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Urbanisation and Spatial Organisation of Urban Centres of Nadia District With Reference to Census Towns (1961-2011)

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Abstract : *The paper has intended to analyse the urbanisation from demographic perspective i.e. the growth and spatial organization of non-municipal urban especially Census Towns (CTs) using census data. The spatial organization of CTs is assessed by nearest neighbour analysis and inter-block urbanisation is measured by index of urbanisation using seven indicators i.e. a growth rate of the urban population, literacy rate, level of urbanisation, urban area, household density, urban-rural population ratio and urban density. From the analysis, it is found that most of the CTs are located in Nabadwip, Santipur, Chakdah, Ranaghat-I and Ranaghat-II C.D.block. Among all size class CTs, class-III (population size-20,000-49,999) and class-IV (10,000-19,999) share maximum urban population and in term of closeness, average spacing of all size class towns has been reduced during 1991-2011 which indicates an increase of urban centres and emergence of these urban centres has mainly been accentuated by nearness of municipal towns, development of transport network and long history of traditional non-agricultural economy which resultant into disparity in growth of CTs between northern and southern blocks of the district.*

Keywords : *Census towns, Index of urbanisation, Nearest neighbour analysis, Nadia district*

Introduction

Urbanisation is a process by which society changed from traditional rural society to a modern and prosperous society (Kumar and Rai, 2014). "Urbanisation refers to the process of concentration of people in densely populated settlements where a majority of the people derive their livelihood from non-primary occupation" (RaiChaudhuri, 2001). The urbanisation is interlinked with the degree of industrialization, commercialization, job opportunities, a better quality of life, economic development and thereby, the urban centre and urban population distribution is not even (Anisujjaman, 2015). In 1961, the Census of India first time adopted two-fold criteria for classifying the urban centers of India i.e. statutory town (ST) which is based on administrative criteria and census town (CT) which is defined by demographic criteria. According to 2011 census, CTs are identified based on a minimum

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5000 population, 400 persons per square kilometre minimum population density and 75 per cent or above male non-agricultural workers.

In West Bengal, according to the 2011 census, Nadia district along with some other northern districts (Maldah, Murshidabad, Jalpaiguri and Birbhum etc.) have experienced a growing trend of urbanization (Chakraborty et al. 2015). In 2011, Nadia district has recorded 1438873 urban populations (27.84 per cent to total population). Out of the urban population, 40.75 per cent is recorded in non-municipal towns i.e. Census Towns (CTs). The district has registered rapid growth of census towns during 2001-2011 census period i.e. from 15 in 2001 to 55 in 2011.Rapid emergence of CTs is changing the characteristics of urbanisation pattern in Nadia district as well as the state (Chakraborty et al. 2015). It is fact that according to the 2011 census, about half of the CT population of the district reside in Ranaghat-I, Chakdah, Santipur and Ranaghat-II blocks which reveals the uneven growth of urbanisation throughout the district. Most of the CTs of the district are concentrated in southern part and dispersed in northern part of the district. Such type of unbalanced urban growth among the blocks may create regional disparity which is common in India.

The Study area

The study area, Nadia district lies between 22º53' 00"to 24º11' 00" north latitude and 88º9' 00"to 88º48' 00" east longitude. The district is situated in the eastern part of the state and surrounded by Bangladesh in the east, Burdawn and Hooghly district in the west, North -24 Parganas in the south -eastern part and Murshidabad in the northern part of the district. Ganga River flows along the western part of the district boundary and the Tropic of Cancer divide the district into two parts. The district is well connected by rail and roads with the surrounding district and as well state. According to the 2011 census, the district has 5167600 number of population of which 72.16 per cent of people live in rural areas and 27.84 per cent of people live in urban areas.The average literacy rate is 74.97 per cent where the rural literacy rate is 70.84 per cent and the urban literacy rate is 85.35per cent. According to the 2011 census, the district has 55 census towns and ten statutory towns and two notified areas (Figure 1).

Material and Methods

The data are collected from the District Census Handbook of the Nadia district. The block-wise urbanisation of the district is assessed by the level of urbanization, urban density, growth rate, the ratio of urban-rural population, changing urban area and household density. The index of urbanisation is computed by standardised mean composite score (Chakraborty, 2016; Ghosh and Khatun, 2019) for assessing the block-wise urbanisation status.The spatial distribution of urban centres is analysed using the nearest neighbour index (Clark and Evans, 1954).

The nearest neighbour index (NNI) was calculated by using this formula- $R = \frac{\overline{D_0}}{\overline{D_e}}$ (*Equation no-1*)where R is the randomness index, $\overline{D_0}$ is the mean observed distance between nearest neighbour,

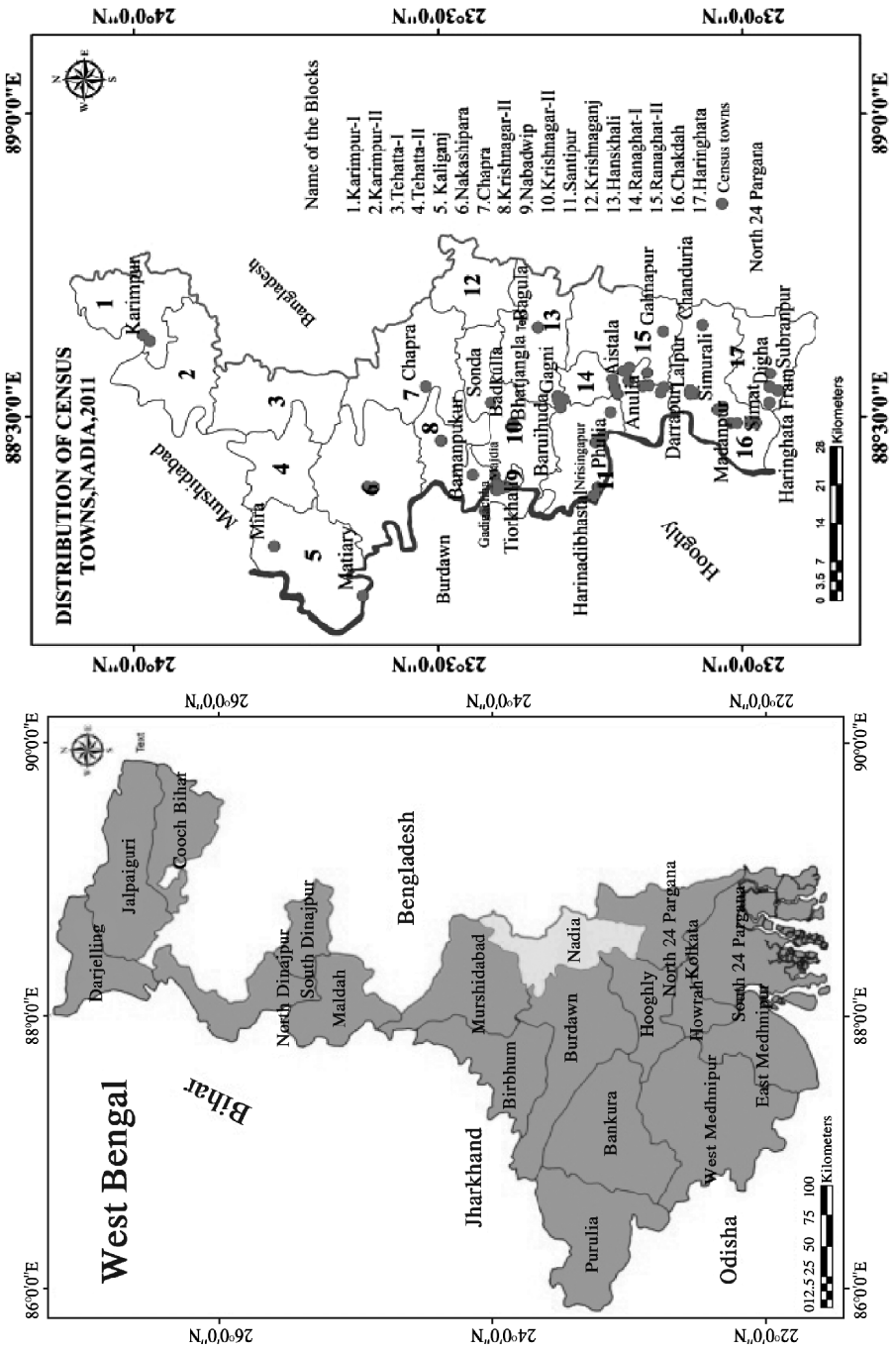

Fig. 1: The Study area

$\overline{D_e}$ is the mean expected distance between nearest neighbour and it is calculated by $\overline{D_e} = \frac{1}{\sqrt{\frac{N}{A}}}$ (*Equation no-2*) where N is the number of urban centres and A is the area of the region. The value of R ranges from 0 to 2.15, where '0' denotes cluster distribution, 1 denotes random and 2.15 signify uniform distribution. If the value of *R* falls between 0 and 1, the distribution pattern of the settlements may be explained as approaching cluster, while if the value falls between 1 and 2.15, it means the urban centres are approaching a uniform distribution pattern.

Level of urbanisation (LU): means proportion of urban population to total population (Verma, 2006) and higher the value higher the degree of urbanization.

$$\text{Level of urbanisation} = \frac{\text{Urban population}}{\text{Total population}} \times 100$$

Growth rate (GR): Growth rate has been measured to assess the decadal change of absolute urban population.

$$\text{Growth rate} = \frac{(\text{Present year urban population} - \text{Past year urban population})}{\text{Past year urban population}} \times 100$$

Urban Density (UD): Urban density is used to measure the concentration of urban area in study units

Urban density = (Urban area of the study unit) / (Total area of the study unit)

Urban Rural Ratio (URR): Urban rural ratio is used to assess the increase of urban population in compare to rural population of an area

Urban Rural Ratio = (Urban Population) / (Rural Population)

In order to assess the index of urbanisation, z- score method has been applied. At first z- score value has been calculated based on individual variables (level of urbanisation, urban density etc.) thereafter to get a summed up mean value mean composite z-score has been calculated. The formula is:

$$Zi = \frac{Xi - \overline{X\tau}}{\partial i(SD)}$$

Where Zi- Z-Score (Standard score of the ith variables)

Xi -Value of the ith variable

$\overline{X\tau}$ – Mean of the ith variable

∂i -Standard deviation of the ith variable.

$$CS = \frac{\sum Zij}{N}$$

Where, CS- Mean composite z-score

Σzij-Standard score of ith variable at jth unit of study

N-Number of variables.

Results and Discussion

***Development of CTs in Nadia District*:** Table 1 shows the temporal change of number of CTs and their populations. In the census year 1961, the district had only five CTs and accounts only 12.13 per cent urban population of the district and thereafter, share of CT population to total urban population continuously has increased. After 1981, the number of CTs has increases at a very rapid rate which led to an increase in the urban population of the district as well as the state.

Table 1: Temporal distribution of CTs (Number and population)

Year	CTs	Population	Total Urban population	Share of CTs population to total urban population*
2011	55	586393	1438873	40.75
2001	15	187947	979519	19.19
1991	19	237035	871818	27.19
1981	8	113976	639869	17.81
1971	6	53736	418059	12.85
1961	5	38263	315348	12.13

*Source: Census of India, *Computed by author*

***Spatial distribution of CTs*:** Spatial distribution of urban centres (CTs) of Nadia district is highly unequal and a wide variation has found in their spacing which is reflected in the nearest neighbour analysis. If the district is divided into a northern and southern part, it is seen that 85 per cent CTs are located in the southern part which creates regionally imbalance growth. From the random index ($R_{n)}$ it is found that the distribution of the urban centre of the district is said to be more random than dispersed up to 1981 and thereafter, mean observed distance ($D_{0)}$ of the urban centers of the district gradually reduced. In 2011, the range of spacing of urban centres varies from 18 kilometres between Mira and Matiari (northern part of the district) to only 1 kilometre between Hijuli and Halalpur in southern part of the district. According to 2011 census, the distribution

pattern of CTs is said to be more random than cluster. On the other hand, most of the CTs emerge around the eight-kilometre buffer region of statutory towns (Figure 2) and four-kilometre buffer region of road transport (Figure 3).

***Average spacing by size class of CTs*:** Table 3 seeks to analyse the relationship between sizes of urban centers (CTs) and the spacing among them. The distribution pattern of the CTs is assessed with respect to nearest statutory towns (STs) and they are spotted within eight-kilometre buffer zone from the centre of the STs.

Table 2: Nature of spatial distributions of CTs

Year	CTs	D_{0*}	D_{e*}	R_{n*}
2011	55	2.76	4.22	0.65
2001	15	6.40	8.09	0.79
1991	19	3.87	7.18	0.53
1981	8	11.38	11.07	1.02
1971	6	16.55	12.80	1.29
1961	5	6.61	14.02	0.47

*Source: Census of India, *Calculated by author*

The analysis has revealed that the average spacing of the urban centres of the district was 3.87 kilometres in 1991 which is reduced to 2.76 kilometres in 2011 and it indicates the rapid growth of number of urban centres from 19 in 1991 to 55 in 2011. Table 3 has showed a significant relationship between the size of urban centers and their spacing. In terms of population size, the larger the size of the towns, the higher the average spacing among them whereas the smaller the towns lower the spacing. This pattern is followed by all the size class except class-III in 1991 because one of them is transformed in statutory towns and another transformed into the class-II category. In terms of closeness, average spacing of all size class towns has reduced from 1991 to 2011 which indicates the growth of urban centers. The patterns of the urban centers of class-III and IV are generally more random than dispersed while the distribution pattern of class-V towns is more random than cluster.

***Class wise growth of CTs*:** Table 3 shows the class-wise distribution of CTs and share of the urban population. From the result, it is observed that Class-IV and V hold greater number of populations than class-II, III and V. It is evident that out of total urban population of the district 59.24 per cent live in statutory towns and 40.75 per cent people live in CTs in the 2011 census year. On the other hand, in case of total CTs population, most of the population is concentrated in class-IV (44.73 per cent) and class- V (31.34 per cent) and followed by class-III (11.44 per cent), class-II (9.49 per cent) and class-V (2.97 per cent). Locational advantage (Kolkata urban agglomeration) is

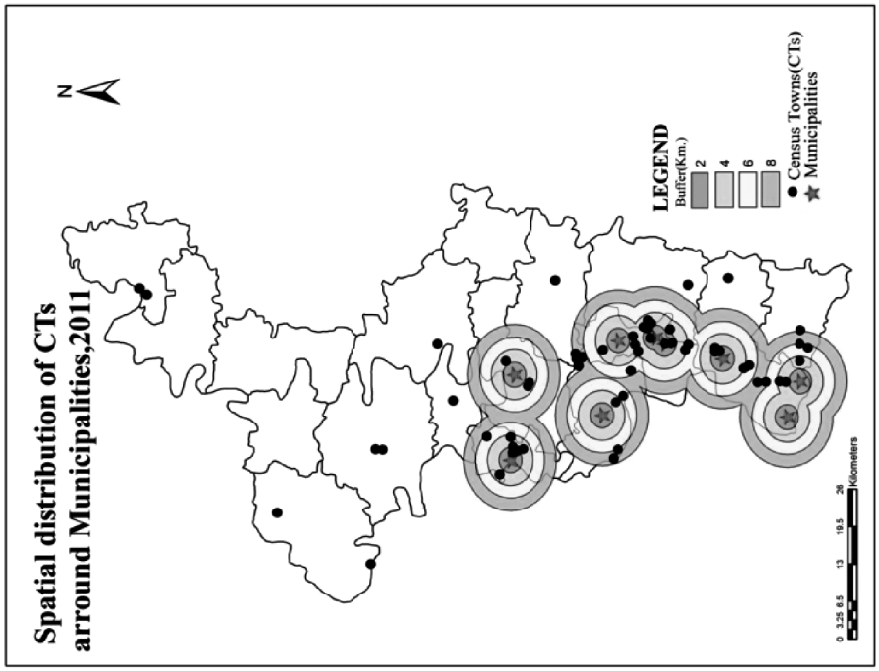

Fig. 2: Spatial distribution of CTs, 2011.

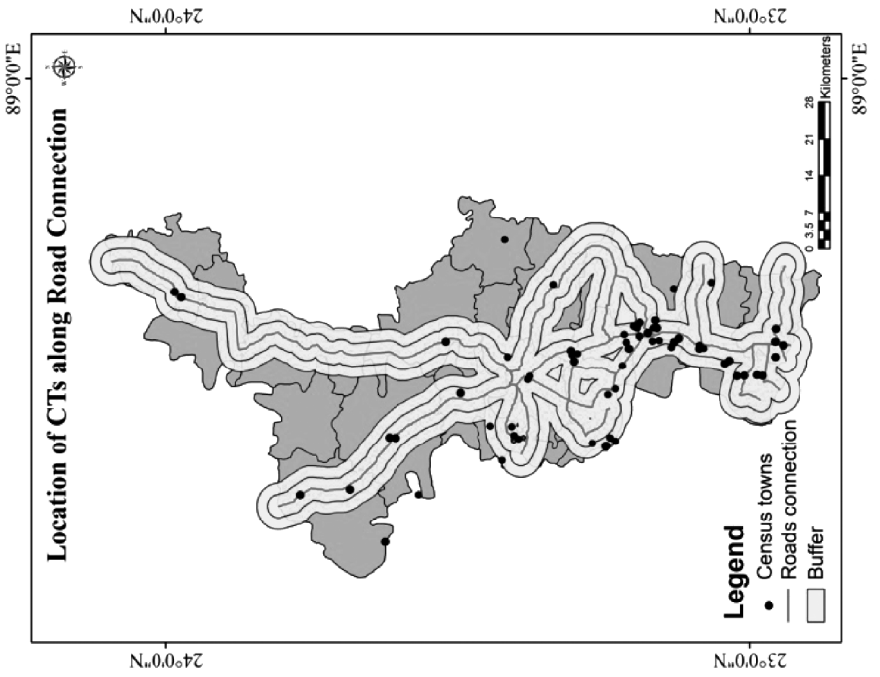

Fig. 3: Location of CTs along road connection

one of the main reasons for the extensive growth of CTs towards southern blocks of the district as it has help to induce the transformation of the rural economy into an urban non-agricultural economy.

Table 3: Average spacing by size class of CTs

Class	1991				2011			
	No. of CT	D_{0*}	D_{e*}	R_{n*}	No. of CT	D_{0*}	D_{e*}	R_{n*}
I	–	–	–	–	–	–	–	–
II	–	–	–	–	1	–	–	–
III	3	6.75	18.11	0.37	3	25.9	18.1	1.39
IV	4	21.14	15.74	1.34	20	8.74	7	1.24
V	11	8.45	9.45	0.89	27	4.54	6.03	0.75
VI	1	–	–	–	4	23	15.7	1.46

*Source: Census of India, *Computed by author*

Table 4: Class wise growth of CTs

Class of CTs	I	II	III	IV	V	VI
Percentage of CTs number	–	1.81	5.45	36.36	49.09	7.27
Percentage of CTs population	–	9.49	11.44	44.73	31.34	2.97

Source: Computed based on data of Census of India

Block-level assessment of CTs pattern: Based on 2011, the density of the urban population of Nadia district is (3397 person/sq.km). Highest density of urban population is recorded in Nakashipara (5330 person/sq.km) and fallowed by Hanskhali (4733 person/sq.km), Karimpur-I (4461person/sq.km), Nabadwip (4030 person/sq.km) Ranaghat-I (3885 person / sq.km), Chakdah (3670 person/sq.km) and Chapra (3428 person/sq.km) which is much greater than the district average (Figure 4). Apart from these blocks, the density of the urban population of the remaining blocks is lower than the district average. The growth rate of urban population of Nadia districts is 212 per cent. It is evident that the growth rate of the urban population of Ranaghat-II (372.72 per cent), Chakdah (362.13per cent) and Nabadwip (250.31per cent) is greater than the district average and growth rate of the remaining blocks is lower than the district average (Figure 5). The highest growth rate is found in Ranaghat-II (372.12 per cent) block and followed by Chakdah (362.13 per cent), Nabadwip (250.31 per cent) and so on. The lowest growth rate is found in Nakashipara block (16.30 per cent). After 2001, most of the census towns have been emerged in Santipur, Chakdah, and Ranaghat Blocks which lead to the rapid growth rate of the urban population in these blocks.

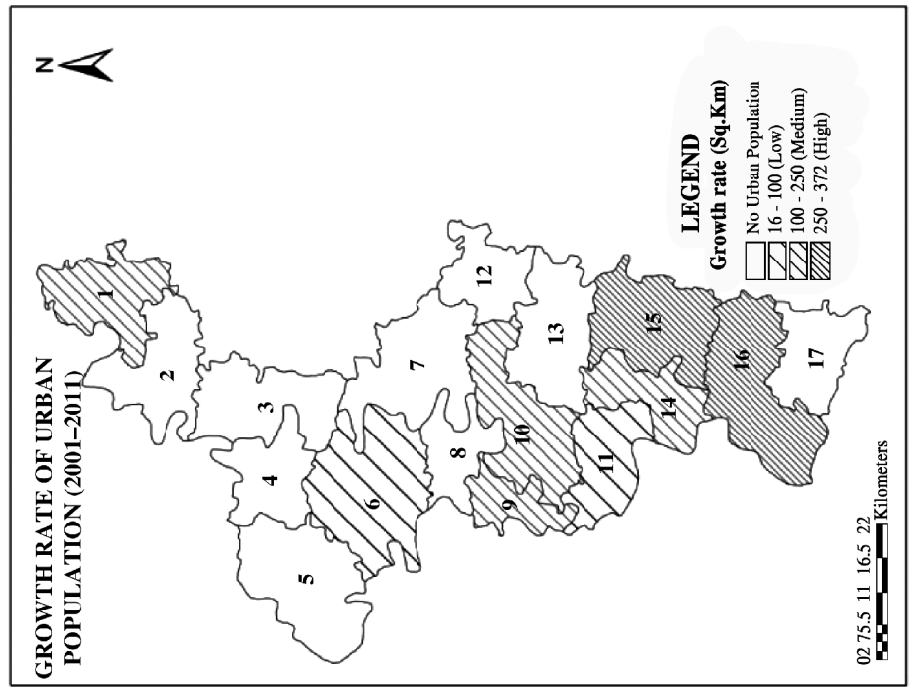

Fig. 5: Growth rate of Population

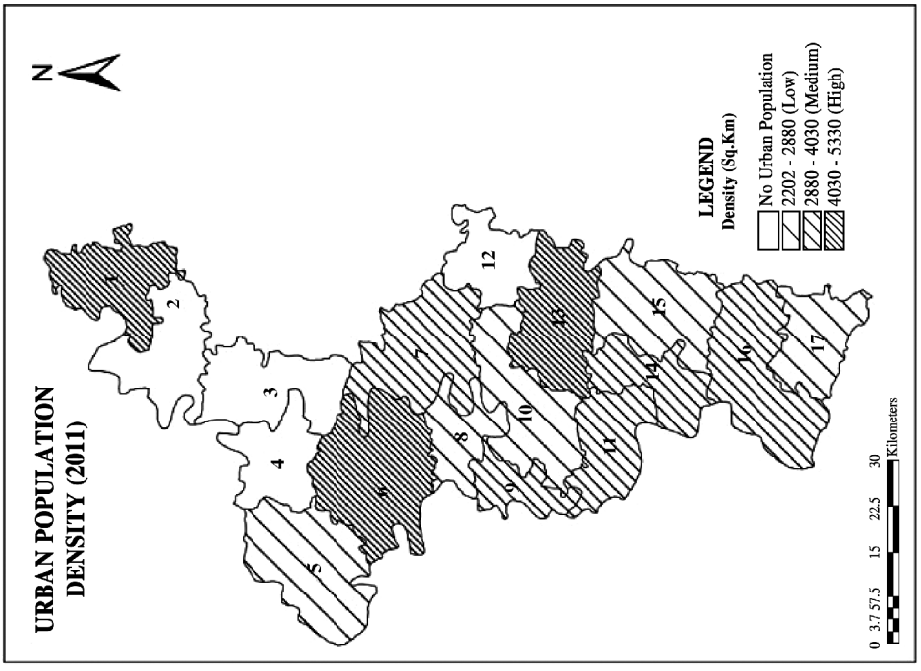

Fig. 4: Urban population density

The ratio of urban-rural population (Table 5) is helpful to identify the growth of urban population with respect to the rural population. From the result, it is revealed that the highest urban-rural ratio is recorded in Ranaghat-I (0.411) followed by Nabadwip (0.160), Ranaghat-II (0.102), and the lowest ratio is found in Krishnagar-I (0.035) in 2001. Over the decade (2001-2011) urban-rural ratio has been increased which signifies the increase of urban population to the rural population.In 2011 the highest ratio is found in Ranaghat-I (0.78) followed by Nabadwip (0.77), Santipur (0.56), Chakdah (0.29) and the lowest rate found in Krishnagar-II and Chapra (0.04).The change of the ratio of the urban-rural population from 2001 to 2011 is higher in Nabadwip (0.61) and followed by Ranaghat-I (0.36) and Santipur (0.26) So, the result indicates that urban population is increasing at a higher rate in Ranaghat-I, Nabadwip, Santipur and Chakdah where as Nakashipara, Karimpur-I, Chapra, Krishnagar-II have registered very slow growth.

Table 5: Urban -Rural ratio

Name of Blocks	Ratio		Change
	2001	2011	
1. Karimpur-I	0.05	0.14	0.08
2. Karimpur-II	-	-	-
3. Tehatta-I	-	-	-
4. Tehatta-II	-	-	-
5. Kaliganj	-	0.09	0
6. Nakashipara	0.09	0.09	0
7. Chapra	-	0.04	0.04
8. Krishnagar-II	-	0.04	0.04
9. Nabadwip	0.16	0.77	0.61
10. Krishnagar-I	0.03	0.1	0.06
11. Krishnaganj	-	-	-
12. Hanskhali	-	0.19	0.19
13. Santipur	0.3	0.56	0.26
14. Ranaghat-I	0.41	0.78	0.36
15. Ranaghat-II	0.1	0.15	0.05
16. Chakdah	0.06	0.29	0.22
17. Haringhata	-	0.11	0.11

Source: Computed based on data of Census of India

Table 6 shows the block-wise changing urban area and changing household density from 2001 to 2011.In 2001, the total urban area of all the blocks was 68.63 square kilometres in which the highest percentage of the urban area is possessed by Santipur (23.51 per cent) and followed by Ranaghat-I, (22.88 per cent), Ranaghat-II (18.80 per cent), Chakdah (11.44 per cent) and lowest percentage of the urban area is recorded in Karimpur-I (2.50 per cent). In 2011, the total urban area has been increased to 172.63 square kilometres. So it is cleared that total urban area becomes double (from 68.63 sq.km to 172.63 sq.km) in 2011 with compare to 2001 which signifies the emergence of new census towns. In 2011, 104 square kilometres urban area has been increased in which 40.72 square kilometres in the blocks which had no CTS and 63.28 square kilometres in blocks which have CTS. In the case of the urban area, some blocks show positive changes and some negative changes. However, nine blocks have positive change i.e. Haringhata (8.21 per cent), Kaliganj (5.77 per cent), Hanskhali (5.76 per cent), Krishnagar-I (3.57 per cent), Chakdah (2.97 per cent), Chapra (2.38 per

Table 6: Changing urban area and household density

Name of the Blocks	Area (Per cent)		Change	Household Density		Change
	2001	2011	(2001-2011)	2001	2011	(2001-2011)
1. Karimpur-I	2.5	2.94	0.44%	1326	1168	-158
2. Karimpur-II	–	–	–	–	–	–
3. Tehatta-I	–	–	–	–	–	–
4. Tehatta-II	–	–	–	–	–	–
5. Kaliganj	–	5.77	5.77	–	676	676
6. Nakashipara	10.18	3.76	-6.42	968	1298	330
7. Chapra	–	2.38	2.38	–	793	793
8. Krishnagar-II	–	1.43	1.48	–	573	573
9. Nabadwip	7.68	8.48	0.80	788	1--5	217
10. Krishnagar-I	2/97	6.54	3.57	1083	598	-485
11. Krishnaganj	–	–	–	–	–	–
12. Hanskhali	–	5.76	5.76	–	1130	1129
13. Santipur	23.51	15.97	-7.54	709	755	46
14. Ranaghat-I	22.88	14.05	-8.83	912	1123	211
15. Ranaghat-II	18.8	10.22	-8.58	563	737	174
16. Chakdah	11.44	14.41	2.97	670	880	210
17. Haringhata	–	8.21	8.21	–	396	396

Source: Computed based on data of Census of India

cent), Krishnagar-II (1.48 per cent), Nabadwip (0.8 per cent) and Karimpur-I (0.44 per cent). In 2001, the highest household density was found in Karimpur-I(1325) followed by Krishnagar-I(1082), Nakashipara (968), Ranaghat-I(918) and the lowest density found in Ranaghat-II(562.91). After 2001, the density of the urban population of all the blocks has been increased except Karimpur (-157.32) and Krishnagar-I (-484).

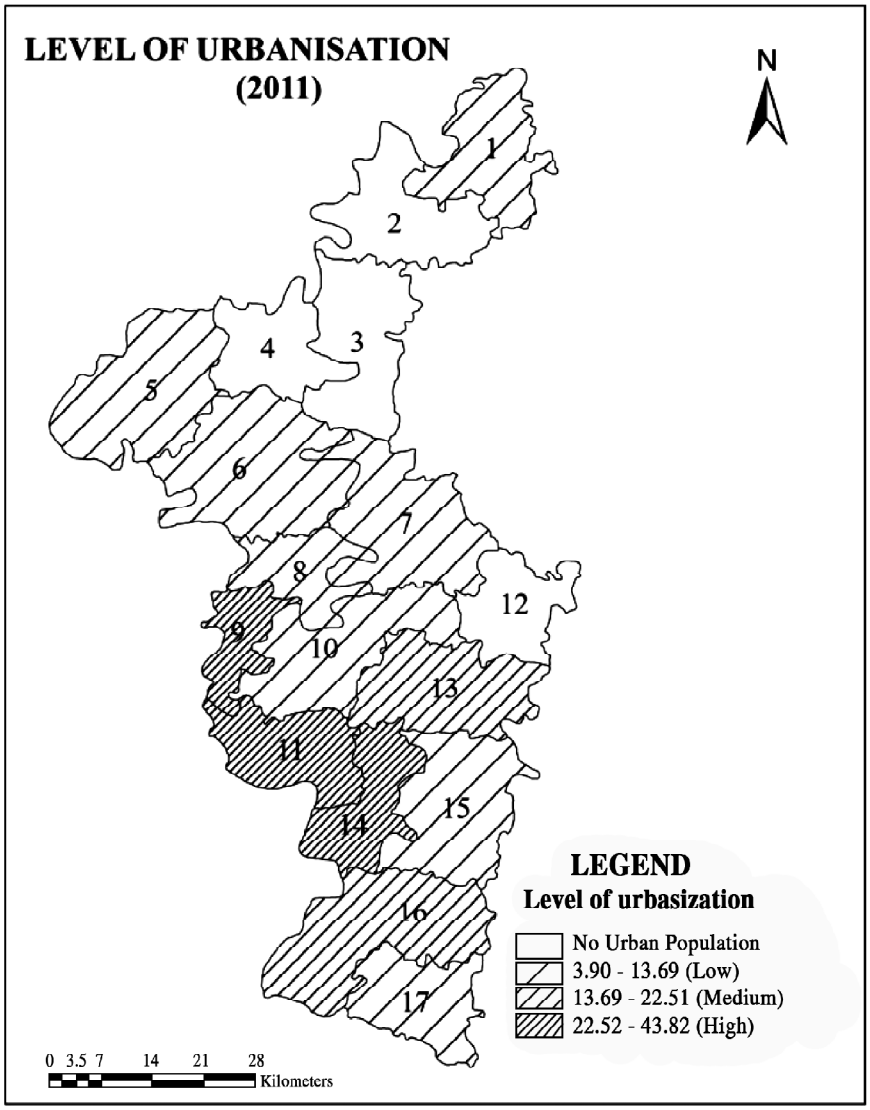

Fig. 6: Level of urbanisation

Level of urbanization of the district is 40.75 per cent. Only Nabadwip (43.65 per cent) and Ranaghat-I (43.82 per cent) have exceeded the district average and remaining blocks have below the district average. Santipur (36.01 per cent), Ranaghat-I (43.82 per cent) and Nabadwip (43.65 per cent) belongs to high density zone; Hanskhali (16.08 per cent), Chakdah (22.51 per cent), belong to medium density zone and Haringhata (10.21 per cent), Krishnagar-I (9.19 per cent), Nakashipara (8.96 per cent), kaliganj (8.65 per cent), Chapra (4.54 per cent), Krishnagar-II (3.90 per cent) belong to low density zone (Figure 6).

Table 7 shows the block wise urbanisation by using composite Z- Score. Seven indicators (Growth rate, urban density, level of urbanisation, urban area, household density, ratio of urban rural population,) have been used to find out the urbanisation. The result clearly indicates that

Table 7: Index of Urbanisation

Name of the Blocks	GR	LI	LU	UA	HD	URR	UD	Mean composite score
1. Karimpur-I	0.86	0.27	-0.09	-0.54	1.21	-0.23	-0.35	0.14
2. Karimpur-II	-	-	-	-	-	-	-	-
3. Tehatta-I	-	-	-	-	-	-	-	-
4. Tehatta-II	-	-	-	-	-	-	-	-
5. Kaliganj	-	-1.14	-0.35	-0.02	0.07	-0.42	-0.43	-0.28
6. Nakashipara	-0.49	0.94	-0.33	-0.4	1.53	-0.42	-0.4	0.05
7. Chapra	-	-0.73	-0.63	-0.65	0.34	-0.61	-0.63	-0.36
8. Krishnagar-II	-	0.47	-0.67	-0.83	-0.15	-0.61	-0.64	-0.3
9. Nabadwip	1.88	-1.17	2.05	0.48	0.83	2.19	1.98	1.03
10. Krishnagar-I	1.39	-1.91	-0.31	0.12	-0.1	-0.38	-0.35	-0.19
11. Krishnaganj	-	-	-	-	-	-	-	-
12. Hanskhali	-	1.04	0.16	-0.02	1.12	-0.03	0.04	0.29
13. Santipur	0.07	-0.34	1.52	1.88	0.26	1.38	1.51	0.78
14. Ranaghat-I	-0.09	-0.12	2.06	1.53	0.72	2.23	2.24	1.07
15. Ranaghat-II	-0.03	0.62	-0.003	0.81	0.09	-0.19	0	0.16
16. Chakdah	2.34	0.81	0.6	1.59	0.54	0.34	0.63	0.86
17. Haringhata	-	1.26	-0.24	0.43	-0.57	-0.34	-0.2	0.04

Source- Computed based on data of Census of India, GR-Growth rate, LI- Literacy rate, LU-Level of Urbanisation, UA Urban area, HD- Household Density, URR- Urban rural ratio, UD- Urban density

composite score of urbanisation is the highest in Nabadwip (1.03) followed by Ranaghat-I (1.07), Chakdah (0.6) and Santipur whereas the lowest is found in Chapra (-0.36) and then Krishnagar-II (-0.30). So, from standardize value of the variables it can be said that in demographic aspect, southern part of the district is more urbanised than northern part of the district.

Conclusion

A wide disparity is observed from the block-level spatio-temporal analysis of urbanisation of Nadia district. Relatively higher-level urbanisation is found in Nabadwip, Ranaghat-I, Chakdah, Santipur and lower level in Cahpara, Krishnagar-II and Nakashipara. The census towns are highly concentrated in Ranaghat-I, Chakdah, Santipur and Nabadwip. Therefore, it is cleared that the development and growth of census towns is high in the southern blocks and low in the northern blocks of the district. So, such types of inter block disparity in urban development may also induce inter-block imbalance in development of infrastructures and quality of life which need to be addressed and given attention for further research and planning purpose.

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