

Spatio-temporal Distribution of Population in Bankura District, West Bengal: A Study on the Pattern of Centrality and Regional Disparity

Abstract: This study focuses on the demographic evolution of Bankura district from 1901 to 2021, exploring the shifts in population trends, urbanization, and rural-urban dynamics. The district has experienced notable socio-economic and infrastructural changes over the past century, influencing population growth, distribution, and concentration. Understanding these trends is critical for analysing regional development and disparities in population distribution. The study uses census data from 1901 to 2021 to track changes in population, decadal growth rates, and shifts in the population's mean center. The Population Concentration Index (CI) and Regional Disparity Index (DI) were employed to assess population distribution and disparities across different blocks, particularly in terms of SC and ST populations, and the ratio of workers to non-workers. Statistical analysis and spatial mapping techniques were used to visualize and interpret these trends. The study reveals significant population growth, particularly in urban areas post-1951, while rural growth slowed. The decadal growth rates fluctuated, with notable declines during the 1918 influenza pandemic and subsequent recovery in the following decades. The mean center of population shifted gradually towards the north-eastern region, indicating an increasing concentration of population there. The Population CI showed growing concentrations in certain blocks, while the Regional (DI) highlighted imbalances in SC and ST populations, especially in the Lowland and Midland regions. Disparities between worker and non-worker populations were also observed, with higher non-worker populations in some blocks.

Keywords: Decadal Growth Rate, Mean Center of Population, Population Concentration Index, Regional Disparity Index

Population distribution and its patterns play a crucial role in shaping regional development and influencing socio-economic dynamics. Understanding how populations grow, migrate, and concentrate in certain areas over time provides insights into broader regional changes such as urbanization, infrastructural development, and socio-economic transitions. The distribution of population affects political, social, and economic aspects of life, influencing how resources are allocated and how services are provided. Governments and policymakers use these analyses to

inform decisions on infrastructure development, public health interventions, and emergency preparedness¹.

Spatio-temporal analysis of population distribution examines how population is spread across different geographic regions and how these distributions change over time. This field leverages geospatial technologies and statistical methods to provide insights into demographic patterns, and the impacts of socio-economic factors on population dynamics. Previous studies have highlighted the significance of population distribution analysis in understanding urban-rural divides, migration patterns, and socio-economic disparities. For instance², emphasized the importance of integrating spatial analysis techniques with demographic data to identify population clusters and assess urbanization processes.

Centrality analysis has been utilized in various contexts, such as transportation planning and accessibility assessment³ have demonstrated how centrality measures, such as gravity models and network analysis, can identify key nodes within urban and regional contexts. These measures are crucial for understanding the influence of different areas within a region and for planning efficient transportation networks and resource distribution⁴ also demonstrated the applicability of centrality measures in urban planning, showing how these tools can help identify central areas that are critical for regional development.

In the specific context of West Bengal, previous studies have conducted spatio-temporal analyses of population distribution patterns in the Kolkata Metropolitan Area, highlighting the impact of urbanization on demographic trends. However, limited research has focused on population distribution and centrality within Bankura District, despite its significance for regional development planning.

Bankura, located in the western part of West Bengal, is characterized by its diverse topography, comprising forested areas, hilly terrains, and fertile plains. The district has seen significant changes in its population distribution over the years due to factors such as urbanization, migration, and natural population growth. According to the Census of India, the population of Bankura increased from approximately 3.2 million in 1901 to around 3.5 million

in 2011, reflecting both natural growth and rural-urban migration.

This study fills a crucial gap in the literature by providing a comprehensive analysis of population dynamics and spatial patterns within Bankura District, West Bengal. By building upon existing methodologies and theories in spatial analysis and urban geography, this research aims to contribute to a deeper understanding of demographic trends and spatial dynamics in the region. The insights gained from this study can inform policy interventions and planning strategies for sustainable development, addressing the challenges posed by population growth and urbanization.

Objectives of the Study

The objectives of the present study are as follows:

1. To study the spatial-temporal trends and stages of population growth in Bankura District;
2. To identify and examine the shifting mean center and spatial pattern of population centrality in the district; and
3. To evaluate the degree of population concentration and regional disparities population distribution within the district.

Study Area

Bankura district is situated in the south-western part of West Bengal, India, and is bounded by Purulia to the

west, Bardhaman to the north, Paschim Medinipur to the south, and Hooghly to the east. Geographically, it spans between 22°38' N to 23°38' N latitude and 86°36' E to 87°47' E longitude, covering an area of approximately 6,882 square kilometres (Fig. 1). It forms a crucial link between the fertile plains of Bengal and the Chota Nagpur plateau. The district is organized into three subdivisions – Bankura Sadar, Khatra, and Bishnupur – and features a sprawling network of 21 police stations, 22 development blocks, 3 municipalities, and 190-gram panchayats, encompassing a total of 5,187 villages. Bankura serves as the district headquarters.

As of the 2011 census, Bankura's population stands at 3,596,674, with a population density of 523 people per km². The district's population growth rate over the past decade was 12.64%. It has a sex ratio of 954 females per 1,000 males and a literacy rate of 70.95%. Urban areas house just 8.33% of the population, while Scheduled Castes and Scheduled Tribes together constitute 42.9% of the district's inhabitants.

Economically, Bankura remains predominantly agricultural but majority of farmers are small or marginal. Despite frequent droughts, improvements in irrigation, land reforms, and high-yield crops have enhanced economic conditions. The district also benefits from small-scale industries such as stone-crushing and traditional handicrafts like Dokra and Terra-cotta. Designated as one of India's 250 most backward districts in 2006 by the Ministry of Panchayati Raj, Bankura is currently receiving support from the Backward Regions Grant Fund Programme

(BRGF), underscoring its ongoing efforts to overcome developmental challenges and improve overall living standards. These features allow Bankura to serve as a microcosm of the critical issues facing backward but resource-rich regions in India, making it highly relevant for spatial analysis and policy-driven research in regional development and planning.

Methodology

The study employs a spatio-temporal analysis of population distribution in Bankura district from 1901 to 2021, focusing on demographic changes, urbanization, and regional disparities. A combination of quantitative and spatial analysis techniques was used to assess

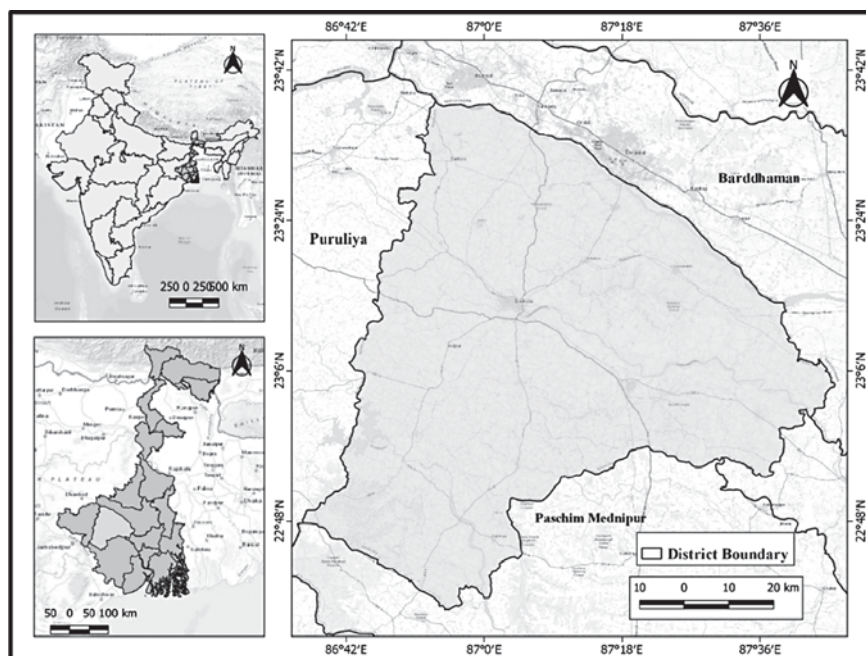


Fig. 1: Location of the study area

population trends, growth rates, the shift in the mean center of population, and disparities across different blocks within the district.

The study utilized data from Census of India. To analyse the trend in population growth in the district, database for the last 110 years have been considered to understand the trend of population growth. Projected population for the year of 2021 have been estimated on the basis of exponential growth rate formula. Decadal growth rates were calculated for each decade from 1901 to 2021, with separate assessments for urban and rural populations. These rates help capture fluctuations in population growth, particularly periods of rapid increase or decline.

Mean centre of population have been computed to find the trends in spatial growth pattern of population assuming it to be isotropic in nature. It shifts over time with the difference of sectoral growth of population. This point in the weighted average of the population and location coordinates of all the blocks and the location coordinates of the point can be determined by the following formula.

$$\bar{\phi} = \frac{\sum p_i \phi_i}{\sum p_i} \quad (i)$$

$$\bar{\lambda} = \frac{\sum p_i \lambda_i \cos(\phi_i (\pi/180))}{\sum p_i \cos(\phi_i (\pi/180))} \quad (ii)$$

Where, p_i = Population of i^{th} block, ϕ = Latitude of block head quarter, $\bar{\lambda}$ = Longitude of block head quarter, and $(\phi_i (\pi/180))$ = Correction factor for longitude.

As Bankura district is extended both north-south and east-west by just 1° of latitude and longitude, and it is located in tropical area, the convergence meridians towards the poles is minimum and therefore the correction factor has not been applied to eq....(ii).

The Population Concentration Index (CI) is used to measure how concentrated or dispersed the population is across different blocks. It is calculated using the formula:

$$CI_i = \frac{1}{1} \left/ \left(\frac{P_i}{P} * 100 \right) \right. - \left(\frac{A_i}{A} * 100 \right)$$

Where, CI_i = Concentration Index of i^{th} block, P_i = Population of i^{th} block, P = Total population of the district, A_i = Area of i^{th} block, and A = Total area of the district.

The Regional Disparity Index (DI) quantifies the

differences between population groups, such as Schedule Caste (SC) and Schedule Tribe (ST) populations or workers and non-workers, across different blocks. The formula for disparity between two groups is:

$$DI = \log \frac{X_2}{X_1} + \log (100 - X_1) / (100 - X_2)$$

Where, DI = Disparity index, X_2 = Percentage of non-worker, and X_1 = Percentage of worker.

A higher Disparity Index (DI) value signifies greater inequality between regions or groups, while a lower DI value indicates more balanced distribution, with zero representing perfect equality.

Trend in Population

The population trend in Bankura district from 1901 to 2021 reflects significant demographic changes, with both the urban and rural populations experiencing steady growth (Table 1). In 1901, the total population was 1,116,411, with a predominantly rural population of 1,063,136 and a small urban population of 53,275. Over the next few decades, the population continued to grow modestly, with slight increases in both urban and rural areas. A notable decline occurred in 1921 due to health crises, with the total population dropping to 1,019,941. However, from 1931 onward, the district saw a consistent rise in population, reaching 1,319,259 in 1951. The most significant growth occurred between 1951 and 2021, driven by urbanization and improved living conditions. The urban population

Table 1: Trend in Population, Bankura (1901-2021)

Census Year	Total Population	Urban Population	Rural Population
1901	1,116,411	53,275	1,063,136
1911	1,138,670	57,206	1,081,464
1921	1,019,941	60,889	959,052
1931	1,111,721	67,242	1,044,479
1941	1,289,640	91,976	1,197,664
1951	1,319,259	94,618	1,224,641
1961	1,664,513	122,157	1,542,356
1971	2,031,039	151,735	1,879,304
1981	2,374,815	181,247	2,193,568
1991	2,805,065	232,478	2,572,587
2001	3,192,695	235,248	2,957,447
2011	3,596,674	299,773	3,296,901
2021(exp.)	4,052,670	381,996	3,675,317

increased substantially from 94,618 in 1951 to an estimated 381,996 in 2021, while the rural population also grew, albeit at a slower pace, reaching 3,675,317 by 2021. This period reflects the district's transition from a primarily rural society to one with a growing urban presence, aligning with broader trends of urbanization in India⁶.

Decadal Growth Rate of Population

The decadal growth rate of the population in Bankura district from 1901 to 2021 exhibits significant fluctuations (Table 2), reflecting various socio-economic factors and shifts in urbanization. The first half of the 20th century (1901-51) was marked by significant fluctuations in population growth. From 1901 to 1911, the total growth rate was modest at 1.99%, with minimal changes in both urban (0.07%) and rural (0.02%) populations. The decade from 1911 to 1921 saw a sharp decline in the total growth rate to -10.43%, driven by a significant decrease in the rural population (-11.32%) despite a 6.45% increase in urban areas, likely due to the impact of the 1918 influenza pandemic. The following decade (1921-1931) marked a recovery, with the total population growing by 9.00%, urban areas by 10.44%, and rural areas by 8.91%. The period from 1931 to 1941 experienced the highest urban growth rate (36.85%), contributing to a total growth rate of 16%. From 1941 to 1951, growth rates slowed, with the total population increasing by just 2.3%, as the district began to stabilize after the turbulent early decades⁷.

Table 2: Population Growth Rate in Bankura District, 1901-2021

Census year	Total growth rate	Urban growth rate	Rural growth rate
1901-1911	1.99	0.07	0.02
1911-1921	-10.43	6.45	-11.32
1921-1931	9.00	10.44	8.91
1931-1941	16.00	36.85	14.67
1941-1951	2.30	2.88	2.25
1951-1961	26.17	29.12	25.96
1961-1971	22.02	24.23	21.82
1971-1981	16.93	19.43	16.72
1981-1991	18.12	28.28	17.28
1991-2001	13.82	1.19	14.97
2001-2011	12.65	27.48	11.47
2011-2021	12.68	27.44	11.48

The period from 1951 to 2001 witnessed significant and rapid population growth, driven by post-independence

socio-economic developments. The decade from 1951 to 1961 saw the highest total growth rate of 26.17%, with urban areas expanding by 29.12% and rural areas by 25.96%. This growth continued into the next decade (1961-1971), with a total growth rate of 22.02%. The 1971-1981 period saw a slight decline in growth to 16.93%, but urban areas still grew robustly at 19.43%. The trend of rapid urbanization continued into the 1981-1991 decade, with an urban growth rate of 28.28%, significantly outpacing the rural growth rate of 17.28%. However, the 1991-2001 period marked a stark contrast, with a notably low urban growth rate of 1.19%, while the rural population grew by 14.97%, indicating a shift towards rural population stability after decades of rapid urban expansion⁸.

The most recent stage, from 2001 to 2021, is characterized by a stabilization of the population growth rate, with a total growth rate of around 12.65% to 12.68% over the two decades. Urban areas continued to grow strongly, with a growth rate of approximately 27%, reflecting ongoing urbanization and the increasing prominence of urban centers in the district. In contrast, rural growth rates slowed significantly to around 11.47% to 11.48%, indicating a demographic transition towards a more balanced urban-rural population structure. This stage highlights the district's shift towards modern demographic patterns, with a more moderate and stable growth rate compared to the rapid expansion of the mid-20th century⁹.

Mean Center of Population

The mean centre of the population in Bankura district from 1901 to 2041 reveals subtle yet consistent shifts in population distribution over the decades, centred around the north-eastern part of the district (Table 3). In 1901, the mean centre was located near Panchdanna (23.1532°N, 87.1982°E), and over the next few decades, it gradually shifted to nearby locations like Sadshta in 1911 and Chandrakona in 1921, reflecting minor eastward movements. The period from 1931 to 2011 shows the population mean centre settling in the Madan Mohonpur area, indicating a relative stabilization in population distribution patterns, with the centre remaining consistently within a few kilometers. By 2021, the mean centre is projected to be slightly northeast of Madan Mohonpur (23.1523°N, 87.1698°E), with similar projections for 2031 and 2041.

Overall, the population's mean centre remains closely tied to Madan Mohonpur, with the geographical mean centre of the district at 23.1070°N, 87.1339°E, indicating a balanced yet slightly north-eastern population concentration over the century (Fig. 2). The divergence

Table 3. Mean center of population of the Bankura District, 1901-2041

Census year	Latitude	Longitude	Approximate location
1901	23.15318296	87.19819684	Panchdanna, 8.3km North-East
1911	23.15072535	87.1866846	Sadishta, 7.26km North-East
1921	23.15099943	87.17144039	Chandrakona, 6.22km North-East
1931	23.15274398	87.15758373	Madan Mohonpur, 5.65km North-East
1941	23.16004117	87.15136002	Brindabanpur, 6.14km North-East
1951	23.15410156	87.14428319	Hemchabad, 5.33km North-East
1961	23.15618486	87.15993051	Madan Mohonpur, 6.1km North-East
1971	23.15522819	87.16377064	Madan Mohonpur, 6.16km North-East
1981	23.15582451	87.16813388	Madan Mohonpur, 6.45km North-East
1991	23.1549102	87.17018434	Madan Mohonpur, 6.48km North-East
2001	23.15315738	87.17254664	Chandrakona, 6.45km North-East
2011	23.15274803	87.17117323	Madan Mohonpur, 6.35km North-East
2021 (exp.)	23.15234401	87.16978281	Madan Mohonpur, 6.22km North-East
2031	23.08481404	87.07787705	Madan Mohonpur, 6.12km North-East
2041	23.15155142	87.16695306	Madan Mohonpur, 5.99km North-East
Population mean center	23.14923714	87.1619934	Madan Mohonpur, 6.25km North-East
Geographical mean center	23.10697467	87.13392167	Bhulanpur, Onda, Bankura, West Bengal

between the geographical and population mean centres suggests that the north-eastern part of Bankura has become a focal point for population growth and density during the study period. This shift could be attributed to various factors, including better infrastructure, economic opportunities, and historical settlement trends that have made this area more attractive for habitation. The comparison between the population mean centre and the geographical mean centre underscores the north-eastern region's growing importance in the district's demographic landscape, highlighting a persistent trend of population concentration away from the geographical centre towards this area over the last century¹⁰.

Concentration Index of Population

The Population Concentration Index (CI) data for Bankura District across 1971, 1991, and 2011 reveals

significant shifts in population distribution (Table 4 and Fig. 3). In 1971, blocks in the Western Upland, such as Ranibandh and Khatra, had notably high CIs, indicating significant population concentration. In contrast, most other blocks in this region, like Saltora and Mejia, had low CIs, suggesting a sparse population distribution. The Midland region, particularly Bankura-I, also exhibited high concentration, whereas the Lowland region's blocks like Kotulpur and Indus had moderate concentrations.

By 1991, the CI in many Western Upland blocks, such as Ranibandh, decreased significantly, suggesting a dispersal of the population. However, blocks like Saltora and Chhatna saw an increase, indicating growing concentration in those areas. In the Midland

region, Bankura-I remained highly concentrated despite a slight decrease in CI, while other blocks like Bankura-II maintained moderate levels. The Lowland region saw minor increases in CI for blocks like Kotulpur, indicating a gradual concentration of population¹¹.

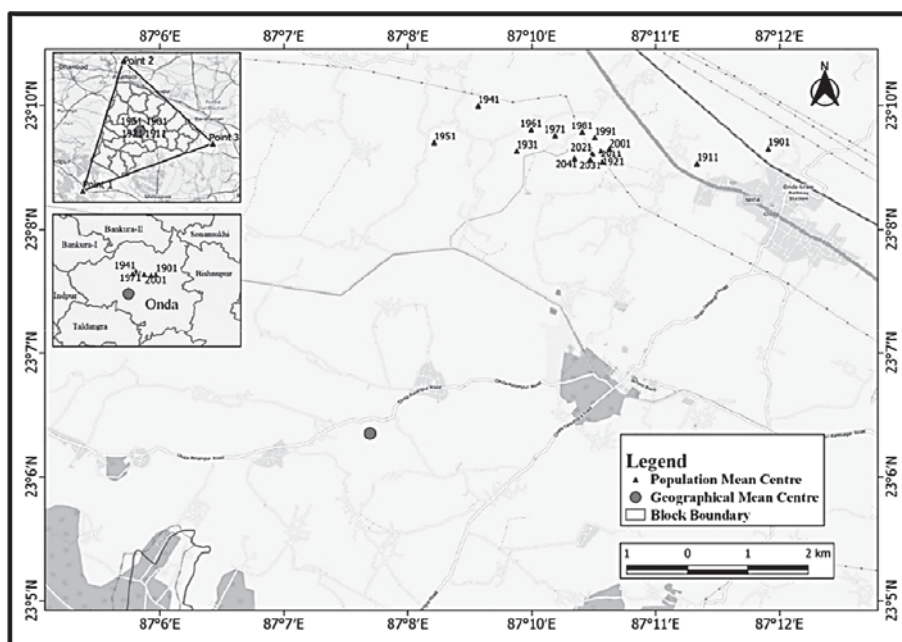


Fig. 2: Population and Geographical Mean Centre of the Bankura District

Table 4: Population Concentration Index of the Bankura District

Sl. No.	Topographical Units	Block	Concentration Index (CI)		
			1971	1991	2011
1	Western Upland	Saltora	0.2	0.3	0.38
2		Mejia	0.06	0.05	0.01
3		Chhatna	0.3	0.47	0.54
4		Gangajalghati	0.03	0.11	0.15
5		Indpur	0.05	0.03	0.03
6		Ranibandh	2.61	1.45	1.46
7		Hirbandh	NA	0.28	0.22
8		Khatra	1.18	0.09	0.06
9	Midland	Barjora	0.05	0.03	0.05
10		Bankura-I	2.43	2.17	2.02
11		Bankura-II		0.3	0.35
12		Onda	0.42	0.25	0.14
13		Taldangra	0.66	0.56	0.49
14		Simlapal	0.41	0.27	0.27
15		Raipur	0.31	0.77	0.31
16		Sarenga	NA	0.3	0.14
17	Lowland	Sonamukhi	0.23	0.2	0.23
18		Patrasayer	0.1	0.16	0.21
19		Indus	0.51	0.5	0.51
20		Joypur	0.21	0.26	0.26
21		Kotulpur	0.65	0.75	0.8
22		Vishnupur	0.02	0.23	0.3

Source: District Census Handbook of Bankura, 1961 & 2011

In 2011, the trend of increasing population concentration continued in blocks such as Saltora and Chhatna, while Mejia experienced a significant drop in CI, potentially reflecting depopulation. Bankura-I in the

Midland region remained the most densely populated block, though with a slight decline, indicating some population dispersal. Meanwhile, Kotulpur in the Lowland region continued its upward trend in CI, solidifying its status as one of the more concentrated blocks. These shifts likely reflect underlying changes in migration patterns, economic opportunities, and demographic factors across the district.

Regional Disparity of Population (SC and ST)

Regional disparity in the SC and ST populations across different blocks in Bankura district for the year 2011 shows in Table 5 and Fig. 4. The regional DI quantifies the extent of difference between the proportions of SC and ST populations in each block. In the Western Upland region, the blocks exhibit varying levels of SC and ST population distributions. Saltora and Chhatna show a relatively balanced distribution with SC populations constituting 64.41% and 59.40%, respectively, and ST populations making up 35.59% and 40.60%. This results in low Regional Disparity indices of 0.52 and 0.33, indicating minimal disparity between the SC and ST populations. Conversely, blocks like Mejia and Gangajalghati are

characterized by a much higher SC population (93.41% and 89.91%, respectively) compared to their ST counterparts (6.59% and 10.09%), leading to higher disparity indices of 2.30 and 1.90. Ranibandh, on the other hand, has a

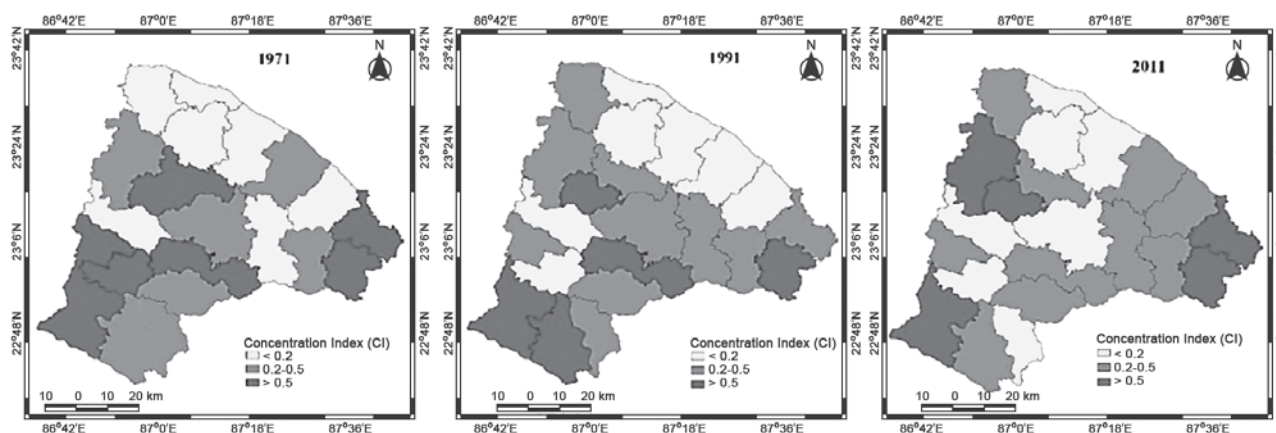


Fig. 3: Spatial Trends in Concentration of Population, 1971-2011

Table 5: Block-wise Regional Disparity of SC/ST Population, Bankura District, 2011

Sl. No.	Topographical Units	Block	% of SC Population	% of ST Population	Regional Disparity
1	Western Upland	Saltora	64.41	35.59	0.52
2		Mejia	93.41	6.59	2.3
3		Chhatna	59.4	40.6	0.33
4		Gangajalghati	89.91	10.09	1.9
5		Indpur	80.9	19.1	1.25
6		Ranibandh	19.57	80.43	1.23
7		Hirbandh	48.95	51.05	0.04
8		Khatra	54.57	45.43	0.16
9	Midland	Barjora	95.37	4.63	2.63
10		Bankura-I	90.21	9.79	1.93
11		Bankura-II	92.21	7.71	2.16
12		Onda	87.09	12.91	1.66
13		Taldangra	65.38	34.62	0.55
14		Simlapal	63.95	36.05	0.5
15		Raipur	44.14	55.86	0.2
16		Sarenga	60.45	39.55	0.37
17	Lowland	Sonamukhi	92.7	7.3	2.21
18		Patrasayer	93.92	6.08	2.38
19		Indus	95.94	4.06	2.75
20		Joypur	95	5	2.56
21		Kotulpur	91.49	8.51	2.06
22		Vishnupur	85.08	14.92	1.51

Source: District Statistical Handbook of Bankura, 2014

predominantly ST population (80.43%), with a relatively low SC population (19.57%), resulting in a Regional Disparity index of 1.23¹².

The Midland region, encompassing blocks like Barjora, Bankura-I, and Bankura-II, generally exhibits a higher proportion of SC populations. Barjora, for instance, has 95.37% SC population and only 4.63% ST population, leading to a significant Regional Disparity index of 2.63. Similar trends are observed in Bankura-I (SC: 90.21%, ST: 9.79%, Disparity: 1.93) and Bankura-II (SC: 92.21%, ST: 7.71%, Disparity: 2.16). These high indices indicate substantial imbalances in the distribution of SC and ST populations within these blocks. However, blocks like Taldangra and Raipur show more balanced distributions, with Regional Disparity indices of 0.55 and 0.20, respectively, reflecting lesser disparity between SC and ST populations¹³.

The Lowland region is characterized by some of the highest Regional Disparity indices in the district, signifying significant imbalances in the SC and ST population distributions. Blocks like Indus (SC: 95.94%, ST: 4.06%) and Joypur (SC: 95.00%, ST: 5.00%) have extremely high disparity indices of 2.75 and 2.56, respectively, indicating a dominant SC population. Patrasayer (SC: 93.92%, ST: 6.08%, Disparity: 2.38) and Sonamukhi (SC: 92.70%, ST: 7.30%, Disparity: 2.21) also exhibit similar trends of high SC concentration and corresponding high disparity indices. Vishnupur, although having a relatively high SC population (85.08%), has a slightly higher ST population (14.92%) compared to other Lowland blocks, resulting in a lower disparity index of 1.51.

Regional Disparity of Population (Worker and Non-worker)

Regional disparity in workers and non-workers population across different blocks of Bankura district presents in **Table 6** and **Fig. 5**. By comparing the percentage of workers and non-workers within each block, we can gain insights into the economic activity and labor force participation in different topographical units of the district. In the Western Upland region, the proportion of workers and non-workers shows some variability, though the general trend is a higher percentage of non-workers. Blocks such as Saltora (39.96% workers, 60.04% non-workers) and Chhatna (39.59% workers, 60.41% non-workers) have similar proportions, with Regional Disparity indices of 0.35 and 0.37, indicating moderate imbalances. Mejia, with only 35.32% workers and 64.68% non-workers, has a higher Regional Disparity index of 0.53, suggesting lower labor force participation. Conversely, Ranibandh (48.26% workers, 51.74% non-workers) and Hirbandh (44.70% workers, 55.30% non-workers) have the smallest disparities, with indices of 0.06 and 0.18, respectively, reflecting relatively balanced worker and non-worker distributions¹⁴.

In the Midland region, the disparity between workers and non-workers follows a similar trend of higher non-

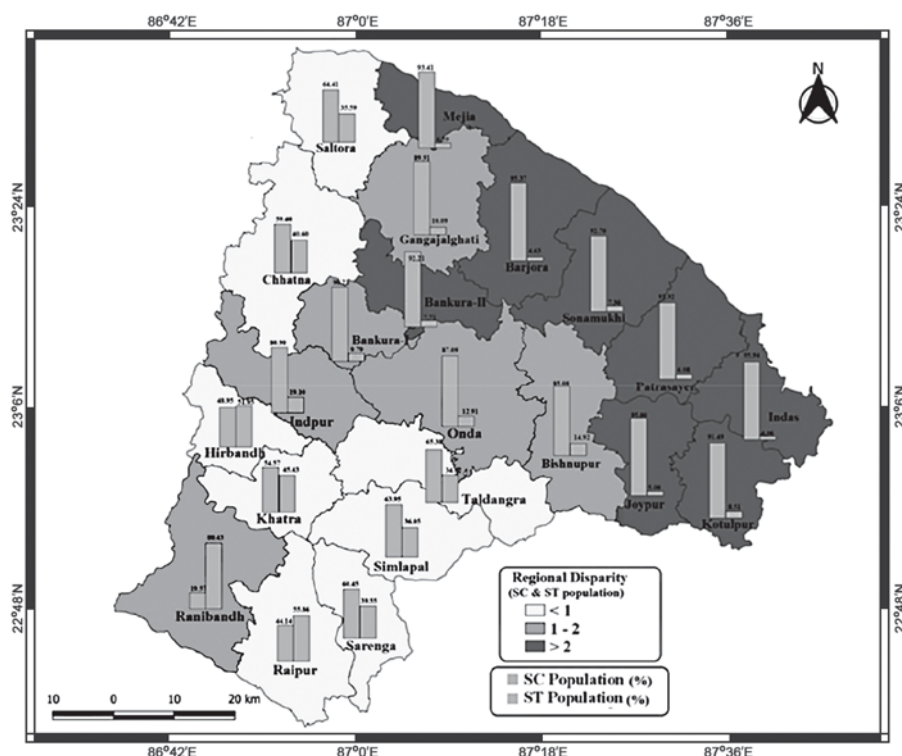


Fig. 4: Block-wise regional disparity of SC and ST population, Bankura, 2011

worker populations, though some blocks exhibit notable variations. Bankura-I (36.65% workers, 63.35% non-workers) and Bankura-II (37.29% workers, 62.71% non-workers) show lower levels of labor force participation, with Regional Disparity indices of 0.48 and 0.45. Barjora (39.15% workers, 60.85% non-workers) displays a Regional Disparity index of 0.38, closely aligned with the overall trend in the district. On the other hand, Taldangra (42.20% workers, 57.80% non-workers) and Raipur (45.65% workers, 54.35% non-workers) have lower disparity indices of 0.27 and 0.15, indicating more balanced labor force participation.

In the Lowland region, labor force participation is relatively higher compared to other regions. Blocks like Sonamukhi (44.55% workers, 55.45% non-workers) and Patrasayer (43.15% workers, 56.85% non-workers) exhibit lower disparity indices of 0.19 and 0.24, respectively, reflecting more balanced populations of workers and non-workers.

regions – the Western Uplands, the Midland, and the Lowland plains.

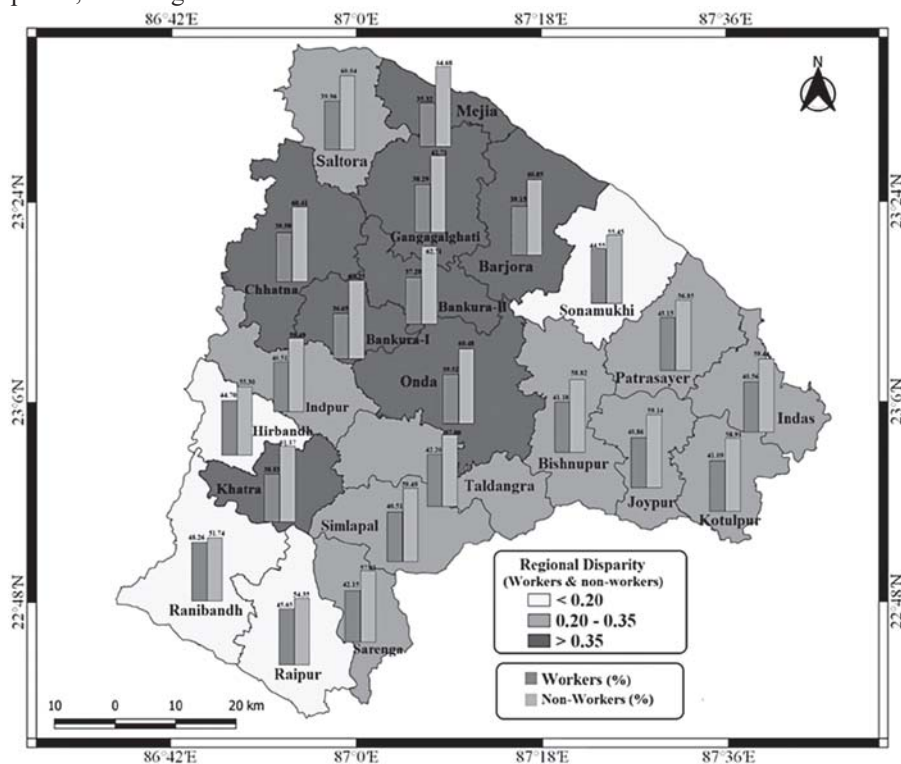


Fig. 5: Block-wise regional disparity of worker/non-worker population, Bankura, 2011

Similarly, blocks such as Kotulpur (41.09% workers, 58.91% non-workers) and Vishnupur (41.18% workers, 58.82% non-workers) show Regional Disparity indices of 0.31, indicating a relatively small gap between the worker and non-worker populations¹⁵.

Linking Population Distribution with Regional Development Patterns

Over the last century, the demographic transformation of Bankura district has closely paralleled its uneven regional development trajectory. Analysing the changing patterns of population distribution reveals distinct trends that offer valuable insights into how development has unfolded spatially across the district's three broad physiographic

Table 6: Block-wise Regional Disparity of Worker/Non-worker, Bankura District, 2011

Sl. No.	Topographical Units	Block	% of Worker	% of Non-Worker	Regional Disparity
1	Western Upland	Saltora	39.96	60.04	0.35
2		Mejia	35.32	64.68	0.53
3		Chhatna	39.59	60.41	0.37
4		Gangajalghati	38.29	61.71	0.41
5		Indpur	40.51	59.49	0.33
6		Ranibandh	48.26	51.74	0.06
7		Hirbandh	44.7	55.3	0.18
8		Khatra	38.83	61.17	0.39
9	Midland	Barjora	39.15	60.85	0.38
10		Bankura-I	36.65	63.35	0.48
11		Bankura-II	37.29	62.71	0.45
12		Onda	39.52	60.48	0.37
13		Taldangra	42.2	57.8	0.27
14		Simlapal	40.51	59.49	0.33
15		Raipur	45.65	54.35	0.15
16		Sarenga	42.15	57.85	0.28
17	Lowland	Sonamukhi	44.55	55.45	0.19
18		Patrasayer	43.15	56.85	0.24
19		Indus	40.56	59.44	0.33
20		Joypur	40.86	59.14	0.32
21		Kotulpur	41.09	58.91	0.31
22		Vishnupur	41.18	58.82	0.31

Source: District Statistical Handbook of Bankura, 2014

One of the most prominent trends is the north-eastern shift in the mean center of population, clustering consistently around the Madan Mohonpur area between 1931 and 2021. This shift suggests growing demographic momentum in the Midland region, where infrastructural accessibility, proximity to urban nodes like Bankura town, and better economic prospects have spurred in-migration and settlement concentration. This region hosts important administrative units, transport linkages, educational institutions, and healthcare facilities, making it a natural pull factor for population growth.

The population CI values further supports this spatial bias. Blocks such as Bankur-1 and Kotulpur have consistently shown high or rising CI values, reflecting increasing concentration due to availability of services and employment opportunities. In contrast, blocks in the Western Uplands, such as Ranibandh and Mejia,

experienced fluctuating and at times declining CI values, indicative of persistent developmental lag and out-migration, possibly driven by poor connectivity, low agricultural productivity, and limited non-farm employment options.

Meanwhile, the decadal growth rates show that the urban population has grown significantly post-1951, with a near fourfold increase by 2021. This growth is likely linked to the post-independence developmental thrust, better living conditions, and urban-centric service delivery. On the other hand, the rural growth rate has shown signs of stabilization post-2001, which may reflect both a saturation effect and the initial success of rural development schemes in reducing pressure on land.

This uneven spatial distribution and demographic transition point to regional disparities in development outcomes. Areas with higher population concentration often align with zones of higher socio-economic development, while dispersed or depopulating blocks correspond to underdeveloped or ecologically fragile areas. These trends have direct implications for regional planning – highlighting the need for targeted interventions in backward

blocks, particularly in the western uplands, through improved connectivity, decentralized service delivery, and promotion of alternative livelihoods.

Thus, the spatial patterns of population in Bankura are not merely demographic phenomena but are deeply interwoven with the district's socio-economic fabric. Recognizing this linkage is essential for balanced regional development and sustainable planning.

Conclusion

The demographic analysis of Bankura district from 1901 to 2021 reveals critical insights into population dynamics and their intersection with spatial and socio-economic development¹⁶. The observed trends and patterns reinforce the central argument that population distribution is not a neutral process but one deeply embedded in historical, geographical, and structural

inequalities – an issue emphasized in the introductory framework.

The trend in total population illustrates steady growth over the last century, punctuated by episodic shocks such as the 1918 influenza pandemic. While population expansion in the post-independence era aligns with national trends of demographic transition, localized shifts in growth rates point to region-specific development pathways.

The decadal growth rates underscore periods of accelerated growth, particularly in blocks experiencing infrastructural development and improved healthcare access, affirming the link between demographic behavior and regional development stimuli.

The mean center of population shows a gradual north-eastward shift, stabilizing around Madan Mohonpur in recent decades. This spatial inertia suggests a concentration of population near administrative and economic hubs—further reinforcing urban primacy and peripheral neglect.

Population CI values highlights spatial disparities, with certain blocks showing pronounced clustering due to historical settlement patterns, natural resource availability, and infrastructural connectivity. This spatial heterogeneity mirrors uneven development and calls for geographically sensitive planning interventions.

The regional disparity in SC and ST populations points to social stratification embedded within the spatial fabric of the district. While ST populations remain concentrated in forested upland regions, SC populations dominate the lowland plains. The high disparity indices in several blocks reflect deep-rooted inequalities in access to land, education, and livelihood opportunities – issues central to discourses on inclusive development. Similarly, the regional disparity in worker and non-worker populations reveals that labour force participation is not uniformly distributed. Blocks with high proportions of non-workers often overlap with those facing educational and infrastructural deficits. Balanced participation is more evident in certain upland and lowland blocks where agriculture or forest-based economies provide subsistence opportunities.

Finally, the analysis linking population distribution with regional development patterns makes it clear that demographic concentrations tend to co-evolve with socio-economic opportunities. However, the persistence of disparities in marginalized blocks reflects a failure of

uniform development strategies to address historical and structural disadvantages.

In sum, the study confirms that population trends and spatial patterns in Bankura district are closely tied to socio-economic inequalities, ecological regions, and policy neglect. Addressing these imbalances requires not just demographic planning but an integrated approach combining land reform, educational outreach, targeted employment schemes, and caste-sensitive development initiatives. This multi-scalar understanding reinforces the academic premise that population geography must be examined through both quantitative indicators and the qualitative lens of social justice and regional equity.

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