



Spatial Analysis of Rural Settlement Dispersion Index in Jalna District Using GIS Techniques

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Abstract:

The main objective of the current analysis is to identify the various types of rural communities in the study region and the factors that affect them. For a thorough examination of rural communities, the degree of concentration has been determined using Bernard's (1931) approach. The majority of the secondary data utilized in this study came from the Jalna District Census Handbook for 2011. This estimated index shows that the Badnapur and Ghansawangi tehsils have a relatively high concentration of settlements due to favourable natural factors such as rich soil and the availability of adequate irrigation infrastructure. Some of these places are occupied by the Godavari River. The research region's eastern part, which is mostly in the Mantha tehsils and is characterized by a mild topography, has a low index of concentration. The index of concentration is moderate in the tehsils of Jafrabad, Bhokardan, and Ambad in the research region.

Keywords: Concentration Index, Compact, Semi Compact, and Dispersed

Introduction

Settlement studies are significant in the subject of geography because they are considered a fundamental expression of the interaction between humans and the environment (Sharma, 2015). The settlements are thought of having concentrated populations. The arrangement of people and their dwellings is frequently referred to as a "human settlement". A settlement is a location where people choose to make their permanent home. Two main groups of human settlements are distinguished by variables such the number of inhabitants, way of life, type of occupation, and socioeconomic characteristics. Both rural and urban settlements are what they are. People who work in non-agricultural businesses are found in urban centres, whereas those who work in agriculture and allied industries are mostly found in rural regions (R. L. Singn, 2002). Numerous other geographers have used a variety of criteria and statistical methods to explain the various types of rural communities. A rural community, as opposed to its urban cousin, is a simple, small group of homes in a handy location (Singh & Kumar, 2018). The concentration of settlement indicates the total area under settlement, often known as the built-up area (Nandi and Mistri, 2018). R. L. Singh (1955) distinguished between four main types of settlement: compact settlements, semi-compact (fragmented or hemleted groups), scattered or dispersed settlement, and semi-compact (hamleted cluster). Every human community is different, depending on their local circumstances. Thus, in rural communities, there is a reciprocal relationship between the environment and human occupancy characteristics (Singh, 1961). India's settlement structure varies, from scattered to nucleated, and from tiny hamlets to large villages, according to Dey and Bhaduri (2016). Compact settlements are mostly found in the extremely productive alluvial plains, whereas scattered settlements are typically found in areas with an extreme climate, poor land for agriculture, regions of extensive cultivation, and areas in which farmers must live on crops rather than in villages (Majid Husain, 2018). Many remote settlements in underdeveloped countries lack proper infrastructure (Ruchi, 2020). The kind and structure of rural communities are directly influenced by the geographical and economic conditions of the surrounding area. Therefore, not every place on earth views colonies in the same manner.

Objective

- 1) To analysis the types of rural settlement.
- 2) To study the concentration index using the Bernard method.

Study Area

On May 1st, 1981, the Aurangabad district shared creation to the Jalna district. It is situated in the Marathwada area in the centre of the state of Maharashtra. The district is situated between latitudes 19°-15' and 20°-32' north and longitudes 75°-36' and 76°-45' east. This district spans 150 kilometres in the north and 110 kilometres in the east and west. Jalna district is shaped like a crescent. Its borders are Beed on the south, Aurangabad on the west, and Parbhani on the east. district bordering Jalgaon district to the north

Location Map

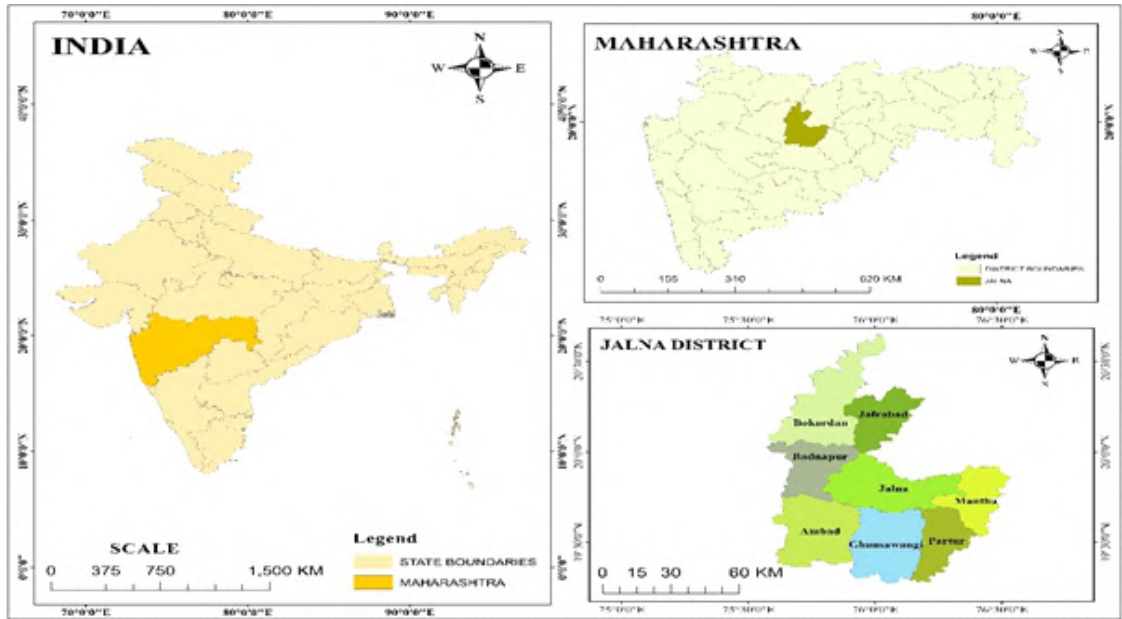


Figure No. 1

Methodology:

Determining the district's degree of concentration (Index) for the 2011 census is the goal of the current study. The Jalna district, which is seen here, was carefully chosen for this study. The secondary sources provided the data for this work. The Jalna District Handbook provides the data needed for the analysis. Refers to a method for computing Bernard's approach and applying the following formula, which he utilized to get the degree of concentration index, while discussing the geographical variations of settlement dispersion:

Degree Concentration Index

$$K = \frac{S * M}{N^2}$$

Where,

K = Degree of Concentration

S = Area of the Tehsil

M = Total number of houses in the tehsil

N² = Total number of settlements in the tehsil

Result and Discussion

A simple formula was used to determine the index of concentration using the Bernard

approach. Every tahsil village in the Aurangabad district has a particular type of rural settlement depending on the index of concentration. They are settlements that are semi-compacted, semi-dispersed, semi-sprinkled, and compact. Table No. 2 and Figure No. 2 show the different types of settlements and the degree of settlement concentration in the research region.

Table No. 1 Jalna District: Types of Settlement 2011

Sr. No	Tehsil	Area (kmsq.)	No. of Villages	No. of Household	N ²	K	Types
1	Bhokardan	1,175	158	58,496	24964	2752.88	SC
2	Jafrabad	725	101	34,404	10201	2443.46	SC
3	Jalna	1,087	149	46,664	22201	2284.35	SS
4	Badnapur	778	91	30,445	8281	2860.64	C
5	Ambad	1,148	137	45,009	18769	2751.83	SC
6	Ghansawangi	1,119	117	42,903	13689	3506.89	C
7	Partur	728	97	28,615	9409	2213.11	SS
8	Mantha	823	117	34,372	13689	2066.06	D

Source: Computed by researcher

Table No. 2 Degree of Concentration Index

Sr. No.	Types of settlement	Index Range	Tehsil	Total No. of settlement	Total area (%)
1	Compact	<2800	Badnapur, Ghansawangi	208	25.02
2	Semi Compact	2300-2800	Jafrabad, Ambad, Bhokardan	396	40.19
3	Semi Sprinkled	2100-2300	Partur, Jalna	246	23.94
4	Dispersed	0-2100	Mantha	117	10.85

Source: Computed by researcher

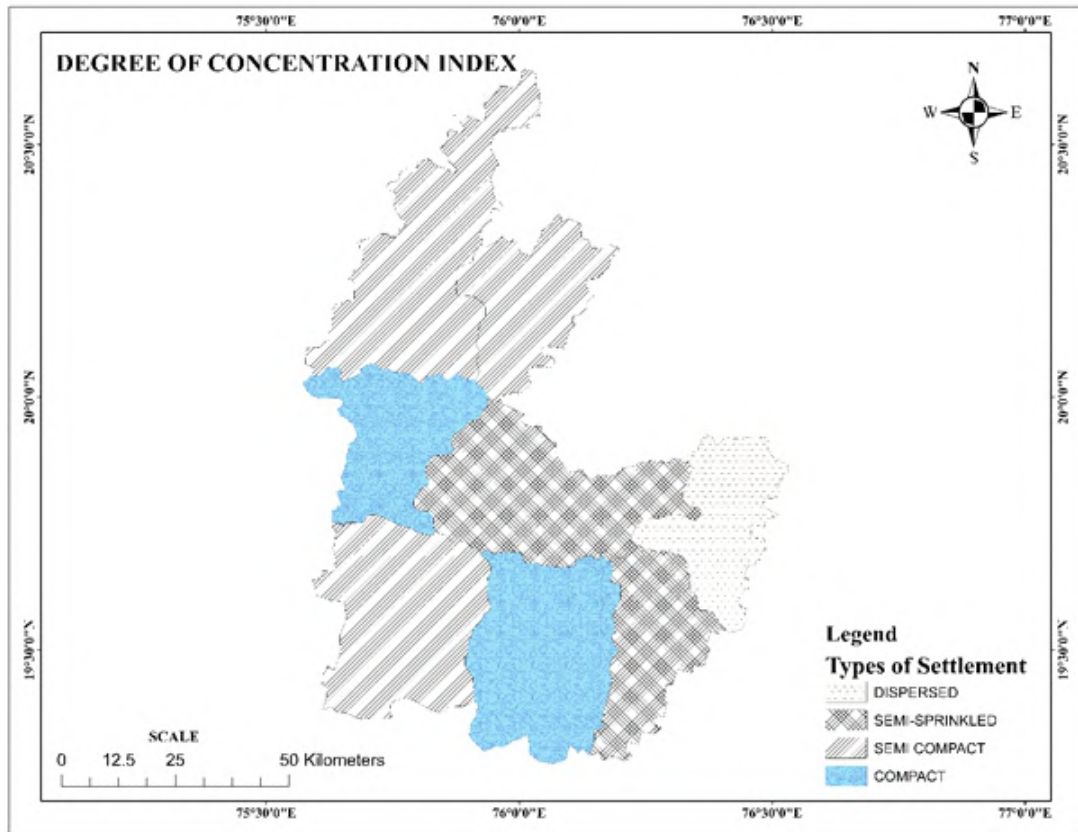


Figure No. 2

Dispersed Settlement:

Small-scale units, which can range from a single home to a small cluster of structures, are typical of isolated villages, also known as scattered settlements. These settlements are mostly located in Mantha tehsil. The concentration index for this group range is below 2100. Low groundwater levels, difficult terrain, steep slopes, and poor soil quality all contribute to the development of such towns. These little settlements are scattered. These communities are less connected due to the terrain's inclines. The eastern Mantha tehsil has seen a concentration of these sorts of villages. Small villages and hamlets make up this area, and homes are spread apart from one another. Since a portion of the population is the main economic pursuits in these villages are agriculture and animal husbandry.

Semi Sprinkled Settlement

These little settlements are located adjacent to arable land. The concentration value range is 2100–2300. This type of village is mostly found in the tehsils of Partur and Jalna in the study area. In Partur tehsil, these settlements are primarily located adjacent to agricultural land. The key characteristics of these towns are their small size, widely scattered individual habitations, poor road condition, and restricted road connection across the region. The centre sections of the tehsils of Partur and Jalna are home to the majority of these villages.

Semi Compact Settlement

Partial settlement Semi-compact settlements are an intermediate kind that lie between compact and hamleted communities. These communities are made up of groups of disconnected

houses congregated in one area (Mondal and Roy, 2020). These settlements are characterized by a small, compact nuclear hub around by a dispersed village. The Jafrabad, Ambad, and Bhokardan tehsils in the study regions are the main locations for this type of habitation. For the tehsils of Jalna, industrial development is the main driver behind the expansion of semi-compact villages around the core city.

These communities are home to most industrial workers. In the case of Bhokardan, the beginning of agricultural development and the availability of infrastructure for communication and transportation made it easier for these settlements to grow. The concentration value range is 2300–2800.

Compact Settlement

The bulk of the compact settlement is located in the tehsils of Badnapur and Ghansawangi in the research area. Dense populations and narrow dwelling spacing define most of the settlements in this tehsil. Concentration levels in this settlement are more than 2800. These villages are also known as clustered or nucleated settlements. Buildings in nucleated villages are usually constructed quite close to one another, and the roadways are rather narrow. Compact rural communities are created when valuable land, permanent agriculture, and a settling climate come together (Patil, 2019). The area's agricultural growth is aided by the rich black soil and superior irrigation infrastructure found in Badnapur and Ghansawangi tehsil. The agricultural businesses and well-established transportation network in this tahsil contributed to the growth of the small town inside it. The main reason behind the establishment of these sorts of communities is the rapidly growing population in the tehsils of Badnapur and Ghansawangi. These settlements are primarily located in the vicinity of Ghansawangi City and Badnapur.

Conclusion

The overall analysis of the research effort demonstrates that the physiographical influence is visible in the way the towns in the studied region have developed. There are four distinct types of settlements observed in the area under study. The four types of settlement are scattered, semi-sprinkled, compact, and semi-compact. According to the Degree of Concentration (Bernard, 1931) estimate for each tehsil, there is a relatively big concentration of settlers in Badnapur and Ghansawangi tehsils because of their excellent irrigation facilities and fertile black soil. A low index of concentration is seen in the Eastern part of the nation, including Mantha, due to adverse physical qualities such as the region's rugged topography. The index of concentration in the Tehsils of Bhokardan, Ambad, and Jafrabad is moderate.

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