CHAPTER 22

DISASTER MANAGEMENT- RISK ASSESSMENT

"Disaster" as catastrophe, mishap, calamity or grave affecting any are from natural and made causes or by accidents or negligence which results in substantial loss of life or human sufferings or damage to and destruction of property or damage or degradation of environment and is of such nature and magnitudes to be beyond the capacity of the community of the affected area.

Disasters and their management generally get discussed in their aftermath. This discussion should result in planning and preparing the strategy to tackle and mitigate disasters in a responsible and effective manner. Disasters, both natural and manmadel, are macro level unexpected events or processes, which can occur anywhere at any time. Disaster management is essentially a dynamic process. It comprises the classical management functions of planning, organizing, staffing, leading and controlling. It also involves many organizations, which must work together to prevent, mitigate, prepare for risk reduction, respond to and recover from the effects of disaster and obey the motto of "Towards a safer state".

This chapter is about the effects of various types of disasters, their dimensions and characteristics in Kannur city.

22.1 INTRODUCTION

Disasters can originate in different sources and systems, such as atmospheric, hydrometeriological, oceanographic, volcanologic, seismic, neotectonic etc. Globally, losses from natural hazards are also increasing which is mostly due to the rapid increase in human population. This unprecedented number of people has reduced resource availability and forced people to live in marginal areas where natural hazards occur more frequently and often with greater severity.

Disaster subcategory definitions:

1. **Naturally Triggered/Weather related:** Events caused by short-lived/small to meso-scale atmospheric processes (in the spectrum from minutes to days).

2. **Geological:** Events originating from solid earth.
3. **Biological:** Disaster caused by the exposure of living organisms to germs and toxic substances.
4. **Anthropogenically technologically triggered:** Disaster triggered by human intervention.

22.2 NATIONAL POLICY

- The themes underpinning the national policy are:
- Community based DM, including last mile integration of the policy, plans and execution.
- Capacity development in all spheres.
- Consolidation of past initiatives and best practices.
- Cooperation with agencies at National and International levels.
- Multi-sectoral synergy.

The objectives of the National Policy on Disaster Management are:

- Promoting a culture of prevention, preparedness and resilience at all levels through knowledge, innovation and education.
- Encouraging mitigation measures based on technology, traditional wisdom and environmental sustainability.
- Mainstreaming disaster management into the developmental planning process.
- Establishing institutional and techno legal frameworks to create an enabling regulatory environment and a compliance regime.
- Ensuring efficient mechanism for identification, assessment and monitoring of disaster risks.
- Developing contemporary forecasting and early warning systems backed by responsive and fail-safe communication with information technology support.
- Ensuring efficient response and relief with a caring approach towards the needs of the vulnerable sections of the society.
- Undertaking reconstruction as an opportunity to build disaster resilient structures and habitat for ensuring safer living.
- Promoting a productive and proactive partnership with the media for disaster management.

22.3 STATE POLICY

The Kerala State Disaster Management Policy underscores an integrated approach to disaster management covering all phases of managing disasters such as:

- Pre disaster phase–Prevention, Mitigation and Preparedness
- Disaster response phase/during disaster

Post disaster phase recovery (rehabilitation and reconstruction)

The state would lay emphasis on pre disaster activities such as prevention, mitigation and preparedness in line with the paradigm shift in disaster management.

The State Government shall issue specific guidelines and devise exact measures for implementation of the State Policy during various phases of a disaster in its State Disaster Management Plan.

Pre disaster phase - Prevention, Mitigation and Preparedness

The pre disaster phase includes prevention, mitigation, and preparedness activities and all these activities together form "Disaster Risk Management".

1. **Prevention:** Measures aimed at eliminating the occurrence of a disaster event or reducing the severity of a disaster.
2. **Mitigation:** Long term measures taken in advance that decrease or lessen the impact of a disaster on society and environment by improving a community's ability to absorb the impact with minimum damage or disruptive effect.
3. **Preparedness:** Measures that enable the government, communities and individuals to respond rapidly and effectively to disaster situations and ensure that communities and services are capable of coping with the effect of disasters.

22.4 DISTRICT LEVEL STUDY OF DISASTERS

Kannur district is a multi-hazard prone district with natural disasters such as floods, landslides, drought, earthquake, coastal related disasters like cyclones, coastal erosion and tidal waves (Tsunami) and manmade disasters such as road accidents, fire accidents, bomb blasts, drowning etc. Every year, the district bears huge loss from natural and manmade disasters. It causes widespread damage to life and property. The unique geo - climatic and social condition of the district make the place more vulnerable to disasters. The coastal community faces constant threat of sea erosion while the communities living in the midland are vulnerable to flood and lightning. The hill communities are prone to land slipping and slides.

While analysing the vulnerability of the district, ecologically sensitive areas in the district as per Gadgil report is to be considered and are shown in Figure.22.1. The figure indicates Cherupuzha, Udhayagiri, Naduvil, Eruvessy, Payyavoor, Ulikkal, Payam, Ayyankunnu, Pattiom

and Kunnothuparamba are identified as Ecological Sensitive Zone 1. That means these areas required special attention in future developments. The new developments should be limited and provides only environmental friendly developments. Moreover, as per Gadgil report, Ayyankunnu, Aralam, Kelakom, Kottiyoor, Peravoor and Kanichar were identified as protected areas in Kannur District.

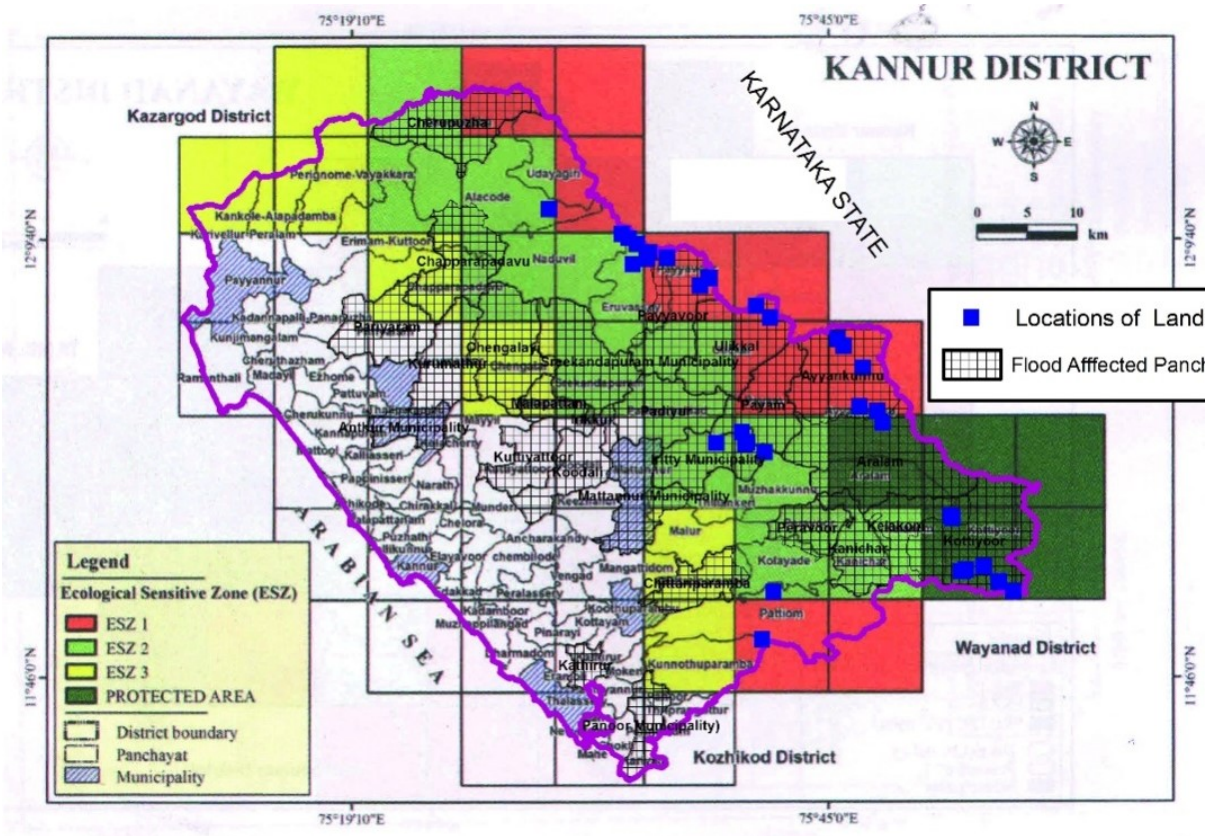

Figure.22.1 Ecological Sensitive Zones as per Gadgil Report

Since the Gagdil Committee report was criticised for being excessively environment-friendly and not in tune with the ground realities, a report on Western Ghats was prepared by K. Kasturi Rangan and it recommended prohibition on development activities in 60,000 km² ecologically sensitive area spread over Gujarat, Karnataka, Maharashtra, Goa, Kerala and Tamil Nadu.

In Kasthuri Rangan report, Aralam, Kottiyoor and Cheruvancherry Villages in the district were identified as ecologically sensitive units. It can be seen that about 10% of land area of Kannur district is zoned as ecologically sensitive area. It can be seen that about 10% of land area of District is zoned as ecologically sensitive area.

While discussing the disasters of Kannur city, the study cannot be limited within its boundary as it depends on its neighbouring areas also. Hence the district level brief study is carried out followed by the town profile.

22.4.1 FLOOD

Floods are naturally occurring events where a particular piece of land that is usually dry in condition, suddenly gets submerged under water.

The district is prone mostly to the river flood and the coastal flood. The reason for local floods found in the low lying areas of coastal region, especially in the northern part of the district, is poor drainage condition mainly due to the geography of the region. Some parts of the sea areas are below sea level and the flooded water from the rain and surge stayed there. Soil erosion and silting of river beds add to the reason.

In 2018 and 2019 years, Kerala experienced an abnormally heavy rainfall which resulted in flood and landslides after 1924. Even though the state had about 23.42% of excess water in 2018, that flood didn't adversely affect the northern part of Kerala that much whereas, during 2019 flood, those parts also got affected. Along with flood, landslides also happened.

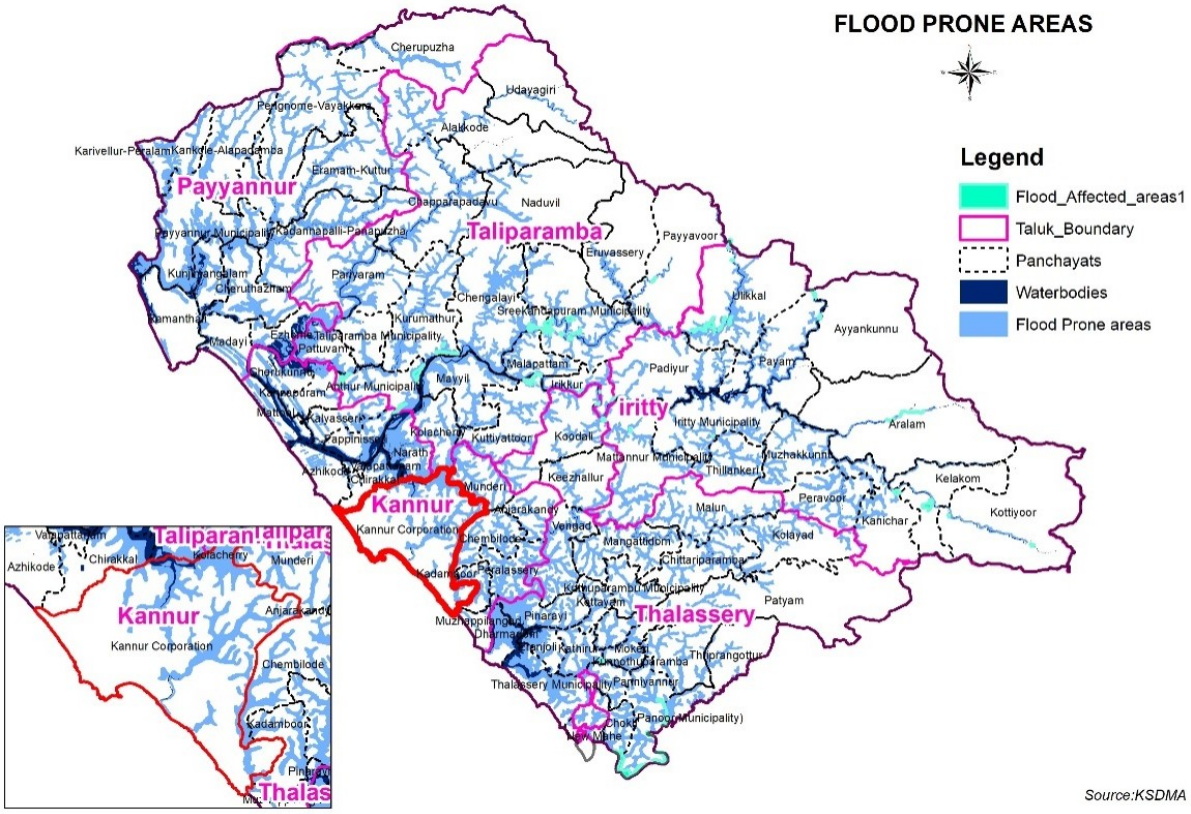

Figure.22.2 Flood prone areas in Kannur district

Kerala State Disaster Management has declared red alert in the entire state. Flooding is extremely dangerous and it results is wiping away an entire area and causes extensive damage to life and property.

The worst flood and landslide affected districts in Kerala are Ernakulum, Idukki, Pathanamthitta, Thrissur, Alappuzha, Kottayam, Palakkad, Malappuram and Wayanad. But in Kannur district, the land slide occurred in eastern part of the district and also in continuation, the moderate flood in low lying areas throughout the district.

There is no effective flood forecasting system evolved so far; but it has to be understood by incessant rains. In the mega flood, 2018 of Kannur district, about 30 people have died and over 2035 people(681 families) had to be evacuated to 22 relief camps across the District during the disaster. Also, 13 buildings were lost along with the lands around it. The number of buildings that suffered complete and partial loss is 147 and 1578 respectively.

In case of a disaster, which may be in the form of heavy floods or earthquake, there is a possibility of dam collapse. The main dam in the District is Pazhassi dam. Pazhassi dam is across of Valapattanam River at Kuiloor, Veliyambra about 38 km from Kannur and Thalassery. Pazhassi reservoir has a full Reservoir Level of 26.52 metres (87.0 ft), with an area of 650 Ha (1,600 acres) and a gross storage capacity of 97,500,000 m^3 (79,045 acre. ft) and extends up to Vallithodu about 12 km north east of the dam. The length of the dam is 245 m with a spillway of 138 m.

During 2019 monsoon, because of the failure in the shutters, the authorities could not open the shutters and this caused flooding in the upper regions of the dam especially in Iritty region. Both the urban and rural areas were flooded and huge losses to the properties occurred.

The flood prone areas of the district are shown in Figure.22.2. The low lying areas which are near to the major rivers in the district are prone to flood. Among these, Valapattanam River and Anjarakkandy River can be considered as in high risk.

Sponge cities are cities designed so that rainwater is kept and absorbed where it falls through sustainable urban drainage systems, leased from its green infrastructure. Green infrastructure technologies involve elements that allow greater permeability in the soil for rainwater absorption. Among them we can highlight: parks, drainage pavements, rain gardens, infiltration and retention wells, urban gardens and plantations, green walls and roofs.

Implementing an effective sponge city strategy requires major investment, particularly when retrofitting existing urban areas. However, compared to the costs

involved in repairing the damage caused by major flooding events a one-off investment in natural sponge city systems is common sense, potentially producing massive savings in the long run. There are also many associated benefits, including reduced pollution and the boost to mental and physical health that comes with adding more green space and water bodies in the city.

22.4.2 LANDSLIDE AND LANDSLIP

Landslide is a common phenomenon in the highland regions of the district especially during Monsoon season. The landslide susceptibility map of the district is shown in Figure.22.3.

In Kannur district, high hazard zonation area constitutes 168.7 km^2 and that of moderate hazard zonation area is 272.6 km^2. More than 5 major landslides were reported recently. Heavy casualty to human beings, properties e.g. roads, buildings and agricultural land crops have also been reported in recent years.

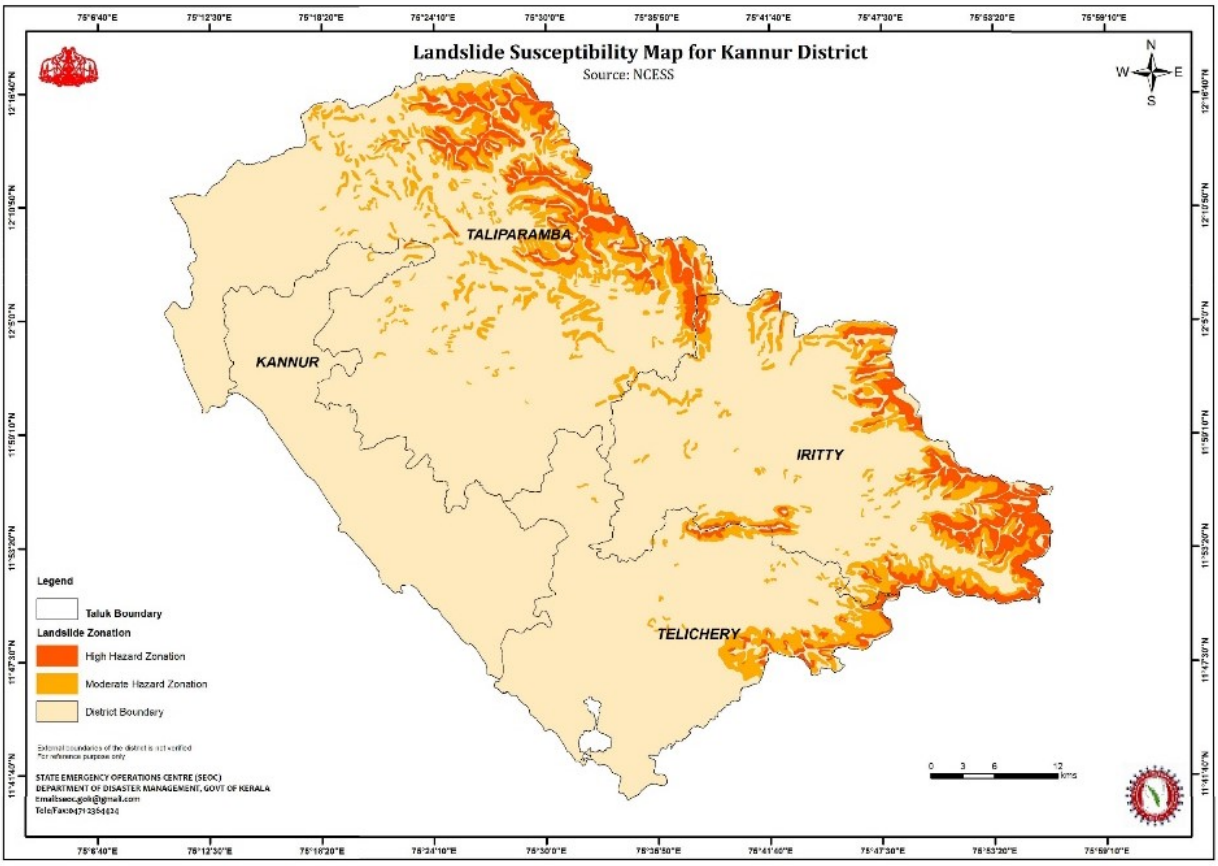

Figure.22.3 Landslide susceptibility map for Kannur district

In Kannur district, Ayyankunnu, Kottiyoor, Aralam, Eruvessy, Kelakom etc. are the moderately landslide affected areas along with the heavy rain fall in 2018 monsoon.

The Table.22.1 indicates the name of local body and the type of disaster occurred.

Table.22.1 The type of disaster occurred in different local bodies in 2018 monsoon

Sl. No.	LSGI	Village	
		Landslide	Flood
1	Eruvessy	Eruvessy	-
2	Iritty	Keezhur	Chavassery
3	Kottiyoor	Kottiyoor	Kottiyoor
4	Kathirur	-	Kathirur
5	Payam	Vilamana	Vilamana
6	Ayyankunnu	Ayyankunnu	-
7	Kuttiyattur	-	Kuttiyattur
8	Kurumathur	-	Kurumathur
9	Kelakom	Kelakom	Kelakom
10	Irikkur	-	Irikkur
11	Aralam	Aralam	Aralam
12	Alakode	Vellad	-
13	Naduvil	New Naduvil	-
14	Thripangotoor	Thripangotoor	-
15	Chengalayi	-	Chengalayi
16	Sreekandapuram	Sreekandapuram	Sreekandapuram
17	Payyavoor	Payyavoor	-
18	Panoor	-	Peringathoor, Peringalam
19	Kanichar	-	Kanichar
20	Ulikal	Vayathur	Nuchiyad, Vayathur

21	Andoor	-	Morazha, Andoor
22	Mattannur	-	Kolari

The Figure.22.4 indicates the identification of landslide and flood affected Panchayats in Kannur district. The major damages in Kannur district were due to the landslide issues. Flooding damages were comparatively low.

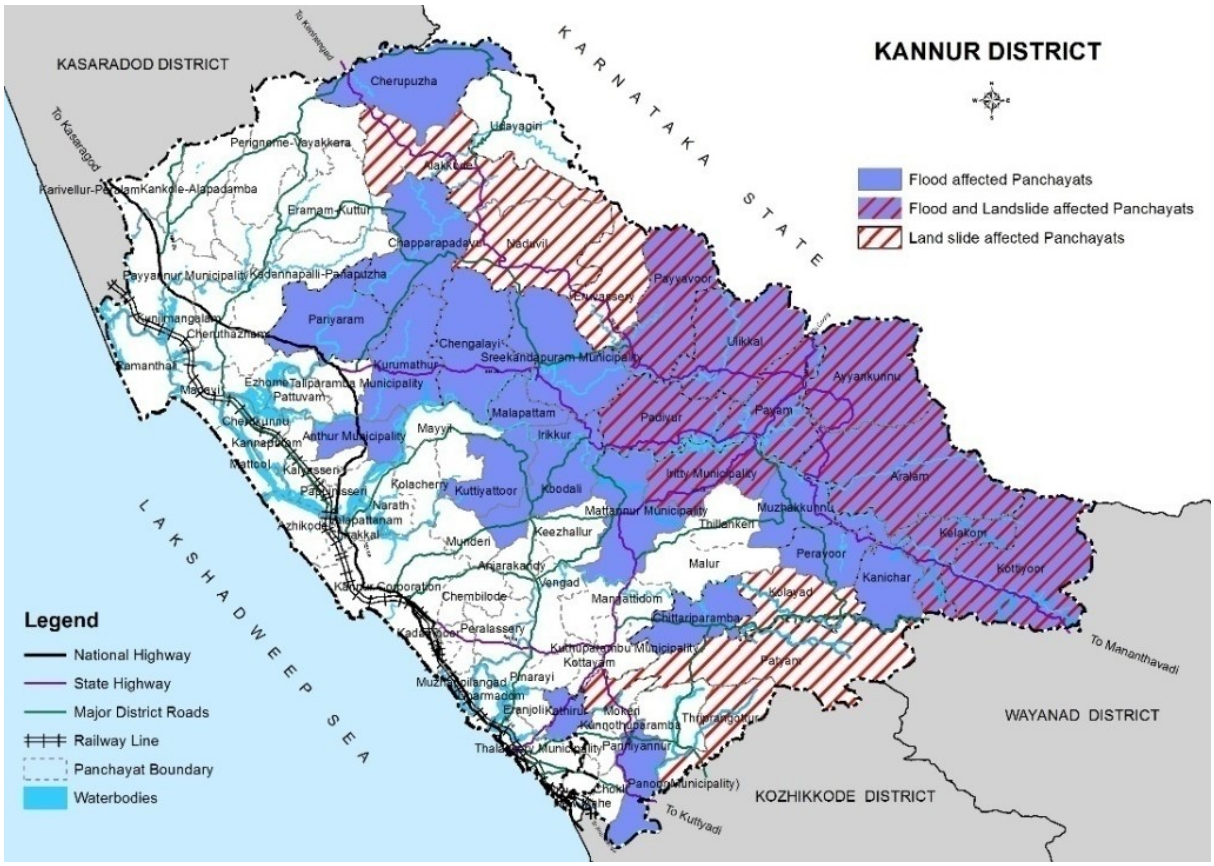

Figure.22.4 Landslide and flood affected Panchayats in Kannur district

22.4.3 DROUGHT

Drought occurs when the level of the groundwater is low and the water content in the soil is less. During last several years, many parts of the district, especially highlands faced serious problems of drought. Several hectares of agricultural land became dry and agricultural crops were lost due to drought. People were forced to walk long distance for fetching drinking water. Water scarcity intensifies during March to end of May, every year.

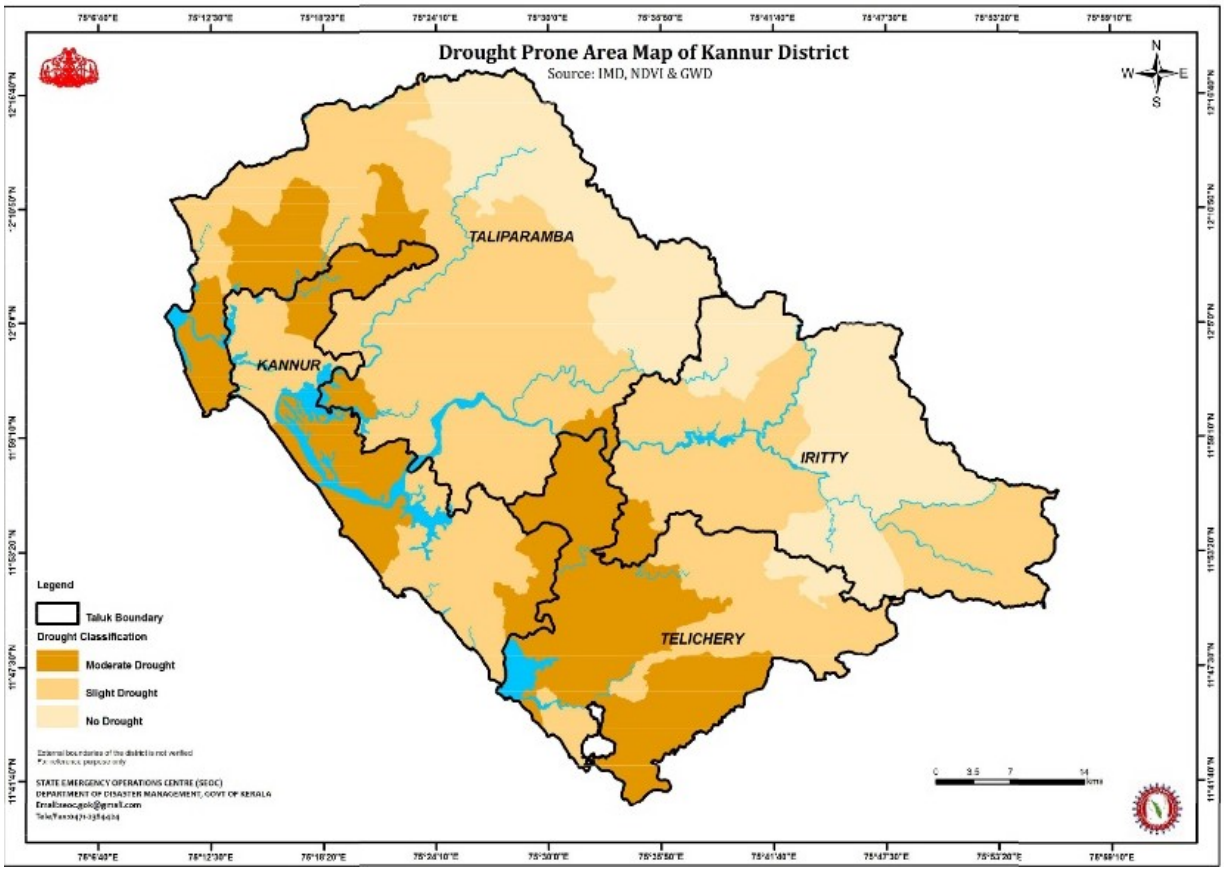

Figure.22.5 Drought areas in Kannur district

The Figure.22.5 indicates that in a given season, if the rainfall density is:

- >10% of the long period average, the area demarcated as severe drought will experience drinking water shortage.
- >26% of the long period average, the area demarcated as moderate drought will experience drinking water shortage.
- >50% of the long period average, the area demarcated as slight drought will experience drinking water shortage.

In Kannur district there are no severe drought areas whereas moderate, slight and no drought areas constitute 24.3%, 50.1% and 25.6% respectively.

22.4.4 THUNDER AND LIGHTNING

Thunder and Lightning are common phenomena in the district during both Monsoons and November rains called "Thulavarsham". Most of the casualties reported due to lightning and thunder are in Pre-Monsoon season and at the time of Thulavarsham. Losses to human lives, livestock, houses and buildings and

crops like Coconut, Arecanut and Rubber are also being reported extensively.

22.4.5 EPIDEMICS/PANDEMICS

Incidence of Epidemics like Viral fever, Leptospirosis, Hepatitis, Chikungunya, Dengue fever, Cholera, Filariasis, Typhoid etc. has become common in the district. Coastal, urban and hilly areas are more prone to epidemics. Some tribal colonies in high ranges and also fishermen colonies usually suffer from such epidemics during monsoon season.

The Pandemic, Corona Virus disease (COVID-19) is an infectious disease caused by Corona Virus. Most of the infected people will experience mild to moderate respiratory illness and recover without requiring special treatment. Older people and those with medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness. The disease seriously affected the district also.

22.4.6 COASTAL RELATED DISASTERS

Coastal hazard susceptibility map of the district is shown in Figure.22.6 which indicates Coastal Taluks are susceptible to coastal hazards. Cyclones, boat capsizing, coastal erosion, storm surge, tsunami etc. are various types of coastal related disasters.

The Kannur district is entirely cyclone prone and a wind speed of 39 m/s can hit the district. Last year's, formation of low pressure in the Arabian Sea, caused heavy rain resulting in severe damages to district. Sometimes, with the unpredictable disturbances in the sea, boats and country crafts get capsized, trapped in to high tide and even get fully destroyed along with man missing cases. Due to bad weather, the fishermen who go for fishing are unable to reach the seashore. Several accidents have taken place in the district and many human lives have been thereby lost.

Heavy rain and landslides accompanied with the low pressure system caused severe damages to the agriculture and infrastructure in the district.

The district suffers damages from sea erosion at the time of monsoon. In Kerala, Kannur district has the longest length of coastal area. The rate of erosion is very high at areas where sea wall is not built. Coastal villages in the southern and northern end of the district face high rate of erosion.

Tsunamis are most commonly generated by earthquakes in marine and coastal regions. Major Tsunamis are produced by large shallow focus earthquakes associated with the movement of oceanic and continental plates. Under water, landslides associated with smaller earthquakes

are also capable of generating destructive Tsunamis. Other large-scale disturbances of the sea-surface that can generate Tsunamis are explosive volcanoes and asteroid impacts. In 2004 Tsunami, the coastal villages in the Kannur district got affected and one person was killed. Severe damages occurred to the sea wall.

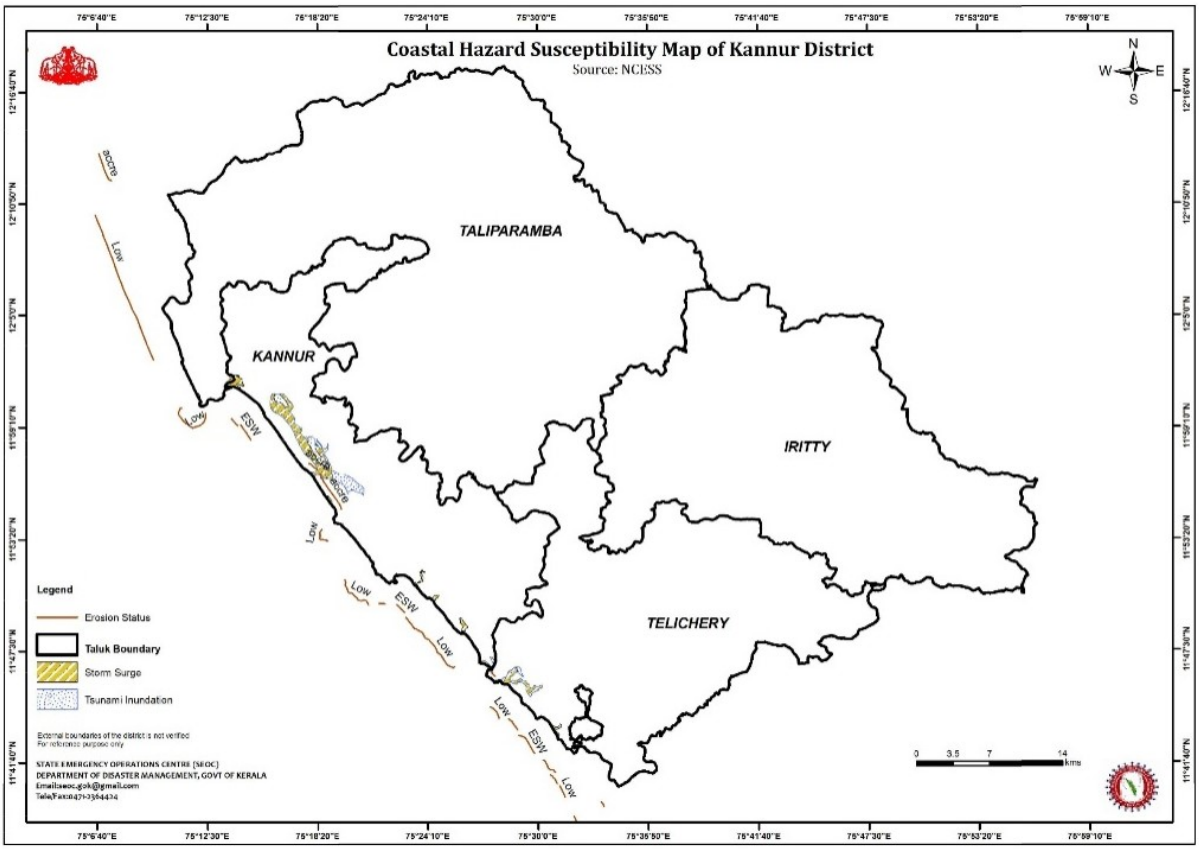

Figure.22.6 Coastal hazard susceptibility map of Kannur district

22.4.7 EARTHQUAKE

Kannur district did not experience the threat of large scale earthquake. But minor tremors have been experienced in several parts of this district especially in high ranges recently. Taliparamba, Thalassery and Mahe are the earthquake/tremor prone areas in the district. If such major disaster occurs, severe damages are likely to be caused to the structure of buildings and houses. A tremor of 1.3 in Richter scales was experienced in August 2006 in some parts of Alakode Panchayath.

The whole district comes under the Earthquake zone IV where an Earthquake of magnitude 6 may occur.

22.4.8 AIR ACCIDENTS

As the district is situated in between Mangalore, Bangalore,

Kannur and Calicut airports the chance of air crashes is very high.

22.4.9 CHEMICAL AND INDUSTRIAL DISASTERS

In Kannur district, chemical industries are rare but there are a lot of small scale industries and Petroleum storage, distribution and LPG bottling centres. The areas near to these centres are prone to disasters. As the NH-66 passes through the district, accidents may occur at the time of transportation of Petroleum products and other toxic substances. Large containers of petroleum products like benzene and chemicals such as ammonia might lead to explosion while transportation or evacuation.

Major Accident Hazard (MAH) unit in the district is Malabar Fuel Corporation Ltd. at Pallivayal, Taliparmba which is a manufacturing unit of LPG. About 20-50 staffs are working in this unit. Critical nature of Flammable and Toxic products being handled there is the main reason for considering that as a MAH unit.

22.4.10 FIRE

Fire can occur due to short circuit; human carelessness, as well as due to the explosion happened by accidents of vehicles which carry inflammable goods. Forest fire; which is another type of fire adversely affect the natural vegetation and destroy the habitats of birds and animals; hence the ecosystem.

In Kannur, there happened a fire disaster with LPG tanker explosion at Chala bypass on August 27, 2012 which led to the death and injuries of many people and animals.

22.5 KANNUR CITY - STUDY OF DISASTERS

22.5.1 MICRO WATERSHEDS OF VALAPATTANAM RIVER IN THE STUDY AREA

The major rivers flowing through the city are Kanampuzha, Kattaambally River (with major tributary Kakkad River) Thottada Puzha, and Ayyarath Puzha (Nadal Puzha) are other minor rivers. Kanampuzha River originates from Ayyappanmala in Munderi Panchayth, once the centre of the Bhoodan Movement. The river flows through Macheri, Vattappoyil, Peringalayi, Kappad, Thilanoor, Elayavoor, ThazheChovva, Marakkarkandy etc. before joining the sea at Adikadalayi in Kannur city.

Kattambally River also known as Munderippuzha is a tributary of Valapatanam River and is a vast water body located at the northern border of Kannur Municipal Corporation. Tidal water enters through Valapatanam River into this water body which makes the low lying banks marshy and the regionis called

Kaippad fields. A barrage called Kattampally spillway is constructed for regulating salt water entry into the Kattambally River. The micro watersheds in the study area are shown in Figure.22.7.

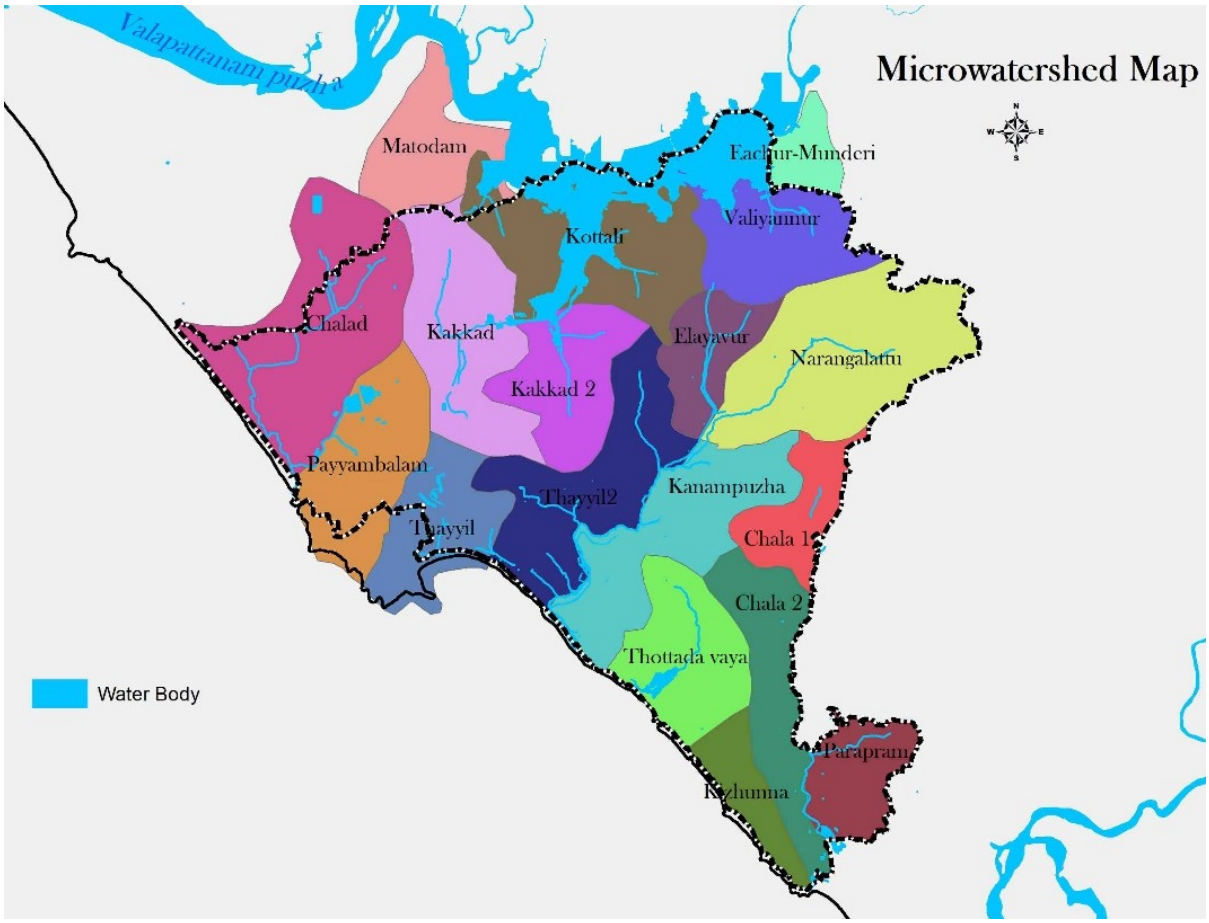

Figure.22.7 Micro-watershed in Kannur Municipal Corporation

22.5.2 FLOOD

The altitude is ranges from 0 to 75 m above M.S.L (Mean Sea Level). The low lying areas are mainly located along the river sides in the study area which are at risk in flooding.

Even though many issues are occurred in the entire Kerala during the Monsoon of 2018, the damage in town area was comparatively less. But about 45 buildings were partially damaged and one building was completely damaged.

In the monsoon of 2019, Kattampally River overflowed and areas like Athazhakkunnu, Kakkad, Pallipram, Varam, Athirakam, Thulicherry etc. were flooded. Similarly, the storm water gathered in Kanampuzha made flood along its bank in Pulukkompalam, Thazhechovva, Averappalam, Maidanappally, etc. Also, low lying areas like Thavakkara, Padannathode etc. were also affected by flood. Many families in the area were shifted to

safer locations. The relief camps were opened at Thavakkara U.P. School and Government Town Higher Secondary School.

The inundated areas of the town during the period from 2018 to 2020 are shown in Figure.22.8.

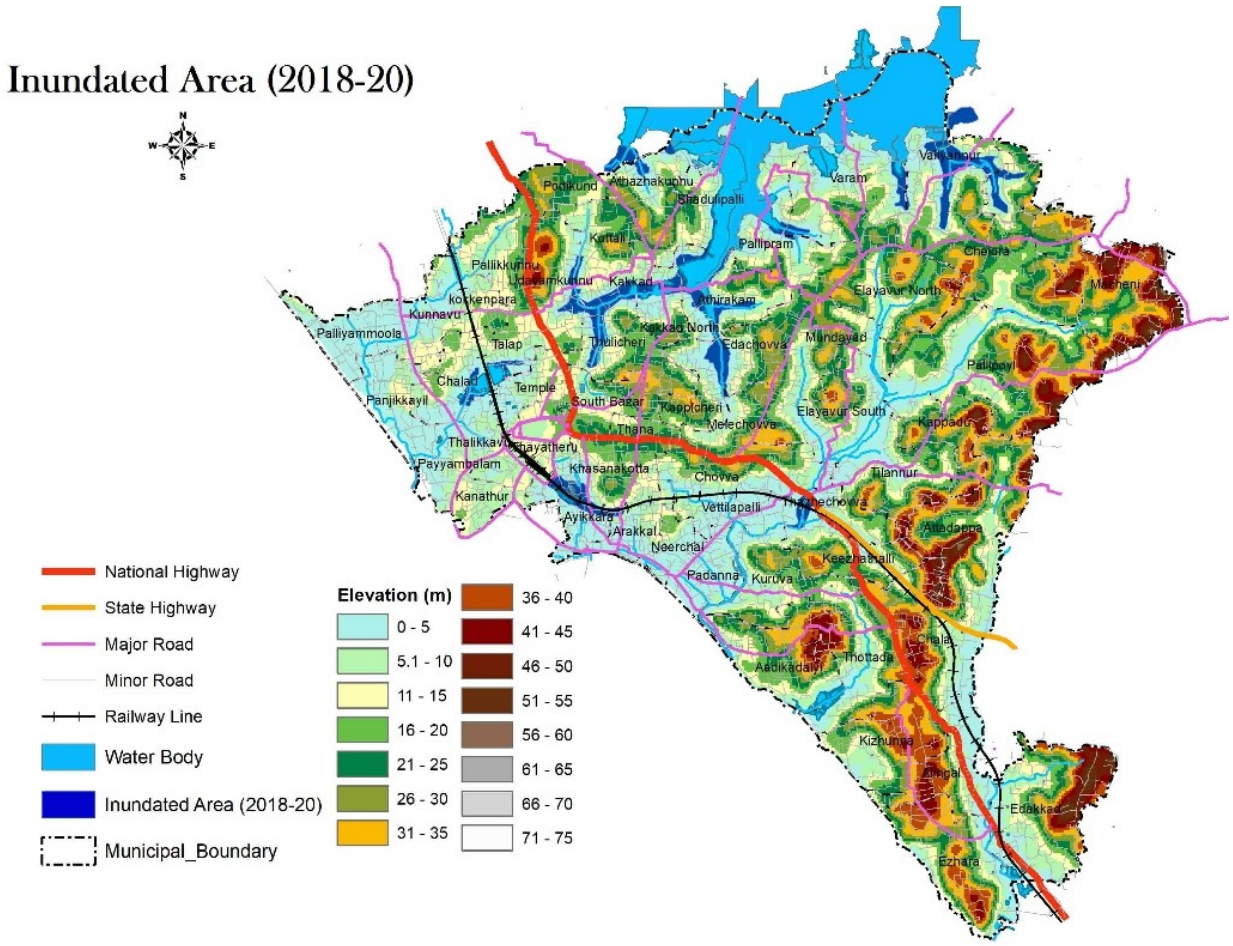

Figure.22.8 Inundated areas in Kannur Municipal Corporation (2018-2020)

The flood prone areas of the Corporation area are shown in Figure.22.9. Poor drainage condition which is mainly due to the geography of the region as well paddy and wetland reclamation and unscientific constructions in low lying areas are the main reason for flood. Since the solid waste management system is not up to the mark, the unwanted dumping of wastes is seen in natural drains which make them blocked and hence the natural flow is restricted which may cause flooding of the particular area.

The low lying areas which are near to the major rivers in the Municipal Corporation are prone to flood. Among these, Kattampally River banks can be considered as in high risk.

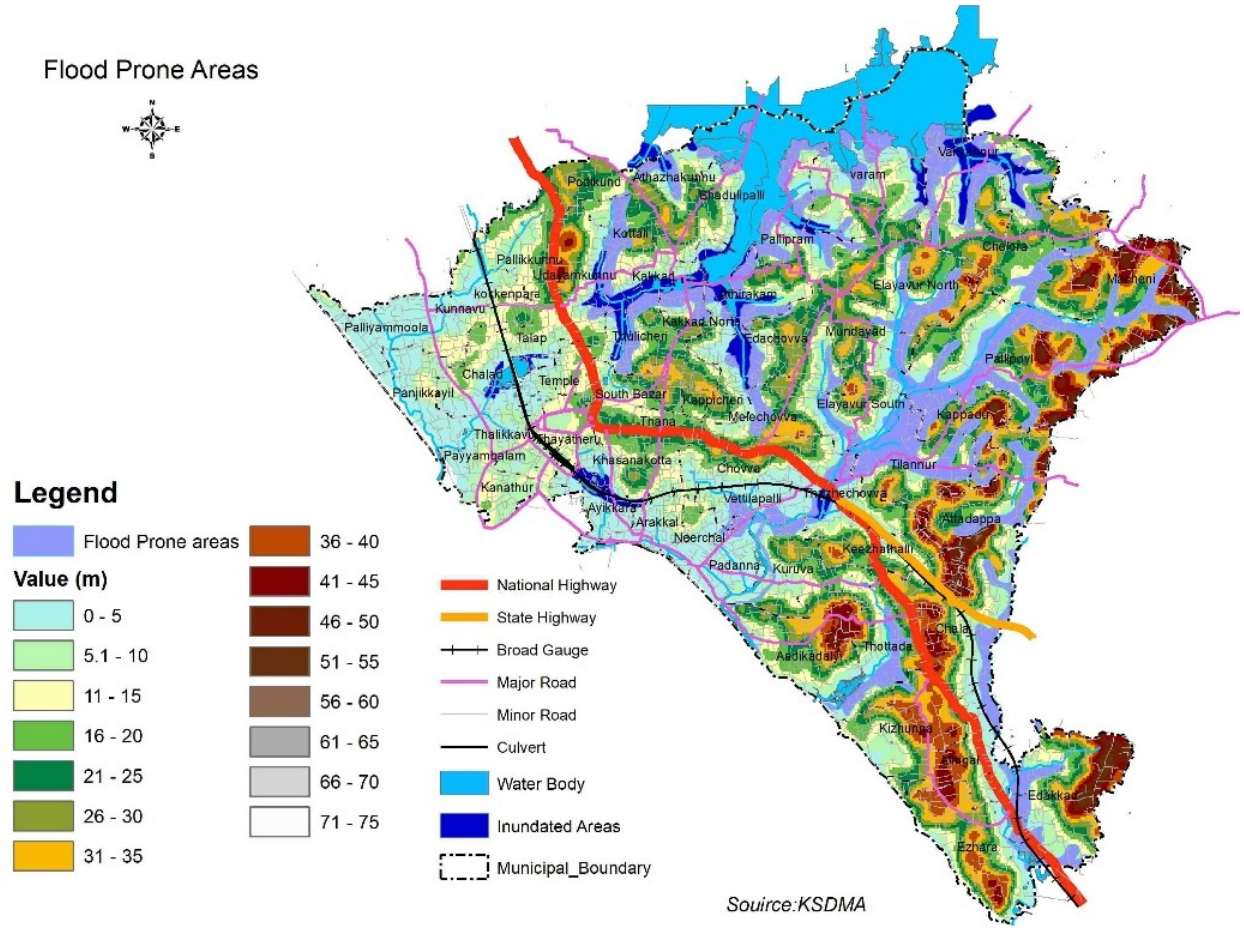

Figure.22.9 Flood prone areas of Kannur municipal town

Fire and Rescue Services personnel use an inflated boat to shift an aged woman marooned in a house at flood - affected ThazheChovva

People negotiating the floodwaters at Kakkad

As per disaster management plan for Kannur district, Elayavur and three other coastal villages; Kannur I, Kannur II and Pallikkunnu are flood prone villages. The flood prone wards are shown in Figure.22.10.

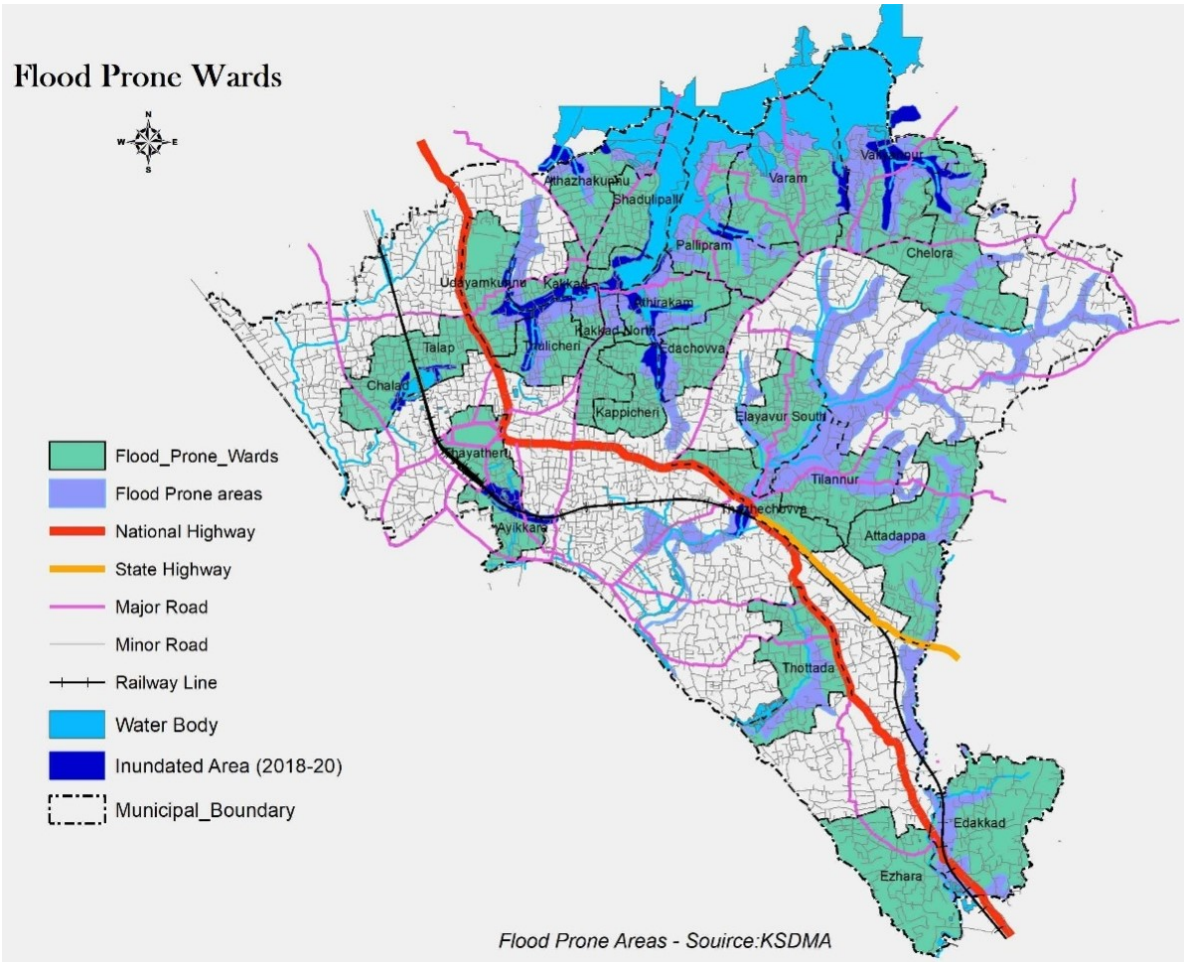

Figure.22.10 Flood prone areas of Kannur Municipal Corporation - Ward wise

22.5.3 EPIDEMICS/PANDEMICS

As in the state, national and international level, the pandemic COVID -19 affected the study area adversely. In this context, more rehabilitation centres are to be established. As a part of infrastructure developments in health sector, District Hospital was converted into Covid hospital. The private hospitals also provided 50% of the bed strength for Covid cell.

The epidemics like Diarrhoea, Jaundice and Typhoid in the city show the unavailability of safe drinking water; while that of mosquito borne diseases such as malaria and dengue fever shows the lack of hygienic conditions. Also, the presence of Leptospirosis reveals that the presence

of rodents. The counts of these epidemics are increasing every year in the city.

22.5.4 DROUGHT

Palliyamoola, Kunnavu, Kokkenpara, Pallikkunnu, Talap, Chalad and Panjikkayil wards are prone to moderate drought whereas others are prone to slight drought.

22.5.5 COASTAL HAZARDS

Since the study area has 17 km costal stretch, there is a chance to occur coastal related disasters. Coastal hazards include cyclones, boat capsizing, coastal erosion, storm surge, tsunami etc. As per disaster management plan for Kannur district, the coastal villages of the city Kannur I, Kannur II, Edakkad and Pallikkunnu are coastal hazard prone areas and it is shown in Figure.22.11.

Figure.22.11 Coastal hazard susceptibility map

22.5.6 FIRE

There was a fire disaster following LPG tanker explosion occurred at Chala bypass, on August 27, 2012. The three chambered tanker with total 16 tonnes (162.57 quintal) LPG collide with the road divider and exploded thrice. Many people as well as animals were killed and injured in that accident.

Table.22.2 Disaster prone wards in Kannur Municipal Corporation

Disaster	Prone area		No. of houses
	Ward No.	Ward name	
Flood	5	Talap	90
	6	Udayamkunnu	108
	9	Athazhakunnu	318
	10	Kakkad	209
	11	Thulicheri	415
	12	Kakkad North	152
	13	Sahdulipalli	11
	14	Pallipram	487
	15	Vaaram	229
	16	Chelora	230
	17	Athirakam	405
	22	Elayavoor South	248
	24	Edachovva	135
	25	Athirakam	405
	26	Kappicheri	50
	28	ThazheChovva	93
	30	Thilanoor	677
	31	Attadappa	250
	33	Edakkad	207
	34	Ezhara	6
	37	Thottada	344
	48	Thayatheru	80
	50	Ayikkara	120
	54	Chalad	100
Total			**5369**

Disaster	Prone area		No. of houses
	Ward No.	Ward name	
Coastal hazards	1	Palliyamoola	1284
	34	Ezhara	1153
	35	Alinkeel	971
	36	Kizhunna	1116
	37	Thottada	1611
	38	Adikadalayi	1555
	39	Kuruva	1461
	40	Padanna	1286
	42	Neerchal	1047
	43	Arakkal	1376
	53	Payyambalam	1133
	55	Panjikkayil	1351
Total			**15344**
Drought	1	Palliyamoola	
	2	Kunnavu	
	3	Kokkenpara	
	4	Pallikkunnu	
	5	Talap	
	54	Chalad	
	55	Panjikkayil	
Total			**20713**

22.6 HAZARD ANALYSIS

The analysis of hazard involves mapping of areas, which are prone to disaster so as to develop a perceptible depiction of the hazard. The analysis aims at identifying areas in which the potential impact of a disaster is higher.

According to the flood report 2018, the entire district is classified in to four zones such as high risk, moderate risk, moderately safe and safe zones which was prepared based on various parameters such as landslide susceptibility areas, slope, elevation from Mean Sea Level, presence of dam/reservoir, proximity to river and coastal areas, affected locations identified in mega flood 2018 etc. The village wise map of vulnerable areas in the District is shown in Figure.22.12. The figure indicates that the Kannur Municipal Corporation falls under moderately risky, moderately safe and safe zones. No high risk areas are there in the study area.

The local bodies which are not included either in safe zone or high risk zone are categorized as moderately safe zone. Local bodies with villages classified as either moderately safe or moderately risk fall under this category. Hence the study area is under moderately safe zone.

Disaster prone wards and the number of houses likely to be affected are given in Table.22.2. The table reveals that about 5369 houses will be affected by flood where as the houses likely to be hit by hazards are 15344. Palliyamoola, Kunnavu, Kokkenpara, Pallikkunnu, Talap, Chalad, Panjikkayil wards are the wards prone to moderate drought. Remaining wards are prone to slight drought.

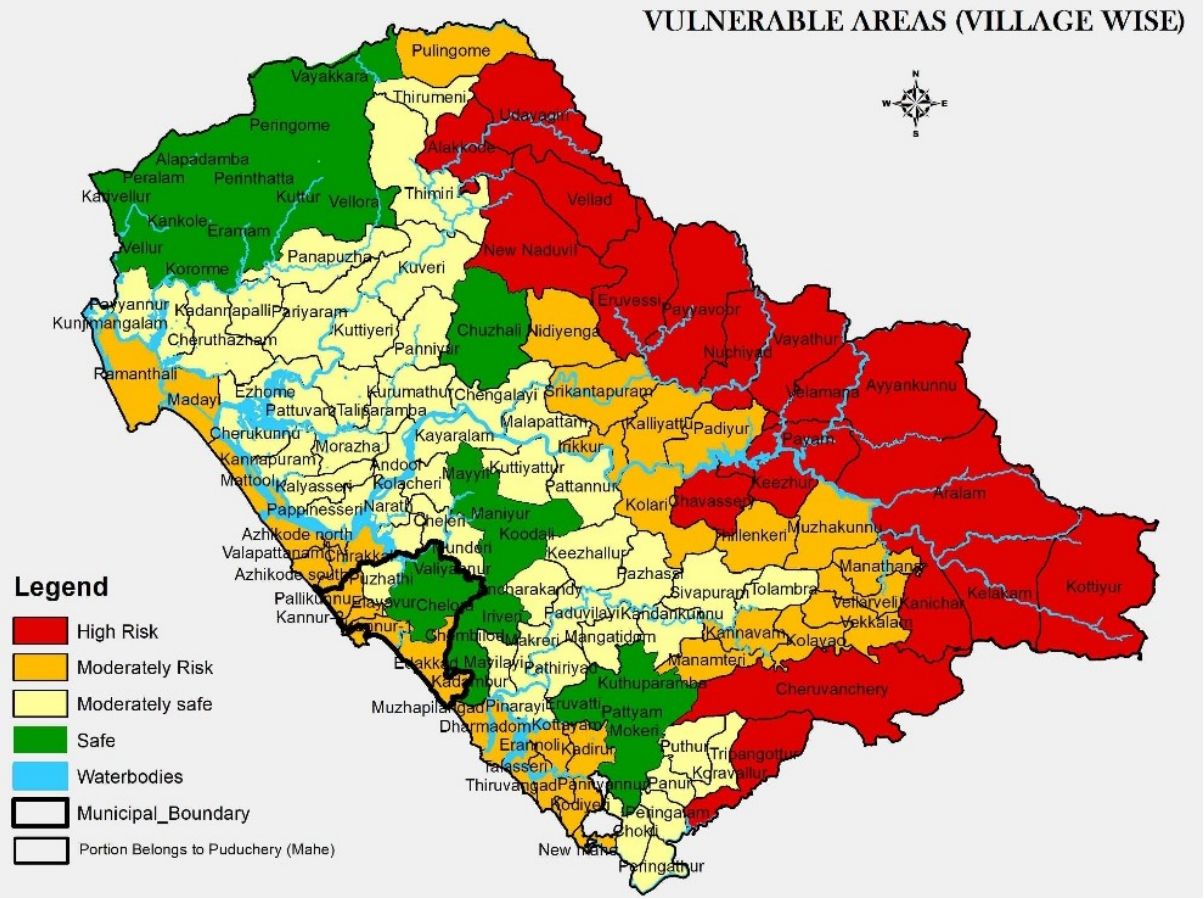

Figure.22.12 Vulnerable areas of Kannur District

22.7 ANALYSIS OF CRITICAL FACILITIES

It includes the identification of all the critical facilities in the Municipal Corporation like educational institutions, police stations, hospitals, fire and rescue stations etc. These facilities play a central role in disaster response and recovery and, hence, it is important to protect these critical facilities to ensure that disruption of

public service is minimized during the disaster. The critical facilities shown in Figure.22.13 include the following:

- Schools - 49 numbers
- Colleges - 6 numbers
- Hospitals - 25 numbers (allopathic - 23, ayurvedic - 1, homeopathic - 1)
- Primary health centres - 6 numbers
- Police Stations - 4 numbers
- Shelter Homes-1 number
- Telecom Offices
- Hostels - 15 numbers
- Key Government Offices - 4 numbers
- Cultural Centers - 1 number
- Fire Stations - 1 number

The distribution of critical infrastructures of the study area is shown in Figure.22.13.

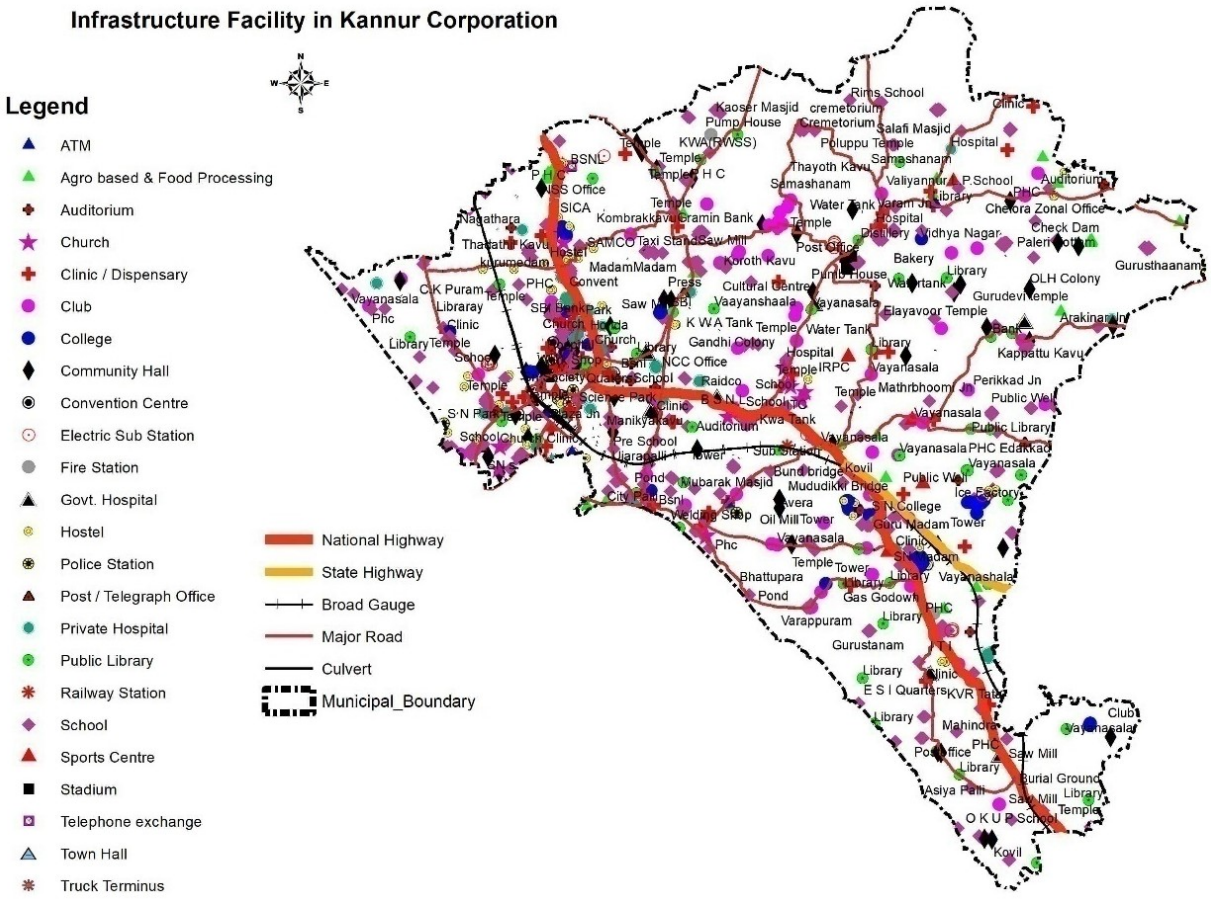

Figure.22.13 Location of critical infrastructures at Kannur Municipal Corporation

22.8 INTEGRATED ANALYSIS OF LAND USE V/S HAZARD ZONE

Figure.22.14 indicates the major land use affected by flood in the city area is mainly agriculture land use (paddy fields) followed by residential land use. Flood prone area of the town covers 6.8 km² (8.68% of the total city Corporation area).

The analysis of land use map along with hazard prone areas of Kannur Municipal Corporation shows that major portion of the hazard prone areas are environmentally sensitive areas like paddy fields, wet lands etc. Some of the residential areas located at the low lying lands adjacent to the banks of rivers and streams within the Municipal Corporation also got affected during 2019 flood. Extensive filling and land use conversion of paddy fields and ponds might be the main reason for flood water entry to the surrounding land. The silt settlement at the bottom of rivers and streams made them shallow which also contributed to the overflow of flood water.

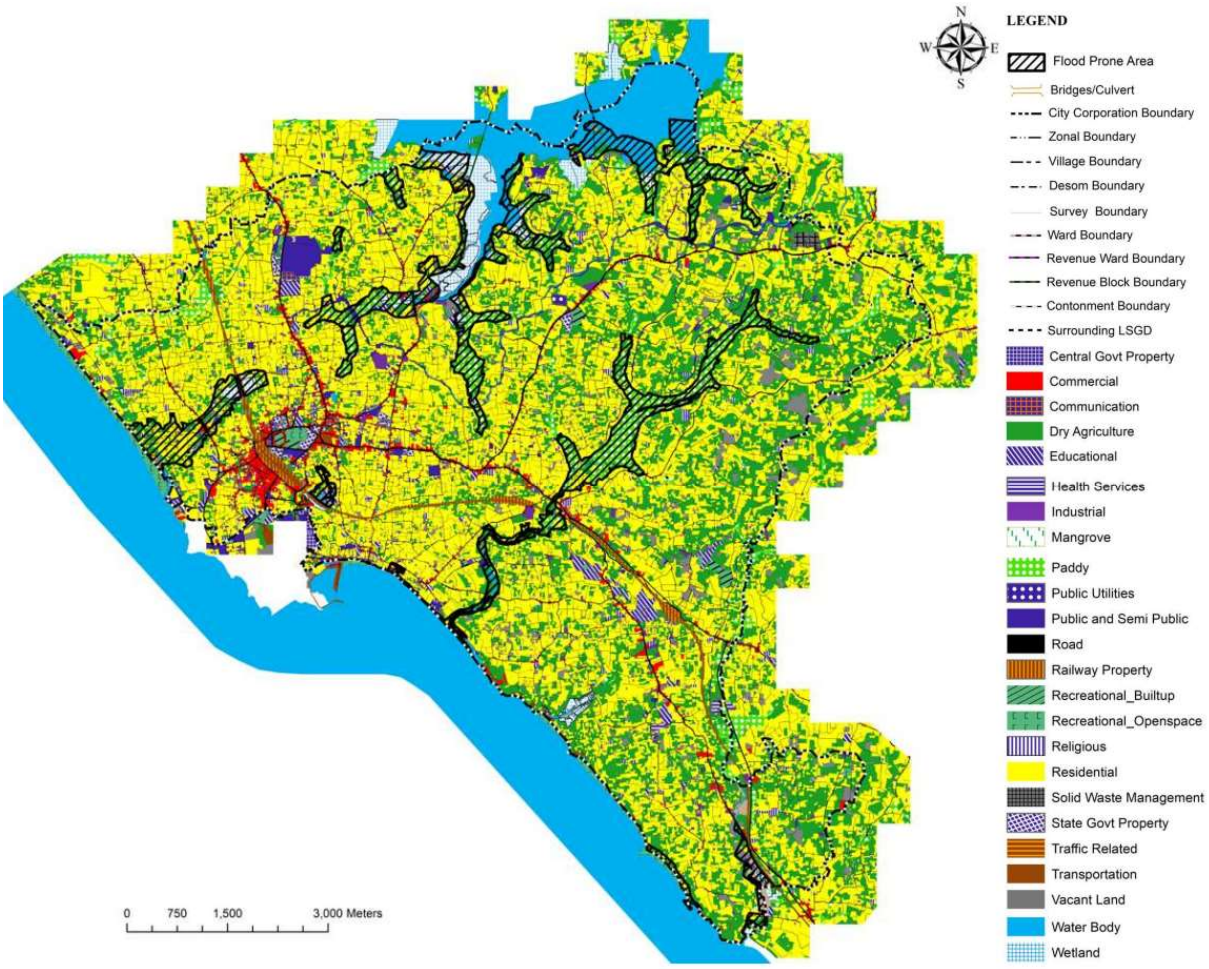

Figure.22.14 Flood prone areas v/s Land use map of Kannur Municipal Corporation

The flood prone areas of Kannur Municipal Corporation includes the banks of Kattambally River, Kanampuzha, Nadalpuzha, Padannathodeetc - strict restrictions and regulations are to be followed for building construction in these flood prone areas for the safety of life and property of people inhibiting there.

Some coastal erosion cases are reported on the beach side areas near Marakkarkandy, Neerchal, Ezhara and Ayyarath Bridge and strengthening of existing sea walls and construction of new sea wall are to be carried out to mitigate the disasters caused by coastal erosion.

22.9 ANALYSIS OF HAZARD ZONE V/S DISTRIBUTION OF INFRASTRUCTURE AND IDENTIFICATION OF GAP

22.9.1 ANALYSIS OF RESCUE RELATED INFRASTRUCTURE

Municipal Corporation Steering Committee including Mayor, Standing Committee Chairpersons, and Secretary has the responsibility to incorporate all the activities during the time of disasters. Depending upon the necessity, they can expand the committee to ensure the involvement of more members like PTA President, Head Masters, Principals, CDS Chair persons, Youth coordinators, Janamaithri Police staffs, Medical officers, Saksharataprerak, ICDS Suprevisor, and Engineer.

During the time of disasters, the emergency response team should be equipped with training and equipment. The details of various types of tools that has been provided for the emergency response team and its collection centres are described in the Table 22.3.

22.9.2 NEED OF PERMANENT SHELTERS

A total number of 13 rescue shelters were functional during the 2018 and 2019 flood whereas in the case of Covid 19 quarantine centres, Covid First Line Centres (CFLTC) as well as Domiciliary Covid Care Centre (DCC) were provided in the plan area. Sports Hostel, Thavakkara (100 beds) was used as CFLTC whereas Payyambalam (18 beds) and Govt. Polytechnic (100 beds) were used as DCC. Also, MTM School, Kannur was used for the rehabilitation of destitutes as they are the community that need prime care and attention in the pandemic situation.

Since the routine functioning of these rehabilitation centres will be affected by these disasters, it is recommended to advocate the use of multipurpose building that can be used as relief camps during the time of calamities, and as community hall for other times.

Table.22.3 Emergency Response Team & available tools at collection centres

Sl. No.	Tools/Services	Tool Collection Centres
1	Spreaders (Hydraulic), Lifting Equipments, Light Equipments, Critical Supplies – Skilled Human Resource, Fire Fighting-Protective Equipments-Personal And Specialized, Breathing Apparatus Set, Fire Fighting Equipments – Pumps, Ladder, Fire Extinguishers, Fire Rescue Tenders	Fire and Rescue Service
2	Light Equipments	Fire and Rescue Service, Jhanavi Motors
3	Lighting Arrangements	Jhanavi Motors, Fire and Rescue Service,
4	Heavy Engineering Equipments	Traffic Police, K.K.Builders, Peravoor
5	Critical Supplies – Skilled Human Resource	Husna Motor Service,Valapattanam
6	Specialized Flood Rescue Equipments	Fire and Rescue Service, DTPC, Naval Academy, Ezhimala
7	Rescue Boats	Police, Fisheries Dept, Marine Police, Fire and Rescue Service
8	Skilled Human Resource (Diverse team, Search and Rescue team for flood)	Fire and Rescue Service, Pratheeksha Timber Society, Kelakam
9	Critical Supplies (Medical Assistance, Special Vehicles etc.)	Govt. Hospital, Koyili Hospital, A.K.G Hospital, Fire Rescue Services
10	Portable Equipments	Fire and Rescue Services, Govt. Hospital, Koyili Hospital
11	Mobile Units (Lab, Medical Van etc.)	Govt Hospital , Kannur, Malabar Cancer Center, Thalassery
12	Hygiene (Water Filter, Water Tank, Reservoirs Treatment Tank)	Kerala Water Authority
13	Sanitation	Govt. Hospital, A.K.G.Hospital, VishachikilsaKendram, Pappinissery
14	Shelters - Tents	A,R, Camp, Kannur, Silpaulin, Kannur, Peekay Steels ,Thana, Fire and Rescue Services
15	Transportation- Light, Medium Vehicles	Fire and Rescue Service, A,R,Camp, Kannur,
16	Tele Communication	Police, B.S.N.L.
17	Video System	Nikshan Electronics, Kannur

18	HAM Radio Operators	DEN, Payyannur
19	Nuclear Biological and Chemical and NBC Specialized Equipments	Kerala Water Authority, Fire and Rescue Service

***Source**: Website of Kannur District*

Table.22.4 Details of camps and rehabilitation centres

Sl. No.	Ward No.	Name of institution that can be converted into camps	Ownership		Whether it can be converted into rehabilitation centre	No. of beds with social distancing	Useful and clean Toilet/ Bathroom available	
			Public	Private			Toilet	Bathroom
1	48	Thavakkara UP School	Yes		Yes	80	6	2
2	47	VHSE Sports	yes		Yes	190	10	5
3	49	Thayatheru LP School	Yes				4	0
4	52	Town school, Payyambalam	Yes		Yes	120	13	6
5	43	City Higher Secondary School	Yes				20	2
6	44	Chovva Higher Secondary School	Yes		Yes	300	30	4
7	42	Govt. UP School, Neerchal	Yes		Yes	110	13	4
8	25	Athirakam UP School	Yes		Yes	120	2	2
9	28	Govt. LP school, ThazheChovva	Yes				3	3
10	29	Keezhthalli UP School	Yes				3	3
11	21	CHM Higher Secondary School	Yes				53	3
12	4	Govt. Higher Secondary School, Pallikkunnu	Yes		Yes	120	10	4
13	9	Govt. Higher Secondary School, Puzhadi	Yes				15	0
14	50	Madrasa Madaniya LP School		Yes	Yes	60	4	2
15	50	DIS HSS (English Medium)		Yes	Yes	210	20	5
16	43	DIS HSS (Malayalam Medium)		Yes	Yes	280	37	7
17	43	City Govt. HSS	Yes		Yes	200	20	2
18	53	GVHSS Girls, Payyambalam	Yes		Yes	240	12	4

19	13	Mappila LP School, Athazhakunnu		Yes	Yes	140	20	2
20	10	BharatiyaVidyabhavan, Kakkad		Yes	Yes	150	21	3
21	41	SFS School		Yes	Yes	90	5	3
22	41	Vethilappalli Madrasa		Yes	Yes	90	10	2
23	42	NNS Auditorium		Yes	Yes	60	5	5
24	54	HIRA English Medium School, Chalad		Yes	Yes	40	9	5
25	54	GMLP School, Chalad	Yes		Yes	60	4	2
26	16	Apex English Medium School		Yes	Yes	30	4	2
27	30	Thilanur UP School		Yes	Yes	80	2	2
28	37	Cultural Centre, Thottada	Yes		Yes	20	2	2
29	32	GHSS Thottada	Yes		Yes	45	10	10
30	32	Chala Devi VilasamLP School		Yes	Yes	40	2	2
31	35	Kuttikkakam LP School		Yes	Yes	40	2	2
32	25	AmrutaVidyalayam		Yes	Yes	110	6	6
33	26	Thunchathacharya UP School		Yes	Yes	100	6	2
34	31	Attadappa LP School						
35	31	AttadappaNo.II LP School						
36	17	Chelora Govt. Higher Secondary School	Yes					
37	31	ChinmayaVidyalaya		Yes				
38	4	Carithas Hostel		Yes	Yes			
39	11	Dhanalakshmi College of Nursing		Yes				
40	3	Edacheri LP School						
41	46	Govt. TTI (Men)		Yes				
42	36	Hostel (Near Edakkad VO)						
43	5	SN Hostel, Talap		Yes				
44	11	Korjan UP School						
45	19	MacheriMappila LP School		Yes				
46	18	Macheri New UP School		Yes				
47	17	Mappila L P School, Vattapoyil						

48	19	Peringalayi LP School						
49	32	Technical High School						
50	21	Women's College, Varam						
51	32	Govt. Polytechnic College Hostel			Yes			
52	4	Auditorium (Near Mookambika Temple)			Yes			
53	18	Auditorium (Near Trenching Ground)			Yes			
54	31	ChinmayaVidyalaya Hostel 1			Yes			
55	31	ChinmayaVidyalaya Hostel 2			Yes			
56	31	ChinmayaVidyalaya Hostel 3			Yes			
57	16	Dinesh Auditorium			Yes			
58	32	Govt. Polytechnic College			Yes			
59	6	Hostel (Near jail)			Yes			
60	12	Hostel (Near Korjan School)			Yes			
61	48	Hostel (Sports Hostel)			Yes			
62	6	Hostel, Sreepuram			Yes			
63	6	Hostel, Sreepuram			Yes			
64	23	Kannur Indoor Stadium	Yes		Yes			
65	6	Krishna Menon Memorial Women's College	Yes		Yes			
66	6	Krishna Menon Memorial Women's College Hostel			Yes			
67	29	S.N College			Yes			
68	29	S.N College Hostel			Yes			
69	6	Working Women's Hostel, Sreepuram	Yes		Yes			
70	21	ElayavurDarmodaya m LP School						
71	14	Pallipram UP School			Yes			
72	9	Puzhadi North UP School						

73	29	SN Trust School						
74	36	South UP School, Kizhunna						
75	20	Thilanur North UP School						
76	21	Varam UP School						
Total		**3125**						

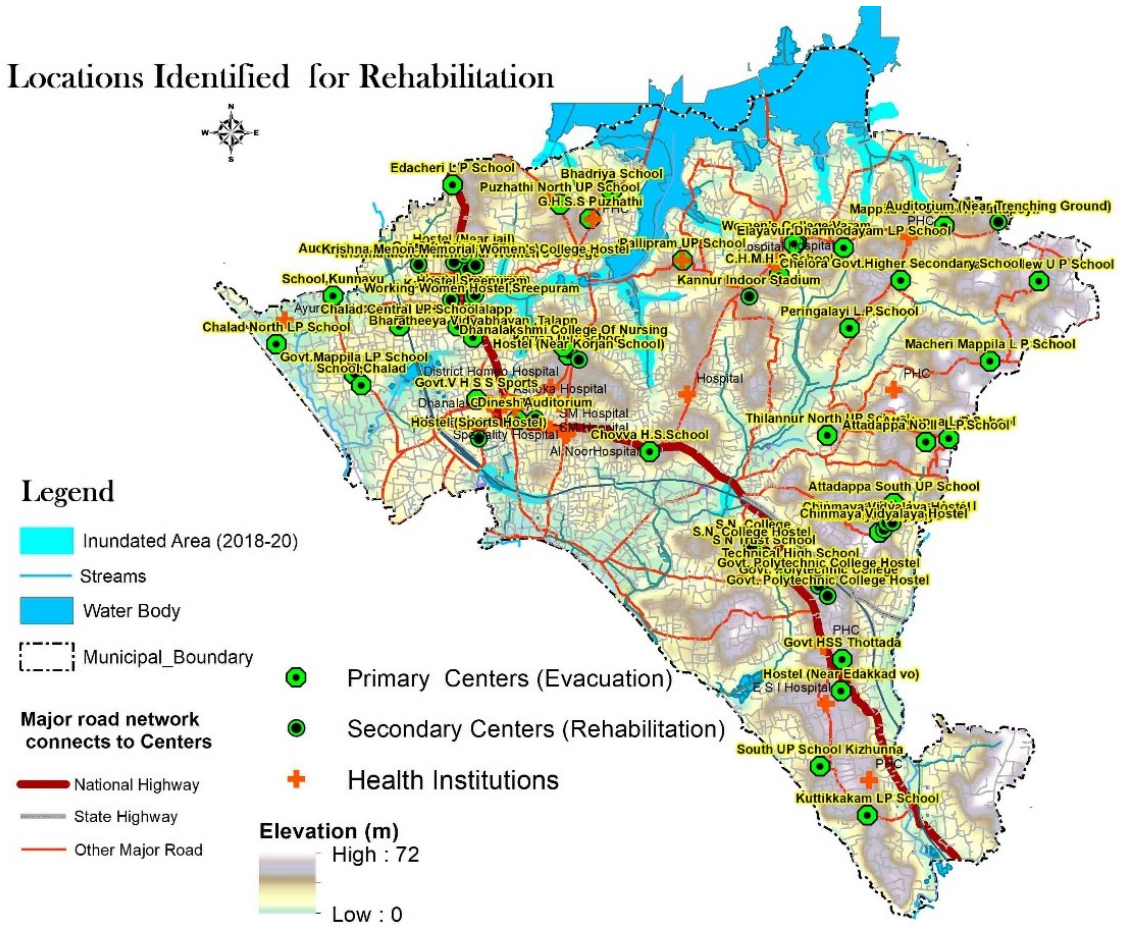

Figure.22.15 Location of Rehabilitation centres at Kannur Municipal Corporation

22.9.3 SAFE ROUTE AND POTENTIAL CAMP LOCATIONS OF KANNUR MUNICIPAL CORPORATION

Details of safe route and potential camp locations of the study area is shown in Figure.22.15.

From the map, it is clear that all potential camps are located within a shorter distance from hazard prone areas and safer routes are also available for easy evacuation. Also, most of these rehabilitation centres are located along the NH and other major roads.

Since these centres are at 50m above MSL, none of these centres as well as the network will be affected by flood.

22.9.4 ANALYSIS OF CATCHMENT OF SHELTERS AGAINST SETTLEMENT

Details of the number of the maximum number of people with social distancing that can be accommodated and the actual number of people that were actually needed to be accommodated during the flood 2018 and 2019 were studied.

From the Table.22.2 and 22.4, the number of people to be accommodated with social distancing is higher than that of the capacity available. Hence it is necessary to establish more rehabilitation centres with best infrastructure for multipurpose facilities as they can be used not only as evacuation centres during calamities but also as DCC/CFLTC camps. Also they can be used for the rehabilitation of the destitutes too. The infrastructure facilities like kitchen, toilets and bathrooms need to be upgraded in the identified camps.

22.10 MITIGATION MEASURES

22.10.1 FLOOD

- Proper warning to the people in right time
- Finding location for rehabilitation centres
- Provide swimming training to the people
- Teach people in the area how to prepare an emergency kit at any time
- Paddy and wetland conservation
- Proper maintenance of drainage network
- Mental and physical assistance to face after effects
- Special attention is needed in the flood prone areas
- KMBR 2019 rules should be strictly enforced when building application is received

22.10.2 EPIDEMICS/PANDEMICS

- Ensure hygienic lifestyle for people
- Provide better treatment facilities
- Provide sufficient health service
- Proper warning to the people at the right time
- Awareness campaigning
- Finding location for rehabilitation centres
- Mental and physical assistance to face after effects

22.10.3 DROUGHT

- Rain water harvesting as well ground water recharging techniques
- Initiatives to recycle polluted water
- Awareness of water conservation
- Conservation of existing water bodies

22.10.4 COASTAL AREA DISASTERS

- Proper warning to the people at the right time
- Finding location for rehabilitation centres
- Awarness in preparing an emergency kit at any time
- Special attention is needed in the coastal erosion prone areas
- KMBR 2019, CRZ rules should be strictly enforced when building application is received

22.10.5 FIRE

KMBR 2019 rules should be strictly enforced when building application is received

22.11 INFERENCE

After studying various disasters affected in the district as well as city level, some mitigation measures are recommended.

Since the Corporation area comes under moderately safe condition, adopting these measures will be useful to reduce the severity of a disaster due to these natural as well as unexpected calamities. There is a good road network connecting all the important identified rehabilitation centres which are located at 50m above MSL; None of these centers as well as the network will be affected by flood. Also, they should be for multipurpose usage with suitable infrastructure facilities like kitchen, toilets and bathrooms. Hence they can be used not only during natural calamities, but also for quarantine centres like DCC/CFLTC camps. Also they can be used for the rehabilitation of the destitutes too.

Road conditions can be improved by building proper drainage, solid waste disposal units and public toilets which are the hallmarks of a healthy city too.

Regulations in the land use pattern are necessary to minimise the causalities caused by hazards. Hence the sustainable development of the study area can be ensured which will be helpful for the conservation of ecosystem as well as nature which in turn plays a role in the reduction of natural calamities up to a limit.

The major hazard found out within the Corporation area is the presence of flood plain areas along the rivers and streams. Some development regulations in the form of built-form regulations are necessary within this risk area for mitigating the disaster, for easy evacuation, and also for saving the life and property of the inhabitants there.

Occasional coastal erosion at two or three areas is another hazard and strengthening of existing seawalls and construction of new seawalls are the only solution for mitigating the damages caused by the high tidal waves.