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Dynamics of Mangrove Distribution due to Urbanization and Population in the Coastal Zone of Kannur

M Ramya[1]*, **T S Lancelet**[2]

1 *Research Scholar, Department of Geography, SSUS, Kalady, Kerala, India*
2 *Professor, Department of Geography, SSUS, Kalady, Kerala, India*

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* **Corresponding author**.
ramyamohan.ms@gmail.com

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Abstract

The term "mangrove ecosystem" describes how the various components interact and depend on one another. Among the most endangered ecosystems worldwide is the mangrove wetland habitat. Mangroves have a key role in reducing the effects of cyclones, coastal erosion, sea level rise, and tsunamis while also protecting shorelines and sequestering carbon. Locals can make a living from the distinctive mangrove ecology, which is ideal for the wide diversity of fish and associated species. In all districts of Kerala, mangroves are found along the coast. Mangroves are most abundant in the Kannur district, followed by Ernakulum and Calicut. Urbanization and population growth have had a detrimental effect on the delicate mangrove habitat. This study looks at how urbanization, functional character and population effected on mangrove distribution.

Keywords: Mangrove ecosystem; Wetland habitat; Climate change; Shoreline protection; Cyclones; Coastal erosion; Sea level rise; Tsunamis; Urbanization; Functional character; Mangrove ecology

1 Introduction

Mangroves are vital to the coastal ecosystems in which they reside. Mangrove ecosystems are uncommon coastal wetlands with high productivity that can be found in tropical and subtropical regions all over the world. According to Giri et al (2011)[(1)] the current estimate of mangrove forests of the world is less than half of what it once was, and reductions suggest that 30–40% of coastal wetlands and 100% of mangrove forests could be lost in the next 100 years if the present rate of loss continues. Population and urbanization are the two major factors responsible for the reduction of mangrove cover. Urbanization is the process in which a sizable percentage of the population establishes permanent residences in relatively small areas, leading to the creation of cities. Urban development is considered a driver for the loss and fragmentation of mangrove forests[(2)]. Floristic diversity of mangroves in Kannur is very rich as compared to other districts of Kerala[(3)] The distribution of mangrove forest reduced drastically over the periods all over the world. The same way that is happening in India as well as Kerala.[(4–12)]

2 Study area

Kannur is one of the 14 districts of the Indian state of Kerala that run along the west coast. Between latitudes 11° 40' to 12° 48' North and longitudes 74° 52' to 75° 56' east is the Kannur

district's coastline zone. The district's midland area makes up the eastern portion of the coastal zone, while the southern portion is bordered to the west by the Arabian Sea and Kozhikode district. The distribution of mangrove forests in Kannur's coastal zone is covered in the study. The coastal zone includes the municipalities of Payyannur, Andoor, and Thalassery, as well as one municipal corporation, Kannur. Twenty-one Panchayaths are included in the coastline zone. Kannapuram, Mattool, Kalliassery, Azhikkode, Pappinissery, Kolachery, Munderi, Narath, Valapattanam, Chirakkal, Eranjoli, Pinarayi, Dharmadam, Muzhappilangad, Madai, Cherutthazham, Ezhome, Pattuvam, Cherukunnnu, and Kunjimangalam.

Objectives

1. To identify the impact of population distribution on Mangroves.
2. To examine the effects of urbanization on mangroves in Kannur's coastal region.

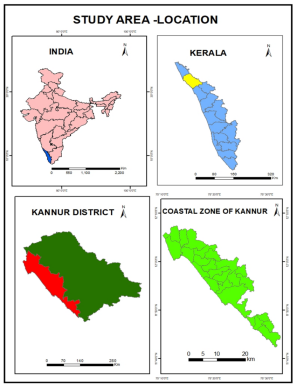

Fig. 1.

3 Methodology

For the present study data were collected from both primary and secondary sources. This will be analysed using the urbanisation and population characteristics of the coastal zone of Kannur. This study examines the regional distribution of urbanization and mangroves between 1991 and 2021.

- Data regarding population and urban aspects have been collected from India's census.
- Secondary data was collected from various governmental and non-governmental agencies.
- Data related to mangroves was collected mainly from primary data using a GPS survey and field investigation for the study.

4 Results and discussions

Understanding a region's demographics is crucial for its sociocultural and physical aspects, and understanding geography is important for sustainable planning and natural resource management. Decrease of Sunderban mangrove were probably due to the massive increase of population, i.e. more than 20% per decade and subsequently with the establishment of new settlements as well as expansion of old ones in the entire Sunderban region [13]. Natural resources suffer when population increase is out of proportion. Over the world's coastal regions, population growth and their dense distribution pattern are noticeably higher. The Kannur coastal zone exhibits the similar pattern.

Table 1. Growth of population in Kannur District

Census Year	Population	% Decennial Variation
1991	22,51,727	16.63
2001	24,08,956	6.98
2011	25,23,003	4.73

Source: District census reports

The Kannur district population is 25,23,003 as per the 2011 Census, constituting around 7.56% of the state population. The population density of Kannur district is about 852 persons per km^2. The district has 5 Taluks namely Taliparamba, Kannur, Thalassery, Iritty and Payyannur. The Table 1 showing decadal growth of population from 1991- 2011. Total population was increasing but growth rate was gradually reducing.

The population distribution pattern in Kannur's coastline zone is unequal throughout the various administrative divisions. There is increased population pressure in the coastal zone's urbanized areas. Approximately two-thirds of Kerala's population resides in the coastal districts. As a result, coastal settlements have an extremely high population density, with 677–2159 person per square kilometre. Increased multi-user conflicts and faster degradation of the region's coastal resources are the results of increasing population pressure and the corresponding shift in land use patterns.

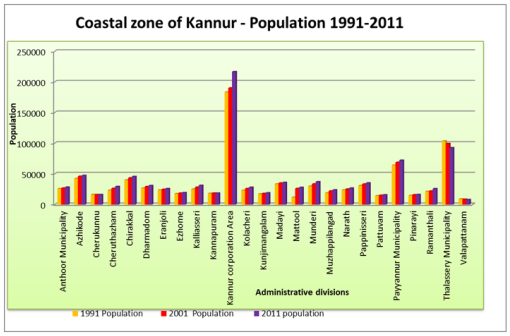

Fig. 2.

Kerala's Kannur district saw significant demographic fluctuations between 1991 and 2011 (Figure 2). This represents a growth rate of roughly 6.7% from 2001 onward. In 2001–2011, the population reached 2523003, a slower growth rate of roughly 4.73%. The most substantial population explosion experienced in urbanised area of the coastal zone of Kannur. Especially in Kannur corporation area followed by Payyannur municipality and Azhikkode Panchayath. Population increased in all the administrative divisions except Thalasseri municipality. There was more population pressure in Kannur city than anywhere else. The middle and southern regions of Kannur's coastal zone have the densest populations. Figure 4 shows Mangrove change from 1991 to 2021 with respect to population change in the coastal zone of Kannur district.

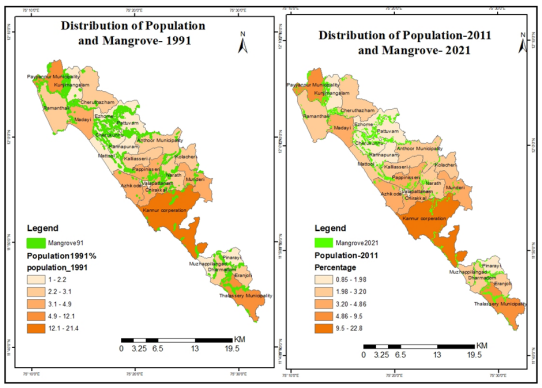

Fig. 3.

In comparison to other parts of the coastal zone, mangroves are more prevalent in the northern portion of Kannur's coastal zone where there is very little population dispersal except for Payyannur municipality. The mangroves' highest density was found in the low-population areas of Cherukunnu, Ezhom, and Kunhimangalam Panchayaths. In 1991, Kannur had approximately 22.2 sq. km of mangroves, but this reduced to 12.47 sq. km, marking a loss of about 9.73 sq. km (44% decrease). Rate of Decline over a period of around 30 years, this represents an average annual reduction of 0.324 sq. km per year. Encroachment of land for resources and population pressure on land is the major reason behind the decline of mangroves in coastal zone of Kannur.

4.1 Trend of Urbanization in Kerala and Kannur

Instead of greater industrialization, as is the case in Tamil Nadu, Maharashtra, Andra Pradesh, and Karnataka, the main cause of urbanization in Kerala is the expansion of the territorial sector. Kerala had an urbanization rate of 65% in 2011, which was much higher than the then-average 31% for the country. In Kerala, the urbanization process

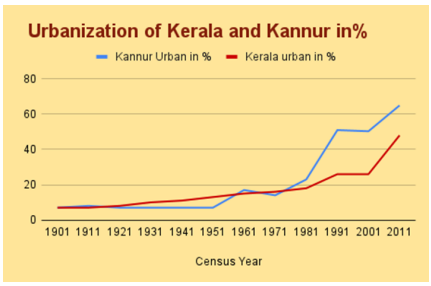

Fig. 4.

spread to semi-urban and smaller towns. Of 2011, the rate of urbanization of Kannur was 48%, compared to 26% in 2001 (Figure 4). In a span of ten years, the urbanized area grew rapidly. Within the decade from 2001 to 2011, Kerala's urban population grew by 22% (26% and 48%, respectively). In the 2011 Census, the Kannur district's urbanization rate rose from 26% in the 2001 Census to 47%.

As the district's administrative centre, Kannur has sway over the entire area. The two main urban centres in the district are Thalassery and Kannur, which are only 23 kilometres apart. To a certain degree, these two towns operate as twin towns.

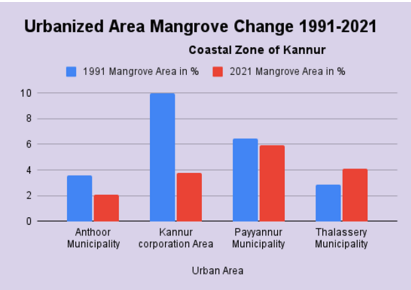

Fig. 5.

There are four major urban areas in the coastal zone of Kannur (Figure 5). Anthoor Municipality, Kannur Corporation, Payyannur municipality and Thalasseri Municipality. According to the 2011 Census, 65.04% of Kannur's entire population resided in urban areas. In Kannur's coastal zone, semi-urbanized areas are densely populated and growing quickly, illustrating the rural-urban transition. The mangrove cover decreased as a result of this change. Mangroves were widely dispersed in the urbanized regions of Payyannur, Kannur Corporation, and Anthoor municipality in 1991. Between 1991 and 2021, the proportion of mangrove cover in Kannur Corporation's urbanized areas decreased from 10% to 3.8%. About 62% of the initial mangrove area was lost in mangrove cover, a 6.2% decline. The Kannur Corporation's rapid development is probably going to cause the mangrove area to be converted to built-up space. The population of Kannur Cor-

poration's coastal areas has increased significantly.

4.2 Functional Character and Distribution of Mangrove in the coastal zone of Kannur

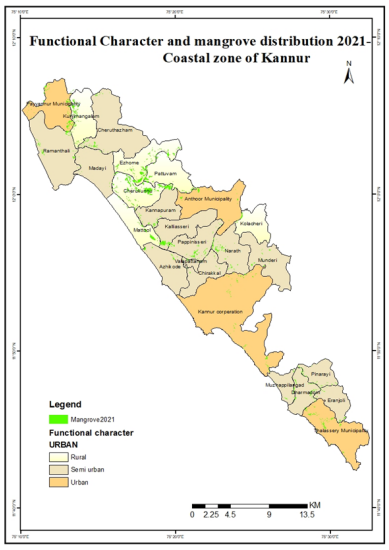

Fig. 6.

The functional character and distribution of mangroves throughout Kannur's coastal zone are shown on Figure 6. In Kannur's coastal zone, there are four main urban administrative units. 65.04% of Kannur's total population, according to the 2011 Census, resided in urban areas. According to the 2011 census, all residents of Kannur, Edakkad, and Thalassery are classified as urban. The Kannur urbanization report's administrative divisions of coastal zone areas into rural, semi-urban, and urban areas are depicted on Figure 6.

The rural administrative divisions of the coastal zone area contain more than half of Kannur's mangroves. Kunhimangalam, Ezhom, Pattuvam, and Cherukunnu account for 52% of Kannur's total mangrove cover. 16% of the total mangrove cover is shared by these regions. High densities and quick expansion of semi-urbanized areas characterize Kannur's coastal zone, which illustrates the rural-urban transition. This change resulted in less mangrove cover. In 1991, mangroves were widely dispersed in the urbanized regions of Anthoor municipality, Kannur Corporation, and Payyannur. In 2021, Kannur's mangroves were undoubtedly concentrated in rural areas.

5 Conclusion

Severe damage and loss of mangroves identified in Kannur Corporation, Payyannur, mainly due to urbanisation and population explosion. Despite of high population density and urbanization, mangrove area increases about 1.2% in Thalassery municipality, mainly due to several conservation efforts. The reduction of mangroves in Kannur highlights the urgent need for conservation efforts to prevent further loss. A multi-stakeholder strategy involving the government, local communities, and environmental organizations is needed to address this issue. Mangrove ecosystem restoration can help mitigate climate change, preserve coastal populations, and maintain wildlife. Policy makers, urban planners, and communities must work together to achieve sustainable interdependence and existence of ecosystem.

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