



SPATIAL ANALYSIS OF URBAN GROWTH AND CHALLENGES IN HARYANA

Riya Sharma

Research Scholar, Department of Geography, P.K University, Shivpuri, M.P

Dr. Manoj Kumar

Assistant Professor, Department of Geography, P.K University, Shivpuri, M.P

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ABSTRACT

The study aims to analyze the spatial dimensions of urban growth and the associated challenges in the state of Haryana, India. Over the past few decades, Haryana has experienced rapid urbanization driven by industrial expansion, migration, and the proximity of several districts to the National Capital Region (NCR). This rapid growth has significantly altered land use patterns, population distribution, and socio-economic dynamics. The study will employ spatial analysis techniques using Geographic Information Systems (GIS) to assess the patterns of urban expansion, identify emerging urban centers, and evaluate the environmental and infrastructural pressures associated with this transformation. The research seeks to highlight the disparities between planned and unplanned urban growth, the uneven distribution of urban facilities, and the challenges of sustainability and governance that accompany such changes. The findings are expected to provide valuable insights for policymakers and planners in formulating balanced urban development strategies for Haryana.



I. INTRODUCTION

Urbanization has emerged as one of the most defining features of the twenty-first century, reshaping the economic, social, and environmental fabric of regions across the globe. In India, the process of urban growth has been uneven and regionally concentrated, often influenced by industrialization, migration, and infrastructural development. Haryana, located in northern India and adjoining the National Capital Territory of Delhi, has experienced an accelerated pace of urbanization over the past few decades. Once predominantly agrarian, the state has transformed into one of the most industrially advanced regions of the country. This transformation has not only contributed to economic development but has also led to a range of spatial, social, and environmental challenges.

The state's urban landscape reflects a strong regional disparity in terms of growth and development. Districts such as Gurugram, Faridabad, and Sonapat, which form part of the National Capital Region (NCR), have witnessed unprecedented urban expansion due to their proximity to Delhi, industrial investments, and improved connectivity. On the other hand, the southern and western districts, such as Bhiwani, Mahendragarh, and Sirsa, continue to exhibit slower urban development and limited access to urban infrastructure. This uneven pattern of urbanization has resulted in significant regional imbalances, making spatial analysis an essential tool to understand and address these disparities.

The spatial dimension of urban growth in Haryana is crucial for understanding land use dynamics, population concentration, and infrastructural pressures. The expansion of urban areas has often occurred at the cost of agricultural land and open spaces, leading to challenges such as land degradation, increased pollution, and the strain on basic amenities like water supply, housing, and waste management. Moreover, the uncontrolled growth of peri-urban areas around major cities has resulted in fragmented land use patterns, inadequate infrastructure, and environmental degradation.

Using Geographic Information Systems (GIS) and remote sensing data, this study will analyze the temporal and spatial patterns of urban growth across Haryana. Spatial analysis will help in mapping urban expansion, identifying growth corridors, and understanding the changing urban morphology of the state. This approach will also facilitate an examination of the relationship between urban growth and socio-economic factors such as population density, industrial activity, and transportation networks.

The study will further explore the major challenges associated with urbanization in Haryana, including the issues of unplanned expansion, inadequate housing, traffic congestion, and environmental sustainability. It will also examine the role of urban governance and planning policies in shaping the state's urban landscape. Understanding these dynamics is essential for developing effective urban management strategies that promote balanced regional development and sustainable urban growth. Through this spatial analysis, the research aims to



contribute to a more comprehensive understanding of Haryana's urbanization process and to propose recommendations for mitigating the challenges associated with rapid and uneven urban expansion.

II. REVIEW OF LITERATURE

Aslam, Doctor et al., (2025) With an eye on the environmental and social effects of urbanization, this research delves into its origins, effects, and policy implications. Transforming economies and lifestyles while creating socioeconomic and environmental concerns, urbanization has greatly impacted contemporary nations, especially those that emerged during the Industrial Revolution. Urbanization is examined from liberal, socialist, capitalist, and environmentalist vantage points in an exploratory study that makes use of secondary data analysis. Impacts on urban infrastructure, population dynamics, and social gaps are highlighted, along with key drivers like industrialization and economic possibilities. In order to combat grassroots migration and unemployment, improve access to healthcare and education, and encourage sustainable urban growth, the report suggests proactive measures. Contributing to informed policymaking and promoting sustainable urban environments, these approaches seek to balance regional development and alleviate the harmful consequences of urbanization.

Brunt, Liam et al., (2021) Recent advances in economic geography have led us to propose a hypothesis on the beginning of the Industrial Revolution. The current body of research points to industrialization and technical advancement as the driving forces behind the spread of cities. We still stand by our claim that causation worked in reverse. The late 1700s saw an exceptionally urban England. This set in motion the production and dissemination of information inside urban areas, leading to long-term, unparalleled advancements in technology. Urbanites were able to invent more often and mimic new ideas quicker because of their increased contact with neighbors. Increases in productivity spurred more people to leave rural areas for urban centers, which in turn increased urban congestion and, by extension, the pace of technical advancement.

Narayan, Laxmi. (2014) Economic development is favorably correlated with the degree of urbanization. More people living in a smaller area has many beneficial effects on the environment, including higher production and efficiency. Numerous cross-national studies have looked at the correlation between the two, and they have also looked at economic disparities across countries in connection to the rate of urbanization and its expansion. According to the data, the connection between urbanization and development shifts as a country progresses through its developmental stages. Even while urban regions create over 60 percent of India's GDP, the nation is nevertheless relatively less urbanized than many others. The purpose of this article is to examine the correlation between India's rising urbanization and economic output during the last 30 years. The study discovered a favorable association between the extent of urbanization and the existing level of state per capita income. So, states



with greater per capita income tend to be more urbanized, whereas those with lower income tend to be less urbanized. In the 1980s and 1990s, researchers discovered no statistically significant correlation between rising urbanization and per capita income, but in the 2000s, they identified a strong correlation. The report finds that the correlation between development and urbanization is becoming stronger over time.

Mangat, Harwant et al., (2021) We provide a theory on the start of the Industrial Revolution based on recent developments in economic geography. According to the available literature, the expansion of cities may be attributed to the forces of industrialization and technological growth. We maintain that causality operated in the other direction. England in the late 1700s was very urbanized. This sparked the creation and distribution of knowledge inside cities, which in turn led to unprecedented technological progress over the long run. People living in cities had greater opportunities to interact with their neighbors, which boosted their creativity and allowed them to imitate new ideas more rapidly. More people left rural regions for cities as a result of productivity gains; this accelerated urban congestion and, therefore, technological progress.

Hussain, Manzoor & Imtiyaz, Iram. (2018) Many scholars from all over the world have long been fascinated by urbanization—the notion, its dimensions, and the elements that contribute to it. Examining topics such as urbanism as a lifestyle, urban sprawl, over-urbanization, urban primacy, urban locations, urban hierarchy, and determinants of urbanization are the main goals of this research. Following the thorough literature review, a systematic correlation was made between the results of different research in order to uncover the findings and make conclusions via further analysis. Urbanized cultures, where the bulk of the population lives in densely populated towns and cities, are clearly shown by the results to be a new and significant phase in man's social development. Urban studies researchers have long been interested in the past and present of city planning due to the profound impact that cities have had on society. The phenomena of urbanization is multi-faceted and intricate. Nevertheless, the majority of definitions of urban population have relied on the size of the location. There is more social diversity and population density in urban regions because people live in closer proximity to one another.

III. DATA SOURCES AND METHODOLOGY

The present paper is based on secondary data obtained from Primary Census Abstracts of Haryana State, various census publications of India. ArcGIS 9.3 has been used to preparing the different types of maps. Urbanization of all districts has been divided into four categories namely very highly (more than 32 per cent), highly (between 24-32 per cent), moderate (between 16 to 24 per cent), and low urbanized districts (below than 16 per cent) and calculated by using following method:

Urbanization = Total Urban Population of District / Total Population of the District × 100

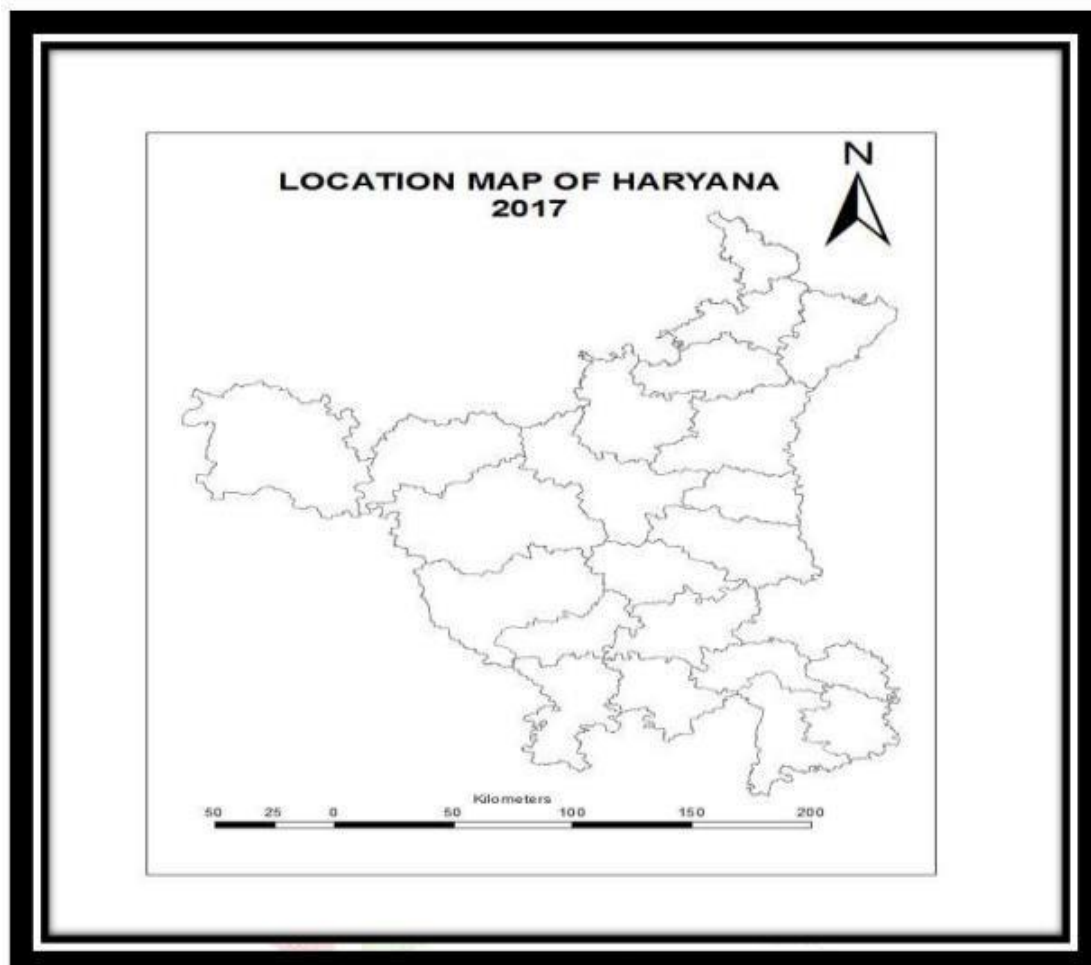


$$\text{Growth of Population} = \frac{\text{Latest Year} - \text{Base Year}}{\text{Base Year}} \times 100$$

IV. DATA ANALYSIS AND INTERPRITATION

Study Area

Haryana is a state in northwest India between 27°37' to 30°35' latitudes and between 74°28' to 77°36' longitudes and separated from the state of Punjab on 1st November, 1966. It is surrounded by Uttar Pradesh in east, Punjab in west, Himachal Pradesh in north and Rajasthan in south where river Yamuna acts as the eastern division for administrative purpose. Haryana state extends for about 44,212 sq. kms with just 1.37 per cent of total geographical area and less than 2 per cent of India's population. Since it ambience Delhi in the northern, western and southern sides, a large area of state is included in National Capital Region (N.C.R.). Chandigarh, a union territory, is the capital of Haryana which is also share by Punjab. The state comprises 21 districts 74 sub districts, 80 statutory towns, 74 census towns and 6841 villages (Census of India, 2011).



Pattern of Urbanization in India and Haryana 1901-2011



Haryana has been predominantly a rural part of India. The urbanization trend in state almost follow the pattern of India as it started with 10.77 per cent in 1911 followed by 11.3 per cent in 1921, 12.38 per cent in 1931 and 13.39 in 1941. In other words, it can be said that up to 1941, the level of urbanization was less than 15 per cent with a highly fluctuating decadal growth rate like the country .Only one-sixth of its total population lived in urban areas at the time of independence in 1947. In 1951 there was 17.07 per cent urban population in the state which has increased 17.22 and 17.66 per cent in 1961 and 1971 respectively against the national urban proportion of 17.97 and 19.90 per cent in the same years. In 1981 this proportion has reached up to 21.88 per cent and 28.92 per cent in 2001. In 2011 census, the urbanization share has been recorded 34.88 per cent that is more than Indian share of 31.16 per cent.

The low level of urbanization in Haryana was associated with the subsistence nature of agricultural economy. Industries, commerce and service sector, which provide the major stimuli for urban growth, had not made a breakthrough in the state. The partition of the country in 1947 stimulated the process of urbanization in this part of the country. A large number of refugees migrated from Pakistan to the Indian Punjab and settled down in towns of Punjab and Haryana, known as ‘camps’. This led to the explosive growth of cities and towns in the state. However, level of urbanization in the state 17.22 per cent was still low in 1961 as compared to that of Punjab 23.10 per cent and the national average of 17.97 per cent. After its formation as a separate state in 1966; Haryana experienced a rapid acceleration in growth of urban population. Rapid developments in the agricultural sector during the Green Revolution period led to the establishment and growth of Mandi Towns in various parts of the state. Thus, with 34.88 per cent of its population as urban and state had a total urban population of 88, 42,103 persons who lived in 154 urban centers of different classes.

Table 1: Urban Population and Its Growth Rate in India, 1901 to 2011

Census Year	Total Urban Population (in crore)	Urban Population (per cent)	Decadal Growth (per cent)
1901	02.59	----	----
1911	02.60	10.29	0.35
1921	02.81	11.17	08.22
1931	03.35	11.99	19.14
1941	04.42	13.85	31.97
1951	06.24	17.29	41.38
1961	07.89	17.97	26.41
1971	10.91	19.90	38.23
1981	15.97	23.31	46.02
1991	21.76	26.10	36.19



2001	28.61	27.81	31.50
2011	37.71	31.16	31.18

Source: Census of India, Primary Abstract Census 1901, 2001 and 2011, Chandigarh, Haryana

Table 2: Urban Population and Its Growth Rate in Haryana, 1901 to 2011

Census Year	Total Urban Population	Urban Population (per cent)	Decadal Growth (per cent)
1901	574074	----	----
1911	449,704	10.77	-21.66
1921	481,195	11.30	07.00
1931	564,743	12.38	17.36
1941	705,945	13.39	25.00
1951	968,694	17.07	37.19
1961	1,307,680	17.22	35.58
1971	1,772,959	17.66	35.58
1981	2,827,387	21.88	59.47
1991	4,054,744	24.63	43.41
2001	6,115,304	28.92	50.82
2011	8,842,103	34.88	44.59

Source: Census of India, Primary Abstract Census 1901, 2001 and 2011, Chandigarh, Haryana

Urban Pattern in Haryana (1971-2011)

The spatial and temporal urbanization in Haryana from 1971 to 2011 has been dealt with Table 3. The district wise profile reflects that in 1971 there was only 17.66 per cent proportion of urban population in Haryana which was concentrated in the study area. The highest level of urbanization has been contained in Ambala district (35.79 per cent) followed by Yamuna Nagar (28.75 per cent), Karnal (22.43 per cent) and Panipat (18.40 per cent) districts whereas in fifteen districts of the Haryana and total number of districts was 19 in 1971. The Haryana state the urbanization has been recorded below state average with lowest level of 7.16 per cent in Faridabad districts followed by districts Kaithal (11.13 per cent), Fatehabad (11.17 per cent), Jhajjar (11.91 per cent) and Mahendergarh (12.07 per cent) districts.

Table 3: Urbanization and Pattern in Haryana, from 1971 to 2011

Sr.No.	Districts	Census Years				
		1971	1981	1991	2001	2011
1	Ambala	35.79	36.77	35.44	35.20	44.38
2	Bhiwani	14.55	15.89	17.24	18.97	19.66



3	Faridabad	07.16	41.43	48.57	77.80	79.51
4	Fatehabad	11.17	14.87	15.93	17.36	19.06
5	Gurugram	13.81	18.61	20.30	35.58	68.82
6	Hisar	17.63	21.55	23.70	25.90	31.74
7	Jhajjar	11.91	12.77	13.90	22.17	25.39
8	Jind	13.55	15.14	17.18	20.30	22.90
9	Kaithal	11.13	11.94	14.69	19.39	21.97
10	Karnal	22.43	25.94	27.46	26.15	30.21
11	Kurukshetra	16.32	20.71	24.01	26.11	28.95
12	Mahenderagarh	12.07	12.39	12.41	13.49	14.41
13	Mewat	DNA	DNA	DNA	07.51	11.39
14	Palwal	DNA	DNA	DNA	19.18	22.69
15	Panchakula	12.54	19.47	35.82	44.49	55.81
16	Panipat	18.40	62.37	27.15	40.53	46.05
17	Rewari	12.92	12.20	15.59	17.79	25.93
18	Rohtak	16.68	19.27	21.31	35.06	42.04
19	Sirsa	14.29	18.07	21.16	26.28	24.65
20	Sonipat	15.06	21.19	23.58	25.15	31.27
21	Yamunanagar	28.75	29.58	33.69	37.73	38.94
22	Dadari	DNA	DNA	DNA	DNA	DNA
	Haryana	17.66	21.88	24.63	28.92	34.88
	India	19.90	23.31	26.10	27.81	31.16

Source:

Census of India 1991, Town Directory, Series-8, Haryana, Part IX-A, Statement-1, pp. 112-123.

Census of India 2001, General Population Tables, Haryana (Tables A-1 to A-4), Series-7, India, Statement 4 & Table A-2, Directorate of Census Operations, Haryana, pp. 35, 86 -91.

Census of India 2011, Primary Census Abstract, Haryana, Series 7, Tables - A5-A8, Directorate of Census Operations, Haryana.

Note: DNA- Data Not Available

In 1981, census India, the state showed the upward trend and recorded 21.88 per cent urbanization with a notable inter-district variation in the study area. Surprisingly, the district Faridabad, who was at bottom in 1971, has been ranked first with highest 41.43 per cent level of urbanization pursued by Ambala 36.77 per cent and Yamunanagar 29.58 per cent districts but till now a large number of fourteen districts have been registered the low level of urbanization than the state average. The district Kaithal 11.94 per cent scored lowest



proportion of urban population adjoining Rewari 12.2 Per cent, Mahendergarh 12.39 per cent and Jhajjar 12.77 per cent districts.

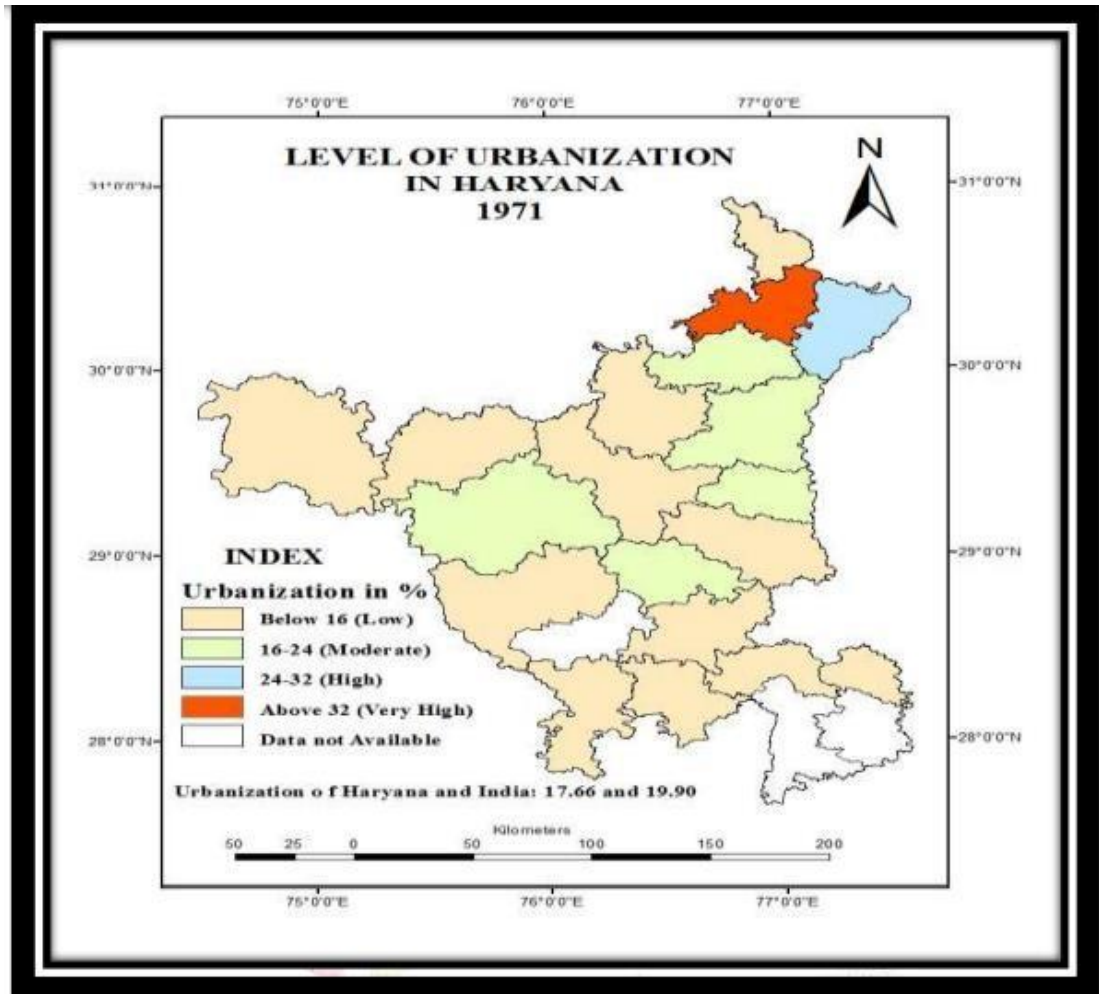
In 1991, the state has kept the increasing trend of urbanization with 24.63 per cent proportion nearby country's proportion of 26.10 per cent. Again the districts Faridabad get first position (48.57 per cent) again followed by Panchkula, Ambala and Yamunanagar with 35.82, 35.44 and 33.69 per cent urbanization respectively whereas lowest urbanization has been seen in Mahendergarh 12.41 per cent followed by Jhajjar 13.90 per cent, Kaithal 14.69 per cent, and Rewari 15.59 per cent district respectively. The districts Karnal, Kurukshetra, Panipat and Sonipat have also witnessed the positive change in urban population with steady increase.

In 2001, the regional gap of urbanization has maintained its spacious gap as compared to previous census. Faridabad district registered highest 77.80 per cent urbanization trailed by 44.49 per cent in Panchkula, 37.73 per cent in Yamunanagar and 35.20 per cent in Ambala districts whereas on another hand the newly set up district of Mewat has been characterized by lowest urban population of only 7.51 per cent but the optimistic point is that except these two, all districts documented the moderate increase in urban proportion in their population due to decentralization of industrial and other activities. The census 2011 reports the 34.88 per cent urbanization in the state against the country's of 31.16 per cent.

The district wise profile has shown significant variation in level of urbanization. The district Faridabad has still engaged first place with an amazing proportion of 79.51 urban populations. The district Gurugram has emerged as big urban centre competing with neighboring district Faridabad with 68.82 per cent urbanization. The table 3 also reports that every district has reported increase in urbanization at various scales which indicates towards the future possibility of overall development of the region.

Urban Pattern in Haryana 1971

Figure 2 shows that in 1971, there was 17.66 proportion of total population live in various urban locale of the state which is near the average of India 19.90 per cent in the same census year. During this time, only one district specifically Ambala has registered in the category of very high urbanization above 32 per cent followed by nearest Yamunanagar district having high urbanization 24-32 per cent.

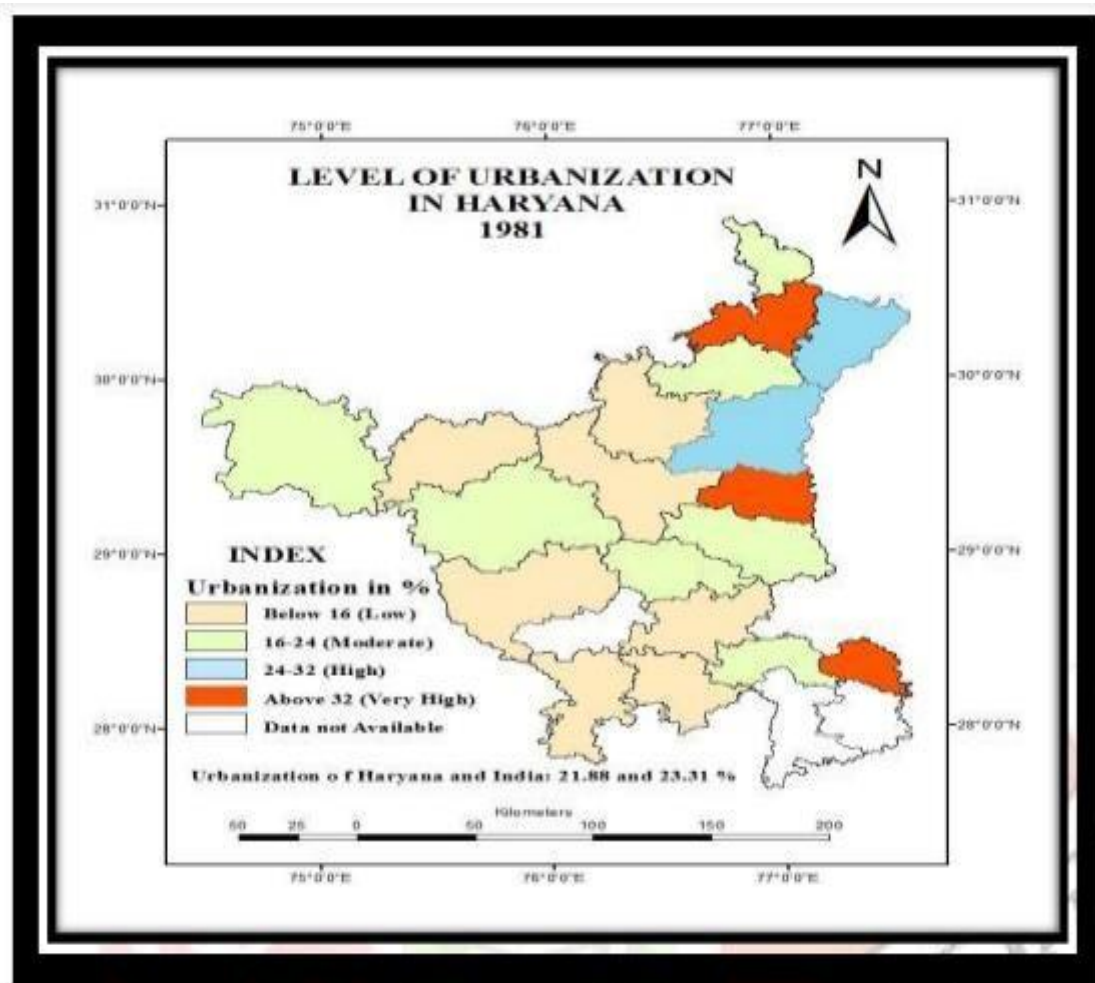


Source: Based on Table 3

A group of five districts namely Kurukshetra, Karnal, Panipat, Hisar and Rohtak have shown 16-24 per cent urbanization whereas highest twelve districts out of nineteen Panchkula, Kaithal, Jind, Sirsa, Fatehabad, Sonipat, Bhiwani, Jhajjar, Mahendergarh, Rewari, Gurgaon and Faridabad have less than 16 per cent share of urban population. It has been observed that except two districts of north which have historical importance and timber activities at large scale respectively, overall state has a less significant level of urbanization.

Urban Pattern in Haryana 1981

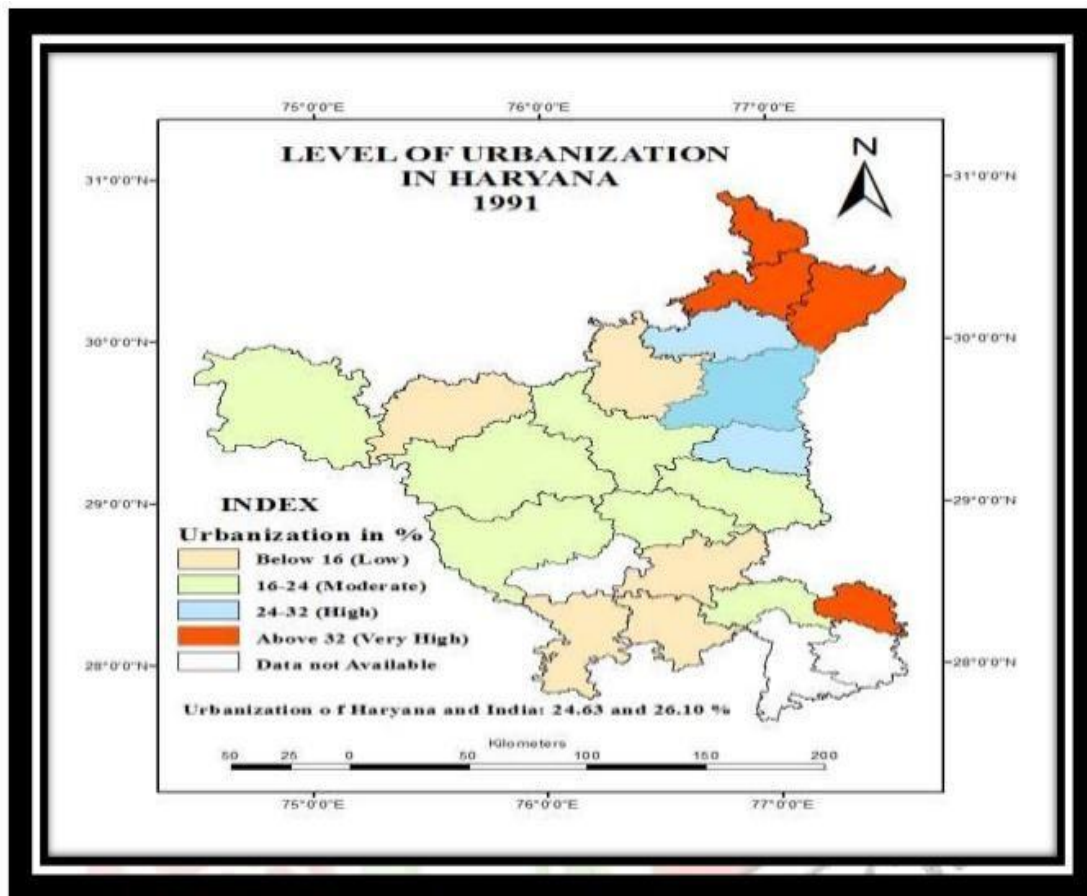
Figure 3 show the wide variation in level of urbanization at district level in the Haryana. The district Faridabad, emerging as an industrial sector has listed very high level of urbanization with Ambala district. The high urbanization has been viewed in district Yamunanagar, Karnal and Panipat followed by the moderate urbanization 16-24 per cent in Panchkula, Kurukshetra, Hisar, Sirsa, Sonipat, Rohtak and Gurgaon districts.



Source: On Based of Table 3

The districts Kaithal, Jind, Fatehabad, Bhiwani, Jhajjar, Mahendergarh and Rewari are found least urbanized in the state. The western and southern of the state is lagging behind in urbanization as compared to highly urbanized north-eastern districts. The reason of this may be that this is agricultural belt dominating by semi-arid and arid climatic conditions and characterized by poor industrial and social development while the districts of north and eastern part have witnessed high to moderate urbanization due to development in different activities like, lumbering, dairying, textiles, hardware and software industries, administrative centers as well as gaining the benefits of Grand Truck Road and nearness to state and national capital cities.

Urban Pattern in Haryana 1991



Source: On the Base of Table No. 3

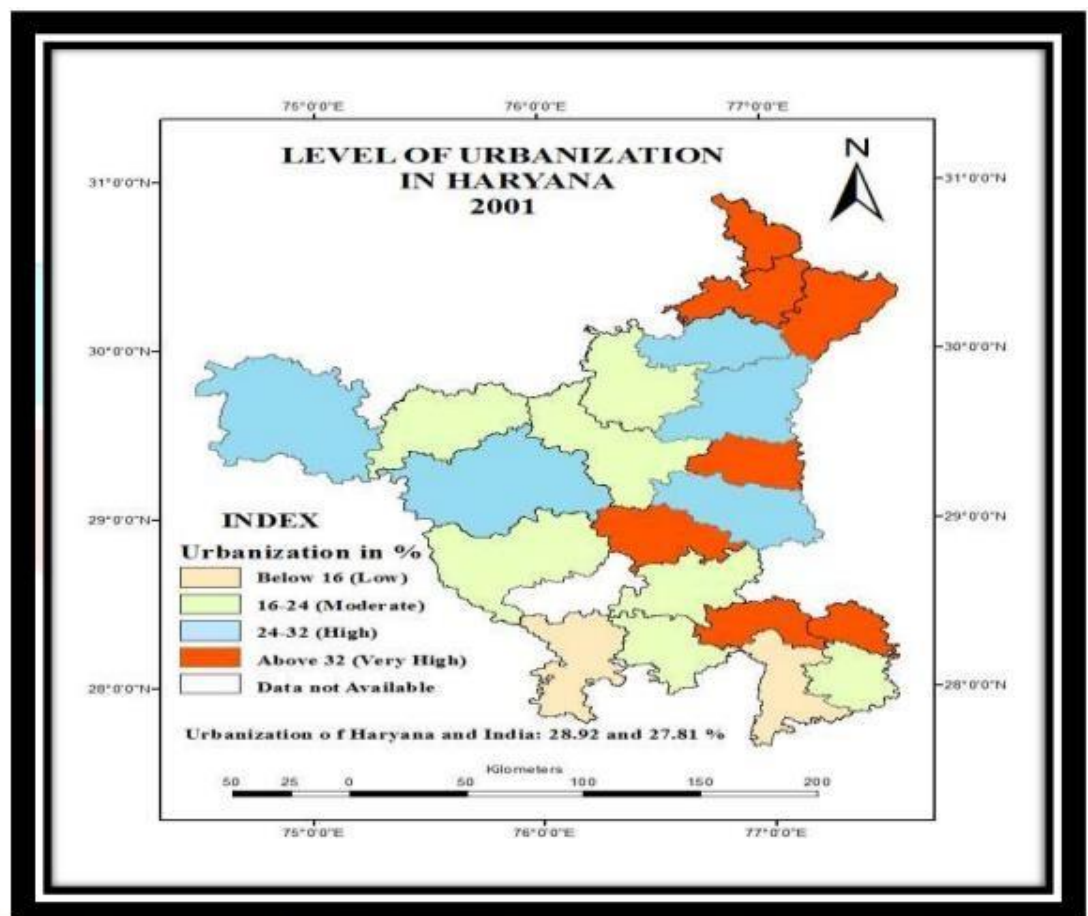
Figure 4 reveals that almost all districts have upgraded their category of previous census by positive increase in proportion of urban population. The districts Panchkula, Ambala, Yamunanagar and Faridabad have been found very highly urbanized above 32 per cent chased by Kurukshetra, Karnal and Panipat districts having high level of urbanization 24-32 per cent.

A cluster of seven districts, Sirsa, Jind, Hisar, Bhiwani, Sonapat, Rohtak and Gurgaon, have shown moderate urbanization whereas five districts, Kaithal, Fatehabad, Jhajjar, Mahendergarh, and Rewari witnessed low level of urbanization. The observation reflects that northern and eastern ribbon is continuously experiencing more urbanization. Though some districts of western and southern Haryana have promoted in higher category yet the major part is at the back in urbanization and require more attention in development policies and programmes.

Urban Pattern in Haryana 2001

The regional analysis reflects that seven districts namely Panchkula, Ambala, Yamunanagar, Panipat, Rohtak,

Gurgaon and Faridabad have established very high urbanization pursued by highly urbanized districts of Kurukshetra, Karnal, Sonapat, Hisar and Sirsa. The districts Kaithal, Jind, Fatehabad, Bhiwani, Jhajjar, Rewari and Palwal have been observed moderately urbanized areas whereas only two districts, Mahendergarh and Mewat, have registered low urbanization. The picture reveals that whole northern and eastern strip of the state except Sonapat district, comprise either very high or high ratio of urban population because of development in manufacturing activities, good educational institutions, amusement sources and high-quality residential sectors. In west part of Haryana, Hisar and Sirsa districts have also come forward with development of heavy steel industries as well as other activities supported by agricultural economy.



Source: On the base of table No. 3

Urban Pattern in Haryana 2011

The urban pattern of 2011 shows same scene as like of 2001 apart from little ups and downs in the study area. Likewise seven districts of 2001 as Panchkula, Ambala, Yamunanagar, Panipat, Rohtak, Gurgaon and Faridabad have maintained their earlier position in 2011 also whereas addition of two new districts of Jhajjar and Rewari, the class of high urbanization



include seven districts in total with prior Kurukshetra, Karnal, Sonapat, Hisar, Sirsa districts. The moderate districts are Kaithal, Jind, Fatehabad, Bhiwani and Palwal and low urbanization level Mahendergarh and Mewat also matching with former pattern excluding of the conversion of two districts Jhajjar and Rewari in higher group show figure 6. The depiction too shows that the northern and eastern districts has shown more urbanization because of old cantonments and scientific instrument and sports items manufacturing of Ambala, paper mills of Yamunagar and national fertilizer Ltd, textiles industries, oil refinery and a number of industries in Panipat attract the people from adjoining rural areas in search of employment opportunities

V. CONCLUSION

The spatial analysis of urban growth in Haryana reveals that while urbanization has driven economic progress and modernization, it has also intensified spatial inequalities and environmental challenges. The concentration of urban development in NCR-adjacent districts has led to regional disparities, while peripheral areas continue to lag behind. Rapid and often unplanned urban expansion has created pressures on land, infrastructure, and the environment. Therefore, future urban planning in Haryana must integrate spatial data and GIS-based insights to promote balanced and sustainable growth. A coordinated approach that emphasizes equitable resource distribution, improved infrastructure, and environmentally responsible planning will be essential for ensuring that urbanization becomes a driver of inclusive and sustainable development across the state.

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