

Exploring Urbanisation and Population Dynamics in Prayagraj District (UP), India Spatial and Temporal Patterns

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Abstract

Urbanisation results from increasing interdependence between urban and rural economies, rapid population expansion, and ongoing infrastructural and technological advancements. It is a significant problem for developing nations, presenting both a challenge and an opportunity. Uttar Pradesh is comparatively less urbanised than India overall, with an urban population of 21.78% compared to the national average of 31.16%. This research analyses the population distribution of urban centres at the regional level in Prayagraj District, Uttar Pradesh, both temporally and spatially. The research seeks to examine the differences in urbanisation across various sub-districts and units to uncover trends in urban growth. The absolute growth is linked to the growth rates of towns, showing a positive correlation in most cases. The Census of India is one of the primary secondary data sources used in this study. The demographic aspects of the region's urbanisation are the main focus of its results. Politically and administratively focused urban cities predominate in the area. The Prayagraj district is a crucial geographical and cultural area within the state, exhibiting notable disparities in urbanisation across its different regions. Situated at the confluence point of the Ganga and Yamuna rivers, the district is segmented into distinct areas by these rivers. The Doab region, located between the two rivers, has witnessed a remarkable urban population growth of 87.1%. In contrast, the trans-Yamuna and trans-Ganga regions have seen limited urban population growth, particularly the trans-Yamuna area, which had an urbanisation rate of 5.79% according to the 2011 census.

Keywords: Urbanisation, Growth, Census towns, sustainable urbanisation, Urban Centres

1. INTRODUCTION

Determining what constitutes an "urban" settlement is challenging, and many governments now utilise different standards and approaches. Twenty-five nations identify cities based on economic qualities, 105 employ administrative criteria, 100 define cities based on population density and size, and 18 define cities based on the availability of urban infrastructure. Six nations consider their whole population urban, whereas 25 countries do not represent an urban area (UN, 1998, 2003). India uses population size, density, and economic features to create administrative requirements for urban areas. Urbanisation "reflects a much deeper social transformation, restructuring economies and difficult livelihoods, changing class systems, refashioning urban fabric, and a new politics," according to Nijman (2012). It is not simply about numbers

and quantitative change. Urbanisation is not recent; it started as a way to live in a planned and safe environment, particularly for non-agricultural purposes. Several levels of urban centres have been created throughout history, dating back to the Mediaeval Ages. Urbanisation has accelerated throughout Europe since the Industrial Revolution. The population of cities worldwide has grown about four times since the second half of the 20th century. Because more people live in cities than in rural areas for the first time in human history, the 21st century is known as the "urban century." (Mohan and Dasgupta, 2004). According to the World Urbanisation Perspective (2018), the projected data reveal that by 2050, 68% of the global population will reside in urban areas, a notable increase from 30% in 1951 to 55% in 2018. Developing nations are expected to contribute nearly 90% to the overall urban growth worldwide.

India is the world's second most populous country, with 1.2 billion people living in around 6 lakh villages and 7935 metropolitan areas. Between 1951 and 2011, the percentage of Indian citizens residing in urban areas rose from 17.3% to 31.16%. The overall population of India increased fivefold between 1901 and 2011, whereas urban areas saw a seventeen-fold growth during the same period. However, unlike patterns in many other nations, India did not see an "urban explosion" (Mohan, 1985). Urbanisation is transitioning from rural-agricultural activities to non-agricultural occupations, accompanied by significant societal organisational and behavioural changes. Urban centres are the product of this process, fueled by several variables and produce several vital outcomes, including the development of social interaction and economic growth hubs. The Prayagraj District stands out due to its unique site, geographical setting, historical development, and population characteristics. These elements collectively influence urban growth and development. Therefore, it is crucial to study the district's urbanisation trends over the past decades and to examine the intra-district variations in urbanisation levels.

The primary objectives of this study are to analyse the spatial and regional patterns of urbanisation in Prayagraj District using sub-district level census data, to identify changes in urbanisation levels across different census decades, and to explore the tehsil and town-level variations in urbanisation. Currently, 55% of people live in urban areas, making urbanisation one of the biggest trends of the past several decades globally. According to UN estimates, this percentage might climb even higher, reaching around 68 per cent by the middle of the century. Although India's urbanisation rate has been slower than the average for less developed countries, its share of the world's urban population has steadily increased over the decades. However, when examining different categories of urban settlements in India, a clear pattern emerges: growth rates have been disproportionately higher in metro cities and larger settlements.

Uttar Pradesh, with a population of around 200 million, had approximately 44 million urban residents, according to the 2011 census, making it the state with the second-largest urban population in India after Maharashtra. Urbanisation has gradually risen from 13.6% in 1951 to 22.27% in 2011, with urban centres increasing from 410 to 915. Although there were dips in urbanisation in 1961 and 1991, the trend has shown steady growth in recent decades. The state is divided into four regions: Western UP, Central UP, Eastern UP, and Bundelkhand. Western UP, benefiting from industrial expansion and its proximity to the National Capital Region (NCR), has the highest urbanisation rate at 31.38%. By contrast, Eastern UP, especially in its northern Tarai belt, has the lowest urbanisation rate at 12.19%. Central UP and Bundelkhand have urbanisation rates of 25.73% and 22.67%, respectively. Class I urban centres, which house around 60% of the urban population, have grown from 14 towns in 1951 to 64 in 2011. Additionally, census towns—especially those close to Class I cities and the NCR—rose sharply from 66 in 2001 to 267 in 2011. These census towns often act as economic hubs for nearby rural areas, illustrating strong economic connections and an integrated urban landscape.

2. Study area

The district of Allahabad is located at the southern tip on the eastern side of Uttar Pradesh State. Historically, during British and Mughal times, Allahabad was a significant centre of learning and administration. The district's total area is 5,482.0 square kilometres, with the rural area covering 5,279.1 square kilometres and the urban area comprising 202.9 square kilometres. Allahabad is primarily an administrative and educational city. It is situated between 5°20'N to 25°33'N latitude and 81°42'E to 81°55'E longitude. It is home to the High Court of Uttar Pradesh, the Auditor General of Uttar Pradesh, the Principal Controller of Defence Accounts (Pension) PCDA, the Uttar Pradesh Madhyamik Shiksha Parishad (UP BOARD) office, and the Police Headquarters. In education, it hosts Moti Lal Nehru Regional Engineering College (MNREC), Medical and Agriculture Colleges, and the Indian Institute of Information Technology (IIIT). Significant industries include ITI Naini, IIFCO Phulpur, and Triveni Glass.



Figure 1: Location Map of Study Area

3. Data Source and Methodology

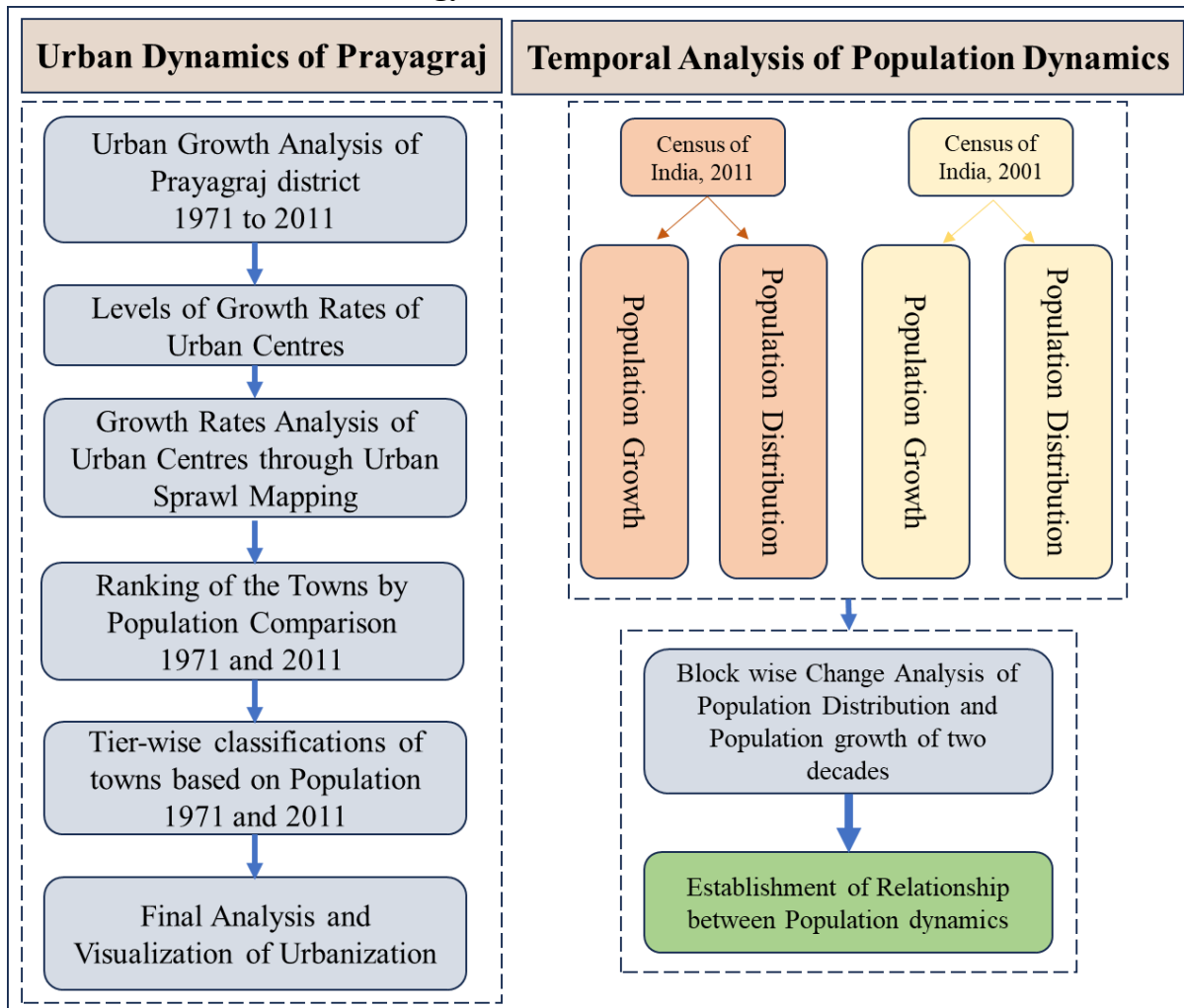


Figure 2: Methodological framework

This study relies entirely on published secondary data sources, including the Village and Town Directory, Primary Census Abstract, District Census Handbooks, and the 2016 District-wise Development Indicators of Uttar Pradesh. These resources provide critical demographic, socio-economic, and spatial data for comprehensive analysis. Landsat 4-5 TM satellite imagery, acquired from the United States Geological Survey (USGS) platform, developed a sprawling map highlighting urban growth centres. Advanced geospatial techniques, including image processing and GIS-based mapping, were employed to assess urban expansion patterns and quantify changes over time. Thematic maps and tables were meticulously prepared to analyse urbanisation trends and spatial distribution across Uttar Pradesh, particularly in the Bundelkhand region. Furthermore, Google Earth imagery was leveraged to digitise urban centres and generate thematic layers, which were integrated into the spatial database to enhance the visualisation and interpretation of urbanisation dynamics.

4. Results and Discussions

4.1 Temporal Analysis of Population Dynamics in Prayagraj District, 1991-2011

Population Distribution

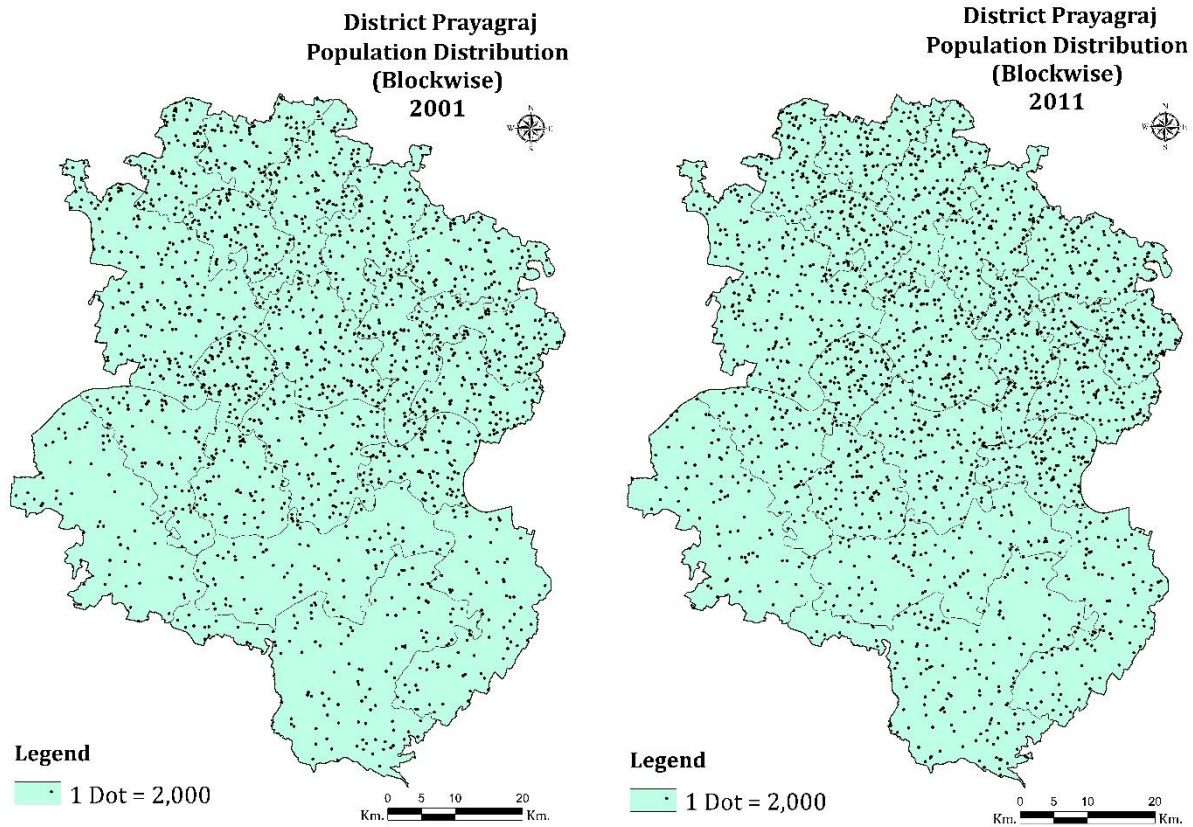


Figure 3: Population Distribution, 2001 and 2011

Population plays a crucial role in understanding urban landscape changes and their effects on agriculture and socio-economic dynamics. Prayagraj, a Uttar Pradesh, India district, is part of the fertile Ganga Plains and among the state's largest districts. As per the 2011 Census, it had a population of 5.94 million, with 70% living in rural areas dependent on agriculture and 30% residing in urban centres, primarily in Prayagraj. The district's population density is 1,088 persons per square kilometre, surpassing the national average, with metropolitan areas being more densely populated due to better infrastructure and opportunities. Prayagraj is culturally and religiously diverse, with Hindus forming the majority, followed by Muslims and smaller communities. The literacy rate is 74.41%, higher in urban areas, while the sex ratio is 902 females per 1,000 males. The district's fertile plains, shaped by the Ganga, Yamuna, and Saraswati rivers, support farming, while its urban areas serve as key administrative and cultural hubs. Events like the Kumbh Mela add to its socio-cultural significance. Analysing Figure 5, the distributional pattern of the population of prayagraj can be seen. The figure also gives a comparative distributional pattern between 2001 and 2011.

Population Growth

Prayagraj district, formerly Allahabad, experienced notable population growth between 2001 and 2011. The population increased from approximately 4.94 million in 2001 to 5.95 million in 2011, reflecting a growth rate of around 20.5%. This rise is attributed to natural growth, rural-to-urban migration, and the district's role as a regional hub for education, culture, and administration. The urban expansion, particularly in Prayagraj city, has

attracted people seeking better opportunities, straining urban infrastructure like housing, water supply, and sanitation. Rapid urbanisation poses challenges for sustainable resource management and socio-economic development. As a pilgrimage centre during events like the Kumbh Mela, the district's significant cultural and

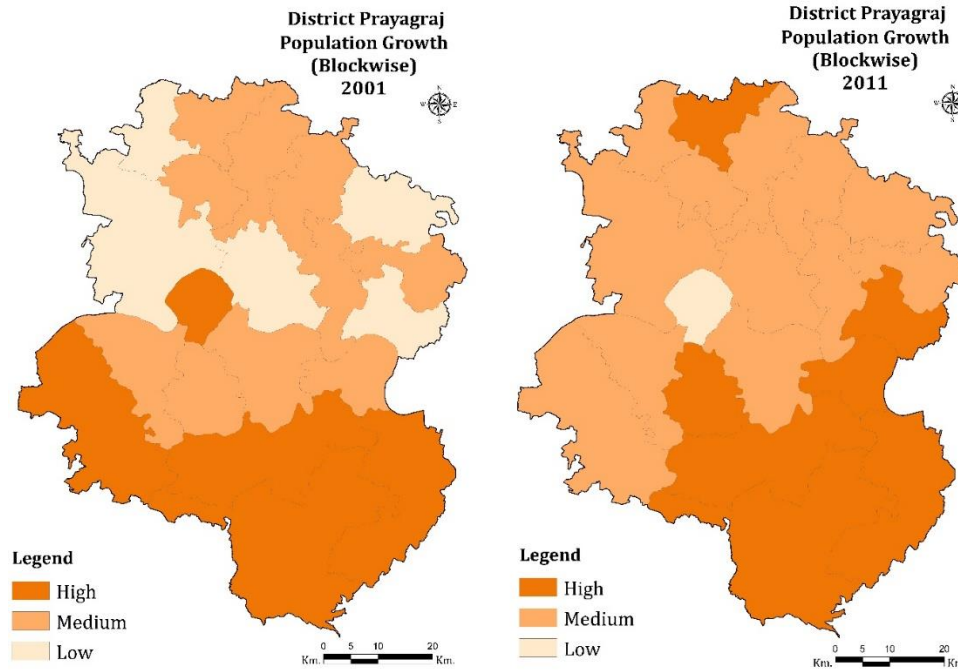


Figure 4: Population Growth, 2001 and 2011

religious significance further contributes to its population density and urban Sprawl. Managing growth sustainably while ensuring equitable resource access remains a priority for future planning. Figure 6 shows the population growth from 1991-2001 to 2001-2011. The figure shows the blockwise growth of the whole district. The entire district is categorised by administration in 20 blocks. Prayagraj Municipal Corporation and Cantonment Board, the district's most populous and Major growth centre, lies in some parts of Chaka, Kaurihar and Bahadurpur blocks.

4.2 Growth of Urban Centres

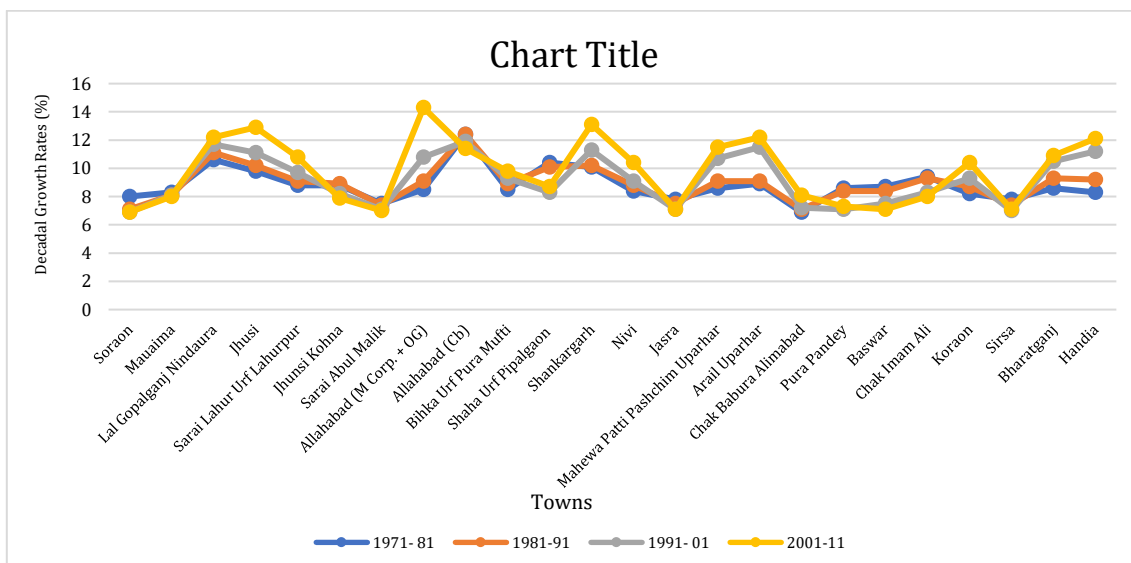


Figure 5: Decadal Growth Rates of Urban Growth Centres

Prayagraj district, formerly known as Allahabad, has witnessed significant changes in the number of towns over three census decades, highlighting shifts in administrative boundaries and urbanisation patterns. According to the 1991 Census, the district had 18 municipalities, providing a baseline for analysing urban growth trends. By the 2001 Census, the number of towns increased to 23, marking a notable rise in urban settlements. This figure climbed to 26 municipalities in 2011, reflecting ongoing urban expansion and administrative reclassification. Throughout these decades, Allahabad Tehsil consistently maintained its position as the district's primary urban centre. This tehsil showcased its prominence in population, infrastructure, and economic activities, housing the highest number of urban settlements within the district during each census period. This reinforced its status as a central hub for governance, education, and commerce. Karchhana Tehsil, which had the second-highest number of towns, experienced growth in its urban centres from four to five between 1991 and 2001. This incremental increase mirrored localised development and urbanisation. However, the administrative landscape changed significantly in 2001 when the Manjhanpur, Chail, and Sirathu tehsils were carved out and transferred to form the new district of Kaushambi. Despite this reorganisation, Allahabad Tehsil remained the leading urban centre. Despite administrative adjustments, the consistent increase in the number of towns indicates a broader urbanisation trend in the Prayagraj district. This urban growth can be attributed to factors such as population pressure, rural-to-urban migration, and the district's strategic importance as an educational and cultural hub. This growth has led to an increase in employment opportunities, further driving urbanisation. Sustainable urban planning can help mitigate these challenges by promoting green spaces, improving public transportation, and implementing efficient waste management systems.

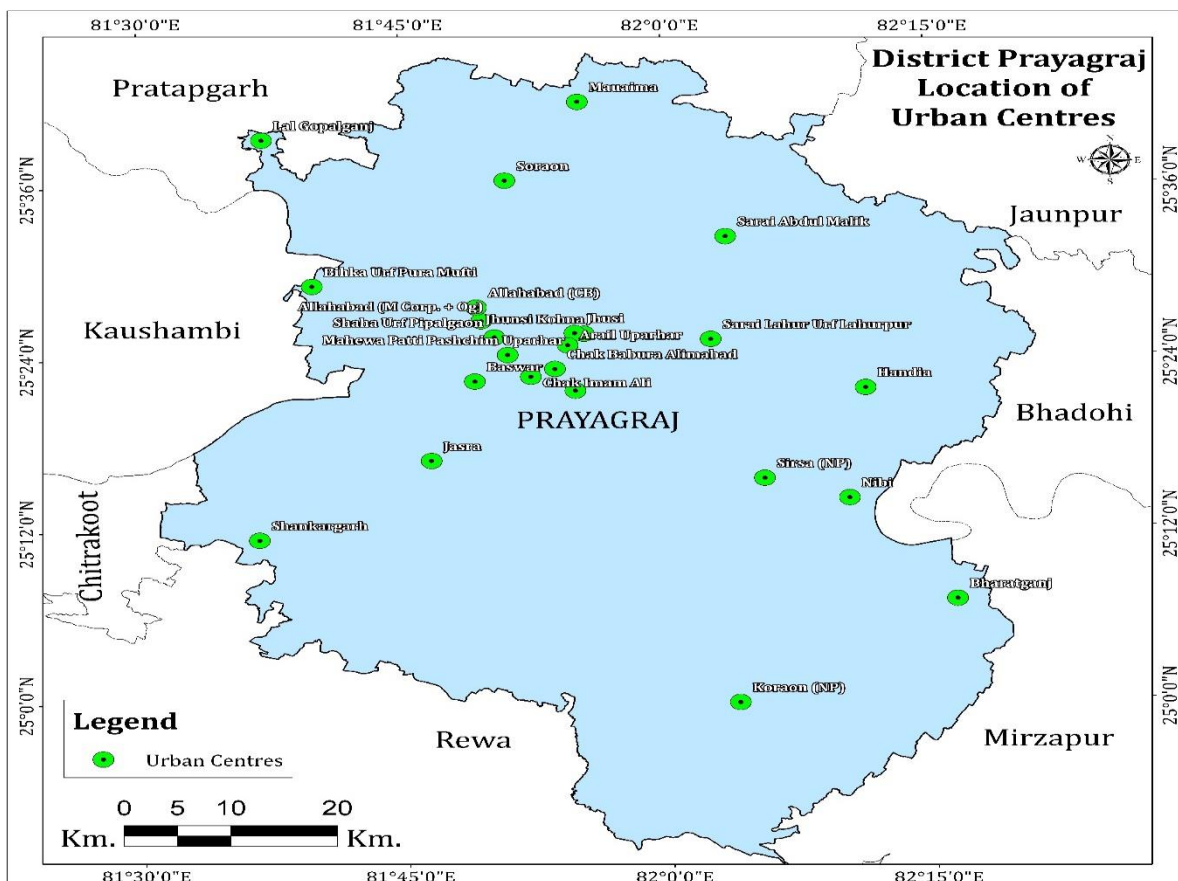


Figure 6: Location of Towns Urban Growth Centres

Every town has been categorised block-by-block to comprehend the urban population's geographical and temporal distribution. The growth rates of each village in the Prayagraj District, according to the census, are displayed in Table 2. The population of each town in 1971 and 2011 is shown in the table's rightmost two columns. A growth pattern among urban centres may be observed by analysing the decadal growth rates of various cities. Every town in the district that has demonstrated growth at a rate of seven per cent or above also has growth rates. The municipalities that have had growth rates of five per cent or less in the census decades that have followed are also seeing declining growth rates. In a single decade, the cities of Allahabad M. corp., Phulpur Np., Shankargarh, Lal Gopalganj., Arail, and Mahewa Uparhar have seen growth rates of 7% and higher, and in certain instances, up to 13%.

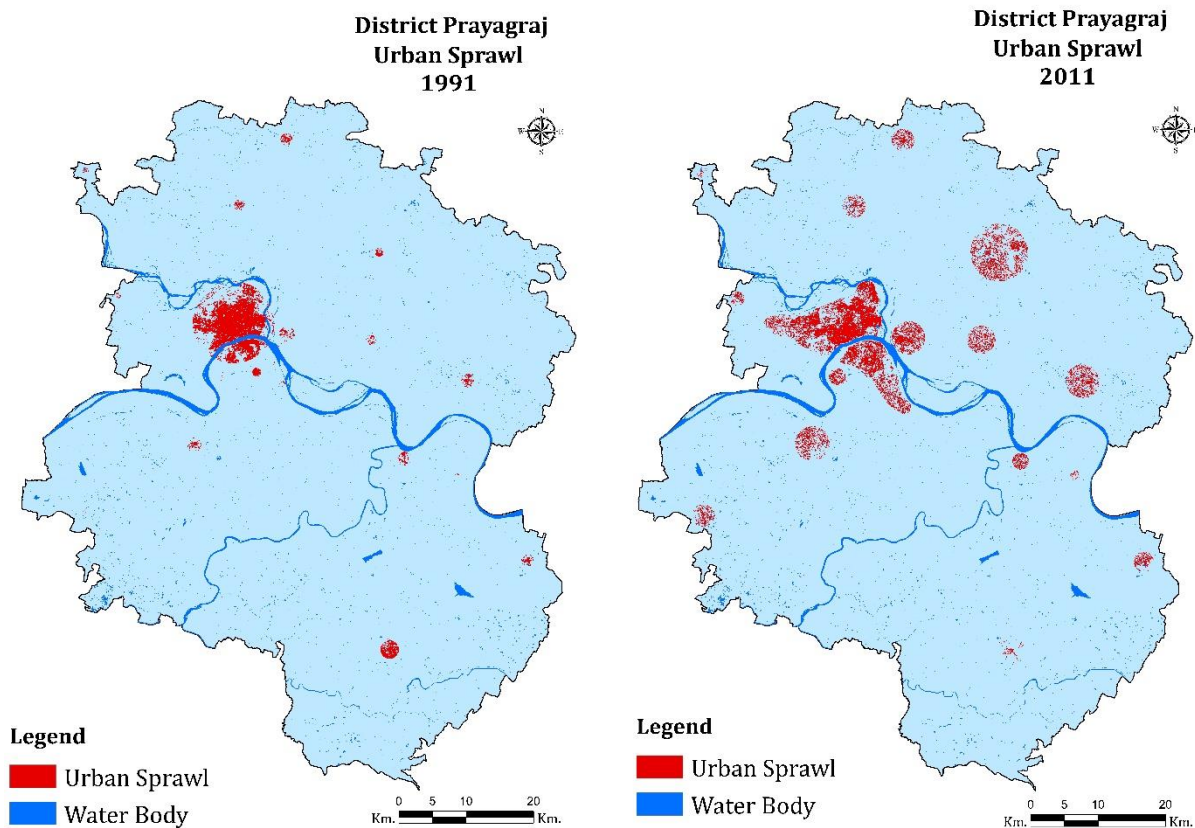


Figure 7: Urban Growth Centres and Sprawl, 1991 and 2011

Table 6: Tier-wise classifications of towns based on Population 1971 and 2011 Computed By Author.

S.N.	TOWN	POPULATION 1971	CLASS	POPULATION 2011	CLASS
1	Allahabad (M Corp. + Og)	779373	II	1168385	I
2	Lal Gopalganj	18369	IV	27944	III
3	Allahabad (CB)	17109	IV	27288	III
4	Handia	14786	IV	21798	III
5	Jhunsi Kohna	14475	IV	20023	III

6	Mauaima	14373	IV	19645	IV
7	Shankargarh	11645	IV	17785	IV
8	Bharatganj	11206	IV	15345	IV
9	Koraon (NP)	10443	IV	14821	IV
10	Sirsa (NP)	9562	V	13878	IV
11	Jhusi	9144	V	12686	IV
12	Arail Uparhar	8201	V	12190	IV
13	Soraon	8037	V	10749	IV
14	Bihka Urf Pura Mufti	7580	V	10624	IV
15	Shaha Urf Pipalgaon	5830	V	8342	V
16	Nibi	5016	V	7125	V
17	Mahewa Patti Pashchim Uparhar	4382	VI	6408	V
18	Jasra	4125	VI	5552	V
19	Baswar	4093	VI	5483	V
20	Chak Babura Alimabad	3675	VI	4876	VI
21	Sarai Abdul Malik	3639	VI	4815	VI
22	Chak Imam Ali	3318	VI	4641	VI
23	Sarai Lahur Urf Lahurpur	3054	VI	4406	VI
24	Pura Pandey (Ct)	3006	VI	4066	VI

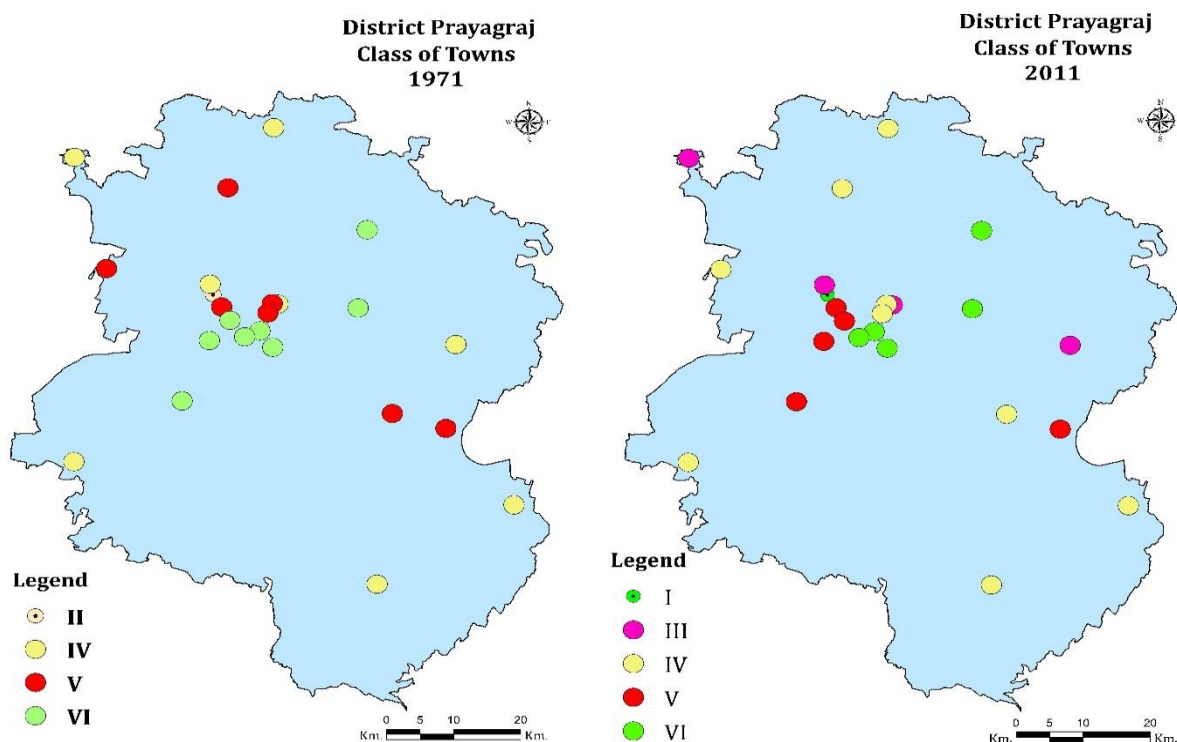


Figure 8: Class of towns in 1971 and 2011

5. SUMMARY AND CONCLUSION

The prior debate has made evident a trend towards unequal urban expansion concerning time and space. The Main Tehsil of Allahabad is the district's main urban centre. The geographic structure also exists in the post-1991 urbanisation trend. According to national data, urbanisation is developing unpredictably, with tier 1 and 2 cities benefiting the most. There are few intervening opportunities; therefore, growth rates decrease in the middle and lower settlement ranges. A similar trend may be seen in centre-level findings, where the rate of urbanisation expansion is slower in areas that are farther from the economic core. Higher migration and lopsided infrastructural expansion in the major Allahabad Tehsil are to blame. A pattern of urban centre expansion may be seen by examining the decadal growth rates of several towns. Every town in the district that has demonstrated growth at a rate of 7% or above includes the cities with growing growth rates. The municipalities that have had growth rates of five per cent or less in the census decades that have followed are also seeing declining growth rates. As a result, there was a more significant disparity between larger and smaller towns throughout the previous census decades. Interestingly, this growing disparity may be partially explained by examining migration statistics from the 2011 census decade.

The towns of Mahewa Uparhar, Phulpur Np, Shankargarh, Lal Gopalganj, Arail, and Allahabad M. Corp. have all seen growth rates of 7% and more in the past ten years, with some instances reaching 13%. The primary cause of the disparities in population growth rates has been urban-to-urban migration, mainly from inside and outside the district.

This is the primary concern for achieving Sustainable Urban Growth SDG target 11 in the long run. Such skewed patterns of urban growth should be checked by providing intervening opportunities like hospitals, educational institutes, business centres, and other economic opportunities in the lower-level towns in the district.

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