

Growth and Distribution of Towns: A Case Study of Nadia District, West Bengal, India

Sujan Mandal¹

Abstract : *The origin of towns is traced around 5000 B.C. when growth and development of different river valley civilizations led to the origin of towns. Similarly, Nadia has a glorious history of it. Nabadwip is the earliest known town of the district which was built in the medieval period of Indian history. Santipur, Krishnanagar, Ranaghat, Birnagar were also built up before Independence of India. Kalyani and Gayespur are the newly built-up towns only in the 20th century. Most of the towns of Nadia district are established and developed on the bank of river Ganga, Jalangi and Churni. Other small towns have developed near to the main towns. This paper aims to determine the distribution pattern of municipal towns and the relationship between concentration of census towns and municipal towns. All data has been collected from government sources. To assess the distribution pattern of the municipal towns of Nadia district Nearest Neighbour Analysis [NNA] method is used. This study reveals the more random than clustered type distribution pattern of municipal towns and tremendous growth of census town along the municipal town of Nadia district. Therefore, it will be helpful to government and district authorities for proper planning and development of the district.*

Key words: *Connectivity, Development, Distribution pattern, Urban concentration.*

Introduction

A settlement is an organised colony of human beings in which they live or work. Settlements change the natural environment by the cultural elements. In the beginning these settlements hold simple forms but with the growth of civilization and technological enhancement their size and complexity become greater. The term urban usually applied to a spatial or areal unit having certain specific characteristics which distinguish it from a rural unit. An urban unit may take the form of a town or city or metropolis (Chaudhuri, 2001). The origin of urban centres or town has been traced in 5000 B.C. when the growth and development of several river valley civilizations in the world led to the origin of towns at favourable locations as permanent human settlements (Mandal, 2000). In India the earliest urban developments were found in the Indus valley and in the adjoining parts of Rajasthan, Punjab and to some extent in the western Uttar Pradesh (Ramachandran, 1997). At present India is an over populated developing country of the world and is gradually growing up. Tremendously increasing population is the major problem for the development of the country.

¹ Former Post Graduate Student, Department of Geography, University of Kalyani, Nadia, West Bengal
Mail ID: sujan.geog@gmail.com

According to Census of India there are mainly two types of towns are found i.e. Statutory Town [ST] and Census Town [CT]. Statutory Towns are those towns where a development authority i.e. municipality, municipal corporation, cantonment board, notified town area committee has been present. On the other hand, census towns are those towns where should be three criteria that is given by census of India i.e. total population is minimum 5000, minimum population density 400 persons per sq.km. and minimum 75 percent main male worker should engage in non-agricultural sectors. The urban units also been classified into six categories on the basis of their population viz. class-I, class-II, class-III, class-IV, class-V and class-VI. There are 53 urban agglomerations (Census of India, 2011) in India where about 43 percent of the urban population live. Nadia is a district in West Bengal. It comprises of 17 C.D. blocks, 10 statutory towns and 55 census towns. Nadia district ranked 7th in terms of total population and ranked 11th in terms of total area among the districts of the state.

Nadia district is situated in the heart of the Bengal delta held within the arms of the river Ganga, comprising of the Bhagirathi on the west and the Padma (in Bangladesh) on the east bordering Bangladesh. The district has a rich historical background and presence of cottage and small scale industries, particularly relating to hand woven textile. Nadia was also the last bastion of independent Hindu Kingdom of Bengal before it was annexed by the Muslim rulers from North India towards the end of the 12th century A.D. The centres of Sanskrit learning situated across the district were well acclaimed throughout the country. Nadia district was the birth place of Shree Chaitanya (*Mahaprabhu*) who was one of the foremost religious reformers of the country during the middle ages apart from being one of the principal preachers of the Bhakti movement (District Census Handbook, Nadia, 2011).

After the independence of India (1947) and emergence of independent Bangladesh (1971) huge number of people immigrated from Bangladesh to Nadia district and its adjoining areas. In 1951, total population of Nadia district was 1144924 and in the year 1971 total population were 2230270 (Census of India, 2011). Population was doubled within just 20 years. At that time few camps were established in Nadia district for the immigrant peoples. Cooper's camp was one of those camps. Due to this rapidly increased population, they could not provide any job for their earning. That is why maximum number peoples went to the municipal towns and get job in different firms, factories and other sectors. They lived outside the main town as living cost in those towns was very high compared to their earning. Thus, some new settlements started coming up beyond the periphery of municipal towns and at present these settlements have grown up as census town. Some towns also have developed on the sides of well-developed roadways and railways.

The entire study is segmented into three parts. First part is assessing the distribution pattern of municipal towns of Nadia district with the help of NNA method. Second part of the study analyses the connectivity and accessibility of the study area and the last part of this study is the locational and distributional relationship between municipal towns and census towns and development of Nadia district.

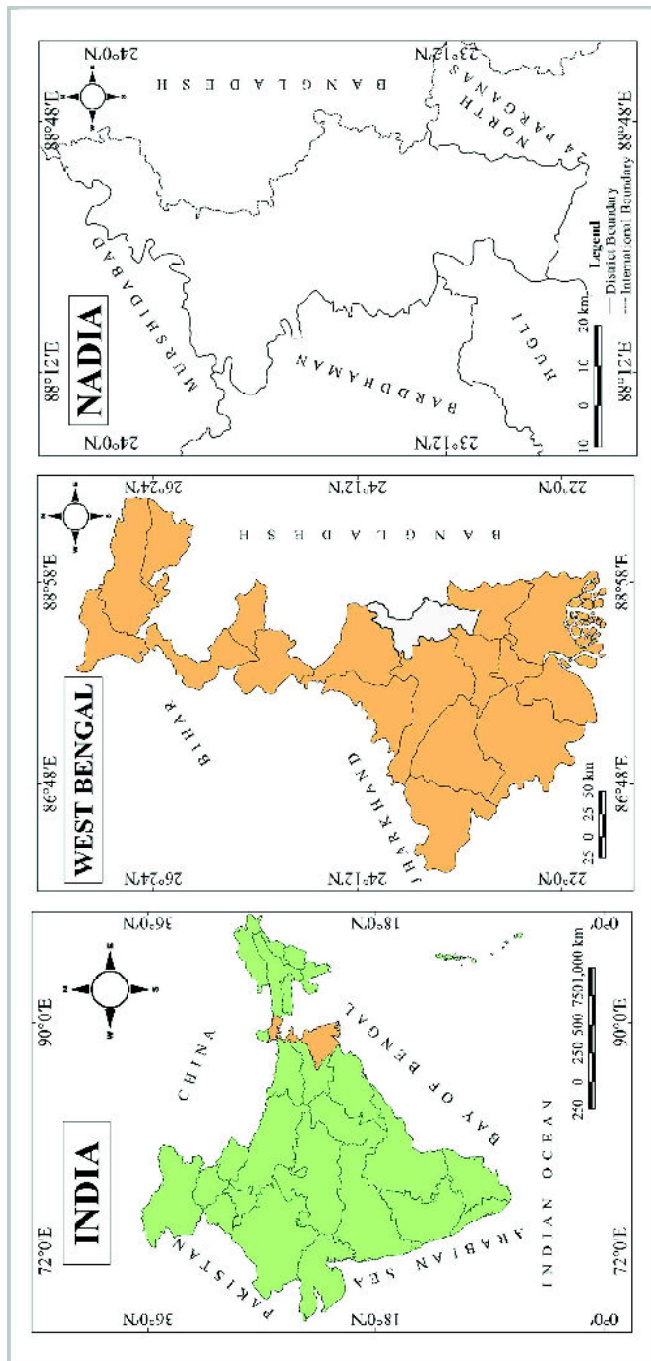


Fig.1: Location of the study area

Source: Prepared by author based on Census of India, 2011

Study Area

Nadia district lies in the eastern part of West Bengal. The geographical boundary of Nadia district comprises Bardhaman and Hugli districts on the West, Bangladesh on the East, Murshidabad district on North and North West and North 24 Parganas district on South and South-East. Nadia district lies between 22°53'30" and 24°54'0" North latitude and 88°08'103 and 88°48'153 East longitudes. Geographical area of the Nadia district is 3,927 sq. km. and the district lies 46 ft. above sea level. The distance of the district from North to South and East to West are 135 km and 45 km. respectively. Total population of the Nadia district is 5167600 (Census of India, 2011).

The district is a large alluvial plain spreading south-ward from the head of the delta formed by the Bhagirathi-Hugli River system. Rivers of Nadia district are described as off shoots of the rivers Padma or Ganga. The Bhagirathi-Hugli River, Jalangi and Mathabhanga-Churni rivers are collectively known as Nadia Rivers (Census of India, 2011). The collective flow of the rivers Jalangi, Bhairab-Jalangi and Mathabhanga-Churni join river Bhagirathi. The climatic condition of Nadia district is hot and wet sub-tropical monsoon climate. Maximum and minimum temperature of Nadia district is 37 degree Celsius and 5 degree Celsius respectively and annual rainfall of the district is 1488 mm (Census of India, 2011). Nadia district has 65 towns, whereas 55 census towns, 8 municipalities and 2 notified areas. Nadia District occupies 4th position in terms of Scheduled Castes Population in the State and 13th position in terms of Scheduled Tribes Population in the State.

Objectives

1. To determine the distribution pattern of the municipal towns of Nadia district
2. To analyse the connectivity of different parts of the Nadia district
3. To find out the relationship between the distribution of municipal towns and census towns

Literature Review

There are few notable literatures on the coexistence of growth and distribution towns. Ali and Varshney (2012) in their paper "Spatial Modeling of Urban Growth and Urban Influence: Approach of Regional Development in Developing Economy (India)" discussed on the spatial distribution of population and socio-economic facilities with hierarchical arrangement of urban centres and delineation of zone of influence. They also established laws governing how urban centres grow and how their sphere of influence is increased. While Taylor, Sekhar and D'Este (2006) in their paper "Application of Accessibility Based Methods for Vulnerability Analysis of Strategic Road Networks" studied the socio-economic impacts of network degradation on the basis on changes of level of accessibility provided by the degraded network. Snellen, Borgers and Timmermans (2002) in their study entitled "Urban form, road network type, and mode choice for

frequently conducted activities: a multilevel analysis using quasi-experimental design data” has tried to show the urban form and network types with the help of the multilevel analysis. But Samanta (2001) in her reputed work “Rural-Urban Interaction: A Study of Burdwan Town and Surrounding Rural Areas” has described the rural-urban linkage of Burdwan town and its surroundings. Firstly, she described the historical background of that town and then she described the socio-economic features of that area. She also studied that the various market centres of the rural areas and its growth and development. She investigated that how rural market centres integrates rural with urban. She introduced migration as a factor of the rural-urban interaction. She uses some elements like road network, railway network, educational linkage, telecommunication system, health services. She concluded that, “we may note the need for diversification of the rural economy through the development of rural agro-based and other smaller industrial units” (Samanta, 2001). While Diwakar (1991) in his study entitled “Urban Expansion and Rural Land Acquisition in the Fringe Villages: A Case Study of Union Territory of Delhi” analysis the process of urbanisation in Delhi. He investigated that how various scales of land acquisition occurred and its development and disposal policy. He also studied the spatio-temporal distribution of land acquisition of rural and urban Delhi. Basically he tried to show that how the urban area expanse into the rural area of the union territory of Delhi. He concluded that, “Urban land policy at national level should be formulated which is capable of generating employment for the poor being engine of economic growth” (Diwakar, 1991).

Database and Methodology

Data are mainly obtained from District Census Handbook, Nadia, 2011. Other data have been collected from 18th All India Livestock Census, Agriculture Implements and Machinery, Fishery Statistics, 2007. To determine the distribution pattern of the town, Nearest Neighbour Analysis [NNA] after Clark and Evans, 1954 [Rn] method has used. This is as follows,

$$Rn = \frac{ro}{re}$$

$$\text{Where, } ro = \frac{\sum dt}{N} \text{ and } re = \frac{1}{2\sqrt{N/A}}$$

Rn is Nearest Neighbour Value, $\sum dt$ is total nearest neighbour distance, N is the total no. of settlement and A is the ground area of the map

Results and Discussion

The structure of population of urban areas is obtained by analysing the distribution of urban population in different size classes. In West Bengal, urbanization has been spreading in Malda, Murshidabad, Nadia, Birbhum and Jalpaiguri in spite of their distant location from Kolkata which is the urban magnet of West Bengal (Chakraborty et al. 2015) and it is one of the reasons for

taking Nadia district as the study area for assessing the district level urbanization and inequality in urban growth and development. Nadia district represents the high to moderate level of urbanization compared to the other districts of the state (Ghosh and Khatun, 2021) and according to Census of India 2011, this district shares about 5 per cent of state's urban population and comprises 27.84% as urban population to its total population. The higher rate of urbanization of Nadia district which is mainly accentuated by emergence of CTs indicates the urban growth without the development of infrastructures and amenities (Ghosh and Khatun, 2021). According to Indian Census, the urban units have classified into six categories on the basis of population Distribution of settlements and it is an indicator for the development of a region. Nadia district has 65 towns, whereas 10 statutory towns and 55 census towns. Among 10 statutory towns, 8 are the municipalities and 2 notified areas with outgrowth. Among the municipalities 4 municipalities are the class-I towns, 3 municipalities are the class-II towns and 1 is the class-III town. Total population of urban Nadia is 1438873.

Table 1: Size Class Wise Towns of Nadia District (2011)

Size Class of Town	No. of Towns	Population	
		Population in Person	Population in Percentage
I	4	530957	36.90
II	4	285219	19.82
III	6	159090	11.06
IV	20	262314	18.23
V	27	183828	12.78
VI	4	17465	1.21
Total		1438873	100

Source: Based on Census of India Data, 2011

Among 65 towns 4 are Class I towns and 4 are the Class II towns, 6 are Class III towns, 20 are Class IV towns, 27 are Class V towns and 4 are Class VI towns. Class-wise urban population percentages are shown in the Table No. 3.2. 36. Around 90% urban population live in Class-I town. These 4 towns are the Krishnanagar, Santipur, Nabadwip and Kalyani and are all statutory towns. 19.82% urban population lives in the Class II towns, where 3 are statutory towns and 1 is a Census town. 18.23% urban population lives in the Class IV towns which are all census towns. 12.78% urban population live in the Class V towns which are all census towns. 11.06% urban population live in the Class III towns where 3 are the statutory and the other 3 are the

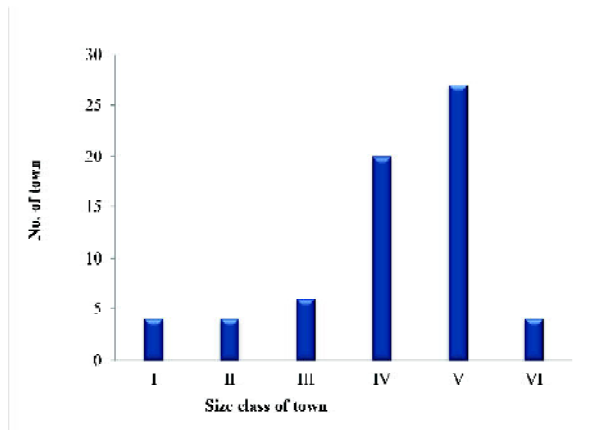


Fig. 2: Size Class Wise Towns

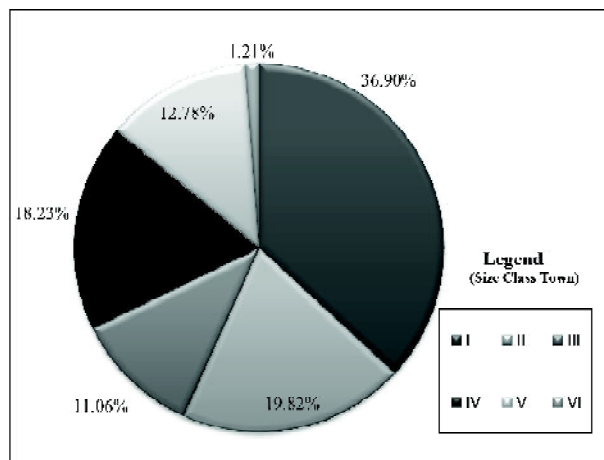


Fig.3: Urban Population Distribution of Towns

Data Source: Census of India, 2011

census towns. Lastly, the rest of 1.21% urban population live in the Class VI towns. From the above study it can be ascertained that 8 Municipalities are the major towns of Nadia District on the basis of their total population. Among 8 Municipalities 4 are the Class I towns, 3 are the Class II towns and 1 is a Class III town. Hence it can be concluded that, Krishnanagar, Nabadwip, Santipur, Ranaghat, Chakdaha, Kalyani, Birnagar and Gayespur are the major towns of Nadia district.

Distribution Pattern of Municipal Towns

In Nadia district, administratively there are 17 C.D. blocks and Krishnanagar is the District Head Quarter. This is located approximately in the middle of the district. In the Town Distribution map (Fig. 6) of Nadia district, it is found that 85.45% of Census towns are located in the southern part of the district, whereas Krishnanagar is located in the middle of the district. Other 14.55% census towns are located in the northern part of the district. On the other hand, the distribution of municipalities and

outgrowths and notified areas are also prominently concentrated in the southern part of the district. All the municipalities are located in south of the district head-quarter.

It may be argued that the existence of pattern in the spatial arrangement of phenomena on the earth's surface provides a fundamental stimulus to much of the geographer's work (Ebdon, 1977). The recognition and measurement of pattern of the settlement has great importance to the geographer. Nearest-Neighbour Analysis [NNA] is a technique, developed by plant ecologist Clark and Evans in the year of 1954. This is specifically designed for measuring pattern in terms of arrangement of a set of points in two or truly three dimensions. It involves calculating the mean

of the distances between all points and their nearest neighbour (Ebdon, 1977). The distribution pattern of municipal towns of Nadia district are 'more random than clustered' type (' R_n ' value is 0.67718). Kalyani and Gayespur municipalities are situated very close to each other and Ranaghat and Birnagar municipality are also close to each other. Nabadwip, Krishnanagar and Santipur municipalities are situated far away from each other. Chakdaha's nearest municipality is Ranaghat which is situated 8.4 km away from Chakdaha Municipality.

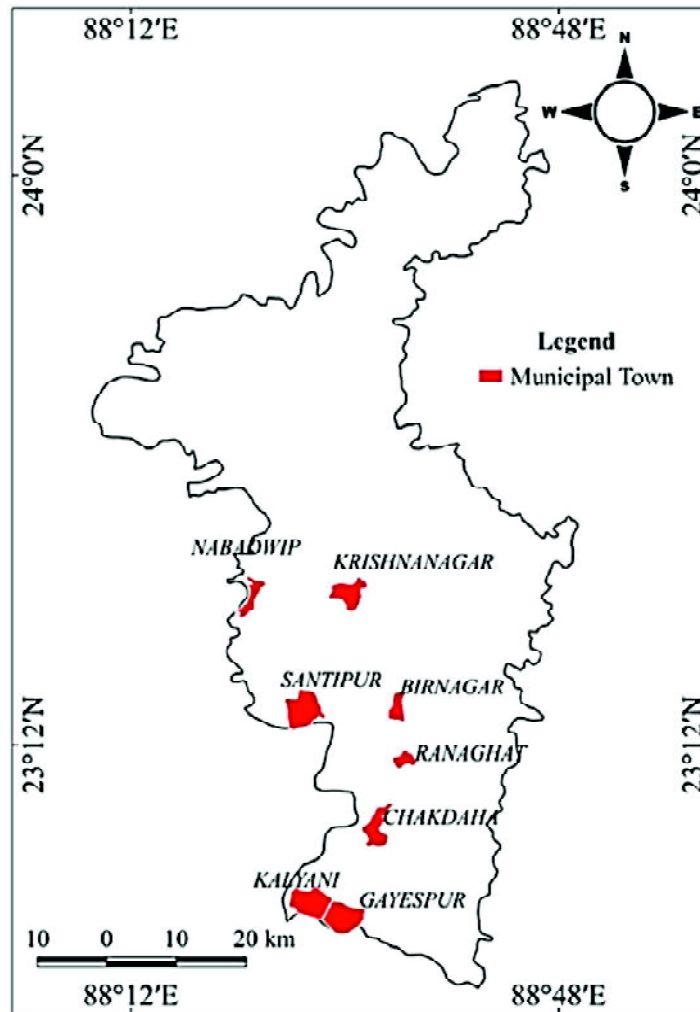


Fig. 4: Location of Municipal towns

Source: 18th all India livestock census, agriculture implements & machinery, fishery statistics, West Bengal (2007)

Table 2: Calculation for Nearest-Neighbour Analysis

Name of The Municipality	Name of Nearest Neighbour Municipality	Distance of Nearest Neighbour Municipality in cm	Distance of Nearest Neighbour Municipality in km (dt)
Krishnanagar	Nabadwip	2.5	10.5
Nabadwip	Krishnanagar	2.5	10.5
Santipur	Birnagar	2.5	10.5
Birnagar	Ranaghat	1.4	5.88
Ranaghat	Birnagar	1.4	5.88
Chakdaha	Ranaghat	2.0	8.4
Kalyani	Gayespur	1.0	4.2
Gayespur	Kalyani	1.0	4.2
			$\Sigma dt = 60.06$

Source: Based on calculation by author

- Observe mean nearest neighbour distance (ro): $\Sigma dt/N$
 $= 60.06/8$
 $= 7.5075$

Where, Σdt is the total nearest neighbour distance

N is the total municipality

- Since the ground area of the Nadia district is 3927 sq. km.

- Expected mean nearest neighbour distance (re): $\frac{1}{2\sqrt{N/A}}$
 $= 11.0864$

Where, A is the ground area of the district

- Nearest Neighbour Index (Rn): $ro/re = 7.5075/11.0864 = 0.67718$

Connectivity and Accessibility

The growth and development of transportation provides a medium contributing to the progress of agriculture, industry, commerce, administration, defence, education, health and other community activity (Saxena, 2005). The main transport link found in the district is between District Head Quarter Krishnanagar and Sub-divisional Head Quarter Ranaghat. Eastern Railway has

provided railway junction at both the places. The road connecting east to west starts from Krishnanagar to Nabadwip and is extended to the south up to Santipur. Roads in the district are maintained by the Government of West Bengal, PWD and local authorities. Municipalities in the district also maintain certain important road links in the district. National highway [NH] 12 (formerly known as NH 34) passes through the Nadia district along with Some State Highways that cross the district as well. Kalyani, Gayespur, Chakdaha, Ranaghat, Santipur and Krishnanagar towns are all linked with the National Highway 12. From Krishnanagar to Karimpur there is only one

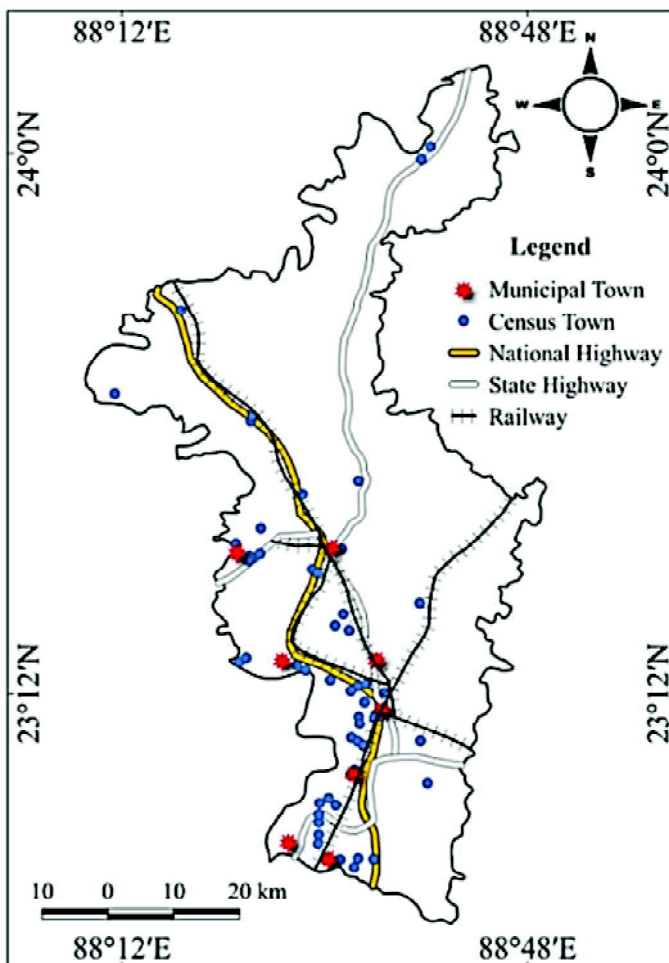


Fig.5: Roadways and Railways of Nadia District

Source: 18th All India Livestock Census, Agriculture implements and machinery, fishery statistics, West Bengal (2007)

two-lane State Highway present which covers Karimpur 1 and Karimpur 2 C.D. blocks, Tehatta 1 and Tehatta 2 C.D. blocks, Nakashipara C.D. block and Chapra C.D. block.

Kolkata sub-urban railway is also connected with different towns of Nadia district. From Sealdah railway station to Krishnagar city junction station there are well established railway networking system. But northern part of this district has not connected with the railway.

Distributional Relationship between Municipal Towns and Census Towns

There is a positive relationship between municipalities and census towns. Maximum numbers of census towns are located near to the municipalities. Basically infrastructural development is

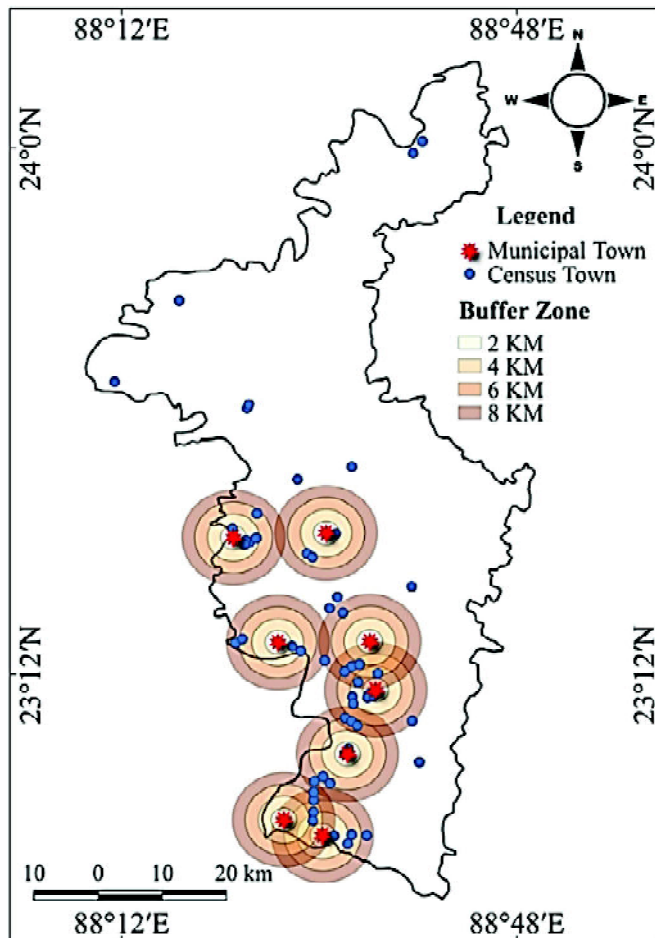


Fig.6: Concentration of Census Towns along the Municipalities of Nadia District

Source: Prepared by author based on Google Earth Pro

the main reason to growth the towns. Infrastructure of the municipalities of Nadia District is more or less good. That is why the adjoining areas of the municipalities grow rapidly and the municipalities adjoining villages are transformed into urban centres despite the facilities of those urban areas as not good as municipalities. Thus, these urban centres basically grow in terms of population only, not due to infrastructural development. The outside areas (villages) of the municipalities have grown and developed into urban areas. In the Map (Fig. 6) of concentration of Census Towns along the Municipalities of Nadia District shows 78.18% census towns are located within 8 km radius of the municipalities of Nadia district.

The maximum number (14) of census towns is located within the 8 km radius of the Ranaghat municipality. 11 census towns are located within the 8 km radius of the Nabadwip municipality, 8 census towns are located within same radius of the Chakdaha municipality, within 8 km radius of the Birnagar, Santipur, Kalyani, Gayespur and Krishnanagar municipality the number of census towns located are 7, 5, 5, 4 and 3 respectively. In the Fig. 6, where 4 buffer zones are drawn from the centre of 8 municipalities of Nadia district, i.e., 2 km, 4 km, 6 km and 8 km. Thereafter, it is found that 23 census towns are located within 4-6 km radius of the municipalities of the district and 15 towns are located within 6-8 km radius of the municipalities of the district. 9 census towns are located within 0-2 km radius of the municipalities of district, remain 8 census towns are located within the 2-4 km radius of the municipalities of the district. According to Census of India (2011) Nadia district has 55 census towns. It indicates that 43 census towns are located within 8 km radius from the centre of the municipalities of the district. The study shows that the northern part of the district has no municipal town and the number of census town similarly is less. On the other hand, all the municipal towns have located in the southern part of the district headquarter i.e. Krishnanagar, Nabadwip, Birnagar, Ranaghat, Chakdaha, Kalyani, Santipur and Gayespur and all are the municipal towns are the major towns of Nadia district because their infrastructural and economic potentiality is higher than the other towns.

Conclusion

Urban growth is the results of concentration of population due to availability of different amenities and facilities in the urban centre. Nadia district has 8 municipal towns and all are located in south of the district headquarter. Due to this type of distribution, northern part of the district has no municipality town. In general, municipal town have better amenities and facilities than census town. That is why the concentration of people is higher near the municipal towns. For this reason, the concentration of census towns is also high near the municipal towns. Southern part of the district has 85.45% census towns and out growths and 78.18% towns are located within 8km radius of the municipal towns. Rest of the census towns are located in the northern part of the district. Thus, southern part of the district is more developed than northern part of the district. People of north use trucks for sending their produced goods to other districts and other states. Thus, the transportation cost is increased and their profit reduced. There is need of proper planning for all over development and growth of the district. The government and

authorities need to prepare a fruitful plan to build up railways good network in the northern part of the district to obtain an all-round development of Nadia district.

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