



Urbanization Scenario in the selected districts in and around the Kolkata Metropolitan Area (KMA)

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Abstract

The shifting of the population of rural society to urban society results in the urbanization which is associated with the industrialization, modernization and rationalization. Urbanization is the backbone and important part of the economic development of any nation. The comparative studies of the level of urbanization and its disparities have been analyzed in municipalities of Kolkata Metropolitan Area and its surrounding area. The level of urbanization has been checked with the help of selected indicators such as decadal growth, the density of population. Consistency of urbanization among the municipalities has been examined with the help of Spearman correlation co-efficient method which indicated that the highly positively correlate with p -value 1 between 1991 and 2011. The result of surrounding districts shows that the highest position in the level of urbanization occupied by Howrah district with 63.38 percent in 2011. On the other hand, during the same year (2011) the level of urbanization in West Bengal is recorded higher as per compare of Nation level that is 31.87 percent in West Bengal and 31.16 percent in India in 2011.

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Introduction

Urbanization refers to the shifting of the population from a rural society to an urban society and is associated with modernization, industrialization. It is well-linked with rationalization (Venkatesham, 2015) and is regarded as an important part of economic development. This term has been used by many researchers to describe the process of transformation of the agrarian economy to an industrial economy or the conversion of homogeneous functional society to a heterogeneous functional society (Riesman, 1964). It is the alteration of a rural unit to an urban center (Paul & Sharma, 2016). Urbanization is measured in terms of three aspects i.e. demographic, behavioural and structural extent of settlement (Lampard, 1965). In demographic sense, urbanization is described by the movement of the population from rural to an urban or increasing proportion of the population over a period of time living in the urban areas rather than the rural areas (Bose, 1974). It results in the expansion of built-up area that may be either horizontal or vertical (Akter & Sultana, 2014) or maybe out-migration of population from inner part of the city, i.e., CBD due to high traffic congestion,

overcrowding and high land rent causes expansion of urban area at fringe of the city (Basu & Dhar, 2013; Rukhsana & Hasnine, 2019). At present, urbanization is a burning topic for developed as well as developing nations. It is also considered as one of the major factors of socio-economic development. In the developed country it is regarded as an engine of development but on the other hand, it is considered as parasites for the developing countries because it may take away the resources from rural areas to urban (Anisujjaman, 2015). In contrast, rural areas also get lots of benefits due to urbanization in terms of job opportunities, health facilities, education, market etc. The Kolkata Metropolitan Area (KMA) is bounded by the five districts of West Bengal (i.e. Nadia, Hooghly, North 24 Parganas, South 24 Parganas, and Howrah). These districts (except, South 24 Parganas) experienced a striking rate of urbanization since the 1950s.

Objectives

The objectives of the present study are:

- 1) to find out the disparity in the level of urbanization among



different administrative unit (national, state and district level) of the country,

- 2) to evaluate the consistency and trend of urbanization in all municipalities of KMA with the help density, growth and total population.

The Study Area

The Kolkata Metropolitan Area (KMA) is the study area. It is located between 22°19'00''N to 23°00'00''N latitudes and 88°05'00''E to 88°35'00''E longitudes (fig. 1) in the eastern part of India. It contains a number of urban bodies in both left and right bank of the Hooghly river. Basically, it is an urban agglomeration (UA) of Kolkata city which occupies 1851.41 km² of area and a population of 14.72 million (Census of India, 2011). This region consists of 38 Municipalities, 3 Municipal corporations, 77 Census Towns, 16 Outgrowths and 445 villages.

Database and Methodology

The present study is based on published data collected from various sources for the year 1951, 1961, 1961, 1971, 1981, 1991, 2001 and 2011. The following statistical techniques have been adopted to fulfill the aim of the study as follows:

- a) **Level of Urbanization:** It represents the percentage of the urban population with respect to the total population at a particular time:

$$L = (U/TP) \times 100\%$$

Where, L = level of urbanization, U = urban population, TP = total population

- b) **Decadal Growth:** It is used to show the rate of growth of the urban population in a decade:

$$DG = \{(P_t - P_{t-1})/P_{t-1}\} \times 100\%$$

Where, DG = decadal growth rate, P_t = population at time, t, P_{t-1} = population at the earlier time

- c) **Population Density:** Per capita income depends on the density of population. If the density of population increases within an area per capita income decreases. Therefore, this is an important indicator to understand the economic condition of a region:

$$PD = (\text{Population}) / (\text{Area})$$

Where, PD = population density

- d) **Spearman's Rank Correlation Coefficient :** It measures the strength of a monotonic relation between two variables.

$$\rho = \frac{6 \sum d^2}{n.(n^2 - 1)}$$

Where, d = difference in ranks of the two variables, x and y, and n = the number of paired data.

The value of correlation coefficient lies between -1.0 and +1.0.

- +1.0 = perfect positive correlation,
- 0 to 1 = the two variables tend to increase together,
- 0 = the two variables do not vary together at all
- 1 to 0 = one variable increases as the other decreases
- .-1.0 = perfect negative or inverse correlation

- e) **Z-Score:** It is used here to know the standard deviation below or above the mean population to compare the individual score with the mean score of the data unit or population, as follows:

$$z = \frac{x - \bar{x}}{\sigma}$$

Where z = standard score, x is the individual score of the variable, \bar{x} = sample mean, σ = standard deviation.

A number of choropleth maps have been prepared with the help of Arc Map 10.1.

Results and Discussion

Comparative Analysis of Urbanization

The level of urbanization refers to the percentage of the urban population in a territory. After independence, developed states like West Bengal, Maharashtra and Tamil Nadu have a high level of urbanization associated with higher per-capita income. The concentration of large economic activity in metropolians (like Kolkata, Mumbai and Chennai) is the main reason behind the high level of urbanization. The present study area covers five surrounding districts of the Kolkata city, viz. Hooghly, Howrah, South 24 Parganas and North 24 Parganas and Nadia. It is necessary to know the trend and pattern of urbanization of those districts.

North 24 Parganas experienced rapid urbanization since independence. Two main factors are migration of people from rural to urban and another is the partition of India which brought a large number of migrants from Bangladesh. Besides, due to the increase of industrialization, transportation facility, concentration of the service sector and adequate non-agro based industry, this district gets high in level of urbanization. The industrial belt along Hugli river, rural-urban migration, unauthorized migration from Bangladesh result in a high concentration of urbanization (Sarkar & Malik, 2017). Bidhannagar, Barrackpur and Barasat Subdivision of North 24 Parganas are very close to Kolkata Metropolitan Corporation (KMC). Bidhannagar subdivision contains one Municipality i.e. Bidhannagar(M) and one Industrial Township i.e. Nabadiganta. Barrackpur subdivision contains 24 census towns and 17 municipalities as per the 2011 census of India. Barasat subdivision has 34 census towns and 6 Municipalities.

The level of urbanization of North 24 Parganas is constantly increasing from 1951 to 2011 census. Figure 2(a) shows that the level of urbanization is much higher than the West Bengal and India. Table -2 reveals that the level of urbanization is only 31.87% and 31.16% as a whole in West Bengal and India respectively where North 24 Parganas recorded about 57.27% in 2011. This high level of urbanization is contributing to the growth of industrial belt and other service sectors for the district and on the other side, it is also credited with the growth of the Kolkata Metropolitan Area.

South 24 Parganas district experienced deceleration in the urbanization process. The nature of urbanization of this district is Kolkata-centric. According to Bagchi and Chatterjee (2015), the urbanization process of this district is bearing symptoms of immaturity and they considered this process of urbanization is similar to pseudo-urbanization. But 2011 census data reveals that a large number of census towns (CT) have come up, although the level of urbanization is very low in the South 24



Parganas district. The percentage of the urban population in South 24 Parganas in every decade from 1951 to 2011 remained much below the state average (Fig.2.b). But the growth of the urban population in terms of percentage is much better in the last census (2001) data. Up to the 2001 census, the difference in the proportion of the urban population has not increased by more than 4%. The emergence of census towns (CT) has been really striking from 3 in 1951 to 111 in 2011.

In Hooghly district, the percentage of urban population grew slowly from 1901 to 1951 (Census of India, 1901 to 2011). It was 14.94% in 1901 and 24.61% was in 1951, only 9.69% increases within these five decades. It experienced a moderate pace of urbanization growth since 1951. The percentage urban population geared up from 24.61%(1951) to 38.57% (2011) (Table - 1) (fig 2.c). The urbanization pitched up from 1965 to 1971. Two major incidents i.e. Indo Pak war (1965-1961) and Bangladesh war of Independence (1970-1971) happened which were the vital causes of heavy migration. Besides this natural increase, birth rate is another cause of population growth of this district. Fig. (2.c) shows that the level of urbanization of the Hooghly district from 1951.

After Independence (1947), a large number of influxes of the population have received in the eastern part of India due to industrial development particularly in Kolkata, Howrah, North 24 Parganas and South 24 Parganas. In 1971, the Independence of East Pakistan gave a drastic change in the volume of the population in the West Bengal. Due to this a large number of refugees had gathered in the southeast part of West Bengal from Bangladesh (former East Pakistan). Not only the increase of population but also reduction of death rate due to improvement of the medical facility, promoted the overall growth of the population of Howrah district (fig 2.d). Nadia district also experienced a low level of urbanization compared to the State and National level (Table-1). Since independence, the level of urbanization of this district has been laid below India and West Bengal, followed by a relatively higher growth in the last decade (fig.2.e).

Population Growth in the selected Municipalities and Municipal Corporations under KMA

According to the census 2001, West Bengal has 31.87 percent of the urban population which was 27.48 percent in the 1991. So it is revealed that more than 4 percent of the urban population has increased within the last two decades. The people of surrounding districts of Kolkata city are progressively choosing non-agricultural activity since the last decades resulting in rapid urbanization of all municipalities around the city. From 1991 to 2011, a large number of urban centers have been increasing or on the other way, it can be said that a decreasing number in the village seen in the selected study area.

From 1991 to 2011, a huge number of the census town has been increasing in the selected districts of the study area. It is a clear-cut indication of transformation from a rural society to an urban society. Therefore the peoples of the study area are increasingly ignoring the primary economic activity basically agricultural activity as a livelihood option and choosing more the other secondary alternatives. Twenty-seven municipalities have been selected for the study. Here, the variables i.e. population growth, population density, rural-urban population ration have been

taken for showing the urbanization and degree of urbanization among the different municipalities which are situated around the Kolkata Municipal Corporation(KMC). Spearman's Rank Coefficient also used to show the consistency of urban growth among the municipalities.

Consistency of Urbanization among Municipalities

The Spearman correlation coefficient value was 0.98 during 1991-2001, 0.88 during 2001-2011 and 1 recorded during 1991-2011 which indicates a high positive association.

The decadal Growth rate of Population in Municipalities

The decadal growth of population has been calculated based on equation (i). There are 38 municipalities that have been taken for the study and 3 municipal corporations. Among them, the growth rate is highly fluctuating within these two decades (i.e. 1991-2001 and 2001-2011). In this two decades, some municipalities experienced high positive growth and in the next decade have high negative growth (Fig 3 and 4).

In the last decade (2001-2011), Rajarhat Gopalpur municipality (48.21%) recorded the highest growth whereas New Barrackpur (-7.63%) experienced the lowest rate of population growth. In the 1991-2001 decade, the Rajpur-Sonarpur municipality (212.00%) recorded the highest population growth whereas the Chapmdani municipality (2.16%) had the lowest rate of population growth. In the 1991-2001 decade, all municipalities had a positive population growth rate but in the immediate last decade, some municipalities experienced a negative growth rate of population. In this decade, the negative growth rates are seen in five municipalities. These are Srirampur (-8.09%), Titagarh (-6.17%), Khardah (-4.58%), New Barrackpur (-7.63%) and Baranagar (-2.22%)(Table 5).

Density of Population in selected Municipalities

Increasing density of population in an area represents a decreasing rate of per capita income. Through this indicator, the economic condition of a region may predict. According to Dawodieh (2017), high population density affects the built environment. Most of the time, implementation of any policy within an area is dependant upon the density of population because a certain amount of amenities may not distribute equally in the high population-dense region or may face lots of difficulties in the distribution of wealth. Therefore, it is necessary to study the density of the population of an area which helps to make policies and implement them in a proper way. Table 4 shows the density of population of 38 municipalities and 3 municipal corporations of three census year i.e. 1991, 2001 and 2011. Fig.5, 6 and 7 show the density of the population where the set of data is divided into 5 zones (Very High, High, Medium, Low, and Very Low) through quantile division technique.

I) Very High-density Zone: The range of population density is above 15866, 19472 and 20817 for 1991, 2001 and 2011 respectively. Chandannagar (CMC), Titagarh, Kamarhati, Baranagar, South Dumdum, Howrah(HMC), Kolkata(KMC) were belonging to the Very high-density zone for the year of 1991. Basically, this northern portion of Kolkata was the industrially developed area that is why the municipalities were



experiencing high population density. For 2001, Kolkata (KMC), Bally, South Dumdum, Baranagar, Kamarhati and Titagarh were included in this Very high population density zone. Here, Howrah (HMC) and Chandannagar (CMC) shifted to a high density zone from a very high-density zone. In 2011, five municipalities of 2001 are to be continued but only Baranagar is excluded from this zone.

ii) High-Density Zone: In this zone, population density ranges between 12561-15865, 13717-19471 and 15349-20816 persons/ sq km. for the years 1991, 2001 and 2011 respectively. Rishra, Khardah, Konnagar, Panihati and Bally were included in this zone. In 2001, Chandannagar(CMC), Rishra, Konnagar, Khardah, Panihati, New Barrackpore, Howrah(HMC) were included in this zone. Bally is excluded in 2001 and included in a Very High population zone. Howrah (HMC), New Barrackpore, Chandannagar(CMC) were newly admitted in this zone in 2001. All municipalities of 2001 are to be continued in 2011 but only New Barrackpore is excluded from this year.

iii) Medium Density Zone: The population density in this zone continued between 5939-1256, 8720-13716 and 10147-15348 persons/sq km in the years of 1991, 2001 and 2011 respectively. In 1991, Baydabati, Budge Budge, Uttarpara Kotrong, Serampore, Barrackpore and North Barrackpore were included in this zone. In 2001, all six municipalities of 1991 are to be continued but another one i.e. Dumdum is included in this zone.

iv) Low Density Zone: In this region, population density ranges between 3716-5938, 6088-8719 and 6679-10146 persons per sq.km.in 1991, 2001 and 2011 census year respectively. In 1991, North Dumdum, Dumdum, Rajarhat Gopalpur, Mahestala were included within this zone. In 2001, Barasat, Madhyamgram, Dumdum, Rajarhat Gopalpur, Mahestala, Budge Budge were included in this range. In 2011, Barasat, Madhyamgram, Uttarpara-Kortrang, Mahestala, Budge Budge and Rajpur-Sonarpur were included in this range.

v) Very Low Density Zone: In this region, the population remains below 3715, 6087 and 6678 persons per sq.km for the years 1991, 2001 and 2011 respectively. In 1991, Rajpur-Sonarpur, Bidhannagar, New Barrackpore, Madhyamgram were included in this class. In 2001, Uluberia, Pujali, Rajpur-Sonarpur, Bidhannagar, North Barrackpore were included in this low-density range and in 2011, Uluberia, Pujali, Bidhannagar, North Dumdum, New Barrackpore are included in this range.

The 'z' score values show the standard deviation below or above the mean population. It is used to compare the individual score with the mean score of the data unit or population. Appendix 3 shows the 'Z' scores value of 27 municipalities for the year of 1991, 2001 and 2011. Negative 'Z' score value represents the deviation from individual value is being low and vice versa. In 1991, maximum municipalities have found negative value and high positive value represent found in Kolkata, Naihati, Titagarh, Baranagar and Kamarhati. In 2001, again Kolkata, Titagarh, Kamarhati, Baranagar were found high positive 'Z' score value whereas Bally and South Dumdum were the new units included in this group. In 2011, Kamarhati, Titagarh, Bally,

South Dumdum, Baranagar are also found the highest population density because of a large number of industries, different factories (Wagon, Papermill factories) are situated here that is why the concentration of population is higher than the other municipalities.

Conclusion

The selected study area is experiencing a rapid acceleration in the process of urbanization. Kolkata and neighbouring districts (except Nadia and South 24 Parganas) have gone through a greater level of urbanization than the state of West Bengal as well as India due to a huge number of refugees' influx in and surrounding the Kolkata city. It's contributed to the extension of city and town in the adjacent areas of Kolkata city. With the huge increase of population in a short time span, there arose various problems like overcrowding, traffic congestions, increased slums, scatter settlements, an unprecedented increase of unemployment, urban sprawl etc. Particularly, this selected study area has experienced huge population pressure consequently it has damaged the environment and associated features.

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Table-1: Level of Urbanization in selected Districts of West Bengal (1951-2011)

Year	1951	1961	1971	1981	1991	2001	2011
North 24 Parganas	42.45	45.83	49.2	51	51.31	54.3	57.27
South 24 Parganas	4.58	7.05	8.84	11.99	13.3	15.73	25.58
Hooghly	24.61	25.96	26.18	29.30	30.95	33.47	38.57
Howrah	32.41	40.48	41.93	45.12	49.58	50.36	63.38
Nadia	18.21	18.41	18.74	21.59	22.63	21.27	27.81
West Bengal	23.88	24.45	24.75	26.47	27.48	27.97	31.87
India	17.29	17.97	18.24	23.34	25.72	27.78	31.16

Source: computed by author based on Census of India 1951, 1961, 1971, 1981, 1991, 2001, 2011

Table-2: Municipalitywise Density of Population in Kolkata Metropolitan Area

	Very High	High	Medium	Low	Very Low
1991	Kolkata(MC), Howrah(MC), Rishra, Titagarh, Naihati, Baranagar, Kamarhati, South Dumdum	Halisahar, Garulia, Champdani, Barrackpore, Kharda, Panihati	Bansberia, Hooghly Chinsurah, Bhatpara, Bhadreswar, Baidyabati, Sreampore, Budge Uluberia	Chandan Nagar(MC), North Barrackpore, Uttarpara Kotrong, Mahestala, Uluberia	Kalyani, Gayespur, New Barrackpore, Madhyamgram, Bidhanagar, Sonarpur Rajpur, Baruiipur
2001	Kolkata(MC), Howrah(MC), Baranagar, Kamahati, Dumdum, South Dumdum, Titagarh, Naihati	Panihati, Rishra, Konnagar, Baiduabati, Champdani, Kanchrapara, Halisahar	Bansberia, Hooghly Chinsurah, Bhatpara, Bhadreswar, Serampore, Barrackpore,	Chandannagar, North Barrackpore, Bally, North Dumdum, Rajarhat Gopalpur, Barasat, Mahestala, Budge Budge	Kalyani, Gayespur, New Barrackpore, Madhyamgram, Bidhanagar, Sonarpur Rajpur, Baruiipur, Uluberia, Pujali
2011	Naihati, Titagarh, Kamarhati, Baranagar, South Dumdum, Dumdum, Kolkata(MC), Howrah(MC)	Konnagar, Rishra, Panihati, Kharda, Barrackpore, Baydabati, Champdani, Halisahar	Bansberia, Kanchrapara, Bhatpara, Garulia, Bhadreswar, Rajarhat Gopalpur	Hooghly Chinsurah, North Barrackpore, Uttarpara Kontrong, Sonarpur Rajpur, Mahestala, Budge Budge, Barasat, Madhayamgram	Kalyani, Gayshpur, Chandand Nagar(MC), North Dumdum, New Barrackpore, Bidhanagar, Baruiipur, Uluberia, Pujali

Source: Prepared by the Author based on Census data 1991, 2001 and 2011

Table-3: Municipalitywise Growth and Density of Population 1991, 2001 and 2011

Name	Density (1991)	Density (2001)	Density (2011)	Growth (1991-01)	Growth (2001-11)
Kolkata(MC)	23733	24666	24255	3.93	-1.67
Howrah(MC)	18369	19473	20817	6.01	6.90
Bhatpara	8788	12749	11059	45.07	-13.25
South Dumdum	17194	28984	29787	40.68	2.77
Mahestala	5939	8720	10148	31.89	16.37
Panihati	14226	17961	19451	20.79	8.30
Rajpur Sonarpur	1088	6089	7674	212.00	26.03
Kamarhati	24351	28696	30129	15.14	4.99
Rajarhat	4574	7773	11520	41.15	48.21
Bally	15620	24841	24841	29.29	12.44
Baranagar	31576	35220	34440	10.35	-2.22
Barasat	3268	7371	8865	55.66	20.26
North Dumdum	5670	8319	4340	31.85	-47.83
Naihati	30506	49495	50092	62.25	1.21
Uluberia	4664	6076	6680	30.27	9.95
Srirampur	9450	13645	12541	30.74	-8.09
H Chinsura	8780	9844	10407	12.12	5.71
Bidhanagar	2987	4902	6433	39.08	31.23
Chandannagar	5464	7362	7575	34.73	2.89
Madyamgram	3248	7291	9199	55.45	26.17
Uttarpara	6198	9202	9740	32.65	5.84
Barrackpur	12560	13609	14400	7.71	5.81
Kanchrapara	11047	13913	13268	25.95	-4.63
Halisahar	13771	15037	15089	9.19	0.34
Titagarh	35211	38333	35969	8.14	-6.17
North Barrackpore	7985	9815	10540	22.92	7.39
Kharda	13657	18002	17176	24.14	-4.58
Rishra	15867	17485	19225	9.26	9.95
Baidyabati	11417	13717	15350	16.77	11.90
Bhadreswar	8753	12811	12256	46.36	-4.33
Bansberia	10311	11512	11458	11.65	-0.47
Champdani	15621	15958	17195	2.11	7.75
Dumdum	4649	11498	13029	59.56	13.32
New Barrackpur	3715	4845	4476	23.32	-7.63
Kalyani	1910	2823	3456	47.78	22.45
Garulia	12487	12334	13169	-1.23	6.77
Budge Budge	8052	8337	8481	3.42	1.73
Konnagar	14072	16330	17233	13.82	5.54
Gayeshpur	1739	1835	1967	5.54	7.18
Baruiipur	4152	4952	5858	16.15	18.29
Pujali	-	3988	4364	100.00	9.42

Source: Computed by Author

Table- 4: Municipalitywise Z score for 1991, 2001 and 2011

Name	Z-Score 1991	Z- Score 2001	Z-Score 2011
Naihathi	2.3	3.5	3.5
Titaghar	2.9	2.4	2.1
Baranagar	2.4	2.1	2.0
South Dumdum	0.7	1.4	1.5
Kamarhati	1.6	1.4	1.5
Bally	0.5	1.0	1.0
Kolkata(MC)	1.5	1.0	1.0
Howrah(MC)	0.9	0.5	0.6
Khardha	0.3	0.4	0.2
Panihati	0.4	0.4	0.5
Rishra	0.6	0.3	0.4
konnagar	0.4	0.2	0.3
Champdani	0.5	0.2	0.2
Halisahar	0.3	0.1	0.0
Kanchrapara	0.0	0.0	-0.1
Baidyabati	0.0	-0.1	0.1
Srirampur	-0.2	-0.1	-0.2
Barrackpur	0.2	-0.1	0.0
Bhadreswar	-0.3	-0.1	-0.2
Bhatpara	-0.3	-0.2	-0.4
Garulia	0.2	-0.2	-0.2
Bansberia	-0.1	-0.3	-0.3
Dumdum	-0.8	-0.3	-0.2
H Chinsura	-0.3	-0.4	-0.4
North Barrackpore	-0.4	-0.4	-0.4
Uttarpara	-0.6	-0.5	-0.5
Mahestala	-0.6	-0.5	-0.5
Budge Budge	-0.4	-0.6	-0.6
North Dumdum	-0.6	-0.6	-1.0
Rajarhat	-0.8	-0.6	-0.3
Barasat	-0.9	-0.7	-0.6
Chandannagar	-0.7	-0.7	-0.7
Madyamgram	-0.9	-0.7	-0.6
Rajpur Sonarpur	-1.2	-0.8	-0.7
Uluberia	-0.8	-0.8	-0.8
Baruipur	-0.8	-0.9	-0.9
Bidhannagar	-1.0	-0.9	-0.8
New Barrackpur	-0.9	-0.9	-1.0
Pujali	-1.3	-1.0	-1.0
Kalyani	-1.1	-1.1	-1.1
Gayeshpur	-1.1	-1.2	-1.3
Mean	11040	14288	14730.5
SD	8464.0	10176.2	10010.4

Source: Prepared by Author based on Census of India 1991, 2001 and 2011

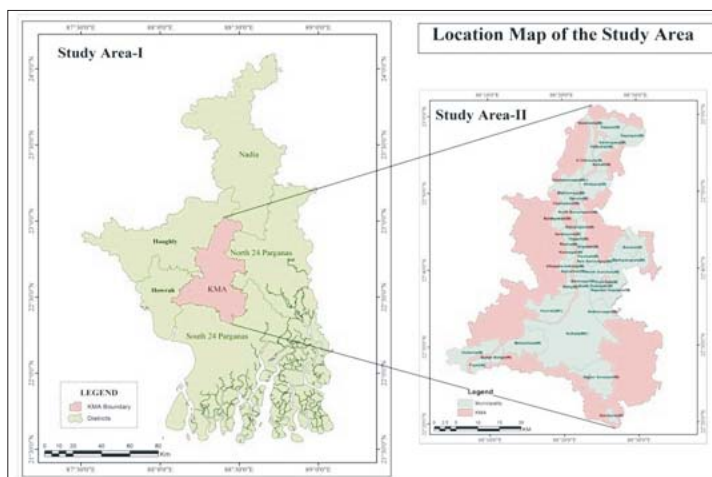


Fig. 1: Location of the Study Area

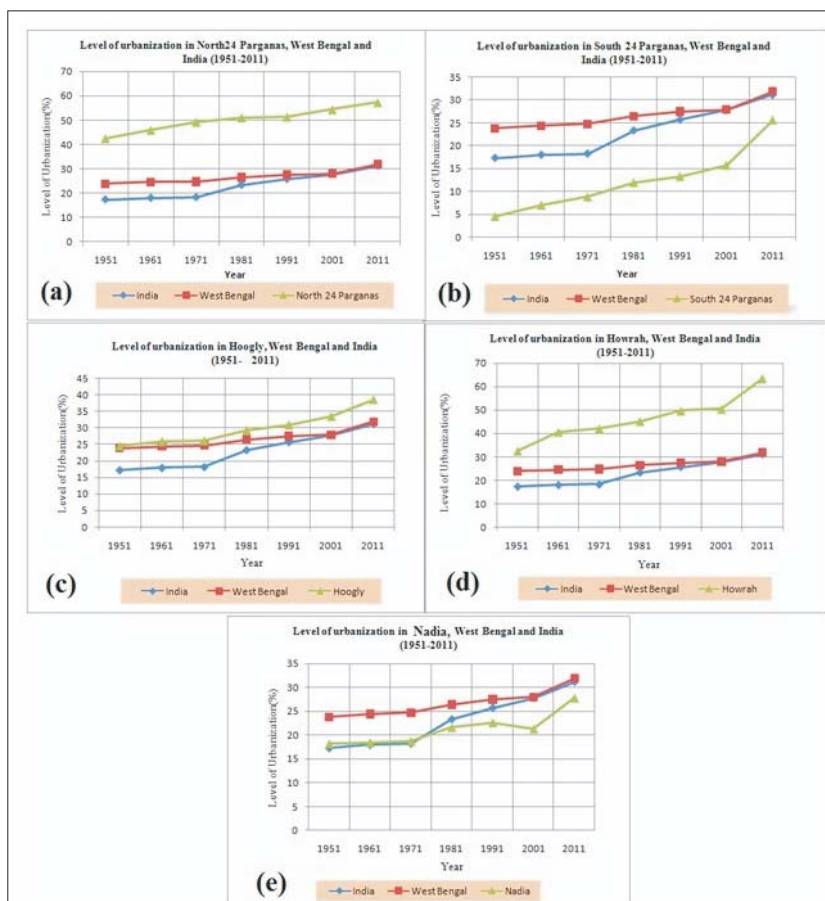


Fig. 2: (a), (b), (c), (d) and (e)

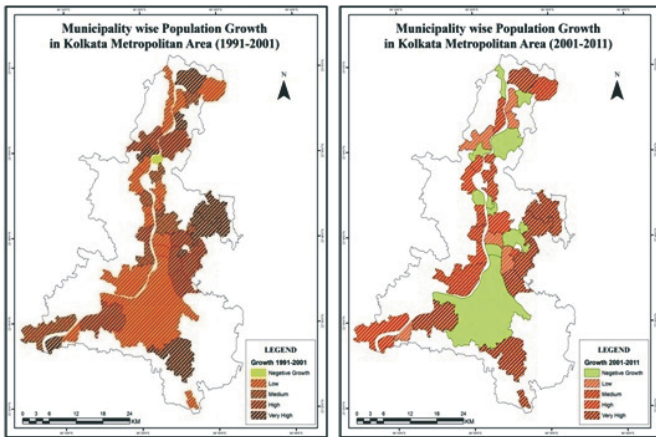


Fig. 3

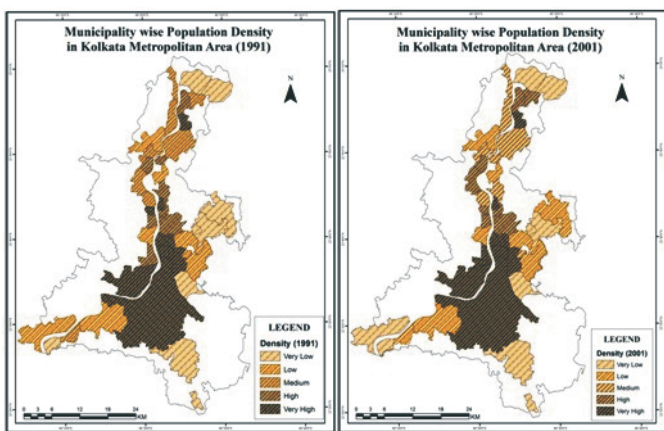


Fig. 4

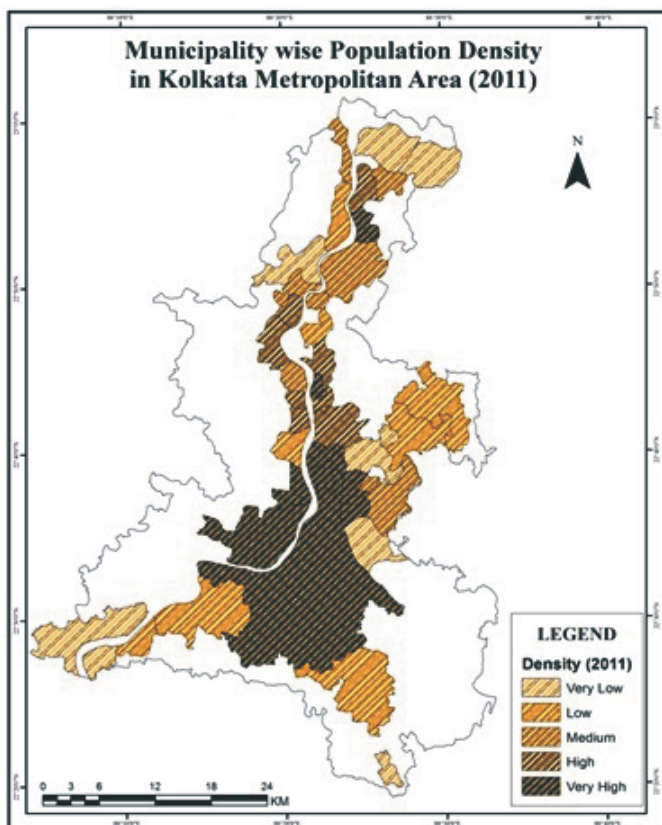


Fig. 5



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