

## A Study of Inter-District Spatio-Temporal Disparity of Gender, Caste and Tribe and their Nexus in West Bengal

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### *Abstract*

*The current study intended to assess the dynamics of inter-district spatio-temporal disparity in the concentration gender, caste and tribe population in West Bengal, India. The state has imperative diversity and disparity in the distribution of gender, caste and tribes, which distress the developmental scenario of the socially disadvantaged groups and the society accordingly. As per the last census (Census, 2011), the total populace of the state was 91.35 million with a growth rate of 17.70% and a population density of 1028/km<sup>2</sup> and therefore facing tremendous challenges in diverse aspects. The study deals with the quantitative investigation of variability and concentration of distinct populations over the 1991 to 2011 census and finds its connection with development. GIS mapping application was carried out for geo-spatio-temporal analysis using various cartographic and statistical techniques, like standard score, disparity index etc., concentrating on the district-wise secondary database. As per the 2011 census, the highest concentration of SC, ST and Muslim populations was observed in South 24 Parganas, Paschim Medinipur and Murshidabad districts, respectively; while Kendall's composite score value symbolises that the lowest and highest attention of the communities was noticed in Kolkata, Burdwan and Jalpaiguri districts. The outcomes depicted a haphazard and eccentric picture of the concentration and disparity of gender-wise SC and ST populations as per the used indices, which are mostly grouped into high, moderate and low. It reveals from such analysis that this district-level scenario should be inserted during the formation of plans because it helps in location-specific planning and desired human development in West Bengal.*

*Keywords: Development, GIS, gender, inter-district, SC, ST, spatio-temporal, disparity, West Bengal.*

### 1. INTRODUCTION

The developmental scenario of any region is not only dependent on the socio-economic parameters

but is also closely associated with the demographic attributes. In India, such demographic attributes are taking a prime role in the development, and the states have diverse developmental scenarios; due to their demographic disparity, the state of West Bengal is probably a perfect paradigm of such depiction. Against this backdrop, the current study is designed to assess the dynamics of inter-district spatio-temporal disparity in the concentration of gender, caste and tribes in West Bengal, India, which distress the developmental scenario of the socially disadvantaged groups. In the post-independence period of India, during 1950, the Scheduled Caste (SC) and Scheduled Tribes (ST) are constitutionally registered (article 341 and article 342) among other backward Caste groups and tribal communities. Since 1992, according to the Constitution of India, the Muslims, Sikhs, Christians, Buddhists, Jains, and Parsis religion are included as a minority community under section 2(c) as per the National Commission for Minority Act. Besides, Muslims are the second-largest minority denomination after the Hindu religion, whereas their percentage constitutes only 14.2% of India's total population.

Furthermore, the SC and ST community drops behind in various development sections concerning the society's upper caste. These marginal communities are at the lower level of social indicators because of socio-economically and psychologically backwardness in India (Raghavendra, 2020). As per the 2011 census, there is a total of 104.281 million Scheduled Caste and 93.819 million Scheduled Tribe population, constituting 16.6% and 8.6% of India's aggregate population. The maximum percentage of SC was observed in the state of Punjab (31.94%), Himachal Pradesh (25.19%) and West Bengal (23.51%); while the lowest prevalence is found in Mizoram (0.11%), Meghalaya (0.58%), Dadra and Nagar Haveli (1.80%). On the other side, a high proportion of the ST population is noticed in Lakshadweep (94.8%), Mizoram (94.4%), Nagaland (86.5%) and the smallest values confined in the state of Uttar Pradesh (0.6%), Tamil Nadu (1.1%), Bihar (1.3%). In this context, the dynamics of the spatio-temporal disparity in the concentration of gender, caste and tribes' population in West Bengal from 1991 to 2011 was designed to find out its correlation with the developmental scenario.

However, the development of a community is measured by the socio-economic condition, population concentration, sex ratio, literacy, education and work participation rates etc. These are the significant factors to affirm the situation of a community that faced unenviable avoidance in Indian society (Mainuddin, 2011). In the Indian rural areas, conflicting poverty was seen among SC and ST populations with the other section. Moreover, impoverishment is high in the SC and ST houses (Gang et al., 2008); low income and landlessness are the main problems; due to poverty, their sanitation system is inferior for maintaining good health and hygiene (Sardar, 2020). On the other side, they have to face a stricter reality in terms of socio-economic inadequacy compared with other communities and was seen less probability of engaging in the available educational opportunities in India (Wani and Qadri, 2020). West Bengal is popularly defined as "The heart of East India" due to its strategic location. The state is also known for its geographical location, political features, and economic importance, accelerating all communication and transportation with northeast India. Besides, the neighbouring countries and states of eastern India largely depend on West Bengal. In the state, diversity in language, culture, socio-economic status, etc., is the crucial discrimination among the major and minor inhabited communities. As the SC and ST are considered the backward section of the society, there are numerous reasons for backwardness, amongst which the lack of education is crucial.

Some of the earlier research depicted the SC and ST population's poor condition in terms of literacy, socio-economic status, poverty, health, etc. Although, as per the latest census (2011), the literacy rate of West Bengal is about 69.43% (India: 66.07%), still there have vast discrepancies in the concentration of literate, gender-wise literacy levels, literacy gaps and disparity amongst the different districts of the state and the differential is more observable within SC and ST population (Chattoraj and Chand, 2015). The spatial distribution of disparity in education creates inequality in male-female literacy rates among the SC, ST and unreserved categories between the district of Purulia and North 24 Parganas; probably thus, Purulia has far behind in terms of literacy from North 24 Parganas district

(Sarker and Chakraborty, 2021). A critical investigation divulged that around 50% of SC people are well progressed in comparison to ST people from the socio-economic status and level of primary education in the Birbhum district of West Bengal (Ghosh, 2019). West Medinipur became one of the backward tribal (ST) districts in West Bengal (Chakraborty, 2019); and economic recession, poverty, geographical structure, language gap, paucity and lack of improvement in the health care system, political unawareness, etc. are the prime barrier in the progression of education and health. After independence, many policies and conservancy are taken to develop the SC and ST communities, and they have a secure proportion of reservations. But there is a gap in its implementation, and in the rural areas, SC girls, particularly in the backward districts like Purulia, Birbhum, Bankura, Paschim Medinipur (Das et al., 2011; Rukhsana and Alam, 2014; Hoque and Biswas, 2015) are not aware of the educational facility.

The previous studies on this particular theme are minimal as most of the researchers focus on one individual aspect or a comparative analysis of SC, ST community concentrates on one or two selected districts of West Bengal. Moreover, most of these researches did not highlight inter-district spatial disparity and dynamics of male and female concentration of these communities (SC, ST) together over the decades in West Bengal. There lies the research gap, which is addressed in the current attempt. This study aims to explore the quantitative analysis of the inter-district concentration and variability of gender, caste, and tribes (SC, ST population) from 1991 to 2011 and its correlation with uneven and disrupted development in West Bengal. The study harmonised the spatio-temporal analysis of secondary datasets with the help of cartographic and statistical techniques by employing GIS mapping.

The current research addresses the following objectives:

- To identify the inter-districts spatio-temporal inequality of Scheduled Caste (SC) and Scheduled Tribe (ST) populations of West Bengal.
- To assess the gender-wise (male and female) concentration of SC and ST populations of different districts.
- To examine the spatio-temporal dynamics of the proportion of SC and ST populace over the decades.
- To trace the disparity index in the distribution of the gender, caste and tribes in West Bengal's districts.
- To sketch the correlation and nexus with the districts' educational development (literacy rate).

## **2. MATERIAL AND METHODS:**

### **2.1 Study Area:**

The state of West Bengal, situated in the eastern parts of India, has been selected for the present study. The study area is positioned between 21°38' to 27°10' North latitudes and 85°50' to 89°50' East longitudes (Fig. 1). The total land area of the state is about 88,752 sq. km., which is only 2.7% of the total land area of our country and stands as the 14<sup>th</sup> ranked in terms of area among the other states of India. The total population of West Bengal is approximately 9.13 million (91,276,115 as per the 2011 Census), comparing 7.54% of India's population. West Bengal is the fourth most populace state in India, having 46,927,389 male and 44,420,347 female populations and the density of population is 1,029 per sq. km. (as per the 2011 census). The state has a total of 104.281 million SC and 93.819 million ST populations, constituting 16.6% and 8.6% of the state's aggregate population as per the 2011 census.

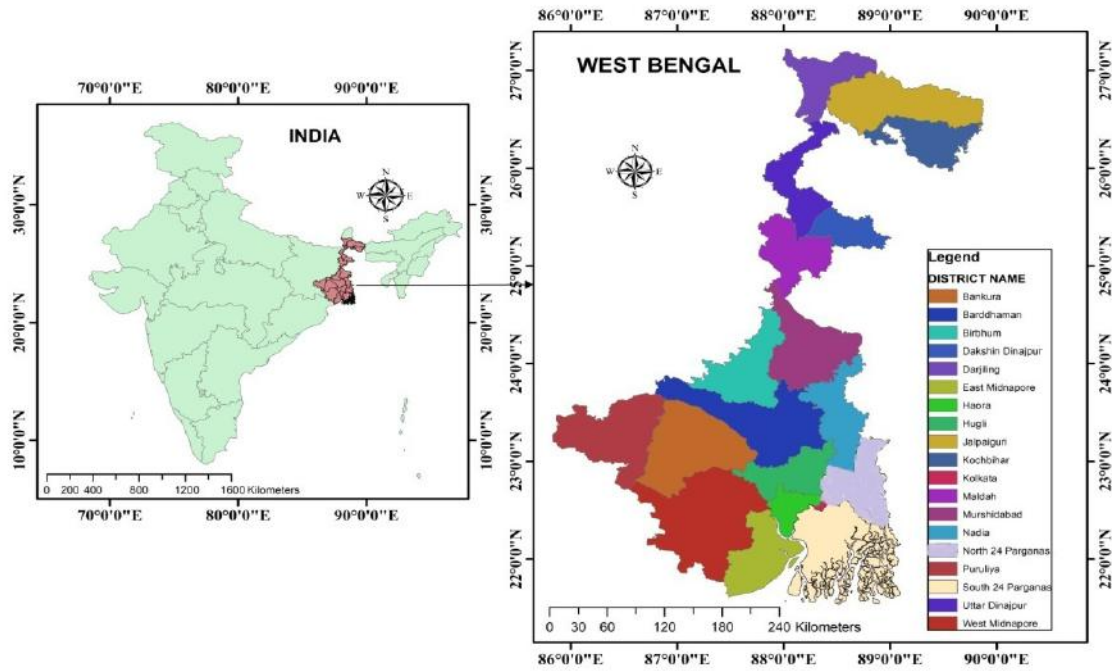


Fig. 1: Location of the study area

2.2 Database and Methodology

2.2.1 Data Collection:

The present research is based on the systematic analysis of the secondary dataset, which was obtained from various reports, websites and published works in national and international journals. The gender, caste and tribes of the state were mainly collected from the Statistical Handbook of West Bengal (2014), the district-level data of different census years (1991, 2001, 2011) were collected from the website of the Census of India ([www.censusindia.gov.in](http://www.censusindia.gov.in)).

2.2.2 Methodology of Data Computation:

Herein various statistical methods, like standard score (Z-score); disparity index (DI) by Sopher’s method and Kendall’s composite score by ranking coefficient method, are used to measure the concentration and uneven distribution of gender-wise scheduled caste and scheduled tribe population over the decades at an inter-districts level in West Bengal. The data were calculated using Microsoft Excel, and the districts’ mapping was employed using the Arc GIS (10.3) and MapInfo (12.5) software. The visual scenario is one of the imperative outcomes of the study, which helps to understand the Spatio-temporal dynamics and can add some extra sugar to the research. The formulas of the applied indices are described below:

1. Location quotient (LQ) has been calculated by using the formula (Bhadra 2016):

$$LQ = \frac{E_i / T_i}{E_j / T_j} \dots\dots\dots (i)$$

(Where  $E_i$ = individual population of the respective district;  $E_j$  = sum of the population of all districts;  $T_i$  = total population of the respective district;  $T_j$  = sum of the total population of all districts.)

2. Standard score (z-score) method has been computed using the formula below (Ray and Rahaman, 2017):

$$z = \frac{x - \mu}{\sigma} \dots\dots\dots (ii)$$

(Where, z = standard score; x = actual value of population;  $\mu$  = mean of population;  $\sigma$  = standard

deviation of the population.)

3. Sopher's Disparity index (1974) has been calculated using the following formula:

$$DI = \frac{\log X_2 - \log X_1}{\log X_2 + \log X_1} \quad \dots\dots\dots (iii)$$

(Where, DI = disparity index; X<sub>2</sub> = refers to maximum value; X<sub>1</sub> = refers to minimum value; X<sub>2</sub> > X<sub>1</sub>)

4. Kendall's composite score has been calculated by ranking the indices and finally adding the ranks (Pramanik, 2021) \dots\dots\dots (iv)

$$C_j = \frac{1}{n} \sum_{i=1}^n R_i$$

(Where, C<sub>j</sub> = composite rank of j<sup>th</sup> district; n = number of variables; R<sub>i</sub> = rank of the variables)

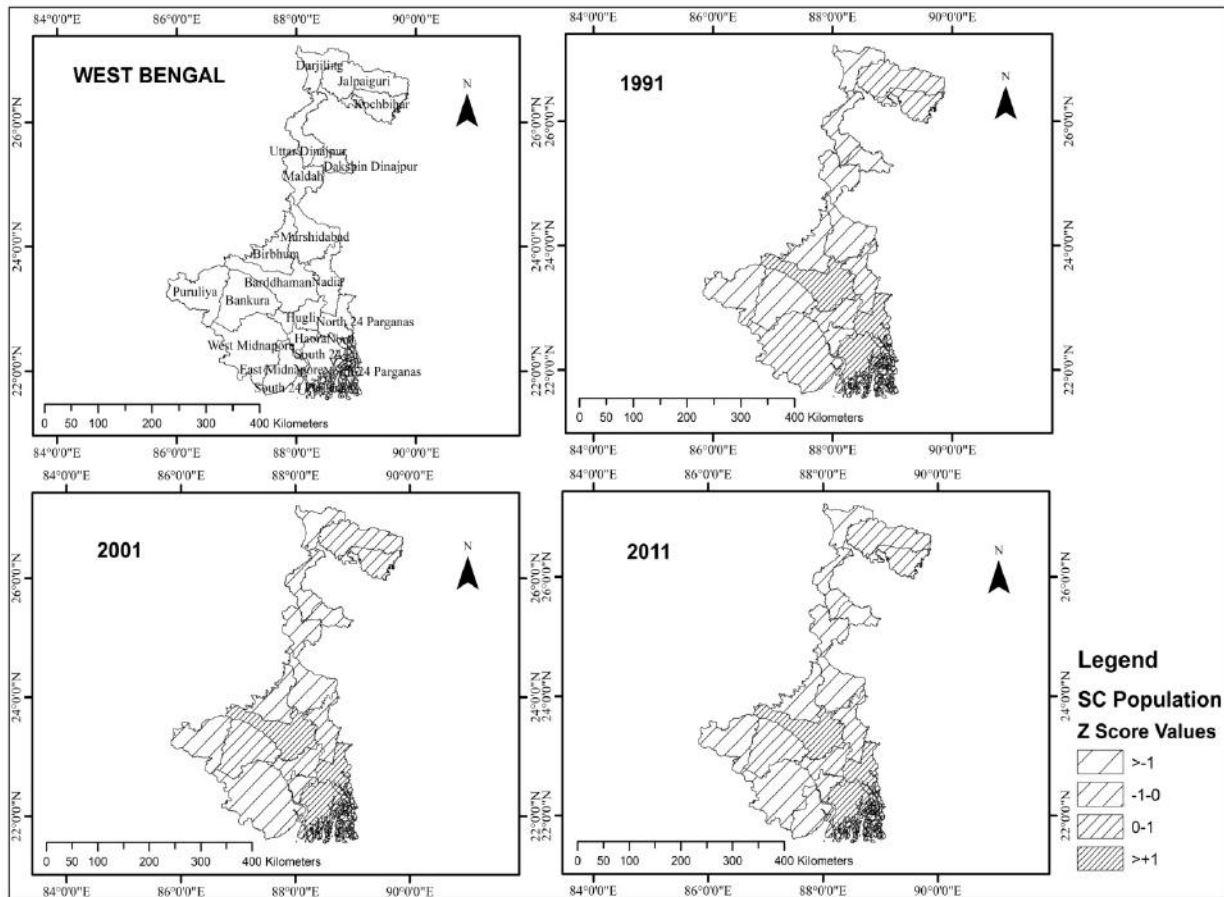
### 3. RESULTS:

#### 3.1 Inter-districts spatio-temporal inequality of SC and ST population:

Caste system in West Bengal is less rigid in compare to the ancient civilization like Aryan civilization. But, the remanent of ancient caste structure still exist in the modern society and spatial variation observed district wise. The spatio-temporal variations of the concentration of the Scheduled Caste and Scheduled Tribe populations of West Bengal were studied at the inter-district level using statistical calculations and represented by GIS mapping. Before going into the intensive inequality of concentration analysis by the Standard Score method, the picture of the overall number needs to be known. According to the latest census in 2011, the total SC population of West Bengal is 2.14 million, which was 1.85 million in 2001 and 1.61 million in 1991. The total ST population of West Bengal in 1991 was 0.38 million, which increased to 0.44 million in 2001 and further increased to 0.68 million in 2011. In this context, the district-wise regional distribution of SC and ST population of West Bengal has been analysed from 1991 to 2011 and their population concentration by the Z-score value. The calculated values have been placed in four categories, viz. high (>+1), moderate (0-1), low (-1 to 0) and very low (>-1) zones and tabulated, which was self-explanatory.

##### 3.1.1 Spatial concentration of SC population (1991 to 2011):

In 1991, the maximum concentration (about 17%) of SC population was dominated in the districts of south-eastern and south-central parts (Burdwan, North 24 Parganas, South 24 Parganas) of West Bengal (Fig. 2). Furthermore, the moderate concentration (about 28%) was occupied in the district of southern, south-western, and the north-eastern section (Medinipur, Hooghly, Nadia, Jalpaiguri, Coochbehar). At the same time, the less concentration (about 39%) and very less (about 16%) were majorly notified in the central, south-eastern, northern and western districts of West Bengal, like Birbhum, Bankura, Howrah, Murshidabad, Uttar Dinajpur, Maldah, Purulia, Kolkata, Dakshin Dinajpur, Darjeeling. After a decade, in 2001 there had been observed very meagre changes occurred within stern segments. A closer look reveals that in 2001, the highest concentration of SC inhabitants was seen in the same region as in 1991, with a varied degree of concentration (Table 1). After the division of the Medinipur district (1<sup>st</sup> January 2002) into two parts, Purba and Paschim Medinipur, the concentration SC population was shared in the two districts. Therefore, the scenario changed and found a distinct concentration in the south-western and southernmost regions, respectively. Compared with the previous year, in 2011, apart from the south-western part, the highest concentration of SC (about 16%) remained the same in the districts of Burdwan, North and South 24 Parganas; besides the moderate zone (about 26%) had also seen in the same region likewise previous census year with a bit of alteration (Hooghly, Nadia, Bankura, Jalpaiguri, Coochbehar); whereas the low concentration was observed in the south-western, southernmost, northern, southern and central, western districts, like Birbhum, Purba and Paschim Medinipur, Howrah, Murshidabad, Uttar Dinajpur, Maldah, Purulia.



**Fig. 2:** District-wise level of disparity of SC population in West Bengal

**Table 1:** Concentration zones of SC population in West Bengal from 1991 to 2001

Category	1991		2001		2011	
	Districts	% of districts	Districts	% of districts	Districts	% of districts
>+1	Burdwan, North and South 24 Parganas	16.67	Burdwan, North 24 and South 24 Parganas	16.67	Burdwan, North and South 24 Parganas	15.79
0 to 1	Medinipur, Nadia, Hooghly, Jalpaiguri, Coochbehar	27.78	Bankura, Hooghly, Nadia, Jalpaiguri, Coochbehar	27.78	Bankura, Nadia, Hooghly, Jalpaiguri, Coochbehar	26.32
-1 to 0	Birbhum, Bankura, Howrah, Maldah, Murshidabad, Uttar Dinajpur, Purulia	38.89	Birbhum, Purulia, Medinipur, Howrah, Murshidabad, Uttar and Dakshin Dinajpur, Maldah	44.44	Birbhum, Purba & Paschim Medinipur, Howrah, Purulia, Murshidabad, Uttar Dinajpur, Maldah,	42.11
>-1	Dakshin Dinajpur, Darjeeling, Kolkata	16.66	Kolkata, Darjeeling	11.11	Kolkata, Dakshin Dinajpur, Darjeeling	15.78

Source: Computed by the authors

**3.1.2 Spatial concentration of ST population (1991 to 2011):**

The spatio-temporal variations of the concentration of the ST population of West Bengal were also studied (Fig. 3) in a similar way, and it was observed that in 1991, the highest ST population was concentrated (16.67%) in the Medinipur, Purulia and Jalpaiguri districts of West Bengal. The moderate concentration (11.11%) was occupied by Burdwan and Bankura districts. At the same time, the less concentration (55.56%) and very less (16.66%) were majorly found in the central, south-eastern and northern districts of West Bengal, like Birbhum, Hooghly, North 24 and South 24 Parganas, Nadia, Murshidabad, Uttar and Dakshin Dinajpur, Maldah, Darjeeling, Kolkata and Howrah. After a decade, in 2001, a similar condition was notified, and only Paschim Medinipur was added along with Purulia and Jalpaiguri to this highest zone of ST population concentration in 2011.

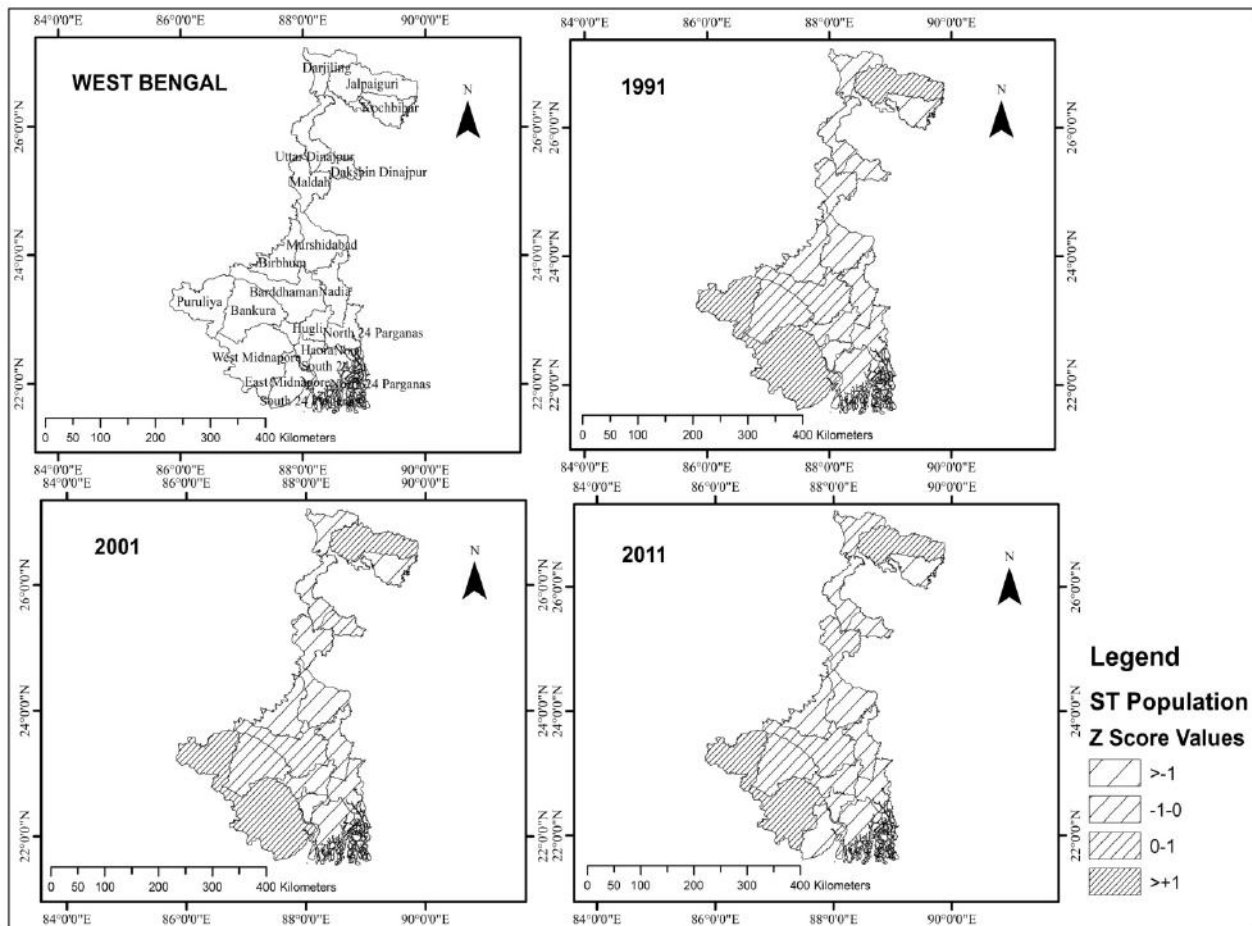


Fig. 3: District-wise level of disparity of ST population in West Bengal

The moderate concentration of ST population was noticed in Burdwan, Bankura and Dakshin Dinajpur districts in 2001 and further expanded to Maldah, Darjeeling district in 2011. However, the lowest ST population concentration in 2001 was observed in the south-eastern, and middle and northern parts (Birbhum, Hooghly, North 24 Parganas, South 24 Parganas, Nadia, Murshidabad, Uttar and Dakshin Dinajpur, Maldah, Darjeeling), and that remain continued up to the year 2011. The very less concentration was situated in the Howrah, Kolkata, and Coochbehar districts of West Bengal from 1991 to 2011 (only Purba Medinipur district was added to the existing) (Table 2).

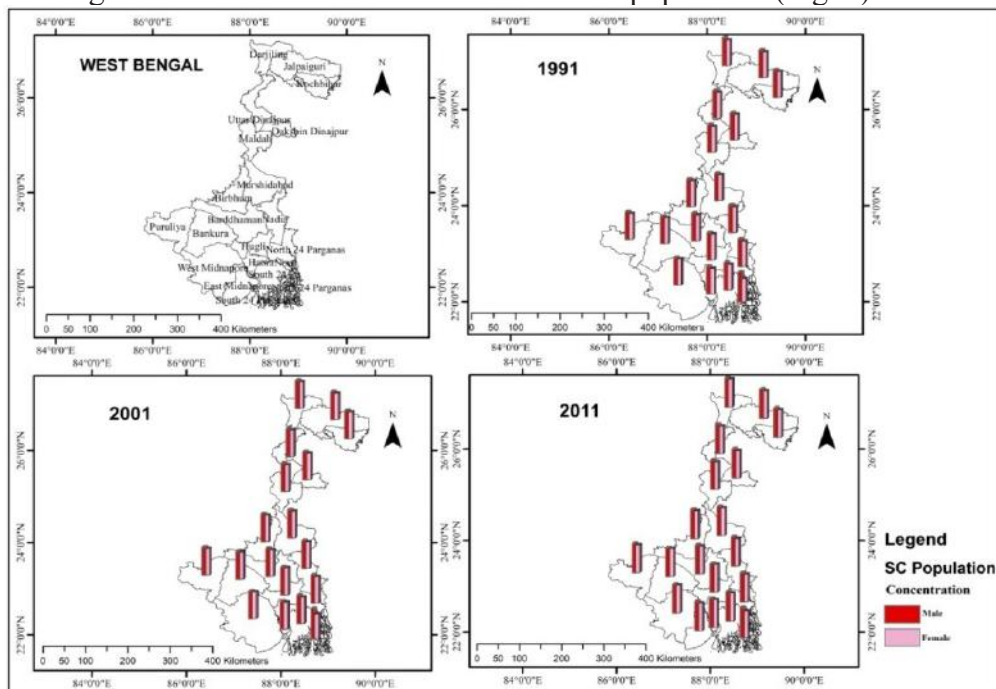
**Table 2:** Concentration of district-wise ST population in West Bengal

Category	1991		2001		2011	
	Districts	% of districts	Districts	% of districts	Districts	% of districts
>+1	Medinipur, Jalpaiguri, Purulia	16.67	Medinipur, Jalpaiguri, Purulia	16.67	Paschim Medinipur, Purulia, Jalpaiguri,	15.79
0 to 1	Burdwan, Bankura	11.11	Burdwan, Bankura, Dakshin Dinajpur	11.11	Burdwan, Bankura Maldah, Darjeeling	21.05
-1 to 0	Birbhum, Hooghly, North 24 and South 24 Parganas, Nadia, Murshidabad, Uttar and Dakshin Dinajpur, Maldah, Darjeeling	55.56	Birbhum, Hooghly, North and South 24 Parganas, Nadia, Maldah, Murshidabad, Uttar Dinajpur, Darjeeling,	55.56	Birbhum, Hooghly, North and South 24 Parganas, Nadia, Murshidabad, Uttar and Dakshin Dinajpur	42.11
>-1	Howrah, Kolkata, Coochbehar	16.66	Howrah, Kolkata, Coochbehar	16.66	Howrah, Kolkata, Coochbehar, Purba Medinipur	21.05

Source: Computed by the authors

**3.2 Gender-wise inter-districts concentration of SC, ST population:**

The gender-wise concentration of SC and ST population of the districts of West Bengal in the census years, viz. 1991, 2001 and 2011, were studied and analysed by the Sopher’s disparity index to show the inter-districts gender-based concentration of SC and ST population (Fig. 4).



**Fig. 4:** Gender disparity of SC population in West Bengal



As a whole, West Bengal had 51.78% male and 48.23% female SC population according to the 1991 census, which was changed to 51.32% male, 48.68% female SC in 2001, and again it further modified to 51.27% male and 48.73% female SC in 2011. On the other hand, the picture of the ST population (Fig. 5) was close to the scenario of the SC population, and in 1991 the state had 50.91% male, 49.09% female ST, which was changed to 50.11% male and 49.89% female ST in 2001; and further altered to 50.03% male & 49.97% female ST in 2011 census. In this context, it was found that the Sopher’s disparity index represents the speckled, vibrant level of disparity of SC and ST populations from 1991 to 2011 among the districts of West Bengal. For the year 1991, highest value of Sopher index for SC population was found for the district of Darjeeling, followed by North 24 Parganas and Jalpaiguri. In 2001, South 24 Parganas secure the first place followed by North 24 parganas and Uttar Dinajpur. For 2011 census year, Kolkata occupied the top place followed by Maldah and Uttar Dinajpur. Approximately the similar picture has been seen for the Sopher’s disparity index value for ST population.

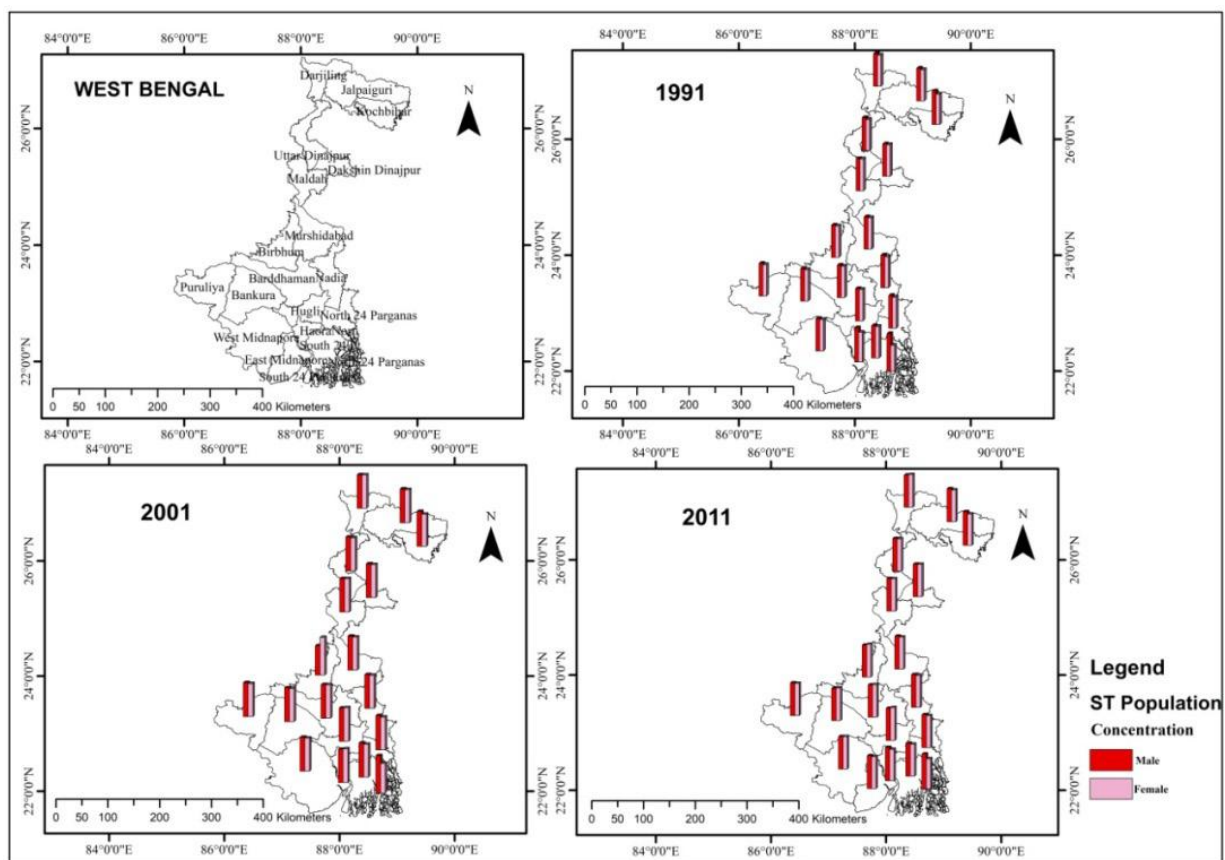


Fig. 5: Gender disparity of ST population in West Bengal

**3.3 Spatio-temporal dynamics of the proportion of SC and ST population:**

The spatial concentration of the SC population was calculated using the 1991, 2001 and 2011 census data and district-wise plotted (Fig 6) to depict the concentration scenario. In 1991, high and moderate concentrations were observed in the seven districts each, and low concentrations were located in four districts. In 2001, the scenario almost remained the same, and only the concentration level of the Medinipur district had been changed and condensed to the moderate category from high. This picture of concentration level was carried out in 2011 for all the districts.

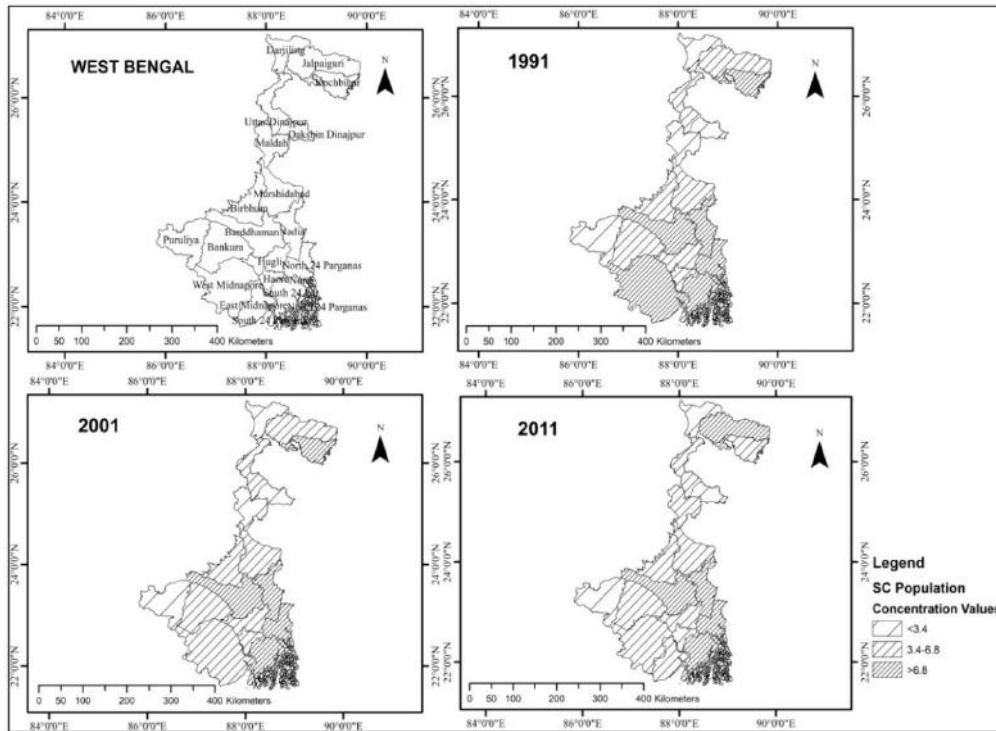


Fig. 6: District-wise spatial concentration of SC population

The inter-district spatial concentration of the ST population was also calculated in the same way GIS mapping was carried out (Fig. 7) using the 1991, 2001 and 2011 censuses. It revealed that in 1991, a high concentration was observed in the four districts, moderate concentration was located in eight districts, and low concentration was found in six districts. This concentration level was carried out in the year 2001. In 2011, the scenario almost remained almost the same, and only the Paschim Medinipur district remained in the high category while the Purba Medinipur condensed to the moderate category.

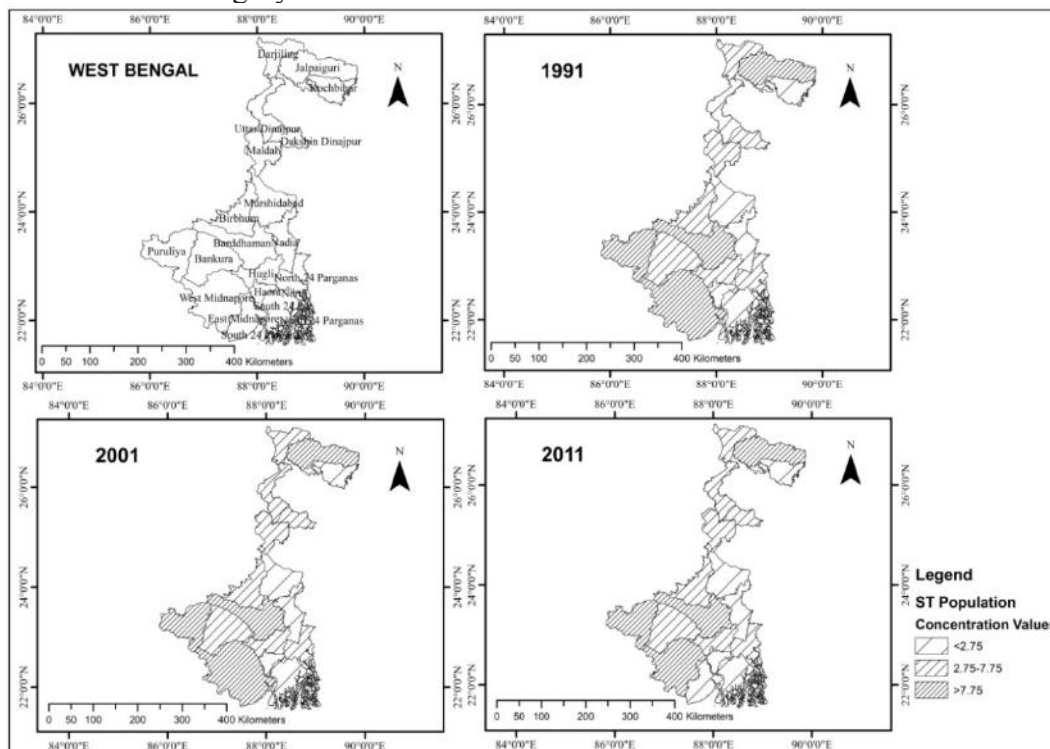
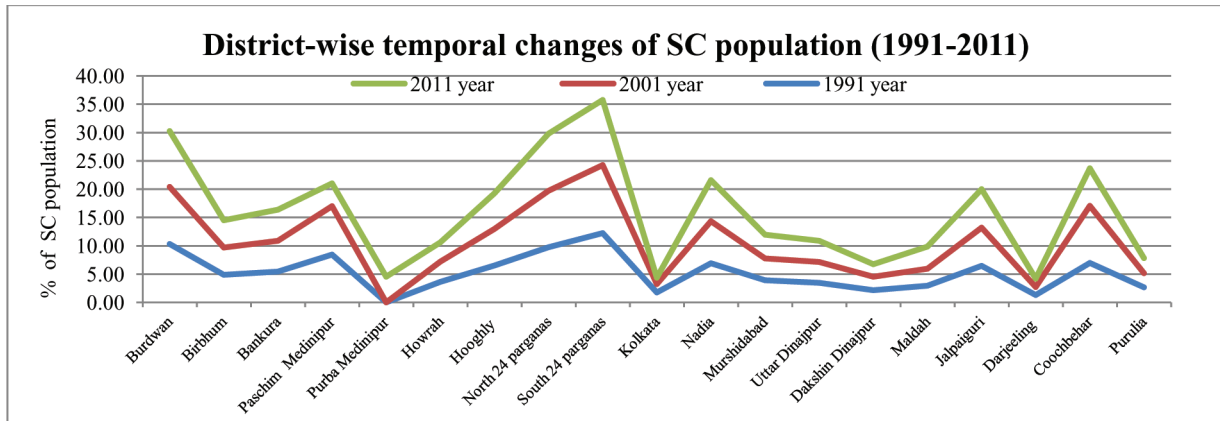
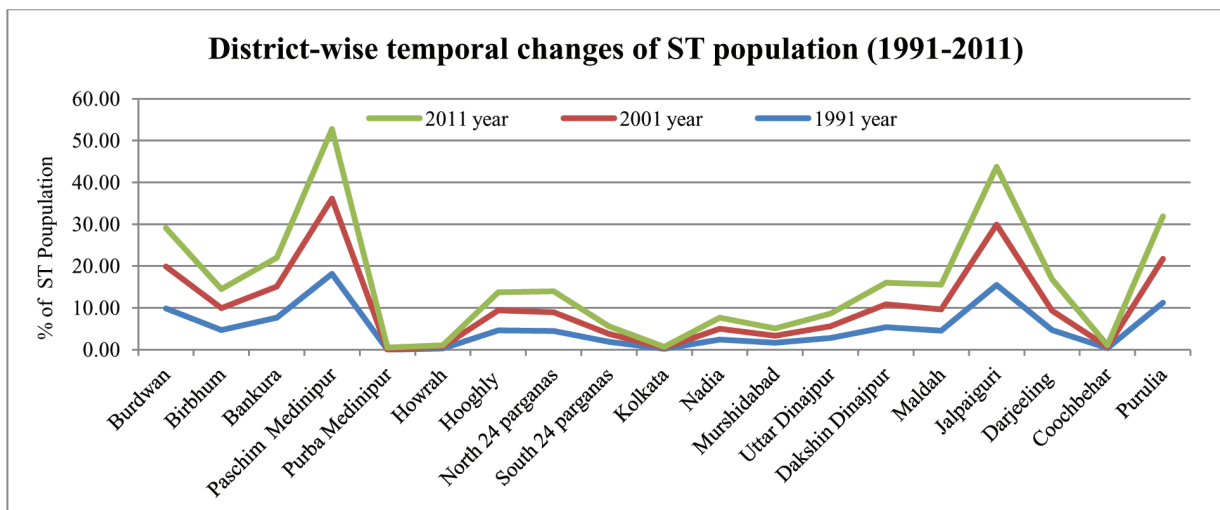


Fig. 7: District-wise spatial concentration of ST population

The temporal changes in SC and ST populations were calculated using the 1991, 2001 and 2011 census data and plotted in a graph to depict the changing dynamics of the concentration (Fig 8 & 9). The district-wise temporal changes from 1991 to 2011 in SC and ST populations were studied minutely, and it reveals that a higher percentage of SC is observed in Burdwan, Paschim Medinipur, North and South 24 Parganas, Nadia, Jalpaiguri and Coochbihar districts; while the lower percentage is noticed in Kolkata, Purba Medinipur and Darjeeling districts of West Bengal



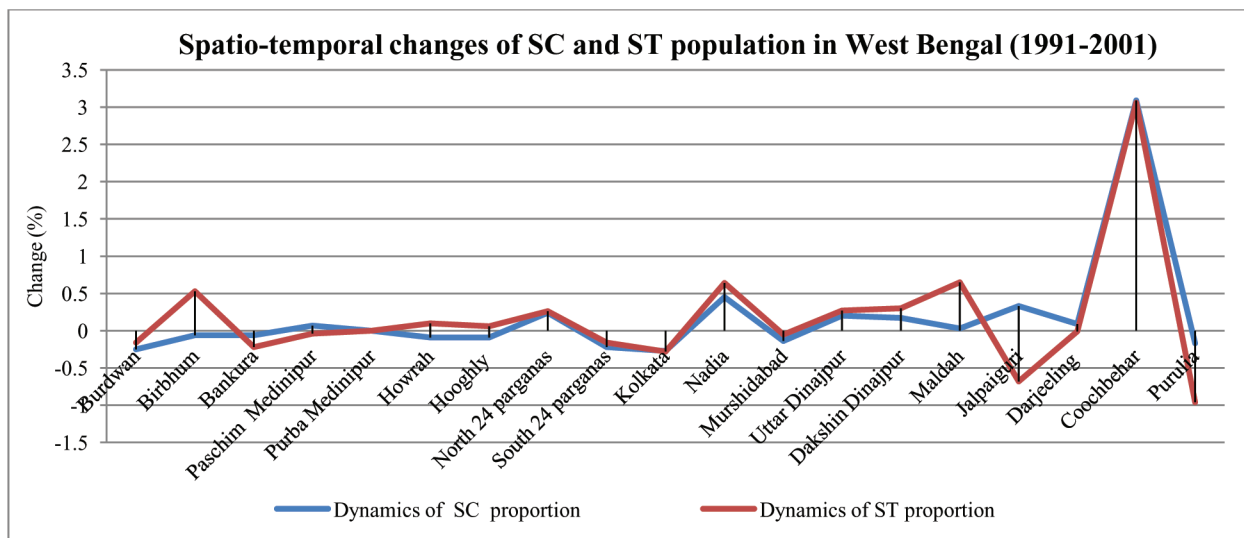
**Fig. 8:** Temporal changes of SC population in the districts of West Bengal



**Fig. 9:** Temporal changes in ST population in the districts of West Bengal

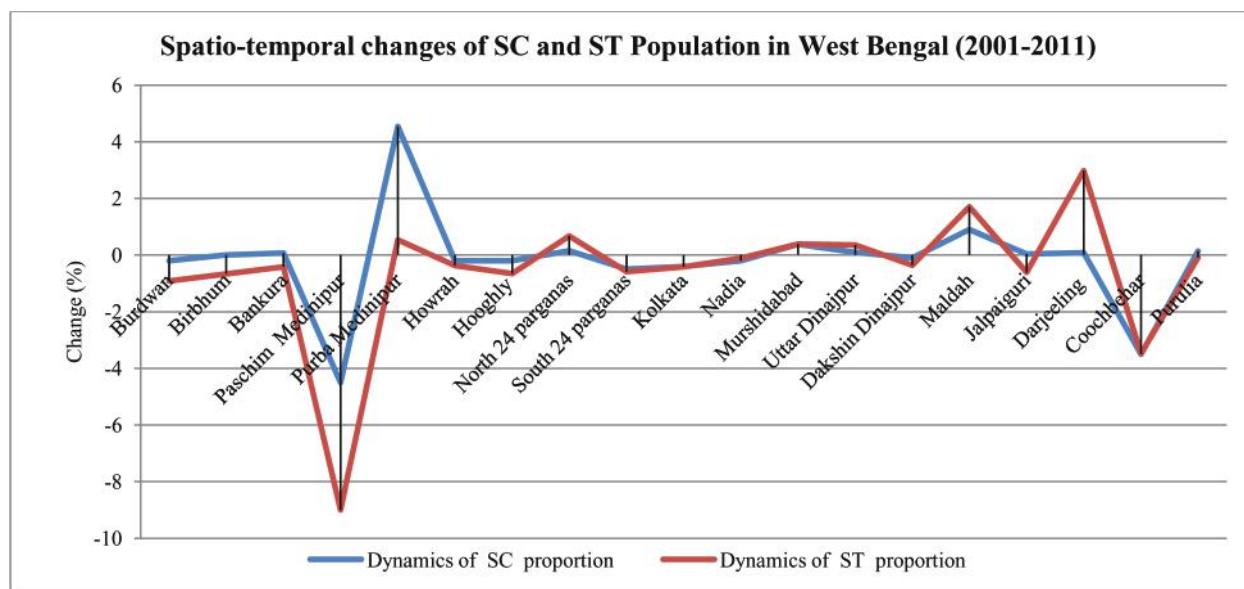
The positive and negative changes in SC and ST populations from 1991 to 2011 are noted in three sections and described accordingly:

*Temporal changes from 1991 to 2001:* There has been a negative change (Fig 10) in the percentage of SC population in Burdwan, Birbhum, Bankura, Howrah, Hooghly, South 24 Parganas, Kolkata, Murshidabad, Purulia districts of West Bengal. The positive growth was found in Medinipur, North 24 Parganas, Nadia, Maldah, Uttar and Dakshin Dinajpur, Jalpaiguri, Darjeeling, and Coochbihar districts. Whereas the positive growth of ST population was found in the Bankura, Birbhum, Howrah, Hooghly, North and South 24 Parganas, Nadia, Murshidabad, Maldah, Uttar and Dakshin Dinajpur districts and the remaining seven districts have negative growth.



**Fig. 10:** Temporal dynamics of Caste and Tribe in West Bengal (1991-2001)

*Temporal changes from 2001 to 2011:* From 2001 to 2011, Burdwan, Paschim Medinipur, Howrah, Hooghly, South 24 Parganas, Nadia, Dakshin Dinajpur, Coochbihar districts have prevalent in negative growth of SC population (Fig 11); whereas Birbhum district has zero growth; besides positive changes in have notified in Bankura, Purulia, Purba Medinipur, North 24 Parganas, Murshidabad, Maldah, Uttar Dinajpur, Jalpaiguri, Darjeeling districts. Likewise, the positive growth of ST was notified in Purba Medinipur, North 24 Parganas, Murshidabad, Maldah, Uttar Dinajpur, and Darjeeling districts. Negative growth was notified in Burdwan, Bankura, Birbhum, Purba and Paschim Medinipur, Howrah, Hooghly, South 24 Parganas, Kolkata, Dakshin Dinajpur, Jalpaiguri and Coochbihar districts.



**Fig. 11:** Temporal Dynamics of Caste and Tribe in West Bengal (2001-2011)

*Temporal changes from 1991 to 2011:* The change in the proportion of SC population was found in Burdwan, North and South 24 Parganas districts from the 1991 and 2011 census period (Fig 12). The negative changes were confined to Burdwan, Birbhum, Purulia, Paschim Medinipur, Howrah, Hooghly, South 24 Parganas, and Coochbehar districts, and the positive changes were found in the rest of the ten districts. The negative changes in the proportion of the ST population were concentrated

in Burdwan, Birbhum, Purulia, Bankura, Paschim Medinipur, Hooghly, South 24 Parganas, Kolkata, Dakshin Dinajpur, Jalpaiguri, Coochbehar districts; In contrast, Purba Medinipur, Howrah, North 24 Parganas, Nadia, Maldah, Murshidabad, Uttar Dinajpur, Darjeeling districts hold the positive growth.

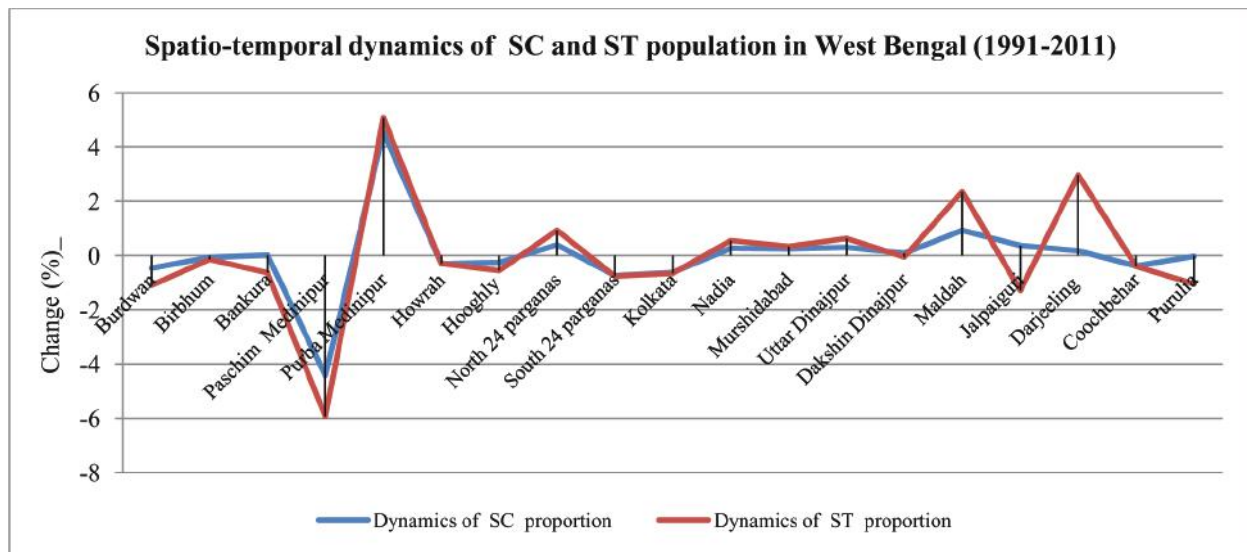


Fig. 12: Temporal Dynamics of Caste and Tribe in West Bengal (1991-2011)

**3.4 Level of disparity in the distribution of the SC and ST Population:**

**3.4.1 Spatio-temporal disparity of SC population (1991 to 2011):**

The spatio-temporal disparity of SC and ST populations was studied from 1991 to 2011 in the districts of West Bengal by Sopher’s disparity index. In 1991, the highest disparity of SC was observed in 14 districts out of 18, located in the south-eastern, south-western, and south-central regions. While two districts (Hooghly and Birbhum) belong to the moderate level of disparity, another two districts (Medinipur and Bankura) belong to the low level of disparity (Fig. 13). In 2001, the scenario changed drastically. It was observed that North and South 24 Parganas and Uttar Dinajpur had the most significant disparity of SC, followed by the moderate disparity located in the central districts. In contrast, the lowest disparity was seen mainly in the southern and north-eastern regions (Howrah, Hooghly, Bankura, Purulia, and Coochbehar districts) of West Bengal. In 2011, the disparity level was transformed once more, and the highest disparities (Coochbehar, Uttar Dinajpur, Maldah, and Nadia) were observed, followed by a moderate disparity (most of the central districts), and the lowest disparity was observed in Medinipur, Bankura, Purulia, Hooghly, and Darjeeling districts. In case of gender based disparity of SC population, the picture is quite different from the disparity of total SC population. The disparity level fluctuated by nature for the time period of 1991 to 2011. Kolkata secure the first place in terms of disparity of gender-based SC population concentration, followed by North and South 24 Parganas, Uttar Dinajpur districts (Fig. 14). Purba Medinipur district secure the lowest gender-based SC population concentration for the census year 1991, 2001 and 2011.

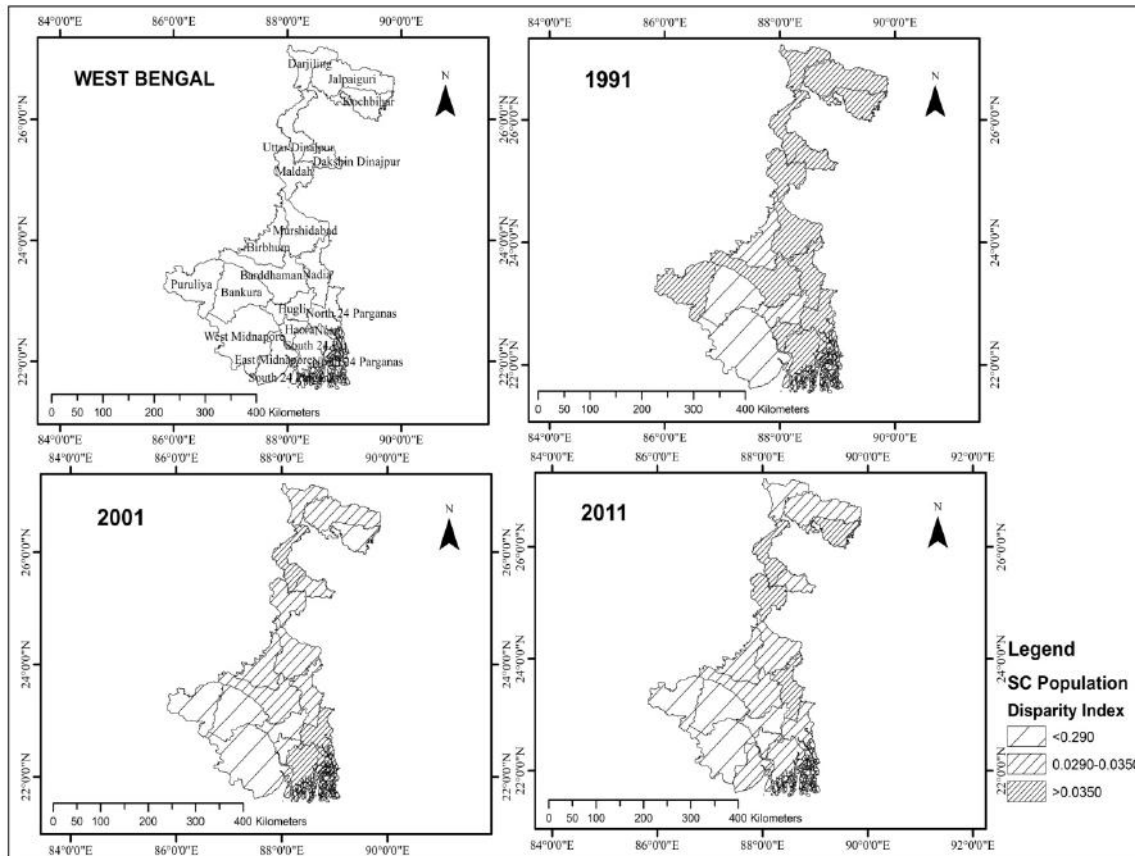


Fig. 13: District-wise disparity index of SC population

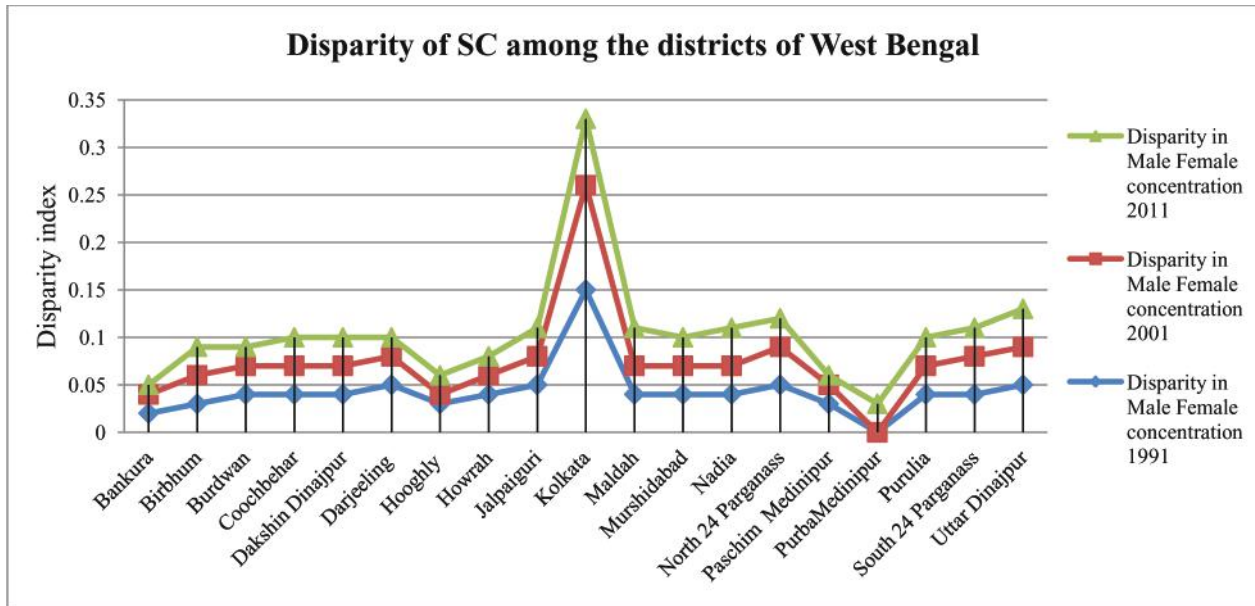


Fig. 14: Disparity of SC population among the districts of West Bengal

3.4.2 Spatio-temporal disparity of ST population (1991 to 2011):

The highest disparity of ST population was observed in about 13 districts out of 18 spread all over the state; in comparison, five districts (Kolkata, Hooghly, South 24 Parganas, Birbhum and Uttar Dinajpur) belonged to a moderate and Maldah district belonged to a low level of disparity in 1991 (Fig. 15). In the year 2001 the scenario is quiet change. The high level of disparity of ST was notified in seven districts (Kolkata, Nadia, South 24 Parganas, Purulia, Birbhum, Murshidabad and Coochbehar), while the low disparity was found in six districts (Howrah, Hooghly, Bankura, Burdwan, Maldah, and Darjeeling) of West Bengal. The level of disparity was changed in 2011, and

the most noteworthy disparity of the ST population was found in eight districts (Kolkata, Howrah, North and South 24 Parganas, Purba Medinipur, Bankura, Murshidabad and Coochbehar), while the lowest disparity was concentrated in eight districts. In the scenario of gender based ST population concentration, it was observed that the largest disparity of ST population was prevalent in Kolkata, followed by Birbhum, Coochbehar, and Howrah districts and the lower values were concentrated in Maldah, Dakshin Dinajpur, Hooghly, Purba Medinipur districts. (Fig. 16)

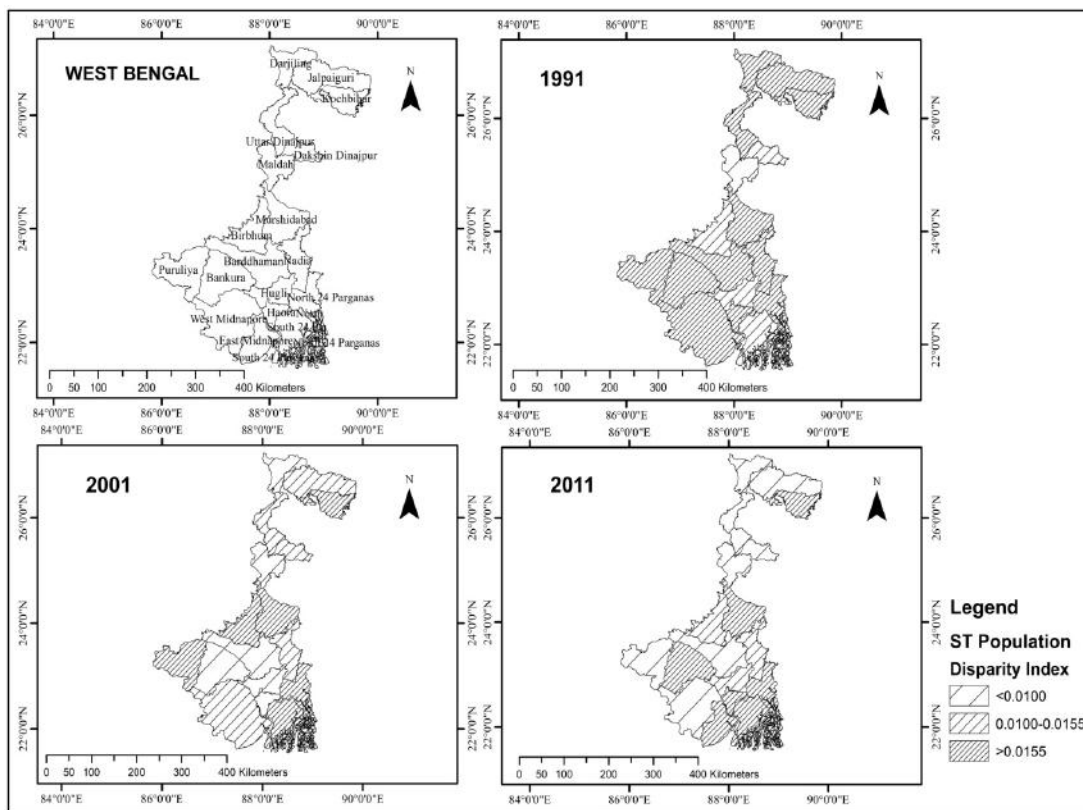


Fig. 15: District-wise disparity index of ST population

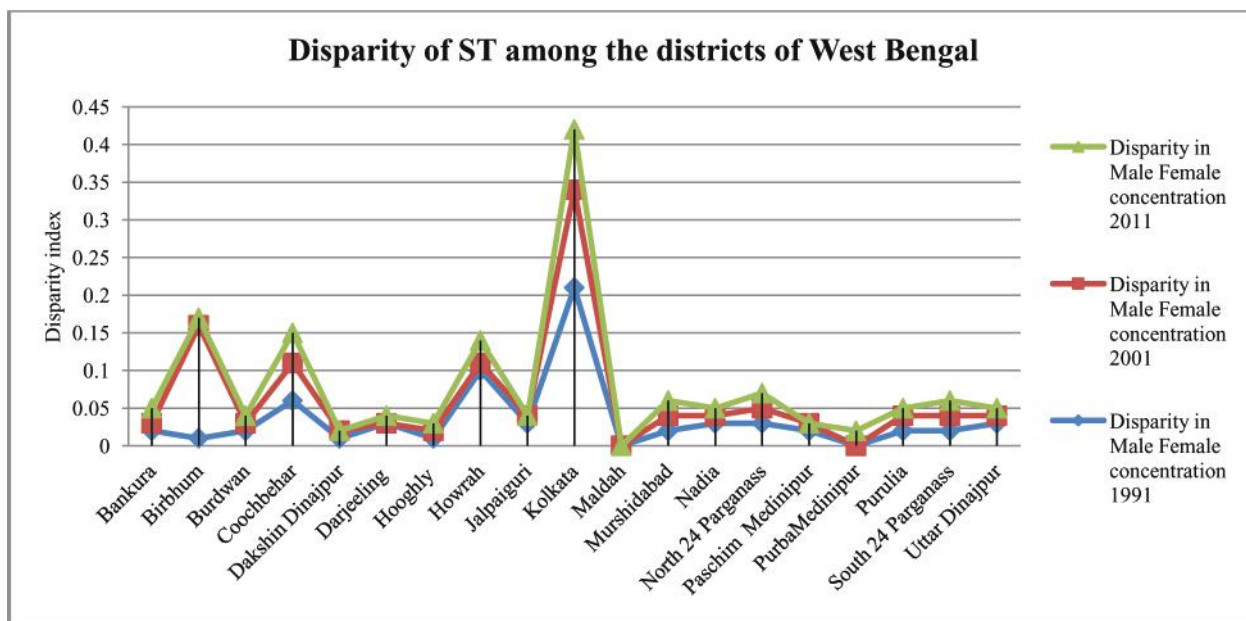


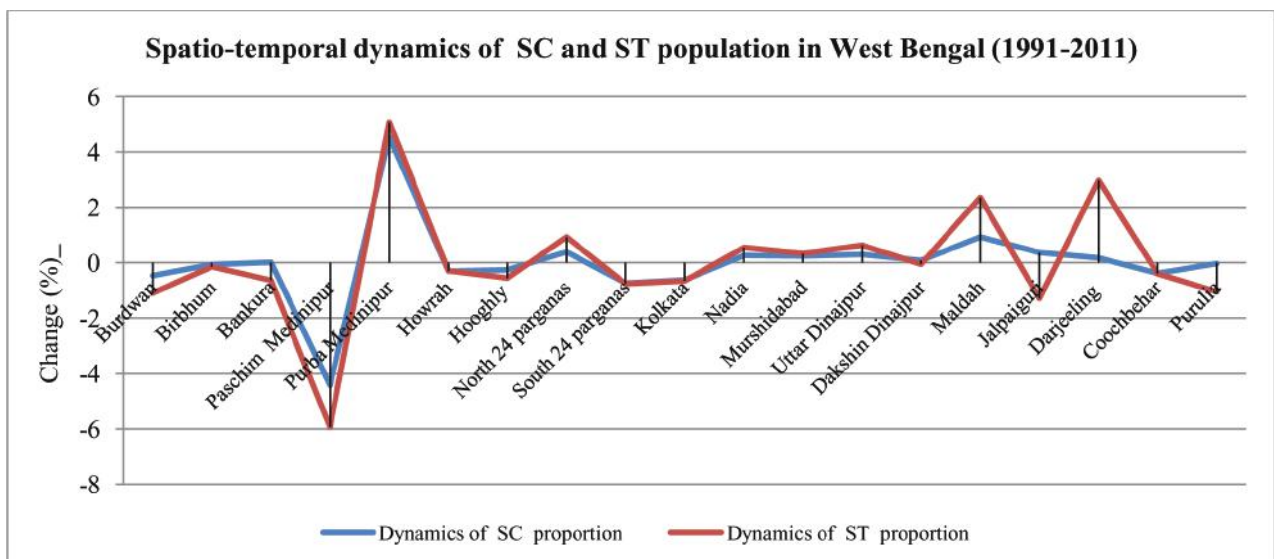
Fig. 16: Disparity of ST population among the districts of West Bengal

### 3.5. The nexus of SC and ST dynamics with educational development:

Education is crucial for both genders because without equal access to resources and education for half of the population, society will never be able to realise its full potential. Due to caste and gender issues, it is frequently discovered that women from scheduled castes are severely disadvantaged in educational issues (Sedwal & Kamat, 2008). In this study, the nexus of disparity in male-female concentration, literacy rates, and gender gaps in male-female literacy have been calculated using the latest 2011 census data and analysed to establish the correlation between SC, ST dynamics with the developmental scenario.

#### 3.5.1 Inter-districts gender gap in literacy of SC, ST of West Bengal, 2011

The SC male-female literacy rates have been calculated from 2011 census data, and then the gender gaps in male-female literacy deliberated to find out the inter-districts disparity and concentration of literacy. The picture (Fig. 17) revealed that high male and female literacy was found in Kolkata, North and South 24 Parganas, Howrah, Hooghly, Darjeeling, Purba and Paschim Medinipur districts. On the other hand, the low literacy rate was seen in Uttar Dinajpur, Purulia, Murshidabad and Maldah districts. The moderate literacy rates were concentrated in Bankura, Birbhum, Burdwan, Coochbehar, Dakshin Dinajpur, Jalpaiguri and Nadia districts. The literacy gap was highest in Purulia and Bankura districts, while it was low in Kolkata, North 24 Parganas, Nadia, and Howrah districts.



**Fig. 17:** Inter-districts gender gap in literacy of SC of West Bengal, 2011

It was revealed from the picture (Fig. 18) that the high male and female literacy of the ST population was found in Kolkata and Darjeeling districts and followed by North 24 Parganas, Howrah, Paschim Medinipur districts. Still, the proportion is comparatively lower than the SC population. The low literacy rate was seen in Uttar Dinajpur, Maldah and Murshidabad districts. The moderate literacy rates were concentrated mainly in Bankura, Purulia, Birbhum, Burdwan, Coochbehar, Dakshin Dinajpur, Jalpaiguri and Nadia districts. The literacy gap among the ST male and female population was highest in Purulia and Bankura districts, while it was low in Kolkata, North 24 Parganas, Nadia, and Howrah districts.



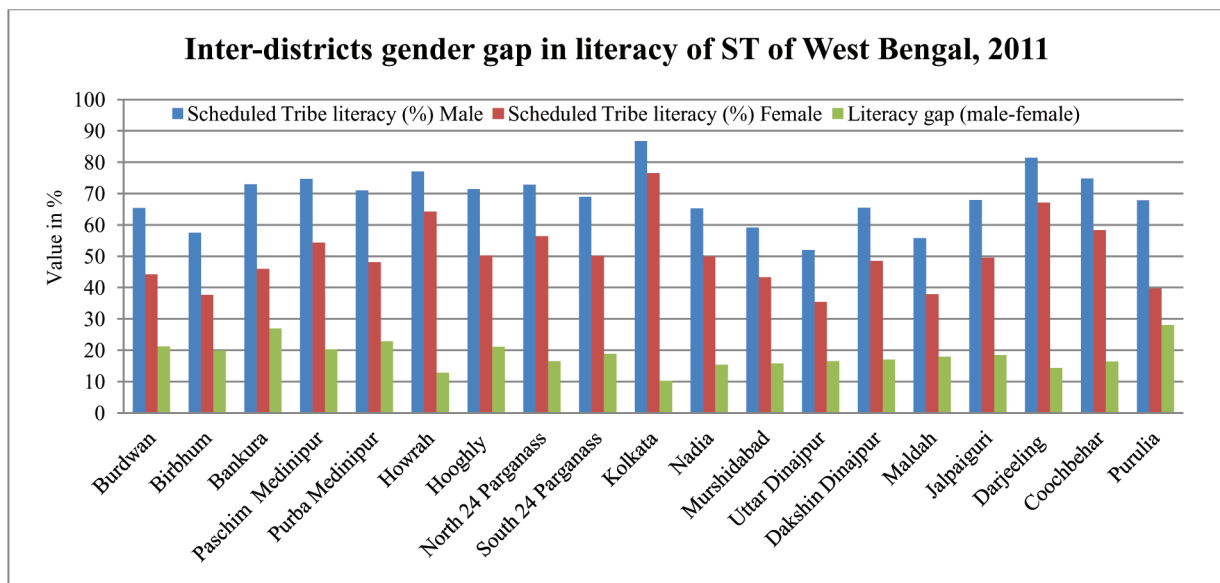


Fig. 18: Inter-districts gender gap in literacy of ST of West Bengal, 2011

**3.5.2 Correlation of the concentration of SC, ST population with the literacy level:**

The distribution of ST and SC populations in the districts of West Bengal has been jointly analysed with the help of composite score values by Kendell’s method using 2011 census data (Fig. 19). It is revealed from the composite score that the highest SC and ST populations were positioned in Burdwan and Jalpaiguri districts, respectively. On the other hand, the lowest SC and ST population was concentrated in Kolkata. According to composite score values, lowest the score signifies more concentration of SC and ST population, which indicate the low stage of socio-economic development, and therefore, it can be stated that Burdwan and Jalpaiguri districts belong to the lowest stage of development. Highest the value indicates the less concentration of SC and ST population and highest stage of socio-economic development, and therefore it can be said that Kolkata was in the highest stage of development.

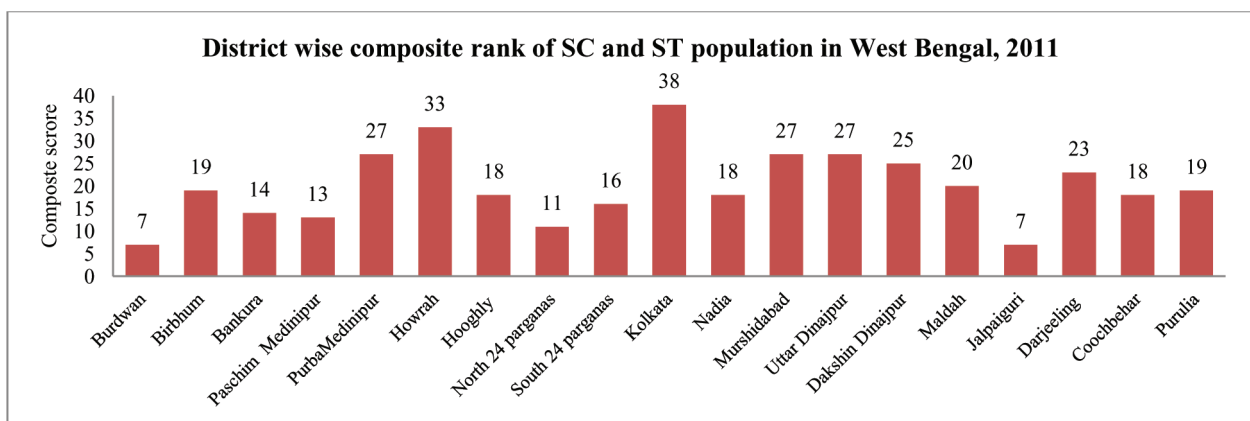
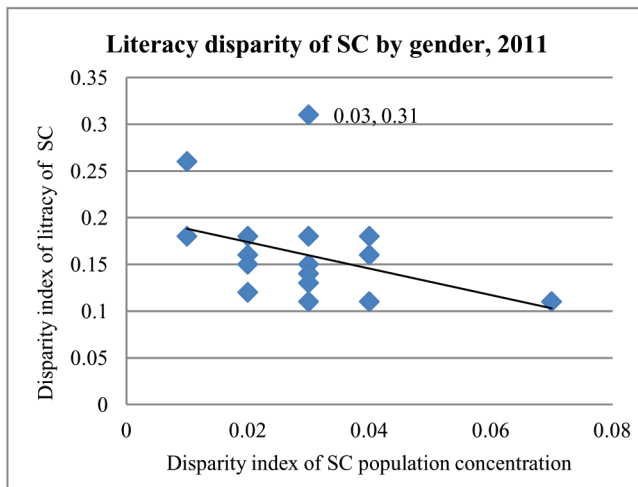


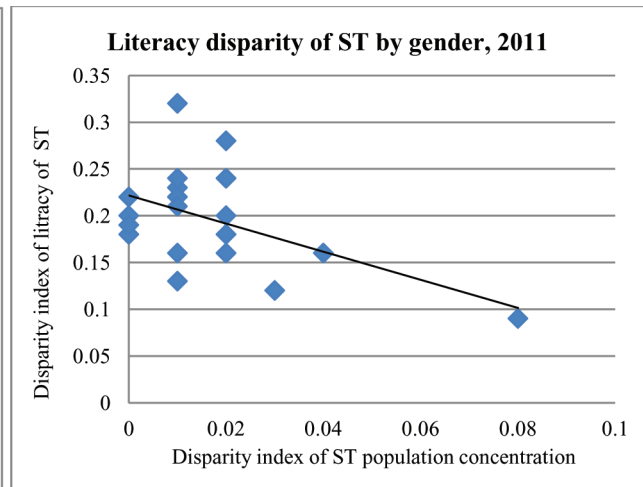
Fig. 19: Distribution of Caste and Tribe populace in West Bengal

The correlation between the gender-wise disparity of population concentration and literacy level were studied for both SC and ST male and female populations through linear regression analysis. It was found from the graph (Fig. 20 & 21) that a strong negative relationship exists between the two-disparity index of both SC and ST population, which indicates that when disparity in the population concentration increases, the literacy level decreases and vice versa. Therefore we can say that, there is

no corresponding dependency between the disparity of male-female concentration and male-female literacy.



**Fig. 20:** Literacy disparity of SC by gender



**Fig. 21:** Literacy disparity of ST by gender

#### 4. DISCUSSION:

West Bengal has diversity in population, especially in the distribution of socially isolated groups like SC and ST. The ‘scheduled caste’ and ‘scheduled tribe’ are usually used to describe a group of people with different cultures, socio-economic statuses, religious beliefs and occupations, with which the development of different socio-economic sectors is largely associated. Thus, the present study was designed to depict the spatio-temporal and gender disparity of SC and ST in the districts of West Bengal. The geospatial ordination of the disparity index shows the level of the male-female disparity in SC and ST concentration among 19 districts of West Bengal. In 1991, a high level of gender disparity in SC was found in the south-eastern part of the state; the low disparity was found in the western part. This scenario continued and remained almost the same in the 2001 and 2011 censuses. But, in the case of disparity of ST population, there was no such gender gap in the middle part of the state, and the northern, southern and eastern parts had a moderate gender disparity in 1991. While in the high level of ST, gender disparity was found in the western part. But this ST disparity was changed in the preceding census years, and the middle and northern parts had no such disparity in the concentration of the ST population.

The study harmonised the spatio-temporal analysis of SC and ST populations from a diverse angle by employing GIS mapping using the secondary datasets with the help of cartographic and statistical techniques. The current research addresses the inter-district spatio-temporal inequality and gender-wise concentration of SC and ST populations in different districts of West Bengal. It also examined the spatio-temporal dynamics of the proportion of SC and ST populace over the decades. It also elaborated the inter-districts disparity index in the distribution of the gender-wise caste and tribes. Male SC literacy rate is much higher than the female SC literacy rate in all the district of West Bengal and it create a wide gender-gap. It may be due to factors including poverty, the desire to end isolation and humiliation, the presence of family members, institutional settings, institutional atmosphere, and government services (Dutta & Bisai, 2020). The same scenario is observed in distribution of gender-wise literacy rate of ST population. Finally, it sketched the correlation and nexus between the disparity of concentration and literacy with the literacy rate of the districts of West Bengal.

#### 5. CONCLUSION:

It may be concluded that the systematic analysis of the inter-district’s regional concentration and disparity of gender-wise caste and tribe over three periods from 1991 to 2011 in West Bengal was

carried out in the study. The major finding reveals that the maximum concentration of SC and ST population was observed in South 24 Parganas, Medinipur and Murshidabad as per the 2011 census. The study also highlighted that a very high concentration of SC population was revealed in North and South 24 Parganas, Burdwan. A lower concentration was noticed in Kolkata, Darjeeling, and Dakshin Dinajpur. The greatest imbalanced concentration of the ST population has been located in Jalpaiguri, Medinipur, and Purulia districts, while the less unevenness was observed in Howrah, Kolkata. Therefore, it could be said that such a level of inequality in the concentration may cause uneven and less development and haphazard development on that eminent denomination in those districts as it affects the developmental scenario. After analysis of caste-wise male-female disparity, from 1991 to 2011, high SC disparity was in Kolkata, and the low disparity was seen in Bankura, Hooghly, and Paschim Medinipur. However, Kolkata had a high disparity in male-female concentration, but high literacy gap was seen in Purulia, while the low literacy gap of SC was seen in North 24 Parganas. In the case of the ST population, the high disparity was seen in Kolkata with a low literacy gap, while Purulia had a high literacy gap in the ST population. Numerous studies have demonstrated a negative correlation between women's educational attainment and fertility. Infant mortality is impacted by female marital age, which is impacted by education (Chouhan, 2013). These women might be able to break out from the dominance and poverty cycle only via education. When we see an overall concentration of the communities, Burdwan and Jalpaiguri were high, and Kolkata is in a low concentration zone. The outcomes from the correlation analysis revealed no corresponding dependency between the disparity of male-female concentration and male-female literacy. It may be stated that such inter-districts analysis was very helpful in formulating any plans, welfare schemes, and the implementation of any developmental schemes may be the result of the execution of such spatio-temporal analysis of the SC and ST population in the state.

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