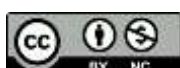




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Mapping Inequality: Spatial Distribution of Scheduled Castes and Scheduled Tribes in North Bengal, India

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ABSTRACT

This paper analyses the spatial distribution and the level of inequality of marginalized community i.e., scheduled caste (SC) and scheduled tribe (ST) by Lorenz Curve and Gini's Coefficient in North Bengal based on Census of India 2011 data. It focuses mainly on district wise regional pattern with rural-urban SC and ST concentration and inequality. The findings show that the distribution of SC community is uniform and have less inequality, but ST is unevenly distributed and have higher level of inequality in the urban regions i.e., towns. The paper titled "Mapping Inequality: Spatial Distribution of Scheduled Castes and Scheduled Tribes in North Bengal, India" describes the subject perfectly. The study highlights significant spatio-regional inequalities and suggest the need of proper policies for reducing these socio-economic inequalities in the marginalized communities like SC and ST in North Bengal.

KEYWORDS: Scheduled caste (SC); Scheduled tribe (ST); Spatial distribution; Regional inequality; North Bengal; Rural-Urban disparity; Lorenz curve; Gini coefficient; Census.

1. INTRODUCTION

Indian Constitution had recognized only four major castes in India i.e., SC, ST, OBC (by The Constitution Amendment Act 2018- Article 342-A, recognized as socially and educationally backward classes) and general caste. SC under Article 341 and ST under Article 342 are identified as marginalized communities based on their socio-economic conditions and limited access to resources (Deshpande, 2011).

As per 2011 census of India, only 16.4% population is SC and only 7.0% population is ST, where Punjab has the highest percentage (31.9) of SC population and Lakshadweep has the highest percentage (94.8) of ST population. In case of SC population, Haryana (20.2), Himachal Pradesh (25.2), Karnataka, Nagaland, Rajasthan, Tamil Nadu (20.0), Tripura, Uttar Pradesh (20.7), West Bengal (23.5), Jammu & Kashmir (23.5), Uttarakhand, Chandigarh and Delhi have more than the national average SC population. And rest

of the states have lower than the national average SC population. Mizoram has the lowest percentage (0.1) of SC population. In case of ST population, except Daman and Diu, Andaman & Nicobar Islands, Uttarakhand, West Bengal (5.8), Uttar Pradesh, Madhya Pradesh, Karnataka, Himachal Pradesh, Bihar and Andhra Pradesh, all the other states have the more ST population than the national average. So, there is a vast regional and spatial distribution of SC and ST population observed (Thorat & Newman, 2010).

Similarly, North Bengal comprises the districts of Maldah, North and South Dinajpur, Darjeeling, Jalpaiguri and Koch Bihar have socio-economic, demographic, political, regional and spatial ecological diversities. This paper has focused on the spatial distribution of SC and ST population in rural and urban regions to identify the inequality and to support targeted policy interventions (Datta, 2012; Deshpande, 2011).

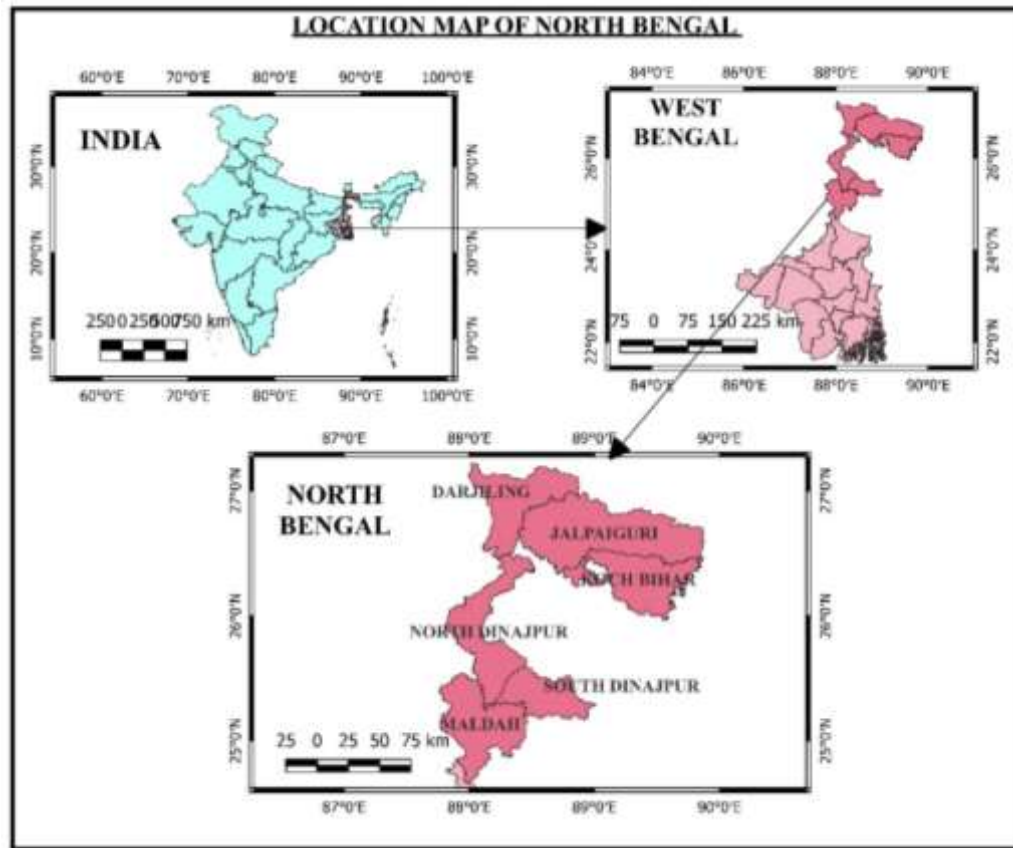


Fig. 1. Location Map of North Bengal (Prepared by author in QGIS 3.42.3)

2. OBJECTIVES

The following objectives are discussed in this paper -

- To examine district-wise distribution of SC and ST populations in North Bengal (Census 2011).
- To analyse the rural-urban composition with special reference to SC and ST communities.
- To compare rural and urban distribution and identify areas of concentration.

3. LOCATION OF THE STUDY AREA

North Bengal (Fig. 1) consists of six districts in northern West Bengal. It extends from about 24°45' N to 27°20' N latitude and 87°45' E to 89°50' E longitude, covering around 21,859 sq. km. Geographically, it lies in the Teesta-Torsha-Mahananda basin between the Eastern Himalayas in the north and the Gangetic Plains in the south.

The region is bounded by Sikkim and Bhutan in the north, Assam and Bangladesh in the east, South Bengal in the south, and Bihar and Nepal in the west. The Ganges separates North Bengal from South Bengal (Karmakar, 2011).

4. METHODOLOGY

The distribution of SC and ST populations has been represented using pie charts, while the rural-urban population composition is shown through compound bar graphs. Comparative bar graphs are used to analyse rural and urban SC and ST population distribution. Inequality in population distribution has been illustrated using the Lorenz Curve, and its extent has been measured through the Gini Coefficient (Saha & Basu, 2021).

The Lorenz Curve, developed by Max O. Lorenz (1905), is used to depict inequality in distribution. A 45° diagonal line represents perfect equality, while deviation from this line indicates the degree of inequality (Sitthiyot & Holasut, 2020). The steps followed to construct the Lorenz Curve are:

- Calculation of the percentage of SC population to total population
- Ranking districts in ascending order based on SC population share
- Calculation of percentage and cumulative percentage of total population
- Calculation of percentage and cumulative percentage of SC population

- Plotting the Lorenz Curve using cumulative total population (X-axis) and cumulative SC population (Y-axis) in Excel

The Gini Coefficient (G), introduced by Corrado Gini (1912), is derived from the Lorenz Curve and measures inequality on a scale from 0 (perfect equality) to 1 (perfect inequality). It is calculated based on the relative areas within the Lorenz Curve diagram.

$$G = \frac{1}{100 \times 100} \left| \sum_{i=1}^n x_i y_{i+1} + 1 - \sum_{i=1}^n y_i x_{i+1} \right|$$

A higher Gini value indicates greater inequality, whereas a lower value reflects a more equal distribution. The nature of distribution has done in the following way (Table 1).

Table 1 Nature of distribution of 'G' value

Gini coefficient	Nature
0.0	Perfectly uniform distribution or perfect equality
0.2	Uniform distribution
0.4	Nearly uniform distribution
0.6	Non-uniform or unequal distribution
0.8	Highly non-uniform or unequal distribution
1.0	Perfectly non-uniform or completely clustering distribution or perfect inequality

Source: Adhikari (2020); p. 248.

All the statistics tables and figures are created using Microsoft Excel and QGIS 3.42.3 version is used to prepare the location map, pie graph and bar graph maps of the study area.

5. RESULTS AND DISCUSSION

The distribution of SC and ST populations in North Bengal has been analysed in four stages. First, their distribution is examined in relation to the total population. Second, the overall rural-urban population composition is analysed. Third, the rural distribution of SC and ST populations is assessed with respect to the total population. Finally, the urban distribution of SC and ST populations is discussed.

According to the Census of India (2011), caste-wise population data are available for Scheduled

Castes (SCs), Scheduled Tribes (STs), and the General category, while separate data for Other Backward Classes (OBCs) are not provided. Therefore, the term "Other Population" in this study refers to the combined group of OBC and General categories. SCs and STs are historically disadvantaged communities recognized in the Constitution of India for affirmative action and social justice.

5.1. SC & ST Population Distribution

According to the Census of India (2011) (Table 1), the proportion of the 'Other' population (General + OBC) is highest in Darjeeling, Uttar Dinajpur, Dakshin Dinajpur, and Maldah, with Maldah recording the highest share (71.19%). In all these districts, more than 50% of the population belongs to this category. In contrast, the share is relatively lower in Jalpaiguri (43.46%) and Koch Bihar.

Koch Bihar has the highest concentration of Scheduled Caste (SC) population, comprising about 50% of its total population, followed by Jalpaiguri (37.65%). In the remaining districts, the SC population is below 30%. On the other hand, Darjeeling has the highest concentration of ST population i.e., 21.52% followed by Koch Bihar (0.64%). ST population is below 20% in the remaining districts. These shows inequal regional distribution of SC and ST population in North Bengal.

5.1.1. Measures of Inequality by Lorenz Curve and Gini's Co-efficient

The extent of inequality in population distribution has been analysed using the Lorenz Curve and Gini Coefficient (Fig. 3). The Lorenz Curve shows deviation from the line of perfect equality, indicating uneven distribution. SC population shows lower inequality. Because the bottom 10.73% of the population accounts for only 5.97% of SCs, while 83.62% holds 73.39%. The calculated Gini Coefficient is 0.194 (19.4%), indicating a relatively uniform distribution.

In contrast, ST population shows greater inequality. The bottom 16.38% of the population accounts for only 0.95% of STs, while 89.27% holds 79.08%. The Gini Coefficient for STs is 0.37 (37%), indicating a comparatively higher level of unevenness.

Overall, the Lorenz curves reveal that ST population distribution is more uneven than SC distribution across North Bengal.

Table 2 Population Distribution in North Bengal, 2011

Districts	% of Caste wise Population to Total Population			% of Rural Population to Total Population			% of Urban Population to Total Population		
	SC	ST	Other	Rural	Rural SC	Rural ST	Urban	Urban SC	Urban ST
Jalpaiguri	37.65	18.89	43.46	72.62	29.94	17.82	27.38	7.72	1.07
Koch Bihar	50.17	0.64	49.19	89.73	47.91	0.60	10.27	2.26	0.04
Darjiling	17.18	21.52	61.30	60.58	12.17	17.28	39.42	5.01	4.24
Uttar Dinajpur	26.87	5.41	67.72	87.95	24.65	5.27	12.05	2.22	0.15
Dakshin Dinajpur	28.80	16.43	54.77	85.90	26.26	15.98	14.10	2.54	0.44
Maldah	20.94	7.87	71.19	86.42	19.24	7.71	13.58	1.70	0.16

Source: Office of the Registrar General & Census Commissioner, India, 2011 and calculation done by author.

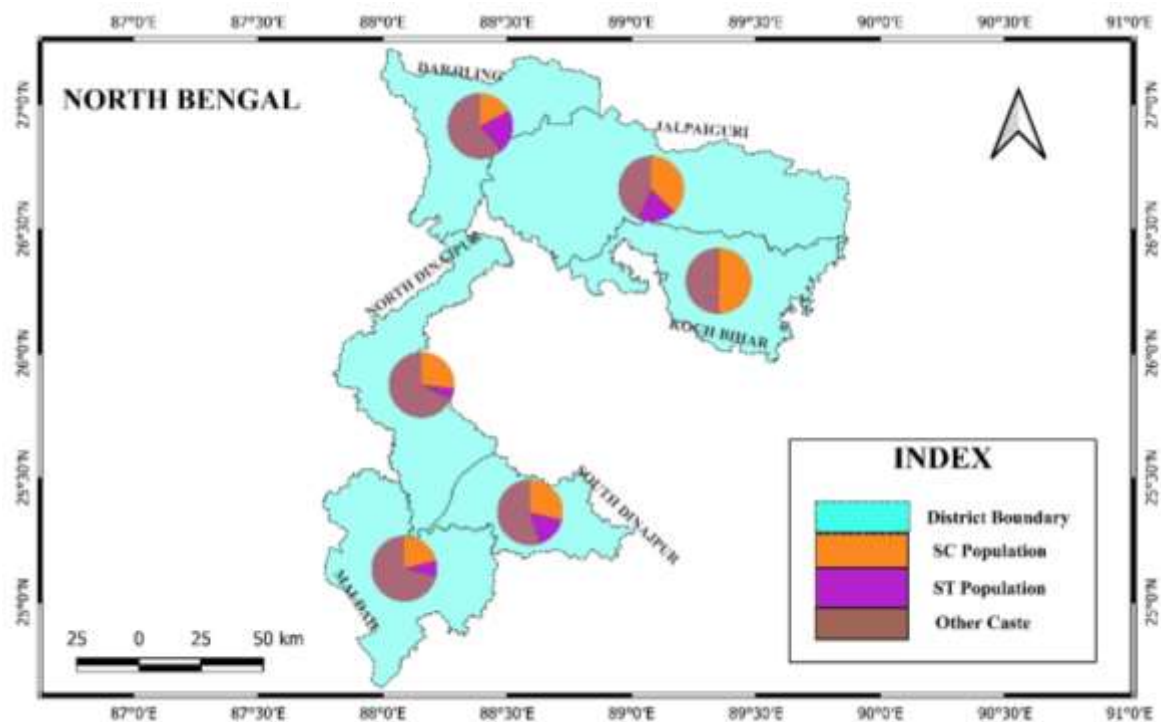


Fig. 2. The caste-wise distribution of ST and ST population in North Bengal in 2011

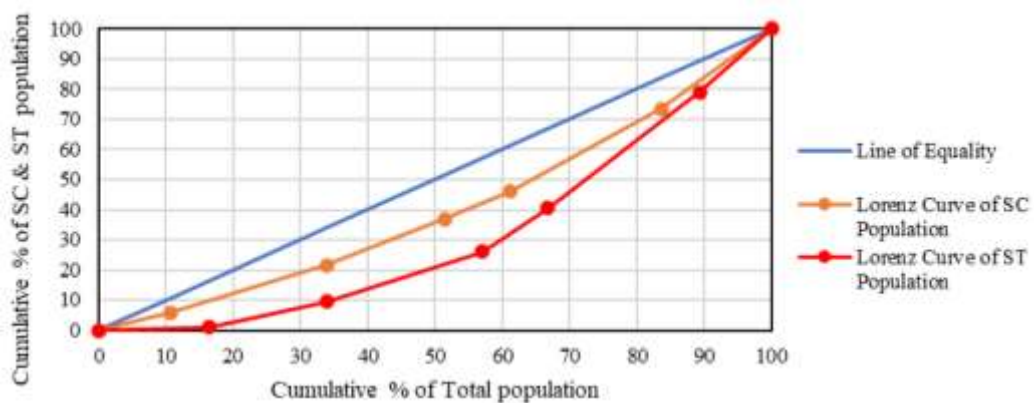


Fig. 3. Distribution of SC & ST population by Lorenz Curve in North Bengal (India) in 2011

5.2. Rural & Urban Population Distribution

According to the 2011 Census (Table 1), all districts have a higher rural population. Among them, four districts have over 85% of the population living in rural areas, while in the remaining two districts, more than 60% of the population is rural. In terms of majority, Koch Bihar district ranks first with 89.73% rural

population, whereas Darjeeling district has the lowest with 60.58%. In terms of urban population, Darjeeling district ranks first, with 39.42% of its total population living in urban areas. Jalpaiguri district holds the second position with 27.38%. in all other districts, the urban population is very low- less than 15% of the total population. Koch Bihar district has lowest urban population, with only 10.27%.

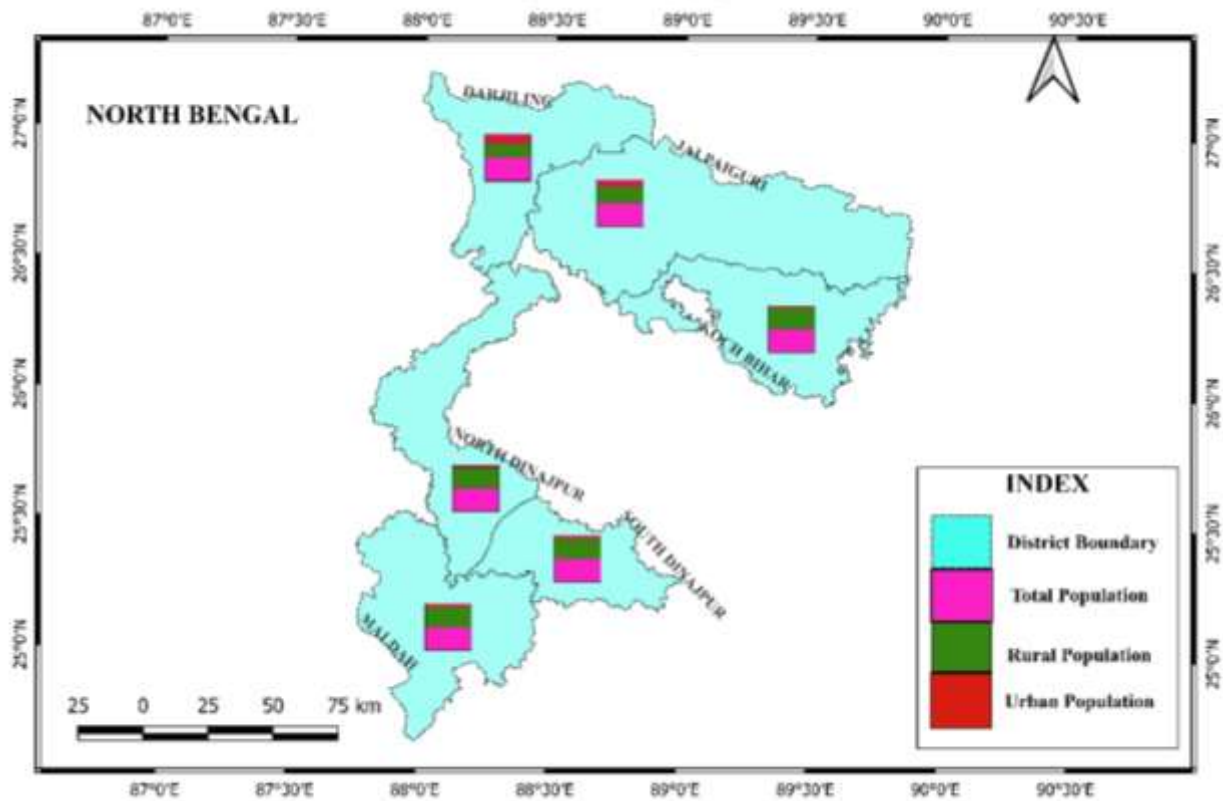


Fig. 4. The distribution of Rural and Urban population in North Bengal in 2011

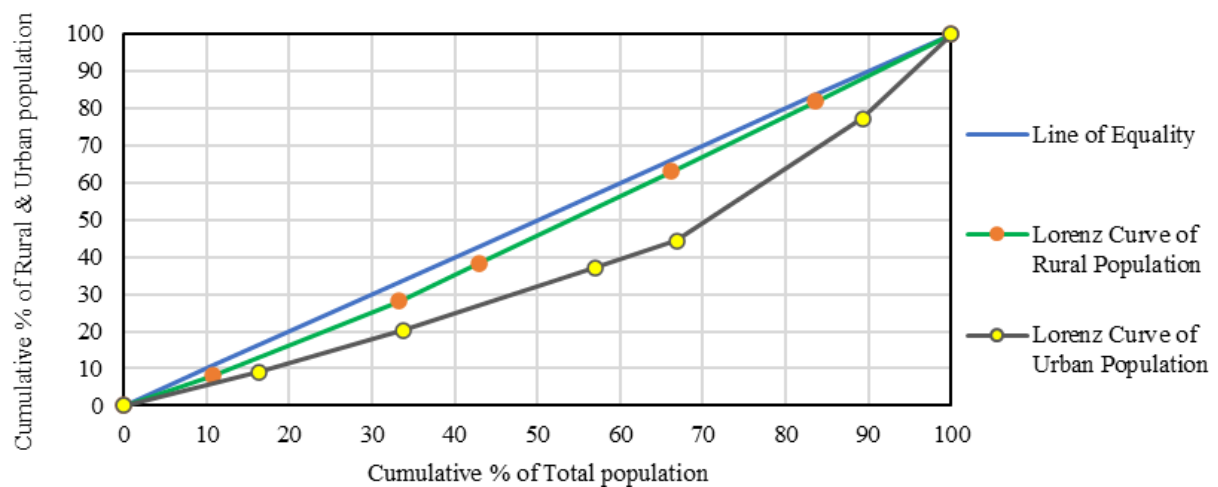


Fig. 5. Distribution of Rural & Urban population by Lorenz Curve in North Bengal (India) in 2011

5.2.1. Measures of Inequality by Lorenz Curve and Gini's Co-efficient

It is observed (Fig. 5) that in all six districts in North Bengal (W.B., India) mentioned here the concentration of Rural population is almost evenly distributed and Urban population is unevenly distributed. The curve of Rural population formed has very less concavity but the curve of Urban population formed has sufficient concavity with reference to the line of perfect distribution.

For Rural population, the value obtained is 0.059 or 5.9% unevenness in the distribution of Rural population is marked. The value of Gini coefficient (0.059) indicates almost Perfectly uniform distribution or almost perfect equality. For Urban population, the value obtained is 0.26 or 26.0% unevenness in the distribution of Urban population is marked. The value of Gini coefficient (0.26) indicates approximately uniform distribution.

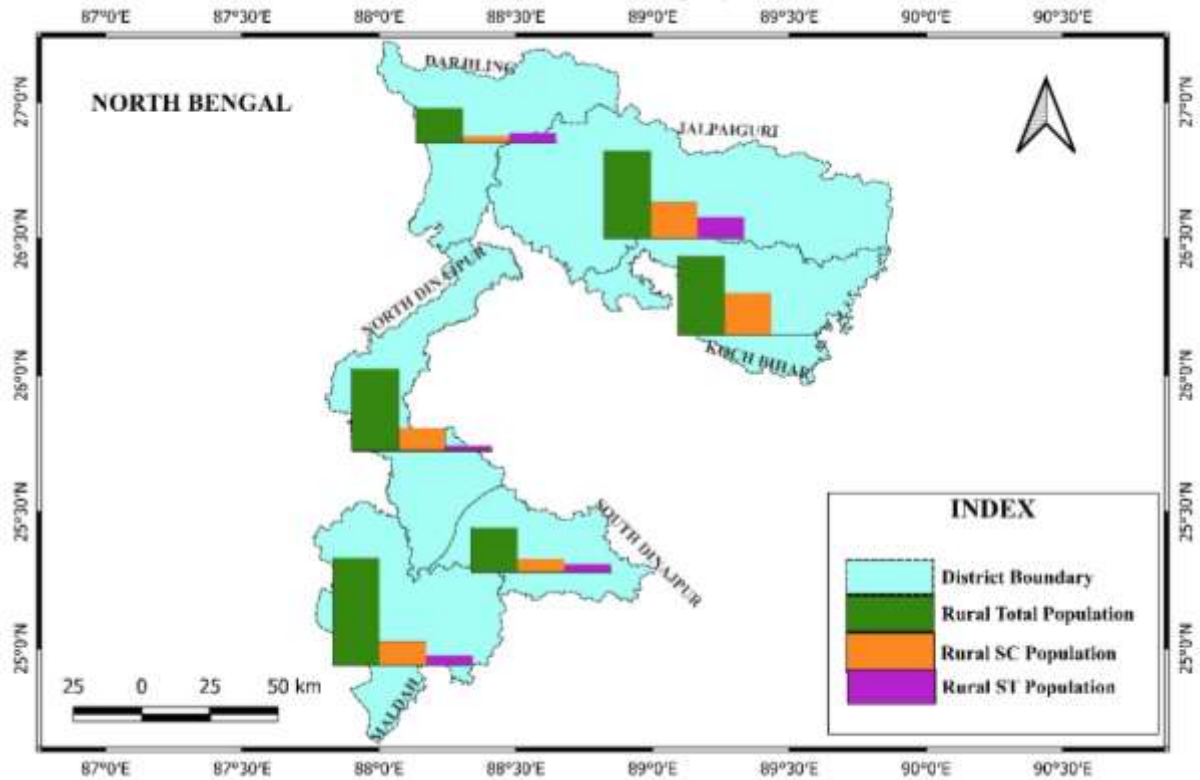


Fig. 6. The distribution of Rural SC and ST population in North Bengal in 2011

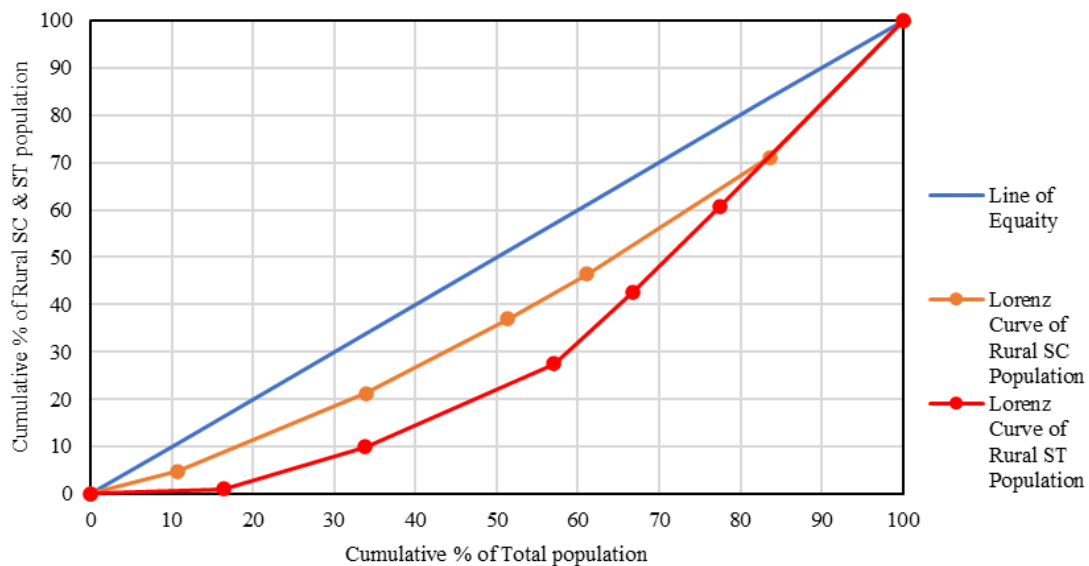


Fig. 7. Distribution of Rural SC & ST population by Lorenz Curve in North Bengal (India) in 2011

5.3. Rural SC & ST Population Distribution

According to the 2011 Census (Table 1), Koch Bihar district has the highest rural SC population, comprising 47.91% of the total population. Jalpaiguri district ranks second, with rural SC population i.e., 29.94% of the total population. Darjeeling district has the lowest, with only 10.17%. In remaining districts, rural SC population constitutes less than 25% of the total population. However, in every district, the rural SC population is significantly higher than the rural ST population.

In terms of rural ST population, Jalpaiguri district ranks first, with 17.82% of the population being rural ST. Darjeeling district comes second, also with 17.28%. In South Dinajpur, the figures stand at 15.98%. However, in the remaining three districts, the percentage is very low- less than 8% of the total population. Koch Bihar district has the lowest, with only 0.60%.

5.3.1. Measures of Inequality by Lorenz Curve and Gini's Co-efficient

It is observed (Fig. 7) that in all six districts in North Bengal (W.B., India) mentioned here the concentration of Rural SC and ST population is unevenly distributed, as the curve formed has sufficient concavity with reference to the line of perfect distribution.

For Rural SC population, the 'G' value obtained is 0.21 or 21.0% unevenness in the distribution of Rural SC population is marked. The value of Gini coefficient (0.21) indicates uniform distribution.

For Rural ST population, the 'G' value obtained is 0.35 or 35.0% unevenness in the distribution of Rural ST population is marked. The value of Gini coefficient (0.35) indicates Nearly uniform distribution.

5.4. Urban SC & ST Population Distribution

According to the 2011 Census (Table 1), the proportion of urban SC and ST population in North Bengal is significantly lower than their rural counterparts. For instance, in case of urban SC, in all districts the urban SC population is less than 8% of the total population. Jalpaiguri ranks first with 7.72%, while Maldah has the lowest at just 1.7%. Except Darjeeling (5%), the percentage in the other districts is closed to 2%.

The proportion of urban ST population is even lower. Except for Darjiling (4.24%) and Jalpaiguri (1%) districts, all other districts have less than 1%

of their total population as urban ST. Koch Bihar district has the lowest, with only 0.04%.

5.4.1. Measures of Inequality by Lorenz Curve and Gini's Co-efficient

It is observed (Fig. 9) that in all six districts in North Bengal (W.B., India) mentioned here the concentration of Urban SC and ST population is unevenly distributed, as the curve formed has sufficient concavity with reference to the line of perfect distribution. To quantify the unevenness in the distribution of Urban SC and ST population, Gini's coefficient has been calculated.

For Urban SC population, the value obtained is 0.32 or 32.0%, it gives the unevenness of distribution in perfect value. Hence, 32.0% unevenness in the distribution of Urban SC population is marked. The value of Gini coefficient is 0.32 which indicates Nearly uniform distribution.

For Urban ST population, the value obtained is 0.65 or 65.0%, it gives the unevenness of distribution in perfect value. Hence, 65.0% unevenness in the distribution of Urban ST population is marked. The value of Gini coefficient is 0.65 which indicates non-uniform or unequal distribution.

6. MAJOR FINDINGS

The major findings of the present investigation are listed as follows:

- District-wise Caste Composition: Koch Bihar has the highest proportion of SC population (50.17%), followed by Jalpaiguri (37.65%). ST population is concentrated in Darjeeling (21.52%) and Jalpaiguri (18.89%), while Koch Bihar shows the lowest ST presence (0.64%).
- Rural-Urban Divide: All six districts are predominantly rural, with Koch Bihar being the most rural (89.73%). Darjeeling has the highest urban population (39.42%).
- Inequality Analysis: SC population have low inequality (G-19.4%) and relatively uniform concentration of Spatial distribution across North Bengal. But for ST population, inequality is moderate (G-37%) and shows more uneven concentration, while urban ST population showed high inequality (G-65%) across the region.
- Rural-Urban Composition: Both Schedules Caste and Scheduled Tribe population distributions are mostly even in the rural

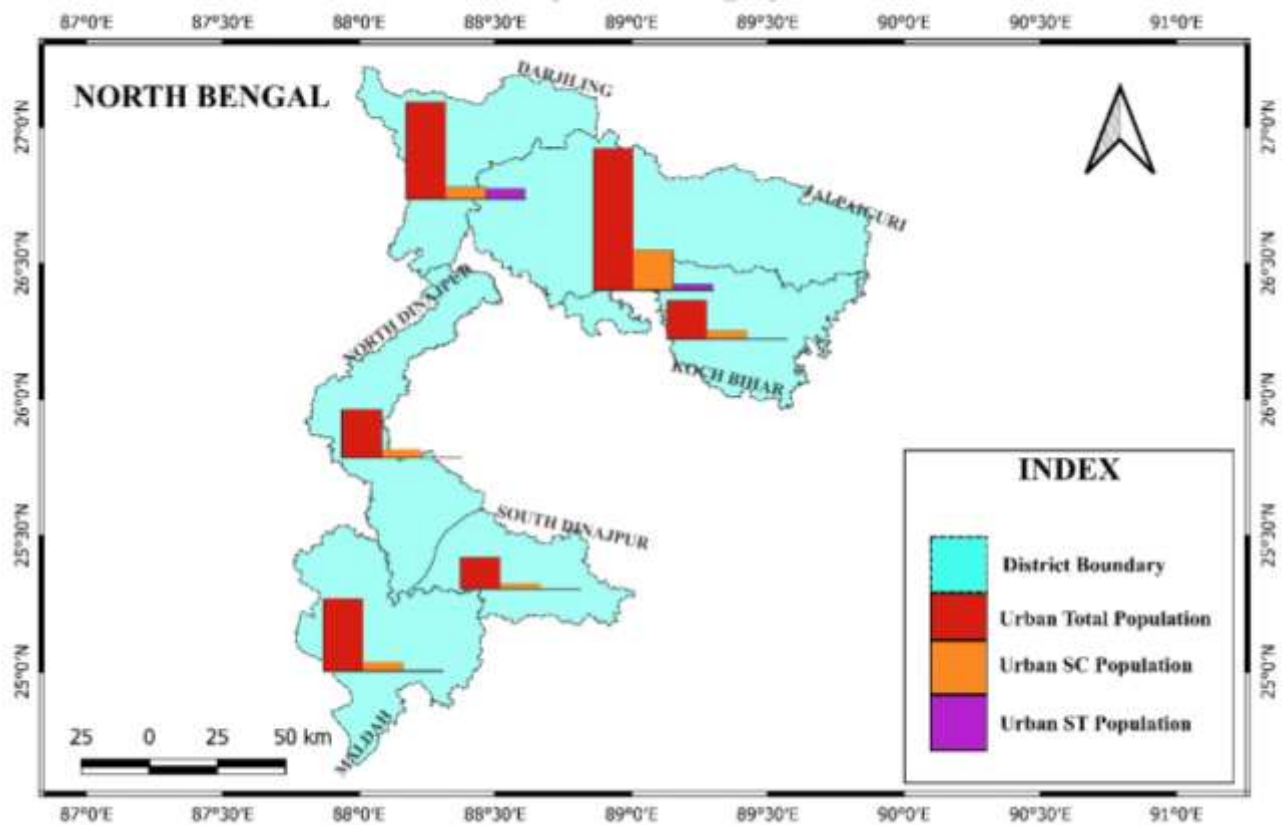


Fig. 8. The distribution of Urban SC and ST population in North Bengal in 2011

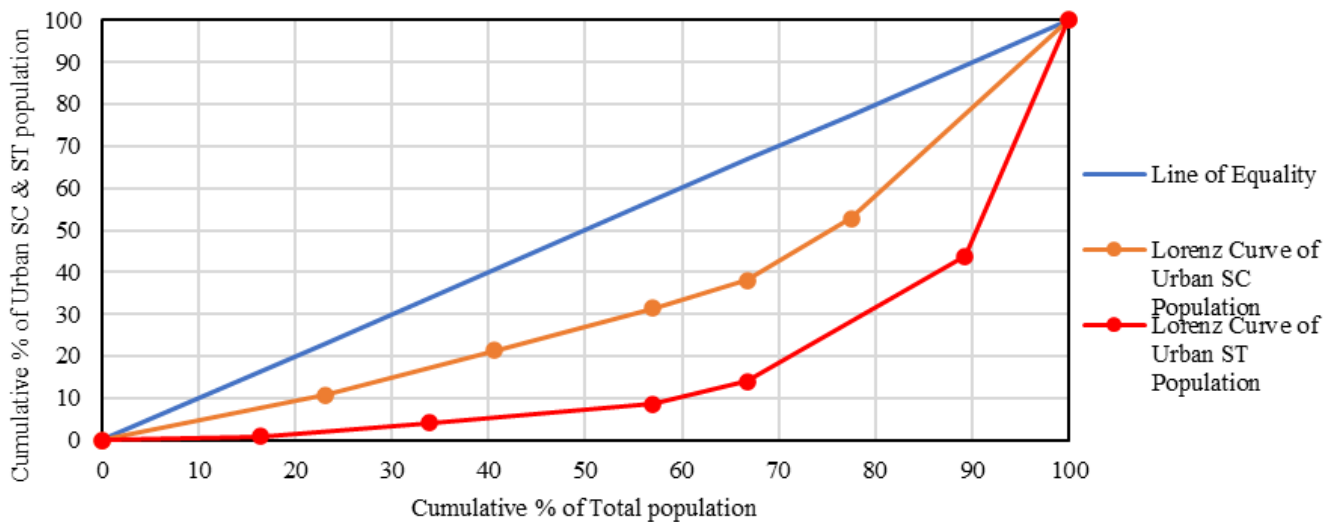


Fig. 9. Distribution of Urban SC & ST population by Lorenz Curve in North Bengal (India) in 2011

areas but the proportion of SC and ST population is very low in the urban areas. Especially The proportion of urban ST is lower than the urban SC. It shows very low concentration of urban SC and ST by constituting less than 1%.

7. CONCLUSION

Inequality study is one of the relevant parts of regional planning. SC and ST groups of people very often marginalized in mainstream society and tends to cluster in geographically isolated regions across India. Therefore, the study of spatial

distribution and concentration of these marginalized groups is very significant to identify to formulate welfare schemes for improving their socio-economic-political gaps, and to ensure all the constitutional rights in the region.

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CONFLICTS OF INTEREST/COMPETING INTERESTS

The authors have no relevant financial or non-financial interests or conflict of interest to disclose.

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