Cities in Transition: A Case Study of Urban Population Growth and Spatial Transformation in Begusarai

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ABSTRACT

This paper examines Begusarai's ongoing urban transition by integrating demographic trends with land use–land cover (LULC) dynamics. Using decennial Census data (1901–2011) and district industrial records, and long-run urbanization patterns has been analysed. To project urban population of Begusarai to 2025 a geometric growth model has been used in this study. Complementary LULC assessments for 2005–06 and 2015–16, derived from Bhuvan and processed in QGIS to quantify geo-spatial change. Results show a historically subdued but uneven urban trajectory in Begusarai registering a sharp inflection between 2001 and 2011 as the urban share rose to 19.18%, driven by the recognition of new census towns, expanding industrial activity around the Barauni node, and improved connectivity. Projections indicate continued, though moderating, urban growth through 2025 (urban population ~1.02 million), consistent with demographic and reclassification-led urbanization. LULC analysis reveals substantial conversion of fallow and wastelands to cropland and built-up areas, with rural built-up expanding more rapidly than urban cores, and concurrent contraction of wetlands—signalling environmental trade-offs. Taken together, the evidence points to a dispersed, peri-urban mode of growth propelled by employment opportunities and infrastructure upgrades, but constrained by governance and ecological pressures. The study argues for integrated, district-scale planning that simultaneously manages settlement expansion, protects critical water bodies and wetlands, and aligns industrial siting with serviced land and resilient infrastructure.

Keywords: ***Urbanization, Emerging Town, Begusarai,*** **Environmental**

Introduction :

Urbanization represents a fundamental transformation of human settlement systems, reshaping economic structures, social relations, and spatial organization.It refers not only to the increasing concentration of population in urban areas but also to the functional transition of settlements from agrarian economies to diversified, non-agricultural systems (Davis, 1965). While urbanization has been underway for centuries, its pace has accelerated significantly in recent decades due to globalization, industrial restructuring, and demographic transition (Sarif & Roy, 2024).

In developing countries, urban growth often proceeds rapidly but unevenly, frequently outpacing infrastructure provision and institutional capacity, resulting in informal expansion and governance stress (UNDESA, 2019). In contrast, most developed countries have entered advanced stages of urbanization characterized by slower growth or urban shrinkage. India's urban transition since independence has been shaped by industrialization, internal migration, declining fertility, and state-led development strategies (Planning Commission of India, 2011). However, urban growth remains highly uneven across states. Economically advanced states exhibit higher urbanization levels, while states such as Bihar remain predominantly rural with limited urban expansion (Bhagat, 2018; Kumar & Pandey, 2012).

Recent urban studies emphasizes that urbanization in India is no longer confined to

metropolitan regions. Smaller districts and emerging industrial towns have become important sites of urban growth, driven by localized economic opportunities, infrastructure development, and administrative reclassification (Shaw, 2019; Imam, 2021). Begusarai district in Bihar exemplifies this emerging pattern of decentralized and transitional urbanization.

Study Aream:

Begusarai district is located in central Bihar along the northern bank of the River Ganga, between latitudes 25.15°N–25.45°N and longitudes 85.45°E–86.36°E. The district covers approximately 1,918 sq. km and is bordered by Samastipur to the north, Munger and Lakhisarai to the south, Khagaria to the east, and Patna to the west.

According to the 2011 Census, Begusarai had a total population of 2.97 million with a literacy rate of 59.13%, reflecting its predominantly agrarian socio-economic base (Census of India, 2011). However, post-independence industrialization—particularly following the establishment of the Barauni Refinery in 1965—has significantly altered the district's economic structure (Directorate of Industries, Government of Bihar, 2012). The growth of MSMEs and large industrial units has strengthened Begusarai's role as an industrial hub in Bihar, often described as the "industrial capital" of the state.

Materials and Methods :

This study is based entirely on secondary data sources. Long-term trends in urban population growth were analyzed using decennial Census of India data from 1901 to 2011 (Census of India, 2001; Census of India, 2011). Urban population projections up to 2025 were estimated using the geometric growth method, a widely used demographic forecasting technique in urban studies (Bhagat, 2018).

Land Use and Land Cover (LULC) analysis was carried out using satellite-derived datasets for 2005–06 and 2015–16 obtained from the Bhuvan portal of the National Remote Sensing Centre (NRSC, 2016). The datasets were processed and analyzed using QGIS software to quantify changes in cropland, built-up areas, wetlands, and wastelands. Comparative analysis was conducted at district, state, and national scales to situate Begusarai's urban trajectory within broader spatial patterns of urbanization (Kumar & Pandey, 2012).

Urbanization in Bihar: Context :

Bihar has historically exhibited one of the lowest levels of urbanization in India. According to the 2011 Census, only 11.3% of the state's population resided in urban areas, compared to 31.2% at the national level (Census of India, 2011). This lag is closely linked to Bihar's agrarian economic structure, limited industrial base, and inadequate urban infrastructure (Kumar & Pandey, 2012).

In recent decades, however, Bihar has experienced a gradual rise in urban population, largely driven by the proliferation of census towns rather than organic urban growth (Sharma, 2014). This form of administrative or demographic urbanization has produced a dispersed pattern of small and intermediate towns, particularly along transport corridors and emerging industrial nodes such as Begusarai. The analysis of district-wise urban population percentages in Bihar between 2001 and 2011 reveals a pattern of slow but regionally concentrated urban growth. At the state level, the proportion of urban population increased only marginally—from 10.44% in 2001 to 11.28% in 2011, marking a decadal rise of 0.84 percentage points. This modest increase highlights Bihar's continued position as one of the least urbanized states in India, where the pace of urbanization remains below the national average (table 1).

Among individual districts, Patna (43.48%) emerged as the most urbanized, followed by Munger (28.30%), Begusarai (19.19%), and Bhagalpur (19.79%). These districts serve as major urban and industrial hubs, benefiting from administrative importance, better connectivity, and industrial growth. Notably, Begusarai recorded the sharpest increase in urban share a remarkable 15.19 percentage point rise which can be attributed to the industrial expansion around the Barauni industrial belt and the emergence of new census towns during the decade.

Table 1:

District-wise Urbanisation and Decadal Change in Bihar (2001–2011)

Sl. No	District	Urban Population (%)	Urban Population (%)	Urban Population Change (%)
1	Araria	6.41	6.13	0.27
2	Arawal	7.36	N.A	7.36
3	Aurangabad	9.38	8.05	1.32
4	Banka	3.52	3.51	0.01
5	Begusarai	19.19	4.00	15.19
6	Bhagalpur	19.79	18.23	1.56
7	Bhojpur	14.29	13.99	0.30
8	Buxar	9.61	9.19	0.42
9	Darbhanga	9.69	8.14	1.55
10	E.Champaran	7.85	7.10	0.75
11	Gaya	13.14	13.07	0.07
12	Gopalganj	6.32	6.08	0.25
13	Jamui	8.24	7.39	0.85
14	Jehanabad	11.95	7.38	4.57
15	Kaimur	4.02	3.25	0.77
16	Katihar	8.91	8.90	0.01
17	Khagaria	5.26	5.08	0.18
18	Kishanganj	9.68	9.07	0.61
19	Lakhisarai	14.29	14.10	0.19
20	Madhepura	4.42	4.06	0.36
21	Madhubani	3.68	3.49	0.19
22	Munger	28.30	27.49	0.81
23	Muzaffarpur	9.83	9.77	0.07
24	Nalanda	15.93	14.93	0.99
25	Nawada	9.72	7.65	2.07
26	Patna	43.48	41.05	2.43
27	Purnea	10.41	8.75	1.65
28	Rohtas	14.43	14.10	0.33
29	Saharsa	8.18	8.01	0.17
30	Samastipur	3.46	3.21	0.24
31	Saran	8.93	8.08	0.84
32	Shekhapura	17.14	15.48	1.65
33	Sheohar	4.28	4.13	0.14
34	Sitamarhi	5.58	4.74	0.83
35	Siwan	5.49	4.52	0.98
36	Supaul	4.74	4.05	0.68
37	Vaishali	6.65	5.88	0.77
38	W.Champaran	10.04	9.17	0.87
39	Bihar Total	11.28	10.44	0.84

Source: Census of India, 2001, 2011

Urbanization Dynamics in Begusarai:

Begusarai's urbanization trajectory reveals distinct phases of growth and stagnation. Census records indicate that the district remained entirely rural until 1921, when urban population was recorded for the first time (Census of India, 2001). Urban growth remained slow and fluctuating until independence, reflecting limited industrial development and infrastructural investment.

Post-independence industrialization — particularly around the Barauni industrial complex contributed to gradual urban expansion in the district (Directorate of Industries, Government of Bihar, 2012). However, a sharp decline in the recorded urban share between 1991 and

2001 was primarily the result of administrative reclassification rather than actual de-urbanization, a phenomenon observed elsewhere in Bihar during the same period (Sharma, 2014).

The 2011 Census marked a watershed moment for Begusarai, with urban population rising dramatically to 19.18%. This surge was driven by the recognition of new census towns, increased industrial employment, and improved transport connectivity (Census of India, 2011). Similar patterns of reclassification-led urban growth have been documented in other semi-urban districts of India (Sarif & Roy, 2024).

From the analysis of data shown in table 2, Begusarai remained a predominantly rural district during the early decades of the 20th century. The

process of urbanization only began to manifest by 1921, with an urban population of 9,062 persons, constituting 1.61% of the total district population. However, this nascent urban growth experienced fluctuations, as seen in

1931, when the urban population declined to 7,739, lowering the urban percentage to 1.22%. This decline may be attributed to either a fall in population in small towns or administrative changes that reclassified urban areas.

Post-independence, the urban scenario began to change more steadily. The urban population increased from 38,516 in 1941 (5.36%) to 96,908 in 1961 (10.15%), as infrastructural development, industrial activity, and government interventions began to concentrate in specific nodal centers like Begusarai town. However, despite this numerical increase, the urban percentage plateaued in the following decades, registering 9.22% in 1971, 10.58% in 1981, and 9.79% in 1991. This stagnation suggests that the rural population was growing at a comparable or even faster rate than urban population, thereby offsetting gains in urban percentage.

A notable deviation is observed in the 2001 Census, where the urban population was recorded at 107,623, but its share drastically dropped to 4.58% of the total population. This unusual decline was likely due to administrative reclassification, where some areas previously counted as urban were re-designated as rural, as also discussed in various studies on urban demography in Bihar.

The 2011 Census, however, marks a significant shift in the urban landscape of Begusarai. The urban population increased sharply to 569,823, accounting for 19.18% of the total district population. This dramatic rise in urban percentage is attributed to the recognition of several new census towns, increased urban migration, and economic diversification in the region. With the emergence of industrial establishments, educational institutions, and better connectivity, Begusarai has increasingly come to function as a regional urban hub (Census of India, 2011).

In conclusion, the trajectory of urbanization in Begusarai reflects a transitional and uneven growth pattern, marked by initial stagnation, modest mid-century growth, and rapid urban expansion in the last decade. The district is now firmly on the path of urban transition, propelled by both structural economic changes and policy-led urban recognition.

Table 2:

Decadal growth of urbanization in Begusarai (1901-2011)

Census Year	Total	Rural	Urban	Urban (%)
1901	5,75,455	5,75,455	-	-
1911	5,93,470	5,93,470	-	-
1921	5,64,328	5,55,266	9062	1.61
1931	6,35,456	6,27,717	7739	1.22
1941	7,18,390	6,79,874	38516	5.36
1951	7,93,942	7,49,100	44842	5.65
1961	9,54,333	8,57,425	96908	10.15
1971	11,47,429	10,41,596	105833	9.22
1981	14,56,343	13,02,292	154051	10.58
1991	18,14,773	16,37,071	177702	9.79
2001	23,49,366	22,41,743	107623	4.58
2011	29,70,541	24,00,718	569823	19.18
2021	3,480,000*	2,590,069*	889,931	25.56*
2025	3,720,000*	2,696,198*	1,023,802	27.51*

Source: District Census Handbook (2011)

Land Use–Land Cover Change

The Land Use and Land Cover (LULC) information for Begusarai district in 2005–06 reveals a landscape predominantly dominated by agriculture. Out of the total geographical area of 1,889 square kilometers, a substantial 61.01% was used for crop cultivation, indicating the agrarian nature of the district's economy during that period. Additionally, around 11.42% of the land lay fallow, suggesting that a significant portion of land was left uncultivated seasonally or temporarily, likely due to crop rotation practices or soil fertility concerns.

Urban built-up areas accounted for only 3.2% of the land, while rural settlements covered 6.69%, showing that human habitation was more rural in character and that urbanization was relatively modest at the time. Together, the built-up areas—both urban and rural—comprised nearly 10% of the district's land, reflecting a growing but still limited presence of infrastructure and human settlements. Water bodies, including rivers, streams, and canals, constituted 8.56% of the district, while inland wetlands added another 3.24%. These figures emphasize the ecological richness of the region, particularly the presence of prominent wetlands such as Kanwar Lake and the influence of the Ganges River system. Reservoirs, lakes, and ponds made up a much smaller fraction, with only 0.12% of the area.

The land under plantation farming stood at 3.69%, showing that while less prominent than crop farming, plantations played a modest role in the local land use system. Meanwhile, barren or unculturable lands, including scrublands, made up 2% of the district's area. Forest cover was extremely sparse, with deciduous forests occupying merely 0.07%, pointing to either the absence of significant forested zones or the result of long-term deforestation and land conversion (figure 1a&b).

The Land Use and Land Cover (LULC) data for Begusarai district in 2015–16 indicates a landscape

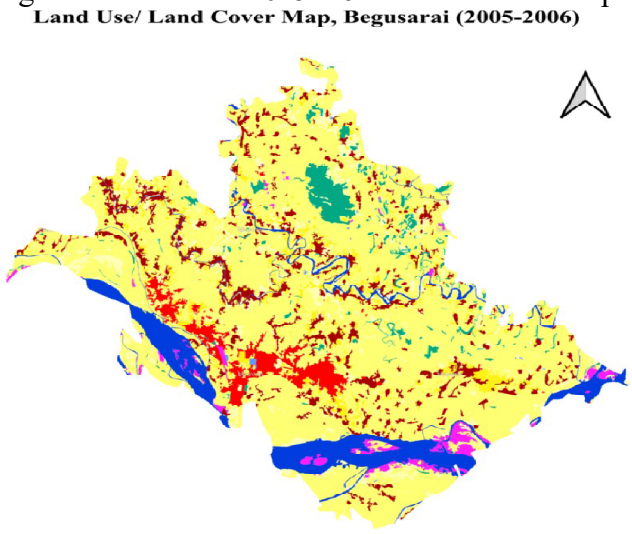
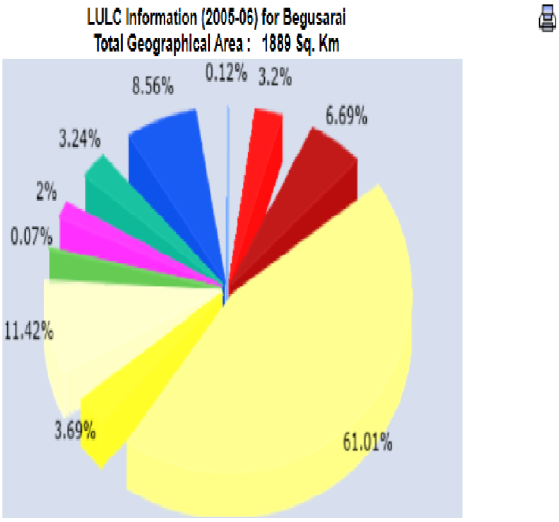


Fig 1a: Land Use/Land Cover of Begusarai (2005-06) ***Source: BHUWAN***



LULC Class	Area (Sq.Km)	LULC Class	Area (Sq.Km)
Builtup,Urban	60.45	Builtup,Rural	126.41
Agriculture,Crop land	1152.47	Agriculture,Plantation	69.7
Agriculture,Fallow	215.81	Forest,Deciduous	1.29
Barren/unculturable/ Wastelands, Scrub land	37.73	Wetlands/Water Bodies, Inland Wetland	61.24
Wetlands/Water Bodies, River/Stream/canals	161.64	Wetlands/Water Bodies, Reservoir/Lakes/Ponds	2.27

Fig 1b: Graphical representation of LULC of Begusarai (2005-06) ***Source: BHUWAN***

still dominated by agriculture but with notable changes from the 2005–06 period. Of the total geographical area of 1,889 square kilometers, agricultural cropland now covers 70.25%, a substantial increase from the previous 61.01%. This expansion of cultivated land suggests growing agricultural intensification or land reclamation for crop production. Meanwhile, the area under agricultural fallow has sharply declined to just 0.85%, signaling either improved cultivation practices or increased pressure to utilize all arable land.

The built-up urban area has grown modestly from 60.45 sq. km to 66.06 sq. km, reflecting a gradual but consistent trend toward urbanization. Rural built-up area has also expanded, now covering 150.41 sq. km, up from 126.41 sq. km in 2005–06. This shift indicates not just a rise in urban habitation, but also a broader spatial spread of human settlements in rural areas, possibly due to population growth and suburban expansion.

Interestingly, a new category, built-up mining land, appears in this dataset for the first time, covering 1.28 sq. km, which points to the initiation or formal recognition of mining activities in the region. The plantation area has increased slightly to 93.89 sq. km, while the area classified as barren or unculturable land has significantly decreased to 13.53 sq. km, suggesting a reduction in wasteland possibly due to land development or conversion for other uses.

Water bodies such as rivers, streams, and canals now cover 167.77 sq. km—an increase from the earlier figure—while coastal wetlands and other inland water features also appear more prominently in the classification, with coastal wetlands occupying 51.03 sq. km. This reflects improved mapping and classification or possibly ecological changes due to floodplain dynamics. However, reservoirs and lakes have seen a slight decline to 1.9 sq. km (figure 2a & b).

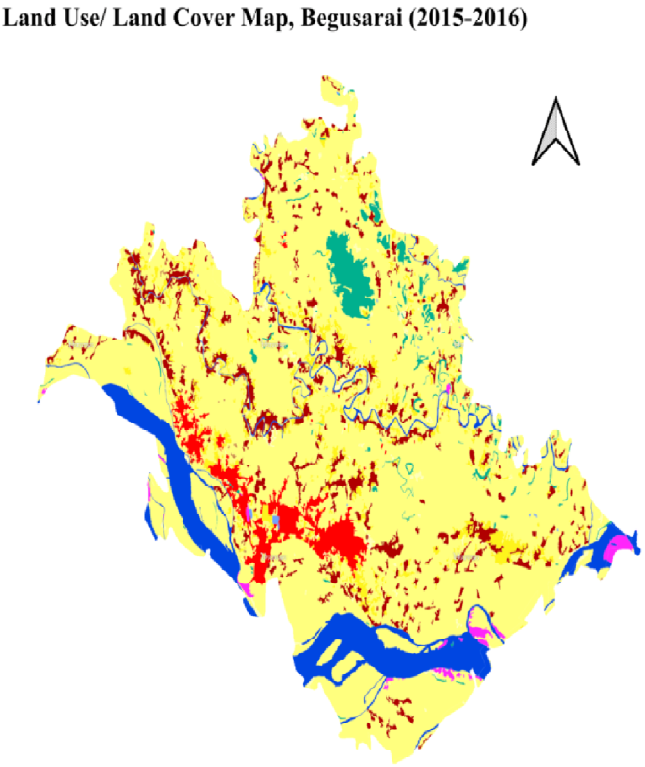
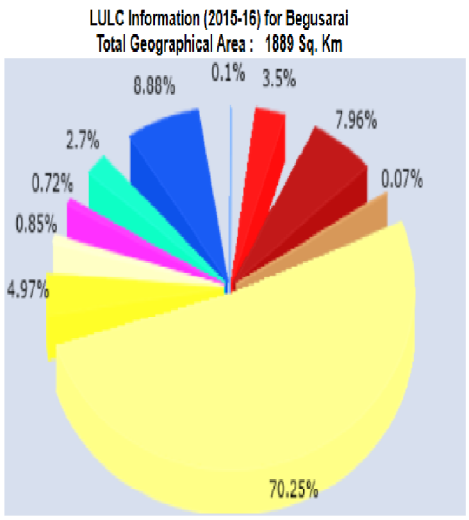


Fig 2a: Land Use/Land Cover of Begusarai (2015-16)

Source: BHUWAN



LULC Class	Area (Sq.Km)	LULC Class	Area (Sq.Km)
Builtup,Urban	66.06	Builtup,Rural	150.41
Builtup,Mining	1.28	Agriculture,Crop land	1327.08
Agriculture,Plantation	93.89	Agriculture,Fallow	16.04
Barren/unculturable/ Wastelands, Scrub land	13.53	Wetlands/Water Bodies, CoastalWetland	51.03
Wetlands/Water Bodies, River/Stream/canals	167.77	Wetlands/Water Bodies, Reservoir/Lakes/Ponds	1.9

Fig 2b: Graphical representation of LULC of Begusarai (2015-16)

Source: BHUWAN

LULC analysis reveals substantial spatial transformation in Begusarai between 2005–06 and 2015–16. Agricultural cropland expanded significantly, largely through the conversion of fallow land, indicating agricultural intensification under increasing population pressure (NRSC, 2016). Simultaneously, both rural and urban built-up areas increased, reflecting dispersed peri-urban expansion rather than compact city growth (table 3).

At the same time, wetlands and wastelands declined, raising concerns regarding ecological sustainability, flood regulation, and groundwater recharge in the Ganga floodplain (Central Ground Water Board, 2013; Central Ground Water Board, 2016). The near absence of forest cover further underscores the district's environmental vulnerability.

Table- 3

Land Use/Land Cover Change (2005-2016)

LULC Class	2005–06 (Area in Sq. Km)	% of Total	2015–16 (Area in Sq. Km)	% of Total	Change (Sq. Km)	Change (%)
Built-up, Urban	60.45	3.20%	66.06	3.50 %	5.61	9.30%
Built-up, Rural	126.41	6.69%	150.41	7.96 %	24	19.00%
Agriculture,Crop land	1152.47	61.01%	1327.08	70.25 %	174.61	15.10%
Agriculture,Fallow	215.81	11.42%	16.04	0.85 %	“199.77	“92.6%
Agriculture, Plantation	69.7	3.69%	93.89	4.97 %	24.19	34.70%
Barren/Uncul tivable /Wastel ands	37.73	2.00%	13.53	0.72 %	“24.20	“64.1%
Forest, Deciduous	1.29	0.07%	**0**	**0**	**0**	**0**
Wetlands/Wat er Bodies (Rivers etc.)	161.64	8.56%	167.77	8.88 %	6.13	3.80%
Other Wetlands	63.5 (combined)	3.40%	52.93 (combined)	2.80 %	+10.6	+16.7%

Source: BHUWAN

Conclusion :

Begusarai’s urban transition illustrates the complexities of urbanization in economically lagging regions. The district has moved from a predominantly agrarian system toward a semi-urban industrial economy, driven by policy interventions, infrastructure development, and land-use change (Directorate of Industries, Government of Bihar, 2012; Census of India, 2011). However, the transformation has also generated ecological stress and governance challenges, particularly the loss of wetlands and unplanned settlement expansion (Central Ground Water Board, 2016). The study underscores the need for integrated, district-level planning that balances economic growth with environmental sustainability and strengthens secondary towns as engines of inclusive urban development (Planning Commission of India, 2011).

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