ന ഭക്ഷ്യ വിഭവങ്ങൾ മാർക്കറ്റിൽ വിൽക്കുന്നതിന് സംവിധാനം ഏർപ്പെടുത്തണം. [*A system should be established in market to sell food produced in the town itself].* - Public Opinion

8.6.2 Kumbazha Market

Kumbazha is a city suburb, a gateway and one of the main road intersections in eastern side of Pathanmthitta Municipality. Kumbazha is classified as a Second-order node based on its commercial characteristics. Kumbazha serves as a key transit point for pilgrims traveling to Sabarimala, Erumeli, Malayalappuzha, and Maramon, four of the district's most prominent pilgrimage destinations. Kumbazha hosts the largest wholesale fish market in the town.

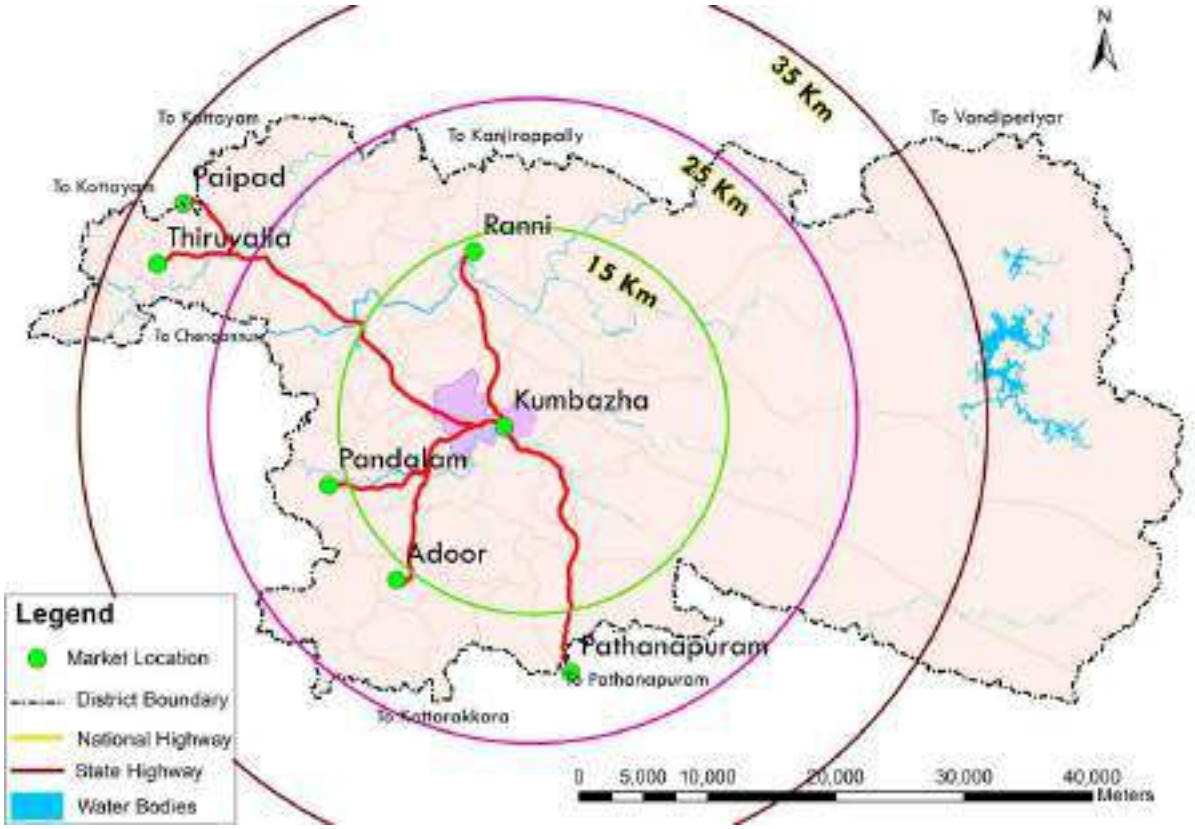

Figure 8.17 Location of nearest wholesale markets from Kumbazha Market

It serves as the primary source of fish for the Pathanamthitta market and surrounding areas (Figure 8.17). The T.K. Road (SH-07) and Main Eastern Highway (Punalur- Pathanamthitta-Muvattupuzha Road) (SH-08) intersect at the Kumbazha Junction, which is located 3 km east of Pathanamthitta Central Jn. Facilities for the purchase and sale of regional goods are also offered by this market. Annual income from the market to Municipality is around one lakh in a year. Goods transacted in the market is around 4000 tonnes.

Whole sale fish trade takes place between 3 and 5 in the morning, during the day. For wholesale trading, fish are sourced from Kochi, Alappuzha, Neendakara, Kollam, and even from Tamil Nadu. However, beyond this specific hour in the morning, there is no activity at all, and the area remains empty. The nearest wholesale fish market to Kumbazha is in Ranni, located 16 kilometers away. Figure 8.18 shows the Kumbazha market of Pathanamthitta.





Figure 8.18 Above two images Kumbazha Market Pathanamthitta

> നഗര മധ്യത്തിലെ പാർക്കിംഗ് സൌകര്യങ്ങളുടെ അഭാവം കച്ചവടം കുറക്കുന്നു. മൾട്ടി ലെവൽ പാർക്കിംഗ് നഗരമധ്യത്തിൽ ഏർപ്പെടുത്തുകയും പാർക്കിംഗ് സൌകര്യങ്ങളുള്ള മേഖലകളിലേക്ക് പുതിയ വികസനം കൊണ്ടുവരികയും ചെയ്യണം. [*The lack of parking facilities in the city center is reducing trade. Multi-level parking should be introduced in the city center and new development should be brought to areas with parking facilities*]- Public Opinion

8.7 Financial Institutions

There are a total of 82 financial institutions in the town altogether in Nationalised, Cooperative and private sectors. There are 42 private financing companies in the town which contribute the 51% of the total banking facilities. (Figure 8.19).

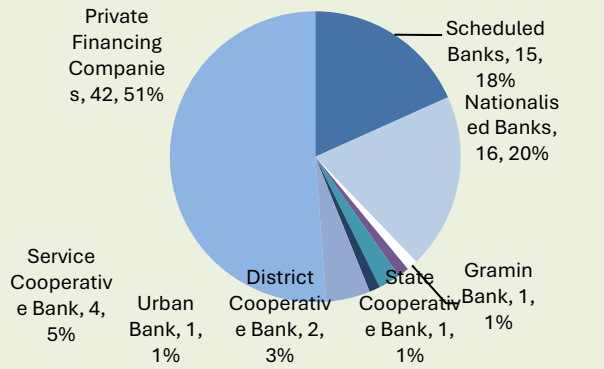

Figure 8.19 Financial Institutions in the town

8.7.1 Other Shopping Facilities

In addition to wholesale & retail shops and markets, the town features restaurants, hotels, banking & business establishments, gold merchants, shopping complexes and various other commercial establishments. Major shopping complexes in the town are listed in Annexure 8.3.

Classification of shops based on number of floor of the building is shown in Figure 8.20 & 8.21. It shows that majority of the commercial buildings in the town is G+2 or G+1 structures.

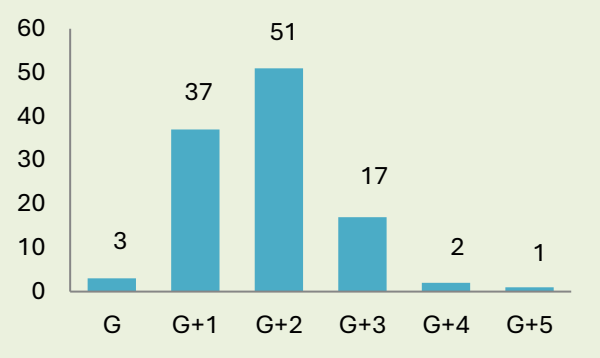

Figure 8.20 Commercial buildings in the town with number of floor





Figure 8.21 Above two images shows the various building type of commercial activities

> പത്തനംതിട്ടയിൽ ഉന്നത നിലവാരത്തിലുള്ള ഷോപ്പിംഗ് കോപ്ലക്സുകളും, മാളുകളും, ഫുഡ് കോർട്ടുകളും ഉണ്ടാകണം. വിവാഹ ഷോപ്പിംഗ് പോലുള്ള വലിയ ആവശ്യങ്ങൾക്ക് സൗകര്യങ്ങൾ ഇല്ല. [*There should be high-quality shopping complexes, malls, and food courts in Pathanamthitta. There are no facilities for large needs like wedding shopping.]* - Public Opinion

8.8 Impact of Hazard & Climate Change

Natural hazards and climate change can deeply affect the commercial sector of a town, often in interconnected ways. Floods, landslides, drought, heatwaves and lightning all can have significant and varying impacts on the commercial sector of a town. The increased frequency and severity of these events can disrupt operations, harm infrastructure, and raise costs.

The Topography of the Pathanamthitta Municipality varies from High to low lying topography. Most of the low laying area of the town lies in flood prone area. In Pathanamthitta town commercial activities and major road networks, commercial nodes and two markets that are Pathanamthitta Municipal market and Kumbazha market are located in the low lying area of the Municipality. 31.28% of commercial activity area of the town located flood prone area as per the 1 in 50 year flood return probability map published by KSDMA. Figure 8.22 and 8.23 shows the flood prone area overlaid with commercial land use.

Kumbazha is the major wholesale fish market in the municipality. On the eastern side of the Kumbazha market, there is a natural drainage flow that merges with the Achankovil River at Thundumankara Kadavu. During floods, a large volume of water from the river enters the area through this natural drain. The absence of a proper water channel and the narrow width of the drain cause the stream to overflow.

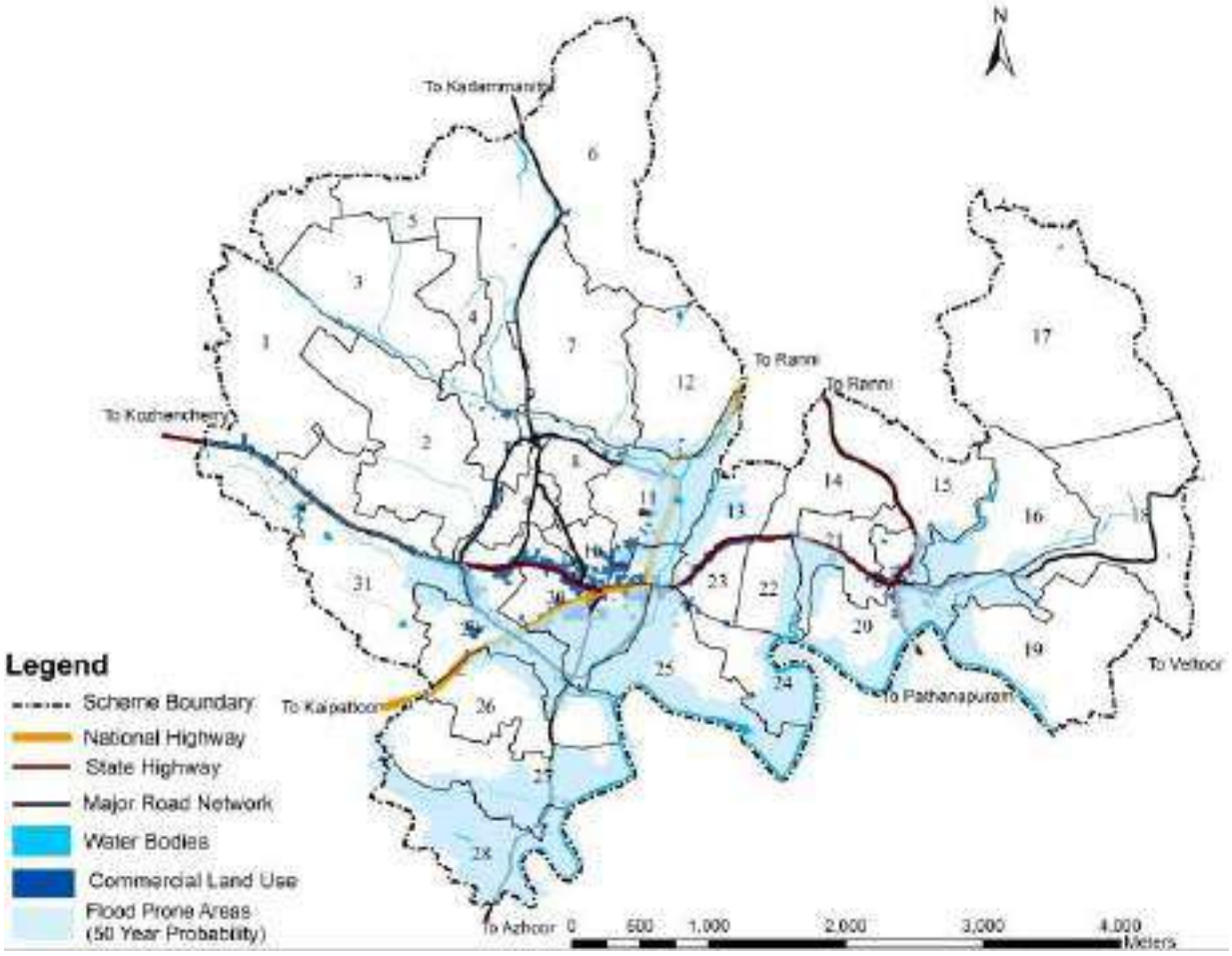

Figure 8.22 commercial land use in flood prone area

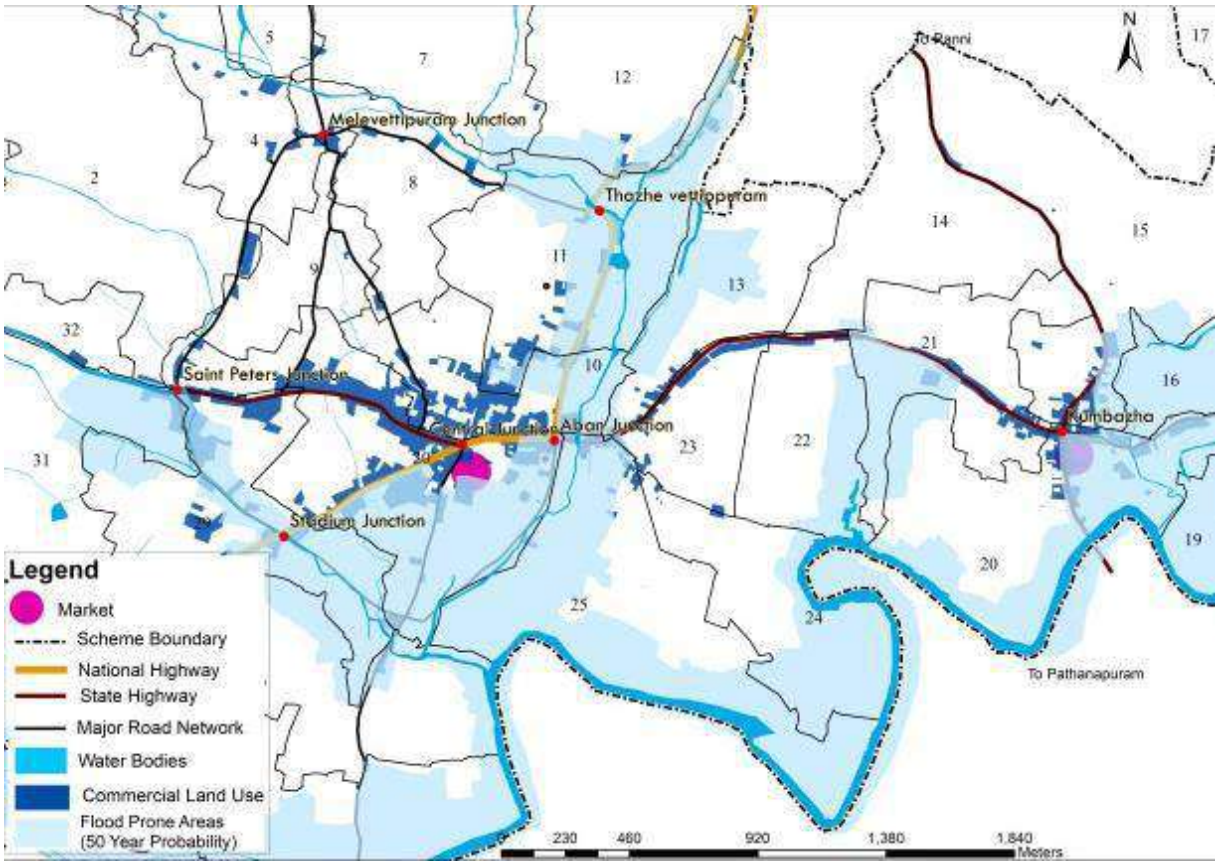

Figure 8.23 major market and major junctions in flood prone area

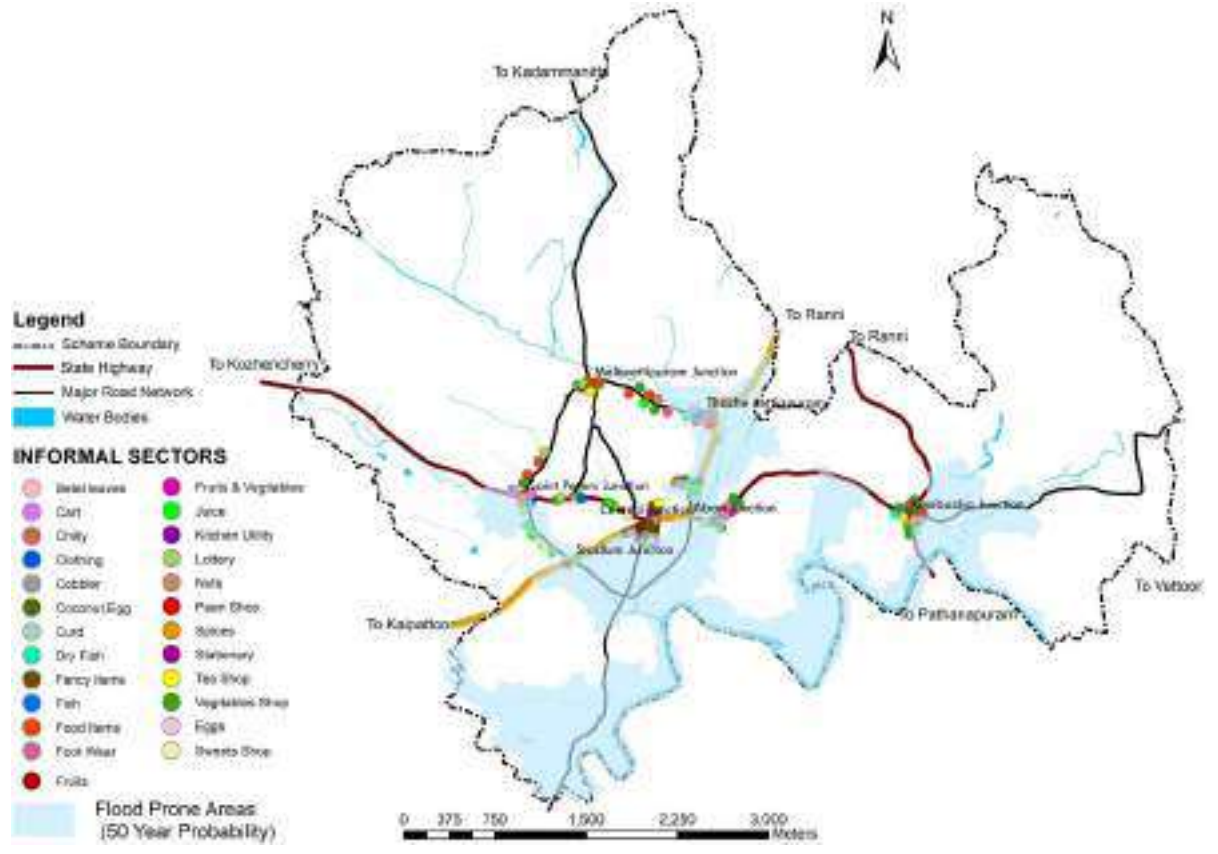

Figure 8.24 street vendors in flood prone area

A number of street vendors are located around the ring road and almost all street vendors are located in flood prone region. All street vendors from Stadium Junction to Saint Peter's Junction are affected by flooding. Street vendors on eastern side of the kumbazha junction are in the flood prone area (Figure 8.24). The impact of flooding can be mitigated by constructing flood-recharging ponds in this low-lying area, connected to the natural drainage system. According to KSDMA, the town is affected by low intensity landslide-prone zones, which are located in the northern section of the town where there is no commercial activities. The detailed analysis of economic zone areas in the flood and landslide prone areas of the town has been incorporated in risk assessment section of chapter 4.

Drought is a moderate intensity hazard in entire Pathanamthitta town according to KSDMA vulnerability map. Although droughts do not directly damage trade and commercial buildings like floods or landslides, they create challenges affecting water availability, energy costs, building aesthetics, and local economic stability. Commercial buildings experiences higher utility bills for water usage, leading to increased operating expenses in summer time. For buildings that rely on water for cooling systems, landscaping, or sanitation (e.g., restrooms), drought conditions forces the businesses to make adjustments in operations or even temporarily close parts of the business (like public facilities or landscaping services) to conserve water.

Now the commercial / businesses of the town is not directly affecting moderate intensity of drought condition as adequate water supply is provided by the Kerala Water Authority. However, it is essential for each commercial establishment to implement water conservation measures to ensure sustainable water usage for the future. By adopting water-efficient technologies, making buildings more resilient, and planning for water scarcity, businesses can mitigate the effects of droughts and maintain their operations during periods of water scarcity.

Heat stress vulnerability significantly impacting the purchasing power of the people of the town by influencing their income levels, living costs, health, and overall economic stability. As heat stress affects various sectors (agriculture, labor productivity, healthcare, energy costs, etc.), these impacts translate into changes in income, expenses, and consumer behaviour, ultimately altering the purchasing power of individuals. It also leads to changes in consumer behaviour and spending patterns. People are less inclined to go shopping in the morning and midday hours as heat stress and sunburn problems are on the rise. A section of the town's ring road is lined with trees on both sides, offering a cooling effect and relief from the sun's heat. People require shade when traveling, so it is imperative to encourage the planting of trees on both sides of the town's main highways.

8.9 Problems and Potentials

The major problem faced by the town is the congestion at commercial units due to insufficient space. It is due to vehicular and pedestrian traffic beyond the capacity of the existing facilities. It prevents smooth manoeuvring of vehicles causing frequent traffic block and also lack basic infrastructure facilities. The town lacks supporting infrastructure like organized taxi/auto/lorry stands, public comfort stations etc. Concentration of commercial activities in junctions, ribbon development along the main road, less parking facilities and insufficient road widths adversely affects the attractiveness of the trade and commerce sector in the town and hinders the progress of the sector. The existing commercial nodes need further development to stimulate economic growth and create a healthier urban environment for residents. Pathanamthitta market should be properly maintained and developed to enhance convenience for the public. Local authorities should introduce innovative designs for stalls,

push-carts, and mobile vans of various sizes, while also ensuring the provision of cleaning facilities. Proper waste collection facilities should be provided to every shop.

A large number of informal sector units operate in the city, primarily concentrated around the market area, private bus stand, KSRTC, Kumbazha, and Melevettippuram. However, these units are not organized into clusters. There is a need to establish designated spaces for informal activities along with casual shopping areas. Informal sector areas should be equipped with adequate public conveniences and solid waste disposal systems. Establishing more comfort stations and ensuring their regular maintenance by the authorities at every major commercial center is essential for creating a healthy and hygienic environment in the planning area.

In Pathanamthitta town, major activities such as commercial and administrative functions are concentrated in low-lying areas, which are prone to flooding. South east side of the two major junctions of the town i.e. Central Junction and Kumbazha Junction also falls within the flood-prone zone.

8.10 Inference

Pathanamthitta town have a low rise, low dense mixed type commercial pattern. High end commercial facilities are lacking in Pathanamthitta and people depend Adoor and Thiruvalla for the same. Trade and commerce can be treated as one of the major economic bases of the town. Traditional gold merchants, banking, financial institutions, seasonal trade during Sabarimala pilgrimage season, wholesale shops for the surrounding regional hilly/forest/rural areas are the inevitable part of trade and commerce in Pathanamthitta. Unhygienic and congested conditions in markets are arising due to the absence of waste management system and parking facilities. The existing condition of the commercial activities demands well developed infrastructure facilities for market. The concentration of economic activities within the selected nodes can develop a well distributed hierarchy of commercial nodes and improve the market facilities. Proper plan is needed for rehabilitation of hawkers and vendors. Compared to other towns in the district, Pathanamthitta has the highest availability of land under commercial use, offering significant potential for future development. However, the wetland in the central core of the town faces increasing pressure due to its prime location in the heart of the urban area. Previous floods in Pathanamthitta severely impacted the commercial sector, causing loss of work and damage to commercial buildings.



9. AGRICULTURE

Kerala shares diverse agro-climatic conditions making it fertile for the farming of various crops. Kerala is known as the spice garden of India and also famous for the production of paddy, coconut, rubber, tea and coffee, spices and others. Reducing rural poverty through a socially inclusive strategy that comprises both agriculture as well as non-farm employment, Ensuring that agricultural growth responds to food security need and incorporation of climate based agricultural practices are the agriculture sector challenges influencing Kerala's agricultural development and the improved welfare of its population.

Agriculture sector in a Master Plan helps to protect and conserve farmland for current and future generations and to support agricultural economic development. It also discusses how the town's crop circumstances are impacted by the current climate change scenario.

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1 Agriculture Profile

2 Area under Agriculture

3 Important crops & Productions

4 Spatial Distribution

5 Agricultural Infrastructure

6 Irrigation facilities

7 Marketing Facilities

8 Consumption of Agricultural Produces

9 Ongoing projects /schemes

10 Impact of Hazard & Climate Change

11 Problems & Potentials

12 Inference

9.1 Agriculture profile

The concept of agro-ecological delineations was developed by FAO (1976, 1978) with strong emphasis on comparable agro-climatic parameters to delineate agriculturally potential areas suitable for particular crops or combination of crops so that optimum production potential is achieved.

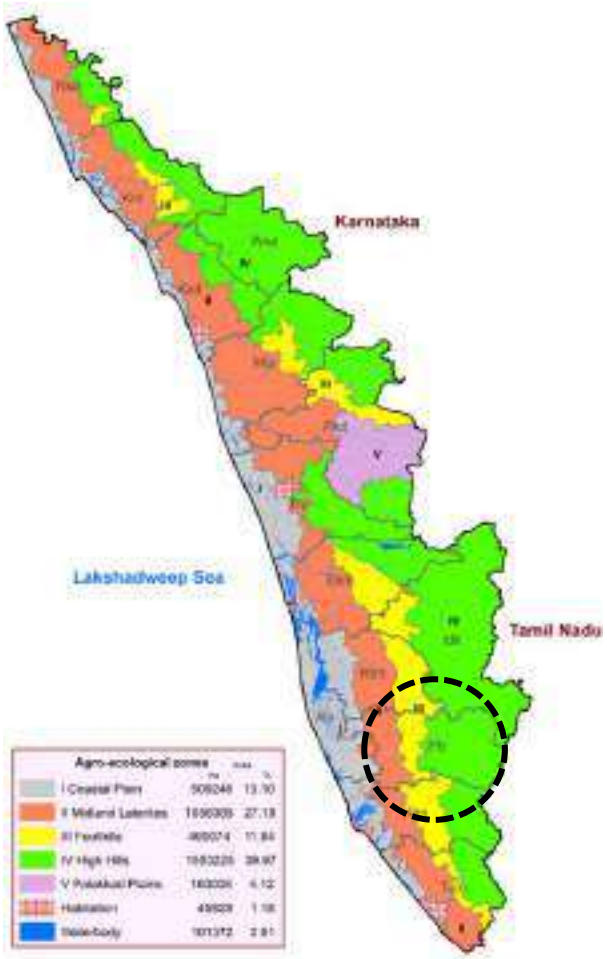


Figure 9.1 Kerala 5 Agro Ecological zones

Source: Generated from Package of practices recommendations; crops 2016

The State has been divided into five agro-ecological zones (AEZ's). Coastal Plain, Midland Laterites, Foothills, High Hills, Palakkad Plain. Pathanamthitta district falls under four agro-ecological zones except Palakkad Plain (Figure 9.1). Based on climatic variability, landform and soils, these zones have been further divided into twenty-three agro-ecological units (AEU's). The spatial bounding limits (external) of the agro ecological units have been made to correspond to the administrative boundaries of panchayats. That is to say that any agro-ecological unit is a collection of panchayats. This has been done to facilitate planning of development activities on an administrative basis.



Figure 9.2 Spatial distribution of the agro-ecological units

Source: Generated from Package of practices recommendations; crops 2016

Pathanamthitta District comes under four divisions (Figure 9.2). Zone 4 Kuttanad (Coconut is grown on the uplands of Kuttanad), Zone 9 South Central Laterite (Mono-cropped rubber and coconut intercropped to a variety of annual and other perennial crops is the major land use on uplands and rice, tapioca, banana and vegetables on lowlands). Zone 12 South & Central foothills (Plantations of rubber, coconut, pepper and coffee abound in the unit). Zone 14 Southern high hills (while forests cover major part of the unit, plantations of rubber, coconut, pepper, tea and coffee are not uncommon). Pathanamthitta district is number one in farming of Tuber crops.

9.2 Area under Agriculture

The total agricultural area of the district is 999.38 sq.km. Dry Agriculture contributes an area of 925.72 sq.km and wet agriculture contributes an area of 73.66 Sq.km.

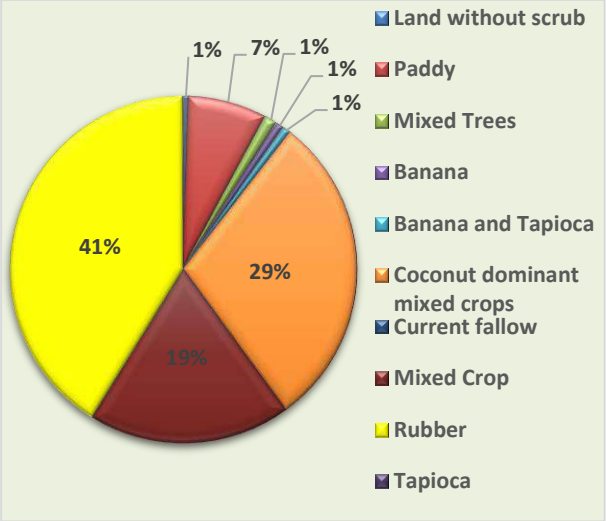


Figure 9.3 District Agricultural Land use

Source: District Urbanization Report Pathanamthitta, 2011

The breakup of the agricultural land use of Pathanamthitta district is shown in Figure 9.3 & Table 9.1. Major share among various crops in Pathanamthitta District is rubber (41.17%), followed by coconut dominant mixed crops (29.43%), mixed crops (18.86%) and paddy (7.37%) The contribution of other crops is negligible. So, the agricultural land use is analyzed further considering these four main crops (Rubber, Coconut (coconut dominant mixed crops), Mixed Crops and Paddy). LSGIs wise land use concentration has been analysed in district urbanization report 2011and Pathanamthitta town comes under the Agriculture land use concentration with Activity pattern of Agriculture, Animal husbandry and Small scale industries.

Table 9.1 District Agricultural land use

Sl. no	Type of cultivation	Area in Per Sq.km	Percentage
1	Land without scrub	4.67	0.467
2	Paddy	73.66	7.371
3	Mixed Trees	11.91	1.192
4	Banana	7.25	0.725
5	Banana and Tapioca	7.7	0.770
6	Coconut dominant mixed crops	294.12	29.430
7	Current fallow	0.0	0.000
8	Mixed Crop	188.44	18.856
9	Rubber	411.45	41.171
10	Tapioca	0.18	0.018
	Total	999.38	100

Source: District Urbanization Report Pathanamthitta, 2011

9.2.1 Area under agriculture in town

The total area of Pathanamthitta town is 23.43 sq.km out of which 10.18 sq.km (43.44%) is dry agricultural land 2.02 sq.km (8.61%) is wet agricultural land. The dry agriculture land is distributed in all parts of the town but a concentration can be seen in the North-West part of the town. The wet agriculture land located in the valleys in between hills and is distributed in central part the town.

9.3 Important Crops & Productions

Rubber is the dominant crop among the plantation crops in the district. Rubber cultivation is concentrated mainly in the hilly eastern zone. Rubber is cultivated extensively in the district, 9.41 per cent was in the district in 2010-11. In area and production, the district has the second position, the first being occupied by Kottayam district.

Tapioca is a major food crop next only to paddy in the extent of acreage. While tapioca is cultivated in all parts of the district, it is concentrated in Mezhuveli, Konni and Konnithazham of Kozhenchery taluk and Pandalam, Kurampala and Enath of Adoor taluk. Tapioca is cultivated in an extent of 9.77 per cent of the state production in 2010.

Coconut also enjoys an important position in the agricultural economy of the district. There is seen some decline in the area under coconut plantation. The second largest cultivation is coconut. But this crop is facing severe crisis in

view of sharp decline in price during the last two years and the reduction on productivity due to the wide attack of Mandari pest, which is an exotic mite that appeared all of a sudden.

Paddy is cultivated in two seasons viz. 'Virippu' (first crop from April-May to August-September), immediately followed by 'Mundakan' (second crop from September-October to December-January). Both are rain fed and hence extensively cultivated. Banana and other plantains are cultivated in different parts of the district. But Kozhenchery taluk covers the maximum area under banana cultivation. Sugarcane cultivation is concentrated in Thiruvalla taluk. But with the closing down of sugar cane factories, there is substantial decline in area under sugarcane cultivation.

For Inland fish production, the reservoir fisheries development programme is carried out in the reservoirs of Pathanamthitta district.

9.3.1 Cropping pattern of town

Rubber is the major crop of the town and 66.55% of dry agriculture land is under rubber cultivation. Mixed crops cultivation is in second position with 17.8 % of dry agriculture land. Area under coconut cultivation with 15.67 % of total agriculture land comes third position in dry agricultural cultivation.



Figure 9.4 Rubber Cultivation



Figure 9.5 Household level Banana Cultivation



Figure 9.6 Fruit Cultivation



Figure 9.7 Dry agriculture land without cultivation



Figure 9.8 wetlands in the town

> റബ്ബർ കൃഷിക്കു പകരം റംബുട്ടാൻ, മാങ്കുസ്റ്റിൻ, ജാതി, ഡ്രാഗൺ ഫ്രൂട്ട്, അവോക്കാഡോ, മുതലായ വിളകൾ പ്രോത്സാഹാഹിപ്പിക്കുന്നതിനും അവയുടെ കൃഷി രീതികൾ, വിളവെടുപ്പ് എന്നിവ സഞ്ചാരികൾക്ക് അനുഭവ വേദ്യമാകും വിധമുള്ള ഫാം ടൂറിസം, ഫാം സ്റ്റേകൾ എന്നിവ നമ്മുടെ നഗരത്തിൽ കൊണ്ടുവരണം. [*Instead of rubber farming, we should promote crops like rambutan, mangosteen, dragon fruit, avocado, castor, etc. and introduce farm tourism and farm stays in our town so that tourists can experience their farming methods and harvest.] - Public Opinion*

Even though there is 2.02 sq.km of paddy field/wetland /low lying areas available in the town, there is no paddy cultivation in the town. But there is increasing trend in "Karanelkrishi" within the town. Presently 1Ha of land is under "Karanelkrishi". Banana, Vegetables, Plantation crops and tuber crops are the other major crops

showing increase in production year by year. Most paddy fields are left unused, while some have been converted into dry land and repurposed for multi-crop cultivation. These areas are now used for growing vegetables, plantains, betel, and tapioca. Figure 9.4 to 9.8 shows various types of agriculture activities and available agricultural lands in the town.

9.3.2 Labour strength

Among the four categories of workers (Cultivators, Agricultural Labours, Household industry & other workers), Agricultural labourers with 14.1 per cent take the second position among the workers in the district after other workers. Males dominate with 15.7 per cent as against 10.1 per cent of females in this category.

As per the Socio – Economic survey 2019 the percentage of Agriculture Labourers in the Pathanamthitta town is 2.85% and the percentage of cultivators is 5.63%. The total percentage of workers engaged in Agriculture and allied sector is 8.48%.

9.4 Spatial Distribution

The dry agriculture area is distributed in almost all part of the town. In some area it is mixed with other urban land uses especially the residential area. More concentration of dry agriculture land is along the periphery of the town predominantly in the northern part of the municipality. Figure 9.9 & 9.10 shows the spatial distribution & ward wise concentration index of dry agriculture land use of the town respectively. Dry agriculture land is distributed in all wards of the municipality. The concentration index of dry agriculture land use is varying from 0.04 to 1.95. Concentration index is maximum in Peringamala, Anchakkala, Vanchippoika, Saradamadom, Poovanpara, Kairalipuram and Myladumpara wards. These wards are located in the hilly peripheral area of the municipality in the northern part of the town and these are mainly rubber plantations.

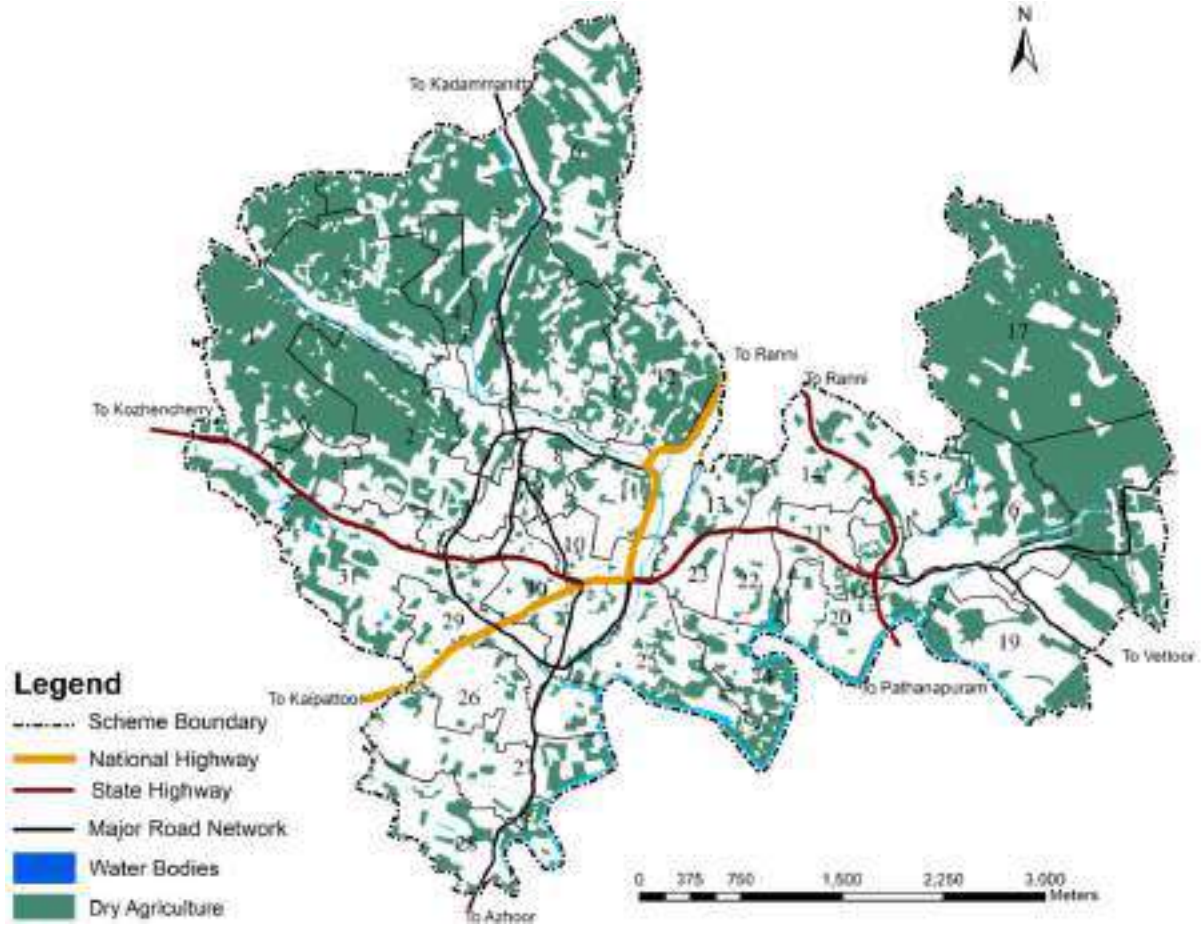


Figure 9.9 Spatial distribution of dry agriculture in town

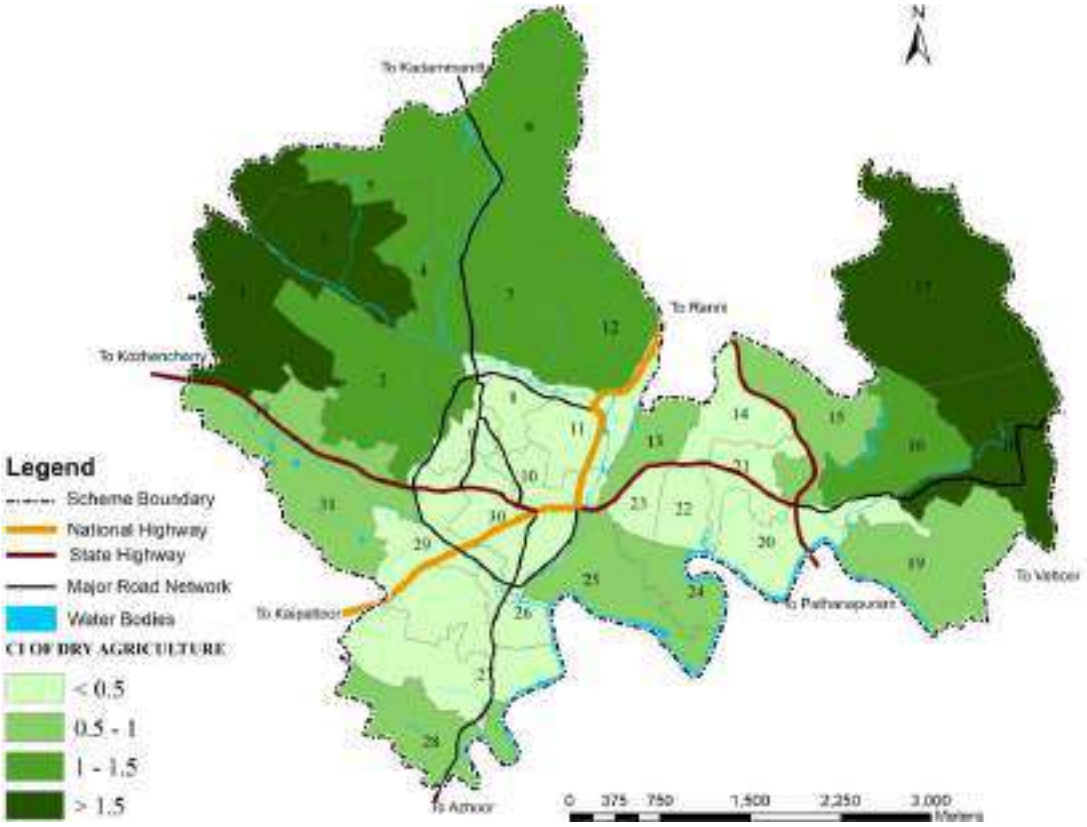


Figure 9.10 Ward wise concentration index of dry agriculture land use

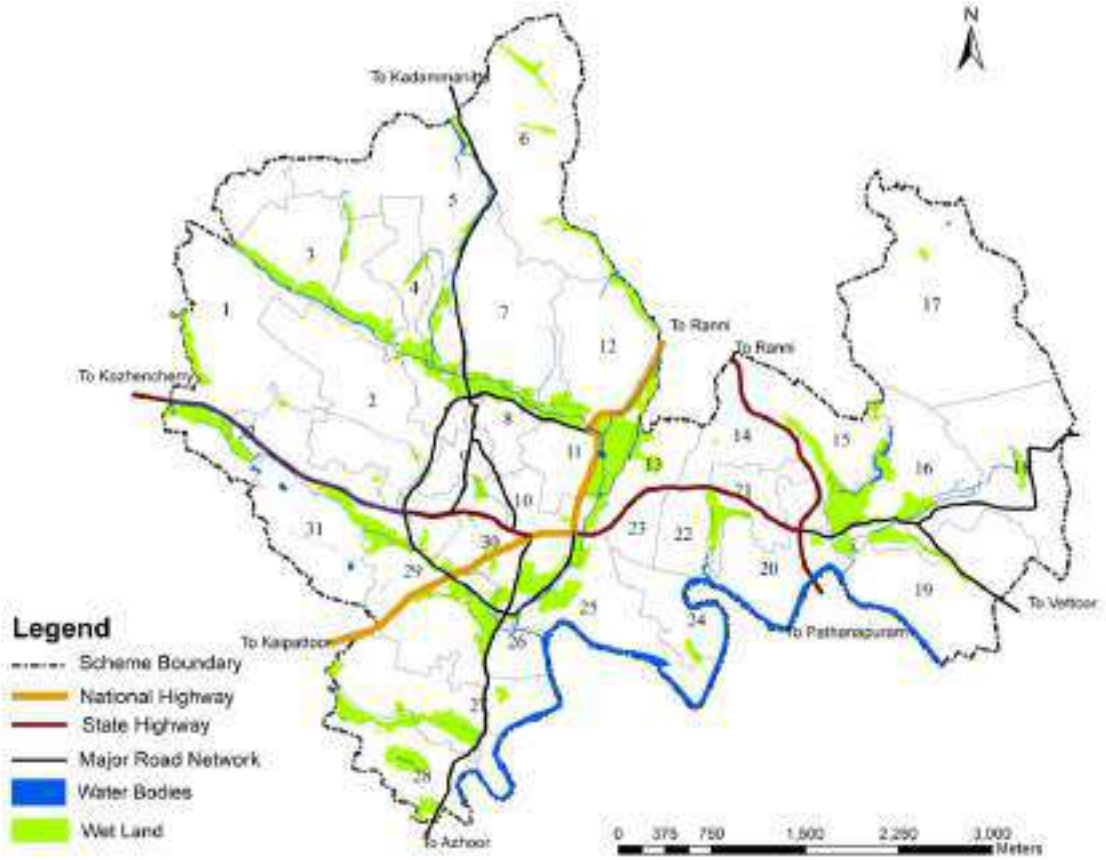


Figure 9.11 Spatial distribution of wet land in town

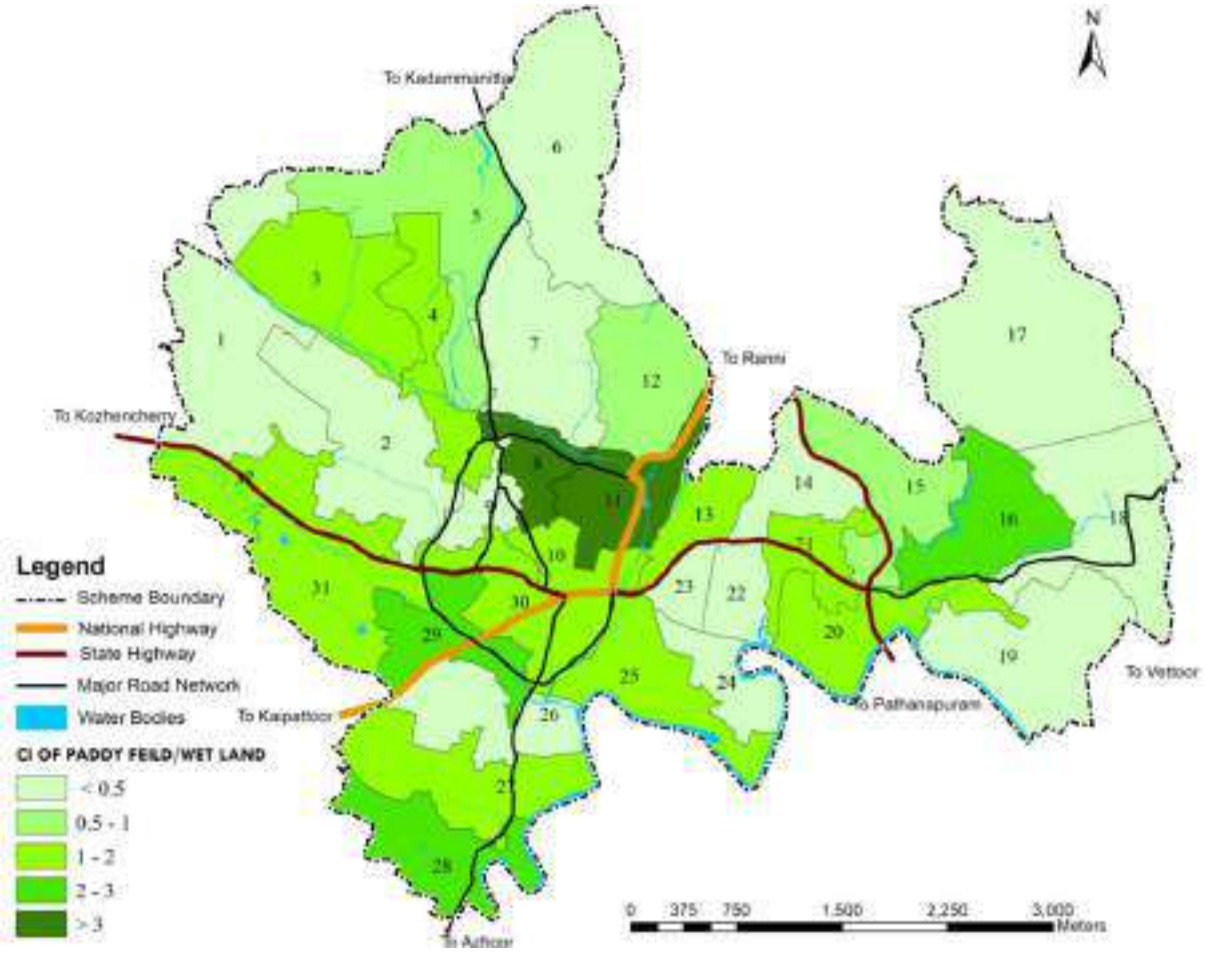


Figure 9.12 ward wise concentration index of paddy field/wet land

The Spatial distribution & concentration pattern of wet land in the town is shown in Figure 9.11 & 9.12. The concentration index is varying from 0 to 4.36 and is high in Myladumpara thazhom, Thykkavu, Pettah North and College wards.

9.5 Agricultural Infrastructure

There are two seeds farms in the district. These seed farms are concentrated in production of paddy seeds, vegetable seeds, rooted pepper cuttings, etc. The Krishi Vijnan Kendra at Thelliyoor, near Kumband, which is sponsored by ICAR (Indian Council of Agricultural Research) is imparting training to farmers. The Sugarcane Research Station of Kerala Agricultural University functions at Kallumkal near Thiruvalla. A Tapioca Research Station is also functioning at Thiruvalla and A soil testing lab. There are 57 Krishi Bhavans in the district. They implement developmental activities in the agricultural section.In town, there is a farm unit, an organic manure unit and two fodder units. All these are under private ownership.



Figure 9.13 Krishi Bhavan in the town

There is a marketing centre and 3 agricultural institutions under government. There are 8 fertilizer depots in town out of which 5 are private and 3 are under co-operative ownership. There are 3 pesticide depots also out of which 2 are private and one under co-operative ownership. Number of agricultural units within the municipality is shown in Figure 9.14.

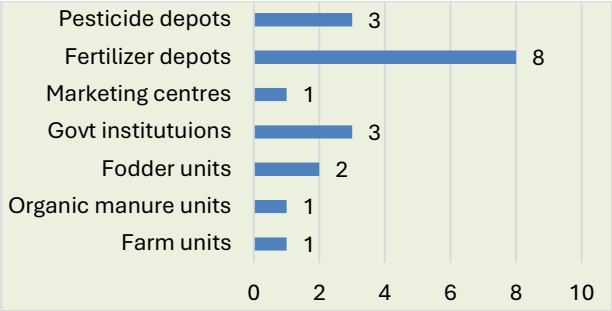


Figure 9.14 Number and type of agricultural units within the town

9.6 Irrigation facilities

There are no irrigation canals or lift irrigation projects within the municipal area. The only initiative under minor irrigation is the protection of river side bunds, and the Kallarkadavu check dam serves as the sole infrastructure for irrigation in the town. The number of available sources for irrigation within the town is shown in Table 9.2. People are using private tanks, private wells, tube wells for the irrigation of the crops. Trip irrigations and furrow type irrigations are also used for various cultivations. Water from river, quarry and rain water collection pits are also used for cultivations (Figure 9.15).

Table 9.2 Irrigation facilities in town

Available water resource	Numbers
Private tanks	500
Govt wells	56
Private wells	526
Tube wells	8

Source: Socio Economic Survey







Figure 9.15 Types of irrigations used in the town (above three images)

> നഗരസഭയിൽ ധാരാളം പൊതു കുളങ്ങളും ജലാശയങ്ങളും ഉണ്ട്. അതിൽ മത്സ്യകൃഷി പ്രോത്സാഹിപ്പിക്കു. നിലവിൽ വെള്ളക്കെട്ടായി കൃഷിചെയ്യാതെ കിടക്കുന്ന പാടങ്ങളിൽ ടൂറിസം പ്രവർത്തനങ്ങൾ വിഭാവനം ചെയ്യുമ്പോൾ ആയവയിൽ മത്സ്യകൃഷി ഉൾപ്പെടുത്താവുന്നതാണ്. [*There are many public ponds and water bodies in the municipality. Fish farming should be encouraged in them. When planning tourism activities in the fields, fish farming also can be included in the water stagnant areas where agriculture is not practicing.] – Public Opinion*

9.7 Marketing Facilities

Being Pathanamthitta town is the headquarters of the district, the markets in the town also need to cater the need of entire district and should act as a first order market. Pathanamthitta Municipal market and Kumbazha market are major agriculture markets of the region. Agriculture products like banana, yam, ginger, betal and all other local agriculture products from the town and surrounding area are transacted through Municipal market. (Details of Markets are mentioned in Trade & Commerce Chapter of this Master Plan). Local level shops are also available in the town.

Omallur, Pramadom, Konni, Kodumon, Keerukuzhi, Pandalam, Adoor markets are spatially located southern part of Pathanamthitta and Ranni, Kozhenchery markets is located in northern region (Figure 9.16).

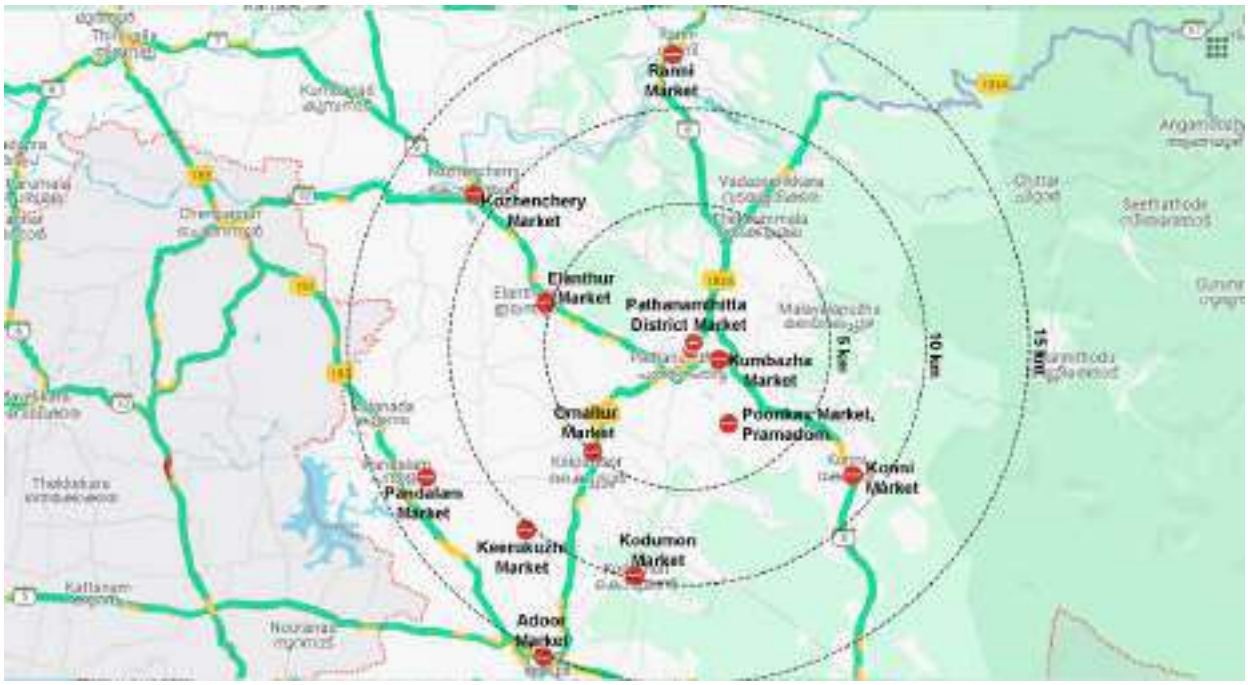


Figure 9.16 Spatial Locations of local market around Pathanamthitta town

Source: Generated from google map.

As a district market and first major town from the eastern part of the district, Pathanamthitta town can act as a regional agricultural distribution centre for entire district. The upcoming hill highway connecting Pathanamthitta can also increase the proximity of town as distribution centre to entire district for the agriculture products coming from neighbouring state Tamil Nadu. Proposed Greenfield highway also connects town with Vizhinjam port which will be a major corridor for the movement of goods.

9.7.1 Regional Agricultural Potentials

The regional agricultural potentials and facilities of the district can also influence the economy of the town. Various types of agricultural production from surrounding areas, along with agricultural events, will contribute to the town's economic growth and overall development.

9.7.1.1 Regional Agricultural production

One of the main agricultural products in the surrounding region of the town is Kodumon Rice. The area of production covers the entire seven Grama Panchayaths of Parakode block in Pathanamthitta district. These variety of rice are in high demand in market due to high quality. Kodumon is just 10km away from the Pathanamthitta Town.

> നഗരസഭയിൽ കൃഷിചെയ്യാതെ വർഷങ്ങളായി തരിശ് കിടക്കുന്ന നെൽപ്പാടങ്ങളും, മൺപുരയിടങ്ങളും പച്ചക്കറി/ പൂവ്/ മത്സ്യ/ ഫല വൃക്ഷ/ ഔഷധ സസ്യ കൃഷി ചെയ്യും, ഫാം ടൂറിസം പോലുള്ള വിനോദ സഞ്ചാര പരിപാടികൾ ഉൾപ്പെടുത്തിയും ആദായമുണ്ടാക്കുവാനുള്ള പദ്ധതി നടപ്പിലാക്കുവാൻ പദ്ധതിയിടണം. ഉത്പാദിപ്പിക്കുന്ന ഭക്ഷ്യവിഭവങ്ങൾ മാർക്കറ്റിൽ വിൽക്കുന്നതിന് സംവിധാനം ഏർപ്പെടുത്തണം. [*The paddy fields in the municipality, which have been lying fallow for years without cultivation, should be cultivated with vegetables/ flowers/ fish/ fruit trees/ medicinal plants. Plans should be made to implement income-generating projects, including tourism programs such as farm tourism. A system should be established to sell the food produced in the market.] – Public Opinion*

Another product is Central Travancore Jaggery which is made from sugarcane grown along the riverbanks of the Manimala, Pampa, Achenkovil and Meenachil rivers of the Thiruvithamcore Kingdom (currently Kottayam and Pathanamthitta districts and Chengannur taluk

in Alappuzha district). It got Geographical Indication (GI) tag. Now the sugar production is reduced. Due to the better taste, flavour and sweetness, jaggery prepared from this area, which was a major centre for jaggery production and trade in the past, definitely will be having immense scope in the world market also.

Aranmula Arecanut, Pulikkezh Tamarind, Kallungal Jaggery, Pullad Tapioca and Elanthur Banana are the famous regional agricultural products of the region.

9.7.1.2 Regional Agricultural Events/ Festivals

There are two traditional agricultural events happening every year in the district. One is Omallur Vayal Vanibham and another is Thelliyoor Vrischika Vanibham. Omallur Vayal Vanibham is a marketing fair held annually in Omallur under the leadership of Omallur Grama Panchayat in collaboration with Department of Agriculture and Farmers Association. It takes place in the Omallur market and the paddy field nearby. The Vyal Vanibham, where the farmers of Central Trivandrum come together, is more than eight hundred years old. For cattle trade, farmers from Kollam, Pathanamthitta, Alappuzha, Kottayam districts and Tamil Nadu come with cattle. Marketing of agricultural products, agricultural equipment, seeds, household appliances, utensils etc. is also done. From seeds to orchid plants, the fair has a huge collection. Tens of thousands from within and outside the district come to the traditional fair for an entire month in search of seeds and agricultural equipment. Omallur is just 5km away from Pathanamthitta town.

Thelliyoor Vrischika Vanibham, is a centuries old rustic fair, at Thelliyoor, Ezhumattoor panchayat in Pathanamthitta district which is just 21 km away from Pathanamthitta town. People from all over the central Kerala visit this rural Village to enjoy the 5 day event. The fish folks from the coastal areas bring shark fins as their offering to the deity, Bhadrakali, of the temple and even today it is the major attraction of the fair. Along with all the other agricultural produces and traditional crafts the various sects of people gather at this event every year.

Regional agriculture products have potentials to attract visitors who are interested in learning about or purchasing these products. These can also include in the tourist circuit. The municipality can promote this local agricultural product and attract investment by providing chances for focused education and research facilities.

9.8 Consumption of Agricultural Produces

Majority of rice consumed is imported from Palakkad, Andhra Pradesh & Tamil Nadu. Locally grown vegetables cover less than 25-30% of consumption. Fruits and tubers, spices etc. are produced and partly imported. Agricultural production in Pathanamthitta town is insufficient to meet local consumption needs, primarily due to the nature of crops cultivated. The town's agriculture is predominantly focused on rubber cultivation, along with some seasonal fruit crops, which are not staple food sources. As a result, essential food products such as rice and vegetables are not cultivated at a scale that can support the dietary needs of the local population. This dependency on external sources for food supply makes the town more vulnerable, particularly during extreme events like floods, which can disrupt transportation and supply chains. Enhancing local food resilience through the promotion of flood-resilient farming practices and the diversification of crops towards essential food items could be an important strategy for strengthening the town's food security in the face of climate and disaster risks.

9.9 Ongoing projects/Schemes

In order to increase income from agriculture, the Department of Agriculture aims to turn farmers into entrepreneurs through value addition and

product diversification. For this purpose, through the "One Krishibhavan One Product" project, 94 value-added products were produced from 57 agricultural houses in the district and delivered to the market. For online trading of value-added products, the Kerala Grow brand led by the Department of Agriculture is marketing Pandalam jaggery produced at Pandalam farms in the district.

The Department of Agriculture has taken the initiative to make the agriculture sector a major source of income, to create awareness among the farmers about ornamental plant cultivation and to adopt it as a permanent income mainly in the rubber plantations of the district. Volatility in rubber cultivation has inspired spice cultivation and fruit tree cultivation. Department also gives knowledge support to commercially important crops like rambutan, mangosteen. Dragon fruit and Pineapple. The Smart Krishi Bhavan project has been started by the State government to make agricultural services farmer-friendly and timely. The Farmer Training Centre at Pandalam has emerged as a hub for agricultural learning in the district, having conducted training sessions on over 80 diverse topics. Plant Health Clinics are actively operating in conjunction with 16 Krishi Bhavans across the district including in Pathanamthitta town, offering field-level advisory support. Minimum processing centers, pack houses, cool chambers and honey processing units have been set up by the State Horticulture Mission. Nine automatic weather stations will be started in the district by India Meteorological Department (IMD) to promote climate-based farming practices and warn farmers in case of natural calamities and one is proposed in Pathanamthitta town.

9.10 Impact of Hazard & Climate Change

Climate change and specific natural hazards (such as landslide, droughts, floods, heat stress and change in precipitation pattern) affect crop production and overall agricultural systems.

9.10.1 Hazard Vulnerability

Flood and landslide hazard vulnerability is carried out by overlaying the spatial distribution of dry & wet agriculture land use with one in fifty year flood return probability map and landslide prone area map published by KSDMA (Figure 9.17, 9.18 & 9.19 respectively). The detailed analysis consist of vulnerability of economic zone areas in the flood and landslide prone areas of the town has been incorporated in risk assessment section of chapter 4.

The concentration of dry agricultural land uses is in the northern side of the town due to the physiographic conditions of the town. Because of the slope and hilly terrain, rubber plantations are the major crops. Flood-prone areas are located in the southern part of the town, affecting 8.27% of the town's dry agricultural land. The major crops in these regions are rubber, tapioca and mixed crops. Wet agricultural land and low-lying areas are concentrated in the central part of the town, forming a continuous stretch from the northwest to the southern region. 57.66% of the low laying land is under flood vulnerability zone. There is no wet agriculture now due to less profit from paddy cultivation.

The plantation (Rubber crop) land use comes under the landslide prone area (Figure 9.19). Tapping of latex from rubber trees starts after 6 to 7 years of planting and when the yield decreases, the entire plantation is clear felled and new saplings are planted. So, land area under rubber plantation is rigorously modified or disturbed for planting new saplings and it leads to slope failures. There are several conservation techniques, such as terrace, raised bed and contour farming in agricultural practice. However, inappropriate farming systems can cause slope failures. Farmer's understanding of landslide factors is crucial for adopting preventive measures, ensuring sustainable land use, and minimizing the risk of soil erosion and land degradation

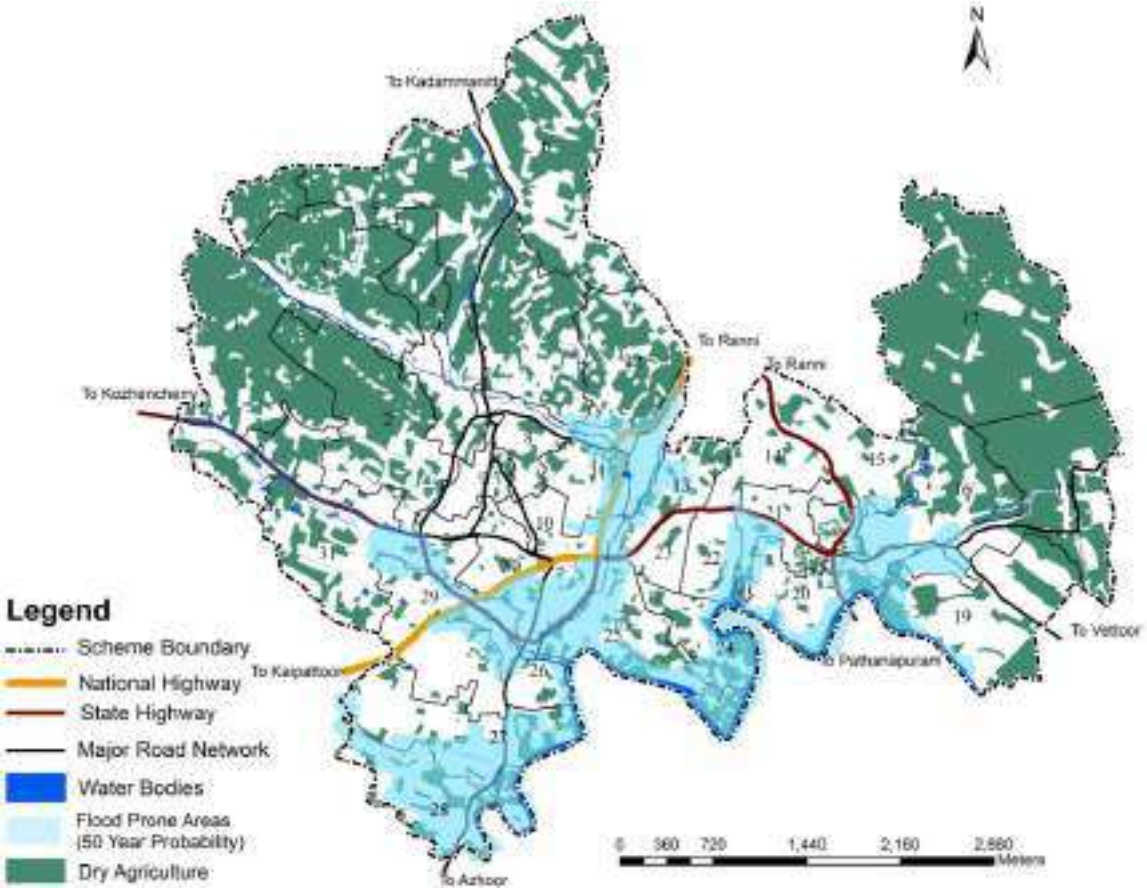


Figure 9.17 Dry agriculture in flood prone area

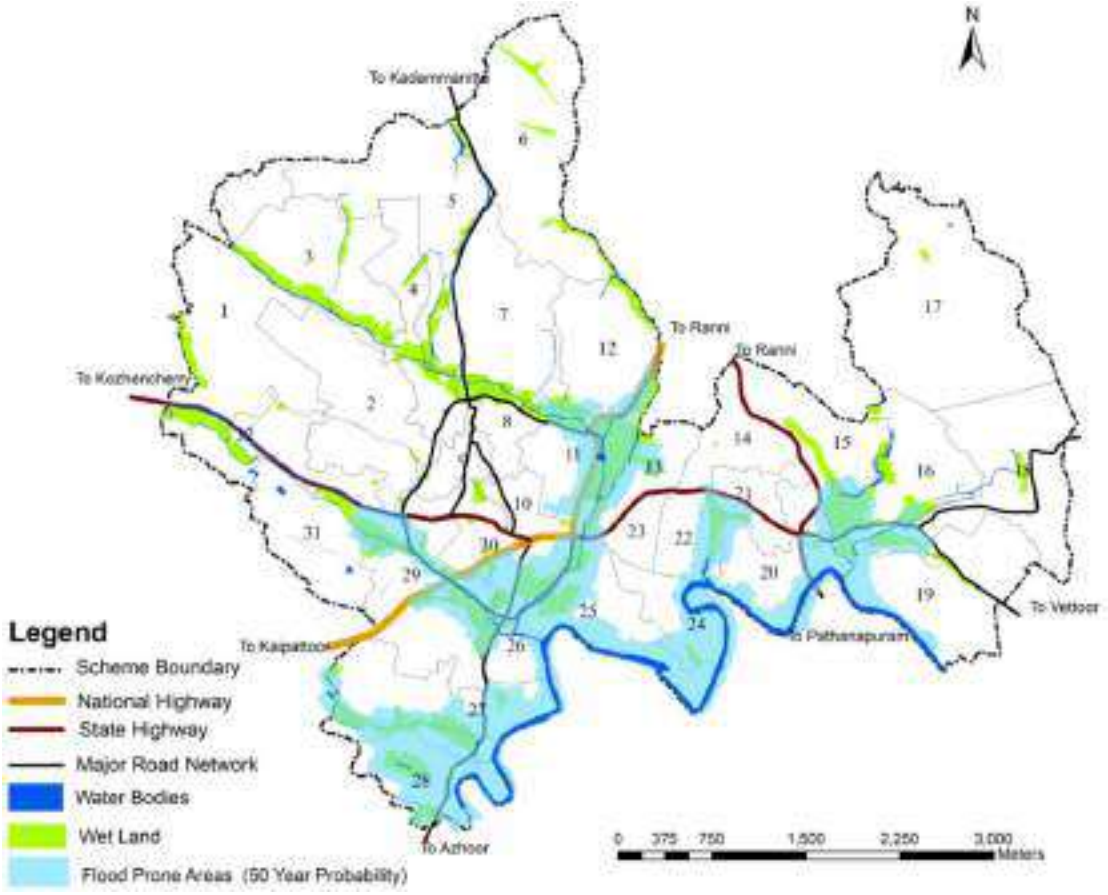


Figure 9.18 Wet agriculture in flood prone area

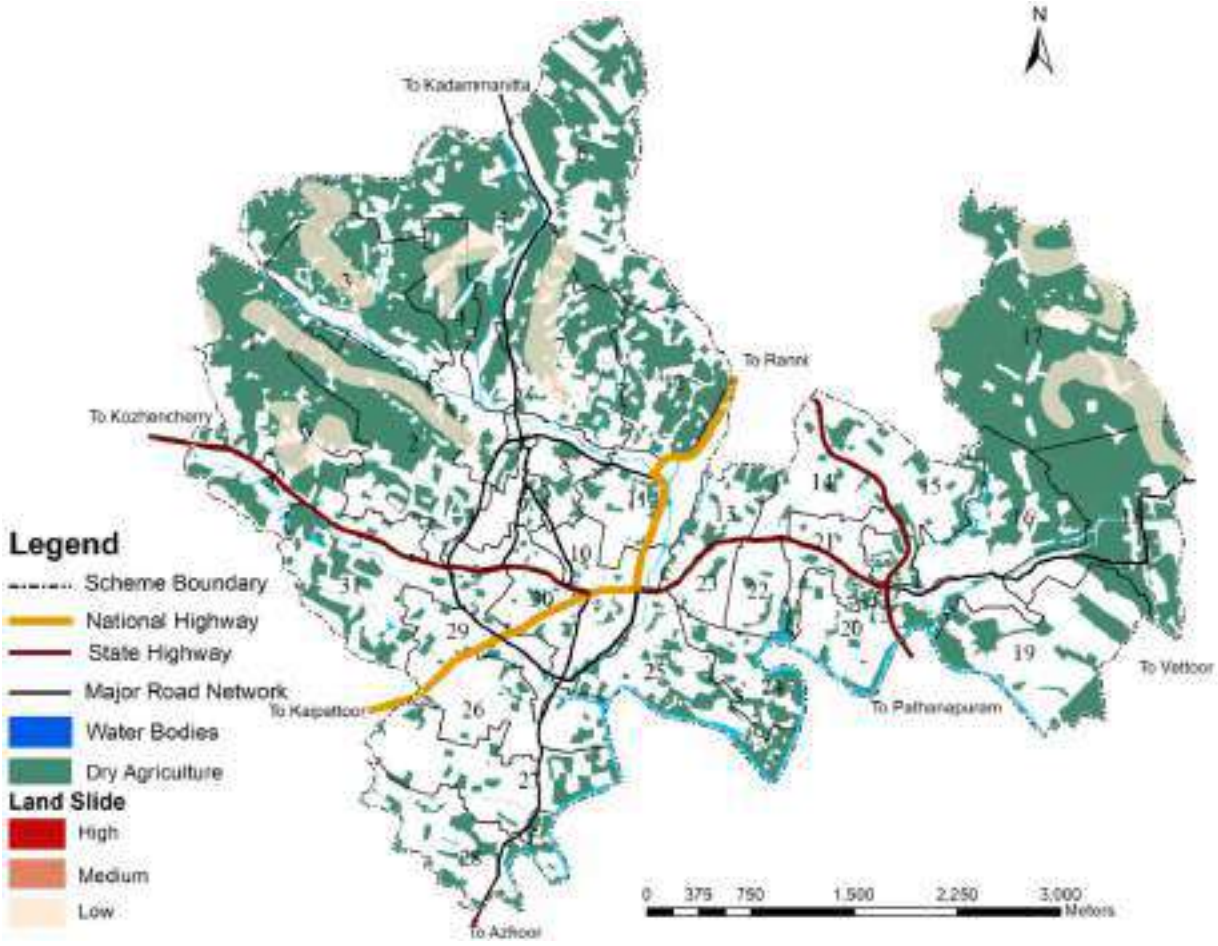


Figure 9.19 Landslide prone areas in agricultural land use of town

9.10.2 Climate Change Assessment

Department of Environment, Government of Kerala compiled data on climate change at district level (SAPCC). According to this data, Pathanamthitta District is listed as medium vulnerable in terms of Agriculture vulnerability. Also, it mentioned that Rice yield will decrease due to increase in temperature and decrease in rainfall and predicted decrease in productivity of Black pepper, cardamom, coconut etc.

According to LAPCC report, for the last 30 years, various changes has been carried out in agricultural sector of the town. Farmers changed crop selection from rice and sugarcane to tubers, plantain etc. due to untimely and heavy monsoon, increased in pest and wildlife attack, lack of labour and price hike of manure, water spillage from streams to agriculture land at the time of rain and flooding etc. Due to these challenges, cultivators face economic losses and often shift to other professions, moving away from agriculture.

As per KSDMA data, Pathanamthitta town comes under moderate drought (26-50% deficient from long period average) prone area based on rainfall data and normal drought intensity in groundwater drought index. From Stakeholders consultations and focus group discussions, it is identified that droughts-based changes like precipitation and temperature also impact the productivity of the crops. Droughts impact water availability for irrigation, soil moisture levels and crop health. Similarly, the rising temperatures and heatwaves also stress crops as extreme heat events affect yields, water demand, and overall productivity.

9.11 Problems & Potentials

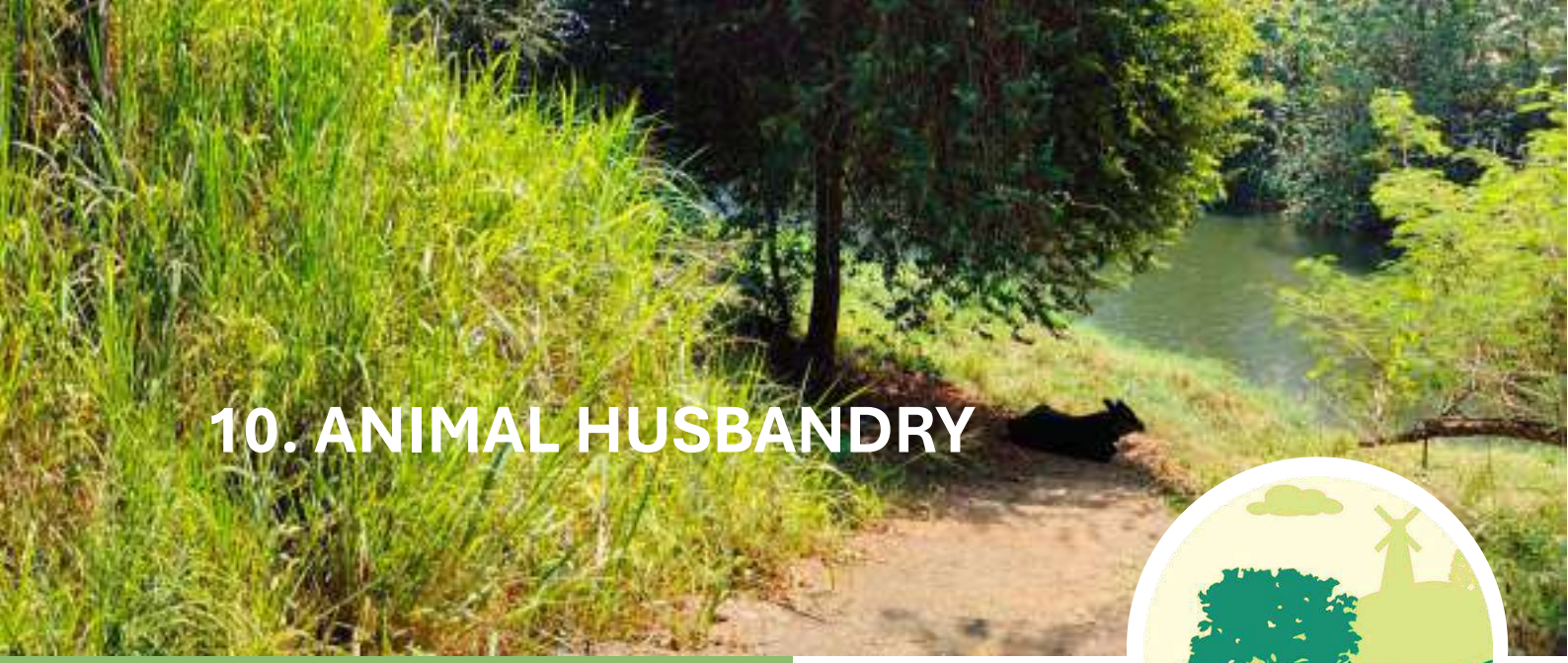
Major problems faced in the agricultural sector of the town are increased attack from wild

animal's especially wild pig, lack of irrigation facilities in summer, lack of proper agricultural aid (seeds/manure/machinary) and subsidies or funding and low rate for farmers. Huge availability of imported vegetables in the market is also a threat to the farmers. For the next ten years, there is chance to change the cropping pattern completely. So the irrigation facilities required in for those cropping pattern in following years has to be identified.

Conversion of wet land and left unused is the major problem in wet agriculture. Promoting cultivation of vegetables, banana and tuber crops in Fallow land or dry land can bring out huge increase in the agricultural productivity of the town. Fallow land or cultivable waste land (either public or private land) within the town should be properly identified and grouped and initiatives must be taken to promote cultivation in these lands. Cultivation of crops such as karanellu, Ginger, Turmeric, Pepper, Banana, Vegetables, Coconut, and Fruits in fallow land has already initiated in the town in small scale under Agriculture department and Kudumbasree. Further Initiative is needed to flourish the same. The opportunities to sell the products in the locality itself can be promoted so that farmers can benefit maximum. It can improve Economy and Health of the town at the same time. Due to the importance of human mental health and the need to coexist with nature, work-life balance initiatives and work staycations projects can also be implemented in the uncultivable land as town has more dry agricultural lands. Awareness programs may be conducted to farmers who have doing plantation activities in landslide prone areas of town about effect of disturbed modification of land for rubber and other plantation activities.

9.12 Inference

The agriculture sector has a major role in the economy of the town. About half of the town area is under agriculture use (48.89%). Rubber is the major crop of the town. Three fourth of agriculture land is currently under rubber cultivation. A change in cropping pattern from rubber & coconut to fruit cultivation is witnessing in some areas of the town. In this era, it is necessary to adopt new methods for food processing and biological diversity protection. It is needed to create a new agricultural habit through safe food and nature conservation through various agricultural projects and also implement projects to bring back paddy cultivations with the help of people participations and subsidies. Structural or non-structural mitigation measures can be adopted in the landslide areas in order to reduce the adverse impact on the community especially to farmers. Changing crop pattern according to the hazard pattern of the area can reduce crop damage due to flood/landslide and it can act as a mitigation tool for the entire town also. It is essential to bring back the agriculture as a profession and increasing the productivity by creating adaptation strategies. By doing so, towns can better equip their agricultural sectors to handle the challenges posed by climate change and extreme weather events, ensuring long-term food security and economic stability.



10. ANIMAL HUSBANDRY

Livestock is an integral part of agriculture, and it plays a significant role in the nutritional security of the people. Livestock sector contributes in numerous ways to the socioeconomic development of rural households. It is the most promising sector in the agriculture and allied sectors. Milk, meat, eggs, fish, wool etc. ensures additional income to the Livestock farmers. Livestock sector is one of the fastest growing sectors of the rural economy in Kerala.

The lack of infrastructure and non-availability of grazing lands makes this occupation vulnerable resulted into lower production and inferior quality of livestock breeds. Disaster like flood and drought affect the health of animals which leads to the reduction of income to farmers and even sometimes cause death. Master Plan guide where farming activities including livestock farming, should occur within a town ensuring that the needs of animal husbandry are balanced with other land uses and environmental considerations.

Contents

1 Number of Domestic Animals

2 Production

3 Physical Infrastructure

4 Dairy farms & Poultry farms

5 Marketing of Products

6 Slaughter House

7 Impact of Hazard & Climate Change

8 Ongoing programs /schemes

9 Problems & Potentials

10 Inference

10.1 Number of Domestic Animals

The 20th Livestock Census was conducted in 2019 in Kerala. The breed-wise number of animals and poultry with their age and sex composition for various species had been collected through the census. The data is collected from each household and non-household of both rural and urban areas. In Kerala the Panchayat wards form the basic rural enumeration units and municipality and corporation wards constitute urban enumeration units. Fifteen species of animals (Cattle, Buffalo, Mithun, Yak, Sheep, Goat, Pig, Horse, Pony, Mule, Donkey, Camel, Dog, Rabbit and Elephant) and five poultry species (Fowl, Duck, Turkeys. Quail and other poultry birds) possessed by the households, enterprises and institutions were counted at their site. The livestock as well as poultry birds were counted according to their breeds as recognized National Bureau of Animal Genetic Resources (NBAGR).

Table 10.1 Number of livestock's in Pathanamthitta district

Sl.No	Type of Livestock's	Numbers
1	Cattle	61157
2	Buffalo	3260
3	Goat	52106
4	Pig	894
5	Sheep	27
6	Rabbit	3851
7	Horse	12
8	Elephant	17
9	Poultry	631843
10	Duck	147809
11	Turkey	1205
12	Quail	15877
13	Fowl	934
14	Emu	32
15	Goose	1127

Source: Animal Husbandry Department, Pathanamthitta

Number of livestock in the Pathanamthitta district as per 20th Livestock Census in 2019 is mentioned in the Table 10.1 Among the 14 districts of Kerala, Pathanamthitta holds 13th position in livestock of Exotic/Crossbred cattle population, Indigenous Buffalo, exotic/crossbred pig and 14th position in Commercial Fowls.

Major share of livestock population in the town is cattle. Exotic and cross breed varieties together constitute 64% of the total livestock population in the town. 33% of the livestock population are goats and 3% are buffalo. The number of livestocks in the town is shown in the Table 10.2.

Table 10.2 Number of livestock's in the town.

Category	Sex	Number
Buffalo	Male	46
	Female	2
Cattle Exotic/ Crossbreed	Male	148
	Female	1046
Goats	Male	379
	Female	627
Dogs		1464

Source: Basic Statistics for Local Level Development 2016.

Among the cattle population which constitute 64% of the total livestock in the town, 87.6% are females and 12.2% are males. 62.33% of the total goats in the town are females and 37.67% are males. Buffalo which constitutes only 3% of livestock consists of 95.8% of males and 4.2% females.

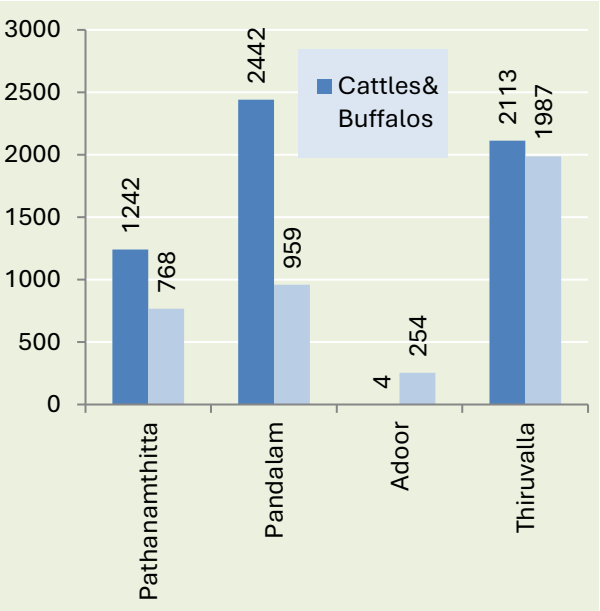


Figure 10.1 Livestock's comparison with towns in the district

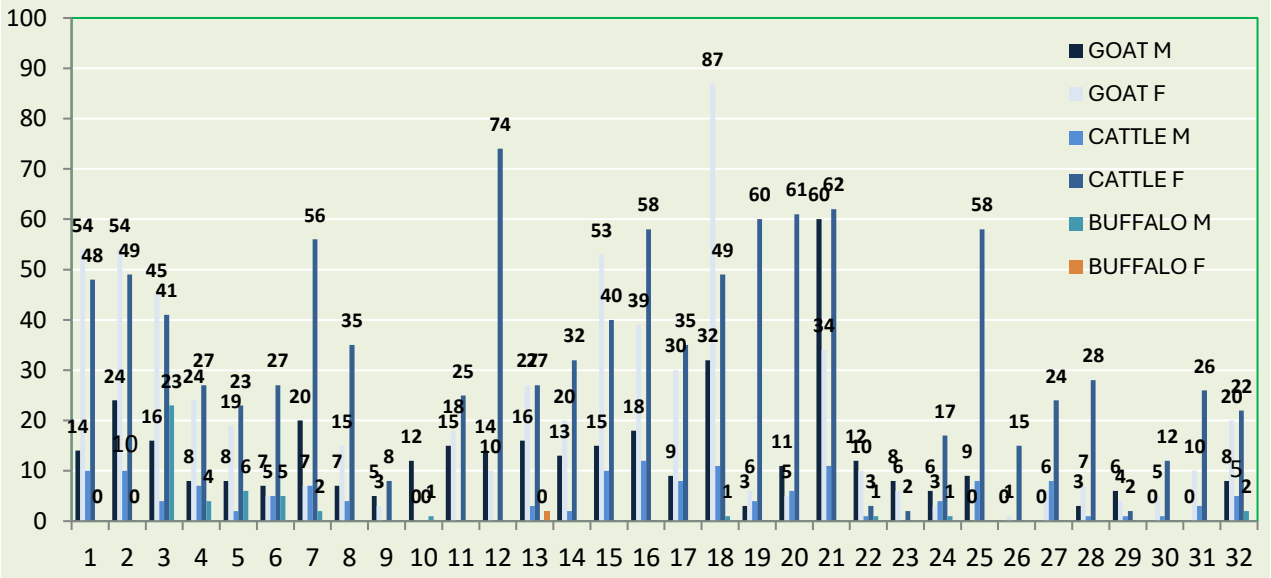


Figure 10.2 ward wise number of livestock's in town.

Comparison of the livestock population of Pathanamthitta with other town in the district is shown in Figure 10.1. Pathanamthitta is in the third position in population of cattles and buffalos. Highest population of cattle and buffalos are in Pandalam. Adoor has the least number of livestock population. The ward wise distribution of livestock population in the town is shown in Figure 10.2. Even though Plaveli ward(18) has the largest livestock population in the town, wards Myladumpara(17), Myladumparathazhom(16), Kumbazha East(19), Kumbazha West(21), Anchakkala(2), Pettah North(11) and Churulikode (32) have the highest percentage.

10.2 Production

The district has a strong tradition of livestock farming, providing significant contributions to local food production and income. The production in the animal husbandry sector in Pathanamthitta involves various forms of livestock, including cattle, goats, poultry, and other animals

10.2.1 Dairy

As per the 20th Live Stock Census (2019), cattle population in the district stood at 61157, buffalo population stood at 3260 and goat 52106. There is a high demand for quality milk in the district.

The status of milk production in Pathanamthitta is given in Table 10.3.

Table 10.3 Milk production in Pathanamthitta district 2018-2019

Milk – Demand per day (2018-19)	Milk Production per day (2018-19)	Shortage of milk per day (2018- 19)
3,07,000 litres	2,52,000 litres	55,000 litres

Source: Potential Linked Credit Plan 2021-2022, Pathanamthitta District, NABARD,

10.2.2 Poultry

Backyard poultry farming is the striking feature of poultry sector in Pathanamthitta. Commercial poultry, especially layers is not very common in Pathanamthitta district. Poultry rearing on commercial lines is, therefore, largely confined to broiler production. Duck rearing is not widely practiced in the district, even though there is scope for promoting duck rearing units in the Upper Kuttanad areas of Pandalam and Pulikeezhu blocks.

The egg requirement in the district as per ICMR standard works out to 234 million. The meat requirement at a rate of 11 kg per head per annum works out to around 10000 tons. But as per the Live Stock Census, there are only 179919 backyard poultry units and 84 Poultry farm and hatcheries under Households and Household Enterprises supplying the egg and meat

requirements in the district which is inadequate and this results in supply of poultry eggs and birds form other districts/ state.

More than 75 per cent of the population in the district are non-vegetarian offering good market for poultry products in the district. However, there are only a few broiler units of above 1000 birds capacity, the majority being small units of 150 to 250 birds, catering to local demand.

10.2.3 Sheep, Goat and Piggery

As per the livestock Animal Census 2019, total number of goats in the district was 52106 and that of pigs 894. Generally, small goat units with an average size of 5 animals on homestead basis are highly suitable for the district. Goat and rabbit rearing, which can be taken up as subsidiary activity along with other activities, can be promoted on an increased scale to provide gainful employment and income to rural households. Goat rearing in the district is being undertaken only under stall fed conditions.

10.3 Physical Infrastructure

To ensure the development of livestock's and supporting the farmers, various institutions has been controlled in district level and local level by government and ULBs. Pathanamthitta district has a District Animal Husbandry Office, District Veterinary Centre, Intensive Cattle Development Project Office, three Regional Artificial Insemination Centres (Pathanamthitta, Mallappally, Ranni), 13 Veterinary Hospitals, 42 Veterinary dispensaries, one duck farm at Niranam and Avian Disease Diagnostic Laboratory at Thiruvalla. Among these institutions, District Animal Husbandry Office, District Veterinary Centre, Intensive Cattle Development Project Office, ADCP Project office and ICDP Project office are functioning within the Municipality.

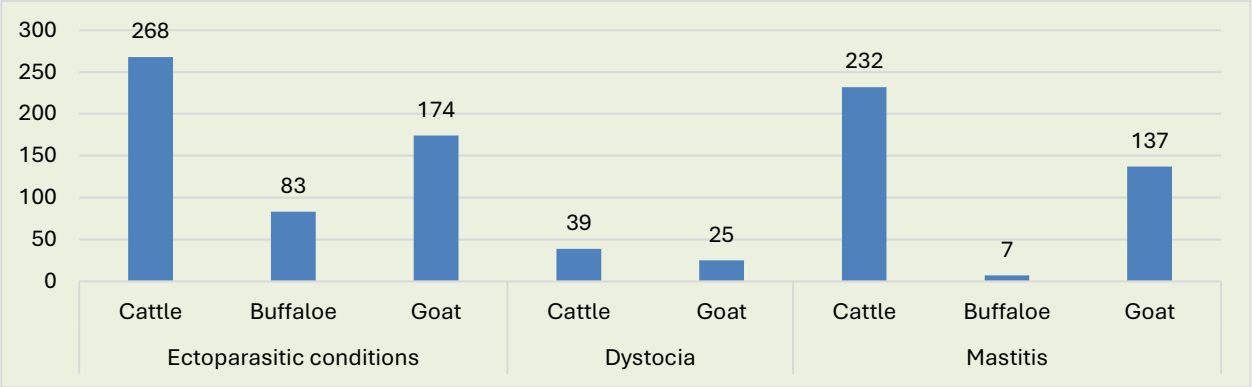


Figure 10.3 Treatments in District Veterinary Centre in a year (2015-16)

Source: District Veterinary centre Pathanamthitta

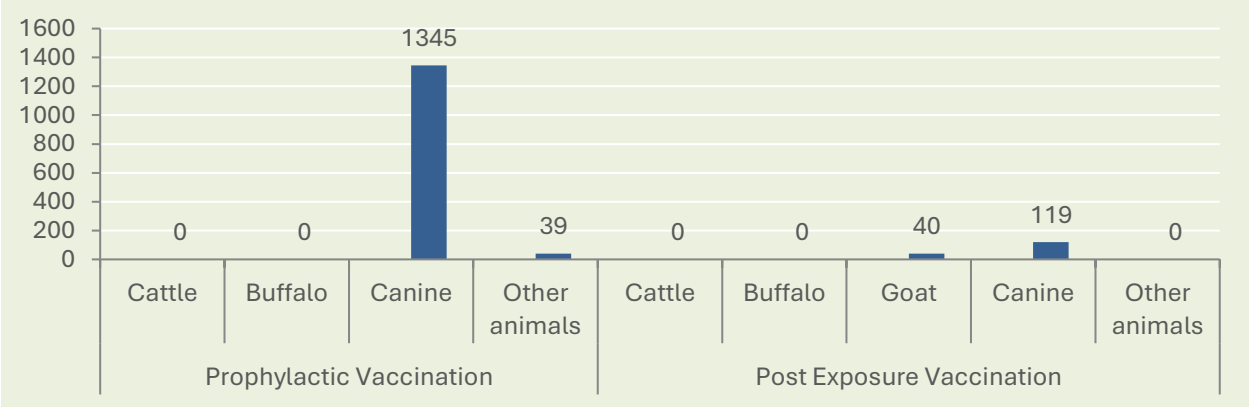


Figure 10.4 Vaccinations in District Veterinary Centre in a year (2015-16)

Source: District Veterinary centre Pathanamthitta

Table 10.4 Activities of the District Veterinary Centre in a financial year (2015-16)

Number of Artificial Inseminations Done	Number of animals tested for pregnancy	Number of animals conceived	Recorded calving	Castrations (for Dogs & Pigs)	Number of infertility camps	Vaccinations done		Recorded number of milking animals	Area of Fodder cultivation (ha.)
						Livestock	Poultry		
2576	273	199	463	12	2	3057	33362	800	2.7

Source: District Veterinary centre Pathanamthitta

The District Veterinary Center, Pathanamthitta is located adjacent to Ring Road. Details of treatments given for various animals at District Veterinary Hospital is shown in Figure 10.3. 268 cattle and 174 goats were treated for ectoparasitic conditions,232 cattles and 137 goats were treated for mastitis and 165 cattles were treated for other reproductive disorders. Details of prophylactic and post exposure vaccinations given at District Veterinary hospital during a year is shown in Figure 10.4. Activities in District Veterinary Centre during a year 2015-16 is shown in Table 10.4.







Figure 10.5 Animal husbandry offices in the town

District Animal Husbandry Office, District Veterinary Centre, Intensive Cattle Development Project Office are working in a same building (Figure 10.5)

10.4 Dairy Farms

The district is known for its small to medium-scale dairy farming, where farmers rear cows, buffaloes, and sometimes goats for milk production. Both local breeds (such as Vechur and Keralam, native to Kerala) and crossbred cattle (such as Jersey and Holstein Friesian) are raised. Crossbred cows tend to produce more milk, while native breeds are hardy and well-

adapted to the local environment. There no medium or large-scale dairy farms in the town. Some household level dairy farms are in the town with average of ten or less in number of cows, buffaloes and goats. The presence of cooperative societies, such as Milma, plays a crucial role in purchasing milk from local farmers and ensuring it reaches consumers. These cooperatives also help farmers by offering technical guidance and better market access.

Poultry farming is another key livestock activity in Pathanamthitta. Poultry farming in the district includes both commercial poultry (broilers for meat) and layer poultry (hens for egg production). There are larger farms that manage hundreds or thousands of birds in the district. They focus on either broiler farming or layer farming and are an important part of the region's poultry supply chain. In addition to commercial farms, backyard poultry farming is widespread in Pathanamthitta. Families often raise small flocks of chickens for personal consumption or for local sale. This practice is common in rural households and provides a supplementary source of income. There are small number of poultry farms in the town with hundreds to two hundred birds. More households in the town follows backyard poultry farming.

> കൃഷി, മൃഗ സംരക്ഷണം, പാൽ ഉത്പാദനം, മത്സ്യകൃഷി തുടങ്ങിയ മേഖലകൾ സംഘടിപ്പിച്ച് വിനോദ സഞ്ചാരവുമായി ചേർന്ന് Integrated Farm Tourism പോലുള്ള പദ്ധതികൾ നടപ്പിലാക്കുന്നത് സമഗ്ര വളർച്ചക്ക് വഴിതെളിക്കും. [*Implementing projects such as Integrated Farm Tourism, which combines sectors such as agriculture, animal husbandry, dairy production, and fish farming with tourism, will pave the way for comprehensive growth.*] – *Public Opinion*

10.5 Marketing of Products

The marketing of dairy products is carried out through various channels that help deliver these products from farms to consumers. Milma plays a central role in the dairy industry in Kerala. Milma collects milk from farmers, processes it, and markets it through a vast network of retail outlets and distribution systems. Milma also runs its own network of retail outlets and kiosks in the town, where consumers can purchase dairy products directly from the producer. In rural areas of Pathanamthitta, small-scale dairy farmers often sell milk directly to consumers in nearby villages or towns. This direct selling model can also include home deliveries, where dairy products are delivered to customers daily. In urban and peri-urban areas, local milk vendors play an important role in distributing milk. They purchase fresh milk from farmers or cooperative societies and sell it door-to-door.

10.6 Slaughter House

There is one authorized slaughter house in Pathanamthitta town, at ward 30 near the crematorium. The Municipality will take action for establishing modern slaughter house with proper waste dumping solutions. There is no facility for collection, treatment and disposal of waste from chicken stalls in the town.



Figure 10.6 Slaughter House in the town

10.7 Impact of Hazard & Climate Change

Pathanamthitta District is listed as low vulnerable in terms of livestock vulnerabilities per SAPCC. Higher-milk-producing breeds are more susceptible to heat stress. Heat stress adversely affects poultry farming also. Heat stress reduces chicken feed intake, resulting in poorer body weight, egg production, and meat quality, as well as reduced eggshell thickness and increased egg breakage. Livestock is vulnerable to most of the extreme events, but the most calamitous is flood. When animals stand in contaminated water for an extended amount of time, diseases of the hooves and skin may develop. As per LAPCC for the last 30 years, various changes have been carried out in animal husbandry sector of the town. Reduction in milk production by half, Livestock exposed to new diseases are the major problems.

Drought leads to decrease in water availability, which directly affects livestock. Shortage of water leads to dehydration, reduced milk production, lower weight gain, and even death in severe cases. Prolonged dry condition led to reduced pasture growth and quality. This affects the availability of forage for grazing animals, resulting in lower feed availability and higher feed costs. Additionally, droughts encourage pests like flies, ticks, and rodents, which can further compromise livestock health.

10.7.1 Flood & Landslide vulnerability

Based on the risk assessment survey conducted in the flood prone wards, the total number of livestock in flood prone area is identified (Table 10.5). There are total of 885 livestock in flood prone wards of the municipality. Out of this 734 are hen, 31 are goat and 28 are cows. Others include dogs, cat, birds etc. Highest number of animals comes under ward 19. These animals are the additional income source of the households. There is no poultry farm and pig farm in these area. The relocation of livestock posed a significant challenge for people during the 2018 flood.

Table 10.5 ward wise number of livestock in flood prone area

Ward No	No of domestic animals					
	Hen	Duck	Goat	Ox	Cow	Others
08	3	0	0	0	0	2
09	10	0	0	0	0	1
10	2	0	0	0	0	0
11	67	0	1	0	2	6
12	45	0	3	0	2	7
13	33	4	0	0	0	0
15	9	0	0	0	0	4
16	92	0	1	0	7	24
19	164	0	3	3	9	0
20	70	0	0	0	0	4
21	50	5	8	0	0	5
22	48	0	10	0	0	0
24	13	0	0	0	0	0
25	0	0	0	0	4	1
26	21	0	0	0	1	1
27	34	0	5	0	1	1
28	8	0	0	0	0	7
29	5	0	0	0	0	5
30	32	0	0	0	0	5
31	28	0	0	0	2	7
Total	734	9	31	3	28	80

Source: Risk assessment survey 2023

According to a risk assessment survey conducted in the town's landslide-prone zones, there are only a few numbers of animals at the household level. The detailed analysis of animal husbandry economic zone areas in the flood and landslide prone areas of the town has been incorporated in risk assessment section of chapter 4.

10.7.2 Institution analysis

1 in 50-year flood return probability map of Pathanamthitta town published by KSDMA is overlayed with the spatial location of Institutions related to Animal Husbandry.

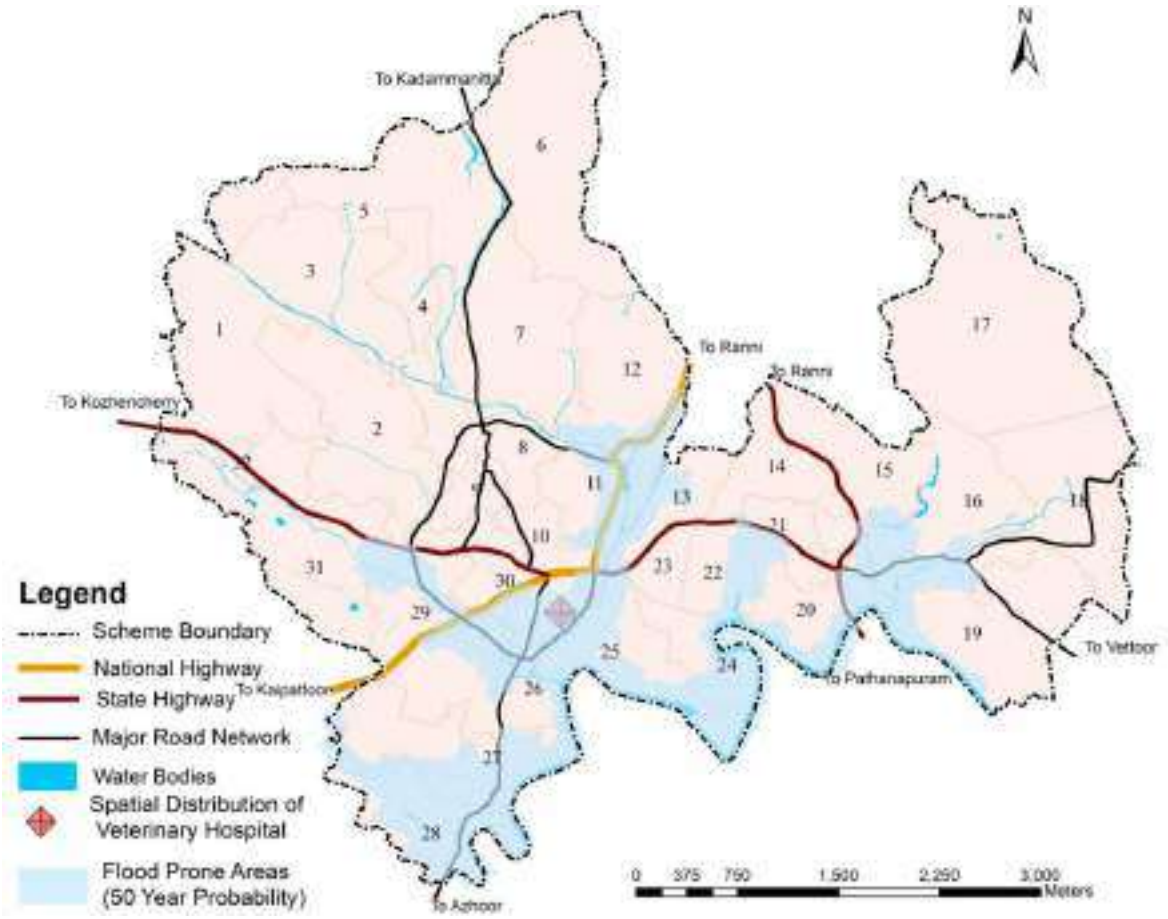


Figure 10.7 Flood overlay map with location of livestock's institution

District Animal Husbandry Office, District Veterinary Centre, Intensive Cattle Development Project Office located in the town are functioning in the flood prone area. (Figure 10.7). 2018 flood affected this building with flood level of 3m. Veterinary hospital is situated in the ground floor of this building. Veterinary Hospital is the critical infrastructure to livestock to prevent from the injuries and diseases in post flood scenario. But the hospital is not easily accessible during or post flood period since it is situated in the flood prone area. So, relocation of the hospital to flood free zone is necessary. Also, the building is to be provided with structural flood mitigation measures.

10.8 Ongoing Programmes / Schemes

Propagation of Malabari Breeds of Goats, Financial assistance to dairy farmers, Financial assistance for poultry farms, Rabies Awareness Campaign, Anti rabies injection for pets, Artificial insemination programs, Vaccinations, Regional Awareness Campaigns, Awareness camps in dairy blocks, Assistance to farmers to promote animal husbandry activities and to increase the milk, meat and egg production of the State are the major ongoing programmes implemented by the District Veterinary Center, Pathanamthitta

> നഗരത്തിൽ തെരുവ് നായ്ക്കളുടെ ശല്യം ഇല്ലാതാക്കുന്നതിനും കാർഷീക മേഖലകളിലെ കാട്ടുപന്നി ശല്യം ഇല്ലാതാക്കുന്നതിനുള്ള മാർഗങ്ങൾ കണ്ടെത്തണം. [*Ways must be found to eliminate the nuisance of stray dogs in the city and the nuisance of wild boars in agricultural areas]– Public Opinion*

10.9 Problems and Potentials

Reduction in the cultivation of paddy, increase in production cost, unavailability of good cattle breed, high cost of the cattle feed, unavailability of fodder grass etc are the major issues faced by the sector. There are no Cattle farms, Goat

farms, Pig farms, Broiler farms, Layer farms, Rabbit farms, Quail farms, Egger nursery, ornamental birds farm in the town where as these farms are available plenty in number in other part of the district. Farmers are limiting dairy farming to household requirements only because of the increased cost of cattle feed, non-competitive price for milk supplied or low procurement price of milk and lack of Government support for the farmers.

Increased number of street dogs in the town is threatening the society. There is tremendous increase in the number of pet animals especially dogs and cats in the town. 6 pet shops are registered in the town. Therefore, necessary awareness should be provided to the people about the diseases, treatments, vaccinations, precautions for their pets.

Lack of awareness about modern scientific cattle/goat farming techniques and lack of initial funding or subsidies for the same. Modern techniques and methodologies shall be adopted in Animal husbandry sector with the changing trend of urbanization. There is no identified higher grazing ground, higher elevation area or local alternatives like fairgrounds in the town to relocate the livestock at the time of flooding. Veterinary Hospital is situated in the flood prone area which is to be relocated.

10.10 Inference

Agricultural use is predominant land use in Pathanamthitta Municipality and utilising the potential there is ample scope for developing Animal Husbandry sector in the town. Decline in the cultivation of paddy, increase in production cost, unavailability of good cattle breed, high cost of the cattle feed, unavailability of fodder grass etc. are the major hindrances in growth of the sector. However high demand for milk, egg and meat in town and surrounding area and comparatively good price for product are potentials. The community has a lot of potential for dairy farms, which will create job opportunities. Hence this sector can be developed as an income generating sector for the town.



11. INDUSTRY

The industrial sector contributes significantly to employment generation, poverty alleviation and improvement to general standard of living of the people. The growth of industry is also linked to the modernisation of agriculture, development of science and technology and efficient utilisation of natural resources.

There are many factors favouring industrial growth in Kerala. Those include Kerala's highly skilled labour force and the relatively high levels of consumption in the State. Per capita consumption expenditure in rural Kerala is twice that of rural India. The per capita consumption expenditure in urban Kerala is 1.3 times that of urban India. Therefore, Kerala offers a ready market for several industrial activities.Industrial sector has a vital role in the master plan. It shows the most suitable locations and provides an overview of future requirements. This also prevents unplanned industrial growth and damages from natural calamity.

Contents

1 Existing Industrial Base

2 MSME & Large-Scale Industries

3 Industrial Estates/ Parks

4 Spatial Distribution

5 Impact of Hazard & Climate Change

6 Problems & Potentials

7 Inference

11.1 Existing Industrial Base

Pathanamthitta is generally considered as industrially backward. Large /Medium scale industries are limited in the district. As per District Industries Centre Pathanamthitta, 10940 MSME industrial units registered in 2017 with total Investment of 95961 lakhs and generated 55815 employment opportunities.

11.1.1 Public Sector undertakings

There are two enterprises working under public sector in the district (Table 11.1). Both the units are located in Thiruvalla region at a distance around 30km from Pathanamthitta town.

Table 11.1 Public sector undertakings in Pathanamthitta *district*

Name of Enterprise	Product	Value of P&M (Rs in Crore)	Employees (Nos)
Travancore Chemicals & Sugars Ltd.	Beverages	135.00	68
Traco Cable Company Ltd.	Cable	300.00	120

Source: Industrial Potential Survey 2017-18, District Industries Centre Pathanamthitta

11.1.2 Prominent/Major Industries

More than 150 major units are working in the district in manufacturing / Services sector under various category of Granite, M.Sand, Ice Creams, Flavoured Chips, PVC tanks, Curcumin Powder, Solar Equipment, Flexo Printing etc.

11.1.3 Micro & Small Enterprises

Majority of the units in district falls under service and repairing activity. Considering the manufacturing sector, food and agro based units plays a major role in the industry. Table 11.2. Shows the type & details of industries in the district.

Table 11.2 Type of MSME in the Pathanamthitta district

Sl. no.	Type of industry	Number of units	Investment (lakh rs.)	Employment
1	Agro & Food based	1434	11760	9791
2	Soda water	163	1790	769
3	Ready-made garments & embroidery	1407	2567	6684
4	Wood/wooden based furniture	161	1548	819
5	Paper & Paper products	431	2022	1769
6	Leather based	79	102	472
7	Chemical/ Chemical based	392	2348	2344
8	Rubber, Plastic & petro based	316	2176	2049
9	Mineral based	726	7255	4288
10	Metal based (Steel Fab.)	339	1062	1339
11	Engineering units	1110	3233	4021
12	Electrical Machinery and transport equipment	149	424	538

Source: Industrial Potential Survey 2017-18, District Industries Centre Pathanamthitta

11.1.4 Traditional sectors in the District

Manufacturing of Aranmula Kannadi (15 km from Pathanmthitta Town) is another major industrial activity which availed Geographic Indication (GI Tag) by Government of India. Aranmula Kannadi' is a unique art which cannot be found else anywhere in the world. The making of the metal mirror is a long process. Some undisclosed metals are alloyed with copper and tin to cast the Aranmula Kannadi in typical clay moulds. The technique of production of this mirror is a closely guarded secret handed over from generation to generation of craftsmen. 22 households in the Aranmula Panchayath involved in this industrial activity. In Kadapra and

Parumala village of Pulikeezhu block, some families are engaged in bell metal crafts. Nowadays most of them are driven out from this area because of high cost of raw material.

11.1.5 Major Exports in the District

There are four major export enterprises in the district. Details are shown in Table 11.3. Major Exporting item in the district are Oleoresin, Spice Oil, Other Food Products, Fried Food Products, Etc. Growth Trend of the district are in the field of Construction, Food Processing, Light Engineering, Bakery Products, and Rubber Based Products. Potential industries for new MSMEs in the districts are in Food Processing, Construction, and Rubber Based products etc. Figure 11.1 shows the existing industrial base of Pathanamthitta district.

Table 11.3 Export enterprises in the district

Name of Enterprise	Location
Akay flavours & aromatics pvt Ltd	Elavumthitta, Pathanamthitta
Kanti floor furnishers	Kunnamthanam, Mallappally
Enjayes spices and chemical oils limited	spices hill, Vallicode Kottayam
Wynad Exports	Kozhencherry

Source: Industrial Potential Survey 2017-18, District Industries Centre Pathanamthitta

11.1.6 Service Industries

Kumbazha region in Pathanamthitta town was an automobile service hub for the entire district in the past decades. Kumbazha was famous for the lorry services. Lorry drivers who are carrying hill products and timbers depended this region as Kumbazha is the spatially nearest junction to eastern hilly region of the entire district. While some car mobile services are still operational in this area, the scope of these services has now shrunk. Figure11.2 shows existing industries in the town.

11.2 MSME and Large-Scale Industries

Major or medium type of industrial units are not functioning in the town and the industrial sector is limited to few industries in the category of MSME.

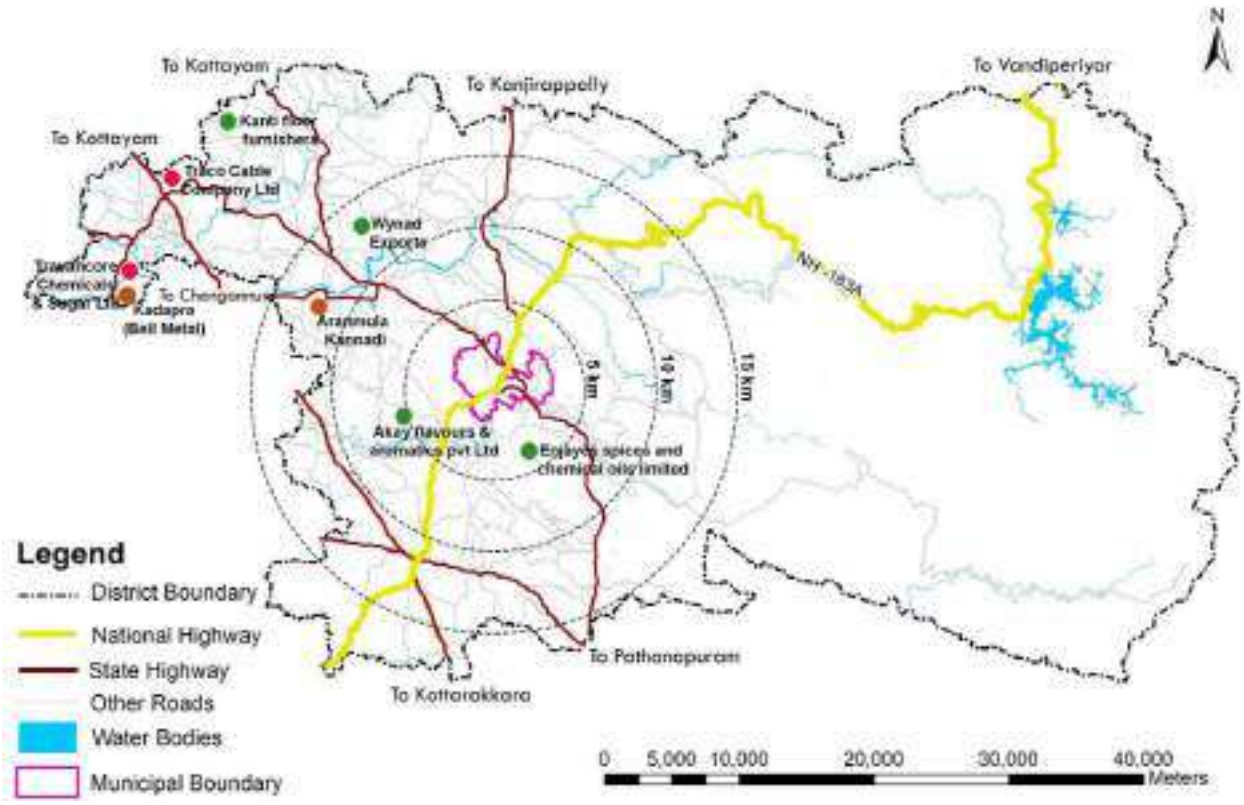


Figure 11.1 Spatial location of public undertakings, Export enterprises and traditional industries in district



Figure 11.2 Pictures of Industries in town (Service (Automobile), Manufacturing (Well ring, Ice Plant)

11.2.1 MSME units

The number of MSME units in the town according to the Industrial potential survey report 2017-18 by District Industries Centre is found to be 368 Nos. around 1700 workers are working under these MSME units. Out of 368 industrial units 55% of total units are in service sector and the remaining 45 % are in manufacturing sector. Out of the 164 manufacturing industries, 160 are micro industries and 4 are small industries. Similarly out of the 204 service industries, 200 are micro industries and 4 are small industries. General Engineering, Wood Industries, Cement Blocks, Software Development, food products, candles and Paper products are the units functioning in the manufacturing sector. Category wise distribution of industrial unit is shown in Figure 11.3.

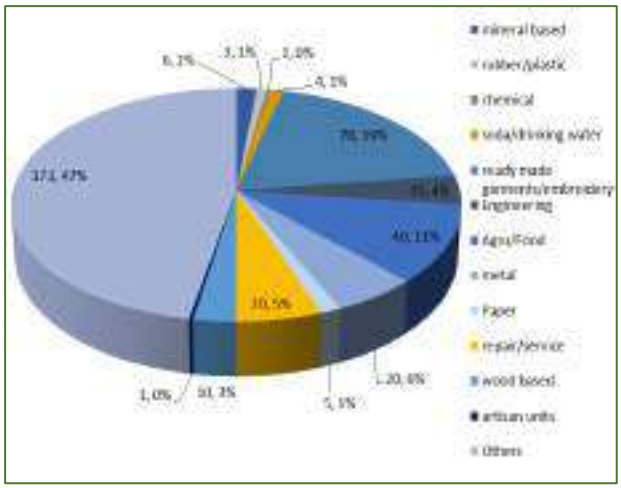


Figure 11.3 Category of industrial units in the town
Source: Socio Economic Survey

The industries in town include 70 readymade garments, 5 paper, 15 Engineering, 40 Food, 4 Soda/drinking water, 20 repair/service, 6 mineral, 20 metal, 10 wood, 3 plastic/rubber,1 chemical, 1 artisan and 176 other industries. Agro based units are very few in number even though the town have abundant agricultural resources. There is a total investment of 1500 lakhs in these 368 industrial units and they generate 1700 employment opportunities within the municipality. The breakup of units, investment and employment generated in each type of industry are shown in Figure 11.4.

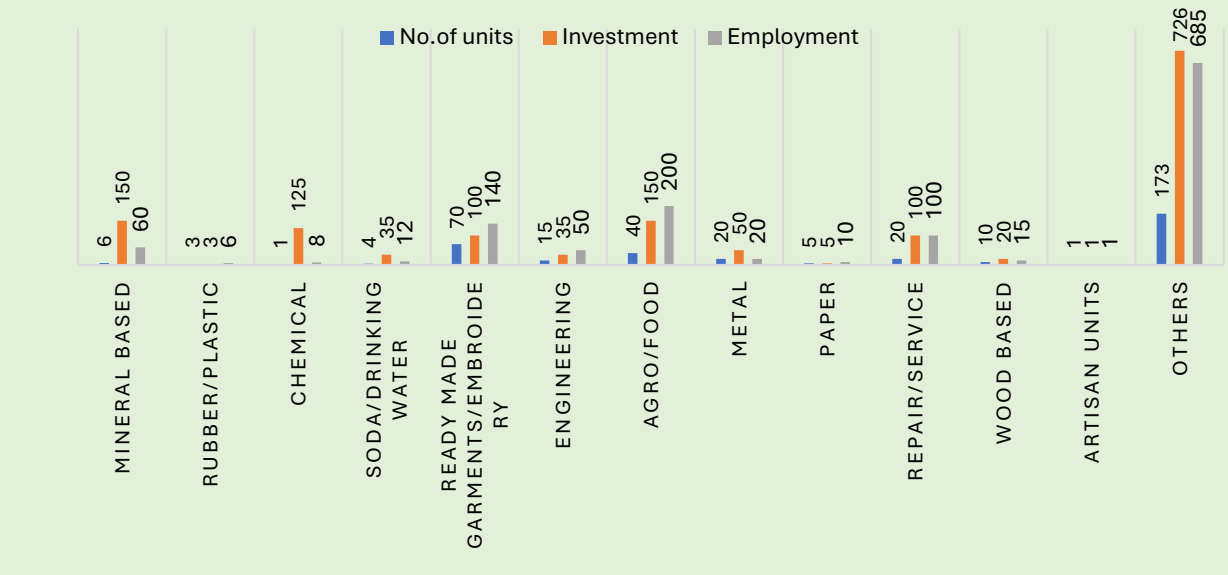


Figure 11.4 Number of units, Investment in lakhs and number of employments generated in each type of industry in the town

Source: Socio Economic Survey

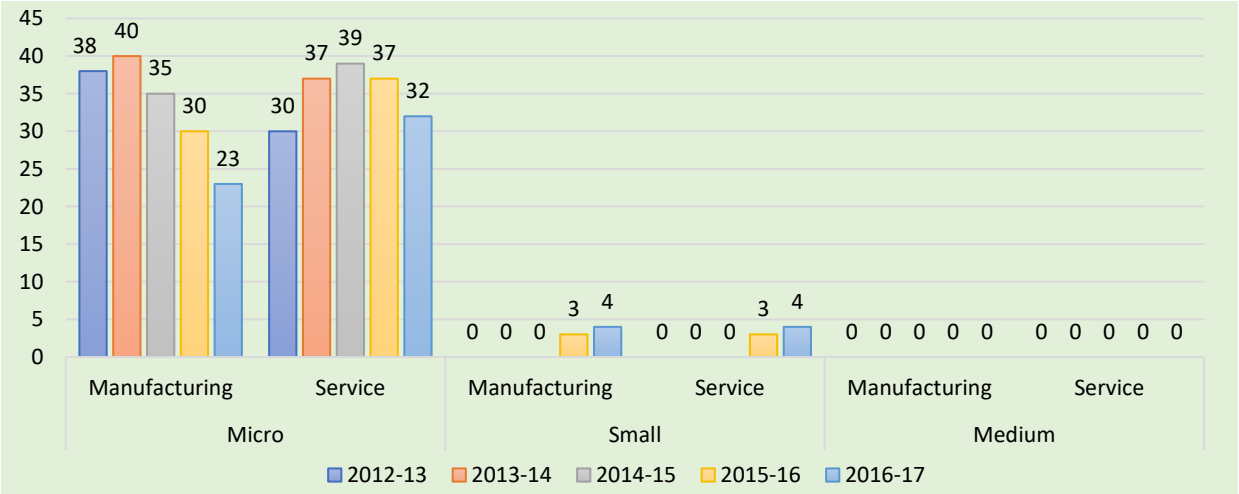


Figure 11.5 The year wise growth in number of units in MSME

Source: Socio Economic Survey

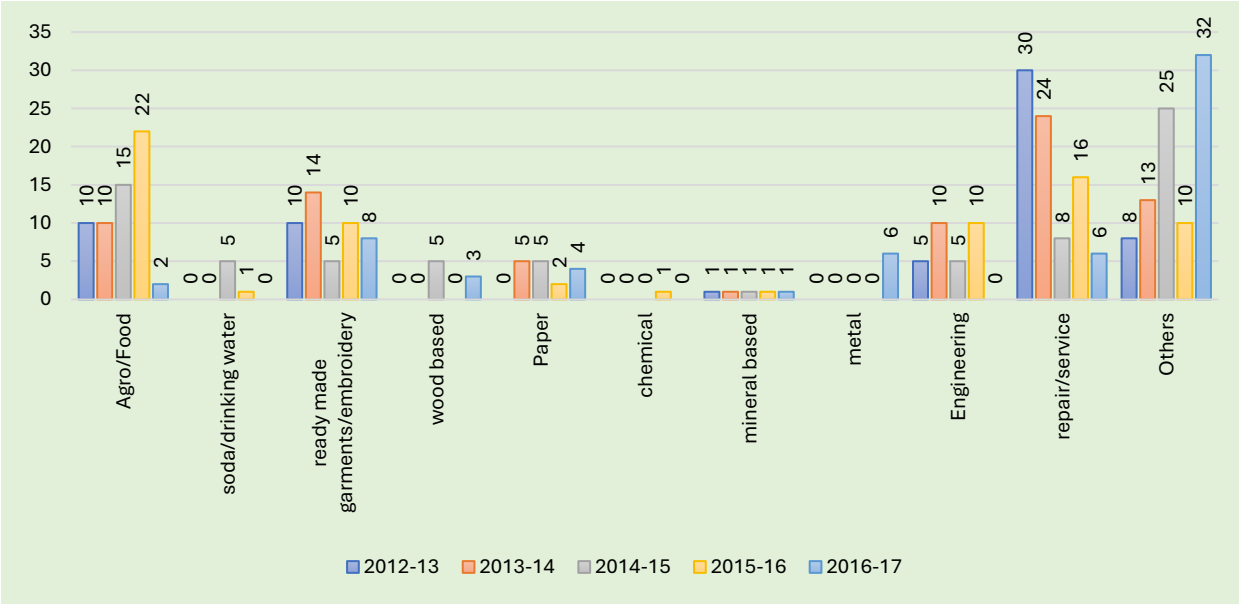


Figure 11.6 The sector wise growth in number of units in MSMEs in various years

Source: Socio Economic Survey

The year wise growth of MSME, from 2012-13 to 2016-17 is shown in Figure 11.5. The level of industrialization of the town is very low. Only micro industries show little growth and there is no growth in the case of small and medium type of industries. The sector wise growth of MSME s in various years is shown in Figure 11.6. Only agriculture/ food product, garments/embroidery units, repair/service industries recorded growth. None of the other sectors recorded considerable growth.

> കിഴക്കൻ മേഖലയിൽ വനത്തിൽ നിന്നുള്ള തടികൾ ഉപയോഗിച്ച് പ്ലൈവുഡ് നിർമ്മിക്കുവാൻ നിർമ്മാണ ശാലകൾ ഉണ്ടാകണം. *[There should be manufacturing plants in the eastern region to produce plywood using wood from the forest.]* - Public Opinion

11.2.2 Kudumbasree

Kudumbasree is providing entrepreneurial, marketing and management opportunities to poor women and thus making them self-dependent in financial terms through vegetable farming and selling/marketing of farm products. In Pathanamthitta district a total of 1864 Kudumbasree with 9109 members. 170 service activities and 378 manufacturing activities are taken place in all part of the district.

11.3 Industrial Estate/Parks

Industrial estate / parks are located in the Pathanamthitta district. But the town does not have any industrial estate /parks. The details are shown in the Table 11.4 & Figure 11.7

Table 11.4 Details of Industrial Park/Estate in District

Category	Location	Area in acres	No of units	Total Employment
DA/DPs and multi storied gala in the block	Kunnamthanam	20.93	82	457
Major industrial Estates (SIDCO)	Kunnamthanam	5	10	112
Mini industrial Estates (SIDCO	Pandalam	1	10	74
Mini industrial Estates (Co-operative series)	Mallapally	1	12	14
	Adoor	1	9	18
KINFRA/INKEL/ KSIDC/other industrial park	Elamannur, Adoor	80	26	226
	Kunnamthanam,	39.13	39	315

Source: Industrial Potential Survey 2017-18, District Industries Centre Pathanamthitta

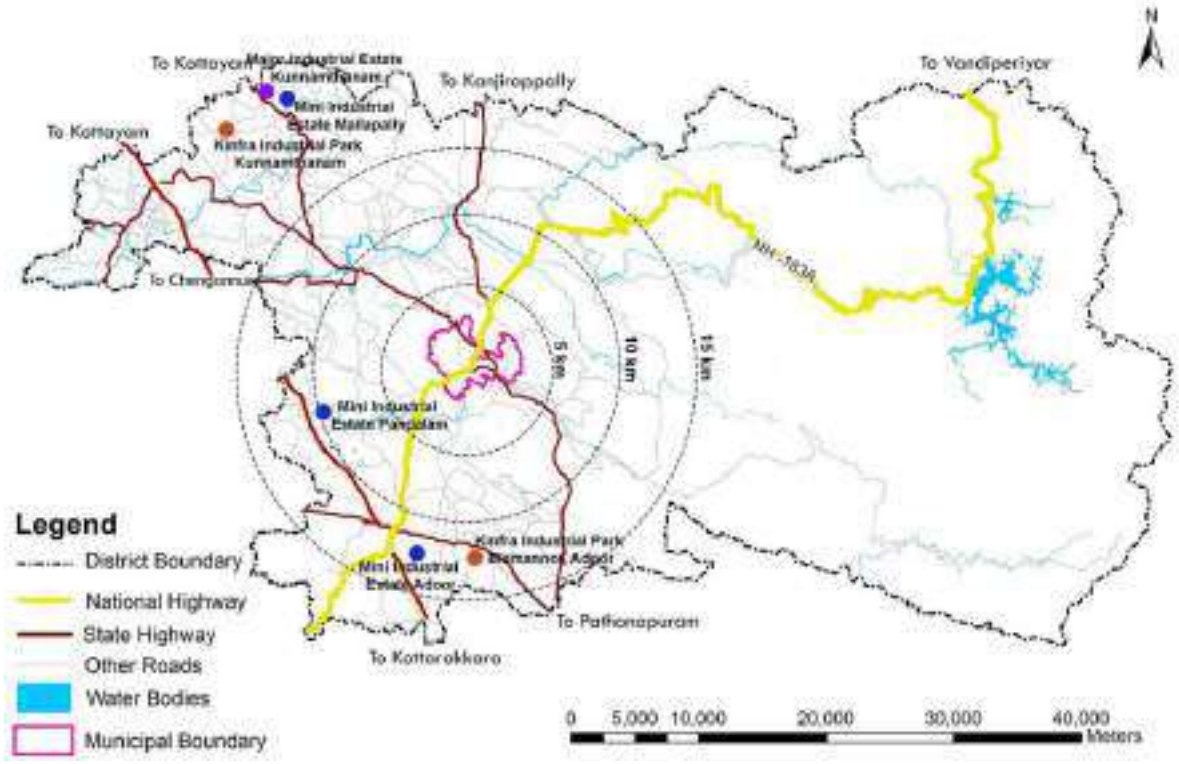


Figure 11.7 Spatial location of Industrial Parks and estates in district

> പത്തനംതിട്ട ജില്ലയിലെ പുളിക്കീഴ് പുളി, കല്ലുങ്കൽ ശർക്കര, ഇലന്തൂർ വാഴ, കൊടുമൺ റൈസ് പോലുള്ള പ്രസിദ്ധമായ കാർഷിക വിഭവങ്ങൾ സംഭരിച്ചു മൂല്യ വർധിത ഉൽപ്പന്നങ്ങൾ നിർമ്മിക്കുന്നതിനും ആയതിന്റെ സംഭരണ കേന്ദ്രങ്ങൾ, പ്രോസസ്സിംഗ് സെന്ററുകൾ, പാക്കിങ് കേന്ദ്രങ്ങൾ മുതലായവയ്ക്കായി നഗരസഭയിലെ ഗ്രാമീണ സ്വഭാവമുള്ള സ്ഥലങ്ങളിൽ ഒരു അഗ്രോ ഇൻഡസ്ട്രിയൽ പാർക്ക് വിഭാവനം ചെയ്യാവുന്നതാണ്. *[To stock up on famous agricultural resources like Pulikeezhu Tamarind, Kallungal Jaggery, Ilanthur Banana, and Koduman Rice in Pathanamthitta district and produce value-added products, an agro-industrial park can be envisaged in rural areas of the municipality for storage centers, processing centers, packing centers, etc.]* - Public Opinion

11.3.1 Concept of Earlier Master Plan

An industrial estate was proposed to the South Eastern part of the town in the published Development Plan for Pathanamthitta in1995. The proposal was for the year 2011. The concept adopted in the published Development Plan is "Industrial area has to be located in an area far away from the main residential areas and the location shall have necessary infrastructures at low cost. This can be best achieved by bringing in agglomeration economy by evolving an Industrial Estate concept. Provision of an industrial area is a primary need in the evolution of stable economic base for the town." This proposal is not achieved yet as master plan is only at published stage. (Figure 11.8).

11.4 Spatial Distribution

The MSME units are scattered in different part of the town. As per the land use analysis 3 hectares of land which constitute just 0.13 % of total town area is coming under industrial land use. There are 125 micro enterprises set up by Kudumbasree with in the town. Majority of them are food-based enterprises and about 3525 members are involved in them. There is only one handloom unit within the town. Prominent industries within the town are SSPU Foams, Myladumpara with 8 employees and Macro flex cable industry, Azhoor with 3 employees.

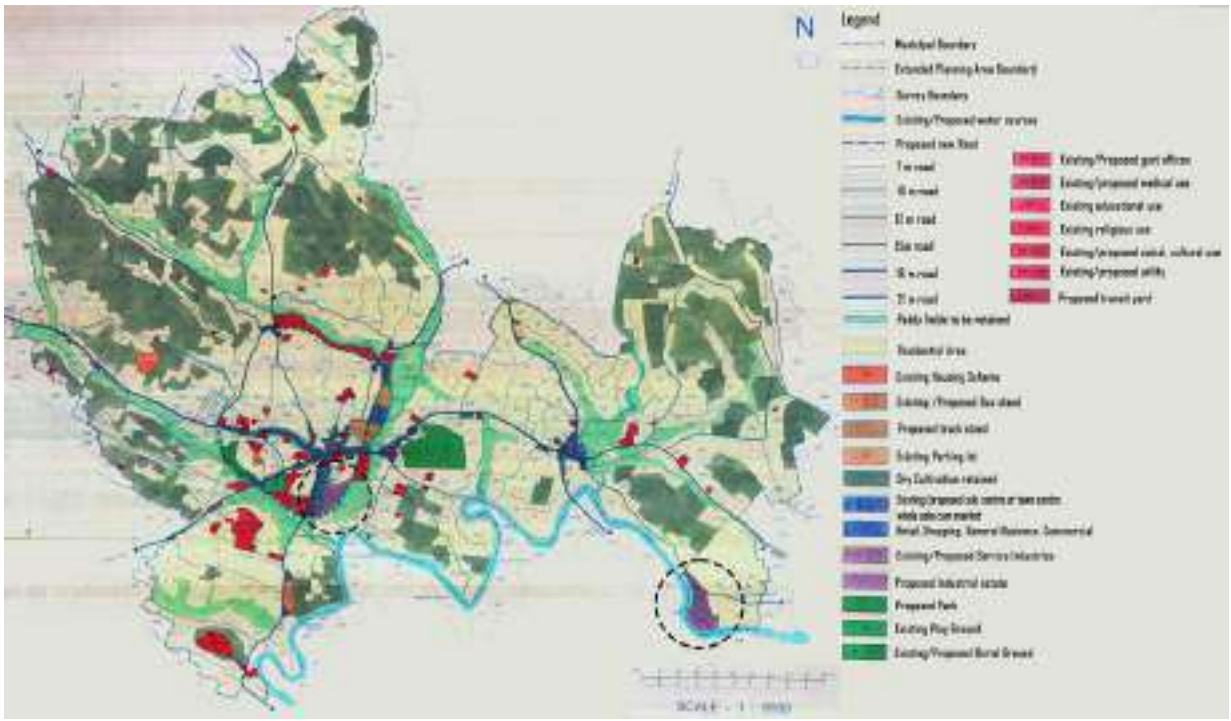


Figure 11.8 Proposed service industry and industrial estate in published development plan 1995, Pathanamthitta

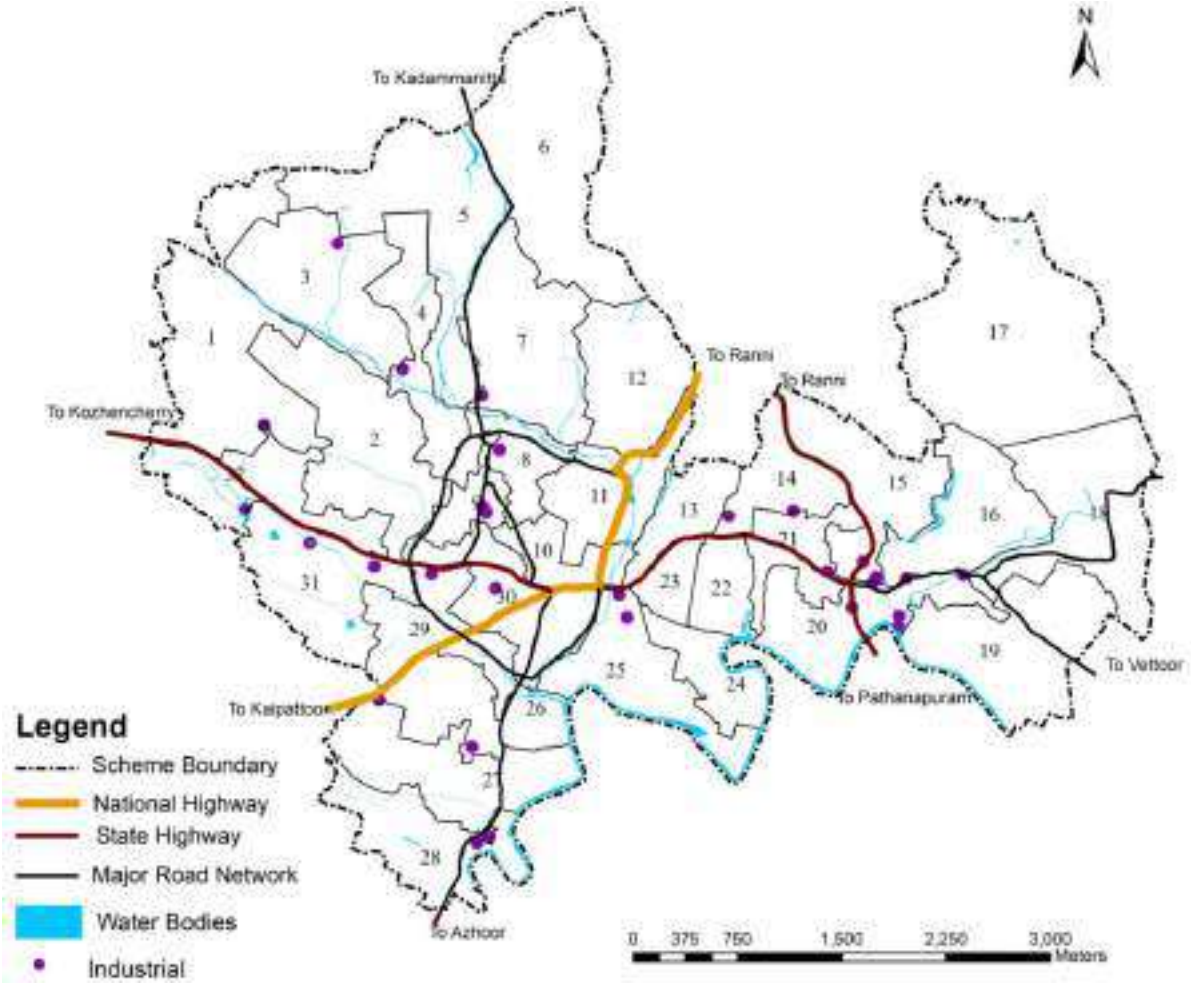


Figure 11.9 Location of industries in town

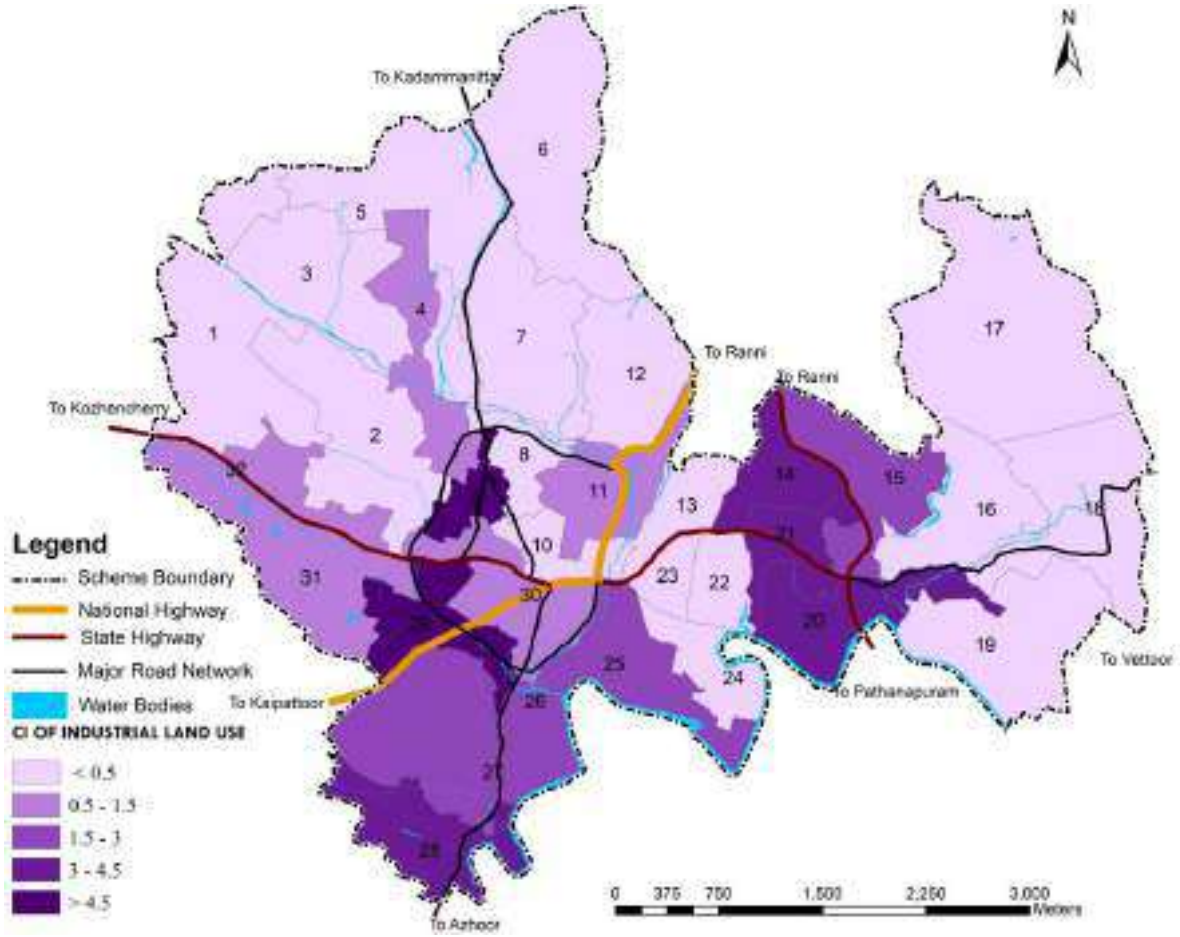


Figure 11.10 Ward wise concentration of industries in town

Saw mills, Concrete block & well ring production units, an Ice plant and automobile service centres are the other industries apart from household industries in the town. The concentration of industrial land use is maximum in Pattamkulam(9) and College (29) wards. Spatial location and ward wise concentration of industries are shown in Figure 11.9. & Figure 11.10 respectively.

11.4.1 Industrial Land availability

There is no land identified/ demarcated in the Pathanamthitta town by the industries department/ agencies for industrial development. 37 acres of land at Malyalappuzha Village and 57 acres of land at Perunad Village are identified. Similarly identified land availability in the district by agencies are shown in the Table 11.5.

Table 11.5 Land identified for future industrial development of district

Agency	Name of Block, Grama Panchayath/ Municipality	Extent of Land	Type of Land (wet/ dry)
DIC	Adoor Municipality	98.5 are	Dry
	Pulikkezhu, Kadapra Village	1 Acre	Dry
KINFRA	Nil		
INKEL	Nil		
SIDCO	Nil		
KSIDC	Nil		
Private party	Nil		
Other Agencies (KVIB)	Ranni- Perunad and Omallur	2 acres each	dry

Source: Industrial Potential Survey 2017-18, District Industries Centre Pathanamthitta

The Industrial promotion agencies like KINFRA, INKEL, SIDCO, KSIDC have not identified any land for future industrial development in the district. But land with industrial potential is available in the town.

> പുനലൂർ മൂവാറ്റുപുഴ സ്റ്റേറ്റ് ഹൈവേക്ക് ചേർന്ന് ഇൻഡസ്ട്രിയൽ സോൺ നിർമ്മിക്കുക. *[Propose an industrial zone along the Punalur - Muvattupuzha State Highway.]* - Public Opinion

11.5 Impact of Hazard & Climate Change

The Vulnerability of MSMEs in the town is determined spatially and structurally. Compared to major industries, MSMEs are more vulnerable to natural hazards due to gap in resources, knowledge, planning and experience. MSMEs also have additional constraints such as informal operations which keeps them out of disaster risk management strategies like insurance, lack of ability to diversify their supply and customer base, lack of compliance with norms and regulations thus increasing disaster risk, lack of social protection for their employees and so on.

Disasters affect MSMEs' operations because of the resultant supply and demand constraints and may also result in huge financial burdens through resources spent for physical reconstruction, and loss of business continuity through loss of inventory, etc. All these factors increases the vulnerability of MSMEs, especially in post-disaster situations.

Impact of hazard on infrastructure, business continuity, employee health and safety are the vulnerable part of MSMEs. The industries distributed in both flood and landslide probable areas were identified and analysed.

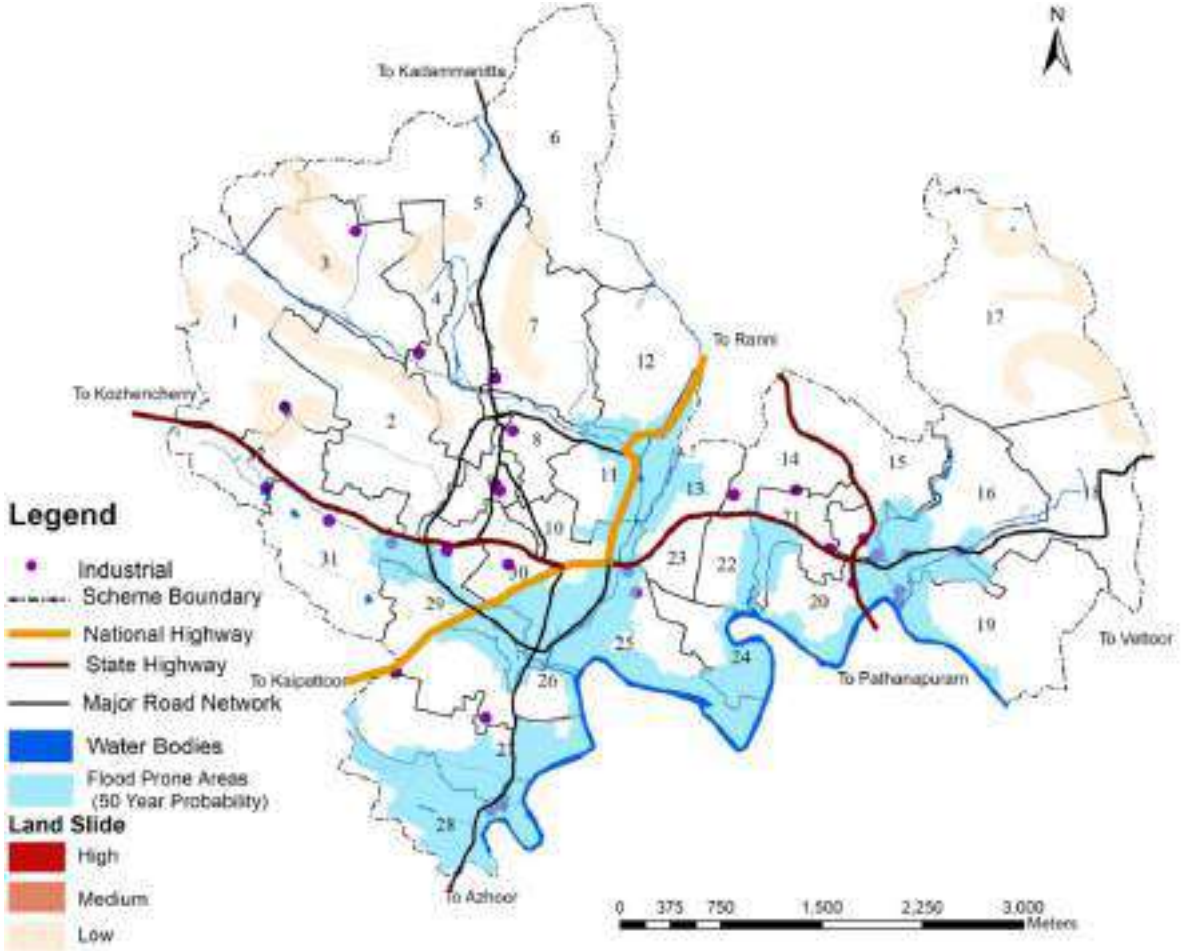


Figure 11.11 Industries in hazard prone areas

The aim is to understand the types and number of industries coming under the hazard areas and identifying mitigation measures spatially and structurally. Hazard zonation of existing industries of town is analysed by overlying the spatial distribution of industries with flood and landslide probability map published by KSDMA. (Figure 11.11). Since the majority of industries are located in the low lying area, flood is the major hazard affecting the industrial sector. The number of landslide affecting existing household industries are very few in the town as majority of them are located in non-hazard areas. As water intensive industries, one ice plant is working in the town. But drought is not that much affecting the production as it is situated in the bank of River Achankoil. As majority of the industries are MSME and household, number of industries insured against the hazard is very low. The detailed analysis of economic zone areas in the flood and landslide prone areas of the town has been incorporated in risk assessment section of chapter 4.

11.6 Problems & Potentials

There is no large scale industry presently functioning in the planning area or in the immediate surrounding area. There is no land under industries department in the town. There are no industrial estates /SIDCO/ Kinfra/ Inkel/ Ksidc/ startups/ Incubation centres/ others in the town. The major hurdle faced by the industrial sector is the non-availability of infrastructure for industrial purposes at reasonable rates, lack of skilled labours and absence of standardization and marketing infrastructure. Lack of raw materials, decline in Traditional industries, and lack of availability of infrastructure are also major threats. Even though lot of funds from financial institutions are available for starting industries, there is little scope for infrastructure like Development Area (DA) /Development Plot(DP) / Mini Industrial Estate(MIE) facilities. Major portion of the municipality is coming under residential area and marshy areas which are hindrances for starting new units. Migration of educated youth is another problem.

There are a large number of commercial banks in both private and public sector with huge amount of deposits in the town. NRI/NRK population is very high in this area. Literacy rate is also very high. There are highly educated youth with IT and other engineering qualifications. Availability of fruits, industrial wood, minerals like granite, M sand etc are abundantly available from the adjoining areas. The border areas of the town, being low-density regions, are suitable for establishing mini industrial estates. Since the town has been declared a plastic-free zone, there is significant potential for setting up paper cup, plate, and bag manufacturing units, as well as cloth bag production units. Utilizing the neighbourhood unit like Kudumbasree, there is ample scope for starting nano household units in sectors like tailoring, food processing etc.

Even though in this area there is no tourist or pilgrim places, it is a hub of both tourism and pilgrim centres and beneficial for starting hospitality and service units. Acquiring suitable land for industrial purpose is essential for growth of industrial sector. Although land is available in the town, some areas remain unused due to topographical constraints. These lands can be strategically utilized for developing industrial units. Additionally, there is significant potential for exporting units, as a major share of the population consists of NRIs, creating demand for locally produced goods in international markets.

11.7 Inference

The level of industrialization of Pathanamthitta district and town are very low. In Pathanamthitta municipality, service sector enterprises are fast growing comparing to manufacturing units. The

scope for starting medium and large-scale industries is high as land is available in the town. Acquiring of these land for industrial purpose is essential for growth of industrial sectors. It is advisable to promote service enterprises by incorporating them into the Entrepreneur Support Scheme. Kerala Governments new Industrial Policy 2023 has identified 22 priority sectors for the growth of industrial sectors in Kerala. Priority sectors like Food Technologies, High Value-Added Rubber Products, High-tech Farming and Value-Added Plantation Produce, Recycling & Waste Management, Renewable Energy and Tourism & Hospitality have potentials in the town. Surrounding local markets can be interlinked with new industrial units from where local products can be exported to foreign countries which becomes fruitful since major share from the town itself are NRIs. Land availability, huge floating population of Sabarimala pilgrims, Greenfield Highway connecting the town to Vizhinjam port and new Sabari Airport at Erumeli are all favouring export/movement of industrial products in town.



12. TOURISM, HERITAGE & AESTHETICS

This chapter on Tourism, Heritage and Aesthetics of the Town in the Master Plan report explores the critical interplay between a town's historical legacy, its tourism potential, and its visual appeal. Tourism creates jobs, stimulates local businesses (hotels, restaurants, shops), and can drive infrastructure development. A well-preserved heritage offers the town a unique identity that locals can take pride in. This heritage often becomes a focal point for both residents and visitors. A town's aesthetics like its visual appeal, urban design, natural beauty, and overall atmosphere also significantly affects its attraction

By preserving the unique heritage, enhancing tourism infrastructure, and improving aesthetic elements, this chapter aims to understand the problems and potentials of town's tourism sector of town and creating an attractive environment for both residents and visitors.

Contents

1 Places of Tourist Interest

2 Present Scenario

3 Tourism Infrastructure

4 Potential Areas in the Town

5 Impact of Hazard & Climate Change

6 Heritage

7 Aesthetics

8 Problems & Potentials

9 Inference

12.1 Places of Tourist Interest

Pathanamthitta district has a rich cultural tradition. The district of Pathanamthitta is hailed as the headquarters of pilgrim worship in Kerala. A hilly province with three rivers course through its prosperous terrains, comprising the natural divisions of the lowlands, the midlands, and the highlands. Interspersed with temples, rivers, mountain ranges, and coconut groves, more than fifty percent of the total area of this region is covered by forests. Pathanamthitta has been dubbed as a Heritage Village as it attracts visitors from all over the world for its spectacular water fiestas, religious shrines, and cultural centers. It is also home to the unique Aranmula Kannadi—metal mirrors that are meticulously handcrafted—and the Vasthu Vidya Gurukulam, a village that practices the ancient Indian school of architecture. (Kerala tourism.org)

The Pathanamthitta region is rich in various types of tourism such as Pilgrim tourism, Eco tourism, Heritage tourism, etc.

12.1.1 Pilgrim Tourism

Pilgrim tourism combines religious devotion with travel, offering both spiritual enrichment and cultural exploration.

12.1.1.1 Sabarimala

Sabarimala temple is located 64 km from Pathanamthitta town at the Periyar Tiger Reserve in the Western Ghat mountain ranges of Pathanamthitta District, Perunad Grama Panchayat.





Figure 12.1 Sabarimala Temple

Source: website-keralatourism.org

It is one of the largest annual pilgrimages in the world, with an estimated 1 million devotees visiting every year. The temple is situated on a hilltop at an altitude of 468 m (1,535 ft) above mean sea level, and is surrounded by mountains and dense forests. The dense forest, (Periyar Tiger Reserve), around the temple is known as Poomkavanam.

12.1.1.2 Aranmula Parthasarathy Temple

Aranmula Parthasarathy temple dedicated to Sri Krishna on the bank of Holy River Pampa located 15km from Pathanamthitta attracts large crowds of devotees. The temple has more than 1000 years age. The idol here is 'Chathurbahu'. It is believed that Arjuna himself has installed this idol here. Temple structure consist of beautiful architectural work.



Figure 12.2 Aranmula Parthasarthy temple

Source: website-keralatourism.org

12.1.1.3 Parumala Church

The Ormaperunnal (commemoration day) of Mar Gregorios Metropolitan, the declared saint of Malankara Orthodox Church at Parumala in Pathanamthitta District, is celebrated on the 1st

and 2nd of November. The mortal remains of the Bishop are interred in the church. Lakhs of pilgrims flock here to ask favours of the saint at this 2000 year-old church believed to be one of the oldest in India.



Figure 12.3 Parumala Church
Source: website-keralatourism.org

12.1.1.4 Maramon Convention and Church

Situated near Kozhencherry, Maramon is the venue of a mammoth religious convention of Christians from all over the world. It is attended by people from all communities. The convention which is usually held in February is addressed by religious thinkers and Christian scholars from across the world. This is perhaps the largest Christian convention in Asia.



Figure 12.4 Maramon Convention and Church
Source: website-keralatourism.org

12.1.1.5 Malayalapuzha Bhagavathy temple

Malayalapuzha Bhagavathy temple, located 8 km from Pathanamthitta, is a famous pilgrim centre. It is believed that the temple was built more than 1000 years ago. The main idol is 5.5 feet high, made from katusarkarayogam. The goddess at the Bhagavathy Temple here is believed to grant boons to devotees and help them realise dreams. The temple has beautiful wall paintings and artistic stone carvings.



Figure 12.5 Malayalapuzha Bhagavathy Temple
Source: website-keralatourism.org

12.1.1.6 Niranam Church

Situated 37 km from Pathanamthitta town, this famous church is believed to be among one of the seven-and-a-half churches originally established by St. Thomas (52 AD) in Kerala. This church displays a marked influence of ancient temple architecture and is a renowned centre of worship for the Christian community. The St. Thomas art gallery here is another major attraction. Niranam is also the birth place of the poets and social reformers popularly known as the Karnassa Kavikal.



Figure 12.6 Niranam Church
Source: website-keralatourism.org

12.1.1.7 Pathanamthitta Mosque

Pathanamthitta Muslim Jamaath located near Central Junction of Pathanamthitta town is believed to be constructed 300 years back. It was a granite structure at the beginning but because of the lack of space for prayer, it has been reconstructed twice. The Chandanakudam festival conducted in this mosque is very famous.



Figure 12.7 Pathanamthitta Mosque
Source: website-keralatourism.org

12.1.1.8 Nilakkal Church

Nilackal is a forest, almost 52 kilometres east to Ranni and near Sabarimala. It was a mountain route of trade between Kerala and Tamil Nadu. Saint Thomas came over here and baptised 1100 people. Saint Thomas who was an apostle of Jesus Christ established seven and half churches in India and was called as Seven and Half Churches or Ezharappallikal. One of these churches is the St.Thomas Ecumenical Church at Nilackal. This church is an example of the unity of the Christian churches and also of the communal harmony.



Figure 12.8 Nilakkal Church
Source: website-keralatourism.org

12.1.1.9 Sreevallabha Temple,Thiruvalla

This is an ancient temple, enshrining Sree Vallabha at Tiruvalla. It has been glorified by the tamil hymns of Tirumangaialwar and Nammalwar of the 1st millennium CE. The shrine has a vritta (circular) vimanam. Carvings of Dakshinamurthy and Shiva - Yogiswara are seen in this temple. In front of the sanctum are a namaskaramandapam, a mukhamandapam a gopuradwaram and an agramandapam. There is a subshrine to Vishwaksena, in the north east corner of the inner prakaram, facing south.



Figure 12.9 Sreevallabha Temple
Source: website-keralatourism.org

12.1.1.10 Manjinikkara Dayara Church, Omallur

Located at Omallur in Pathanamthitta, ManjinikkaraDayara Church is a famous pilgrimage centre. It is here the mortal remains of Mar Ignatius Elias III, the Holy Patriarch of Anthioch, are kept. The important festival of the church is held in February every year. A large number of pilgrims visit the church to receive spiritual blessings.

12.1.2 Eco Tourism

Pathanamthitta is blessed with lot of water bodies and waterfalls also very good for water related tourism. Its high contours helps in various types of adventures tourism related with leisure tourism. High percentage of forest area helps in creating a very good atmosphere and the air quality also helps in attracting the tourists for a clam and fresh tour program.

12.1.2.1 Gavi

Gavi is a village spread across the beauty of Periyar Tiger Reserve. It is a quiet, beautiful and pristine forest haven. It is at the eastern extreme of the Pathanamthitta District at 3400 ft above MSL. These evergreen forests are abundant with magnificent Wildlife including the tiger, elephants, leopards, bears, Indian gaur, sambar, barking & Mouse deers, lion tailed macaque, other varieties of Kumarakom-bird Sanctuary monkeys, Nilgiri Marten and a lot more.



Figure 12.10 Gavi

Source: website-keralatourism.org

12.1.2.2 Perunthenaruvi

The waterfalls in Pampa river at Perunthenaruvi in Vechoochira Grama Panchayat, 36km from Pathanamthitta town attract thousands of people from inside and outside of the district. This is a natural beautiful waterfall and an ideal place for tourist attraction. It is one of the most beautiful, wild and adventures (dangerous too) water falls. The wild sounds of water falls surely scares, the same time chilling too. Visit in summer season can help in seeing lot of different types of beautiful marks in rocks like foot, chariot like etc. and some stories also related to this. This area is very good for trucking. And it is very beautiful site of film location too.



Figure 12.11 Perunthenaruvi

Source: website-keralatourism.org

12.1.2.3 Kakki

Kakki Reservoir, set in sylvan background, is a tourist delight. The splendid artificial lake offers a pleasure boating experience. The surrounding forests abut in Tigers, Elephants, Deer and Monkeys. The dams were built in 1966 as part of the Sabarigiri Hydroelectric project. The splendid artificial lake offers a pleasure boating experience. The surrounding forests abuts in Tigers, Elephants, Deer and Monkeys.



Figure 12.12 Kakki dam

Source: website-keralatourism.org

12.1.2.4 Orakkanppara Waterfalls

At a distance of 29 Kms from Pathanamthitta town, Orakkampara Waterfalls is a cute waterfall located in Kottangal Panchayat. This is an unexplored waterfall located in thick forest. This little waterfall is a nice place to spend few hours. It demands little trekking from the road. Kottangal is connected by few buses from Mallappally (which is 32 Kms from Pathanamthitta via Kozhenchery and Eraviperoor).



Figure 12.13 Orakkanppara Waterfalls

Source: website-keralatourism.org

12.1.2.5 Kattathippara

Drive towards the destination itself is very interesting. A perfect place to visit for one day and to enjoy nature. It is situated near to Konni reserve forest so the provision of animal watching is also an important feature of Kattathippara



Figure 12.14 Kattathippara
Source: website-keralatourism.org

12.1.2.6 Cherukolpuzha Convention

Cherukolpuzha convention is an important religious convention of the Hindus held at Cherukole on the sand banks of the Pamba, usually in February every year.



Figure 12.15 Cherukolpuzha Convention
Source: website-keralatourism.org

These regional tourism spots (Figure 12.16) benefiting Pathanamthitta town in numerous ways, impacting the local economy, culture, infrastructure, and overall community well-being.

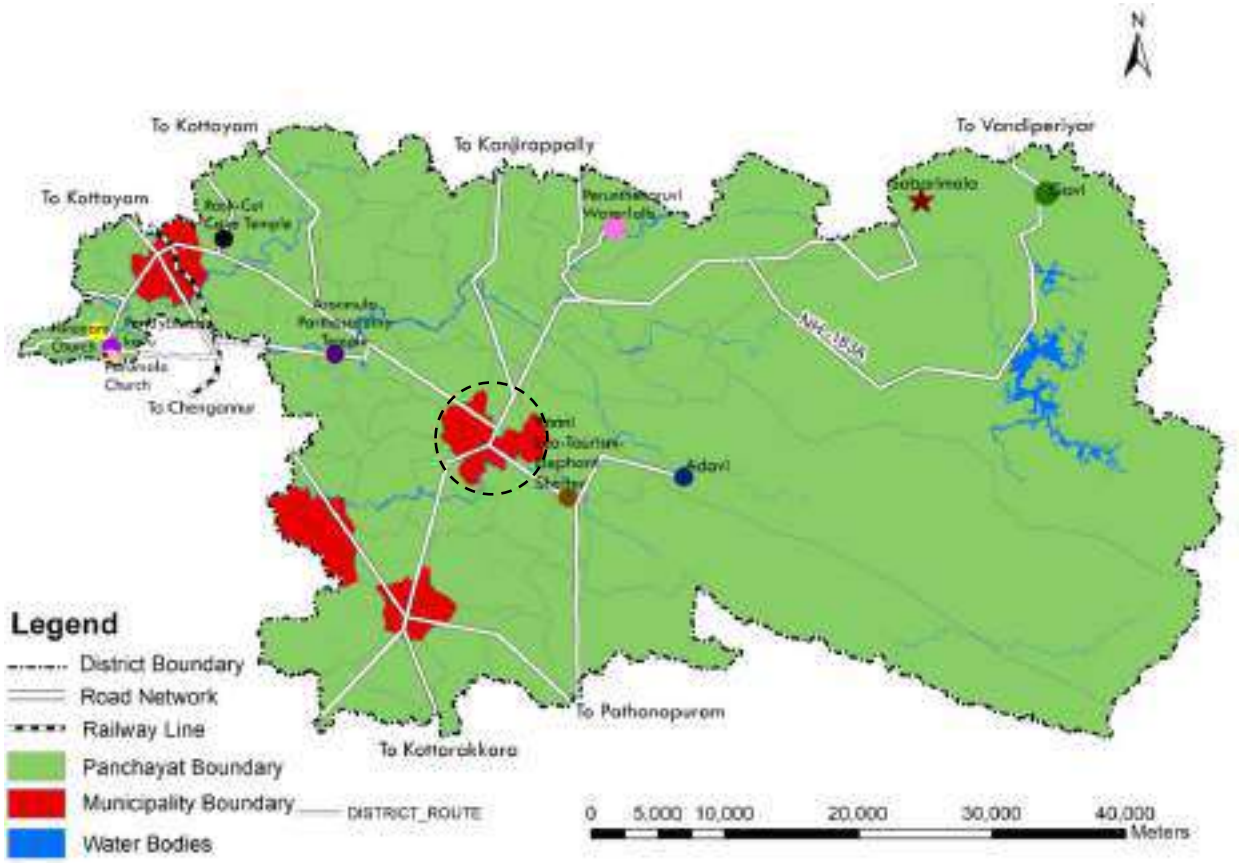


Figure 12.16 Regional level tourism spots and location of Pathanamthitta town

12.2 Present scenario

Currently no tourism activities are properly established in town with infrastructures.

12.2.1 Existing tourist circuits

Pathanamthitta district offers diverse tourism circuits:

Pilgrim Tourism

1. Sabarimala
2. Aranmula Parthasarathy Temple
3. Kaviyoor Mahadeva Temple
4. Malayalappuzha Devi Temple
5. Thiruvalla Sree Vallabha Temple

Eco-Tourism:

1. Gavi Eco-Tourism
2. Konni Forest Reserve
3. Perunthenaruvi Waterfall
4. Adavi Eco TourismCharalkunnu Hills

Heritage Tourism

1. Aranmula
2. Pandalam Palace
3. Kadammanitta Padayani Gramam
    1. Kaviyoor Rock-Cut Temples
2. Mannadi Smarakam
3. Muloor Smarakom (Muloor memorial)

12.2.2 Number of tourists

Tourist statistics in the districts of Kerala is shown in Table 12.1. Pathanamthitta holds last position in case of domestic tourist arrival and last position in case of foreign tourist arrival among the other districts in Kerala. South Kerala tourism contributes 46.16% of the Kerala tourism sector while Pathanamthitta contributes only 1.2% which is comparatively very low comparing to Thiruvananthapuram, Alappuzha and Kollam. The general trend of tourist arrival has reduced in 2018 due to the Mega flood in Kerala. Even though the share of Pathanamthitta in Kerala Tourism is very less, the number of tourists are increasing year by year. Even though there are a large number of tourist destinations in Pathanamthitta district, most of them remain unexplored.

Table 12.1 District wise ranking of Tourist arrival 2018

Domestic			Foreign			Total		
RANK	Districts	No. of Tourist	RANK	Districts	No. of Tourist	RANK	Districts	No. of Tourist
1	ERNAKULAM	2384652	1	ERNAKULAM	347987	1	ERNAKULAM	2732539
2	TRIVANDRAM	2018136	2	TRIVANDRAM	249731	2	TRIVANDRAM	2267867
3	THRISSUR	1866712	3	ALAPPUZHA	67935	3	THRISSUR	1874966
4	IDUKKI	856295	4	IDUKKI	31987	4	IDUKKI	888282
5	KOZHIKODE	779395	5	KOTTAYAM	26668	5	KOZHIKODE	791535
6	WAYANAD	643722	6	MALAPPURAM	13506	6	WAYANAD	652124
7	KANNUR	571986	7	KOZHIKODE	12140	7	KANNUR	575548
8	MALAPPURAM	415409	8	WAYANAD	6402	8	ALAPPUZHA	429268
9	KOTTAYAM	387847	9	THRISSUR	6243	9	MALAPPURAM	428915
10	PALAKKAD	382007	10	KOLLAM	6415	10	KOTTAYAM	414515
11	ALAPPUZHA	361333	11	KANNUR	3562	11	PALAKKAD	383471
12	KOLLAM	300144	12	KASARAGOD	2633	12	KOLLAM	306559
13	KASARAGOD	207334	13	PALAKKAD	1464	13	KASARAGOD	209967
14	PATHANAMTHITTA	143978	14	PATHANAMTHITTA	1445	14	PATHANAMTHITTA	145423
Total Arrival		11318850	Total 2018		782118	Total 2018		12100968

Source: Tourist Statistics 2018

> പത്തനംതിട്ട ജില്ലയിലെ ടൂറിസം സാധ്യതകളുള്ള സ്ഥലങ്ങൾ ബന്ധിപ്പിച്ചുകൊണ്ട് ഒരു ടൂറിസം നെറ്റ്‌വർക്ക് രൂപകൽപ്പന ചെയ്യുക ടൂറിസ്റ്റ് ഇൻഫർമേഷൻ സെന്ററുകൾ,LED ബോർഡുകൾ,സോഷ്യൽ മീഡിയ വഴി പ്രചരിപ്പിക്കുക. പ്രസിദ്ധമായ സ്ഥലങ്ങളോടൊപ്പം ടൂറിസം സാധ്യതകളുള്ള ശ്രദ്ധിക്കപ്പടാത്ത സ്ഥലങ്ങളും നെറ്റ്വർക്കിൽ ചേർത്ത് പ്രസിദ്ധമാക്കുക *[Design a tourism network connecting places with tourism potential in Pathanamthitta district and promote it through tourist information centers, LED boards, and social media. Along with famous places, add and publicize lesser-known places with tourism potential.]* - Public Opinion

12.3 Tourism Infrastructure

Homestays, Serviced Villas, DTPC sathram complex, PWD Rest houses and Government Rest houses are the major tourist accomodation facilities available in Pathanamthitta district. Tourist Fecilitation Centre near Panchayat Stadium Kozhencherry, Tourism Information Centre at Collectorate Pathanamthitta, Devaswom Information Centre Pamba, Devaswom Guest House Sabarimala and Devaswom Information Centre Sabarimala are the tourism information centres in the district. Pathanamthitta town has no tourism activities and supporting infrastructure such as:

1. Accommodation: only have limited hotels, guesthouses, or homestays.
2. Transportation: road is the only mode of transportation. No rail, Airways or waterways.
3. Tourist Amenities: Insufficient public amenities such as visitor centers, signage, restaurants, or information booths.
4. No Nightlife activities and supporting areas.

12.4 Potential Areas in Town

Following are the potential spots identified in the town for future tourism activities.

12.4.1 Chuttippara

Chuttippara is a cluster of three hills, standing at an impressive height of 200 feet, situated in the central area of Pathanamthitta town (1.1 km from Pathanamthitta KSRTC depot) and the entire town can be seen from the top of the rock. This mountain is renowned for its natural beauty and act as natural identity of Pathanamthitta town.



Figure 12.17 View of Chuttippara

There is a small temple enveloped by lush vegetation and provides a breath taking panoramic vista of Pathanamthitta town. The hills surrounding Chuttippara, namely Chelavirichapara, Kattadippara and Pulippara are intimately linked to the epic of Lord Rama. The finest viewpoint to behold Chelavirichapara is from Kattadippara.

Potentials

- Developing a rope way tourism connecting Chuttippara and Kottappara
- Scope for hiking and souvenir shopping (handicrafts, artwork, and memorabilia related to the Ramayana, Lord Ayyappa) market by collaborating with local community.

- Beautiful panoramic view of the nearby town area and natural beauty of the location can attract tourist who are interested in photography and sightseeing , especially night view from the hill point.

Weakness

- Poor road accessibility to the area
- No Parking facilities

“

പത്തനംതിട്ടയുടെ മുഖച്ഛായയായ ചുട്ടിപ്പാറയുടെ ടൂറിസം സാധ്യതകൾ പരമാവധി കണ്ടെത്തി നഗരസഭയുടെ വരുമാനം വർധിപ്പിക്കുകയും കേരളത്തിലെ തന്നെ പ്രധാന വിനോദ സഞ്ചാര കേന്ദ്രമാക്കി മാറ്റുകയും ചെയ്യണം *[The tourism potential of Chuttippara, the face of Pathanamthitta, should be maximized to increase the income of the municipality and make it a major tourist destination in Kerala.]*
- Public Opinion

12.4.2 Valamchuzhi Temple Area and Nadappalam.

Valamchuzy temple is known to be one of the oldest temples in Kerala and was built over 2000 years ago, and is located three kilometres from Pathanamthitta town. The Achchankovil River flows around the temple. The fact that the river flows around the temple on three sides is the reason why the temple is called Valamchuzhi. This is also the only temple in South India where a river circumambulate. It is also the only place where you can see the opposite flow of the same river. Since the river has been flowing around the temple since ancient times, many parts of the temple have been washed away. The temple is now protected from floods and other disasters. This place was once a forest. There is also a serpent temple located near the temple. Padayani, celebrated in the Malayalam calendar month of Meenam, is observed with deep devotion and enthusiasm. Valamchuzhi nadappalam was constructed in 2013 for the accessibility towards the temple. The bridge provides a beautiful view of the Achankovil river and the temple area.



Figure 12.18 Valamchuzhi Temple, and its cultural events and Nadappalam

Potentials

- Its age, historical significance, and unique location surrounded by the Achankovil River gives a scope for promoting the temple area as a significant pilgrimage destination for developing religious and spiritual tourism sector, by encouraging tourists interested in religious and spiritual experiences to visit and participate in the temple's rituals and festivals.

- Traditional Kerala architecture and the rituals performed during festivals like Rudrapongala and Padayani have potential to promoting cultural tourism.
- The Nadappalam (Bridge) portion have the potential to be used as a sight-seeing spot for the visitors, since it gives a beautiful view of Achankovil river and picturesque view to Valanchuzhi Devi Temple on the opposite island like formation

Weakness

- Flood prone area

12.4.3 Valamchuzhi River Front

The calm and peaceful river front of the valanchuzhi river situated in ward 20 , 22 and 24 have the capability to be developed for tourism activities due to its proximity and accessibility from nearby town areas.



Figure 12.19 Valamchuzhi river front area and location

Potentials

- The almost 2 km river stretch with multiple entry points have the potential to develop as an eco-tourism spot by starting tourism activities like Bowl boat riding through
- Scope for Swimming training programmes
- The calm and nature friendly environment can provide the visitors a space to relax and do nature based recreational activities
- Fishing spot development
- Scope for water sport programs
- Leisure tourism

Weakness

- Flood prone area

12.4.4 Mannaramala Viewpoint

Mannaramala hill point is located near the Mannaramala Devi temple at the western boundary of the Pathanamthitta town. The road access to this area is difficult due to narrow road width. The hilly area gives a beautiful panoramic view of Pathanamthitta, Kadammanitta and Kozhenchery areas. During the monsoon season, the hill is enveloped in lush greenery, and waterfalls cascade down, creating a breathtaking natural spectacle. Mannaramala is a very remote and one of the highest points in the town. The natural beauty and calmness of the area can be used for following tourism activities.



Figure 12.20 View from Mannaramala Hill Point

Potentials

- Cycling and hiking for those who love an adventurous travel thorough the hilly area surrounded by greenery.
- Sightseeing and photography for those who love wide panoramic view of the surrounding areas.
- Scope for Photography tours, village walks and hikes due to the scenic beauty of the hills, and greenery of village

Weakness

- Narrow roads to this location makes it a less accessible area,
- No space for a large tourism supporting infrastructure facility installation

12.4.5 Vanchipoika Waterfalls

Vanchipoika waterfalls near St. George kurishadi of Vanchipoika ward allows visitors to take in the serene landscape of the greenery surrounding area.







Figure 12.21 Vanchipoika Hill point and water fall spot

It is the only prominent water fall in the town which is a small stream of water flowing through the midst of rocks, especially during the rainy season from June to September, transforms into a picturesque waterfall. It is active almost 10 months in a years and will have a forceful flow at monsoon season only.

Potentials

- Potential to start a nature friendly leisure tourism for the nearby people
- Scope to develop a neighbourhood park
- The scenic beauty of the hill point and the seasonal transformation of the waterfall make it a captivating destination for photographers and those seeking photoshoots amidst lush greenery.

Weakness

- Narrow road width and no parking area.

12.4.6 Pulikkotta Para

A vast, gentle expanse of rock which is easy to climb and sprawling endlessly is a perfect place to walk, breathe and view the panoramic view of Malayalappuzha area. It is in the ward 17 of Pathanamthitta town. It is one among the 5 Kotta mala's of Malayalapuzha Bhagavathi temple.



Figure 12.22 View from Pulikkotta Para

Potentials

- The panoramic view of surrounding area can attract people for sightseeing and photography
- Potential to attract foreigners interested in exploring religious and cultural traditions in Kerala

Weakness

- Narrow roads to this location makes it a less accessible area,
- No space for a large tourism supporting infrastructure facility installation

12.4.7 Ottukal Muruppu

Ottukal muruppu is a large vacant area (50 to 70 acre) located at the boundary of ward 1 and 2 . Now this place is unused and covered by forest. It is used by the local people for grazing cattle etc. The good accessibility and calm and naturally beautiful surrounding give it a potential to be developed as an environment friendly theme park with resorts and cottages. The park can be created through Responsible tourism or Farm Tourism and enhances local development and employment for the local people. The park can have adventurous and recreational activities to keep people entertained and relaxed. The E3 park at Wayanad can be considered as a reference model for the development. The installation of a park can bring a mass number of family tourist to the area, especially during vacation time. Addition of Kerala cultural art form performances can attract foreign visitors also.



Figure 12.23 View of Ottukal Muruppu area

12.4.8 Kottapara Hill

Kottappara hill view point gives a scenic panoramic view of whole Pathanamthitta town. Narrow road way and less accessibility are the major weakness of the area. Kottapara Hill is one of the nine guardian hills of Valamchuzhi Devi Temple. It is also known as Koshanathu Mala. Other important guard mountains are Pulipara Kota, Mannaramala and Chuttipara. Thundu Mankara Sri Mahadeva Temple is situated on the top of Kottapara hill. The temple festival is followed by the Padayani ritual to please Male Devi and the art ritual known as Oorali Thullal is also performed.





Figure 12.24 Hill View and Temple in Kottapara

Potentials

- Great spot for sight-seeing and photography, especially at night it gives a great visual of Pathanamthitta town
- Since Chuttippara and Kottappara are in same elevation level, there is a scope to develop a rope way ride by connecting these to mountain areas.
- By proper marketing of historical and religious values of Kottapara, it can be developed as a major religious tourism destination of the municipality. The cultural art forms like Ooralithullal during the festival season have the performed potential to attract foreign visitors.

Weakness

- Topography and access constraints to enter to the top of the hill. Narrow roads to reach the destination and lack of parking facilities will make it less favourable to tourists.

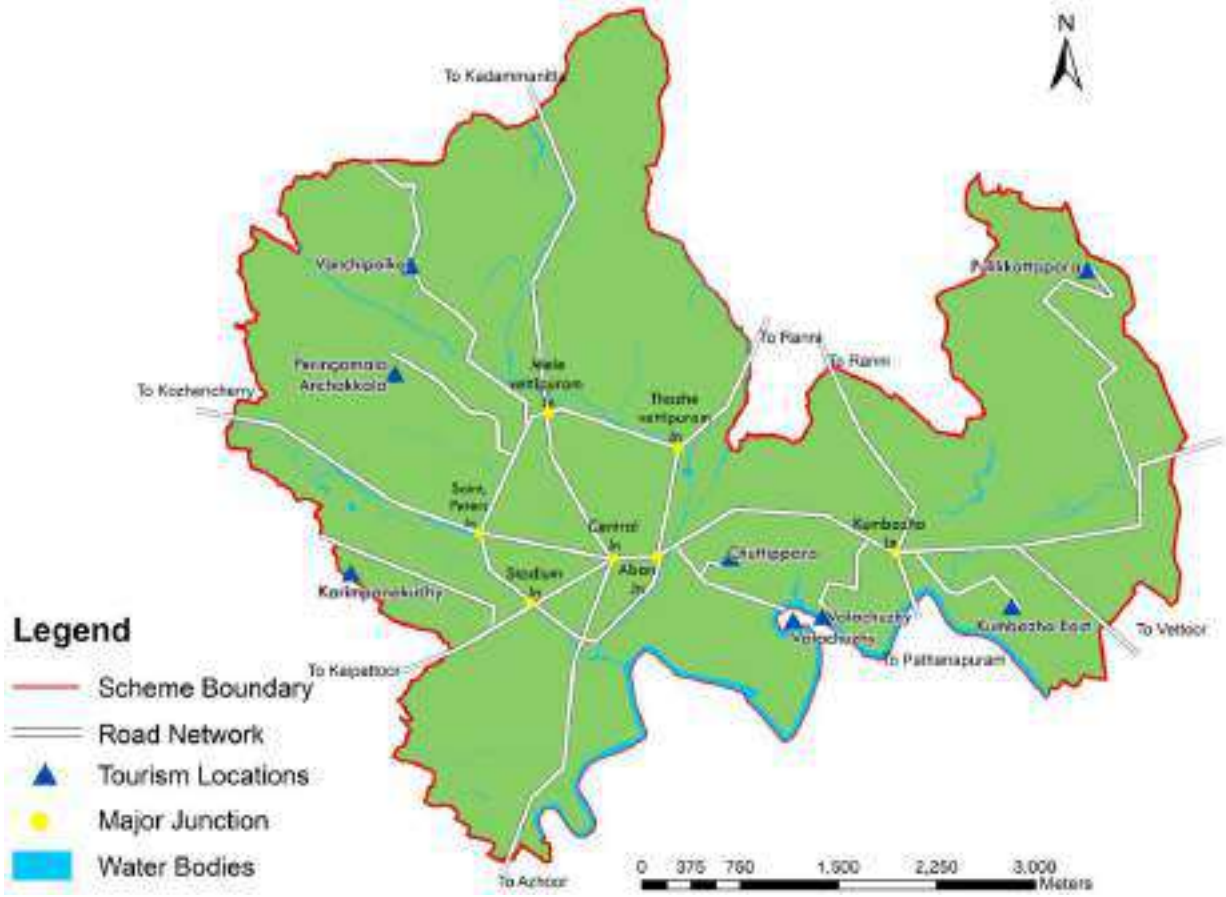


Figure 12.25 Identified tourism potential locations in the town

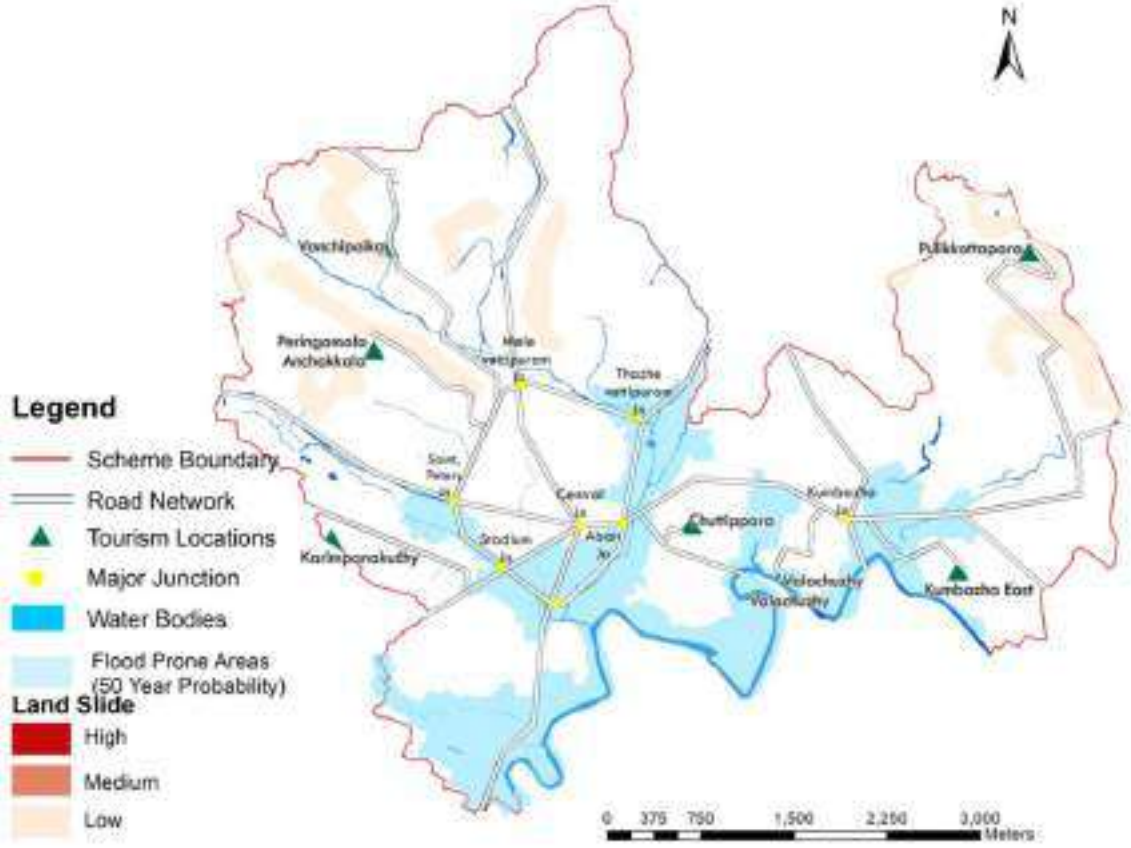


Figure 12.26 Identified potential tourism areas overlaid with flood and landslide prone area

12.5 Impact of Hazard and Climate Change

The town has no active tourism activity areas. But to understand the flood and landslide impact on identified tourism areas of the town, flood and landslide prone area map published by KSDMA is overlaid with it (Figure 12.26). Since most of the identified tourism spots are near river Achankovil, low lying lands and hill view areas, both significant challenges and potential risks but also have opportunities for sustainable tourism development. In some cases, flood- and landslide-prone areas could attract weather-based tourism**.** For example, tourists interested in the monsoon season, or those looking to experience dramatic landscapes shaped by floods and landslides, may visit these areas during specific seasons (though with caution).

12.6 Heritage

Heritage has inevitable significance in the development of an area. Even though there is not much important heritage Places or buildings within the Pathanamthitta town, there are many heritage villages and places in the district.

12.6.1 Kurichi

Another important destination in Pathanamthitta district. An ancient temple remaining, but the attractive point is the ride toward this point. Jeep is mainly the means of transport to Kurichi and the destination point is pollution free due to less number of vehicles.



Figure 12.27 Kurichi temple
Source: website-keralatourism.org

The jeep safari through jungles of Konni will takes first to Kurichi temple. This ancient temple is located inside dense forest.

12.6.2 Aranmula Valla sadhya

Valla Sadya is a celebration in the temple at Aranmula. During the festival the village conducts a snake boat race in the Pampa River, and there is a feast at the temple. The Valla Sadhya is conducted on Ashtamirohini day. During Valla Sadhya, it is believed that Lord Krishna, the main deity worshipped in the temple, will come to take the offerings from people. The legend is that in a Valla Sadya all dishes asked for must be given to the people in order to please the lord.



Figure 12.28 Aranmula Vallasadhya
Source: website-keralatourism.org

12.6.3 Aranmula Vallamkali

Noted for its grandeur and long tradition, the Aranmula Uthrittathi boat race is considered as a ritual than a race that takes place on the Uthrittathi asterism (as per the local Malayalam calendar) during the Onam festival.



Figure 12.29 Aranmula Vallamkali
Source: website-keralatourism.org

Legend has it that a devout Brahmin vowed to offer all the requirements for the Thiruvonasadya

(the grand traditional feast on the day of Thiruvonam) at the Aranmula Parthasarathy Temple. Once, the boat known as Thiruvona Thoni carrying these offerings was attacked by enemies. In order to protect the Thiruvona Thoni people from neighbouring areas sent their snake boats. Later on, this practice evolved into an offering to Lord Parthasarathy in the form of a snake boat race, held on the Uthrittathi day which eventually became popular as the Aranmula Boat Race.

12.6.4 Aranmula Mirror

Aranmula mirror is also related to the history of this temple. The king of Travancore wanted to donate a crown made of rare metal to the temple and he found a rare combination of Copper and lead. It is believed as per the tradition that preparing the metal polished mirror was produced only by a family. They are considered to be one of the eight auspicious items or "ashtamangalyam" that play a role in the entry of the bride at a wedding venue. These unique metal mirrors are the result of Kerala's rich cultural and metallurgical traditions. They have great historical and cultural value and are thought to bring good luck.



Figure 12.30 Aranmula Mirror
Source: website-keralatourism.org

12.6.5 Mural Paintings

Kerala mural paintings are the frescos depicting mythology and legends, which are drawn on the walls of temples and churches in South India, principally in Kerala. Ancient temples, churches and palaces in Kerala, South India, display an abounding tradition of mural paintings mostly dating back between the 9th to 12th centuries CE when this form of art enjoyed Royal patronage.



Figure 12.31 Mural Paintings
Source: website-keralatourism.org

12.6.6 Vastu vidhya Gurukulam

Vastu Vidya Gurukulam, an institution functioning under the department of Culture which gives out training and consultancy services for Vastu Vidya (traditional Indian Architecture) and Mural painting.



Figure 12.32 Vastu Vidhya Gurukulam
Source: website-keralatourism.org

Located on the banks of River Pamba and on the west of Sree Parthsarathy Temple in the heritage village of Aranmula in Pathanamthitta, the Gurukulam starts its functioning from 17th November 1993. Vastu Vidya Gurukulam is the only certified training centre under the government of India which provides training for practice of Vastu Vidya. Based on the ancient texts on Vastu Vidya, the institute conducts University approved courses on Vastu Vidya. Besides courses, there are separate wings for Consultancy and Mural Painting.

12.6.7 Pandalam Palace

Sree Ayyappa the presiding deity of Sabarimala had his human sojourn here as the son of Raja of Pandalam. The Thiruvabharanam of Sri Ayyappa is preserved in a strong room in this palace which is located on the banks of river Achankovil 15km away from Pathanamthitta. This palace is more than 1000 years old. Famous Kathakali artist Kerala Varma and Jayadeva Varma are members of this palace.



Figure 12.33 Pandalam Palace
Source: website-keralatourism.org

12.6.8 Padayani

Celebrated to honor harvest, Padayani is a celebration of fertility and happiness. Padayani, the traditional performing art form of Kerala, to be precise, of central Travancore, is the embodiment of so many elements depicting the innate as well as the acquired, the spiritual as well as the temporal elements of societal structure of an ethnic group. The term Padayani and Pateni are equated. The word Padayani had been evolved by combining two different terms pata and ani both having more than one meaning. In one sense, pata means group of soldiers and ani means rows. Hence the term Padayani can be used to mean the artistic performance of soldiers standing in rows and columns.



Figure 12.34 Padayani
Source: website-keralatourism.org

12.7 Aesthetics

Aesthetics plays a key role in how people perceive and experience a town. It creates a sense of visual harmony in a town, Psychological Benefits to the residents by reduce stress and increase feelings of happiness, charming streetscapes, public parks, cultural landmarks, attract visitors, boosting local tourism and aesthetics is closely tied to sustainable development which help in managing climate challenges, like urban heat islands, and improve air quality.

12.7.1 Present Scenario

Flowers, when incorporated into urban spaces—whether in parks, public squares, or along

roadsides—can significantly enhance the town's aesthetics. Bright colours and lush greenery add vibrancy and natural beauty to the built environment. To make town centre more attractive to people, Municipality has started the initiative of street beautification. As part of this initiative, the flowers were planted along roadsides (Figure 12.35).



Figure 12.35 Street beautification initiative in town

The aesthetics of a town should ideally blend with the infrastructure. When overhead lines and barricades are not integrated thoughtfully into the urban design (for example, through underground cables or the use of aesthetically designed poles), they become a disruption rather than a support system for the urban fabric. The electric lines and other cables in the town centre disrupt the aesthetic flow of the centre area (Figure 12.36).



Figure 12.36 Electric line and cable wires in the town centre reducing visual appeal.

> നഗരത്തിന്റെ ദൃശ്യ മനോഹാരിത നശിപ്പിക്കുന്ന തരത്തിലുള്ള ഇലക്ട്രിക്ക് ലൈനുകൾ ഒഴിവാക്കുക. ഫുട് പാത്തുകൾ മനോഹരമാക്കുക. നഗര മധ്യത്തിൽ ഉപയോഗ ശൂന്യമായി മാലിന്യം കൂട്ടിയിട്ടിരിക്കുന്ന തരിശ്ശ് പാടങ്ങൾ മനോഹരമാക്കുന്ന തരത്തിൽ പാർക്കുകൾ നിർമ്മിച്ച നഗരം സുന്ദരമാക്കുക. *[Avoid electric lines that spoil the visual beauty of the city. Make the footpaths beautiful. Make the city beautiful by proposing parks where waste are dumped and wastelands are available.]* - Public Opinion



Figure 12.37 Road edge irregularity affecting the visual appeal of the town

Roads with uneven widths, irregular width of footpath can create a sense of disorientation or visual clutter. Instead of offering a smooth, flowing visual experience, such roads may seem disjointed and chaotic, disrupting the town's overall design and aesthetics. Roads with inconsistent edges, making it difficult to establish clear and attractive boundaries or landscaping. This irregularity can result in poorly defined sidewalks, inconsistent planting spaces, or uneven road shoulders, which can further distract from the town's aesthetic

cohesion. Figure 12.37 shows the images of town which reduce visual appealing. This can be changed easily through alter the policy by incorporating the importance of visual appeal also in the infrastructure projects while implementation.

12.8 Problems and Potentials

The Pathanamthitta district is blessed with various type of tourism activities such as Pilgrim tourism, Eco tourism, Heritage tourism, etc. but the town lacks active tourism activities and supporting infrastructures. The town's river and hill-related tourism spots are underutilized simply because they are not widely known. Without active promotion, these attractions remain off the radar for tourists, preventing the town from capitalizing on its natural beauty. The lack of existing active tourism infrastructure and the town not have a tourism marketing strategy in place. This absence of promotion makes it difficult to attract both domestic and international visitors.

Identified tourism potential areas like river and hill attractions points are in remote and less accessible areas, requiring significant investment in transportation infrastructure (e.g., roads, signage, and public transport). Without established tourism spots, the town may not have essential tourist amenities like accommodation, restaurants, tour guides, or restrooms. The lack of these basic facilities makes the area less appealing to potential visitors. Rivers and hills in town offer unique experiences that can attract tourists looking for adventure tourism, eco-tourism, or nature-based experiences. Activities like trekking, river rafting, wildlife spotting, and hill station retreats are increasingly popular, especially for those seeking to disconnect from urban life. Achankovil River can create an entire tourism niche around water sports or eco-tours. Tourists could engage in kayaking, rafting, or even birdwatching along the riverbanks. The town has the chance to develop its tourism sector with a focus on eco-friendly practices, such as solar-powered hotels, green transportation options, and low-impact tourism activities. Promoting nature preservation can also serve as a unique selling point, attracting visitors and investors who value sustainability and ecological conservation.

12.9 Inference

As the main transport hub to Sabarimala, the town is known as the 'Pilgrim Capital of Kerala. Numerous eco-tourism, leisure tourism, pilgrim tourism and heritage tourism spots surrounding the town creates a huge opportunity for developing a tourism network. There is enough potential for development of tourism within the town also. By utilizing the location advantage, heritage value, and tourism potential of the town, Pathanamthitta can be developed as a tourist transit centre. During the Sabarimala season, Pathanamthitta witnesses a gathering of lakhs of people, but the area faces significant challenges due to inadequate infrastructure facilities. The aesthetic appearance of the town is to be improved. Pathanamthitta, known for its fresh air and clean water, has the potential to attract more visitors. With the development of proper tourism infrastructure, more people would be eager to experience the town's natural beauty and serene environment. By focusing on eco-tourism, adventure tourism, cultural heritage, sustainable development and aesthetic appeal, the town can create a thriving tourism sector that attracts a diverse range of visitors. The key to success lies in developing infrastructure, ensuring environmental sustainability, engaging the local community, and marketing the town's unique offerings effectively. If done carefully and thoughtfully, the town could transform into a popular and attractive destination for nature lovers, adventure seekers, and eco-tourists alike.

PART I
STUDY & ANALYSIS



III. PHYSICAL INFRASTRACTURE

13. Traffic & Transportation
14. Water Supply
15. Drainage System
16. Sewage System
17. Solid Waste Management
18. Energy



13. TRAFFIC & TRANSPORTATION

Transportation is one of the most important infrastructure facilities that shape the structure and development of the city. A well outlined hierarchy of roads and related infrastructure ensure efficient operation of the transportation system and it facilitates economic growth of the town along with progressive urbanisation. Urban areas with well-connected and efficient transportation system are necessary to meet the diverse needs of people and businesses, including social interaction, recreation, work commuting, and residential activities. In order to make the transport system efficient, there is need to maintain a balance between demand and supply of facilities within the town and its premises. The issues and potentials in existing road infrastructure, public transportation system, pedestrian & parking facilities and impact of potential hazards on transportation infrastructure of Pathanamthitta town is analysed in this session.

Contents

1 Roads

2 Vehicle Population

3 Characteristic Study of Transportation Network

4 Public Transport System

5 Rail/ Water/ Air Transport

6 Characteristic of Inter city Traffic

7 Other Infrastructure Facilities

8 Accident Prone Areas

9 Gaps in Network

10 Impact of Hazard & Climate Change

11 Inference

13.1 Roads

Various studies related to Traffic and Transportation were conducted as the part of preparation of master plan for Pathanamthitta town. The base study was conducted by NATPAC in 2010, which was later updated in 2019 using volume counts; secondary data and other surveys to estimate vehicle population, road network characteristics, traffic volume, parking, pedestrian movement etc.

13.1.1 Existing Road Network

National Highway 183A, State Highway 5, 7,8,9 & 10 are the major roads passing through Pathanamthitta District (Figure 13.1). The road transport is the only available mode of transportation in Pathanamthitta town. At present connectivity through railways and water ways are not established. It is placed outside the main road corridors ie. National Highway (NH) 66 and Main Central (MC) road, of the State. Road Transport system caters all the intra and inter town travel demands and the connectivity to other modes are fairly established through roads, longer journeys can also be accessible for the citizens.

Town consist of roads in different categories such as, National and State highways, Major district roads and other municipal roads. The existing road network of the town having a length of 3.7Kms of National Highway, 13 Kms of State Highways, 38 Kms of major district roads and 103 Kms of Municipal roads. The images (Figure 13.2) show type of roads in the town and the Figure 13.3 shows the existing road network map of Pathanamthitta town.

The Kollam- Vandiperiyar (NH-183A), Thiruvalla-Kumbazha (SH-7) and Punalur-Muvattupuzha (SH-8) roads are passing through the town. Apart from these, major district roads in the town are Kaipattoor road, Kadammanitta road, Azhoor road, Mylapra road, Malayalapuzha road. In addition to the arterial roads under PWD, the Municipality is also maintaining a network of roads which can be categorized mostly as sub-arterial collector roads, lanes and sub lanes.

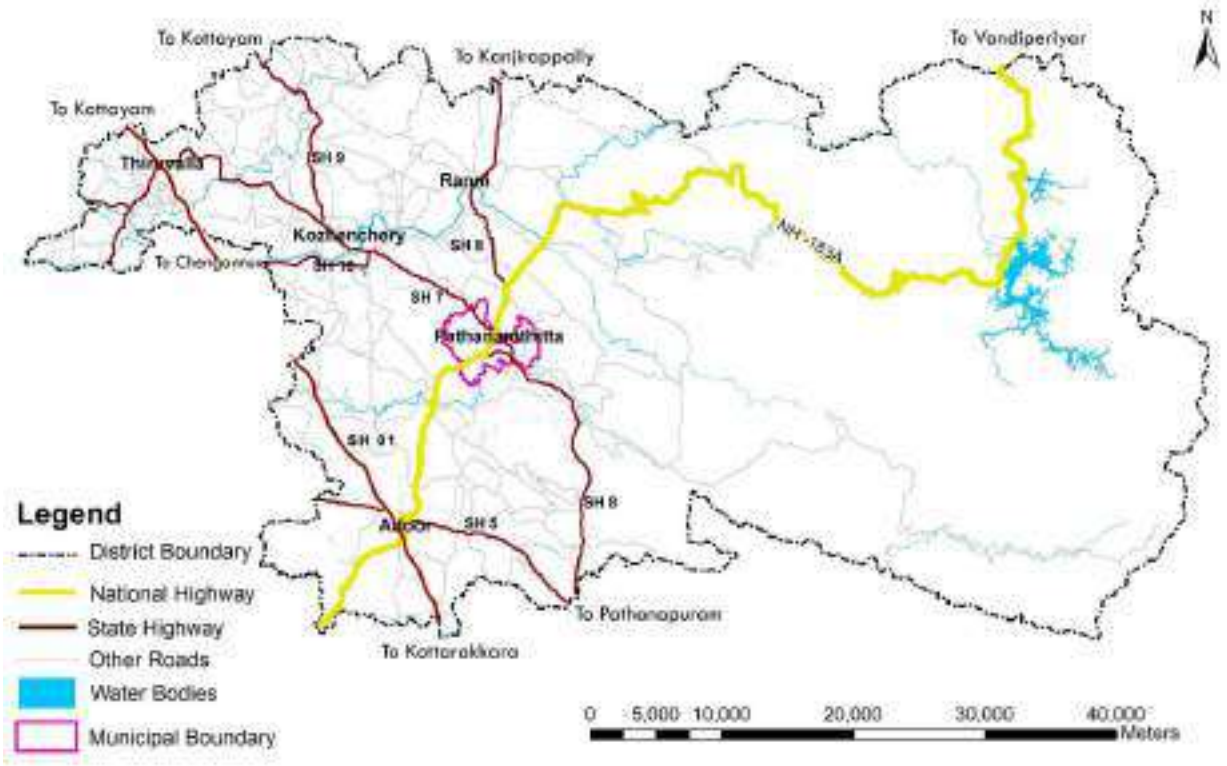


Figure 13.1 Pathanamthitta District Road Network



Figure 13.2 Type of roads in the town (NH 183A, ring road, SH 8 & other road)

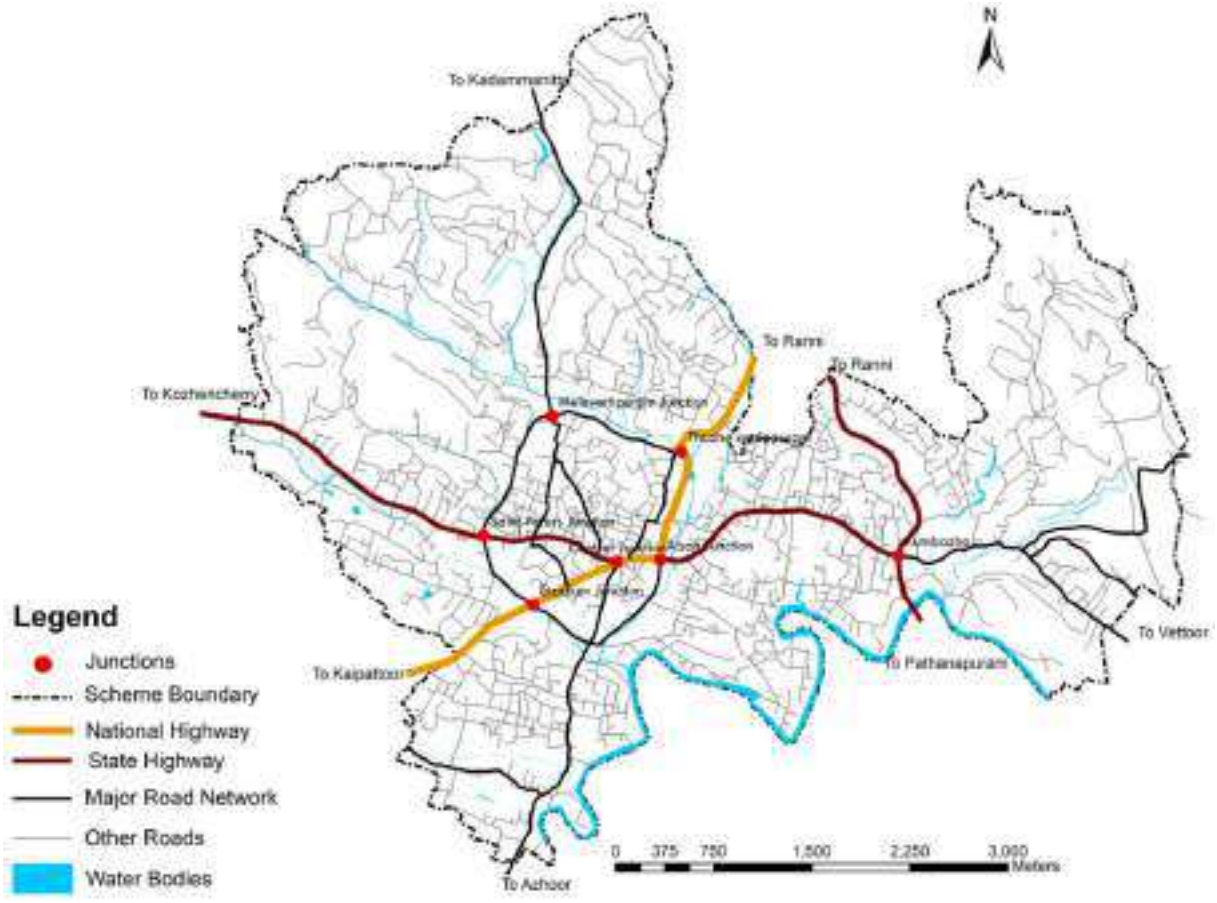


Figure 13.3 Pathanamthitta town existing road network

13.1.2 Road Inventory Study

The road network in Pathanamthitta town follows a ring and radial pattern. The town has well-defined ring road (Figure 13.4). The ring road connects the junctions of Melevettipuram, Thazhe-Vettipuram, Aban, Stadium and Saint

Peters. The road stretch between Thazhe-vettipuram Junction and Aban Junction in the ring road comes under the National Highway. The remaining road stretch of the ring road comes under major road category. Some basic inventory details of major roads in the town are shown in Table 13.1 and detailed Road inventory details are given in Annexure 13.1. Intense commercial activities are found all along the road section. Mixed land use includes mainly commercial activities. Major land use along the stretch of the road is commercial and residential and agricultural activities.

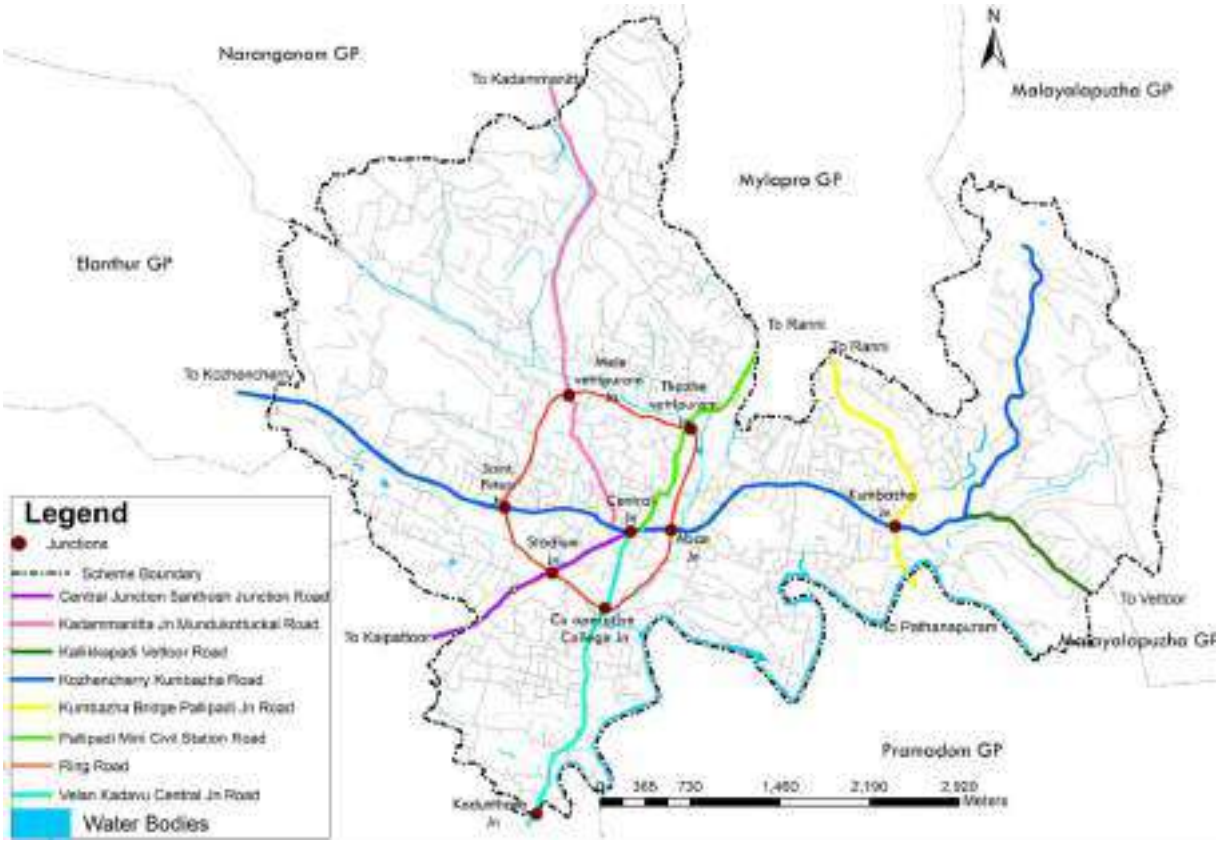


Figure 13.4 Major Road Stretches in the town

Table 13-1 Road Inventory details

Sl. No.	Name of road	Length (Km)	Type of Road	Width (m)		Median (m)	Road side drain	Adjoining land use
				CW	ROW			L & R
I	Ring Road	5.600	PWD	6.5 - 7.5	14.0-18.0	Nil	Part	Commercial, Residential. agriculture, marshy
II	Kozhenchery - Kumbazha-Malayalappuzha Road	9.550	SH , PWD	7.0-13.5	12.0-21.0	Nil	Part	Commercial, Residential. agriculture, marshy
III	Kalikkapadi - Vettoor Road	1.2	PWD	5.25-5.5	11.0-11.20	Nil	Part	Agriculture, marshy, Residential.
IV	Kumbazha Bridge - Pallipadi Jn.	2.8	SH	6.2	8.5-9.5	Nil	Part	Commercial, Residential. Plantation
V	Pallipadi - Mini Civil Station Road	2.3	PWD	6.2	9.0-10.0	Nil	Part	Commercial, Residential. Paddy
VI	Central Junction - Santhosh Junction	2.2	PWD	5.5-6.75	8.0-11.0	Nil	Part	Commercial, Residential

VII	Velan Kadavu - Central Junction	2.7	PWD	6.0-6.75	8.0-11.10	Nil	Part	Commercial, Residential. Low lying area, agriculture, marshy
VIII	Kadammanitta Jn. - Mundukottuckal	3.65	PWD	5.0-5.5	7.5	Nil	Part	Commercial, Residential. agriculture, marshy

Source: NATPAC, LSGD Planning Pathanamthitta

The majority of roads within the study area are in satisfactory condition, featuring bituminous surfacing. Shoulders are of earthen type but in most of the road length, due to the lack of proper drainage facility, the earthen shoulders are found deteriorated on heavy rain. Even if some traffic regulatory measures are provided towards CBD area, it doesn't cater the needs efficiently. This necessitates steps to be taken to improve the capacity, geometry, road furniture etc. of the road traffic system and to provide traffic regulation and management options to effectively manage the traffic inside the CBD area. Proper pedestrian cross facilities are found lacking on most of the road stretches.

> കുമ്പഴ – പത്തനംതിട്ട പബ്ലിക്ക് റോഡിന് വീതി കുറവാണ്. അത് വീതി കൂട്ടുകയോ, അല്ലെങ്കിൽ മറ്റൊരു റോഡ് നിർമ്മിക്കുകയോ വേണം . *[The Kumbazha - Pathanamthitta public road is not wide enough. It needs to be widened or another road needs to be built.]* - Public Opinion

13.1.3 Road Intersections

Road intersections play a crucial role in determining traffic flow and efficiency in urban areas. The design and type of intersection (e.g., signalized, roundabout, uncontrolled) influence how many vehicles can pass through per unit of time. Location of major intersections in the scheme area shows in Figure 13.5.

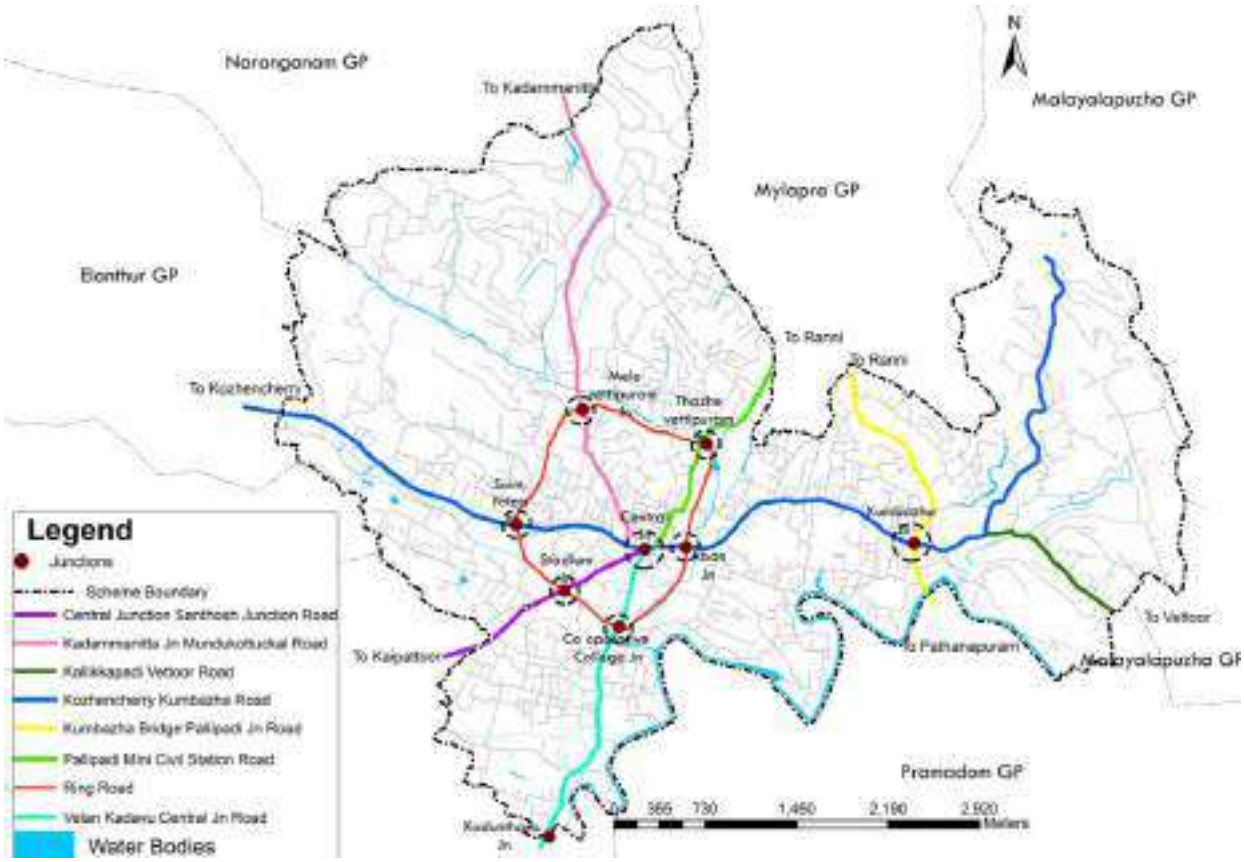


Figure 13.5 Major intersections in the town

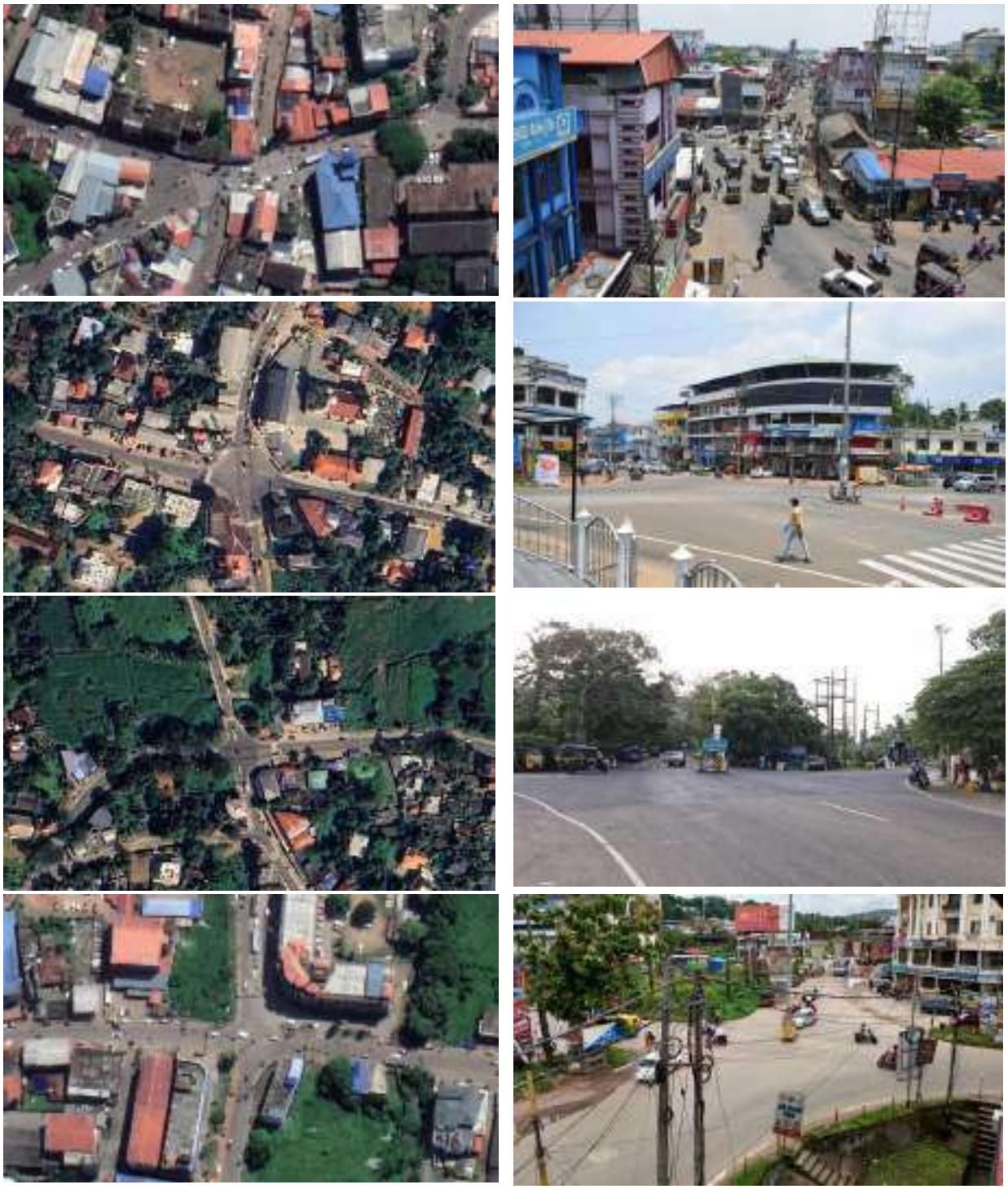


Figure 13.6 Intersections of the town with google images (Central Junction, St.Peters Junction, Melevettipuram Junction, Aban Junction)

The town has one five arm junction which is central junction. All the major roads and activities are connected towards this central junction of the town. Then town has six four arm junctions in the centre area connecting major roads to central junction through ring road. The seventh four arm junction is towards the east of the town called Kumbazha Junction which act as the gateway of the Pathanamthitta connecting SH 7 & SH8. Inside the ring road of the town, there are three major junctions called Mini Civil Station Junction, KSRTC Junction and Municipal Bus Stand Junction with three arm which are act as the major roads in the network. Figure 13.6 showing the images of major junctions with google imagery and Table 13.2 shows its type.

Table 13-2 type of road intersections

Name of Junction	Type
Central Junction	Five arm
Aban Junction	Four arm
Co op. College Junction.	Four arm
Stadium Junction.	Four arm
Saint Peter's Junction	Four arm
Melevettipuram Junction	Four arm
ThazheVettipuram Junction	Four arm
Kumbazha Junction	Four arm
Mini Civil Station	Three arm
KSRTC Junction	Three arm
Municipal Bus Stand Junction at Ring road	Three arm
Kannankara Junction	Three arm

13.2 Vehicle Population

Vehicle population details in Pathanamthitta district is shown in the Table 13.3.

Table 13-3 Year wise Vehicle population in district

Year	Vehicle Population
2011-12	294860
2015-16	424277
2016-17	461630
2017-18	502032
2018-19	553585
2019-20	588293
2020-21	653313
2022-23	688824

Source: Economic Review 2023, Government of Kerala

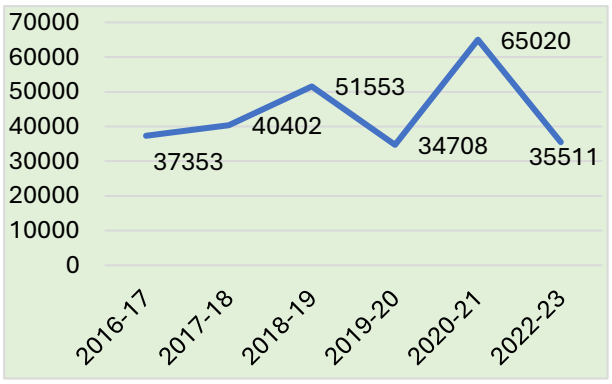


Figure 13.7 Year wise number of vehicle registration in Pathanamthitta district

Source: Economic Review 2023, Government of Kerala

Year wise vehicle registration in the district is shown in Figure 13.7. It can observe that the number of vehicles being registered in a year in comparison to previous year keeps on fluctuating giving an average vehicle registration of around 32000.

13.3 Characteristic Studies of Transportation Network

Road characteristics of the town impact safety, efficiency, and overall driving experience. It includes Traffic Volume Study, Traffic Volume/ Capacity Study, Speed and Delay Study, Parking Study and Pedestrian Movement Study.

13.3.1 Traffic Volume Study

Traffic volume in a particular road network is important to understand the efficiency at which the system works and the general quality of service offered to road users. Data pertaining to traffic volume and its composition was collected for all major roads through link volume survey. The traffic on Kumbazha to Aban link on Thiruvalla Kumbazha Road (SH 7), is found to be very high. A maximum daily peak hour traffic of 43984 PCU were observed in the section. The second maximum daily traffic of 39101 PCU were observed between Aban Junction – Thachanpady junction on ring road, 37556 PCU were observed between Ring Road junction-Santhosh junction on Kaippattoor Road, 36116 PCU were observed between Aban junction-Cooperative College junction and 31215 PCU was observed between Mini civil station junction and Central junction (one way). (Table 13.4)

Table 13-4 Traffic Volume (PCU/ day) on Major Road Links within Pathanamthitta in 2019

Sl. No.	Road Link	PCU/ day
I	Punalur -Muvattupuzha Road (SH - 8)	
1	Kumbazha Bridge-Kumbazha Jn.	17097
2	Kumbazha Jn.-Pallippadi Jn.	30233
II	Thiruvalla-Kumbazha Road (SH - 7)	

3	Kumbazha Jn.-Aban Jn.	43984
4	Aban Jn.- Mini Civil Stn.Jn.	24463
5	Mini Civil Stn.Jn.- Central Jn(one way)	31215
6	Central Jn.- Hospital Jn.	19023
7	Hospital Jn.- Ring Road Jn	12758
8	Ring Road Jn.- Churulikkode	21259
III	Kaippattoor Road	
9	Central Jn.- Ring Road Jn	17643
10	Ring Road Jn.- Santhosh Jn.	37556
IV	Azhoor Road	
11	Central Jn.- Co op. College Jn.	10473
12	Co op.College Jn.-Velankadavu Rd.Jn	19830
V	Kadammanitta Road	
13	Mosque Jn.- Vettippuram	5748
14	Vettippuram-Mundukottakkal	6899
VI	Mylapra Road	
15	Mini Civil Stn, Jn.- KSRTC Station	18877
16	KSRTC Station- Ring Road Jn.	12788
17	Ring Road Jn.- Pallippadi Jn	27738
VII	Malayalappuzha Road	
18	Kumbazha Jn.-Kalikkapady Jn.	25952
19	Kalikkapady Jn.- Eng. College Jn.	20761
VIII	Vettoor Road	
20	Kalikkapady Jn. - Muni. Boundary	4152
IX	Ring Road	
21	Aban Jn - Co op. College Jn.	36116
22	Co op. College Jn.- Stadium Jn.	29579
23	Stadium Jn.- Saint peter's	20972
24	Aban Jn - Thachanpady Jn.	39101
25	Mylapra Rd Jn.- Vettippuram	11327

13.3.2 Traffic Volume/Capacity Study

Capacity utilization of the road stretches is interpreted through Volume-Capacity ratio (V/C Ratio). It is the ratio of volume of traffic on the road stretch to the capacity of the road stretch. The volume capacity ratio of major roads of the town and the anticipated decadal variation of V/C ratio is shown in Table 13.5 & Figure 13.8. It can be seen that many of the roads in the town including stretches in SH 7, SH 8, Malayalappuzha road, Mylapra road and ring road have V/C ratio greater than 1 indicating congested movements during peak hours. The V/C ratio projection was done to understand the decadal variation on traffic and the level of service of different road stretches in the town and it can be observed that most of the roads will be carrying a traffic volume more than the capacity in coming decades due to the steady increase in traffic. This demands for alternate strategies to manage road traffic so as to provide an unhindered flow of traffic.

> സെന്ട്രൽ ജംങ്ഷനിൽ ഗതാഗത കുരുക്ക് നിയന്ത്രിക്കുവാൻ റോഡുകൾ ചേരുന്ന ഭാഗങ്ങൾ വീതി കൂട്ടി വികസിപ്പിക്കണം. ഇപ്പോൾ അഴൂർ റോഡ് പ്രവേശിക്കുന്ന ഭാഗം കൂപ്പിക്കഴുത്ത് പോലെയാണ്. സമീപത്തെ കടക്കാർക്ക് വേണ്ട ക്രമീകരണങ്ങൾ ചെയ്ത് കൊടുക്കണം. ജംങ്ഷന് വീതി വേണം. *[To control traffic congestion at the Central Junction, the junctions should be widened and developed. Currently, the section where Azhoor Road enters is like a bottleneck. Necessary arrangements should be made for the nearby vendors. The junction needs to be widened.]* - Public Opinion

Table 13-5 Volume Capacity Ratio on major Road Links

Sl. No.	Road Link	Existing Volume in 2019 (PCU/day)	Capacity (PCU/day) as per design standard	Volume Capacity ratio in 2019
I	Punalur -Muvattupuzha Road(SH - 8)			
1	Kumbazha Bridge-Kumbazha Jn.	17097	15000	1.14
2	Kumbazha Jn.-Pallippadi Jn.	30233	15000	2.02
II	Thiruvalla-Kumbazha Road(SH - 7)		15000	
3	Kumbazha Jn.-Aban Jn.	43984	15000	2.93
4	Aban Jn.- Mini Civil Stn.Jn.	24463	15000	1.63
5	Mini Civil Stn.Jn.- Central Jn(one way)	31215	15000	0.87
6	Central Jn.- Hospital Jn.	19023	15000	0.79
7	Hospital Jn.- Ring Road Jn	12758	15000	0.85
8	Ring Road Jn.- Churulikkode	21259	15000	1.42
III	Kaippattoor Road			
9	Central Jn.- Ring Road Jn	17643	24000	0.74
10	Ring Road Jn.- Santhosh Jn.	37556	15000	2.50
IV	Azhoor Road			
11	Central Jn.- Co op. College Jn.	10473	12000	0.87
12	Co op.College Jn.-Velankadavu Rd.Jn	19830	12000	1.65
V	Kadammanitta Road			
13	Mosque Jn.- Vettippuram	5748	12000	0.48
14	Vettippuram-Mundukottakkal	6899	12000	0.57
VI	Mylapra Road			
15	Mini Civil Stn, Jn.- KSRTC Station	18877	12000	1.57
16	KSRTC Station- Ring Road Jn.	12788	12000	1.07
17	Ring Road Jn.- Pallippadi Jn	27738	12000	2.31
VII	Malayalappuzha Road			
18	Kumbazha Jn.-Kalikkapady Jn.	25952	12000	2.16
19	Kalikkapady Jn.- Eng. College Jn.	20761	12000	1.73
VIII	Vettoor Road			
20	Kalikkapady Jn. - Muni. Boundary	4152	12000	0.35
IX	Ring Road			
21	Aban Jn - Co op. College Jn.	36116	15000	2.41
22	Co op. College Jn.- Stadium Jn.	29579	15000	1.97
23	Stadium Jn.- Saint peter's	20972	15000	1.40

24	Aban Jn - Thachanpady Jn.	39101	15000	2.61
25	Mylapra Rd Jn.- Vettippuram	11327	15000	0.76

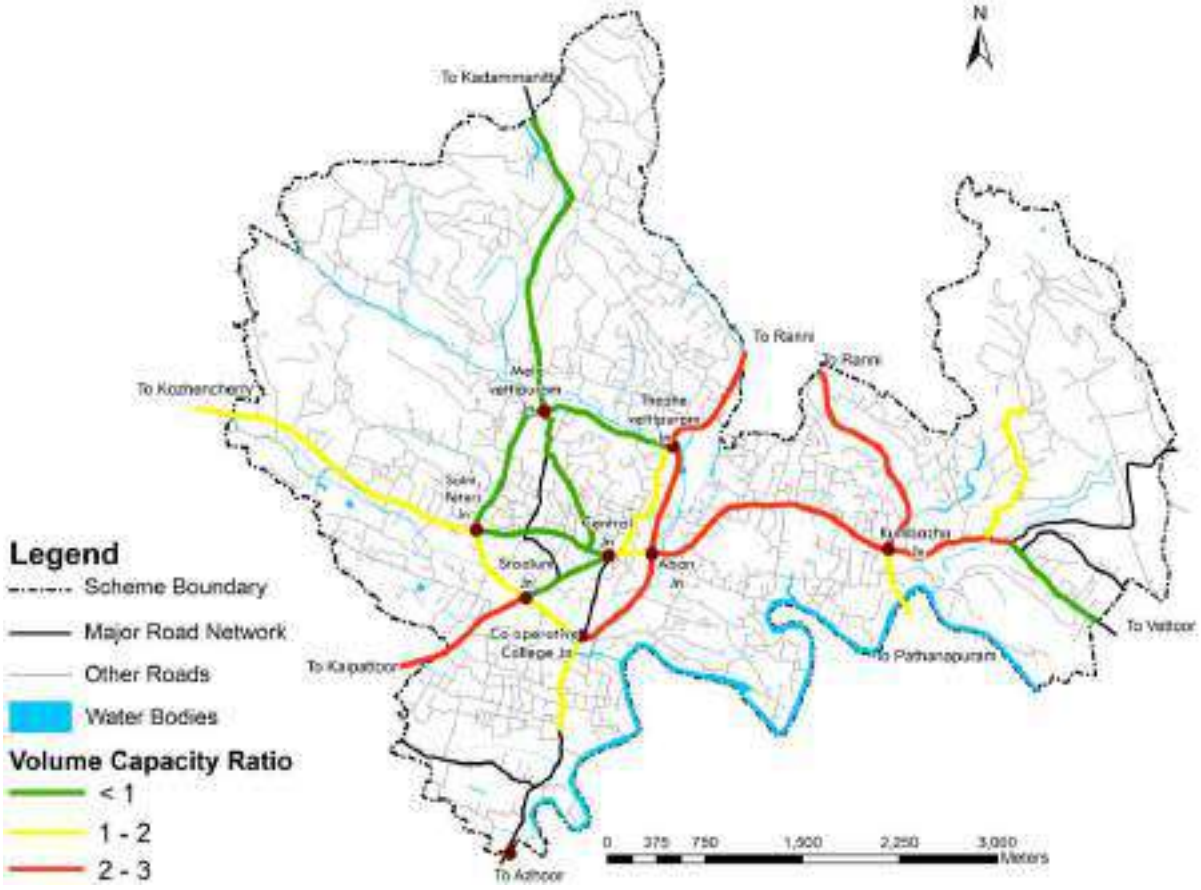


Figure 13.8 Volume Capacity Ratio of major road in the town



Figure 13.9 Vehicular volume at Central Junction.

> റിംഗ് റോഡിന്റെ മുഖ്യ ജംങ്ഷനുകൾ വിപുലീകരിക്കണം. ജംങ്ഷനുകളിൽ ഹൈമാസ്റ്റ് ലൈറ്റുകൾ വേണം. മെയിൻ റോഡ്, മുനിസിപ്പൽ അതിർത്തികളിൽ സ്വാഗത ബോർഡുകൾ സ്ഥാപിക്കുക *[The Kumbazha - Pathanamthitta public road is not wide enough. It needs to be widened or another road needs to be built.]* - Public Opinion

13.3.3 Traffic Volume at Intersection

Based on the transportation survey, turning movement surveys at major intersections in the study area were conducted to ascertain the peak hour demands. The surveys were carried out for a period of 4 to 8 hours during morning and evening peak periods depending on the availability of past data. Total volume, composition of traffic and turning characteristics were recorded for different types of vehicles. Traffic volume at Aban Jn is the highest followed by Cooperative college junction, Central junction and Stadium junctions. Major intersections and their corresponding peak volume are given in Table13.6

Table 13-6 Peak hour traffic volume at intersections

Name of Junction	Type	Peak Hour Traffic Flow	Peak Hour
Central Junction	Five arm	2881	10-11AM
Aban Junction	Four arm	3190	5-6 PM
Co op. College Junction.	Four arm	2909	5.15-6.15 PM
Stadium Junction.	Four arm	2637	10-11 AM
Saint Peter's Junction	Four arm	1554	5-6 PM
Mele vettipuram Junction	Four arm	475	4.15-5.15 PM
Thazhe Vettipuram Junction	Four arm	1520	4.30-5.30 PM
Kumbazha Junction	Four arm	1554	9.30-10.30 AM
Mini Civil Station	Three arm	2062	10-11 AM

13.3.4 Parking Characteristics

Parking accumulation and duration survey were carried out at all the major road stretches where the parking accumulation is found to be high (Figure 13.10).

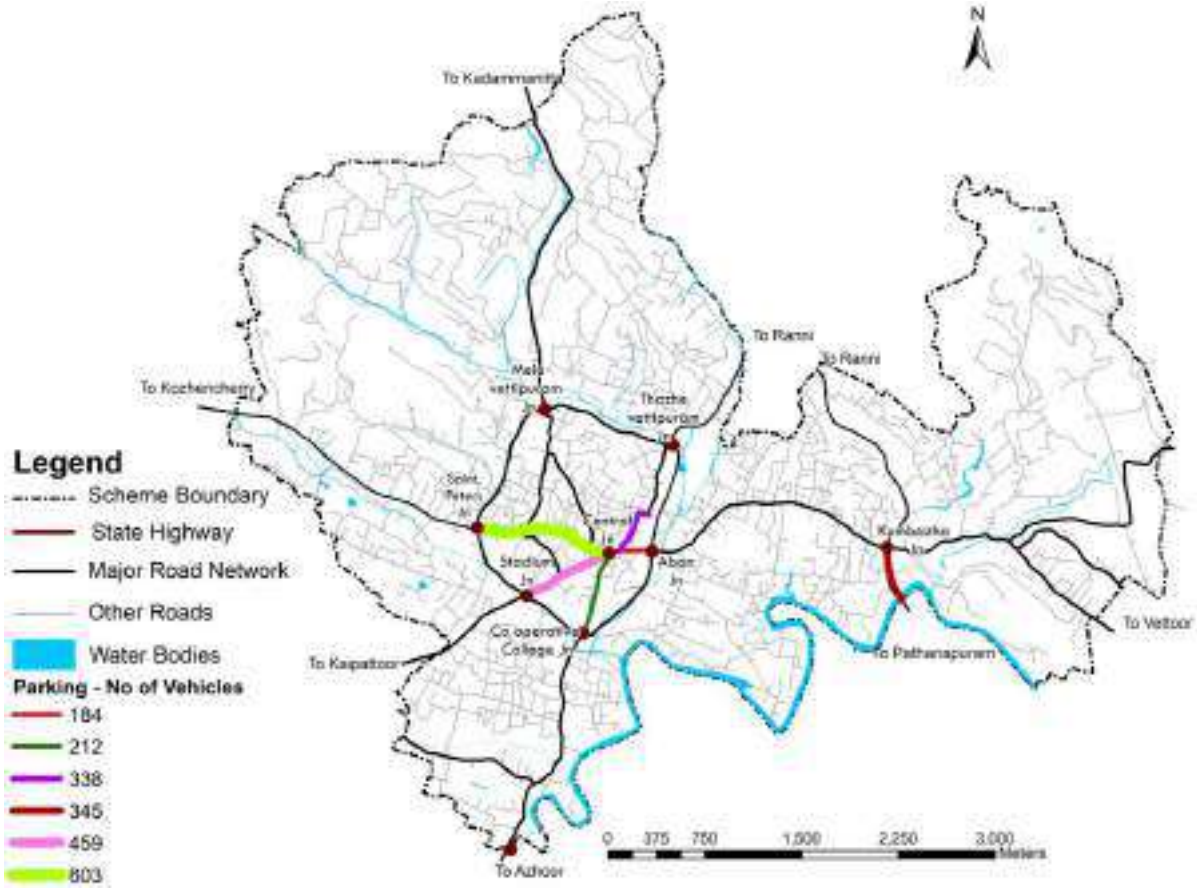


Figure 13.10 On street parking road areas in town.



Figure 13.11 On street parking in town

Parking study is done to obtain the peak parking demand and parking duration of various categories of vehicles along these road sections. The surveys were carried out for a period of 4 to 8 hours during the peak periods. 'The Registration Plate Method' was used to collect the data on parking duration and accumulation of all categories of vehicles. Highest parking accumulation of 146 vehicles was found in the main road between St Peters Jn and Central Jn at 15.30 hrs on a normal working day. About 80% of the vehicles are parked for duration less than 30minute. Apart from on street parking, old municipal bus stand area under municipality and two private lands near town centre is currently used as pay and parking area.

13.3.5 Average journey speed and Delay

Average speed is an indicator of the traffic conditions in an area. The average journey speed is found to be varying between 6 kmph to 69 kmph in various stretches of the town. The causes of delay were identified as traffic congestion, intersections, bus stop locations, presence of slow-moving vehicles, parking of vehicles in efficient signal timing etc. Major delays were observed on the road stretches between KSRTC stand to Aban Jn., Central Jn. To Police Station Jn. Road and co-operative College Jn. to Stadium Jn. Road.

13.3.6 Pedestrian Characteristics

Pedestrian volume survey was conducted at important intersections and road sections where the cross movements of pedestrians were found to be very high. The surveys carried out for a period of four to eight hours during the peak periods. Analysis of the pedestrian cross movement at major activity/traffic generation areas revealed that a high volume of pedestrian cross movements occurred in from Central Jn. – Stadium Jn. during the time period between 16.30 and 17.30 hours. (Table 13.7 & Figure 13.12).

Table 13-7 Peak hour pedestrian cross movements at major locations

Sl.No.	Name of location	Peak Time		No. of pedestrians		
				Up	Down	Total
1	Central Jn.-Stadium Jn.	16.30	17.30	1398	891	2289
2	Central Jn.-Mini civil station	10.00	11.00	342	418	760
3	Central Jn.-Old Bus stand.	9.15	10.15	277	231	508
4	Central Jn.-Co-operative college Jn.	16.15	17.15	1,075	1,081	2156
5	Mini civil station-KSRTC	12.30	13.30	328	409	737
6	T.B Jn.- Central Jn.	11.00	12.00	225	176	401
7	Kumbazha-Punalur	9.00	10.00	196	268	464
8	Kumbahza Jn to Pathanamthitta	8.15	9.15	130	51	181
9	Kumbazha -Malayalapuzha	10.00	11.00	110	85	195
10	Kumbazha -Pallipadi	11.00	12.00	98	92	190

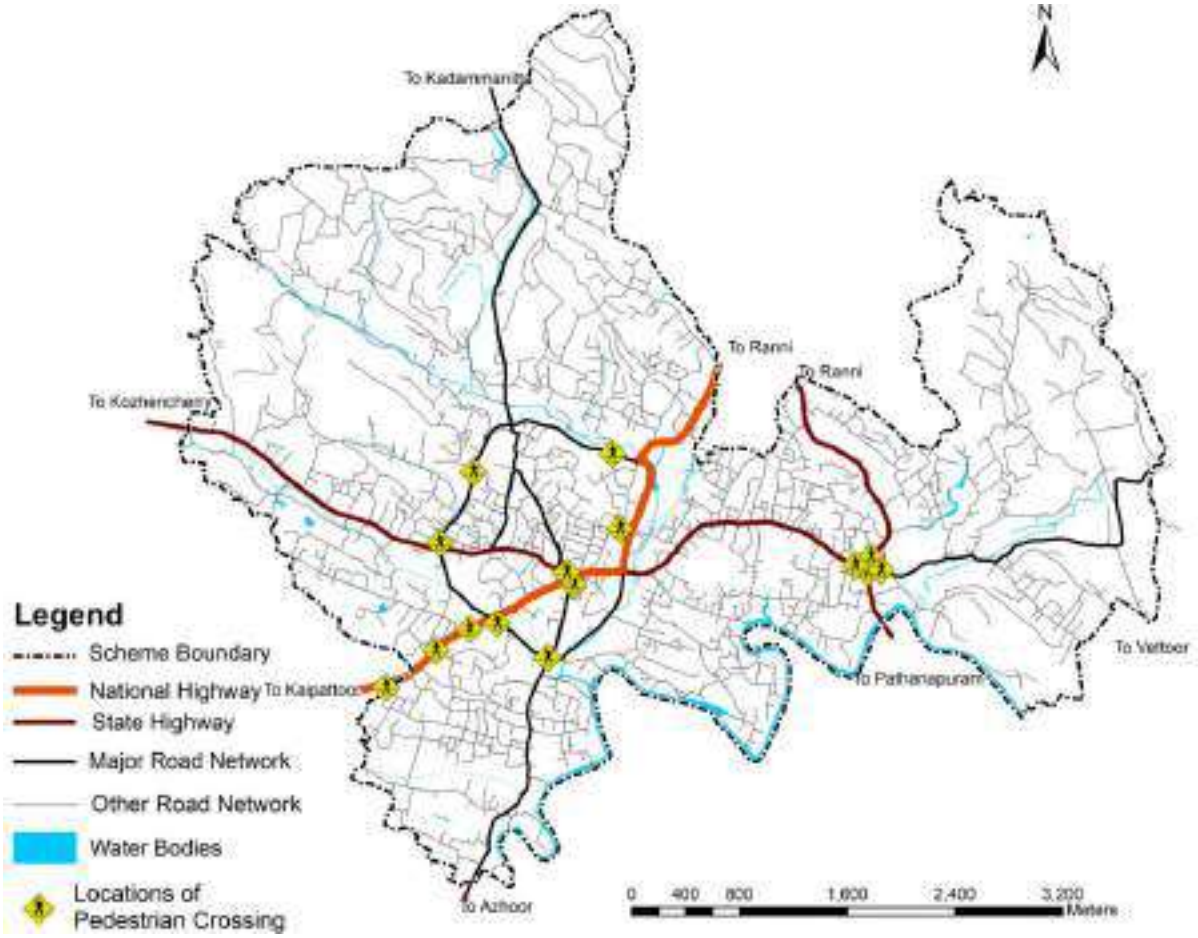


Figure 13.12 Pedestrian Crossing locations in the town

13.4 Public Transport System

KSRTC and Private bus operators provide public transport service in the town. Bus services are available through Punalur -Muvattupuzha Road (SH 8) and Thiruvalla -Kumbazha Road (SH 7). Kaipattor road, Azhoor Road, Kadammanitta Road, Mylapra and Malayalappuzha are among the major roads through which public transport system connects Pathanamthitta town. with surrounding destinations (Figure 13.13). Average distance to the bus stop of various wards of the town is shown in Annexure 13.2.

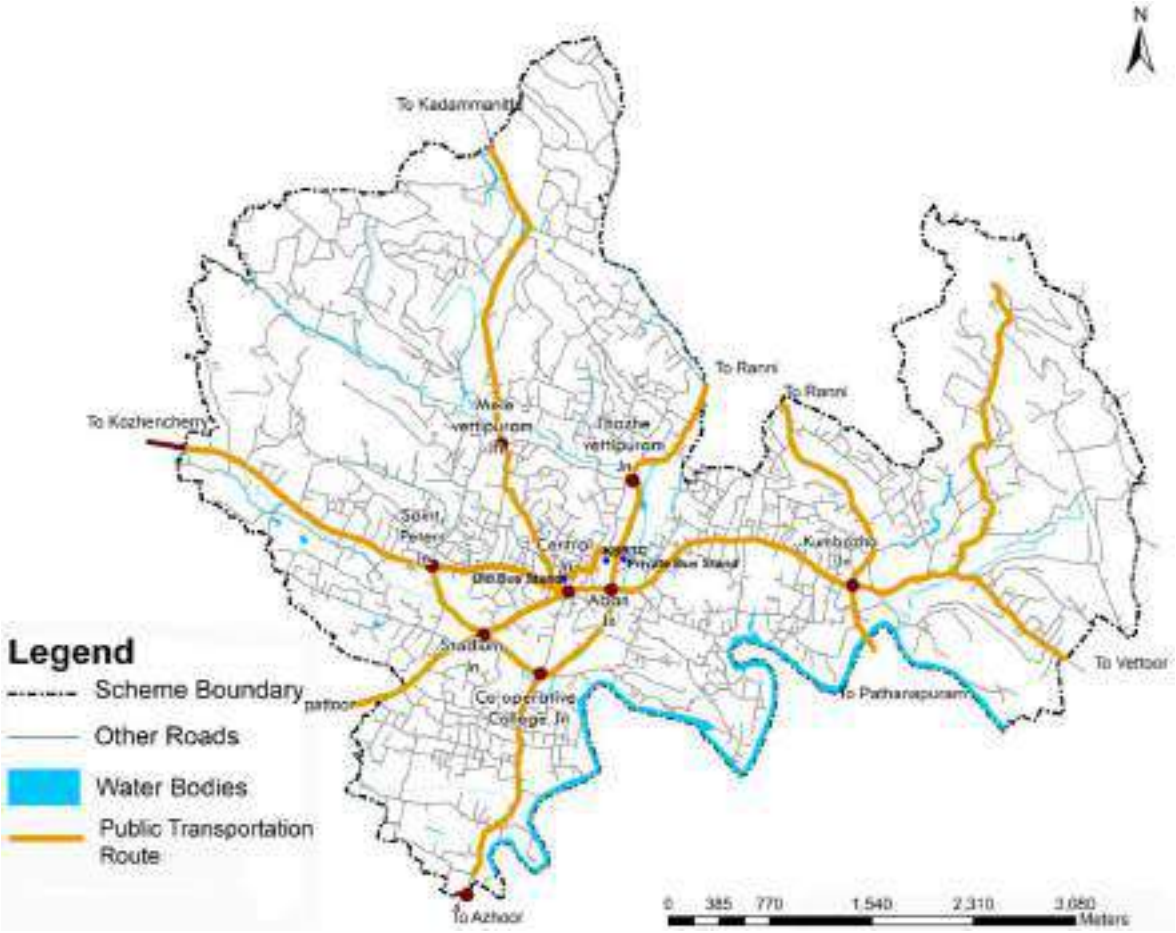


Figure 13.13 Public Transportation Route and bus terminals

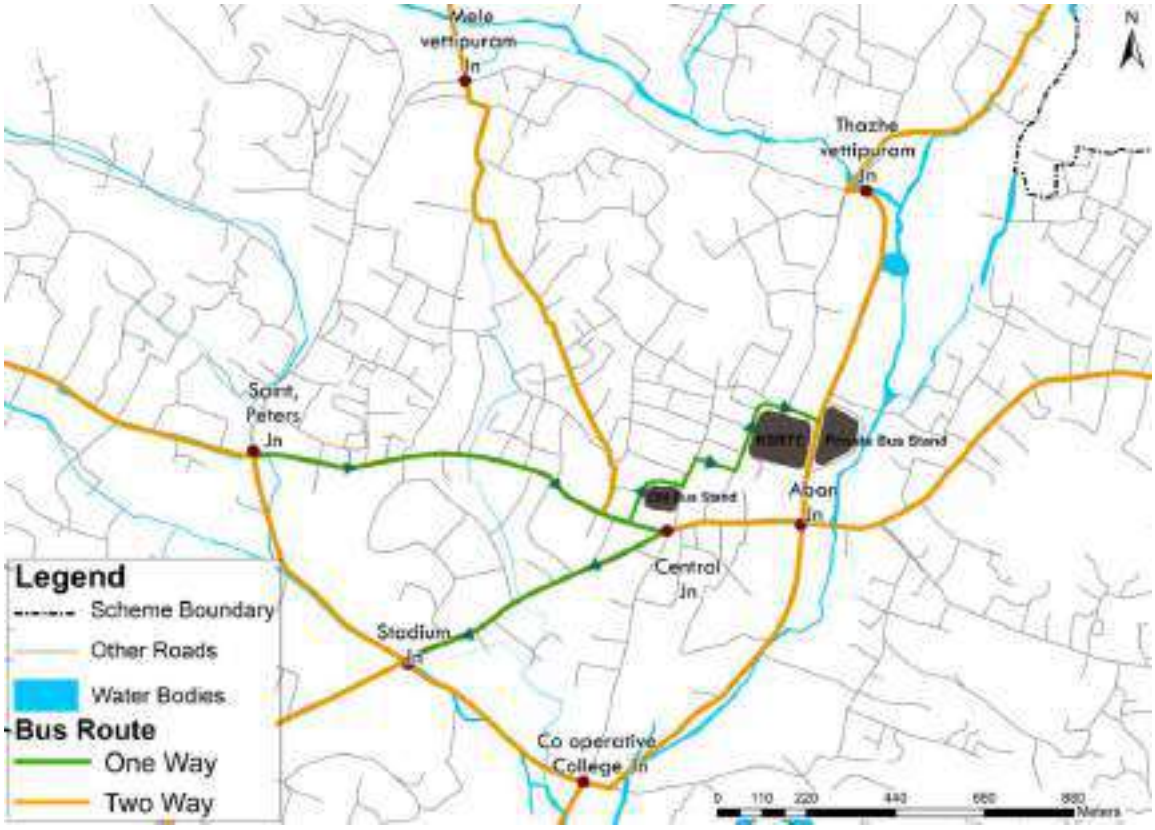


Figure 13.14 Traffic flow management route in the town

There are bus terminals, taxi stands and auto stands in the town which are the public transport infrastructure utilized by users. Two bus stations ie, KSRTC Bus station and Municipal Bus station are functioning in the town. These bus stations were located near Aban Junction and on either side of the Ring Road. A new building complex for KSRTC Bus station is under construction. The old private bus stand near Central Junction is now used as a bus bay and parking area.

A one-way traffic system is implemented in the town during specific times to manage traffic flow efficiently, reduce congestion, and enhance accessibility to key areas. Road stretch from Saint Peters Junction to Central Junction in Thiruvalla -Kumbazha Road (SH 7) and Road stretch from Central Junction to Stadium Junction in NH 183A is designated as One Way Traffic from 8.00am to 8.00pm every day (Figure 13.14)

13.5 Rail / Water / Air Transport

The transportation system of Pathanamthitta town is limited to one mode of transport, ie, road ways. Thiruvalla Railway Station is the only one railway connectivity in the district. But the nearest railway station to the Pathanamthitta town is the Chengannur railway station of Alappuzha District which located about 26 km from the town. Thiruvananthapuram and Kochi international airports are within 150 km reach from the town with a distance of about 113 kms and 138 kms from the town. There is no waterway transport in the district.

13.6 Characteristics of Inter City Traffic

Inter city traffic refers to the movement of vehicles and people between different cities or towns. Inter city traffic of the town has been analysed based on passenger traffic and goods traffic. Total of 19 zones (Table 13.8) has been identified in the town area and its surroundings for analysing the data of inter city traffic from Origin & Destination Survey.

> ശബരി റെയിൽവേ എരുമേലിയിൽ നിന്നും കുമ്പഴ – വെട്ടൂർ വഴി പുനലൂരിൽ എത്തിക്കണം. പത്തനംതിട്ടയുടെ വികസനത്തിന് ഏറെ സഹായകരമാകും അത്. പത്തനംതിട്ടക്ക് സമീപം വിമാനത്താവളം വേണം. പ്രവാസികൾ ഏറെയുള്ള പ്രദേശമാണ്. *[Sabari Railway should be extended from Erumeli to Punalur via Kumbazha-Vettoor. It will be very helpful for the development of Pathanamthitta. An airport should be built near Pathanamthitta. It is an area with a large number of expatriates.]* - Public Opinion

Town area is divided as six zones combining certain wards. Outer cordon points connecting the town with surrounding Panchayat, District and States.

Table 13-8 Traffic zoning pattern adopted for the town

Zone Number	Zone Area
Zone 1	Pathanamthitta Central Area
Zone 2	Kumbazha Area
Zone 3	North Area of CBD
Zone 4	South side of CBD
Zone 5	East Side of CBD
Zone 6	West side of CBD
Zone 7	Pathanamthitta District (Punalur Side)
Zone 8	Pathanamthitta District (Ranni Side)
Zone 9	Pathanamthitta District (Pandalam Side)
Zone 10	Pathanamthitta District (Kozhenchery Side)
Zone 11	Nearby District (Kollam & Thiruvananthapuram) (Punalur road)
Zone 12	Nearby District (Kottayam & Idukki)
Zone 13	Nearby District (Alappuzha & Ernakulam)
Zone 14	Nearby District (Kollam & Thiruvananthapuram) (Pandalam road)
Zone 15	District other than above mentioned.
Zone 16	Nearby State (Kanyakumari District, TamilNadu)
Zone 17	Nearby State (Tirunelveli District, TamilNadu)
Zone 18	Nearby State (Coimbatore District, TamilNadu)
Zone 19	Nearby State other than Tamilnadu

Source: Traffic & Transportation Study, NATPAC

13.6.1 Inter-City Passenger Traffic

Intercity passenger traffic refers to the movement of passengers between different cities or towns, typically using public transport modes such as buses, trains, taxis, or private vehicle for purposes like work, education, business, tourism, or family visits.

13.6.1.1 Modal Split

The inter town passenger transport in Pathanamthitta Town is catered by KSRTC buses, private buses, mini buses, auto-rickshaws and personalized vehicles like cars, two wheelers etc. Analysis of the O-D survey data revealed that an estimated 109933 inter town passenger trips were performed in the study region on a reference day consisting of 55665 bus passenger trips, 30412 car passenger trips, 12,327 two-wheeler passenger trips. About 50% of the passenger trips are catered through buses which shows the significance of public transport in the town. Table 13.9 gives the modal split of inter town passenger traffic in Pathanamthitta Town.

Table 13-9 Modal split of intercity daily passenger trips in Pathanamthitta Town

Mode of Travel	No. of Passengers	% of Passengers
Bus	55,665	50.64
Mini-bus/ tempo	4,934	4.49
Car/ van/ jeep	30,412	27.66
Autorickshaw	6,595	6.00
Two-wheeler	12,327	11.21
Total	109,933	100

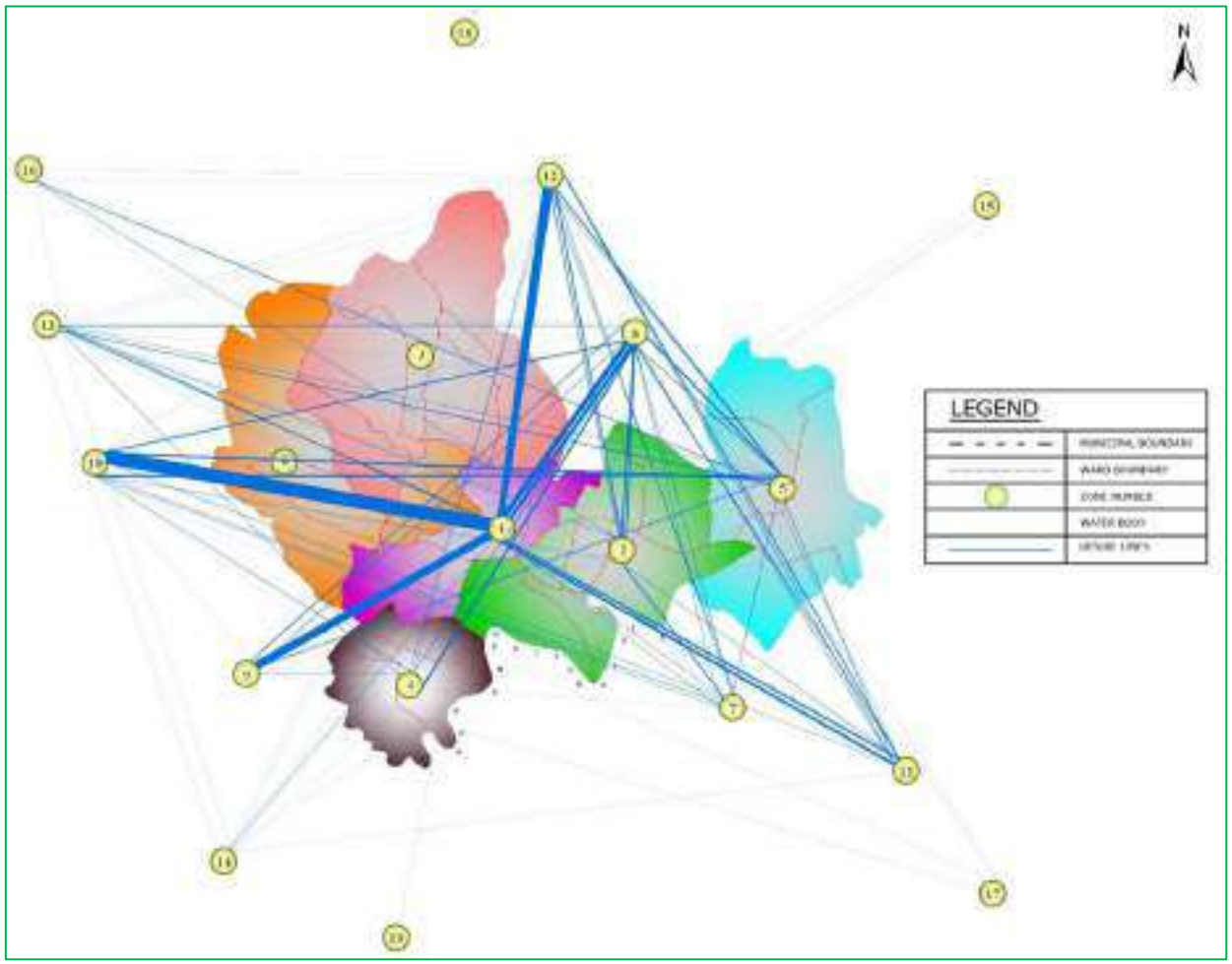


Figure 13.15 Desire line - Inter- City Daily Passenger Trips

Source: Traffic & Transportation Study, NATPAC

13.6.1.2 O-D of Passenger trips

The major traffic generating zones within the study region is the core area of the town with 30974 trips, followed by 18847 trips originate from Kozhenchery. The origin destination matrix of inter-town passenger trips is shown in Annexure 13.3. The desire lines of inter-town passenger trips (Figure 13.15) shows that majority of the trips to Pathanamthitta are from Padalam, Ranni, Thiruvananthapuram, Kollam, Kottayam and Idukki region

13.6.2 Inter-City Goods Traffic.

Intercity goods traffic refers to the movement of goods or commodities between different cities or towns. This involves the transportation of products, raw materials, and finished goods through various transport modes.

13.6.2.1 Volume of goods vehicles

A maximum number of 5799 goods vehicles passed through outer cordon points selected for the study, comprising 470 Multi Axle Truck (MAT), 2328 trucks, 1901 mini-trucks and 1099 goods autos. At Mylapra survey point, a total of 1866 goods vehicles were observed on a reference day, comprises of 87 MAT, 282 trucks, 497 mini-trucks and 219 goods auto rickshaws. At Santhosh junction survey point, as many as 55 MAT, 658 trucks, 506 mini-trucks and 338 goods auto rickshaws totalling 1556 goods vehicles passed on the reference day. A minimum number of 1103 goods vehicles passed through Kumbazha survey point comprising of 105 MAT, 282 trucks, 497 mini-trucks and 219 goods auto rickshaws.

13.6.2.2 Modal split

A total of 4078 goods vehicles were found to be involved in carrying goods traffic to and from the study region, consisting of 234 MAT,1760 truck, 1238 mini-trucks and 845 goods auto rickshaws. The quantum of goods handled by these goods vehicles was to the tune of 12233 tonnes. About 80% of the goods are handled by MAT and Trucks, mini trucks carry about 16% of the goods. Modal split of inter- town daily goods traffic (in tonnes) in Pathanamthitta study area is given in Table 13.10. The origin-destination matrix of different goods vehicle trips are presented in Annexure 13.4. Total of 1760 trucks trips were observed during 24 hours origin-destination survey in Pathanamthitta Town.

Table 13-10 Modal split of intercity daily goods traffic (in tonnes)

Mode of travel	No. of vehicles		Quantity carried	
	No.	%	Tons	%
MAT	234	5.75	1,842	15.06
Truck	1760	43.17	8,129	66.45
Mini Truck	1238	30.35	1,959	16.01
Goods/Auto rikshaw	845	20.73	303	2.48
Total	4,078	100	12,233	100

13.6.2.3 O-D of goods transportation

The origin-destination matrix of different goods vehicle trips is provided in Annexure 13.5. Total of 1760 trucks trips were observed during 24 hours origin-destination survey in Pathanamthitta Town. The major traffic generator of goods traffic within the study region was Zone 8 (Pathanamthitta District -Ranni) side area with 3407 tonnes, most of them bound for other districts within the State. Total of 272 mini-trucks were observed during 24 hours origin-destination survey in Pathanamthitta Town and the maximum movement occurred towards Zone 8 (Figure 13.16).

13.7 Other Infrastructure Facilities

The study of various traffic and transportation infrastructure facilities, including bus stops, auto/taxi parking, pedestrian facilities, and truck terminals, is detailed below.

13.7.1 Bus Stops

The walking distance to bus stops is an important aspect that decides the utility of Public Transport System and it is seen that the optimum distance to bus stops shall be 0.5 km.

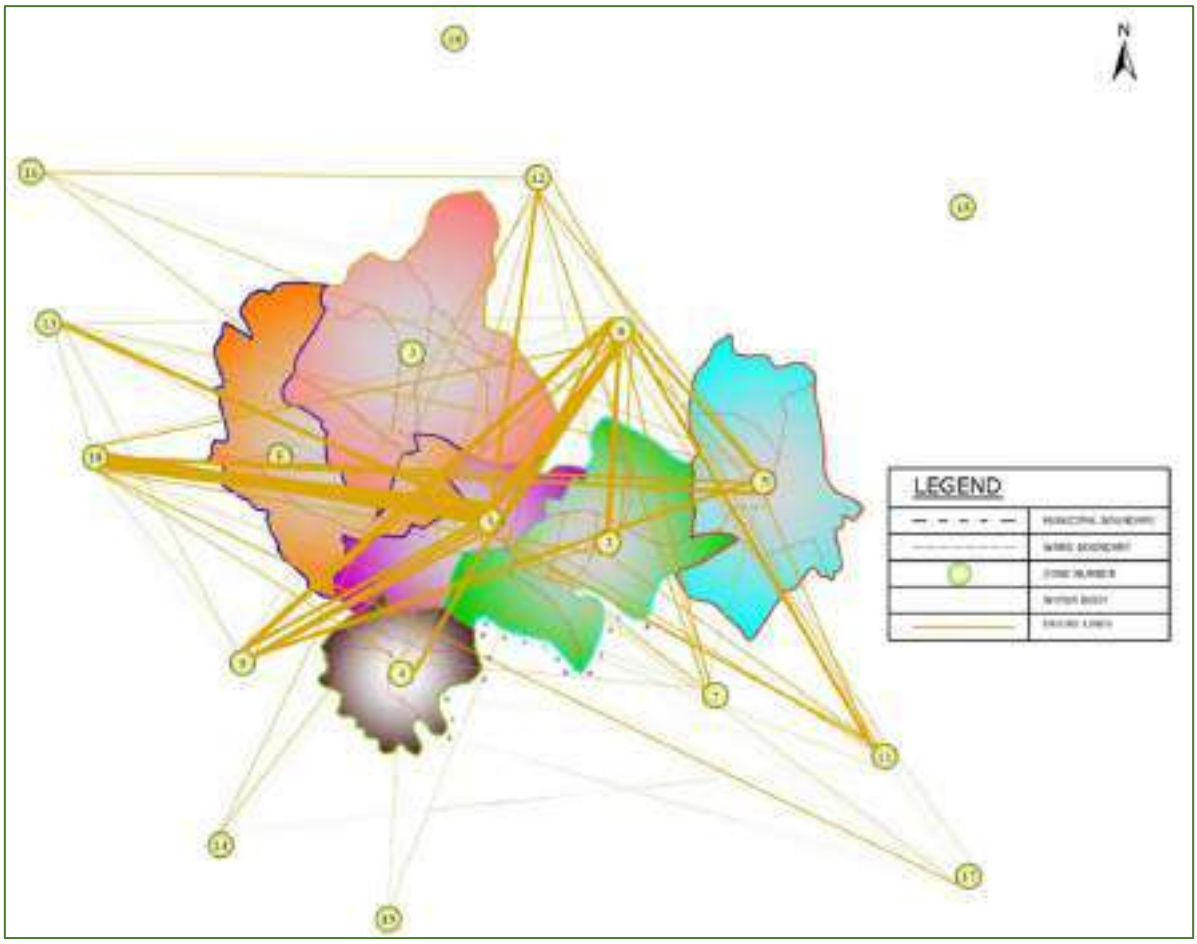


Figure 13.16 Desire lines of inter-town goods traffic

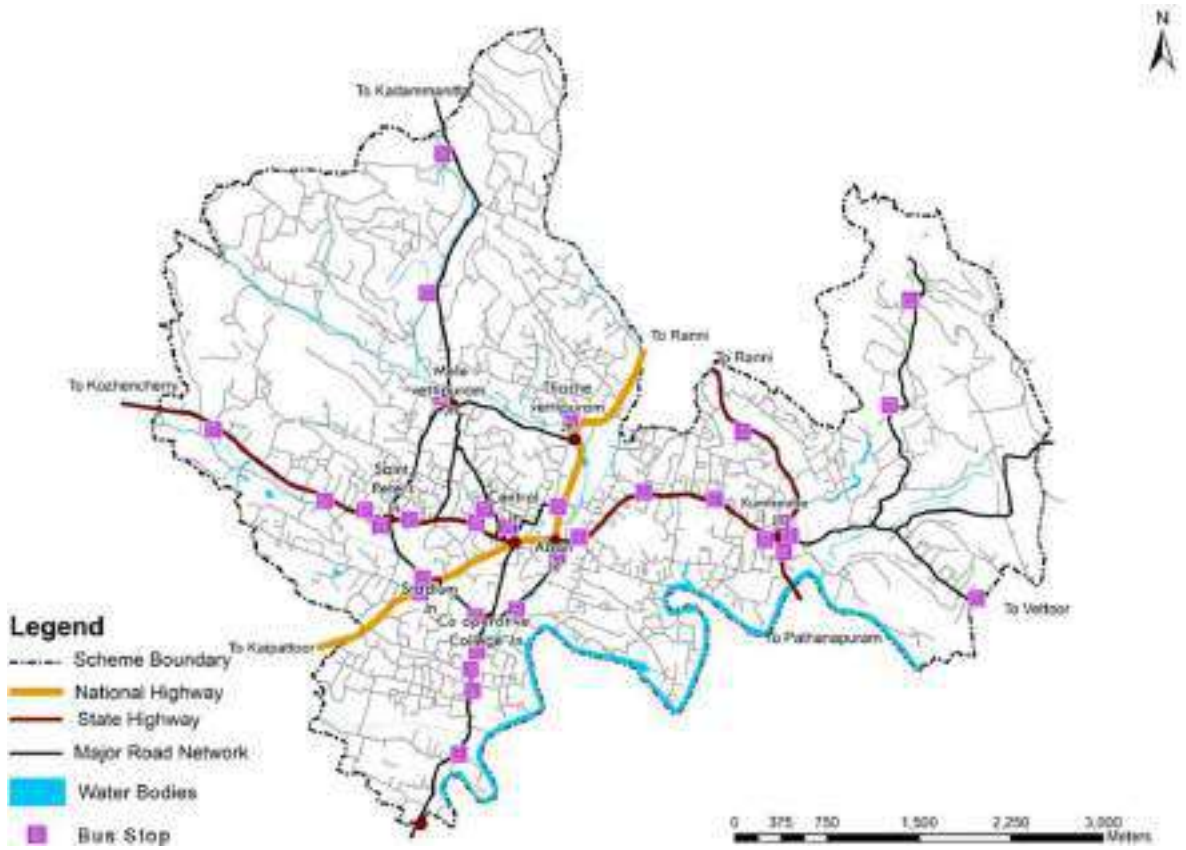


Figure 13.17 Location of bus stops in the town



Figure 13.18 Bus stops in the town

As per the Socio – Economic Survey conducted in year 2019 the average distance to bus stop was found to be 800m. People in the northern wards of the town travel more distance towards bus stops as public transport is limited in these areas. The location of bus stops in the town are shown in Figure 13.17. The central area is well connected with bus services but areas in the north-west and north-east are not well connected through buses.

Most bus stops lack dedicated spaces for buses to pull over, leading to congestion and obstructing pedestrian movement. Ideally, bus stops should be designed to allow buses to stop without disrupting traffic flow. Currently, 90% of bus stops do not have designated bays and are located on road shoulders or footpaths, causing pedestrian inconvenience. To improve functionality and aesthetics while generating economic benefits for the Urban Local Body (ULB), bus stops can be redesigned with dedicated bays, proper seating, shelter, and commercial elements such as advertisement panels or kiosks.

13.7.2 Auto/Taxi Stand

The taxi stands and auto stands are located in all major road junctions. People are using auto rikshaws for internal and movement with in town centre and ring roads. Currently, bus services are limited to the southern part of the ring road, leaving areas like Melevettipuram and Thazhevettipuram underserved. As a result, residents in these areas heavily rely on auto-rickshaws for transportation. Car taxis are also available in major junctions like KSRTC junction, Aban Junctions. Auto and taxi stands lack dedicated spaces, leading to vehicles being parked on footpaths and at road turns. This not only causes obstruction to pedestrian movement but also contributes to traffic congestion. Properly designated auto and taxi stands with clearly marked areas, waiting zones, and seating facilities should be established to ensure smooth traffic flow and pedestrian safety. Major Auto/ Taxi stand locations in the town is shown in Figure 13.20.



Figure 13.19 Existing images of auto stands.

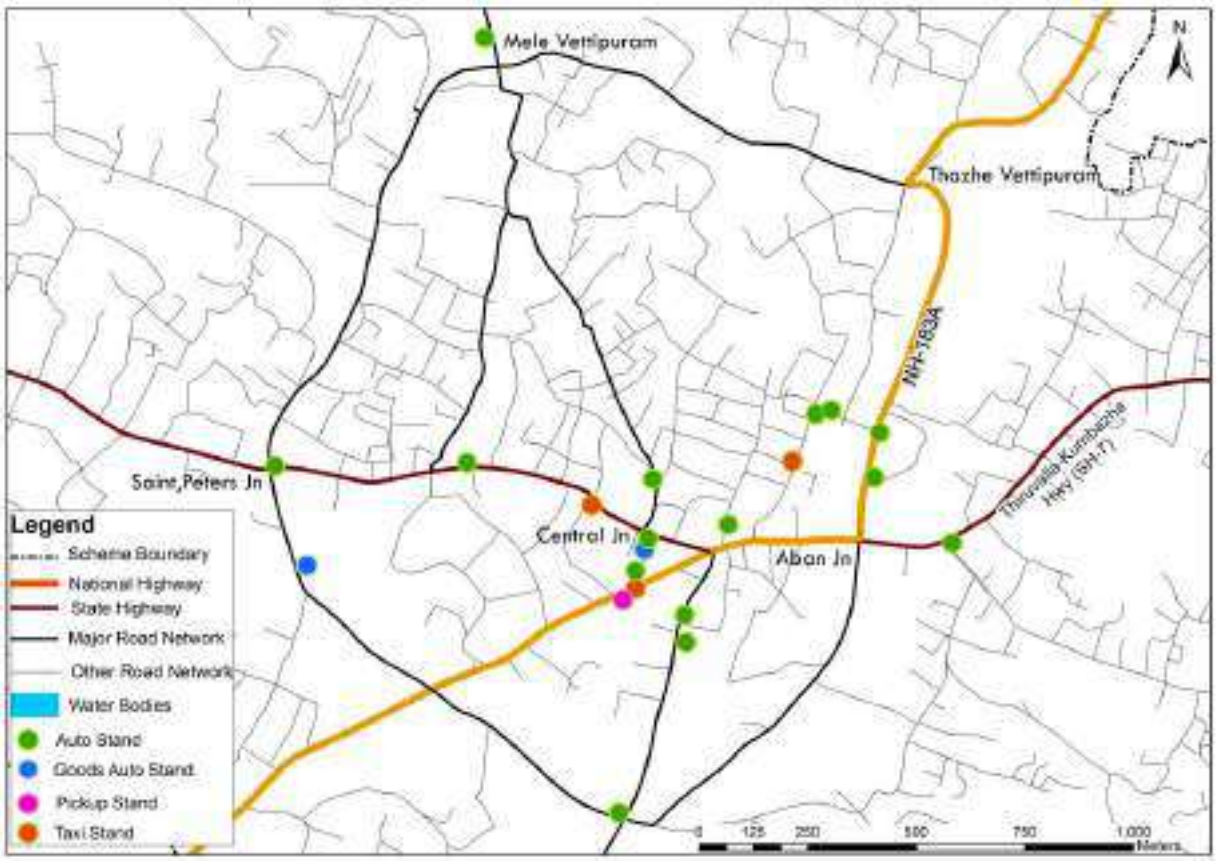


Figure 13.20 Locations of auto/taxi availability in the centre area of town

13.7.3 Pedestrian Facilities

A Footpath or Sidewalk is a dedicated part of a road exclusively for pedestrians, located on both sides of the road. These pathways should be easily walkable, kept clean, and ensure safety for pedestrians by being free from encroachments, parked vehicles, and other obstructions such as utilities. Well-maintained footpaths are crucial elements of a well-functioning city street. The width of the footpath varies as per the adjacent land use based on guidelines. Footpaths in residential areas require a minimum clear width of 1.8 m, which is enough space for two wheelchairs to pass each other. For commercial areas, the clear width should be at least 2.5 m. All major roads in the Planning area have footpath except ring road portion. Generally, the top portion of Storm water drain is used as footpath in the town. People are using shoulder areas for walking in ring road. The range of width of footpath inside the town area is varies from 0.7m to 1.5m. Existing width of footpath could not cater the pedestrian volume and free movement. In addition to width, several other factors impact the functionality of footpaths and the ease of pedestrian movement. These include level differences, surface quality, encroachments by vendors, the placement of electric poles, the positioning of bus stops, and the presence of trees.

Most of the footpaths in the town are laid with guide tiles to facilitate better walking conditions. However, in some areas, frequent level changes discourage pedestrians from using them, leading people to walk on the carriageway instead. Additionally, the absence of designated vending zones results in street vendors occupying footpaths, further obstructing pedestrian movement. Proper planning is needed to create level, accessible footpaths and designated vending areas to ensure smooth pedestrian flow. (Figure 13.21).



Figure 13.21 Footpaths in the town

> കാൽനടക്കാർക്കും, സൈക്കിൾ യാത്രക്കാർക്കും പ്രത്യേക സുരക്ഷിത പാത റിംഗ് റോഡ് വശങ്ങളിൽ നിർമ്മിക്കുക. ഫുട്പ്പാത്തുകൾ (സുൽത്താൻബെത്തേരി നടപ്പിലാക്കിയ രീതിയിൽ) ബ്യൂട്ടിഫിക്കേഷൻ നടത്തണം. റോഡ് ഡിവൈഡറുകൾ ചെടികൾവച്ച് മനോഹമാക്കുക *[Construct separate safe paths for pedestrians and cyclists on the sides of the ring road. Beautify the footpath and road dividers with plants.]* - Public Opinion

Footpaths contribute to the overall walking comforts of town by making them more pedestrian-friendly. Towns that prioritize well-designed footpaths create attractive, vibrant, and inclusive environments where people feel encouraged to live, work, and visit. A well-planned footpath network enhances walkability, encourages pedestrian activity, and boosts local businesses by increasing foot traffic. To create a pedestrian-friendly town, the municipality should develop a comprehensive footpath plan that ensures accessibility, safety, and continuity. This includes maintaining level surfaces, integrating designated vending zones, and minimizing obstructions like utility poles and unplanned parking.

13.7.4 Truck Terminals

Town does not have proper truck terminal area. Currently trucks are parked in the shoulder areas of ring road and open ground near ring roads. Fuel stations are currently being used as informal parking areas by truck drivers due to the availability of fuel, comfort, and sanitation facilities. To address the issue of on-street

parking of trucks in the town, a dedicated truck terminal station is essential. Establishing a well-planned truck terminal with proper amenities, including parking spaces, rest areas, and sanitation facilities, will help decongest streets, improve traffic flow, and enhance road safety in the town.

> പത്തനംതിട്ട നഗരത്തിലെ ഗതാഗതകുരുക്ക് അവസാനിപ്പിക്കുവാൻ ഔട്ടർ റിംഗ് റോഡ് അത്യാവശ്യമാണ്. പത്തനംതിട്ട നഗരത്തിൽ വികേന്ദ്രീകൃത വികസനം മേഖലകൾ വേണം. നഗരത്തിൽ പ്രവേശിക്കേണ്ടാത്ത ഭാരവാഹനങ്ങൾ ഒട്ടർ റിംഗ് റോഡിലൂടെ തിരിച്ച് വിടാം. സമീപത്തെ പഞ്ചായത്തുകളായ ഓമല്ലൂർ, ഇലന്തൂർ, വള്ളിക്കോട്, കടമ്മനിട്ട, മൈലപ്ര മുതലായ പഞ്ചായത്തുകളിൽ നിലവിലുള്ള പൊതുമരാമത്ത് റോഡുകൾ കൂട്ടിയോജിപ്പിച്ച് വീതി കൂട്ടി ഔട്ടർ റിംഗ് റോഡ് നിർമ്മിക്കാം. *[The Outer Ring Road is essential to end the traffic congestion in Pathanamthitta city. Decentralized development areas are needed in Pathanamthitta city. Heavy vehicles that do not need to enter the city can be diverted through the Outer Ring Road. The existing PWD roads in nearby panchayats such as Omallur, Ilanthur, Vallikode, Kadammanitta, Mylapra etc. can be combined and widened to build an Outer Ring Road.]* - Public Opinion

13.8 Accident Prone Areas

Aban Junction to Kumbazha Junction Road is very accident-prone stretch due to poor condition and reduced width of carriage way. All junctions in the ring road and Kumbazha junction has electronic traffic signal system and road markings for safe movement of vehicle at junctions. But most of the junctions in the town lack proper channelization and pedestrian islands. Despite the relatively low accident rate as per survey data, improving road conditions, widening the carriageway, and incorporating pedestrian-friendly infrastructure can significantly enhance road safety and traffic efficiency.

13.9 Gaps in networks

Town have a proper inner ring road network. Some areas in the northern part of the town suffer from poor connectivity to other parts, limiting accessibility and hindering seamless movement. Northern areas lack vital roads that connect neighbourhoods, central area and to main highways. A new outer ring road for the town and a regional outer ring road connecting surrounding Panchayat of the town can bridge the gap of regional connectivity. In some areas, the absence of traffic control systems like roundabouts or traffic lights result in chaotic or inefficient road layouts. Some areas of the town still have gravel roads instead of paved ones, which creates gaps in the road network in terms of usability and comfort. Too many vehicles concentrated on a few roads due to the lack of a balanced road system. This leads to traffic congestion and delays, particularly on roads meant for lower volumes of traffic. Through proper road hierarchy this can be managed. Currently, non-motorized transport is absent in the town. To promote sustainable and safe mobility, adequate pathways, dedicated bike lanes, and pedestrian-friendly roads should be integrated into the urban infrastructure. Encouraging non-motorized transport can reduce congestion, lower emissions, and improve the overall livability of the town.

13.10 Impact of Hazard & Climate Change

As per the guideline for preparation of risk informed master plan for a town, assessing transportation vulnerabilities of the town is included in the category of physical vulnerability. 20% weightage is given to physical vulnerability and following are the sub parameters and its weightage included:

1. Buildings (50%)
2. Transportation (35%)
3. Landcover (15%)

Out of these three sub parameters, percentage area of transportation likely to be affected by a hazard is analysed in this chapter and the inference of this analysis is used in the chapter 4 to find out the total risk of the town. Remaining two sub parameters are analysed in chapter 7 'Land use & Buildup Density' and chapter 21 'Housing'.

To understand the transportation vulnerability in the town, percentage of transportation area likely to be affected by flood and landslide is analysed in this chapter. The data is collected by 100% door to door socio economic survey in the flood prone and landslide prone areas of the town and analysed in GIS software. Varying degrees of population vulnerability (low, moderate, and highly vulnerable areas) has been identified in each cadastral based on value assigned as per guidelines of risk informed master plan. As town has only road connectivity, the value assigned for railway transportation vulnerability in transportation vulnerability as per guidelines is incorporated with road transportation vulnerability. Table 13.11 shows the criteria and its value adopted for the analysis of percentage of roads likely to be affected by the hazard at cadastral level.

Table 13-11 Criteria and its value adopted for vulnerability analysis of percentage of roads likely to be affected by a hazard

Criteria	Value
> 75% of roads in a survey number is likely to be affected	4.2
51 – 75% of roads in a survey number is likely to be affected	3.15
26-50 % of roads in a survey number is likely to be affected	2.1
<26% of roads in a survey number is likely to be affected	1.05

Source: Guidelines for Risk Informed Master Plan

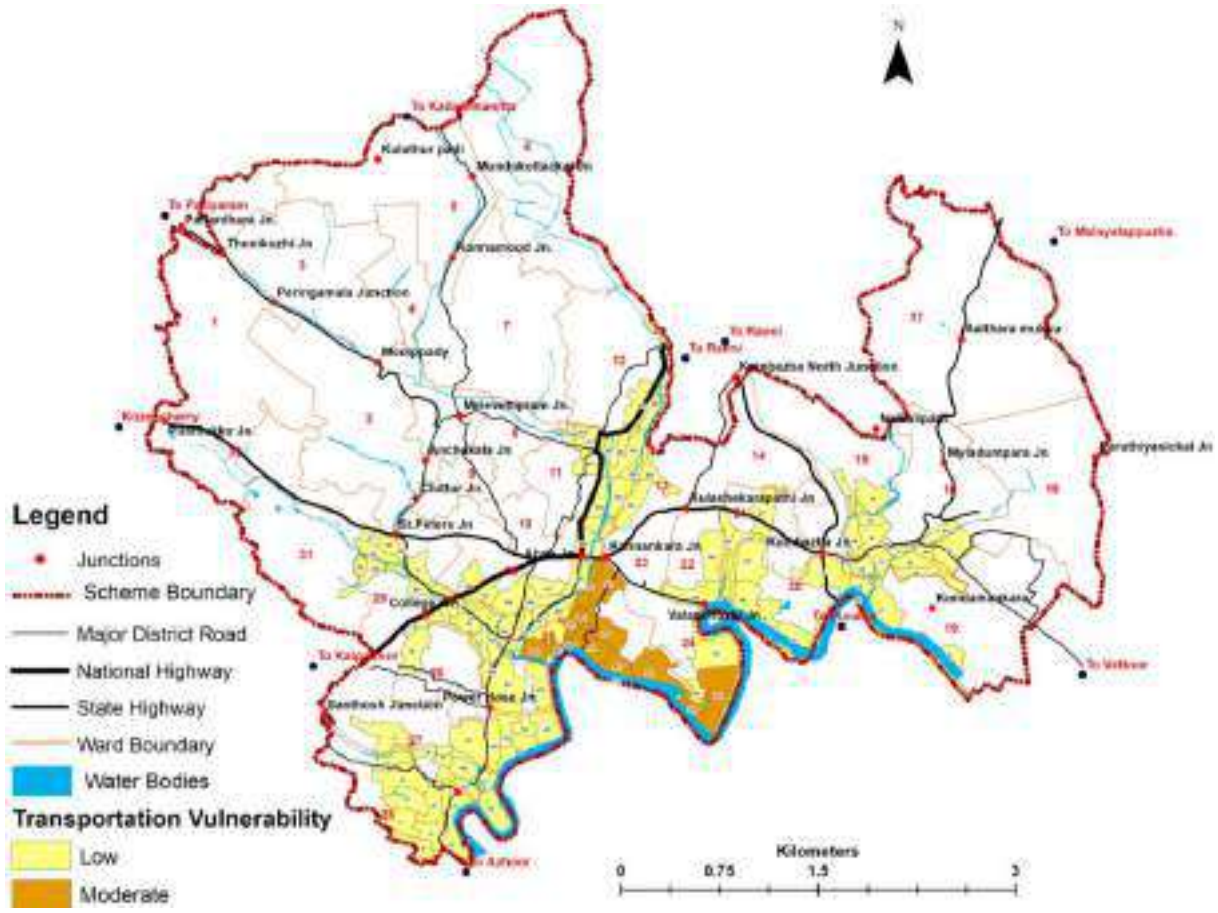


Figure 13.22 Cadastral level transportation vulnerability in flood prone area

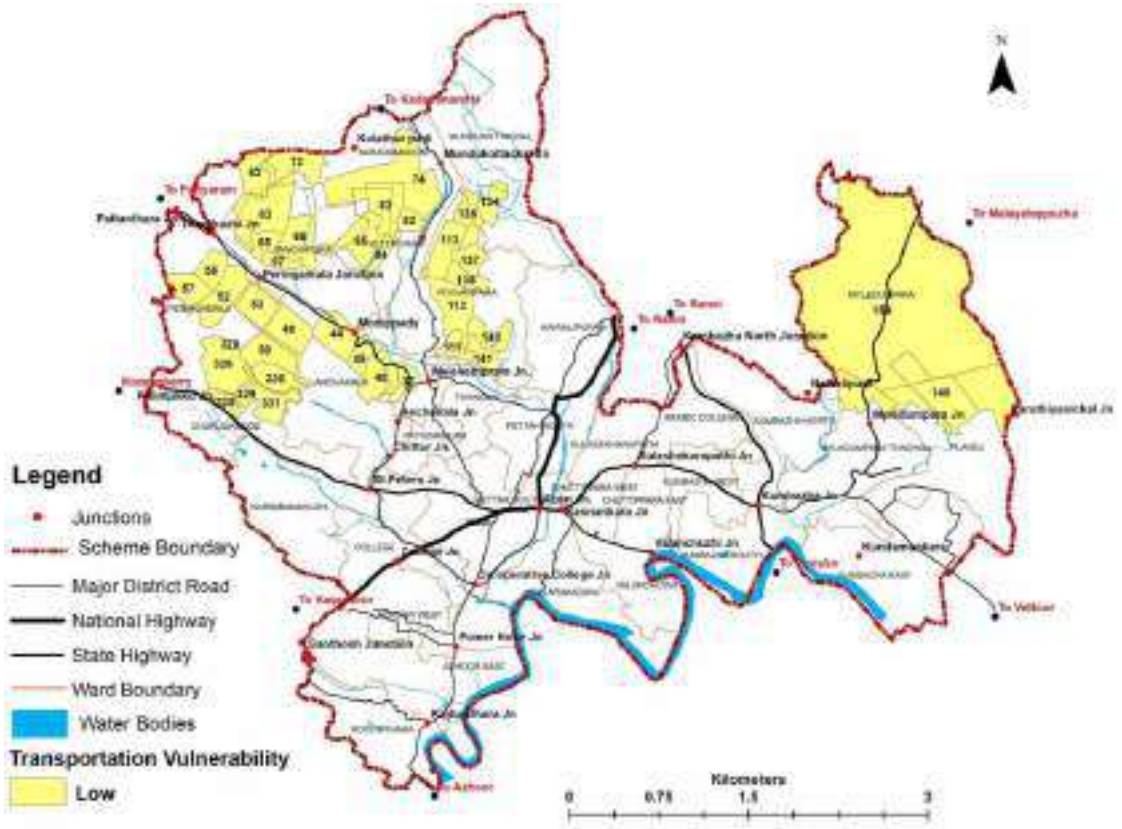


Figure 13.23 Map showing cadastral level transportation vulnerability in landslide prone area

13.10.1 Flood vulnerability

The vulnerability of percentage of roads likely to be affected in the flood prone area of the town at cadastral level is analysed here. The transportation vulnerability in flood prone area is low to moderate as percentage of roads likely to be affected by flood is not covering more than 50% of the roads (Figure 13.22). In this 14 cadastral (12.28%) out of 114 shows the moderate transportation vulnerability which are located on the banks of River Achankoil.

13.10.2 Landslide vulnerability

Percentage of roads likely to be affected in the landslide prone area of the town at cadastral level is analysed here. The transportation vulnerability in landslide prone area is low vulnerability.ie. All 38 cadastral have low transportation vulnerability as percentage of roads likely to be affected by landslide is not covering more than 25% of the roads (Figure 13.23).

13.11 Inference

The transportation system of Pathanamthitta town is limited to road ways only. Major share of the traffic in the town is handled by Punaloor- Moovattupuzha road (SH-8), Thiruvalla- Kumbazha road (SH-7) and Ring road, the traffic volume of all these roads exceeds its capacity. Parking and pedestrian problem is experiencing in the central part of the town. Geometric deficiencies at major junctions along Thiruvalla-Kumbazha Road, Mylapra Road, and Kaipattor Road contribute to traffic breakdowns. The ring road holds significant potential for the growth and development of the town by improving connectivity, reducing congestion in the core areas, and facilitating smooth movement of goods and people. Ensuring that public transportation covers the entire ring road is crucial to maximizing its benefits. Issues identified through study and analysis: hot spots, junction improvement requirements, hazard issues that should be addressed at phased manner. Adequate infrastructural facilities are not available for truck terminals.



14. WATER SUPPLY

Water plays a vital role in our day to day life. SDG 6 targeted “By 2030, achieve universal and equitable access to safe and affordable drinking water for all”. However, climate change significantly affects water availability, leading to scarcity in some regions and flooding in others.

To ensure equitable access of water and sanitation for all, it is essential to study about water supply situation of a town. Master plan focus on adequate and high-quality water supply (amount of water required to meet the needs of population and available sources of water), Protecting the environment (water sources are protected from pollution and degradation), developing necessary infrastructure (reservoirs, pipelines, treatment plants), promoting economic growth and ultimately, improving the quality of life for the population.

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1 Water sources

2 Existing Water Supply System

3 Water Supply Coverage

4 Ground Water

5 Water Scarcity

6 Ongoing Projects

7 Drinking Water Sustainability of Town

8 Impact of Hazard & Climate Change

9 Problems & Potentials

10 Inference

14.1 Water sources

According to socio-economic survey 2019, 55% of households depends Open Well of their own houses as primary source of water for drinking and other domestic purposes. 41% of households depends on water supplied by Kerala Water Authority (KWA) (piped water supply) as primary source of water. 1 % uses public well and bore well each, 2% depends in other sources of water like quarry water, water from nearby houses etc. (Figure 14.1).

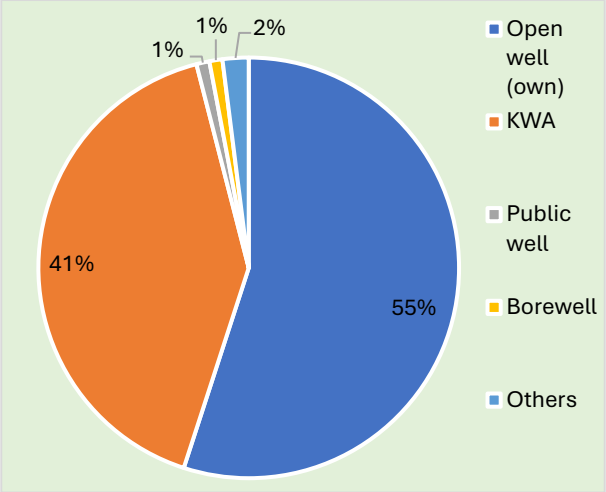

Figure 14.1Major Source of water in the town

Source: Socio Economic Survey 2019

14.2 Existing Water Supply System

The Town is catered by two piped water supply schemes. Both of them are owned and operated by Kerala Water Authority.

14.2.1 Urban Water Supply Scheme for Pathanamthitta Municipality

The scheme is commissioned in 1990 and the source of the scheme is River Achankovil which passes through the boundary of the Municipality. 95% of the drinking water supply in Pathanamthitta Town is provided through this scheme. There is a nine-meter diameter concrete intake well at Kallarakkadavu area on the banks of river Achankovil (Figure 14.2). Water is collected to 26 lakhs capacity Over Head Tank at Pampoorippara which is nearly 700 meters away from the intake well. About 70% of the Town area is catered from this overhead tank.



Figure 14.2 Intake well at Kallarakkadavu

In some isolated elevated areas within the Town, the gravity-based water supply system is ineffective. To address this, water is first collected in booster sump cum pump houses and then pumped to overhead tanks at the highest points before being distributed. Vanchipoika- Kumbangal, Ezhuppuramuruppu, Anchakkala - Ottukal and Mannaramala are examples of such areas.

14.2.2 Rural Water Supply Scheme for Mylapra panchayat

Mylapra is one of the adjoining Panchayat of Pathanamthitta town. It is a small rural water supply scheme that is commissioned in1990s which is functioning in the Mylapra Panchayat. The source of this scheme is also river Achankovil. Myladumpara area in the Pathanamthitta municipality (Part of wards 16 & 17) is covered by water from the two-overhead tanks at Myladumpara area which covers 5-10% of the municipal area. Figure 14.3 shows the water supply line diagram of the Pathanamthitta town.

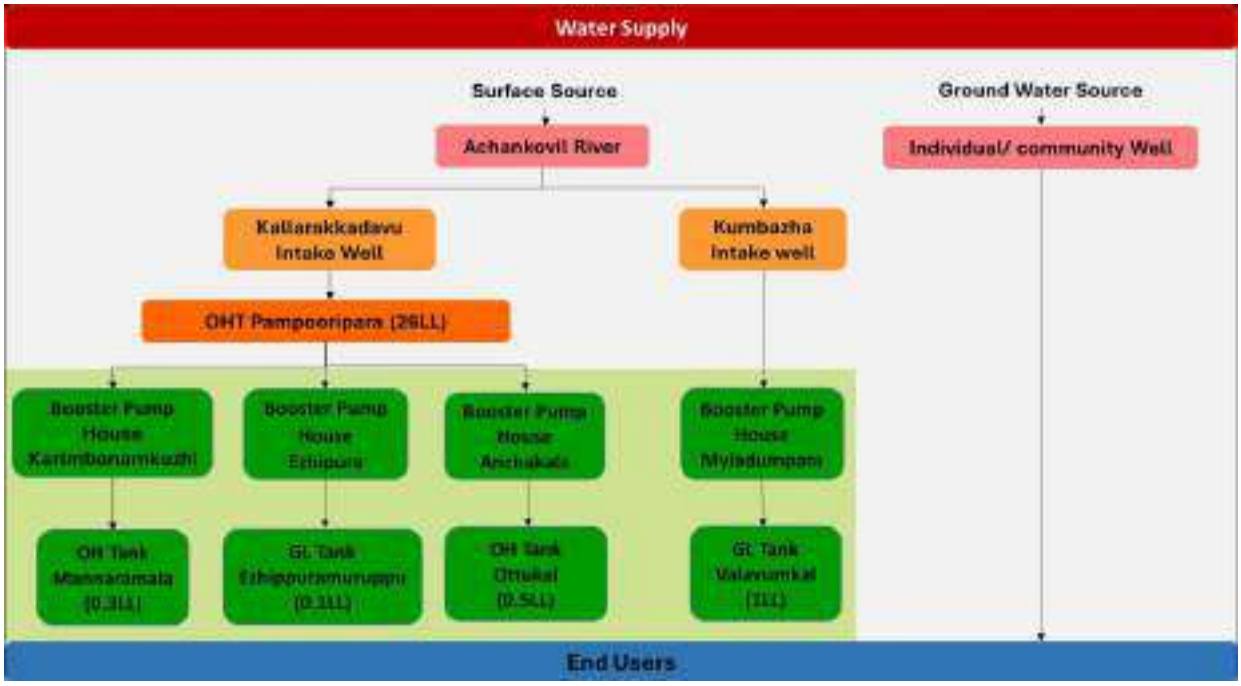

Figure 14.3 Water supply line diagram - Pathanamthitta town

14.2.3 Treatment facilities

The available water treatment facilities in both the water supply schemes are limited. In Urban Water Supply Scheme, the outdated four clarifier units are provided which is not capable to remove the turbidity from the raw river water especially in monsoon months when the turbidity level in river water goes beyond 150NTU. This is because of the absence of coagulation –flocculation facility and limited filter area in the unit (Figure 14.4). Backwashing and cleaning of filter beds are not effective compared to the rapid sand filters. Hence turbidity removal is less effective and efficient in clarifier. Clarifier is an outdated system of water treatment that are not capable of treating turbid river water. Pathanamthitta is the last location in Kerala where the Kerala Water Authority (KWA) constructed a clarifier unit-type water treatment system. Currently these systems are not recommended for community water supply scheme due to its inefficiency in handling turbid waters of rivers in Kerala. Therefore, these treatment systems must be replaced as soon as possible.



Figure 14.4 Four units of Clari-filter for UWSS at Pampoorippara

> എല്ലാ വാർഡുകളിലും 24*7 water supply ഉറപ്പാക്കണം. ഉയരം കൂടിയ പ്രദേശങ്ങളിൽ പ്രത്യേക ചെറുകിട കുടിവെള്ള പദ്ധതികൾ നടപ്പിലാക്കണം. [*24*7 water supply should be ensured in all wards. Small-scale drinking water projects should be implemented in high altitude areas.]– Public Opinion*

14.2.4 Distribution

There is a total of 6247 water connections out of which 5415 are domestic connections (55.18% households), 77 in Government institutions and 755 in private institutions.



Figure 14.5 26 LL Capacity Overhead Tank at Pampoorippara

A total of 543 public taps are there in the Municipality. Even 55.18% domestic water connections are in the town, only 41% of the households are using piped water supply as primary source of water. Present water demand of 2.62MLD (@70 l/h/d) is met by the current water supply scheme (2.6 MLD) (Figure 14.5). But availability of water during summer is found inadequate since demand of water increases due to lack of water availability in open wells and public wells.

14.3 Water Supply Coverage

When the present water supply scheme was commissioned in 1990, the original distribution system was provided in the town areas only. Additional distribution lines were laid in subsequent years under various schemes, but there are many residential areas and interior roads, that were developed later on in which there are no distribution pipe lines. 15% of the municipal area still need distribution pipe lines. Figure 14.6 shows the main distribution lines and location of existing infrastructure facilities for piped water supply.

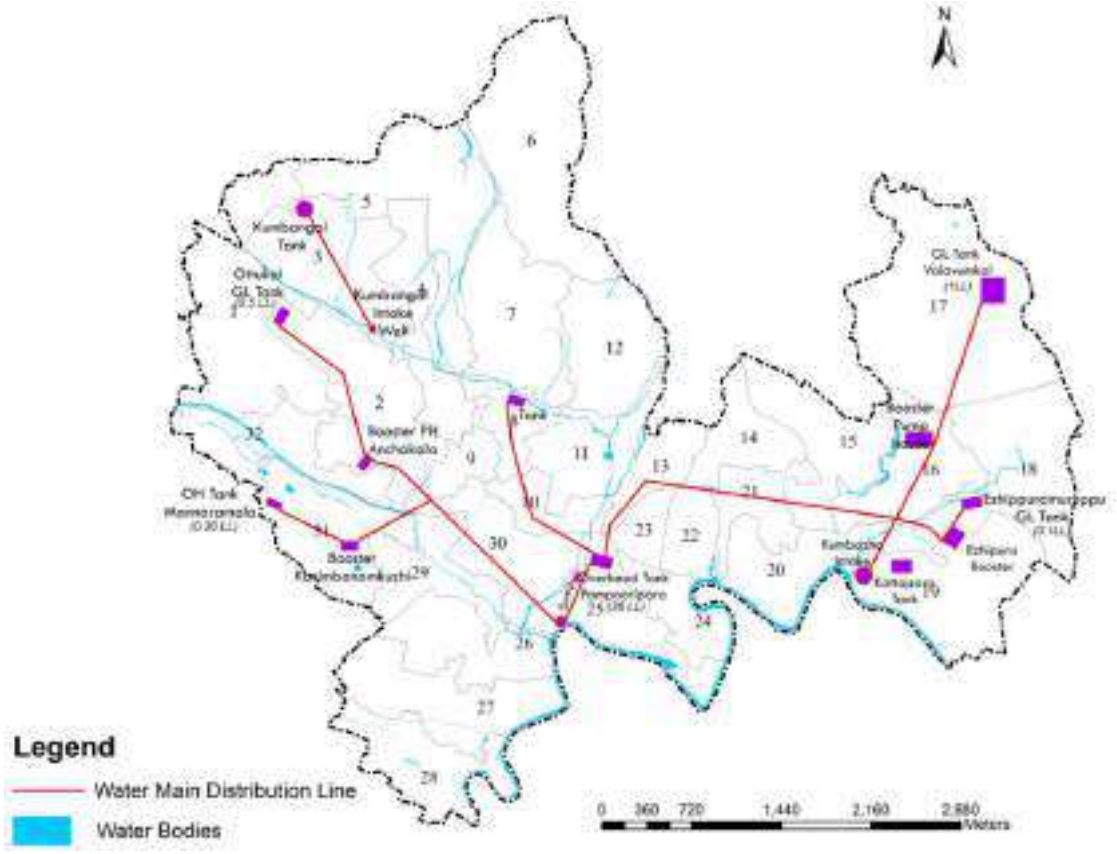

Figure 14.6 Schematic Diagram of existing piped water supply main distribution line

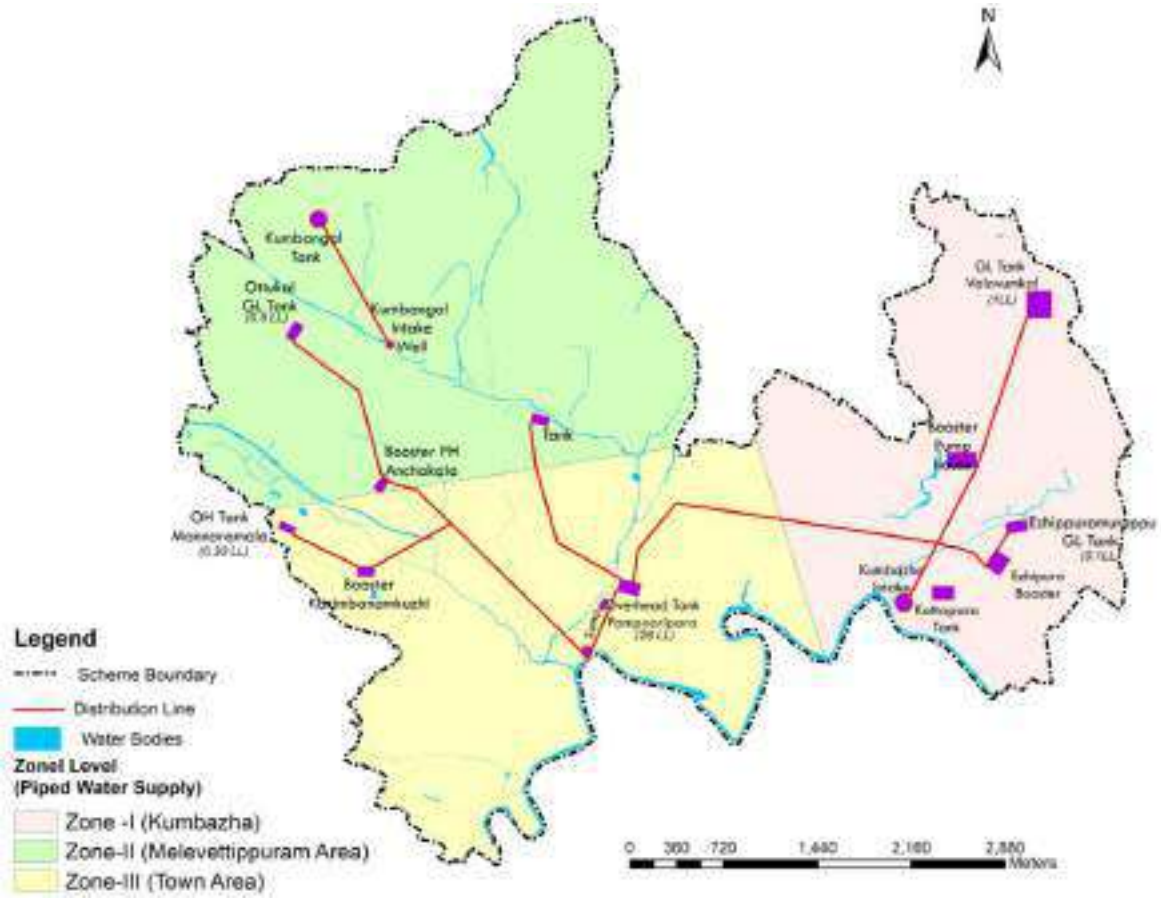

Figure 14.7 Zonal Level piped water supply diagram

> കുടിവെള്ളത്തിന്റെ ശുദ്ധത ഉറപ്പാക്കണം. അച്ചന്കോവിലാറിൽ കുടിവെള്ള പദ്ധതിയുടെ intake നോട് ചേർന്ന് വരുന്ന കുമ്പഴ മത്സ്യമാർക്കറ്റ് ഉൾപ്പെടെയുള്ളവയിൽ നിന്ന് ഒഴുകി വരുന്ന മാലിന്യം ശുദ്ധീകരിക്കുന്നതിനും ആയവ കുടിവെള്ളത്തിൽ കലരുന്നില്ലെന്നു ഉറപ്പാക്കുന്നതിനുമുള്ള സൗകര്യങ്ങൾ വേണം. [*The purity of drinking water should be ensured. Facilities are needed to treat the waste flowing from the fish market in Kumbazha, which is adjacent to the intake of the drinking water project in Achankovilar, and to ensure that it does not mix with the drinking water.]– Public Opinion*

Zone based Water distribution is carried in the town by KWA. The town is divided into three zone based on the topography and positions of intake well and overhead tanks (Figure 14.7). The zone one is covering the Kumbazha region, Zone two is covering the Melevettipuram region and zone three coving the town area. The quantity of water and the distribution intervals depend on seasonal variations and the availability of source water, differing across various zones.

14.4 Ground Water

Measurements of water levels in wells provide the most fundamental indicator of the status of groundwater resource and are critical to meaningful evaluation of the quantity of ground water and its interaction with surface water. As per the study of 'Aquifer mapping and management plan of hard rock areas of Pathanamthitta district, Kerala conducted by Central Ground Water Board, water levels in the district are monitored four times (April, August, November and January) using 96 monitoring dug wells across Pathanamthitta district. The water level maps for the pre-monsoon and post-monsoon periods (Figures 14.8 and 14.9) indicate that the water table in Pathanamthitta town generally ranges between 2 to 5 meters

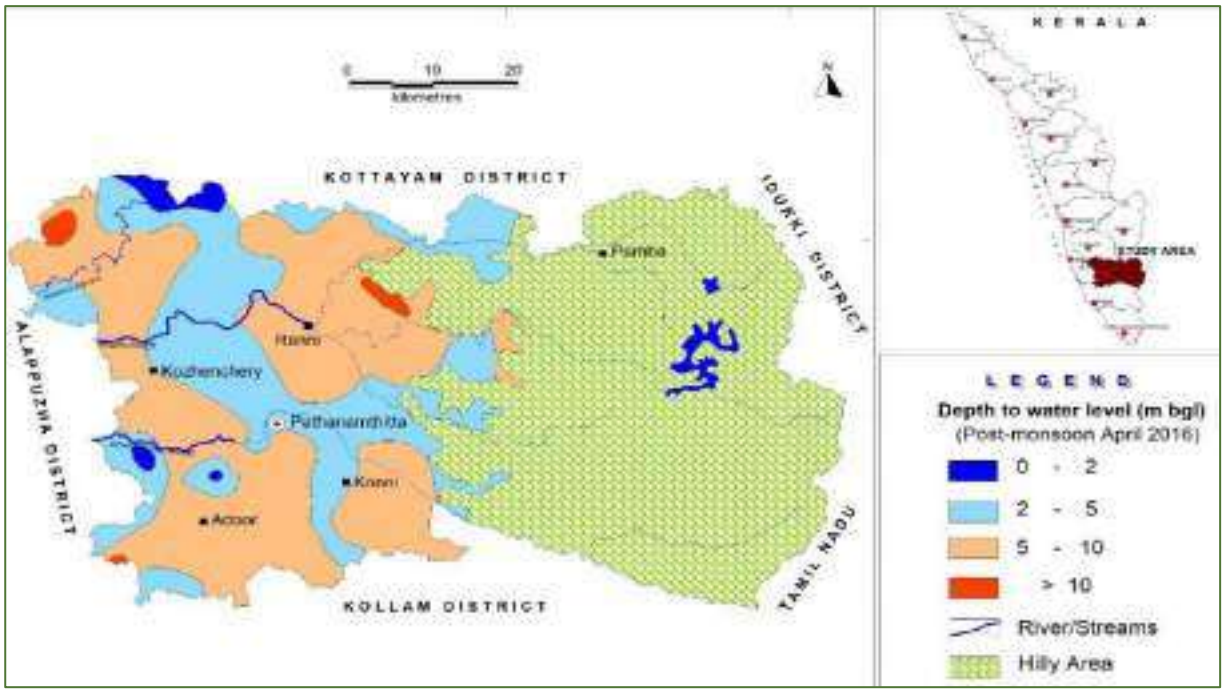

Figure 14.8 Pre monsoon water level of Pathanamthitta District

Source: Central Ground Water Board

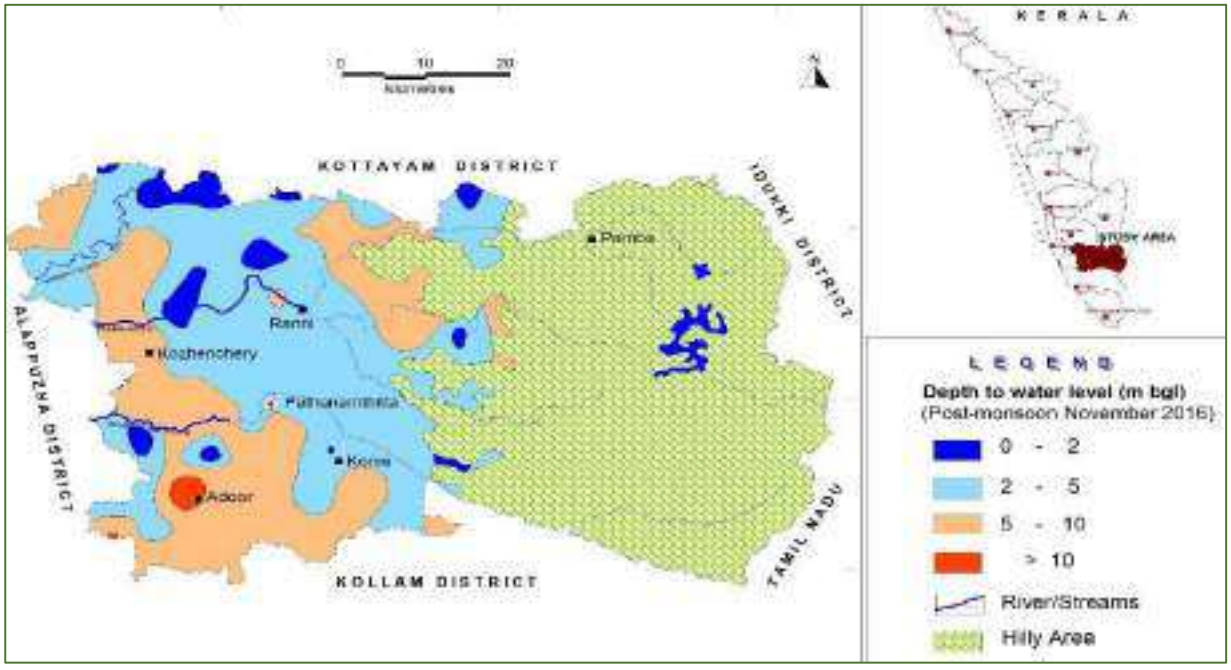

Figure 14.9 Post monsoon water level of Pathanamthitta District

Source: Central Ground Water Board

during both seasons, suggesting relatively stable groundwater availability throughout the year. The Table 14.1 shows the water quality (range of chemical) parameters in the ground water taken from Ground Water Monitoring Wells (GWMW) in the Pathanamthitta district during April 2016. The groundwater in Pathanmathitta district is good and can be used for drinking, domestic and irrigation purposes. The minimum and maximum values suggest that the groundwater in most of the area is very fresh and potable.

Table 14.1 Quality of ground water at Pathanamthitta town

#	Location	pH	EC in us/cm at 25°C	TH as $CaCO_3$	Ca	Mg	Na	K	CO_3	HCO_3	SO_4	Cl	F	NO_3
					----------mg/l----------									
1	Angadikkal	6.8	51	12	4	0.49	3.6	1.1	0	17	0.32	5.7	0	3.4
2	Aranmula	7.13	220	62	14	6.8	13	1.1	0	68	12	21	0.12	9.3
3	Enathu	7.35	610	90	22	8.5	66	18	0	55	25	107	0.7	53
4	Konni	6.33	330	68	12	9.2	23	6.4	0	9.8	0.32	71	0.14	31
5	Kottanadu	6.5	126	18	6.4	0.49	9.5	4	0	12	0.86	16	0.1	18
6	Mallapally	6.4	71	12	4	0.49	7.1	1.2	0	4.9	0	13	0.32	9.7
7	Naduvathumuzhi	6.92	78	20	7.2	0.49	3.7	1.5	0	24	0.32	5.7	0.02	6.9
8	Nilakkal	6.71	108	22	7.2	0.97	9	1.8	0	9.8	0	21	0	11
9	Pandalam I	6.73	74	14	4	0.97	7.1	0.4	0	20	0	11	0	4.9
10	Pathanamthitta	7.01	194	50	17	1.9	13	8.9	0	44	20	16	0.12	11
11	Thelliyur	7.03	91	24	8	0.97	7.2	2.1	0	39	0.21	7.1	0.12	4.3
12	Ullannur	6.75	45	10	2.4	0.97	4	2.6	0	9.8	0	7.1	0.09	6.6
13	Vadasserikkara	6.93	101	38	14	0.8	1.8	2.1	0	27	6.1	5.7	0.24	21

Source: Central Ground Water Board, 2016

The pH of groundwater varies from 6.33 to 7.35 indicating slightly acidic to neutral character of water in most samples. The electrical conductivity values of the water samples range from 45 to 610 µs/cm at 25^{0}C, indicative of low mineral content of water. All the chemical constituents fall within the permissible limits as per the drinking water standards of WHO (1971) and ISI (1983).

14.5 Water Scarcity

The water scarce wards in the town are shown in Figure 14.10. As per the Socio-economic Survey (2019), 74 % of the households reported that there is no water scarcity. However, when analysed ward-wise, water scarcity is prevalent in 22 wards out of 32. The wards in the central areas of the town shows no water scarcity. This is due to the water supply in these wards from existing water supply schemes as these areas are high in density. 21% households have water scarcity for 2-3 months and 3% have water scarcity for 1-2 months. And 2% of the population suffers from water scarcity more than 6 months in a year. Tanker lorry water supply is a common practice in the municipality during summer season.

> തരിശ് പാടങ്ങളിൽ കിണറോ, കുളമോ നിർമ്മിച്ച് സമീപ വാർഡുകളിൽ ശുദ്ധ ജല വിതരണത്തിന് സാധ്യത ഉണ്ട്. ജല അതോറിറ്റി നൽകുന്ന ജലത്തേക്കാൾ കെമിക്കൽ ചേരാത്ത ജലവിതരണം സാധ്യമാകും. ദൗത്യം വാർഡ് സഭകളിൽ സാധ്യമാകും. [*There is a possibility of supplying clean water to nearby wards by constructing wells or ponds in fallow fields. It will be possible to supply water that is free from chemicals compared to the water provided by the water authority. The mission will be possible in ward councils.]– Public Opinion*

14.6 Ongoing projects

ARMUT 2.0 is a step towards Atma Nirbhar Bharat with aim of making the cities 'water secure' and providing functional water tap connections to all households. The mission envisages providing water tap connections to households in all statutory towns. Under this AMRUT 2.0 project, to augment the existing water supply scheme for making it capable to supply sufficient quantity of good quality water to entire Town, a conventional type water treatment plant of capacity 20MLD is under construction in the land of KWA at Pampoorippara.

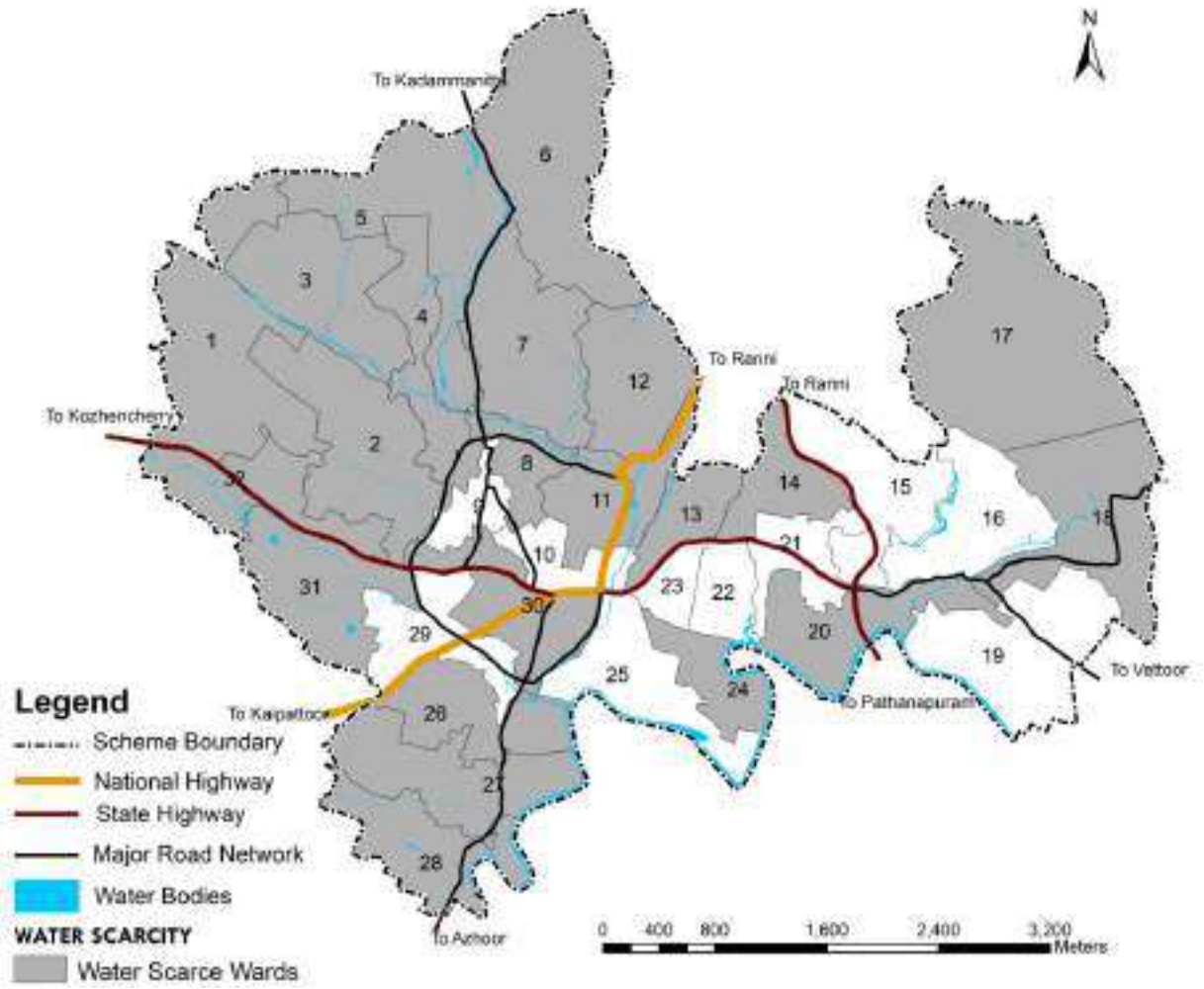

Figure 14.10 Water Scarce wards in Pathanamthitta town

A new water intake system also is under this project at existing location for sufficient flow of water into the well from the river. Additional coverage of distribution systems in various wards is to be provided by giving water connections. Considering the most undulating topography of the town the distribution system can be divided into 8 zone (Table14.2) for proper control and easy operation of water supply.

Table 14.2 Proposed zone wise water supply distribution for AMRUT 2.0

Zone	Name	% allocation of total production	Water To be distributed (MLD)
1	Town & low laying areas	70	13.30
2	Kumbankal area	5	0.95
3	Achankkala	6	1.14
	Ottukal area		
4	Ezhuppuramu ruppu area	5	0.95
5	Myladumpara	7	1.33
6	Chuttippara	2	1.38
7	Mannaramala area	3	0.57
8	Poovanpara area	2	0.38
	Total	100	20.00

Source: Augmentation of Water supply scheme for Pathanamthitta Municipality, KWA, PH Division Pathanamthitta

14.7 Drinking water sustainability of town

River Achankovil passing through the southern boundary is the main water source of the municipality. The main piped water supply scheme operating the municipality takes water from this river. People also depend on shallow

wells at their residence for water demand. There were plenty of paddy fields in the low lying wetlands of the Municipality some 20-25 years ago. These paddy fields were the natural water storages and helped to maintain a steady ground water recharging system and flow to the river and nearby areas in all seasons.

As the town continues to grow, wetlands have been increasingly converted in the name of development, leading to a significant shift in the municipality's land use pattern. Nearly all wetlands along both sides of the ring road have been filled and converted for commercial and public uses. This transformation has severely impacted groundwater retention, reducing natural recharge capacity and increasing vulnerability to water scarcity and urban flooding. As a result, individual wells in residential areas dry up early in the summer months, forcing residents to rely entirely on piped water supply or tanker lorry services to meet their water needs.

> നഗരസഭയിൽ ഉപയോഗ രഹിതമായി കിടക്കുന്ന പാറക്കുളങ്ങളിൽ നിന്നും പരിസര വാസികൾക്ക് വെള്ളം കിട്ടത്തക്ക രീതിയിൽ ആയവ ശുദ്ധീകരിച്ചു ചെറുകിട കുടിവെള്ള പദ്ധതികൾ രൂപീകരിക്കുക. [*Purify unused quarry in the municipality to provide water to the residents of the area and to establish small drinking water projects.]– Public Opinion*

14.7.1 Alternative source for Future

Many water supply schemes in the Pathanamthitta district depend on River Achankovil. The rural and urban water supply schemes constructed at downstream of Pathanamthitta are Pramadom, Vallikkodu-Kodumon, Omallur, Adoor Municipality, Pandalam Thekkekkara, Pandalam and Kulanada. The water supply scheme located at the upstream of Pathanamthitta Municipality are Mylapra, Konni-Aruvippuram, Konni- Thazham and Attachakkal. During summer months, the flow in the river becomes very lean and regular functioning of the water supply schemes will get affected due to low water level in the river. In such conditions temporary check dams will be constructed at intake locations to raise water level in the river for the operation of the water supply schemes. For Pathanamthitta Municipality, a permanent check dam need to be constructed at the downstream of the intake well at Kallarakkadavu. This check dam serve as a solution for the water shortage in the river in summer months.



Figure 14.11 Maiyar Reservoir
Source: Google

But this cannot be taken as a permanent solution as the availability of water depends on the flow in the river. So Maniyar reservoir of Pampa Irrigation Project (Figure 14.11) is much more reliable water source for Pathanamthitta Town and those adjoining panchayats such as Mylapra, Pramadom, Vadasserkkara, Malayalapuzha amd Omallur.

> നഗരത്തിൽ water ATM/water booth കൾ സ്ഥാപിക്കുക [I*nstall water ATMs/water booths in the town.]– Public Opinion*

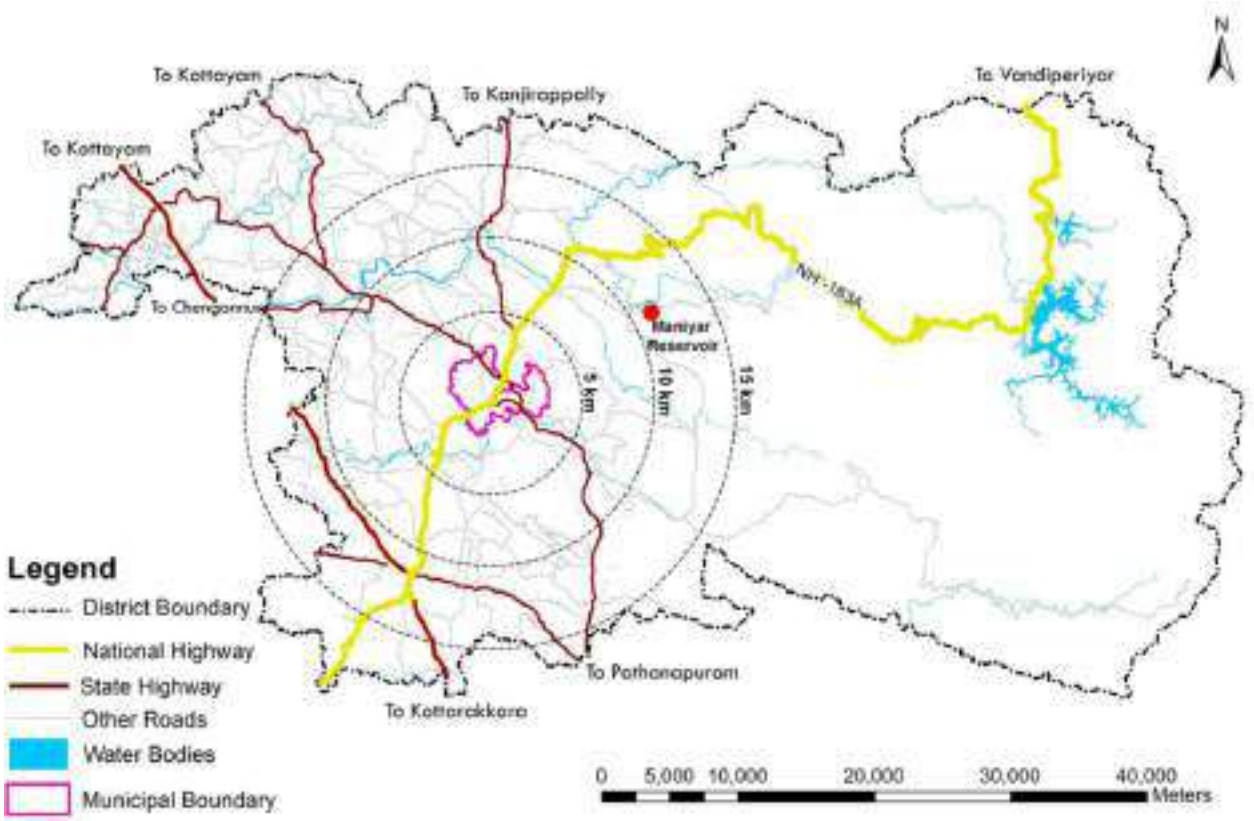

Figure 14.12 Spatial location of Maniyar reservoir

This reservoir is constructed across river Kakkadu at Maniyar, nearly 15km away from Pathanamthitta Town (Figure 14.12). It is possible to supply some quantity of treated water to Pathanamthitta municipality from this project to supplement the water requirement of the municipality during the summer months if the flow in the river Achankovil is not sufficient for meeting the requirement. At least 60% (12MLD) of water can be brought to the Town from this project.

> നഗരത്തിലെ ഭാവി കുടിവെള്ള ആവശ്യങ്ങൾക്ക് അച്ചൻകോവിലാറിലെ ജലം മതിയാകാതെ വരുമെന്നതിനാൽ മണിയാർ ഡാമിൽ നിന്നും വെള്ളം എത്തിക്കാനുള്ള പദ്ധതികൾ ആവിഷ്കരിക്കുക [*Plans should be formulated to bring water from the Maniyar Dam as the water in Achankovil river will not be sufficient for the future drinking water needs of the city.]– Public Opinion*

14.8 Impact of Hazard & Climate Change

Two type of Hazard Vulnerability understanding is carried on water supply of Pathanamthitta town. One is the availability of quality drinking water to all residences at the hazard prone areas of the town and the other is impact of natural hazards on supporting infrastructures of the water supply system.

14.8.1 Flood vulnerability

In Hazard Vulnerability of water supply, flood is the major hazard affecting the people. Surface water, groundwater, and piped water systems are the sources of drinking water. Floods adversely impact these sources. Surface water becomes contaminated during a flood by picking up of pollutants from the ground. Groundwater also gets contaminated during a flood while floodwaters seep into the aquifer. Municipal water supply gets their water from both surface water and groundwater sources.

The major risk factor associated with flooding is the contamination of drinking water facilities. Flooding cause epidemics of water-borne and vector - borne disease. Water-borne outbreaks of diarrhoeal disease after floods are primarily from contamination of water. Ensuring uninterrupted provision of safe drinking water (piped water supply) is the most important preventive measure to be implemented following flooding, in order to reduce the risk of outbreaks of water-borne diseases.

As per the guidelines for preparation of risk informed master plan for a town, vulnerabilities on water supply of the town which is included in the category of Basic Service vulnerability is assessed. 20% weightage is given to Basic Service vulnerability and following are the sub parameters and its weightage included:

1. Social Infrastructure (45%)
2. Water supply (30%)
3. Sanitation (25%)

Out of these three sub parameters, percentage of households, whose potable water supply likely to be affected by flood is analysed in this chapter and the inference of this analysis is used in the chapter 4 to find out the total risk of the town. Remaining two sub parameters are analysed in following social sector chapters and chapter 16 'Sewerage System'.

To understand the water supply vulnerability in the town, the number of households having protected water supply in the town in the flood prone area at cadastral level is analysed. If the source of drinking water is piped connection, it is assumed to be not affected. But the source is well or other open water source, it is assumed to be affected. The data is collected by 100% door to door socio economic survey in the flood prone areas of the town and analysed in GIS software.

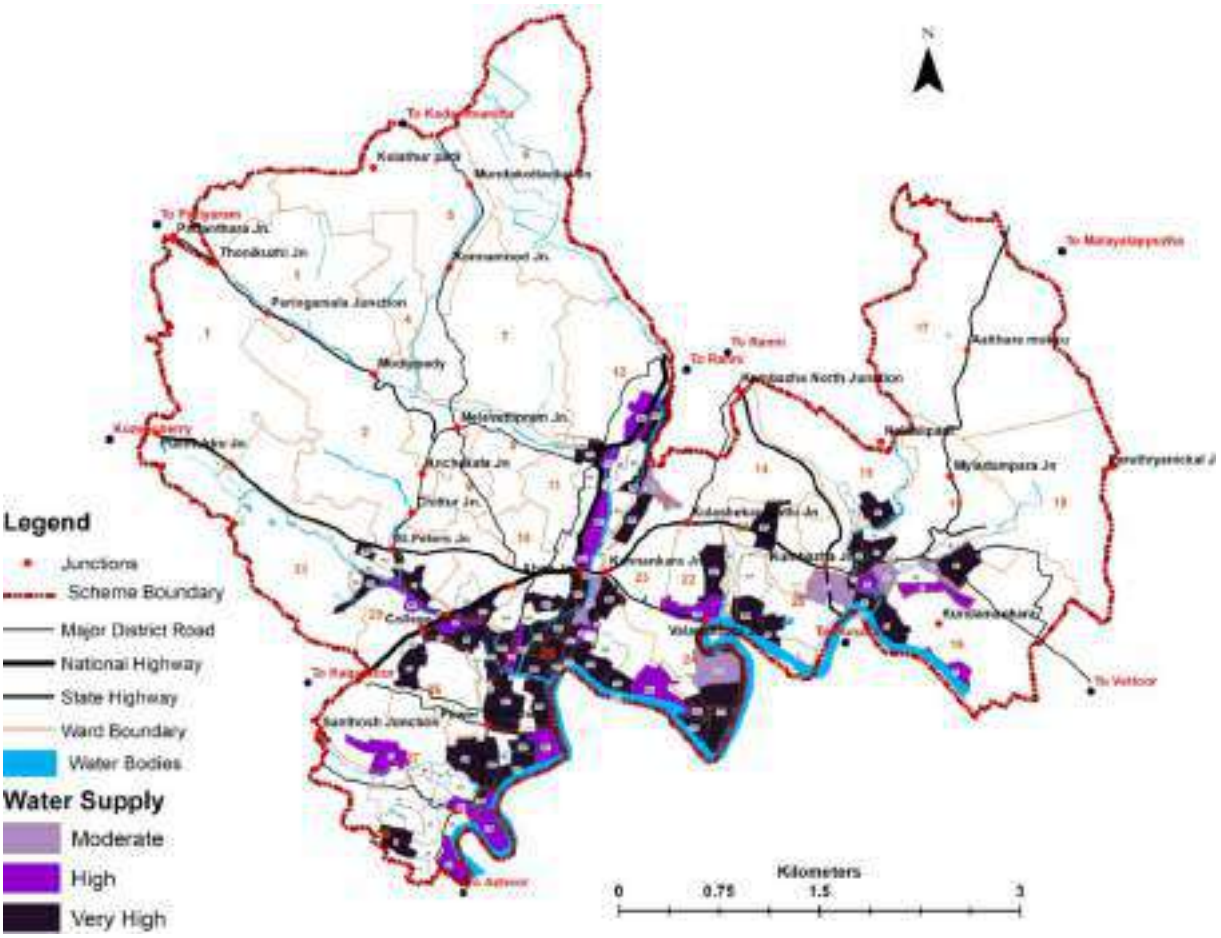

Figure 14.13 Cadastral level water supply vulnerability in flood prone area

Varying degrees of vulnerability (low, moderate, and highly vulnerable areas) has been identified in each cadastral based on value assigned as per guidelines of risk informed master plan. The following Table 14.3 shows the criteria and its value adopted for this analysis.

Table 14.3 Criteria and its value adopted for water supply vulnerability

Criteria	Value
> 75% households likely to be affected	6
51 - 75% households likely to be affected	4.5
26-50% households likely to be affected	3
<26% households likely to be affected	1.5

Source: Guidelines for Risk Informed Master Plan

From the socio-economic survey, it is identified that 42 cadastral units (37%) out of 114 in the flood prone area have no vulnerability as the people in these cadastral are using piped water as primary source of water. (Figure 14.13). The other cadastral shows the moderate to very high vulnerability. 48 cadastral (42%) shows very vulnerability as the source of water for that cadastral are open wells or other open water sources and more than 75% households in that cadastral are likely to be affected.

14.8.2 Spatial Location of infrastructure

Generally on-site water supply systems (intake well and sumps) may not be structurally damaged by flooding, but it can fill with silt & debris and damaging of pumping stations. It leads to blocking and supply of quality water. Hazard vulnerability study is carried out for water supply infrastructure by overlying the spatial distribution of water supply infrastructure with flood and landslide probability map prepared by KSDMA (Figure 14.14).

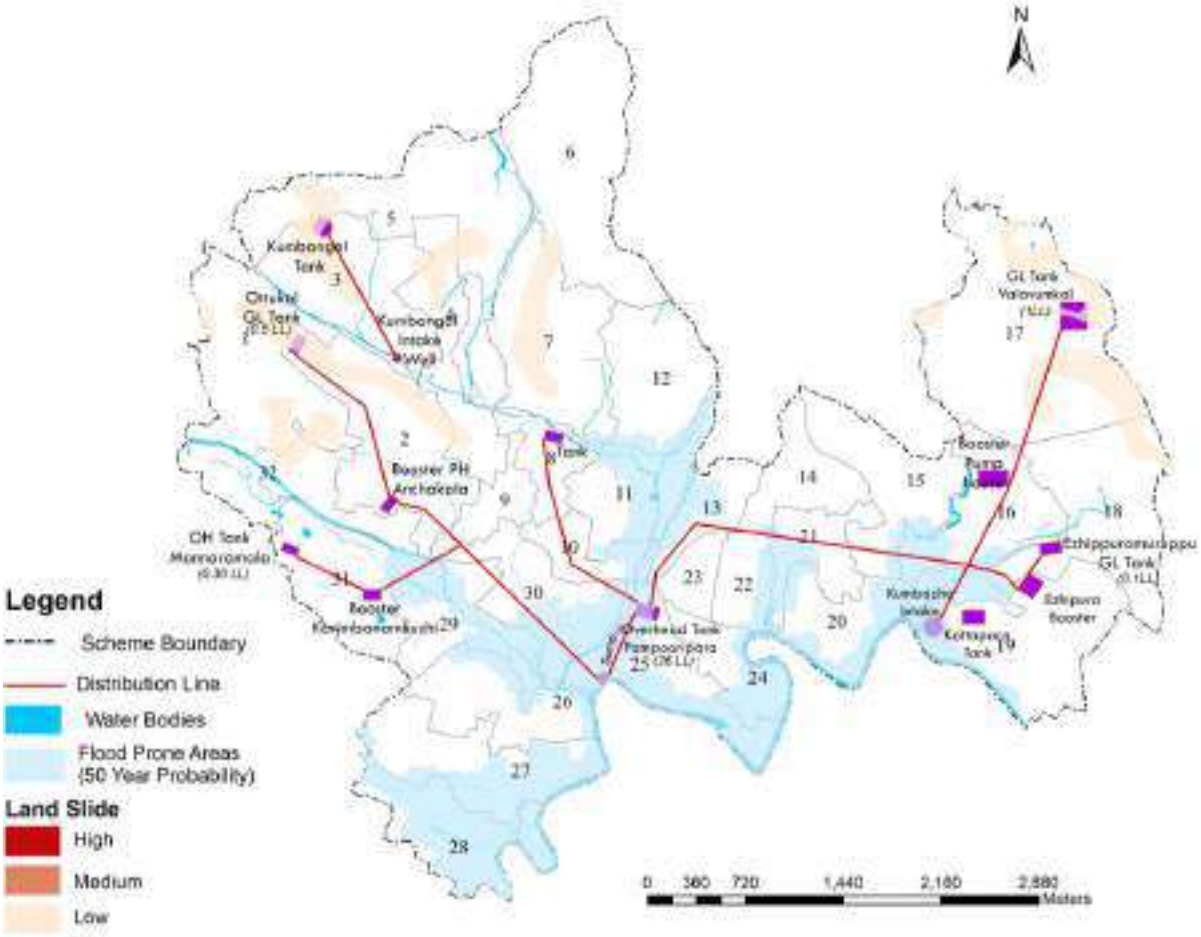

Figure 14.14 Hazard zonation map overlay with water supply infrastructure of the town

Two GL tank (Ottukal & Valavumkal) are situated in the landslide prone area. But the intensity of the landslide in the Pathanamthitta is low as per KSDMA and there is no past landslide incidents in the Pathanamthitta, the structures are assumed to be safe. Intake wells are situated in river have chances of filling with silt and debris.

14.9 Problems & Potentials

There are some shortcomings in the present water supply system in the municipality. Due to this the people are devoid of sufficient good quality water. The poor quality of water due to outdated clarifier units for treating, inadequate supply of water, insufficient distribution systems, deposition of silts at the flood time which choke the intake pipe due to the improper intake arrangement.

15% of the municipal area still need water supply distribution pipe lines and it is essential to provide intake arrangement for sufficient flow of water into intake well from the river for future demand. Also the existing water treatment system is an outdated system that are not capable of treating turbid river water. A new water treatment system or updating the treatment methods of existing treatment plant can ensure quality of water. The current source of water treatment system to the town is not enough for the future demand. As per KWA, the new water supply scheme by AMRUT will helps to meet the demand the town, but the source is still the River Achankovil. Potentials of alternative sources like Maniyar reservoir may be studied and DPR has to be prepared.

During summer season, water scarcity is common in the northern part of the town. Through providing piped water supply with adequate quantity, water scarcity can be managed. Majority of the population depend on well as the major source of water. Therefore regular periodic cleaning and disinfection methods are necessary for the wells to control the amount of Coliform bacteria in well water.

37% cadastral units in the flood prone area is not vulnerable as the people are using piped water as primary source of water. Ensuring the availability of safe drinking water for people in flood-prone areas must be a top priority.

14.10 Inference

The total current domestic water demand of the town is 2.62 MLD. The ongoing water supply scheme under AMRUT project will cater the future water supply demand of the town. Expanding the water distribution network to unserved areas should be a key priority for the municipality in the water supply sector. Undulating topography is a major hurdle in providing piped water supply. Only 55.18% of households receive piped water from the Kerala Water Authority (KWA). The northern part of the town requires special attention due to severe water scarcity. Municipality may check the feasibility of decentralised water supply system using quarry water. The spatial location of water supply infrastructure of the town is structurally safe when compared with the hazard vulnerability of the town. However, 42% of cadastral units in flood-prone areas lack access to piped drinking water. Ensuring the availability of safe drinking water during floods to the people in the flood prone area must be a priority.



15. DRAINAGE SYSTEM

Drainage systems help maintaining the ecological and functional balance of urban areas by enabling the safe and efficient disposal of excess rainwater. Natural drainage system of rivers, streams and ponds guide the flow of water through the terrain, often following the land's natural slopes and contours. In contrast, man-made drainage systems consist of constructed channels, storm water drains, and culverts designed to supplement or redirect natural water flow, especially in developed or densely built environments.

This chapter assesses the existing condition of the town's drainage system, including its coverage, infrastructure integration, discharge practices and identifying gaps and vulnerabilities. By evaluating the system in a spatial context, the chapter seeks to identify strategic interventions that promote efficient storm water drainage and flood mitigation.

Contents

1 Existing System

2 Existing Drainage Network

3 Impact of Hazard & Climate Change

4 Inference

15.1 Existing System

Pathanamthitta town does not have a proper drainage network / coverage to adequately address storm water. The existing drainage network comprises of natural channels and man-made storm water drains. Town has a total length of 3.07km covered man made drainage system for the storm water drainage which is discharged into the water bodies like small streams and river Achankoil without any scientific treatment. Figure 15.1 & 15.2 shows the existing conditions of manmade drainage system of town.







Figure 15.1 conditions of covered drainage system in the town (above three images).



Figure 15.2 Conditions of uncovered drainage system in the town

Various types of natural drainage system are in the town, with river and streams spread across 32 wards (Table15.1).

Table 15.1 Natural Drainage system in the town

Sl. No	Name of natural drainage system	Type
1	Achankovil	River
2	Kannankara Thodu	Stream
3	Kumbazha Thodu (Mukkadapuzha Thodu)	Stream
4	Saradamadam-Kudilkuzhi- Adiyani-Vettipuram	Stream
5	Kottakadav	Stream
6	Kalikalpadi	Stream
7	Kalikalpadi - Achankovil	Stream
8	Kumbazha - Kulasekharapathi	Stream

Source: DM Plan & LAPCC Pathanamthitta

Figure 15.3 shows the map of natural drainage network of town and figure 15.4 shows the existing conditions of natural drainage systems in the town.

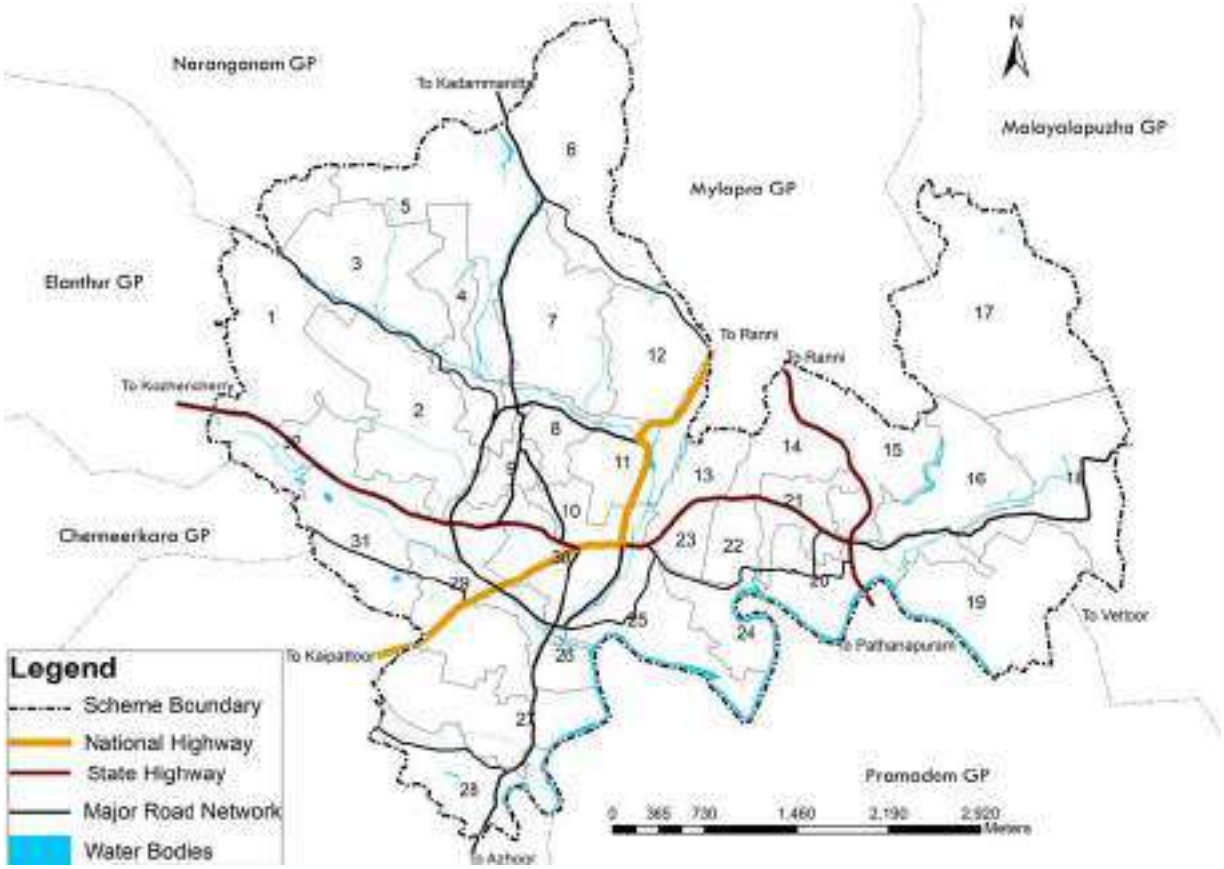

Figure 15.3 Natural drains / water bodies in the town



Figure 15.4 First order streams in the town





Figure 15.5 Seven and eight order stream in town

Town has lost several streams due to development and encroachment by individuals. The Mukkadappuzha stream, has an average width of 12 meters. This stream flows through wards 16, 15, 18, and 19 of the town, passes near the Kumbazha Fish Market, enters the Kumbazha old kadav (old ferry), and joins the Achankovil river. This river flows through the water-scarce areas of town and has great development potential. Saradamadam-Kudilkuzhi- Adiyani- Vettipuram stream flows through five wards and it is used as a water source also since it is a large stream. However, the protective wall of the stream has collapsed and there is a lot of dumping of waste. The focus group discussion revealed that water overflowed the stream and entered the nearby areas due to the narrowing of the stream during the 2020 period.

The central area of Pathanamthitta town has been identified as a vulnerable area for water logging , particularly during the monsoon months. Due to its relatively low elevation and inadequate drainage infrastructure, rainwater tends to accumulate, causing frequent surface water stagnation. The convergence of multiple drainage steams without sufficient outflow capacity further exacerbates the issue. This persistent waterlogging hampers mobility, affects commercial activity, and poses health and environmental concerns, highlighting the urgent need for improved stormwater management in the town centre. Figure 15.6 shows the central area of Pathanamthitta under water logged condition and Figure 15.7 shows Fire and Rescue team pumping out the storm water from the buildings near Aban junction.





Figure 15.6 Central area under water logged condition



Figure 15.7 Pumping out water due to chocking of drain by Fire and Rescue team.

15.2 Existing Drainage Network

A comprehensive drainage study was undertaken during 2024–25 under the Rebuild Kerala Development Programme (RKDP), with financial support from the World Bank, to prepare a scientific Drainage Plan for Pathanamthitta. The study was carried out by M/s Venkateshwara Enterprises, appointed through a competitive tendering process. As part of the assignment, a detailed technical assessment of the existing drainage system was conducted, including analysis of hydrological parameters, hydraulic capacity, and overall network performance. The assessment identified critical gaps and deficiencies, which form the basis for targeted drainage interventions and system improvements. The outcomes of this study constitute a key input to the Risk Informed Master Plan (RIMP) for Pathanamthitta, positioning the proposed drainage plan as a strategic and regulatory framework to enhance stormwater management, mitigate flood risks, and promote sustainable, climate-resilient urban development.

The existing drainage network of Pathanamthitta town comprises a complex system of primary, secondary, and tertiary natural channels (locally referred to as *nalas*) that collectively convey stormwater runoff to the Achankovil River and its associated outfalls. The network is predominantly natural in character, consisting of earthen channels with irregular cross-sections, varying widths, and unlined banks, traversing diverse land uses including urban, semi-urban, agricultural, and low-lying flood-prone areas. While certain stretches have been partially modified or stabilized, a significant portion of the system remains non-engineered and is influenced by natural terrain, vegetation growth, and anthropogenic interventions such as encroachments and waste disposal.

The existing drainage network of the town is shown in Figure 15.8. The drainage system is structured around a few major trunk nalas—particularly Nala–2 and Nala–3—which drain extensive catchments and serve as the backbone of stormwater conveyance in the town. These primary channels are supported by an extensive network of secondary and feeder nalas, which collect runoff from localized catchments and discharge into the main channels. The details regarding velocity, Flow capacity and Hydraulic status of various Nalas identified in the town along with maps showing adequate and inadequate stretches are given in Annexure15.1.

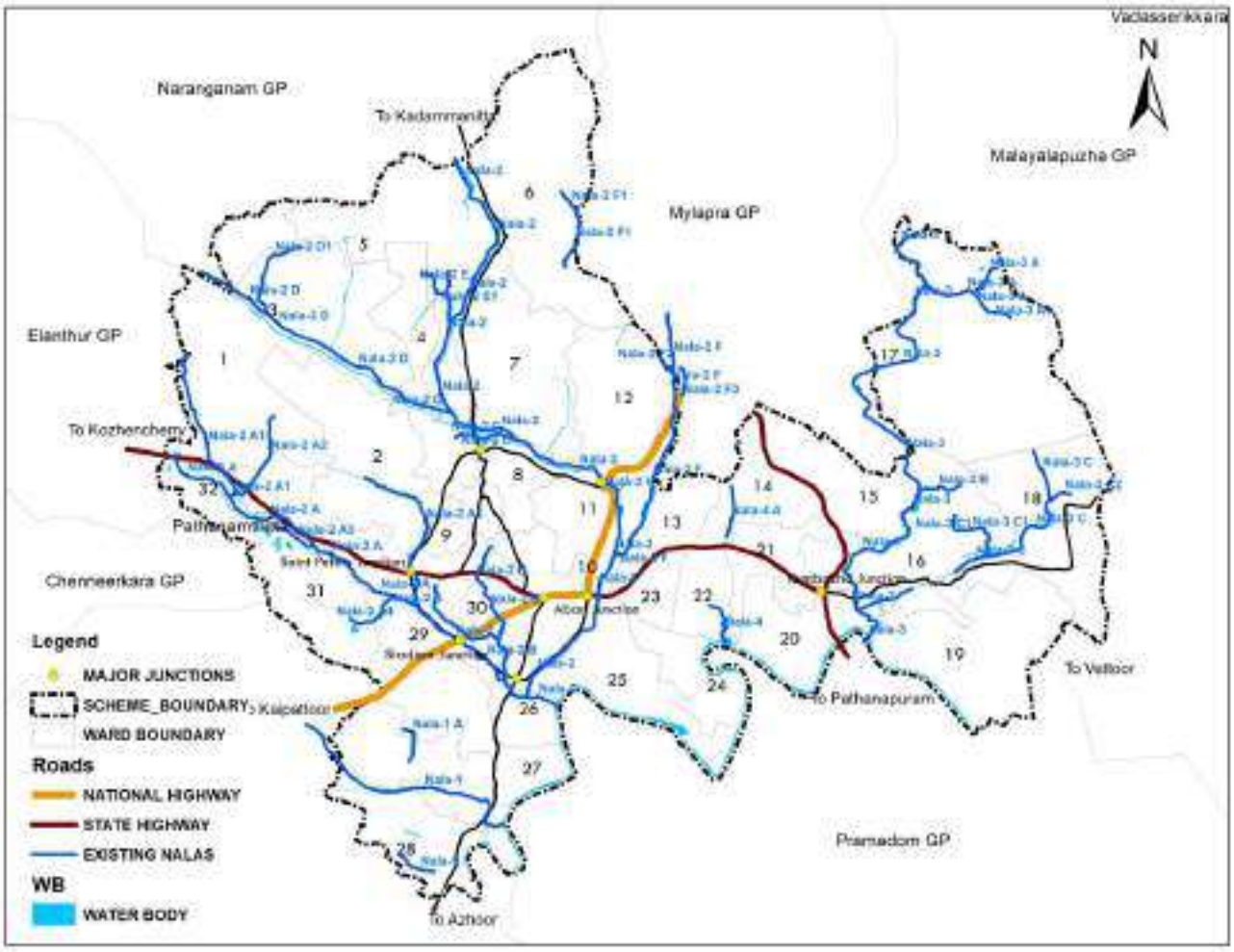

Figure 15.8 Existing drinage Network of the Town

15.3 Impact of Hazard & Climate Change

Steam Order Map (Figure 15.9) has been prepared to understand the natural drainage patternsof Pathanamthitta town. This map highlights areas where surface runoff converges, helping identify natural drainage paths, high-risk flood zones and potential water retention areas.

The map provides detailed insights into how rainwater flows across the terrain of Pathanamthitta town from small feeder channels (1st order streams) to major river (8th order). 1st order streams are the smallest and have no tributaries. These are generally found in the upper catchment areas and appear as thin lines on the map. When two 1st order streams merge, they form a 2nd order stream. When two 2nd order streams merge, they form a 3rd order stream and so on. The highest number, in this case 8th order, represents the main or largest stream or river in the area, flowing through low-lying areas.

The map shows a dense network of 1st to 3rd order streams in the hilly or undulating parts of the town, indicating dispersed catchment origins.

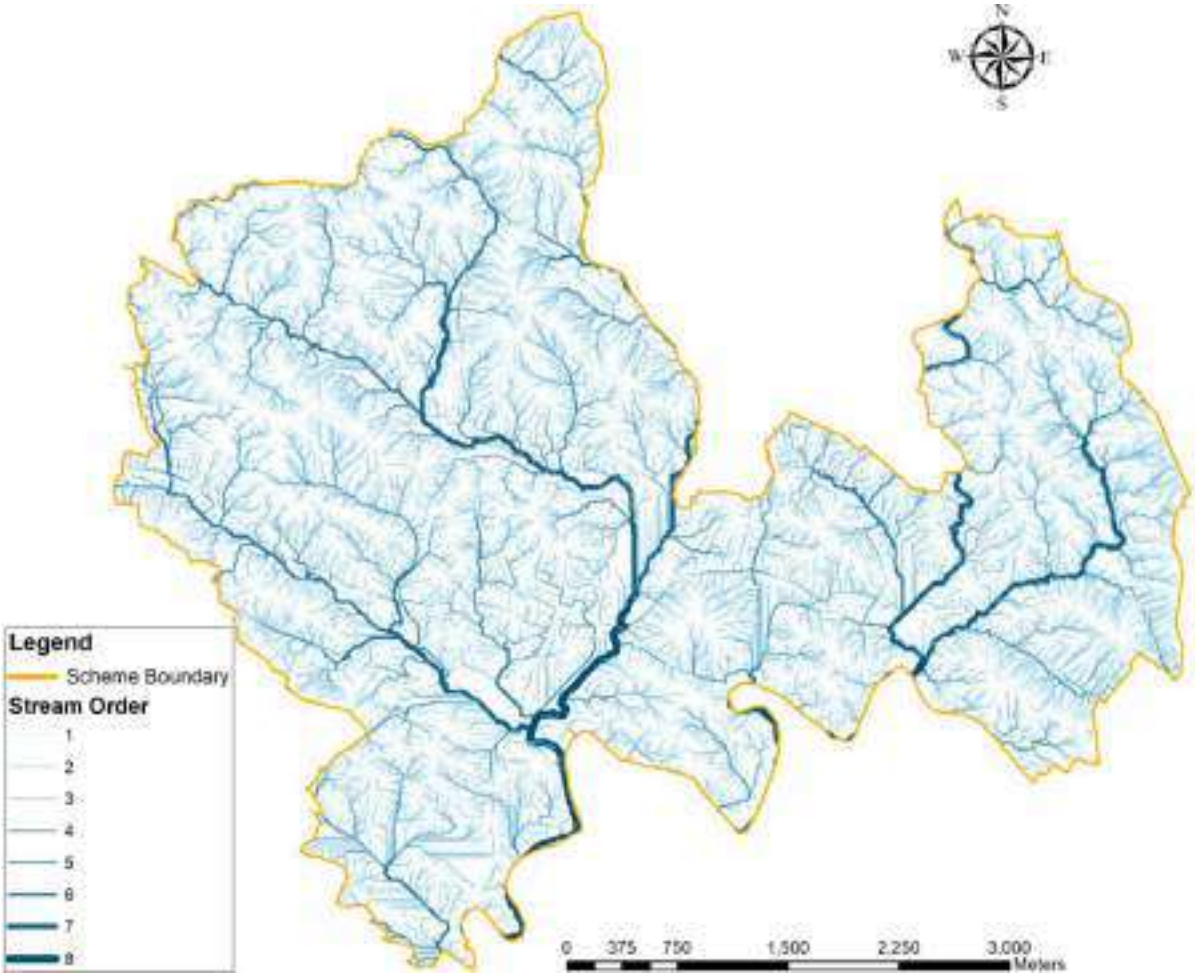

Figure 15.9 Steam Order map of Pathanamthitta town

As these streams merge, they form higher order streams like 4th to 6th order (Kottakadav Thodu, Kalikalpadi Thodu, Kalikalpadi – Achankovil Thodu and Kumbazha - Kulasekharapathi Thodu) which start defining the main drainage channels. The 7th order (Kannankara Thodu, Kumbazha Thodu (Mukkadapuzha Thodu) Saradamadam-Kudilkuzhi- Adiyani- Vettipuram thodu) and 8th order stream (River Achankovil) represent major natural watercourses.

All major development and built-up zones, especially near town centre, ring road from Melevettipuram to Cooperative College Junction via Thazhe vettipuram & Aban junction and Kumbazha region, intersect with high accumulation paths, indicating a high risk of localized flooding during peak rainfall events.

Comparison of Steam Order map of Pathanamthitta town with existing natural drainage map of town reveals several critical disruptions in the continuity of natural drainage lines, particularly in densely built-up areas. While the map clearly indicates well-defined runoff paths aligned with topography, a field comparison shows that many of these flow paths have either been interrupted, encroached upon, or completely lost due to unplanned development. These missing links are most prominent between mid-order (3rd to 6th) streams, where culverts, drains, or natural channels are either undersized, blocked, or non-existent. As a result, surface runoff fails to

connect to the main drainage channels, leading to localized waterlogging, backflow, and erosion in vulnerable zones. Restoring these missing links through proper alignment of stormwater drains with natural flow paths through channel protection, widening, and strategic water retention measures is essential for re-establishing the town's hydrological balance and mitigating flood risk.

15.4 Inference

Due to urbanization, many natural streams have been encroached upon, blocked, or converted into narrow concrete drains, disrupting the original hydrological flow. The town faces issues of waterlogging, flash floods, and drainage congestion, particularly during the monsoon season, owing to inadequate capacity, poor maintenance, and lack of integration between natural and engineered systems. The velocity, Flow capacity and Hydraulic status of various channels in the town are identified and adequate and inadequate stretches are identified. To enhance storm water management and reduce flood risk, it is recommended to widen critical water bodies and natural drainage channels based on their stream order and catchment response. Furthermore, a comprehensive drainage master plan must be prepared that integrates ecological buffers, retention basins, and improved connectivity of the drainage network, while also incorporating climate resilience and urban expansion forecasts. Strengthening both types of drainage with environmentally sensitive design and spatial planning is essential to ensure sustainable urban water management and resilience against climate impacts. Preservation and restoration of existing streams, along with stringent controls on future encroachments, will be key to maintaining the hydrological balance of the town.

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16. SEWERAGE SYSTEM

A well-planned and efficiently managed sewerage system is fundamental to ensuring urban health, environmental sustainability, and overall quality of life. As towns expand and population densities increase, the demand for safe and reliable wastewater management becomes increasingly critical. Inadequate or poorly integrated sewerage infrastructure can lead to public health hazards, water contamination, urban flooding, and the degradation of natural ecosystems.

This chapter assesses the existing condition of the town's sewerage system, including its coverage, infrastructure integration, discharge practices, while identifying gaps and vulnerabilities. By evaluating the system in a spatial context, the chapter seeks to identify critical gaps and identifying strategic interventions that promote sewerage management.

Contents

1. Existing System
2. Quantification of Grey Water
3. Quantification of Septage
4. Treatment Technology
5. Hazard & Climate Change
6. Inference

16.1 Existing System

Pathanamthitta town does not having a proper sewerage network to address liquid waste produced in the municipal area. As per the socio-economic survey (2019), all the houses in the town have some sort of sanitation system. Houses of the town are depending by on-site individual septic tanks and leech pits for their management of liquid waste. 45% of houses have septic tank and 55% of houses adopting other system for the disposal like soak pits, leach pit etc. 90% of the households in the town treated grey water in own compound for agriculture purpose. Some households and small-scale commercial establishments near roadside discharge the greywater to into nearby storm water drains. Also, town does not have a proper FSTP in its administrative limits.

16.2 Quantification of Grey water

The quantity of grey water was calculated by the survey of various sources of liquid waste generators in the local body. The number of users were identified and the total water usage was calculated by the LPCD water consumption rate for different establishments as given in URDPFI guideline. The quantity of grey water thus calculated as 75% of the total quantity of the consumed water. (Table 16.1)

Table 16.1 Grey water Calculation- Pathanamthitta town

Establishments	No. of Establishments	LPCD	Total No. of Seats/ Beds/ Users	Total Water Consumption / Day (Litres)	Quantity of waste water generated/ day (Litres)
1	2	3	4	5=(3) x(4)	6=(5) x 0.5-0.75
Hotel	14	180/Bed	592	106560	79920
Restaurants	61	70/seat	2340	163800	122850
Hospitals with number of beds exceeding 100	3	450/bed	864	388800	291600
Hospitals with number of beds less than 100	5	340/bed	93	31620	23715
Nurse homes	32	135	866	116910	87682.5
Hostels	9	135	560	75600	56700
Boarding schools and colleges	4	135	620	83700	62775
Day schools and colleges	61	45	17510	787950	590962.5
Offices	216	45	4787	215415	161561.25
Factories	0	45-30	0	0	0
Cinema halls/concert halls /auditoriums	16	15	5907	88605	66453.75
Apartments	1	70	104	7280	5460
Any other establishments	182	70	797	55790	41842.5
Total				2122030	1591522.5
Total Quantity of Water Consumed				2122030	Litres
Total quantity of grey water (75% of water consumed in Liters)				1591522.5	Litres
Daily quantity of grey water (In MLD)				1.59	MLD

Table 16.2 Quantification of Septage, Pathanamthitta town

Urban Local Body	Septage Value- Per Capita Per year (Litres)	No. Of House Holds (No.)	Population (No.)	Yearly Septage Generated (Litres)	Daily Septage Generated (KLD)
Pathanamthitta	120	9813	44159	5,299,020.00	14.72

16.3 Quantification of Septage

The Septage quantification was carried out by the population of the town. According to the IS Codes (CSE, 2017), Septage Value- Per Capita Per year (Litres) was taken as 120 litres. The yearly Septage generated is thus calculated based on this value and thus daily Septage generated is calculated. (Table 16.2).

> നഗരത്തിലെ കച്ചവട സ്ഥാപനങ്ങളിലേയും പൊതു ശൌചാലയങ്ങളിലേയും കക്കൂസ് മാലിന്യം കൃത്യമായ ഇടവേളകളിൽ നീക്കം ചെയ്യുന്നതിന് വേണ്ട നടപടികൾ ആസൂത്രണ ചെയ്യുക. [*Plan measures to remove toilet waste from commercial establishments and public toilets in the city at regular intervals.*] - Public Opinion

16.4 Treatment Technology

According to the standards given and from the case studies, the land required for the STP having a capacity of 1-5 MLD is given as up to 50 cents and the land required for the FSTP having a capacity of 10 -25 KLD is given as up to 25 cents.

16.4.1 Suitable location

The identification of suitable location for treatment technology for the liquid waste management is carried in a systematic manner starting from the overall demand to the site specific studies. The identification of area suitable for liquid waste management is carried out in 7 stages (Figure 16.1).

The quantification of the grey water and Septage were initially calculated based on the population and from the primary data available for the institutions/ establishments in the municipal area. The quantity thus arrived spatially studied over the Municipal area, and a basic zoning was delineated. By studying the parameters such as existing land use, population density, elevation and topography and functional character of the Municipal area, the zones were even sub divided/ joined for the exact positioning of the FSTP/ STP in the given region (Figure 16.2). The relevance of each parameters of the sub divisions are described below.

16.4.2 Existing Land use

According to the existing land use of Pathanamthitta town, the urban centre having commercial and public & semi-public uses coming inside the ring road area. The economic development is towards Kumbazha area and rest of the surrounding land masses are having majorly Dry agricultural land use and residential use. The land use pattern suggests that the provisions for the STP shall be made mainly on the central area of the town.

16.4.3 Population density

The population density of the town varies from 514 persons/sq.km to 7205 persons/sq.km and the average population density is 2190 persons/ sq.km. The wards Chuttippara East (7205 persons/sq.km.), is having higher population density, while Mundukottakkal (514 persons/sq.km.), Myladumpara (576 persons/ sq.km.) has lower Population density due to hilly terrain. The population density demands a STP in the CBD area of the town.

16.4.4 Topography and Geology

The town has an undulated terrain with lots of hills and rocks. It is one of the main hurdles in development of the area. The River Achankovil forms the southern boundary of Pathanamthitta town. The ground level varies from 15 m to 150 m above the mean sea level (MSL). The general slope and the consequent flow of drainage water are mainly tended towards the Achankovil River. The soil condition of the municipality varies in different places because of the variation in the geographical conditions.

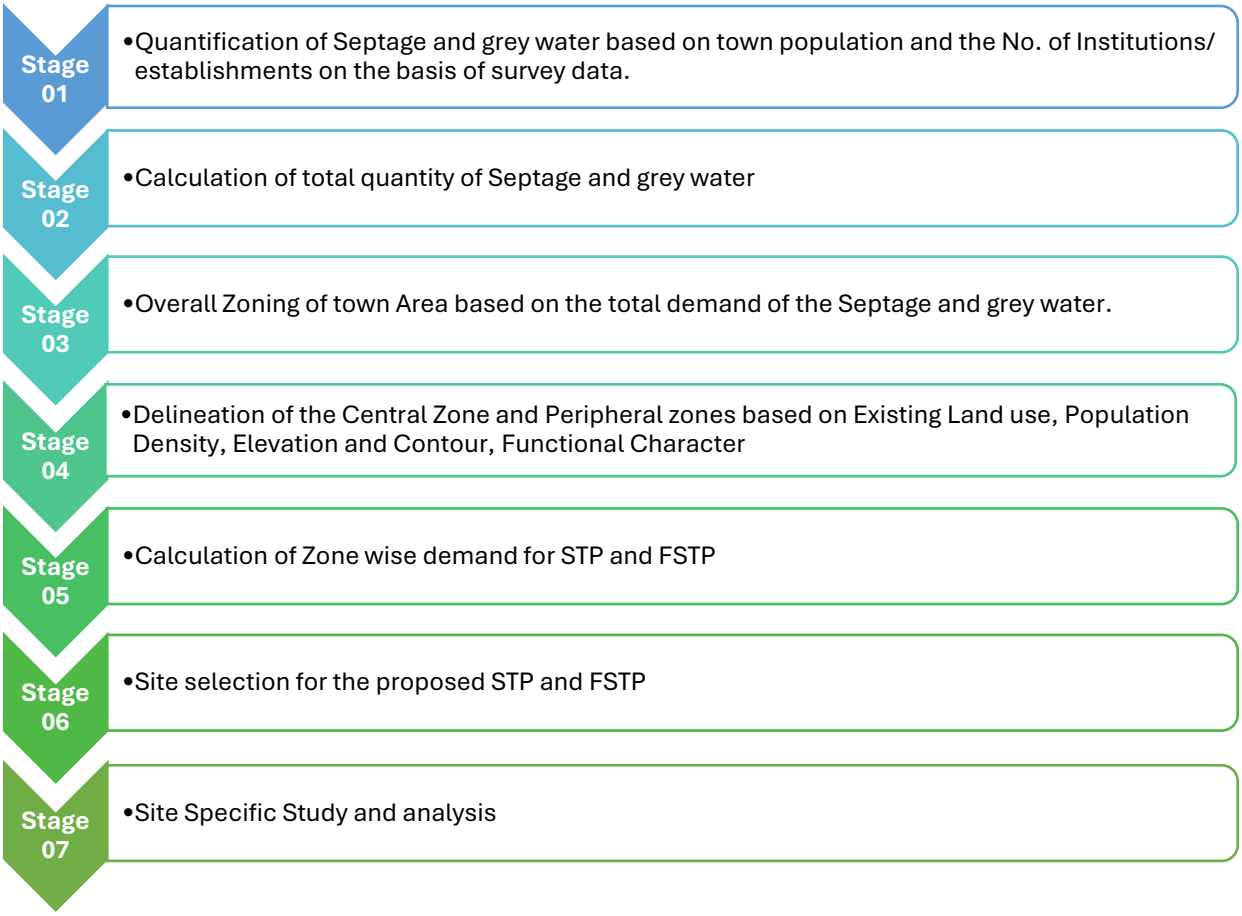

Figure 16.1 Stage wise treatment technology location suitability analysis liquid waste management

Laterite soil is found in the plain, hilly and intermediate area. The water table depth of the town varies from 1.1m to 18.5m below the ground level in the town.

Considering the elevation profile of the town and the above parameters, it is suggested that the central area which forms the level site compared to the rest of the areas shall be treated separately to include an STP. The peripheral areas, which have high altitude, can be given respective FSTP for according to the demand generated. But since the individual demands of FSTPs with respect to the zones of the Municipality are very less, a centralized FSTP will be enough to cater to the demand.

16.4.5 Functional Character

The functional character reveals that the urban activity tend to be more on the central region of the town- mainly central junction & Kumbazha regions of the town. The surrounding areas are having less urban profile. Because of the increasing urban activity at the central area, the central zone will be subject to get maximum demand of liquid waste generation. The primary surveys also reveals that the presence of commercial establishments, offices and such government institutions at the central zone will also be getting expansion in the coming years.

All these factors suggest that, the central zone should have a proper sewerage network in order to address the growth of the town. A site which is in close proximity with the central area will give an enhanced functioning of the town.

16.4.6 Extent of land

The selection of treatment technology for the Pathanamthitta town is taken based on the liquid waste demand calculated from the sources in the Municipality.

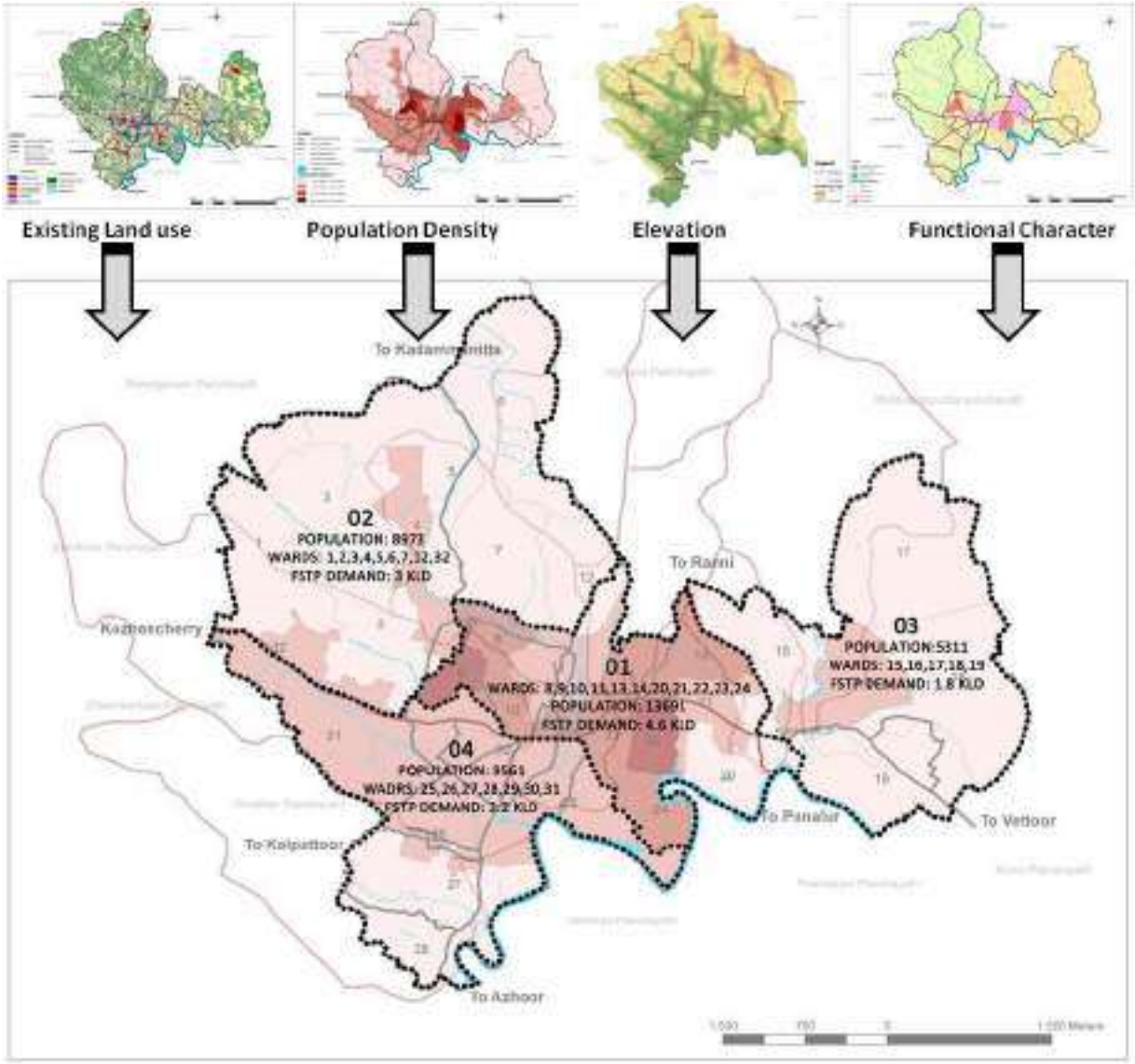

Figure 16.2 Process of identification of suitable location for sewerage treatment system in the town

Since the population density is more at the central area, and considering nature of developments of the municipality, the hinterlands of the town does not need the centralized large scale STPs. Also considering the urban activities inside the town, a small scale STP will be enough considering the future demands also. Thus, for Pathanamthitta town, low network with a small scale STP and Faecal sludge treatment plants is chosen as the appropriate technology.

The central zone will be facilitated with an STP of capacity between 1-5MLD. Therefore the land required will be 50 cents in this zone. For this purpose central zone will be connected with a sewage line. The rest of the zones are having much lesser amount of FSTP demand (Total 14.72 KLD). Therefore by combining all these zones, only one FSTP with a capacity of 10-25 KLD will be enough. The land required for this purpose may be 25 cents. This can also be positioned at the same location of the STP.

16.5 Impact of Hazard and Climate Change

Flood is the major hazard affecting the sewerage system of the town. Floodwaters can damage or destroy toilets, latrines, and septic tanks, making them inoperable and leading to the release of human waste into the environment.

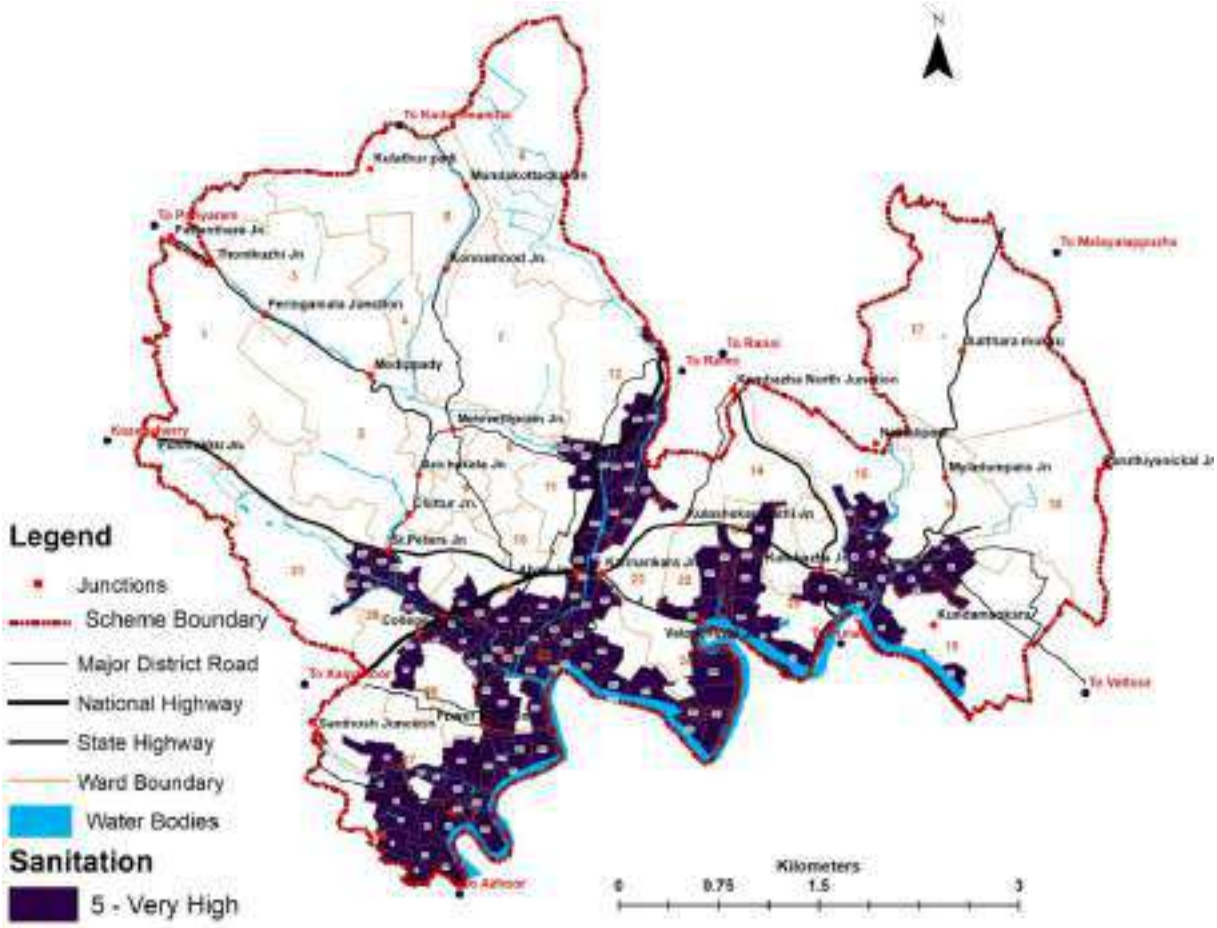

Figure 16.3 Cadastral level sanitation vulnerability in flood prone area

Floodwaters can carry a mix of sewage and other contaminants into drinking water sources. This makes water unsafe for consumption and increases the risk of waterborne diseases like cholera, dysentery, and typhoid. To understand the hazard impact on sewerage system of the town, sanitation vulnerability of the town has been analysed.

As per the guideline for preparation of risk informed master plan for a town, assessing sanitation vulnerabilities of the town is included in the category of Basic Service vulnerability. 20% weightage is given to Basic Service vulnerability and following are the sub parameters and its weightage included:

1. Social Infrastructure (45%)
2. Water supply (30%)
3. Sanitation (25%)

Out of these three sub parameters, percentage of households whose sanitation facilities likely to be affected by flood is analysed in this chapter and the inference of this analysis is used in the chapter 4 to find out the total risk of the town. Remain two sub parameters are analysed in Water Supply chapter 14 and following Social Sector chapters.

To understand the sanitation vulnerability in the town, the number of households have sewerage connection in the flood prone area at cadastral level is analysed.

Table 16.3 Criteria and its value adopted for water supply vulnerability

Criteria	Value
> 75% households likely to be affected	5
51 - 75% households likely to be affected	3.75
26-50% households likely to be affected	2.5
<26% households likely to be affected	1.25

Source: Guidelines for Risk Informed Master Plan

If the households have sewerage connection, it is assumed to be not affected. But if the sanitation facility is septic tank, soak pit etc., then it is assumed to be affected. The data is collected by 100% door to door socio economic survey in the flood prone areas of the town and analysed in GIS software. Varying degrees of population vulnerability (low, moderate, and very highly vulnerable areas) has been identified in each cadastral based on value assigned as per guidelines of risk informed master plan. The following table 16.3 shows the criteria and its value adopted for this analysis.

The town has no sewerage system. So, the entire cadastral in the flood prone area is affected by flood. All cadastral in the flood prone areas shows very high sanitation vulnerability as 75% households are likely to be affected (Figure 16.3).

16.6 Inference

Pathanamthitta town does not have a proper sewerage network system to address the liquid waste produced. With no sewerage system, leaving large portions of the population dependent on on-site sanitation systems, which are often poorly maintained. A site which is in close proximity with the central area is best suitable for liquid waste management facilities. A Sewage Treatment Plant (STP) and a Faecal Sludge Treatment Plant (FSTP) would provide a long-term solution to the town's liquid waste management challenges. However, the identified suitable area for these facilities are comes under flood-prone area. With advancements in treatment technology, mobile FSTP systems offer a more reliable and adaptable solution, ensuring uninterrupted waste treatment even in flood-affected areas.



17. SOLID WASTE MANAGEMENT

Proper solid waste management is crucial for preventing the spread of diseases. Inadequate handling of waste or improper disposal can lead to contamination of drinking water, breeding grounds for vectors like mosquitoes, and unsanitary living conditions that contribute to diseases. The spatial plan outlines how different areas will be used. Waste management need to align with land-use plans to ensure efficient service delivery, avoid environmental hazards, and minimize the impact of waste treatment facilities on the community.

Integrating solid waste management within the spatial plan helps ensure these services are accessible to all residents, particularly in densely populated areas. As population and urbanization increase, the demand for scientific treatment of various type waste disposal services grows. Planning these systems in advance ensures that the town can accommodate this growth without straining infrastructure.

Contents

1. Solid Waste Generation
2. Solid Waste Collection
3. Waste Conveyance & Treatment
4. Solid Waste Disposal
5. Management of Other Waste
6. Impact of Hazard & Climate Change
7. Inference

17.1 Solid Waste Generation

One of the most important parameters of solid waste management is the quantity of waste to be managed. The quantity is the parameter determining the size and number of functional units and equipment required for managing the waste.

17.1.1 Sources of waste generation

Seven major sources of solid waste generators are in the Pathanamthitta town.

1. Individual Households: Dwelling units are the major waste generators of MSW. Solid waste comprises of bottles, cans, disposables, food packaging, food scraps, newspapers, magazines, garden moppings, discarded leather, clothes and rubber materials etc.
2. Commercial Establishments/ Hotels: Hotels and restaurants, shops, theatres, lodging places etc. are major source of waste.
3. Offices and Institutions
4. Market Waste: Another major contributor of MSW is the waste from market yard. The market wastes are ideal for composting.
5. Hospitals and Health Care Institutions
6. Town Hall and Community Halls.
7. Street Sweeping: The waste generated by the daily sweeping of roads, streets, lanes, and by-lanes comprises of various materials.

17.1.2 Quantity of Waste

As per the URDPFI Standards, the per capita waste generation of a town ranges from 0.3 to 0.4 kg/capita/day.

Total waste generation = Per capita waste generation x Total population.

Total population =37538 (Census 2011)

Minimum waste generation = 0.3 x 37538 =11.2 TPD

Maximum waste generation= 0.4 x 37538 =15.01 TPD

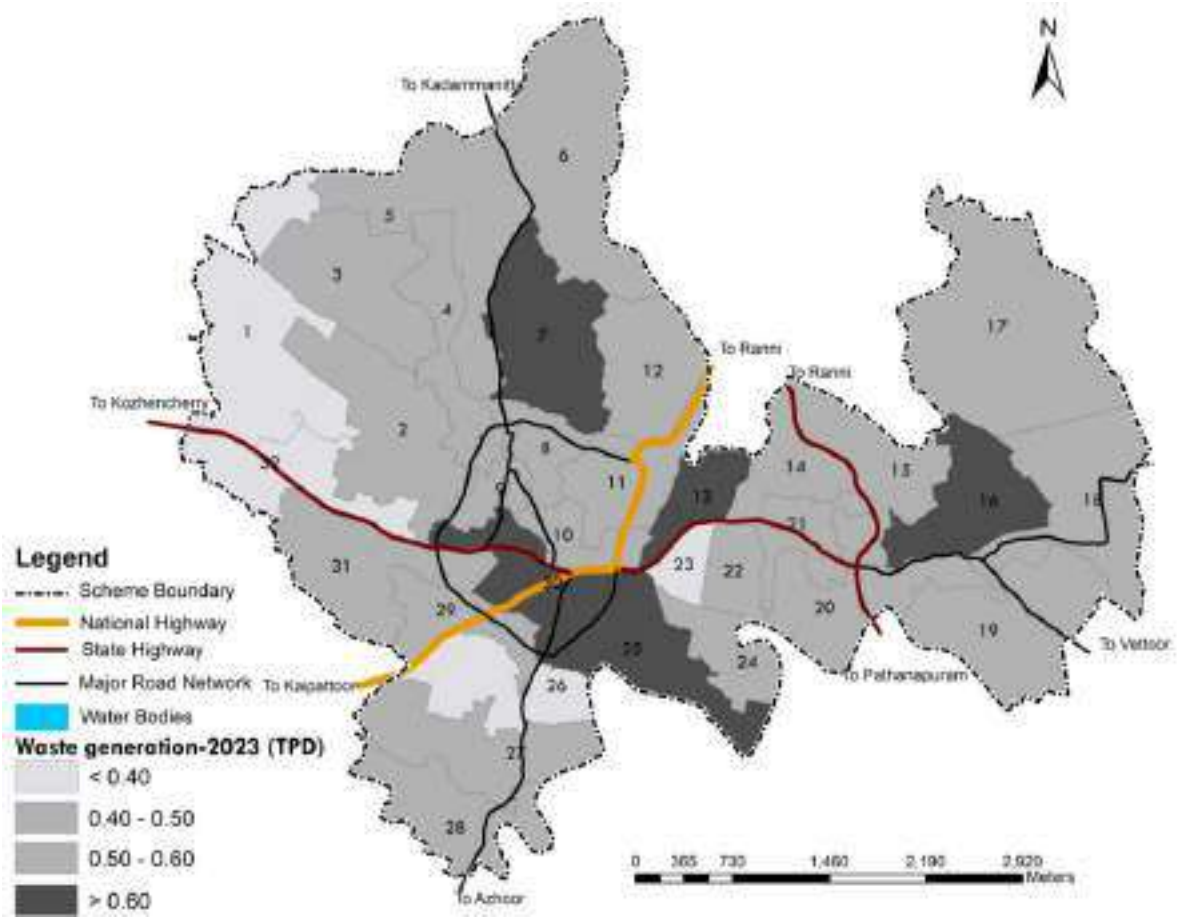

Figure 17.1 Ward wise solid waste generation based on population.

The per capita generation of Pathanamthitta town is taken as 350 gm per day, the total solid waste generation of the town is 13.14 tonnes per day (TPD).

Out of this, 70% of the total solid waste (9.2 TPD) generated is biodegradable waste and 30% of total solid waste (3.94 TPD) generated is non-biodegradable waste. Based on the guidelines issued by the Local Self Government Department, Government of Kerala, for management of construction and demolition waste, the quantity of Construction and Demolition (C& D) waste can be taken as 10% of the total waste generated in the town. It is found that the total C&D waste generated is about 1.31 TPD. Generation of Electronic waste is estimated to be 2% of the total waste which is 0.26 TPD. The ward wise quantity of solid waste generation based on population is shown in the Figure 17.1. The central area of the town is more contributing to the generation of solid waste.

17.2 Solid Waste Collection

A solid waste collection system for a town is the first step in management of waste designed to collect, transport, and manage waste generated by households, commercial establishment, market and institutions etc.

17.2.1 Collection Field Workers

Two types of solid waste collection field workers are working in the town. The First one is Haritha Karma Sena (HKS). They collect generally non-biodegradable waste from houses and establishments to shredding units for recycling. The second one is Sanitation/ Contingency workers. They collect solid waste from markets and road street sweeping.

Table 17.1 Staff Strength of collection field workers

Collection Field Worker	Numbers
Haritha Karma Sena	45 Staff (43 female & 2 male)
Sanitary / Contingency workers	Permanent- 23 Staff Contract – 6 Staff

Source: Pathanamthitta Municipality



Figure 17.2 Haritha Karma Sena Workers

> നഗരത്തിലെ അജൈവ മാലിന്യം തരംതിരിച്ചു ശേഖരിക്കുന്നതിനും, വാർഡുതലത്തിൽ സംഭരക്കുന്നതിനും, നഗരസഭാ തലത്തിൽ സംസ്കരിക്കുന്നതിനും ഉള്ള സൌകര്യം ഏർപ്പെടുത്തണം. [*Facilities should be provided for the segregation and collection of inorganic waste in the city, its storage at the ward level, and it's processing at the municipal level]* - Public Opinion

17.2.2 Collection Coverage

Source level treatment is promoted for biodegradable waste generated in the town. There is no waste collection points in the town. The town does not directly handle the collection of biodegradable waste from households in the town. However, the Haritha Karma Sena is responsible for collecting biodegradable waste from three major public institutions: the Mini Civil Station, the Collectorate, and the SP Office. Waste from two market (Town market and Kumbazha Market) are collected by Sanitation/Contingency workers.

Three private agencies (Table 17.2) are working in the town for collection of bio degradable waste from commercial establishments, houses at the town centre and chicken stalls. Slaughter house waste is also collected by private agencies. Non-biodegradable waste is collected through door-to-door mechanism by Haritha Karma Sena on a monthly schedule and covers all 32 wards of the municipality. Waste collected

at monthly rate of Rs.60 from households and Rs.100 from commercial and Institutional.

Table 17.2 List of private agencies functioning in the town for collection of biodegradable waste

Name of Private Agency	Collection & coverage	Remarks
Bison Valley	From commercial Establishments/ Institutions of the town	200 shops @ 5.5rs/kg. 0.5 rs/kg given to Municipality
Chris Global	From Households at the town centre	300 houses @ 300rs/month
Green Tech	Waste from Chicken stalls	16 shops @ 5.5rs/kg. 0.5 rs/ kg given to Municipality

Source: Pathanamthitta Municipality

17.2.3 Street Sweeping

Street sweeping is conducted based on the quantity of waste generated. The sanitation workers sweep and collect roadside dumped waste daily along the main road stretches, while pocket roads are cleaned based on the volume of waste generated.

1. Aban Junction - KSRTC
2. St. Peters Junction - Central Junction
3. Azhoor- Kozhenchery road stretch
4. Kumbazha- Malayalappuzha

> വലിച്ചെറിയൽ മുക്തമാക്കുന്നതിന് പൊതുസ്ഥലങ്ങളിൽ നഗരസഭാ ബിന്നുകൾ (bottle booths) സ്ഥാപിക്കണം. [*Municipal bins (bottle booths) should be installed in public places to eliminate littering.]* - Public Opinion

17.2.4 Collection Frequency

Pathanamthitta town follows a collection schedule (Table 17.3) issued by the Local Self Government Department, GoK for NBDW through HKS.

Table 17.3 Waste collection schedule by Pathanamthitta town

Month	Item of Collection
January	Bag, Shoes, Rubber, Leather, upholstery item
February	Mirror, Bottles, Glasses
March	Medicine strips and medicine bottles
April	Metals, Polystyrene/ Thermocol, Furniture, Coconut shell
May	Cloth waste, Bed, Pillow
June	E- waste
July	Medicine strips and medicine bottles
August	Bag, Shoes, Rubber, Leather, upholstery item
September	Mirror, Bottles, Glasses
October	Metals, Thermocol, furniture, Coconut shell
November	Medicine strips and medicine bottles
December	E- waste, Hazardous waste

Source: Pathanamthitta Municipality

17.3 Waste Conveyance & Treatment

As per the Kerala State SWM Policy 2018 and the SWM Rules, 2016, it is the responsibility of the waste generator to segregate, store and treat BDW at source or as directed by the ULB and NBDW should be handed over to the authorised agency as directed by the ULB for ensuring recycle, reuse and end use.

Decentralized waste management system is adopted in the town for the treatment of solid waste. Source level treatment is promoted at the household level for biodegradable waste generated in the town. Kitchen Bio Compost, Pit Compost and Ring Compost are the major treatment facilities adopted in the town for household source level treatment of biodegradable waste. The biodegradable waste collected by private agencies is repurposed as feed for pig farms. The biodegradable waste collected from two market, street sweeping, Edathavalam centre and 3 public offices are treated by the following treatment mechanism.

Table 17.4 Biodegradable treatment mechanisms in the town

Treatment Mechanism	Location	Capacity
Thumbormozhi aerobic composting	At private bus stand	3 unit (6 Bin)
	At town Market	3 unit (6 Bin)
	At Kumbazha Market	3 unit (6 Bin)
	At old private bus stand	3 Bin
Biogas Plant	At town Market	1TPD
	At Slaughter house	0.5 TPD
Portable Bio Bin	At Mini Civil Station Building	1 unit
	At Collectorate	1 unit
	At SP office building	1 unit

Source: Pathanamthitta Municipality



Figure 17.3 Thumbormozhi aerobic composting unit at town market

All collected non-bio degradable waste are transferred into Material Collection Facility (MCF) Centre at Town Market and Private Bus Stand for segregation. Two type of treatment mechanism are adopted for non-bio degradable waste. Bailing and Shredding. Bailing is a process that compresses plastic waste material into a rectangular block (bale). Shredding is a process that breaks down plastic waste into smaller pieces to make it easier to recycle. These two treatments are carrying at the Resource Recovery Facility (RRF) centre at Private Bus Stand. Location of all solid waste treatment systems in the town is shown in Figure 17.5.



Figure 17.4 Thumbormozhi aerobic composting unit at private bus stand

> ജൈവ മാലിന്യത്തിന് ഉറവിട മാലിന്യ സംസ്കരണം പ്രോത്സാഹിപ്പിക്കണം. കച്ചവട സ്ഥാപനങ്ങളിലും സർക്കാർ ഓഫീസുകളിലും ബയോ കംപോസ്റ്റിംഗ് യൂണിറ്റുകൾ സ്ഥാപിക്കണം. [*Source-based waste management should be encouraged for organic waste. Bio-composting units should be set up in commercial establishments and government offices.]*- Public Opinion

17.4 Solid Waste Disposal

The compost generated from aerobic units are given to farmers of the town at free of cost. The biogas generated from biogas plant is burned openly to free the plant capacity. The shredded or baled non-bio degradable waste are collected by Clean Kerala Company Limited (CKCL) for recycled uses. The CKCL is giving the money to municipality for the shredded or baled good quality plastic rejects. Town is giving the money to CKCL for taking shredded or baled bad quality plastic rejects at 10 Rs/kg. There is no landfill site for disposal of other type of waste generated in the town.

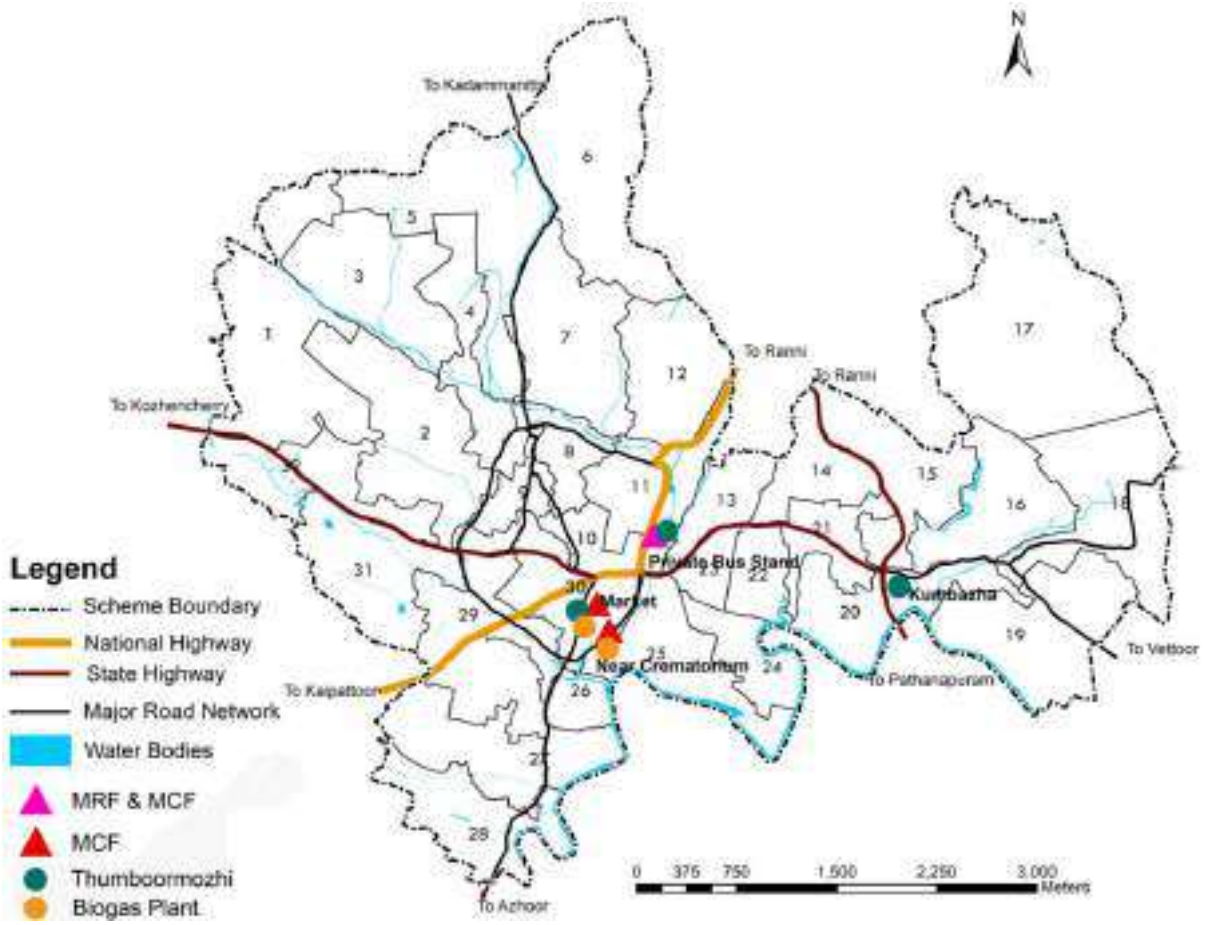

Figure 17.5 Location of Solid waste treatment systems in the town

17.5 Management of other waste

Other waste types in the town, apart from biodegradable and non-biodegradable waste, include sanitary waste, medical waste, domestic hazardous waste, e-waste, construction and demolition waste, inert and ceramic waste, and non-recyclable waste.

17.5.1 Sanitary Waste

Sanitary waste from households and institutions comprising of sanitary pads, diapers (for children and adults) is about 0.33 TPD (about 2% of the total generated waste) in Pathanamthitta town Area as per the Solid Waste Management Rule 2016 Government of India. At present there is no proper system for collection, conveyance, treatment and disposal of sanitary waste in the town area except an institution based sanitary waste treatment system which is working in Mini Civil Station office building. Haritha Karma Sena is managing the treatment operations.

17.5.2 Medical Waste

Medical waste refers to any kind of waste that is generated during the diagnosis, treatment, or immunization of humans or animals. It can be hazardous, non-hazardous, or infectious, depending on the type of materials it contains. Proper disposal and handling of medical waste are critical to prevent contamination, injury, and the spread of diseases. Currently all the medical waste from the town is collected and treated by the Kerala Enviro Infrastructure Limited (KEIL) through its Common Biomedical Waste Treatment Facility at Ambalamedu in Ernakulam district. KEIL is responsible for collecting and processing biomedical waste generated in government and private healthcare institutions across five districts, including Pathanamthitta.

17.5.3 Domestic Hazardous Waste

Domestic Hazardous waste including batteries, medicine covers, pesticides, masks, discarded

paint, CFL bulbs, tube lights, broken mercury thermometers, needles and syringes etc. At present collection is done in the town as per schedule, but no proper treatment facilities are available in the town.

17.5.4 E-Waste

E-waste is the discards of electronic and electrical devices DVDs, music systems, TVs, telephones, mobile phones, computers, vacuum cleaners, refrigerators, air conditioners, and all other household electrical equipment come under E-waste/ E- scrap/ waste electrical and electronic equipment (WEEE). Some E-waste items contain lead, mercury, cadmium, and brominated flame retardants which are harmful to life and environment. So, it is important to ensure proper disposal of such waste. E-Waste generated in Pathanamthitta town is found to be 0.33 TPD (2% of the total waste generated as per the CPCB norms). At present collection is done in the town as per schedule, but no proper treatment facilities are available in the town.

17.5.5 Construction and Demolition Waste

Construction and Demolition waste (C&D Waste) generated in the town is 1.63 TPD (10% of Total waste generated as per G.O.(Ms)No.168/2022/LSGD issued by the Local Self Government Department, GoK). Construction waste is the remnant of construction of roads and buildings. Demolition waste is generated during pulling down of old buildings and structures. It is common in the new urban landscape of old cities and includes huge quantities of concrete debris, wood, sand, boxes, plastics and the like. C&D Waste Management Rule, 2016 is a separate legislation for managing construction and demolition waste. As approximately 1 TPD of C&D waste is generated in Pathanamthitta town, suitable land will be identified for storage facility.

17.5.6 Inert Waste

Inert waste is waste that doesn't break down biologically or chemically, and doesn't react with other matter in a way that could harm human health or the environment. As per the data from the municipality, the contribution of inert waste to the total NBDW is 4.96% (Metal, Wood, Bricks, and Asphalt or cement concrete, ceramics) which is 0.89 TPD. At present there is no proper system for collection, conveyance, treatment and disposal of inert waste generated in the town area. Inert waste can be reused or recycled, but it can only be disposed of in a landfill if there's no other use for it, or if it's mixed with other types of waste. Inert waste landfills are typically safe however it difficult to compact and cover in a landfill, which can reduce the amount of space available for other waste.

> മാലിന്യ സംസ്കരണ പ്ലാന്റ് ആളൊഴിഞ്ഞ സ്ഥലത്ത് സ്ഥാപിക്കുന്നതിന് പകരം നഗരമധ്യത്തിൽ തന്നെ സ്ഥാപിക്കുകയും, ആയതിനു ചുറ്റും പൂന്തോട്ടവും, പാർക്കും മറ്റും നിർമ്മിക്കുക. [*Instead of placing the waste treatment plant in a deserted area, place it in the city center and build a garden, park, etc. around it.]*- Public Opinion

17.6 Impact of Hazard and Climate Change

1 in 50-year flood return probability map of Pathanamthitta town published by KSDMA is overlayed with the spatial location of institutions related to solid waste management. All solid waste treatment facilities of the town are located in the central part of the town. This makes the town's solid waste management system highly vulnerable to flooding, which poses a significant risk to its operation and efficiency.

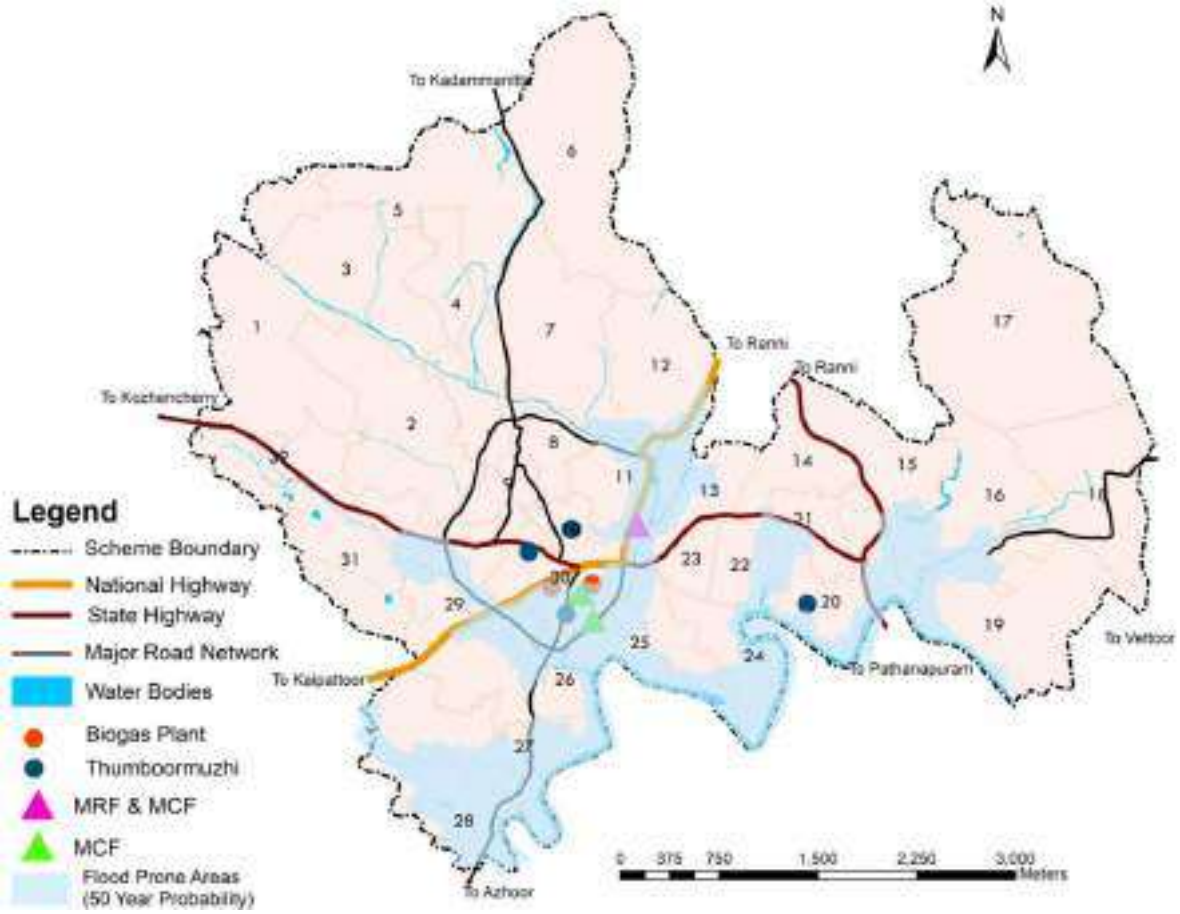

Figure 17.6 Map showing Flood probability map overlay with location of solid waste management institution

Thumboormozhi unit in the market area, biogas plants in the town and all MCF and MRF are located in the flood prone area. (Figure 17.6). However, three out of the four Thumboormozhi units, which are biodegradable waste treatment units, are situated outside the flood-prone zone and should be utilized more effectively during the rainy season. Additionally, while the MCF in the market area is on the first floor, preventive measures must still be implemented to ensure its functionality during flooding events.

17.7 Inference

Source level treatment is promoted for biodegradable waste generated in the town. Households treat bio degradable waste in their own compound and private agencies collected waste from commercial establishments. Non-biodegradable waste are collected by municipality through door to door collection mechanism and treated and handover to agencies for reuse. Considering future demand, new Thumboormozhi units and expansion of MCF are necessary. Regional treatment facilities are more suitable for treatments of rejects and municipality should take initiative to identify land for regional treatment facilities. Preparation of a solid waste management plan for the town also help to manage the overall solid waste of the town in structured manner.



18. ENERGY

The socio-economic development of the town and the welfare of its people are heavily reliant on energy. An efficient, reliable and sustainable energy supply is mandatory for accelerating economic growth and human development. It not only supports economic growth but also contributes to income generation, employment, improved living standards and poverty reduction.

The integration of energy considerations into spatial planning processes is essential for promoting sustainable development, mitigating environmental impacts and enhancing the resilience of communities and infrastructure. Energy infrastructure, such as power plants, transmission stations and renewable energy installations requires physical space. Master plan helps to identify suitable location for facilities, taking into account factors like environmental impact and land availability.

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1 Energy Status

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3 Petroleum

4 Electric Charging Stations

5 Non-Conventional Sources

6 Energy Institutions

7 Energy Efficiency Initiatives

8 Impact of Hazard & Climate Change

9 Problems & Potentials

10 Inference

18.1 Energy Status

Power development activities in the State are carried out mainly through four agencies, namely, Kerala State Electricity Board Limited (KSEBL), Agency for Non-conventional Energy and Rural Technology (ANERT), Electrical Inspectorate, and Energy Management Centre (EMC). The quantum of power available in the State is met from Central Stations, private generators, Power Exchanges and also from internal sources including stations owned by KSEBL, Independent Power Producers (IPPs), Captive power plants (CPPs), and prosumers.

18.1.1 Electricity Distribution Network

The energy sector of Pathanamthitta district is studied based on three criteria i.e., Generation, Transmission and Distribution of energy.

18.1.1.1 Generation

Pathanamthitta district collectively contribute the State's Electricity generation capacity through hydel and solar source. Pamba Basin hydro project is the major Hydro Electric Project in the Pathanamthitta district. This include 3 Hydro Electric projects namely Sabarigiri Hydro Electric Project, Ranni Perinad small hydroelectric project and Kakkad hydroelectric project.



Figure 18.1 Sabarigiri Hydroelectric project.

Source: Website KSEB

Sabarigiri Hydro Electric Project (340 MW) is the second largest hydroelectric project of Kerala. This dam was constructed as a part of Sabarigiri Augmentation Scheme. There are two main reservoirs under Sabarigiri HEP scheme namely Kakki and Pamba reservoir. Both these reservoirs are interconnected through underground tunnel. The power house of Sabarigiri HEP receives water from Kakki dam through a tunnel and discharges into Moozhiyar dam with an installed capacity of 340 MW.

The Kakkad Hydro Electric Project area is accessible by road from the Pathanamthitta town via Vadasserikara, Chittar. The power house site is at Seethathode, 37 km away from District headquarters. The scheme utilises the tail water of Sabarigiri Power Station together with the inflow from the two tributaries of Kakkad river, viz. Moozhiyar and Veluthode. After generation tail race water is fed to kakkad river. This water is used by private power projects like Ullunkal (EDCL), Maniyar (CUMI), Karikkayam (Ayyappa HEP) and KSEBL's Ranni-Perinad Power Project. There are two 110 kV feeders to Pathanamthitta 110 kV substation.



Figure 18.2 Kakkad Hydro Electric Project

Source: Website KSEB

Ranni-Perinad Small Hydro Electric project (RPSHEP) was built and owned by KSEBL is situated on the right bank of the Kakkad River which is a tributary of the Pamba River at Mampara in the Ranni-Perinad villages of the Pathanamthitta district. The release of the water from the powerhouse/dam is to the Kakkad River which in turn flows and joins the Pamba River and flows through Taluks such as Ranni, Konni, Kozhencherry, Thiruvalla, Chengannur, Kuttanadu, Mavelikara, and Karthikappally.

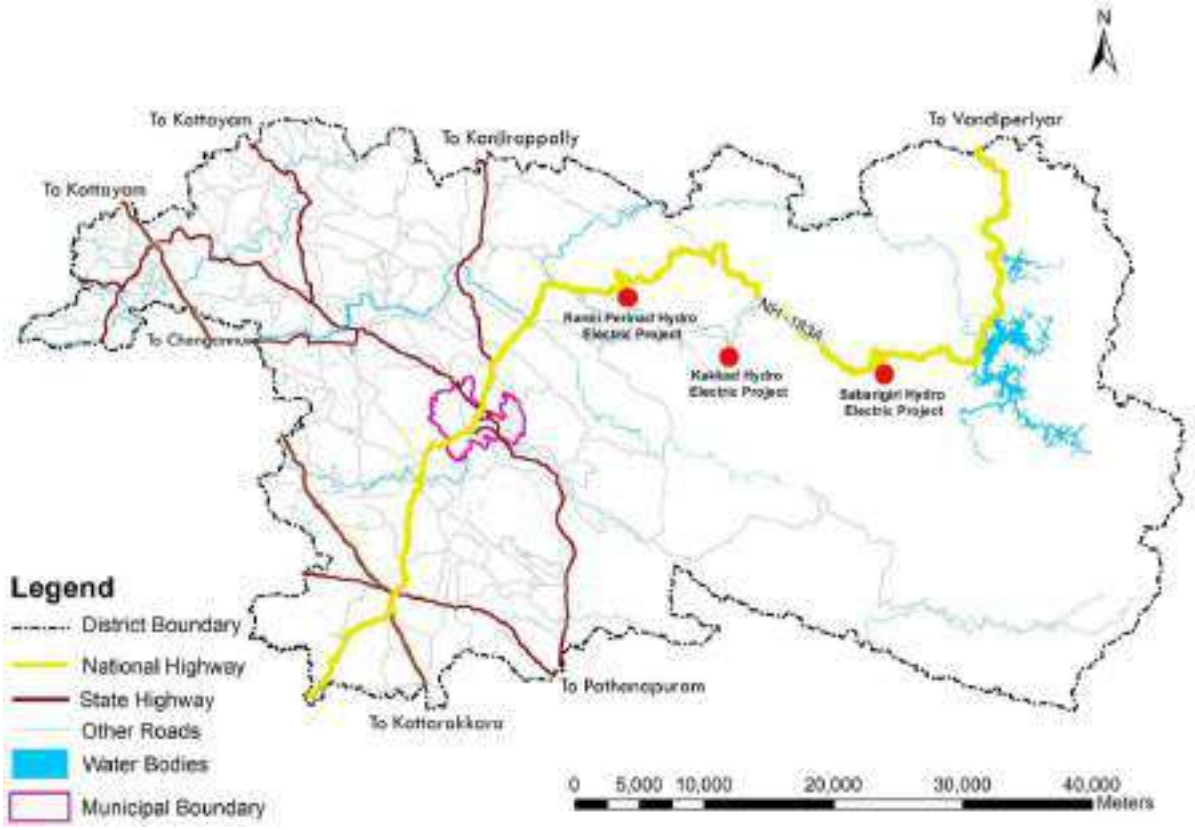

Figure 18.3 Location of hydroelectric projects in Pathanamthitta District



Figure 18.4 Ranni Perinad small hydroelectric project.

Source: Website KSEB

Location of hydroelectric projects in Pathanamthitta District is shown in Figure 18.3.

18.1.1.2 Transmission

Kerala has 432 transmission substations with 14,431.11 circuit km lines having 25555.70 MVA total transformation capacity. In Pathanamthitta district, there are 15 transmission substations (Table 18.1) with 158.5 circuit km lines of 220KV line, 69 circuit km lines of 110KV line and 85 circuit km lines of 66KV line. There is one substation in the Pathanamthitta town.

Table 18.1 Locations of Substations in Pathanamthitta District

Name of Substation	Voltage ratio	MVA
Kozhenchery	110/11	22.5
Pathanamthitta	110/11	69.5
Mallapally	110/11	38.5
Koodal	110/11	25
Ranni	110/11	25
Kakkad	110/11	25
Thiruvalla	66/11	20
Adoor	66/11	20
Chumathra	66/11	20
Thriveni	66/11	16.3
Kochupamba	66/11	8
Konni	33/11	8
Kadapra	33/11	10
Ranni-Perunad	33/11	5
Kumbanad	33/11	10

Source: District Plan Pathanamthitta 2018, District Planning committee

18.1.1.3 Distribution

Table 18.2 shows the existing energy distribution infrastructure status of Pathanamthitta district.

Table 18.2 District energy Distribution status

Category	Units
Electrical Sections	31 Numbers
Total Consumers	452840 numbers
11KV line	3359.44km
Transformers	3281Number
Average monthly usage	51 Million unit
Total connected load	1088.06Megawatt
Average monthly revenue	2162.34 lakhs

Source: District Plan 2018 Pathanamthitta, District Planning committee

18.2 Energy Consumption

Distribution of power in Pathanamthitta town is managed by KSEBL is from Pathanamthitta 110KV substation through two sections namely Pathanamthitta and Kumbazha. KSEB Electrical Circle office and KSEB Subdivision office are the two institutions managing the energy related activities in the town.



Figure 18.5 KSEB Sub division office Pathanamthitta

18.2.1 Sector wise connections

80% of the total energy connection are in domestic sector and 18% are commercial connections. There are limited connections for industrial, irrigation, street lighting etc. Electric connection details of each sections of Kumbazha and Pathanamthitta are given in Figure 18.6 and 18.7. Domestic connections form the major share followed by Commercial connections. Agriculture and industrial connections are comparatively very less. Pathanamthitta and Kumbazha sections almost equally shares supply of connections in the town.

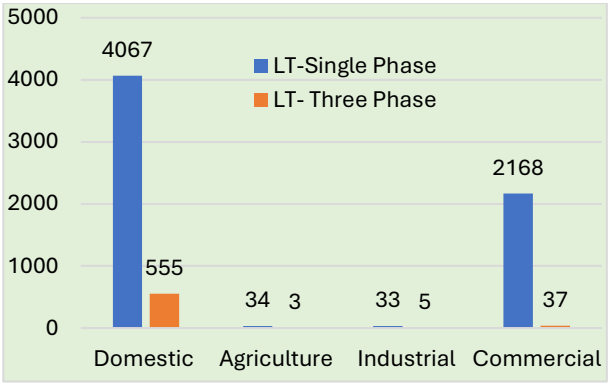

Figure 18.6 Number of electric connection details of KSEB Kumbazha section

Source: BSLLD Pathanamthitta, 2016

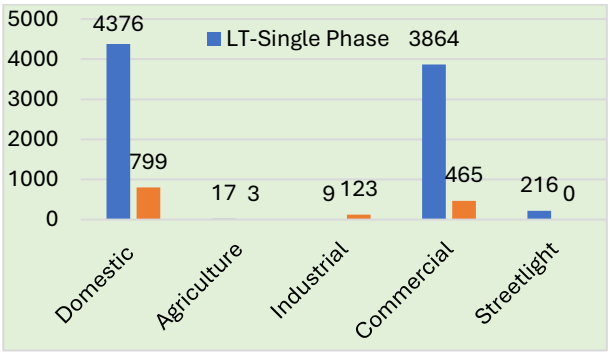

Figure 18.7 Number of electric connection details of KSEB Pathanamthitta section

Source: BSLLD Pathanamthitta, 2016

18.2.2 Electric Consumption Rate

As per the socio economic survey 2019, 4.23% of the average monthly income of every household is spend for electricity consumption. 2.71% of the households use electricity as domestic fuel along with LPG. 13.5% households use inverters.

> നഗരത്തിന്റെ ദൃശ്യഭംഗി നശിപ്പിക്കുന്ന തരത്തിലുള്ള overhead electric line കൾ നഗരമധ്യത്തിലെങ്കിലും underground cable ആക്കുക. [*Replace overhead electric lines that ruin the visual beauty of the city with underground cables, at least in the city center.]*
> - Public Opinion

18.3 Petroleum

7 petrol and diesel pumps and one LPG go down is there in town.

18.4 Electric Charging Stations

Electric charging stations are vital infrastructure for towns to support the shift towards sustainable transportation, enhance local economies, and meet environmental targets. Electric vehicles contribute to reducing air pollution and greenhouse gas emissions compared to traditional vehicles. More charging stations can facilitate a faster transition to cleaner transportation options. There are 5 electric charging stations in the town. Charging stations at Kumbazha (Figure 18.8) and near KSEB office (Figure 18.9) are managed by KSEB. Tata (Figure 18.10) and GOEC are the private institutions managing other three charging stations in the town. Location of electric charging stations in town is shown in Figure 18.11.



Figure 18.8 Electric charging station at Kumbazha managed by KSEB



Figure 18.9 Electric charging station near KSEB office



Figure 18.10 Electric Charging station at Petrol pump near ring road

18.5 Non-Conventional Sources

As per the socio economic survey 2019, 0.73% of the households use non-conventional energy sources as domestic fuel. There are non-conventional energy sources which are fed into the main grid. A few independent private initiatives in the planning area have adopted solar energy to meet their energy demands. As a part of ANERT scheme, 80 houses installed roof top solar plant with subsidy of 40% under Saura scheme through ANERT. Through Sarva Siksha Abhiyan (SSA) Scheme, 5kW On-Grid solar plant Installed in Government LPS Vettipuram in Pathanamthitta town by ANERT. A 3kW hybrid solar plant has been installed at Kadapra School in Pathanamthitta district, as the school serves as a rescue camp during flooding. Roof top solar plants in houses and 8 biogas plants are installed in town. The project related to electric charging stations and solar street light are managed by ANERT.

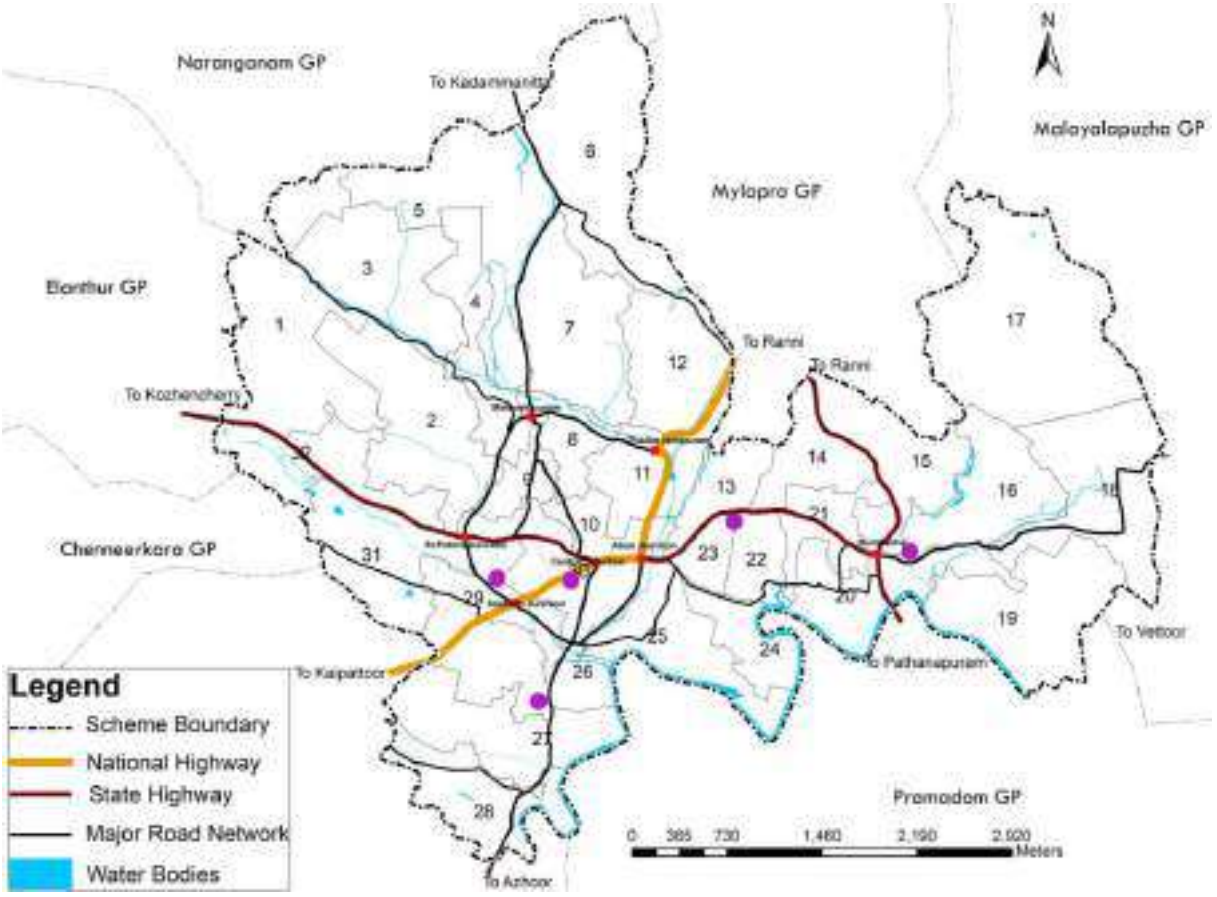

Figure 18.11 Spatial distribution of electric charging stations in town

18.6 Energy Institutions

Power development activities in the State are carried out mainly through four agencies, namely, Kerala State Electricity Board Limited (KSEBL), Agency for Non-conventional Energy and Rural Technology (ANERT), Electrical Inspectorate, and Energy Management Centre (EMC).

Kerala State Electricity Board Limited is a (power utility) company fully owned by Government of Kerala. It is responsible for the generation, transmission and distribution of electricity in the State, with the specific mandate to provide electricity at affordable prices to domestic, agricultural and industrial use. ANERT is the nodal agency for the implementation and propagation of non-conventional sources of energy, rural technologies and promoting the idea of Carbon neutral governance for government institutions with renewable energy and electric mobility in the State. Energy Management Centre (EMC) is the State designated agency of Bureau of Energy Efficiency, MoP, GoI for promoting/ implementing energy conservation activities in order to enhance efficient energy management in the State. Department of Electrical Inspectorate and Meter Testing and Standards Laboratory (MTSL) is functioning under the Department of Power. Safety inspections are carried out and sanction for energisation for all HT/EHT and other medium voltage installation in the State are issued by the Inspectorate.

18.7 Energy Efficiency Initiatives

As part of SSA scheme, ANERT has implemented a 3KW on grid solar plant at Vettipuram LP School in town. In terms of energy efficiency at the household level, some residents have adopted rooftop solar panels to meet their energy needs. But none of the public buildings in the town have implemented the solar energy generation projects despite the presence of

several government offices and institutions. On a positive note, the municipality is making strides toward sustainable urban infrastructure by incorporating LED lighting and solar-powered street lights in its development projects.

Under the 13th Five-Year Plan, the Government of Kerala has adopted a comprehensive strategy to enhance the state's energy sector. The key focus is on developing domestic capacity for power generation, particularly through the expansion of hydroelectric, solar, and wind energy projects. A core objective of the plan is to achieve universal electricity access, ensuring that all households are connected to the power grid. The state also aims to substantially expand large-scale solar power generation, while promoting a transition from stand-alone renewable systems to grid-connected solutions for small-scale energy producers. In parallel, the plan includes initiatives to support households that rely on traditional cooking stoves and high-emission fuels, helping them transition to cleaner, more sustainable energy sources. These measures are designed to reduce environmental impact, improve public health, and promote energy equity across Kerala.

As part of generation of using of renewable energy resources, Government of Kerala setting up of 200 mw Solar Park at Ambalathara, Kinanoor, Karinthalam, Paivelikai and Meenja villages in Kasaragod District. Pathanamthitta town also has land availability to set up solar parks. Kerala aims to transition to 100 per cent renewable energy by 2040, and net carbon neutrality by 2050. The State has a favourable atmosphere for the production of Green Hydrogen with high rainfall, solar insolation, wind potential, and abundant water bodies for floating solar and offshore power generation. To facilitate investments in the green hydrogen domain and transform Kerala to a Green Hydrogen Hub, Government has constituted Kerala Hydrogen Economy Mission (KHEM).

> സർക്കാർ കെട്ടിടങ്ങൾ, പൊതു ഇടങ്ങൾ, വഴിവിളക്കുകൾ എന്നിവ പൂർണ്ണമായും സോളാർ എനർജി ഉപയോഗത്തിലാക്കുക. [*Replace Government buildings, public spaces, and streetlights with solar energy* - Public Opinion

18.8 Impact of Hazard & Climate Change

One of the most immediate and visible impacts of natural hazard on energy development is infrastructure damage. Landslide or rising waters due to flooding can damage or destroy critical components of energy infrastructures like sub stations and solar panels resulting in costly or difficult repairs and delayed energy production. For identifying relative exposure of existing energy infrastructure of town to natural hazards, spatial distribution of energy infrastructure facilities overlaid with hazard prone area of town prepared by KSDMA. (Figure 18.12).

Town has only one KSEB substation which is 110KV electric substation located near flood prone area. So, chances of inundation are high. Suitable mitigation measures have to be implemented. Transformers located in flood-prone areas must be made resilient by the KSEB, either through flood-proofing measures such as elevating or sealing critical components, or by relocating them to safer, elevated locations to ensure uninterrupted power supply during flood events.

18.9 Problems & Potentials

All houses and institutions in the town have an adequate electricity supply. However, the town has yet to progress toward the next level of sustainable energy efficiency and generation. Town has high potential for solar energy generation as Pathanamthitta town is the administrative centre of the district with lot of government institutions.

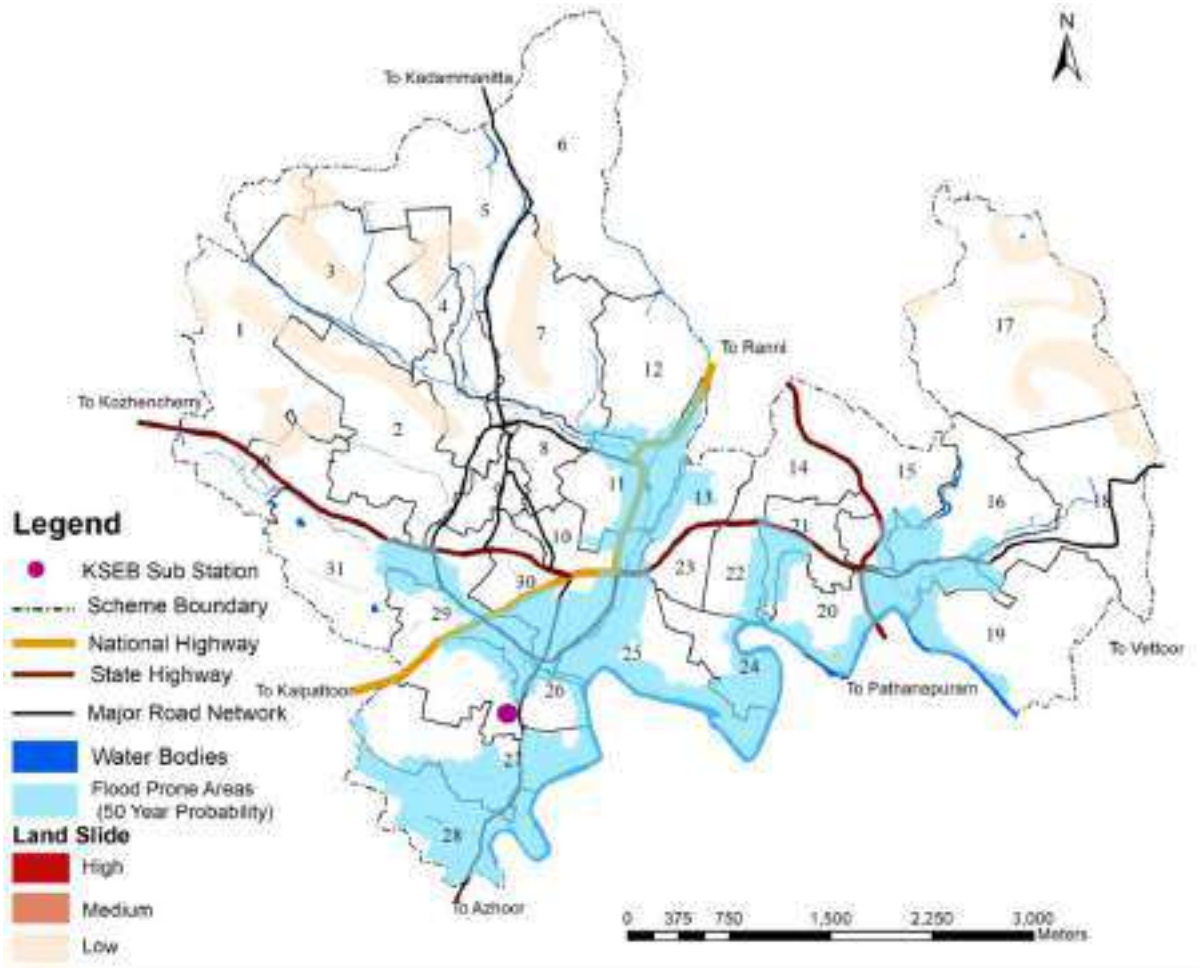

Figure 18.12 Spatial distribution of KSBE substation overlay with hazard prone area of Pathanamthitta

Currently, electric lines are installed overhead along both sides of the road network, with some crossings that pose potential electrical hazards and affect the town's aesthetics. Underground cabling offers a much safer alternative, as it is protected from external elements and inaccessible to the public. This significantly reduces the risk of electrical shocks and related accidents. Therefore, provisions for underground ducts should be incorporated along roadsides whenever road widening or maintenance projects are planned and executed. In recent years, extreme heat is recorded in all districts. The number of days with high temperatures is also increased. Since the beginning of March in last year, the temperature in of most of the district including Pathanamthitta District has shown 37 to 39 degrees. This leads to high usage of electricity. A sustainable energy plan for the town/district must be developed and implemented as a top priority, considering the rising temperatures.

18.10 Inference

While analysing the category wise consumption of electricity, major share of electricity is distributed for domestic purpose. All houses in the Municipality are electrified. Use of non-conventional sources of energy is to be promoted. Electric hazard are zero in the town and clearance of electric lines from trees and other elements are properly managed by the officials of KSEB. Projects related to achieve green energy and carbon neutral has to be implemented.

PART I
STUDY & ANALYSIS



III. SOCIAL INFRASTRACTURE

19.Education
20. Health
21. Housing
22. Recreational Facilities
23. Other Civic Amenities
24. Special Concern Areas
25. Environment
26. Administration & Finance
27. Community Involvement
28. Summary & Findings
29. Sectoral & Other Linkages
30. Existing Spatial Structure



19. EDUCATION

Kerala is far ahead of the national objectives in primary and secondary education and is striving to attain international standards in higher education, technical education and research. Kerala is the first State to have achieved universal literacy. Kerala has a well-developed education system, with a network of schools, as well as higher education institutions including medical, engineering, and technical colleges.

Educational institutions need to be strategically located to ensure that all residents, especially children and young people, have convenient access to schools, colleges, and universities. This reduces travel time and transportation costs for families. Incorporating educational institutions into the spatial planning of towns is not just about providing places for education; it is about creating a sustainable, equitable, and thriving community. The well-being, growth, and future of the town and its

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1 General Educational Status

2 Existing Facilities -School Education

3 Higher & Professional Education

4 Distance to Education Facilities

5 Infrastructure Facilities

6 Comparison with Planning Standard

7 Schemes & Programs

8 Impact of Hazard & Climate Change

9 Problems & Potentials

10 Inference

19.1 General Educational Status

The general education status is assessed based on the literacy rate, number of educational institutions per one lakh population and educational status. The literacy rate of Kerala State, Pathanamthitta District and Pathanamthitta Municipality as per 2011 census is 93.91%, 96.93% and 96.4 % respectively.

The literacy rate of Pathanamthitta Town is slightly less than the district, but higher than the state literacy rate.

The literacy rate of Pathanamthitta town is increasing over years from 82.06% in 1981 to 96.4% in 2011 (Figure 19.1) Total number of literates in Pathanamthitta town as per Census 2011 is 32,910 out of which 17,305 are females. Female literacy rate is more than male literacy rate in the town. The trend in growth of both male and female literacy rate follows similar pattern.

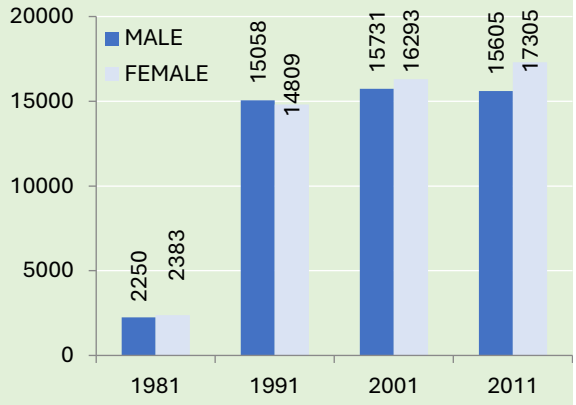

Figure 19.1 Decadal male and female literates of the town
Source: Census 2011

19.2 Existing Facilities - School Education

School education is divided into three different stages in Kerala, viz., Primary, Secondary and Higher Secondary. Primary or Elementary Education serves as the foundational stage of schooling. Details of educational institutions of the town is shown in Table 19.1

Table 19.1 Number of education institutions in the town

Category	Number
Schools	36
Arts & Science Colleges	3
Professional Colleges	4
Arabic College	1
Play school	4
Technical Institutes	20
Tutorials	2

Source: Town Directory 2019 Pathanamthitta Municipality & LSGD Planning Pathanamthitta

Among the 36 Schools within the town, 7 are Government schools, 16 are Government Aided Schools and 13 are Un Aided Schools. The number of Schools in various levels are shown in Table 19.2. The details of the schools in the town, i.e. number of students, number of teachers, categories like government aided/unaided, unrecognised etc., facility available and established year are given in Annexure 19.1.

Table 19.2 Type and Number of Schools in the town

Category	No. of School
Play school	4
Pre-Primary	1
LPS	23
UPS	10
High School	11
Higher Secondary	8
VHSS	2
Special school	1

Source: Town Directory 2019 Pathanamthitta Municipality, LSGD Planning Pathanamthitta

All schools are mixed gender type schools. 16 schools are English medium schools, 15 schools use Malayalam medium and remaining 5 schools have both English and Malayalam as medium of instruction. 24 schools are following Kerala Syllabus, 8 schools following Central Board of secondary Education(CBSE) syllabus, 2 schools follow Indian Certificate of secondary Education (ICSE) syllabus and multiple syllabus in other schools except special school.

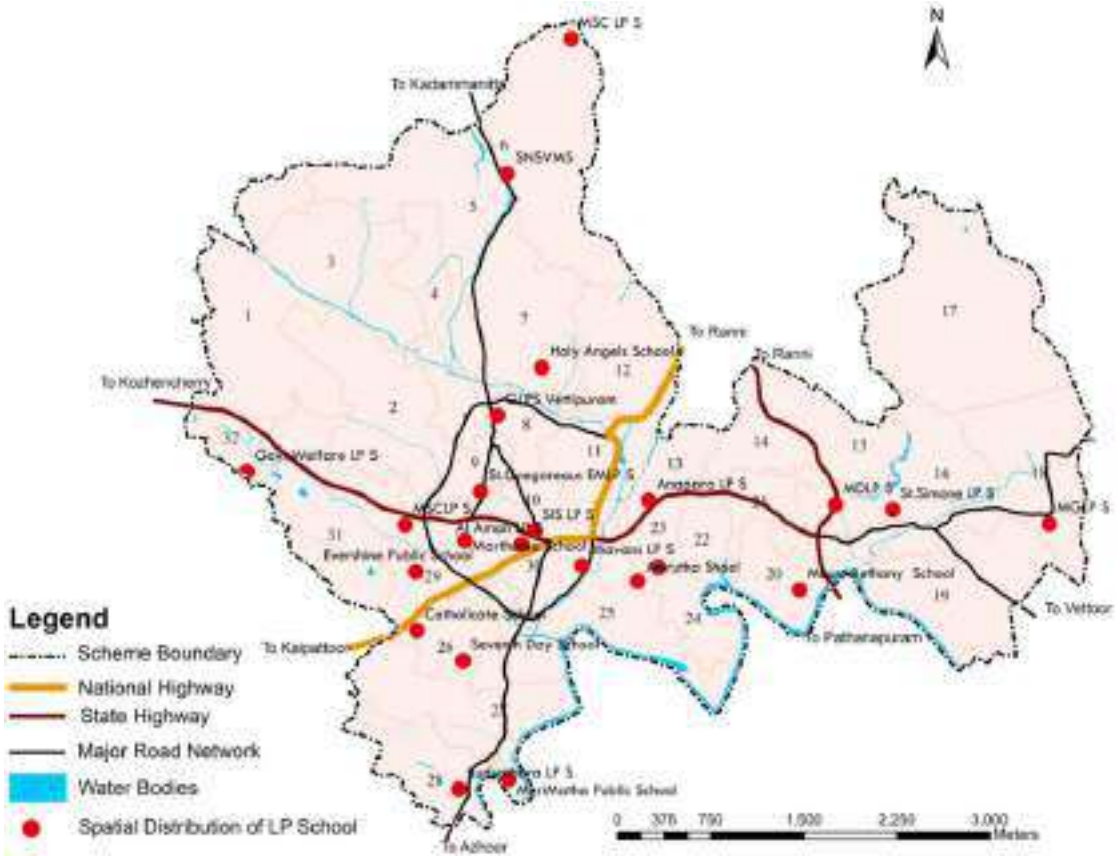

Figure 19.2 Location of LP Schools in the town

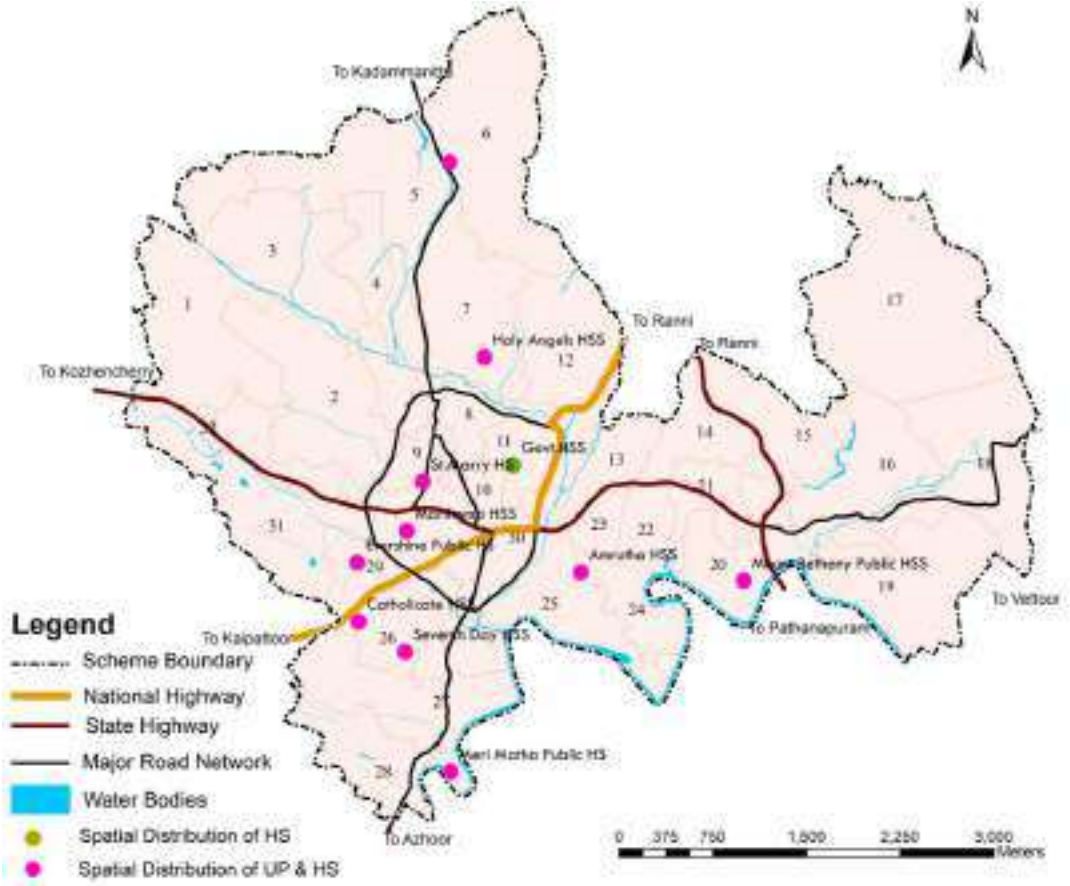

Figure 19.3 Location of UP schools & High schools in the town

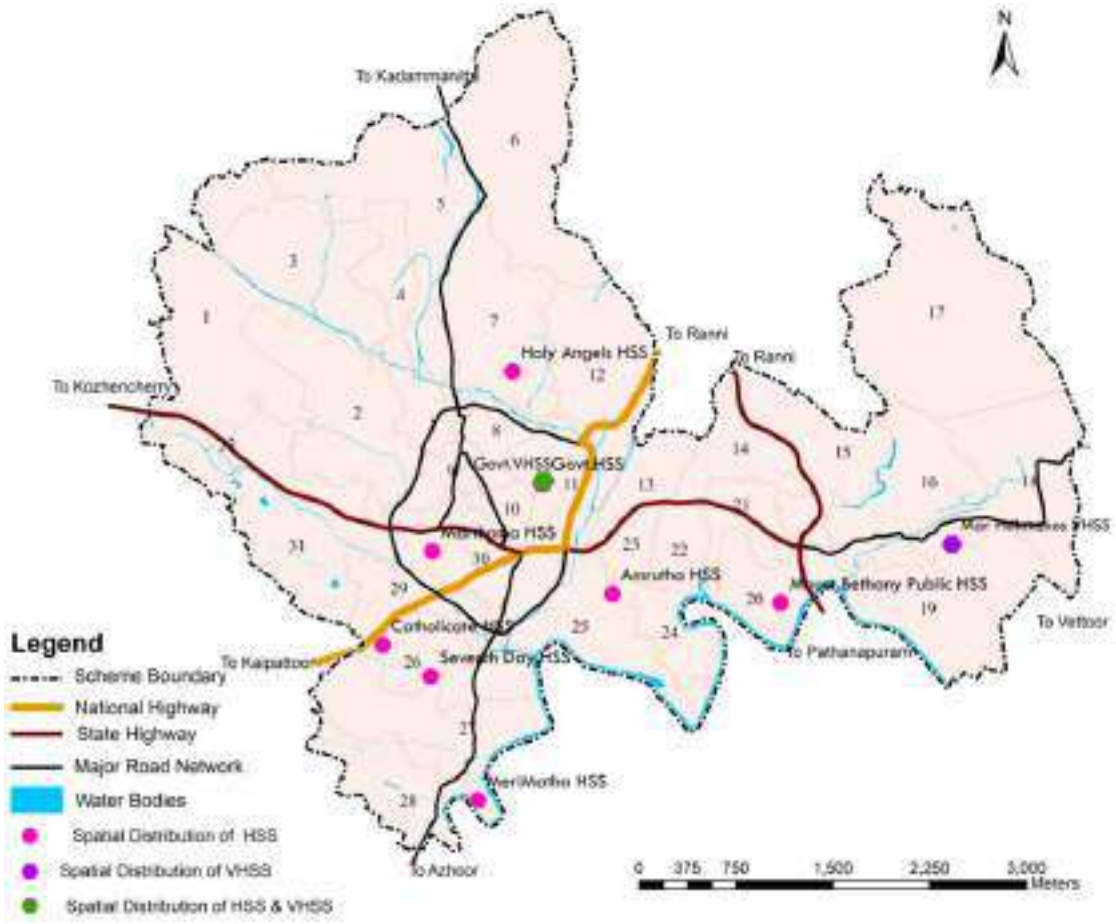

Figure 19.4 Location of HSS & VHSS in the town

There are no Technical, Sports or Tribal schools in the town. Student Teacher ratio in Higher Secondary School level is comparatively greater than high school level. The student teacher ratio is within norms in all schools. It is less than 30 in LP, less than 35 in UP and less than 27 in High school.

Total of 23 Lower Primary (LP) schools in the town spatially distributed along the major roads of the town (Figure 19.2). Out of 23 LP schools in the town, 9 are government schools and 14 are managed by private sector. Government LP schools serve the education demand of low-density areas of the town. Total of 10 Upper primary (UP) schools and 11 high schools in the town which are spatially distributed in central area and southern side of town along the major roads (Figure 19.3). 2 UP schools and 1 High School are managed by Government sector. Total of 8 Higher Secondary Schools (HSS) and 2 Vocational Higher Secondary (VHS) school in the town spatially distributed towards the central area and southern side of the town (Figure 19.4). One HS School and VHS school managed by government sector.

19.3 Higher & Professional education

Higher education of the town comprises of Arts & Science colleges, Professional Colleges and other educational institutions.

19.3.1 Arts & Science Colleges

There are two Arts and Science colleges in Pathanamathitta town which are Catholicate College and College of Arts and Commerce under MG University which are located at college junction and Chuttipara respectively. All are mixed colleges. Degree and post graduate degree courses are offered in both colleges and PhD, M Phil are also there in Catholicate College. There is an Arabic college in the town called Kassaful Uloom Arabic College at Kulasekharapathy.

19.3.2 Professional Colleges

Four professional colleges are there in the town. Musaliar College of Engineering at Mylayalappuzha, Institute of Nursing Education at Chuttipara, School of Applied Science and Technology at Chuttipara and Muthoot College of Nursing at Manorama Junction. The three colleges namely College of Arts and Commerce, Institute of Nursing Education and School of Applied Science and Technology are together functioning at Chuttippara region. The name of the colleges and details regarding number of students, lectures, courses provided, type of college etc are furnished in the Annexure 19.2. The spatial distribution of higher education institutions in the town is showed in Figure 19.5.

19.3.3 Other Educational Institutions

Five private tutorial schools/colleges are functioning in the town. They are Prathibha College, AVM College, Providence College, Mulakkal Academy, Darsana Academy and Universal College. These colleges together offer course from Class VIII to Degree level. There are about 20 institutes offer software as well as other job-oriented courses. The offered courses are AutoCAD, Accounting, Fashion designing and beautician course, DHA, HAAD Prometry, Tally, MS Office, Spoken English, MMV, D/CIVIL, , Project Management, PPM, SAP, CAM, CAE Animation & multimedia, MBA, MCA, M COM, MA, BBA,BAMSN, Lift Technology, Fire and Safety, Optical Fibre, Primary Lab Tech Coaching, IELTS, Technical course in engineering, computer courses, Accounting, PSC Coaching etc.

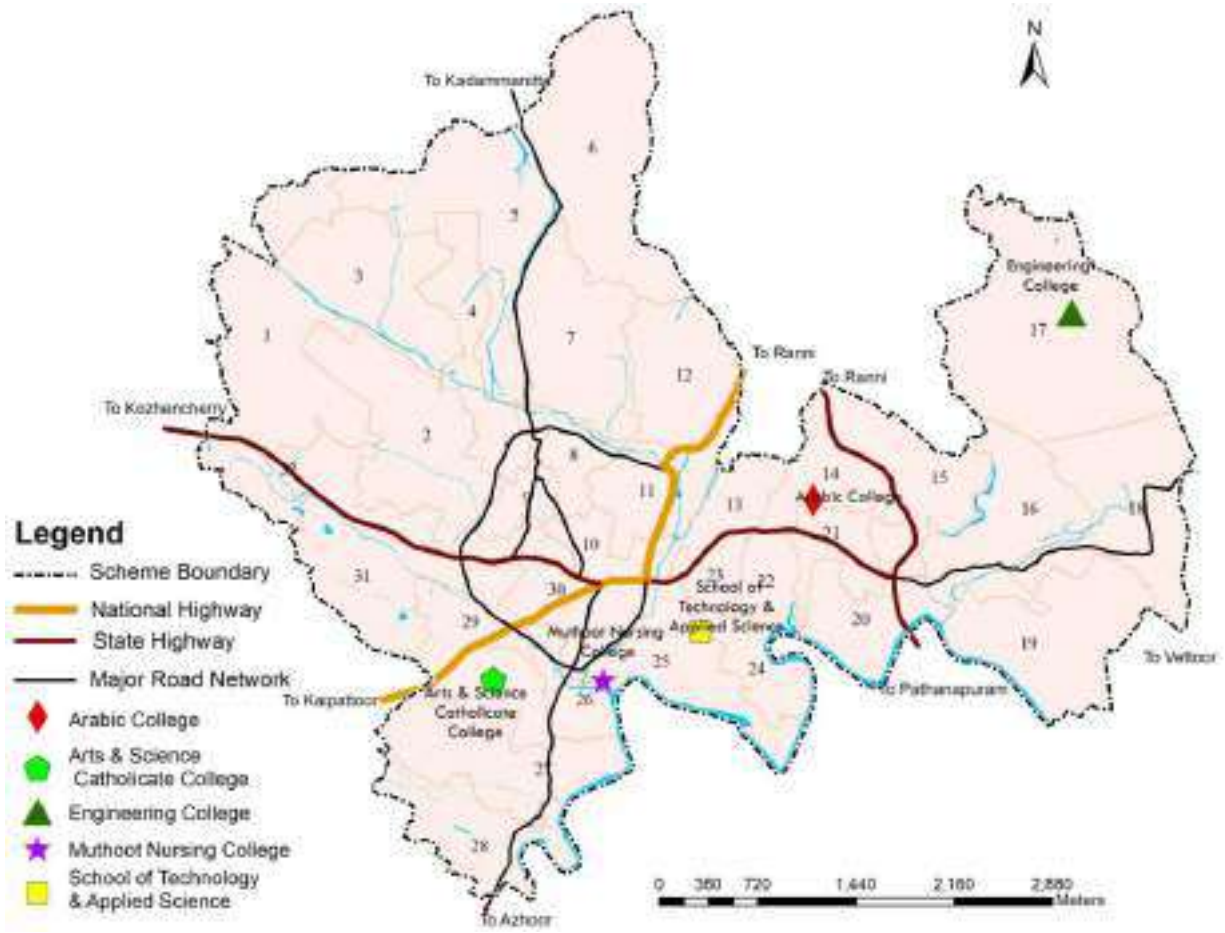

Figure 19.5 Spatial distribution of higher educational Institutions in the town

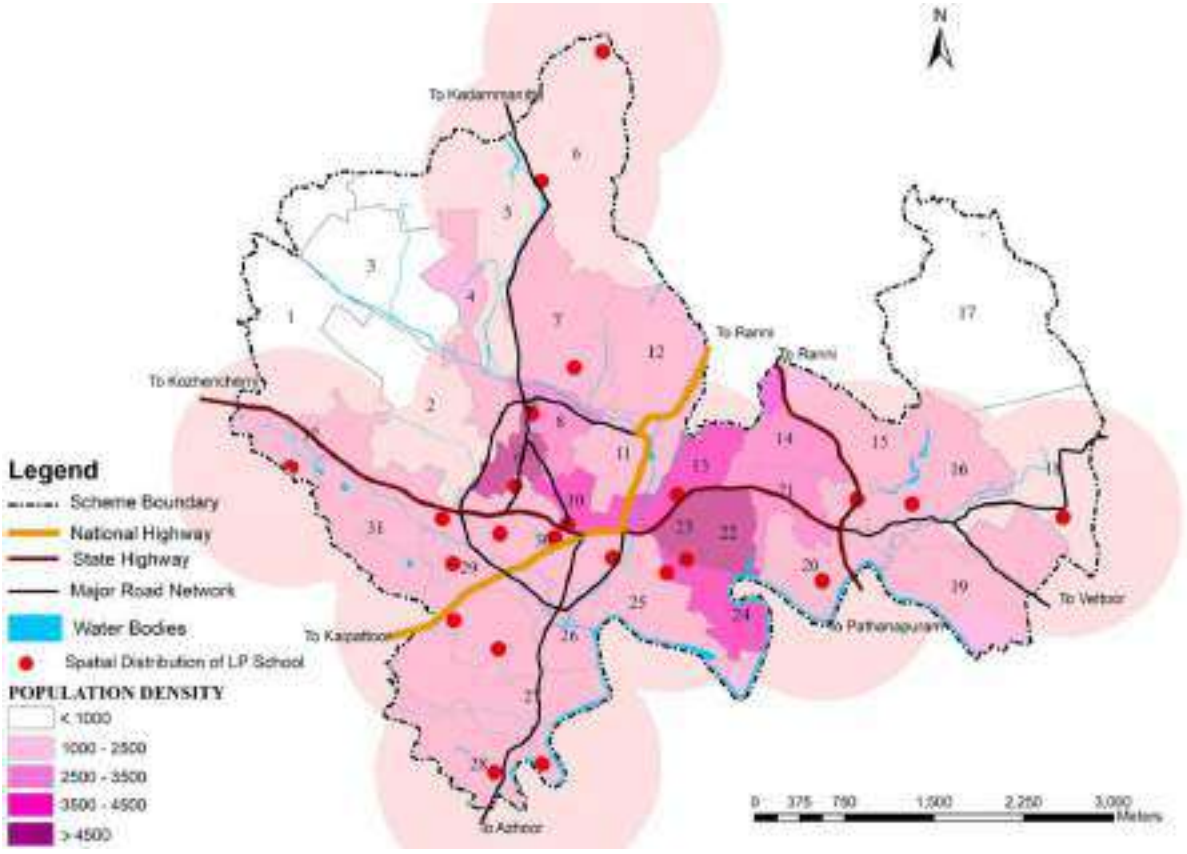

Figure 19.6 500 m coverage area of LP school overlay with ward wise population density of the town.

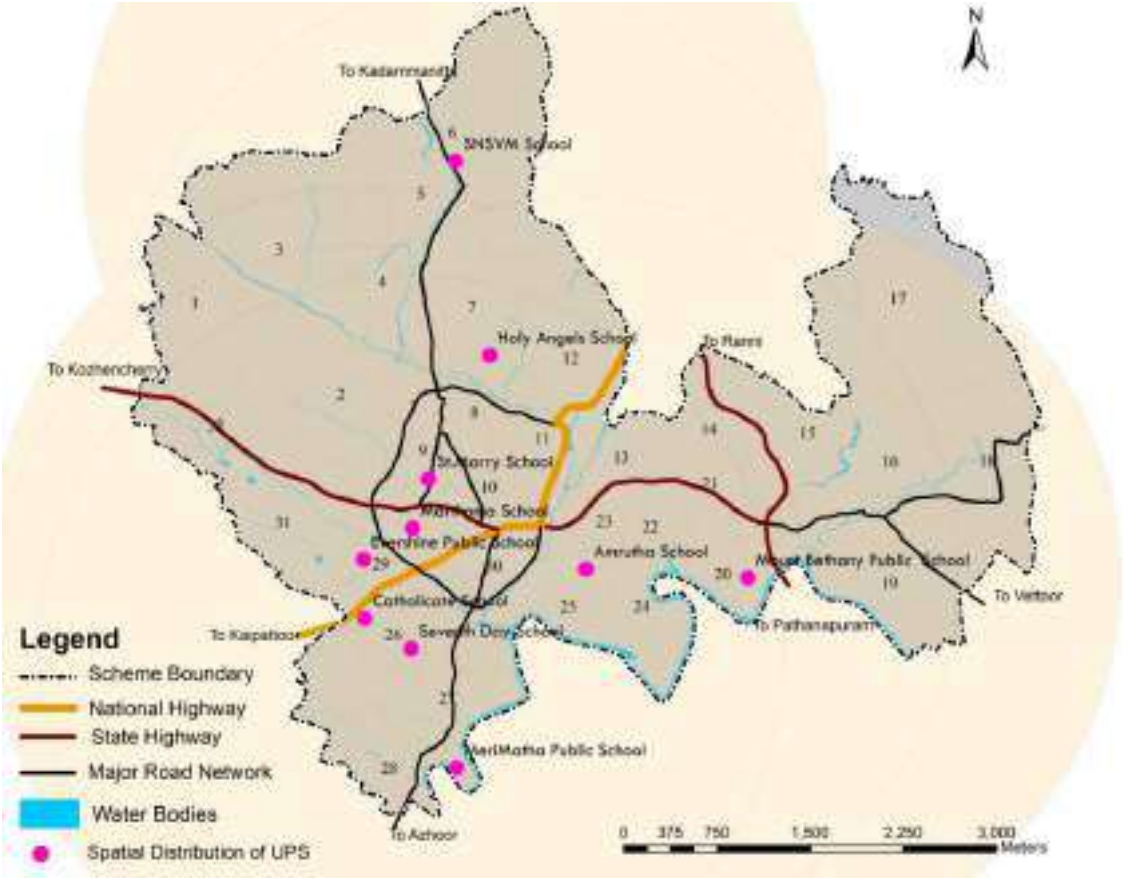

Figure 19.7 1 km coverage area of UP school in the town

19.4 Distance to Education Facilities

According to the planning standards, educational institutions should be available in reachable distances of within 0.5km for LP school, 1km for UP school and 3km for High school. Based on socio economic survey, the average distance to education in the town are 0.91km to LP school, 1.06km to UP school and 1.35 km to High school. Coverage radius of 500 m from each LP school in the town encircles the all-high-density wards of the town. (Figure 19.6) Students in wards 1, 3 and 17 need to travel more distance to reach LP school than specified as per planning standard.

No need of additional LP schools in these uncovered areas as the density of these wards are low and have sufficient number of LP schools in the town spatially for catering the demand total population. Coverage radius of 1Km standard distance from each UP school in the town encircles entire area of the town. (Figure 19.7) Distance to reach high school education is within the planning standard specifications. There is no uncovered area in the town for UP education and have sufficient number of UP schools to catering the demand of total population spatially, no need of additional UP schools in town.

19.5 Infrastructure Facilities

The various facilities available at schools were assessed on the basis of parameters like Smart classrooms, Libraries, Laboratories, Sports facilities, Health facilities, Sanitation facilities and Multipurpose infrastructures which helps students to experience and delivers better educational outcomes through primary survey.

19.5.1 Schools

Regarding facilities available at schools, the infrastructure facilities like building conditions, drinking water, rain water harvesting, playground, solar panel, medical check-up, computer lab, internet, digital facilities, smart classrooms and sanitation facilities etc. are considered. Basic facilities are available in most of the schools. Advanced facilities such as computer labs and internet access are also available in selected schools through government programs implemented in a phased manner.



Figure 19.8 Schools in town

Schools in the eastern side of the town has no playground (Figure 19.9). Suitable land maybe identified near Melevettipuram region (Eastern side) near ring road for playground for schools in those regions.

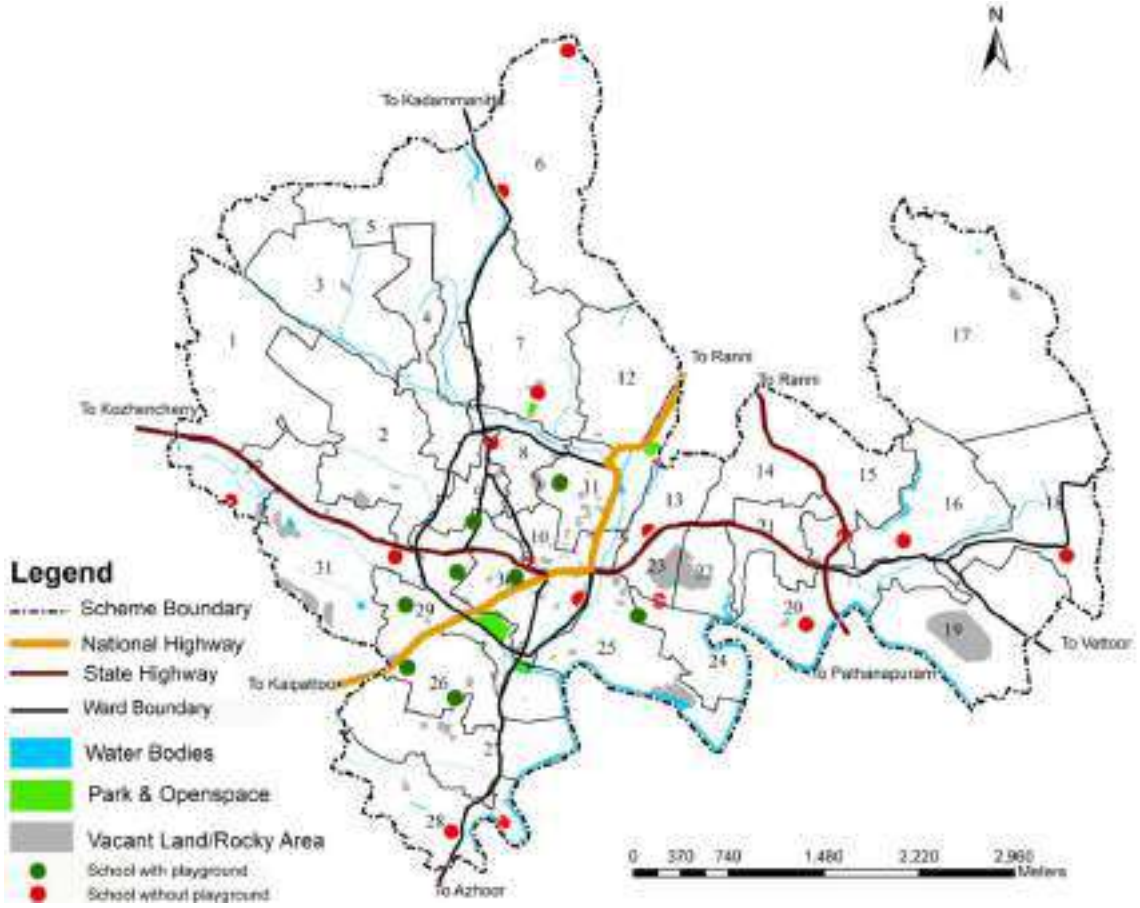

Figure 19.9 Schools with/without playground

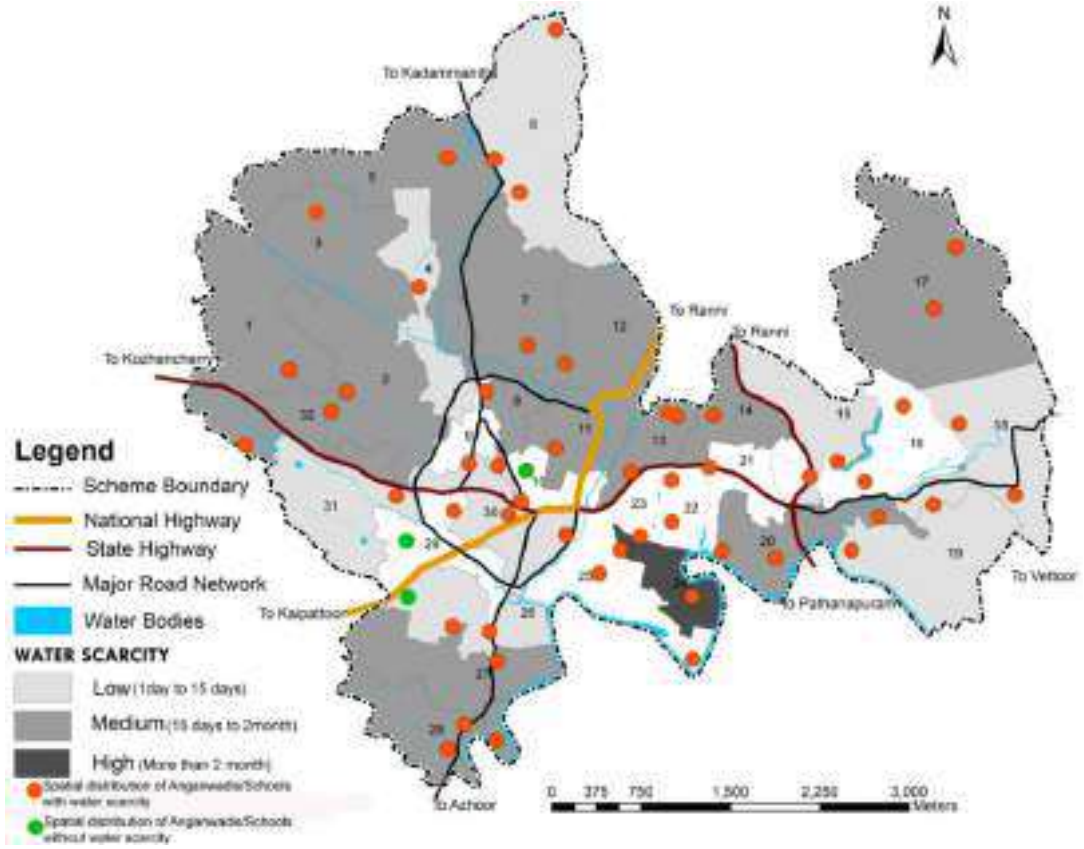

Figure 19.10 Location of institutions (School/Anganwadi) and ward wise duration of water scarcity

Even the Education institution located in the wards with low water scarcity, (Figure 19.10) faces water scarcity issues as the distribution of piped water supply by KWA is not sufficient enough. Institution level solutions like Rain Water Harvesting can also be suggested along with ensuring 24x7 piped water supply system.

> കുട്ടികൾക്കായി ആധുനിക രീതിയിലുള്ള പഠന മുറികൾ, ലൈബ്രറികൾ, ട്രെയിനിംഗ് സെന്ററുകൾ, കലാ/കായിക വിനോദ സൗകര്യങ്ങൾ എന്നിവ ഉറപ്പാക്കുക [*Ensure modern study rooms, libraries, training centers, and arts/sports and recreational facilities for children.]– Public Opinion*

19.6 Comparison with Planning Standards

The existing educational facilities in Pathanamthitta town are compared with URDPFI standards (Table 19.3) to determine the gap in educational infrastructure at Pathanamthitta town. Anganawadi in the town can cater the demand of pre-primary school. The number of schools and higher education facilities are found to be enough for the town. The demand includes the establishment of schools for physically handicapped students and technical education facilities such as technical schools, ITIs, and polytechnic colleges. Although these facilities are not available within the town, they can be accessed in nearby towns. The town currently has a greater number of education institutions than required by planning standard.

Table 19.3 Comparison of number of education institutions with URDPFI planning standard

Category of Education	Planning Standard (Population Served)	Required Numbers	Existing Numbers
Anganwadi	5,000	8	33
Pre-Primary School	2,500	16	1
Primary School (I to v)	5,000	8	16
Senior Secondary School	7,500	5	10
Arts and Science College	1.25 Lakhs	1	3
Engineering College	10 Lakhs	1	1

Source: URDPFI Guideline

> വിദ്യാലയങ്ങളിൽ മാനസിക, കായിക വിനോദങ്ങൾക്കുള്ള സൗകര്യങ്ങൾ ഉറപ്പാക്കുക. Playground, yoga, counselling, zoomba, skill development, cultural Corus, open stage, amphitheatre, Parks, കൃഷി തുടങ്ങിയ സൗകര്യങ്ങൾ ഉൾപ്പെടുത്തുക. [*Ensure facilities for mental and sports recreation in schools. Include facilities like play ground, yoga, counselling, zoomba, skill development, cultural Corus, open stage, amphitheater, parks, agriculture etc.]– Public Opinion*

19.7 Schemes/ Programmes

The State has taken measures to address the needs and requirements of children from different sectors, particularly the marginalised and vulnerable. Through projects such as 'Vidya Kiranam', a component of the Nava Kerala Mission which is a continuation of 'Pothu Vidyabhyasa Samrakshana Yajnam', and 'Kerala Knowledge Economy Mission', the Government aims to bring major changes in the standards of school and higher education.

14th Five-Year Plan of Kerala State envisages ending the digital divide, ensuring better connectivity to school education and ensuring access to digital study material and library networks on a completely new scale. Kerala has made remarkable attempts in bridging the digital divide during the pandemic, when online learning became the major mode of school education. The 14th Five-Year Plan also supports the efforts to help preschool education help

children's emotional, social, and personal growth in an inclusive environment, and efforts to dovetail vocational learning in higher secondary schools with the general emphasis to upgrade skill levels in the economy.

Pothu Vidyabhasa Samrakshana Yajnam is a comprehensive educational reforms project with focuses on implementation of the budget announcement of upgrading 1000 schools into international standards, transform all classrooms from Standards 9 to 12 in high and higher secondary schools into high-tech learning spaces, modernize standards 1 to 8 in alignment with contemporary needs by actively involving teachers, parents, and alumni to enhance the relevance of public schools, special packages for renovation of schools which have completed 50 and 100 years and to encourage english learning.

Kerala State Literacy Mission Authority (KSLMA) works to implement literacy, continuing education and lifelong learning programmes in the State. Illiterates, neo-literates, school drop-outs, people who are interested in life long education or continuing education are the main beneficiaries of these programmes. The activities of Literacy Mission have been expanded to vulnerable and marginalized sections of the society with special focus on women, scheduled caste, scheduled tribes, transgender, coastal area people and migrant workers. Literacy is not merely the ability to read and write, but in broad sense it is the basic awareness of how to lead a healthy and progressive social life.

Samagra Shiksha Kerala (SSK) implementing various programmes for differently abled students as part of inclusive education. SSK supports them by setting up Autism centres, home-based education, adapted learning and providing equipment. Additional Skill Acquisition Programme (ASAP) project impart skill training to higher secondary and undergraduate students.

19.8 Impact of Hazard & Climate Change

Drought directly connects with the availability of drinking water. Pathanamthitta town comes under the moderate drought area as per KSDMA. Providing piped water supply is the only one solution to address the drinking water problem. All higher education institutions have piped water supply connections. However, the supply is not available 24x7 in terms of frequency and duration. It varies from season to season. During the summer season, the water supply frequency varies, often reducing to three times a week with a daily supply of only five hours. Due to this irregular supply of water, all education institutions need water tanks to store drinking water.

19.8.1 Spatial distribution of institutions

To identify the education institutions in the hazard prone area of the town, flood and landslide probability map published by KSDMA is overlaid with location of education institutions in the town (Figure 19.11 & 19.12). Three Government LP school and three private school (2 LP & 1 HSS) are in the flood prone area and none of the schools situated in the landslide prone area. Among higher education institutions in town, Muthoot nursing college is situated in the flood prone area.

19.8.2 Institutions as rescue camps

Education institutions are usually used as the rescue camps at the time of hazards. Nine schools and 4 higher education institutions are identified as rescue/relief camps at the time of hazards. The rescue camps are identified based on the transportation facility, number of rooms, capacity, availability of water supply, electricity, sanitation facility and cooking area. Figure 19.13 and Table 19.4 shows the education institutions which are identified as rescue camps by Town as part of disaster management plan 'Nammal Namukkayi 2023-2024'.

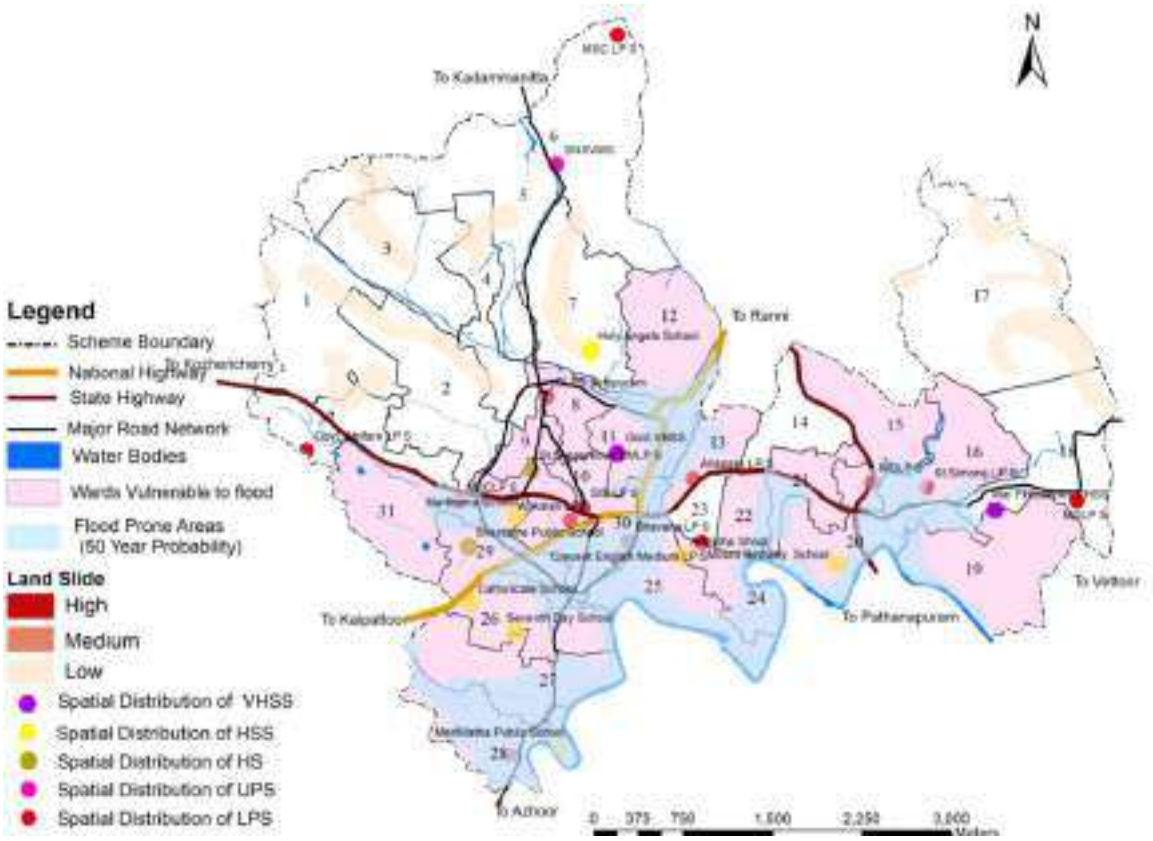

Figure 19.11 Location of schools overlay with hazard zonation map of Pathanamthitta

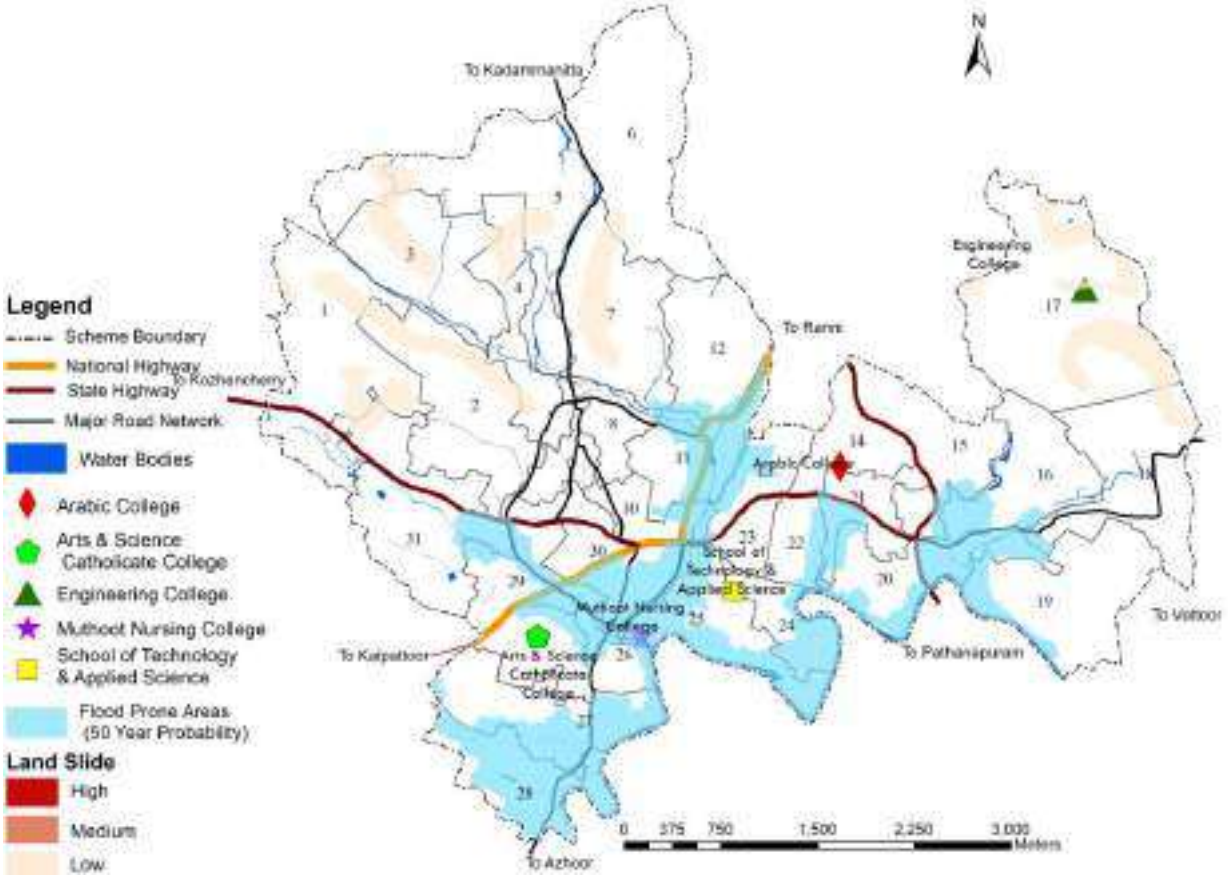

Figure 19.12 Location of higher education institution overlaid with hazard zonation map of Pathanamthitta

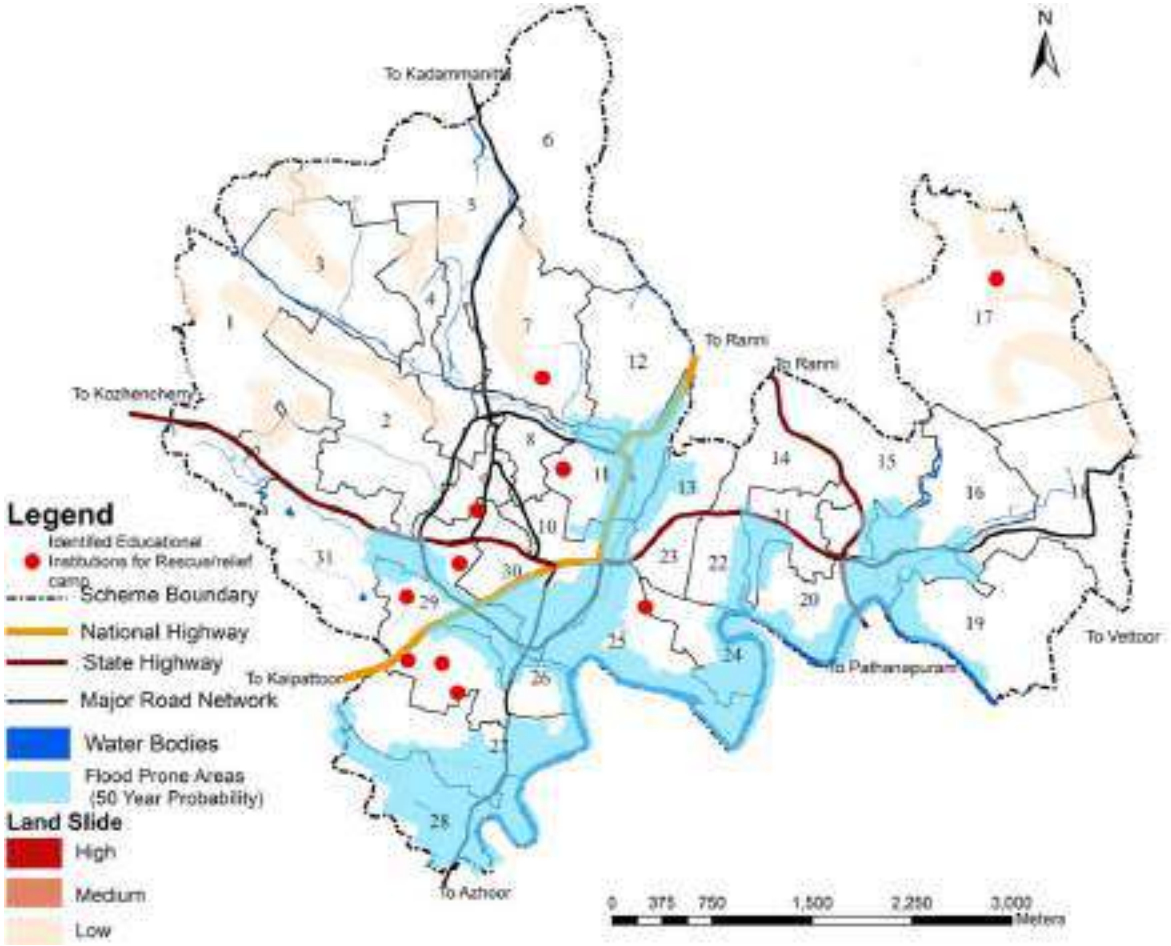

Figure 19.13 Location of educational institutions identified as rescue/relief camps at the time of hazards

Table 19.4 Education Institutions identified as rescue camp at the time of Hazard

Education Institutions	Number of rooms	Capacity	Govt/ Pvt
Catholicate HSS	40	600	Private
Govt.HSS & VHSS	40	500	Govt
Seventh Days Adventist	20	250	Private
Marthoma HSS	40	500	Private
Amrutha Vidhyalayam	60	800	Private
St.Marys Vettipuram	20	200	Private
Holi Angels Thazhevettipuram	15	200	Private
Evershine school Makkamkunnu	15	200	Private
Al-Ameen(Near Masjid)	10	100	Private
Catholicate College	100	1500	Private
Co-operative college	10	100	Private
Musliar College	100	1500	Private
College of Applied Science	30	100	Private

Source: DM Plan Pathanamthitta 2023

19.8.3 Vulnerability Analysis

As per guideline for preparation of risk informed master plan for a town, assessing social infrastructure vulnerabilities of the town is included in the category of Basic Service vulnerability. 20% weightage is given to basic service vulnerability and following are the sub parameters and its weightage included:

1. Social Infrastructure (45%)
2. Water supply (35%)
3. Sanitation (15%)

Out of these three sub parameters, whether the social infrastructures like Hospitals, Schools, Community Halls, Police Station, Fire Station,

Village Office, LSG office, Pumping stations, Treatment plants, Electric sub stations, Transformers etc are affected by hazard and the impact of those infrastructures is assessed in this chapter. Remaining two sub parameters are analysed in chapter 14 & chapter 16.

To understand the social infrastructure vulnerability in the town, critical infrastructure which has impact on municipality based on the percentage of municipal area likely to be affected by flood and landslide is analysed in this chapter. The data is collected by 100% door to door socio economic survey in the flood prone and landslide prone areas of the town and analysed in GIS software. Varying degrees of vulnerability (low, moderate, and highly vulnerable areas) has been identified in each cadastral based on value assigned as per guidelines of risk informed master plan. The Table 19.5 shows the criteria and its value adopted for the analysis of social vulnerability likely to be affected by the hazard at cadastral level. The inference of this social vulnerability analysis is also incorporated in the social sector related chapters of this report (Health, Housing and Civic amenities) as the social vulnerability analysis is done together. This inference is also incorporated in the chapter 4 to find out the total basic service vulnerability and risk of the town.

Table 19-5 Criteria and its value adopted for vulnerability analysis of percentage of social infrastructure vulnerability by a hazard

Criteria	Value
> Critical infrastructure which has impact on whole LSG or >75% of LSG likely to be affected	9
Critical infrastructure which has impact on 51-90% of LSG likely to be affected	6.75
Critical infrastructure which has impact on 26-50% of LSG likely to be affected	4.5
Critical infrastructure which has impact on <26% of LSG likely to be affected	2.25

Source: Guidelines for Risk Informed Master Plan

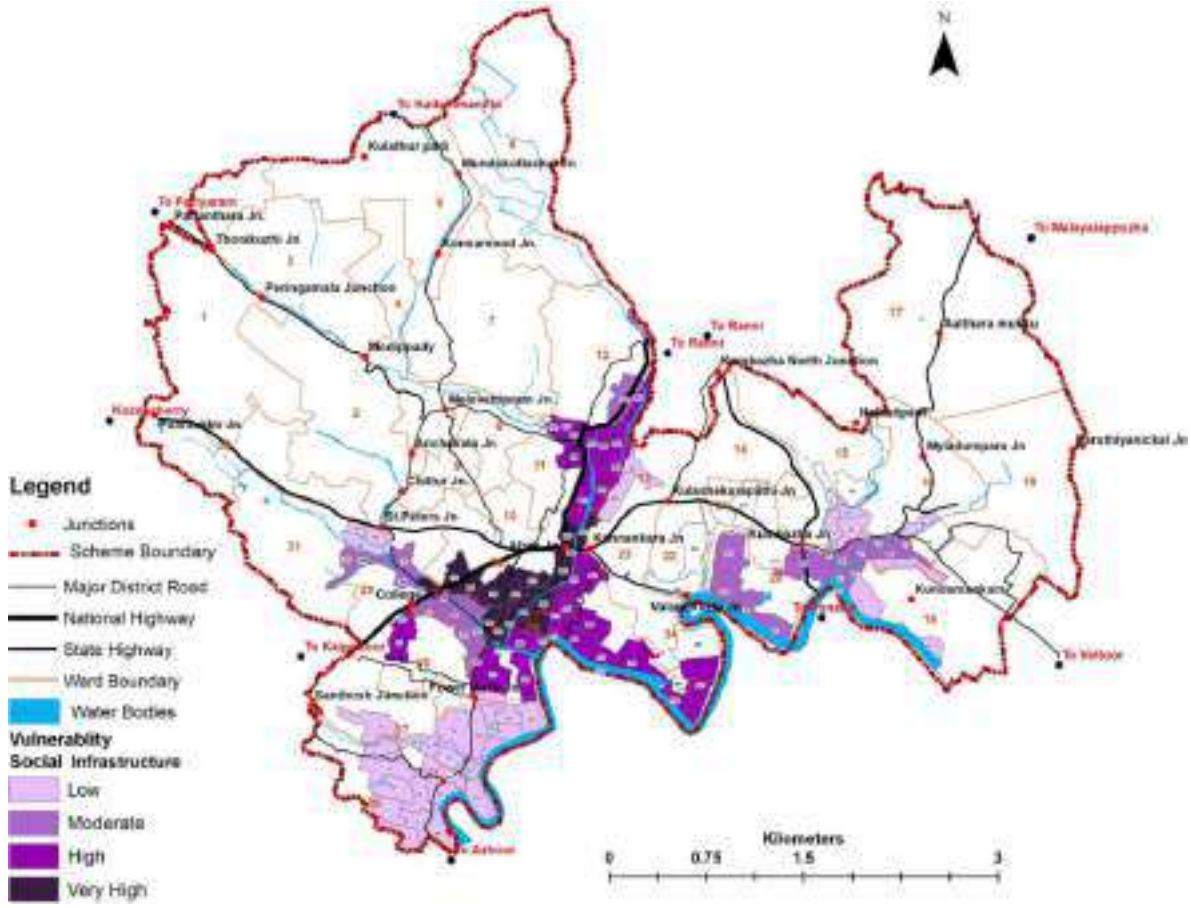

Figure 19.14Cadastral level social infrastructure vulnerability in flood prone area

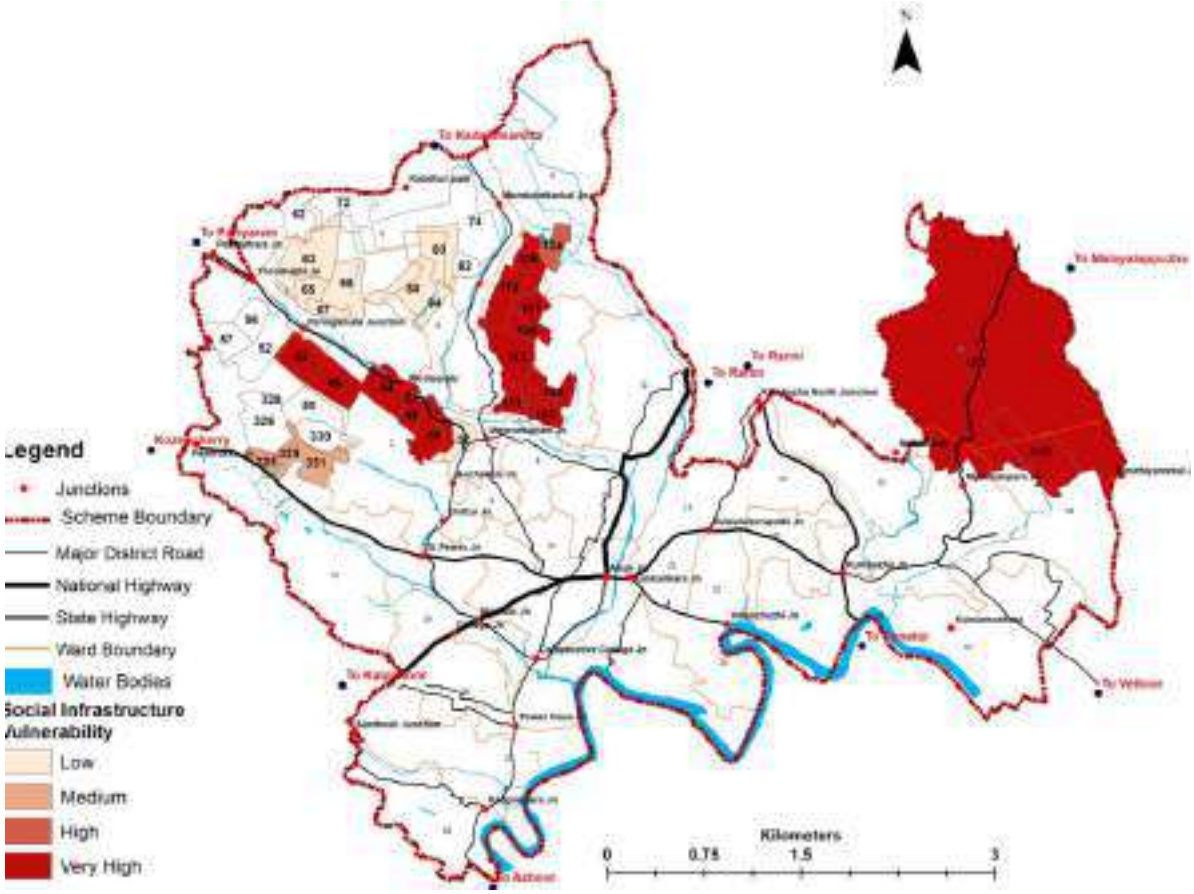

Figure 19.15 cadastral level social infrastructure vulnerability in landslide prone area

19.8.3.1 Flood vulnerability

The social infrastructure vulnerability in the flood prone area of the town at cadastral level is analysed here. The social infrastructure vulnerability in the flood prone areas shows low to very high (Figure 19.14). Cadastral in the central part of the town shows high and very high social infrastructure vulnerability (37.71%) as critical infrastructure in these cadastral has impact on more than 50% of LSGI area. Cadastral away from the central area shows low social infrastructure vulnerability (31.57%) as critical infrastructure in these cadastral has impact on less than 25% of LSGI area.

19.8.3.2 Landslide vulnerability

The social infrastructure vulnerability in the landslide prone area of the town at cadastral level is analysed here. The social infrastructure vulnerability in the landslide prone areas shows low to very high (Figure 19.15). 15 cadastral (37.6%) out of 38 show high to very high critical infrastructure vulnerability as critical infrastructure in these cadastral which has impact on more than 50% of LSGI area. Major vulnerability contributing factors are in landslide prone area are water supply systems and Critical infrastructures like Pump House, PHC, Water tank, School, College, Health Centres.

19.9 Problems & Potential

All education institutions in the town have infrastructure facilities for regular functioning, but still lacking proper facilities like lack of libraries, labs, playgrounds and insufficient sanitation facilities. All classrooms schools are not smart and some buildings need renovation. All schools have piped water supply, but lacking continuous 24x7 availability of drinking water. In these schools rain water harvesting units needs to be constructed. Schools have library and lab facilities but not sufficient enough to cater the complete demand of children. Renovation of school buildings, construction of rain water

harvesting units, energy efficient schools by implementing solar energy, facilities for smart classrooms and gardening are the projects needs to be addressed in education institutions.

The only one government higher secondary school in the town is Thykkavu School. The inside pathway within the institution is currently being utilized as a public road. It has resulted various safety issues like risk of potential accidents or incidents involving unfamiliar individuals and the school community, allowing public access to school walkways compromises the overall security of the campus, Public use disrupting the peaceful educational atmosphere, Noise, litter, and other disturbances hindering the learning experience for students and staff. These problems can be addressed by redeveloping the Thykkavu School and campus.

There has been 10% to 20% decline in college admissions over the past three years. Kerala is seeing large-scale student migrations to western countries such as Canada and the United Kingdom. Most colleges in MG University (Ernakulam Pathanamthitta, and Kottayam district) have seen a lack of demand for science courses post covid. Parents in these districts prefer to send their children abroad for education, with migration being influenced by employability prospects. They prioritize courses that guarantee job opportunities, such as nursing or lab technician programs, over traditional degree courses, further driving the trend of migration. The institute helps to learn IELTS, OET, PTE are also more in the district which helps the students to take higher education aboard. Six schools (16.6%) are in the flood prone area.

19.10 Inference

The town has high literacy rate and educational facilities. In primary and high school level a greater number of students are studying in unaided schools. But in higher secondary level more students are studying in Government school.14th Five-Year Plan of Kerala State envisages ending the digital divide, ensuring better connectivity to school education and ensuring access to digital study material and library networks on a completely new scale. Infrastructural facilities which reduce the digital divide are needed in the schools. Travel distance to the schools in primary level and upper primary level is higher than standard. Location and existing number of education institutions in the town are sufficient while comparing with planning standards. Thykkavu Government School need to be upgraded to model school by redevelopment mechanism. School for physically handicapped, technical education facilities like technical schools, ITI/Poly technic colleges and Medical College are found to be needed for the town as per standards. Institutional level solutions like rain water harvesting can be suggested in education institutions in high altitude terrain and in those functioning in wards with water scarcity. 13 Education institutions can be used as the rescue camps at the time of natural hazards.



20. HEALTH

Kerala government is focused on offering all of its resident's access to fair, inexpensive, and excellent healthcare, with a priority on the most vulnerable and marginalized populations. The state's primary, secondary, and tertiary healthcare networks are well-established and have an adequate number of medical experts (Economic Review 2023). Indicators like life expectancy at birth, infant mortality, maternal mortality, and the proportion of males to females in the population continue to place the State at the top of the nation.

Generally urban policies of a town determine the quality of the air we breathe, the spaces we use, the water we drink, how we move, and what foods we can get. Planning is therefore crucial to the prevention of diseases. Planning decisions have the power to either significantly increase or decrease public health hazards, or they can promote healthier surroundings, lifestyles, and the development of resilient, healthy cities and civilizations.

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1. Health Institutions Status
2. Existing Facilities in Town
3. Epidemics
4. Schemes & Programs
5. Impact of Hazard & Climate Change
6. Problems & Potentials
7. Inference

20.1 Health Institution Status

The health care is divided into three categories in view of service of care: Allopathy, Ayurveda, and Homeopathy, and three categories in view of the ownership: Public, Private and Co-operative sectors. In Kerala, both modern medicine and AYUSH systems play a crucial role in providing universal access and availability to the poorer sections of society. Table 20.1 shows the type and number of government allopathy health institution in Pathanamthitta district.

"The main objective of Government of Kerala is to establish a people friendly health care delivery system"- 14th five-year plan

Table 20.1 Government allopathy Health institutions in Pathanamthitta district

Type of Health Institution	Numbers
Government Medical College	1
General Hospital	2
District Hospital	1
Taluk Head Quarters Hospital	4
Taluk Hospital	2
Community Health Centre	12 (222beds)
24x7 Primary Health Centre	2 (48 beds)
Primary Health Centre	33 (192 beds)
Family Health Centre	8 (120 bed)
District TB Centre	1
Mobile Units/Dispensaries/ Health Clinics	1
Speciality Hospitals – Women and Children Hospital	0
Speciality Hospitals – Mental Health Centre	0
Speciality Hospitals – TB Hospital	0
Speciality Hospitals – Leprosy Hospital	0
Speciality Hospitals – Others	0
Government School of Nursing	1
District Vector Control Unit	1
Government Dispensary	1
Total	68
Sub Centres	261
Grand Total	329

Source: Directorate of Health Services.

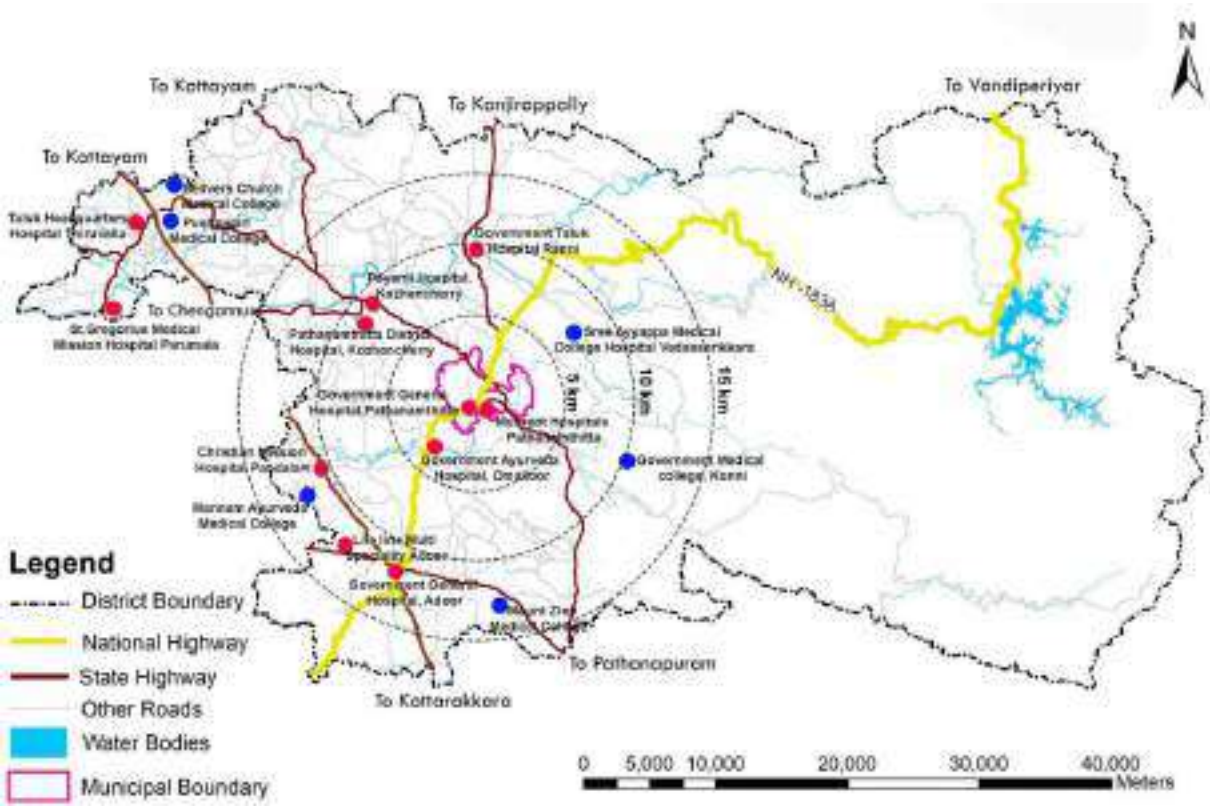


Figure 20.1 Location of higher order health institutions (both public and private) in the district

Around 12 higher order health institutions in the district managed by both government and private to address the district population. Medical College at Konni is the first order health institutions in district under government. Even though Pathanamthitta town is the headquarters of the district, Pathanamthitta District Hospital is located in Kozhencherry panchayat since Pathanamthitta Town comes under the Kozhenchery taluk. Since Pathanamthitta town is located spatially at the centre of the district, most of the higher order health institutions are encircling the town with in 15km radius (Figure 20.1) which give more access to multiple options of higher order health care service for people in the town.

Government School of Nursing at Elanthoor, District Vector Control unit at Thumbamon, Government Dispensary at Pampa are the other major health institutions in the district. Pathanamthitta is one among the district with highest number of medical colleges in Kerala. Six medical colleges spatially located across major towns of the district. Medical college at Konni is managed by government of Kerala. Even though the district has a significant number of higher-order hospital institutions, people still depend on the Medical College in Kottayam (with 2,094 beds and 39 departments) due to the limited availability of specialized facilities such as Cardiology, Oncology, Nephrology, Neurology, Paediatric Surgery, Plastic Surgery, and Trauma Care in the government sector within the district. The details of higher order health institutions are shown in Table 20.2.

Table 20.2 Details of higher order health institutions in district

Name of Hospital	Type	No of Departments	No. of bed
Government Medical college Konni	Medical college	24	500
Believers Church Hospital Thiruvalla	Medical college	32	750
Pushpagiri Hospital Thiruvalla	Medical college	57	1200
Mount Zion Hospital Adoor	Medical college	19	604
Sree Ayyappa Hospital Vadasserikkara	Medical college	33	300
Ayurveda Hospital Mannam	Medical college	8	50
District Hospital Kozhenchery	District Hospital	21	210
General Hospital Pathanamthitta	General Hospital	21	414
General Hospital Adoor	General Hospital	21	300
Taluk Headquarters Hospital Thiruvalla	Taluk Hospital	18	175
Taluk Hospital Ranni	Taluk Hospital	18	105
Taluk Hospital Konni	Taluk Hospital	18	24
Taluk Hospital Mallappally	Taluk Hospital	18	128

Source: Directorate of Health Services.

20.2 Existing Facilities in Town

Out of higher order health institutions in district, three institutions namely Government General Hospital, Government Ayurveda Hospital and Muthoot Private Hospital are located in Pathanamthitta town. Pathanamthitta town has all three categories of health institutions like allopathy, ayurveda, and homeopathy working under government sector itself. The General Hospital Pathanamthitta is the higher-order health institution located in the central area of the town, and four primary health centres (one UPHC and three PHC Sub centres) serving different parts of the town. Also, one Homeo dispensary is functioning in the town. Table 20.3 shows the list of Health institutions and Figure 20.2 shows the locations of health institutions in the town.

Table 20.3 List of major health institutions in the town

Name of Hospital	Category	No.of beds	Ownership
General Hospital Pathanamthitta (Ward 30)	Allopathy	414	Government

Urban Primary Health Centre Kumbazha (Ward 15)	Allopathy	-	Government
3 PHC Sub Centre at Ward 3, 14, 16	Allopathy	-	Government
Urban Health Welfare Centre Vettipuram	Allopathy	-	Government
Muthoot Hospital	Allopathy	170	Private
St.Luke Hospitals	Allopathy	18	Private
Goods Samariatn Hospitals	Allopathy	10	Private
Peoples Clinic	Allopathy	40	Private
Ayurveda Hospital Azhoor	Ayurveda	-	Government
Changeithu Baskaran Nair Memorial Hospital	Ayurveda	-	Private
Homeo Dispensary Pathanamthitta	Homeo	-	Government

Source: Town directory Pathanamthitta

Higher order Health institution (General Hospital) located in the heart of the town with proper accessibility helps to respond faster to accidents or emergencies. Apart from General hospital at town centre, one Urban PHC is located at Kumbazha region for the first contact point of people in the eastern part of the town. Ayurveda Hospital and Homeo Dispensary are located near major roads which is easier for people to locate and reach in times of need. Spatially the existing health institutions can address the need of the town.

20.2.1 Allopathic System of Medicine

Total of 29 hospitals in Allopathic system of medicine functioning in the town out of which 14 are Dental clinics, 3 are Eye care hospitals and one skin care clinic. The institutions in allopathic system are functioning both in Government and Private sector.

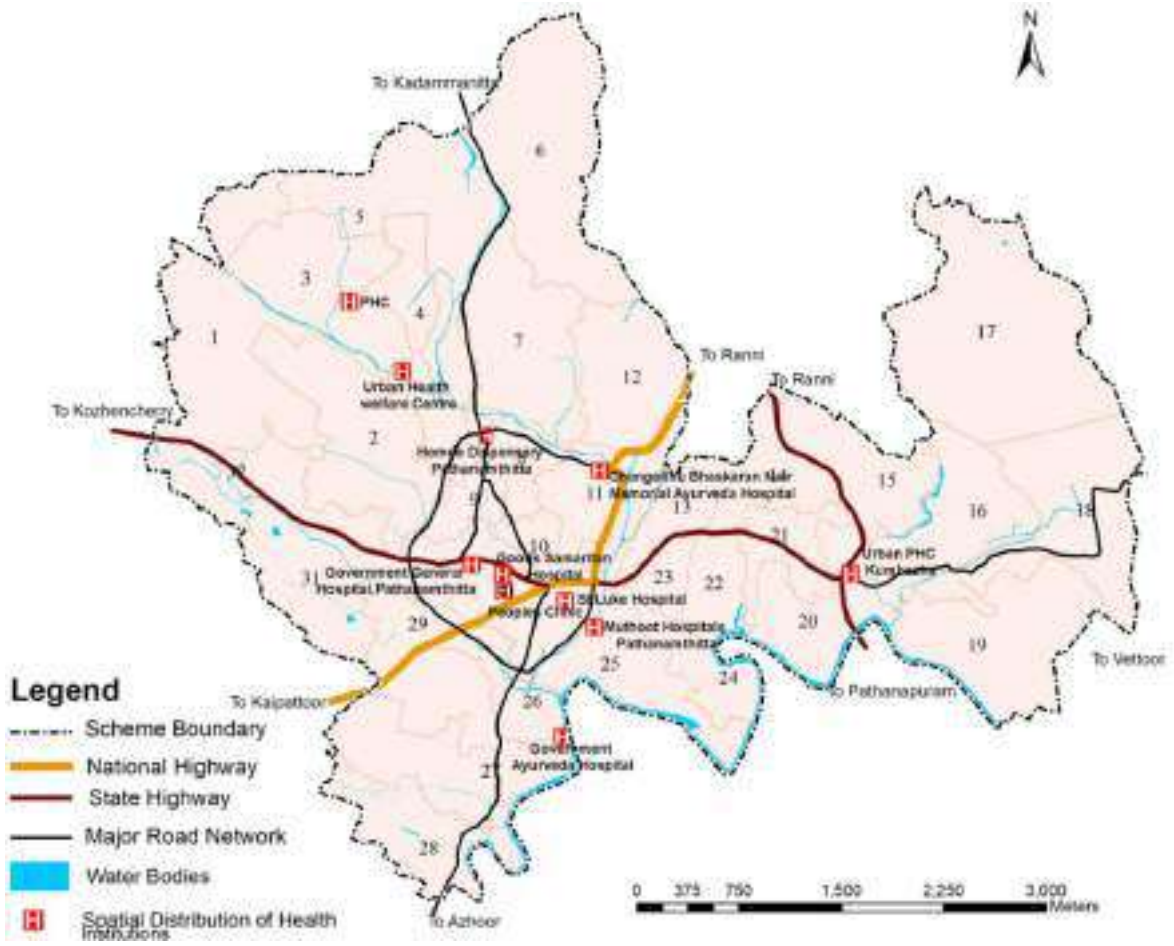


Figure 20.2 Location of health institutions in the town

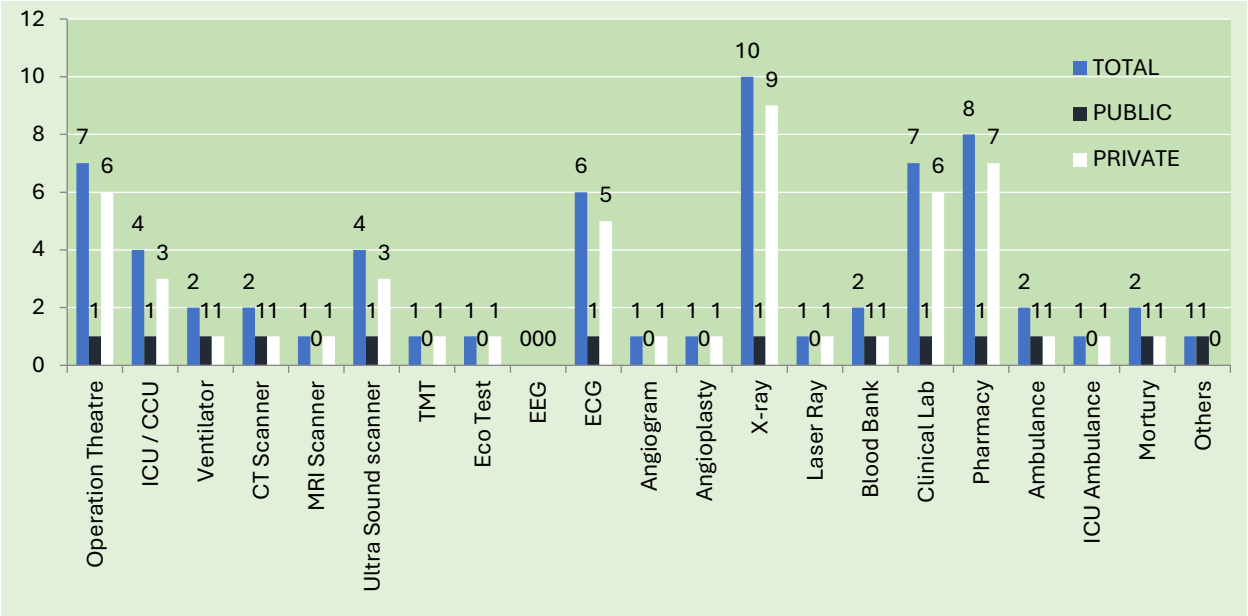


Figure 20.3 Number of doctors available at various departments in all public and private hospitals in the town

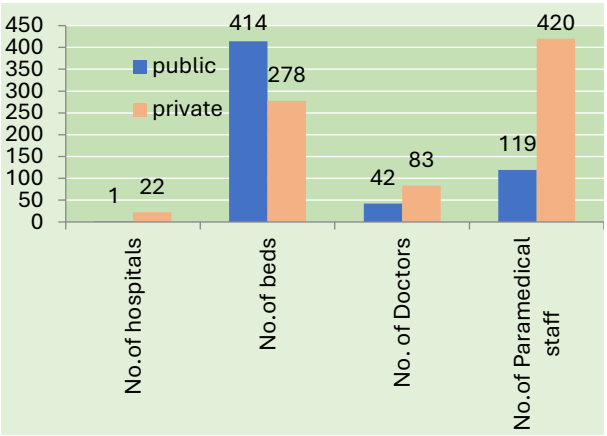


Figure 20.4 Available infrastructure facilities in all public and private hospitals

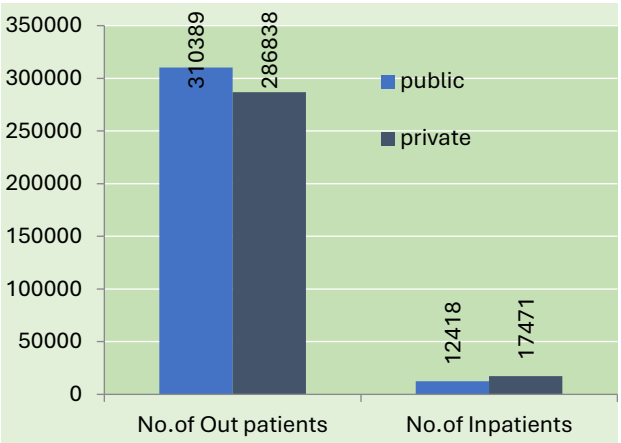


Figure 20.5 Number of inpatients and outpatients in public and private hospitals in a year.

Number of doctors available at various departments in all public and private hospitals in the town is shown in Figure 20.3. A total of 942 beds are available in the town in all the hospitals together out of which 414 is in Government hospital. 15 clinical labs and 80 retail medicine shops are there in the town. The list of allopathic hospitals with facilities in the hospitals like number of beds, number of doctors, departments etc. are given in Annexure 20.1. Comparison of Number of hospitals, Number of beds, Number of Doctors and Number of para medical staff in all public and private hospitals in the town are shown in Figure 20.4 and Comparison of the number of inpatients and outpatients in public and private hospitals are shown in Figure 20.5. No. of outpatients (OP) are more in public hospitals where as number of inpatients is more in private hospitals.

> ജനറൽ ആശുപത്രി നഗരത്തിൽ കൂടുതൽ തിരക്ക് സൃഷ്ടിക്കുന്നതിനാൽ ആയതിന് സ്റ്റേഡിയം റോഡിൽ നിന്നും കൂടി പ്രവേശനം സാധ്യമാക്കിക്കൊണ്ട് വിപുലീകരിക്കുക. കൂടുതൽ വിദഗ്ധ സൗകര്യങ്ങൾ ഉൾപ്പെടുത്തുക. [*The general hospital is creating more congestion in the town, so expand the facility by providing more access from the stadium road. Also include more specialist facilities.]* - Public Opinion



Figure 20.6 General Hospital, Pathanamthitta



Figure 20.7 UPHC at Kumbazha

This shows that people are getting admitted more in private hospitals and people like to get admitted in private hospitals than public hospitals due to better facilities. But people opt public hospitals more for OP. General Hospital Pathanamthitta (Figure 20.6), UPHC at Kumbazha (Figure 20.7) are the major allopathic institutions in public sector.

20.2.2 Indian System of Medicine (Ayurveda System of Medicine)



Figure 20.8 Government Ayurveda Hospital at Pathanamthitta Town

15 health institutions in Ayurveda system of medicine with 19 doctors are functioning in the town. The Government Ayurveda Hospital at Pathanamthitta Town (Figure 20.8) is the only Ayurveda hospital in public sector, functioning with 1 doctor and 3 staff. The private Ayurveda institution within the town limit includes Ayurveda hospitals, Clinics, and Vaidyashalas. Location, number of beds, and average number of daily outpatients of the Ayurveda system of medicine are furnished in the Annexure 20.2

20.2.3 Homeopathic System of Medicine

In Homeopathic system of medicine, 14 dispensaries with 15 doctors are functioning under private sector. Under government, there is NHM AYUSH Primary Health Centre (Figure 20.9) working with a doctor and 2 supporting staff. No higher order facilities are available in this system of medicine. Details like location, number of beds, average number of daily outpatients of all institutions in Homoeopathic system of medicine in town is given in Annexure 20.3.



Figure 20.9 Government Homeo dispensary Pathanamthitta Town

20.3 Epidemics

Although the State has been successful in controlling a number of communicable diseases earlier, the prevalence of dengue, leptospirosis, malaria, hepatitis, H1N1, scrub typhus, Covid-19 in recent years (Table 20.4) has led to considerable morbidity and mortality.

Table 20.4 Year wise Covid case reported in Town

Year	2020	2021	2022	2023
Covid +	632	5174	1144	18
Covid Death	8	67	15	0

Source: Pathanamthitta Municipality

20.3.1 Non-Communicable Diseases

Diabetes and Cataract are the common Non communicable diseases in the town. Pathanamthitta district have the major share in Diabetes in the State. But the disease which cause major death share in the town is cardio vascular diseases. Major Non communicable diseases in town are shown in Figure 20.10.

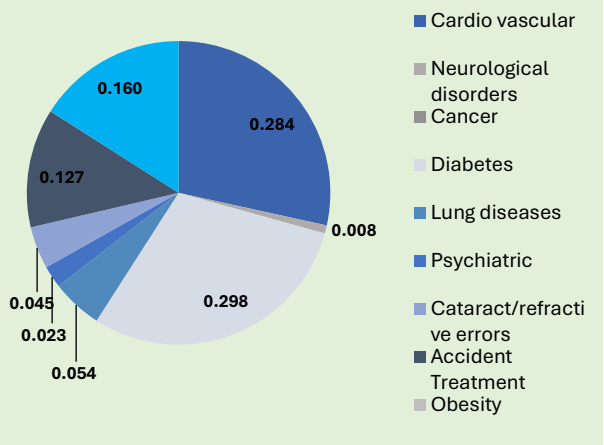


Figure 20.10 Type of non-communicable diseases in the town

Source: Health department Pathanamthitta

20.3.2 Communicable Diseases

Dengue fever is reported as the major communicable disease in the town after Fever and Diarrhea. Hepatitis and Typhoid are also reported in the town. No cases of Chikungunya or Cholera are reported in recent years. Major Communicable diseases in town are shown in Figure 20.11.

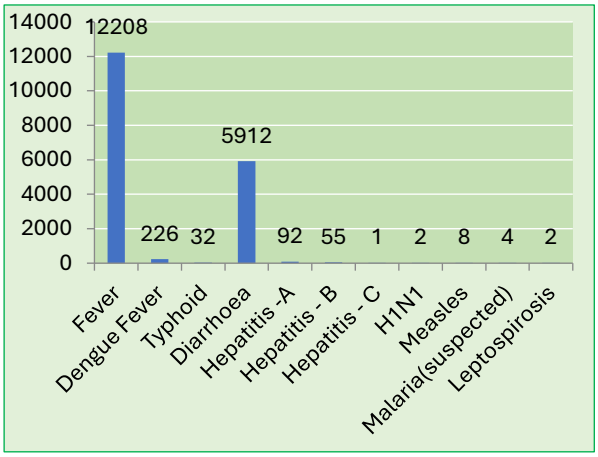


Figure 20.11 Major communicable diseases in the town in past year

Source: Health department Pathanamthitta

20.3.3 Child hood Diseases

Respiratory Infections, Diarrhea and Measles are the major child hood disease in the town. Major Non communicable diseases in town in the year 2021 is shown in Figure 20.12.

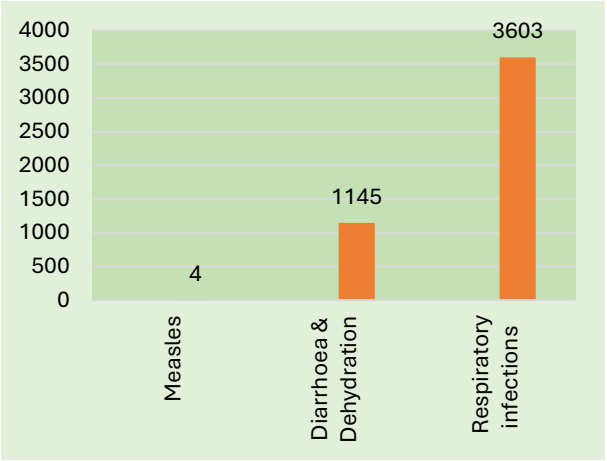


Figure 20.12 Childhood diseases

Source: Health department Pathanamthitta

> മാതൃ ശിശു ആശുപത്രി നഗരത്തിൽ സ്ഥാപിക്കുക. [*Establish a maternal and child hospital in the town]*- Public Opinion

20.4 Schemes / Programs

During the 14th five-year plan period, the State envisioned to make the best possible preventive, curative, and palliative care available in the public sphere. The main objective of the Government is to establish a people friendly health care delivery system. (Economic Review 2023). The Aardram Mission I was started during the 13th Five Year Plan period by Kerala government in order to make government hospitals people-friendly by improving their basic infrastructure and capacity to provide services. Renovation of District hospital Pathanamthitta is taking place for improving the basic infrastructure facilities. The primary goal of the Family Health Centres project is to revamp existing PHCs, making them more comprehensive and user-friendly, thereby providing improved health services to the public.

> നഗര ജനതയുടെ ആരോഗ്യക്ഷേമം ഉറപ്പാക്കുന്നതിനായി jogging, cycling track കൾ നഗരത്തിൽ സ്ഥാപിക്കുക.. [*Establish jogging and cycling tracks in the city to ensure the health and well-being of the town's population.]*- Public Opinion

The conversion of PHCs as family health Centres (FHCs), FHCs as Block Family Health Centres with adequate supply of drugs and assured treatment protocols would ensure better health of public and enhance their trust in the public health system. Upgradation of Kumbazha Urban PHC to FHC is also considered in this project.

Patient friendly transformation of the outpatient wings in district level hospitals was taken as a priority item under Aardram Mission. Outpatient transformation with adequate OP registration counter, patient waiting area, adequate seating facilities, token system and other amenities such as drinking water, toilet facilities, public address system, information education & communication arrangements and signage systems are being incorporated. This will be achieved in district hospital Pathanamthitta through the ongoing renovation works. All sub-centres in the State have been elevated as Janakeeya Arogya Kendram to carry out activities in the field of public health with improved physical conditions and converted into people-friendly institutions.

Kerala Social Security Mission is implementing the Vayomithram project which provides health care and support to elderly above the age of 65. The Vayomithram project mainly provides free medicines through mobile clinics, Palliative care, and Help desk to the old age. District cancer care units, strengthening of palliative care networks, 'One Health' activities to detect new diseases, including new animal-borne diseases by screening and intervention are the other programs conducted by government in health sectors.

20.5 Impact of Hazard & Climate Change

As health of the community is one of the basic criteria for quality of life, accessibility to health institutions even at the time of hazards are necessary. Natural hazard can either damage health institution facilities directly or disrupt access to them. Damage may be direct costs such as losses in infrastructure, expensive medical equipment, hospital furniture, lifeline installations and medical supplies. Indirect costs are unforeseen expenses after emergencies such as increased risk of outbreaks, temporary solutions like field hospitals and the loss of income normally generated by health care services.

Hazard vulnerability of health sector is included in the social infrastructure sub parameter under basic service vulnerability as per guideline for risk informed master plan. This vulnerability analysis in flood and landslide prone area of the town is incorporated in chapter 19 under social infrastructure sector of this report. The best measure to prevent the institutions from the natural hazards is to plan the institutions spatially away from the hazard zone. Here location of health institutions which comes under hazard prone areas are analysed. So spatial distribution of health institutions in the town is overlaid with flood and landslide probability map published by KSDMA (Figure 23.13). No existing Health institutions are located in the landslide zone area. Muthoot & St.Luke private hospitals and Government Ayurveda Hospital are located in the flood prone area.

20.6 Problems& Potentials

The health facilities in the Pathanamthitta town serve the hinterland areas as well. As per planning standard, a General Hospital should serve the population of 2.5 lakhs. Pathanamthitta Town population is 37538, so existing general hospital in the town is well enough to serve the town population.

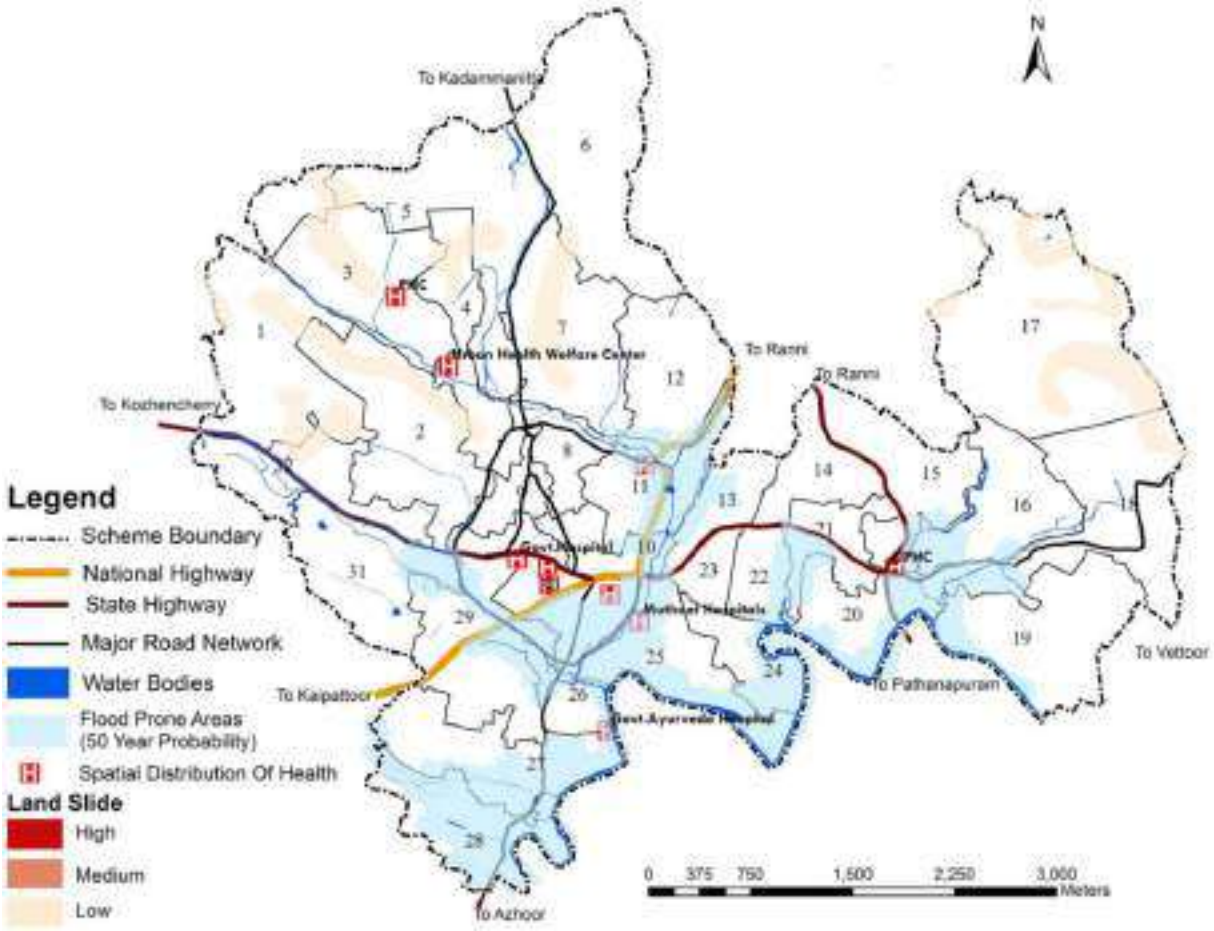


Figure 20.13 Hazard zonation map overlay with spatial location of health institutions

However, the infrastructure and modern medical equipment in public health centres is a matter of concern and needs to be upgraded. Over dependency on the private sector can pose issues of affordability.

The General Hospital needs to be upgraded in terms of physical infrastructure and accessibility to provide better services to the people of the town. Based on Physical aspects, the arrangement of existing buildings in the general hospital are in Haphazard/ irregular pattern which limit the access to each building, Facilities for person with disabilities are not provided in the campus, ramps, parking, lifts are not ensured, staff quarters provided are not sufficient, underutilization of land parcels and insufficient parking within the campus are the major problems in the general hospital. Existing General hospital needs to be upgraded through redevelopment process by enhancing infrastructure and improving accessibility. Similarly new building block for dialysis units, nephrology are also need to be included in the General hospital. There are no dedicated Women and Children Hospital, Mental Health Centre, TB Hospital and Leprosy Hospital in the district. As Pathanamthitta serves as the district headquarters, bringing these hospitals in the town would contribute to its future growth and enhance healthcare accessibility. Due to non-availability of land on existing general hospital plot for future development and parking facilities, new land may be identified away from town centre which also help to reduce the congestion of town centre. Hospitals located in hazard-prone zones are at risk of operational disruptions during floods. Implementing mitigation measures such as elevated structures, flood barriers, emergency evacuation plans, and alternative power sources is essential for better preparedness and uninterrupted healthcare services.

20.7 Inference

The healthcare sector in Pathanamthitta town has a strong and widespread presence in both the Government and Private sector. Medical institutions of all three systems are available in the town. This decentralised three tier medical systems helped to tackle the covid disease very efficiently in the district and Town. Many of the district level medical institutions are located outside the district headquarters yet sufficient enough to serve the existing population due to the presence of general hospital. For higher order and super speciality medical facilities, people have to depend institutions at Thiruvalla and Kottayam. Hospitals for Women and Children, Mental Health Centre, TB Hospital and Leprosy Hospital are not present in the district. Town has sufficient land to bring these hospital in the district headquarter. The redevelopment of the General Hospital should be considered a priority project, as it will bring a significant transformation to the town's healthcare landscape. Enhancing infrastructure, accessibility, and specialized services will improve healthcare delivery and reduce dependency on facilities outside the district. In addition to regular healthcare facilities for treating illnesses and diseases, the town should also focus on establishing urban health infrastructure. This includes wellness centers, mental health support, lifestyle disease clinics, rehabilitation facilities, and emergency response units to address the evolving health needs of the urban population.



21. HOUSING

Shelter is the basic human requirement that needs to be met on priority basis. Housing sector is employment intensive because it generates employment during its construction period and also during its life for proper maintenance. The demand for housing increases due to growth of population, rapid pace of industrialization and urbanization and the emergence of nuclear families.

Adequate housing includes secure land title, access to basic services, like water and sanitation, sufficient space and shelter. Housing is one of the strongest instruments we have in breaking the cycle of poverty. It is very important for carving out any future city development scenario.

The chapter provides a detailed overview of the existing housing scenario in the city in terms of present housing stock, quality of housing infrastructure and other services, potentials and problems of the housing sector etc.

Contents

1 Housing Status

2 Spatial Distribution

3 Housing Characteristics

4 Unoccupied Houses & Housing Shortage

5 Availability of services

6 Housing Nagars

7 Schemes/ Programs

8 Impact on Hazard & Climate Change

9 Problems/Potentials

10 Inference

21.1 Housing Status

Among the 14 districts of Kerala, Pathanamthitta district has least position in number of household and as per census 2011, total number of households in Pathanamthitta town is 9813 and household size is 3.83. The variation of number of households in Pathanamthitta town is shown in Figure 21.1.

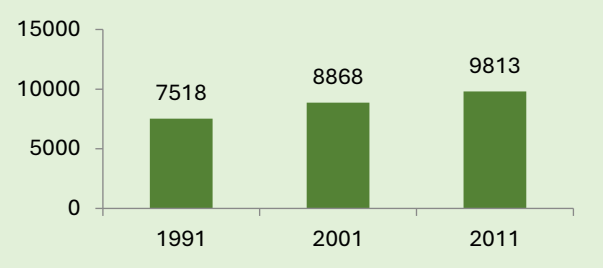


Figure 21-1 No of Households in Town

Source: Census 2011

Number of households is increasing continuously from 1981 to 2011. Comparison of number of households in Pathanamthitta town with other towns in the district is shown in Figure 21.2. Pathanamthitta town is in the second position in number of households where Thiruvalla is in the first and Pandalam in the last position.

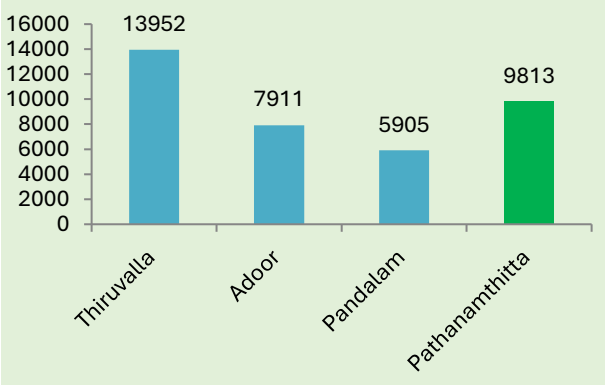


Figure 21-2 No of Households in other Town

Source: Census 2011.

21.2 Spatial Distribution

Pathanamthitta town has scattered homestead type of residential developments and residential areas are scattered in all parts of the town. From the land use analysis of this report, residential areas are mostly concentrated adjacent to major roads and the concentration decreases towards the periphery of the town. The ward wise housing density in the town is shown in Figure 21.3.

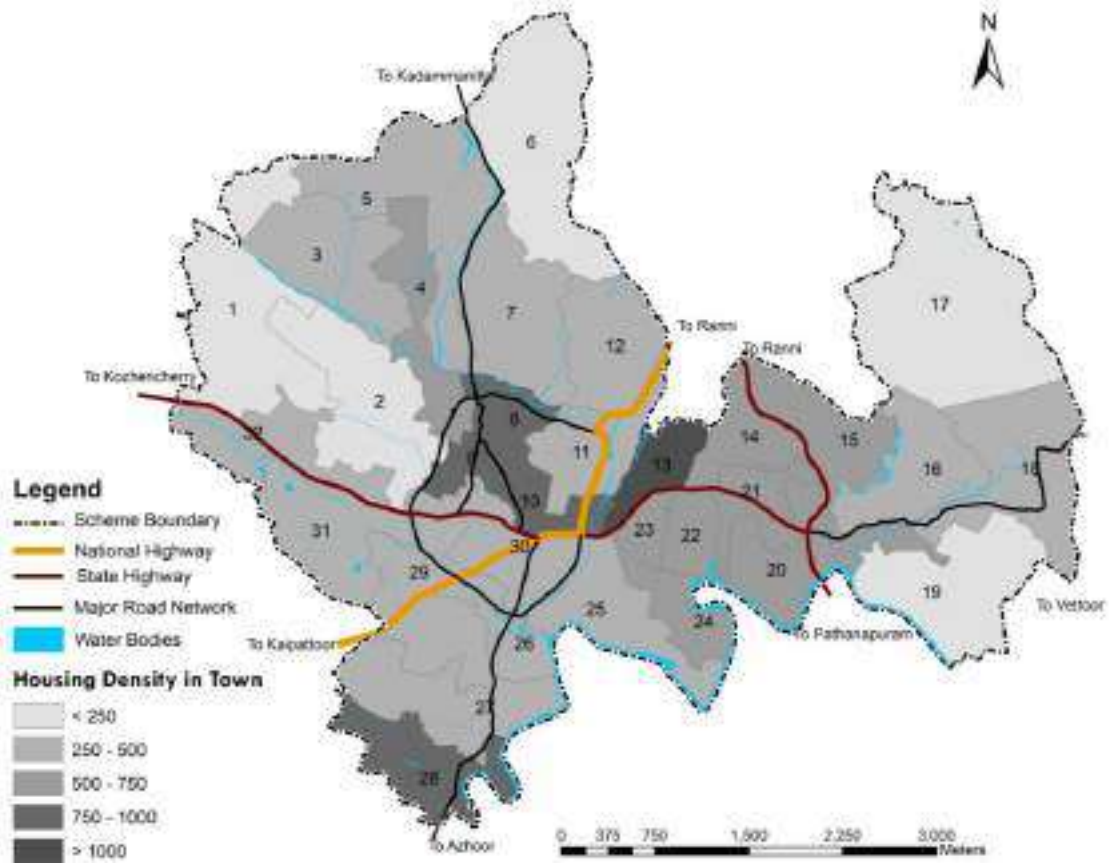


Figure 21-3 Ward wise housing density in town

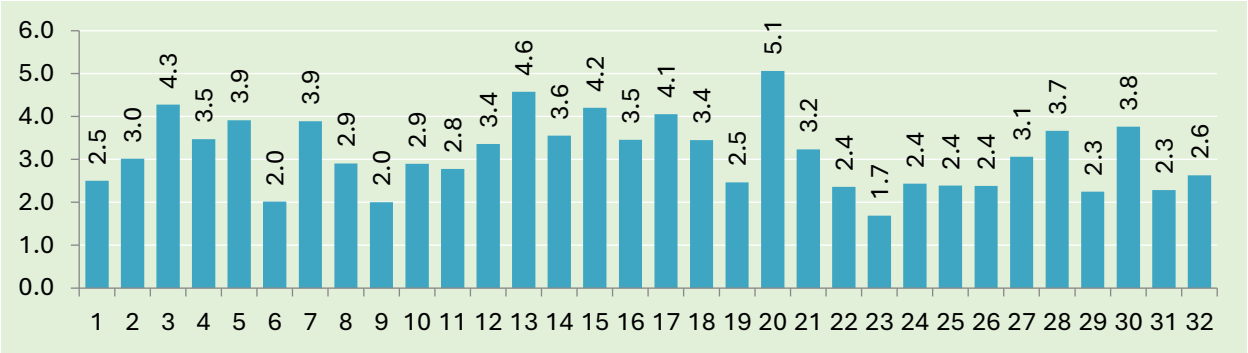


Figure 21-4 Ward wise percentage share of houses in town

Source: Socio-Economic Survey, 2019

The number of houses per sq.km is found to be less than 250 in certain wards and it is above 1000 in some other wards. Ward wise number of houses in the town is given in Annexure 21.1. Percentage share of total housing in each ward is shown in Figure 21.4. Maximum numbers of houses are concentrated in ward 13 Kulasekharapathy has a share of 5.2% of the total housing stock in the town. 243 un-occupied houses are there in the town. A minimum number of houses are concentrated in Chuttippara (23) which has a share of only 1.7% of the total housing stock in the town. But the case is different when the housing density is considered. Based on the area of ward, housing density differs in such a way that maximum housing density is found in Kulasekharapathy and minimum density is in Mundukottakkal. The average plot size varies from 20 cents in Kulasekharapathy and 200 cents in Mundukottakkal.

Pathanamthitta town have only one high rise residential building (PTC Building). The flat has ten storeys. Generally, people in the town prefer individual houses with their own land, allowing space for gardening and agricultural activities.

21.3 Housing Characteristics

Housing characteristics analyse the typology of houses in the town, including the material used for the roof and walls, the range of plinth and plot areas, ownership patterns, and the number of floors.

21.3.1 Material of Roof

93 % of houses are made of good quality roof materials i.e., Concrete (73.35%) and tiled roof (19.23%) and only remaining percentage is with other materials like tin and plastic (Figure 21.5)

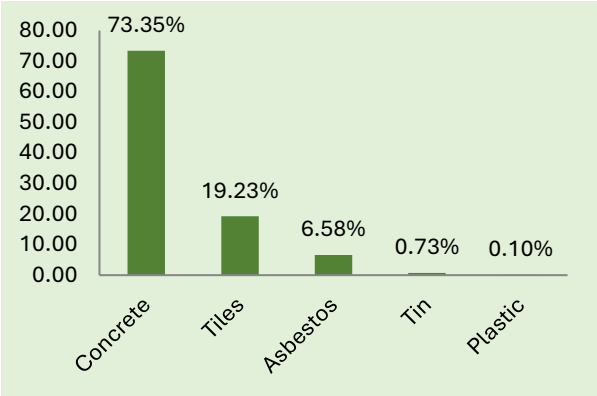


Figure 21-5 Percentage of houses using type of material in roof

Source: Socio-Economic Survey, 2019

21.3.2 Material of Wall

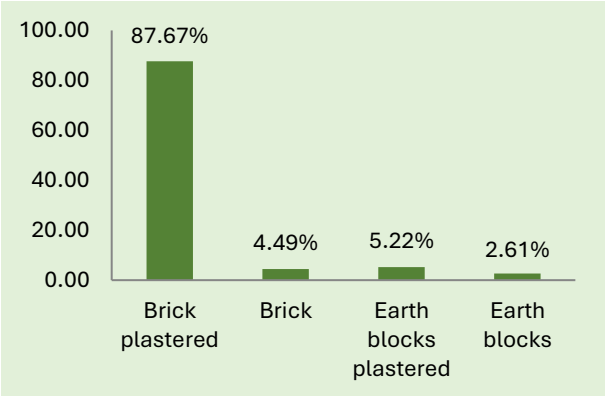


Figure 21-6 Percentage of houses using type of materials in wall

Source: Socio-Economic Survey, 2019

Figure 21.6 shows that 97.37% of the houses are made of good quality wall materials and 2.61 % is other material like earthen block. This shows that the wall of almost all houses is made with good quality material.

21.3.3 Flooring

Figure 21.7 indicates that 59.04% of houses have flooring made of ordinary tiles, while 31.66% have cement flooring. Additionally, 4.08% of houses feature marble flooring, 3.97% have mosaic flooring, and the remaining 1.36% have floors made of earth or other materials.

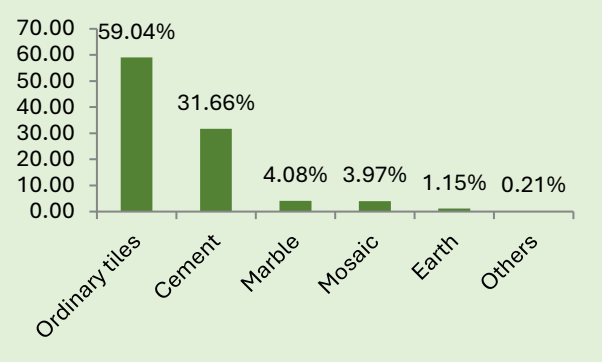


Figure 21-7 Materials used for flooring
Source: Socio-Economic Survey, 2019

21.3.4 Range of plinth area

54.9% of the houses are having plinth area ranging between 75 to 150 sq.m followed by 25% of the houses with plinth area between 50 to 75 sq.m (Figure 21.8)

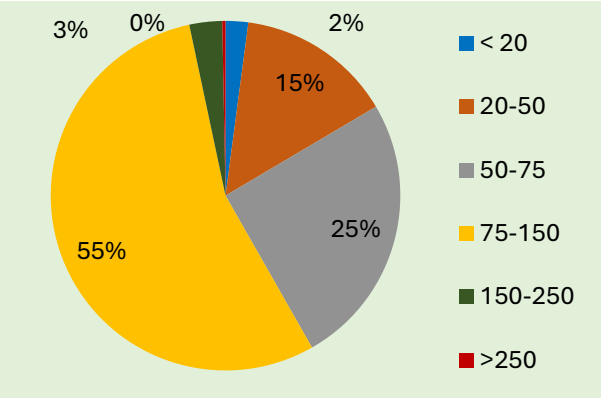


Figure 21-8 Plinth area size of houses in sq.m
Source: Socio-Economic Survey, 2019

21.3.5 Range of total plot area

30.9% of the plots in the town have an area of 6 to 10 cents, 23.38% have 4 to 5 cents, and 9.6% have less than 3 cents, which is the smallest plot size in the town (Figure21.9).

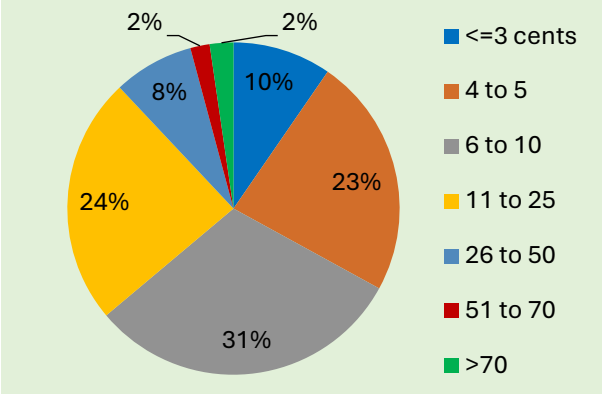


Figure 21-9 Residential Plot size in cents
Source: Socio-Economic Survey, 2019

21.3.6 Nature of ownership

97% of households own their own houses, while only 3% live in rented or other accommodations.

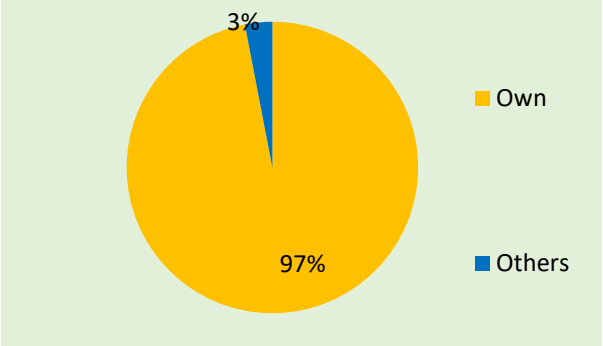


Figure 21-10 Ownership residential land in the town
Source: Socio-Economic Survey, 2019

21.3.7 Number of floors

Most of the houses (77%) are single storeyed buildings. 23% are double storeyed, showing preference for individual residences and plotted development (Figure 21.11).

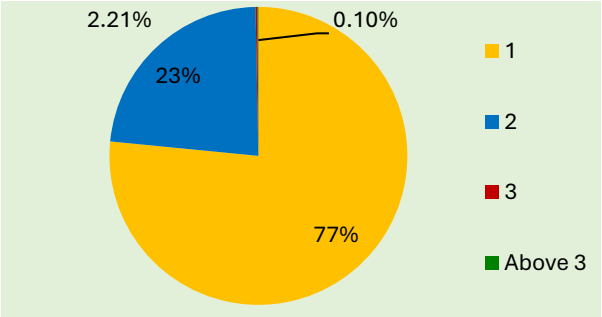


Figure 21-11 No of floors of residential buildings in the town
Source: Socio-Economic Survey, 2019

21.3.8 Ward wise analysis of housing condition

85 % of houses in Pathanamthitta town are pucca houses, 8% is tiled, 5% is Asbestoses/ Sheet, 0.1% Tatched House and 1.9% is vacant houses. It indicates that comparatively better housing quality in the town. Ward wise housing typology is shown in Figure 21.12 & 21.13.

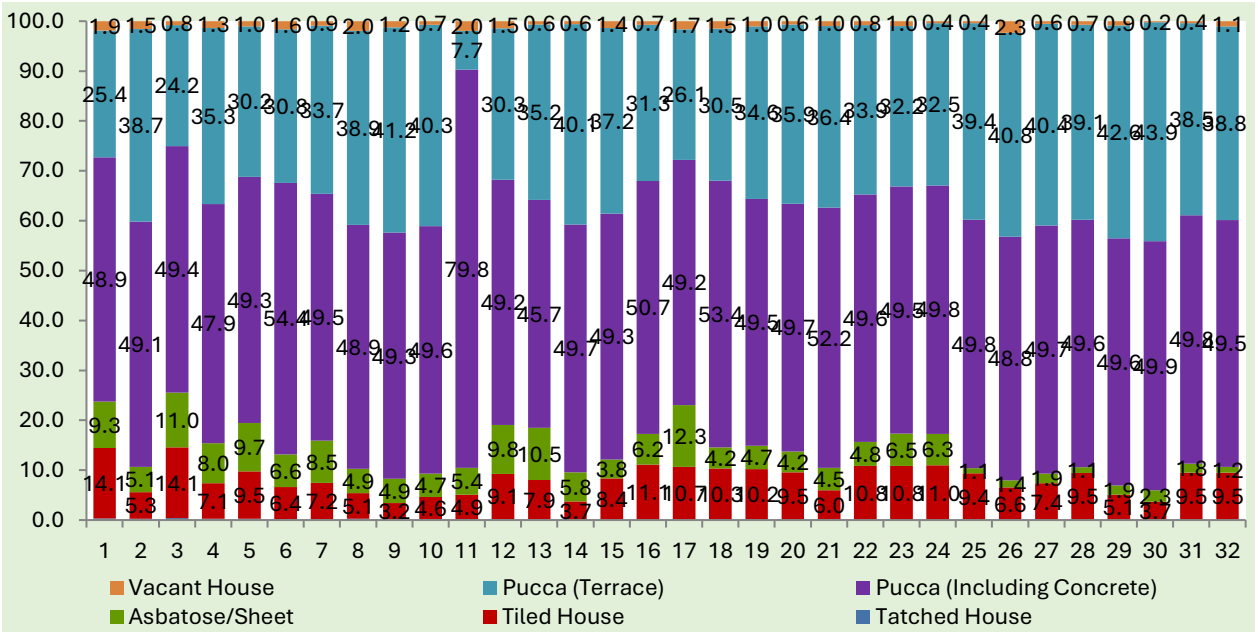


Figure 21-12 Ward wise housing typology in percentage

Source: Socio economic survey 2019

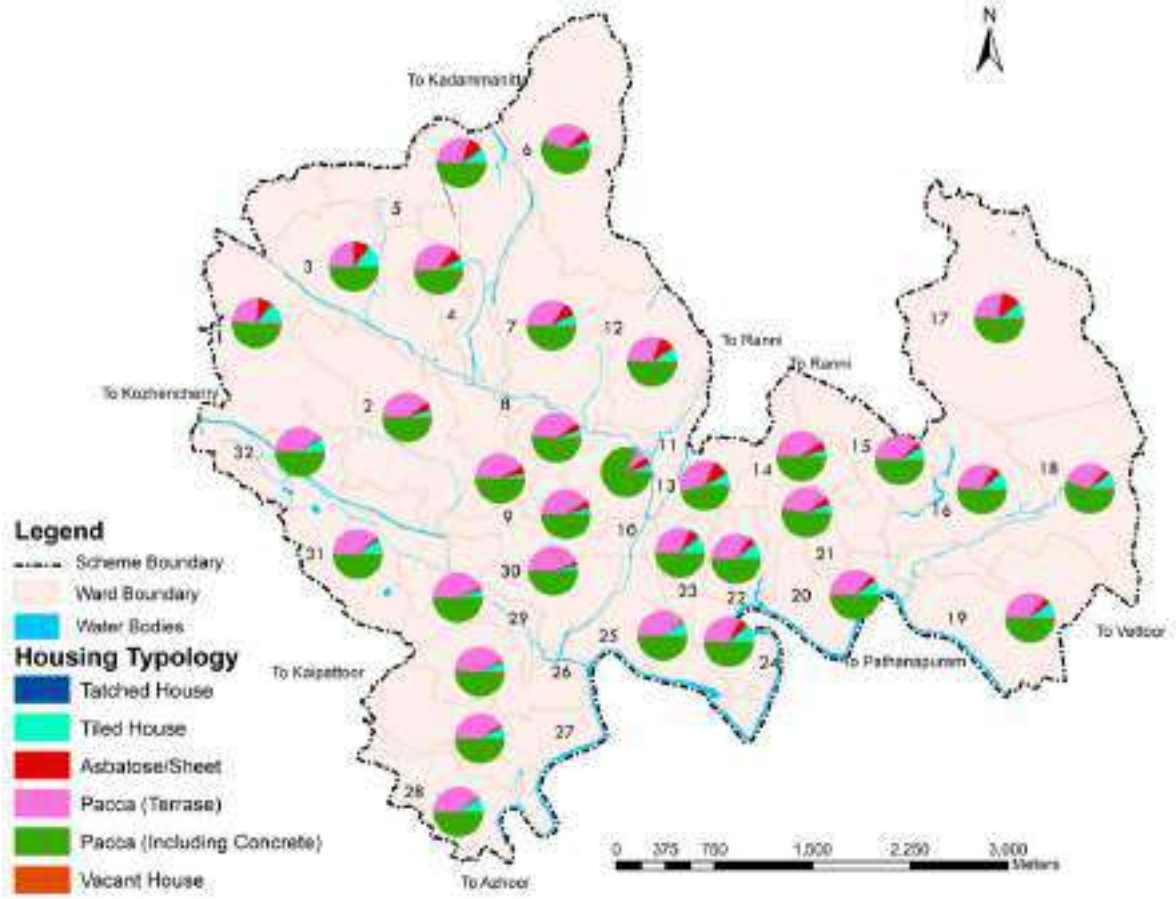


Figure 21-13 Ward wise housing typology of the town

Source: Socio economic survey 2019

21.4 Unoccupied Houses & Housing Shortage

As per Census 2011 there are a total of 9813 households in the town. The total number of houses in the town as per BSLLD survey 2016 is 10473. Total Number of Household in the town (2024) is 10,934, as per Municipal records. This indicates that certain households own more than one house. As per Municipal records, 217 people are marked as homeless and land less and there are 243 unoccupied houses. Ward wise number of unoccupied houses shows in Figure 21.14.

21.5 Availability of Services

The average distance in kilometre (As per the Socio-Economic survey 2019) from houses to facilities like motorable roads, bus stops, schools, Post offices, health facilities, hospitals, ration shops, play grounds etc. are shown in Figure 21.15. The Socio-Economic survey data is also analysed by comparing the distance to various facilities with certain standard. The average distance to various services is shown in Annexure 21.2.

The percentage of households having their distance to the facilities is exceeding the adopted standard is given in the Table 21.1 The analysis shows that when compared with the adopted standards, the facilities like motorable roads, primary school, LP School, Place of worship and Ration shops are available at a close (up to < 5 Km) distance to the residential areas. However, facilities such as cinema theatres require residents to travel more than 3–4 km.

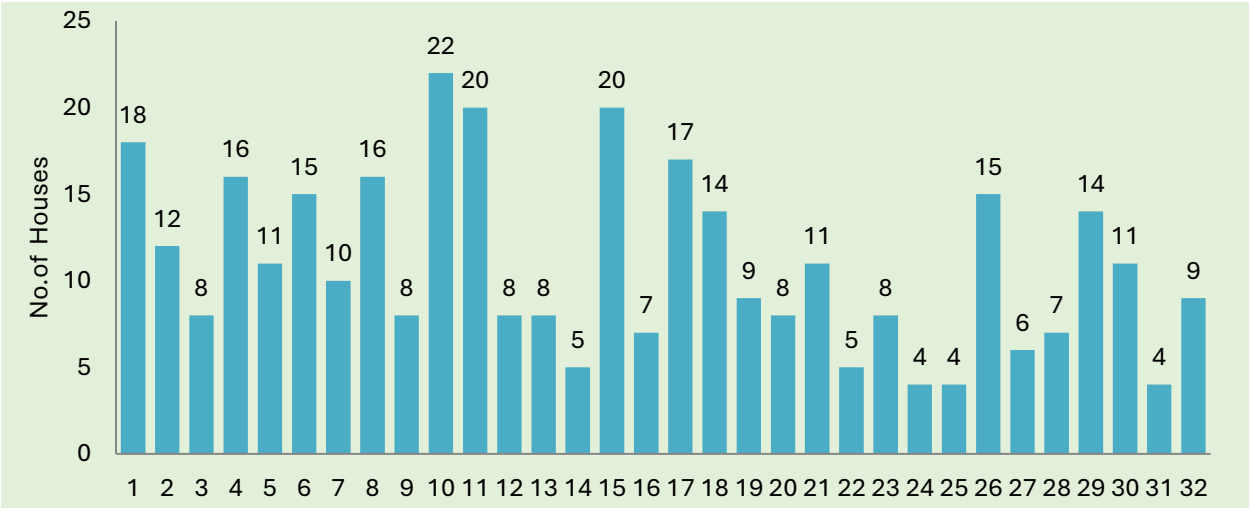


Figure 21-14 Ward wise no of unoccupied houses

Source: DM Plan Pathanamthitta Municipality 2023-24

നഗരത്തിൽ ആൾതാമസം ഇല്ലാത്ത വീടുകൾ ധാരാളം ഉണ്ടെങ്കിലും വാടകയ്ക്ക് വീടുകൾ ലഭിക്കുന്നത് പ്രയാസമാണ്. വീടുകളുടെ വാടക വൻകിട നഗരങ്ങളെ അപേക്ഷിച്ച് വളരെ കൂടുതലാണ്. ഉദ്യോഗസ്ഥരടക്കം മറ്റ് ജില്ലകളിൽ നിന്നും വന്ന് താമസിക്കുന്നവരുടെ എണ്ണം കൂടുതലായതിനാൽ മിതമായ വാടകയ്ക്ക് വീടുകൾ ലഭ്യമാകുന്നതിനും ക്വാർട്ടേഴ്സുകൾ നിർമ്മിക്കുന്നതിനും സൗകര്യം ഒരുക്കണം [*Although there are many vacant houses in the city, it is difficult to find houses for rent. The rent for houses is much higher than in big cities. Since the number of people coming from other districts, including officials, is high, facilities should be made available for affordable rental houses and for the construction of quarters.]* - Public Opinion

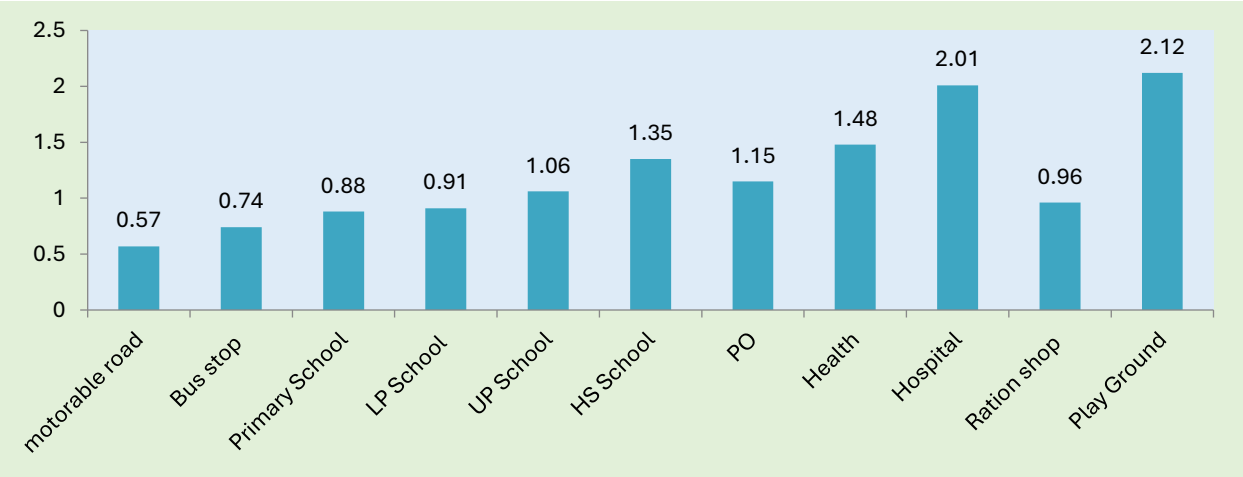


Figure 21-15 Average distance to availability of services from houses in Km

Source: Socio economic survey 2019

Table 21.1 Distance to facilities from houses and comparison with standards

Sl.No	Facilities and standard	% of people with the opinion that distance to facilities is higher than standard
1	Distance to motorable road greater than 0.5 km	14.3
2	Distance to bus stop greater than 0.5 km	41.13
3	Distance to Primary school greater than 0.5 km	57.52
4	Distance to LP school greater than 0.5 km	62.63
5	Distance to UP school greater than 1 km	32.05
6	Distance to HS school greater than 3 km	10.02
7	Distance to Post Office is greater than 3 km	3.34
8	Distance to Health greater than 5 km	4.8
9	Distance to Hospital greater than 5 km	10.75
10	Distance to Ration shop greater than 5 km	0.1
11	Distance to Play Ground greater than 5 km	11.8

Source: Socio economic survey 2019

21.5.1 Sanitary System and Solid Waste Disposal System

As per the Socio-Economic Survey, every house in the town has some sort of sanitary system. No public sewerage system is there in the town. Pit latrine is the major form of sanitary waste disposal system and it is followed by septic tank. Percentage wise usage of different sanitary waste disposal systems of the town is shown in Figure 21.16. Sanitation system available for the houses in the town are average quality and nearly 55 % of houses have pit latrine. Septic tank is available in newly constructed houses only.

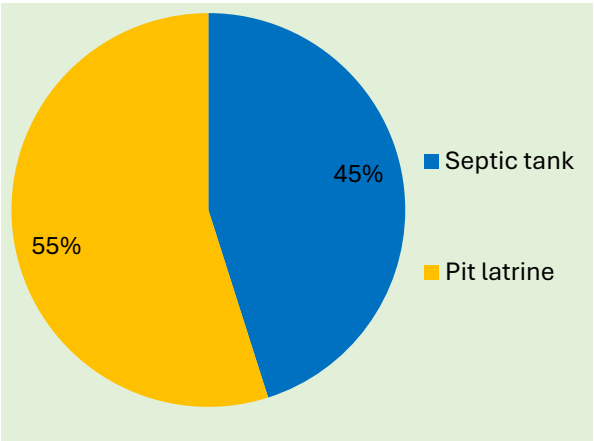


Figure 21-16 Sanitary waste disposal system using in town

Source: Socio economic survey 2019

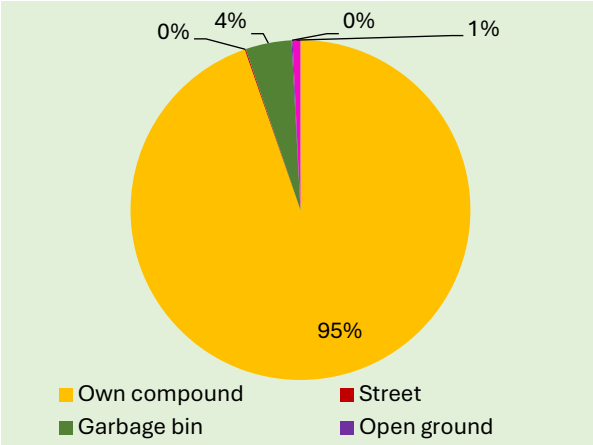


Figure 21-17 Solid waste disposal system using in town
Source: Socio economic survey 2019

The survey also reveals that 94.68 % of bio degradable solid waste from the houses is disposed in their own compound. Streets, community garbage facility etc. are the other means of disposal. The Various systems of solid waste disposal are shown in Figure 21.17.

21.5.2 Electrification of Houses

As per the Socio-economic survey (2019), 99.48 % of houses of the town are electrified.13.57% of the households have inverters.

21.6 Housing Nagars

As per the primary survey 2019, there are 34 Nagar (formerly named Nagars) identified in the town. Which include, 25 SC Nagars, and 9 ST Nagars. All Nagars are having their own land. Details of Nagars are given in Annexure 21.3 location and number of households in each Nagars is shown in Figure 21.18 and 21.19. The total number of households in Nagars are 814, Kumbangal and Thengapparamuruppu are Nagars which have 120 and 60 households respectively.

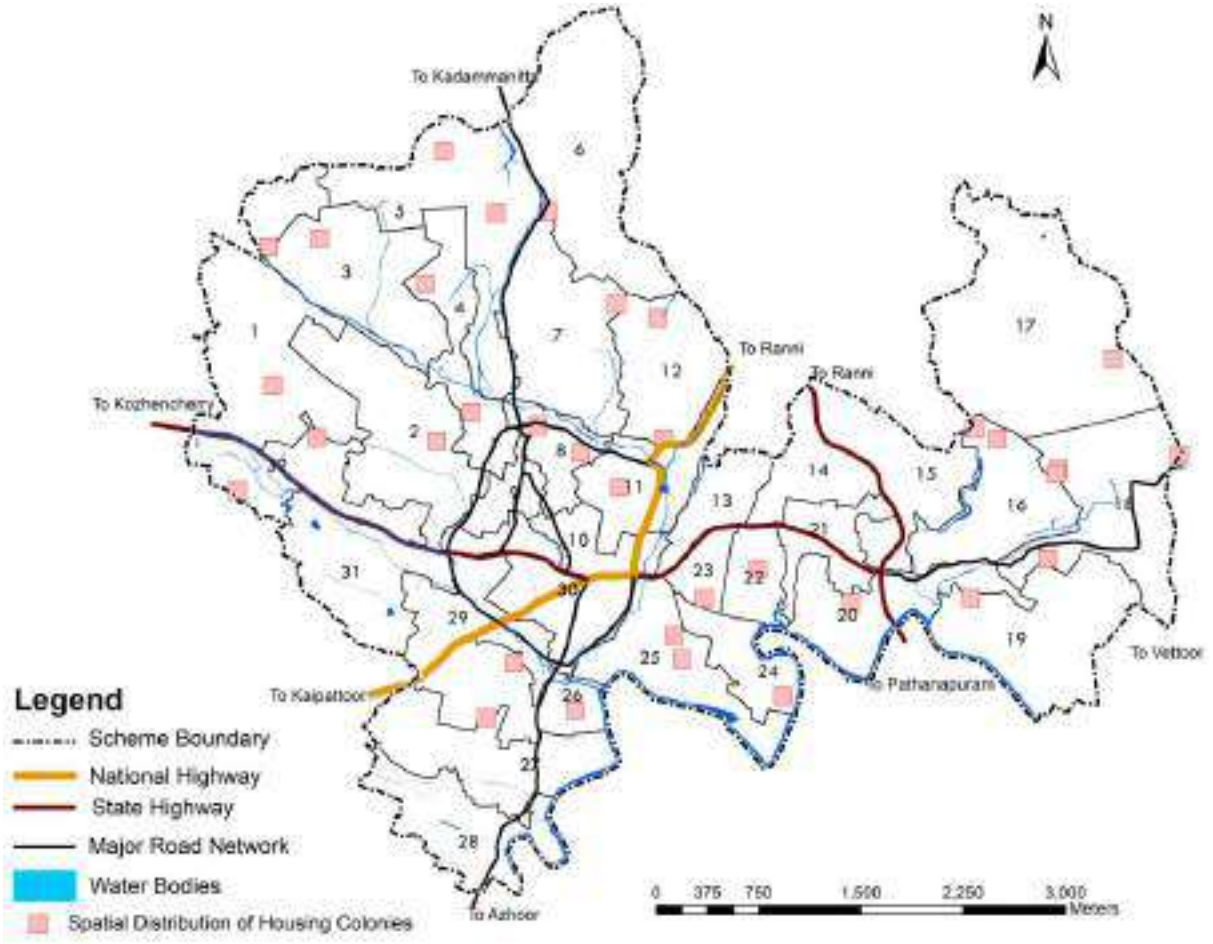


Figure 21-18 Location of housing Nagars

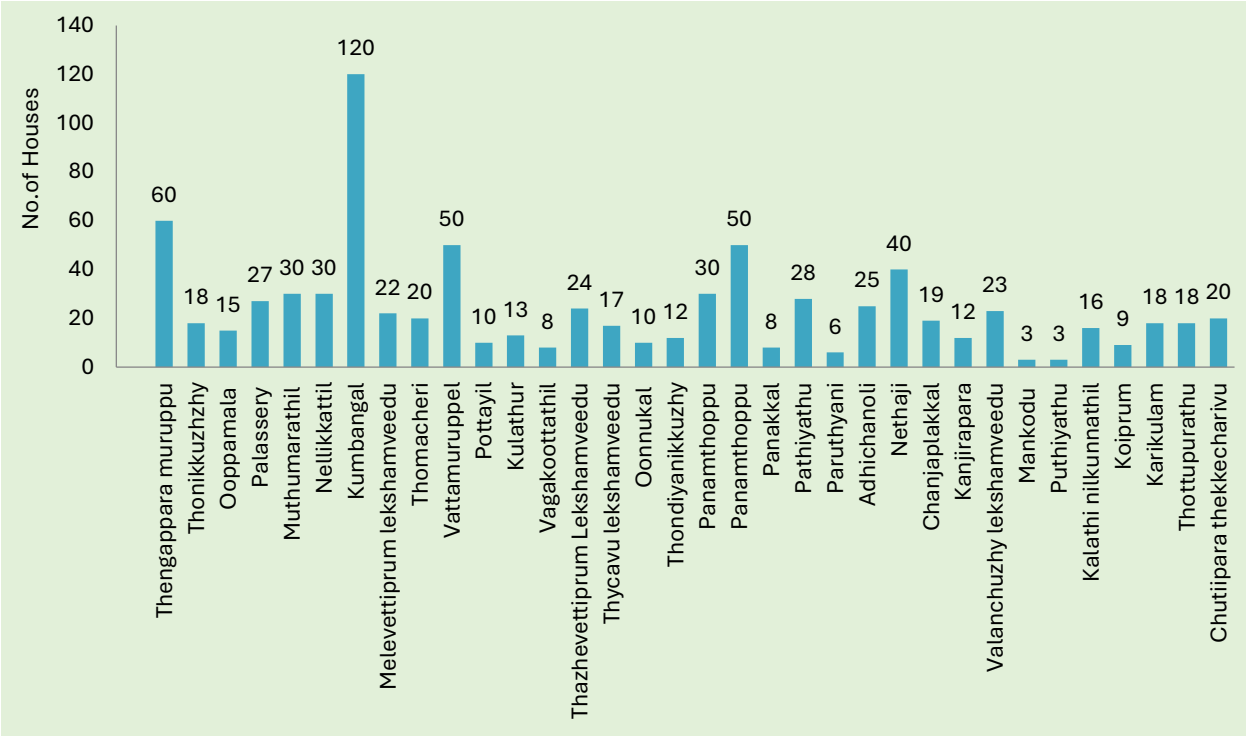


Figure 21-19 Ward wise number of Nagars

Source: Socio economic survey 2019

21.6.1 Infrastructural Facilities

Out of the 34 clusters, 25 clusters are accessible by concrete road and clusters Thonikkuzhzhy, Muthumarathil, Kumbangal, Thazhevettiprum Lekshamveedu, Oonnukal, Valanchuzhy lekshamveedu, Mankodu, Kalathi nilkunnathil and Karikulam have tarred roads. But the internal roads are not tarred except Thykkavu lekshamveedu. Five Nagars have no internal roads and twelve Nagars have only steps

It is noted that clusters have to depend on public well, public water tap and bore well for drinking water. Public water tap is available in 73% of the Nagars. Public wells are found in 7 clusters; 3 clusters have public deep wells and 7 clusters have public water tab. Survey data reveals that almost all clusters still experience water scarcity during the summer season. Public well is the main source of water for Nagars like Thonikkuzhzhy, Melevettiprum lekshamveedu, Kumbangal, Pottayil, Thycavu lekshamveedu, Pathiyathu and Valanchuzhy lekshamveedu. Only three Nagars have borewell i.e., Vagakoottathil, Nethaji and Mankodu. Many public wells and borewells in various nagars remain unused due to a lack of maintenance.

In the 34 clusters there are 814 houses, of which 813 are electrified and only one house in Palassery nagar is not electrified. Most of people in every cluster use mobile phones for communication. Many of the houses in the clusters are provided with individual toilets. Only three Nagars such as Kulathur, Muthumarathil and Palassery have Municipal waste collection system. Drainage is available only in Melevettipram laksham veed nagar. All other Nagars are disposing waste in their own compound.

Street light is not available in Vagakkoottathil, Mankodu and Koipram clusters. Educational facilities are available beyond 3kms for Kulathur, Nellikkattil, Muthumarathil and Thengappara muruppu. Public transportation is available beyond 3km in Paruthyani nagar. More than 50% of the Nagars have access to public transport within 1km. All Nagars except Palassery, Muthumarathil and Kulathur have 100% toilet facilities. Electric connection is available in all Nagars except Palassery.

> സാമ്പത്തികമായി പിന്നോക്കം നിൽക്കുന്നവർക്കുള്ള ഭവന പദ്ധതികൾ നടപ്പിലാക്കുന്നതിനായി നഗരത്തിൽ സ്ഥലം കണ്ടെത്തുക. [*Find land in the town to implement housing projects for the economically backward.]* - Public Opinion

21.7 Schemes / Programmes

Life Mission aims at assuring the secure feeling of an own home, helping to make houses for those who have land, assuring homes in apartments for 1,58,000 landless people, geriatric care and palliative care across Kerala state. Beneficiaries identified for life Mission project within the town is shown in Table 21.2.

Table 21.2 Life Mission status in town

Beneficiaries identified	Completed	Percentage
50	48	96

Source: Pathanamthitta Municipality 2019

Pradhan Mantri Awas Yojana (PMAY) mission is implemented during 2015-2022 to provide central assistance to Urban Local Bodies (ULBs) and other implementing agencies through States/UTs for In-situ Rehabilitation of existing slum dwellers using land as a resource through private participation, Credit Linked Subsidy, Affordable Housing in Partnership and subsidy for Beneficiary-led individual house construction/ enhancement. As per 2023, there are 870 PMAY beneficiaries in the town. As per the PMAY list, 654 families as listed as houseless within the town. PMAY status over the past years is shown in Table 21.3.

Table 21.3 PMAY status inTown

Year	Beneficiaries	Completed	%
2016	213	93	43.6
2017	367	76	20.7
2018	69	3	4.3
2019	174	0	0

Source: Pathanamthitta Municipality 2019

As a part of Janakeeyaasoothranam scheme, Rs. 25000 each is given for 5 families in the General category and Rs. 50000 each is given for 3 families in the SC /ST category for repair and renovation of houses in each year by the Municipality.

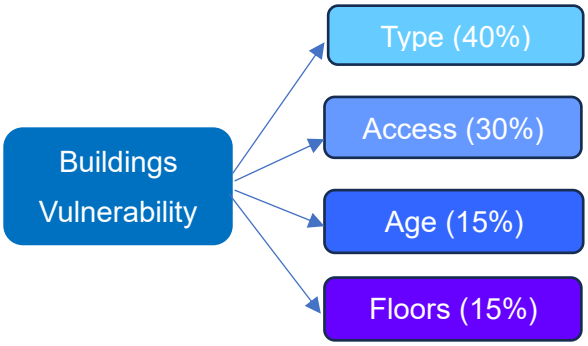
> മിതമായ നിരക്കിലുള്ള മതിയായ സൗകര്യങ്ങളോടുകൂടി ഹോസ്റ്റലുകൾ, വൺഡേ അക്കോമഡേഷൻ, വിശ്രമ കേന്ദ്രങ്ങൾ എന്നിവ നഗരത്തിൽ ലഭ്യമാക്കണം [*Hostels, one-day accommodation and rest centers with adequate facilities at reasonable prices should be made available in the town.]* - Public Opinion

21.8 Impact of Hazard & Climate Change

As per the guideline for preparation of risk informed master plan for a town, assessing building vulnerabilities of the town is included in the category of physical vulnerability. 20% weightage is given to physical vulnerability and following are the sub parameters and its weightage included:

1. Buildings (50%)
2. Transportation (35%)
3. Landcover (15%)

Out of these three sub parameters, building vulnerability is analysed in this chapter and the remain two sub parameters are analysed in chapter 13 and chapter 7. To understand the building vulnerability in the town, Type, Access, Age and Number of floors of the buildings in the flood and landslide prone area is analysed.



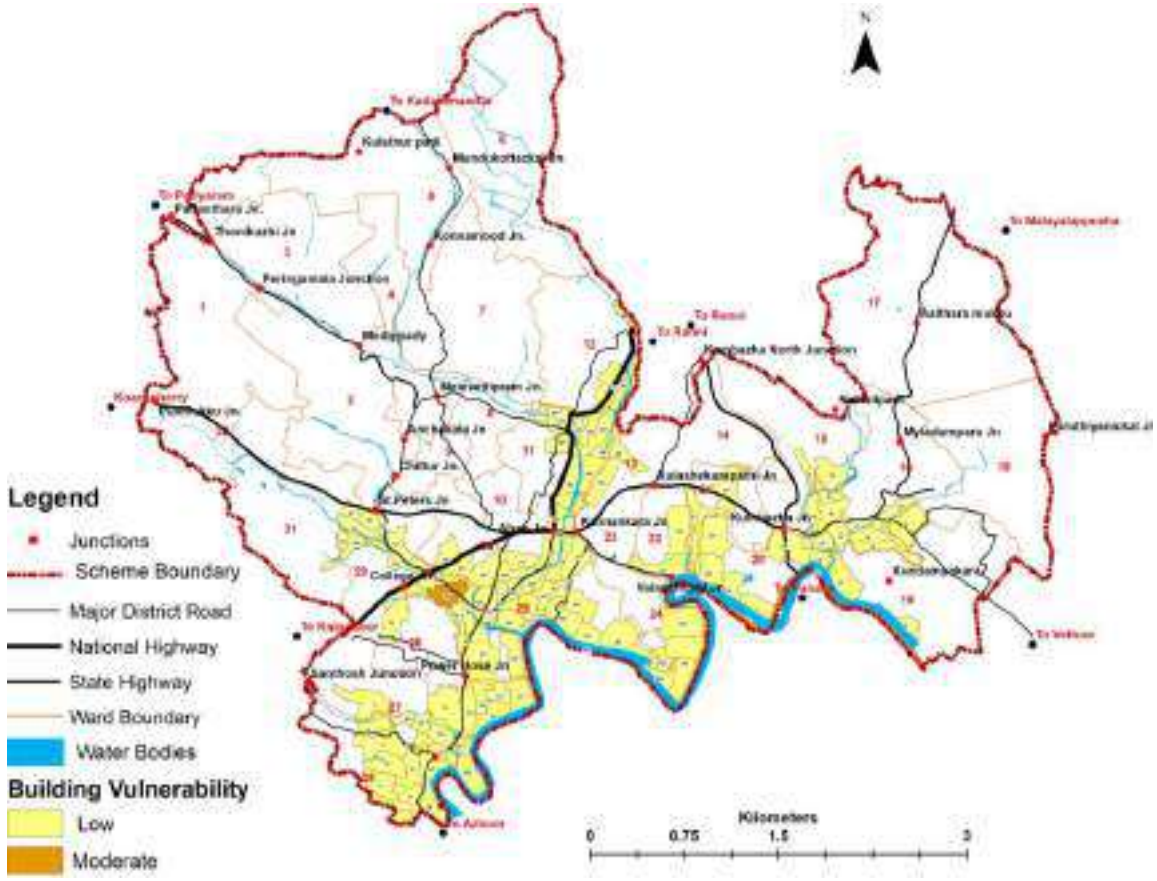


Figure 21-20 Cadastral level building vulnerability in flood prone area

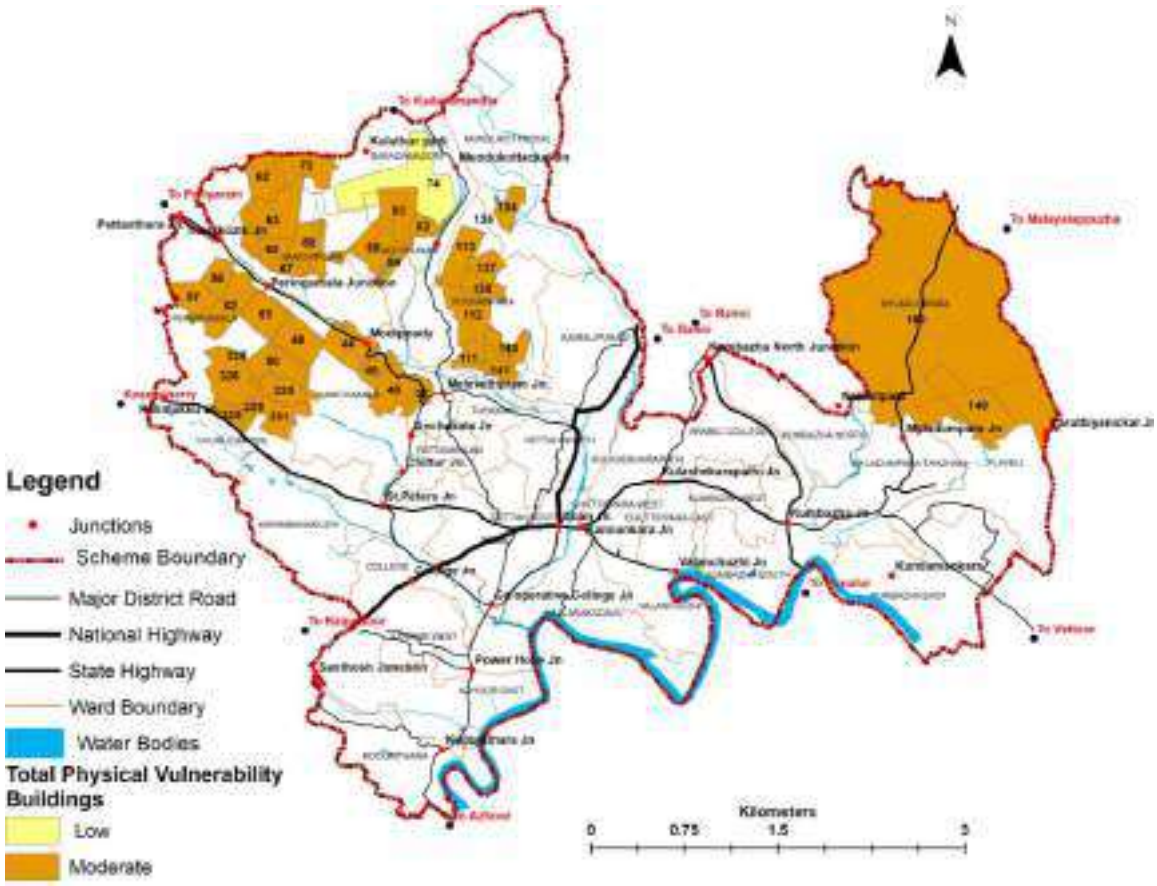


Figure 21-21 Cadastral level building vulnerability in landslide prone area

The data is collected by 100% door to door socio economic survey in the flood prone and landslide prone areas of the town and analysed in GIS software. Varying degrees of vulnerability (low, moderate, and highly vulnerable areas) has been identified in each cadastral based on value assigned as per guidelines of risk informed master plan. Inference of this analysis is used in the chapter 5 to find out the total risk of the town.

21.8.1 Flood vulnerability

The vulnerability of buildings in the flood prone area of the town based on building type, access width to each building, age and number of floors of the building at cadastral level is analyzed here. The building vulnerability in flood prone area is low to moderate vulnerable as buildings in the cadastral are in good conditions. (Figure 21.20).

21.8.2 Landslide vulnerability

The vulnerability of buildings in the landslide prone area of the town based on building type, access width to each building, age and number of floors of the building at cadastral level is analysed here. The building vulnerability in landslide prone area shows moderate to very high vulnerability as buildings access width to each cadastral is very poor. (Figure 21.21)

21.9 Problems & Potentials

The town has no slums. The housing and infrastructural quality including those in low-income group housing areas were found satisfactory. To facilitate low-income group housing, the municipality is offering financial assistance. Nationalised and private sector banks are also offering housing finance. The migrant labour is getting accumulated in the town. They should be provided with necessary accommodation and sanitation facilities to ensure hygienic environment in the town. Labour office Pathanamthitta identified project for providing housing to Migrant labours. So suitable land maybe identified for housing scheme. The projects related to unoccupied houses may be identified to promote economic generation of town. Mitigation measures must be implemented for houses located in hazard-prone zones.

21.10 Inference

The total number of households of the town as per 2011 Census is 9813. The number of households shows an increasing trend, but the household size is showing a decreasing trend. It indicates change from joint family system to nuclear family. Even though the residential areas are located in all parts of the town, there is concentration around the central area of the town. There is no planned residential area or service schemes in the town. The rate of construction of new houses is showing a decreasing trend. The structural condition of the houses is comparatively good and there is a large number of unoccupied houses in the town. Identifying suitable projects for these unoccupied houses can contribute to the town's economic growth by utilizing vacant spaces for productive purposes. Building vulnerability is high in landslide probable area of the town as the access width to these areas are poor due to topographical conditions. To mitigate risks, projects focusing on road widening and new road linkages need to be implemented in these areas.



22. RECREATION FACILITIES

Recreational facilities play a key role in improving the quality of life, promoting social cohesion, and contributing to the town's overall sustainability. Access to parks, sports complexes, and outdoor recreational spaces encourages physical activity, which is vital for combating health issues such as obesity, heart disease, and mental health disorders. Green spaces and recreational areas offer a retreat from urban stress, contributing to mental well-being.

Green spaces play a critical role in mitigating the effects of urban heat islands by providing shade, cooling the environment, absorb rainwater and reduce flooding contributing to better storm water management. They also absorb carbon dioxide, improving the town's overall environmental health. A spatial plan ensures enough accessible areas for people to exercise, walk, or engage in sports. It integrates recreational facilities into urban spaces ensures that people have nearby areas to de-stress, offering relief from the pressures of daily life.

Contents

1. Existing Facilities
2. Comparison with Planning Standard
3. Impact of Hazard & Climate Change
4. Problems & Potentials
5. Inference

22.1 Existing Facilities

22.1.1 Stadium/ Play Grounds

K.K Nair stadium in the town for sports activities located near the Ring road (Figure 22.1) covers around 38000 square metre of land. There was no synthetic track, pavilion, gallery buildings, sanitation facilities, well allocated dedicated parking spaces, drainage facilities and sports equipment. Stadium is currently under renovation as a sports complex with indoor stadium, gallery, pavilion, swimming pool, retaining walls and earth filling to raise the synthetic track above flood level.



Figure 22.1 KK Nair Stadium at Pathanamthitta

The stadium is also used for non-sporting activities like conducting fares and meetings. With existing availability of land, Stadium have potential to upgrade as district stadium with providing sufficient facilities.

In addition to that there are 31 small play grounds in the town out of which 29 are associated with various schools of the town and the remaining 2 are Catholicate college ground and Musaliar College ground. Town stadium as well as Catholicate college ground are used as Helipad locations in town.

22.1.2 Parks & Open spaces

Municipal children's park (Figure 23.2) with an area of 810sq.m in the town centre is near Sri Chithira Thirunnal Town Hall. This is the only park in the town, and it is well-maintained by the town despite not collecting any entry fees.



Figure 22.2 Public children's park at Pathanamthitta



Figure 22.3 Subala Park, Pathanamthitta

22.1.3 Multi- open spaces

Multi-open spaces are the spaces generally used for cultural events, public gatherings of the town. There are two multi open spaces in the town. One is at Kumbazha and another is Thazhe Vettipuram.



Figure 22.4 Open Stage at Kumbazha

Multi-open space at Kumbazha (Figure 21.4) is an open stage owned and managed by municipality. It is a small fair ground with capacity of around 100 persons. The land is also used as parking area. Another multi open space in the town is Sabarimala Edathavalam at Thazhevettipuram area (Figure 22.5).

This land is used as resting place/camp for the devotees visiting Sabarimala temple at the time of November to January every year. During the pilgrimage season, Edathavalam operates 24 hours a day. It provided essential facilities and services for pilgrims like, shelter, free food, drinking water, toilet facilities, bathing area, basic medical aid and parking etc. During the pilgrimage season, services such as women police officers and police night patrols are available to ensure the safety and security of devotees. This land is owned and managed by Municipality. Currently, the land remains unused during the non-seasonal period. Figure 22.6 shows the spatial location of recreational spaces of the town.





Figure 22.5 Sabarimala Edathavalam

> വാർഡുതലങ്ങളിൽ കുട്ടികളുടെ പാർക്ക്, കളിസ്ഥലം, പൊതുഇടങ്ങൾ എന്നിവ സൃഷ്ടിക്കുക [*Create children's parks, playgrounds, and public spaces at ward levels.]*
> - Public Opinion

22.2 Other Recreational Facilities

Other recreational Facilities of the town includes Theatres/clubs, Community Hall/auditoriums, Library/reading rooms etc. The details are mentioned below.

22.2.1 Theatres/Clubs

There are 6 Cinema Theatres (2 multiplex with 6 screens) (Table 22.1) and 9 Clubs in the town. There are no Swimming pools, Aquarium, Community centres or Museum in the town. Akshara Club, Deepam Club, Sevens arts & sports club, Kallarakadavu recreations club, Lions club, Central Club, Seven stars club, MV Chandi athletic club, Master athletic association, Surya club, Yuvajena vedi etc. are the clubs in the town.

Table 22.1 Theatres in Town

Name	Location	Seating capacity
Dhanya	NH 183 A, Aban junction	420
Remya	NH 183 A, Aban junction	200
Aiswarya	NH 183 A, Aban junction	527
Trinity movie max	NH 183 A, Aban junction	210
Trinity	NH 183 A, Aban junction	105

Source: Town Directory 2019, LSGD Planning Pathanamthitta

22.2.2 Library/Reading Room

There are six libraries in the town, housing a total of 65,913 books, with 1,277 registered members. Pathanamthitta Municipal library (Figure 22.6) is the first automated library in the district. Readers can use the computer to know where books are without having to search the shelves. Details of libraries are given in following Table 22.2.



Figure 22.6 Municipal Library Pathanamthitta

Table 22.2 Details of Library in the town

Name	Location	Building Type	No. of books available
Pablic Library and reading	Kannamkara	Own	2368
Municipal Library	Stadium Jn.	Own	50196
YMA Librrary & reading room	Kumbazha	Own	7234
Public Library and reading room	Vanchipoika		1935
Samanyayam Grandasala and study centre	Kannamkara	Own	2297
E K Pillai Memorial Library	Near Sub jail, Kulasekharapathy	Own	1883

Source: Town Directory 2019, LSGD Planning Pathanamthitta

22.2.3 Community Halls/Auditoriums

There are 10 Auditorium/ Community halls within the town which all together having a seating capacity of 3915 persons. Details are given in following Table 22.3.

Table 22.3 Details of community hall/Auditorium in the town

Name	Location	Seating Capacity	Ownership
Sree Chithira Thirunal Town Hall	College Road	100	Municipality
Geetanjali Auditorium	Near KSRTC	300	Private
Marymatha Church hall	Near Stadium	2000	Private
Royal Auditorium	Near General Hospital	700	Private
St.Stephens Parish Hall	Mannaramala	280	Private
St. Peters Auditorium	St.Peters Jn.	150	Private
Aban Auditorium	Aban Junction	300	Private
Gregorian Hall	Chittoor	400	private
St.Simone Auditorium	Kumbazha	250	Private
Lijo Auditorium	Kumbazha	250	priavte

Source: Town Directory 2019, LSGD Planning Pathanamthitta

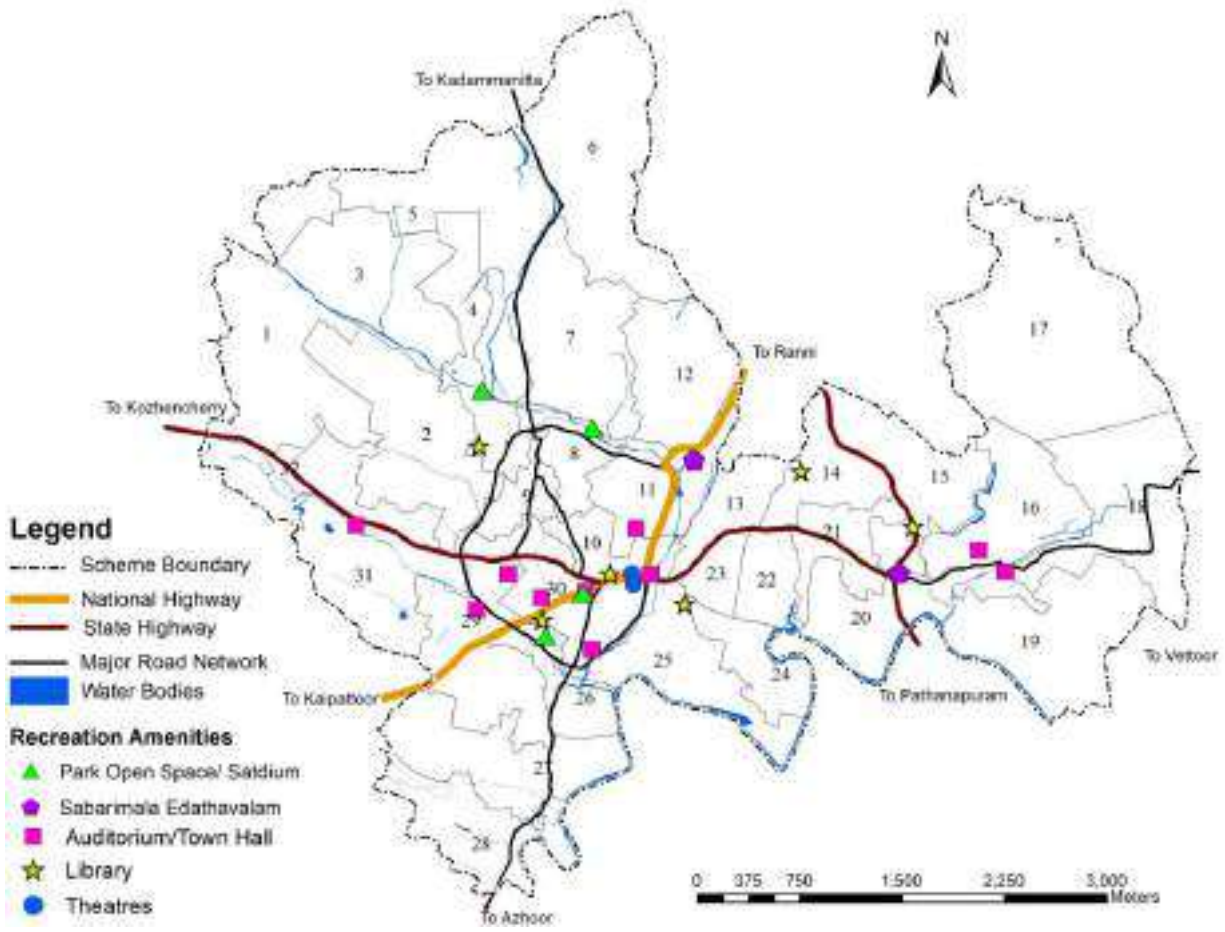


Figure 22.7 Spatial distribution of recreational facilities in town

Location of existing recreational facilities are shown in Figure 22.7.

> ഒരു കടൽ തീരം പോലുമില്ലാത്ത പത്തംതിട്ട നഗരത്തിൽ നിലവിൽ വൈകുന്നേരങ്ങളിൽ ഒന്നു വിശ്രമിക്കുവാനോ, കുടുംബ സമേതം പോയി ഇരിക്കുവാനോ, പാർക്കുകളോ, ഉദ്യാനങ്ങളോ, ഇരുന്നുള്ള സ്ഥലങ്ങളോ ഒന്നും ഇല്ലാത്ത സ്ഥിതിയാണ്. [*In Pathanamthitta, which does not even have a beach, there are currently no parks, gardens, or open spaces where you can relax in the evenings or go out with your family.]* - Public Opinion

22.3 Comparison with Planning Standard

As per the breakup of existing land use in 2023 of Pathanamthitta town, 0.27% of the land is used under recreational space. But for medium category town, URDPFI guidelines suggesting of minimum 12% to 14% of the land area should be used for recreational purposes. Town need more recreational spaces in all categories.

22.4 Impact of Hazard & Climate Change

Natural hazards can significantly impact recreational spaces in a town in various ways like Damage to Infrastructure, Safety Concerns, Closure of Facilities, Erosion and Land Degradation, Loss of Amenities, Impact on Local Economy, Long-term Environmental Changes etc. Spatial distribution of recreational facilities of the town has been overlaid with hazard probability map of town published by KSDMA (Figure 22.8) to identify the hazard probability of existing recreational facilities. None of the exiting recreational facilities are coming under landslide prone area. The stadium in the town is located in a flood-prone area and was completely submerged during the 2018 flood (Figure 22.9).

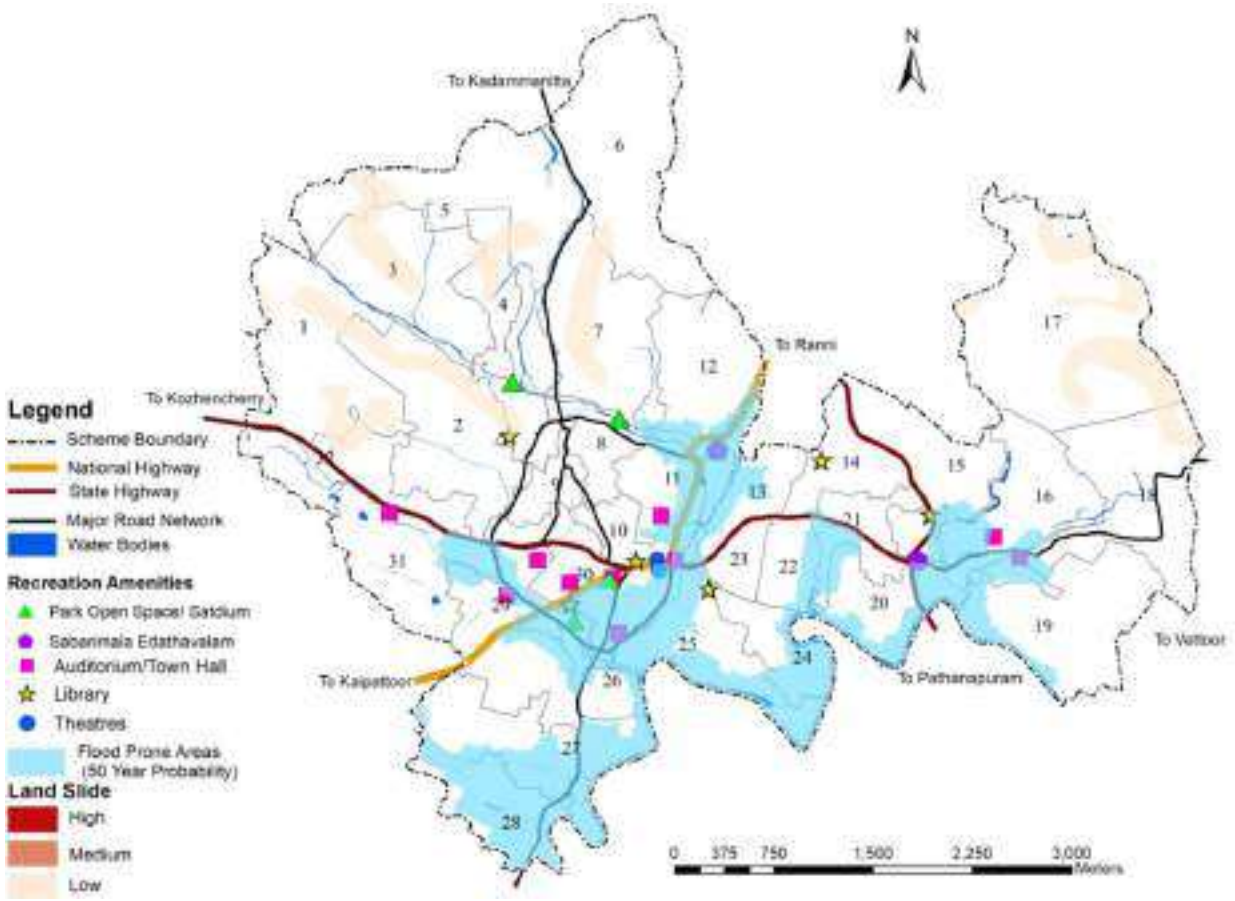


Figure 22.8 Hazard zonation map of town overlay with spatial distribution of recreational facilities



Figure 22.9 KK Nair stadium submerged in 2018 flood

Additionally, the analysis indicates that all Sabarimala Edathavalam facilities and the Children's Park also fall within flood-prone zones.

22.5 Problems and Potentials

As per the URDPFI guidelines, the per capita requirement of public open space in the town is 10-12 sq.m per person. But the present per capita availability of open space per person is only 3.8 sq.m which is very less. Only lower order recreational facilities are available in the town.

Connected public spaces are lacking in town. A resilient stadium for sports, open ground and a town hall for conducting different cultural activities and fairs are also needed. Stadium should be upgrade to district stadium through renovation by providing synthetic track, pavilion, gallery buildings, sanitation facilities, well allocated dedicated parking spaces, drainage facilities and sports equipment. Small grounds/parks at neighbourhood level is also needed. A cultural centre is also needed in the town.

There is no district level or city level parks in the district. The Kumbazha region in the town holds significant potential to be developed as a recreation hub for the district with projects like city level recreation park, ecological parks, recharging ponds, river view Cornish park, water adventure spots, hanging bridge, Pedestrian friendly vending Street with Street Lighting, night life friendly vending shops etc. Certain places

like Anchakala murup, Rocky areas, wetlands around ring road are some recreational potential areas in the town. The Adventure Park at Chuttipara and the Sree Ayyappa Convention Centre are key potential projects in the town's recreational sector.

Landslides do not impact the existing recreational facilities; however, floods pose a significant threat to the stadium. To minimize infrastructure damage, appropriate flood mitigation measures should be implemented, ensuring the stadium's resilience against future flood events.

22.6 Inference

Being the administrative capital of the district, district level as well as local level recreational facility in the town has to be improved considering the people of the town and its influence area. By integrating hazard mitigation strategies into recreation planning, town can create safer and more sustainable outdoor spaces for everyone to enjoy and safeguard the well-being of communities.



23. OTHER CIVIC AMENITIES

Civic amenities refer to essential public services and infrastructure required to ensure a high quality of life for residents. The population density and distribution play a significant role in determining the demand and accessibility of civic amenities. A large population may require more infrastructure, while scattered population groups in certain areas may be harder to serve.

The study of civic amenities in a town is essential in a spatial plan for several reasons, especially for effective urban development, disaster resilience, and ensuring a good quality of life for the residents. It allows masterplan to prioritize the most needed amenities in underserved or growing areas, ensuring the town's development is both sustainable and balanced.

Contents

1 Existing Facilities

2 Comparison with Planning Standards

3 Impact of Hazard & Climate Change

4 Problems & Potentials

5 Inference

23.1 Existing Facilities

Civic amenities like Police station, Fuel Station, Crematoria & Burial grounds, Communication facilities, public toilets & Comfort station, fire station, banks, post offices, etc. for society to function better. The population-based requirements for the number of civic facilities and their equitable distribution are crucial.

23.1.1 Police Station

There are two police institutions in the town. Office of district police chief (Superintendent of Police) and Pathanamthitta Police Station. Office of the district police chief is located in Thazhevettipuram area in ward 11. Pathanamthitta police station located in the central area of the town in ward 30. As per the URDPFI guidelines, one police station is needed for 90,000 persons which is satisfied with the current population of the town. Women police station is also functioning in the Office of district police chief. A police quarters is also functioning opposite to the Office of district police chief. District Jail is located at Kannamkara junction at the town centre and the jail is no longer in active use.



Figure 23.1 Office of the district police Chief Pathanamthitta

> ജില്ലാ ജയിൽ ടൗൺ സെൻ്ററിൽ നിന്നും മാറ്റി സ്ഥാപിക്കണം *[The district jail should be relocated from the town centre.]* - Public Opinion



Figure 23.2 Pathanamthitta Police Station

23.1.2 Fuel Stations

Seven petrol/ diesel pumps and one LPG go down in the town. 5 Petrol pumps are located in the ring road and one is at near central junction and one is at Kumbazha junction. All these are located along major roads of the town and serve entire town area.

23.1.3 Crematoria Burial grounds

There are 2 public burial grounds/Crematorium in the town in which one is owned by Government and other by Hindu community. All other burial grounds/ crematorium are attached with religious institutions. The burial grounds are shown in Table 23.1.

Table 23.1 List of Burial ground in the town

Location	Management	Crematorium
Behind Pathanamthitta Municipal office	Government	Yes
Near Veterinary Hospital	Hindu Community	Nil

Source: Pathanamthitta Town Directory 2019,

23.1.4 Communication facilities

Communication facilities mainly include Post and Telegraph Offices and telephone Service. BSNL is the major public telephone service provider in town. District BSNL office is located in ward 10 of the central area of town. Private telecommunication and internet service providers are also operating in the town, ensuring connectivity for residents and businesses. Optical fibre cable and wireless

internet services are available in the town based on the service providers. Pathanamthitta district post office is working in the town in ward 30 at centre area of the town opposite to town hall.



Figure 23.3 Pathanamthitta BSNL office



Figure 23.4 Pathanamthitta Post office

23.1.5 Public toilets and comfort stations

There are 6 Public comfort stations in the town. (Table 23.2). Pay and use toilets are only maintained properly. In addition to these public toilets, comfort stations are also available at all fuel stations in the town free of cost.

Table 23.2 Public comfort stations in town

Location	Run By	Fare
Old Private stand	Municipality	Charged
New Private stand		Charged
KSRTC Bus Stand		Charged
Kumbazha market		Charged
Stadium		Free
Town Market		Free
At Children's Park		Free

Source: Pathanamthitta Town Directory 2019

23.1.6 Fire Stations

Pathanamthitta fire station is located in ward 23 near the Chuttipara hill rock. Fire station located in the central area of the town and the present access road width is not enough to carry the smooth operations of the fire vehicle. The availability of water also affects the operations of the fire station. Therefore, the fire station needs to be relocated to an appropriate location with better water availability and good access to ensure smooth operations.



Figure 23.5 Pathanamthitta District fire station

> ജല ലഭ്യതയുള്ള സ്ഥലത്തിലേക്ക് ഫയർ സ്റ്റേഷൻ മാറ്റി സ്ഥാപിക്കണം [*The fire station should be relocated to a place with water availability.]* - Public Opinion

23.1.7 Religious Institutions

A major share (44.5%) of the population in the town belong to Hindu community followed by 31.5% Christians and 23.9% Muslims. Around 9 temples, 14 churches and 6 mosques within the town limit. Religious institutions are concentrated more in densely populated areas. List of religious institutions are given in Annexure 23.1. Location of civic amenities in the town is shown in the figure 23.6.

23.2 Comparison with Planning Standard

The number of existing civic amenities in the town aligns with planning standards (URDPFI Guidelines) and is sufficient to cater to the needs of the population.

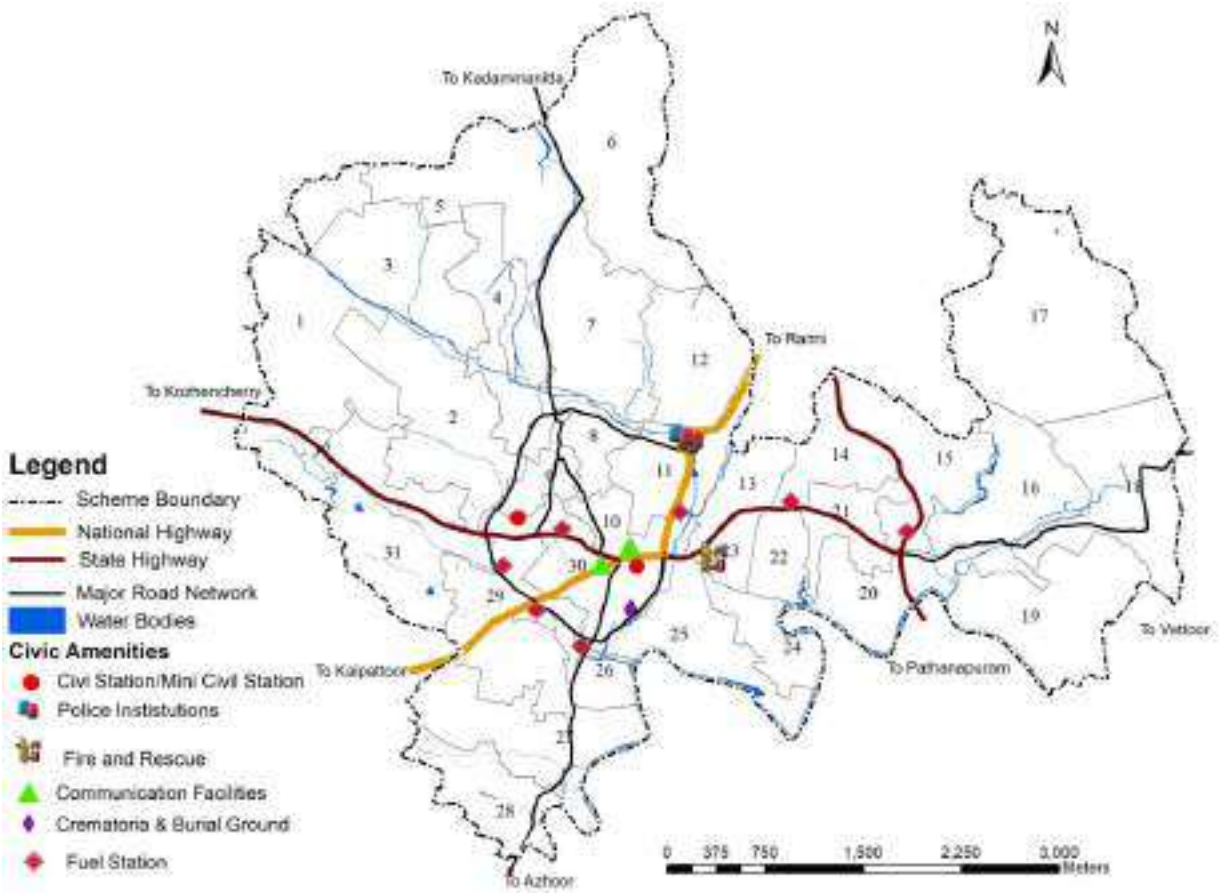


Figure 23.6 Location of civic amenities in the town

> നിലവിൽ വാടക കെട്ടിടങ്ങളിൽ പ്രവർത്തിക്കുന്നതും കോഴഞ്ചേരിയിൽ ഉള്ള ജില്ലാതല ഓഫീസുകളും ടൗണിലേക്ക് കൊണ്ടുവന്ന് ഒരു മിനി സിവിൽ സ്റ്റേഷൻ അനക്സ് സ്ഥാപിക്കണം [*The district-level offices currently operating in rented buildings and those in Kozhencherry should be brought to the town and a mini civil station annex should be established.]* - Public Opinion

23.3 Impact of Hazard & Climate change

Natural hazards can significantly impact the functions of civic amenities, which are crucial for delivering public services. These buildings are often designed to support essential services, but natural hazards such as floods and landslides can disrupt their operation, safety, and overall effectiveness.

Detailed analysis of hazard vulnerability of civic amenities as per guideline for risk informed master plan is included in the social infrastructure sub parameter under basic service vulnerability. This detailed analysis in flood and landslide prone area of the town is incorporated in Education Chapter under Social infrastructure sector. Here location of civic amenities which comes under hazard prone areas are analysed. So spatial distribution of civic amenities in the town is overlaid with flood and landslide probability map published by KSDMA (Figure 23.7). From the Figure 23.6, all civic amenities of the town are located in the centre and southern part of the town. None of the civic amenities are coming under landslide prone areas.

Under civic amenities, critical infrastructure functioning at the time of any hazard of the town is police station and fire station. But currently these two are located in the flood prone area of the town. During the 2018 flood, access to the fire station was completely blocked by floodwaters, isolating the facility and hampering its operations.

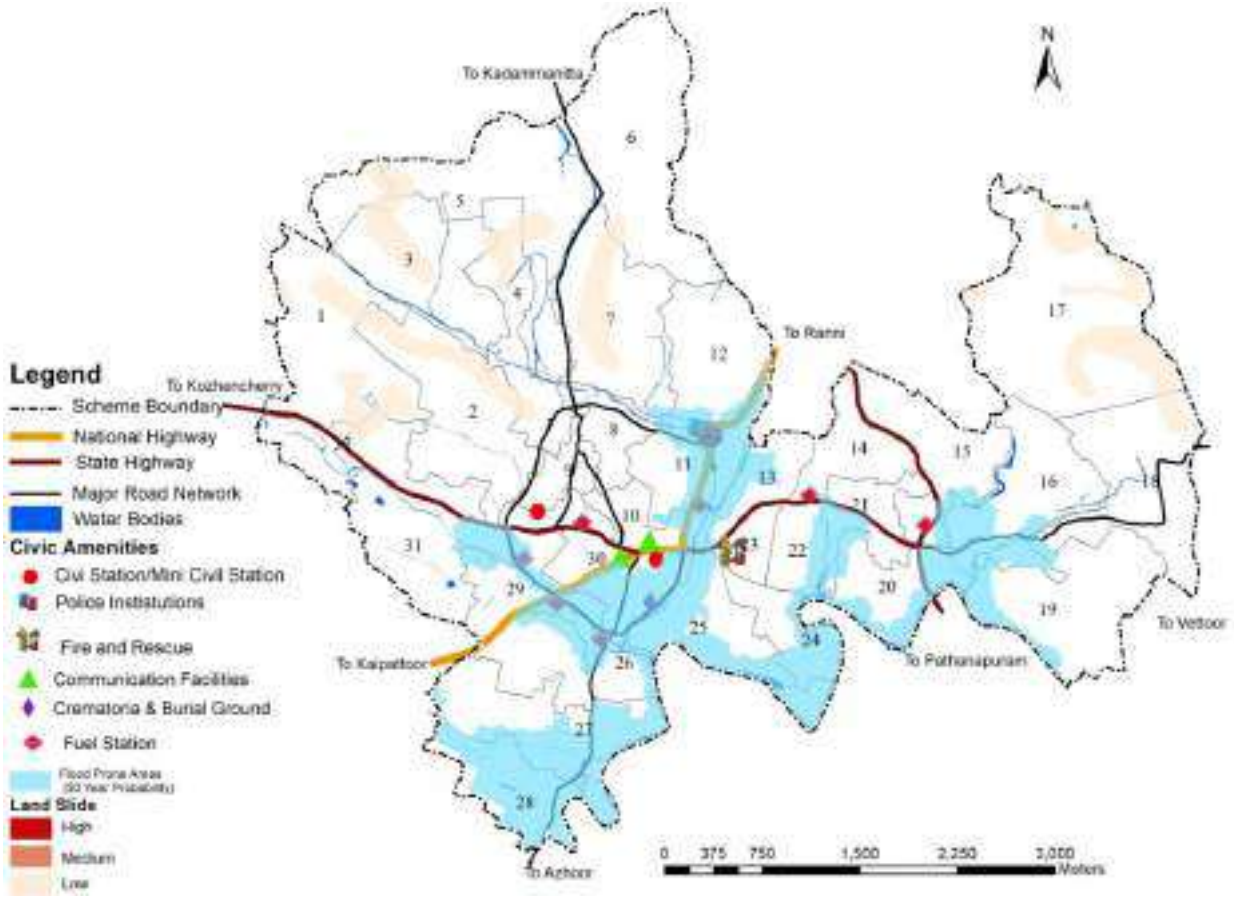


Figure 23.7 Hazard zonation map of town overlay with spatial distribution of civic amenities

This directly affected the function of the fire station. So the relocation of fire station is necessary. Police station is also in the flood prone area. But since it is centrally positioned where it is most needed, relocation is not advisable. Instead, it is recommended to implement flood mitigation measures to enhance its resilience and ensure its continuous operation during flooding events.

23.4 Problems and Potentials

The number of existing civic amenities in the town are as per planning standard to cater the functions of the population of the town. The fire station and police stations are the critical civic amenities needed to be function at the time of hazard. As both facilities are located in a flood-prone area, the fire station needs to be relocated to a safer location, while flood mitigation measures should be implemented for the police station to ensure its continued functionality. All civic amenity buildings can be upgraded to energy-efficient structures, contributing to climate change mitigation efforts and promoting sustainable urban development.

23.5 Inference

As an administrative capital of the district, integrating hazard mitigation strategies into civic amenities can create safer and more sustainable infrastructure to everyone and safeguard the well-being of communities.



24. SPECIAL CONCERN AREAS

The inclusion of people with special concerns in the spatial plan of a town is essential for ensuring equitable access to resources, services, and opportunities. This category of people includes groups such as the elderly, people with disabilities, children, low-income families, and those facing social exclusion. A well-planned town can contribute to the physical and mental health of people with special concerns by providing spaces for recreation, social interaction, and access to healthcare. People with special concerns may have unique vulnerabilities in times of crisis. Spatial planning could include clear disaster evacuation routes and emergency facilities that accommodate their needs.

Integrating the needs of people with special concerns into a town's spatial plan is not just a matter of legal or moral obligation, but also a way to create a healthier, more equitable, and more sustainable community. It benefits everyone by fostering a community that is inclusive, resilient, and welcoming to all.

Contents

1 Social Backwardness

2 Social Welfare & Security

3 Poverty Alleviation Programmes

4 Impact of Hazard & Climate Change

5 Problems & Potentials

6 Inference

24.1 Social Backwardness

Social backwardness generally refers to the condition where a group of people or a community faces disadvantages or remains underdeveloped compared to the rest of society.

24.1.1 BPL Index

The BPL Index in Kerala classifies families into different categories based on income and occupation. Families with a lower income or those engaged in informal or low-paying occupations are identified as BPL families. As per Disaster Management plan of Pathanamthitta town. 37.80% of the households in the town are under BPL category. Ward 1 Peringamala and ward 20 Kumbazha south are the highest BPL household concentrated wards in the town with more than 300 BPL households.

24.1.2 Scheduled Castes and Tribes

Pathanamthitta district has a highest share of Scheduled Caste population with 13.74%, when compared to that of the State of 9.10%. SC population of Pathanamthitta town is 8.77% of total population (Figure 24.1).

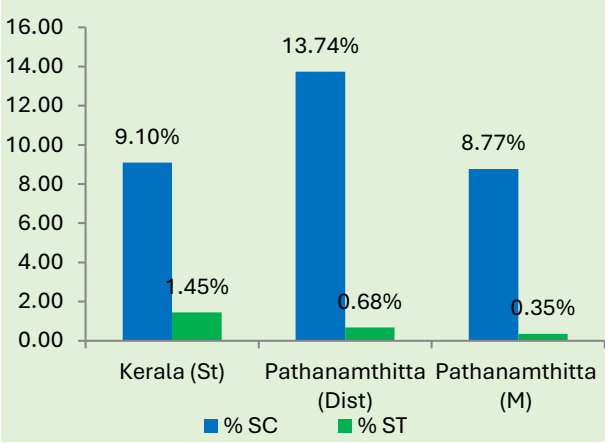


Figure 24.1 SC/ST Population - Comparison with State & District

Source: Census 2011

0.0012% households in the town are scheduled Tribes. Comparing with other towns in the District, Pathanamthitta town has a lower share of SC population (8.77%) and second highest in ST Population. (Figure 24.2)

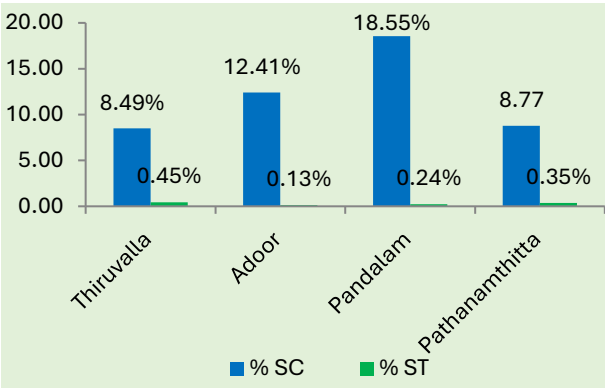


Figure 24.2 SC/ST Population - Comparison with other towns

Source: Census 2011

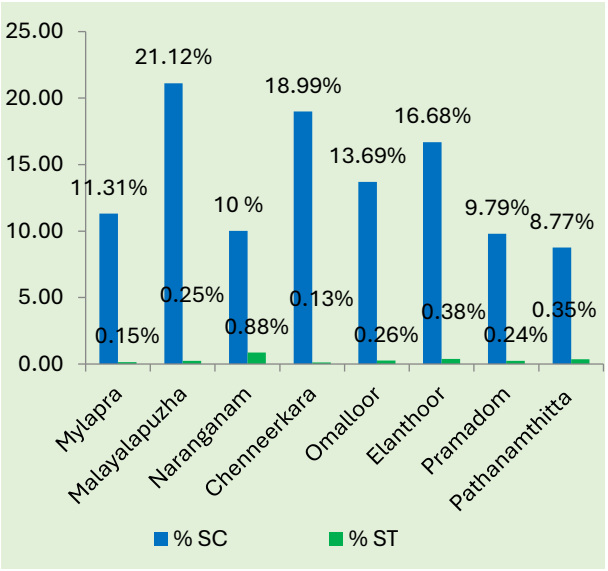


Figure 24.3 SC/ST Population - Comparison with surrounding LSGs

Source: Census 2011

Comparing with LSGIs around the Town, Pathanamthitta has the lowest share of SC population (8.77%) and third highest in ST Population (Figure 24.3).

24.1.3 SC/ST Settlements

According to the 2024 primary survey, 34 Nagars have been identified within the town, of which 25 are designated as SC Nagar. The map showing location of these settlements are mentioned in Housing Sector Chapter. All Nagars are having their own land. Out of 34 clusters, 25 clusters are accessible by concrete road and clusters Thonikkuzhzhy, Muthumarathil, Kumbangal, Thazhevettiprum Lekshamveedu, Oonnukal,

Valanchuzhy lekshamveedu, Mankodu, Kalathi nilkunnathil and Karikulam have Tarred roads. Clusters depend on public well, public water tap and bore well for drinking water. Only three Nagar such as Kulathur, Muthumarathil and Palassery have Municipal waste collection system. Electric connection is available in all Nagar.

The Scheduled Caste population of Pathanamthitta town as per 2011 census is 3423 and it is 8.77 % of total population. There are 131 persons in Scheduled Tribe category which constitute about 0.35% of total population.

24.2 Social Welfare & Security

Social welfare & security is the support provided to improve quality of life and meet the basic need of vulnerable sectors of society.

24.2.1 Differently Abled Population

The town has 0.03% of its residents with disabilities. Differently abled people is found more in Myladumpara (Ward 17) and in Kairalipuram (Ward 12) (Figure 24.4). The details of differently abled child population are shown in Figure 24.5. Out of the total child population within the town, 0.0048% are differently abled children. These include movement disability, mentally retarded, hearing problem and speech disorder.

Focus group discussion with differently abled individuals brought to light several critical accessibility challenges within the town. Participants emphasized that many public buildings and spaces lack essential accessibility features such as ramps, tactile paths, and elevators, making navigation difficult and, at times, impossible. They also pointed out the limited accessibility of persons with disabilities in key areas such as social and recreational. The lack of accessibility environment not only restricts physical movement even in town centre but also reinforces social exclusion. These insights highlight the urgent need for inclusive planning and the implementation of universal design principles to ensure equal access and opportunity for all.

> പത്തനംതിട്ട ഭിന്നശേഷി സൗഹൃദ നഗരമാക്കിക്കൊണ്ട് നഗരത്തിലെ എല്ലാ പൊതു ഇടങ്ങളും കെട്ടിടങ്ങളും നടപ്പാതകളും ഭിന്നശേഷിക്കാർക്ക് പ്രവേശനകരമാക്കുക. നഗരത്തിലെ കെട്ടിടങ്ങൾക്ക് റാമ്പ്, ലിഫ്റ്റ്, പാർക്കിംഗ്, ഡിസേബിൾഡ് ടോയിലറ്റ് നിർബന്ധമാക്കുക. [*Make Pathanamthitta a disability-friendly town by making all public spaces, buildings, and sidewalks in the city accessible to the disabled. Make ramps, lifts, parking, and disabled toilets mandatory for buildings in the town.]* - Public Opinion

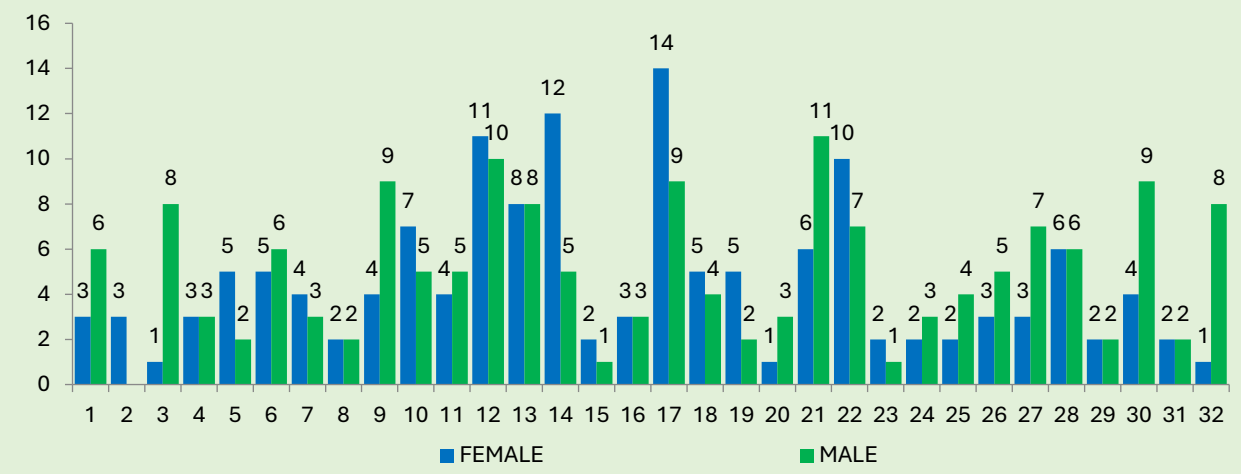


Figure 24.4 Ward wise number of differently abled population

Source: DM Plan Pathanamthitta Municipality 2023-24

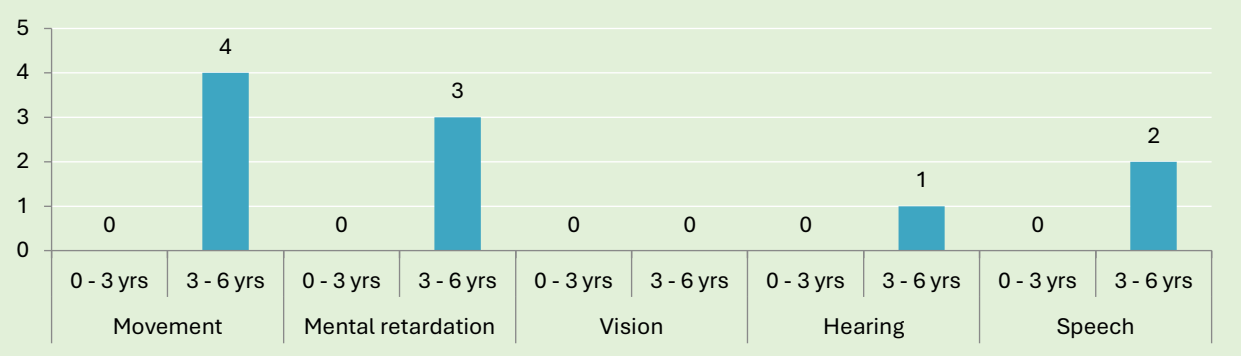


Figure 24.5 Differently abled Child Population in the town

Source: DM Plan Pathanamthitta Municipality 2023-24

24.2.2 Old Age Population

The people above 60 years are considered as the old age people. Pathanamthitta district has the highest percentage of old age population in Kerala. Table 24.1 shows the comparison of old age population in all the districts of Kerala.

Table 24.1 District wise percentage of old age population

Districts	% of old age population
Kasaragod	10
Kannur	13
Wayanadu	10
Kozhikode	12
Malappuram	9
Palakkad	12
Thrissur	14
Ernakulam	14
Idukki	12
Kottayam	16
Alappuzha	15
Pathanamthitta	18
Kollam	13
Thiruvananthapuram	13
Kerala	13

Source: Census 2011

As per the Census data, 19.7% of the population in the town is above 60 years of age where it is 18% in Pathanamthitta district and 12.6% in Kerala. The number of old age population expected to increase in coming 5-10 years as the percentage of age group 55-60 is high. The narrowing down of the base of the Age-Sex pyramid shows that there is decrease in the birth rate. The number of male and female varies in different age group. The percentage of female population is less among children and it is higher for aged group above 75. The age sex pyramid of the town is given in Figure 24.6.

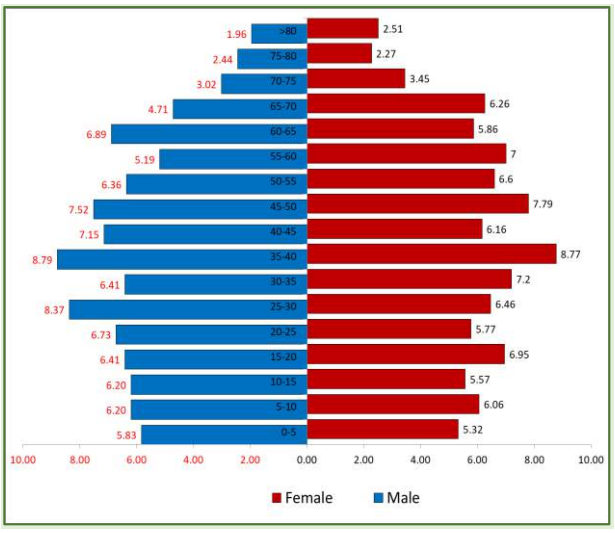


Figure 24.6 Age- Sex Pyramid

Source: Socio Economic Survey 2019

In Pathanamthitta town, from 1985 to 2019, old age population has been increased from 8% of the total population to 19.7%. Population below age of 30 decreased from 1985 to 2019 whereas population above 30 years old increased. The child population also decreased. Over the years, the percentage of the age group under 15-25 reduced to become half of that of 1985 population. As per Municipal Records (Nammal Namukkay) 2023-24, Myladumpara (17), Kumbazha South (20) and Kallarakkadavu (25) wards have the highest number of old age population, followed by Mundukottakkal(6), Thykkavu (8), Kairalipuram (12), Kumbazha West

(21) and Azhoor (27). Anchakkala (2), Vettippuram(4), Petta North (11) and Chuttippara (23)) have the lowest no of old age population. Figure 24.7 & Figure 24.8 shows the ward wise distribution of aged people in Pathanamthitta town.

Focus group discussion conducted with senior citizens revealed several key challenges they face in their daily lives in the town. Participants highlighted limited access to the nearby primary health centre, which poses significant difficulties for those with mobility issues or chronic health conditions. Poorly lit streets contribute to a sense of insecurity, especially during evening hours, while the absence or deterioration of footpaths makes walking both unsafe and uncomfortable. Additionally, the lack of dedicated social spaces leaves seniors feeling isolated, with few opportunities for community interaction and engagement. These concerns underscore the urgent need for age-friendly infrastructure and services to support the well-being and independence of the elderly population.

> വയോജനങ്ങൾ കൂടുതലുള്ള പത്തനംതിട്ട നഗരത്തെ വയോജന സൌഹൃദ നഗരമായി ഉയർത്തുക. മുതിർന്ന പൌരന്മാരുടെ ആരോഗ്യപരമായ വാർദ്ധക്യം, മാനസിക ഉല്ലാസം, ക്ഷേമം, സുരക്ഷ ഉറപ്പാക്കുന്ന പദ്ധതികൾ ആവിഷ്കരിക്കുക. [*To elevate the town, which has a large elderly population, into an age-friendly town. To devise projects that ensure healthy aging, mental well-being, well-being and safety of senior citizens.]* - Public Opinion

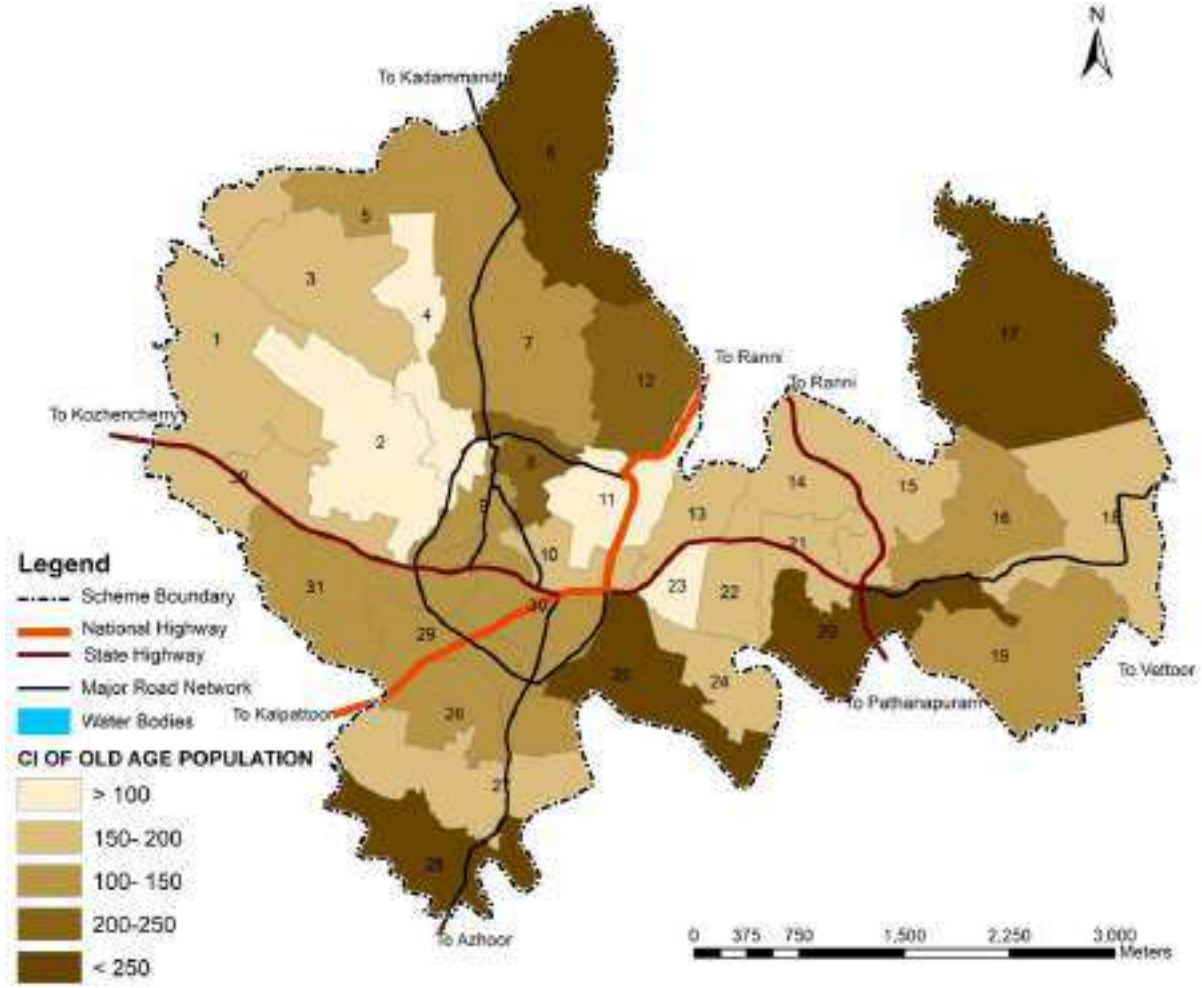


Figure 24.7 Ward wise concentration of old age population in the town

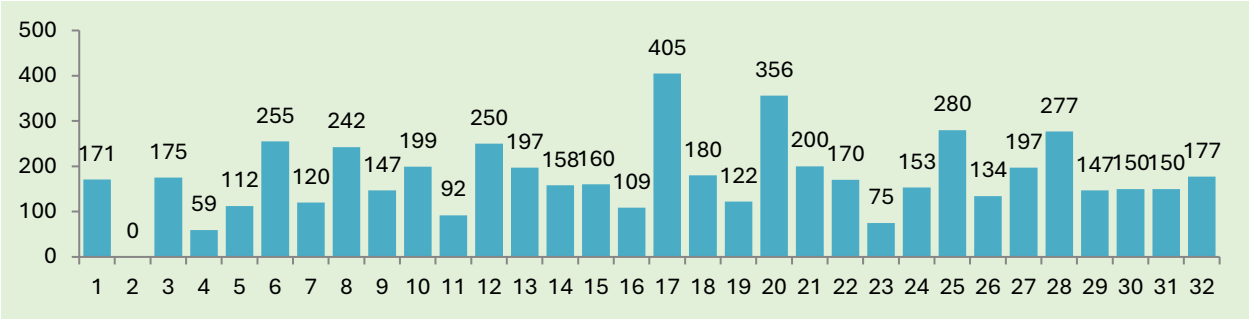


Figure 24.8 Ward wise number of old age population

Source: DM Plan Pathanamthitta Municipality 2023-24

24.2.3 Women Development

As per 2011 census, out of total population of 37,538, the number of females in the town is 19,794, which is 53% of total population. The structure of female population in Pathanamthitta town is shown in Figure 24.9. From the figure it is clear that among the total female population, 5% are children below 6 years, 25% are adolescent girls, 3% are pregnant women, 2% are lactating mothers,17% are elderly women aged above 60 years.

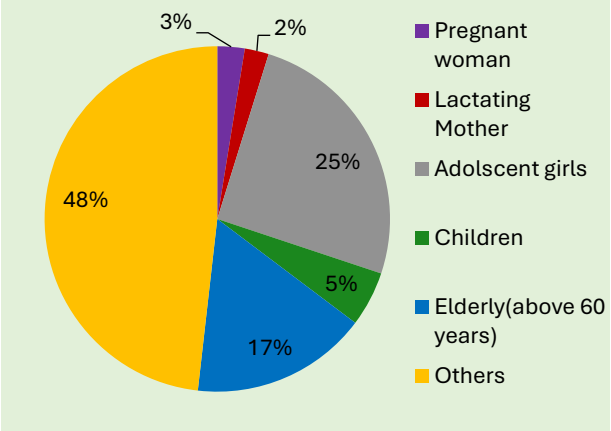


Figure 24.9 Structure of Female population

Source: ICDS 2015 -16 Annual Survey

Even though Pathanamthitta town is district headquarters with lot of public institutions, sufficient number of government women's hostels is absent in the planning area. The lack of women friendly public comfort stations is also one of the major problems faced by the women here.

Focus group discussion with women from various sectors of town expressed concern over poor street lighting and the absence of surveillance in isolated locations, which contribute to a heightened sense of vulnerability, particularly after dark. Restricted mobility due to congested or poorly planned urban spaces further limits their freedom of movement. The lack of clean, accessible public toilets poses serious hygiene and convenience challenges, especially for women on the move. Additionally, the absence of unsafe walking conditions, dedicated cycle paths and limited vending zones were noted as barriers to both safe commuting and economic participation. These concerns call for gender-sensitive urban planning that prioritizes safety, mobility, and inclusion.

In Pathanamthitta town, the active women welfare program is mainly through Kudumbashree units and is working effectively in all wards. The ward wise distribution of Kudumbasree units is shown in Figure.24.10. Around 3200 women are members of the 229 Kudumbasree.

> യാത്രക്കാരായ വനിതകൾക്കുള്ള വിശ്രമ മുറികൾ, മെച്ചപ്പെട്ട വനിതാ ഹോസ്റ്റലുകൾ, സ്ത്രീ സൌഹാർദ്ദ പൊതു ഇടങ്ങൾ, തെരുവുകൾ, വനികൾക്കായുള്ള സ്വയംതൊഴിൽ സംരംഭങ്ങൾ, Skill Development Centre എന്നിവ സ്ഥാപിക്കുക. [*Establish rest rooms for women travellers, improved women's hostels, women-friendly public spaces and streets, self-employment initiatives for women, and Skill Development Centres.* - Public Opinion

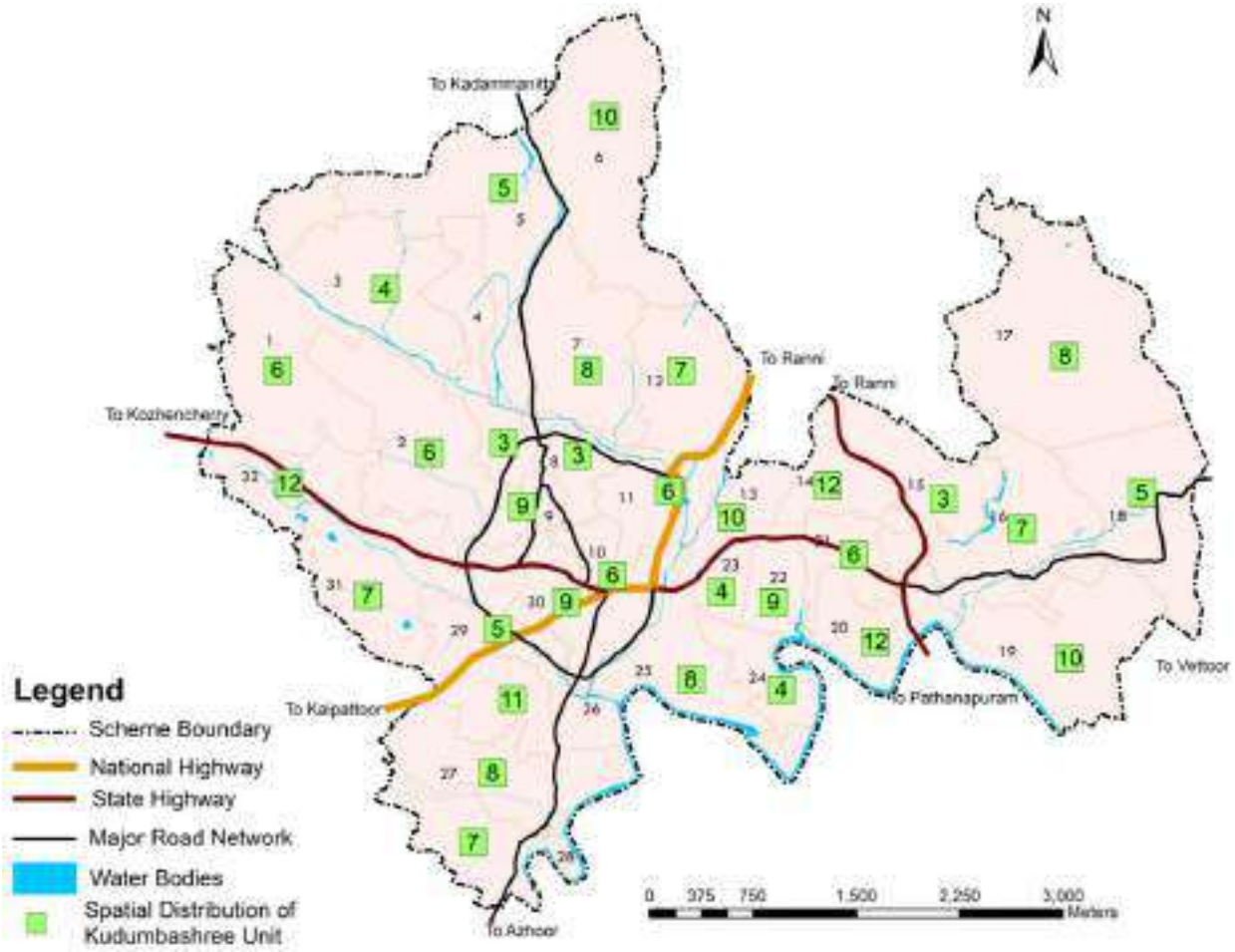


Figure 24.10 Ward wise number of distributions of Kudumbasree units

24.2.4 Welfare of Children

As per the ICDS (Integrated Child Development Services) Annual Survey, 2019, out of 37,538 i.e., 5.54 % of the total population is coming under an age group of 0-6 years out of which 2.82% are male and 2.72% are female (Figure 24.11). Integrated Child Development Services (ICDS) is a major Government of India programme that addresses the needs of children under the age of six. The Department owns and operates Anganwadi Centres (AWC) in the State.

24.2.4.1 Anganwadi

Anganwadis are the grass root level delivery point of institutions for social welfare activities in town with focus on woman and child welfare which work for the welfare of 0-6 age group children, adolescent females, pregnant women and nursing mother. The important objective of the Anganwadis is to reduce malnutrition especially among women and children and to ensure protection of women and children through empowerment and legal and institutional support.

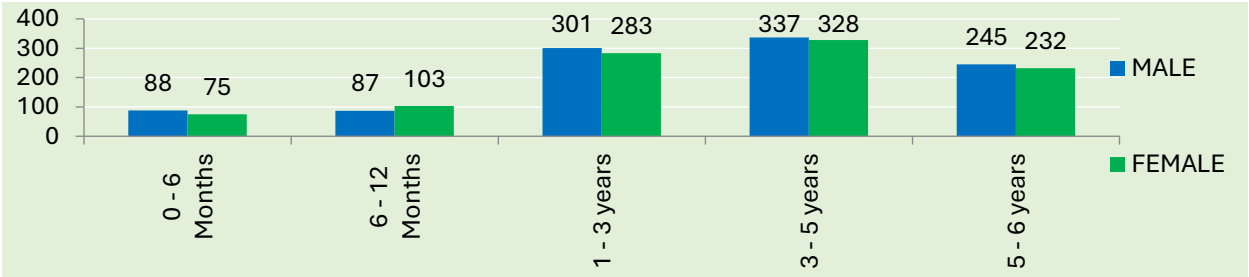


Figure 24.11 Child Population (aged below 6 years)

Source: ICDS (Integrated Child Development Services) Annual Survey

Pre-school activities and health awareness programmes are organised and nutrition are supplied to young females and mother.

As per primary survey conducted (Figure 24.12), 33 Anganwadies are functioning in town and out of these, 18 are functioning in own buildings, 12 are functioning in rented building and remaining are in other public buildings. All Anganwadies are functioning in pucca buildings with separate kitchen/ covered space for cooking and toilet facilities. 15% have adequate space for pre-education and 30% have adequate space for storing food and medicines. 51.5% Anganwadi's have own well for drinking water, seven have pipe connection, two depend on next house and the remaining depend on other sources for drinking water. Anganwadi in ward 14(Arabi college) has baby friendly toilet. All Anganwadis are not covered by 24x7 drinking water supply. Own building, water tanks and rain water harvesting systems are the major requirement of the Anganawadis in the town. The infrastructure details are shown in Figure 24.14 and spatial distribution of Anganwadies are shown in Figure 24.15.



Figure 24.12 Primary Survey conducting in Anganwadi









Figure 24.13 Anganawadis in town

A focus group discussion with parents and Anganwadi teaches highlighted several critical issues related to early childhood development. Parents emphasized the need to upgrade all Anganwadis into Smart Anganwadis with improved infrastructure, learning materials, and child-friendly facilities. They also pointed out the limited availability of designated play areas in the Anganawadi premises. Reaching Anganawadis in high lands town is often difficult and risky due to poor connectivity and unsafe travel conditions, especially when accompanied by young children. These insights underscore the importance of investing in accessible, safe, and well-equipped spaces that support the overall well-being and development of children.

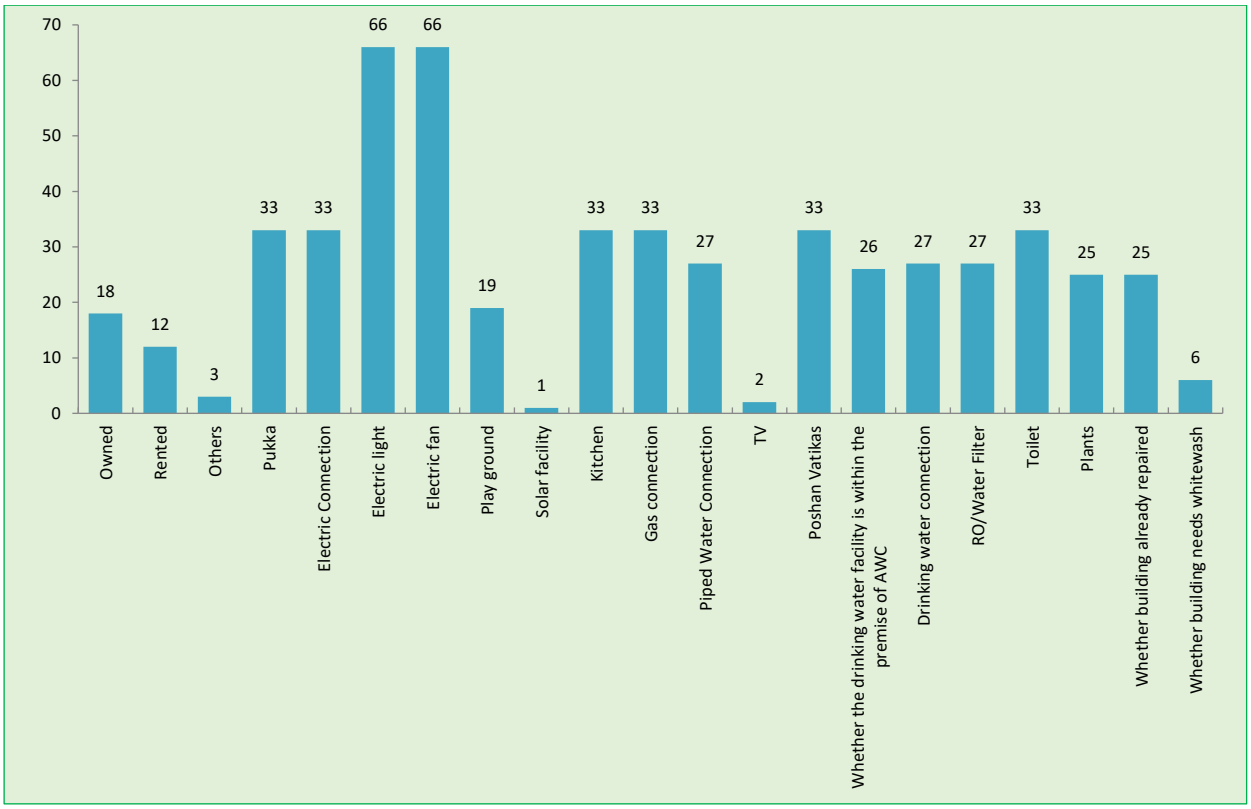


Figure 24.14 Infrastructure details of Anganawadis in town

Source: Primary survey, 2024

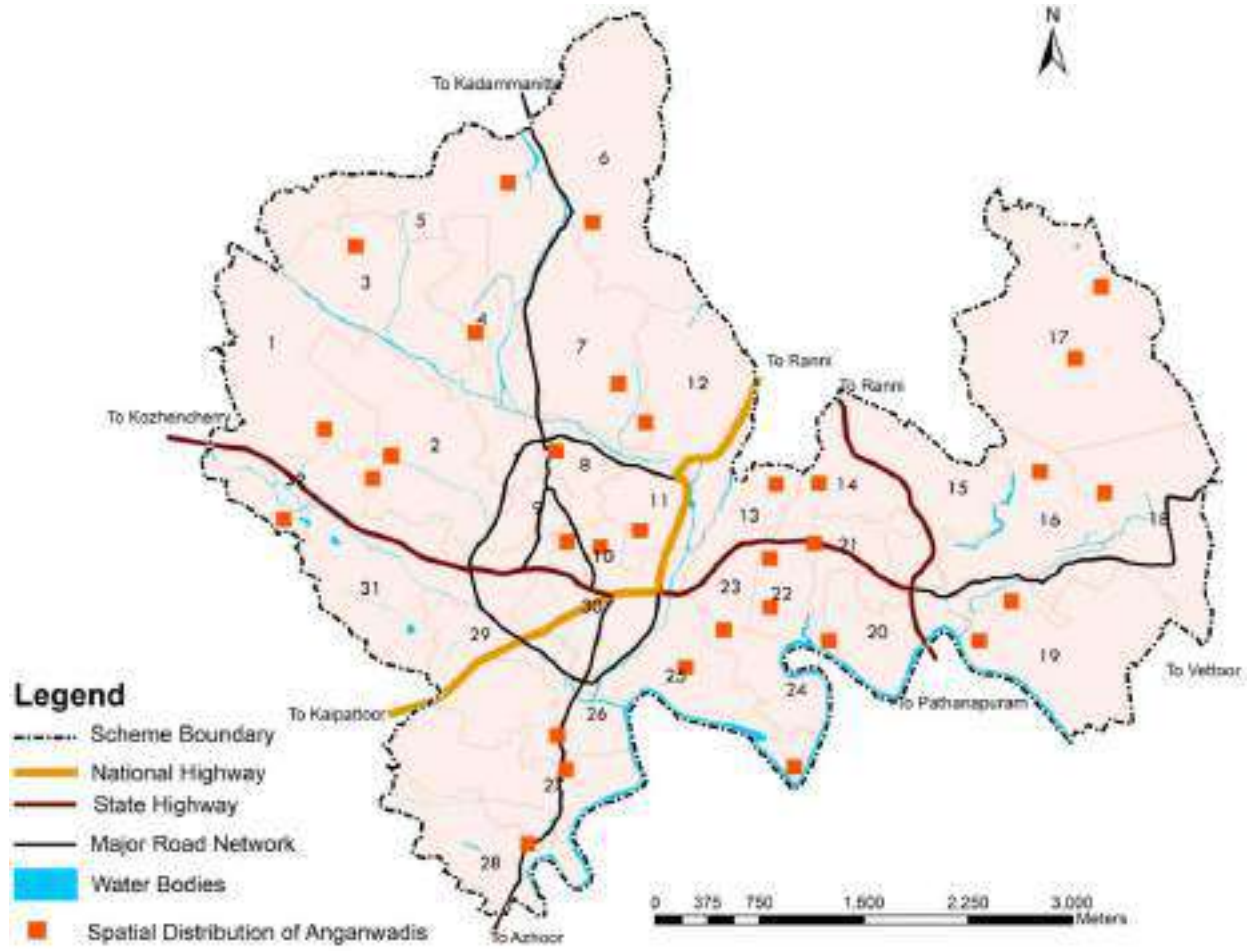


Figure 24.15 Location of Anganwadies in town

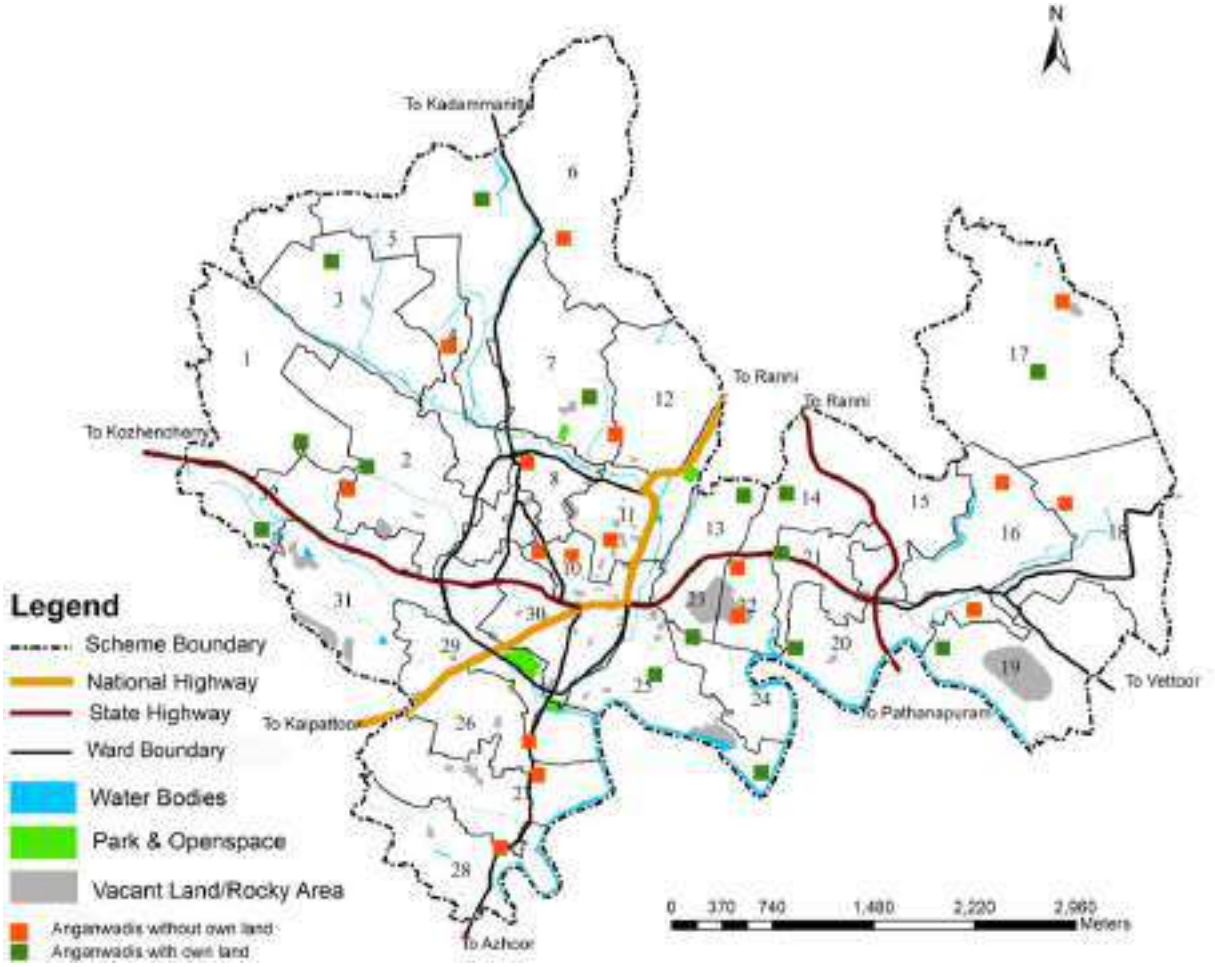


Figure 24.16 Anganwadis with/without own land and nearby vacant areas of town

Anganwadis with/without own land and vacant areas of town shown in Figure 24.16. Minimum of 3cent plot area is necessary for an Anganwadi for healthy activity. There are no vacant lands available near Anganwadis that do not have their own land. Suitable vacant land may be identified for 15 Anganwadis within their respective wards.

24.2.5 Security

Jana Mythri police station operates in Pathanamthitta town. The presence of institutions like the Jana Mythri Police Station enhances community policing, ensuring public safety and crime prevention. Other police institutions within the town include the Circle Inspector Office and DySP Office near the Municipal Market, the SP Office, AR Camp, and Police Telecommunication Office at Thazhevettippuram. The Vigilance and Anti-Corruption Bureau is located near People's Hospital, while the State Special Branch Office is at Vanchippadi, Azhoor. Additionally, the Fingerprint Bureau, Kerala Police Housing Construction Corporation, and the District Police Control Room are situated near the General Hospital.

> ഭവന രഹിതരായി ഒറ്റക്ക് തെരുവിൽ കഴിയുന്നവർ, നിരാലംബർ, ഉപേക്ഷിക്കപ്പെട്ടവർ മുതലായവരെ പുനരധിവസിപ്പിക്കുന്നതിനും അവരുടെ പരിരക്ഷ ക്ഷേമം ഉറപ്പാക്കുന്നതിനുമുള്ള ജില്ലാ തല കേന്ദ്രങ്ങൾ ആരംഭിക്കുക. [*Start district-level centers to rehabilitate the homeless, those living alone on the streets, the destitute, the abandoned, etc., and ensure their protection and welfare.]*- Public Opinion

24.2.5.1 Crime against Women and Children

Kerala, despite being one of the most developed states in India in terms of human development

indices, faces a paradoxical challenge when it comes to crime rates and mental health issues. While the state boasts impressive indicators in education, healthcare, and literacy, it ranks among the top states for crime and suicide rates. However, this could be partially attributed to a higher rate of crime reporting in Kerala compared to other states, where such incidents might go unreported.

Despite the high level of literacy and education among the people of Kerala, violence against Women is reported and it is a matter of serious social concern, which calls for serious policy interventions. The rate of crime against women in the State (Figure 24.17) indicates an increasing trend over a period of time. Crime against women in town is not too high but still have some reported case. Crime against children are also reported in the town. (Figure 24.18 & 24.19). The Women's Desk is functioning in Pathanamthitta Police Station during daytime ie. From 8 AM to 6 PM on all days under the control of a WHC/WPC who listens to the complaints patiently and sympathetically, and takes the matter to higher authorities wherever necessary. This system has been found to be a great success in redressing the grievances of the needy women and children.

24.3 Poverty Alleviation Programmes

During the 14th Plan period (2022-2027), the Government of Kerala aims to wipe out extreme poverty in the State. As part of Extreme Poverty Eradication Programme, specific micro-plans to provide food, shelter, livelihood, entitlement, and medical assistance, were formulated based on status of impoverishment and other key information collected from each identified household. Kudumbashree, the State Poverty Eradication Mission is an innovative, women-based, participatory poverty alleviation programme consists of a three-tier structure with Neighbourhood Groups (NHGs) as primary level units, Area Development Societies (ADS) at the ward level, and Community Development Societies (CDS) at the LSGI level (Economic Review 2023). Status of Kudumbasree units in Pathanamthitta town is mentioned in the section under Women Development.

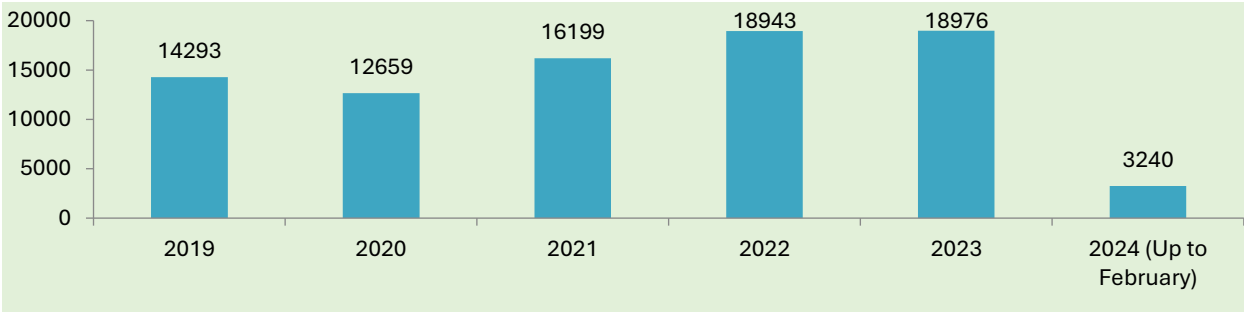


Figure 24.17 Crime against Women in Kerala

Source: Official Website of Pathanamthitta District Police

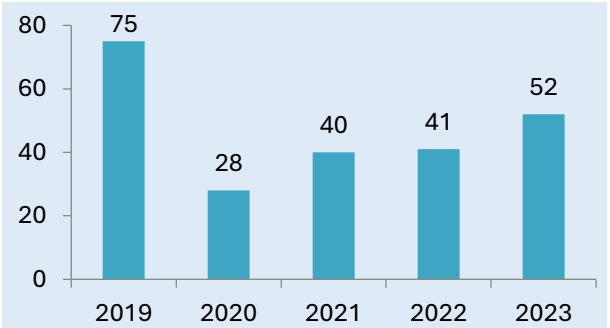


Figure 24.18 Crime against Women in town

Source: DYSP Office Pathanamthitta

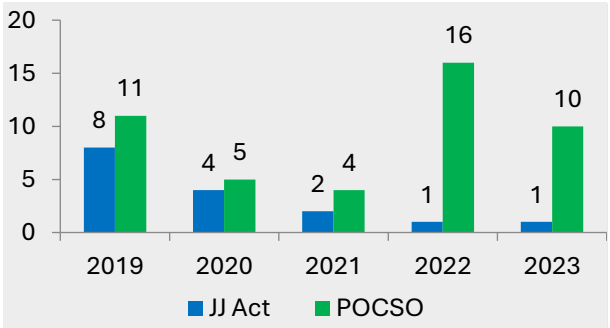


Figure 24.19 Crime against Children in town

Source: DYSP Office Pathanamthitta

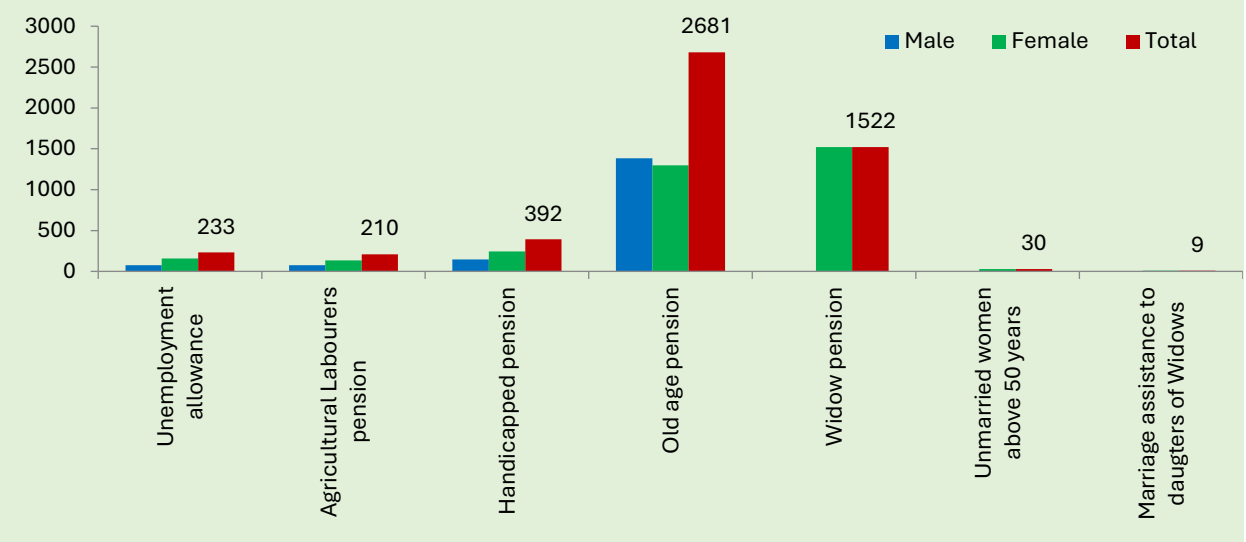


Figure 24.20 Pension Scheme Details

Source: Socio-Economic Survey-2019)

24.3.1 Pension Schemes

Number of beneficiaries under various pension schemes in the town is shown in Figure 24.20. 52% of beneficiaries are old age pension category, 30% are availing Widow pension, 392 are getting Handicapped pension, 210 are getting agriculture labourers pension, 233 get allowance,30 get pension for unmarried women above 50 years and 9 are getting marriage assistance to daughters of widows.

24.4 Impact of Hazard and Vulnerability

As per the guideline for preparation of risk informed master plan for a town, assessing vulnerabilities of special concern areas of the town is included in the category of social vulnerability. 30% weightage is given to social vulnerability and following are the sub parameters and its weightage included:

1. Population likely to be affected (25%)
2. Economically backward population (20%)
3. Women headed family (10%)
4. Children below 6 years (10%)
5. Senior citizen (10%)
6. Differently abled / population with severe illness (10%)
7. Transgender population (10%)
8. Socially backward population (5%).

Out of these eight sub parameters, Population likely to be affected of a town by a hazard is analysed in chapter 5 and remain seven sub parameters are analysed in chapter. The inference of this analysis is used in the chapter 4 to find out the total risk of the town.

Hazard likely to be affecting on economically backward population, Women headed family, Children below 6 years, Senior citizen, differently abled / population with severe illness, Transgender population and socially backward population in the flood and landslide prone area of the town is analysed here. The data is collected by 100% door to door socio economic survey in the flood prone and landslide prone areas of the town and analysed in GIS software. Varying degrees of vulnerability (low, moderate, and high vulnerable areas) has been identified in each cadastral based on value assigned as per guidelines of risk informed master plan.

24.4.1 Flood Vulnerability

The vulnerability of above mentioned sub components in the flood prone area of the town at cadastral level is analysed here. Number of economically backward population, socially backward population, women headed families, differently abled population, senior citizens and children below 6 years in each cadastral has

been identified. Vulnerability degree of each cadastral is identified based on percentage of these population likely to be affected by flood. No Transgender population is not identified in flood prone area.

There are around 10 cadastrals showing flood vulnerability of economically backward households with moderate to very high as the percentage of AAY (Antyodaya Anna Yojana) ration card holders likely to be affected by flood is more than 10% (Figure 24.21). 7 cadastrals show low to high socially backward vulnerability as percentage of socially backward population in each cadastral likely to be affected by flood is between 5 to 20% (Figure 24.22). There are 24.75% women headed households in the flood prone area. Ie.27 cadastrals are having women headed households. Vulnerability of women headed family is low to very high as percentage of women headed family likely to be affected by flood in cadastral varies from 5% to more than 20% (Figure 24.23). 2 cadastral show high vulnerability of differently abled population (Figure 24.24). 194 senior citizens are in the flood prone area in 54 cadastrals which varies low to very high vulnerability. 43 0ut of 54 cadastral shows high and very high vulnerability as percentage of population with age above 60 years at these cadastral likely to be affected by flood is more than 10% (Figure 24.25). 39 children below six in 20 cadastrals of flood prone area shows low to very high vulnerability. Six cadastrals show high and very high vulnerability as more than 10% of the population in these cadastrals are likely to be affected by flood (Figure 24.26).

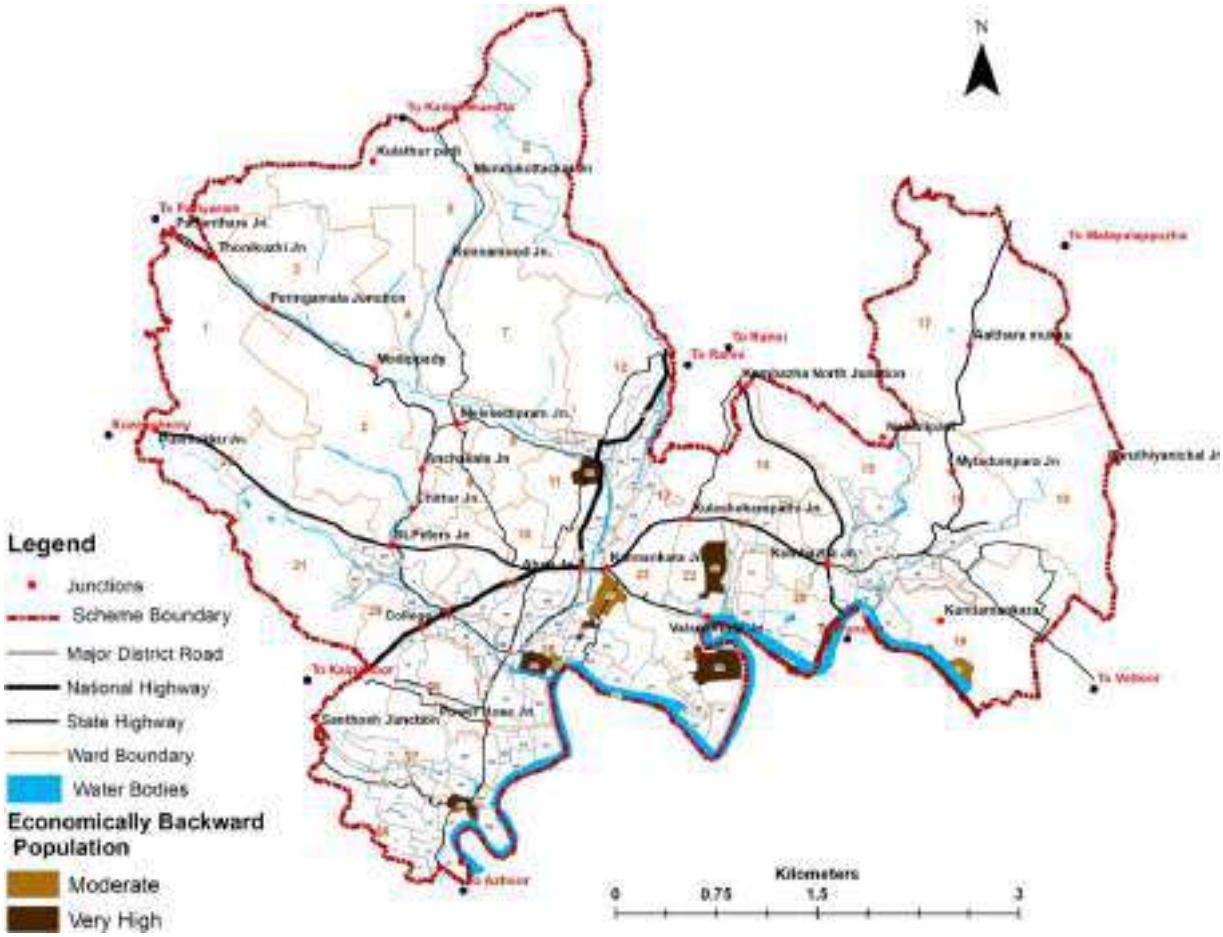


Figure 24.21 Vulnerability of economically backward population in flood prone area of town

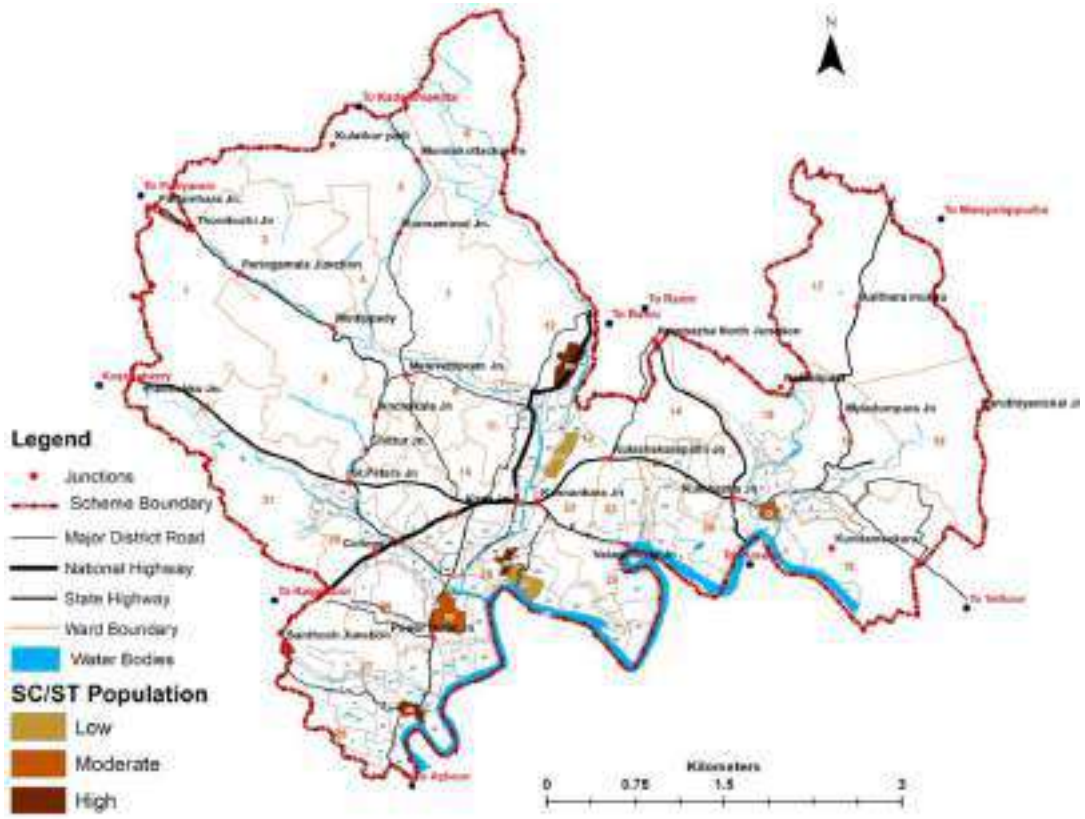


Figure 24.22 Vulnerability of socially backward population in flood prone area of town

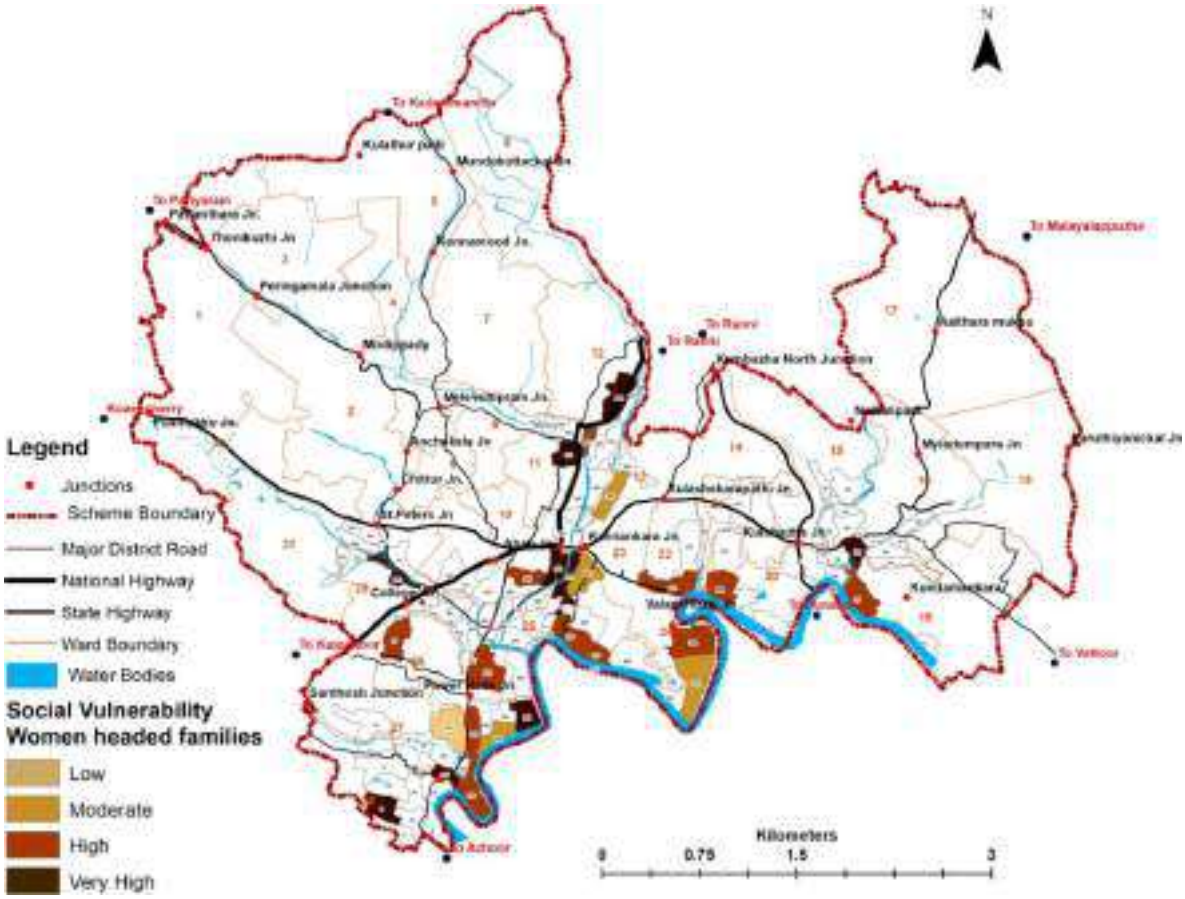


Figure 24.23 Vulnerability of women headed families in flood prone area of town

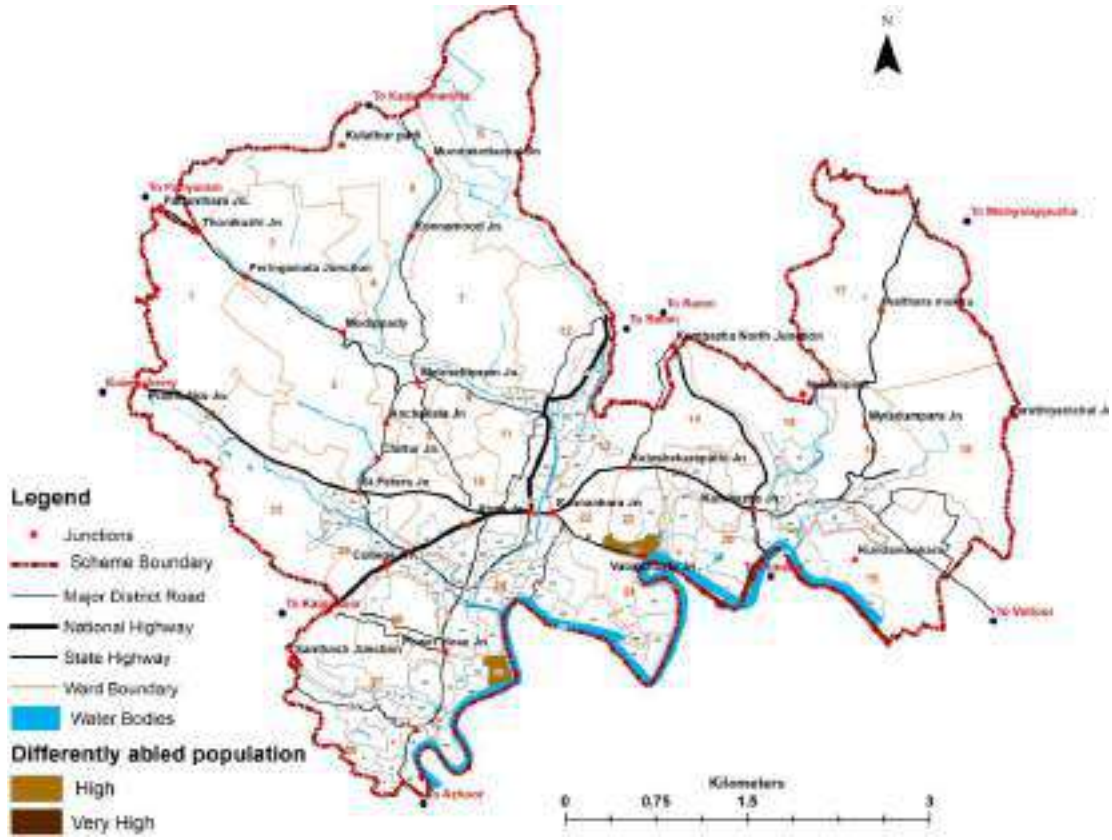


Figure 24.24 Vulnerability of differently abled population in flood prone area of town

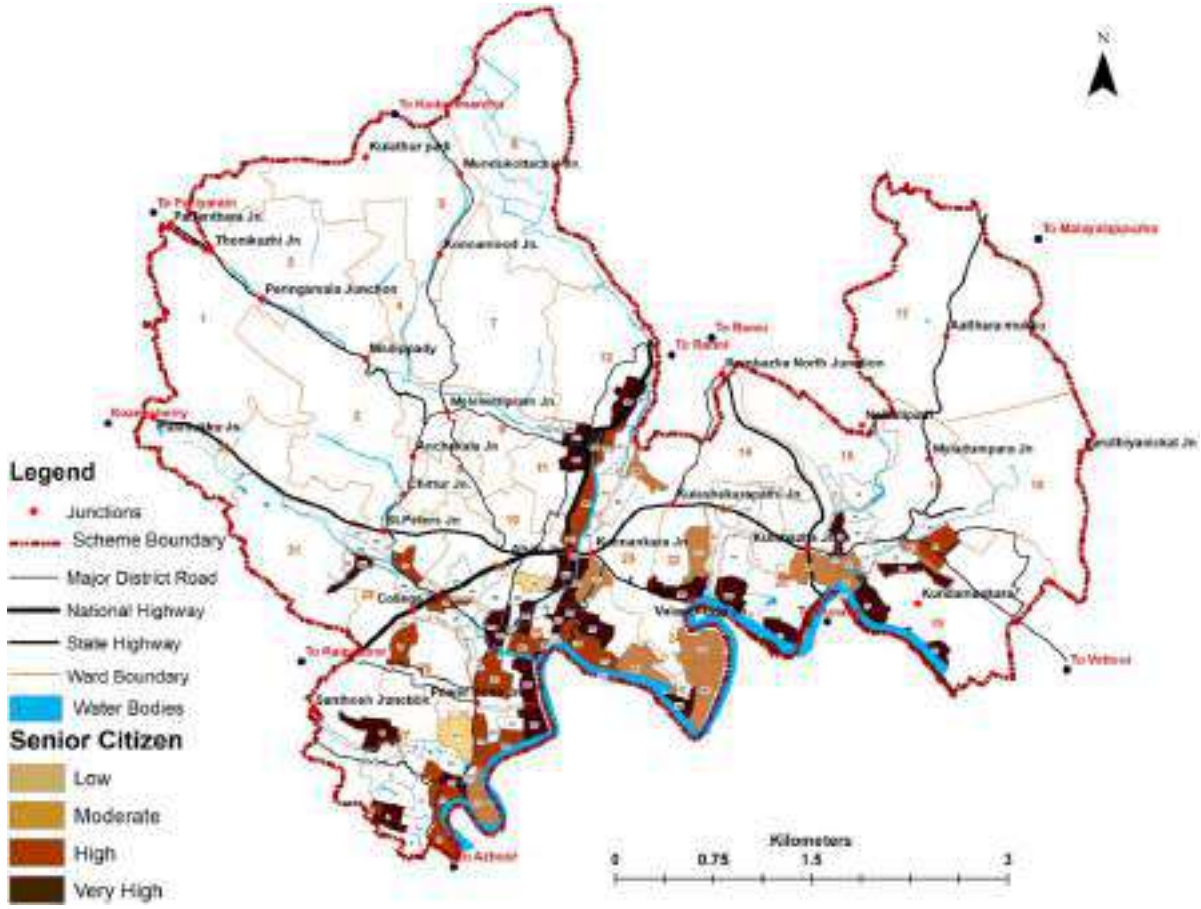


Figure 24.25 Vulnerability of senior citizen population in flood prone area of town

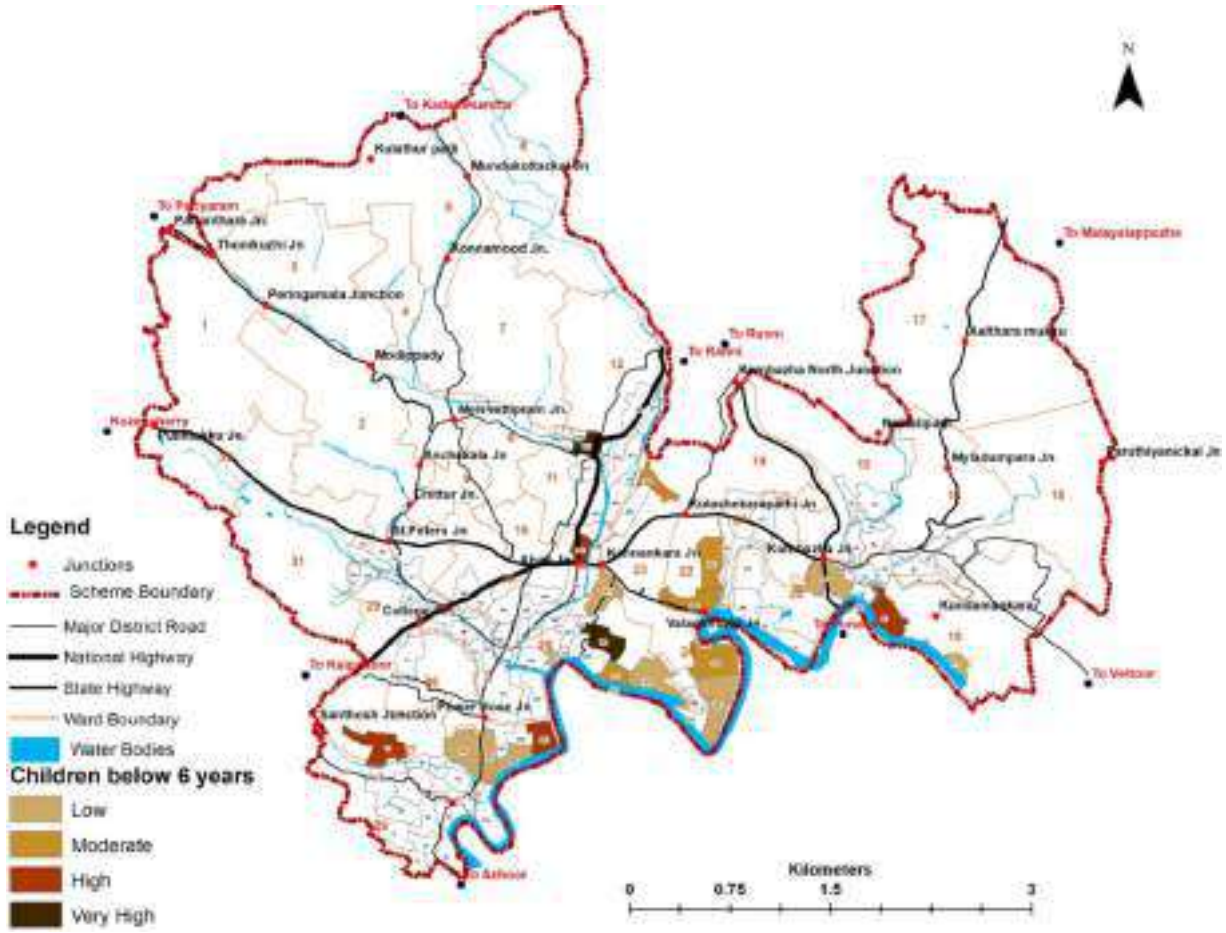


Figure 24.26 Vulnerability of children below 6 years in flood prone area of town

24.4.2 Landslide Vulnerability

The vulnerability of above mentioned seven sub components of social vulnerability in the landslide prone area of the town at cadastral level is analysed here. Number of economically backward population, socially backward population, women headed families, differently abled population, senior citizen and children below 6 years in each cadastral has been identified. Vulnerability degree of each cadastral is identified based on percentage of these population likely to be affected by landslide. No Transgender population is identified in landslide prone area.

31% houses in landslide prone area is economically backward households. ie.15 cadastrals comes under this category. Vulnerability of economically backward households shows low to very high as percentage of AAY (Antyodaya Anna Yojana) ration card holders are likely to be affected by landslide is more than 5% (Figure 24.27). 64 families in 18 cadastrals shows low to very high socially backward vulnerability as percentage of population in each cadastral likely to be affected by landslide is more than 5% (Figure 24.28). 24 differently abled persons are in the landslide prone area in 11 cadastrals which shows low to high & very high vulnerability (Figure 24.29).

384 senior citizens are in the landslide prone area. 33 out of 38 cadastral shows high and very high vulnerability as percentage of population with age above 60 years at these cadastral likely to be affected by landslide is more than 10% (Figure 24.30). 108 children below six in 38 cadastrals of landslide prone area shows low to very high vulnerability. 18 cadastrals show low vulnerability as more than 5% of the population in these cadastral are not likely to be affected by landslide (Figure 24.31).

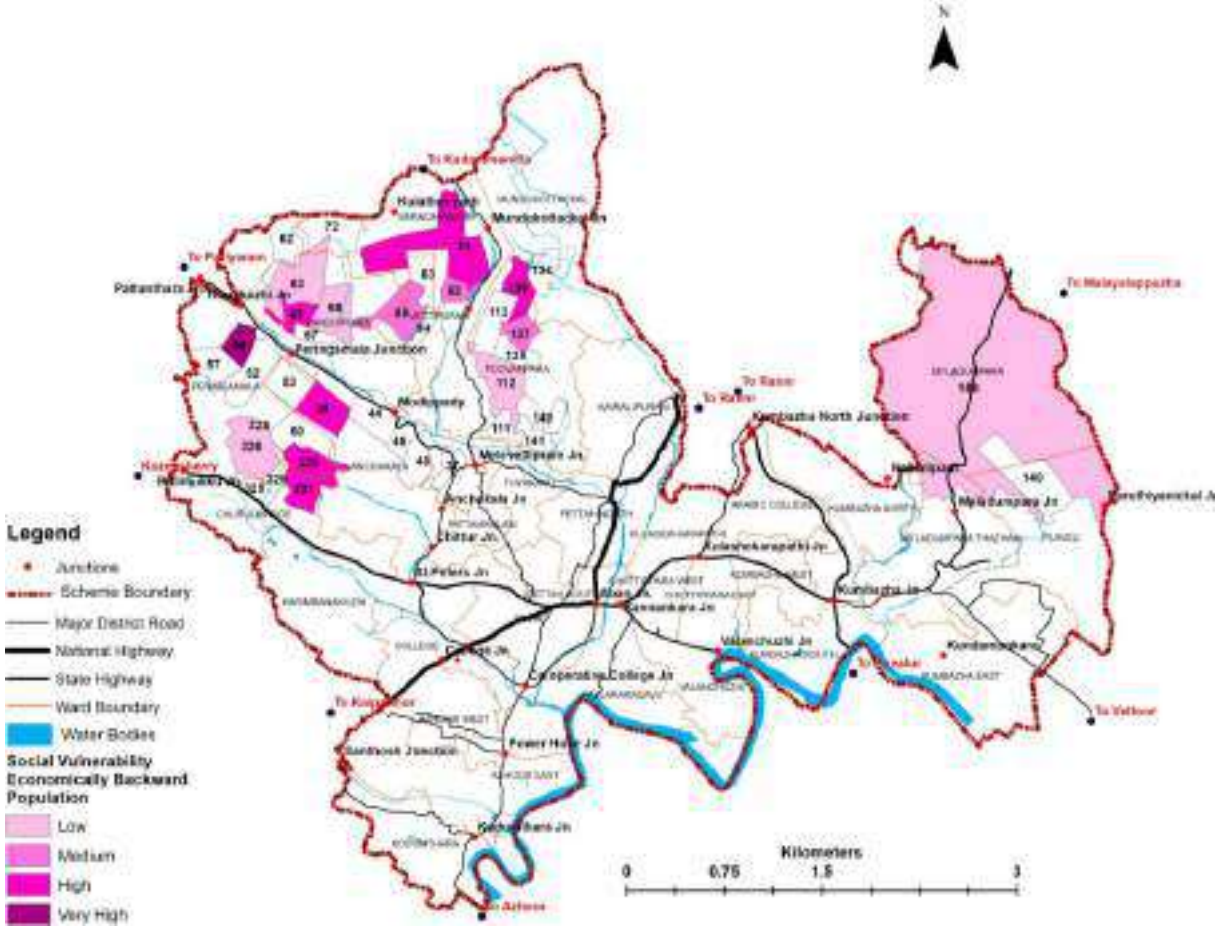


Figure 24.27 Vulnerability of economically backward population in landslide prone area of town

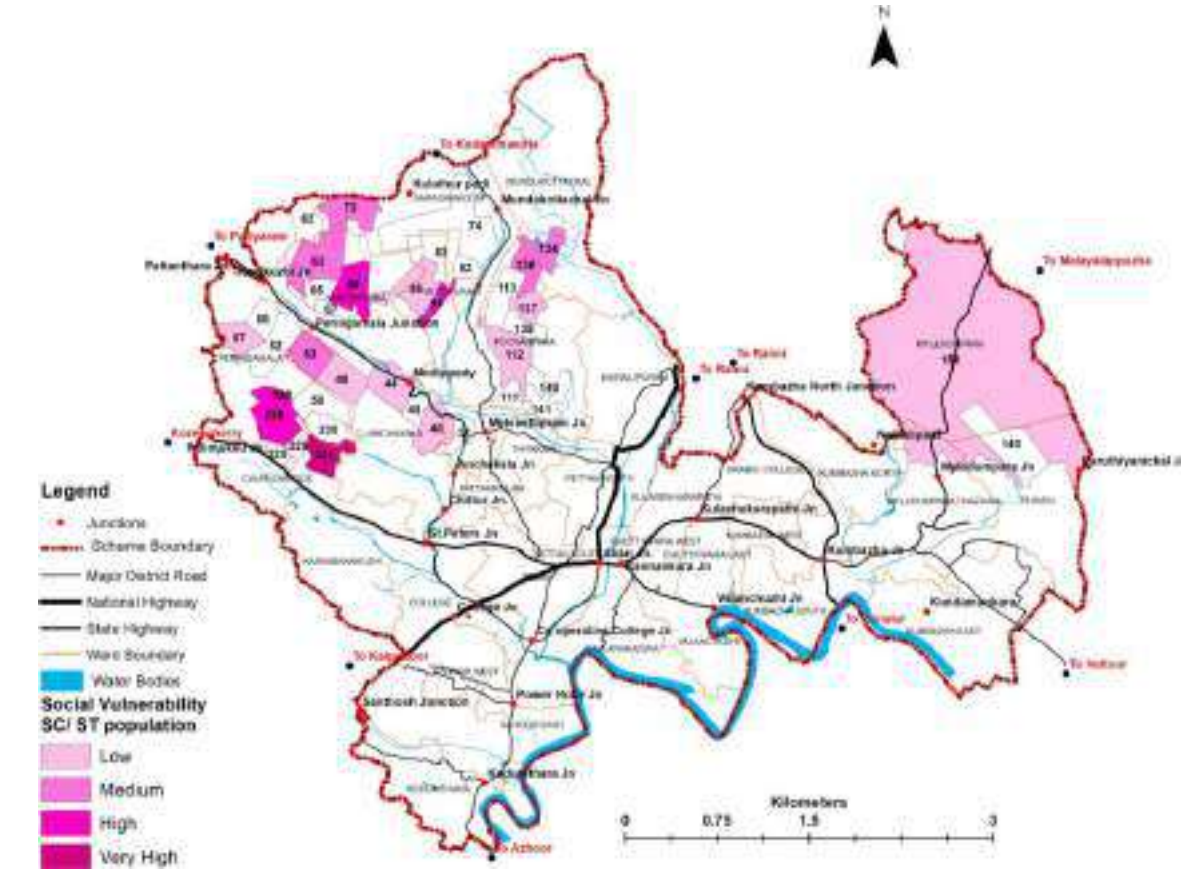


Figure 24.28 Vulnerability of socially backward population in landslide prone area of town

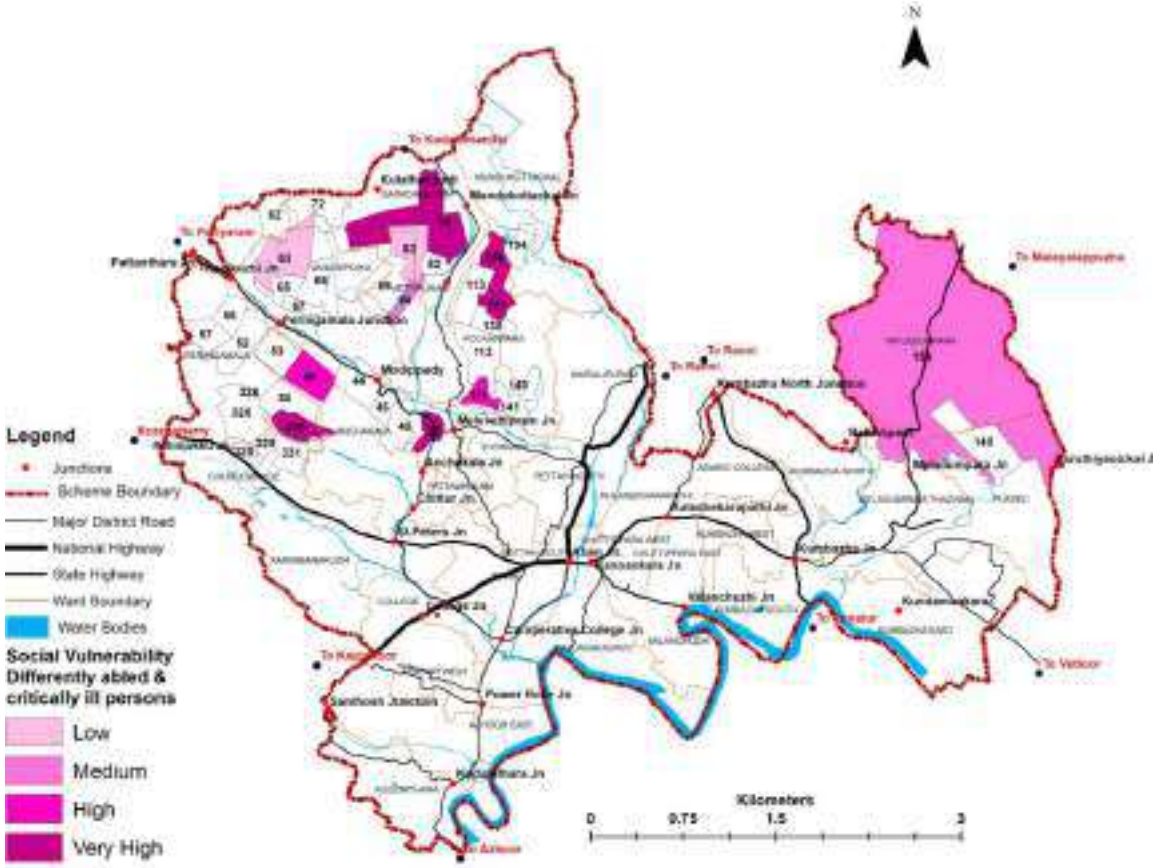


Figure 24.29 Vulnerability of differently abled population in landslide prone area of town

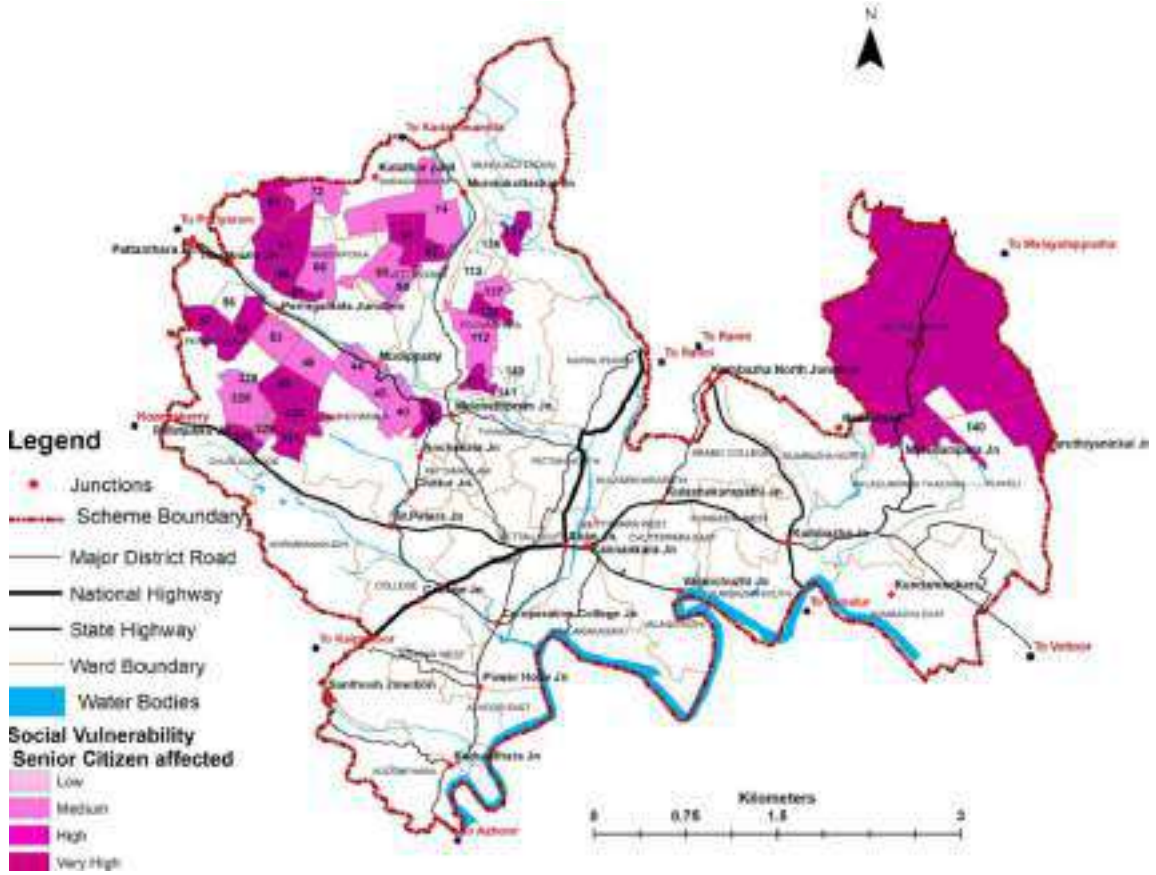


Figure 24.30 Vulnerability of senior citizen population in landslide prone area of town

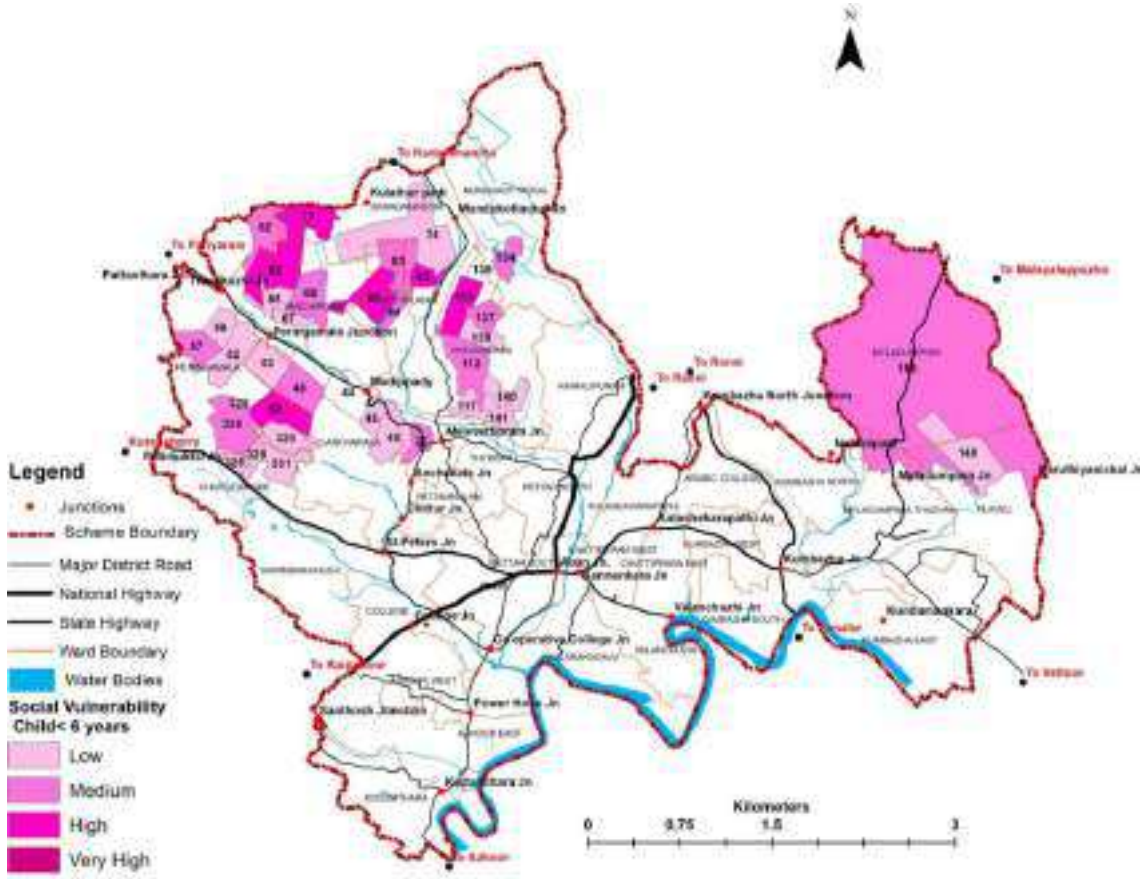


Figure 24.31 Vulnerability of children below 6 years in landslide prone area of town

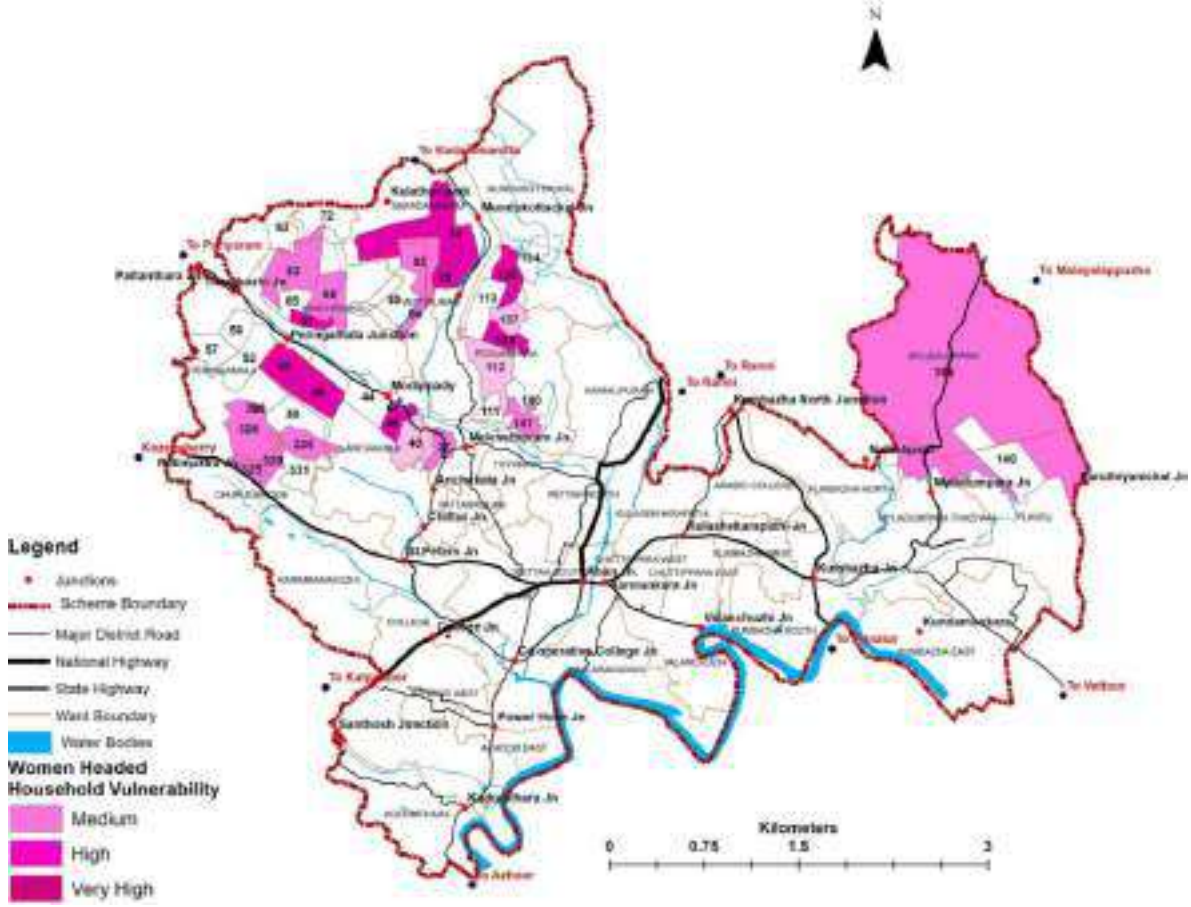


Figure 24.32 map showing vulnerability of women headed families in landslide prone area of town

There are 79 women headed households in the landslide prone area out of 524. ie.23 cadastrals are having women headed households. Vulnerability of women headed family shows moderate to very high as percentage of women headed family likely to be affected by landslide in cadastral is more than 5% (Figure 24.32).

To identify the Anganawadis in the hazard prone area of the town, flood and landslide probability map published by KSDMA is overlaid with location of Anganawadis in the town (Figure 24.33). 7 Anganawadies are in the flood prone area and one is in the landslide prone area. 2018 mega flood affected the 4 Anganawadi (numbers 82, 78, 94 and 98 in the wards 15, 21, 24 & 28 respectively) of the town.

There have been no recorded landslide events in the town's history and the probability of a landslide occurring is considered low. Even though the probability of landslides is low, Anganwadis are highly sensitive institutions. Therefore, relocating the Anganwadi in ward number 3 is necessary.

24.5 Problems & Potentials

Both Kudumbasree as well as Anganwadis are functioning very effectively in the town area. The large number of Kudumbashree units, along with the widespread presence of Anganwadis, serves as a significant potential for the town. These organizations strategically utilized to address the needs of vulnerable sections of society, such as women, children, and the elderly, while simultaneously contributing to the economic development of the town. Kudumbashree units not only encourage women but also enhance the economic development. Various activities in Anganwadis and other centres provide equal opportunity and often promote the development of children in all respects. There is a special school and three buds school centres in town for special care needed children.

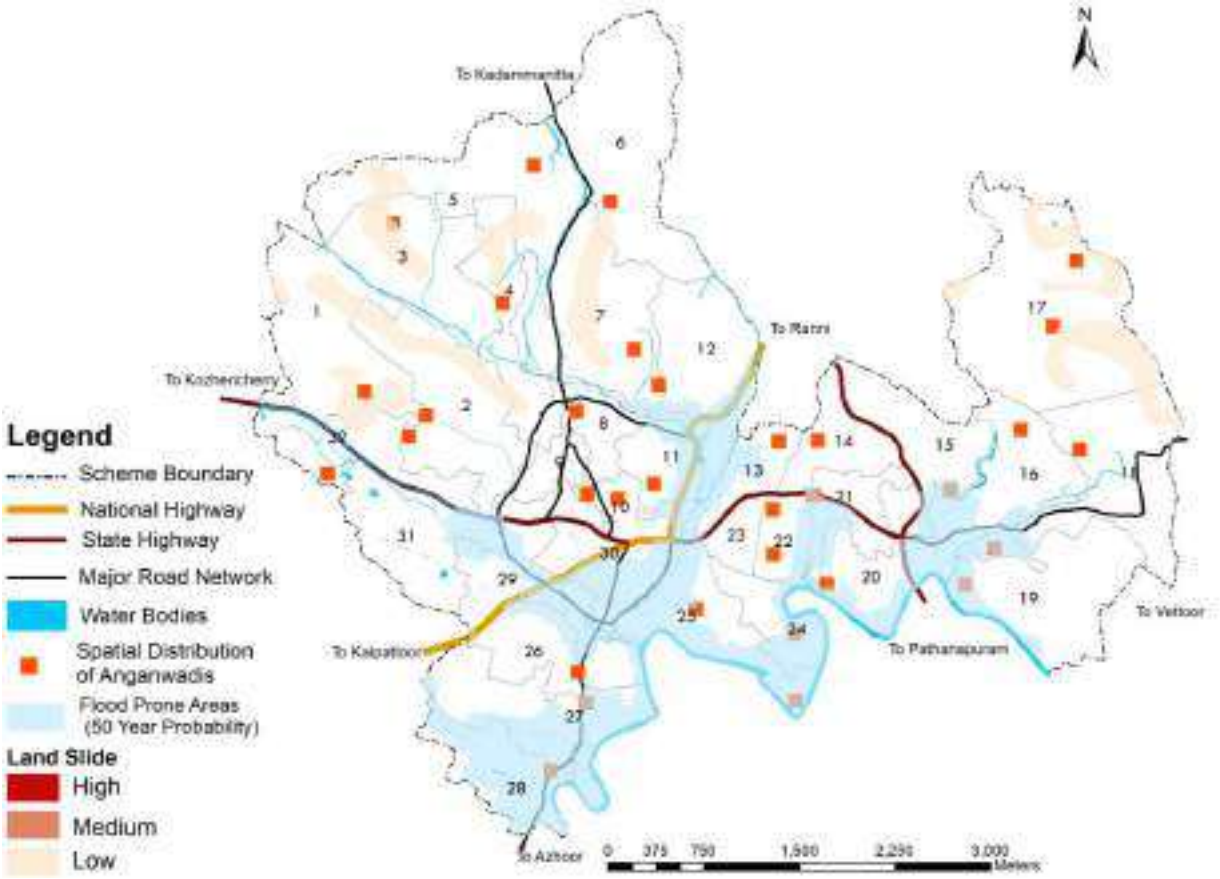


Figure 24.33 Spatial distribution of Anganawadi overlaid with hazard probability map of Pathanamthitta town

The infrastructural facilities in Anganwadis need to be improved and maintained. The Kudumbashree units operating within Pathanamthitta town would benefit from designated gathering spaces for meetings and improved coordination. Additionally, there is a need to establish old age homes with proper medical facilities to support the welfare of the elderly, particularly those who are poor and needy. The current public spaces in the town are not age-friendly, which poses challenges for senior citizens.

The SC/ST colonies in Pathanamthitta Municipal area are facing shortage of infrastructure facilities like drinking water, study rooms etc. Also, more cultural centres should be provided. Lack of job training centres is another problem faced by the special concern group. Town lacks essential facilities such as working women's hostels, She hostels, and e-toilets for women and therapy centres for differently abled. Public comfort stations are generally limited in number, and there is a significant shortage of women-friendly public comfort stations. Strategies should prioritize proactive planning, education, and resilience-building for wards with high elderly populations, particularly those located in flood and landslide-prone areas.

24.6 Inference

The focus group discussions conducted with various community groups—senior citizens, differently abled individuals, women, and children—revealed a range of critical issues affecting the inclusivity, safety, and accessibility of urban spaces. Common concerns included poor infrastructure, lack of barrier-free environments, inadequate lighting and surveillance, limited access to public facilities, and the absence of dedicated spaces for social interaction and recreation. Each group highlighted the need for inclusive planning, improved mobility, and better access to essential services. The findings underscore the importance of adopting a people-centric and equitable approach in urban development to ensure the well-being and active participation of all segments of society, particularly the marginalized and vulnerable.



25. ENVIRONMENT

When preparing a master plan for a town, incorporating environmental study is crucial to ensure sustainable development. This process involves understanding the local ecosystem, climate, natural resources, and potential environmental impacts of proposed developments. By integrating environmental considerations, planners can mitigate negative effects such as pollution, habitat destruction, and resource depletion.

Also, a thorough environmental study helps in designing infrastructure that is resilient to climate change and natural disasters. Ultimately, prioritizing environmental factors leads to healthier, more liveable communities and preserves the natural environment for future generations.

This chapter sets the stage for exploring comprehensive solutions to mitigate environmental challenges, ensuring a balanced approach that safeguards both natural resources and human health in Pathanamthitta.

Contents

1. Existing Scenario
2. Ecologically Sensitive Areas
3. Conservation Efforts
4. Impact of Hazard & Climate Change
5. Problems & Potentials
6. Inference

25.1 Existing Scenario

Pathanamthitta town is endowed with rich natural assets that play a vital role in maintaining ecological balance and supporting the overall well-being of its residents. Town features a continuous chain of wetlands that act as natural drainage channels, supporting biodiversity and regulating the microclimate. The landscape is further enriched by the presence of rivers, ponds, rocky outcrops, and sacred groves—each contributing to the ecological and cultural fabric of the area. These natural elements not only enhance the town's scenic beauty but also provide essential ecosystem services such as groundwater recharge and flood mitigation.

The interaction between human populations and natural resources in Pathanamthitta town has intensified with economic development, giving rise to significant environmental challenges. Urban areas, in particular, face a spectrum of environmental issues that directly impact human well-being. These issues stem from human activities that harm the physical environment, originating and exacerbating within urban settings. These urban environmental problems encompass various dimensions:

1. Localized challenges such as inadequate household water and sanitation, and indoor air pollution.
2. Town-level issues including air pollution, insufficient waste management, and contamination of water bodies.
3. Degradation of natural areas crucial for ecological balance.
4. Infrastructure deficits that strain environmental sustainability efforts.

Addressing these complexities requires a holistic approach, integrating environmental conservation with urban planning strategies aimed at enhancing resilience and sustainability. Figure 25.1 shows various type of natural assets of town.



Figure 25.1 Various type of natural assets of town

25.1.1 Air Quality

Pathanamthitta town has been recognized as the second least polluted town in India next to Tezpur in Assam, according to the figures of the Central Pollution Control Board in 2018. This recognition is based on air quality data, particularly the Annual Average Air Quality Index (AQI), and other environmental indicators such

as levels of particulate matter (PM2.5 and PM10), nitrogen oxides (NOx), and sulphur dioxide (SO_2).

Several factors contribute to Pathanamthitta's distinction as one of the least polluted towns in India. Pathanamthitta is relatively less industrialized compared to other urban centres. Pathanamthitta is located in a region that is rich in biodiversity and green cover. The presence of forests in the district, hills, and other natural landscapes helps absorb pollutants and improves the overall air quality. Efficient waste management practices and strong cleanliness initiatives have also played a crucial role in maintaining environmental health. Being a smaller town, Pathanamthitta has fewer vehicles on the road compared to larger cities, which helps reduce vehicular emissions — one of the leading causes of urban air pollution. The town benefits from natural features such as rivers and forests, which act as natural cleansers by filtering the air and water. This proximity contributes to a healthier environment overall.

25.1.2 Surface Water Quality

Major surface water body existing in the town is Achankovil River. The Achankovil River is formed by the confluence of Kallar and several small streams originating from the Western Ghats. It is flowing through Kollam, Pathanamthitta and Alappuzha districts. The river travels a distance of nearly 128 km and finally joins the Pamba River at Veeyapuram village near Mavelikkara.

As per Water and Air Quality Directory 2023 of Kerala State Pollution Control Board, 8 river sampling stations have been established along the River Achankoil to monitor the water quality. One of these key sampling stations, Kallarakadavu, is located within the Pathanamthitta town. The water quality analysis report at the Kallarakadavu station is illustrated in Table 25.1. The analysis indicates that the water in this stretch of the River Achankovil belongs to Class C (drinking water source suitably used after conventional treatment and disinfection) as per CPCB water quality criteria.

Table 25.1 Water quaiity test result at Kallarakadavu Station

Components	Value			
	Max	Min	Mean	Std.Dev
pH	8.2	6.4	6.9	0.5
EC µmhos /cm	244	79	155	62
DO mg/l	7.4	6.1	7.0	0.5
BOD mg/l	1.7	0.4	1.2	0.4
TC MPN/ 100ml	1200	810	976	142
FC MPN/ 100ml	330	20	198	99

Source: Water and Air Quality Directory 2023, Kerala PCB

Continued monitoring and appropriate pollution control measures are necessary to preserve and enhance water quality in river Achankovil (Figure 25.2)



Figure 25.2 River Achenkovil in Pathanamthitta

25.1.3 Ground Water Quality

In order to assess the present ground water quality, one borewell in Pathanamthitta town was considered. The Location details of the well along with the analysis results of available parameters are presented in Table 25.2. The results revealed that all the parameters were

within the permissible limits as prescribed by IS 10500:2012 standards for drinking water quality.

Table 25.2 Ground Water quality of well near Pathanamthitta Govt. Hospital

Parameter	Value	Permissible Limits (As per IS 10500:2012)
pH	7.01	6.5-8.5
EC in us/cm at 25oC	194	--
TH as CaCO3	50	200
Calcium (mg/L)	17	75
Mg(mg/L)	1.9	30
Na(mg/L)	1.3	--
K(mg/L)	8.9	--
CO3(mg/L)	0	--
HCO3(mg/L)	44	--
SO4(mg/L)	20	200
Cl(mg/L)	16	250
F(mg/L)	0.12	1
NO3 (mg/L)	4.3	--
Cu (mg/L)	ND	0.05
Cd (mg/L)	0	0.003
Fe (mg/L)	0.001	0.3
Zn(mg/L)	ND	5
Li (mg/L)	0.015	--
Ni (mg/L)	0.16	0.02
Mn(mg/L)	ND	0.1
Cr (mg/L)	ND	0.05
Pb (mg/L)	ND	0.01

Source: Aquifer mapping and Management of Ground water resources-by CGWB -2019

25.1.4 Noise Pollution

The intensity of noise pollution in the town is significantly lower compared to other towns. This is largely because there are no major industries contributing to noise pollution. The primary source of noise in the town is from motor vehicles. However, the number of vehicles and the level of traffic congestion are both minimal compared to other towns, resulting in reduced noise levels. In addition, the town's proximity to forests, rivers, and open landscapes naturally absorbs and diffuses noise, enhancing acoustic comfort.

25.1.5 Land Pollution

Generally land pollutions in the towns of Kerala is influenced by improper waste management. Pathanamthitta town follows a proper waste management plan. So, majority of the bio and non-biodegradable waste produced in the town are properly managed. While the town largely avoids widespread land pollution, there are instances of illegal dumping in a few isolated areas. These activities, though limited in scale, underscore the need for continued public awareness, strict monitoring, and enforcement to ensure complete compliance with waste disposal norms. The town’s relatively low population density and absence of large-scale industries also contribute to the minimal generation of hazardous or industrial waste. So there is no major land pollution activities in the town.

25.2 Ecologically Sensitive Areas

Wetlands, rocky areas, sacred groves, and natural water bodies are the major ecologically sensitive areas in Pathanamthitta town's (Figure 25.3) due to their environmental, cultural, and biodiversity value. Each of these areas plays a vital role in sustaining the town’s ecosystem and maintaining its ecological balance.

25.2.1 Wetland

Wet agricultural areas/ paddy lands and low-lying regions in Pathanamthitta town comes under wetland category. There is a narrow continuous chain of wetland in the town beginning from the northern boundary and extending towards town centre in between the hilly stretches and lying around ring road and finally continues to river. These along with drains acts as a strong natural drainage system for the town and act as a protective barrier from flood and drought.

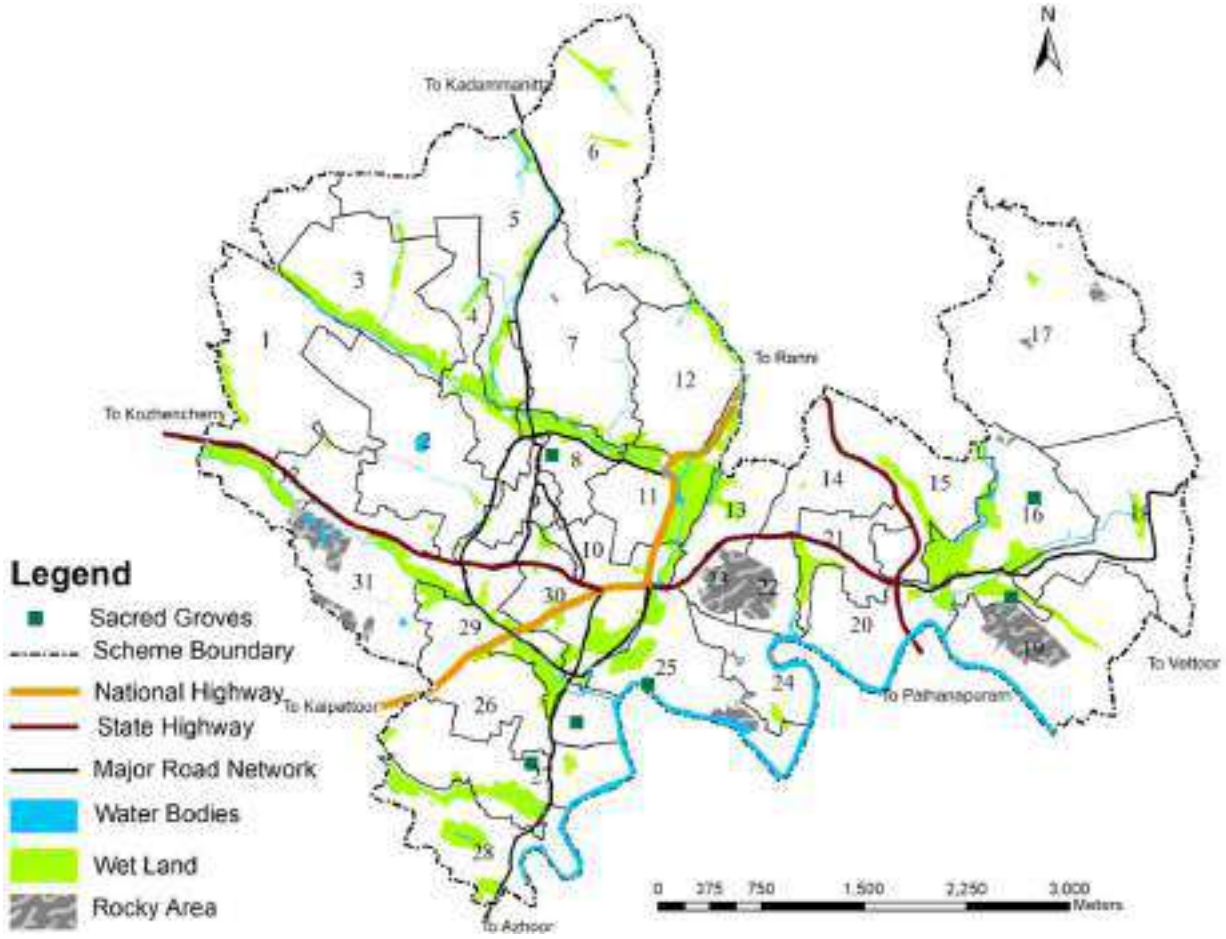


Figure 25.3 ecologically Sensitive Areas in the town

However, the conversion of these ecologically sensitive lands is notably prevalent. Significant transformations disturbing the continuity of narrow chains of wetland may disturb the drainage flow and cause severe flooding. These wetlands act as natural water filters, purifying water by trapping pollutants and sediment. They also help in flood control by absorbing excess water during heavy rains. These wetlands reduced the impact of flood 2018 in the town as they acted as retention basin/ room for river for storing the flood water. However, due to their delicate ecosystems, wetlands are highly vulnerable to pollution, encroachment, and land use changes.



Figure 25.4 Wetlands in the town

> റിംഗ് റോഡിനു ചുറ്റുമുള്ള വയലുകളെ സംരക്ഷിക്കണം. അവ നികത്തിയാൽ കൊടുന്തറ ഭാഗത്തുള്ള വീടുകളിൽ വെള്ളം കയറുന്നു [*The fields around the ring road should be protected. If they are converted, flood water will enter the houses on the Kodunthara side.]* - Public Opinion

The destruction or degradation of wetlands can lead to the loss of biodiversity, increased flooding, and reduced water quality. The major wetlands near Achankovil river act as protection from the riverine flooding.

25.2.2 Rocky areas

Rocky areas are sensitive to human activities such as quarrying, deforestation, and construction. Disturbances in these areas can lead to soil erosion, landslides due to altered land stability, loss of habitat, and reduced biodiversity. These areas also play a critical role in regulating local hydrology by influencing water flow and drainage patterns.



Figure 25.5 Chuttipara rocky hill

Town has many major and minor rocky areas, distributed across various parts of the municipality. Prominent among them are Chuttipara, Mannarmala, Kottapara, Pulikottapara, Villoonnipara, Pamboorippara, Chakkankkuzhypara and Kulavarikkappara. These larger rocky areas are primarily concentrated in the central parts of the town. Chuttipara and Kottapara holds cultural significant and tourism potential. In contrast, some other rocky areas have been subjected to quarrying activities in the past and currently remain unused, posing opportunities and challenges for future land use and conservation. As part of the natural landscape, rocky areas contribute to the region's geodiversity, and their ecological value is often overlooked. Preserving these areas is crucial to maintaining the balance of local ecosystems.



Figure 25.6 unused rocky area after quarrying

> ചെറുതും വലുതുമായ പാറകൾ പൊട്ടിക്കുന്നത് പരിസ്ഥിതി ആഘാതം ഉണ്ടാകാൻ സാധ്യത ഉണ്ട്. ആയതിനാൽ അവ സംരക്ഷിക്കണം. [*Breaking small and large rocks can have environmental impacts, so they should be protected.]* - Public Opinion

25.2.3 Sacred Grove

Sacred groves are small patches of forest traditionally protected by local communities due to religious or cultural beliefs. Sacred groves are ecologically sensitive because they are typically located in biologically rich areas, preserving cultural identity and beliefs and maintaining the ecological balance. They are threatened by

urbanization, encroachment, and deforestation. However, owing to traditional religious beliefs, sacred groves often remain protected and untouched by destructive human activities. Poovampara Malanada, Thundiyath Thamburan kavu, Kodumthara, Kottakkathu Sarppakavu, Madathil Kavu, Valamchuzhy etc. are prominent sacred groves and these are well protected by authorities and local people.



Figure 25.7 Sacred Grove in town

> കാവും കുളങ്ങളും സംരക്ഷിക്കുക. പച്ചത്തുരുത് പോലുള്ള പദ്ധതികൾ ആവിഷ്കരിക്കുക. [*Protect sacred grove and ponds. Develop projects like Pachathuru.]* - Public Opinion

25.2.4 Natural Water bodies

Natural water bodies, such as river, canal, and ponds, are critical components of the ecosystem in Pathanamthitta town.

25.2.4.1 River Achankovil

The Achankovil River is a key water source that sustains local agriculture, wildlife, and human populations. In addition to providing water for daily use, it supports aquatic life, including fish and amphibians. The river remains relatively protected from pollution due to the effective measures taken by municipal authorities and the active participation of local communities living along its course.



Figure 25.8 River Achenkovil

25.2.4.2 Natural Drains

Kannankara Thodu is the major drain in the town encircling the ring road through wetlands before discharging into the river Achenkovil. The width of the drain is varying from 5m to 15m. This drain serves as the natural drainage for storm water flowing towards Achankoivil River. This drain protects town centre from flooding and it drain's out storm water from town centre to the river. In certain stretches, the drains width has been reduced due to illegal encroachments. Conserving this canal and ensuring the

preservation of its uniform width is essential for maintaining effective stormwater management and ecological balance. Details of all other natural drainage system and location map are mentioned in chapter 15 'Drainage System'.

25.2.4.3 Ponds

Ponds are considered ecologically sensitive areas due to their vital role in supporting biodiversity and providing essential ecosystem services. Ponds support a variety of life forms, both aquatic and terrestrial, including fish, amphibians, invertebrates (like insects), birds, and plants. Many species of frogs, insects (such as dragonflies), and birds depend on ponds for breeding, feeding, and shelter. Ponds play an essential role in managing local water cycles by storing water during rainy seasons and releasing it gradually, reducing the risk of floods. They help maintain groundwater levels by replenishing the surrounding aquifers. They help moderate the local climate by maintaining humidity levels and preventing extreme temperature fluctuations, which is particularly important in areas with hot summers or cold winters. There are fifty ponds in the town, out of which 17 are under public ownership. The size of these ponds ranges from 2 cents to 10 cents. Currently the ponds in the town are generally well-managed and less polluted and no significant instances of waste dumping. locations map is mentioned in chapter 15 'Drainage System'.

> തോടുകളുടെ വീതിയും ആഴവും കൂട്ടി സ്വാഭാവിക ഒഴുക്ക് സംരക്ഷിച്ചു നഗരത്തിലെ വെള്ളപ്പൊക്ക സാധ്യത കുറയ്ക്കുക [*Reduce the risk of flooding in the city by increasing the width and depth of canals and preserving natural flow.]* - Public Opinion

25.3 Conservation efforts

Two approaches to conserving ecologically sensitive areas of the town are legal protection through legislation and dedicated conservation projects.

Acts and legal frameworks provide formal protection to ecological sensitive areas. They create a structured, enforceable system that safeguards the environment. Under Environment Protection Act, 1986, government can declare areas as "ecologically sensitive" and regulate human activities within those areas. The act gives the government the authority to impose restrictions on land-use change, pollution, and construction to preserve biodiversity. Kerala Conservation of Paddy Land and Wetland Act, 2008, aimed at protecting and conserving paddy fields and wetlands in the State of Kerala. This act came into force as a response to the widespread reclamation of paddy lands for non-agricultural purposes, such as construction and urban development, which was leading to the loss of crucial ecosystems and biodiversity. The Act primarily focuses on preserving paddy lands and wetlands, ensuring their sustainable management, and curbing their conversion for urbanization.

Published master plan of Pathanamthitta town in 1995 also conserved the wetland/low laying areas and natural water bodies of town from urban development through zoning regulations.
Conservation projects focus on repairing and rehabilitating degraded ecosystems in ecologically sensitive areas. These projects aim to restore the original biodiversity, functionality, and resilience of the ecosystem.Conservation projects are done by Pathanamthitta Municipality on yearly basis. It includes physical removal of debris, plastics, and other waste materials that accumulate in canals and water bodies. This helps prevent blockages and further pollution. Planting vegetation along the ring road and canal banks to reduce soil erosion and prevent sedimentation, which can degrade water quality and habitat for aquatic species. Removing excess sediment from the bottom and side protection of Kannankara thodu to restore

their depth and improve water flow. This also helps in preventing flooding by increasing the water retention capacity.

25.4 Impact of Hazard & Climate Change

As per the guideline for preparation of risk informed master plan for the town, assessing environment related vulnerabilities of the town is included in the category of Environmental vulnerability. 10% weightage is given to environmental vulnerability out of all six-vulnerability assessment and following are the sub parameters and its weightage included:

1. Sensitive Areas (60%)
2. Heritage Areas (40%)

Vulnerability of these two sub parameters in flood and landslide hazard prone area of the town is analysed in this chapter. As town has no heritage areas in the hazard prone areas, the value assigned for heritage areas vulnerability is incorporated with sensitive areas vulnerability. The varying degrees of vulnerability **(**low**,** moderate, and high vulnerable areas) has been identified in each cadastral based on value assigned as per guidelines of risk informed master plan. For environmental vulnerability in flood and landslide prone area, cadastral level percentage of area of ecologic importance is analysed. The following Table 25.4 shows the criteria and its value adopted for this analysis. This inference is incorporated in the chapter 4 to find out the total vulnerability and risk of the town.

Table 25.3 Criteria and its value adopted for environmental vulnerability analysis (Area of ecological importance)

Criteria	Value
>25% area is of ecological importance	6
0-25% area is of ecological importance	4
<10% area is of ecological importance	2

Source: Guidelines for Risk Informed Master Plan

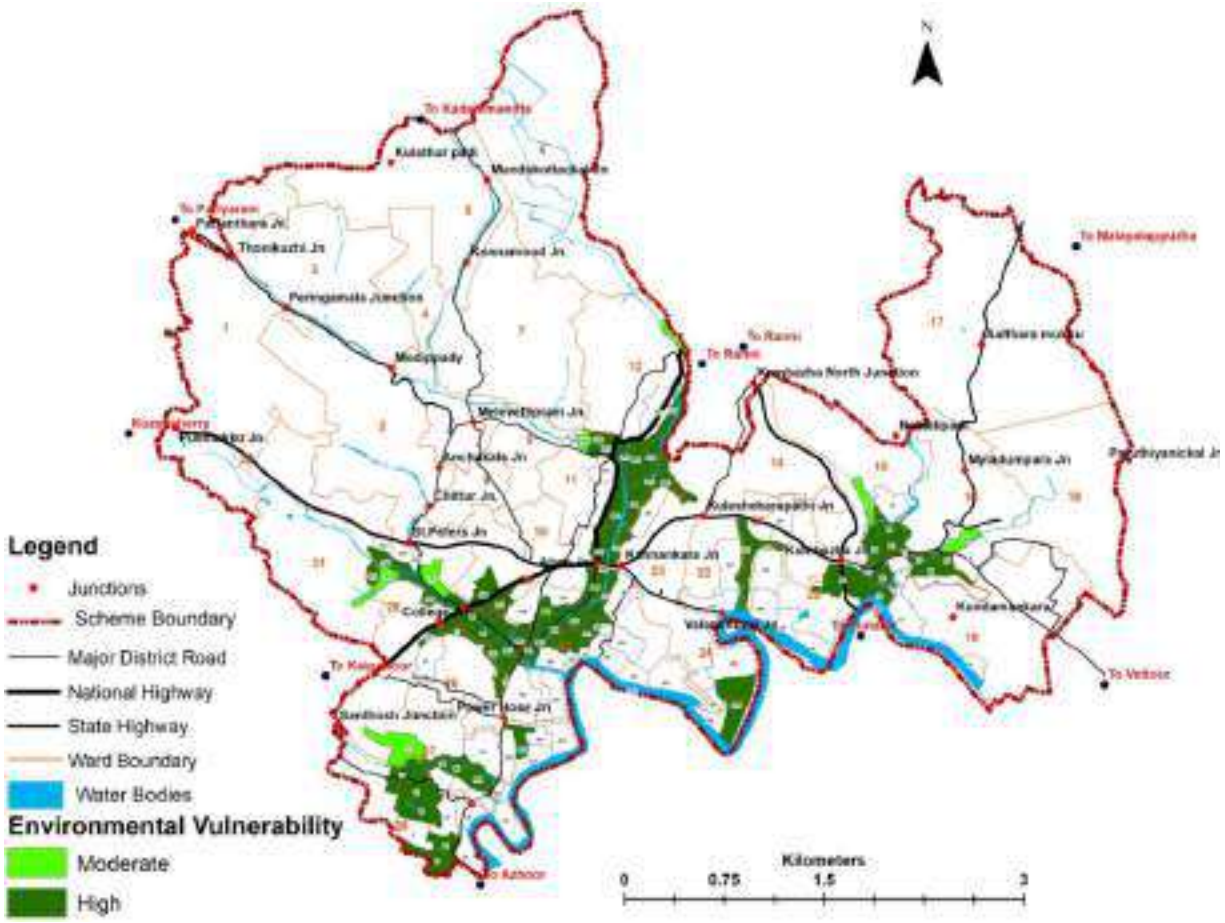


Figure 25.9 Cadastral level environmental vulnerability in flood prone area

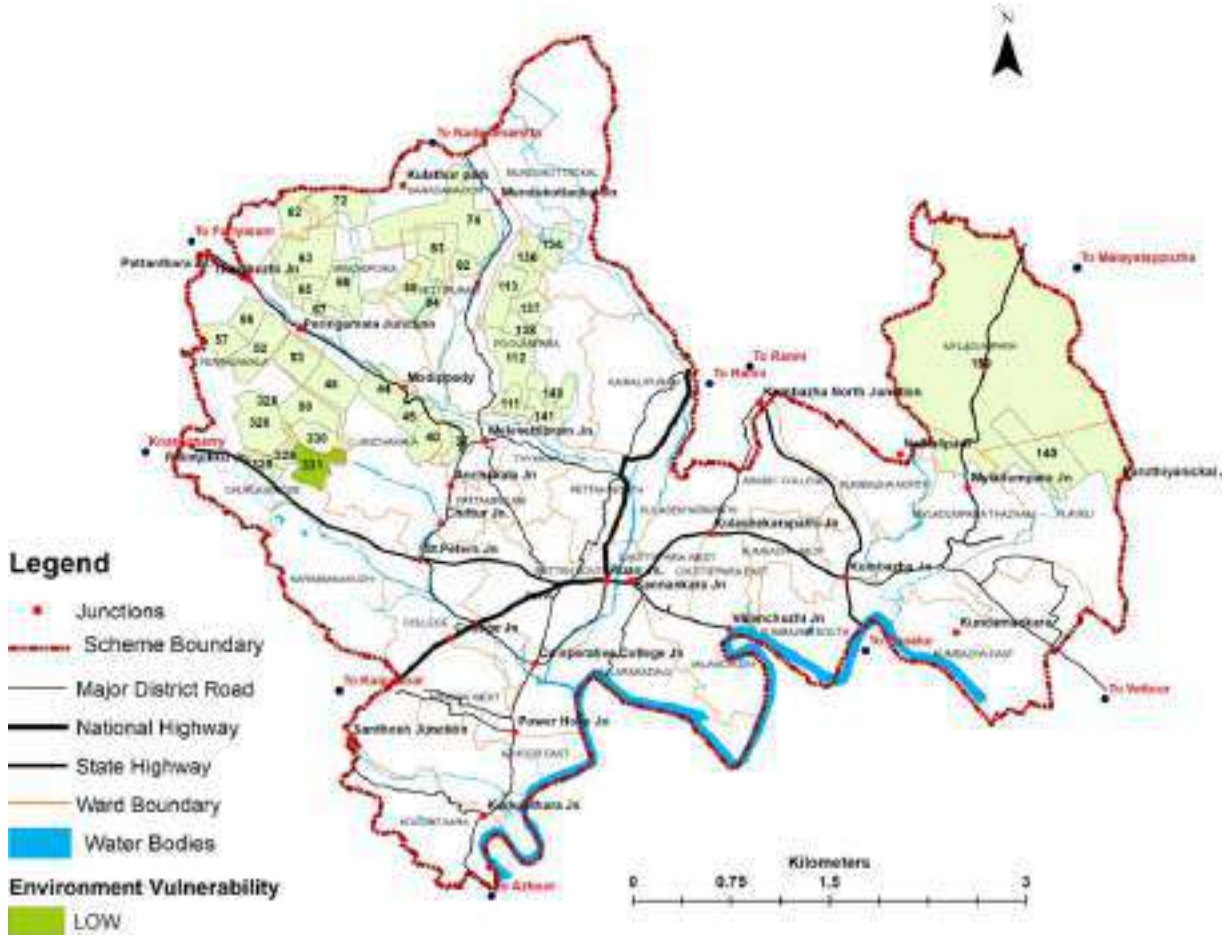


Figure 25.10 Cadastral level environmental vulnerability in landslide prone area

25.4.1 Flood Vulnerability

The percentage of areas of ecological importance in the flood prone area of the town at cadastral level is analysed here. From the socio-economic survey, it is identified that45.6% cadastral units in the flood prone do not come under environmental vulnerability as these cadastral do not possessing ecological importance areas. (Figure 25.9). The remaining cadastrals in the flood prone area show moderate to high environmental vulnerability as the percentage of area of ecologic importance in each cadastral is more than 10%.

25.4.2 Landslide vulnerability

The percentage of areas of ecological importance in the landslide prone area of the town at cadastral level is analysed here. The socio-economic survey identified that only one out of 38 cadastral units contains ecologically important areas. However, this unit is categorized as having low environmental vulnerability, as the ecologically significant area constitutes less than 10% of its total extent. (Figure 25.10)

25.5 Problems and Potentials

Wetlands and rocky hill area are distributed close to the urban area which naturally restrict extensive urbanization in the town's core. But for the sustainable development and resilient, conservation and preservation of these ecological sensitive areas are necessary. Considering the flood and landslide hazard risk, protection of all environmentally sensitive areas of the town through appropriate protective measures is necessary and should be treated as a high priority. Although these environmentally sensitive areas limit urbanisation, non-built recreation activities can be promoted in these areas to generate economic benefits while ensuring the conservation of nature.

25.6 Inference

While Pathanamthitta faces notable environmental challenges such as unregulated development, and pressure on natural resources, it also presents significant opportunities for sustainable transformation. The town's rich natural heritage—comprising wetlands, rivers, sacred groves, and green hilly areas—offers a strong foundation for ecological conservation. By adopting eco-friendly practices, promoting sustainable tourism, and investing in green infrastructure, Pathanamthitta can move towards a more resilient and environmentally responsible future.



26. ADMINISTRATION & FINANCE

The administration of a municipality involves several key aspects and functions to ensure effective governance and service delivery to residents. The main components of municipal administration are Elected Bodies, Finance and Budgeting, Departments and Divisions, Public Services, Infrastructure and Development, Community Engagement and Grievance Redressal, Legal and Regulatory Compliance, Inter-Governmental Relations, Transparency and Accountability.

Effective coordination between administration and spatial planning is essential for achieving sustainable and inclusive urban development in municipalities. Spatial planning provides the framework for policies by determining land use patterns, zoning regulations, and development controls. By aligning policies, infrastructure investments and community priorities, municipalities can create well-planned, livable environments that support economic vitality and social equity.

Contents

1 Development Administration

2 Municipal Finance

3 Existing Sources of Funds

4 Inference

26.1 Development Administration

The adoption of 74th Constitutional Amendment Act has paved the ways and means for independent functioning of local bodies. This act makes election to the urban local government mandatory, in addition to greater devolution of administrative and financial powers.

The governance of the Municipality consists of two Wings i.e., the Administrative Wing and the Executive Wing.

26.1.1 Administrative Wing

Municipal Council is a fundamental part of the local governance structure by ensuring representation, participation, and accountability in municipal governance. It serves as a platform for citizens to voice their concerns, contribute to decision-making processes, and influence policies that affect their daily lives.

The Municipal Council is composed of elected representatives known as councillors. Councillors are elected by the residents of the municipality from different wards or constituencies. The number of councillors in a Municipal Council varies depending on the size and population of the municipality. Each councillor represents a specific ward within the municipality. The number of wards and councillors in a municipality is determined based on population density and other demographic factors. The Municipal Council is presided over by the Chairperson, who is elected from among the councillors. The Chairperson's role is to lead the council meetings, facilitate discussions, and represent the municipality in various forums.

26.1.1.1 The Elected Council of Pathanamthitta

There are 32 wards in Pathanamthitta Municipality in which 14 wards are reserved for women, 3 wards for reserved Scheduled Caste and 2 wards reserved for Scheduled Caste Women in election. The elected council consists of 32 members, which includes 17 women members. The Chairperson who is the head of the council has been elected from the elected members of the council. The Vice-chairperson is also elected by the council members to assist the chairperson and discharge the duties of chairperson in the absence of Chairperson.

26.1.1.2 Functions of the Municipal Council

Pathanamthitta Municipality is the major agency implementing development works within Pathanamthitta municipal limit. The development works under the responsibility of Pathanamthitta Municipal Council includes, the construction of Municipal roads and their maintenance, Public health - Primary health centre, Community health centre, Solid waste disposal, Construction of public market and their maintenance, Public cremation ground and its construction procedures, Open spaces, parks and their construction works, Providing infrastructure in slums, Protection of common ponds, maintenance of the institutions transferred to the Municipal Council such as Schools, Hospitals and other institutions.

26.1.1.3 Standing Committees

There are six standing committees to assist the Municipal council in respective fields. They are Taxation - Finance, Development, Welfare, Health, Education- Arts – Sports and Public works. The standing committees consist of four to six members. The vice- Chairperson is the Chairman of the Finance standing committee and the members of the council elects the chairpersons of other standing committees.

26.1.1.4 Steering Committee

Steering Committee consisting of the Chairperson, Deputy Chairperson, and Chairmen of Standing Committees and Chairperson shall be the Chairman of the Steering Committee. Co-ordinate and monitor

the functioning of the Standing Committees are the functioning of Steering Committee.

26.1.1.5 Ward Sabha

In every Municipality where the population does not exceed one lakh, there is a Ward Sabha for each of its Ward and all persons included in the electoral roll of that ward will be members of that Ward Sabha.

Ward Sabha" refers to a forum or assembly comprising residents of a specific ward within a municipality or local self-government institution. The Ward Sabha is a significant element of participatory democracy, aiming to promote grassroots democracy, transparency, and citizen engagement in local governance. The Ward Sabha serves as a platform for residents of a particular ward to come together, discuss local issues, and participate in decision-making processes affecting their community. It facilitates direct interaction between elected representatives (like councillors) and the residents they serve. The Ward Sabha meet at least once in three months at a specified place. Topics discussed may include local development projects, infrastructure needs, public services, environmental concerns, and community welfare initiatives. Residents have the opportunity to express their views, propose solutions, and prioritize projects or initiatives for the ward. Ward Sabhas also serve as a feedback mechanism where residents can provide feedback on the functioning of the local government and its services.

26.1.2 Executive Wing

The executive wing is responsible for day-to-day operations of the municipality, and is headed by the municipal secretary, who is appointed by the Government and supported by the following seven sections with government officials. Organizational structure of Pathanamthitta Municipality is shown in Figure 26.1

1. General Administration section
2. Revenue & Account section
3. Engineering & Town Planning section
4. Public Health section
5. Mother & Child Care Section
6. Sanitation Section
7. Education Section



Figure 26.1 Organisation Structure of Pathanamthitta Municipality

Source: Budget 2023-24, Pathanamthitta Municipality

> എല്ലാ വാർഡുകളിലും വാർഡ് ഭവൻ സ്ഥാപിക്കുക [*Establish ward bhavans in all wards]* - Public Opinion

26.2 Municipal Finance

The chief sources of revenue of ULBs are grants devolved as per recommendations of State Finance Commission and own revenue of municipality comprising tax and non-tax revenue and other revenue.

The LSGs allocate their funds mainly in three sectors viz. productive, service and infrastructure. The productive sector includes sub sectors such as agriculture, animal husbandry, dairy development irrigation, industry, energy conservation, fisheries etc. Social welfare and service sector is the major sub sector under, which the local governments set apart a major source of Plan allocation.

The major service sector expenditure incurred by local governments include housing, education, sanitation and waste management etc. and these investments play a crucial role in local public governance. The service sector priorities of local governments enhance the quality of basic services provided to the public through welfare oriented programmes. Infrastructure sector activities includes street lighting, transportation, and construction activities etc.

The funds available to the LSGIs are classified in various ways as per different Government Orders and Reports issued from time to time. The receipts of the LSGIs are classified into four groups: grant-in-aid, loan, own funds and other receipts.

GRANT IN AID -

Category A - Grant to Decentralized Plan
Category B - State sponsored Scheme
Category C - General & Maintenance Grant
Category D - Centrally sponsored Scheme

LOAN -

Category E- Loan from World Bank/ADB

OWN fund -

Category F - Own revenue

Other receipts-

Category G - Receipts from other sources

Category 'A' funds are Plan funds provided by the State Government from the State Annual Plan Outlay to carry out the projects relating to the functions transferred to, and formulated by, the LSGIs under People's Plan Campaign now renamed as Kerala Development Plan. Category 'B' funds consist of Plan and Non-plan funds for implementation of State schemes transferred to LSGIs and State share of Centrally Sponsored Schemes. Category 'C' funds are Non-plan grants provided by the State Government to meet the expenditure on maintenance of assets of LSGIs. Funds were provided separately for the maintenance of road and non-road assets under separate heads of accounts. Category 'D' funds consist of grants received from Government of India for implementation of Centrally Sponsored Schemes. Category 'E' funds consist of funds from World Bank, Asian Development Bank etc.

Category 'F' funds consist of tax and non-tax revenue of LSGIs which are also known as 'Own Funds'. Property tax, Profession tax, Entertainment tax, Advertisement tax and Timber tax constitute tax revenue. Non-tax revenue consists of licence fees, registration fees, etc, leviable under the Acts. This category also includes income derived from assets of LSGIs, beneficiary contributions, earnest money deposits, retention money etc.

Category 'G' funds consist of all other funds which do not come under any other category.

26.2.1 Structure of Municipal Revenue

Tax, Non-Tax, General Purpose fund, Plan Grants, Non Plan Grants, Capital Income-Loans, and Capital Income- other than Loans are the source of revenue of Pathanamthitta Municipality (Figure 26.2.)

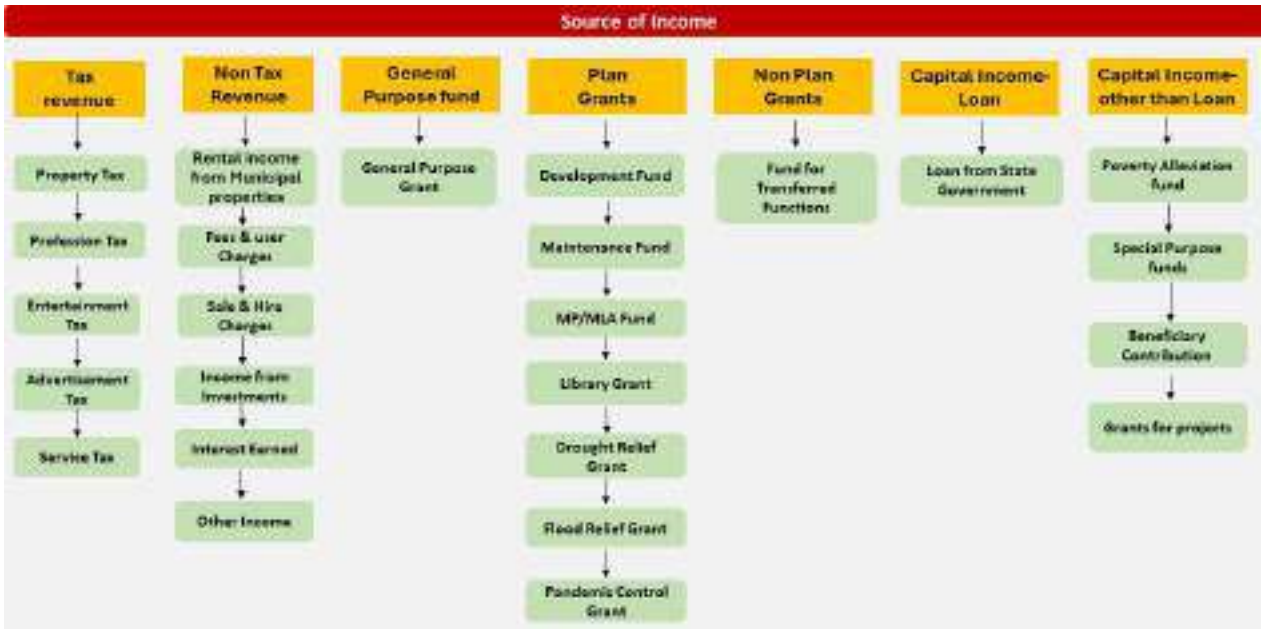


Figure 26.2 Source of income structure of Pathanamthitta Municipality

Source: Budget 2023-2024 Pathanamthitta Municipality.

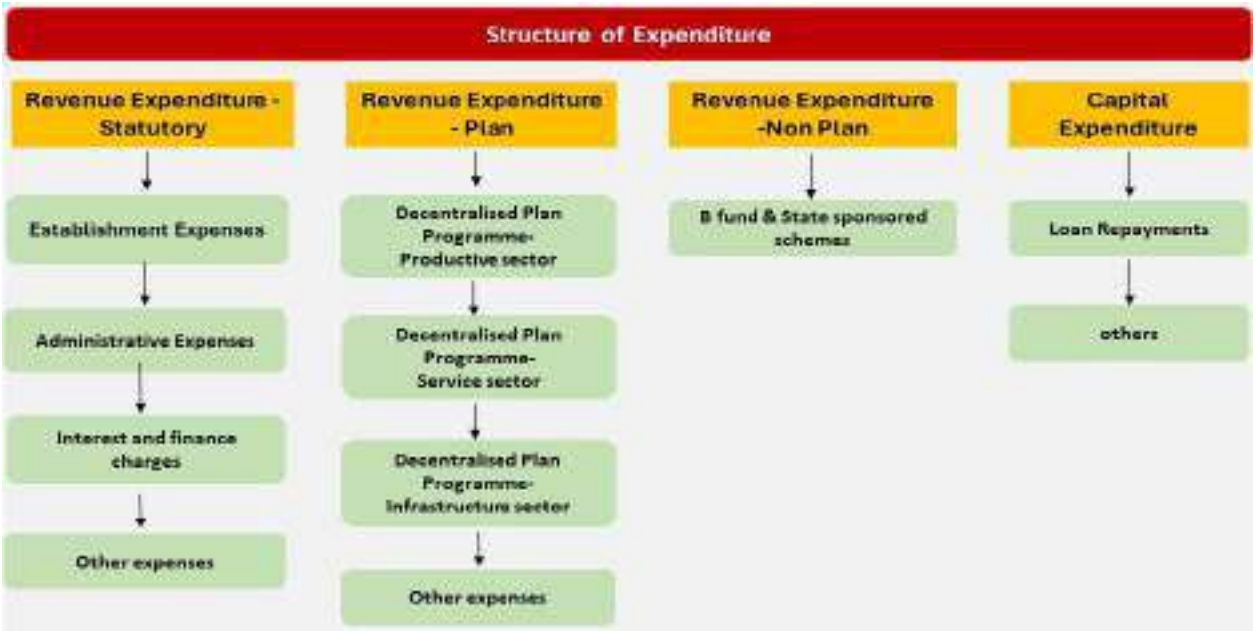


Figure 26.3 Structure of expenditure pattern of Pathanamthitta Municipality.

Source: Budget 2023-2024 Pathanamthitta Municipality.

26.2.2 Structure of Expenditure Pattern

The expenditure incurred by Municipality is categorised into Revenue expenditure and Capital expenditure. Establishment expenditure, Administrative expenditure, Operations and maintenance expenditure and Interest payments on loans are comes under Revenue expenditure category. Capital expenditure comprises of expenditure on capital formation and principal repayment. (Figure 26.3)

26.2.3 Income & Expenditure of Pathanamthitta Municipality

The receipts of the municipality has been grouped and described as in table 26.1. Total Income of Pathanamthitta Municipality is largely contributed by Tax Revenues and Revenue Grants, Contributions & Subsidies, accounting

Table 26.1Income & Expenditure of municipality

Sl .No	Financial Year	2020-21	2021-22	2022-23	2023-24
	Income				
1	Own Fund				
	Tax Revenue	5,95,90,207	5,46,20,747	6,72,78,556	8,63,65,047
	Non Tax Revenue	3,14,18,940	3,19,50,339	2,27,80,230	4,59,75,850
2	General Purpose Fund	1,90,00,000	2,02,54,000	1,85,18,000	2,27,32,800
3	Other Grants(Plan)	22,83,33,000	10,30,26,426	11,65,76,520	13,26,57,412
4	Other Grants(Non Plan)	9,50,00,000	8,59,05,900	6,11,62,900	6,91,89,720
5	Capital Income- Loans	0	0	1,00,00,000	1,00,00,000
6	Capital Income other than loans	5,43,45,000	7,22,23,938	8,95,54,334	8,38,72,248
	Total Income	**48,76,87,147**	**36,79,81,350**	**38,58,70,540**	**45,07,93,077**
	Expenditure				
1	Revenue Expenditure				
	Statutory functions	11,40,10,198	10,23,24,182	8,06,03,271	9,41,32,982
	Plan	20,39,85,000	8,15,66,142	17,06,68,610	21,37,91,390
	Non Plan	9,50,00,000	8,59,98,300	6,11,62,900	6,91,89,720
2	Capital Expenditure				
	Loan Repayment	1,50,00,000	0	50,00,000	80,00,000
	Other than loan repayment	3,27,50,000	4,23,16,697	5,40,43,414	8,10,52,055
	Total Expenditure	**46,07,45,198**	**31,22,05,321**	**37,14,78,195**	**46,61,66,147**
	Gross surplus/Deficit of income over expenditure	**2,69,41,949**	**5,57,76,029**	**1,43,92,345**	**-1,53,73,070**

Source: Budget 2020 to 2024 Pathanamthitta Municipality.

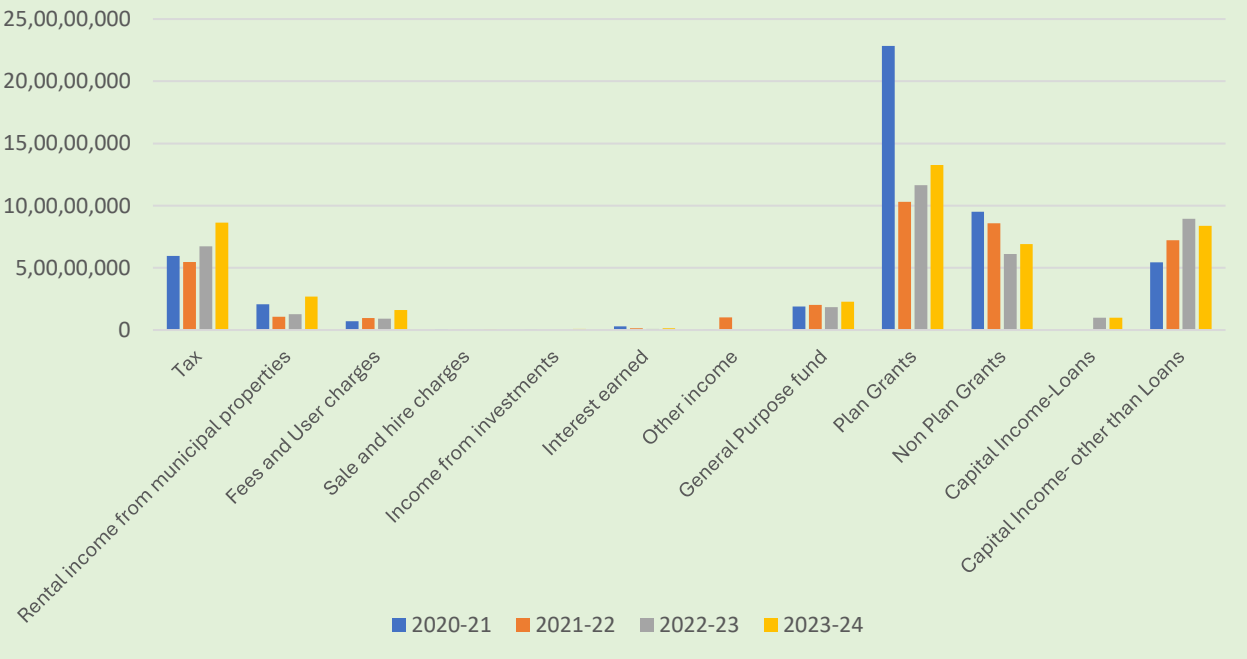


Figure 26.4 Four year source of income structure of Pathanamthitta Municipality (in rupees)

Source: Budget 2020 to 2024 Pathanamthitta Municipality.

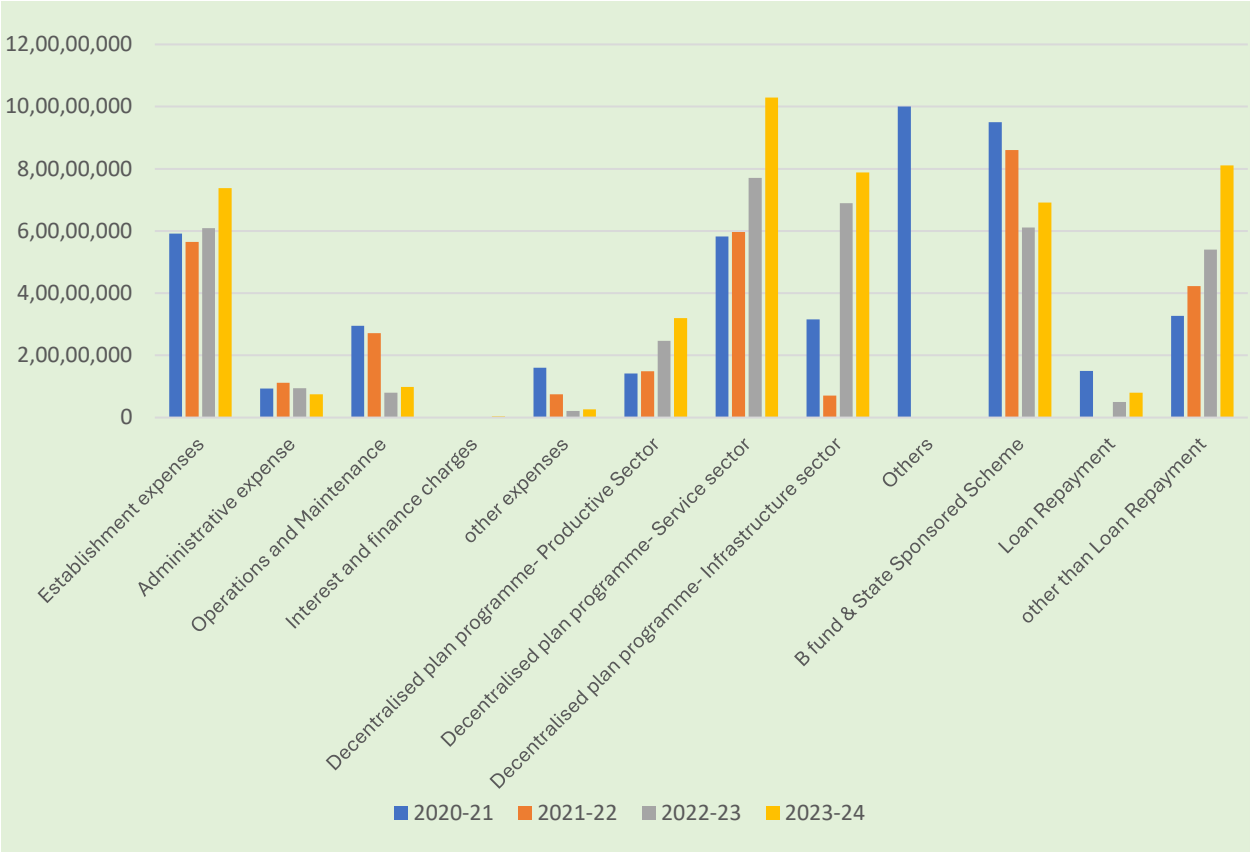


Figure 26.5 Four year expenditure structure of Pathanamthitta Municipality (in rupees)

Source: Budget 2020 to 2024 Pathanamthitta Municipality.

for more than 80% of the total revenue income during the last four years. Overall, the total revenue of Pathanamthitta Municipality has been increasing year by year (Figure 26.4). Total expenditure is mainly incurred towards Programme Expenditure & Establishment Expenditure. Programme Expenditure mainly consists of social and welfare programmes like implementing housing programmes, development fund programmes for social welfare etc. Establishment Expenditure, the second largest contributor to revenue expenditure, primarily consists of salaries & wages, travelling allowances and contribution to Pension Fund (Figure 26.5).

> മുനിസിപ്പൽ സബ് ഓഫീസ് കുമ്പഴയിൽ സ്ഥാപിക്കണം [*A Municipal sub-office should be established in Kumbazha area*] - Public Opinion

26.3 Existing Sources of funds

In the beginning of the twelfth Five-Year Plan some changes were made by government in the Plan guidelines, mainly in sectoral ceilings and project appraisal. In case of infrastructure sector, the mandatory ceiling was fixed at 45 per cent in Grama Panchayats and Block Panchayats, 55 per cent in Municipalities and Corporations and 50 per cent in District Panchayats under general sector outlay. In addition, mandatory minimum allocation of 20 per cent under productive sector, minimum allocation of 10 per cent for sanitation, 10 per cent of the development fund was mandatorily earmarked for Women Component Plan and 5 per cent to children, old age, differently abled, palliative care and other vulnerable groups.

26.3.1 Annual Plan Scheme

Decentralised planning by LSGIs introduced in the State from 1997-98 with devolution of 35 to 40 per cent of State Plan funds envisaged

identification of local development problems, prioritisation and formulation of plans and their implementation with people's participation. Section 175 of the Kerala Panchayat Raj Act (KP Act) 1994 and section 51 of the Kerala Municipality Act (KM Act) 1994 provide that the three tier Panchayats, Municipalities and Corporations are to prepare every year a Development Plan for the succeeding year and submit to the District Planning Committee (DPC) for approval. The Grama/Ward Sabhas decide the priorities in planning and select beneficiaries for beneficiary oriented schemes.

Local Self Government Institutions are provided Plan Allocation in two different streams. They are;

I. Plan Allocation for Centrally Sponsored Schemes and State Sponsored Schemes

II. Plan Allocation for Local Development (Development Fund)

The guidelines for Centrally Sponsored Schemes are formulated by the Central Government and for State Sponsored Scheme, the State Government. The role of the LSGIs under this stream is to act only as an agency for executing the scheme after deciding the location or beneficiaries of the scheme.

For Development Fund stream, the LSGIs have full freedom in formulating and implementing schemes after deciding their priority subject to a general overall framework. Basic minimum needs in terms of housing, sanitation, water supply, power connection and physical connectivity of an Urban Local body is addressed through this.

26.3.2 Members of Parliament Local Area Development Scheme (MPLADS)

Under the scheme, each MP has the choice to suggest to the District Collector for works to the tune of Rs.5 Crores per annum to be taken up in his/her constituency. The Rajya Sabha Members of Parliament can recommend works in one or more districts in the State from where he/she has been elected. The Ministry has issued the guidelines on MPLADS Scheme including implementation and monitoring of the scheme.

26.3.3 MLA- Legislative Assembly Constituency Asset Development Fund (LACADF)

This scheme aims at creating durable assets for which each MLA will be allocated 5 Crore during a particular financial year for undertaking capital works in his/her constituency so as to improve infrastructural facilities in all the Assembly Constituencies. Asset means fixed assets for long term uses like buildings, roads, bridges, water supply, sanitation, irrigation, infrastructure, machinery and equipment and fixtures of permanent nature that forms part of infrastructure facilities of Government essential for imparting effective service to the citizens.

Major works of the choice of the MLA concerned will be taken up subject to the condition that the cost of works proposed during a year shall not exceed 5 Crore. The LAC-ADF Scheme aims at the upliftment of infrastructure facilities under various Legislative Constituencies by creating durable physical infrastructure of capital nature.

26.3.4 MLA- Special Development Fund (SDF)

A Special Development Fund (SDF) is being allotted to the Members of Legislative Assembly of the State at the rate of Rs.25 lakhs per MLA per year.

26.3.5 Kerala Local Government Service Delivery Project (KLGSDP)

The objective of the Kerala Local Government and Service Delivery Project for India is to enhance and strengthen the institutional capacity of the local government system in Kerala to deliver services and undertake basic administrative and governance functions more effectively and in a sustainable manner. The project will have four components. Component one will provide Gram Panchayats (GPs) and

Municipalities with additional discretionary funds to provide increased resources for expanded local investment for the creation, maintenance and operation of capital assets in a manner which incentivizes the strengthening of their institutional capacity.

Component two will provide capacity-building inputs to strengthen and supplement the existing systems and human resource of Municipalities and GPs to enhance their institutional performance.

Component three will strengthen the system of performance monitoring of GPs and Municipalities in Kerala. Component four will support project management. The Project will benefit 941 Grama Panchayats (GPs) and 87 Municipalities in the State. Investments made by the GPs and Municipalities will indirectly benefit the entire population of the State outside the six City Corporation areas.

26.3.6 AMRUT (Atal Mission for Rejuvenation and Urban Transformation)

AMRUT is a Centrally Sponsored Scheme under Ministry of Urban Development, Government of India. Purpose of AMRUT is to create infrastructure to provide basic services and to build amenities to households. This will improve the quality of life of all, especially the poor and the disadvantaged. The infrastructure should lead to provision of better services to people. Mission components are water supply, sewerage facilities, septage management, storm water drains to reduce flooding, Pedestrian, non-motorized and public transport facilities, parking spaces and enhancing amenity value of cities by creating and upgrading green spaces, parks and recreation centres especially for children.

26.4 Summary

Pathanamthitta Municipality plays a pivotal role in providing essential infrastructure and civic services to its residents. The Municipality's primary sources of revenue include grants, contributions, and subsidies, followed by a steadily growing stream of tax revenues—particularly from property tax and professional tax. These income streams have demonstrated consistent growth over recent years. On the expenditure side, the Municipality allocates a significant portion of its budget toward program implementation and establishment costs. Notably, financial management has improved over time, resulting in a progressively healthier fiscal balance. There is substantial potential for economic growth through the promotion of tourism, which can be strategically leveraged to enhance municipal revenues. The effective utilization of municipal assets and the implementation of innovative and sustainable projects will be key to ensuring long-term financial stability. Additionally, major upcoming regional infrastructure developments—such as the Greenfield Highway, Sabari Rail Corridor, and Sabari Airport—are expected to stimulate the local economy significantly. To further strengthen revenue stability, the Municipality can focus on promoting small-scale industries, revitalizing the agricultural sector, upgrading market infrastructure, and incorporating comprehensive disaster risk reduction strategies.



27 . COMMUNITY INVOLVEMENT

Community involvement is a vital component in the preparation of master plans, ensuring that development aligns with the needs and aspirations of local residents. Engaging the community in the planning process fosters a sense of ownership, enhances transparency, and leads to more informed decision-making. Local knowledge and lived experiences provide valuable insights into environmental concerns, infrastructure gaps, and social priorities, making the master plan more effective and inclusive. By incorporating participatory approaches such as Development Seminars, Focus group Discussions and stakeholder consultation planners can create resilient, sustainable, and people-centric urban spaces.

Community involvement is essential in risk-informed planning, ensuring that strategies for disaster resilience and climate adaptation are grounded in local realities. Engaging residents, local organizations, and stakeholders helps identify vulnerabilities, improve early warning systems, and develop practical mitigation measures. Community participation fosters awareness, enhances preparedness, and promotes sustainable practices that reduce long-term risks. This inclusive approach not only strengthens community resilience but also ensures that risk-informed plans are more effective, equitable, and widely accepted.

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1 Development Seminar

2 Stakeholder Consultation

3 Capacity Building

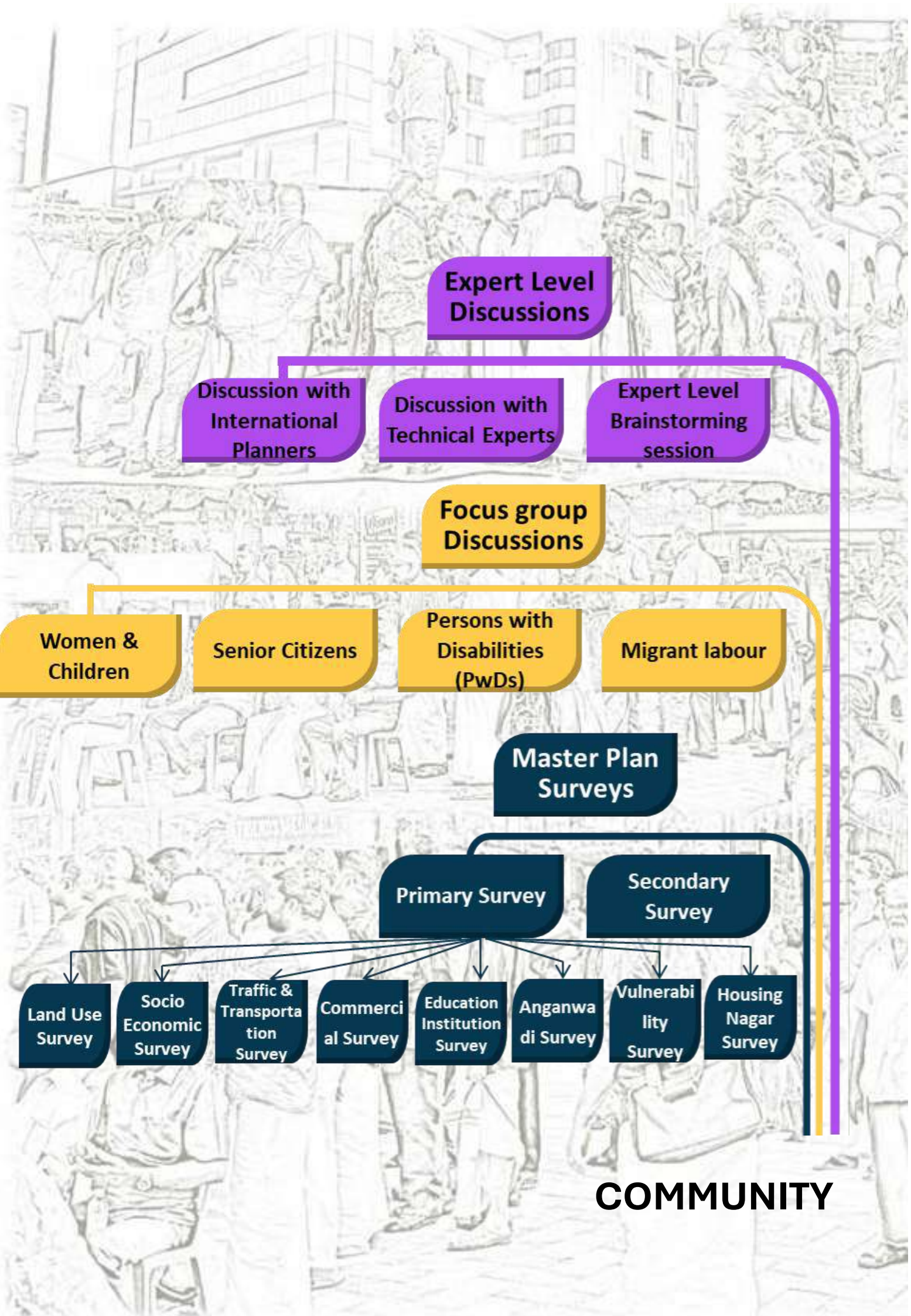
4 Focus Group Discussions

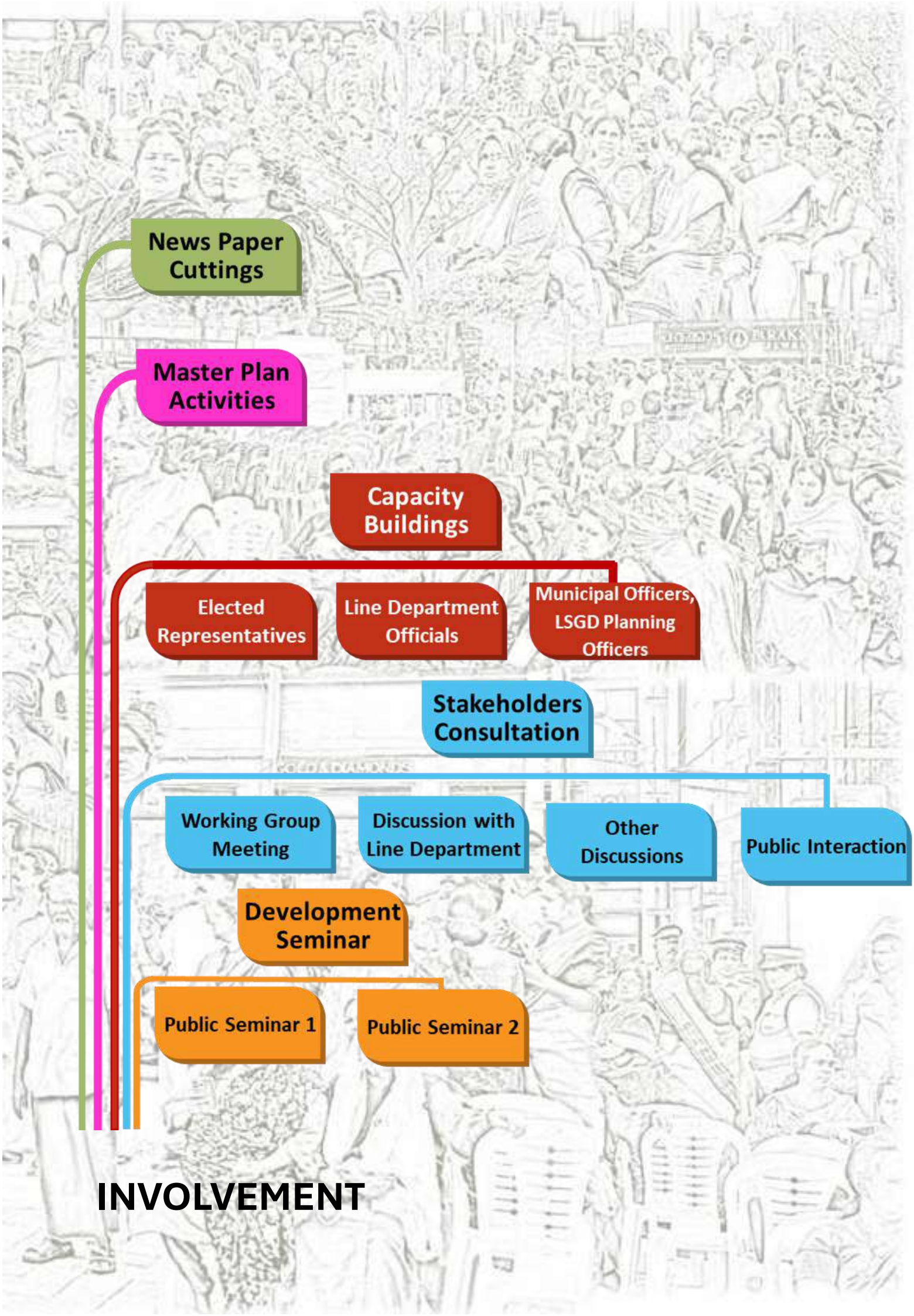
5 Expert Level Discussions

6 Draft Proposals Discussions

7 Public Interactions

8 Master Plan Activities


Expert Level Discussions
Discussion with International Planners
Discussion with Technical Experts
Expert Level Brainstorming session
Focus group Discussions
Women & Children
Senior Citizens
Persons with Disabilities (PwDs)
Migrant labour
Master Plan Surveys
Primary Survey
Secondary Survey
Land Use Survey
Socio Economic Survey
Traffic & Transportation Survey
Commercial Survey
Education Institution Survey
Anganwadi Survey
Vulnerability Survey
Housing Nagar Survey
COMMUNITY


News Paper Cuttings
Master Plan Activities
Capacity Buildings
Elected Representatives
Line Department Officials
Municipal Officers, LSGD Planning Officers
Stakeholders Consultation
Working Group Meeting
Discussion with Line Department
Other Discussions
Public Interaction
Development Seminar
Public Seminar 1
Public Seminar 2
INVOLVEMENT

27.1 Development Seminars

27.1.1 Public Seminar 1



Public seminar was organized as part of the preliminary steps toward the preparation of the Master Plan for Pathanamthitta, to ensure active community participation and gather valuable insights from stakeholders. The seminar served as a platform to discuss key urban development issues, understand local concerns, and initiate a data collection process for informed planning decisions.

Seminar Overview

The seminar was attended by a diverse group of participants, including community leaders, elected representatives, working group members and members of the general public. This inclusive gathering facilitated a broad discussion on various aspects of urban development and planning priorities for Pathanamthitta.

Objectives of the Seminar

1. To introduce the master plan process and its significance.
2. To engage local stakeholders in urban planning discussions.
3. To identify major concerns, opportunities, and challenges in the town.
4. To collect relevant data through structured forms for local analysis
5. To ensure transparency and public involvement in decision-making.

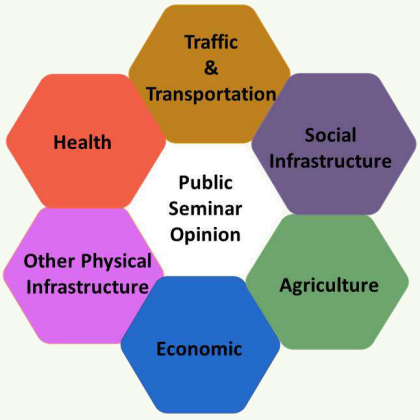
Key Discussions and Concerns Raised

During the seminar, participants actively voiced their opinions on several critical issues, including:

- Urban Infrastructure: Need for improved road networks, traffic management, and enhanced public transportation facilities.
- Recreational Facilities: Strong demand for parks, open spaces, and community recreation centers to improve the quality of life.
- Environmental Conservation: Emphasis on wetland protection, sustainable land use, and the importance of integrating green spaces into urban planning.
- Waste Management: Concerns over inadequate waste disposal systems and suggestions for better solid waste management strategies.
- Economic Development: Ideas on boosting local commerce, agriculture,tourism, and employment opportunities

















Data Collection and Local Analysis

To support evidence-based planning, a Data Collection and Local Analysis Form was distributed among the attendees. The form was designed to gather specific information on:

- Existing Facilities and infrastructure conditions.
- Socio-economic profiles of different neighborhoods.
- Environmental concerns and areas requiring conservation efforts.
- Public service accessibility, including healthcare and education facilities.
- Potentials and suggestions for future development and urban improvement projects.



27.1.2 Public Seminar 2



Public seminar for envisioning Pathanamthitta town and its future development based on the studies and analysis in the Draft master Plan was successfully conducted before the Envisioning studies in the master plan. The event brought together experts, community leaders, Elected representatives and residents to engage in an open discussion on the Town's developmental prospects. The session concluded with a consensus on the need for collaborative efforts among Govt local bodies and citizens to ensure balanced and progressive development. The outcomes of the discussions were compiled and incorporated in the report. The event was well received, highlighting the public's enthusiasm and commitment towards shaping better future for Pathanmthitta.

Public Seminar Announcement







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Presentation of Study and Analysis

Sectorial Studies and analysis results in the draft master plan were presented during the seminar and certain model projects detailing were also presented.

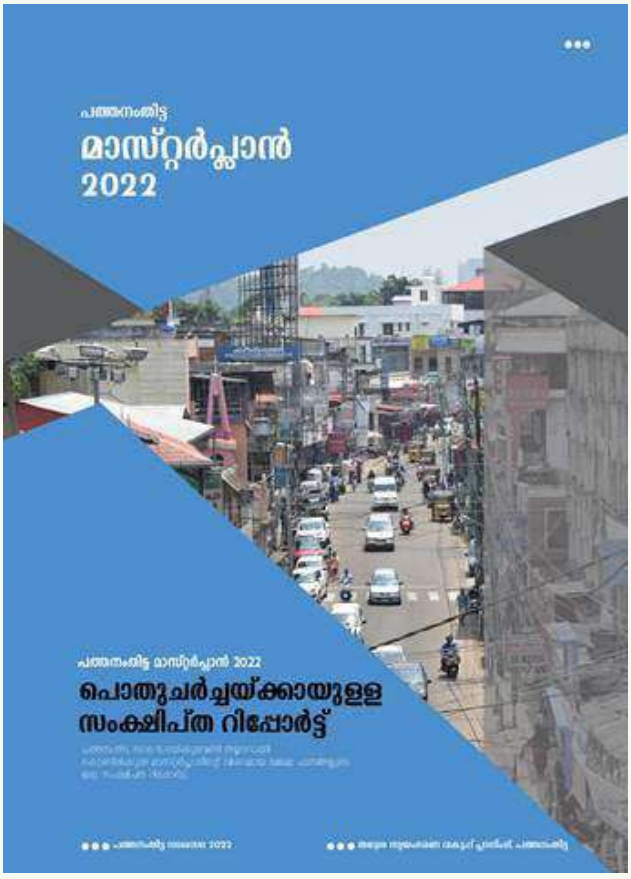






Distribution of Hand-outs

Hand-outs were distributed to the public summarizing the findings from sectoral studies and analyses. These leaflets, along with the presentation of the draft master plan's sectoral study results, aimed to raise awareness and encourage continued discussion beyond the seminar.









Open Discussion

An Open Discussion on future vision for development of Pathanamthitta town was conducted successfully. During the open discussion, attendees actively contributed ideas on how to enhance infrastructure facilities, new economy generating projects including tourism network, employment generation and the liveability of the town.

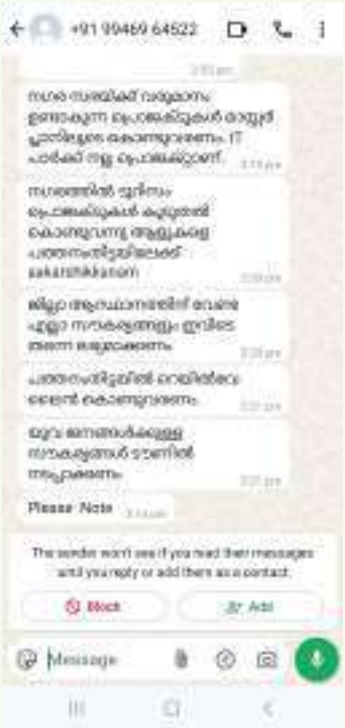




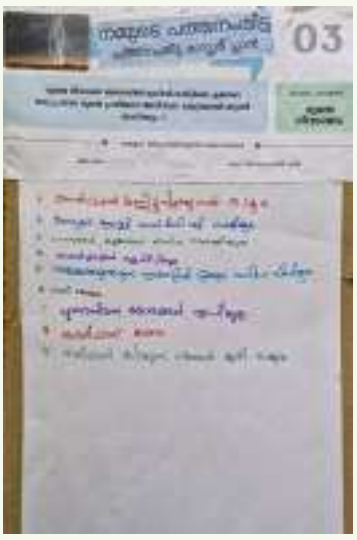
Sector wise Suggestions from Public

Channels of Public Suggestions











Public Suggestions



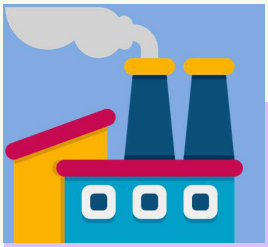
- The encroachment on the Pathanamthitta - Kumbazha road should be completely cleared. Facilities should be provided for those crossing the road in those parts to pass smoothly.
- Good Foot Path should be given near the Civil Station.
- The Outer Ring Road should be completed quickly and planned in such a way those heavy vehicles like trucks can pass through it.
- The Pathanamthitta-Kumbazha Road should be widened.
- Footpaths should be made mandatory on roads.
- The Ring Road should be made into 4 lanes.
- Arrange taxi parking outside the road carriageway and footpath.
- Find a place for a bus bay.
- Trading on the footpath should be avoided.
- The flyover should be extended to the Pathanamthitta Post Office road.
- If vehicles coming from kumbazha to Pathanamthitta turnaround from Kulasekharapathi and reach the town via the Edathavalam road, the congestion at Kannankara Aban Junction will be reduced.
- The road from Kannankara to the Central area should be widened.
- The parakkad line road in the 30th ward of Pathanamthitta has been included as a proposal. This road should be excluded from the proposal.
- Construct a tunnel passage from chuttippara to Kumbazha.
- Construct safe paths for pedestrians and cyclists on the sides of the Ring road
- One more bridge should be built in Kumbazha.
- Provide parking facilities every 500 m inside the town.
- Arrange taxi parking outside the road carriageway and footpath
- Basic facilities should be provided at the place next to the bus stop.



- Commercial space should be increased
- Food Street should be built near the ring road .
- An indoor stadium and commercial complex should be built near Kumbazha to Malayalapuzha, after the market
- Demolish the 80 year old building and take necessary steps to construct a new commercial building
- The Edathavalam should be utilized throughout the year, not limited to the Sabarimala pilgrimage season.
- A vertical high-rise commercial building should be constructed around the ring road
- The entire inner area of the ring road should be designated as a mixed-use



- Provide facilities for the smooth flow of water in Achankovil River
- Protect the streams.
- Ensure smooth flow in the drains



- Construct an industrial zone along the Punalur-Muvattupuzha State Highway
- Provide infrastructure & planning in global standard
- Take steps to convert the lands on the lower and upper Vettipuram roads of the ring road, except the court complex, into a mixed zone



- Public space in the town should be reclaimed.
- A place should be proposed for people to gather in the evenings. Along with this, a good cultural centre should be started.
- The municipal library should be protected by building a compound wall.
- Municipality office should be built on the Ring Road.
- Town Hall should be rebuilt to seat 1000 people.
- The fire station should be shifted to the 'Edathavalam area'
- A helipad system should be built in Kumbazha East. Along with that, a convention center should be built.
- Kannankara Sub-jail should be relocated.
- Establish a comfort station.
- Establish 3 fire hydrants in the city.



- Places such as Kumbazha Vanchipoyka should be proposed for holding sports-related competitions like cycling.
- A hospital for children should be started in association with Sri Ayyappa Medical College.
- Neurosurgery department should be started in Pathanamthitta General Hospital
- General Hospital should be developed into a super specialty hospital



- A good park is needed near the coastal area of Valanchuzhi Achan Kovil
- It would be good to take land and build a public square in Kumbazha. Land is available near Kumbazha market. This should be included in the master plan
- Planting plants on the roadside will add beauty to the town
- Beautify the footpath
  Beautify the road dividers with plants
  An open gym is needed near the ring road



- The Kannamkara stream and the areas near it should be cleaned and converted into a recreational area.
- The area including the Vanchipoyka waterfall should be converted into a tourist centre.
- Chuttipara should be developed as a tourist destination.
- If the dam to be constructed by Pramadam Panchayat near the Parakkadavu Bridge is completed, it will help retain water in the Kannankara stream solving the drinking water storage in the higher areas of the city to some extent. As part of the Valanchuzhi tourism project, a small boating service can also be arranged on the Valanchuzhi River.
- Tourism development should be further improved
- Sabarimala gate should be constructed in the district.



- Implement general waste management
- Provide facilities for the complete collection and disposal of non-biodegradable solid waste .
- Punish those who dump waste
- Find a suitable vacant land for waste disposal
- Install waste bins in the town

Public Seminar











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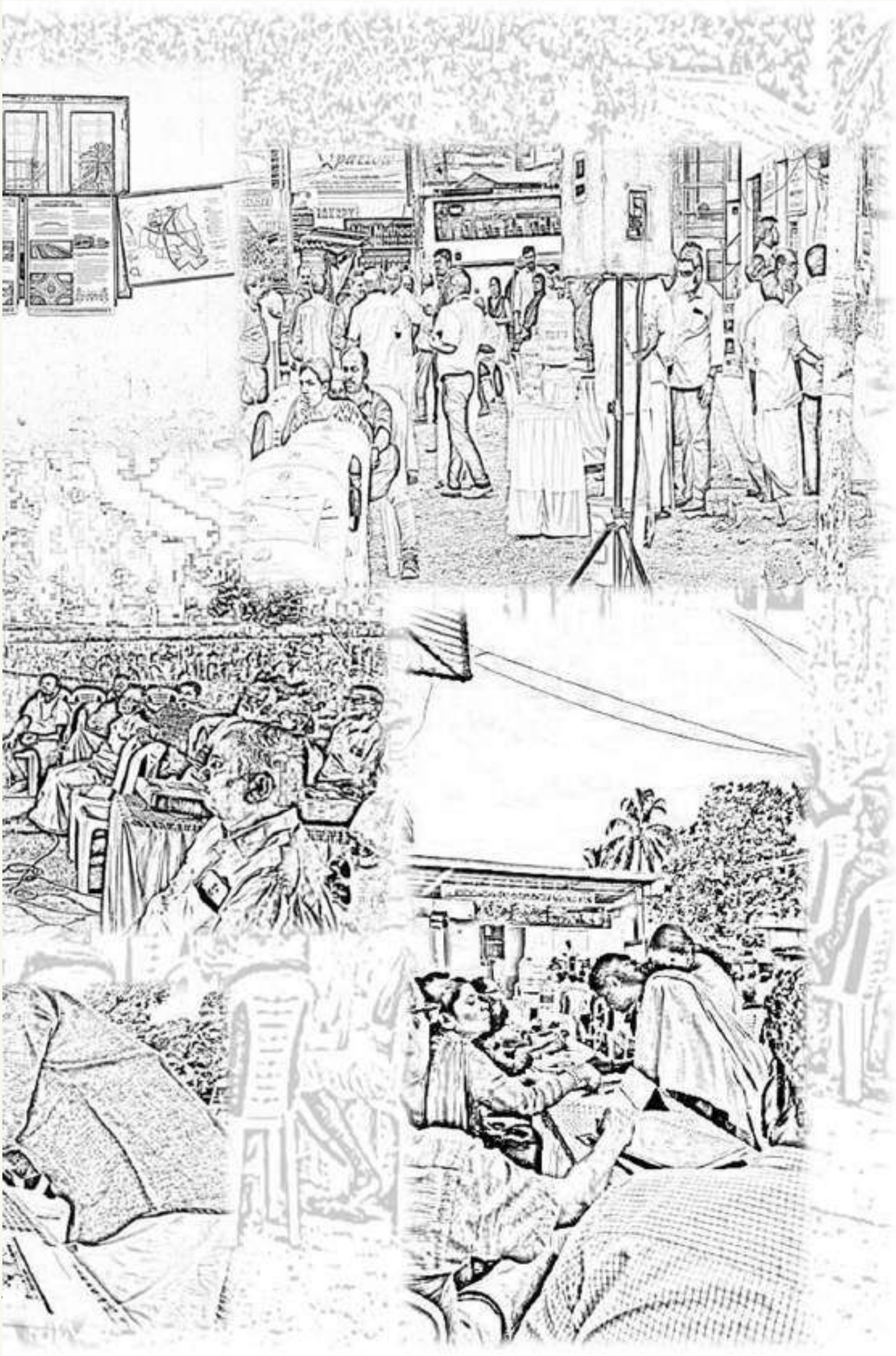
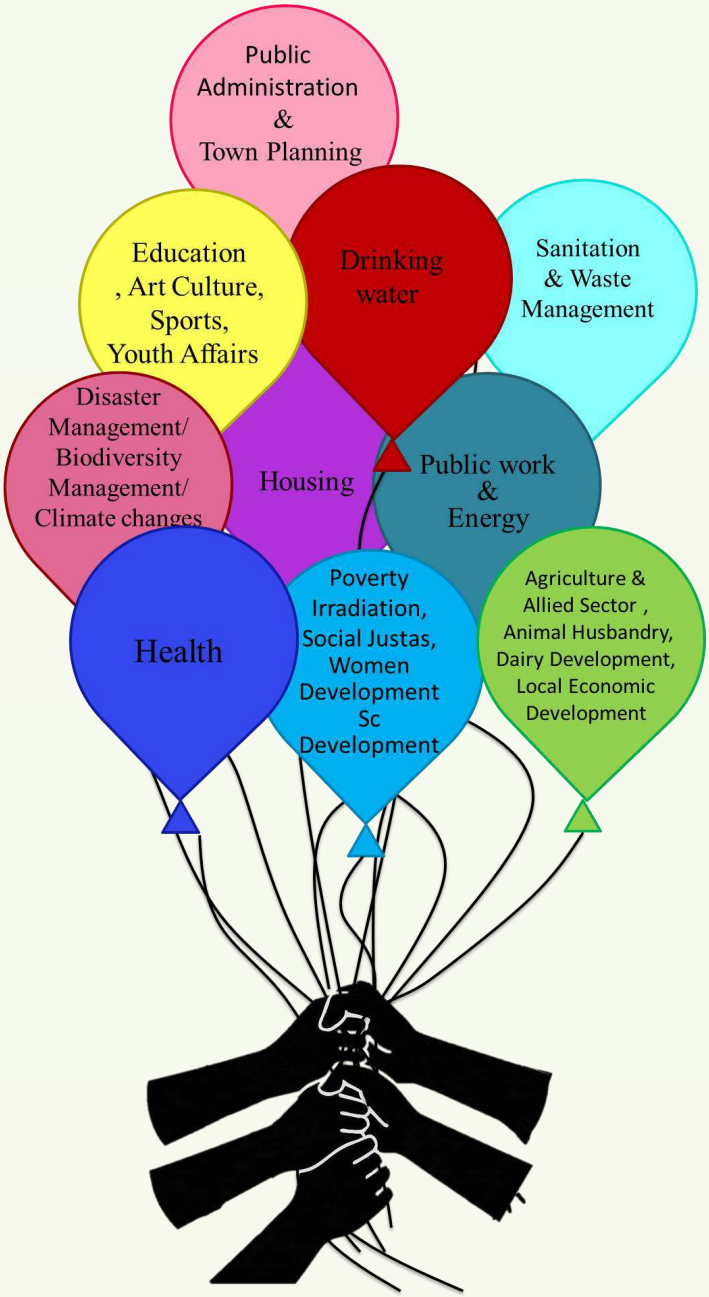


27.2 Stakeholder Consultation

Working Group Meetings

As part of the participatory master plan process, Working Group Discussions were held across sectors, involving stakeholders, experts, and community members. These sessions focused on assessing the current status, challenges, and opportunities within each sector.

Participants shared experiences, concerns, and local knowledge to support practical planning. Simultaneously, data collection and analysis helped to map existing infrastructure, identify gaps, highlight strengths, and capture community needs. Each group developed a sectoral vision and outlined key requirements for Pathanamthitta's sustainable development.



⇒ Greater Pathanamthitta Developmental Authority (GPDA) to be formed incorporating villages surrounding the town. An Outer ring road to be formed along these adjacent villages.
⇒ A Municipal sub office to be established in the eastern part of the Town. Also ward level offices can be established for Municipal councillors.

⇒ "Implement an irrigation facility for farmers during droughts.
⇒ To Provide proper measures to prevent the entry of wild animals into the farm."
⇒ To supply appropriate vaccinations for household pets, correct sentence
⇒ To implement programs and subsidies for cow farming

⇒ To Ensure that people living in PMAY and LIFE houses get skilled jobs

⇒ To take necessary actions to complete the Poovanpara Clean Water Project.
⇒ Renovation of existing wells

⇒ To dismantle the outdated 66 kV HT lines
⇒ illuminate each and every roads.

⇒ Provide a modern slaughterhouse.
⇒ Install waste disposal units in every ward

⇒ Provide government Ayurvedic hospitals with inpatient facilities.
⇒ Install waste disposal units in every ward

⇒ Provide necessary educational instruments for SC/ST students
⇒ Take the appropriate steps to prevent violence against women.

⇒ Take the appropriate steps to safeguard environmentally delicate areas.
⇒ Protect all Water bodies














Discussion with Line Departments

- Agriculture Office — 19.01.2024
- Social Welfare Office — 16.04.2024
- Labour Office — 10.06.2024
- Kerala Solid Waste Management — 20.04.2023
- Public Works Department — 13.02.2024
- Deputy Director of Panchayats — 12.03.2024
- Principle Agriculture Officer — 15.04.2025
- 19.01.202 — ICDS/Social Justices/Animal Husbandry/ Water Authority/Police
- 25.04.2024 — Soil Survey Office
- 03.01.2024 — Employment Exchange Officer/ PSC Officer
- 26.03.2025 — SC/ST Development Office
- 07.05.2024 — Industrial Department
- 15.01.2024 — Joint Director Office
- 07.05.2024 — Revenue Department







Other Discussions

Projects detailed in the master plans were discussed with corresponding groups to incorporate their needs and suggestions in various stages.

- Thykkav Government School Restructuring and expansion project with Parents Teachers Association





- Town square project with a group including family members of Jusice Fathima Beevi,Sri. K K Nair Foundation, Sculpture, Architect, Contractor



- **District Fire Officer**

Fire station being a critical amenity located in the flood prone area, a discussion was conducted with District Fire officer about relocation of the office. The present hurdles of the office location such as water scarcity, limited accessibility, flood proneness etc. were discussed.







Discussion of Master Plan Projects



With Collector



With Minister



Municipal Engineering Wing



A Discussion was oranised with Municipal Engineering wing on the difficulties in practicing and rigidity of regulations in the published Pathanamthitta master plan and Detailed Town Planning Schemes.







Public Interactions

Public participation was a central and continuous component of the master plan preparation for Pathanamthitta. Recognizing the importance of inclusive planning, efforts were made to engage the general public at every critical stage — from the initial phase of data collection to the finalization of proposals. These interactions ensured that the voices of the local community were heard, respected, and reflected in the plan.

- Initial Consultations and Seminars: To create awareness about the objectives and importance of the master plan.
- Site Visits and Field Checks: Informal yet impactful exchanges took place during on-ground site inspections where residents shared local knowledge, raised concerns, and suggested improvements.
- Written Submissions and Suggestions: Channels were provided for residents to submit their suggestions in writing—either individually or through resident associations—ensuring that even for those unable to attend meetings could still contribute.












Stake Holders Consultations

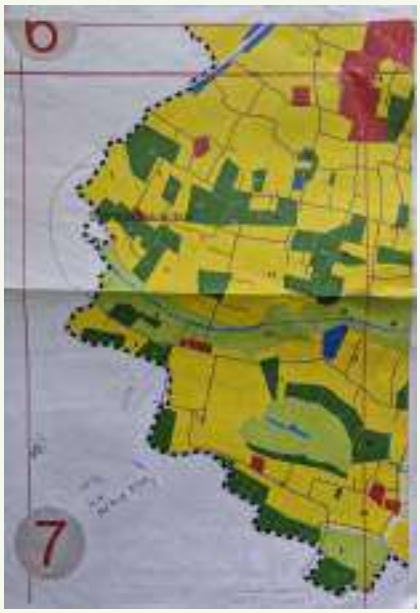


Master Plan –Primary Surveys

Land Use Survey

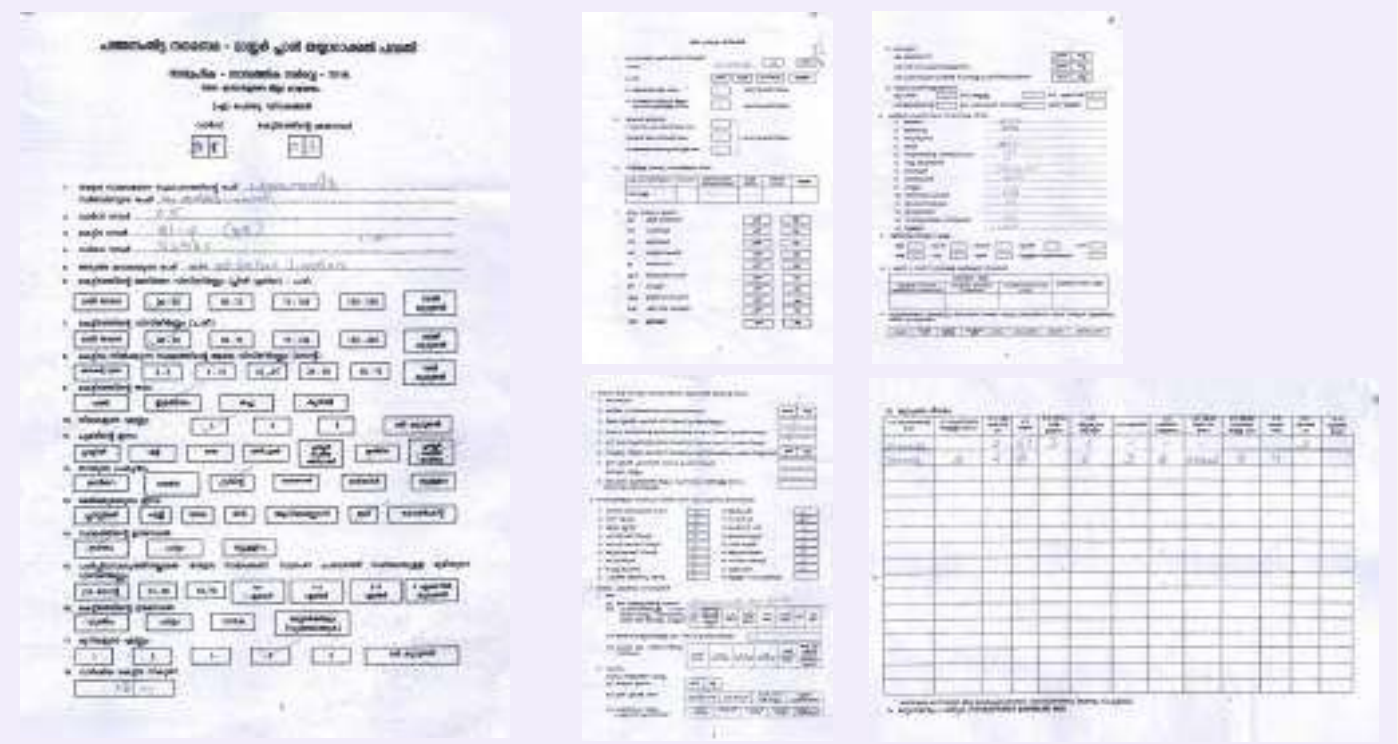
Land use survey was conducted in ward wise by teams on cadastal maps prepared by combining FMB sheets. Survey was conducted in 2023 for a period of 70 days. The existing landuse of the cadastral were demarcated plot wise in sheets using colour schemes and are digitized to base map using GIS.





Socio-Economic Survey

Socio Economic Survey was conducted in 10% of the Households in town. The sample was selected randomly based on the electoral roll.



Traffic and Transportation Survey

The Traffic and Transportation surveys and studies of Pathanamthitta town were carried out by National Transportation Planning and Research Centre (NATPAC) in 2010. Later the studies were updated .


TRAFFIC AND TRANSPORTATION STUDIES
FOR 23 TOWNS IN KERALA STATE

PATHANAMTHITTA TOWN

FINAL REPORT

Submitted to
DEPARTMENT OF TOWN AND COUNTRY PLANNING
GOVERNMENT OF KERALA

JANUARY 2011

NATIONAL TRANSPORTATION PLANNING AND RESEARCH CENTRE











Commercial Survey

Market, Whole sale and Retail shops in town were surveyed to assess their Location types of shops movement pattern and quantity of goods handled











LiDAR Survey

Lidar survey was conducted in town by Venkiteswara Enterprises, Hyderabad using drone to prepare Drainage master plan for Pathanamthitta.



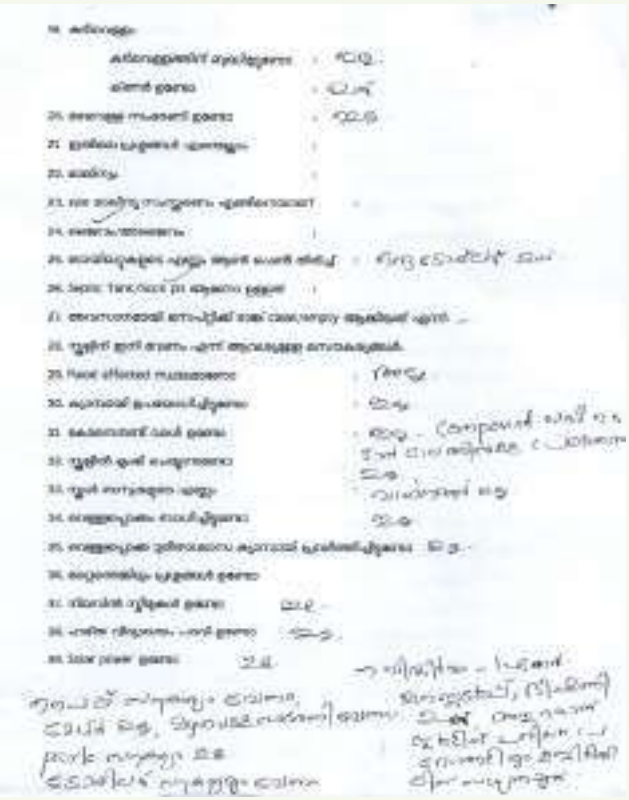




Education Institutional Survey

Educational institutions in the town were surveyed to assess their needs, with a focus on identifying spatial requirements that can be spatially addressed through master plan.



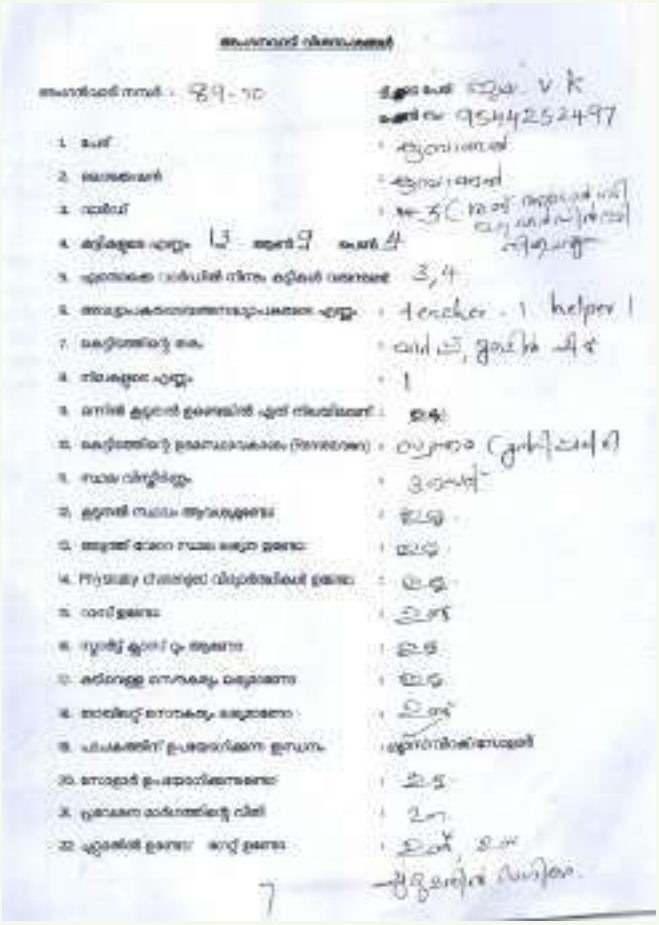


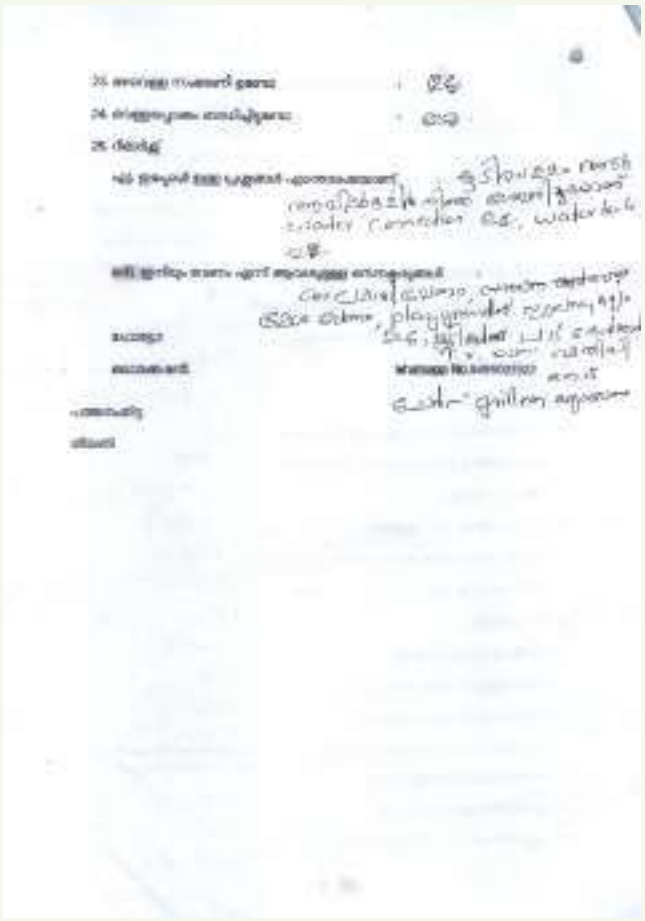




Anganwadi Survey

Anganwadis in the town were surveyed to assess their requirements aiming to identify spatial needs that can be addressed through master plan.







vulnerability Survey in Flood prone areas

Flood Vulnerability Survey is conducted in all (100%) households located in KSDMA 50 year flood return probability map published by KSDMA. The survey was conducted by filling an online questionnaire in kobo tool box. The location and Photograph of the building was also collected to spatially locate the houses.




ee.kobotoolbox.org
KoboToolbox
Buildings - Risk Informed Master Plan survey form of Pathanamthitta town (flood hazard prone area)
The study area is the flood prone area in 50-year flood return probability data as published by KSDMA. The survey is meant to assess the baseline status of vulnerability to floods and to formulate measures to reduce risk in the study area.
Name of the surveyor
Ward Number
Building details
* 1) Building Number of the house
Authorised
Un Authorised



















Vulnerability Survey in Landslide prone areas

Landslide Vulnerability Survey is conducted in all (100%) households located in KSDMA landslide prone area map published by KSDMA. The survey was conducted by filling an online questionnaire in kobo tool box. The location and Photograph of the building was also collected to spatially locate the houses.

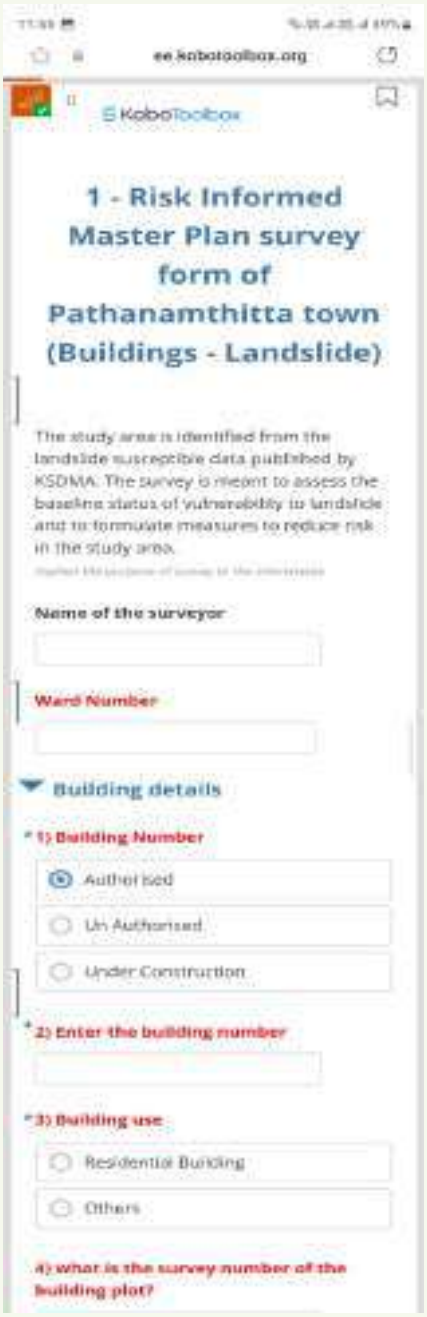
























Housing Nagar Survey

To evaluate their needs and determine which facilities may be spatially addressed by the master plan, the Housing Nagar survey was carried out in each SC/ST Housing Nagar.



GOVERNMENT OF KERALA
DEPARTMENT OF TOWN AND COUNTRY PLANNING

1	Name	
2	Location	
3	Ward No	
4	Village	
5	SC/ST/Others/Mixed	SC
6	Ownership of land	
7	Area of colony	
8	Total No of Houses	6
9	Approach road type	
10	Internal road type	
11	Collection of Garbages	
12	Drainage of waste water	
13	Street light	
14	Public Water Tap	
15	Public Well	
16	Borewell/Hand pumb	
17	Flood affected or not	
18	Educational facility	½ km
19	Health facility	½ km
20	Public Transport Facility	
21	Housing Status	
22	Toilet Facility	
23	Electricity	
24	Mobile Tower distance	½ km



GOVERNMENT OF KERALA
DEPARTMENT OF TOWN AND COUNTRY PLANNING

1	Name	
2	Location	
3	Ward No	
4	Village	
5	SC/ST/Others/Mixed	SC
6	Ownership of land	
7	Area of colony	
8	Total No of Houses	60
9	Approach road type	
10	Internal road type	
11	Collection of Garbages	
12	Drainage of waste water	
13	Street light	
14	Public Water Tap	
15	Public Well	
16	Borewell/Hand pumb	
17	Flood affected or not	
18	Educational facility	
19	Health facility	
20	Public Transport Facility	½ km
21	Housing Status	
22	Toilet Facility	
23	Electricity	
24	Mobile Tower distance	½ km

Secondary Data Collection

In addition to public seminars and working group discussions, secondary data collection played a vital role in providing a comprehensive understanding of the existing conditions and developmental context of Pathanamthitta. This phase focused on gathering and verifying relevant data from official sources and domain experts to support evidence-based planning.

These discussions helped gather valuable insights into ongoing projects, policy guidelines, infrastructure status, challenges, and departmental visions for the future. Expert opinions were also sought on technical aspects, regional constraints, and sustainable development strategies.

Engagement with Department Officials and Experts

To ensure the accuracy and depth of sectoral analysis, focused discussions were held with officials from various departments, including:

Public Works Department Agriculture Departments Water Authority Disaster Management Authority Labour office Fire & Rescue Health Services Department Industries Department Social Justice Department of Education Tourism Department Police NORKA Animal Husbandry Departments KSWMP Irrigation Department SC/ST Department KSEB ICDS

Combined Site Visits

Joint site visits were conducted involving planners, departmental officials, and local experts to verify physical conditions and ground realities. These visits enabled the team to:

Cross-check secondary data with on-site observations
Assess the condition of key infrastructure and service areas
Identify environmentally sensitive zones and encroachments
Understand spatial patterns of development and constraints
Locate potential sites for future development or conservation

HOUSING NAGAR SURVEY

















OTHER SURVEYS







27.3 Capacity Building Programs

A series of trainings were conducted for building the capacity of different stakeholders, on the concept and preparation of Risk Informed Master Plan. The training programme was structured into 3 modules and targeted different stakeholder groups. The training was given to the nine Urban Local Governments (ULGs) in the Pamba River Basin districts of Alappuzha, Pathanamthitta, and Kottayam .







PREPARATION OF RIMP: TRAINING FOR ELECTED MEMBERS & SECRETARY of LSGIs

Venue: Nagarodaya Hall, KILA, Date: 05 - 06/04/2024

PROGRAM SCHEDULE

Day 1 - 05/04/2024

Time	Sessions	Trainer
9.30 – 10.00	Registration	
10.00 – 10.15	Objectives and Contents of the Training	Dr. Ajith Kaliyath, Urban Chair Professor, Kila
	Quick round of introduction of trainers and participants	
	Pre-Assessment	
10.15 -11.00	Session 1 - Introduction	Shan L, Town Planner LSGD Planning, Kollam
11.00 – 11.15	Refreshments	
11.15 – 12.15	Session 2 - Urbanisation, Master Plan, Risk-informed Master Plan	Raja K, Town Planner LSGD-KILA-PR-012-4, Thiruvananthapuram
12.15 – 13.00	Session 3 – Process of Preparation of Master Plan	Shan L, Town Planner LSGD Planning, Kollam
13.00 – 14.00	Lunch	
14.00 – 14.45	Session 4 – Climate Change, Hazards, Disasters and Disaster Management	Shina Shazia Wilson, Meteorologist KSDMA, Thiruvananthapuram
14.45 – 15.30	Session 5 – Hazard Identification and Hazard Data for RIMP	Poornima Rajan, Geospatial analyst LSGD-KILA-PR-012-4, Thiruvananthapuram
15.30 – 15.45	Group work – Split into groups	
15.45 – 16.00	Refreshments	
16.00 – 17.00	Group work to continue	
17.00 – 17.30	Group presentations	

Day 2 - 06/04/2024

Time	Sessions	Trainer
10.00 – 11.00	Session 6 - Risk Assessment	Sujith P, Assistant Town Planner, LSGD Planning, Kottayam
11.00 – 11.15	Refreshments	
11.15 – 13.00	Session 7 - Disaster Risk Reduction	Nimmy Kurian, Deputy Town Planner LSGD Planning, Pathanamthitta
13.00 – 14.00	Lunch	
14.00 – 14.45	Session 8 - Priority Action Plan and Resource Mobilization	Gladis William, Deputy Town Planner LSGD Planning, Alappuzha
14.45 – 15.00	Post assessment	
15.00 – 16.00	Conclusion and reflections on training Feedback	Ramachandran A, Town Planner LSGD-KILA-PR-012-4, Thiruvananthapuram
16.00 – 16.30	Refreshments	

Course Director: Dr. Ajith Kaliyath, Urban Chair Professor, Kila
Course Coordinator: Mr. Vineesh K, Programme Coordinator, Kila

Kerala Institute of Local Administration (KILA), Mulankunnathukavu P.O, Thrissur – 680 581

PREPARATION OF RIMP: TRAINING FOR STAKEHOLDER DEPARTMENT OFFICERS

Date : 12 & 13 (Batch 1)/ 14 & 15 (Batch 2)

Venue: Nagarodaya Hall, KILA

PROGRAM SCHEDULE

Day 1

Time	Sessions
9.30 – 10.00	Registration
10.00 – 10.15	Objectives and Contents of the Training
	Quick round of introduction of trainers and participants
	Pre-Assessment
10.15 -11.00	Session 1 - Introduction
11.00 – 11.15	Refreshments
11.15 – 12.15	Session 2 - Urbanisation, Master Plan, Risk-informed Master Plan
12.15 – 13.00	Session 3 - Process of Preparation of Master Plan
13.00 – 14.00	Lunch
14.00 – 14.45	Session 4 – Climate Change, Hazards, Disasters and Disaster Management
14.45 – 15.30	Session 5 - Hazard Identification and Hazard Data for RIMP
15.30 – 15.45	Group interactions
15.45 – 16.00	Refreshments
16.00 – 17.00	Group interactions to continue
17.00 – 17.30	Group presentations

Day 2

Time	Sessions
10.00 – 11.00	Session 6 - Risk Assessment
11.00 – 11.15	Refreshments
11.15 – 13.00	Session 7 - Disaster Risk Reduction Measures
13.00 – 14.00	Lunch
14.00 – 14.45	Session 8 - Priority Action Plan and Resource Mobilization
14.45 – 15.00	Post Assessment
15.00 – 16.00	Conclusion and reflections on training Feedback
16.00 – 16.30	Refreshments

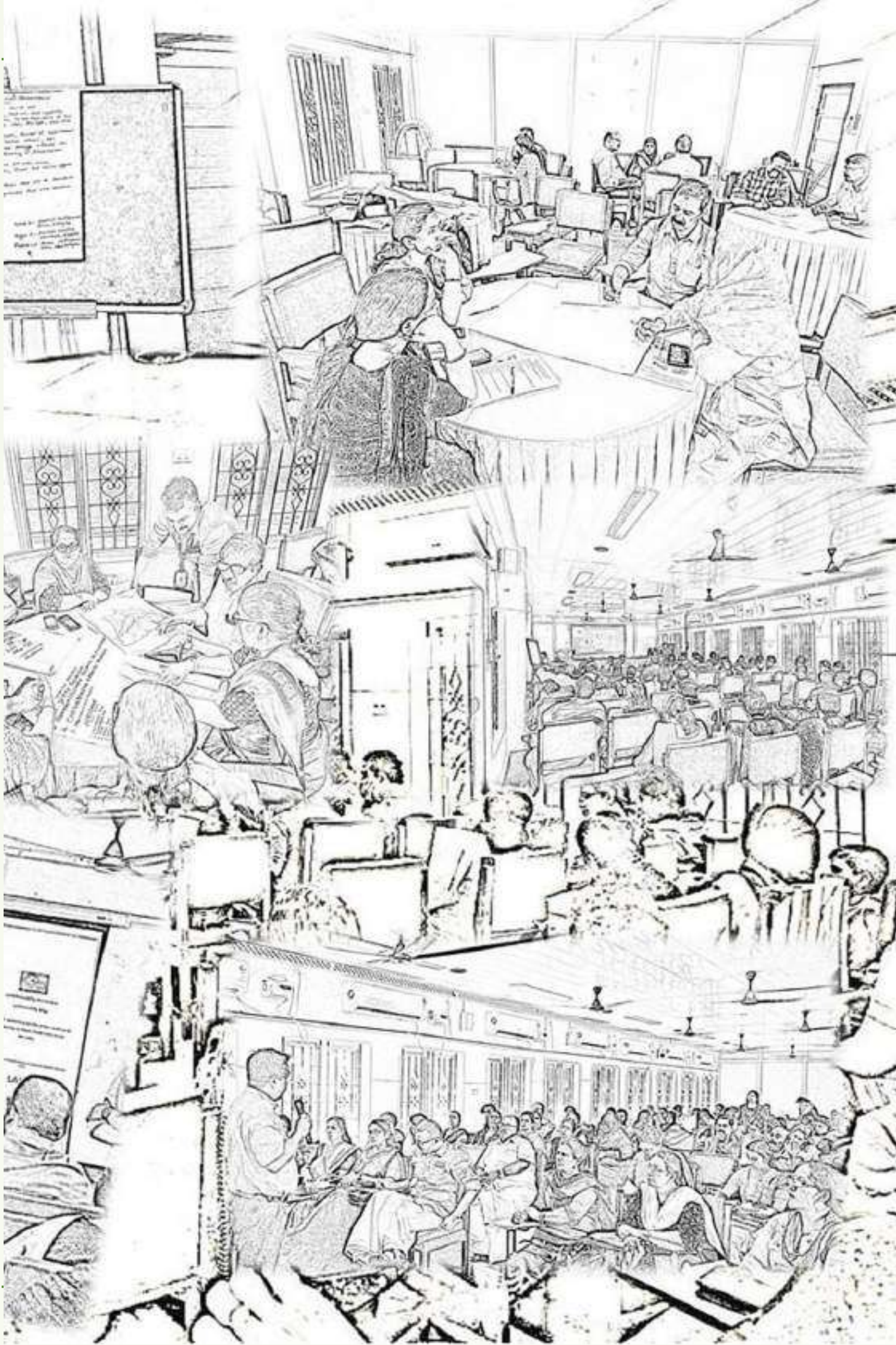
Course Director: Dr. Ajith Kaliyath, Urban Chair Professor, Kila
Course Coordinator: Mr. Vineesh K, Programme Coordinator, Kila







Capacity Building



27.4 Focus Group Discussions

27.4.1Focus Group Discussion -Flood 2018

A Focus Group Discussion was organised with participants from various Departments who were directly involved in or affected by the 2018 floods . Discussions included their challenges and losses faced during the Flood, Mitigation or Reduction measures adopted post flood, Future Suggestions to reduce damage and improving disaster management.















Constructing a protective wall along the riverside.
Removing accumulated sand from the river
Preventing overflow into nearby streams by building protective walls around them.

Those trapped in the flood were shifted to a safe place using rubber dinghy. Civil defence volunteers were involved in the cleaning operation in flood affected areas. If hydrant points are installed for fire prevention activities in the municipal area, rescue operations will be facilitated.

Government offices in Pathanamthitta's low-lying areas were damaged in the 2018 floods and restored through urgent maintenance. RIMP should include measures for their resilience or relocation.

Relief camps related to the 2018 floods were opened and people were evacuated from all flood-prone areas. Permanent relief camps are to be proposed in high risk areas.

A large-scale maintenance operation had to be carried out to ensure clean water after Floods 2018. Most of the pump houses were submerged, causing water supply disruptions. Efforts were made to install the newly constructed pump houses above the 2018 flood level

To avoid waterlogging in the city during the rainy season, the existing drainage system should be surveyed and inspected, and if there is any encroachment, the drainage should be re-established.

The protective walls of the Kotan Thod, which runs along the side of the old Fact Road in Punnalathpadi, collapsed due to strong winds and rain. Only a small part has been rebuilt. The rest needs to be rebuilt. TK Road should be raised from St. Peters to Pulimukku, the road should be widened, drains should be constructed properly with manhole. Steps should also be taken to cut down trees standing near roads. Drains should be constructed in a proper manner to drain dirty water and waterlogging should be avoided. Only by removing sand and waste from the river can we control floods and retain water

The new projects should include measures to improve the city's drainage network

Publish the master plan as soon as possible to regulate new constructions in flood prone area

The master plan should include the provision of additional drainage systems, including the provision of building ground level and main drainage (River, Thode) in accordance with the flood level.

The streams and rivers surrounding the city are good water sources, but the natural flow of these streams is obstructed in many places. Due to illegal sand mining in the bed of the Achankovilar river, the bed is very low. As a result, the previous slope has decreased and water is not flowing properly.

A clear proposal is needed as waterlogging in the stadium is becoming common



27.4.2Senior Citizen

As part of the citizen engagement process for the preparation of the revised Master Plan for Pathanamthitta, a focused group discussion was conducted with elderly residents. The objective was to understand their lived experiences, challenges, specific needs, and aspirations, and to ensure that the future development of the town remains inclusive and age-friendly. A mix of retired professionals, homemakers, farmers, pensioners, etc. were participated.

Objective

- To identify the key challenges faced by the elderly in Pathanamthitta.
- To explore their needs with respect to health, mobility, safety, and recreation.
- To gather their vision for a senior-friendly town.
- To develop actionable inputs for inclusion in the Master Plan.







Key Discussion Points

Mobility and Accessibility

- Limited access to nearby primary health centres.
- Inadequate geriatric services and poor emergency response.
- Need for mobile health services in interior areas.

Healthcare Gaps

- Broken or absent footpaths, especially in market and Public areas.
- Lack of ramps and handrails in public buildings.
- Infrequent and overcrowded public transport with no senior-friendly options.

Social Isolation

- Loneliness due to migration of children.
- Lack of structured social spaces for elderly gathering.
- Minimal opportunities for engagement or contribution to society.

Safety and Security

- Poorly lit streets in residential areas.
- Fear of theft or harassment.
- Need for more visible police presence and community support.

Needs and Suggestions

Healthcare Access
Geriatric clinics, mobile health units, and wellness centers.

Safety Measures
Better lighting, police patrolling, and senior helplines.

Recreational Facilities
Parks with open gyms, reading rooms, cultural clubs.

Barrier-free infrastructure:
Walk able paths, Resting benches, Accessible toilets

Community Engagement
Platforms for mentoring youth, storytelling, or volunteering.

Administration and Finance
Need a standing committee for Old age welfare in Municipality . Need social auditing in old age homes and special census for elderly.



27.4.3Persons with Disabilities (PwDs)

A focus group discussion was conducted to gather the perspectives of persons with disabilities (PwDs) regarding their day-to-day challenges, infrastructural needs, and aspirations, in order to integrate inclusive, accessible, and equitable planning principles into the Pathanamthitta Master Plan.

Key Challenges

Accessibility Barriers

Public buildings and spaces often lack accessibility features like ramps, tactile paths, lifts, proper footpaths, accessible toilets, and clear signage's or auditory signals

Transportation Difficulties

Public transport and town centers lack accessibility features, with inaccessible buses, auto-rickshaws refusing service to disabled individuals, and no designated parking for persons with disabilities.





Social Exclusion & Stigma

Attitudinal barriers and lack of sensitivity from service providers. limited inclusion in key areas, and a lack of accessible social and recreational platforms hinder opportunities for disabled individuals.

Employment and Livelihood

Works places lack accessibility, with limited skill development programs and insufficient support for self-employment and entrepreneurship for disabled individuals.





Needs and Suggestions

- **Infrastructure Improvements** — Enforce barrier-free design in all infrastructure projects, with accessible toilets, proper ramps, tactile flooring, and lifts with Braille/audio support. Upgrade parks, markets, and public buildings for full accessibility.
- **Inclusive Mobility Solutions** — Introduce low-floor buses with wheelchair space and audio announcements, install tactile indicators, promote accessible taxis through incentives, and ensure reserved parking for PwDs near key locations.
- **Digital and Information Access** — Ensure municipal updates are accessible through screen readers and sign language, and conduct awareness campaigns on rights and entitlements for persons with disabilities
- **Skill Development and Social Integration** — Establish inclusive community centres for skill training, promote accessible recreation spaces, and ensure PwD representation in planning committees.

27.4. 4 Migrant labours

As part of the stakeholder engagement process for the Pathanamthitta Master Plan, a focused group discussion (FGD) was conducted involving two key stakeholder groups: migrant labourers from other states residing in Pathanamthitta, and local house owners who provide rental accommodations to them. The objective of the discussion was to gain firsthand insights into the living conditions, needs, and challenges faced by migrant workers, as well as the perspectives and concerns of the house owners hosting them. This engagement is aimed at ensuring that the Master Plan reflects inclusive and equitable urban development. The participants represented a diverse group from various states including West Bengal, Bihar, Odisha, and Assam, engaged in sectors such as construction, hospitality, retail, and other informal sectors Local residents who rent out rooms or housing units to migrant workers, including individual landlords and small-scale accommodation providers, were also part of the discussion.

Key Discussion Points and Findings

Migrant workers live in overcrowded, low-quality housing with limited basic services, face barriers to welfare access and social integration, and lack safe transport and healthcare. Both migrants and house owners seek better infrastructure, support services, and job facilitation centers.

Recommendations for the Master Plan

Formalize migrant housing areas with essential services, support rental upgrades, ensure multilingual access to public services, promote social integration, improve non-motorized transport infrastructure, and establish a central Labour Resource Centre.







27.4.5 Women & Children

As part of the inclusive planning approach for the preparation of the Master Plan for Pathanamthitta, a focus group discussion was conducted with women from various walks of life. The objective was to bring women's voices to the forefront of the planning process and understand their specific challenges, needs, and aspirations with respect to urban infrastructure, safety, mobility, livelihood, and community life.

Objective

- To identify key urban and social challenges faced by women in Pathanamthitta.
- To gather inputs on infrastructure, safety, health, transport, and employment needs.
- To understand the aspirations and vision of women for a gender-inclusive town.
- To generate actionable recommendations for the Master Plan based on women's perspectives

Key Challenges

Safety and Accessibility

Poor lighting, unsafe public transport, and lack of surveillance in isolated areas contribute to harassment and restricted mobility in public spaces.

Infrastructure Deficiencies

- Lack of clean, safe, and accessible public toilets.
- Few inclusive parks or public spaces designed for women and children.
- Limited seating, water, and shade in waiting and market areas,

Mobility and Transport

- Infrequent and overcrowded buses.
- Absence of women-only travel options and poor last-mile connectivity.
- Unsafe walking conditions and lack of cycle paths.

Economic and Social Constraints

- Limited vending spaces

Needs and suggestions

Safety And Mobility

Enhance street lighting, women-friendly transport with reserved seating, and pedestrian infrastructure like footpaths and crossings.



Health and Sanitation

Ensure affordable healthcare, clean women's toilets in public areas, and menstrual health awareness programs



Employment and Livelihood

Offer skill training for women in key sectors, support women entrepreneurs with micro-financing and SHGs, and provide childcare to aid working mothers.



Recreation and Public Spaces

Create women-only recreation times, inclusive parks with safe zones, and promote women's cultural and social clubs.



Governance and Participation

Include women in planning bodies and hold regular public hearings on women's issues.



Education and Awareness

Provide scholarships, digital education, and legal, self-defense, and rights awareness programs for women and girls.



നഗരസഭയിൽ ഉപയോഗ രഹിതമായി കിടക്കുന്ന പാറക്കുളങ്ങളിൽ നിന്നും പരിസര വാസികൾക്ക് വെള്ളം കിട്ടുന്നതിന രീതിയിൽ ആയവ ശുദ്ധീകരിച്ചു ചെറുകിട കുടിവെള്ള പദ്ധതികൾ രൂപീകരിക്കുക

പത്തനംതി
റിംഗ് റോഡ
വികസനം
ഭാരവാഹന
പഞ്ചായത്ത
മുതലായ പ
ക്കുട്ടിയോടു

യാത്രക്കാരായ വനിതകൾക്കുള്ള വിശ്രമ മുറികൾ, മെച്ചപ്പെട്ട വനിതാ ഹോസ്റ്റലുകൾ, സ്ത്രീ സൌഹാർദ്ദ പൊതു ഇടങ്ങൾ, തെരുവുകൾ, വനികൾക്കായുള്ള സ്വയംതൊഴിൽ സംരംഭങ്ങൾ, Skill Development Center എന്നിവ സ്ഥാപിക്കുക.

പത്തനംതിട്ട നഗരം ഭിന്നശേഷി, വയോജന സൗഹൃദമാക്കുക

നഗരമധ്യത്തിലെ
അഭാവം കച്ചവട
പാർക്കിംഗ് നഗര
പാർക്കിംഗ് സൌ
പുതിയ വികസന

മാലിന്യ സംസ്ക്കരണ പ്ലാന്റ് ആളൊഴിഞ്ഞ സ്ഥലത്ത് സ്ഥാപിക്കുന്നതിന് പകരം നഗരമധ്യത്തിൽ തന്നെ സ്ഥാപിക്കുകയും, ആയതിനു ചുറ്റും പൂന്തോട്ടവും, പാർക്കും മറ്റും നിർമ്മിക്കുക. നഗരത്തിലെ കച്ചവട സ്ഥാപനങ്ങളിലേയും പൊതു ശൌചാലയങ്ങളിലേയും കക്കൂസ് മാലിന്യം ക്രിത്യമായ ഇടവേളകളിൽ നീക്കം ചെയ്യുന്നതിന് വേണ്ട നടപടികൾ ആസൂത്രണ ചെയ്യുക.

ഒരു കടൽ തീരം പോലുമില്ലാത്ത പത്തംതിട്ട നഗരത്തിൽ നിലവിൽ വൈകുന്നേരങ്ങളിൽ ഒന്നു വിശ്രമിക്കുവാനോ, കുടുംബ സമേതം പോയിരിക്കുവാനോ, പാർക്കുകളോ, ഉദ്യാനങ്ങളോ, തുറസ്സായ സ്ഥലങ്ങളോ ഒന്നും ഇല്ലാത്ത സ്ഥിതിയാണ്.

ട്ട നഗരത്തിലെ ഗതാഗതകുരുക്ക് അവസാനിപ്പിക്കുവാൻ ഔട്ടർ
് അത്യാവശ്യമാണ്. പത്തനംതിട്ട നഗരത്തിൽ വികേന്ദ്രീകൃത
ുമേഖലകൾ വേണം. നഗരത്തിൽ പ്രവേശിക്കേണ്ടാത്ത
ാങ്ങൾ ഒട്ടർ റിംഗ് റോഡിലൂടെ തിരിഞ്ഞ് വിടാം. സമീപത്തെ
ുകളായ ഓമല്ലൂർ, ഇലന്തൂർ, വള്ളിക്കോട്, കടമ്മനിട്ട, മൈലപ്ര
ഞ്ചായത്തുകളിൽ നിലവിലുള്ള പൊതുമരാമത്ത് റോഡുകൾ
പ്പിച്ച് വീതി കൂട്ടി ഔട്ടർ റിംഗ് റോഡ് നിർമ്മിക്കാം.

പത്തനംതിട്ടയിലെ ഉന്നത നിലവാരത്തിലുള്ള ഷോപ്പിംഗ് കോപ്ലക്സുകളും, മാളുകളും, ഫുഡ് കോർട്ടുകളും ഉണ്ടാകണം വിവാഹ ഷോപ്പിംഗ് പോലുള്ള വലിയ ആവശ്യങ്ങൾക്ക് സൌകര്യങ്ങൾ ഇല്ല

പാർക്കിംഗ് സൌകര്യങ്ങളുടെ
ം കുറക്കുന്നു. മൾട്ടി ലെവൽ
മധ്യത്തിൽ ഏർപ്പെടുത്തുകയും
കര്യങ്ങളുള്ള മേഖലകളിലേക്ക്
ം കൊണ്ടുവരികയും ചെയ്യണം.

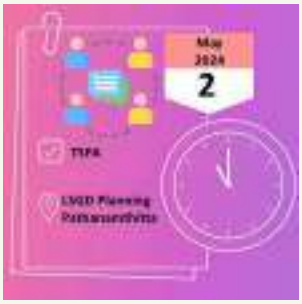
ലൈവ മാലിന്യത്തിന് ഉറവിട മാലിന്യ സംസ്ക്കരണം പ്രോത്സാഹിപ്പിക്കണം. കച്ചവട സ്ഥാപനങ്ങളിലേയും സർക്കാർ ഓഫീസുകളിലും ബയോ കംപോസ്റ്റിംഗ് യൂണിറ്റുകൾ സ്ഥാപിക്കണം.

ശബരി റെയിൽവേ എരുമേലിയിൽ നിന്നും കമ്പഴ -
വെട്ടർ വഴി പുനലൂരിൽ എത്തിക്കണം.
പത്തനംതിട്ടയുടെ വികസനത്തിന് ഏറെ
സഹായകരമാകും അത്. പത്തനംതിട്ടക്ക് സമീപം
വിമാനത്താവളം വേണം. പ്രവാസികൾ ഏറെയുള്ള
പ്രദേശമാണ്.

കിഴക്കൻ മേഖലയിൽ വനത്തിൽ നിന്നുള്ള തടികൾ ഉപയോഗിച്ച് പ്ലൈവുഡ് നിർമ്മിക്കുവാൻ നിർമ്മാണ ശാലകൾ ഉണ്ടാകണം.

27.5 Expert Level Discussions

27.5.1 Discussion with International Planners



- **Thomas Stellmach**

Thomas Stellmach, the founder and director of TSPA (Thomas Stellmach Planning and Architecture) having his focus of interest in sustainable urban development, visited Pathanamthitta town especially the flood prone areas. He strongly emphasized the importance of conserving wetlands, stating that they should never be converted, even for public development. He highlighted that wetland conversion is a major cause of flooding, as these ecosystems naturally absorb excess water, reduce runoff, and act as buffers during heavy rainfall.

His recommendation included:

- Strict Protection Policies: Enforcing laws to prevent wetland conversion in Flood prone areas.
- Sustainable Urban Planning: Integrating wetlands into city planning rather than reclaiming them.
- Restoration Efforts: Rehabilitating degraded wetlands to regain their flood-mitigation capacity.
- Community Awareness: Educating local stakeholders on the ecological and flood-control benefits of wetlands.









Sylvain Moreira– CEREMA France

Sylvain Moreira, An Environmental expert from CEREMA,Centre for Studies on Risks, the Environment, Mobility and Urban Planning, in France providing public expertise for the ecological transition and regional planning whose research focus on adapting regions to climate change visited Pathanamthitta to to assess risks,understand the situation and provide informed recommendations. He visited Flood-prone areas in the town and also he discussed with District Collector,Municipal Chairperson,DM Deputy Collector,DDMA Hazard Analyst regarding the Risk Informed Master Plans.

His approach likely included:
1. Identifying Key Issues – Understanding local hazards, vulnerabilities, and risks, such as natural disasters, urban development challenges, or climate-related threats.
2. Assessing Existing Practices – Evaluating current planning policies, infrastructure resilience, and community preparedness.
3. Suggesting Solutions – Proposing strategies based on best practices adopted in France, such as land-use zoning, early warning systems, risk communication, sustainable construction, or policy adjustments.
4. Mitigation Measures – Recommending proactive steps to reduce risks, such as flood-resistant infrastructure, improved drainage systems



- **Dr. George Koshy**



George Koshy is an International Planner from Pathanamthitta who brings both global and local expertise to planning discussions, ensuring that Pathanamthitta benefits from well-informed strategies. His emphasis on recreation facilities suggests a vision for a more livable and community-friendly urban environment. His approach aligns well with sustainable urban planning—protecting wetlands for their ecological benefits while integrating recreation in a way that respects natural ecosystems.









27.5.2 Discussion with Technical Experts



Sri. Swaminathan, Retd.CE,KWA

Sri. Swaminathan, Chief Engineer retired from Kerala Water Authority in collaboration with Pathanamthitta Municipality prepared a new water supply scheme for Pathanamthitta town. As the Achankovil river cannot serve the entire demand of water during summer, he suggests a suitable alternative for the Drinking water source for the town from Maniyar Dam. Detailed water supply network plan prepared by him for the projected drinking water demand in the town has been included in the master plan.



Check dam at Intake well cum pump house of UWSS to Pathanamthitta



Main reservoir of capacity 26.00 Li

The proposal

It is proposed to augment the existing the water supply scheme in the municipality for making it capable to supply sufficient quantity of good quality water for achieving the mission target of **providing universal piped water supply with household tap connections to all households by 2025.**The water requirement as per the CWBP is 15.70 MLD. Inorder to supply 15.70 MLD of water through the distribution system the water production has to be increased to 19.00 MLD.Since the present water treatment system is not capable of producing quality water as per ISO standards,anew conventional type water treatment plant of capacity 20.00 MLD is proposed to be constructed in the available land at Pumpoorippara. Some of the existing structures at the site are to be demolished for constructing the new water treatment plant. New raw water pumping main of size 600 mm is required pump water from the intake well to the treatment plant. It is also suggested to provide new water intake system at the existing for sufficient flow of water into the well from the river.New pumpsets are also suggested to pump the new estimated quantity of water. Additional coverage of distribution systems in various wards are to be provided for giving water connections.

Considering the most undulating topography of the municipality the distribution system can be divided into the following 8 Zones for proper control and easy operation of the water supply system.The 19.0 MLD of water has to be distributed in the 8 Zones as detailed below



Reservoir at Omalur

Zone	Name	% allocation of total production	Water to be distributed (MLD)
1	Town and law laying areas	70	13.30
2	Kambankal area	5	0.95
3	AnthikkalaOttukal area	6	1.14
4	Kithappuramuruppu area	5	0.95
5	Myladuparu area	7	1.33
6	Chattipara area	2	0.38
7	Mannaramala area	3	0.57
8	Peovarpara area	2	0.38
	Total	100	19.00



Intake well cum pump house of UWSS to Pathanamthitta at Kallarakkadavu

The various works suggested for achieving the mission target are the following

1. Construction a conventional type water treatment plant of capacity 20.0 MLD with SCADA (Supervisory control and data acquisition)system at Pumpoorippara in the land owned by Kerala Water Authority.
2. Laying new raw water pumping main of size 600 mm for a length of 700 meters from the existing intake pump house at Kallarakkadavu to the proposed new water treatment plant
3. Laying additional distribution lines in the uncovered areas and proving household water connections
4. Improvements to intake system at Kallarakkadavu for proper flow of water from river to intake well.
5. Installing new pump sets of higher capacities at pumping locations and allied electrical works.
6. Constructing new water tanks at the required location to supply sufficient water to households





Clarifier units in UWSS to Pathanamthitta

27.5.3 Expert Level Brainstorming session

A 2 day in-house Expert level Brain Storming discussion on Pathanamthitta Risk Informed master plan was conducted. Experts from various sectors participated in the discussions. In house presentations, Open Discussions, Site Visits etc. were included in the 2 day program.

Planning experts including retired Town Planners, International Planners, Other Department heads, Municipal Chairperson, Secretary, Municipal Engineer were participated in the Discussion.












Pathanamthitta is not to be developed like Kochi or Trivandrum. But enhance the existing character of Pathanamthitta by highlighting its potentials, improving basic facilities and make the town more livable for existing inhabitants and attract people from outside. A concept of "ENHANCING LIVABILITY' in Pathanamthitta can be adopted.

Critical Infrastructure in Flood prone areas are to be suitably relocated to new location. A phase wise planning for shifting is to be prepared. Also identify some Rescue/ Rehabilitaion centres and Evacuation routes for the town during Floods and Landslides.

Promote Tourism activities,Staycation facilities,work nest,Farm tourism,Destination tourism etc,. in town.

Regional importance of Pathanamthitta town and impact of regional development on Pathanamthitta town have to be considered in formulating vision.

Develop Pathanamthitta as an accessible, inclusive, livable, barrier free and safe town.

New Proposals and projects are to be identified for economic development of the town. Diversification of economic activities.

Being administrative capital of the District, more office complexes, staff quarters, hostels, temporary accommodation facilities are to be ensured at affordable rate.

Ensure proper connectively to Pathanamthitta town. Isolation of town during floods to be mitigated and also propose Rail connectively. The potential of Greenfield highway, NH 183A, Sabari Rail, Erumeli Airport are to be exploited beneficial to the town.

Conserve urban wetlands in Pathanamthitta as in previous master plan and adopt new recreation projects in these wetlands. (Sponge City concept)



KILA DLI 4 PIU

Preparation of Risk Informed Master Plan for Pathanamthitta Expert Level Discussion

Date: 28th and 29th February 2024
Venue: Govt. Guest House, Pathanamthitta

PROGRAM SCHEDULE

DAY 01

Time	Session
9.30-10.00 am	**Registration**
10.00-10.30 am	Inaugural Address: Chief Town Planner (Planning)
10.30-11.00 am	Towards Risk Informed Master Plan(RIMP) for Pathanamthitta : Additional Chief Town Planner & Nodal Officer, DLI 4
11.00-11.30 am	Introduction- Objectives and schedule of the program, Earlier Planning efforts and Status Briefing on Draft Pathanamthitta Master Plan : Town Planner,Pathanamthitta
11.30-11.45 am	**Tea Break**
11.45-1.00 pm	RIMP Sectoral Analysis (Physical Character, Regional Setting, Demography, Land use)
1.00-2.00 pm	**Lunch Break**
2.00-3.00 pm	Discussion on DTP scheme for Kumbazha Junction and Surroundings, Pathanamthitta
3.00-5.00pm	Site vist at Master Plan area

DAY 02

Time	Session
9.30-10.00am	Discussion with Adv. T Zakkir Hussain, Pathanamthitta Municipal Chairperson
10.00 -11.30am	RIMP Sectoral Analysis and Discussion with line department experts(Agriculture, Animal Husbandry)
11.30-11.45 am	**Tea Break**
11.45-1.00 pm	RIMP Sectoral Analysis and Discussion with line department experts(Industry,Housing,Health,Education)
1.00-2.00 pm	**Lunch Break**
2.00-4.00 pm	RIMP Sectoral Analysis and Discussion with line department experts(Water supply, Energy)
4.00-4.15 pm	**Refreshments**
4.15-4.30 pm	**Concluding Session**





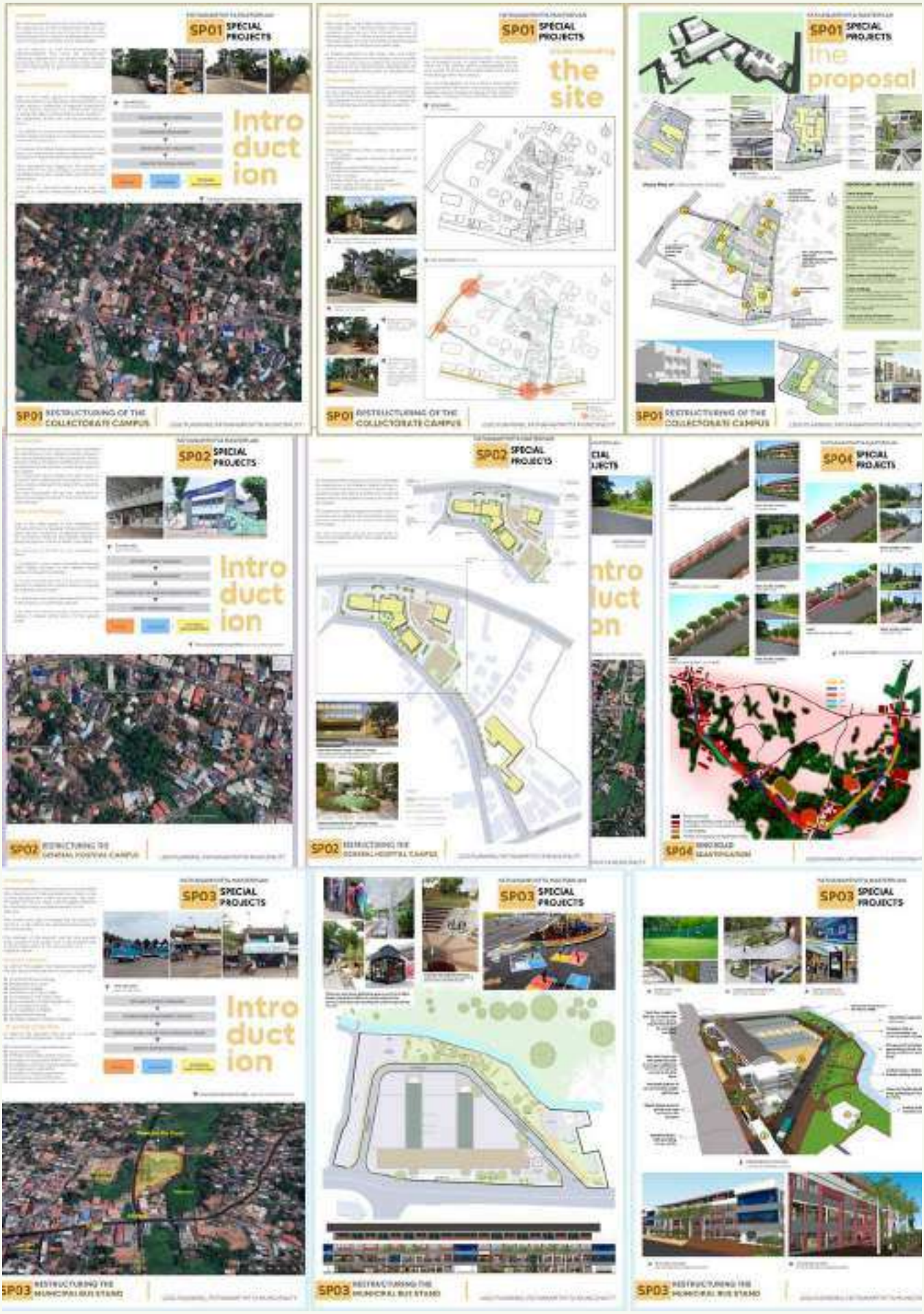








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Intro duct ion
SP01 RESTRUCTURING OF THE COLLECTORATE CAMPUS
SP01 SPECIAL PROJECTS
the site
SP01 RESTRUCTURING OF THE COLLECTORATE CAMPUS
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the proposal
SP01 RESTRUCTURING OF THE COLLECTORATE CAMPUS
SP02 SPECIAL PROJECTS
Intro duct ion
SP02 SPECIAL PROJECTS
SP04 SPECIAL PROJECTS
SP03 SPECIAL PROJECTS
Intro duct ion
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SP03 SPECIAL PROJECTS




SOLUTION

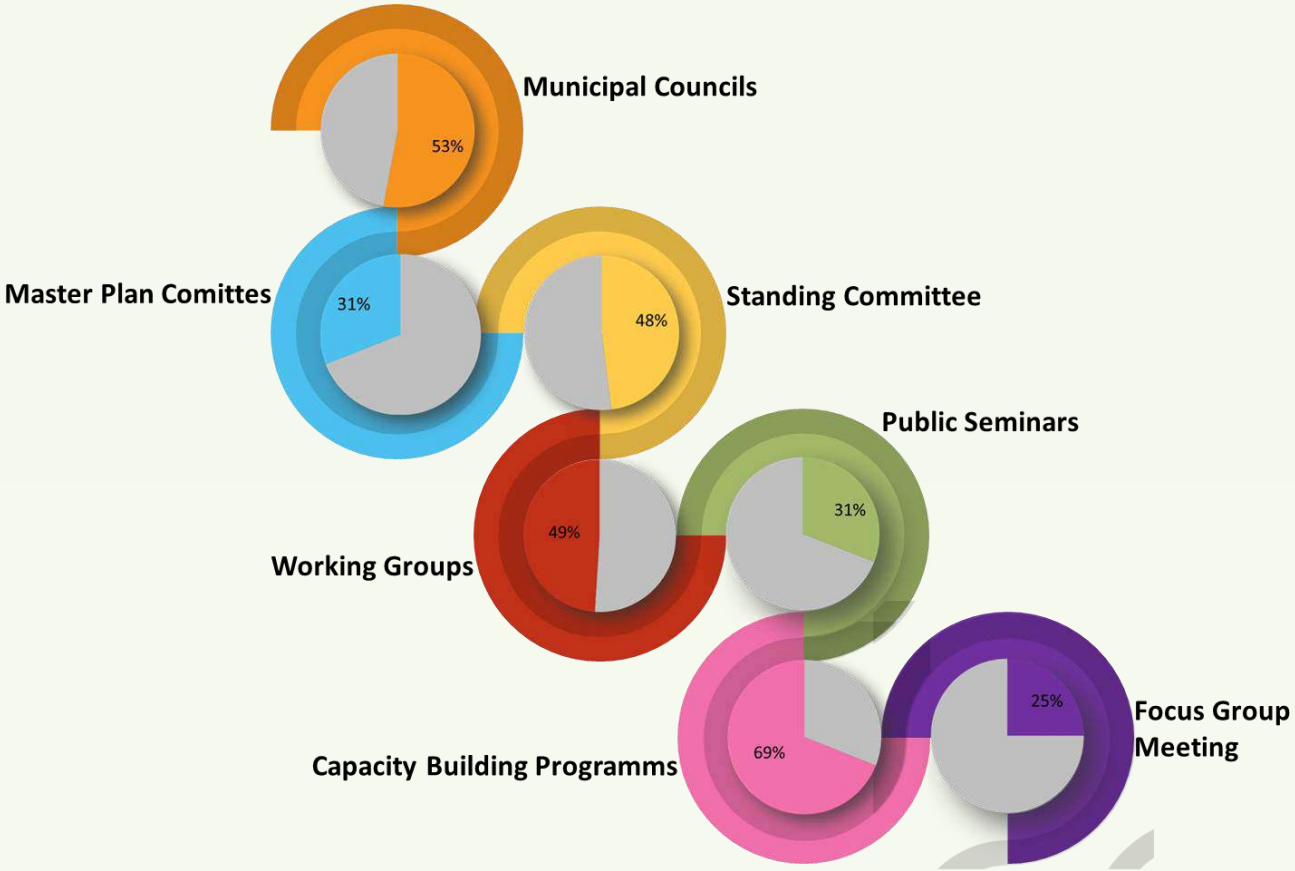






Women's Participation in Planning Process

Active participation of women is ensured in all stages during the preparation of master plan. The participation of women was recorded across various activities as follows.

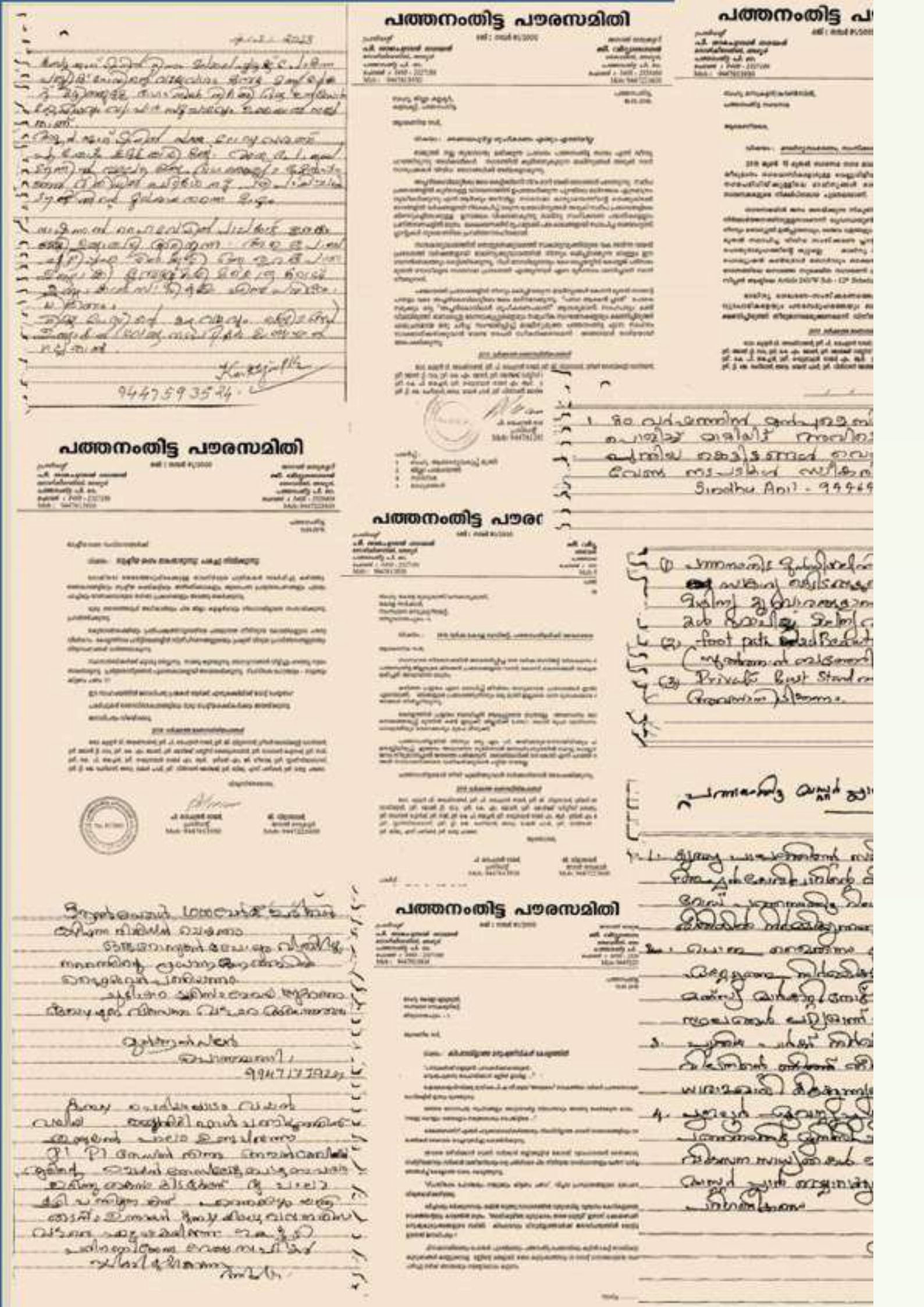












പത്തനംതിട്ട പൗരസമിതി

പത്തനംതിട്ട പൗരസമിതി

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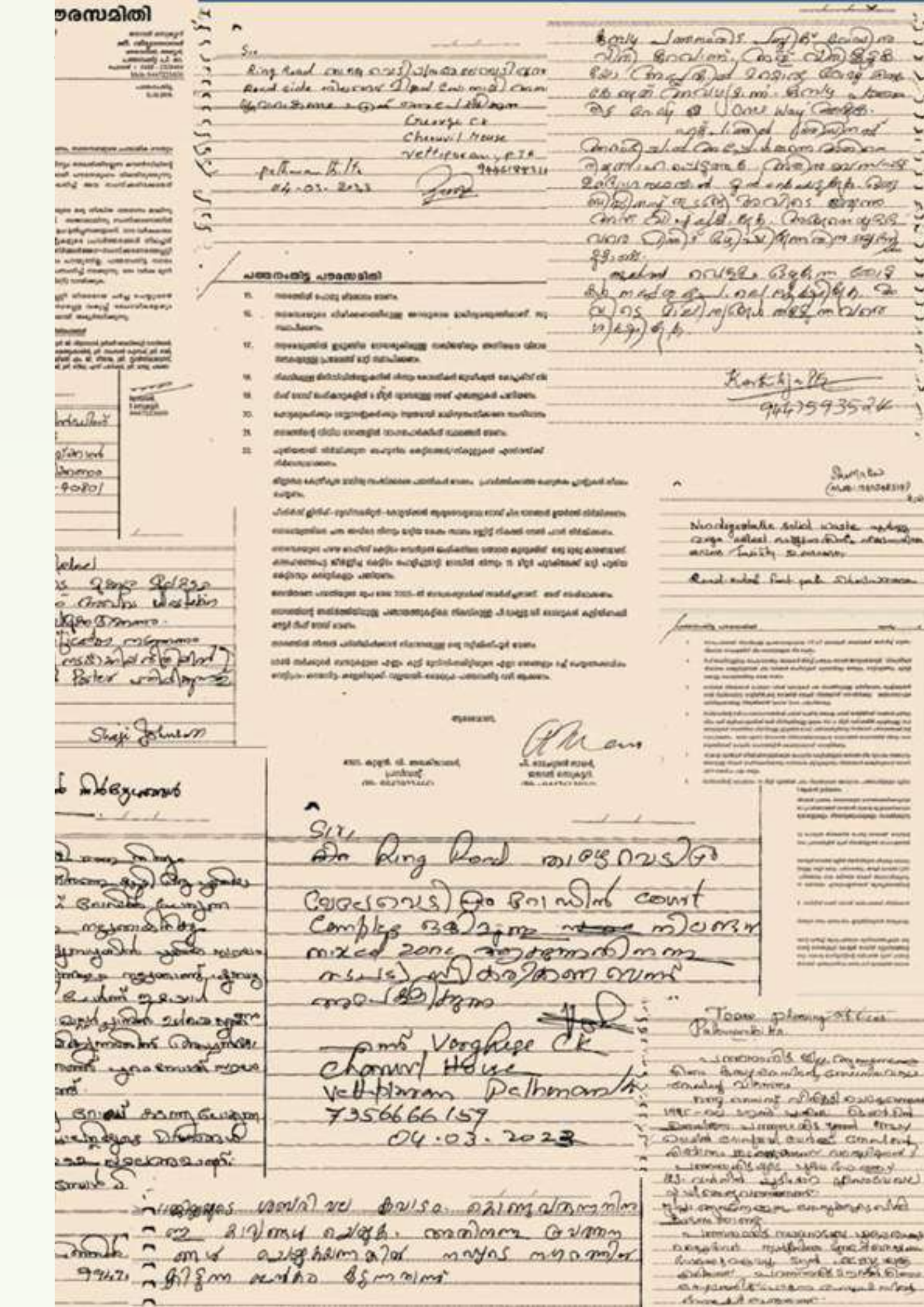

തരസമിതി

Sir,
Ring Road വരുന്ന വെട്ടിപ്പിടിക്കുന്ന
Road side നിലവരെ വീടുകൾ വരെ
ഉൾപ്പെടുത്തണം എന്ന് അഭ്യർത്ഥിക്കുന്നു
Cherian C K
Chennil House
Vettiparambu P.O
pathanamthitta 9446788311
04.03.2023

Kochuthara
9447599356

Shaji Johnson

Sir,
The Ring Road നിർദ്ദേശിക്കപ്പെട്ടിരിക്കുന്ന
വേദഗിരി ഭാഗത്തിൽ court
complex ഒഴിവാക്കി നിലവിൽ
നാഷണൽ ഹൈവേ കടന്നുപോകുന്ന
ഭാഗത്തിലൂടെ
Cherian C K
Chennil House
Vettiparambu Pathanamthitta
7356666157
04.03.2023

Town planning Officer
Pathanamthitta

Master Plan Activities












































റീബിൽഡ് കേരള ഇനിഷ്യേറ്റീവ്
Rebuild Kerala Initiative : DLI -8
Meeting with World Bank Representatives























News Paper Cuttings

» സെൻട്രൽ ജങ്ഷനിലെ നഗരസഭ കെട്ടിടം നിക്കും ചെയ്യും: പുതിയ കേന്ദ്ര ചത്വരം നിർമിക്കും

» ദുവിനിയോഗത്തിൽ നിരവധി ഇളവുകൾ » വിനോദ വിശ്രമ ഉപാധികൾ

പത്തനംതിട്ട ടൗൺ സ്ക്വയർ

അന്തിമരൂപരേഖ തയ്യാർ

■ ഫാത്തിമാബീവിക്കും കെ കെ നായർക്കും സ്മാരകങ്ങൾ

■ വിശ്രമസ്ഥലവും തുറന്ന സ്റ്റേജും ഒരുക്കും

എല്ലാം ഉപയോഗപ്രദം

ദേശാഭിമാനി Sat, 10 August 2024 https://epaper.deshabhimani.com/c/75618977

മാസ്റ്റർ പ്ലാൻ ആശങ്ക: യുഡിഎഫ് സംഘം കുമ്പഴ സന്ദർശിച്ചു

പത്തനംതിട്ട ● നഗരത്തിൽ നടപ്പിലാക്കുന്ന മാസ്റ്റർ പ്ലാനിൽ കുമ്പഴ സ്കീമിലുള്ള ജനങ്ങളുടെ ആശങ്കയും പരാതികളും മനസ്സിലാക്കാൻ നഗരസഭ യുഡിഎഫ് കൗൺസിലർമാരുടെ നേതൃത്വത്തിൽ കുമ്പഴ മേഖല സന്ദർശിച്ചു.

നാട്ടുകാർ അവരുടെ പരാതികളും നിർദേശങ്ങളും ജനപ്രതിനിധികളോടു പങ്കു വച്ചു. നഗരസഭ യുഡിഎഫ് പാർലമെന്ററി പാർട്ടി ലീഡർ കെ.ജാസിം കുട്ടി, കൗൺസിലർമാരായ എ.സുരേഷ് കുമാർ, എം.സി.ഷെറീഫ്, അംബിക വേണു, ആനി സജി, ഷീന രാജേഷ്, നേതാക്കളായ ദീപു ഉമ്മൻ, നാസർ തോണ്ടമണ്ണിൽ, കെ.പി. നൗഷാദ്, ജി.ആർ.ബാലചന്ദ്രൻ, പി.കെ.ഇഖ്ബാൽ, റെജി മൂലമുറിയിൽ, റജി ഡാനിയേൽ, നിതിൻ മണക്കാട്ടുമണ്ണിൽ, സജു കുമ്പഴ, മോനി വർഗീസ്, അഖിൽ സന്തോഷ്, സജി കുമ്പഴ, തൗഫീഖ് കൊച്ചുപറമ്പിൽ എന്നിവർ നേതൃത്വം നൽകി. ചൊവ്വാഴ്ച കൂടുന്ന കൗൺസിൽ യോഗത്തിൽ വിഷയങ്ങൾ അവതരിപ്പിക്കുമെന്നും ആരാധനാലയങ്ങൾ പൊളിച്ചു കൊണ്ടുള്ള ഒരു പദ്ധതിയും അംഗീകരിക്കില്ലെന്നും പാർലമെന്ററി പാർട്ടി ലീഡർ കെ.ജാസിം കുട്ടി പറഞ്ഞു.

കുമ്പഴ നഗരസമുച്ചയ പദ്ധതി

നഗരവികസനത്തിൽ പുതുമാതൃക

കുമ്പഴ സ്റ്റീം

നഗരവികസനത്തിന് ജനാഭിപ്രായം തേടി സെമിനാർ

പത്തനംതിട്ട

നഗരവികസന സങ്കല്പത്തെയും ഭൂവിനിയോഗത്തെയും പൊളിച്ചെഴുതുന്ന പത്തനംതിട്ട മാസ്റ്റർ പ്ലാൻ, കുമ്പഴ സ്റ്റീം സംബന്ധിച്ച പൊതു സെമിനാർ നടത്തി. നഗരസഭാ ചെയർമാൻ അഡ്വ. ടി സക്കീർ ഹുസൈൻ ഉദ്ഘാടനം ചെയ്തു. അതിവേഗം നഗരവൽക്കരിക്കപ്പെടുന്ന നാടിന്റെ 20 വർഷത്തെ വികസന ആവശ്യകതകൾ വിശകലനം ചെയ്യാണ് മാസ്റ്റർ പ്ലാൻ തയ്യാറാക്കിയതെന്ന് അദ്ദേഹം പറഞ്ഞു. ഡെപ്യൂട്ടി ചെയർപേഴ്സൺ ആമിന ഹൈദരാലി അധ്യക്ഷയായി.

സ്ഥിരം സമിതി അധ്യക്ഷരായ കെ അനിഷ്, നഗരസഭാ കൗൺസിലർമാരായ ആർ സാബു, വിമല ശിവൻ, ലാലി രാജു, സുജാ അജി, മുനിസിപ്പൽ സെക്രട്ടറി സു ധീർ രാജ് തുടങ്ങിയവർ പങ്കെടുത്തു. ജില്ലാ ടൗൺ പ്ലാനർ ജി വിനിത്, നഗരാസൂത്രണ ഡ്രാഫ്റ്റ്സ്മാൻ ആർ അനിഷ് എന്നിവർ കാര്യങ്ങൾ വിശദീകരിച്ചു.

ദേശാഭിമാനി Sat, 24 February 2024 https://epaper.deshabhimani.com/c/74619089

നഗരസഭാ കെട്ടിടവും ബസ് ടെർമിനലും നിർമാണം പുരോഗമിക്കുന്നു

നഗരസഭ മാസ്റ്റർ പ്ലാനിൽ വിശദമായ ചർച്ച വേണം: എ.സുരേഷ് കുമാർ

പത്തനംതിട്ട ● നഗരസഭ കുമ്പഴയിൽ നടപ്പിലാക്കാൻ ഉദ്ദേശിക്കുന്ന മാസ്റ്റർ പ്ലാനിൽ വിശദമായ ചർച്ച വേണമെന്ന് നഗരസഭാ മുൻ ചെയർമാൻ എ.സുരേഷ്കുമാർ പറഞ്ഞു. ഇപ്പോൾ തയാറാക്കിയിരിക്കുന്നത് അശാസ്ത്രീയമായ മാസ്റ്റർ പ്ലാനാണ്. വിസ്തൃതി വളരെ കുറവുള്ള കുമ്പഴ പ്രദേശത്തെ വികസനത്തെ തടയുന്നതും തദ്ദേശ വാസികൾക്ക് ഭാവിയിൽ ജീവിതം ബുദ്ധിമുട്ടുണ്ടാക്കുന്നതുമാണ് മാസ്റ്റർ പ്ലാൻ. ഇത് നിലവിൽ വന്നാൽ സ്കൂൾ കെട്ടിടങ്ങളും വ്യാപാര സ്ഥാപനങ്ങളും പൊളിക്കേണ്ടതായി വരും. ആരാധനാലയങ്ങളെ ഇത് ബാധിക്കും. നിലവിലുള്ള റോഡിൽ നിന്ന് 30 മീറ്റർ അകലെ വരെ ഒരു നിർമാണ പ്രവർത്തിയും ചെയ്യാൻ കഴിയാത്ത സാഹചര്യം സൃഷ്ടിക്കും. നഗരസഭാ കൗൺസിലർമാരോട് വിശദമായി ചർച്ച നടത്താതെയാണ് മാസ്റ്റർ പ്ലാൻ സെപ്റ്റിൽ പരസ്യപ്പെടുത്തിയത്. മാസ്റ്റർ പ്ലാനിലെ വിഷയം മുഖ്യമന്ത്രിക്കടക്കം ചർച്ച ചെയ്ത് നടപ്പിലാക്കുന്നതിൽ ദുരുദ്ദേശപരമായ പ്രതിഷേധം ഉണ്ടാകുമെന്നും അദ്ദേഹം പറഞ്ഞു.



തീരസംരക്ഷണ റോഡ് നിർമിക്കുന്നത് മാസ്റ്റർ പ്ലാനിൽ ഉൾപ്പെടുത്തുന്നതിന് മുന്നോടിയായി ടൗൺ പ്ലാനർ ജി.അരുണിന്റെ നേതൃത്വത്തിൽ സാധ്യതാപരിശോധന നടത്തുന്നു. നഗരസഭാ കൗൺസിലർ എ.സുരേഷ് കുമാർ സമീപം.



28. SUMMARY & FINDINGS

The "Findings and Summary" chapter synthesizes the outcomes of the analysis conducted on various sectors of the town. This chapter draws conclusions from the detailed studies conducted in the previous chapters and provides a comprehensive summary that can guide future decisions, policies, and interventions for urban development.

It consolidates the outcomes of sectoral studies and helps to translate them into actionable insights and recommendations. It serves as the foundation for guiding the town's development, ensuring that future growth is sustainable, equitable, and well-coordinated across all sectors. This chapter provides a clear direction for the next steps in implementing the plan and addressing the

Contents

1 General

2 Sectors of Economy

3 Sectors of Physical Infrastructure

4 Sectors of Social Infrastructure

28.1 General

The chapters in the general section of Part I provides an overview of the key factors such as the town's linkages with other surrounding regions, its physical and economic setting, hazard profile & climate change considerations, demographic analysis, Employment and land use patterns. Below is a summary of these chapters and the key findings.

Regional Linkages

- Pathanamthitta is the Pilgrim Capital of Kerala and gateway to Sabarimala.
- Pathanamthitta Town is centrally located within the district and act as a first order settlement.
- Entire Pathanamthitta district is treated as the influence area of Pathanamthitta town.
- Pathanamthitta town is well connected by roads. But there is no rail, Air, water way mode of transportation.
- The National Highway 183A and State Highway (SH 7 & SH 8) pass through the town connecting it with other mega towns in and outside the State.
- Pathanamthitta Town is part of the Kottayam - Pathanamthitta urban growth corridor while considering physical development as well as proximity of urban clusters and other urban areas.

Hazard Profile & Climate Change

- Floods Landslides, droughts, and urban heat island effects are the major risks for Pathanamthitta town.
- The landslide risk is relatively low but still a concern in northern area (7.8% of total area) especially with steep terrain and weak soil conditions.
- Pathanamthitta Town has around 10% of area that are susceptible to flooding especially locations near Achankovil river experiencing high level of flood risk.
- Urban Heat Island hotspots need green spaces
- As per risk assessment and vulnerability analysis, 10% of the area is under flood risk and 7.8% of area is under risk of landslide since vulnerability is dynamic with changing time and population, the mitigation measures are to be suggested for the present risk prone areas and development regulations are to be enforced based on the hazard intensity.

Demography

- As per Census 2011 Number of households in the town is 9813 and household size is 3.82.
- Population in town is more concentrated in Chuttippara East ward with an average population density of 1597 person per sq.km.
- One third of the population of town is concentrated in 12%, half of the population is concentrated in 23%, and two – third of the population is concentrated in 38% of the geographical area of the town.
- Population of Pathanamthitta town is decreasing (37,538) and there is a declining birth rate and a higher proportion of elderly population.
- 6.1% of the population in the town are NRIs.
- 9.4% of the total population of the town resides in areas identified as flood prone and landslide prone.

Employment

- WPR of town is 33% with 26% main workers and marginal workers constitute 7% of total population.
- Female work participation is 16.83%. Majority of workers in the town are coming under other workers classification.

- Town shows occupational shift from primary sector to other sectors.
- The northern wards of the town shows the highest percentage of primary workers.
- Considering population in hazard prone areas, 2.78% population in flood prone area and 85.87% in landslide prone area are facing employment vulnerability as they are employed in informal sector/ daily wages/ local level economic sector/ agriculture activities.
- In areas under economic zones, agricultural, animal husbandry, trade & commerce, industrial and tourism, 1.02sqkm is prone to flood and 4.3sq.km is prone to landslide.

Land use & Built-up Density

- Total area of Pathanamthitta Municipality is 23.43 Sq.km. The major land use of the town is Dry Agriculture having area of 38.98% followed by Residential use area of 36.24%. The Land use pattern is predominantly residential-agriculture mixed land use.
- 8.61% of the town area comes under /Low Lying Wetland /Paddy/ Environmentally Sensitive Zone.
- Residential area is scattered in all parts of the town and the high-density residential development is mostly found in the southern and eastern area of Pathanamthitta town.
- Geographical factor/ topographical constraints contribute to lower residential density and restricted urban development in norther part of the town.
- Commercial Land use is concentrated in the central part of the town. Ribbon development is observed along major transport corridors.
- Dry Agriculture land is distributed in all wards of the municipality. But more concentrated in the hilly peripheral areas in the northern part of the town.
- The ecologically sensitive areas of the town includes wetland/low lying areas, Rocky areas, Sacred Groves and Natural water bodies.
- Wards in the central and southern part of the town have urban character.
- Transportation, recreational and industrial use in the town is far below as per URDPFI standard.
- Flood profile reveals that flood - prone areas closely align with low-lying lands of town.

28.2 Sectors of Economy

The chapters in the sectors of the economy section of part I provides an overview of current state of the economy in the town. It looks at key sectors, trends, and challenges affecting economic development. This include Trade and Commerce, Agriculture, Animal Husbandry, Industry, and Tourism sectors.

Trade & Commerce

- Pathanamthitta town has a diverse commercial scenario with a mix of traditional markets, wholesale shops, modern retail outlets, and emerging businesses.
- Commercial development is primarily concentrated in the town center, with limited expansion into outer areas. Contiguous ribbon commercial development is evident along major transport routes.
- High-rise commercial complexes, shopping malls, wedding centers etc., are lacking in Pathanamthitta Town. People depend on Adoor and Thiruvalla towns for high end shopping facilities.

- Central Junction, Kumbazha Junction and Saint peters Junction are the first, second and third order nodes of town respectively.
- Two markets in town - Pathanamthitta town market and Kumbazha Market, need infrastructure upgradation for better economic generation.
- There is no dedicated space for street vending in the town.
- Commercial plots in town centre without access and parking facilities are to be opened for effective densification.

Agriculture

- Rubber is the major crop of the town. 66.55% of dry agriculture land is under rubber cultivation, followed by mixed crops (17.8 %).
- Even though there is 8.61% of Paddy field/wetland available in the town, there is no paddy cultivation in the town.
- A change in cropping pattern from rubber & coconut to fruit cultivation is observed in the town.
- 8.48 % of workers engaged in Agriculture and allied sector.
- There are no irrigation canals or lift irrigation projects within the town.
- Private tanks, private wells, and tube wells are used for the irrigation of crops. Drip irrigations and furrow type irrigations are also used. Water from river, quarry and rain water collection pits are also used for cultivations.
- Flood-prone areas are located in the southern part of the town, affecting 8.27% of the town's dry agricultural land. The major crops in these regions are rubber, tapioca and mixed crops.
- The plantation (Rubber crop) land use comes under the landslide prone area.

Animal Husbandry

- The Livestock population status of Pathanamthitta is 13th among district and 3rd among other towns in the district.
- There is no medium or large-scale dairy farms in the town. A few household level dairy farms exists, with average of ten or fewer cows, buffaloes and goats.
- The slaughter house in Pathanamthitta town need to be upgraded as modern slaughter house.
- District Animal Husbandry Office and District Veterinary Centre are located in the flood prone area.
- Decline in the cultivation of paddy, increase in production cost, unavailability of good cattle breed, high cost of the cattle feed, unavailability of fodder grass etc. are the major hindrances in growth of the sector.
- High demand for milk, egg and meat in town and surrounding shows the high potential in animal husbandry sector.

Industry

- Industrial sector of town is limited to few industries in the category of MSME.
- Kumbazha region in Pathanamthitta town was an automobile service hub for the entire district in the past decades. Kumbazha was famous for the lorry services.
- 55% of total industrial units are in service sector and the remaining 45 % are in manufacturing sector.
- General Engineering, Wood Industries, Cement Blocks, Software Development, food products, candles and Paper products are the units functioning in the manufacturing sector.

- Agro based units are very few in number even though the town have abundant agricultural resources.
- Priority sectors like Food Technologies, High Value-Added Rubber Products, High-tech Farming and Value-Added Plantation Produce, Recycling & Waste Management, Renewable Energy and Tourism & Hospitality have potentials in the town.

Tourism & Heritage

- The Pathanamthitta district is rich in various types of tourism such as Pilgrim tourism, Eco tourism, and Heritage tourism.
- Town has no active tourism destinations and no tourism potential areas has been properly established with infrastructures.
- Pathanamthitta holds last position in domestic and foreign tourist arrival among the other districts in Kerala.
- There are no heritage Places or buildings within the Pathanamthitta town.
- As part of town beautification, the flowers were planted along roadsides.
- Areas such as Chuttipara Hill rock, Kottapara, Valamchuzhi river front areas, Vanchikapoka water falls, Mannaramala view point, Pulikkotta para, Kulavarikkapara, Ottukal muruppu, Myladumpara, Villoonnipara, wetlands, water bodies etc. have tourism potential.
- By utilizing the location advantage, heritage value, and tourism potential of the town, Pathanamthitta can be developed as a tourist transit center.
- By focusing on eco-tourism, adventure tourism, cultural heritage, sustainable development and aesthetic appeal, the town can create a thriving tourism sector that attracts a diverse range of visitors.
- Tourist facilities and accommodation for Sabarimala pilgrims have great potential in town.

28.3 Sector of Physical Infrastructure

The chapters in the sector of physical infrastructure of part I provides a comprehensive assessment of the current state of physical infrastructure within the region. It covers the status and functionality of transportation networks and utilities (water supply, electricity, waste disposal).

Transportation

- The existing road network in Pathanamthitta town consist of roads in different categories such as, National and State highways, Major district roads and other municipal roads.
- The Kollam- Vandiperiyar (NH-183A), Thiruvalla- Kumbazha (SH-7) and Punalur-Muvattupuzha (SH-8) highways are passing through the town.
- The road network in Pathanamthitta town follows a ring and radial pattern. The town has well-defined ring road.
- The five arm junction called central junction is where all the major roads and activities are connected towards center of the town.
- Four arm junction at eastern side called Kumbazha Junction serves as the gateway to Pathanamthitta connecting SH 7 & SH8. Other six four arm junctions in the central area connects major roads to central junction in the ring road.
- Many of the roads in the town including stretches in NH 183A, SH 7, SH 8, Malayalappuzha road, Mylapra road and ring road have V/C ratio greater than 1 indicating congested movements during peak hours.

- Traffic volume at Aban Junction is the highest followed by Cooperative college junction, Central junction and Stadium junctions.
- Highest parking accumulation of 146 vehicles is found in between St Peters Junction and Central Junction on normal working day.
- Existing width of footpaths could not cater the pedestrian volume and free movement. Footpath are not continues and barrer free.
- Two bus stations ie, KSRTC Bus station and Municipal Bus station are functioning in the town. A one-way traffic system is implemented in the town during specific times to manage traffic flow efficiently, reduce congestion, and enhance accessibility to key areas.
- Currently, bus services are limited to the southern part of the ring road, leaving areas like Melevettipuram and Thazhevettipuram underserved. As a result, residents in these areas heavily rely on auto-rickshaws for transportation.
- Town lacks have proper truck terminal area. Currently trucks are parked in the shoulder areas of ring road and open ground near ring roads.
- Northern hilly area the town suffer from poor connectivity to other parts, limiting accessibility and hindering seamless movement.
- To promote sustainable and safe mobility, adequate pathways, dedicated bike lanes, and pedestrian-friendly roads should be integrated into the urban infrastructure.
- Urban flooding and riverine flooding had affected some of the important road stretches. During 2018 floods the town was isolated from other parts of the district as the connecting roads got inundated.

Water supply

- The town is catered by 2 water supply schemes both of them are owned and operated by Kerala Water Authority.
- Present water demand is met by the current water supply scheme (2.6 MLD). But availability of water during summer is found inadequate since demand of water increases due to lack of water availability in open wells and public wells.
- Only 41% of the households are using piped water supply as primary source of water.
- Water scarcity is prevalent in peripheral wards in town. Central have better coverage by existing water supply schemes, which prioritize these high-density areas.
- Under AMRUT 2.0 project, water treatment plant of capacity 20MLD is under construction in the available land of KWA at Pampoorippara.
- Transformation of wetlands has severely impacted groundwater retention, reducing natural recharge capacity and increasing vulnerability to water scarcity and urban flooding.
- Expanding the water distribution network to unserved areas is a key priority. The northern part of the town requires special attention due to severe water scarcity.
- Ensuring the availability of safe drinking water during floods to the people in the flood prone area must be a priority.
- Local water supply scheme can be promoted from quarries & ponds.

Solid waste management & Sewerage System

- Total solid waste generation of the town is 13.14 tonnes per day (TPD) with70% is biodegradable.

- Source level treatment is promoted for biodegradable waste generated in the town. There are no waste collection points in the town. Kitchen Bio Compost, Pit Compost and Ring Compost are the major treatment facilities adopted in the town for household source level treatment of biodegradable waste.
- Non-biodegradable waste is collected through door-to-door mechanism by Haritha Karma Sena on a monthly schedule and covers all 32 wards of the municipality.
- All collected non-bio degradable waste are transferred into Material Collection Facility (MCF) Centre and hand over the waste to government agencies for reuse after shredding and bailing.
- Preparation of a solid waste management plan for the town help to manage the overall solid waste of the town in structured manner.
- Town lacks proper drainage or sewerage network to address the liquid waste produced.
- Mobile FSTP systems offer a more reliable and adaptable solution, ensuring uninterrupted waste treatment even in flood-affected areas.

Energy

- Distribution of power in Pathanamthitta town is managed by KSEBL through the Pathanamthitta 110KV substation with Pathanamthitta and Kumbazha.
- 80% of the total energy connection in the town are in domestic sector. There are limited connections for industrial, irrigation, street lighting etc.
- There are 5 electric vehicle charging stations located within Pathanamthitta town.
- Currently town has no projects related to achieve green energy and carbon neutral. Construction of Energy efficient buildings maybe promoted.
- Underground electric cabling need to be promoted for safety and aesthetic view of town.

28.4 Sectors of Social Infrastructure

The social infrastructure sector in Part 1 focuses on the facilities and services that support the well-being and quality of life for the population. This includes healthcare, education, housing, public spaces, and community services. Below is a general summary of the contents of these chapters and the potential findings that may emerge from their analysis.

Education

- Town has efficient educational institutions in both public and private ownership. Upgradation of infrastructure facilities are needed in government schools.
- Smart class rooms are there in all major schools.
- The district has witnessed a 10% to 20% decline in college admissions over the past three years, reflecting large-scale student migration to Western countries, a broader trend across Kerala.
- Spatial location and existing number of education institutions in the town are sufficient while comparing with planning standards.
- Rain Water Harvesting can be used in schools/anganawadis in high altitude terrain and in those functioning in wards with water scarcity.
- 14 Education institutions can be selected as the rescue camps at the time of natural hazards.

- School for physically disabled, technical schools, poly technic colleges etc. are needed.

Health

- Pathanamthitta town being located spatially at the centre of the district, most of the higher order health institutions are encircling the town with in 15km radius which give more access to multiple options of higher order health care service for people in the town.
- Upgradation of facilities required in existing government hospitals.
- Pathanamthitta town has all three categories of health institutions like allopathy, ayurveda, and homeopathy working under government sector itself.
- For higher order and super speciality medical facilities, people depends institutions at Thiruvalla and Kottayam.
- Hospitals for Women and Children, Mental Health Centre, TB Hospital and Leprosy Hospital are not in the district. Town has sufficient land to bring these hospitals in the district headquarter.
- For higher order and super speciality medical facilities, people depends institutions at Thiruvalla and Kottayam.
- Hospitals for Women and Children, Mental Health Centre, TB Hospital and Leprosy Hospital are not in the district. Town has sufficient land to bring these hospitals in the district headquarter.
- Proposals are needed for urban health, mental health such as fitness and wellness centers, counselling centers etc.

Housing

- Pathanamthitta town has scattered homestead type of residential developments and residential areas are scattered in all parts of the town.
- residential areas are mostly concentrated adjacent to major roads and the concentration decreases towards the periphery of the town
- People in the town generally prefer individual houses with their own land, allowing space for gardening and agricultural activities.
- House hold size is decreasing continuously from 5.4 in 1981 to 3.8 in 2011 and number of houses are increasing.
- There are 34 Nagars identified in the town which include, 25 SC Nagars, and 9 ST Nagars. All Nagar are having their own land and good infrastructure facilities.
- There are above 200 unoccupied /closed houses in the town. Identifying suitable projects for these unoccupied houses can contribute to the town's economic growth by utilizing vacant spaces for productive purposes.

Recreation

- The Stadium and children’s park are the only recreational facilities available in the town which is far below the planning standards.
- Other recreation centres include theatres, auditorium and library.
- Being the capital of the district, regional level recreation facilities are also to be created by the town along with neighbourhood level recreations.

Other Civic Amenities

- The number of existing civic amenities in the town is sufficient to cater to the needs of the population as per planning standards (URDPFI Guidelines)
- During the 2018 flood, access to the fire station was hindered by floodwaters, isolating the facility and hampering its operations. So, critical infrastructure in hazard prone area may be relocated.

Special Concern Areas

- 37.80% households in the town are comes under Below Poverty Line category.
- SC population of Pathanamthitta town is 8.77%. 0.35% are Scheduled Tribes.
- The town has 0.008% population with disabilities.
- 19.7% of the population in the town is above 60 years of age
- In Pathanamthitta town, the active women welfare program is mainly through Kudumbashree units and is working effectively in all wards. Around 3200 women in the town are members of the 229 Kudumbasree units.
- Smart Anganawadis are limited in town
- The infrastructure with inclusive designs are absent in the town.
- Barrier free footpath/buildings, child friendly design, women rest rooms/hostels, therapy centres for differently abled, skill development centres for vulnerable groups are needed.
- Upgradation of SC/ST habitats are neede in the town.

Environment

- Pathanamthitta town has been recognized as the second least air polluted town in India next to Tezpur in Assam, according to Central Pollution Control Board in 2018.
- Major surface water body existing in the town is Achankovil River. As per water quality analysis of CPCB, River Achakoil come under Class C Category surface water which is suitable for drinking after conventional treatment and disinfection.
- No major land pollution and noise pollution activities happening in the town.
- Wetlands, rocky areas, sacred groves, and natural water bodies are the components of the Pathanamthitta town's environmentally sensitivity areas.
- Town has many major rocky areas along with numerous minor rocky areas. These rocky areas are spatially distributed across almost all parts of the town.
- Town has many sacred groves and these are well protected by authorities and local people.
- Kannankara Thodu in the town with varying width from 5m to 15m serves as the natural drainage for storm water flowing towards Achankoivil River.

Administration & Finance

- Pathanamthitta town is a Grade 2 Municipality with population less than 50,000 and more than 25,000, annual income less than 4 crore and more than 2 crore.
- Municipal Council is a fundamental part of the local governance structure by ensuring representation, participation, and accountability in municipal governance.

- Total Income of Pathanamthitta Municipality is largely contributed by Tax Revenues and Revenue Grants, Contributions & Subsidies which accounting for more than 80% of the total revenue income during the last four years.
- The gross financial balance of the Municipality has been showing an increasing trend.

- Total expenditure is mainly incurred towards Programme Expenditure & Establishment Expenditure. Programme Expenditure mainly consists of social and welfare programmes like implementing housing programmes, development fund programmes for social welfare etc. Establishment Expenditure, the second largest contributor to revenue expenditure, primarily consists of salaries & wages, travelling allowances and contribution to Pension Fund.



29. SECTORAL & OTHER LINKAGES

Urban planning requires a multidimensional approach that integrates various sectors to ensure sustainable and resilient development. The chapter on *Sectoral and Other Linkages* explores the interdependencies between land use, settlement patterns, economic activities, transportation networks, environmental resilience, and social cohesion.

In the context of Pathanamthitta town, where vulnerability to natural hazards necessitates risk-informed planning, it is crucial to analyse how different sectors interact. By understanding these linkages, master plan can develop strategies that promote adaptive capacity, reduce vulnerabilities, and foster sustainable urban development in Pathanamthitta.

Contents

1. Integrated Land use
2. Settlement Characteristics
3. Accessibility & Connectivity
4. Economic Viability
5. Social Cohesion
6. Environment & Resilience
7. Summary

29.1 Integrated Land use

Land use integration refers to the strategic arrangement and management of different types of land uses such as residential, commercial, industrial and recreational etc. within a town. Understanding of integration of land use linkages of town is essential for sustainable and balanced development.

29.1.1 Residential and Agricultural Linkages

The land use pattern of town is primarily of a mixed nature comprising agricultural and residential land use. Residential areas are spread throughout the municipal region, including agricultural lands in the peri-urban areas. Households situated in fringe areas rely on agriculture for their livelihoods. The mixed development of agricultural and residential land to support live-work arrangements without disrupting agricultural land may be promoted. It is crucial to designate and protect productive farmland through zoning regulations to avoid uncontrolled urban encroachment.

29.1.2 Residential and Commercial Linkages

Commercial hubs are concentrated in the central of the town, serving the dispersed residential clusters. Mixed-use development or well-integrated residential and commercial zones are not in the town which leads to high commuting time and traffic congestion. The need for neighbourhood-scale commerce in outer areas of town is essential, especially due to the scattered nature of settlements. Connectivity and public transport must be enhanced to ensure equitable access to commercial services for residents in fringe areas.

29.1.3 Agricultural and Commercial/ Industrial Linkages

Agricultural land is concentrated in the peripheries, while commercial activities are central or road-linked. Agricultural areas supply raw materials (e.g., rubber, spices, and coconut, dairy) to town-based markets. Industrial activities are less compared to the potential of agricultural land uses. As the district headquarters with an agro-residential land use pattern, the town lacks large-scale diverse industries to support economic growth, despite the availability of land. Town has the availability of land for the agro related industries, agro tourism, recreational activities to support the future requirement.

29.1.4 Ecological and Other Land Use Linkages

A chain of wetlands and water bodies flows through the central and southern portions of Pathanamthitta town, forming part of the Achankovil River basin. Wetlands act as natural drainage systems, especially crucial for flood-prone areas and safeguarding urban infrastructure. They provide groundwater recharge, benefiting both residential and agricultural water needs. However, urban encroachment threaten these ecological zones. Rocky Hills are also in the town which need to be protected from further environmental degradation. Currently there is no buffer zones in the town. Buffer zones should be established, and wetlands should be integrated as nature-based infrastructure in land use planning.

29.1.5 Residential and Recreational Linkages

Residential settlements in Pathanamthitta town are dispersed across the municipal area. Currently, town lacks dedicated recreational spaces such as parks, open grounds, and waterfront amenities even though land is available. Recreational land use is limited in the town and not inter connected with residential and commercial land uses. Wetlands and rivers can offer a unique opportunity to create eco-recreational spaces (e.g. riverfront promenades, greenways, nature parks). Integration of green-blue infrastructure (parks and water bodies) with walking and cycling networks can improve public health, tourism potential, and environmental resilience.

Pathanamthitta's land use system demonstrates clear functional and spatial interdependencies. Agriculture in the outskirts sustains the local economy; the urban core drives services, commerce and institutional activity; and natural ecosystems like wetlands provide life-supporting ecological services. However, the lack of recreational zones and growing pressure on natural areas highlight the need for a more balanced and integrated land use policy. Future planning must focus on harmonizing these interdependencies, improving spatial connectivity, preventing land use conflicts, and ensuring inclusive access to resources, services, and green spaces.

29.2 Settlement characteristics

Settlement characteristics significantly influence and interconnect with various sectors of a town shaping its overall functionality by influencing patterns of economic activity, social dynamics, environmental sustainability and overall urban context. The settlement pattern of Pathanamthitta town exhibits a complex interplay between topography, plot size, density, transport corridors, and natural features such as wetlands. The town's physical character is shaped by both natural constraints and human interventions, resulting in distinct patterns across its central, southern, and northern regions.

29.2.1 Settlement Character Linkage with Plot Size and Density

The central part of Pathanamthitta town have predominantly small plot sizes (subdivided land parcels), reflecting a pattern of high-density. Historically central area of town developed as the commercial and administrative core. The proximity to major roads, institutions, and services has led to land fragmentation over time. The density of the settlements in the town is based on the size of the plot differences, not because of the high rise buildings like other cities/towns. The people of the town predominantly prefer individual houses over apartments. The majority of the settlements in the central part of the town consist of small-sized plot divisions, which pose challenges in providing adequate infrastructure to these areas. High-density development increases demand on public infrastructure and reduces open space availability. Small plots lack space for parking, or green cover, contributing to urban heat and drainage stress. These central areas need urban renewal strategies such as replotting, mixed-use vertical development, and green infrastructure integration.

Outskirts and northern part of town exhibit larger plot sizes, generally used for low-density residential, agricultural, or mixed rural uses. Larger plots in peri-urban areas support home-stead cultivation, livestock rearing, or future expansion. These areas offer opportunities for planned development and infrastructure provisioning, avoiding unplanned densification. There are several vacant/closed houses in the town as many residents are NRIs. These houses can be utilized for generating economic income by repurposing them to support the town's essential facilities and services.

29.2.2 Topography and Settlement Pattern Linkages

Concentration of buildings and residential land use is found to be high in the southern and central part of the town aligned with road network and least in northern part of the town due to topographical undulations. The central part and southern part of Pathanamthitta town lies in low-lying terrain, intersected by drains, wetlands and river. These areas are prone to waterlogging and flash floods, especially during monsoons. These are higher density settlement areas of the town due to topography and accessibility. But these areas are at higher risk during extreme weather events, requiring improved drainage, flood zone regulation and stilt-based construction where feasible. Land use control in such zones must restrict high-intensity development and promote wetland conservation.

Northern part of the town feature higher elevations and hilly terrain. Settlements here are more dispersed and follow conventional type of settlement construction patterns. Settlement here need to follow the contour-based development pattern. Construction in steeper zones must follow hill regulation guidelines, including retaining walls, slope stabilization, and controlled cut-and-fill. These areas are suitable for low-impact eco-residential with emphasis on soil conservation and slope-sensitive architecture.

29.2.3 Connectivity and Settlement Pattern Linkages

Areas in the central and southern parts of the town exhibit higher population and built-up densities. These areas are traversed by major transport routes such as NH 183A and regional connector roads. These roads drive densification by attracting commerce, services, and transport-based development. Settlements along these corridors are highly accessible but vulnerable to congestion and environmental degradation. Prioritizing Non-Motorised Transport, service clustering, and pedestrian-friendly infrastructure are needed in these high-density belts.

The settlement character of Pathanamthitta is deeply influenced by topography, transportation and ecological features, resulting in a mosaic of densities and land use patterns. Central areas are dense and fragmented, while peri-urban zones remain under-utilized. Wetlands and low-lying zones have both ecological value and developmental constraints.

Terrain-sensitive, risk-informed and infrastructure led approaches ensuring resilience, spatial equity, and sustainable growth are needed. Integration of settlements with parks, green areas, community centres and neighbourhood recreational areas to promote social interaction, strengthening community ties and enhancing the quality of life are needed in town.

29.3 Accessibility & Connectivity

The road network of Pathanamthitta town plays a pivotal role in linking different sectors, including residential, commercial, and institutional areas. This correlation influences accessibility, economic development, land use patterns and social interactions ultimately shaped the overall functionality of the town.

29.3.1 Changes in Traffic and Transportation Needs due to Growth in Various Sectors

The central area of the town has seen concentrated growth in retail, banking, hospitality, and public administration services. Certain well-developed residential areas near the town center (e.g., Catholicate College area) benefit from frequent bus services, pedestrian walkways, and proximity to main roads. Peripheral residential zones like Valanchuzhy and Anchakkala face limited bus routes, poor last-mile connectivity, and lack of street lighting or walkable footpaths, discouraging use of public transport. This leads to increased private vehicle dependency, congestion during peak hours near arterial roads and reduced accessibility for elderly and school-going children.

The town centre, especially near the KSRTC bus stand and market areas, has good transport connectivity. High footfall supports local commerce. Congestion and lack of parking near commercial hubs lead to unauthorized street parking, obstructing smooth traffic flow. This leads to customer inconvenience, reduced business potential in congested zones, and safety hazards due to mixed traffic. Educational institutions near bus route and Government Hospital have bus stops nearby, facilitating student and patient mobility. Institutions in interior locations lack proper road infrastructure connectivity leads to lack of direct public transport access.

Well-connected sectors of town show higher economic activity, real estate demand, and

better quality of life indicators. Sectors with transport gaps remains underutilized, marginalized, and exhibit slower growth. Because of these town shows over-reliance on private vehicles due to poor public transport in some sectors, narrow roads and encroachments, lack of integrated traffic management and parking solutions and seasonal traffic surges without permanent infrastructure improvement. Changes like strengthening intra-town bus services to underserved sectors, develop non-motorized transport infrastructure (sidewalks, cycle lanes), introduction of traffic calming and smart signalling in congested zones and preparation of a comprehensive mobility plan (CMP) for the town need to be addressed.

29.3.2 Changes in Traffic and Transportation Needs Due to Changes in Land Use

The concentration of traffic attracting land uses of the town, i.e. major government offices, hospitals, markets, bus stands etc. are in the central part of the town. Intensified commercial and residential activity is there in core areas is seen due to land subdivision and plot densification. Narrow internal roads in the central areas experience overcapacity usage, affecting both vehicular and pedestrian flow. Shortage of on-street parking and traffic management systems increases congestion. Higher pedestrian activity necessitates footpaths, crossings, and street lighting. Increase in private vehicle dependency of residential areas in northern and western peripheries of town is due to lack of public transport. Longer travel distances result in higher fuel consumption and emissions. Town demands inter connectivity with bridging, ring roads, and rural road upgrades. Increasing overlap of residential, retail, and institutional land uses in central zones leads to overlapping peak-hour demands from residents, employees, and students cause modal conflict. There is need for multimodal integration, particularly non-motorized and shared transport solutions. Commercial intensification has led to the informal use of public roads and vacant land for parking. Reduction in effective carriageway width, leads to traffic slowdowns, increased jaywalking and traffic safety issues. Enforcement of parking policy, multilevel parking structures, and pricing mechanisms is needed.

29.4 Economic Viability

Economic development of Pathanamthitta town is intricately connected to the various sectors, influencing and being influenced by factors such as land use, infrastructure, social dynamics, and local policies. It is closely tied to employment opportunities available within different sectors of town. A diverse range of sectors promotes job creation across various skill levels, contributing to a more robust local economy. The distribution of land use helps to shape the economic activity within town.

29.4.1 Linkage between Agriculture, Animal Husbandry, Trade & Commerce, Industries & Tourism

Agriculture is concentrated in the northern and peripheral rural zones of town. Major crops include rubber, coconut, tapioca, and banana. These agricultural products feed into small-scale trade and support local consumption. Surplus produce is sold in local markets, especially in Pathanamthitta central market. Rubber tapping and latex collection done by local residents and rubber-based shops. Agricultural landscapes and plantations of town hold potential for agro-tourism if developed with supporting facilities. Pathanamthitta has limited livestock farming, mostly backyard poultry and cattle. Low mechanization and lack of cold storage chains limit expansion. Crop-livestock integration is minimal but could be improved for organic farming practices. Town has potential for developing small-scale dairy, meat processing, or poultry units. Also have potential to support eco-tourism or farm-stay models if developed in tandem with rural homestays.

The town lacks a significant industrial base; only a few small enterprises. Agro-based industries (e.g., tapioca chips, coconut oil, rubber products) can be scaled up. Local industries can fuel wholesale and retail sectors with value-added goods. Handicraft industries have potential to cater to tourists, especially during the Sabarimala season.

Pathanamthitta town centre, including areas near KSRTC Bus Stand, Market Road, and College Junction, serves as the primary commercial hub. It hosts wholesale shops, retail stores, banks, transport agencies, and services that support other sectors. Primarily religious tourism centred around Sabarimala, with Pathanamthitta as a key transit point. Natural resources (river Achankovil, hills), temples and churches remain underutilized for broader tourism (e.g., eco-tourism, heritage tourism). Local businesses benefit during pilgrimage seasons. Promoting farm stays and plantation visits, local craft industries can cater to tourist demands.

Pathanamthitta town presents a layered economic structure, where the vibrant commercial core is supported by surrounding agricultural activities but lacks a strong presence of industry and tourism beyond seasonal inflows. The town as a first order settlement in the district can lead to development of the service sector and also to corresponding increase in employment opportunities. The main tourism potential areas in the town like Chuttipara and Valamchuzhy needs to cater floating population needs more facilities. The night life activities, food streets which are currently lacking in the town will also encourage the local economy of the town.

29.4.2 Effect on Real Property Values

Town centre areas such as TK Road, Market Junction, and KSRTC areas host dense commercial activities like banks, textile shops, electronics, and restaurants. Presence of bus stations and markets boosts foot traffic. Growth in Thiruvalla Kumbazha Road, Adoor Road, and Ranni-Punalur stretch and northern part of ring road has increased land demand.

Commercial core areas have higher land values due to high demand for retail and office spaces, limited space for expansion and Better transport connectivity. Real estate in and around Market Junction is priced significantly higher due to its commercial density. Areas like Kumbazha and Catholicate college Junction where residential and commercial uses coexist tend to have moderate to rising property values, driven by accessibility. As commerce decentralizes (e.g., through retail chains and shops), property values in fringe areas like Kaippattoor Road and Kumbazha - Malayalappuzha stretch are increasing. Anticipation of infrastructure (roads, shopping complexes) leads to speculative buying. In Pathanamthitta, real property values are strongly tied to the proximity to commercial hubs, transport networks, and pilgrimage-related footfall. While central zones are stable high-value areas, peripheral zones are emerging hotspots due to decentralization of trade and road expansion.

29.5 Social Cohesion

Social cohesion deeply intertwined and influence various sectors, including economic, educational, health and recreational sectors. The number of existing educational institutions, health centres and hospitals along with the availability and quality of housing in Pathanamthitta town, indicate that the town has adequate infrastructure to support for social development. Recreational and cultural sectors needs to be addressed in the town. This integration paves the way for a sustainable urban future that benefits all sectors and residents alike.

29.5.1 Inclusive Growth in Various Sectors

Inclusive growth in Pathanamthitta town that ensures equitable opportunities and access to resources across all communities—regardless of caste, gender, religion, income level, or

geographic location. Public health centres (PHCs) in town ensure basic healthcare access. But town shows gaps in mental health and geriatric care. Life Mission has provided housing to homeless and economically weaker sections. Drainage and sanitation issues prevail in town. Flood-prone areas (e.g. near the Achankovil River) need resilient infrastructure. Active Ward Sabhas and ward-level meetings promote inclusive planning. Decentralized governance allows for local solution-making. Community participation are in the town in afforestation and river cleaning drives. Disaster response has improved post-2018 floods, with better community awareness. Pathanamthitta shows positive signs of inclusive growth across sectors, especially in health, education, and grassroot governance.

29.6 Environment & Resilience

Pathanamthitta town has a chain of environmentally sensitive areas which act as sponge of the town at the time of natural calamities and flood. The protection and recovery of environmentally sensitive areas, along with the regulation of infrastructure in flood and landslide-prone zones, and the enhancement of building resilience will collectively contribute to strengthening the town's resilience.

29.6.1 Energy Efficiency and Land Use

While the town is semi-urban with both dense and dispersed settlements, how land is used (zoning, transport planning, and building patterns) has a direct effect on energy consumption—especially in sectors like transportation, housing, and commerce. Compact land use in the town centre (like Market Junction and TK Road) supports shorter travel distances with more walkability, reducing transport energy needs. Low-density sprawl on outskirts of northern part of town increases dependency on private vehicles which leads to higher per capita energy use for commuting and goods transport. Land use along SH7 & SH8 corridor is predominantly commercial. These zones attract vehicle-heavy commerce. The lack of integrated public transport routes increases fuel usage of town. Poor last-mile connectivity in hilly and fringe areas increases reliance on diesel/petrol autos. Traditional homes in outer wards with large plots are less energy-efficient due to poor insulation, more surface area exposed to heat and rain. Newer flats and buildings in town use more air conditioning and lighting, increasing electrical energy demand and these are not built with green standards. Dense tree cover and water bodies (e.g., near Achankovil River) help regulate microclimate, reducing cooling energy demand. Unplanned urban expansion of town leads to loss of natural ventilation corridors. Formation of Urban heat islands, especially in paved commercial hubs at central part of town. Potential for solar installations on public buildings (schools, hospitals) and urban rooftops is not fully utilized.

29.7 Summary

The study of linkages reveals the need of giving due consideration to the core sectors of Trade & Commerce, Agriculture, Transportation, Tourism, Environment and their inter connections. Additionally, inter-sectoral linkages as well as the linkages between settlements character and sectoral developments is essential to ensure the optimal resource utilisation and to trigger the local economic development with resilient nature.



30. EXISTING SPATIAL STRUCTURE

A town's built environment, infrastructure, land uses and natural features etc. all physically arrange within its limits creating its spatial structure. Spatial structure of a town based on land use pattern refers to the distribution and arrangement of different types of land uses across its geographical area.

Understanding Existing Spatial Structure of the town is the last step in the study and analysis part of this report. Existing Spatial Structure of the town is obtained by overlaying different existing spatial aspects of town. It provides a comprehensive understanding of how the town is currently organized in terms of land use, transportation networks, infrastructure, and socio-economic patterns. This helps in identifying strengths, weaknesses, opportunities, and challenges within the city's spatial development and to develop future Integrated Development Vision.

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1. Geography of the town
2. Activity Pattern
3. Functional Character
4. Connectivity Pattern
5. Existing Hierarchy of Nodes
6. Environmentally Sensitive areas
7. Existing Spatial Structure
8. Future projections
9. SWOT Analysis
10. Development Issues

30.1 Geography of the town

The development activity of an area is decided by the topography of the area. Topography, which encompasses the physical features of the land, including elevation and slope profoundly influences how communities and infrastructure are developed. The ground level of Pathanamthitta town varies from 15 m to 181 m above the Mean Sea Level (MSL). To understand the existing development, town elevation is divided as four levels. The general slope of the town directs the flow of drainage water primarily toward the Achankovil River, which is situated in the southern boundary. The central and southern areas of the town lie in low-elevation zones, where development is primarily concentrated. Northern areas are under steep slope and high elevation. The town features numerous steep hills and rocky terrains, influencing its topography and development patterns. Most of these highly elevated areas are under rubber plantation. The Figure 30.1 shows the elevation of the town in different range.

30.2 Activity Pattern

The activity pattern of Pathanamthitta town is analysed ward wise based on land use concentration index. Combining the ward wise concentration pattern of the major land uses spatially and by analyzing the resulting pattern, activity pattern of town (based on the existing land use) is evolved (Figure 30.2). The commercial activity is concentrated at the central area of the town. A few wards with a high concentration of public activity are primarily located in the southern part of the town. A mix of Commercial and Public activity is also concentrated near the central part of the town. Residential activity is primarily concentrated in wards surrounding the central nucleus, particularly in areas with plain terrain.

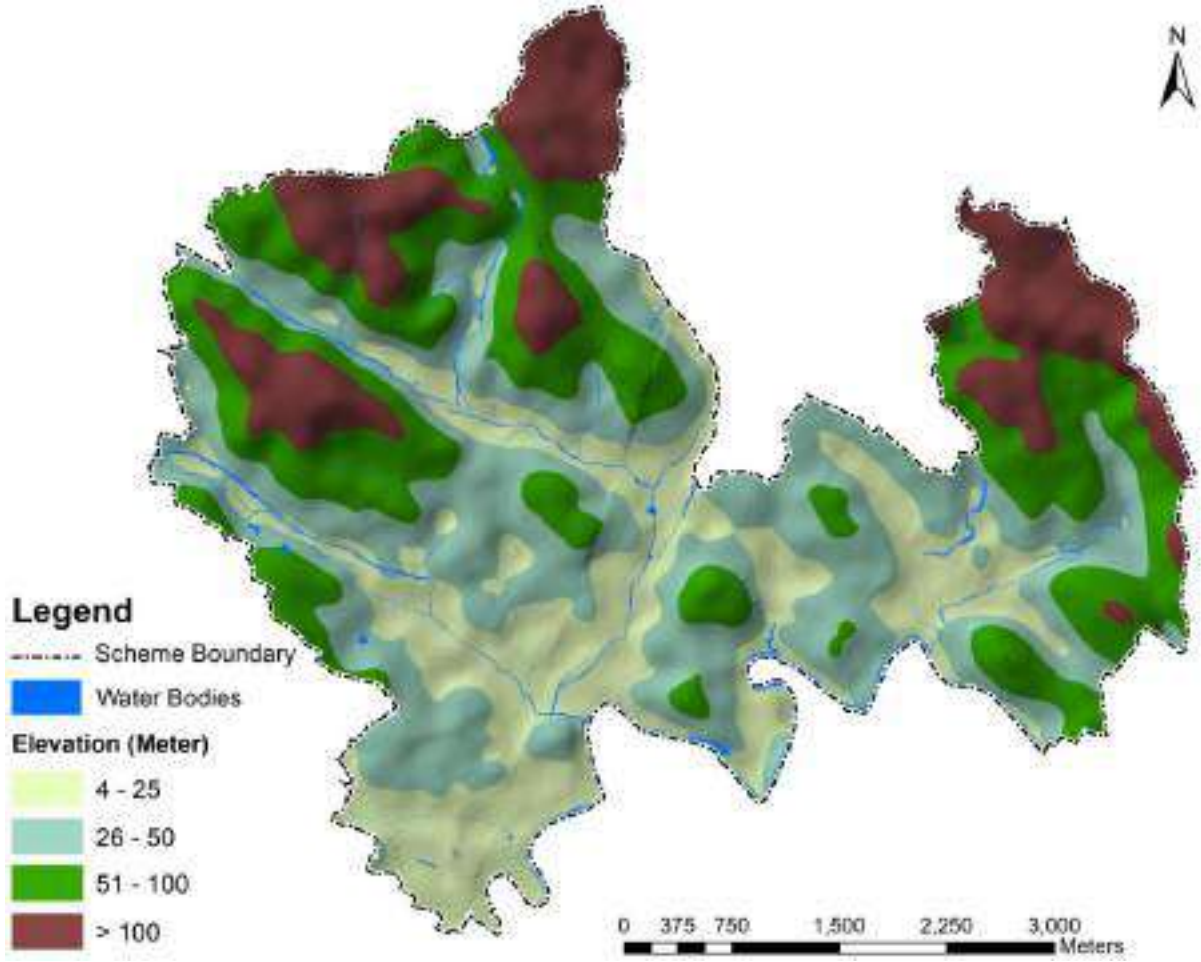


Figure 30.1 Elevation of the Pathanamthitta Town

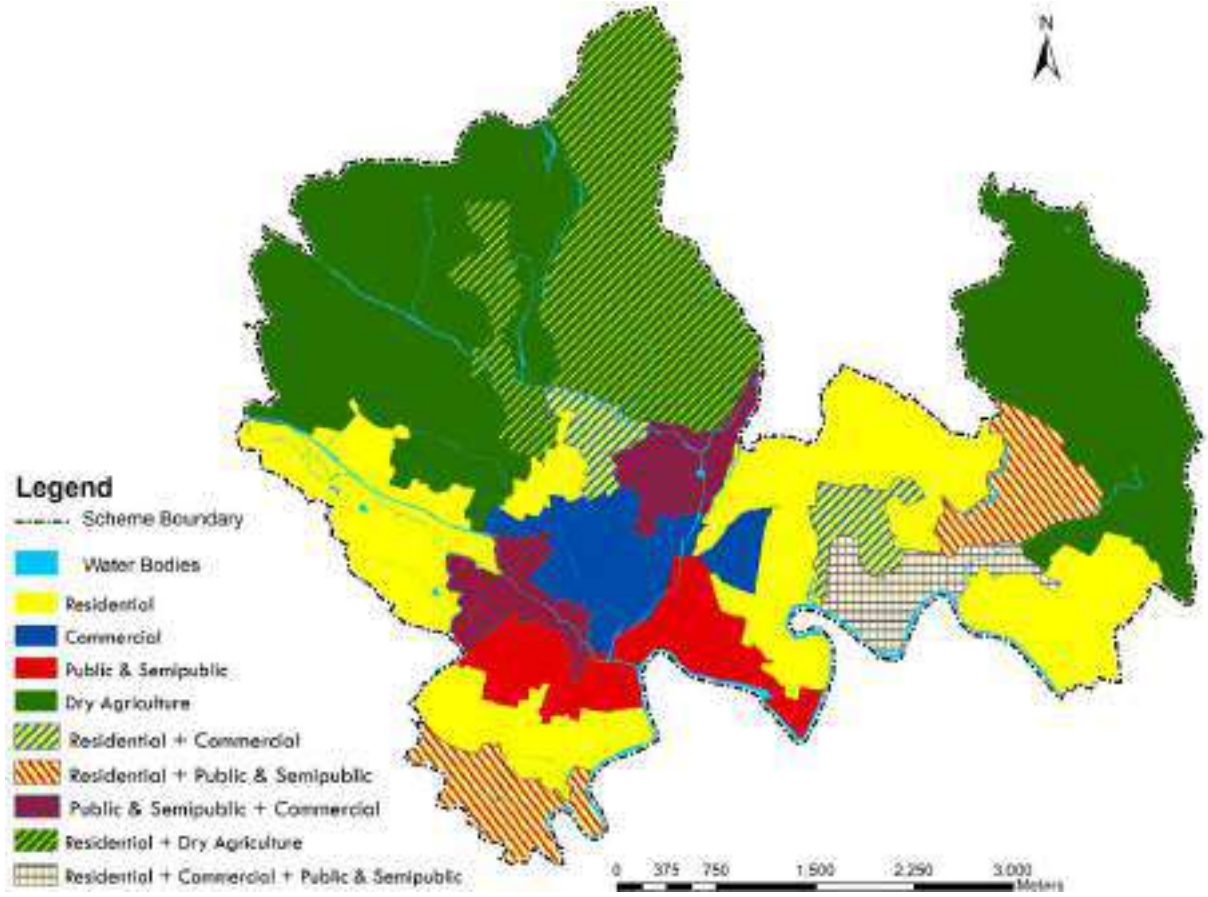


Figure 30.2 Ward wise land use Activity pattern of Town

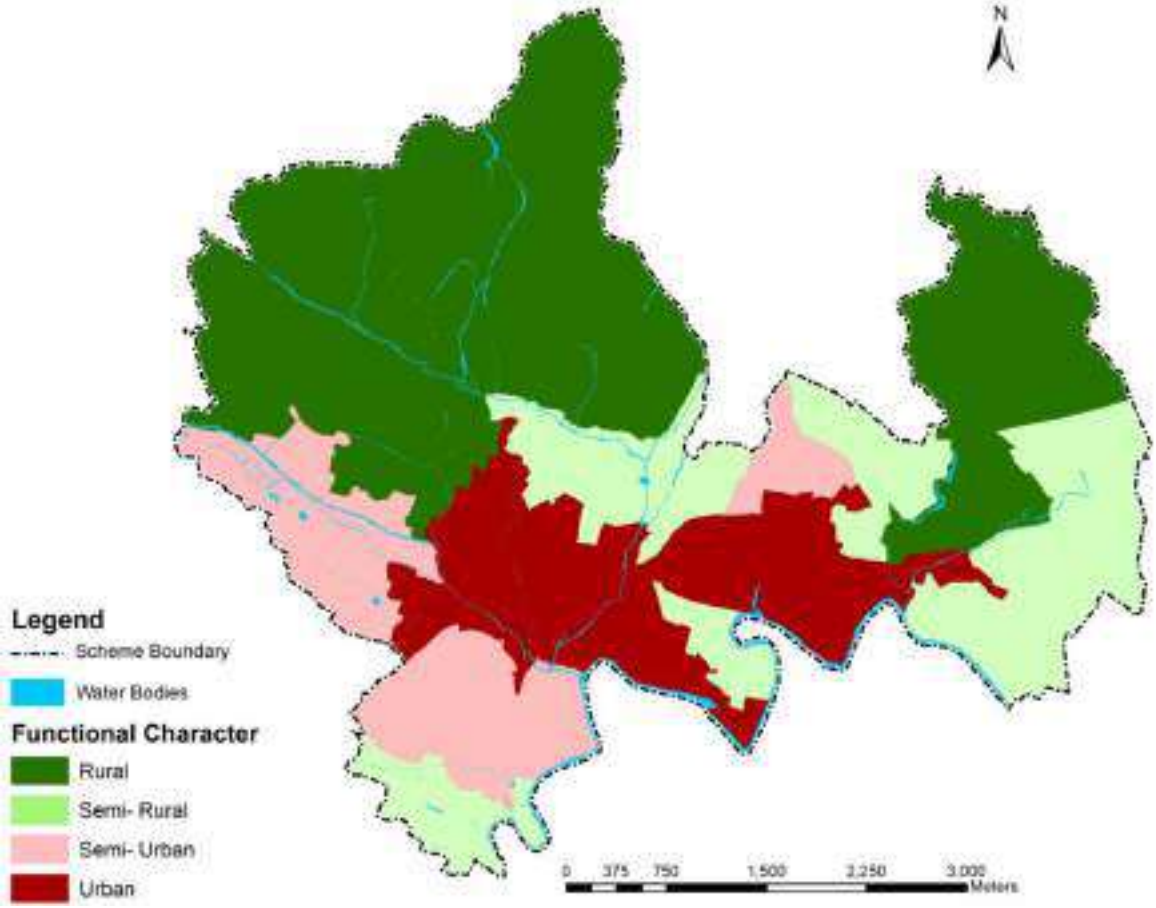


Figure 30.3 ward wise functional character of the town

Low lying and easily accessible areas which are mostly located in the southern part of Pathanamthitta town have a higher density than hilly areas which are located in the North. The agricultural activity is concentrated in wards along the periphery of the town and the paddy fields are surrounding the town centre.

30.3 Functional Character

The functional character of each ward of the town is determined based on population distribution, average plot size and land use. (Figure 30.3). The predominance of any of the four-land use (urban land use, rural land use, semi urban or semi-rural) determines the functional character of the area. Wards along the roads passing through the central part of the town have urban character. Some wards near the urban core and southern part of town exhibits semi urban character. Wards with residential activity in the northern part of the town shows semi-rural character and wards in the northern part of the town shows the rural character as primary economic activity is considered.

30.4 Connectivity Pattern

The road network of Pathanamthitta town is ring and radial pattern (Figure 30.4). The ring road is connecting major roads of Kollam- Vandiperiyar (NH-183A), Thiruvalla- Kumbazha (SH-7) to the town centre. Punalur-Muvattupuzha (SH-8) is another State Highway passing through the eastern part of the town connecting Kumbazha region of the town. In addition to that there are other minor roads connecting the above roads from the rural part of the town to ring road. The major non – agriculture activities of the town are concentrated along these roads.

30.5 Existing Hierarchy of Nodes

Hierarchy of commercial nodes are identified among all important intersections of roads where there is a concentration of commercial activities.

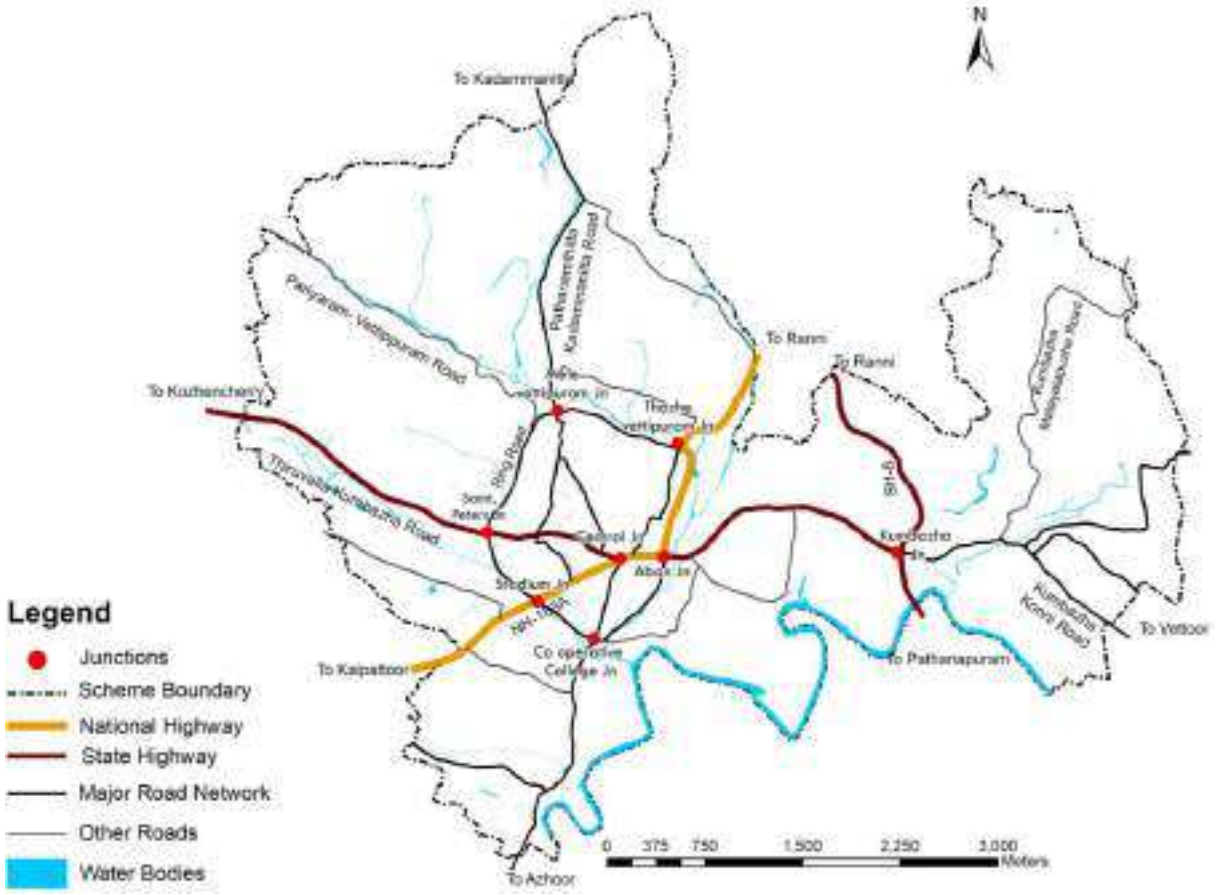


Figure 30.4 Existing Connectivity Pattern of the town

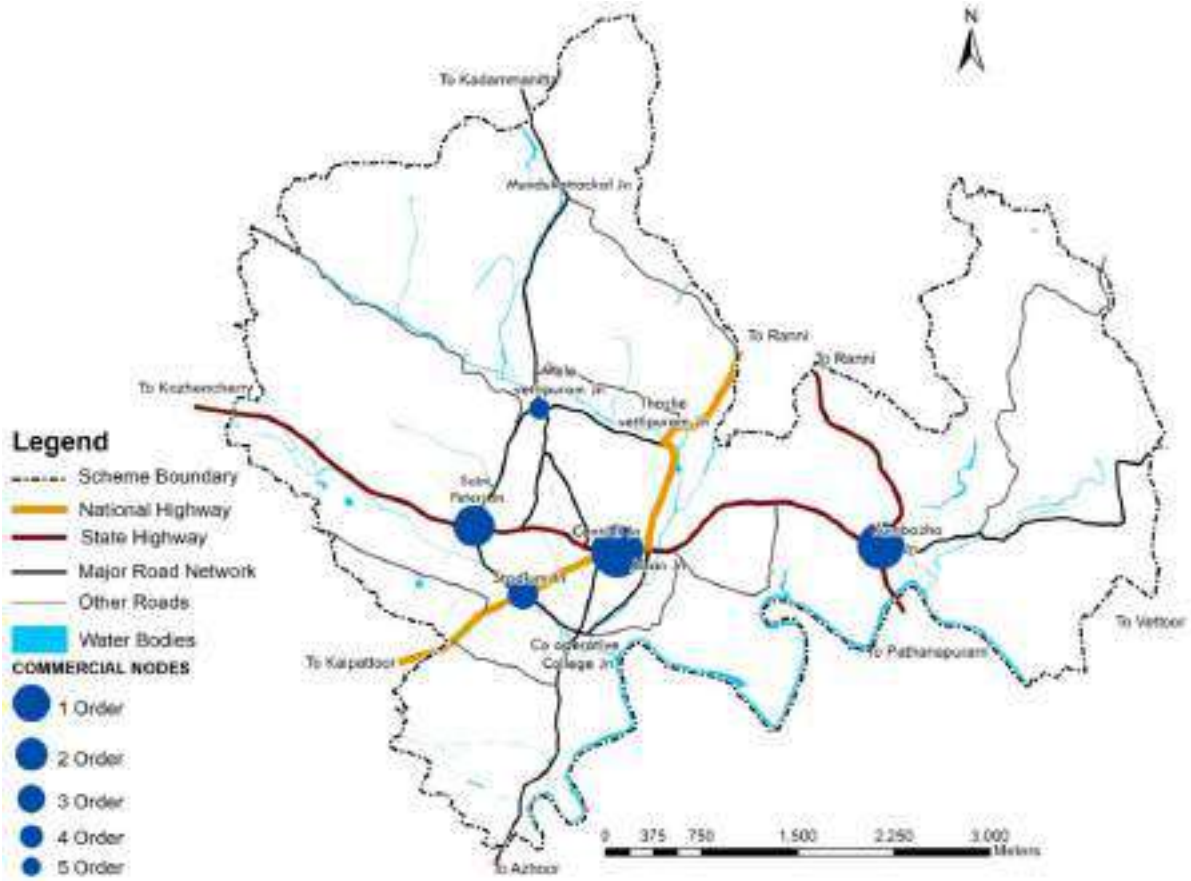


Figure 30.5 Existing Hierarchy of the commercial node of the town

For identifying existing hierarchy of nodes, the nodes are selected from junctions which enhances connectivity to different places in different direction. Node may contain one or more junctions which are closer and is having contiguous development of commercial establishments. Central area with Central junction and Aban Junction forms the first order node. Kumbazha forms the second order node. Third and fourth-order nodes have developed along the ring road. (Figure 30.5).

30.6 Environmentally Sensitive Areas

The environmentally sensitive areas of Pathanamthitta town mainly consist of wetlands. It is distributed as a continuous chain covers almost all parts of the town in between the hilly areas (Figure 30.6). The chains of wetland is mainly concentrated around central part of the town around ring road and in Kumbazha region. Rocky areas, Sacred groves, natural water bodies etc are also considered as environmentally sensitive areas.

30.6.1 Natural Hazard Prone Area

Some hilly region in northern part of the town falls under the low intensity landslide prone areas. The southern side of the town falls under the flood prone area. The flood prone area covers the central area and major roads of the town also (Figure 30.7).

30.7 Existing Spatial Structure

Overlay analysis of above all factors highlight the existing spatial structure of the town (Figure 30.8). Based on the overlay analysis, entire town is categorised as three areas ie. Agriculture, Urban and Residential. (Figure 30.9). The existing spatial structure reveals that the central part of the town shows the urban character particularly dominance in commercial and public & semi-public activities. Residential use with a mixture of other uses could be seen when moving away from the core to the fringes. Industrial activity is found to be minimal and agricultural activity dominates in the northern periphery of the town.

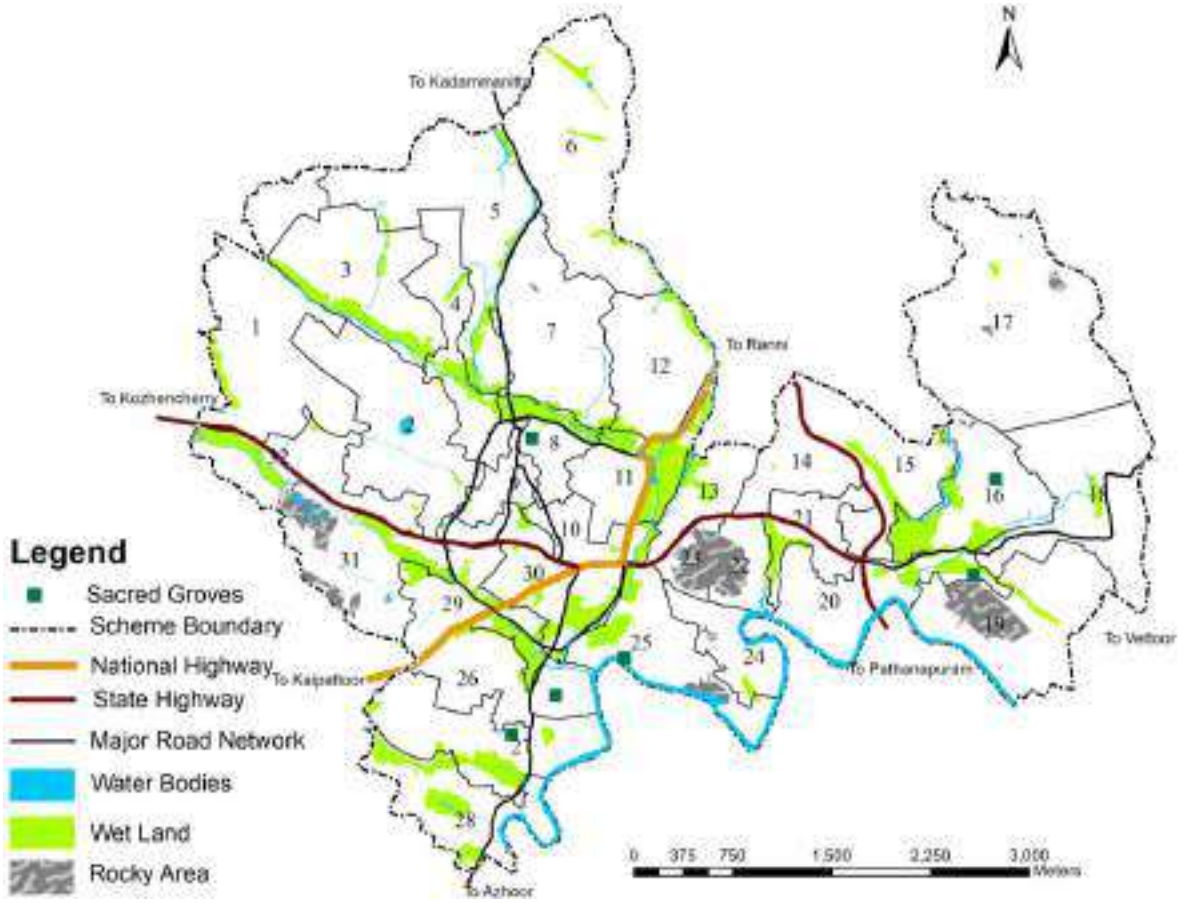


Figure 30.6 Existing Environmental sensitive areas of the town

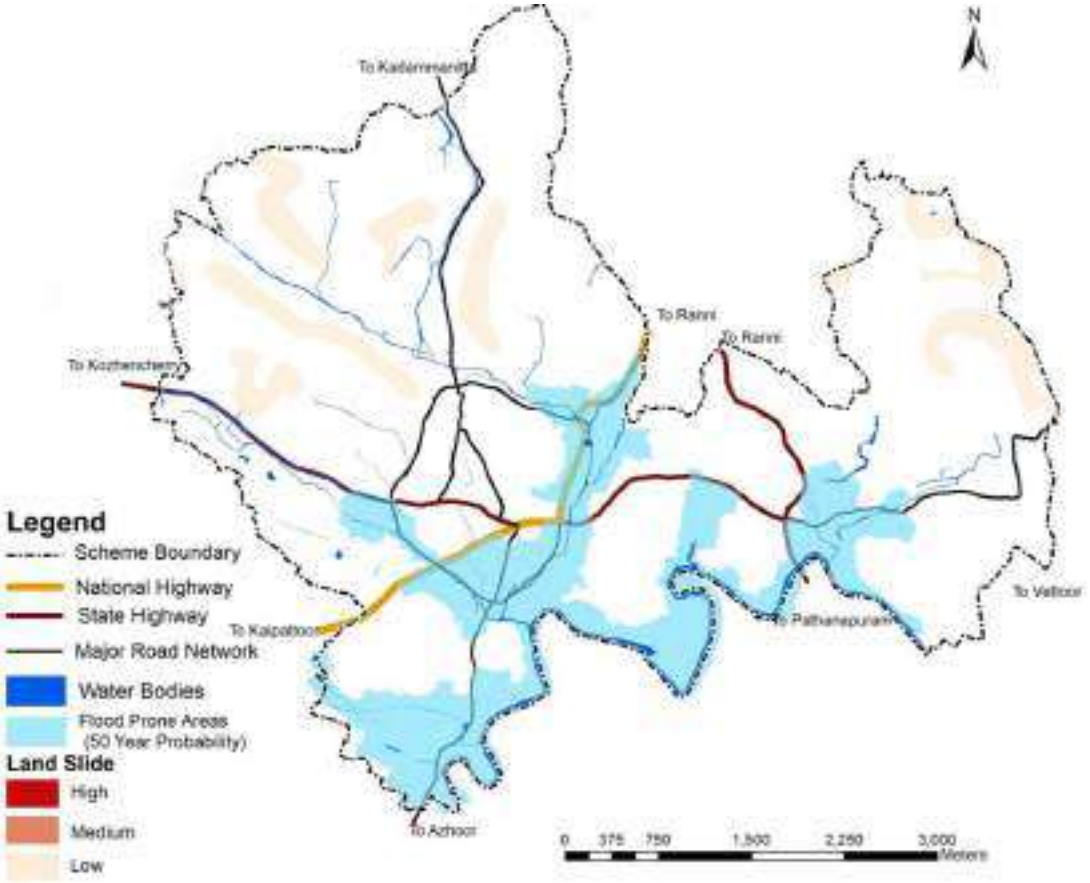


Figure 30.7 Natural Hazard prone areas of the town

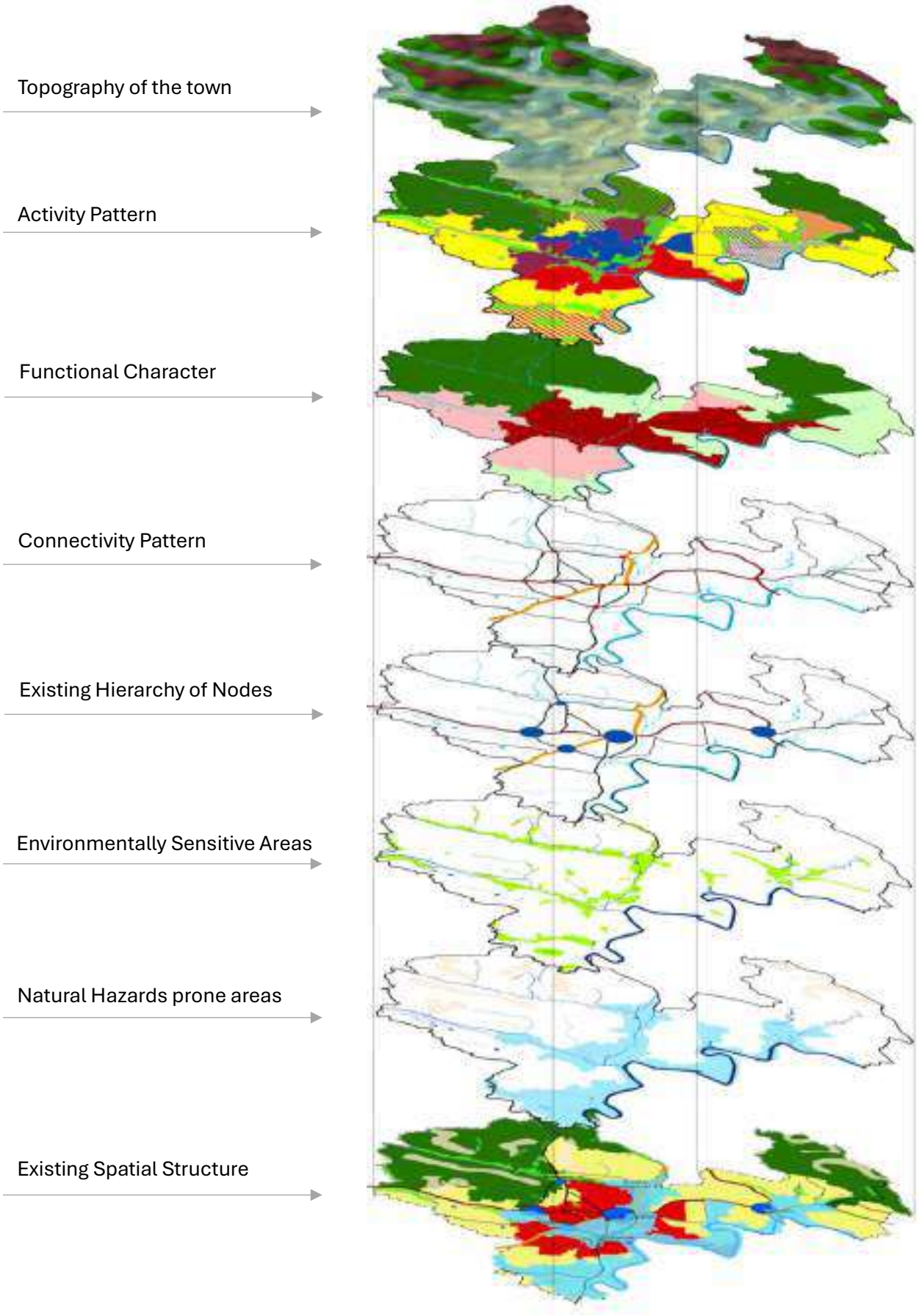


Figure 30.8 Overlay analysis of various spatial aspects of the town

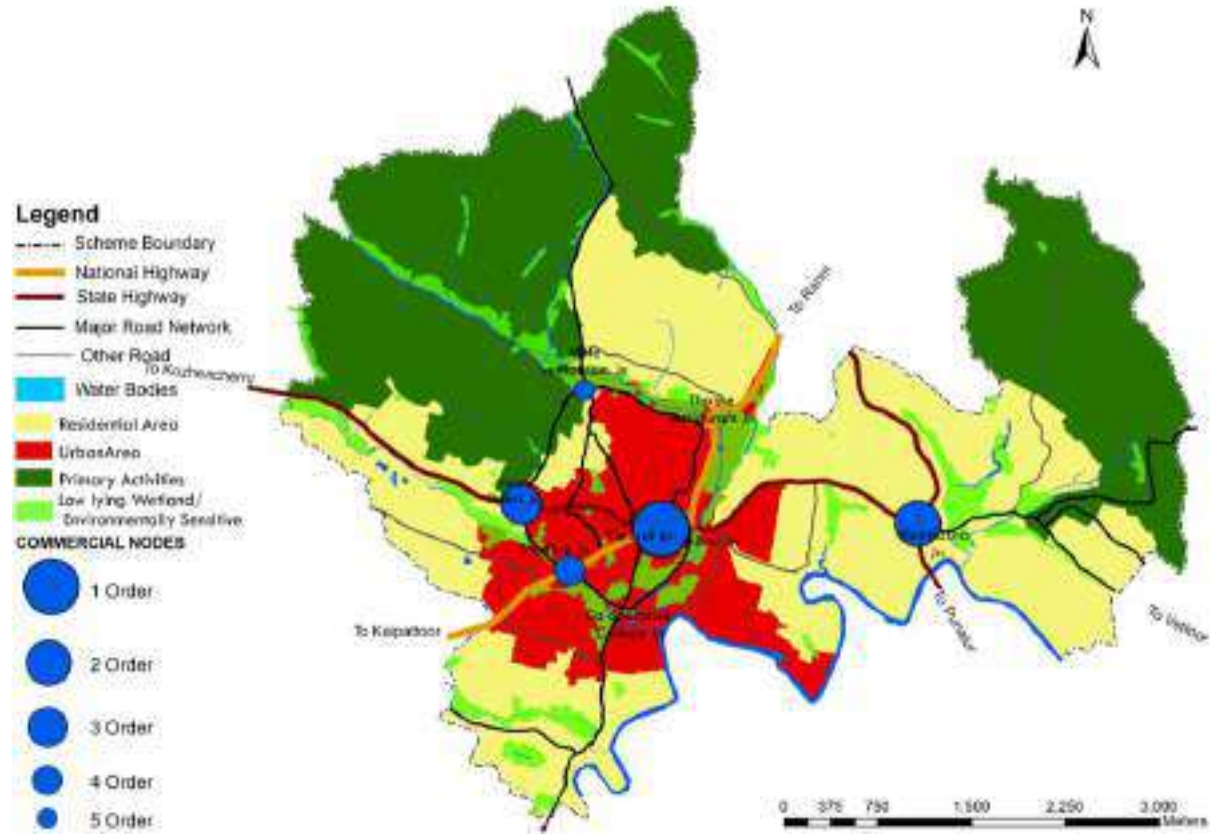


Figure 30.9 Existing Spatial structure of the town

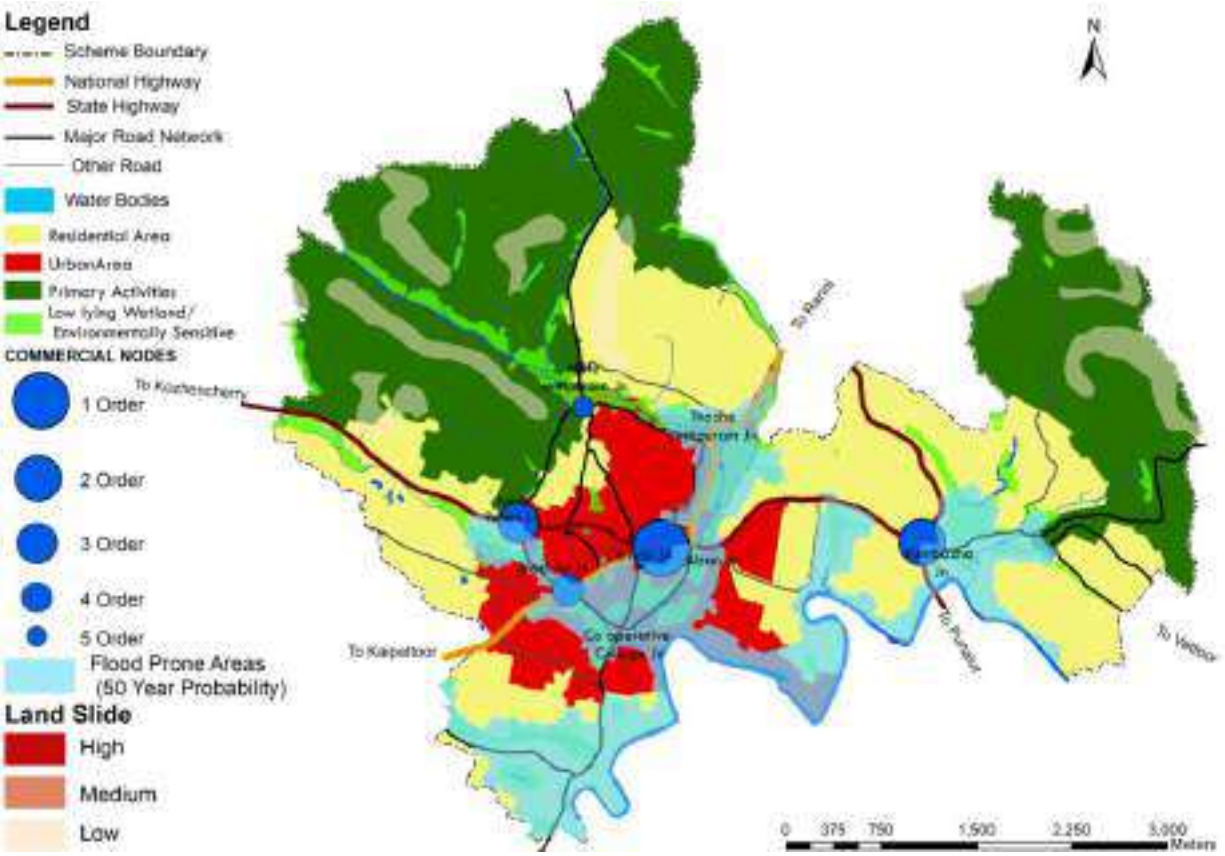


Figure 30.10 Existing Spatial Structure of the town with hazard prone areas

Development of transportation network has great influence in forming the character of the city. Major settlements are found in places which are in close proximity to the ring road networks. All commercial nodes are found in the urban area at central part of the town except second order. Kumbazha is the second order commercial node, but the surrounding concentrated is residential area.

The environmenally sensitive areas are lying as a chain in between all these three areas of the town.(Figure 30.10) Part of urban areas in the central part of the town falls under the flood prone area. similarly the residential areas of the southern part of the town also falls under the flood prone area. Part of agriculture area is in landslide prone area.

30.8 Future Projections

Understanding the trajectory of Pathanamthitta town's growth and development is critical for ensuring sustainable, equitable, and resilient futures. The process of making future projections for Pathanamthitta town involves comprehensive analysis across multiple sectors including demographic trends, economic shifts, infrastructure needs, environmental impacts, social dynamics and more. By studying and analysing various sector wise chapters previously in this Part I of report, this section helps to build a clear, data-driven picture of the town's future. These projections help to ensure that the Pathanamthitta town's development aligns with long-term goals, addresses emerging needs, and remains adaptable to unexpected changes or crises. Since the future is always associated with uncertainties, precise projection is extremely difficult.

30.8.1 Population Projection

Population projection is usually done by understanding the pattern of population growth in the past and assuming the same pattern will continue in the future, the present population is projected to the desired future period. Past population is taken based on the Census data. As the master plan is prepared for 20 years, the requirements are projected to the year 2045.

The population projection for the years 2021, 2031, 2041 and 2045 of the town are made by assuming that the same trend in the population growth continues. The methods used for projecting population are

1. Arithmetical Increase Method
2. Geometrical Increase Method
3. Incremental Increase Method
4. Decreasing Rate of Growth Method

30.8.1.1 Arithmetical Increase Method

It is a simple and commonly used technique for projecting population into the future. It assumes that the population increases by a constant number (not percentage) over equal time intervals — usually decades.

Year	Population	Increase in population
1981	32967	
1991	35882	2915
2001	38009	2127
2011	37538	-471
	Total	4571
	Average	1523.67

Year	Projected Population	
2021	37538 + (1523.67x1)	39062
2031	37538 + (1523.67x2)	40585
2041	37538 + (1523.67x3)	42110
2045	37538 + (1523.67x3.4)	42724

30.8.1.2 Geometrical Increase Method

In this method, the rate of growth of population is considered as proportional to the population at present. Therefore, it is assumed that the percentage increase in population is constant. It is similar to compound interest calculations. The population predicted by this method is the highest of all.

Year	Population	Increase in population	Growth rate
1981	32967		
1991	35882	2915	0.088
2001	38009	2127	0.059

2011	37538	-471	-0.0123
	Total	4571	0.135
	Average	1523.67	0.0451 or 4.51%

Year	Projected Population	
2021	37538 x $(1+0.045)^1$	39228
2031	37538 x $(1+0.045)^2$	40998
2041	37538 x $(1+0.045)^3$	42852
2045	37538 x $(1+0.045)^{3.4}$	43680

30.8.1.3 Incremental Increase Method

This method is adopted for average-sized towns under normal conditions, where the rate of population growth is not constant i.e., either increasing or decreasing. It is a combination of the arithmetic increase method and geometrical increase method. Population predicted by this method lies between the arithmetical increase method and the geometrical increase method.

Year	Population	Increase in population	Incremental Increase
1981	32967		
1991	35882	2915	
2001	38009	2127	-788
2011	37538	-471	-2598
	Total	4571	-3386
	Average	1523.67	-1693

Year	Projected Population	
2021	37538 + 1523.67+(- 1693 x1)	37369
2031	37538 + 1523.67+ (-1693 x2)	35676
2041	37538 + 1523.67+ (-1693 x3)	33983
2045	37538 + 1523.67+ (-1693 x3.4)	33306

30.8.1.4 Decreasing Rate of Growth Method

This method is adopted for a town which is reaching saturation population, where the rate of population growth is decreasing. In this method, an average decrease in growth rate (S) is considered.

Year	Population	% Increase	Average decrease per decade in %
1981	32967		
1991	35882	8.84	
2001	38009	5.92	-2.91
2011	37538	-1.24	-7.16
	Average	4.51	-5.04%

In 2011, the growth rate = -1.24%, and every decade growth rate decreases by 5.04%. This is extreme, so observed trend is conservatively used for the population projection

Year	Growth	Projected Population	
2021	-1.24 - 5.04 = -6.28%	37538 x (1-0.0628)	35180
2031	-6.28 - 5.04 = -11.32%	35180 x (1 – 0.1132)	31198
2041	-11.32 - 5.04 = -16.36%	31198 x (1-0.1636)	26094
2045	Half decade, 2.52%growth. -16.36-2.52= -18.88%	26094 x (1 - 0.0944) (Half decade)	23630

30.8.1.5 Projected Population of Pathanamthitta Town

Four recognized population projection methods are applied to estimate the town's population for the year 2045. The average of these methods produced a figure that is lower than the town's current population, indicating a potential decline. However, given the inherent uncertainties in projection methodologies and the likelihood of upcoming socio-economic shifts, it is both prudent and strategically sound to adopt the highest projection value among the methods for planning purposes. This approach ensures that future development strategies are aligned with the possibility of renewed growth driven by factors such as urban expansion, infrastructure investment, improved connectivity, and proactive government initiatives. Moreover, planning based on the highest estimate mitigates the risks of underbuilding critical infrastructure and public services, which could lead to congestion, inadequate facilities, and reduced quality of life in the event of population recovery. By contrast, overestimation poses minimal long-term harm, as surplus capacity can be gradually utilized or adapted. Therefore, higher value of four methods is considered as the projected

population of town which reflects a risk-aware, forward-looking stance that prioritizes long-term sustainability and resilience Table 30.1 and Figure 30.11 shows the projected population for the years 2021, 2031, 2041 and 2045.

Table 30.1 Projected population of Pathanamthitta town

Method	Projected Population			
	2021	2031	2041	**2045**
Arithmetic method	39062	40585	42110	42724
Geometric method	**39228**	**40998**	**42852**	**43680**
Incremental increase method	37369	35676	33983	33306
Decreasing rate of growth method	35180	31198	26094	23630

30.8.2 Work Force Projection

Change in occupational structure mostly depends the change in economic activities of the town. As per 2011 census the work participation rate of Pathanamthitta town is 32.64%. It means, out of total population of 37538 persons, 12253 people are workers. Pathanamthitta town serves as an administrative town, the predominant activity of the town is tertiary activity and 89% of workers are engaged in tertiary sector. Trade and Commerce has a major activity for the future and more job opportunity is expected from this sector. Another feature of the town is that nearly 44% of the land of the town is under Agriculture land use but only 9 % of workers are engaged in Primary sector activities.

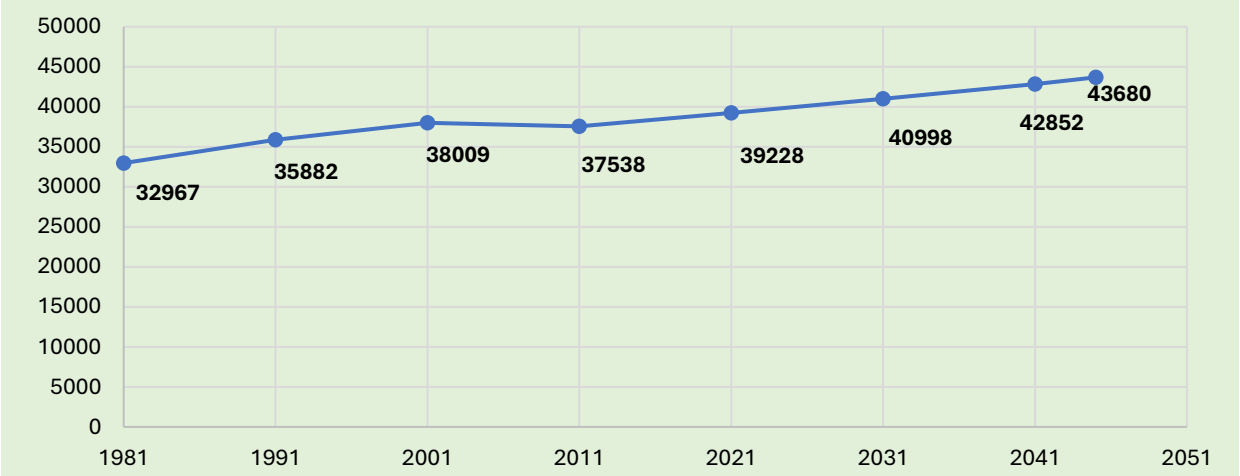


Figure 30.11 Projected Population of Pathanamthitta town by the year 2045.

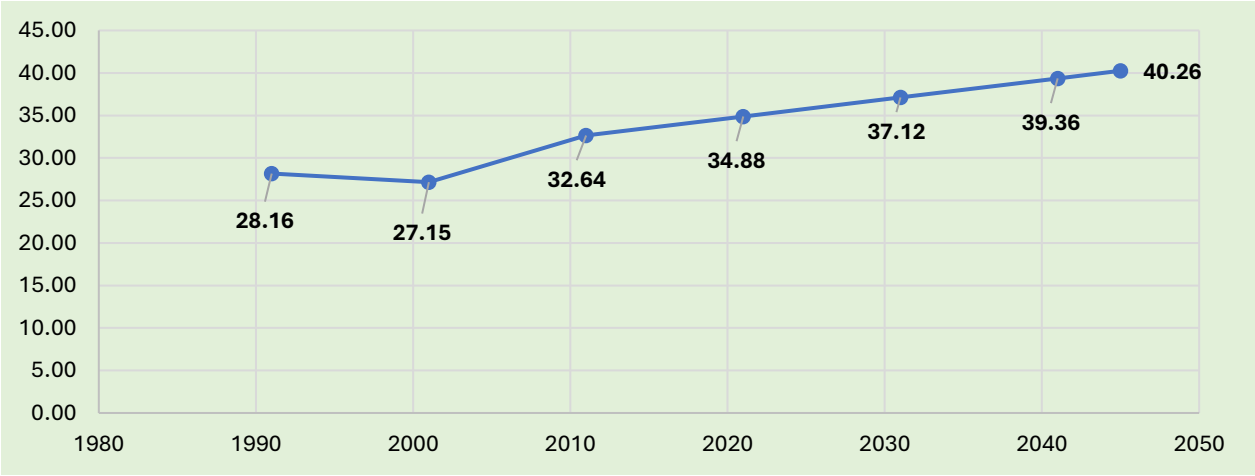


Figure 30.12 Projected workforce participation rate of Pathanamthitta town by the year 2045 in percentage

Hence there is scope for developing Agriculture activity, particularly homestead cultivation and allied activities. Being an urban area, more emphasis has been given for industrial development, particularly through small scale Industrial units. Potential for job opportunities in tourism sectors are also in the town. Average decadal WPR increase is 2.24%. The projected workforce participation rate of Pathanamthitta town by the year 2045 is furnished in Figure 30.12 by average decadal WPR.

30.8.3 Physical Infrastructure

Physical infrastructure is the combination of basic facilities which is helpful in economic development of a town. It includes facilities of water supply, drainage, sewerage system, telecommunication, electricity, transportation, energy etc. The infrastructure backlogs and demand has been calculated on the basis of projected population and standards given in URDPFI guidelines.

30.8.3.1 Water Supply

As per URDPFI guidelines desirable standard of water for domestic use for a medium size town is 135 - 450 lpcd. As per Central Public Health and Environmental Engineering Organization (CPHEEO) manual, the domestic water requirement is 135 lpcd, and this value is taken for assessing the future domestic water requirement of the town. Table 30.2 shows the estimated water demand for Pathanamthitta town. The total water requirement for the town in 2045 is 7.74 MLD.

Table 30.2 Estimated Water demand of Pathanamthitta Town in MLD by the year 2045

Year	2021	2031	2041	2045
Population	39228	40998	42852	43680
Domestic water demand @ 135 l/h/d	5.3	5.4	5.5	5.6
Non-domestic water demand @20%	1.1	1.1	1.1	1.1
Fire demand @1%	0.06	0.06	0.07	0.07
Unaccounted for Water (UFW) @15%	0.96	0.98	1.00	1.01
Total water demand (MLD)	7.38	7.54	7.66	7.74

30.8.3.2 Solid Waste Disposal

Measuring quantities aims at ensuring adequate capacity for waste collection, recycling and disposal. The waste service must be able to cope with daily and seasonal fluctuations, so measurement of variability is important. The CPHEEO Municipal Solid Waste Manual indicates a range of 0.2-0.4 kg/capita/day in the urban centers. So the capita waste generation rates is taken as 0.3 kg/capita/day. Area requirement for solid waste composting is calculated @ 400 sq. m/tonnes.

Table 30.3 Requirement of solid waste treatment system for Pathanamthitta town

Year	2021	2031	2041	2045
Population	39228	40998	42852	43680
Solid waste generation @ 300 g/h/d (in tonne)	11.8	12.0	12.2	12.3
Area required for Composting plant @400 sq.m/tonne (in acre)	1.16	1.19	1.21	1.22

30.8.3.3 Liquid Waste Disposal

Liquid waste quantification includes the quantification of grey water generation and quantification of Septage generation. As per CPHEEO manual 80% of water supply may be expected to reach the sewers. 135 lpcd water supply is considered for waste water (Grey water) generation. According to the IS Codes (CSE, 2017), Septage Value- Per Capita Per year (Litres) was taken as 120 litres.

Table 30.4 Estimated liquid waste generation of Pathanamthitta town

Year	2021	2031	2041	2045
Population	39228	40998	42852	43680
Per capita water demand (MLD)	7.4	7.5	7.7	7.7
Waste water (Grey water) @ 80% of per capita demand (MLD)	5.90	6.03	6.13	6.19
Septage Value- Per Capita Per day (Liters) @ 120 liters (KLD)	12.89	13.17	13.39	13.53

According to the standards, the land required for the Sewage Treatment Plant having a capacity of 1-5 MLD is given as up to 50 Cents and the land required for the Faecal Sludge Treatment Plant having a capacity of 10-25 KLD is given as up to 25 Cents. Combined STP and FSTP at same location is also feasible.

30.8.3.4 Electricity

As per URDPFI planning standard guidelines, one electric substation of 11 KV for 15,000 population is taken as the general standard for all categories of towns.

Table 30.5 Projected Power Requirement of Pathanamthitta town

Year	2021	2031	2041	2045
Population	39228	40998	42852	43680
One 11KV Substation for every 15000	3.0	3.0	3.0	3.0
Area requirement @ 0.05 acre/ substation	0.15	0.15	0.15	0.15

30.8.3.5 Parking

Parking facilities @ 0.4 Ha of land per 10000 people.

Table 30.6 Projected Parking Requirement of Pathanamthitta town

Year	2021	2031	2041	2045
Population	39228	40998	42852	43680
Parking facilities @ 0.4 Ha of land per 10000 people	1.57	1.60	1.63	1.65

30.8.4 Social Infrastructure

Facilities and areas where the community can access social services are considered social infrastructure. These includes services related to health, education, housing, civic amenities as well as facilities for the arts, culture, and recreation.

30.8.4.1 Education

Future educational requirement for Pathanamthitta town is projected based on the URDPFI guidelines. Projected requirement of educational facilities for Pathanamthitta town is shown in Table. 30.7. Existing facilities are sufficient for the projected population.

Table 30.7 Estimated Educational Infrastructure for Pathanamthitta Town

Year	2021	2031	2041	2045
Population	39228	40998	42852	43680
Pre-primary & nursery school (1 for 2500)	16	16	16	16
Primary School (I to V) (1 for 5000)	8	8	8	8
Senior secondary School (VI to XII) (1 for 7500)	5	5	5	5
School for physically challenged (1 for 45000)	1	1	1	1

School for mentally challenged (1 for 10 lakh)	1	1	1	1
College (1 for 1.25 lakh)	1	1	1	1
Technical Education (1 ITI and 1 polytechnic) (1 for 10 lakh)	1	1	1	1
Engineering College (1 for 10 lakh)	1	1	1	1
Medical College (1 for 10 lakh)	1	1	1	1
Nursing & Paramedical Institute (1 for 10 lakh)	1	1	1	1
Other professional colleges (1 for 10 lakh)	1	1	1	1

30.8.4.2 Healthcare facilities

As per the URDPFI guidelines the health institutions necessary for Pathanamthitta town is mentioned in the table given below. At present there are no gaps seen in medical facilities but existing facilities in government sector needs upgradation. Projection of health facilities are shown in Table 30.8.

Table 30.8 Estimated health Infrastructure for Pathanamthitta Town

Year	2021	2031	2041	2045
Population	39228	40998	42852	43680
Dispensary (1 for 15000)	3	3	3	3
Nursing Home, child welfare, maternity centre - 25 to 30beds (1 for 1 lakh)	1	1	1	1
Polyclinic (1 for 1 lakh)	1	1	1	1
Intermediate Hospital B (1 for 1 lakh)	1	1	1	1
Intermediate Hospital A (1 for 1 lakh)	1	1	1	1
Multi-speciality Hospital (1 for 1 lakh)	1	1	1	1
Speciality hospital (1 for 1 lakh)	1	1	1	1
General Hospital (1 for 2.5 lakh)	1	1	1	1
Medical College (1 for 10 lakh)	1	1	1	1

30.8.5 Recreational Facilities

As per the URDPFI guidelines the recreational facilities needed are mentioned in the Table 30.9. At present in Pathanamthitta town there are only limited locations especially for open recreational activities so priority should be given in setting up of recreational facilities in the town.

Table 30.9 Projected Requirement for Recreational Facilities

Year	2021	2031	2041	2045
Population	39228	40998	42852	43680
Community room/hall (1 for every 15000)	3	3	3	3
Library (1 for every 15000)	3	3	3	3
Neighbourhood park(1 for15000)	3	3	3	3
Neighbourhood play area (1 for 15000)	3	3	3	3
Music dance and Drama centre (1 for 1 lakh)	1	1	1	1

Recreational club (1 for every 1 lakh)	1	1	1	1
Community Park (1 for 1 lakh)	1	1	1	1
District sports centre (1 for 1 lakh)	1	1	1	1
Post Office (1 for every 15000)	3	3	3	3
Police Station (1 for every 90000)	1	1	1	1
Fire Station (1 for 2 lakh)	1	1	1	1
Crematoria and burial ground (1 for 5 lakh)	1	1	1	1
LPG Godown (1 for every 50000	1	1	1	1

30.8.6 Utilities

From the standard data, the required numbers of different utilities are worked out as given in Table 30.10.

Table 30.10 Projected Requirement for Utilities

Year	2021	2031	2041	2045
Population	39228	40998	42852	43680

The available facilities in the education, health and civic amenities sector is sufficient to cater the town's future population. Water supply, waste management, parking and recreational facilities need to be addressed for catering the future population.

30.9 SWOT Analysis



Strengths

Strengths refer to existing features or characteristics of the town that are performing well and provide it with a competitive advantage.

Weaknesses

Weaknesses are internal factors that are currently underperforming and hinder the overall development of the town.

Opportunities

Opportunities are favourable external trends or developments that the town can leverage for future growth and development.

Threats

Threats are external factors beyond the control of the town that have the potential to negatively impact its growth, environment, or sustainability.

Strengths

- Centrally located in the district and functions as a first-order settlement with influence across the district.
- Recognized as the gateway to Sabarimala, attracting large numbers of pilgrims annually, boosting local economy and prominence.
- Well connected by roads. The NH 183A and SH 7 & SH 8 passes through the Pathanamthitta town and connecting major cities.
- Education, Health, Housing, Civic amenities and other social sectors achieved already current and future population demands.
- Proper solid waste management activities and electricity connectivity to all households.
- Active public participation in all sectors.
- Presence of rivers, ponds, wetlands, and rocky hill areas, supporting biodiversity and climate regulation.
- Untapped tourism potential due to natural beauty, heritage value, and location advantages.

- Mix of residential cum agricultural land use. Land availability for agriculture and allied industries and activities.
- Availability of municipal land for various projects.
- Planned Ring Road and its urban functionality.

Weaknesses

- Low population growth rate. High aging population leads to a high demand for social infrastructure specifically tailored to senior citizens.
- Narrow width roads and gaps in connectivity of peripheral areas to the town center.
- Lack of barrier free footpaths, dedicated street vending spaces and parking spaces.
- Limited recreational activity areas and night life activities.
- Absence of major industries and energy efficient buildings.
- Water scarcity in several wards
- Despite being the gateway to Sabarimala and possessing ecological and cultural assets, tourism opportunities within the town are not fully tapped.
- Northern parts of the town retain rural character with lower residential density and limited development.

Opportunities

- With its identity as the “Pilgrim Capital of Kerala” and proximity to Sabarimala, Pathanamthitta can be developed into a tourist transit hub by leveraging its location, heritage, environmental assets with tourism potential and cultural significance.
- As part of the Kottayam–Pathanamthitta Urban Growth Corridor, the town can benefit from regional development initiatives, improved connectivity, and increased commercial and residential investments along key transport corridors.
- Medium sized towns like Pathanamthitta have significant opportunities for enhancing community well-being in the future as Kerala witnessing high urbanization and cities facing adverse effect of climate change.
- National and state-level focus on climate resilience opens opportunities to implement sponge city strategies, green infrastructure, and natural flood management, enhancing the town’s adaptability to environmental risks.

Threats

- Vulnerability to Natural Hazards
- vulnerable to climate-induced challenges such as unpredictable rainfall, rising temperatures, and extreme weather events, which can disrupt agriculture, water supply, and public health systems.
- Development pressures, especially near sensitive ecological areas, could result in encroachments on wetlands, paddy lands, and water bodies, affecting the town’s environmental resilience.
- Topography restricting the availability of rail and water transport.
- No proper sewerage system.
- Town isolated from surrounding regions at time of flooding.

30.10 Development Issues

The southern part of the town, being a floodplain near the Achankovil River, is highly susceptible to flooding, especially during the monsoon season or due to sudden heavy rainfall. This can lead to destruction of infrastructure, displacement of people, and damage to homes and businesses. As the floodplain area may not be suitable for dense urban development due to the risks of flooding, the town's growth could be limited to areas that are more flood free. The northern part, with hilly terrain, unsuitable for heavy urbanization or large-scale infrastructure development. The landscape could make construction more expensive and complicated due to the need for land leveling, proper road access, and utilities. The hilly terrain in the north is currently used for agriculture, so the town's expansion might encroach upon productive agricultural land. This can lead to impacting rural livelihoods. The town centre, being low-lying areas, prone to waterlogging and drainage problems, especially in heavy rainfall. This can result in drainage and sewage issues, which are particularly problematic in urban areas where population density is higher. Managing storm water effectively becomes a priority to avoid flooding and waterlogging. The town centre is focused for infrastructure development, while the northern agricultural and hilly areas may remain underdeveloped or neglected. If development is focused in the central urban areas, public transportation infrastructure may not reach all parts of the town, leading to transportation challenges, particularly for residents in rural or peripheral areas.

ANNEXURE 5.1
WARD WISE POPULATION DENSITY

Ward No.	**Name of ward**	**Population**	**Area** (Sq.Km)	**Population density** (Persons/Sq.Km)
1	Peringamala	886	1.26323	701
2	Anchakkala	1066	1.084327	983
3	Vanchippoyka	921	0.929158	991
4	Vettippuram	1078	0.589141	1830
5	Saradamadom	1027	1.182347	869
6	Mundukottakkal	742	1.439248	516
7	Poovanpara	1120	0.918955	1219
8	Thykkavu	979	0.315599	3102
9	Pattamkulam	1456	0.227081	6412
10	Petta South	1129	0.291385	3875
11	Petta North	1049	0.568987	1844
12	Kairalipuram	979	0.673092	1454
13	Kulasekharapathy	1271	0.356377	3566
14	Arabic college ward	1225	0.397387	3083
15	Kumbazha North	1209	0.869863	1390
16	Myladumpara thazham	1258	0.711589	1768
17	Myladumpara	864	1.657294	521
18	Plaveli	848	1.460145	581
19	Kumbazha East	1132	1.017571	1112
20	Kumbazha South	840	0.699933	1200
21	Kumbazha West	1018	0.374015	2722
22	Chuttippara East	2166	0.298982	7245
23	Chuttippara	980	0.200522	4887
24	Valamchuzhi	1578	0.421815	3741
25	Kallarakkadavu	1623	0.715516	2268
26	Azhoor West	1583	0.654017	2420
27	Azhoor	1133	0.846514	1338
28	Kodumthara	1012	0.685837	1476
29	College Ward	1382	0.561369	2462
30	Town ward	1513	0.687119	2202
31	Karimbanakuzhi	1315	0.742219	1772
32	Churulikode	1154	0.589368	1958

ANNEXURE 7.1
CONCENTRATION INDEX OF LAND USE

Ward No	Ward Name	Residential land	Commercial land use	Industrial land use	Public land use	Agriculture Land use	Total Park & Open Space	Transportation	Water bodies
1	Peringamala	0.4	0.2	0.0	0.1	1.4	1.2	0.9	0.1
2	Anchakkala	0.6	0.5	0.0	0.1	0.1	0.1	0.9	0.4
3	Vanjipoyka	0.4	0.0	0.6	0.1	1.5	0.0	0.8	0.2
4	Vettippuram	0.7	1.3	0.0	0.4	2.6	0.9	0.8	0.5
5	Saradamadom	0.6	0.1	0.0	0.2	1.2	0.0	0.9	0.3
6	Mundukottakkal	1.0	0.0	0.0	1.7	0.8	0.1	0.9	0.7
7	Poovanpara	0.9	0.0	1.7	0.8	0.0	0.0	1.1	0.1
8	Thykkavu	0.7	0.5	0.0	0.3	5.9	2.7	0.8	0.7
9	Pattamkulam	1.5	0.9	6.8	1.7	2.4	2.4	1.7	0.0
10	Pettah South	0.9	9.3	0.8	1.8	1.7	0.5	6.5	0.5
11	Pettah North	0.5	3.0	0.6	2.5	4.8	0.4	1.3	1.2
12	Kairalipuram	0.8	0.5	0.0	0.4	0.3	0.0	1.0	0.3
13	Kulasekharapathi	1.3	0.8	20.7	0.5	1.9	0.0	0.8	0.0
14	Arabic college	1.8	0.5	7.0	1.2	0.1	0.0	0.8	0.0
15	Kumbazha North	1.7	1.4	0.0	0.1	0.8	0.1	1.3	0.3
16	Myladumpara	0.9	0.2	0.6	0.2	2.8	0.0	0.9	0.4
17	Myladumpara	0.9	0.0	0.0	1.3	0.5	0.1	0.4	0.0
18	Plaveli	1.1	0.0	0.0	0.2	0.7	0.0	0.6	0.1
19	Kumbazha East	1.4	0.0	0.0	0.1	6.0	5.7	0.6	0.9
20	Kumbazha South	1.4	1.2	4.4	0.5	1.0	0.0	0.8	2.9
21	Kumbazha West	1.8	1.7	2.6	0.1	1.4	0.2	1.2	0.0
22	Chuttippara East	1.4	0.6	0.0	0.4	8.3	7.9	0.9	1.0
23	Chuttippara West	1.2	3.3	0.0	1.9	18.3	18.3	1.4	0.0
24	Valanchuzhy	1.0	0.0	0.0	1.2	3.3	3.0	1.2	2.2
25	Kallarakkadavu	0.6	0.6	0.9	3.5	3.9	2.5	0.9	3.3
26	Azhoor West	1.8	0.7	0.0	4.6	0.0	0.0	1.6	0.7
27	Azhoor East	1.5	0.6	1.8	0.4	1.2	0.0	0.9	1.2
28	Kodumthara	1.3	0.0	0.0	1.0	1.7	0.0	0.8	2.3
29	College	1.1	5.0	0.0	1.5	6.6	3.6	0.8	0.8
30	Town ward	0.8	10.0	1.4	5.0	4.8	2.8	1.2	0.5
31	Karimbanakuzhi	1.2	1.0	1.9	0.9	0.9	0.0	1.1	0.7
32	Churulikode	1.1	1.0	0.0	0.6	1.2	0.0	1.3	0.3

ANNEXURE 8.1
DETAILS OF INFORMAL SECTORS

Sl No	Area of Concentration of informal sector activities	Type of activity - fruits & vegetables, garments, tea & snacks, home appliances, books etc	Extent of informal sector activity in each area (shops/carts/ no. of street vendors)
1	KSRTC Foot path	Clothes seller	6
		Food items	1
		Orange selling	1
		Toys	2
		Shoes seller	1
		Lottery	4
		Lemon seller	3
		cart (lemon Juice and other items)	2
		vegetable seller	4
		Fish seller	1
2	Stadium road	Food items	4
		cart (lemon Juice and other items)	2
		Tea stall	2
3	New private bus stand	Food items	5
		cart (lemon Juice and other items)	4
		Murukkan items and other items	1
		Lottery	6
		Plant Nursery	2
		Jewellery seller	1
		vegetable seller	1
		Vegetable seed seller	1
		Shoes seller	1
		Book shop	1
4	Market	Lemon seller	2
		Aluminium items selling	2
		vegetable seller	44
		Vegetable seed seller	1
		Clothes seller	2
		Fruits seller	4
		Steel items	3
		curd seller	5
		Murukkan items and other items	5
		Jewellery seller	1
		cart (lemon Juice and other items)	3
		Dry fish seller	2
		plastic items	1
		Egg seller	1
		Lottery	2
		Dry spicies	2
		Tappiacco seller	7
		Pappadam seller	1

		Tea Vendor(moving)	1
		Food items	2
		Chicken centre	2
5	Ring road	Tea stall	1
		cart (lemon Juice and other items)	8
		Food items	3
		Fish seller	3
		Stationary items	1
		Juice stall	2
		vegetable seller	1
6	Muncipality Road	Lottery	1
		Fish seller	
		Food items	1
		Fruits seller	1
		vegetable seller	1
7	T K Road	Toys	1
		vegetable seller	2
		Fruits seller	2
		Shoes seller	2
		cart (lemon Juice and other items)	2
		Lottery	1
		Clothes seller	1
		Food items	1
8	Old Private Bus Stand	vegetable seller	4
		Fruits seller	3
		Food items	1
		Clothes seller	4
		Lemon seller	1
		Shoes seller	1
		Tea Vendor(moving)	1
		ayurvedic shop	1
9	Melevettipuram	vegetable seller	1
		cart (lemon Juice and other items)	3
		Food items	1
		vegetable seller	1
		cart (stationary items)	1
		Lottery	1
		cart (lemon Juice and other items)	4
		Fish seller	1
		Tea shop	2
10	Chagethu Road	Fish seller	2
		Tea shop	1
		vegetable seller	1
11	Minicivilstation Road	Shoe seller	9

		Lottery	2
		Tea shop	1
12	Govt Hospital Road	Clothes seller	2
		Toys seller	1
		Shoe seller	1
13	Central Junction	Shoe seller	1
		Murukkan items and other items	1
		Lottery seller	1
14	Thaycavu school Road	vegetable seller	4
		Murukkan items and other items	1
15	Aban Junction	Clothes seller	1
		cart (lemon Juice and other items)	2
		Lottery seller	1
16	Policestation road	Net seller	2
		vegetable seller	1
		vegetable seed seller	1
		Dry fish seller	1
		cart (lemon Juice and other items)	1
		Lottery seller	2
		Clothes seller	1
17	Kumbazha Road	Lottery seller	1

ANNEXURE 8.2
COMMODITIES TRANSACTED IN VARIOUS SHOP CATEGORIES

Sl. No	Commodities	No. of shops	Quantity Transacted /Month	Arrived From	Distributed to
1	Bakery Items		500kg	Ernakulam, Chaganasherry	Pathanamthitta district
2	Fruits	3	9 ton	Chaganasherry, Tamil Nadu, Ernakulam	Pathanamthitta district
3	Vegetables	9	190 ton	Pathanamthitta, Wayanad, Mysore, Coimbatore, Thirichur, chengotta, Ootty, Mettupalayam , other area	Kozhencherry, Konni, Pathanamthitta town
4	Surgical and hospital equipments	1	13.5 ton	Thirunelvelli, Ernakulam, Kollam, Thiruvananthapuram	Pathanamthitta district
5	Chicken centre	3	3.85 ton	Pala, Kozhencherry	Pathanamthitta town
6	Pharmaceutical	3	3005 kg	Ernakulam, Thrissur, Tamil Nadu	Pathanamthitta , Kollam districts
10	Flowers	2	1 ton	Banglore, Tamil Nadu, Karnataka, Mysore, Husur	Pathanamthitta district
11	Textiles	2	65 kg	Ernakulam, Tamil Nadu	Pathanamthitta town
12	Building materials shop	2	16 ton	Bangalore, culcutta,Palakkad, Ernakulam	Pathanamthitta district
13	Electrical Appliances	2	4 ton	Ernakulam, Thrissur, Tamil Nadu	Pathanamthitta district
14	Provision Store	6	473.5 ton	Tamil Nadu, Andhra Pradesh, Thrichur,Ernakulam,	Pathanamthitta town
15	Stationary items	4	22.7 ton	Ernakulam, Pathanamthitta, Bangalore,Thrichur	Kozhencherry, KonniTaluk, Pathanamthitta town
16	Car Accessories	1	1000 Pieces	Ernakulam	Pathanamthitta district
17	Mobile Phone Acessories	2	800 pieces	Ernakulam, Tirur	Pathanamthitta, Kollam, Kottayam, Alappuzha districts
18	Home Appliances	1	80 pieces	Ernakulam	Pathanamthitta district

19	Bakery Items	2	20.5 ton	Ernakulam, Chaganasherry, Pathanamthitta	Pathanamthitta district
20	Furniture	2	70 ton	Kottarakara, Kunnicode, Kottayam, Delhi, Bombay, Chennai	Pathanamthitta, Kollam, Kottayam, Alappuzha districts
21	Computer Shop	1	15 boxes	Ernakulam, Kollam	Kozhencherry, KonniTaluk
22	Disposal items, carriage boxes	1	5 boxes	Ernakulam, Pathanamthitta	Pathanamthitta town
23	Ayurvedic shop	1	150 cases	Ernakulam, TVM	Pathanamthitta district
24	Iron and steel		600ton	Ernakulam	Kozhencherry
25	Kitchen Accessories		300pcs	Kottayam, Pthanamthitta, Kollam	Kozhencherry
26	Allopathy Medicines	1	300 case	Ernakulam,Thrichur, Calicut	Alapuzha,Pathanamthitta, Kottayam, Kollam districts
27	Iron & Steel Products	3	2.7 ton	Ernakulam, Bombay, Gujarat	Kozhencherry
28	Ayurvedic shop	1	150 cases	Ernakulam, TVM	Pathanamthitta district
29	Automobile body Parts , Patch work items	1	3 ton	Kottayam	Pathanamthitta district
30	Stationary and bakery.	3	60 ton	Ernakulam, Kollam	Adoor,Kozhencherry , Konni
31	Fish	2	100 ton	Tamil Nadu, Kollam	Kozhencherry,Konni ,RanniTaluk
32	Bakery with Stationary	3	300 case	Ernakulam, Tamil Nadu, Thirunelvelli, Ernakulam, Kollam, TVM	Kozhencherry, KonniTaluk

ANNEXURE 8.3
SHOPPING COMPLEXES IN THE TOWN

Sl. No.	Name	Ownership of the building	Type of buildings	Built up Area Sq.M	Goods sold	Type of consumers
1	Aban Arcade	Private	RCC Structure	6038	Household items, Stationery etc.	Upper/middle/working class
2	Alankar hyper market	Private	RCC Structure	4000	Household items, Stationery etc.	Upper/middle/working class
3	Maniveena complex	Private	RCC Structure	6000	Garments	Upper/middle/working class
4	Sree sailam shopping complex	Private	RCC Structure	3500	vehicle	Upper/middle
5	Parappattu Building	Private	RCC Structure	6000	LIC, Tyre,education	Upper/middle/working class
6	Johns complex	Private	RCC Structure	6001	LIC, Tyre,education	Upper/middle/working class
7	Private Bus stand shopping complex	Panthanamthitta Municipality	RCC Structure	120	Household items, Stationery etc.	Upper/middle/working class
8	Municipal office shopping complex	Panthanamthitta Municipality	RCC Structure	120	Household items, Stationery etc.	Upper/middle/working class
9	Market shopping complex	Panthanamthitta Municipality	RCC Structure	23	Household items, Stationery etc.	Upper/middle/working class
10	Private Bus stand mini shopping complex	Panthanamthitta Municipality	RCC Structure	70	Household items, Stationery etc.	Upper/middle/working class
11	Municipal Library buliding complex	Panthanamthitta Municipality	RCC Structure	55	Household items, Stationery etc.	Upper/middle/working class
12	Stadium Ground shopping complex	Panthanamthitta Municipality	RCC Structure	15	Household items, Stationery etc.	Upper/middle/working class

ANNEXURE 13.1
DETAILS OF ROAD INVENTORY

Sl.No.	Chainage	Length (Km)	Type of Road	Width (m)		Median (m)	Footpath (m)		Shoulder (m)		Bus stops	Adjoining land use		Drain type /		Junctions and controls	Surface type and condition	CD structures	Remarks
				CW	ROW		L	R	L	R		L	R	L	R			Type	
I	**RING ROAD**	**5.600**																	
1	0/0 to 0/250 (HS- 23)	0.250	PWD	7.00	16.00	Nil	Nil	Nil	0.60 earthen	0.60 earthen	1	Commercial	Paddy + Residential	concrete	Nil	Nil	BT, fair	Nil	Stadium Junction
2	0/250 to 0/500 (HS- 23)	0.250	PWD	7.00	17.50	Nil	Nil	Nil	0.60 earthen	0.60 earthen	0	Residential+ Commercial	Residential+ Commercial	concrete	Nil	Nil	BT, fair	Nil	
3	0/500 to 0/600 (HS- 23)	0.100	PWD	7.00	18.00	Nil	Nil	Nil	0.60 earthen	0.60 earthen	0	Commercial	Commercial	Nil	concrete	One 4 arm	BT, fair	1 (3.50m W)	Saint Peter's Jn.
4	0.600 to 0/750 (HS- 26)	0.150	PWD	7.00	17.00	Nil	Nil	Nil	Nil	Nil	0	Commercial	Commercial	Concrete	Nil	One 3 arm, minor	WBM	Nil	Formation stage
5	0.750 to 1/000 (HS- 26)	0.250	PWD	7.00	17.50	Nil	Nil	Nil	Nil	Nil	0	Crops	Residential	Nil	Nil	Nil	WBM	Nil	Formation stage
6	1/000 to 1/250 (HS- 26)	0.250	PWD	7.00	16.50	Nil	Nil	Nil	Nil	Nil	0	Residential	Residential	Nil	Nil	One 3 arm, minor	WBM	Nil	Formation stage
7	1/250 to 1/500 (HS- 26)	0.250	PWD	7.00	16.50	Nil	Nil	Nil	Nil	Nil	0	Residential	Residential	Nil	Nil	Nil	WBM	Nil	Formation stage
8	1/500 to 1/750 (HS- 26)	0.250	PWD	7.00	16.50	Nil	Nil	Nil	Nil	Nil	0	Residential	Residential	concrete	Nil	One 3 arm, minor	WBM	Nil	Formation stage
9	1/750 to 1/800 (HS- 26)	0.250	PWD	7.00	16.00	Nil	Nil	Nil	Nil	Nil	0	Paddy	Agriculture	concrete	concrete	One 4 arm	BT, fair	1 (1.25m W)	Vettippuram Jn.
10	1/800 to 2/000 (HS-25)	0.200	PWD	7.50	17.00	Nil	Nil	Nil	0.75 earthen	0.60 earthen	1	Agriculture	Residential	Nil	Nil	Nil	BT, fair	Nil	
11	2/000 to 2/250 (HS-25)	0.250	PWD	7.50	17.50	Nil	Nil	Nil	0.75 earthen	0.60 earthen	0	Agriculture	Residential	Nil	Nil	Nil	BT, fair	Nil	
12	2/250 to 2/500 (HS-25)	0.250	PWD	7.00	16.00	Nil	Nil	Nil	0.75 earthen	0.60 earthen	0	Agriculture	Residential	Nil	Pebbled	Nil	BT, fair	Nil	
13	2/500 to 2/800 (HS-25)	0.300	PWD	7.00	16.00	Nil	Nil	Nil	0.75 earthen	0.60 earthen	0	Marshy	Commercial	Nil	Pebbled	One 4 arm	BT, fair	Nil	Thachanpadi Jn.
14	2/800 to 3/000 (HS-24)	0.200	PWD	7.00	15.50	Nil	Nil	Nil	0.50 earthen	0.60 earthen	1	Paddy	Commercial	Nil	Pebbled	Nil	BT, fair	Nil	
15	3/000 to 3/250 (HS-24)	0.250	PWD	6.50	13.50	Nil	Nil	Nil	0.50 earthen	0.50 earthen	0	Paddy	Paddy + Residential	Nil	Nil	Nil	BT, fair	Nil	
16	3/250 to 3/500 (HS-24)	0.250	PWD	7.00	14.00	Nil	Nil	Nil	0.85 earthen	0.75 earthen	1	Residential	Commercial	Nil	Nil	One 3 arm, major	BT, fair	Nil	KSRTC Stand, Bus Station
17	3/500 to 3/750 (HS-24)	0.250	PWD	7.00	17.00	Nil	Nil	Nil	0.85 earthen	1.00 earthen	0	Commercial	Marshy	Nil	Nil	Nil	BT, fair	Nil	
18	3/750 to 3/900 (HS-24)	0.150	PWD	7.00	16.50	Nil	Nil	Nil	0.75 earthen	0.75 earthen	0	Commercial	Commercial	Nil	Nil	One 4 arm, major	BT, fair	Nil	Aban Junction, Partially Signalised
19	3/900 to 4/250 (HS-21)	0.350	PWD	6.50	14.00	Nil	Nil	Nil	0.75 earthen	0.75 earthen	1	Commercial	Commercial	Nil	Nil	Nil	BT, fair	Nil	
20	4/250 to 4/500 (HS-21)	0.250	PWD	6.50	14.00	Nil	Nil	Nil	0.75 earthen	0.75 earthen	0	Marshy	Marshy	concrete	concrete	Nil	BT, fair	Nil	
21	4/500 to 4/800 (HS-21)	0.300	PWD	6.50	14.00	Nil	Nil	Nil	0.75 earthen	0.75 earthen	0	Marshy	Marshy	Nil	Nil	One 4 arm, major	BT, fair	Nil	Co- operative College Junction
22	4/800 to 5/000 (HS-22)	0.200	PWD	7.00	14.75	Nil	Nil	Nil	0.75 earthen	0.75 earthen	1	Public stadium	Marshy	Nil	Nil	Nil	BT, fair	Nil	
23	5/000 to 5/250 (HS-22)	0.250	PWD	7.00	14.75	Nil	Nil	Nil	0.60 earthen	0.60 earthen	0	Marshy	Commercial	Nil	Nil	Nil	BT, fair	Nil	
24	5/250 to 5/400 (HS-22)	0.150	PWD	7.00	14.75	Nil	Nil	Nil	0.60 earthen	0.60 earthen	1	Commercial	Public stadium	concrete	Nil	One 4 arm, major	BT, fair	1 (1.00m W)	Stadium Junction

Sl.No.	Chainage	Length (Km)	Type of Road	Width (m)		Median (m)	Footpath (m)		Shoulder (m)		Bus stops	Adjoining land use		Drain type /		Junctions and controls	Surface type and condition	CD structures	Remarks
				CW	ROW		L	R	L	R		L	R	L	R			Type	
II	KOZHENCHERRY - KUMBAZHA-MALAYALAPUZHA ROAD	9.550																	
1	0/0 to 0/250 (HS- 08)	0.250	SH	7.00	12.00	Nil	Nil	Nil	1.50 earthen	1.50 earthen	1	Commercial	Crops	Earthen	Nil	Nil	BT, fair	1 (3.80m W)	Starts from municipal boundary on
2	0/250 to 0/500 (HS- 08)	0.250	SH	7.00	12.00	Nil	Nil	Nil	2.50 earthen	1.50 earthen	0	Residential+ Commercial	Residential+ Commercial	Earthen	Earthen	Nil	BT, fair	Nil	
3	0/500 to 0/750 (HS- 08)	0.250	SH	7.00	12.50	Nil	Nil	Nil	2.50 earthen	1.50 earthen	0	Residential+ Commercial	Residential+ Commercial	Earthen	Earthen	Nil	BT, fair	Nil	
4	0.750 to 1/000 (HS- 08)	0.250	SH	7.00	13.25	Nil	Nil	Nil	1.50 earthen	1.50 earthen	0	Residential	Residential	Concrete	Nil	Nil	BT, fair	Nil	
5	1/000 to 1/250 (HS- 08)	0.250	SH	7.00	12.75	Nil	Nil	Nil	1.50 earthen	2.00 earthen	0	Residential	Residential	Concrete	Nil	Nil	BT, fair	Nil	
6	1/250 to 1/500 (HS- 08)	0.250	SH	7.00	13.20	Nil	Nil	Nil	1.50 earthen	1.50 earthen	1	Residential+ Commercial	Residential+ Commercial	Nil	Concrete	Nil	BT, fair	1 (3.80m W)	
7	1/500 to 1/750 (HS- 08)	0.250	SH	7.00	14.10	Nil	Nil	Nil	1.50 earthen	1.50 earthen	0	Commercial	Commercial	Nil	Concrete	Nil	BT, fair	Nil	
8	1/750 to 2/000 (HS- 08)	0.250	SH	7.00	16.50	Nil	Nil	Nil	1.50 earthen	1.50 earthen	0	Commercial	Commercial	concrete	Nil	Nil	BT, fair	Nil	Saint Peter's Jn.
9	2/000 to 2/250 (HS- 07)	0.250	SH	7.00	15.50	Nil	1	1	1.00 earthen	1.50 earthen	0	Residential+ Commercial	Residential+ Commercial	concrete	concrete	Nil	BT, fair	Nil	
10	2/250 to 2/400 (HS-07)	0.250	SH	7.50	14.00	Nil	1	1	1.50 earthen	1.75 earthen	1	Residential+ Commercial	Residential+ Commercial	concrete	concrete	One 3 arm, major	BT, fair	Nil	General Hospital Jn.
25	2/400 to 2/500 (HS-06)	0.100	SH	7.50	13.00	Nil	1	1	1.50 earthen	1.75 earthen	0	Residential+ Commercial	Residential+ Commercial	concrete	concrete	Nil	BT, fair	1 (1.25m W)	One Way
26	2/500 to 2/750 (HS-06)	0.250	SH	7.50	12.50	Nil	1	1	1.00 Paved	1.50 Paved	0	Commercial	Commercial	concrete	concrete	Nil	BT, fair	Nil	One Way
27	2/750 to 3/000 (HS-06)	0.250	SH	7.50	13.50	Nil	1	1	1.00 Paved	1.50 Paved	1	Commercial	Commercial	concrete	concrete	One 3 arm, major	BT, fair	Nil	Masjid jn. At Ch. 2/900 & Cental jn. At Ch. 3/000
28	3/000 to 3/100 (HS-05)	0.100	SH	13.50	18.50	0.60	1	1	1.00 Paved	1.50 Paved	0	Commercial	Commercial	concrete	concrete	One 3 arm, major	BT, fair	Nil	Divided CW with small median, covered drain as footpath
29	3/100 to 3/400 (HS-04)	0.300	SH	13.50	21.00	Nil	1	1	1.00 Paved	1.50 Paved	0	Commercial	Commercial	concrete	concrete	One 3 arm, major	BT, fair	Nil	Mini Civil Station Jn.
30	3/400 to 3/750 (HS-03)	0.350	SH	7.50	13.50	Nil	Nil	Nil	1.50 earthen	1.75 earthen	1	Commercial	Commercial	concrete	concrete	One 4 arm, major	BT, fair	Bridge (6m)	Aban Jn. At Ch.3/400
31	3/750 to 4/000 (HS-03)	0.250	SH	7.50	13.50	Nil	Nil	Nil	0.80 earthen	1.25 earthen	0	Residential+ Commercial	Residential+ Commercial	concrete	concrete	Nil	BT, fair	Nil	
32	4/000 to 4/250 (HS-03)	0.250	SH	7.50	14.00	Nil	Nil	Nil	0.60 earthen	0.90 earthen	0	Residential+ Commercial	Residential+ Commercial	Nil	Nil	One 3 arm, minor	BT, fair	Nil	Minor 3 arm junction on Ch.
33	4/250 to 4/500 (HS-03)	0.250	SH	7.50	12.00	Nil	Nil	Nil	1.00 earthen	1.50 earthen	1	Residential+ Commercial	Residential+ Commercial	Nil	Nil	One 3 arm, minor	BT, fair	Nil	Minor 3 arm junction on Ch.
34	4/500 to 4/750 (HS-03)	0.250	SH	7.50	13.00	Nil	Nil	Nil	0.80 earthen	1.20 earthen	0	Residential+ Commercial	Residential+ Commercial	Nil	Nil	Nil	BT, fair	Nil	
35	4/750 to 5/000 (HS-03)	0.250	SH	7.20	12.80	Nil	Nil	Nil	0.75 earthen	1.00 earthen	0	Residential+ Commercial	Residential+ Commercial	Nil	Nil	Nil	BT, fair	Nil	

Sl.No.	Chainage	Length (Km)	Type of Road	Width (m)		Median (m)	Footpath (m)		Shoulder (m)		Bus stops	Adjoining land use		Drain type /		Junctions and controls	Surface type and condition	CD structures	Remarks
				CW	ROW		L	R	L	R		L	R	L	R			Type	
36	5/000 to 5/250 (HS-03)	0.250	SH	7.50	13.25	Nil	Nil	Nil	1.00 earthen	1.25 earthen	1	Residential+ Commercial	Residential+ Commercial	Concrete	Nil	One 3 arm, minor	BT, fair	1 (1.25m W)	Minor 3 arm junction on Ch.
37	5/250 to 5/500 (HS-03)	0.250	SH	7.50	12.60	Nil	Nil	Nil	1.00 earthen	1.00 earthen	0	Commercial	Commercial	Concrete	Nil	One 4 arm, major	BT, fair	Nil	Kumbazha Jn.
38	5/500 to 5/750 (HS-18)	0.250	PWD	7.50	12.00	Nil	Nil	Nil	1.20 earthen	1.20 earthen	0	Commercial	Commercial	Nil	Nil	Nil	BT, fair	Nil	Market
39	5/750 to 6/000 (HS-18)	0.250	PWD	7.50	12.00	Nil	Nil	Nil	0.75 earthen	1.00 earthen	0	Paddy	Marshy	Concrete	Concrete	Nil	BT, fair	Nil	Market
40	6/000 to 6/300 (HS-18)	0.250	PWD	7.50	12.60	Nil	Nil	Nil	1.00 earthen	1.00 earthen	1	Paddy	Marshy	Nil	Nil	One 3 arm, minor	BT, fair	Nil	Kalikkapadi Jn.
41	6/300 to 6/500 (HS-19)	0.200	PWD	6.00	9.50	Nil	Nil	Nil	1.00 earthen	1.00 earthen	0	Residential	Paddy	Nil	Nil	Nil	BT, fair	Nil	
42	6/500 to 6/750 (HS-19)	0.250	PWD	6.20	11.00	Nil	Nil	Nil	1.20 earthen	1.20 earthen	0	Residential	Paddy	Nil	Nil	Nil	BT, fair	Nil	
43	6/750 to 7/000 (HS-19)	0.250	PWD	6.20	11.20	Nil	Nil	Nil	1.50 earthen	1.00 earthen	0	Residential	Paddy	Nil	Nil	Nil	BT, fair	Nil	
44	7/000 to 7/250 (HS-19)	0.250	PWD	6.20	13.25	Nil	Nil	Nil	1.00 earthen	1.25 earthen	1	Residential	Crops	Nil	Nil	Nil	BT, fair	Nil	
45	7/250 to 7/500 (HS-19)	0.250	PWD	6.20	12.60	Nil	Nil	Nil	1.00 earthen	1.00 earthen	0	Residential	Crops	Nil	Nil	Nil	BT, fair	Nil	
46	7/500 to 7/750 (HS-19)	0.250	PWD	6.20	12.00	Nil	Nil	Nil	1.20 earthen	1.20 earthen	0	Residential	Crops	Nil	Nil	Nil	BT, fair	Nil	
47	7/750 to 8/000 (HS-19)	0.250	PWD	6.20	12.00	Nil	Nil	Nil	0.75 earthen	1.00 earthen	0	Crops	Crops	Nil	Nil	Nil	BT, fair	1 (1.25m W)	Slightly rolling terrain
48	8/000 to 8/250 (HS-19)	0.250	PWD	6.20	12.60	Nil	Nil	Nil	1.00 earthen	1.00 earthen	0	Crops	Residential	Nil	Nil	One 3 arm, minor	BT, fair	Nil	Slightly rolling terrain
49	8/250 to 8/500 (HS-19)	0.250	PWD	6.20	12.60	Nil	Nil	Nil	1.00 earthen	1.00 earthen	1	Plantation	Residential	Nil	Nil	One 3 arm, minor	BT, fair	Nil	Slightly rolling terrain, Musaliar College of Engg.
50	8/500 to 8/750 (HS-19)	0.250	PWD	6.20	12.60	Nil	Nil	Nil	1.00 earthen	1.00 earthen	0	crops	crops	Nil	Nil	One 3 arm, minor	BT, fair	Nil	Slightly rolling terrain
51	8/750 to 9/000 (HS-19)	0.250	PWD	6.20	12.60	Nil	Nil	Nil	1.00 earthen	1.00 earthen	0	Plantation	Plantation	Nil	Nil	Nil	BT, fair	Nil	Slightly rolling terrain
52	9/000 to 9/250 (HS-19)	0.250	PWD	6.20	12.60	Nil	Nil	Nil	1.00 earthen	1.00 earthen	1	Crops	Crops	Nil	Nil	Nil	BT, fair	1 (2.00m W)	Slightly rolling terrain
53	9/250 to 9/500 (HS-19)	0.250	PWD	6.20	12.60	Nil	Nil	Nil	1.00 earthen	1.00 earthen	0	Crops	Crops + Residential	Nil	Nil	Nil	BT, fair	Nil	Slightly rolling terrain
III	**KALIKKAPADI - VETTOOR ROAD**	**1.200**																	
1	0/000 to 0/250 (HS-20)	0.250	PWD	5.25	11.00	Nil	Nil	Nil	0.75 earthen	1.25 earthen	0	Marshy	Marshy	Concrete	Nil	Nil	BT, fair	1 (4.00m W)	
2	0/250 to 0/500 (HS-20)	0.250	PWD	5.50	11.20	Nil	Nil	Nil	1.00 earthen	1.00 earthen	0	Crops	Residential	Concrete	Nil	One 3 arm, minor	BT, fair	1 (1.00m W)	Ezhupurapadi Jn.
3	0/500 to 0/750 (HS-20)	0.250	PWD	5.25	11.00	Nil	Nil	Nil	0.75 earthen	1.00earthen	0	Residential	Plantatation	Concrete	Nil	Nil	BT, fair	Nil	
4	0/750 to 1/000 (HS-20)	0.250	PWD	5.50	11.20	Nil	Nil	Nil	1.00 earthen	1.00 earthen	0	Crops	Residential	Nil	Nil	Nil	BT, poor	1 (1.00m W)	
5	1/000 to 1/200 (HS-20)	0.200	PWD	5.25	11.00	Nil	Nil	Nil	0.75 earthen	1.00earthen	0	Residential	Plantatation	Concrete	Nil	Nil	BT, poor	Nil	Municipal boundary

Sl.No.	Chainage	Length (Km)	Type of Road	Width (m)		Median (m)	Footpath (m)		Shoulder (m)		Bus stops	Adjoining land use		Drain type /		Junctions and controls	Surface type and condition	CD structures	Remarks
				CW	ROW		L	R	L	R		L	R	L	R			Type	
IV	**KUMBAZHA BRIDGE - PALLIPADI JN.**	**2.800**																	
1	0/000 to 0/250 (HS-01)	0.250	SH	6.20	9.00	Nil	Nil	Nil	0.75 earthen	1.00 earthen	0	Plantation	Plantation	Nil	Nil	Nil	BT, fair	83m x 6m	Bridge 3 span
2	0/250 to 0/500 (HS-01)	0.250	SH	6.20	9.00	Nil	Nil	Nil	0.75 earthen	1.00 earthen	0	Commercial	commercial	Nil	Nil	One 4 arm, major	BT, fair	Nil	Kumbazha Jn.
3	0/500 to 0/750 (HS-02)	0.250	SH	6.20	9.00	Nil	Nil	Nil	1.75 earthen	1.00 earthen	1	Commercial	commercial	Nil	Nil	One 3 arm, minor	BT, fair	Nil	
4	0/750 to 1/000 (HS-02)	0.250	SH	6.20	9.00	Nil	Nil	Nil	1.75 earthen	1.00 earthen	0	Commercial+ Residential	commercial	Concrete	Nil	Nil	BT, fair	1 (1.50m W)	
5	1/000 to 1/250 (HS-02)	0.250	SH	6.20	9.00	Nil	Nil	Nil	1.25 earthen	1.20 earthen	0	Residential	Residential	Concrete	Nil	Nil	BT, fair	1 (1.00m W)	
6	1/250 to 1/500 (HS-02)	0.250	SH	6.20	8.50	Nil	Nil	Nil	1.25 earthen	1.20 earthen	0	Residential	Residential	Concrete	Nil	Nil	BT, fair	1 (1.00m W)	
7	1/500 to 1/750 (HS-02)	0.250	SH	6.20	8.50	Nil	Nil	Nil	1.00 earthen	0.75 earthen	1	Residential	Residential	Concrete	Nil	Nil	BT, fair	Nil	
8	1/750 to 2/000 (HS-02)	0.250	SH	6.20	8.50	Nil	Nil	Nil	0.90 earthen	0.75 earthen	0	Residential	Residential	Concrete	Nil	Nil	BT, fair	Nil	
9	2/000 to 2/250 (HS-02)	0.250	SH	6.20	8.50	Nil	Nil	Nil	0.80 earthen	0.75 earthen	0	Residential	Residential	Nil	Nil	Nil	BT, fair	Nil	
10	2/250 to 2/500 (HS-02)	0.250	SH	6.20	9.25	Nil	Nil	Nil	0.75 earthen	1.00 earthen	0	Residential+ commercial	Residential+ commercial	Nil	Nil	Nil	BT, fair	1 (1.00m W)	
11	2/500 to 2/800 (HS-02)	0.300	SH	6.20	9.50	Nil	Nil	Nil	1.00 earthen	1.00 earthen	1	Residential+ commercial	Residential+ commercial	Nil	Nil	One 3 arm, major	BT, fair	Nil	Pallipadi Jn.
V	**PALLIPADI - MINI CIVIL STATION ROAD**	**2.300**																	
1	0/000 to 0/250 (HS-17)	0.250	PWD	6.20	10.00	Nil	Nil	Nil	1.00 earthen	1.00 earthen	1	Commercial	Marshy	Nil	Nil	One 3 arm, major	BT, fair	1 (1.00m W)	Pallipadi Jn. Culvert at ch. 100 & Small bridge at Ch.200(6m)
2	0/250 to 0/500 (HS-17)	0.250	PWD	6.20	10.00	Nil	Nil	Nil	0.75 earthen	1.00 earthen	0	Paddy	Paddy	Concrete	concrete	Nil	BT, fair	Nil	
3	0/500 to 0/750 (HS-17)	0.250	PWD	6.20	9.50	Nil	Nil	Nil	0.75 earthen	1.25 earthen	0	Paddy	Mixed	Nil	Nil	One 3 arm, minor	BT, fair	Nil	
4	0/750 to 1/000 (HS-17)	0.250	PWD	6.20	9.00	Nil	Nil	Nil	1.75 earthen	1.00 earthen	0	Residential	Residential	Concrete	Nil	Nil	BT, fair	1 (1.00m W)	
5	1/000 to 1/300 (HS-17)	0.300	PWD	6.20	9.00	Nil	Nil	Nil	1.25 earthen	1.20 earthen	1	Residential	Residential	Concrete	Nil	One 4 arm, major	BT, fair	Nil	Thachanpadi Jn. Bridge at ch. 1/300 (6m)

Sl.No.	Chainage	Length (Km)	Type of Road	Width (m)		Median (m)	Footpath (m)		Shoulder (m)		Bus stops	Adjoining land use		Drain type /		Junctions and controls	Surface type and condition	CD structures	Remarks
				CW	ROW		L	R	L	R		L	R	L	R			Type	
6	1/300 to 1/500 (HS-16)	0.200	PWD	6.20	8.50	Nil	Nil	Nil	1.00 earthen	1.00 earthen	0	Mixed	Mixed	Nil	Nil	Nil	BT, fair	Nil	
7	1/500 to 1/750 (HS-16)	0.250	PWD	6.20	8.50	Nil	Nil	Nil	1.00 earthen	0.75 earthen	0	Residential	Residential	Nil	Concrete	Nil	BT, fair	Nil	
8	1/750 to 2/000 (HS-16)	0.250	PWD	6.75	11.00	Nil	Nil	Nil	0.90 earthen	0.75 earthen	0	Commercial	Commercial	Concrete	concrete	One 3 arm, minor	BT, fair	Nil	KSRTC stand
9	2/000 to 2/300 (HS-15)	0.300	PWD	6.75	11.00	Nil	Nil	Nil	0.80 paved	0.75 paved	0	Commercial	Commercial	Concrete	Concrete	One 3 arm, major	BT, fair	Nil	Mini civil Station Jn.
VI	**CENTRAL JUNCTION - SANTHOSH JUNCTION**	**2.200**																	
1	0/000 to 0/250 (HS-09)	0.250	PWD	6.00	8.00	Nil	Nil	Nil	1.00 paved	0.65 paved	0	Commercial	commercial	Concrete	Concrete	Nil	BT, fair	Nil	One way
2	0/250 to 0/500 (HS-09)	0.250	PWD	6.00	8.00	Nil	Nil	Nil	1.00 paved	0.65 paved	0	Commercial	commercial	Concrete	concrete	One 3 arm, minor	BT, fair	Nil	TB Jn.
3	0/500 to 0/750 (HS-09)	0.250	PWD	6.00	8.00	Nil	Nil	Nil	1.00 paved	0.65 paved	1	Commercial	commercial	Concrete	Concrete	Nil	BT, fair	Nil	Two way Santhosh Jn.
4	0/750 to 1/000 (HS-10)	0.250	PWD	5.50	8.00	Nil	Nil	Nil	1.00 earthen	1.00 earthen	0	Marshy	commercial	Nil	Nil	Nil	BT, fair	Nil	
5	1/000 to 1/250(HS-10)	0.250	PWD	6.20	9.00	Nil	Nil	Nil	1.25 earthen	1.20 earthen	0	Residential	Residential	Concrete	Nil	Nil	BT, fair	Nil	
6	1/250 to 1/500 (HS-10)	0.250	PWD	6.20	8.50	Nil	Nil	Nil	1.00 earthen	1.00 earthen	1	Mixed	Mixed	Concrete	Nil	Nil	BT, fair	Nil	
7	1/500 to 1/750 (HS-10)	0.250	PWD	6.20	8.50	Nil	Nil	Nil	1.00 earthen	0.75 earthen	0	Residential	Residential	Concrete	Nil	Nil	BT, fair	Nil	
8	1/750 to 2/000 (HS-10)	0.250	PWD	6.75	11.00	Nil	Nil	Nil	0.90 earthen	0.75 earthen	0	Mixed	Mixed	Concrete	concrete	Nil	BT, fair	Nil	
9	2/000 to 2/200 (HS-10)	0.200	PWD	6.75	11.00	Nil	Nil	Nil	0.80 earthen	0.75 earthen	1	Residential	Residential	Concrete	Concrete	Nil	BT, fair	Nil	Municipal boundary
VII	**VELAN KADAVU - CENTRAL JUNCTION**	**2.700**																	
1	0/000 to 0/250 (HS-12)	0.250	PWD	6.00	8.50	Nil	Nil	Nil	0.75 earthen	0.75 earthen	0	Paddy	Mixed	Nil	Earthen	Nil	BT, fair	Nil	
2	0/250 to 0/500 (HS-12)	0.250	PWD	6.00	8.00	Nil	Nil	Nil	0.75 earthen	0.75 earthen	0	Mixed	Mixed	Nil	Earthen	Nil	BT, fair	1 (3.00m W)	
3	0/500 to 0/750 (HS-12)	0.250	PWD	6.00	8.00	Nil	Nil	Nil	0.75 earthen	0.75 earthen	1	Mixed	Mixed	Nil	Nil	Nil	BT, fair	Nil	
4	0/750 to 1/000 (HS-12)	0.250	PWD	6.00	8.00	Nil	Nil	Nil	0.75 earthen	0.75 earthen	0	Residential	Residential	Nil	Nil	Nil	BT, fair	Nil	

Sl.No.	Chainage	Length (Km)	Type of Road	Width (m)		Median (m)	Footpath (m)		Shoulder (m)		Bus stops	Adjoining land use		Drain type /		Junctions and controls	Surface type and condition	CD structures	Remarks
				CW	ROW		L	R	L	R		L	R	L	R			Type	
5	1/000 to 1/250(HS-12)	0.250	PWD	6.20	8.50	Nil	Nil	Nil	0.75 earthen	0.75 earthen	0	Residential	Residential	Nil	Nil	Nil	BT, fair	Nil	
6	1/250 to 1/500 (HS-12)	0.250	PWD	6.20	8.50	Nil	Nil	Nil	0.75 earthen	0.75 earthen	1	Mixed	Residential	Nil	Nil	Nil	BT, fair	Nil	
7	1/500 to 1/750 (HS-12)	0.250	PWD	6.20	8.50	Nil	Nil	Nil	0.75 earthen	0.75 earthen	0	Residential	Residential	Nil	Nil	Nil	BT, fair	Nil	KSEB Sub station at Ch. 1/600
8	1/750 to 2/000 (HS-12)	0.250	PWD	6.75	11.00	Nil	Nil	Nil	1.20 earthen	1.00 earthen	0	Commercial	Mixed	Nil	Nil	Nil	BT, fair	6m x 6m	Bridge (6m)
9	2/000 to 2/200 (HS-12)	0.200	PWD	6.00	9.65	Nil	Nil	Nil	1.50 earthen	1.00 earthen	0	Residential+ commercial	Residential+ commercial	Nil	Nil	One 4 arm, major	BT, fair	Nil	Co-operative Jn.
10	2/200 to 2/500 (HS-11)	0.300	PWD	6.00	8.50	Nil	Nil	Nil	Nil	Nil	0	Residential+ commercial	Residential+ commercial	Nil	Nil	Nil	BT, fair	Nil	
11	2/500 to 2/700 (HS-11)	0.200	PWD	6.00	7.50	Nil	Nil	Nil	Nil	Nil	0	Commercial	Commercial	Nil	Nil	Nil	BT, fair	Nil	Central Jn.
VI	**KADAMMANITTA JN. - MUNDUKOTTUCKAL**	**3.650**																	
1	0/0 to 0/250 (HS- 13)	0.250	PWD	5.00	7.50	Nil	Nil	Nil	0.60 earthen	0.60 earthen	1	Commercial	Commercial+ Residential	Nil	concrete	Nil	BT, fair	Nil	
2	0/250 to 0/500 (HS- 13)	0.250	PWD	5.00	7.50	Nil	Nil	Nil	0.60 earthen	0.60 earthen	0	Residential+ Commercial	Residential+ Commercial	Nil	Concrete	Nil	BT, fair	Nil	
3	0/500 to 0/750 (HS- 13)	0.250	PWD	5.00	7.50	Nil	Nil	Nil	0.60 earthen	0.60 earthen	0	Commercial	Residential	Nil	Concrete	Nil	BT, fair	Nil	
4	0.750 to 1/000 (HS- 13)	0.250	PWD	5.00	7.50	Nil	Nil	Nil	0.60 earthen	0.60 earthen	0	Residential	Residential	Nil	Nil	Nil	BT, fair	Nil	
5	1/000 to 1/250 (HS- 13)	0.250	PWD	5.00	7.50	Nil	Nil	Nil	0.60 earthen	0.60 earthen	1	Residential	Residential	Nil	Nil	One 4 arm, minor	BT, fair	Nil	Vettippuram Jn.
6	1/250 to 1/500 (HS- 14)	0.250	PWD	5.50	7.50	Nil	Nil		0.60 earthen	0.60 earthen	0	Paddy	Cultivation	Nil	Nil	Nil	BT, fair	7m x 5.5m	Bridge (7m)
7	1/500 to 1/750 (HS- 14)	0.250	PWD	5.50	7.50	Nil	Nil	Nil	0.60 earthen	0.60 earthen	0	Paddy	Cultivation	Nil	Concrete	Nil	BT, fair	Nil	
8	1/750 to 2/000 (HS- 14)	0.250	PWD	5.50	7.50	Nil	Nil	Nil	0.60 earthen	0.60 earthen	1	Paddy	Cultivation	Nil	Concrete	Nil	BT, fair	Nil	Slightly rolling
9	2/000 to 2/250 (HS-14)	0.250	PWD	5.50	7.50	Nil	Nil	Nil	0.75 earthen	0.60 earthen	0	Agriculture	Residential	Nil	Nil	Nil	BT, fair	Nil	Slightly rolling
10	2/250 to 2/500 (HS-14)	0.250	PWD	5.50	7.50	Nil	Nil	Nil	0.75 earthen	0.60 earthen	0	Agriculture	Marshy	Nil	Earthen	Nil	BT, fair	Nil	Slightly rolling
11	2/500 to 2/750 (HS-14)	0.250	PWD	5.50	7.50	Nil	Nil	Nil	0.75 earthen	0.60 earthen	0	Marshy	Cultivation	Nil	Earthen	Nil	BT, fair	Nil	Slightly rolling
12	2/750 to 3/000 (HS-14)	0.200	PWD	5.50	7.50	Nil	Nil	Nil	0.50 earthen	0.60 earthen	1	Paddy	Cultivation	Nil	Earthen	Nil	BT, fair	Nil	
13	3/000 to 3/250 (HS-14)	0.250	PWD	5.50	7.50	Nil	Nil	Nil	0.50 earthen	0.50 earthen	0	Paddy	Paddy + Residential	Nil	Nil	Nil	BT, fair	Nil	
14	3/250 to 3/500 (HS-14)	0.250	PWD	5.50	7.50	Nil	Nil	Nil	0.85 earthen	0.75 earthen	0	Residential	Cultivation	Earthen	Earthen	Nil	BT, fair	Nil	
15	3/500 to 3/700 (HS-14)	0.200	PWD	5.50	7.50	Nil	Nil	Nil	0.85 earthen	1.00 earthen	1	Commercial	Marshy	Earthen	Earthen	Nil	BT, fair	Nil	Municipal boundary

ANNEXURE 13.2
DISTANCE TO BUS STOP

Ward No.	Ward Name	Average Distance to Bus stop	% saying distance to bus stop greater than 0.5 km
1	Peringamala	0.52	9.68
2	Anchakkala	0.71	51.85
3	Vanjipoyka	0.74	56.25
4	Vettippuram	0.63	28.57
5	Saradamadom	0.76	42.86
6	Mundukottakkal	0.91	55.17
7	Poovanpara	0.96	60.98
8	Thykkavu	0.78	51.85
9	Pattamkulam	0.63	33.33
10	Pettah South	0.5	0
11	Pettah North	0.55	7.69
12	Kairalipuram	0.89	72.73
13	Kulasekharapathi	0.57	29.41
14	Arabic college	0.56	25.93
15	Kumbazha North	0.81	45.16
16	Myladumpara thazhom	1.03	61.11
17	Myladumpara	0.8	63.64
18	Plaveli	1.54	86.67
19	Kumbazha East	1.31	48.48
20	Kumbazha South	0.71	63.33
21	Kumbazha West	0.51	3.23
22	Chuttippara East	0.61	33.33
23	Chuttippara West	0.59	35
24	Valanchuzhy	0.6	40
25	Kallarakkadavu	0.6	40
26	Azhoor West	0.51	4.35
27	Azhoor East	0.66	29.41
28	Kodumthara	0.6	20.69
29	College	0.52	8
30	Town ward	0.6	31.71
31	Karimbanakuzhi	1.09	80.65
32	Churulikode	0.94	60

ANNEXURE 13.3
OD MATRIX OF INTER TOWN PASSENGER TRIPS

Origin	Destination																			Total
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	
1	0	0	0	0	0	0	3063	7241	9369	11415	1447	3859	1006	876	0	0	21	100	0	**38396**
2	0	0	0	0	0	0	2350	1581	196	446	888	1306	50	0	0	0	0	0	0	**6815**
3	0	0	0	0	0	0	21	0	0	0	0	0	0	0	0	0	0	0	0	**21**
4	0	0	0	0	0	0	0	51	59	275	0	0	0	0	0	0	0	0	0	**385**
5	0	0	0	0	0	0	1844	650	59	1625	522	114	26	0	0	0	0	0	0	**4841**
6	0	0	0	0	0	0	51	0	0	50	0	0	0	0	0	0	0	0	0	**100**
7	6469	2513	26	213	230	0	0	376	30	825	30	535	358	0	0	107	0	0	0	**11712**
8	7069	1617	0	694	210	0	1325	0	1908	618	1774	25	25	207	0	0	103	0	0	**15575**
9	15769	1123	0	0	1061	0	155	1259	0	333	0	137	82	0	0	0	204	0	0	**20123**
10	12510	381	24	39	335	0	1123	190	57	0	22	94	0	0	0	0	0	0	0	**14775**
11	461	92	0	0	52	0	0	382	0	474	0	940	126	0	0	0	0	38	0	**2564**
12	5448	1039	0	0	0	0	356	25	165	0	1044	0	147	221	0	0	0	0	0	**8445**
13	2631	0	0	0	0	0	421	0	37	0	540	83	0	0	0	0	0	0	0	**3712**
14	1377	167	0	0	437	0	77	580	0	50	77	256	28	0	0	0	0	0	0	**3047**
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
16	0	0	0	0	0	0	0	103	0	0	0	25	0	0	0	0	0	0	0	**129**
17	92	0	0	0	0	0	0	15	0	12	0	169	0	0	0	0	0	0	0	**287**
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
19	0	0	0	0	0	0	0	0	0	0	105	0	0	0	0	0	0	0	0	**105**
Total	51826	6932	50	947	2325	0	10784	12454	11880	16121	6449	7542	1847	1304	0	107	328	138	0	**131032**

ANNEXURE 13.4
PATTERN OF INTER CITY GOODS TRIPS IN TOWN

Sl. No	Origininating region	Terminating zones				Total	Percent
		Pathanamthitta town	Patthanamthitta District	Other districts	Other States		
	MAT						
1	Pathanamthitta study	0	41	-	-	41	12.38
2	Patthanamthitta	93	42	20	28	183	54.91
3	Other districts	36	17	-	9	62	18.65
4	Other States	26	21	-	-	47	14.06
	Total	155	121	20	37	333	100.00
	per cent	46.59	36.41	5.95	11.05	100.	
	Truck						
1	Pathanamthitta study	0	516	106	-	622	36.19
2	Patthanamthitta	307	295	113	3	718	41.76
3	Other districts	154	74	69	6	303	17.62
4	Other States	28	8	41	-	76	4.43
	Total	489	893	329	9	1,72	100.00
	per cent	28.44	51.93	19.11	0.53	100.	
	Mini truck						
1	Pathanamthitta study	0	397	93	-	491	33.60
2	Patthanamthitta	314	131	148	11	603	41.32
3	Other districts	182	92	58	-	331	22.69
4	Other States	24	11	-	-	35	2.39
	Total	519	631	299	11	1,46	100.00
	per cent	35.54	43.23	20.49	0.74	100.	
	Goods Autorikshaw						
1	Pathanamthitta study	-	447	26	-	473	46.24
2	Patthanamthitta	296	36	24	-	357	34.92
3	Other districts	176	17	-	-	193	18.84
4	Other States	-	-	-	-	-	-
	Total	472	500	50	-	1,02	100.00
	per cent	46.21	48.89	4.90	-	100.	
	Total						
1	Pathanamthitta study	-	1,402	225	-	1,62	35.87
2	Patthanamthitta	1,010	504	306	42	1,86	41.04
3	Other districts	548	200	126	15	889	19.60
4	Other States	78	40	41	-	158	3.49
	Total	1,636	2,145	698	57	4,53	100.00
	per cent	36.06	47.30	15.39	1.25	100.	

ANNEXURE 13.5
OD MATRIX OF INTER TOWN GOODS TRAFFIC

Origin \ Destination	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	Total
1	0	0	0	0	0	0	156	268	296	341	28	59	51	16	0	0	0	0	0	**1216**
2	0	0	0	0	0	0	128	133	23	6	0	13	3	0	0	0	0	0	0	**306**
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
5	0	0	0	0	0	0	0	32	16	3	0	13	0	41	0	0	0	0	0	**105**
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
7	95	29	0	0	46	0	0	17	0	48	0	64	8	0	0	0	0	0	0	**306**
8	165	116	32	0	5	0	64	0	219	11	105	11	46	42	0	0	42	0	0	**858**
9	231	65	0	0	9	0	0	72	0	20	0	25	0	0	1	0	0	0	0	**423**
10	142	34	0	0	31	11	29	11	15	0	4	0	0	0	0	0	0	0	0	**275**
11	18	0	0	0	0	0	0	21	4	4	0	63	10	0	0	0	0	0	0	**120**
12	104	5	0	0	0	0	30	0	25	1	11	0	0	8	0	0	3	0	0	**188**
13	180	18	0	0	28	0	41	32	24	0	11	0	0	6	0	0	4	9	0	**353**
14	137	57	0	0	0	0	0	17	0	0	0	17	0	0	0	0	0	0	0	**228**
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
16	21	0	0	0	0	0	6	0	0	1	0	0	5	0	0	0	0	0	0	**34**
17	57	0	0	0	0	0	0	0	6	22	0	21	10	4	0	0	0	0	0	**120**
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	**0**
19	0	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	0	0	**4**
Total	1150	324	32	0	119	11	454	601	633	458	159	287	133	117	1	0	48	9	0	**4536**

ANNEXURE 15.1
EXISTING DRAINAGE NETWORK

Nala–1

Nala–1 originates from Catch Basin CB–583 near Kaipattor Road (Puthenpeedika Kulam Junction) and extends for approximately 2.0 km before outfalling into the Achankovil River at Kudumthara Junction (OF–1). The channel is predominantly a natural earthen drain with irregular cross-sections, narrow widths, and shallow depths.

Hydraulic assessment indicates that Nala–1 is operating below its required capacity along most of its length. Flow velocities range from approximately 1.17 m/s to 5.7 m/s; however, the effective discharge capacity is considerably reduced due to physical constraints. The majority of the segments are classified as “inadequate,” demonstrating the channel’s inability to convey peak stormwater flows efficiently. Although a few downstream reaches exhibit relatively adequate capacity, these stretches are discontinuous and are affected by upstream bottlenecks, resulting in localized flooding and water stagnation during intense rainfall events.

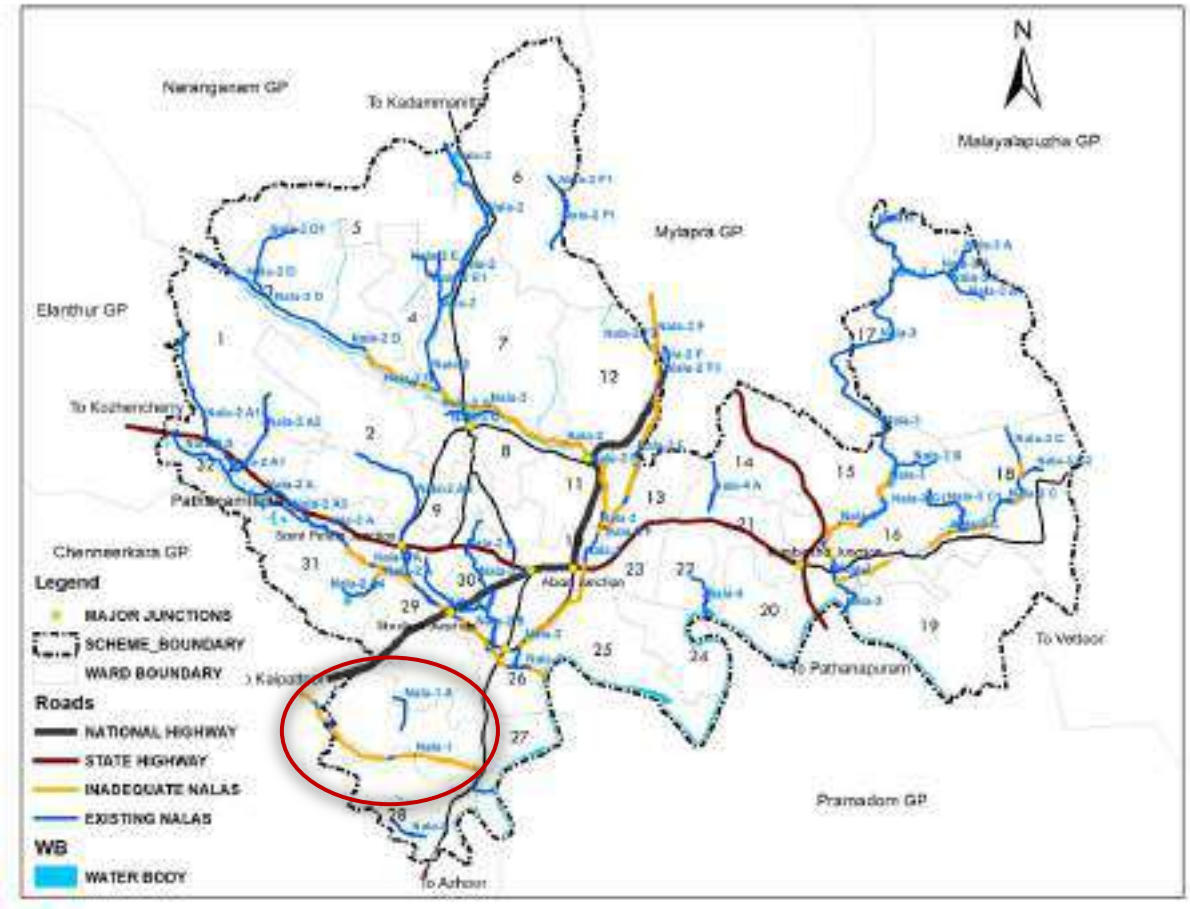
Overall, the existing condition of Nala–1 reflects a combination of natural channel limitations and lack of systematic maintenance or engineering intervention. Issues such as bank erosion, reduced hydraulic section due to encroachments, and flow obstruction from vegetation significantly compromise its performance. Without targeted improvements including channel widening, desilting, vegetation clearance, and structural stabilization, the nala will continue to function inefficiently and contribute to urban flooding within its catchment.





Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–583 to CB–584	2.57	241.0	Inadequate
CB–584 to CB–585	1.88	209.7	Inadequate
CB–585 to CB–586	1.70	58.7	Adequate
CB–586 to CB–587	1.97	208.5	Inadequate
CB–587 to CB–588	1.17	83.4	Adequate
CB–588 to CB–589	2.38	329.3	Inadequate
CB–589 to CB–590	2.23	245.2	Inadequate
CB–590 to CB–591	3.04	574.3	Inadequate
CB–591 to CB–599	2.60	641.7	Inadequate
CB–599 to CB–598	2.37	395.8	Inadequate
CB–598 to CB–597	1.18	47.6	Adequate
CB–597 to CB–596	1.84	102.9	Inadequate
CB–596 to CB–595	2.36	509.6	Inadequate

CB–595 to CB–594	1.98	368.9	Inadequate
CB–594 to CB–618	1.87	286.0	Inadequate
CB–618 to CB–601	2.10	418.4	Inadequate
CB–601 to CB–602	2.18	370.9	Inadequate
CB–602 to CB–603	2.49	369.9	Inadequate
CB–603 to CB–605	1.70	34.6	Adequate
CB–605 to CB–604	1.31	16.8	Adequate
CB–604 to OF–1	5.72	9.1	Adequate



Nala-1A

Nala–1A originates near (CB–779) and extends up to the outfall (O–404), covering a total length of approximately 330 m. The channel is a short, localized drainage link that conveys runoff through a relatively stable reach.

Hydraulic evaluation indicates that Nala–1A is adequate along its entire length, with Flow/Capacity values well below 100% in all segments. The velocities range from about 0.56 m/s to 2.22 m/s**,** which are within acceptable limits for stable flow conditions. The available capacity in each reach is sufficient to handle the design discharge, and no critical bottlenecks or surcharge conditions are observed. Overall, the nala is performing efficiently and meets the current drainage requirements of its contributing catchment.

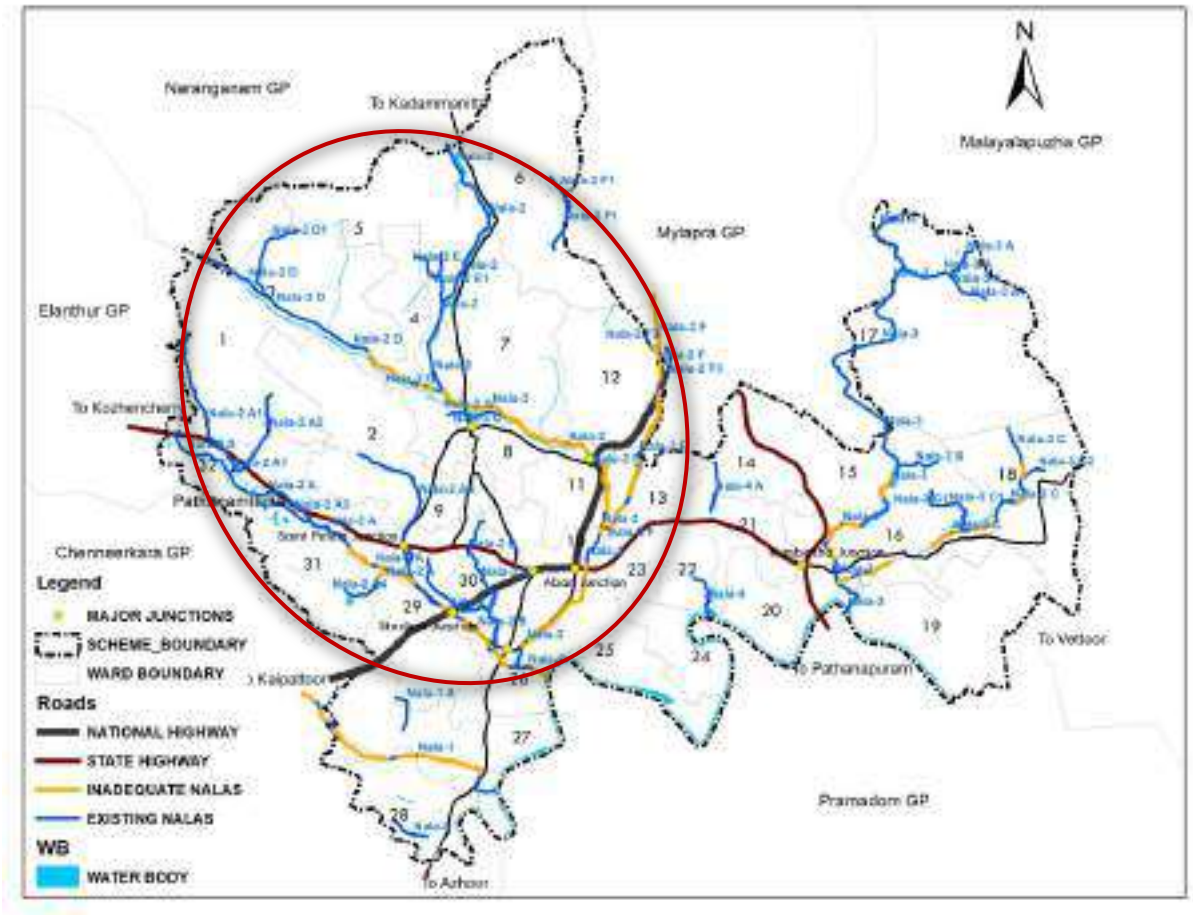
Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–779 to CB–778	1.21	0	Adequate
CB–778 to CB–777	0.82	0	Adequate
CB–777 to CB–776	0.56	0.2	Adequate
CB–776 to O–404	2.22	0.3	Adequate

Nala-2

Nala–2 is the primary drainage channel of Pathanamthitta Town, originating near Sri Valsam Tea Shop along the Pathanamthitta–Kadammanitta Road (CB–328) and extending up to the Achankovil River outfall (OF–2), with a total length of approximately 5.9 km. The upstream and midstream reaches are relatively stable, with defined sections and moderate flow conditions. However, as the nala progresses downstream, the channel becomes increasingly constrained.

Hydraulic analysis reveals a clear spatial variation in performance along the nala. The upstream stretches up to CB–121 (near Ultra Tech Cement Godown) are largely adequate, with Flow/Capacity ratios well within permissible limits, indicating sufficient carrying capacity. In contrast, the downstream reach from CB–121 to the outfall (OF–2) is predominantly inadequate, with Flow/Capacity values significantly exceeding 100% in multiple segments, in some cases reaching extremely high values. This indicates severe hydraulic insufficiency caused by reduced cross-sectional area and flow obstructions. The presence of silt accumulation, and channel narrowing further aggravates the situation, creating bottlenecks and restricting flow continuity.

Overall, Nala–2 exhibits a critical deficiency in its downstream reach, which governs the performance of the entire drainage system. While upstream sections function satisfactorily, the inadequate downstream capacity leads to flow congestion, increasing the risk of flooding and waterlogging in upstream urban areas during peak rainfall events. Therefore, the stretch from CB–121 to OF–2 requires comprehensive redesign, including channel widening, desilting, removal of obstructions, and structural stabilization measures, to ensure efficient conveyance of the system's design discharge and to restore the overall functionality of the drainage network.







Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–328 to CB–329	1.54	0.2	Adequate
CB–329 to CB–330	0.94	1.0	Adequate
CB–330 to CB–327	1.27	0.6	Adequate
CB–327 to CB–616	2.75	2.9	Adequate
CB–616 to CB–331	0.77	11.9	Adequate
CB–331 to CB–817	2.30	7.3	Adequate
CB–817 to CB–325	2.09	3.1	Adequate
CB–325 to CB–326	2.89	3.7	Adequate
CB–326 to CB–333	3.74	5.4	Adequate
CB–333 to CB–334	2.80	11.0	Adequate
CB–334 to CB–335	1.53	21.5	Adequate

CB–335 to CB–336	1.97	10.4	Adequate
CB–336 to CB–337	0.83	3.4	Adequate
CB–337 to CB–338	3.10	43.9	Adequate
CB–338 to CB–339	2.38	14.0	Adequate
CB–339 to CB–340	2.40	47.0	Adequate
CB–340 to CB–341	2.14	18.5	Adequate
CB–341 to CB–342	1.01	83.7	Adequate
CB–342 to CB–343	1.46	72.9	Adequate
CB–343 to CB–344	0.75	89.0	Adequate
CB–344 to CB–345	2.93	78.2	Adequate
CB–345 to CB–346	2.08	6.2	Adequate
CB–346 to CB–347	0.93	74.4	Adequate
CB–347 to CB–121	1.63	48.5	Adequate
CB–121 to CB–348	1.46	144.8	Inadequate
CB–348 to CB–349	2.96	408.9	Inadequate
CB–349 to CB–350	5.99	404.2	Inadequate
CB–350 to CB–351	2.88	240.0	Inadequate
CB–351 to CB–352	3.65	969.2	Inadequate
CB–352 to CB–353	4.19	528.6	Inadequate
CB–353 to CB–354	3.16	442.1	Inadequate
CB–354 to CB–355	2.50	151.3	Inadequate
CB–355 to CB–356	2.89	200.0	Inadequate
CB–356 to CB–357	2.48	253.7	Inadequate
CB–357 to CB–358	3.48	554.6	Inadequate
CB–358 to CB–359	3.71	499.2	Inadequate
CB–359 to CB–360	4.47	1755.6	Inadequate
CB–360 to CB–361	3.32	271.6	Inadequate
CB–361 to CB–362	2.08	72.8	Adequate
CB–362 to CB–363	2.24	113.8	Inadequate
CB–363 to CB–364	2.27	141.3	Inadequate
CB–364 to CB–365	3.40	266.3	Inadequate
CB–365 to CB–366	3.31	396.0	Inadequate
CB–366 to CB–367	2.27	316.9	Inadequate
CB–367 to CB–368	3.30	476.5	Inadequate
CB–368 to CB–369	1.73	87.6	Adequate
CB–369 to CB–370	1.29	49.4	Adequate
CB–370 to CB–371	1.27	58.9	Adequate
CB–371 to CB–372	5.58	301.5	Inadequate
CB–372 to CB–373	7.75	529.3	Inadequate
CB–373 to CB–374	3.64	145.9	Inadequate
CB–374 to CB–375	3.66	168.0	Inadequate
CB–375 to CB–376	3.71	344.9	Inadequate
CB–376 to CB–377	7.95	1238.5	Inadequate
CB–377 to CB–378	7.58	558.7	Inadequate
CB–378 to CB–379	6.15	628.2	Inadequate
CB–379 to CB–468	7.09	343.1	Inadequate
CB–468 to CB–381	4.05	64.0	Adequate
CB–381 to CB–69	4.79	13.1	Adequate

CB–69 to CB–382	3.39	29.3	Adequate
CB–382 to CB–383	1.83	41.7	Adequate
CB–383 to OF–2	5.31	284.7	Inadequate

Nala-2A

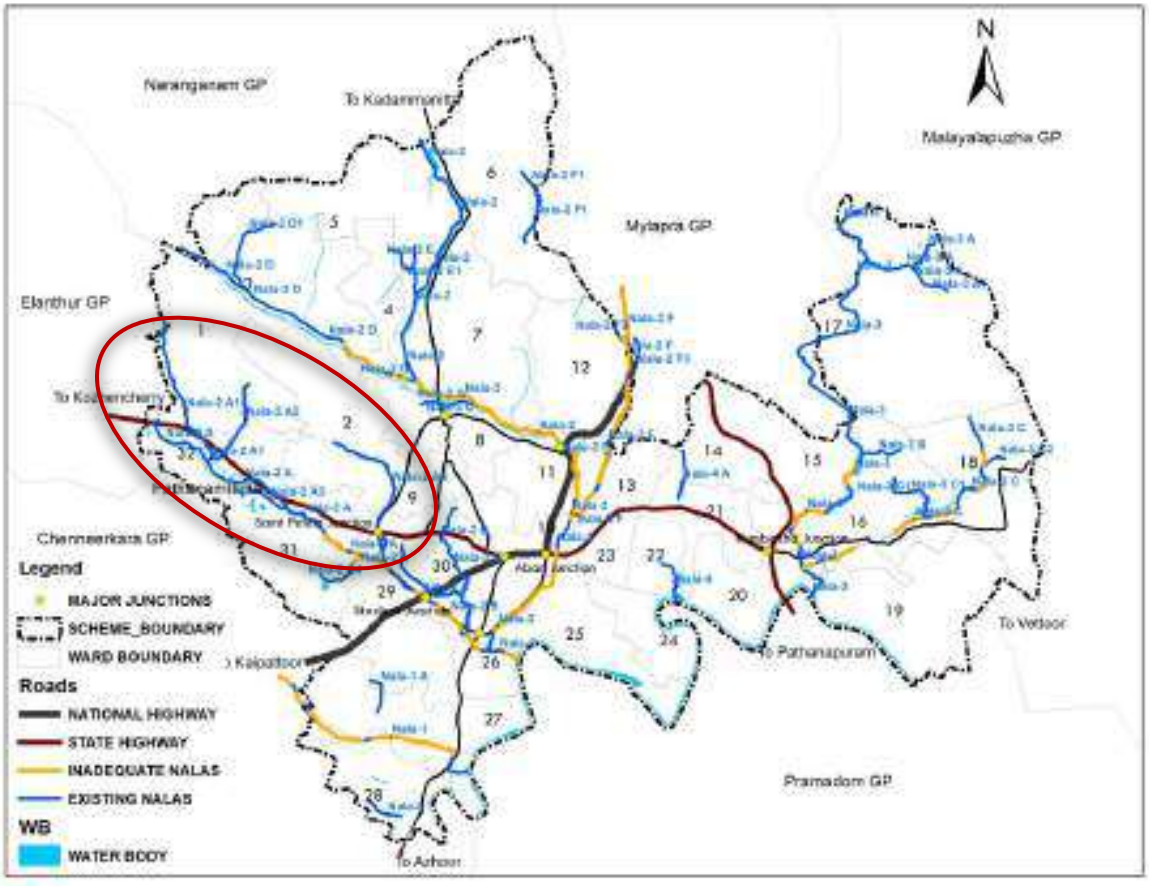
Nala–2A is a secondary drainage channel of Pathanamthitta Town, extending for approximately 3.4 km from TK Road near (CB–521) to near Bharat Petrol Pump, Kurungattu (CB–385). The upstream portions of the nala are relatively well-defined, with stable flow conditions and limited obstruction. However, in several stretches, especially toward the mid and downstream reaches, the channel is affected by obstructions and channel irregularities.

Hydraulic analysis shows that the nala performs adequately in the upstream reach (CB–521 to CB–435), where Flow/Capacity ratios remain well below 100%, indicating sufficient carrying capacity. However, from CB–435 (near Nandila G Mart Godown) onwards, the channel exhibits significant hydraulic stress. Multiple segments in this stretch show Flow/Capacity values exceeding 100%, with some reaches experiencing extremely high ratios, indicating severe inadequacy. This deficiency is primarily due to reduced effective cross-section caused by vegetation encroachment, silt deposition, and localized constrictions. Although a few intermittent segments regain adequacy, the overall performance of this reach remains poor, leading to flow restrictions and reduced conveyance efficiency.

Overall, Nala–2A demonstrates a clear upstream–downstream contrast in hydraulic performance, with the midstream portion acting as a critical bottleneck. The inadequate stretch from CB–435 to downstream sections (up to around CB–421 and beyond) significantly impacts the drainage efficiency of the nala and increases the risk of localized flooding during peak rainfall events. To restore effective functionality, this stretch requires targeted interventions, including channel widening, desilting, removal of vegetation and obstructions, and provision of continuous bank protection. Without such improvements, the nala will continue to operate under constrained conditions and limit the performance of the overall drainage network.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–521 to CB–516	1.82	1.0	Adequate
CB–516 to CB–517	0.83	4.4	Adequate
CB–517 to CB–518	0.64	4.4	Adequate
CB–518 to CB–519	1.76	0.4	Adequate
CB–519 to CB–449	1.08	1.5	Adequate
CB–449 to CB–448	1.10	1.7	Adequate
CB–448 to CB–724	1.14	4.5	Adequate
CB–724 to CB–447	1.29	37.7	Adequate
CB–447 to CB–816	0.48	6.2	Adequate
CB–816 to CB–445	1.10	4.2	Adequate
CB–445 to CB–444	3.24	16.4	Adequate
CB–444 to CB–443	1.05	9.3	Adequate
CB–443 to CB–442	1.08	24.6	Adequate
CB–442 to CB–441	1.91	12.8	Adequate
CB–441 to CB–440	1.54	9.9	Adequate
CB–440 to CB–439	1.26	99.9	Adequate

CB–439 to CB–438	1.22	20.7	Adequate
CB–438 to CB–437	1.13	9.2	Adequate
CB–437 to CB–436	1.57	8.5	Adequate
CB–436 to CB–435	1.16	18.4	Adequate
CB–435 to CB–434	0.87	160.2	Inadequate
CB–434 to CB–433	1.27	224.4	Inadequate
CB–433 to CB–432	1.08	90.1	Adequate
CB–432 to CB–431	2.75	532.2	Inadequate
CB–431 to CB–430	0.95	100.3	Inadequate
CB–430 to CB–632	2.47	837.9	Inadequate
CB–632 to CB–429	2.83	397.3	Inadequate
CB–429 to CB–428	0.94	94.3	Adequate
CB–428 to CB–427	1.53	49.6	Adequate
CB–427 to CB–426	1.25	49.6	Adequate
CB–426 to CB–425	1.51	165.1	Inadequate
CB–425 to CB–424	1.94	79.2	Adequate
CB–424 to CB–423	1.88	191.6	Inadequate
CB–423 to CB–422	3.23	874.2	Inadequate
CB–422 to CB–421	1.59	291.8	Inadequate
CB–421 to CB–819	2.79	46.1	Adequate
CB–819 to CB–385	1.90	260.0	Inadequate
CB–385 to CB–384	2.89	116.0	Inadequate
CB–384 to CB–69	6.22	10.4	Adequate



Nala–2A1

Nala–2A1 is a drainage channel extending for approximately 1.3 km, originating from St. Mary's Chapel (CB–531) and terminating at Krimpanakkuzhi–Punnalathupadi Road (CB–724). The channel traverses predominantly semi-urban and low-lying areas with relatively stable alignment. Nala maintains a fairly uniform section. The channel appears to function as an efficient link within the local drainage network, conveying runoff without noticeable stagnation or overflow issues.

Hydraulic analysis confirms that Nala–2A1 is adequate in its entire length, with all segments showing Flow/Capacity ratios well below 100%. Flow velocities range approximately from 0.42 m/s to 2.48 m/s, indicating stable hydraulic conditions without excessive erosion or sedimentation risks. The available carrying capacity in each reach is sufficient to accommodate the design discharge, and no critical bottlenecks or surcharge conditions are observed. Overall, the nala is performing efficiently and does not require structural augmentation, apart from routine maintenance such as desilting and vegetation management.

Chainage (From–To	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–531 to CB–665	0.42	1.4	Adequate
CB–665 to CB–529	1.12	0.5	Adequate
CB–529 to CB–528	1.24	0.9	Adequate
CB–528 to CB–527	1.16	0.7	Adequate
CB–527 to CB–526	0.80	5.5	Adequate
CB–526 to CB–525	1.52	0.4	Adequate
CB–525 to CB–524	1.45	1.3	Adequate
CB–524 to CB–523	1.37	1.4	Adequate
CB–523 to CB–522	1.25	5.1	Adequate
CB–522 to CB–636	0.80	91.5	Adequate
CB–636 to CB–452	1.75	8.7	Adequate
CB–452 to CB–451	2.09	1.6	Adequate
CB–451 to CB–21	1.48	3.5	Adequate
CB–21 to CB–724	2.48	5.3	Adequate

Nala–2A2

Nala–2A2 is a short drainage channel with an approximate length of 780 m, extending from CB–800 to M/S BH Motors (CB–21). The nala flows through a semi-urban setting with relatively defined channel geometry and stable banks. The channel maintains a consistent cross-section with minimal encroachment and limited obstruction from vegetation. The flow path is continuous, and no significant issues related to bank erosion, siltation, or structural discontinuity are evident along this reach.

Hydraulic analysis confirms that Nala–2A2 is adequate in its entire length, with all segments exhibiting Flow/Capacity ratios well below 100%. The velocities range approximately between 1.61m/s and 3.73 m/s, indicating stable flow conditions without excessive erosion or stagnation. The available carrying capacity is sufficient to accommodate the design discharge across all reaches, and no surcharge or bottleneck conditions are observed. Overall, the nala is

functioning efficiently and meets the current drainage requirements without any need for structural intervention.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–800 to CB–459	2.15	0.3	Adequate
CB–459 to CB–458	2.04	0.0	Adequate
CB–458 to CB–457	2.15	0.2	Adequate
CB–457 to CB–456	3.73	0.1	Adequate
CB–456 to CB–455	2.50	1.0	Adequate
CB–455 to CB–454	2.50	0.5	Adequate
CB–454 to CB–453	1.78	1.8	Adequate
CB–453 to CB–450	2.24	13.3	Adequate
CB–450 to CB–21	1.61	1.8	Adequate

Nala–2A3

Nala–2A3 is a short drainage stretch of approximately 320 m, originating from CB–756 and discharging at the outfall near Gregorian Hall, Chittoor (O–399). The nala flows through a semi-urban environment with a defined channel and stable alignment. The channel is relatively well-maintained, with no major encroachments or obstructions affecting the flow. The banks appear stable, and the flow path is continuous without visible bottlenecks or discontinuities.

Hydraulic evaluation confirms that Nala–2A3 is adequate in its entire length, with all segments exhibiting Flow/Capacity ratios significantly below 100%. The velocities range from about 0.68 m/s to 2.38 m/s, indicating stable hydraulic behaviour. The available carrying capacity in each reach is sufficient to convey the design discharge, and no surcharge or flow restriction is observed. Overall, the nala is functioning efficiently and does not require any structural improvements beyond routine maintenance.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–756 to CB–757	1.80	13.6	Adequate
CB–757 to CB–758	0.68	6.9	Adequate
CB–758 to CB–759	1.32	2.6	Adequate
CB–759 to O–399	2.38	1.1	Adequate

Nala–2A4

Nala–2A4 extends for approximately 475 m, originating from Krimpanakkuzhi Road (CB–760) and discharging at the outfall near Oxygen Digital Shop, Pathanamthitta New (O–401). The nala traverses a semi-urban corridor with partially defined channel sections. It is a generally stable upstream channel with moderate vegetation and limited obstruction. However, toward the downstream end, the channel appears relatively constricted, with reduced effective flow width and possible siltation influences near the outfall.

Hydraulic analysis shows that most segments of Nala–2A4 are adequate, with Flow/Capacity ratios below 100%. However, the final downstream reach (CB–764 to O–401) is hydraulically inadequate, with a Flow/Capacity value exceeding 120%, indicating insufficient carrying capacity. This suggests that while upstream sections function efficiently, the downstream

segment acts as a localized bottleneck, potentially restricting discharge into the outfall and increasing the risk of backwater effects during peak rainfall events.

Overall, Nala–2A4 demonstrates generally satisfactory performance with a critical deficiency at the downstream end. Targeted intervention is required only in the CB–764 to O–401 stretch, including channel widening, desilting, and minor section improvement, to ensure uniform hydraulic performance and efficient conveyance of stormwater.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–760 to CB–761	2.08	6.0	Adequate
CB–761 to CB–762	1.43	13.0	Adequate
CB–762 to CB–763	2.34	14.9	Adequate
CB–763 to CB–764	1.32	6.0	Adequate
CB–764 to O–401	0.47	120.2	Inadequate

Nala–2A5

Nala–2A5 extends for approximately 1,400 m, originating near Nannuvacuad Road (CB–420) and terminating at the catch basin near Marine Aquarium, TK Road (CB–632). The nala traverses a mixed urban corridor comprising roadside stretches, commercial frontages, and semi-natural channel sections. The channel is generally well-defined with moderate vegetation growth, stable side slopes, and no major structural obstructions. Localized vegetation encroachment and minor debris deposition are visible at certain locations, but these do not significantly impede flow.

Hydraulic analysis confirms that the entire reach of Nala–2A5 is adequate, with Flow/Capacity values consistently well below 100%. Velocities remain within a stable range (approximately 1.75–2.58 m/s), ensuring efficient conveyance without risks of excessive erosion or sediment deposition. The channel demonstrates uniform hydraulic performance throughout its length, indicating that the existing cross-sectional capacity is sufficient to handle the system design discharge. No critical bottlenecks or backwater effects are observed along this stretch.

Overall, Nala–2A5 is functioning efficiently and does not require major structural interventions. However, routine maintenance, including periodic desilting and vegetation clearance, is recommended to sustain its performance and prevent future capacity reduction.





Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–420 to CB–419	2.25	4.3	Adequate
CB–419 to CB–418	1.98	2.9	Adequate
CB–418 to CB–417	2.53	5.9	Adequate

CB–417 to CB–416	1.80	12.3	Adequate
CB–416 to CB–415	2.54	6.3	Adequate
CB–415 to CB–414	2.55	7.4	Adequate
CB–414 to CB–413	2.58	10.4	Adequate
CB–413 to CB–412	2.06	9.1	Adequate
CB–412 to CB–411	2.20	33.8	Adequate
CB–411 to CB–410	2.16	29.6	Adequate
CB–410 to CB–409	1.75	27.2	Adequate
CB–409 to CB–408	2.42	31.3	Adequate
CB–408 to CB–511	1.75	43.7	Adequate
CB–511 to CB–632	1.96	25.2	Adequate

Nala–2B

Nala–2B extends for approximately 1250 m, originating near Munna's School of Swimming behind Joyalukkas Jewellery (CB–42) and draining towards Bharat Petrol Pump, Kurungattu (CB–385). The nala traverses a mixed urban setting, including roadside sections, semi-lined channels, and stretches with natural vegetation. The channel is generally well-defined and maintains continuous flow without major obstructions. Minor issues such as localized vegetation growth and silt deposition are present but do not significantly affect conveyance.

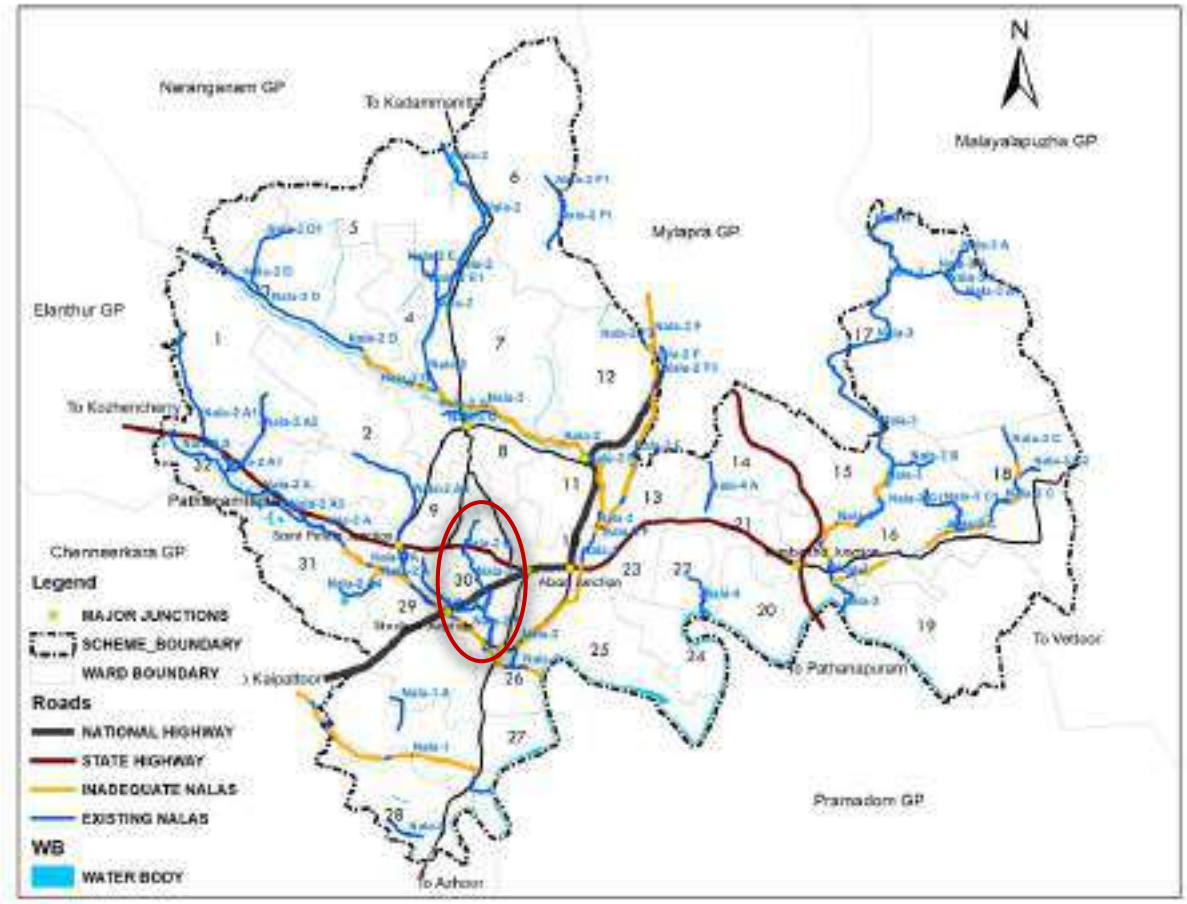
Hydraulic analysis shows that the nala is fully adequate throughout its length, with Flow/Capacity values ranging approximately from 5% to 58%, well within permissible limits. Flow velocities vary between 0.76 m/s and 2.49 m/s, indicating stable hydraulic conditions without risk of excessive erosion or stagnation. The channel exhibits consistent performance with no critical bottlenecks, confirming that the existing cross-section is sufficient to carry the design discharge effectively.

Overall, Nala–2B performs satisfactorily under current conditions and does not require structural augmentation or redesign. However, routine maintenance measures, including periodic desilting, vegetation clearance, and monitoring of encroachments, are recommended to sustain long-term hydraulic efficiency.





Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–42 to CB–398	2.49	8.6	Adequate
CB–398 to CB–397	1.58	18.4	Adequate
CB–397 to CB–396	1.81	13.9	Adequate
CB–396 to CB–395	1.51	33.2	Adequate
CB–395 to CB–394	1.98	5.4	Adequate
CB–394 to CB–393	1.67	11.8	Adequate
CB–393 to CB–392	1.71	33.9	Adequate
CB–392 to CB–391	1.06	49.2	Adequate
CB–391 to CB–390	2.17	35.8	Adequate
CB–390 to CB–389	0.76	11.4	Adequate
CB–389 to CB–388	1.14	5.9	Adequate
CB–388 to CB–387	0.86	57.9	Adequate
CB–387 to CB–386	2.30	13.1	Adequate
CB–386 to CB–819	1.13	45.0	Adequate



Nala–2B1

Nala–2B1 extends for approximately 800 m, originating near Maruti Service (Popular Vehicles & Services Ltd, Gurumandiram, CB–512) and draining towards Municipal Library, Pathanamthitta (O–412). The channel is generally well-maintained, which do not significantly obstruct flow.

Hydraulic analysis confirms that the entire reach is adequate, with Flow/Capacity values consistently low, ranging from 1.2% to 28.9%. Flow velocities vary between 0.52 m/s and 1.48 m/s, indicating stable flow conditions without risk of erosion or stagnation. The channel demonstrates uniform hydraulic performance, and no critical sections or flow restrictions are identified along its length.

Overall, Nala–2B1 is functioning efficiently and does not require any structural improvements or capacity augmentation. Routine maintenance measures such as periodic desilting, vegetation clearance, and inspection of local obstructions are recommended to ensure continued performance.

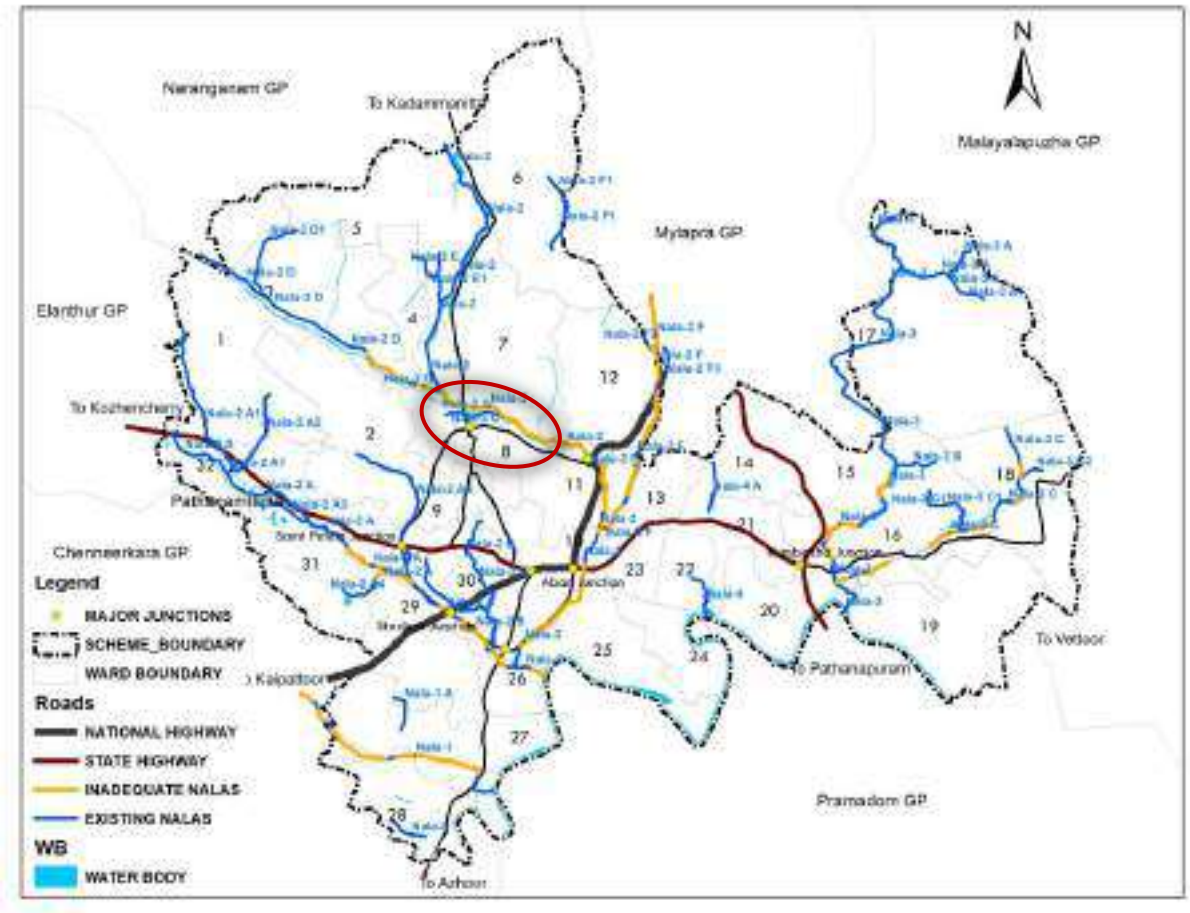
Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–512 to CB–407	0.62	6.6	Adequate
CB–407 to CB–406	1.15	1.2	Adequate
CB–406 to CB–405	0.56	12.8	Adequate
CB–405 to CB–404	0.70	10.7	Adequate
CB–404 to CB–403	1.07	3.1	Adequate
CB–403 to CB–402	0.92	28.9	Adequate
CB–402 to CB–401	1.48	1.7	Adequate
CB–401 to O–412	0.52	3.1	Adequate

Nala–2C

Nala–2C extends for approximately 500 m, originating near Karimbanakkal Devi Temple (CB–751) along Pathanamthitta–Melevettipuram Road and discharging at the outfall near Vettipuram (O–398). The channel primarily consists of a natural stream with relatively stable cross-sections. The nala is free-flowing with minimal obstruction, though minor vegetation growth is present along the banks. The bed and side slopes appear stable, and no major encroachments or structural deficiencies are evident.

Hydraulic analysis shows that the entire reach is well within capacity, with Flow/Capacity values ranging from 0.2% to 6.3%, indicating significant available carrying capacity. Flow velocities vary between 0.51 m/s and 0.89 m/s, which are within acceptable limits for stable channel flow without erosion or sediment deposition concerns.

Overall, Nala–2C is hydraulically adequate throughout its length, and no improvement or augmentation measures are required. Routine maintenance such as vegetation trimming and periodic desilting is recommended to sustain performance.



Chainage (From–To	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–751 to CB–752	0.89	0.5	Adequate
CB–752 to CB–753	0.76	0.2	Adequate
CB–753 to CB–754	0.77	6.3	Adequate
CB–754 to CB–755	0.89	5.5	Adequate
CB–755 to O–398	0.51	2.3	Adequate

Nala–2D

Nala–2D extends for approximately 2270 m, originating from Pariyaram–Veettippuram Road near Dilp School, Pattanthara (CB–580) and terminating near CB–121 (Ultra Tech Cement Godown reach). The nala traverses a mix of residential, semi-urban, and vegetated areas, with both natural and partially modified sections.

The upstream reaches are relatively stable, while downstream stretches exhibit vegetation overgrowth, localized constrictions, and reduced effective channel width, contributing to flow inefficiencies. Certain segments also show signs of silt deposition and minor encroachments, affecting hydraulic performance.

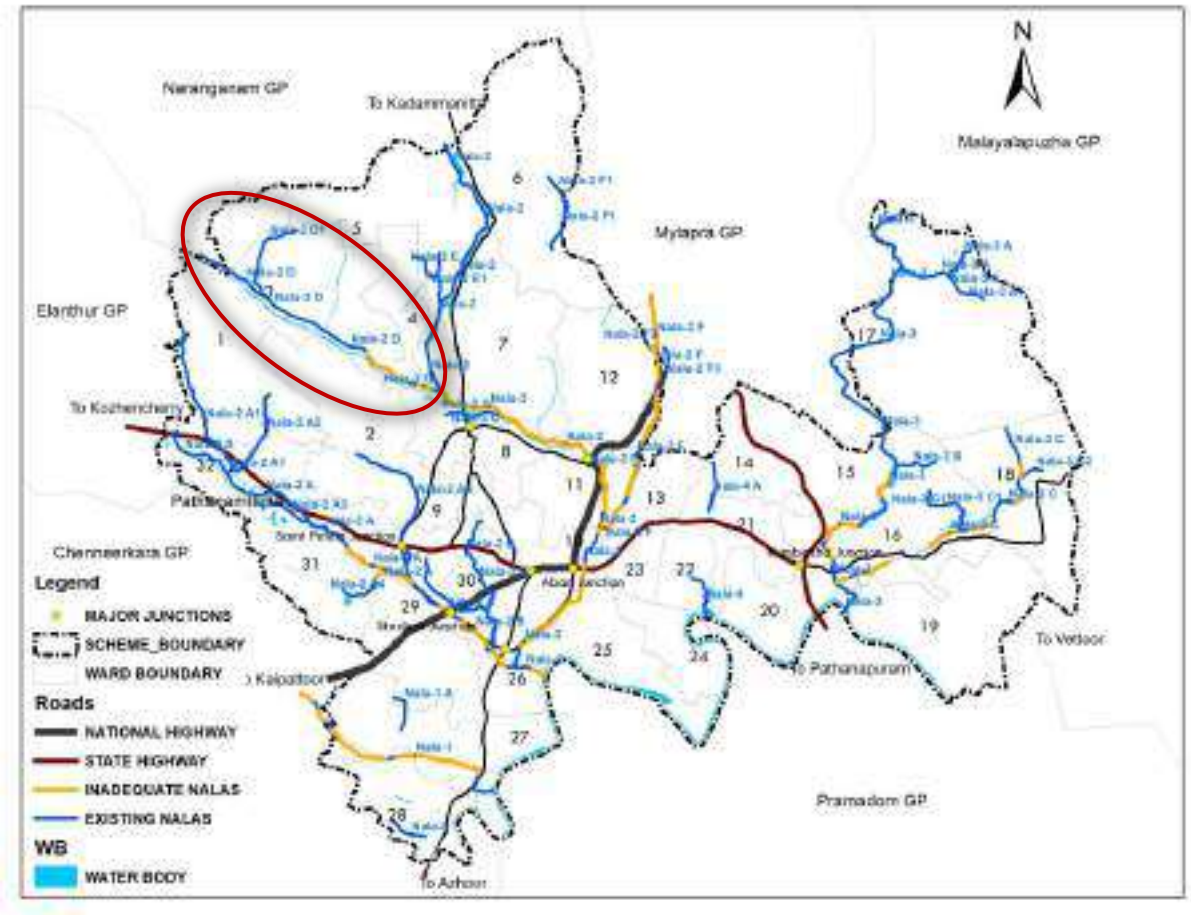
The hydraulic analysis indicates a clear transition from adequate to inadequate performance along the nala. In the upstream to mid reaches, between CB–580 and CB–557, the Flow/Capacity ratios remain within acceptable limits (below 100%), suggesting that these

sections are functioning efficiently under existing conditions. However, a critical deterioration is observed in the downstream reach from CB–556 to CB–121, where several segments significantly exceed their carrying capacity, with Flow/Capacity ratios ranging from 125% to over 1300%. This substantial exceedance highlights severe hydraulic insufficiency, rendering these sections incapable of conveying peak discharge and resulting in backwater effects and an increased risk of flooding. Additionally, flow velocities vary considerably between 0.84 m/s and 3.82 m/s, reflecting inconsistencies in channel geometry and slope along the stretch.





Chainage (From–To	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–580 to CB–581	1.44	0.1	Adequate
CB–581 to CB–582	2.11	97.7	Adequate
CB–582 to CB–571	0.87	44.5	Adequate
CB–571 to CB–109	3.15	16.5	Adequate
CB–109 to CB–569	2.40	72.9	Adequate
CB–569 to CB–567	2.22	93.0	Adequate
CB–567 to CB–129	0.84	90.5	Adequate
CB–129 to CB–723	3.20	15.2	Adequate
CB–723 to CB–564	2.27	35.2	Adequate
CB–564 to CB–563	0.85	74.4	Adequate
CB–563 to CB–562	2.15	32.1	Adequate
CB–562 to CB–561	1.11	22.7	Adequate
CB–561 to CB–560	2.30	33.7	Adequate
CB–560 to CB–559	1.41	83.8	Adequate
CB–559 to CB–558	1.56	47.5	Adequate
CB–558 to CB–557	1.69	75.2	Adequate
CB–556 to CB–555	1.12	125.8	Inadequate
CB–555 to CB–554	1.84	143.9	Inadequate
CB–554 to CB–553	2.12	206.2	Inadequate
CB–553 to CB–552	2.19	272.9	Inadequate
CB–552 to CB–139	1.07	19.5	Adequate
CB–139 to CB–469	3.82	1349.2	Inadequate
CB–469 to CB–121	0.96	51.8	Adequate



Nala–2D1

Nala–2D1 extends for approximately 750 m, starting from coordinates (CB–661) and terminating near Pariyaram–Veettippuram Road (CB–129). The nala predominantly follows a natural stream alignment, passing through vegetated and low-density residential areas.

The channel is well-defined, free-flowing, and largely unobstructed, with stable bed and side slopes. Minor vegetation is present along the banks, but it does not significantly impede flow. No major encroachments or structural constraints were observed along the stretch.

The hydraulic analysis confirms that the entire reach of the nala is performing well within its capacity, with Flow/Capacity ratios remaining very low—generally below 15%, except for the final stretch where it reaches 51.8%—indicating significant available carrying capacity throughout. Flow velocities range from 0.36 m/s to 2.88 m/s, which are within acceptable limits for natural channels without causing erosion or sedimentation issues.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–661 to CB–577	0.62	0.0	Adequate
CB–577 to CB–818	1.82	0.6	Adequate
CB–818 to CB–575	2.88	0.3	Adequate
CB–575 to CB–574	2.80	0.4	Adequate
CB–574 to CB–573	1.49	1.5	Adequate

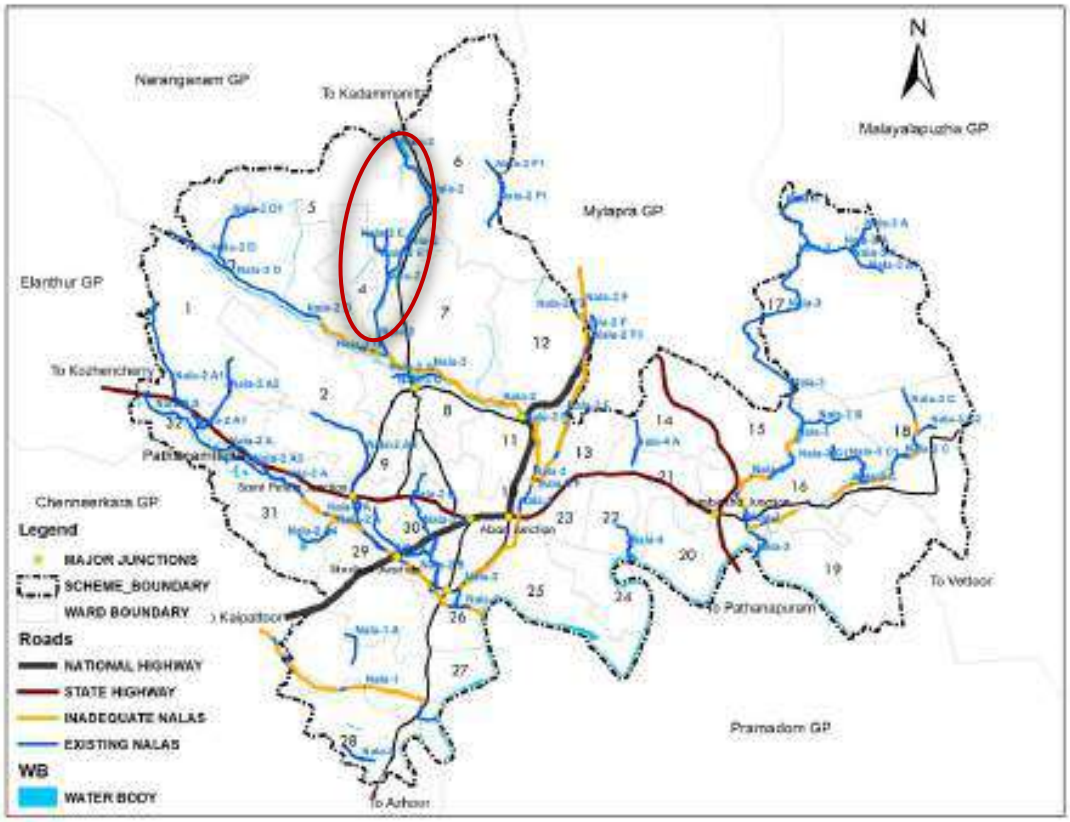
CB–573 to CB–570	2.15	1.5	Adequate
CB–570 to CB–568	0.53	12.8	Adequate
CB–568 to CB–129	0.36	51.8	Adequate

Nala–2E

Nala–2E extends for approximately 450 m, originating from (CB–726) and terminating near AG Church, Mundukottackal (CB–340). The nala flows through a semi-urban residential setting, functioning as a natural drainage channel. The channel is well-maintained, free-flowing, and largely unobstructed. Vegetation growth is present but does not significantly hinder flow, and no major encroachments or structural bottlenecks were observed along the stretch.

Hydraulic analysis confirms that the entire reach operates well within its design capacity, with Flow/Capacity values ranging from 0.2% to 13.1%, indicating substantial available capacity. Flow velocities range between 1.26 m/s and 2.51 m/s, which are within acceptable limits for natural channels, ensuring stable flow conditions without erosion or sedimentation concerns.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–726 to CB–725	2.51	0.2	Adequate
CB–725 to CB–729	2.09	0.3	Adequate
CB–729 to CB–728	1.26	5.5	Adequate
CB–728 to CB–727	1.83	13.1	Adequate
CB–727 to CB–340	1.76	0.7	Adequate



Nala–2E1

Nala–2E1 extends for approximately 320 m, starting from CB–746 and terminating at the outfall (O–397). The nala traverses a semi-urban residential area, functioning as a natural drainage channel with relatively stable geometry. The channel is continuous, unobstructed, and hydraulically efficient, with no major encroachments or structural deficiencies. Minor vegetation growth is present along the banks but does not significantly impacts flow.

Hydraulic analysis confirms that the entire reach is operating well within capacity, with Flow/Capacity values ranging between 0.1% and 24.8%, indicating very low utilization and substantial spare capacity. Flow velocities vary from 1.28 m/s to 2.25 m/s, which are within acceptable limits for stable channel conditions.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–746 to CB–747	1.49	0.1	Adequate
CB–747 to CB–748	1.28	0.1	Adequate
CB–748 to CB–749	1.40	2.0	Adequate
CB–749 to O–397	2.25	24.8	Adequate

Nala–2F

Nala–2F is a major drainage channel extending approximately 2100 meters, originating near Mylapra Durga Devi Temple (CB–495) and terminating at Pathanamthitta Private Bus Stand (CB–368). The nala traverses a mix of semi-urban and peri-urban landscapes, carrying runoff from residential, commercial, and low-lying areas.

The channel is predominantly an irregular natural stream, with sections of earthen banks and localized stone pitching. Dense vegetation growth, silt deposition, and encroachments in several stretches, which restrict the effective flow width and reduce hydraulic efficiency.

Hydraulic analysis reveals that the nala is largely inadequate throughout its length, with most segments exhibiting flow exceeding the designed capacity. Only a few isolated reaches perform adequately. The high Flow/Capacity ratios (often well above 100%) indicate significant risk of overflow and localized flooding, especially during peak rainfall events.

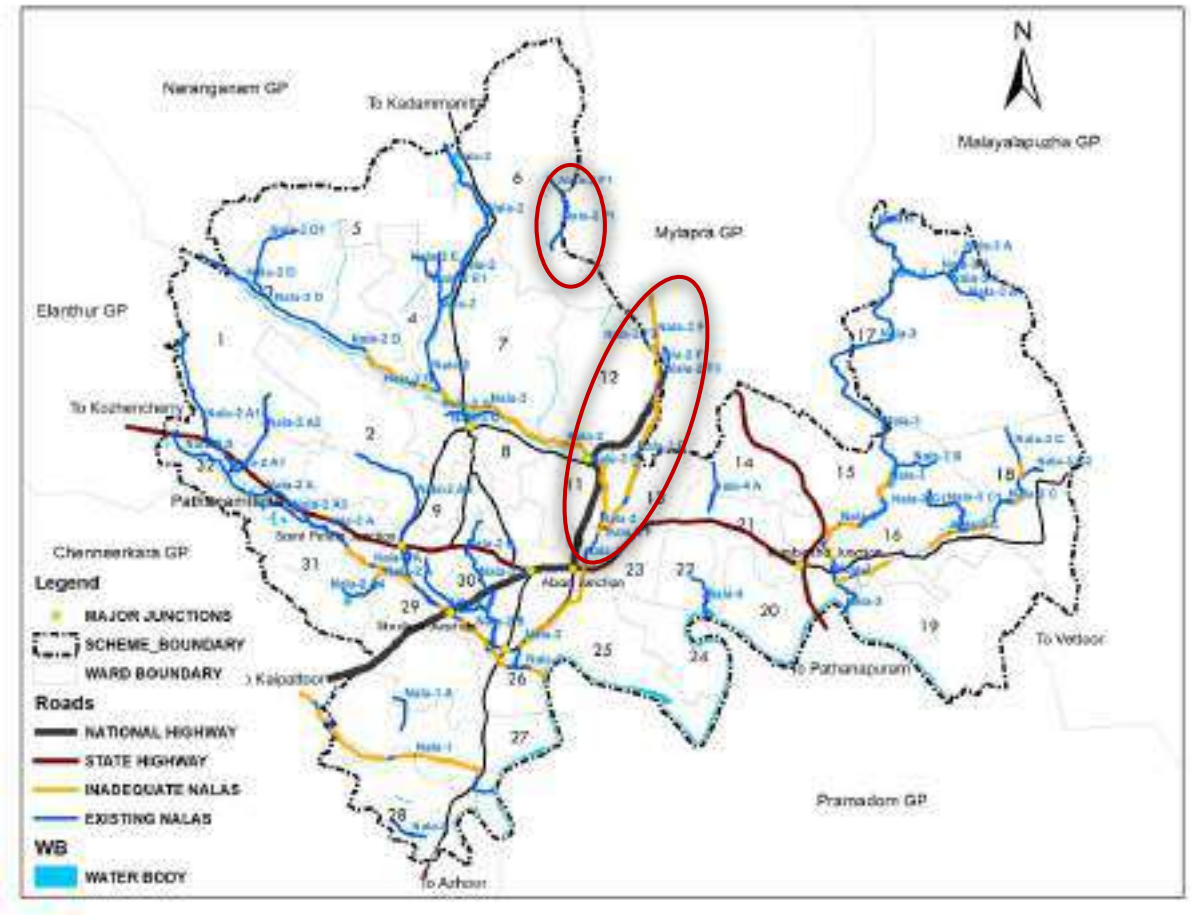








Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–495 to CB–496	2.39	284.3	Inadequate
CB–496 to CB–497	1.53	174.4	Inadequate
CB–497 to CB–498	2.22	548.6	Inadequate
CB–498 to CB–499	2.88	421.0	Inadequate
CB–499 to CB–490	2.52	375.9	Inadequate
CB–490 to CB–489	2.01	115.2	Inadequate
CB–489 to CB–488	2.01	180.8	Inadequate
CB–488 to CB–487	2.51	63.9	Adequate
CB–487 to CB–486	2.71	241.4	Inadequate
CB–486 to CB–485	1.90	120.8	Inadequate
CB–485 to CB–484	2.08	263.5	Inadequate
CB–484 to CB–483	2.89	266.6	Inadequate
CB–483 to CB–482	2.99	308.7	Inadequate
CB–482 to CB–481	3.61	48.6	Adequate
CB–481 to CB–480	2.91	309.4	Inadequate
CB–480 to CB–479	2.06	144.0	Inadequate
CB–479 to CB–478	4.46	373.6	Inadequate
CB–478 to CB–477	1.78	99.7	Adequate
CB–477 to CB–476	3.22	417.9	Inadequate
CB–476 to CB–475	2.87	380.3	Inadequate
CB–475 to CB–368	2.10	218.7	Inadequate



Nala–2F1

Nala–2F1 is a drainage channel extending approximately 675 meters, originating at CB–793 and discharging at the outfall near St. Basil Franciscan Capuchin Ashram (O–405). The channel is predominantly an irregular natural stream, with relatively stable sections and localized protection works. Field conditions indicate clear flow paths with limited obstruction, contributing to efficient conveyance.

Hydraulic analysis confirms that the entire reach is performing well within capacity, with Flow/Capacity values remaining very low (generally below 5%), indicating substantial available capacity. Flow velocities range from moderate to high (approximately 2.3 m/s to 4.9 m/s), which are within acceptable limits for such channels, though localized bank protection may be beneficial to prevent erosion in higher velocity stretches.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–793 to CB–794	2.89	0.1	Adequate
CB–794 to CB–795	4.14	0.2	Adequate
CB–795 to CB–796	3.26	0.2	Adequate
CB–796 to CB–797	4.86	0.2	Adequate
CB–797 to CB–798	4.53	0.3	Adequate
CB–798 to CB–799	3.26	0.3	Adequate
CB–799 to O–405	2.32	2.1	Adequate

Nala–2F2

Nala–2F2 is a short drainage reach of approximately 200 meters, extending from (CB–494) to near Tag Company Outlet (CB–490). The nala conveys runoff from a localized catchment. The channel is an irregular natural stream, with relatively stable geometry and moderate vegetation growth and minor siltation, but no major obstructions affecting flow continuity.

Hydraulically, the nala performs largely within acceptable limits, although a localized deficiency is observed in the downstream reach.

Chainage (From–To	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–494 to CB–491	0.55	68.4	Adequate
CB–491 to CB–490	0.72	109.5	Inadequate

Nala–2F3

Nala–2F3 is a short drainage channel of approximately 225 meters, extending from Sam's Auditorium & Gardens, Mylapra–Mannapuzha Road (CB–500) to the outfall near Chandanakkala Toddy Shop and Family Restaurant (O–362). The nala drains runoff from a localized catchment area consisting of residential and roadside surfaces.

The channel is an irregular natural stream with relatively stable geometry and minimal structural constraints. Clear flow paths with limited obstruction, contributing to efficient hydraulic performance.

Hydraulic analysis shows that the nala is fully adequate throughout its length, with low Flow/Capacity ratios and stable flow conditions.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–500 to CB–501	1.04	8.1	Adequate
CB–501 to CB–502	1.11	5.9	Adequate
CB–502 to O–362	1.12	2.7	Adequate

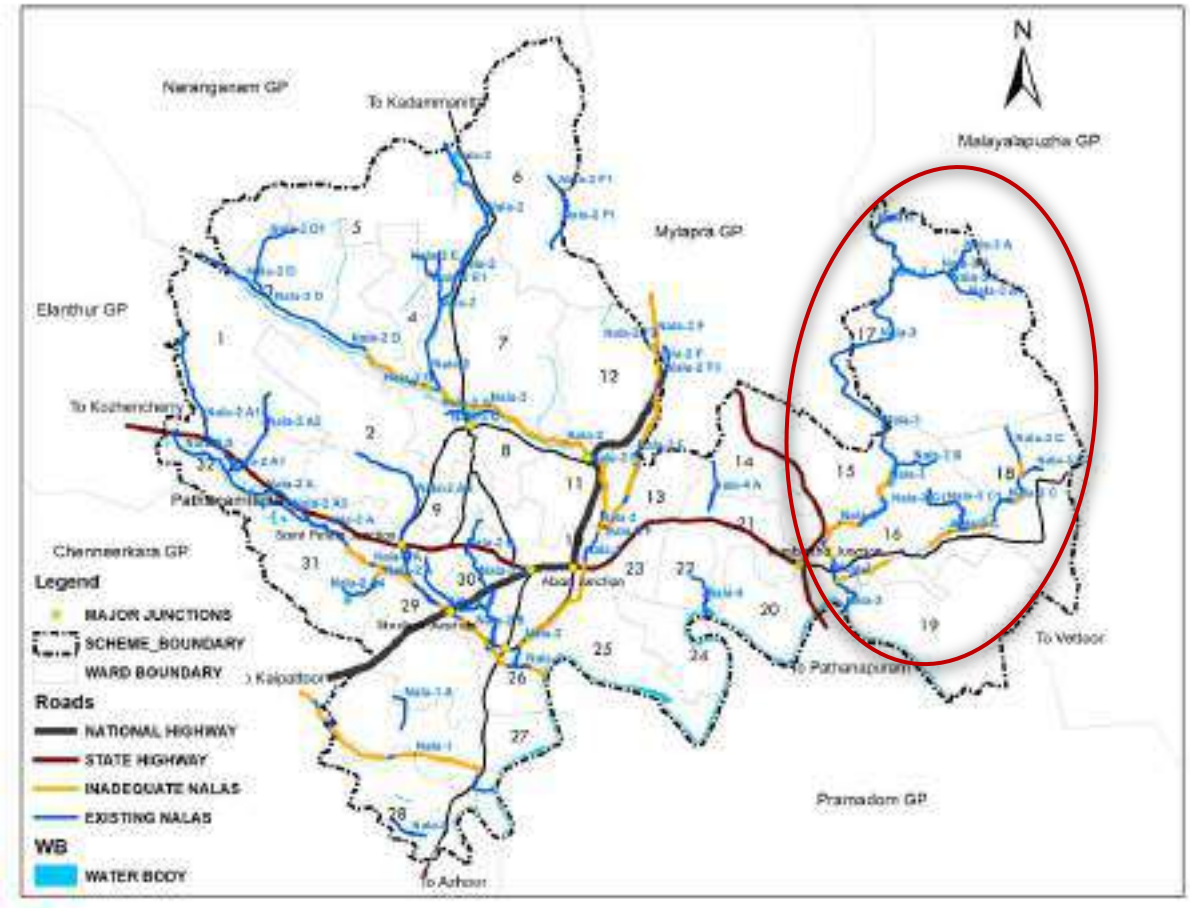
Nala–3

Nala–3 is one of the major primary drainage channels in the study area, extending approximately 4800 meters from CB–278 to its outfall into the Achankovil River at Kumbazha Intake (OF–3). The nala drains a large catchment area. The channel is predominantly an irregular natural stream, with varying cross-sections, stretches of stone pitching, and segments affected by vegetation growth, siltation, and localized encroachments. Upstream reaches generally maintain good flow conditions, while downstream stretches experience reduced hydraulic efficiency.

Hydraulic analysis indicates that the nala is largely adequate in the upstream and mid reaches, but becomes inadequate from around CB–274 to the outfall, where several segments show Flow/Capacity ratios exceeding 100%, indicating insufficient carrying capacity.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–278 to CB–279	4.84	0.8	Adequate
CB–279 to CB–280	2.97	2.8	Adequate
CB–280 to CB–284	2.53	0.6	Adequate
CB–284 to CB–285	0.54	53.3	Adequate
CB–285 to CB–286	3.07	0.8	Adequate
CB–286 to CB–283	4.15	1.6	Adequate
CB–283 to CB–150	4.89	1.1	Adequate
CB–150 to CB–287	2.55	5.5	Adequate
CB–287 to CB–151	6.11	7.3	Adequate
CB–151 to CB–288	5.49	1.1	Adequate
CB–288 to CB–290	3.39	3.1	Adequate
CB–290 to CB–291	5.05	2.7	Adequate
CB–291 to CB–292	4.27	1.2	Adequate
CB–292 to CB–293	3.59	2.1	Adequate
CB–293 to CB–294	4.77	3.2	Adequate
CB–294 to CB–295	2.04	2.3	Adequate
CB–295 to CB–296	0.87	39.6	Adequate
CB–296 to CB–297	5.06	2.2	Adequate
CB–297 to CB–298	5.27	1.6	Adequate
CB–298 to CB–299	4.12	2.4	Adequate
CB–299 to CB–300	5.01	2.6	Adequate
CB–300 to CB–301	2.73	3.6	Adequate
CB–301 to CB–302	4.61	2.0	Adequate
CB–302 to CB–303	5.10	1.8	Adequate
CB–303 to CB–304	2.49	17.6	Adequate
CB–304 to CB–305	3.14	9.7	Adequate
CB–305 to CB–271	1.46	30.0	Adequate
CB–271 to CB–272	1.63	22.5	Adequate
CB–272 to CB–273	1.93	51.5	Adequate
CB–273 to CB–274	2.56	24.0	Adequate
CB–274 to CB–275	1.24	130.8	Inadequate
CB–275 to CB–306	2.24	154.0	Inadequate
CB–306 to CB–307	1.27	54.4	Adequate
CB–307 to CB–269	1.63	40.2	Adequate
CB–269 to CB–270	2.25	14.7	Adequate
CB–270 to CB–308	1.73	31.0	Adequate
CB–308 to CB–309	1.91	313.9	Inadequate
CB–309 to CB–173	4.08	686.3	Inadequate
CB–173 to CB–310	2.66	361.5	Inadequate
CB–310 to CB–311	3.74	351.2	Inadequate
CB–311 to CB–312	2.35	25.0	Adequate
CB–312 to CB–313	3.04	335.6	Inadequate
CB–313 to CB–314	1.52	19.2	Adequate
CB–314 to CB–315	1.46	23.4	Adequate
CB–315 to CB–316	4.88	30.5	Adequate
CB–316 to CB–277	3.84	17.3	Adequate
CB–277 to CB–276	1.16	45.9	Adequate

CB–276 to OF–3	3.87	16.5	Adequate



Nala–3A

Nala–3A is a secondary drainage channel extending approximately 700 meters, originating at CB–786 and terminating near Kuzhikkal Road (CB–150). The nala drains runoff from a moderate catchment. The channel is predominantly an irregular natural stream, with stable bed and bank conditions. Clear flow paths with minimal obstruction, contributing to efficient hydraulic conveyance.

Hydraulic analysis confirms that the nala is fully adequate throughout its length, with very low utilization of capacity and stable flow conditions.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–786 to CB–785	2.49	0.5	Adequate
CB–785 to CB–784	3.49	0.4	Adequate
CB–784 to CB–783	2.90	0.4	Adequate
CB–783 to CB–782	2.66	3.6	Adequate
CB–782 to CB–781	3.40	8.2	Adequate
CB–781 to CB–780	2.74	1.3	Adequate
CB–780 to CB–150	3.71	1.9	Adequate

Nala–3A1

Nala–3A1 extends for approximately 370 m, originating from Pulikkottappara Road (CB–789) and terminating near Kuzhikkal Road (CB–783). The nala serves a localized catchment area and is characterized as an irregular natural stream with relatively stable bed and bank conditions. The channel maintains unobstructed flow, with no significant encroachments or constraints affecting its hydraulic performance.

Hydraulic analysis confirms that the nala is fully adequate throughout its length, with very low Flow/Capacity ratios, indicating ample available capacity.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–789 to CB–790	2.13	0.1	Adequate
CB–790 to CB–791	2.28	0.3	Adequate
CB–791 to CB–792	2.21	0.5	Adequate
CB–792 to CB–783	2.12	1.4	Adequate

Nala–3B

Nala–3B is a short drainage channel extending approximately 320 m, originating from Kumbazha–Malayalapuzha Road (CB–808) and discharging at the outfall near Madathilkavu Devi Temple (O–406). The nala drains runoff from a localized catchment, including residential areas. It is characterized as an irregular natural stream with relatively stable geometry and minimal obstructions. The channel maintains clear flow paths and adequate section capacity, contributing to efficient drainage performance.

Hydraulic analysis confirms that the nala is fully adequate throughout its length, with very low utilization of capacity.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–808 to CB–809	2.16	0.0	Adequate
CB–809 to CB–810	2.10	0.0	Adequate
CB–810 to CB–811	2.93	0.1	Adequate
CB–811 to O–406	3.69	0.2	Adequate

Nala–3C

Nala–3C extends for approximately 1,500 m, originating at CB–771 and discharging at the outfall near O–367. The nala functions as an important intermediate drainage channel, conveying runoff from its contributing catchment. The channel is predominantly an irregular natural stream with varying cross-sections, and is subject to localized constraints such as vegetation growth, reduced channel width, and possible encroachments, particularly in the downstream stretches.

Hydraulic assessment indicates that while the upstream reaches perform adequately, the downstream portions from CB–775 onwards exhibit significant capacity deficiencies, necessitating structural and hydraulic improvements.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–771 to CB–772	3.33	7.8	Adequate
CB–772 to CB–773	3.20	13.7	Adequate
CB–773 to CB–774	2.28	1.2	Adequate
CB–774 to CB–775	3.18	1.4	Adequate
CB–775 to CB–815	0.95	175.7	Inadequate
CB–815 to CB–650	2.36	25.3	Adequate
CB–650 to CB–660	3.26	26.0	Adequate
CB–660 to CB–652	0.91	110.0	Inadequate
CB–652 to CB–651	2.76	39.6	Adequate
CB–651 to CB–653	2.64	16.6	Adequate
CB–653 to CB–654	2.76	78.9	Adequate
CB–654 to CB–655	1.45	130.5	Inadequate
CB–655 to CB–656	1.28	122.2	Inadequate
CB–656 to CB–657	2.84	51.3	Adequate
CB–657 to CB–658	1.34	176.2	Inadequate
CB–658 to CB–659	1.54	206.2	Inadequate
CB–659 to O–367	1.65	114.0	Inadequate

Nala–3C1

Nala–3C1 extends for approximately 600 meters, beginning at CB–801 and discharging at the outfall (O–409). This nala functions as a feeder channel within the Nala–3 system, draining localized runoff from residential catchments. The channel is characterized as an irregular natural stream, generally maintaining stable flow conditions with no significant obstructions observed along the stretch.

Hydraulic analysis confirms that the entire reach operates well within its carrying capacity, with very low Flow/Capacity ratios, indicating substantial available capacity.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–801 to CB–802	0.45	0.0	Adequate
CB–802 to CB–803	0.20	0.1	Adequate
CB–803 to CB–804	0.23	1.2	Adequate
CB–804 to CB–805	1.73	0.2	Adequate
CB–805 to CB–806	2.52	0.1	Adequate
CB–806 to CB–807	1.56	0.5	Adequate
CB–807 to O–409	2.08	0.1	Adequate

Nala–3C2

Nala–3C2 extends for approximately 200 m, originating at CB–813 near Bethel Marthoma Church, Kumbazha, and discharging at the outfall (O–410). The nala functions as a short terminal drainage reach, efficiently conveying runoff from a localized catchment to the outfall with stable flow conditions.

The channel is an irregular natural stream, with relatively stable geometry and no significant constrictions observed along its length.

Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–813 to CB–814	1.55	0.0	Adequate
CB–814 to O–410	1.26	0.1	Adequate

Nala–3D

Nala–3D extends for approximately 450 meters, starting from CB–745 and terminating at the outfall (O–396). This nala serves as a local drainage carrier but is significantly constrained in its present condition. The channel is an irregular natural stream with limited cross-sectional capacity, and several stretches show signs of restricted flow due to narrow sections and possible obstructions.

Hydraulic analysis clearly indicates that most portions of the nala are inadequate, with Flow/Capacity ratios far exceeding 100%, confirming that the channel is unable to safely convey the design discharge.

Chainage (From–To) / CB No	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–745 to CB–744	1.65	185.3	**Inadequate**
CB–744 to CB–743	1.76	288.7	**Inadequate**
CB–743 to CB–742	2.07	310.6	**Inadequate**
CB–742 to CB–741	1.02	14.4	Adequate
CB–741 to O–396	3.33	422.4	**Inadequate**

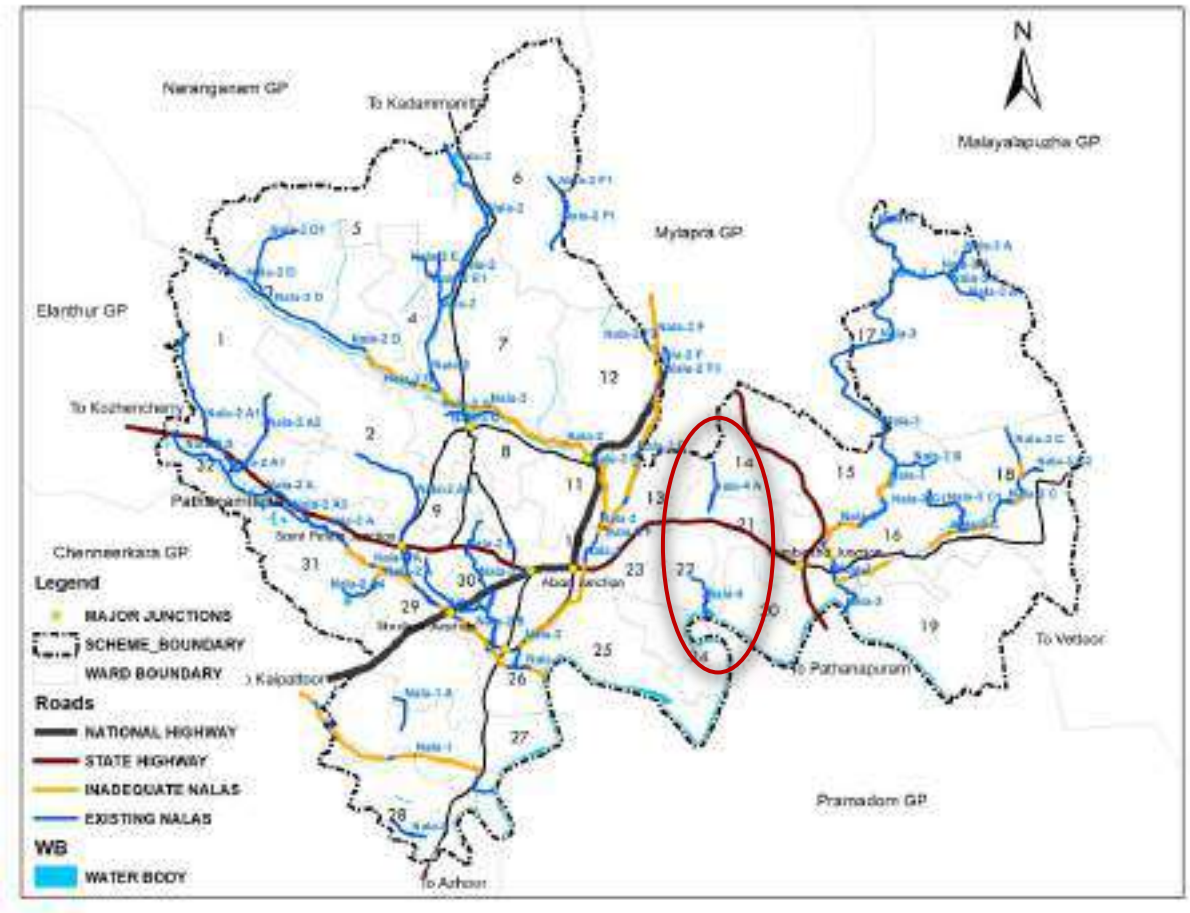
Nala–4

Nala–4 extends for approximately 460 meters, originating at CB–735 near Chutipara Road and discharging into the Achankovil River outfall (OF–4). The nala serves as an important terminal drainage link, conveying stormwater efficiently to the river system.

The channel is an irregular natural stream, generally maintaining adequate cross-section and continuity along its entire length. No major constrictions or flow obstructions are observed.

Hydraulic evaluation indicates that the nala performs well within its design capacity, with very low utilization levels.

Chainage (From–To) / CB No	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–735 to CB–736	1.44	0.1	Adequate
CB–736 to CB–737	1.27	0.0	Adequate
CB–737 to CB–740	1.65	47.1	Adequate
CB–740 to CB–738	2.22	6.9	Adequate
CB–738 to OF–4	2.59	7.8	Adequate



Nala–4A

Nala–4A extends for approximately 400 meters, originating at CB–730 and discharging at the outfall (O–394). The nala functions as a local drainage conduit, efficiently conveying runoff from a residential catchment to the outfall. The channel is an irregular natural stream, with stable geometry and no significant obstructions observed along its course.

Hydraulic analysis indicates that the nala performs well within its capacity limits, with very low utilization levels throughout.

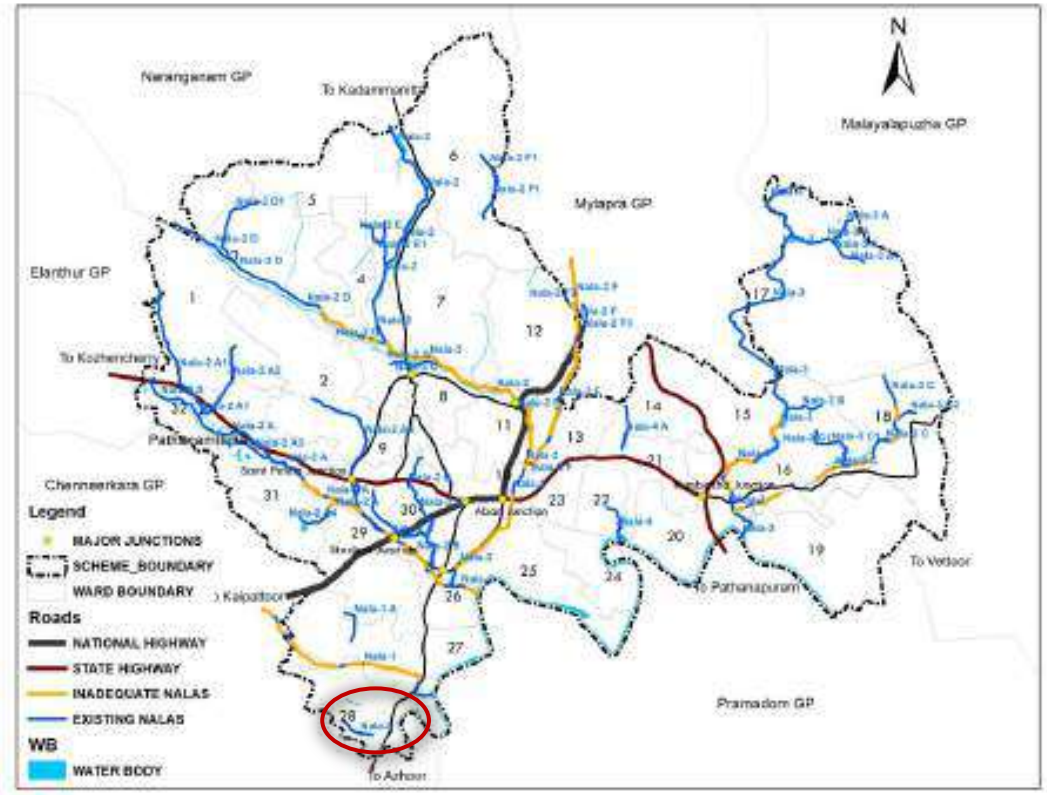
Chainage (From–To)	Velocity (m/s)	Flow / Capacity (%)	Hydraulic Status
CB–730 to CB–731	0.33	1.4	Adequate
CB–731 to CB–732	0.81	0.5	Adequate
CB–732 to CB–733	0.39	0.2	Adequate
CB–733 to O–394	1.19	1.1	Adequate

Nala–5

Nala–5 originates near (CB–765) and extends for approximately 550 meters before discharging into the Achankovil River (OF–5). It functions as an important terminal drainage channel, conveying stormwater from surrounding residential and semi-urban catchments to the river system.

The nala is predominantly an irregular natural channel with a relatively stable cross-section. It has a bottom width ranging from 0.5 to 1.0 meters, a top width of about 3 to 4 meters, and an average depth of approximately 1.2 meters. These physical characteristics support effective flow conveyance along the entire stretch.

Hydraulic assessment indicates that the existing carrying capacity of the nala is adequate when compared with the design (rational) discharge. The channel geometry facilitates smooth flow without significant risk of overtopping, and no major bottlenecks or constrictions are observed. Overall, the nala performs efficiently under current conditions and does not require structural modifications.



ANNEXURE 19.1
DETAILS OF SCHOOLS IN TOWN

Sl. No.	Name of School	Location	Govt./ Private	CBSE/ICSE/ISC/ State	Mixed / Boys/ Girls	Medium (English/ Malayalam/ both)	No. of students	No. of Teachers	No. of Non-teaching staff.	Area in possession of the institution (Hect.)
1	Catholicate HSS	college Jn.	Private	State	Mixed	English	755	28	3	0.1619
2	Govt.HSS	Thycavu	Govt.	State	Mixed	English	110	18	5	0.0608
3	Govt. Boys HSS	Thycavu	Govt.	State	Mixed	English	357	17	2	0.1114
4	Govt. VHSS	Thycavu	Govt.	State	Mixed	English	95	11	1	0.0764
5	Seventh Day Adventist(SDA) HSS Pathanamthitta	Azhoor road	Private	ICSE	Mixed	English	145	12	5	0.0325
6	Marthoma HSS	TB road	Private	State	Mixed	English	354	16	2	0.0334
7	Amritha Vidhyalayam, Pathanamtita	Valanchuzhy road	Private	CBSE	Mixed	English	1350	51	3	0.8189
8	MaryMatha Senior Secondary School	Azhoor	Private	CBSE	Mixed	English	914	52	5	0.97
9	Catholicate HS	college Jn.	Private	State	Mixed	English	296	16	4	0.2105
10	Seventh Day Adventist(SDA) HS Pathanamthitta	Azhoor road	Private	ICSE	Mixed	English	394	18	3	0.0316
11	Marthoma HS	TB road	Private	State	Mixed	Both	1214	36	5	0.2786

12	St. Mary's HS	Vettipru m	Private	Stat e	Mixed	Both	249	14	4	0.0325
13	Holly Angels Model school, Pathanamth itta	Thazheve ttiprum,	Private	CBS E	Mixed	Both	950	44	8	0.0427
14	Bhavans Vidhlya Mandir, Ring road, Pathanamth itta	Ring road	Private	CBS E	Mixed	Both	145	11	3	0.0928
15	Evershine English Medium School Pathanamth itta	Makkamk unnu	Private	ICSE	Mixed	Both	250	15	4	0.0306
16	Catholicate UPS Pathanamth itta	college Jn.	Private	Stat e	Mixed	Englis h	110	18	5	0.1633
17	Seventh Day Adventist(S DA) UPS Pathanamth itta	Azhoor road	Private	ICSE	Mixed	Englis h	260	10	2	0.0300
18	Al Aman school,UPS Pathanamth itta	Pathana mthitta near Juma masjid Road	Private	CBS E	Mixed	Englis h	215	15	6	0.0292
19	Seventh Day Adventist(S DA) LPS Pathanamth itta	Azhoor road	Private	ICSE	Mixed	Englis h	182	8	1	0.0339
20	St.Gregorio us EMLPS, Pathanamth itta	TK road	Private	CBS E	Mixed	Englis h	77	7	2	0.0264
21	Seventh Day Adventist Pre-Primary (SDA) Pathanamth itta	Azhoor road	Private	ICSE	Mixed	Englis h	104	5	1	0.0246

ANNEXURE 19.2
OTHER EDUCATIONAL INSTITUTES IN TOWN

Sl. No.	Name and address	Location	Govt/ Private	Courses / Trades of study	No. of students	No. of teachers	No. of Non-teaching staff.	Area in possession of the Institution (Hect.)	Area in posses of the Institut (Hect.)
1	CAD Point	Near KSRTC	Private	Autocad	20	1	0	430	0.004
2	G-Tech	Near KSRTC	Private	Accounting, Maltimedia, Autocad Software	50	4	0	1400	0.013
3	Institute of Craft and design	Near KSRTC	Private	Fashion designing and beautitian course	20	2	0	700	0.007
4	Emirates academy	Near KSRTC	Private	DHA, HAAD Prometry	5	1	1	400	0.004
5	MGM CAT Centre	Near KSRTC	Private	Acoounting with Tally, MS Office, Spoken English	150	4	2	987	0.009
6	Alex Private ITI	Market road	Private	MMV, D/CIVIL	71	8	1	1100	0.010
7	Air-ON Academy	Aban Jn.	Private	Btech Trainig	5	1	0	1000	0.009
8	Travan corb School	College road	Private	kab tech imaging Tech	8	2		600	0.006
9	Synergy school	T Kroad	Private	TALLY,MS OFFICE,PROJECT MANAGEMENT INSTITUTION,PPM,SAP	20	2	3	400	0.004
10	Cadd centre	Hospital road	private	CAD,CAM, CAE	70	6	4	1000	0.009

11	MCM institution	TK road	private	Animation multi media general course	25	4	1	700	0.007
12	Anjali college	old private bus stand	private	NIOS Secondary 10 th,senior secondary	15	5	0	1000	0.009
13	Learning centre	Near KSRTC	private	MBA,MCA, M COM,MA,B BA,BAMSN	10	1	1	400	0.004
14	TUV Rheinland NIFE	Near KSRTC	Private	LIFT TECHNOL OGY,FIRE AND SAFTY,OPT ICAL FIBRE	100	4	7	200	0.002
15	BEMAX Academy	Near KSRTC	Private	Primary Lab Tech Coaching IELTS Nursing	50	4	1	900	0.008
16	Engineering Training centre	Kadam anitta cross road	Private	Technical course civil,Mech, Ele	45	5	5	1800	0.017
17	International Institute of Information Technology	Near bus stand	Private	computer course	15	4	1	750	0.007
18	Catholicate Institute of Computer and Multimedia Studies	College junctio n	Govt/ universityAff ilated	Accountin g,IT,bankin g,media course	80	3	6	1200	0.011
19	Coaching centre for Minority youth	Govt HS School road	Govt	PSC Coaching	100	15	5	650	0.006
20	Brilliance college	Ring road	private	PSC Coaching	250	15	4	1500	0.014

ANNEXURE 20.1
DETAILS OF ALLOPATHIC HOSPITALS

PART 1

Sl. No	Name of Hospital	No. of Doctors													No.of Beds
		General	Gynaeccology	Paediatrics	Orthopaedics	Cardiology	ENT	Opthalmology	Gastro	Urology	Psychiatric	Dental	Cancer	Others	
1	G H Pathanamthitta	3	3	2	3	0	2	2	0	0	1	2	0	24	414
2	St.Luke Hospital Pathanamthitta	0	2	2	1	0	0	0	0	0	0	0	0	1	18
3	People's Clinic	3	3	1	1	0	1	1	1	0	0	0	0	1	40
4	Good Samaritan Hospital	1	0	0	0	0	0	0	0	0	0	0	0	0	10
5	Geo Medical Trust Hospital	1	0	0	1	0	0	0	0	0	0	0	0	1	25
6	MGM Muthoot Medical Centre	12	3	4	2	1	1	2	1	1	1	1	0	6	170
7	Christian Mission Hospital	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	Sabitha Eye Care Hospital	0	0	0	0	0	0	3	0	0	0	0	0	0	10
9	Ahalya Foundation Eye Hospital	0	0	0	0	0	0	3	0	0	0	0	0	0	5
10	IG Dental Clinic	0	0	0	0	0	0	0	0	0	0	1	0	0	0
11	Tharayakattu Skin Clinic	0	0	0	0	0	0	0	0	0	0	0	0	1	0
12	Smile Dental Clinic	0	0	0	0	0	0	0	0	0	0	3	0	0	0
13	Dr Rajesh Speciality Dental Clinic	0	0	0	0	0	0	0	0	0	0	1	0	0	0
14	Cosmetic Dental Care	0	0	0	0	0	0	0	0	0	0	1	0	0	0
15	Dental Care Home	0	0	0	0	0	0	0	0	0	0	2	0	0	0
16	Kolabhagathu Dental&Orthodontic Speciality Centre	0	0	0	0	0	0	0	0	0	0	2	0	0	0
17	Modern Dental Speciality Centre	0	0	0	0	0	0	0	0	0	0	2	0	0	0
18	Dental Clinic	0	0	0	0	0	0	0	0	0	0	1	0	0	0
19	Kuzhiyil Dental Clinic &Orthodontic Centre	0	0	0	0	0	0	0	0	0	0	1	0	0	0

20	Kulathoor Dental Hospital	0	0	0	0	0	0	0	0	0	0	1	0	0	0
21	Orikottu Cosmetic &Speciality Dental Care	0	0	0	0	0	0	0	0	0	0	2	0	0	0
22	Kripa Dental Hospital	0	0	0	0	0	0	0	0	0	0	1	0	0	0
23	Matha Speciality Dental Clinic	0	0	0	0	0	0	0	0	0	0	1	0	0	0

ANNEXURE 20.1
DETAILS OF ALLOPATHIC HOSPITALS

PART 2

Sl. No	Name of Hospital		Facilities available (Yes-1 ; No-0)																		
		Operation Theatre	ICU / CCU	Ventilator	CT Scanner	MRI Scanner	Ultra Sound scanner	TMT	Eco Test	EEG	ECG	Angiogram	Angioplasty	X-ray	Laser Ray	Blood Bank	Clinical Lab	Pharmacy	Ambulance	ICU Ambulance	Mortury
1	G H Pathanamthitta	1	1	1	1	0	1	0	0	0	1	0	0	1	0	1	1	1	1	0	1
2	St.Luke Hospital Pathanamthitta	1	1	0	0	0	1	0	0	0	1	0	0	0	0	0	1	1	0	0	0
3	People's Clinic	1	0	0	0	0	1	0	0	0	1	0	0	1	0	0	1	1	1	0	0
4	Good Samaritan Hospital	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	0
5	Geo Medical Trust Hospital	1	1	0	0	0	0	0	0	0	0	0	0	1	0	0	1	1	0	0	0
6	MGM Muthoot Medical Centre	1	1	1	1	1	1	1	1	0	1	1	1	1	0	1	1	1	0	1	0
7	Christian Mission Hospital	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1
8	Sabitha Eye Care Hospital	1	0	0	0	0	0	0	0	0	1	0	0	0	1	0	1	1	0	0	0
9	Ahalya Foundation Eye Hospital	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0
10	IG Dental Clinic	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	Tharayakattu Skin	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

	Clinic																				
12	Smile Dental Clinic	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
13	Dr Rajesh Speciality Dental Clinic	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
14	Cosmetic Dental Care	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	Dental Care Home	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
16	KolabhagathDental Speciality Centre	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
17	Modern Dental Speciality Centre	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	Dental Clinic		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	Kuzhiyil Dental Clinic &Orthodontic Centre		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
20	Kulathoor Dental Hospital		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
21	Orikottu Cosmetic &Specialit y Dental Care		0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0
22	Kripa Dental Hospital		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Matha Speciality Dental Clinic		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ANNEXURE 20.2
DETAILS OF AYURVEDIC HOSPITALS

Sl.no	Name & Address	Govt/Pvt/Co-operative/local body	Own/Rent	Location	Hospital/Dispensary/Clinic	No. of Beds	Average daily No. of Out patients	No. of Doctors	No. of Nurses	No. of other technical staff	No. of other staff
1	Aswin Health Care	Pvt	Rent	Aban Tower	Ayurveda Hospital	0	40	2	0	3	1
2	Thankamma stabastan Ayurvedha clinic	pvt	Rent	Hospital Road	Ayurveda clinic	0	30	1	0	3	0
3	Kottackal Arya Vaidhyashala	Pvt	Rent	Behind Masjid	Ayurveda	0	40	1	0	3	1
4	Oushadhi	Pvt	Rent	old bus stand	Ayurveda	0	20	1	0	3	1

ANNEXURE 20.3
DETAILS OF HOMEOPATHIC HOSPITALS

Sl.no	Name & Address	Govt/Pvt/Co-operative/local body	Own/Rent	Location	Hospital/Dispensary/ Clinic	No. of Beds	Average daily No. of Out patients	No. of Doctors	No. of Nurses	No. of other technical staff	No. of other staff
1	Matha (Muhamad)Homoeo clinic	Pvt	Rent	old bus stand	Homeo clinic	0	10	1	0	0	0
2	Bose Homoeo clinic	Pvt	Rent	TK Road	Homeo clinic	0	11	2	0	0	1
3	Betheda Homoeo clinic	Pvt	Rent	Opp: KSRTC bus stand Road	Homeo clinic	0	10	2	0	1	0
4	Modern Homoeo clinic	Pvt	Rent	Opp: KSRTC bus stand Road	Homeo clinic	0	15	1	0	1	0

ANNEXURE 21.1
HOUSING STOCK IN TOWN

Ward No	Ward Name	No of Houses
1	Peringamala	232
2	Anchakkala	280
3	Vanjipoyka	397
4	Vettippuram	322
5	Saradamadom	363
6	Mundukottakkal	187
7	Poovanpara	361
8	Thykkavu	270
9	Pattamkulam	186
10	Pettah South	269
11	Pettah North	258
12	Kairalipuram	312
13	Kulasekharapathi	425
14	Arabic college	330
15	Kumbazha North	390
16	Myladumpara thazhom	321
17	Myladumpara	376
18	Plaveli	320
19	Kumbazha East	229
20	Kumbazha South	470
21	Kumbazha West	300
22	Chuttippara East	219
23	Chuttippara West	157
24	Valanchuzhy	226
25	Kallarakkadavu	222
26	Azhoor West	221
27	Azhoor East	284
28	Kodumthara	340
29	College	209
30	Town ward	349
31	Karimbanakuzhi	212
32	Churulikode	244

ANNEXURE 21.2
AVERAGE DISTANCE TO VARIOUS FACILITIES

PART-1

Ward No	Ward Name	Average distance to										
		Motorable road	Bus stop	Primary School	LP School	UP School	HS School	PO	Health	Hospital	Ration shop	Play Ground
1	Peringamala	0.52	0.5	0.85	0.85	0.88	1.36	0.58	0.9	1.15	0.57	1.06
2	Anchakkala	0.71	0.7	0.67	0.67	0.81	0.83	0.79	0.9	1.1	0.75	1.05
3	Vanjipoyka	0.51	0.7	0.66	0.98	2.3	3.81	1.68	0.8	3.77	0.91	3.73
4	Vettippuram	0.6	0.6	1.02	1.02	1.02	2.03	2	2.0	2.41	0.75	2.71
5	Saradamado	0.76	0.7	1.14	1.25	1.59	2.96	0.96	2.7	3.29	1.36	3.26
6	Mundukottak	0.72	0.9	1.03	1.09	2.48	2.62	1.28	3.0	3.45	1.78	3.17
7	Poovanpara	0.52	0.9	0.89	0.87	0.87	0.99	1.76	2.5	2.63	1.8	2.62
8	Thykkavu	0.55	0.7	0.77	0.77	0.85	1.01	1.16	2.7	1.37	1.02	3.53
9	Pattamkulam	0.61	0.6	0.63	0.63	0.63	0.63	0.78	0.8	0.72	0.69	0.83
10	Pettah South	0.5	0.5	0.5	0.5	0.51	0.51	0.54	0.5	0.54	0.5	0.69
11	Pettah North	0.54	0.5	0.56	0.56	0.56	0.56	0.7	1.1	0.76	0.66	1.16
12	Kairalipuram	0.75	0.8	1.02	0.99	0.99	0.99	1.27	1.2	1.52	0.98	1.33
13	Kulasekharap	0.5	0.5	0.62	0.62	0.9	1.03	1.1	4.6	2.03	0.5	2.3
14	Arabic college	0.54	0.5	0.93	0.91	1.19	1.54	1.11	0.9	1.96	0.71	1.65
15	Kumbazha	0.5	0.8	0.91	0.86	0.85	0.9	0.86	0.8	2.11	0.83	2.14
16	Myladumpara	0.51	1.0	1.35	1.41	1.64	1.93	1.78	1.1	4.89	1.69	4.78
17	Myladumpara	0.52	0.8	1.07	1.08	1.2	2.87	0.98	1.7	4.92	0.95	4.92
18	Plaveli	0.5	1.5	1.82	1.82	1.93	2.2	1.94	2.4	5	1.83	4.37
19	Kumbazha	0.5	1.3	1.08	1.14	1.23	1.43	1.5	1.8	2.73	1.67	3
20	Kumbazha	0.71	0.7	0.91	1	0.99	1.08	0.98	0.9	1.75	1.13	2.4
21	Kumbazha	0.51	0.5	0.89	0.92	0.92	1.54	0.81	0.8	1.19	0.75	2.5
22	Chuttippara	0.51	0.6	0.63	0.75	0.83	0.93	0.83	0.7	1.5	0.51	1.53
23	Chuttippara	0.5	0.5	0.7	0.7	0.86	1.2	0.83	0.8	1.63	0.5	1.73
24	Valanchuzhy	0.51	0.6	0.52	0.58	0.63	0.63	0.75	0.5	0.73	0.57	0.65
25	Kallarakkadav	0.5	0.6	0.51	0.66	0.68	0.68	0.75	0.6	1.03	0.58	0.62
26	Azhoor West	0.51	0.5	0.77	0.77	0.8	0.8	0.93	0.9	0.76	0.66	0.83
27	Azhoor East	0.54	0.6	0.74	0.74	0.74	0.81	1.44	1.7	1.91	1.07	1.41
28	Kodumthara	0.52	0.6	0.92	0.79	0.95	0.99	1.42	1.4	1.45	0.99	1.37
29	College	0.52	0.5	0.64	0.52	0.53	0.53	0.65	0.8	0.73	0.6	0.73
30	Town ward	0.57	0.6	0.82	0.82	0.87	0.86	1.21	0.8	0.8	0.63	1.1
31	Karimbanaku	0.83	1.0	1.3	1.39	1.39	1.56	2.06	2.1	2.15	1.12	2.15
32	Churulikode	0.56	0.9	1.27	1.35	1.43	1.49	1.29	1.4	2.18	1.53	2.46

ANNEXURE 21.2
AVERAGE DISTANCE TO VARIOUS FACILITIES
PART-2

Ward No	Ward Name	Percentage of people saying distance to										
		Motorable road >0.5km	Bus stop >0.5km	Primary School >0.5km	LP School >0.5km	UP School >1km	HS School >3km	PO >3km	Health >5km	Hospital >5km	Ration shop >5km	Play Ground >5km
1	Peringamala	9.68	9.68	74.1	74.1	16.1	6.45	0	0	0	0	0
2	Anchakkala	51.8	51.8	55.5	55.5	14.8	0	0	0	0	0	0
3	Vanjipoyka	3.13	56.2	65.6	96.8	62.5	87.5	6.25	0	0	0	0
4	Vettippuram	14.2	28.5	60.7	60.7	39.2	10.7	17.8	0	0	0	3.57
5	Saradamado	42.8	42.8	85.7	85.7	54.2	51.4	0	5.71	2.86	0	2.86
6	Mundukottakk	31.0	55.1	62.0	62.0	96.5	24.1	0	0	10.3	0	0
7	Poovanpara	2.44	60.9	48.7	46.3	26.8	0	12.2	12.2	0	0	2.44
8	Thykkavu	7.41	51.8	48.1	48.1	22.2	3.7	7.41	37.0	0	0	61.5
9	Pattamkulam	5.56	33.3	50	50	0	0	0	0	0	0	0
1	Pettah South	0	0	0	0	0	0	0	0	0	0	0
1	Pettah North	3.85	7.69	11.5	11.5	3.85	0	0	0	0	0	0
1	Kairalipuram	45.4	72.7	93.9	93.9	30.3	0	0	0	0	0	0
1	Kulasekharap	0	29.4	47.0	47.0	26.4	0	0	82.3	0	0	0
1	Arabic college	14.8	25.9	40.7	74.0	59.2	7.41	0	3.7	0	0	0
1	Kumbazha	0	45.1	54.8	58.0	29.0	0	0	0	0	0	0
1	Myladumpara	2.78	61.1	88.8	88.8	50	25	16.6	0	88.8	2.7	91.6
1	Myladumpara	6.06	63.6	81.8	84.8	39.3	48.4	0	0	96.9	0	96.9
1	Plaveli	0	86.6	93.3	93.3	90	20	6.67	0	100	0	76.6
1	Kumbazha	0	48.4	57.5	63.6	51.5	9.09	3.03	0	15.1	0	18.1
2	Kumbazha	63.3	63.3	73.3	80	40	0	0	0	0	0	0
2	Kumbazha	3.23	3.23	96.7	100	22.5	0	0	0	0	0	0
2	Chuttippara	3.33	33.3	43.3	50	20	0	0	0	0	0	0
2	Chuttippara	0	35	65	65	20	0	0	0	0	0	0
2	Valanchuzhy	3.33	40	6.67	33.3	0	0	0	0	0	0	0
2	Kallarakkadav	0	40	3.33	63.3	0	0	0	0	0	0	0
2	Azhoor West	4.35	4.35	17.3	17.3	13.6	0	0	0	0	0	0
2	Azhoor East	8.33	29.4	41.6	41.6	13.8	0	8.33	0	0	0	0
2	Kodumthara	6.9	20.6	86.2	75.8	20.6	0	6.9	0	0	0	0
2	College	8	8	20	8	0	0	0	0	0	0	0
3	Town ward	21.9	31.7	56.1	56.1	24.3	0	0	0	0	0	0
3	Karimbanakuz	70.9	80.6	90.3	93.5	54.8	3.23	12.9	0	0	0	0
3	Churulikode	12	60	80	84	52	0	0	0	0	0	0

ANNEXURE 21.3
DETAILS OF NAGARS
PART-1

Sl No.	Name of Nagar	Ward No.	Type of Nagar	Ownership of land	Total No Of Houses	Approach Road Type	Internal Road Type	Colletion of Garbages	Drainage of waste water	Street light	Public Water Tap
			SC-1, ST-2, Others-3, Mixed-4	Own-1, Patta-2		Tared-1, Concrete-2, Mud-3	Tared-1, Concrete-2, Mud-3, Step-4, No road-5	Own compound-1, Municipality-2, Others-3	Own compound-1, Municipality-2, Others-3	Yes-1, No-2	Yes-1, No-2
1	Thengapparamuruppu	1	1	1	60	2	2	1	1	1	2
2	Thonikkuzhzhy	1	1	1	18	1	4	1	1	1	2
3	Ooppamala	2	1	1	15	2	2	1	1	1	2
4	Palassery	32	1	1	27	2	2	1	1	1	2
5	Muthumarathil	32	1	1	30	1	4	1	1	1	2
6	Nellikkattil	3	1	1	30	2	2	1	1	1	1
7	Kumbangal	4	1	1	120	1	4	1	1	1	1
8	Melevettiprumlekshamveedu	4	4	1	22	2	2	2	2	1	1
9	Thomacheri	8	1	1	20	2	4	1	1	1	1
10	Vattamuruppel	5		1	50	2	4	1	1	1	2
11	Pottayil	7	1	1	10	2	4	1	1	1	2
12	Kulathur	5	4	1	13	2	4	1	1	1	2
13	Vagakoottathil	7	2	1	8	2	5	1	1	2	2
14	Thazhevettiprum	11	4	1	24	1	2	1	1	1	1
15	Thycavulekshamveedu	11	4	1	17	2	1	1	1	1	1
16	Oonnukal	12	1	1	10	1	2	1	1	1	1

17	Thondiyanikkuzhy	16	1	1	12	2	4	1	1	1	1
18	Panamthoppu	18	1	1	30	2	4	1	1	1	1
19	Panamthoppu	16	1	1	50	2	4	1	1	1	1
20	Pathiyathu	17	1	1	28	2	5	1	1	1	1
21	Paruthyani	18	1	1	6	2	4	1	1	1	1
22	Adhichanoli	19	4	1	25	2	5	1	1	1	1
23	Nethaji	19/20	1	1	40	2	2	1	1	1	1
24	Chanjaplakkal	22	1	1	19	2	2	1	1	1	1
25	Kanjirapara	21	1	1	12	2	2	1	1	1	1
26	Valanchuzhy lekshamveedu	24	4	1	23	1	2	1	1	1	1
27	Mankodu	25	1	1	3	1	5	1	1	2	2
28	Puthiyathu	26	1	1	3	2	2	1	1	1	1
29	Kalathi nilkunnathil	26	4	1	16	1	2	1	1	1	1
30	Koiprum	27	1	1	9	2	2	1	1	2	1
31	Karikulam	29	3	1	18	1	2	1	1	1	1
32	Thottupurathu	4	1	1	18	2	4	1	1	1	1
33	Chutiipara thekkecharivu	23	1	1	20	2	2	1	1	1	1

ANNEXURE 21.3
DETAILS OF NAGARS

PART-2

Sl No.	Name of colony	Public well	Borewell/Hand	Flood affected	Educational facility	Health facility	Public Transport facility	Housing Status in %			Toilet Facility in %			Elecricity		Nearest Mobile tower
		Yes-1, No-2	Yes-1, No-2	Yes-1, No-2	Up to 1 Km-1, 1 to 2-2, 2 to 3-3, Above 3-4	Up to 1 Km-1, 1 to 2-2, 2 to 3-3, Above 3-4	Up to 1 Km-1, 1 to 2-2, 2 to 3-3, Above 3-4	Pucca	Moderate	Katcha	Own	Public	No facility	Yes	No	
1	Thengappara muruppu	1	2	2	4	4	1	80	20		100			60	0	.5 Km
2	Thonikkuzhzhy	2	2	2	3	3	1	25	75		100			18	0	2 km
3	Ooppamala	2	2	2	2	2	1	95	5		100			15	0	3 km
4	Palassery	2	2	2	2	3	1	95		3	95		1	26	1	.5 km
5	Muthumarathil	2	2	2	4	4	1	50	50		85		15	30	0	.5 km
6	Nellikkattil	2	2	2	4	4	1	67	30	3	100			30		2 km
7	Kumbangal	1	2	2	3	4	1	40	54	5	100			120		2 km
8	Melevettiprum lekshamveedu	1	2	2	1	1	1		22		100					0.5 km

9	Thomacheri	2	2	2	1	1	1	80	20		100			20		0.5 km
10	Vattamuruppel	2	2	2	3	3	1	78	20	2	100			50		0.5 km
11	Pottayil	2	1	2	3	3	1	75	25		100			10		1 km
12	Kulathur	2	2	2	4	4	1	63	29	8	77		23	13		2 km
13	Vagakoottathil	1	2	2	2	3	2		100		100			8		.5 km
14	Thazhevettiprum Lekshamveedu	1	2	2	2	2	1	20	80		100			24		1 km
15	Thycavu lekshamveedu	2	2	2	1	1	1	100			100			17		1 km
16	Oonnukal	2	2	2	2	4	1	40	50	10	100			10		.5 km
17	Thondiyanikkuzhy	2	2	2	2	2	1	80	20		100			12		2 km
18	Panamthoppu	2	2	2	2	4	1	80	20		100			50		2 km
19	Panakkal	2	2	2	2	3	1	30	70		100			8		2 km
20	Pathiyathu	1	2	2	1	4	1	20	75	5	100			28		3 km
21	Paruthyani	2	2	2	2	4	4	80	15	5	100			6		0.5 km
22	Adhichanoli	2	2	2	1	4	1	30	70		100			25		2 km
23	Nethaji	2	1	1	1	3	1	50	38	12	100			40		2 km

24	Chanjaplakkal	2	2	2	1	2	2	53	42	5	100			19		1 km
25	Kanjirapara	2	2	2	3	3	1		100		100			12		.2 km
26	Valanchuzhy lekshamveedu	1	2	1	2	2	2	90	10		100			23		2km
27	Mankodu	2	2	2	1	2	1	67		33	100			3		2 km
28	Puthiyathu	2	2	2	1	2	1		100		100			3		2 km
29	Kalathi nilkunnathil	2	1	2	2	2	1	88	12		100			16		2 km
30	Koiprum	2	2	2	1	2	1		100		100			9		1 km
31	Karikulam	2	2	1	1	1	1	22	78		100			18		1 km
32	Thottupurathu	2	2	2	1	2	1	28	72		100			18		1 km
33	Chutiipara thekkecharivu	2	2	2	2	2	1	60	40		100			20		.5 km

ANNEXURE 23.1

RELIGIOUS INSTITUTIONS

Sl.No.	Name	Location	Festivals		
			Name	Date	Average No. of persons attended
A. TEMPLES					
1	Mannaramala Devi Temple	Mannaramala	Pathamudhayam	Medam 10	750
2	Saradamadom Kshethram	Mundukottakkal	Varshika ulsavam		600
3	Erumpanakkal Devi kshethram	Melevettipram	Kumbhabharani	kumbhabharani	1200
4	Orippurathu Mahadevar Kshethram	Orippuram	Shivarathri	Kumbham	600
5	Sree Subhramanya swami Kshethram	Kodumthara	Vishu	Medam	1300
6	Sree Ooramman kovil	Pathanamthitta town	Makam		500
7	Sree Dharmasastha Kshethram	Pathanamthitta town	Uthram Maholsavam	March16-25	1500
8	Sree Mutharamman kovil	Pathanamthitta town	Skanda shashti		650
9	Sree Harihara Mahadhevar Kshethram	Chuttippara	Varshika ulsavam		800
B.CHURCHES					
1	St.Stephens Orthodox church	Makkamkunnu	Convention	January 6-7	2100
2	St.Peters Church	St.Peters Jn.	Perunal		2000
3	St. George Orthodox Church	Ottukal	Perunal		1600
4	St. Marys Orthodox Church	Vettiprum	Perunal	January 14-15	2300
5	St.Johns Church	Kuriylayyam	Perunal		1300
6	St. George Church	Kuriylayyam	Perunal	May 7-8	1600

7	Church of God India	Mundukottakkal	Convention		800
8	Marthoma church	Mundukottakkal	Perunal		1100
9	CSI Church	Poovanpara	Perunal		900
10	Marymatha church	Pathanamthitta	Perunal		1000
11	St. Marys Orthodox Church	Kumbazha Jn.	Perunal	Aug. 30	2500
12	St. Marys Malankara Catholic Church	Kumbazha kizhakkuu	Perunal	May . 05	3300
13	Orthedox Cathetral	Kumbazha kizhakkuu	Perunal	May. 10	3000
14	Brothern Sabha Hall	Mundukottakkal	Convention		2000
15	St Gregorious Orthodox Chappel	Nannuvakad	Perunal		800
C. MOSQUE					
1	Muslim Juma Masjid	Uppukandam	Ramsan		800
2	Muslim Juma Masjid	Konnamoodu	Ramsan		900
3	Muslim Juma Masjid	Vanchipoika	Ramsan		750
4	Muslim Juma Masjid	Anappara	Ramsan		1000
5	Muslim Juma Masjid	Kulashekharapathi	Ramsan		1000
6	Muslim Juma Masjid	Pathanamthitta	Ramsan		1500
7	Muslim Juma Masjid	Valamchuzy	Ramsan		
8	Salafi Masjid	Pathanamthitta	Ramsan		
9	Noor Masjid	Vettippuram	Ramsan		
10	Azharul Uloom Masjid	Anchakkalala	Ramsan		
11	Salman ul Farisi Masjid	Chanjaplackal	Ramsan		
12	Kassaful Uloom Juma masjid	Kulasekharapathy	Ramsan		
13	Thycav Masjid	Churulikkode	Ramsan		
14	Thycav Masjid	Ottukal	Ramsan		
15	Thycav Masjid	Kulasekharapathy	Ramsan		

