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Original Research Article

A geographical study of spatial and structural pattern of urban population in Haryana, India

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ABSTRACT

The research attempts to analyse the social and economic characteristics of urban population as well as its spatial and structural structure. In Haryana, there are significant regional differences in social and economic development as well as urbanisation. The amount of urbanisation has been determined using a composite index of a few chosen indicators. With the use of the UNDP's human development index (HDI), disparities in human development have been discovered. 18 distinct quality of life metrics are used to generate the index. The analysis is presented using choropleth maps and tables, which clearly show the state's East-West divide. Eastern Haryana is more developed than the western parts of the state due to a variety of factors, including government policy, infrastructure growth, and proximity to state and national capitals. Fortunately, the NCR covers about 20% of the state's terrain (National Capital Region). Being a part of the NCR benefits many districts, including Faridabad, Rewari, Gurugram, Rohtak, Jhajjar, Panipat, and Sonipat. Urban Haryana at the moment exhibits three main patterns. One is that the state's NCR region is comparatively more urbanised than non-NCR regions. Similar to how western Haryana is less urbanised than the eastern region. Thirdly. Around the federal and state capitals are two sizable metropolitan areas in Haryana. In the northeast, there are Panchkula, Ambala, and Yamunanagar; in the southeast, there are Panipat, Rewari, Rohtak, Sonipat, Jhajjar, Faridabad and Gurugram. The same trends in urban living quality are also supported by the composite HDI of 18 indicators.

1. Introduction

Urbanization has deep roots in the industrialised nations of the world and is a universal phenomenon. In the developing countries, the spatial process is now progressing at a wealthy and steady rate [1]. Urbanization was seen as an inevitable byproduct of industrialization and growth in the 1950s [2]. In India, urban growth is widely recognised as a trend in overall socio-economic development.

The most noticeable pattern has been noticed to be the rapid rise of large urban centres and the tendency for small towns to stagnate or even decline [3]. The country's urban challenges have gotten worse as a result of the urbanisation trend in the city population [4, 5]. In his analysis of the urban population's features in the western Himalayas, Sharma [6] discovered significant regional differences in both the distribution of the urban population and its socioeconomic characteristics. India's Haryana state's district boundaries are shown on Map 1.

2. Methodology

The majority of the information in the paper is taken from the Haryana-specific Census of India 2011 reports, including the Primary Census Abstract, Household-Tables, General Population Tables, as well as Statistical Abstract of Haryana. The location quotient of the division of the urban-population, the rural-population served by each centre, and also the spacing of towns are calculated to evaluate the spatial pattern of urban

development. Calculated metrics for urban development include the location quotient ratio and composite index. The data processing is shown on maps.

Map 2 displays the proportion of urban residents to all residents in several districts of Haryana, India (Census 2011). This ratio, which ranges from 42.05 to 79.71, is largest in Panchkula, Ambala, Panipat, Gurugram, and Faridabad, as can be observed. On the other hand, this ratio is the smallest and ranges from 11.39 to 22.69 in Fatehabad, Kaithal, Bhiwani, Mahendergarh, Mewat, and Palwal. In Haryana, the average ratio of the urban population to the overall population is 34.88%.

Map 3 displays the decadal urban growth in different Haryana, India, districts (2001-2011). Panchkula, Panipat, Sonipat, Rewari, and Gurugram have the highest percentages (40.27 to 236.53%), while Yamunagar, Sirsa, Bhiwani, and Faridabad have the lowest percentages (8.79 to 20.31%). In Haryana, decadal urban growth has averaged 44.25% between 2001 and 2011.

Map 4 depicts the rural population in Haryana, India, that is served by towns with a population of more than 20,000. Panchkula, Ambala, Kurukshetra, Panipat, Rohtak, and Gurugram have the least values (0.83 to 1.71 lacs), whereas Jind, Bhiwani, Jhajjar, Rewari, Mahendergarh, and Rewari have the highest values (3.23 to 4.38 lacs).



Map 5 depicts the distances between towns with more than 20,000 inhabitants in different districts of Haryana, India. Panchkula, Ambala, Kurukshetra, Panipat, Gurugram, and Faridabad have the least distances (between 15.61 and 20.63 km), whereas Sirsa, Jind, Bhiwani, Jhajjar, and Mahendergarh have the longest distances (in the range 30.17 to 40.98 km).

Map 6 displays the number of towns per 1000 square kilometres in different Haryana, India, districts. Panchkula, Ambala, Kurukshetra, Gurugram, and Faridabad have the highest ratios (2.30 to 4.72) whereas Sirsa, Fatehabad, Jind, Bhiwani, Jhajjar, Mahendergarh, and Rewari have the lowest ratios (0.63 to 1.25).

Map 7 displays the district-level urbanisation index for Haryana, India. Ambala, Kurukshetra, Panipat, and Gurugram have very high values while Fatehabad, Jind, Bhiwani, Jhajjar, Mahendergarh, and Mewat have very low values for this indicator.

Map 8 shows the percentage share of class-I cities to total urban population, Haryana, India.

The detailed analyses of these Maps 2 – 8 is presented in the following sections.

2.1. Spatial patterns of urban population

Two tendencies can be seen in the concentration of urban residents. It is more common in Eastern Haryana and the areas near the national (New Delhi) and state (Chandigarh) capitals. Migration was prompted by the close proximity to these capital cities and the National Highway's excellent accessibility, which provides the best facilities for industrial and commercial activity. Western regions are the least industrialised, primarily due to poor accessibility and agriculture, and as a result, there are fewer people living in cities.

According to the 2011 census, urban areas are home to 34.88% of Haryana's population. The only district where more than half of the people live in cities is Faridabad. More than half of the inhabitants of the area resided in the industrial city of Faridabad.

The other highly urbanised districts are Panipat, Rohtak, Yamunanagar, Ambala, Panchkula, and Panchkula. These are situated close to the capitals of the federal and state governments and are either industrial centres or administrative centres (Panchkula). The least urbanised are Mahendergarh, Rewari, Bhiwani, and Fatehabad, with less than 20% of the population living in cities. Thirdly, due to the rich soil fertility and easy access to fresh groundwater for irrigation, agriculture productivity has grown in eastern regions. This region has seen the growth of multiple agro-based cities (mandi towns), which act as service hubs for nearby villages.

The provision of services to the nearby lower-order settlements is one of the urban centres' main roles. The number of rural villages served by an urban centre is inversely correlated with the level of urbanisation. The higher the rural population served by each site, the lower the level of urbanisation. Central and western districts, notably Hisar, Jind, Bhiwani, Rohtak, Sonapat, Fatehabad, and Kaithal, provided services to the majority of the rural population. Rewari, Faridabad, and Sirsa are some other districts that are comparable. These areas don't have many towns, but Faridabad and Rohtak seem to be an exception.

The maximum distance between towns and the closest metropolitan centre is referred to as town spacing. Literally, it refers to how far apart various urban centres are from one another. Low levels of urbanisation are indicated by greater distances between urban centres, and vice versa. Western Haryana's large districts, such as Hisar, Bhiwani, Sirsa, and Fatehabad, have the widest separation between populated areas. Moderate spacing is evident in the central district. Eastern regions show the least spacing.

The degree of urbanisation can be measured in a variety of ways. It becomes challenging to gauge the degree of urbanisation because the relative rankings of districts alter with respect to different measures. The most often used variables, such as the area served by an urban centre, the percentage of urban residents, and also the spacing of towns, are combined to create a composite score (Z-Score). Second, they are either administrative or industrial centres. Another benefit is being close to state and federal capitals. Since the western regions lacked these benefits, there was little urbanisation there.

2.2. Structural patterns of urban population

There are over a hundred towns of varied sizes in Haryana. The largest urban area is Faridabad, which has a population of about a million. The state also contains 18 class-I cities in addition to this. These are mainly district administrative centres. As many as 17 of the 22 districts' headquarters are located in class-I towns. Only three district headquarters—Jhajjar, Narnaul, and Fatehabad—are class-I towns.

Large urban centres have significant population densities. Rohtak, Kamal, and Rewari are among the towns with a higher proportion of the city's historical population. With an average population density of roughly 1600 people per square kilometre, small urban centres with populations under 20,000 are sparsely populated. The link between population density and land values, which are often high in large metropolitan areas, is positive.

The ratio of the urban population in towns of different classes is heavily skewed in the direction of class-I cities. 20% of the state's urban centres are home to 72.56% of the state's urban population (class I cities). Class II towns have a proportionately large urban population to the number of neighbouring towns.

Their proportion of the urban population is, however, four to eight times lower in medium and small towns than it is in all towns put together. This is partly due to class-I towns serving as hubs for development and expansion. Large cities, which provide many people with employment opportunities and a higher standard of living, are where the majority of infrastructure facilities are located. Small urban areas, in comparison, lack this entire essential infrastructure and resemble overgrown villages.

This is largely because class-I towns act as centres for growth and development. Most infrastructural facilities are found in large cities, which offer many people work possibilities and a higher level of living. In contrast, small urban areas lack this entire necessary infrastructure and resemble overgrown villages. These are mainly district administrative centres. The growth of major towns is more pronounced than that of medium towns. Unexpectedly, the number of small towns has decreased. This problem results

from small towns' inferior infrastructure to that of big metropolis. The key factor causing this trend is urban migration from small to large cities.

In Haryana, there are 22 districts, 81 cities, and 6759 villages. Like Ambala City and Ambala Cantt, Yamunanagar and Jagadhari, Balabgarhand Faridabad, Panipat, Panipat Taraf Makhdum Zadgan, Panipat Taraf Rajputana, Panipat Taraf Ansar, Gurugram and Sukrali, and Bahadurgarhand Sankhol, several of these cities have been created as agglomerations. The only city in the state with a million residents in Faridabad. Six class II towns and eighteen class I cities exist (or nineteen if Ambala Can and Ambala City are combined into one metropolitan agglomeration). The largest classes are III and IV, with 24 and 32 numbers each. There are only one class-VI town and fifteen class-V towns. Most towns are centred in Yamunanagar (12) and Gurugram (12). Both of these regions contain a large number of small towns. Bhiwani, Ambala, Faridabad, and Kamal are the next in order (6 each).

The separation of the Jhajjar district from it over the past ten years is largely to blame for this. Each of the other districts has four to five towns. Small towns (populations under 20,000) are more concentrated in Gurugram and Yamunanagar districts, whilst medium towns (populations between 20,000 and 50,000) are more concentrated in Kamal and Kurukshetra. The districts of Sirsa, Fatehabad, Jhajjar, Hisar, and Mahendergarh are mostly home to large towns (>50,000 people).

The expansion of towns in the United States is calculated for the years 1901–1951, 1951–1961, 1971–81, 1981–91, 1991–2001, and 2001–2011. All of the towns are divided into three groups based on their growth patterns: stable growth, erratic growth, and stagnant growth. Towns in the United States are classified as having experienced consistent growth if they have grown faster than the state average for four or more periods, fluctuating growth if they have grown faster than the state average for two to three periods, or stagnant growth if they have grown faster than the state average for one or fewer periods.

Expansion patterns show a propensity for steady growth among class-I cities. On the outskirts of the National Capital are four of these cities. Old cities with significant historical significance, such as Rohtak, Ambala, and Kamal, exhibit stagnant growth as a result of the ruling class' persistent disregard for them, even though they are ideally suited to development as industrial hubs. The majority of communities, both big and small, exhibit stagnant growth, which is mostly caused by subpar infrastructure facilities. Small towns are where this is more evident.

The state's eastern and western urban centres have developed in very distinct ways. More than half of the district headquarters in eastern Haryana saw decadal growth that was more than the state average (50.87%) between 1991 and 2001. Comparatively, Sirsa, the district's administrative centre, was the only place to set itself apart from the western regions. This is because, throughout the previous ten years, it served as the political capital. Jhajjar (96%), Panchkula and Panipat (87% each), and Faridabad (70%), respectively, experienced the biggest rise. Sonipat, Kaithal, and Gurugram. The districts of Kurukshetra and Yamunanagar also expanded significantly. Administrative hubs and industrial hubs (Faridabad, Panipat,

Sonipat, and Yamunanagar) both experience significant growth (Panchkula). Jhajjar and Kaithal have experienced rapid growth as a result of district-level development initiatives such as the construction of new administrative complexes.

The National Capital Region's (NCR) rapid growth is a result of the center's and its component states' unique efforts. NCR towns are more likely to grow quickly due to better infrastructure, supportive government policies, and their closeness to Delhi. Panchkula is the largest urban centre among the non-NCR districts, having grown by more than 87% during the previous ten years. The other two cities with higher growth rates were Sirsa and Kaithal, primarily because of the factors outlined in the paragraphs before. As was said above, Sirsa has served as the political hub.

More than 80% of all occupants in these districts live in Faridabad and Rohtak, both Class-I cities. Rewari and Yamunanagar are followed by these (by 70–80%). Compared to western districts, the share of class-I cities is larger in the eastern districts. Medium-sized communities show changing tendencies. The percentage of small towns in the overall urban population is particularly high in the southern districts of Gurugram, Rewari, Mahendergarh, Jhajjar, and Bhiwani. The northern districts of Yamunanagar and Kaithal also have a significant percentage of small towns (> 15%).

The index of primacy can be studied using one of two methods. By first calculating the proportion of first-rank to second-rank towns, and then by secondly calculating the percentage of the district's total urban population that resides in first-rank towns. A city is classified as a primate city when first rank cities make up 25% to 30% or more of the population of the region. There are a tremendous number of first- and second-rank towns. Large metropolitan centres are overwhelmingly favoured in the urbanisation of the eastern areas. The industrial areas of Faridabad, Gurugram, Panipat, Yamunanagar, Ambala, and Rohtak are where this is most evident.

3. Demographic and socio-economic attributes

To evaluate the demographic and socioeconomic traits of various sized towns/U.A., three factors are used. These include the gender distribution, literacy rate, and employment rate. The sex ratios in towns of all sizes are all rather low, although class I cities have far lower rates than the other towns. The key reason for this is that more men tend to migrate specifically to these centres. The discrepancy between the sex ratio in urban and rural areas can be explained by the same factor. When compared to towns of various sizes, class-I cities have higher rates of urban literacy among both men and women. There are significant male-female and rural-urban differences. In every type of town, more men than women are literate, but as urban centres grow in size, the gender disparity in literacy decreases. Inverse correlation between participation rate and urban settlement size is evident. There are significant male-female and rural-urban variances in both males and females. Compared to metropolitan regions, rural areas have a higher participation rate (particularly the large centers). This is mostly a result of early job start times and the lack of a functional value of literacy in rural areas. However, the comparatively late

entry of skilled labour into the labour force in metropolitan areas has a detrimental impact on their participation rate.

4. Composite index of urban development

An index of urban development is calculated using the Human Development Index (HOI), which was developed by the United Nations Development Programme [7]. Eighteen indicators form the basis of the index. The following stand out among them: the state and accessibility of the home, the percentage of households with access to drainage, tap water, bathrooms, and other common amenities, the sex and child sex ratios, electricity, television, latrines, female literacy, and similar factors. A distinct east-west division in urban development may be seen on Map 12. The most developed areas are in the east, along NH-1. Panchkula, Ambala, Yamunanagar, Kurukshetra, and Kamal are among them. Along NH-1, Rewari and Gurugram display the similar patterns. These are followed by the highly developed Sonapat, Pantpat, Rohtak, and Hisar districts. The only place that sticks out as having a reasonable level of development is Hisar. The town was established largely as a countermagnet town to ease Delhi's congestion [8]. The western part of Haryana has very little urban development. This includes mention of the districts of Sirsa, Fatehabad, Bhiwani, Mahendergarh, Jind, and Kaithal. Only Jhajjar and Faridabad, two districts in the east, show signs of modest urbanisation [9–12]. The best industrial hubs are located in these two areas (Faridabad and Bahadurgarh). In these industrial hubs, particularly in Faridabad (>40%), a sizeable segment of the population lives in shantytowns without access to the majority of amenities.

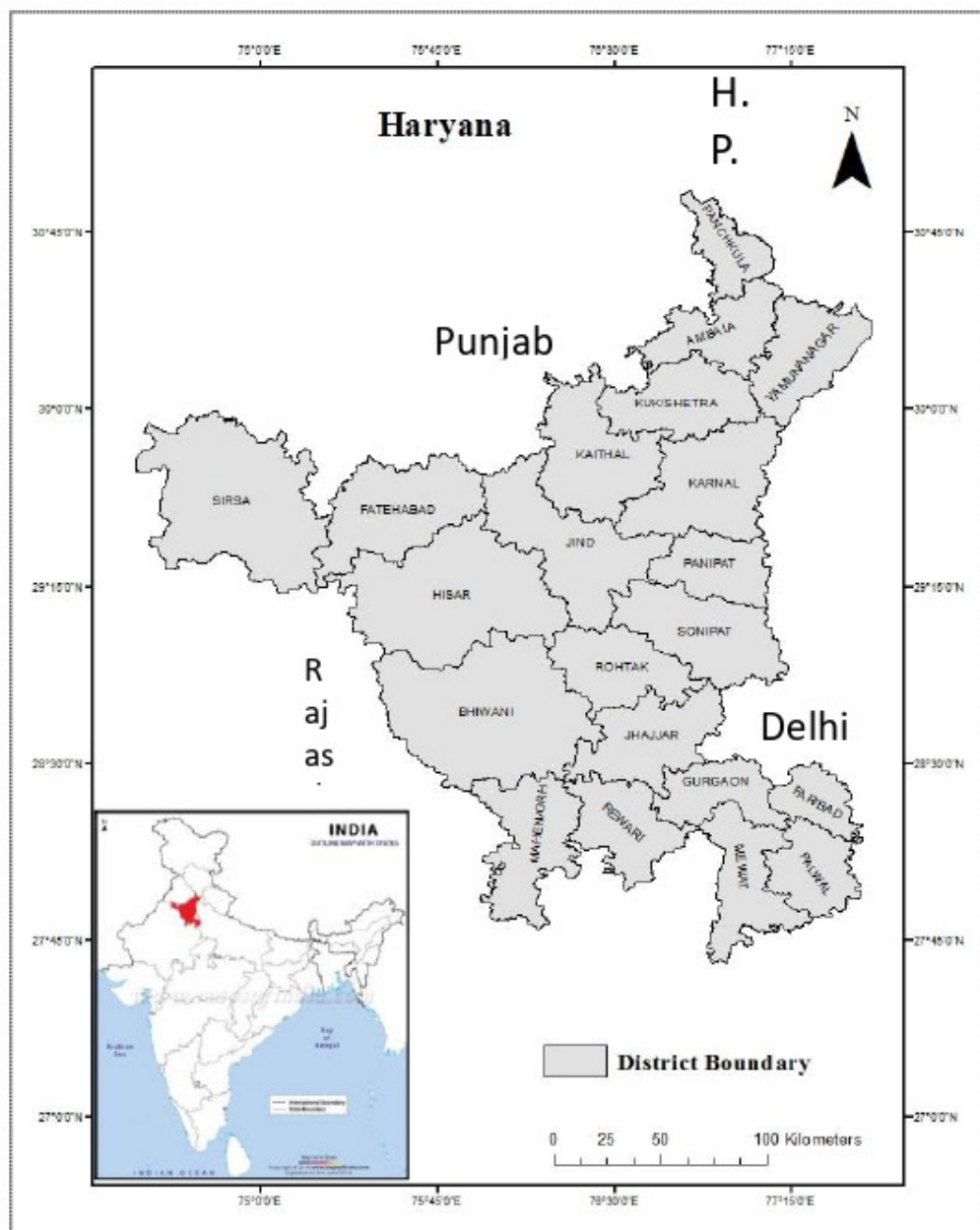
5. Conclusions

The study's main goal was to comprehend the spatial and structural distribution of urban centres in Haryana as well as their socioeconomic and demographic characteristics. In Haryana, there have been a lot more towns added over the past 100 years. This growth is extraordinary given the country's division. The green revolution's successful implementation, the widespread flight of West Pakistani refugees, and the creation of Haryana as a separate state in 1966 were the contributing factors. Growth after the 1980s is primarily attributable to industrial expansion, notably after the liberalization process got underway in 1991. In this primarily agricultural state, industrial development is slowly but surely taking hold. Urban growth in these areas has been spurred by the emergence of Faridabad,

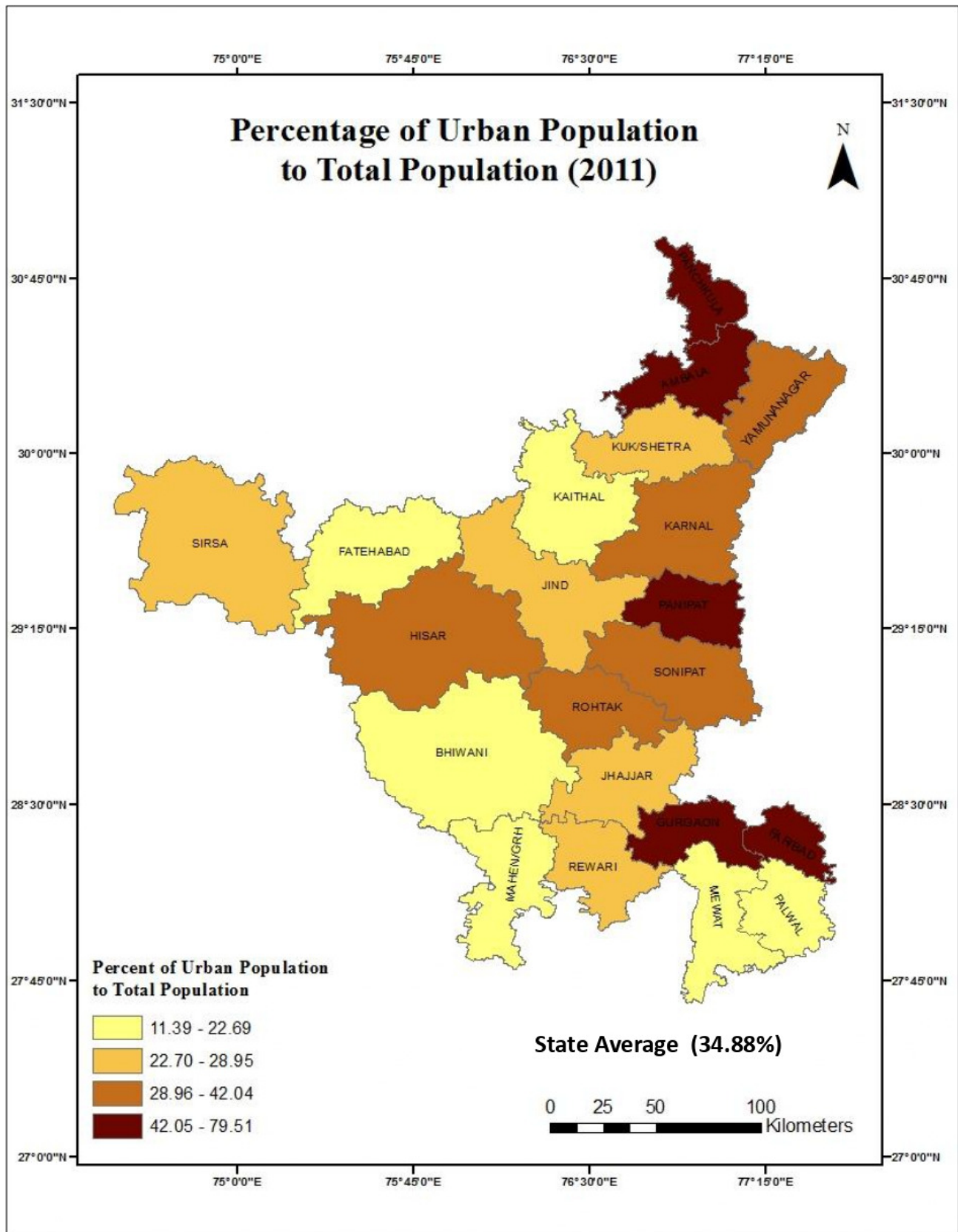
Panipat, and most recently Gurugram on the industrial map of the nation. As opposed to the western regions, the state's eastern regions are more heavily focused on urban growth. Second, cities and towns in the NCR are expanding considerably more quickly than those outside of it. This is partly due to the projects' permissive financing, especially for infrastructural development, which encourages private businesses to participate in the industrial sector.

The state's population is migrating from rural and small urban areas at an accelerated rate due to the expansion of the industrial sector. The northern cities of Panchkula and Yamunanagar exhibit the same patterns. Panchkula has quickly grown into a planned city due to its proximity to the state capital and its importance as an administrative hub. Due in large part to the development efforts and subsequent migration from adjacent places that have been lured by the change in administrative status, Jhajjar and Kaithal are also seeing rapid growth. Sad parts of these events are how neglected many areas remained for a long period. Such patterns are shown in the slow growth of Ambala, Kamal, and Rohtak. Clearly, urban growth in the state's western region is lagging. These factors, along with the unfavourable location, contribute to the problem. The same is supported by the Human Development Index's measurement of life quality. The least developed districts are Mahendergarh, Kaithal, Fatehabad, Bhiwani, and Jind. Most of the essential amenities were absent from these areas' metropolitan centres.

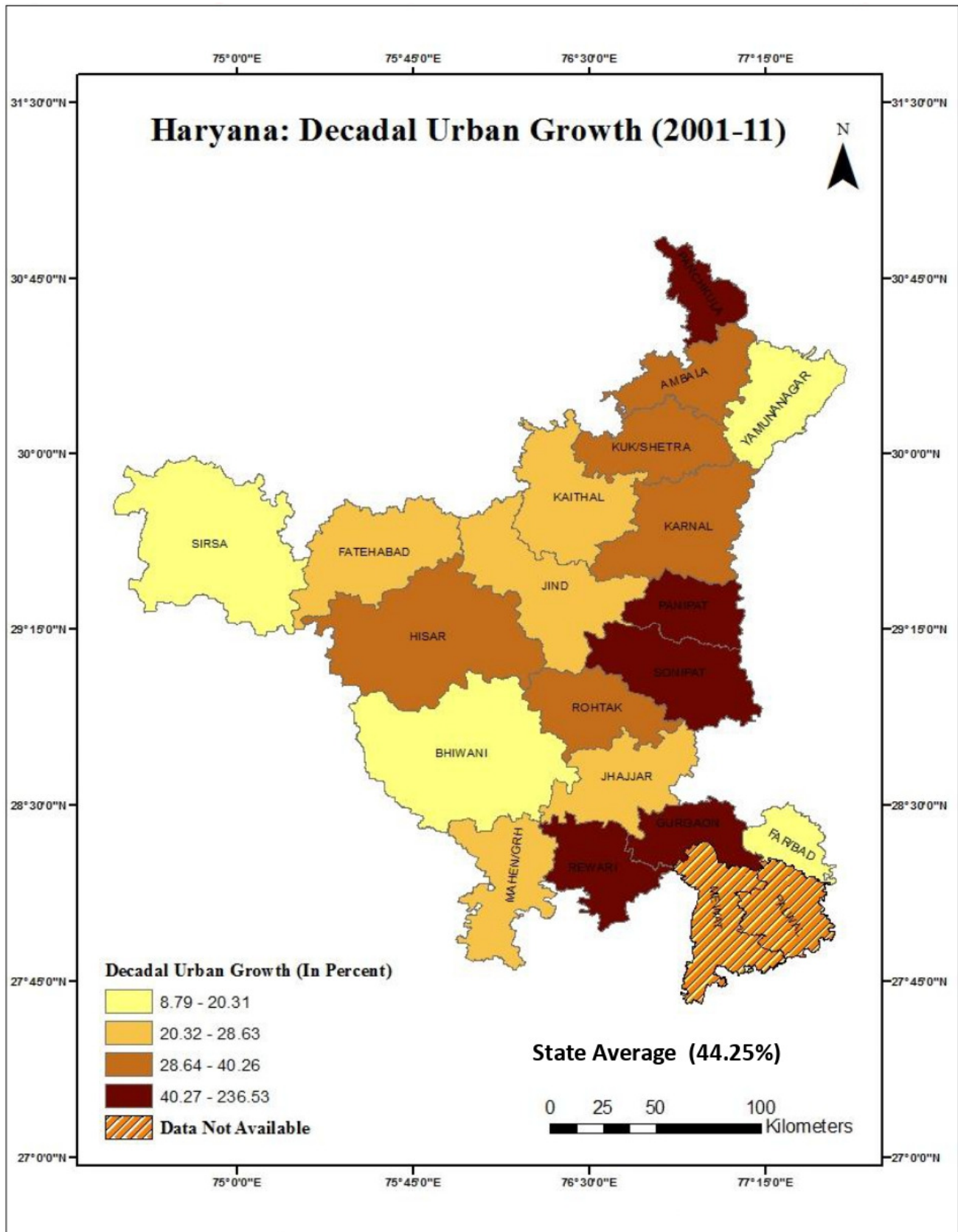
There are enough signs from many economic sectors to conclude that Haryana would have a very rapid increase in its urban population in the near future, especially in the areas surrounding the state and federal capitals and along the national highways that travel through it. It is therefore time to govern it using a comprehensive strategy that includes experts and participants from several fields. Encroachments, unplanned expansion, and infractions must be controlled. It is also time for planners to reconsider the current bylaws governing the expansion of the road network. The current restrictions on construction activities within a particular Right of Way (ROW) from the centre of the various level of roadways have not increased accessibility. Numerous urban issues in major industrial hubs like Faridabad, Panipat, and Yamunanagar can be resolved by decentralising development operations in non-NCR areas. Additionally, it's important to develop the sectors that have lagged behind.



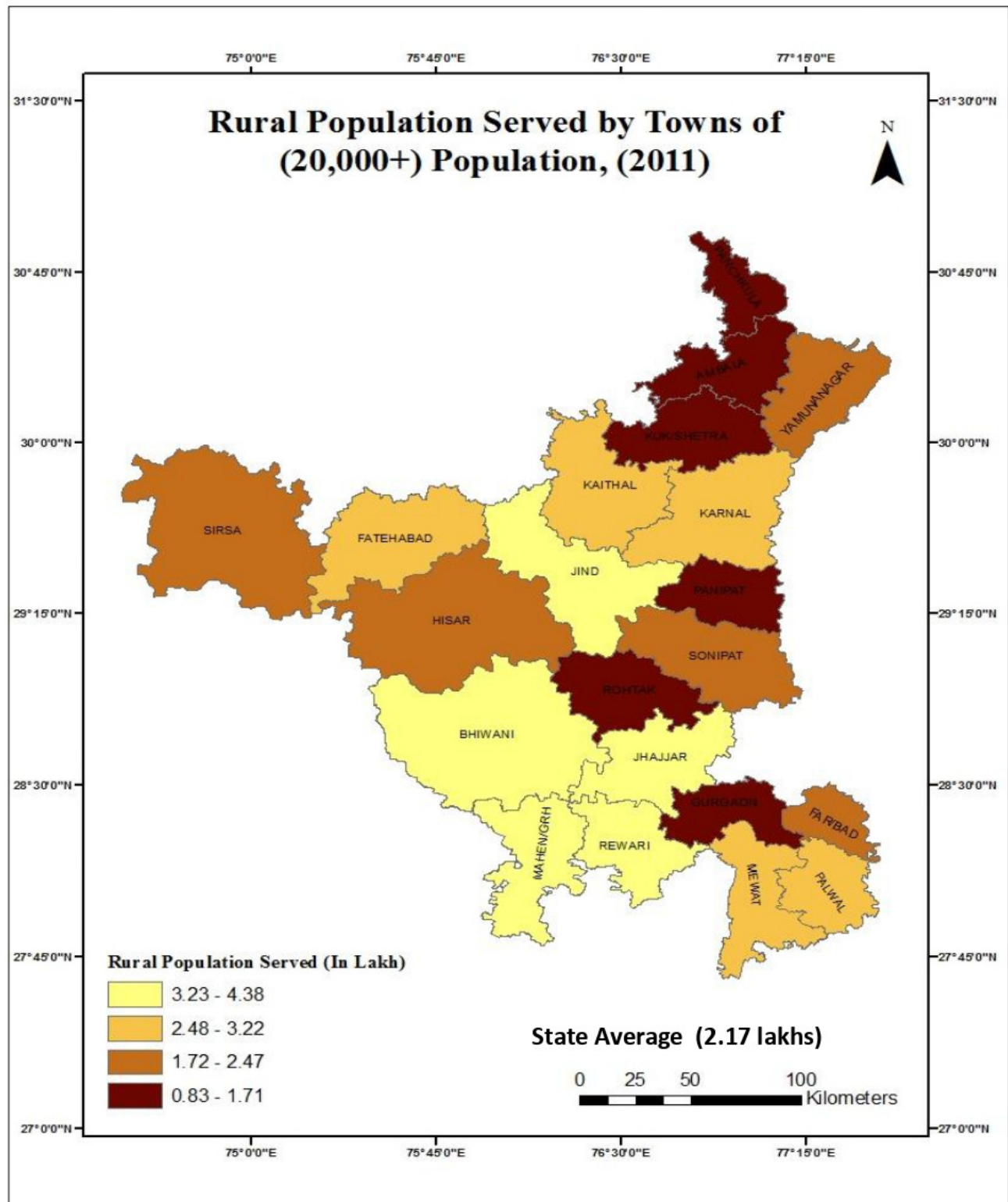
Map 1. Districts boundary in Haryana (India).



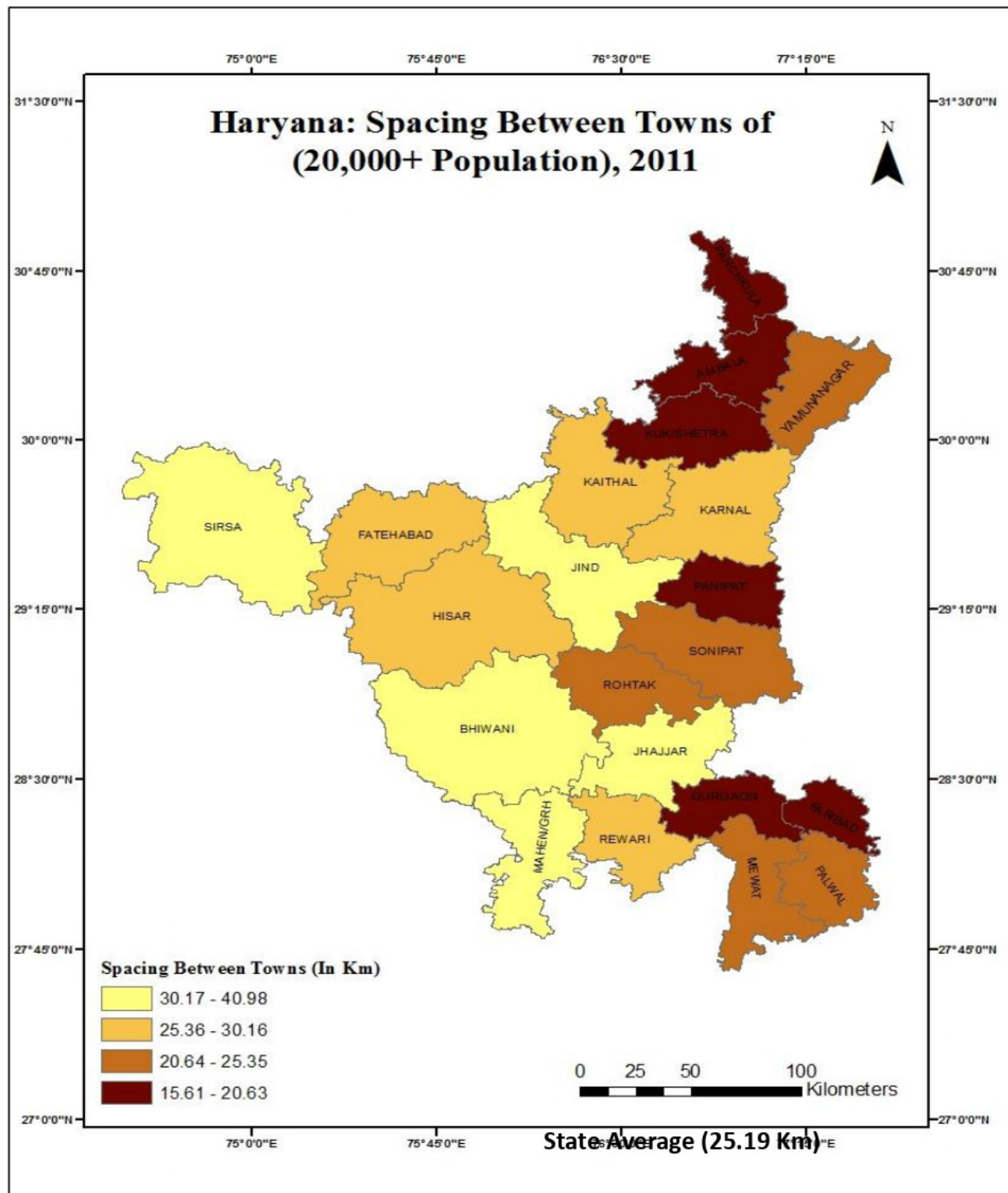
Map 2. Percentage of urban population to total population in various districts of Haryana, India (Census 2011).



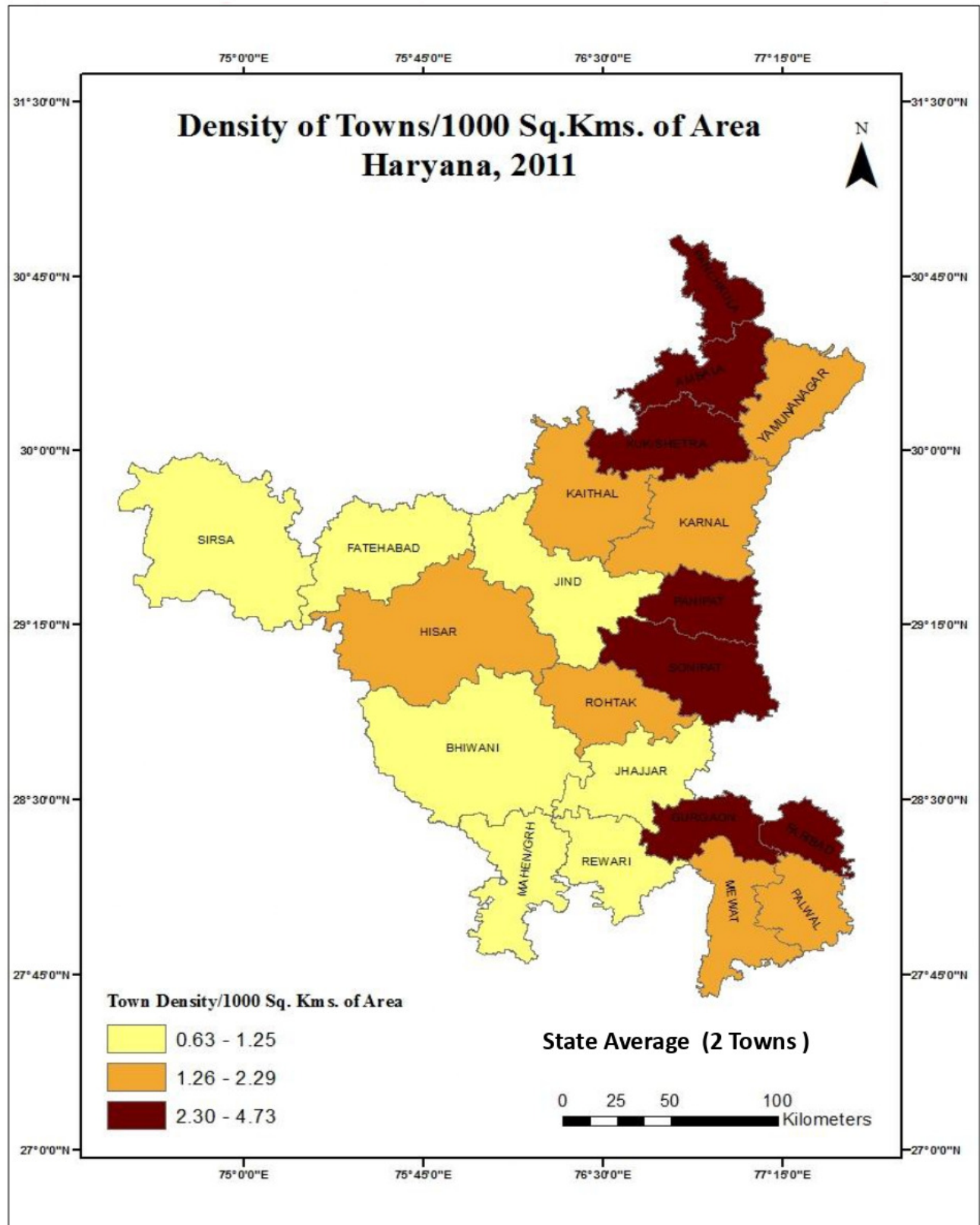
Map 3. Decadal urban growth in various districts of Haryana, India (2001-2011).



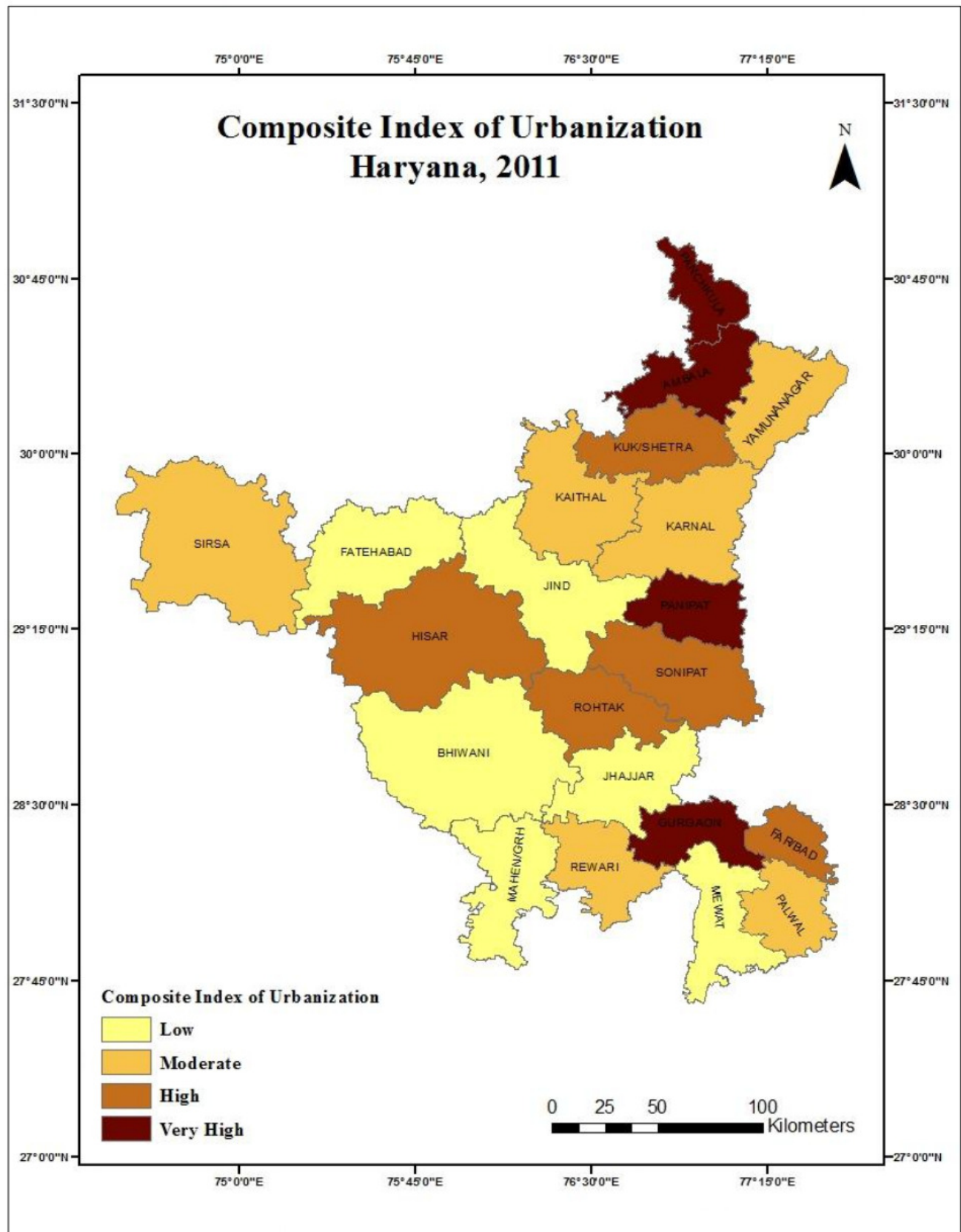
Map 4. Rural population served by towns of (> 20,000) population of various districts of Haryana, India.



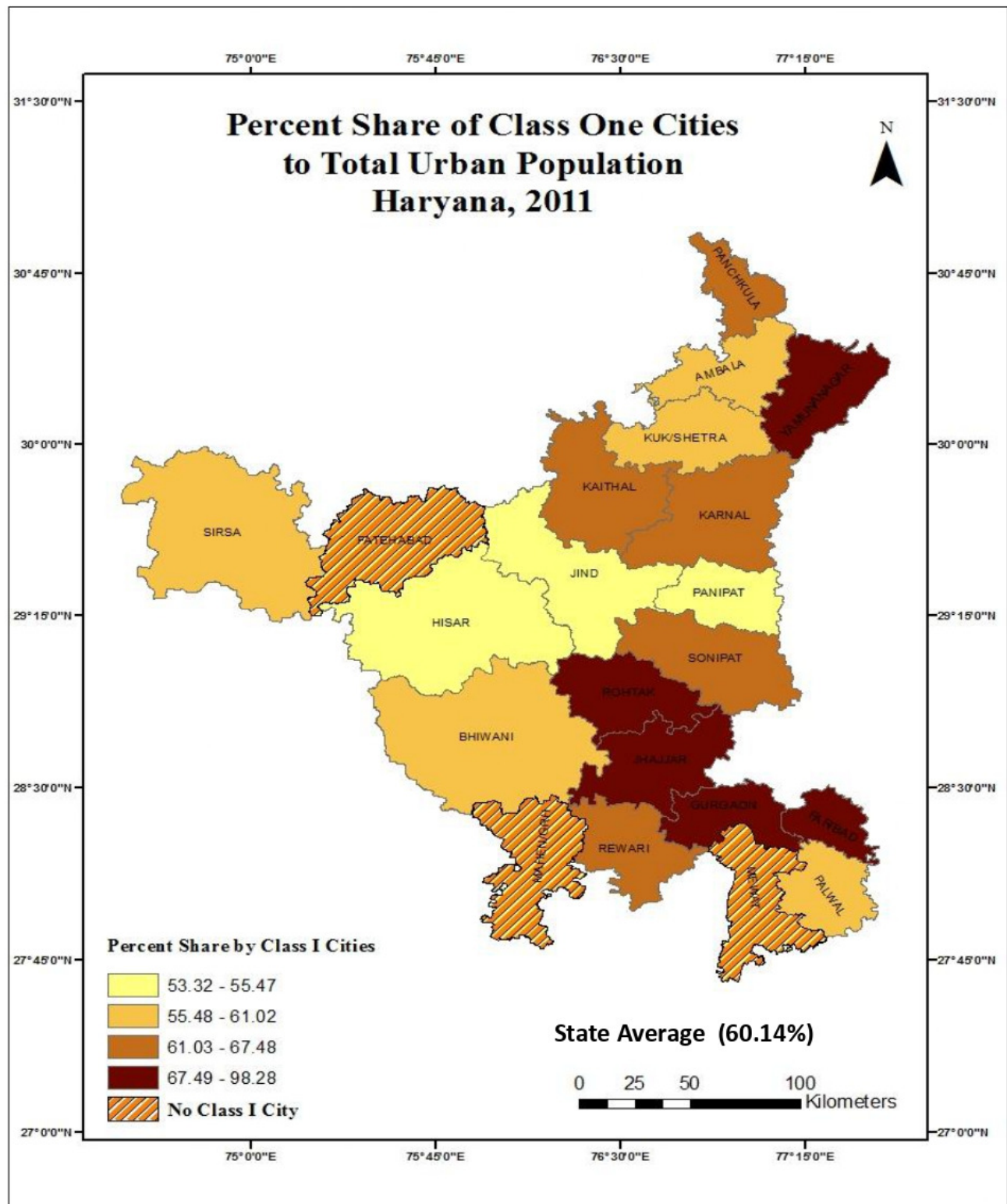
Map 5. Spacing between towns of (> 20,000) population of various districts of Haryana, India.



Map 6. Density of towns per 1000 sq. kms of various districts of Haryana, India.



Map 7. Composite index of urbanization of various districts of Haryana, India.



Map 8. Percentage share of class-I cities to total urban population, Haryana, India.

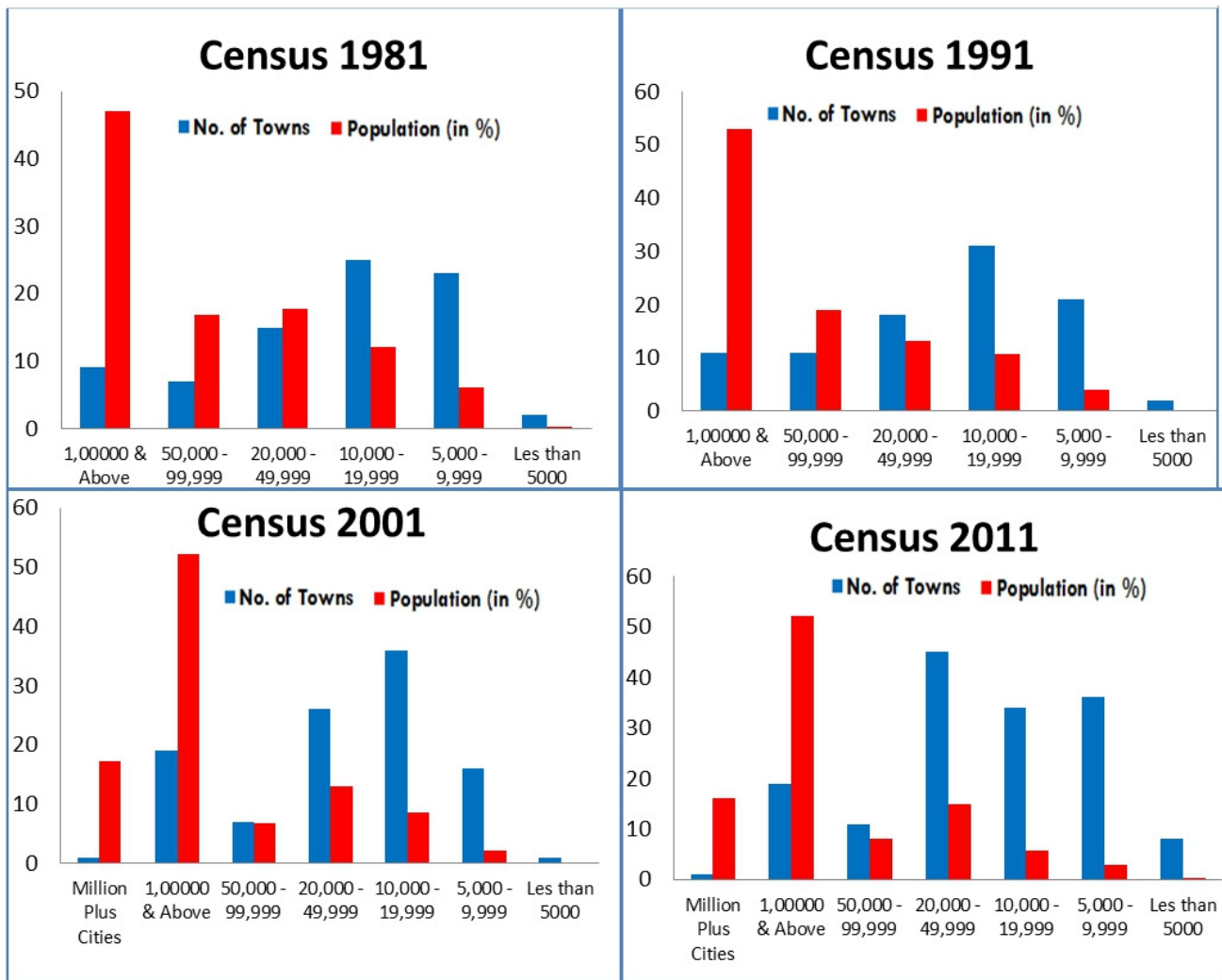


Figure 1. Bar diagram illustrating number of towns and population (in %) for census 1981, 1991, 2002, and 2011, Haryana, India.

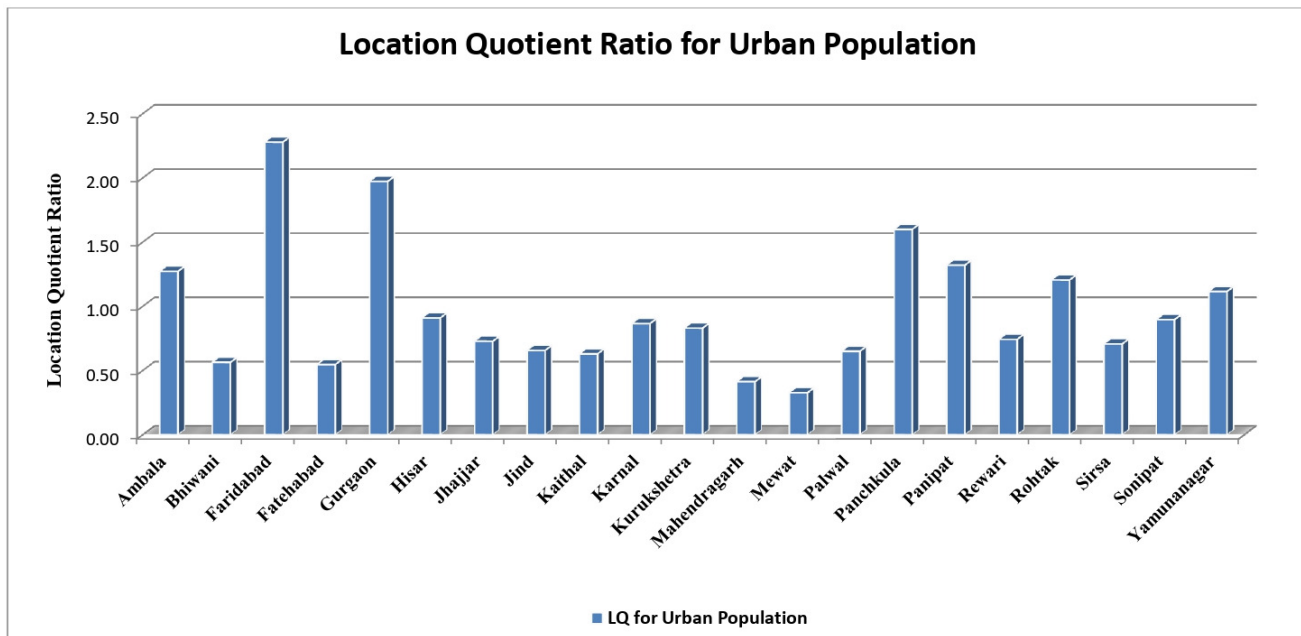


Figure 2. Bar diagram illustrating location quotient ratio for urban population of various districts of Haryana, India.

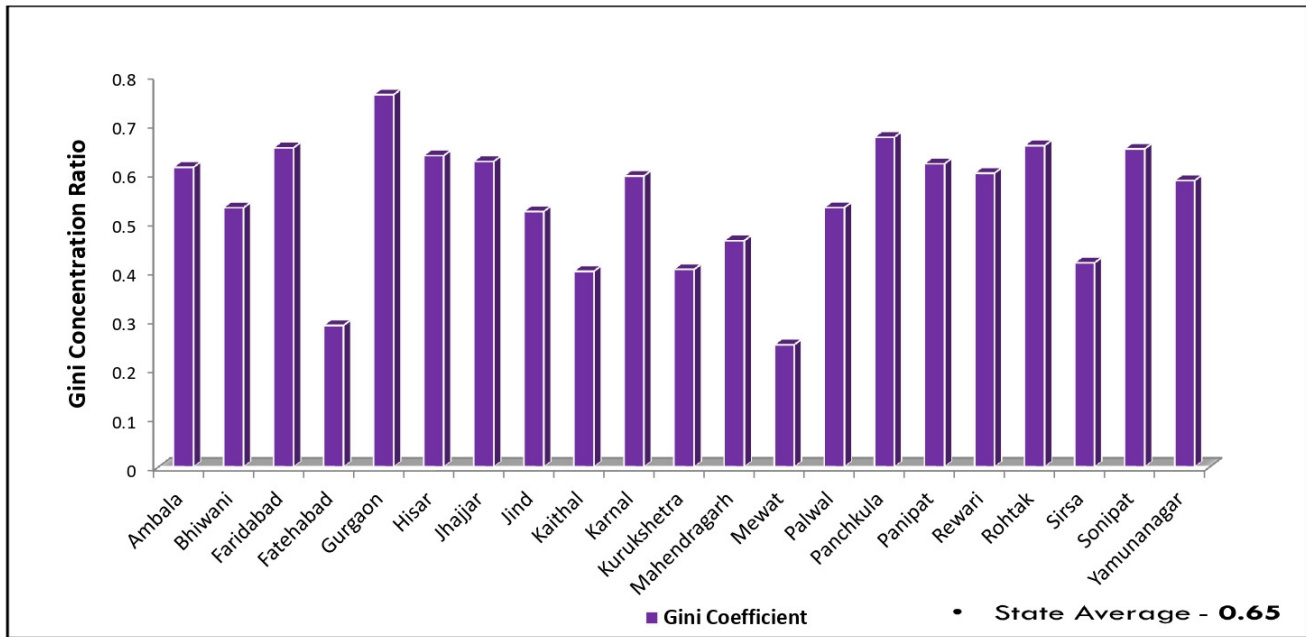


Figure 3. Bar diagram illustrating Gini Coefficient ratio of various districts of Haryana, India.

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