**Research Article**

# IDENTIFICATION OF FUNCTIONAL AREAS USING GEOSPATIAL TECHNOLOGIES FOR URBAN PLANNING: A CASE STUDY OF KANNUR DISTRICT, KERALA STATE, INDIA

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**A B S T R A C T**

The last two decades have witnessed high population growth in India's urban areas. In Kerala, urban population content has increased from 7.1% in 1901 to 26.40% in 1991. A slight decline in this proportion to 26% has been recorded in 2001 census. The process of urbanization of an area can be assessed in relation to its urban population content. The urban population content of Kerala state is 47.72%, whereas that of the Kannur District is 65.04%. Kannur, being the administrative headquarters, of the district has an influence over the whole district. GIS database provides invaluable inputs, not only for planning of infrastructure like road, sewerage and drinking water, but also helps to manage important services to various stakeholders. All the above planning components are interlinked with each other. Moreover, the whole municipal planning is related with the regional planning and the planning of neighboring municipalities. It is possible to integrate slum development plan with infrastructure development as well as the local economic development plan. In a democratic setup, this GIS framework simultaneously provides transparency to the elected representatives who run the municipalities and to the stakeholders.

## INTRODUCTION

Functional character of a region is determined based on the population distribution within the region, average plot size and land use of that area. Function of a settlement is determined based on the major activity within the settlement. This may be rural if agriculture and allied activity or urban if secondary or tertiary sector activities. The methodology used here to determine the major functions of the settlements are by studying the land use and the average plot size within the settlement.

Urbanization is the process of conversion of territories from rural to urban or is defined as the process by which the increases in concentration of population in urban settlement. This is mainly because of three reasons. Natural growth, net immigration and changes in the urban area jurisdiction.

Urbanization is a prime indicator of national development. The level of urbanization is considered as an important indicator of the economic and social progress of a country. The growth of urban population of the Kannur district as well as urban area is increasing. This is contrary to the general trend of rural areas of coastal belt gradually urbanized. This necessitated a study on the urbanization pattern of the district.

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Planners have to study the process of urbanization of an area because this is one of the main criteria considered in the planning process.

The settlement pattern in Kerala is unique with a rural urban continuum and hence cannot classify a settlement as rural or urban. There exist characters of both urban and rural area. This may lead to semi urban and semi-rural areas along with urban and rural based on the analysis of land use and plot size. An area can be classified as semi urban, if there exists both urban and rural activities but the predominant activity is urban. If the predominant activity is rural, it is classified as semirural area. Considering the above facts an attempt has made to formulate a development plan for Kannur district.

### Objective

1. To prepare a developmental plan for Kannur district using GIS
2. To identify the service area and suggest the hierarchy of settlement.

### Database

For the present study data were collected from both primary and secondary sources which will be analyzed by the size of population and functional characteristics of the district.

- Data regarding the demographic aspects have been collected from the Census of India.
- Secondary data were collected from various governmental and quasi governmental agencies.

- Analysis of data was done by using cartographic and statistical techniques.
- Generation of geo-database, analysis, decision making and representation was done using Arc GIS software.

## ANALYSIS AND DISCUSSION

### Settlement Classification

The settlement pattern in Kerala is unique with a rural urban continuum and hence cannot classify a settlement as rural or urban area. Functional aspects of the towns as spelt out by labour participation rate in the primary, secondary and tertiary sectors like industry, commerce, transport, service etc have been dealt with here.

- Agriculture and allied activities
- Secondary & tertiary sector activities
- Combination of 1 & 2 (Semi rural or semi urban)

Categorizing the land use into the major heads under neutral land use, urban land use (Commerce, Industrial, Residential, and Mixed built up), rural land use and residential – agri – mixed land use.

Based on the above criteria the entire Local Self Government of the district is classified in to urban, semi urban, semirural and rural and tabulated in the table 1 below and its spatial distribution is shown in the fig.1.

**Table No 1**

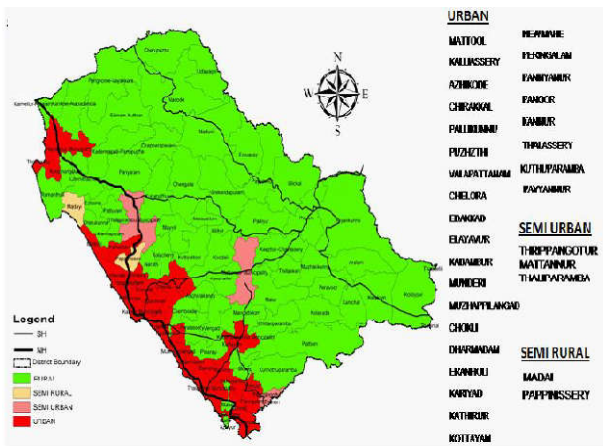| Average plot size (cents) | Category of Res. / Ag. Mix |
|---|---|
| Plot size less than 25 | Urban |
| Plot size 25 – 30 | Semi Urban |
| Plot size 50 -75 | Semi Rural |
| Plot size > 75 | Rural |



Fig No 1 Functional classification of LSG's

### Existing Hierarchy Settlement

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

- Educational facilities
- Health facilities
- Market
- Facilities in agriculture and allied sector
- Physical infrastructure facility
- Transportation facility

The spatial distribution of the settlements is shown in the fig 2.1. The first order and second order settlement are along National Highway 17.

At present first order towns namely Thalasserri and Kannur are I$^{st}$ grade municipalities and the 2nd order settlements Taliparamba and Payyannur are II$^{nd}$ grade municipalities.

Among the nine third order settlements include two III$^{rd}$ grade municipalities namely Koothuparamba and Mattannur which are situated along the State Highway connecting Coorg district of Karnataka state.
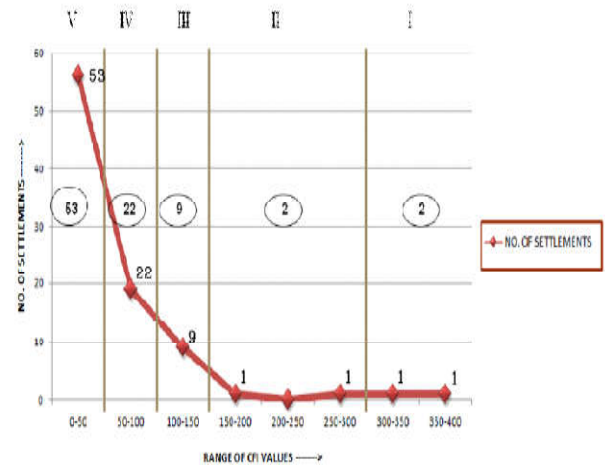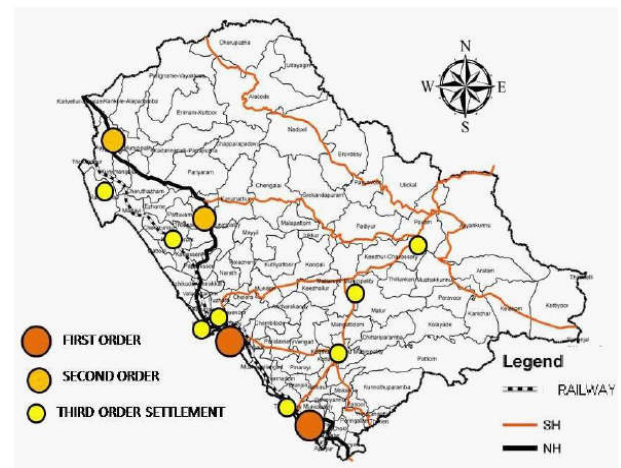


Fig No 2 CFI v/s No. Settlement graph



Fig No 3 Spatial distribution

### Suggested Hierarchy of Settlements

One of the uniqueness of spatial planning is the identification of the future hierarchy of various settlements of a region based on certain factors like the trend of physical development, location importance, administrative status of settlements, trend of urbanization in the next twenty years and existing hierarchy of settlements. Various theories are there elaborating the hierarchy of settlements, its service area, and location of lower order settlements with respect to the higher order settlements. Christaller's central place theory is a well-accepted theory in this regard. The study attempts to identify the proposed hierarchies of various settlements of the district based on these concepts.

### Proposed Hierarchy of Settlements - Methodology Adopted

The methodology adopted to identify the proposed hierarchy is explained here. The concept as per the Christaller's Central

place theory in identifying the proposed hierarchy of the settlements is that spatial distribution of settlements of various hierarchies should be such that they shall be centrally located (as far as possible) with respect to the service area or service population to be served. Theoretically speaking, there will be one first order settlement serving the entire region (District). The service area of a settlement is hexagonal in shape as per the Christaller's theory. But practically the service area of the first order settlement cannot be taken as hexagonal but it is actually the entire district. This limits the identification of the second order settlement by Christaller's Central Place theory. The Christaller's Central Place theory stipulates that the lower order settlements are placed at the vertices of the hexagonal shaped service area of the higher order settlement. But here there are only two first order settlements and one of them is the south-west sub region. Hence it is assumed that there are at least three second order settlements one from each of the remaining sub regions (North-East division, North-West division and South-East division of the district). The service areas of the second order settlements are delineated by drawing the perpendicular bisectors to the straight line connecting the second order settlements. This area may form a hexagon or part of hexagon in shape. The vertices of the hexagon determine the location of the next lower settlements i.e. the third order settlement. The service area of the third order settlement can be delineated as hexagonal in shape. The remaining settlements of the district are assumed to be having the lowest order, i.e. the fourth order.

### Proposed Hierarchy of Settlements - Procedure Adopted

The existing hierarchy of the settlements in Kannur district shows that the settlements here fall under five hierarchies viz. I order settlement, II order settlements, III order settlements, IV order settlements and V order settlements.
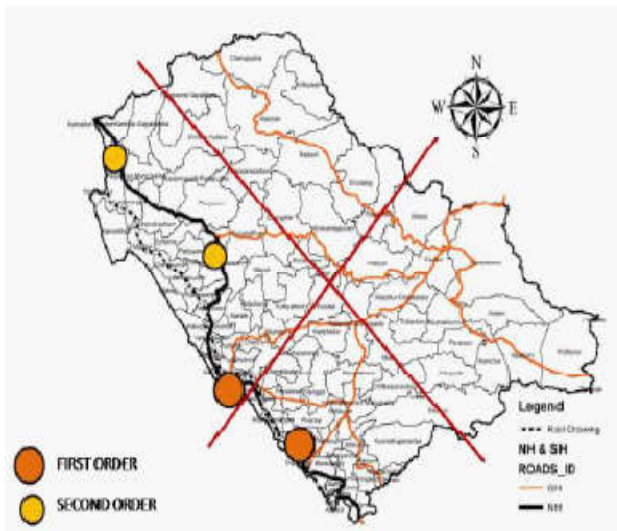


Fig No 4 Existing I$^{st}$ and II$^{nd}$ order settlement

From the figure it is clear that there are no second order settlements from the North – East and South – East division of the region. Christaller's theory (as per the theory the lower order settlements will be placed at the vertices of the hexagonal service area of the higher order) cannot be applied here as the entire district is assumed as the service area of the first order settlements.

Hence a second order settlement is identified from the North - East and South - East division based on the following criteria

- Administrative status of the settlements
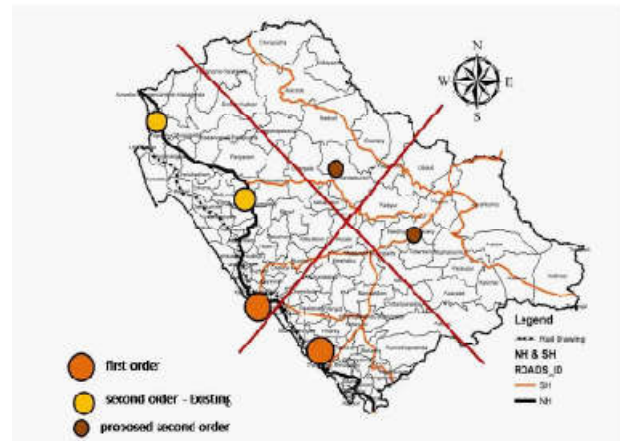- Centrality
- Connectivity
- Existing hierarchy



Fig No 5 Projected II$^{nd}$ order settlement

That settlement with maximum preferred values in the above criteria in each of the division is taken as the third order settlement from the division. Accordingly Sreekandapuram from the N-E division and Keezhur – Chavasserri from the S-E division are identified as the future second order settlements.

The identified future second order settlements are (refer Fig No. 6)
- Payyannur
- Thaliparamba
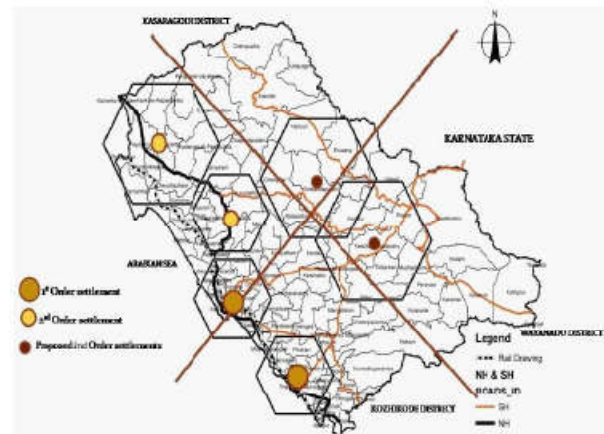- Keezhur- Chavasserri

Sreekantapuram



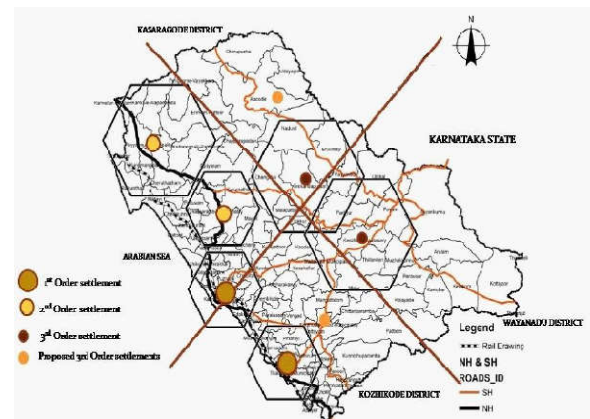Fig No. 6 Service Area of II$^{nd}$ order settlements



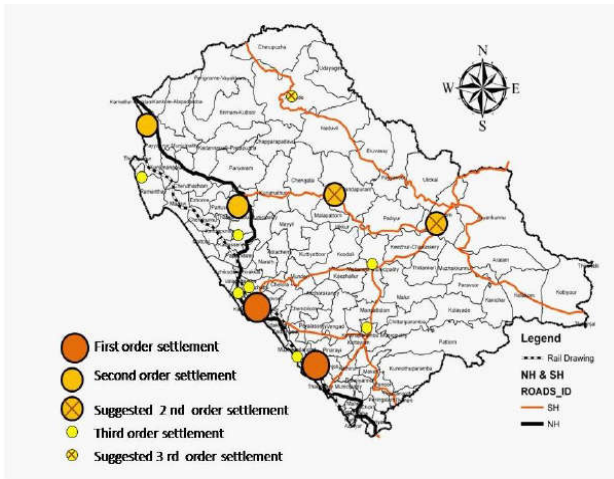Fig No 7 Service area of III$^{rd}$ order settlements

**Fig No 8** Suggested hierarchy of settlement

As per Christaller's theory, the lower order settlements will fall in the vertices of the hexagonal service area of the higher order settlements. This means that the third order settlements will be those settlements coinciding with the vertices of the hexagonal service area of the second order settlements. These settlements can be taken as the third order settlements.

But while providing the hexagonal shape to the service area of each centers a void found in NE and SW quadrant. Here Alakkod and Koothuparamba are taken as the third order settlements after comparing the physical development and facilities in these two LSGs.

Theoretically the service area of each of these third order settlements will be uniform and hexagonal in shape. Five hexagons of equal shape with the third order settlement as the centre are fixed. As per Christaller's theory the higher order settlements will function as the lower order settlements as well.

Hence the service areas of the higher order settlements (first order settlements and the second order settlements), when they function as the third order settlement also are to be delineated. The service areas of these higher order settlements are also hexagonal in shape.

Based on the criteria Centrality, Connectivity, and existing hierarchy, Alakkod and Koothuparamba are selected.

In the remaining areas in sub regions, it is assumed that both second order settlements will function as third order settlements of the sub region catering the needs of the third order settlements. Alakkod in the north east quarter and Koothuparamba in the south west quarter will act as third order settlements. The spatial distribution of the third order settlements and the adjusted service area are shown in Fig 7.

As per the proposed hierarchy of settlements there are two first order settlements, four second order settlements and nine third order settlements in the district. The character wise analysis of this higher order settlements shows that the first order settlements Kannur and Thalasseri municipalities are purely urban in nature. Out of the four second order settlements Payyannur and Thaliparamba municipalities are existing urban areas. Keezhur Chavasseri and Sreekantapuram are the other proposed second order settlements. Among the third order settlements Pallikunnu, Puzhathi and Cantonment are near to Kannur Municipality. Dharmadom near Thalasseri

municipality, Kalliasseri which is near to Thaliparamba municipality and Ramanthali near Payyannur municipality. In municipalities Koothuparamba and Mattannur are the other two third order settlements. Among the proposed third order settlements Alakkode is the ninth one at the north east of the district.

## CONCLUSION

The process of urbanization and the resulting pattern of settlement are unique in Kerala. The process of urbanization is palpable and the urban growth are concentrated and definite elsewhere in India. Whereas in Kerala, there exists urban- rural continuum. It is very difficult to distinguish the beginning of an urban area or a rural area in Kerala. A big urban area like Chennai, Hyderabad or Bangalore which attracts economic activities and creating development impulses is absent in Kerala.

Kannur, one of the northern most district of Kerala, also exhibits the same pattern of settlement as the state has. From the above study it can be concluded that the level of urbanization of the state shows a declining trend in general.

Kannur district shows high level of urbanization when compared to the state average. And also, the level of urbanization shows an increasing trend within the district. The urban areas of the district shows lower growth rate of population whereas the rural areas surrounding the statutory urban towns show significantly higher growth rate indicating possible out migration of people from the urban centers to the surrounding urban settlements. This happens mainly due to the availability of urban facilities in these settlements.

The spatial distribution of urban centers in Kannur district shows a healthy situation. The lowland area in the district shows most urbanized comparing to eastern hilly areas. Out of 87 LSGs 38 are listed as urban as per census (2001) among these include 6 municipalities and Kannur cantonment. Major development projects happened in recent years includes Naval Academy, National Institute of Fashion Technology, Industrial park and the Container Frieght Station. The other major projects ongoing are Kannur International Airport, Azhikkal sea port and Coast guard Academy. All these development activities help the growth of urbanization of the district. The urban continuum in Kannur urban area shows a thrust and need to become Kannur Corporation, by merging adjacent urban settlements. Similarly Keezhallur panchayat were the work of Kannur International Airport is in progress will recently merge with the Mattannur municipality in near future.

Keezhur – Chavassery the heart of hill trade centre also on its way to become a municipality. The study shows 45 LSGs become urban status by 2021 in Kannur district.

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