

# Micro-Level Analysis of Human Settlements in Uttar Dinajpur District: A Quantitative Approach

Jiyaul Hoque

Research Scholar, Department of Geography, Aligarh Muslim University, Aligarh, Uttar Pradesh, India

## ABSTRACT

Settlement plays a crucial role in both directional as well as locational planning. In human geography, any form of habitation from a single house to a mega city is known as settlement. Settlements are the actual expression of human occupation on the earth surface, have always engaged the attention of the geographer. The secondary sources data has been used for the analysis. In the present study an attempt has been made to examine the spatial pattern of settlements in terms of growth, distribution, density, size, (in term of area and population), concentration and spacing for understanding the existing position of the settlement system in the study area for the formulation of micro-level diagnostic planning to achieved balanced regional development. To analysed the distribution and spatial variation of settlements, the standard statistical technique like Mather's Model of Mean Spacing, Gini's technique of Coefficient of Concentration has been used. Besides, Karl Pearson's coefficient of correlation and regression method has been used, and for the hypothesis testing student's 't' test has been used.

**KEYWORDS:** Settlements, Mean Spacing, Mean Size, Decadal Growth, Micro Level Planning

## INTRODUCTION

Settlement plays a crucial role in both directional as well as locational planning. In human geography, any form of habitation from a single house to a mega city is known as settlement (Husain, 2011). After food, shelter is the most important need of man. Men construct houses and develop settlements to protect themselves against the vagaries of weather and to enjoy social life. In fact, settlement is man's important step towards adapting himself to his physical environment (Husain, 2011, p.303). Settlements are the actual expression of human occupation on the earth surface, have always engaged the attention of the geographer. The study of spatial organization settlement is of prime importance to understand the nature of the space with the relationship of functional activities and human occupancy, because no socio-economic progress can occur without the efficient settlements system and the planning. The importance of the study is that settlements are grown in a haphazard manner in that ratio that services are facilitated inadequately. So, regional planning at the micro level comes into focus for balance regional development.

Khan and Ahmad (2013) analyse the hierarchy of rural settlements in Aligarh district. They used the Median Population Threshold of Reed Muench method for the analysis of the hierarchy of rural settlements and spacing of rural settlement calculated by using Mather's model of mean spacing. Further, categorised the hierarchy of settlements into six hierarchical level. Amani and Ansari (1982) studied that spatial organization is the basic requisition for balanced regional development. Mukerji (1970) examined, settlement

pattern is the outcome of functional characteristics. Ali and Ahmad (2005) studies the quantitative analysis of settlements in Malda district, in which they examined the mean spacing, mean size and dispersion of settlements by using Mother's model of mean spacing, Nearest Neighbour Analysis and Gini's coefficient technique has been used to show the concentration of settlements. Schaefer (1953) started the study of the spatial organization of phenomena in modern trend. Besides him, many studies regarding the analysis of pattern and process of human settlements in discrete ecological settings have been conducted by many scholars who emphasized on the study of the spatial organization of settlements in terms of the analysis of size, shape, spacing and dispersion (Monkhouse, F.J., 1965)

## OBJECTIVE:

The main objectives of the study is to examine the spatial pattern of settlements in terms of growth, distribution, density, size, (in term of area and population), concentration and spacing for understanding the existing position of the settlement system in Uttar Dinajpur district.

## HYPOTHESIS:

➤ Spacing is the function of the size of the settlement.

## STUDY AREA:

The latitudinal extent of the district is 25°11' N to 26°49' N and longitudinal extent is 87°49' E to 90°00' E and is bounded by Panchgaon, Thakurgaon and Dinajpur district of Bangladesh on the East, Kishanganj, Purnia and Kathiar

**How to cite this paper:** Jiyaul Hoque "Micro-Level Analysis of Human Settlements in Uttar Dinajpur District: A Quantitative Approach" Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-5 | Issue-1, December 2020, pp.1530-1540, URL: [www.ijtsrd.com/papers/ijtsrd38257.pdf](http://www.ijtsrd.com/papers/ijtsrd38257.pdf)



Copyright © 2020 by author (s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



district of Bihar on the West, Darjeeling and Jalpaiguri district on the North and Dakshin Dinajpur district on the South. The district of Uttar Dinajpur has a total area of 3140\* sq. k.m. and the total population of the Uttar Dinajpur District is 3,007,134 (census 2011). The district has been divided into Nine Blocks for administrative purposes. The overall literacy rate of the district is 59.07 %. And male and

female literacy rate of 66.65 and 53.15, respectively. There are 4 Municipalities, i.e., Raiganj, Kaliaganj, Dalkhola and Islampur, and 5 Census Towns, namely Chopra, Hanskunda, Nachhratpur Katabari, Kasba, and Itahar. And 1484 inhabited settlements including 4 municipalities and 5 census town.

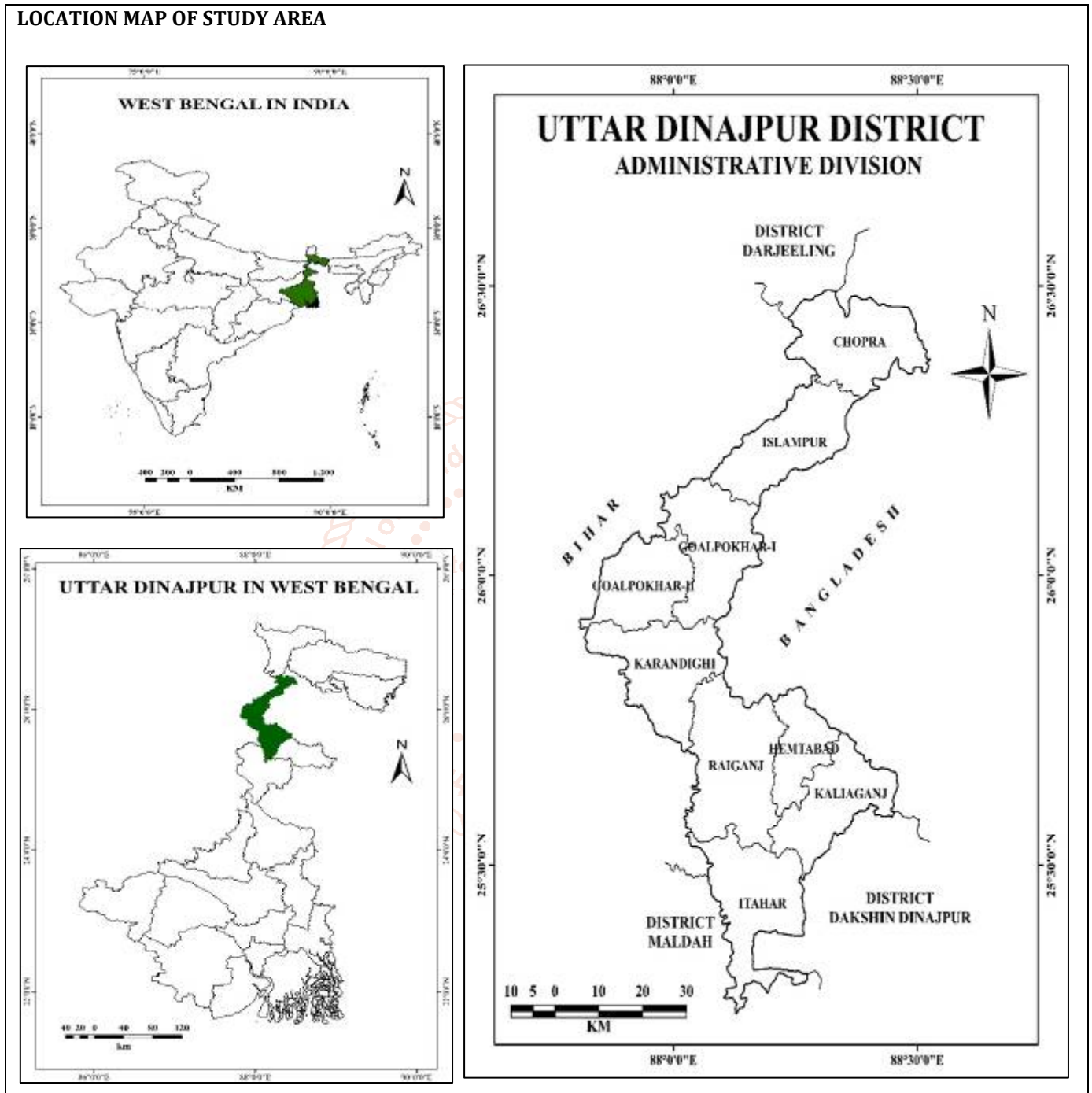


Fig: 1

**DATABASE AND METHODOLOGY:**

The present study is based on secondary sources data. The secondary data has been collected from the District Statistical Handbooks, District Census Handbook, Census of India, Village Directory, 2011. In the present study, both qualitative and quantitative method has been used

The qualitative method refers to the analysis based on empirical observations, and the quantitative method is based on the use of statistical techniques, which are as follows.

- Mather’s Model of Mean Spacing:

$$D = 1.0746 \sqrt{A/N}$$

Where, D = theoretical distance between points of settlements in hexagonal arrangement, or mean spacing in unit length.

A = area of given region  
 N = number of settlements in a given region.  
 1.0746 = Spacing constant.

➤ Rule of Computing Gini's Coefficient of Concentration is as follows:

$$Gi = \frac{1}{10,000} \sum_{i=1}^N (xi \cdot yi + 1) - (xi + 1 \cdot yi)$$

Where,

xi = the cumulative percentage distribution of attribute x.

yi = the cumulative percentage distribution of attribute y.

N = the number of observations.

Gi = Gini's Coefficient Ratio (the relation between the area of the triangle formed between the line of equal distribution and the y axis, and the area is lying between the curve and the line of equal distribution).

The causal relationship between dependent and independent variables has been examined by Karl Pearson's coefficient of correlation and linear regression methods. The testing of hypothesis and finding of the level of significance of the correlation between the variable has been analysed using student's 't' test.

➤ Karl Pearson's coefficient of correlation:

$$r = \frac{\sum xy - \frac{\sum x \sum y}{N}}{\sqrt{\sum x^2 - \frac{(\sum x)^2}{N}} \sqrt{\sum y^2 - \frac{(\sum y)^2}{N}}}$$

Where, r = coefficient of correlation.

x and y are independent and dependent variables.

N = number of observation.

**GROWTH OF SETTLEMENTS:**

Growth of settlements basically refers to the change in the number of settlement between two successive time periods. As per the available data and computed statistics of settlements of Uttar Dinajpur District (Table.1 and Figure.2), it has been seen that there is a rapid range of growth of settlements i.e., 35.99 per cent from 1951 to 1961. There is fluctuating trend of growth of settlements i.e., 1.4 per cent from 1961 to 1971. After that, there is negative decadal growth of settlements i.e., -4.28 per cent from 1971 to 1981. There has been positive growth settlements has been observed i.e., 0.3 per cent from 1981 to 1991. After that, the district observed a highest negative growth i.e., -51.42 per cent from 1991 to 2001, because of the district has been divided into two parts in 1992 by the names of Uttar Dinajpur and Dakshin Dinajpur. It has recorded the growth rate of 0.1 per cent during the last decade i.e., 2001 to 2011. According to Census of India, 2011, there is 9 urban Centre in the District.

**Table: 1 Uttar Dinajpur District: Growth of Settlements (Rural and Urban), 1951-2011**

Census Year	No. of Settlement	Decadal Growth in (%)
1951	2306	0
1961	3136	35.99
1971	3180	1.4
1981	3044	-4.28
1991	3053	0.3
2001	1483	-51.42
2011	1484	-0.1

Source: Computed from Census of India, 2011

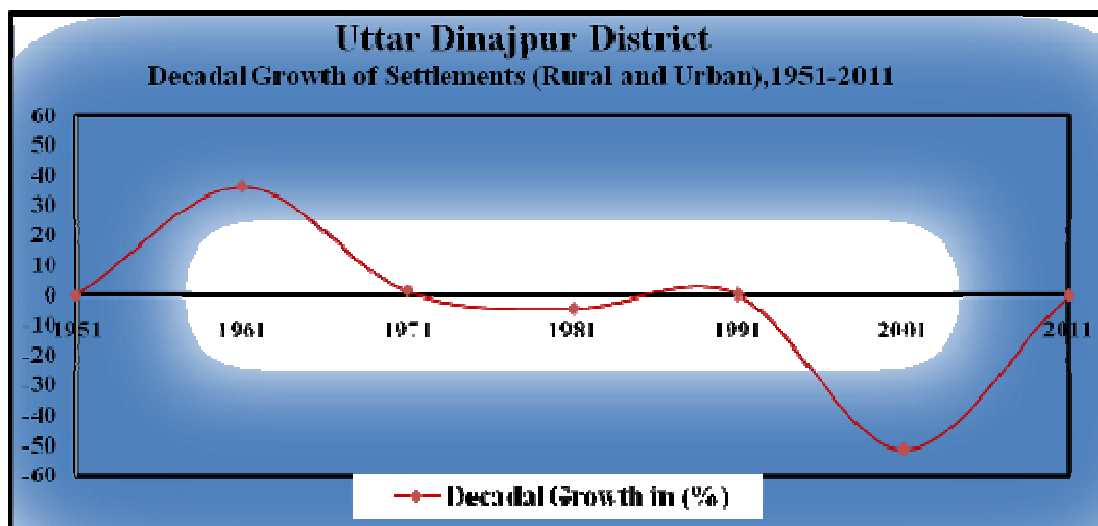


Fig: 2

**DISTRIBUTION OF SETTLEMENTS AND POPULATION:**

Table.2 and fig.3. clearly show the block-wise distribution of settlements in different population size group. Among the total blocks, the maximum number of settlements (15.09 per cent) has been found in Raiganj block followed by Itahar block (14.82 per cent) which accounts 20.41 per cent and 10.10 per cent of the population respectively. The minimum number of settlements (6.87 per cent) has been found in Islampur block with 12.07 per cent of the total population in the district. The study also reveals that the Islampur block do not have very small size of settlements with a population less than 200 persons. While only Hemtabad block do not have overgrowth settlements with the population more than 5000 persons. The percentage of the settlement of very small settlements varies from zero in Islampur to 8.18 per cent in Itahar block. In the same way the proportion of settlement of overgrowth settlements varies from zero in Hemtabad block to 17.65 in Islampur block. Similarly, the disparity between the different categories has also been recorded among the different blocks of the district. Thus the study reveals that the distribution of settlements in different population size groups and in different blocks has been recorded uneven in the district.

Table.3 shows the distribution of settlements and population in different population size groups in the district. The table reveals that, 3.84 per cent of the total settlements are very small in size which are inhabited by less than 200 in each and accounts for 0.21 per cent of the total population. In the district 22 overgrowth settlements (1.48 per cent) are found with their size of the population above 10,000 persons in each and accounts for 18.01 per cent of the total population. There are 366 settlements (24.66 per cent) with their size of population ranging from 500 to 999 persons and share only 8.95 per cent of the total population of the district. Besides, 451 settlements (30.39 per cent) with population size group 1000 to 1999 persons and accommodate 21.48 per cent of the total population. The study also reveals that more than 70 per cent of the settlements with population size group less than 2000 persons in each and accounts for only 32.67 per cent of the total population. However, 18.01 per cent population resides in only 4.51 per cent of the settlements with population size group of more than 5000 in each.

It is one of the important features that only 12.05 per cent population are living in nine different urban areas (census of India, 2011). Among the nine urban centres four urban centres having the municipality i.e., Raiganj is the biggest urban centre with the population of 183612 persons followed by Islampur (54340 persons), Kaliaganj (53530 persons) and Dalkhola (36930 persons) and five non-municipality urban centres i.e., Kasba (10067 persons), Itahar (6022 persons), Nachhratpur Katabari (6011 persons), Hanskunda (5939 persons) and Chopra (5777 persons) are census town (census of India, 2011).

**Table: 2 Uttar Dinajpur District: Block Wise Distribution of Settlement in Different Population Size Groups, 2011**

Block s	Tota l No. of Settl ement	% of settle ment in Distri ct	No. of Populatio n	Populatio n % of Distri ct	Very Small Settlements		Small Settlements		Medium Settlements		Large Settlements		Very Large Settlements		Over Growth Settlements	
					No. of Settlement below 200 Persons		No. of Settlement 200-499 persons		No. of Settlement 500-999 persons		No of Settlement 1000-1999 persons		No. of Settlement 2000-4999 persons		No. of Settlement above 5000 Persons	
					No. of Settlement s	% of Block s	No. of Settleme nts	% of Block s	No. of Settleme nts	% of Block s	No. of Settleme nts	% of Block s	No. of Settle ment	% of Block s	No. of Settle ment	% of Block s
Chopra	117	7.88	284403	9.46	9	7.76	14	11.97	23	19.66	25	21.37	31	26.50	15	12.82
Islampur	102	6.87	362858	12.07	0	0.00	8	7.84	16	15.69	28	27.45	32	31.37	18	17.65
Goalpokhar-I	145	9.77	326120	10.84	3	2.07	13	8.97	31	21.38	38	26.21	46	31.72	14	9.66
Goalpokhar-II	169	11.39	291252	9.69	4	2.37	16	9.47	40	23.67	66	39.05	37	21.89	6	3.55
Karandighi	201	13.54	405262	13.48	6	2.99	17	8.46	44	21.89	67	33.33	55	27.36	12	5.97
Raiganj	224	15.09	613833	20.41	5	2.23	20	8.93	50	22.32	71	31.70	61	27.23	17	7.59
Hemtabad	114	7.68	142056	4.72	6	5.26	16	14.04	36	31.58	37	32.46	19	16.67	0	0.00
Kaliaganj	192	12.94	277672	9.23	6	3.13	39	20.31	63	32.81	57	29.69	24	12.50	3	1.56
Itahar	220	14.82	303678	10.10	18	8.18	29	13.18	63	28.64	62	28.18	44	20.00	4	1.82
Total	1484	100	3007134	100	57	3.84	172	11.59	366	24.66	451	30.39	349	23.52	89	6.00

Source: Computed from Census of India, 2011, Village Directory, 2011

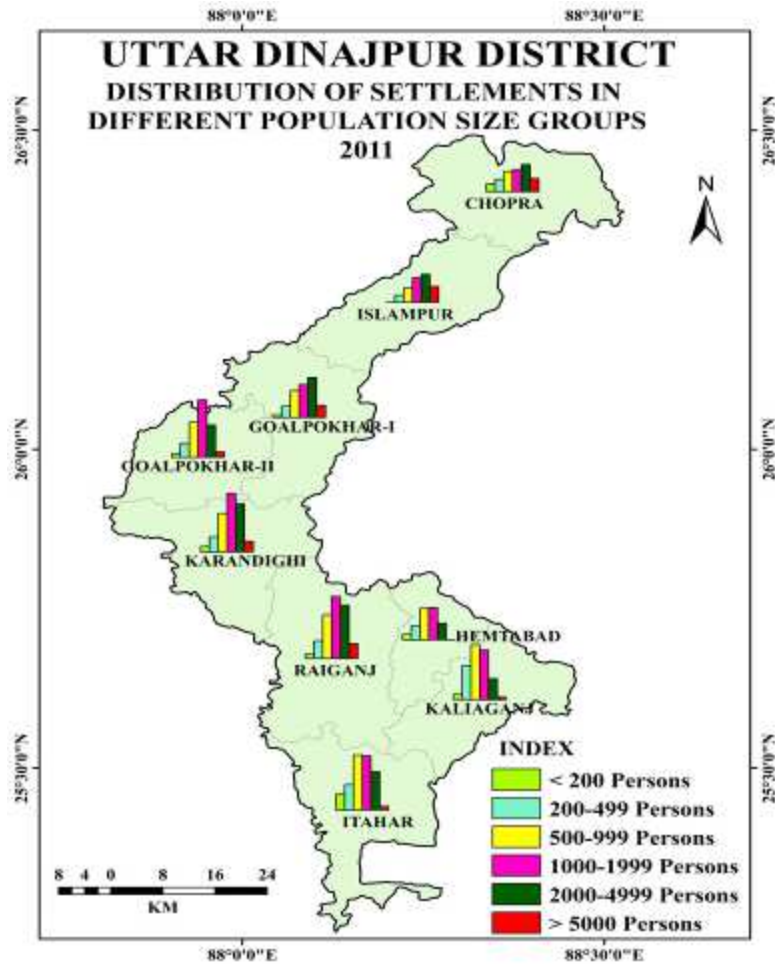


Fig: 3

Fig.4 clearly shows the cumulative percentage of settlements and population in different population size groups in Uttar Dinajpur district. It reveals that in term of population size group, the settlements and population distributed disproportionately.

Table: 3 Uttar Dinajpur District: Distribution of Settlements and Population-based on Population Size Groups, 2011

Population Size Group(Persons)	Settlements			Population		
	No.	Percent	Cumulative Percent	No.	Percent	Cumulative Percent
Below 200	57	3.84	3.84	6325	0.21	0.21
200-499	172	11.59	15.43	61052	2.03	2.24
500-999	366	24.66	40.09	269050	8.95	11.19
1000-1999	451	30.39	70.49	646003	21.48	32.67
2000-4999	349	23.52	94.00	1053653	35.04	67.71
5000-9999	67	4.51	98.52	429494	14.28	81.99
10000 & above	22	1.48	100.00	541557	18.01	100.00
Total	1484	100.00	100	3007134	100.00	100

Source: Computed from Census of India, District Census Handbook, Village Directory, 2011

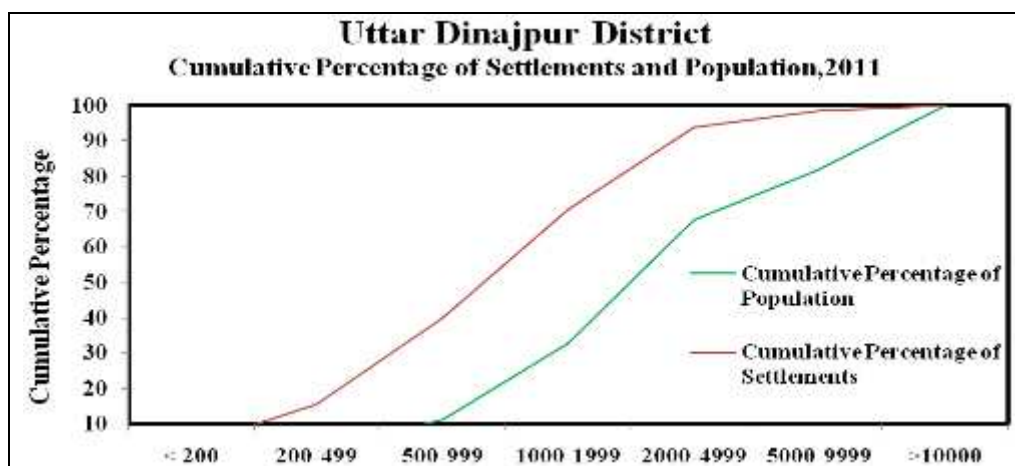


Fig: 4

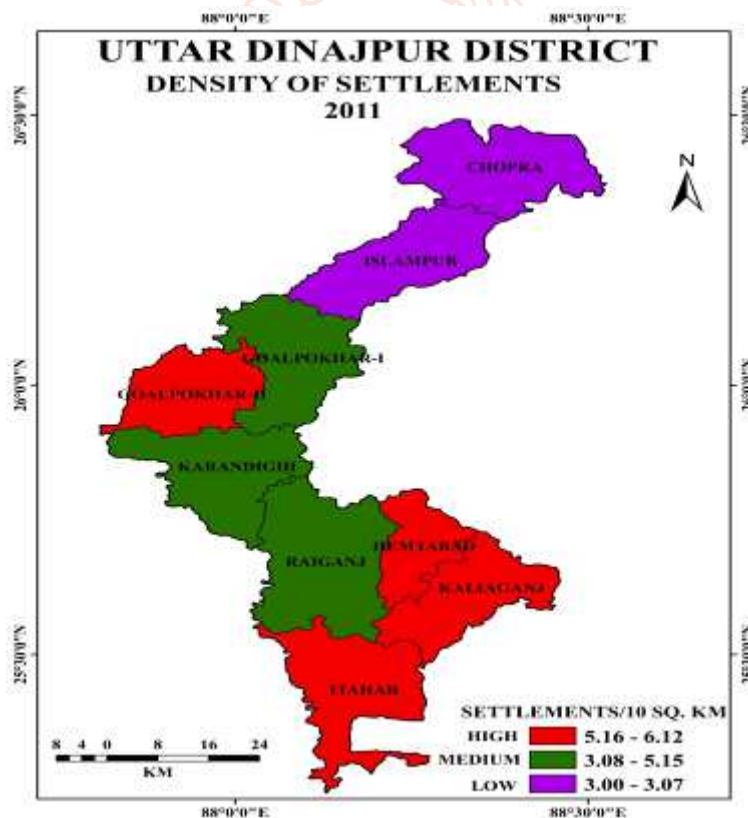
**DENSITY AND SIZE OF SETTLEMENTS (IN TERM OF POPULATION AND AREA):**

Density and size of settlements are intimately related to spacing. It is said that with the decrease in density of settlements tend to increase in the distance between the settlements. The density and size of settlements is one of the important aspects of the spatial organization of settlements for the formulation of micro-level planning of a region. In the present analysis shows the density of settlements at per 10 sq. km. Table.4 and fig. 5 reveals that the average density of settlements in Uttar Dinajpur district is 4.75 at per 10 sq. km. The study also shows that highest density of settlements have been found in Kaliaganj block (6.12 settlements), followed by Hemtabad (5.94 settlements), Itahar (5.91 settlements), and Goalpokar-II (5.66 settlements). Whereas, medium density of settlements has been recorded in the three blocks i.e., Karandighi (5.15 settlements), Raiganj (4.64 settlements), and Goalpokhar-I (4.08 settlements). The low density of settlements has only been recorded in Chopra (3.07 settlements) and Islampur (3.0 settlements).

**Table: 4 Uttar Dinajpur District: Density of Settlements,2011**

BLOCK	Area(sq. km)	No. of Settlements	Density of settlements (Settlements/10 sq. km)
CHOPRA	381.03	117	3.07
ISLAMPUR	340.50	102	3.00
GOALPOKHAR-I	355.11	145	4.08
GOALPOKHAR-II	298.73	169	5.66
KARANDIGHI	390.65	201	5.15
RAIGANJ	482.89	224	4.64
HEMTABAD	191.84	114	5.94
KALIAGANJ	313.60	192	6.12
ITAHAR	372.54	220	5.91
TOTAL	3126.89	1484	4.75

Source: Computed from Census of India, District Census Handbook, Village Directory, 2011



**Fig: 5**

**Table: 5 Uttar Dinajpur District: Block wise Distribution of Average Area Per Settlement, 2011**

BLOCK	Area (Sq.Km)	No. of Settlements	Average area Per Settlement (Sq. Km)
CHOPRA	381.03	117	3.26
ISLAMPUR	340.50	102	3.34
GOALPOKHAR-I	355.11	145	2.45
GOALPOKHAR-II	298.73	169	1.77
KARANDIGHI	390.65	201	1.94
RAIGANJ	482.89	224	2.16
HEMTABAD	191.84	114	1.68
KALIAGANJ	313.60	192	1.63
ITAHAR	372.54	220	1.69
TOTAL	3126.89	1484	2.11

Source: Computed from Census of India, District Census Handbook, Village Directory, 2011

Table.5 and fig.6 shows the block-wise distribution of the average size of settlements (sq. km) in Uttar Dinajpur district. The average space size of settlements is 2.11(sq. km). The highest average size of settlements has been recorded in Islampur(3.34 sq. km), followed by Chopra(3.26 sq. km). Whereas the lowest average size of settlements found in Goalpokhar-II (1.77 sq. km), Karandighi (1.94 sq. km), Itahar(1.69 sq. km). Hemtabad (1.68 sq. km) and Kaliaganj(1.63 sq. km). The medium average size of settlements has been observed in only Goalpokhar-I(2.45 sq. km) and Raiganj(2.16 sq. km).

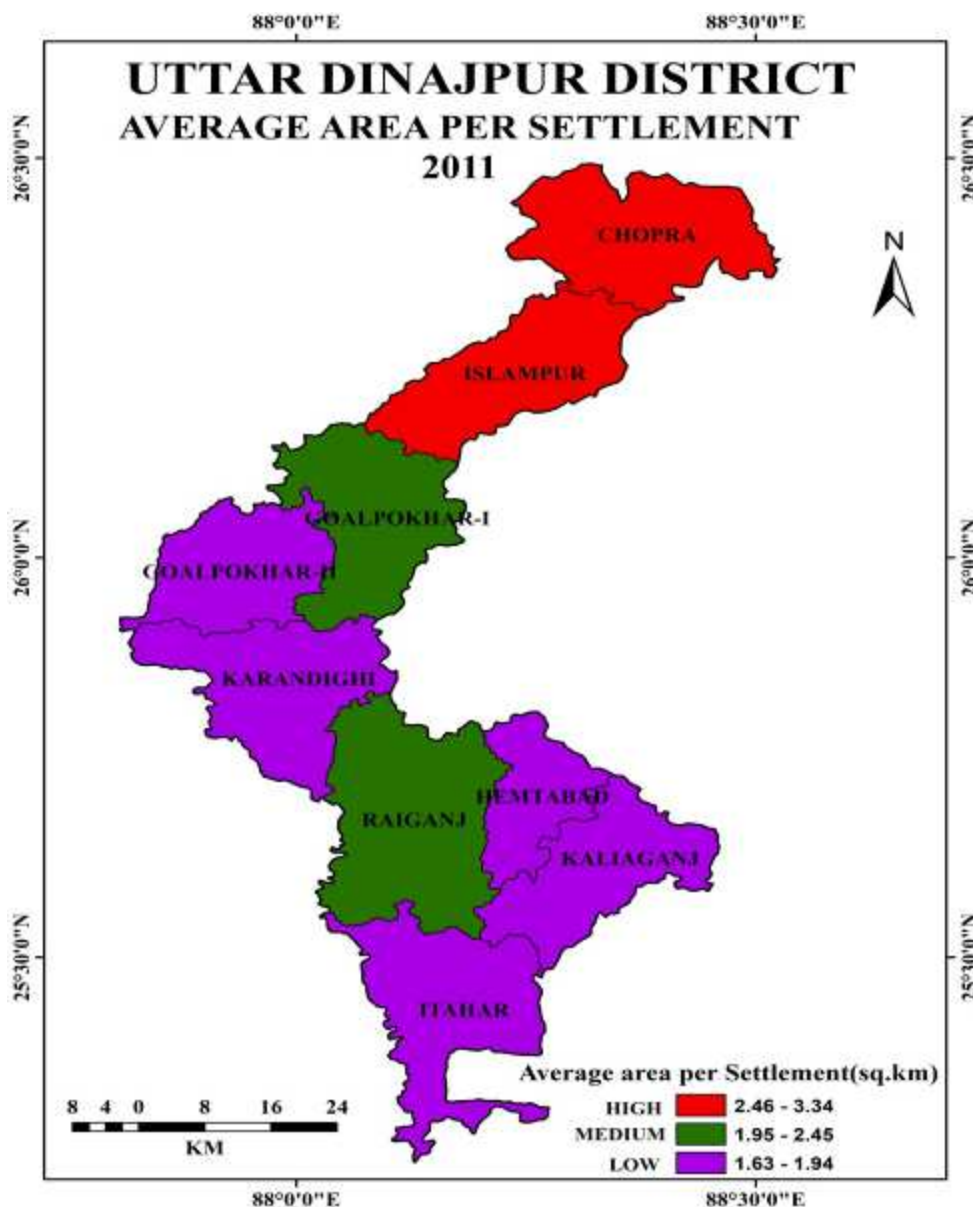


Fig: 6

Table: 6 Block wise Distribution of Average Population per Settlement, 2011

BLOCK	Population	No. of Settlement	Average Per Settlement Population
CHOPRA	284403	117	2431
ISLAMPUR	362858	102	3558
GOALPOKHAR-I	326120	145	2250
GOALPOKHAR-II	291252	169	1723
KARANDIGHI	405262	201	2016
RAIGANJ	613833	224	2740
HEMTABAD	142056	114	1246
KALIAGANJ	277672	192	1446
ITAHAR	303678	220	1380
TOTAL	3007134	1484	2026

Source: Computed from Census of India, District Census Handbook, Village Directory, 2011

Table.6 and fig. 7 clearly shows the block-wise distribution of population per settlements in Uttar Dinajpur district. The average size of population per settlements in the district is 2026 persons. The highest average size of population per settlements has been recorded only in Islampur block (3558 persons). Whereas, the lowest size of population per settlements observed in Goalpokhar-II(1723 persons), Kaliaganj(1446 persons), Itahar(1380 persons) and Hemtabad(1246 persons). The medium average size of the population recorded in Chopra (2431 persons), Goalpokhar-I (2250 persons), Karandighi(2016 persons) and Raiganj(2740 persons).

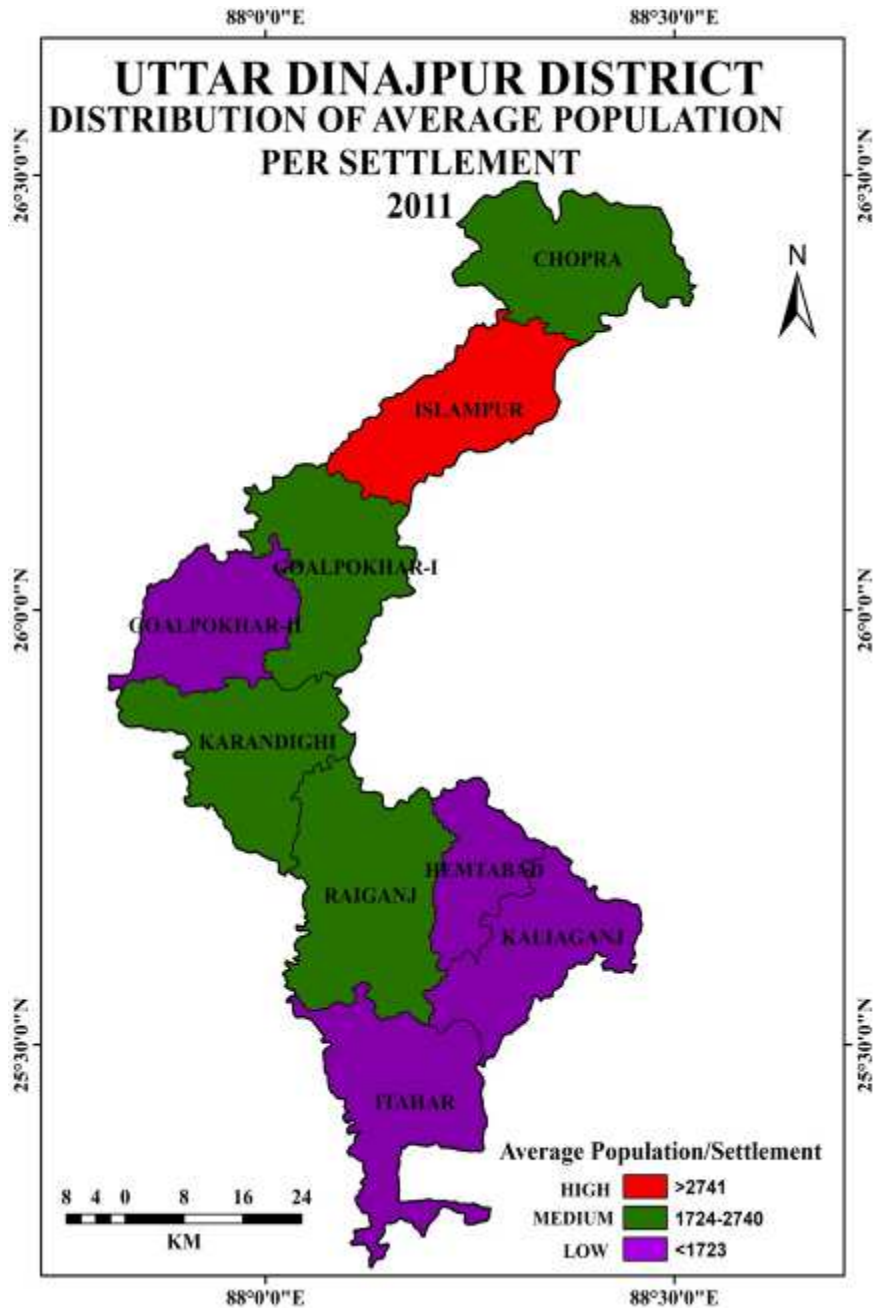


Fig. 7

**Relationship between Density and Size of Settlements:**

By applying the Karl Pearson’s correlation technique, analysis shows that there is high degree of negative correlation ( $r = -0.984$ ) between density and the average size of settlements (in terms of area) which is significant at 1 per cent level at 8 degree of freedom. The regression equation,  $Y = -0.5391x + 4.8229$  shows the best fit regression line (Fig.8) to determine their linear relationship. Besides, there is a negative correlation ( $-0.875$ ) between the density and average size of the population. The equation,  $Y = -537.57x + 4689.7$  gives the best-fit regression line to determine their linear relationship (Fig.9). The study shows that there is an inverse relationship between the density and size of settlements.

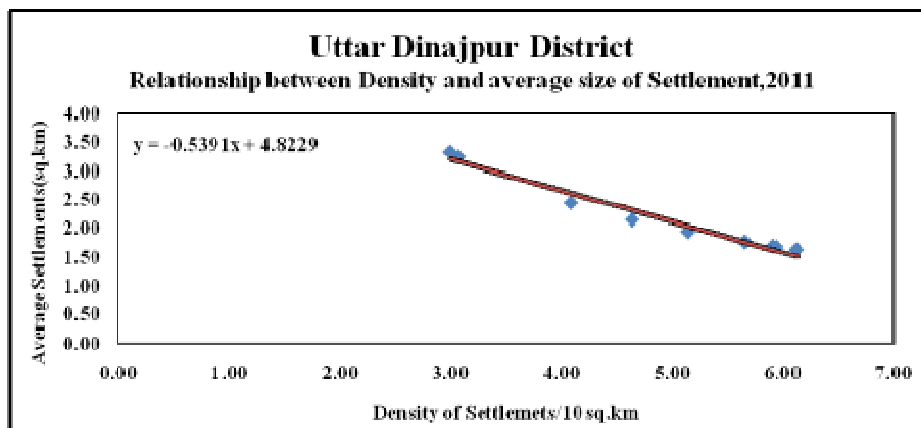


Fig: 8



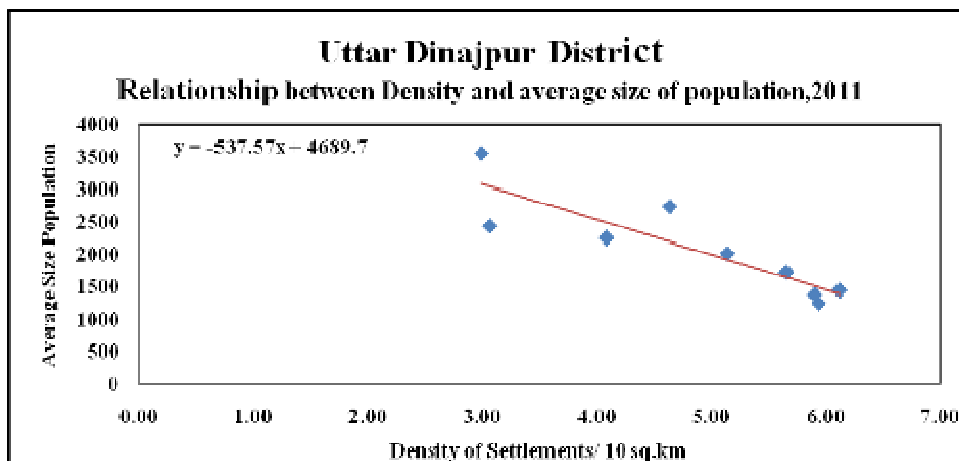


Fig: 9

**COEFFICIENT OF CONCENTRATION OF SETTLEMENTS:**

Gini’s model of the coefficient of concentration ratio has been used to understand the nature of settlement and population concentration in different size of settlements. In this technique, the overall concentration is measured numerically in terms of the ratio. According to this method, when the entire population is concentrated at a point the ratio become unity, i.e., 1 and moving of this ratio from unity to zero explain the distribution pattern is approaching to the uniform. When the ratio is zero, the distribution pattern is completely uniform. Table.7 clearly shows the concentration ratio of settlements in Uttar Dinajpur district, taking block as the study unit and The Gi value is 0.11, which means approaching towards the uniform distribution of settlements in the study area. Whereas Table. 8 show the population concentration among the different size group of settlements, and the Gi value is 0.16 indicate that the population is unevenly distributed in the district.

**Table: 7 Uttar Dinajpur District: Coefficient of concentration of settlements, 2011**

Block	No. of Settlements	Area (sq. km)	Percent to		Cumulative Percentage		xi.yi+1	xi+1.yi
			Total settlements (x)	Total area (y)	x	y		
Chopra	117	381.03	7.88	12.19	7.88	12.19	181.87	179.84
Islampur	102	340.50	6.87	10.89	14.75	23.08	508.05	566.00
Goalpokhar-I	145	355.11	9.77	11.36	24.52	34.44	1078.81	1236.68
Goalpokhar-II	169	298.73	11.39	9.55	35.91	43.99	2028.43	2175.59
Karandighi	201	390.65	13.54	12.49	49.46	56.48	3557.23	3646.04
Raiganj	224	482.89	15.09	15.44	64.55	71.93	5038.94	5195.44
Hemtabad	114	191.84	7.68	6.14	72.23	78.06	6363.04	6648.56
Kaliaganj	192	313.60	12.94	10.03	85.17	88.09	8517.49	8808.67
Itahar	220	372.54	14.82	11.91	100.00	100.00	0.00	0.00
Total	1484	3126.89	100	100	-	-	27273.85	28456.82

$$Gi = \frac{1}{10,000} \sum_{i=1}^N (xi \cdot yi + 1) - (xi + 1 \cdot yi) = 0.11$$

Source: Computed from Census of India, District Census Handbook, Village Directory, 2011

**Table: 8 Uttar Dinajpur District: Coefficient and Concentration of Settlements by Size Groups of Population, 2011**

Pop Size Group of settlements	No. of Settlements	Total population	Percent to total settlements (x)	Percent to total population (y)	Cumulative percentage	xi.yi+1	xi+1.yi	
					x	y		
Below 200	57	6325	3.84	0.21	3.84	0.21	8.60	3.24
200-499	172	61052	11.59	2.03	15.43	2.24	172.62	89.82
500-999	366	269050	24.66	8.95	40.09	11.19	1309.84	788.53
1000-1999	451	646003	30.39	21.48	70.48	32.67	4772.35	3071.00
2000-4999	349	1053653	23.52	35.04	94.00	67.71	7707.26	6670.37
5000-9999	67	429494	4.51	14.28	98.52	81.99	9851.62	8198.98
10000& above	22	541557	1.48	18.01	100.00	100.00	0.00	0.00
Total	1484	3007134	100.00	100.00	-	-	0.00	0.00

$$Gi = \frac{1}{10,000} \sum_{i=1}^N (xi \cdot yi + 1) - (xi + 1 \cdot yi) = 0.16$$

Source: Computed from Census of India, District Census Handbook, Village Directory, 2011

**SPACING OF SETTLEMENTS:**

Spacing is one of the important characteristics of settlements. It is a dynamic phenomenon, subject to change over space and time. The different types of factors like physico-cultural and historical factors are responsible for the distinctive pattern of spacing of settlements. ‘Spacing is mainly defined as the locational arrangement of villages with respect to one another. Generally speaking, spacing refers to the average distance at which settlements of a region are located and their functions distributed (Mukherjee, 1975)’. In the present study, spacing of settlements has been measured by using E. C. Mother’s model of mean spacing, who studied the Linear-Distance map of farm population in United States of America.

**Table: 9 Uttar Dinajpur District: Mean Spacing of Settlements, 2011**

BLOCK	Area(sq. km)	No. of Settlements	Mean Spacing
CHOPRA	381.03	117	1.94
ISLAMPUR	340.50	102	1.96
GOALPOKHAR-I	355.11	145	1.68
GOALPOKHAR-II	298.73	169	1.43
KARANDIGHI	390.65	201	1.50
RAIGANJ	482.89	224	1.58
HEMTABAD	191.84	114	1.39
KALIAGANJ	313.60	192	1.37
ITAHAR	372.54	220	1.40
TOTAL	3126.89	1484	1.56

Source: Computed from Census of India, District Census Handbook, Village Directory, 2011

Table.9 analysis shows the mean spacing of settlements in Uttar Dinajpur district by taking block as the unit of study. The mean spacing of settlements in the district is 1.56 km and the highest and lowest spacing of settlements are observed in Islampur (1.96 km) and Hemtabad (1.39 km) blocks respectively. On the basis of the mean spacing of settlement, the blocks of Uttar Dinajpur has been divided into three categories(Fig.10) i.e., high spacing , medium spacing and low spacing.

**High Spacing (1, 69-1.96 km):**

The high spacing of settlements has been found in northernmost part of the districts, i.e., Chopra(1.94 km) and Islampur Blocks(1.96 km), because of the lack of transport and communication, poor irrigation facilities. Therefore, the spacing of settlements in these blocks is high and the density per ten sq. km, as well as the population per settlements, is also high. As far as the number of settlements is concern, the lowest number of settlements is observed in the blocks.

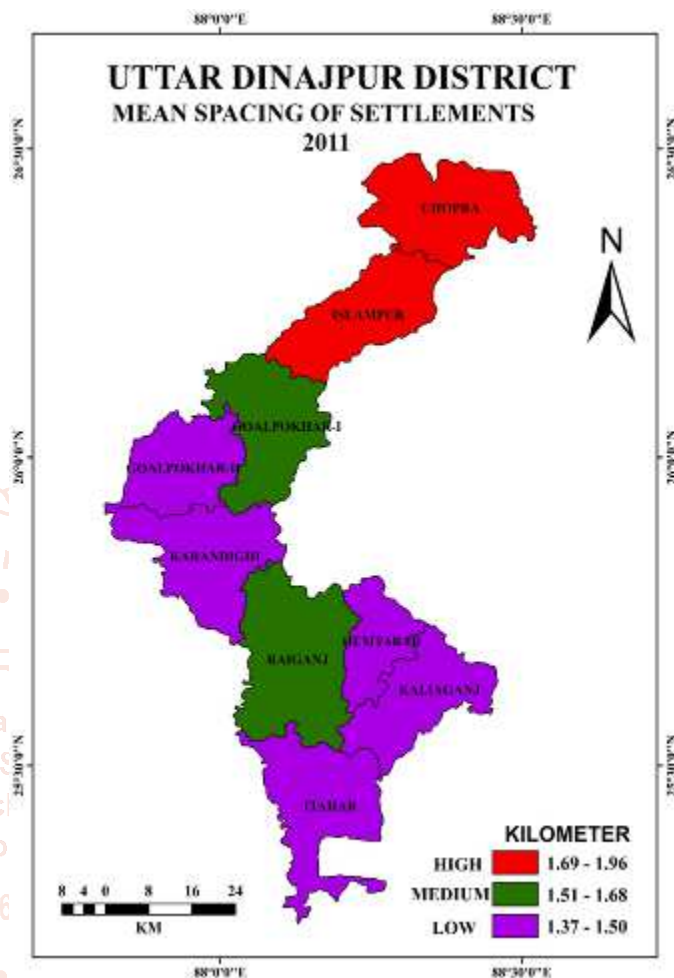
**Medium Spacing (1.51-1.68):**

The medium spacing of settlements has been recorded in Goalpokhar-I (1.68 km) and Raiganj (1.58 km) blocks, because of the number settlements as well as area are high and transportation, communication, irrigation, and others infrastructural facilities lead to the moderate spacing of settlements in these blocks.

**Low Spacing (1.37-1.50):**

The low spacing of settlements shows in five blocks of the district, such as Goalpokhar-II (1.43 km), Karandighi (1.50

km), Hemtabad (1.39 km), Kaliaganj (1.37 km), and Itahar (1.40 km). These low spacing settlements are found in Middle Western, southern and southeastern. The developments of irrigation facilities lead to the low spacing of settlements in these blocks as well as the transport, communication and fertile soil also responsible for the low spacing of settlements in these blocks.



**Fig.10**

**RELATIONSHIP BETWEEN MEAN SPACING AND MEAN SIZE OF SETTLEMENTS:**

Karl Pearson’s correlation and regression analysis is used for the verification of hypothesis that spacing is a function of the size of the settlements. The causal relationship of mean spacing of settlements (in km) independent variable being the ‘X’, while the dependant variable i.e., mean size of settlements by population being ‘Y<sub>1</sub>’, and mean size of settlements by the area being ‘Y<sub>2</sub>’, has been examined by taking blocks as the unit of study. Table.10 shows that both the independent and dependent variable(X) and dependent variable(Y<sub>1</sub>) reveals the high degree of positive correlation (r = 0.8545) at 1 per cent level of significance as well as the correlation between X and (Y<sub>2</sub>) is positively correlated (r = 0.9989) at 1 per cent level of significance.

The regression equation, y = 2.9031x-2.3833 shows the best fit regression line(Fig.11) to determine the linear relationship between mean spacing and mean size of settlements in sq. km., While y = 27.763x-23.08 (Fig.12) determine the linear relationship between mean spacing and mean size of settlements in term of the number of population in the district.

**Table: 10 Uttar Dinajpur District: Correlation (r) between Spacing and Size of Settlements, 2011**

BLOCK	Mean Spacing (X)	Mean Size of Settlements ('00 Persons) (Y <sub>1</sub> )	Mean Size of Settlements (sq.km)(Y <sub>2</sub> )
CHOPRA	1.94	24.31	3.26
ISLAMPUR	1.96	35.58	3.34
GOALPOKHAR-I	1.68	22.5	2.45
GOALPOKHAR-II	1.43	17.23	1.77
KARANDIGHI	1.5	20.16	1.94
RAIGANJ	1.58	27.4	2.16
HEMTABAD	1.39	12.46	1.68
KALIAGANJ	1.37	14.46	1.63
ITAHAR	1.4	13.8	1.69
TOTAL	14.25	187.9	19.92
COMPUTED		r = 0.8545	R = 0.9989

Source: Computed by Researcher.

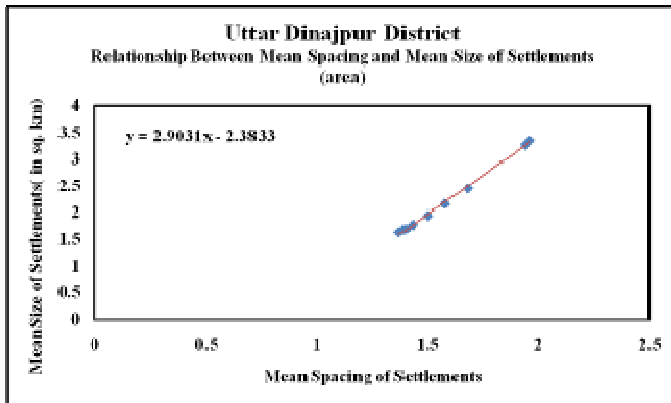


Fig.11

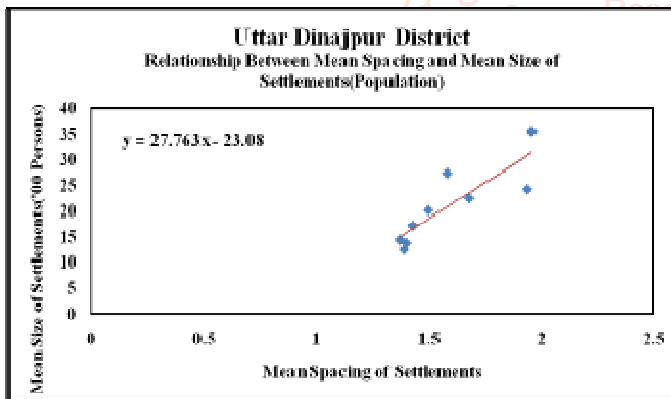


Fig.12

**CONCLUSION:**

In the present study an attempt has been made to show the Spatio-temporal analysis of human settlements in Uttar Dinajpur district and density of settlements in relation to area and population as well as mean spacing of settlements has been analysed at the blocks level. The analysis show that there is high degree of negative correlation between the density and average size of the settlement and average size of the population. From the above studies it is observed that where spacing is high, the settlements are of big sizes of both populations as well as area. On the other hand, whereas low spacing with the small size of settlements shows the scattered pattern of distribution in Uttar Dinajpur district. Settlement plays a crucial role in both directional as well as locational planning. Micro-level study of settlements helps in locational new function in the study area as well as it helps in equal distribution of socio-economic facilities. The present

study also helpful for the regional planner, department of planning government of West Bengal as well as NITI (National Institution for Transforming India) Aayog.

**REFERENCES:**

- [1] Husain, M., *Human Geography*, Rawat Publication, Jaipur, 2011, P.303.
- [2] Husain, M., *Concise Geography*, McGraw Hill Education (India) Private Limited, New Delhi, 2011, P.7.1.
- [3] Morrill, R. L., *Spatial organization of Society*, 2nd edition, Duxburg press, Belmont, 1974, P.260.
- [4] Hermansen, T., *Spatial organization and economic development*, Development Studies, No. 1, Institute of Development Studies, University of Mysore, 1971, P.7.
- [5] Singh, R. L. (1961), 'Meaning, Objective and Scope of Settlements Geography', *National Geographical Journal of India*, Vol. 7, P.12
- [6] Mather, E. C., (1944), 'A Linear Distance Map of Farm Population in the U.S', *Annals of the Association of American Geographer*, Vol.34, pp.173-180.
- [7] Mukherjee, A. B., 'Spacing of Rural Settlements in Rajasthan: A Spatial Analysis', in Singh, R.L., et al. (ed.) 'Readings in Rural Settlements of Geography', *National Geographical Society of India*, Varanasi, 1975, pp. 252-268
- [8] Mukerji, A. B., (1970) 'Spacing of Rural Settlement in Rajasthan: A Spatial Analysis', *Geographical View Point*, Vol. 1, pp.1-10.
- [9] Census of India, 2011, District Census Handbook, Village and Town Directory.
- [10] Monkhouse, F. J., (1965), *A Dictionary of Geography*, Chicago, pp. 346-355.
- [11] Schaefer, F. K., *Exceptionalism in Geography*, *Annals of Association of American Geographers*, Vol.55, 1953, pp. 549-577.
- [12] Ahmad, A. and Ali, M. Julfikar., 'Quantitative Analysis of Settlements in Malda District: A Study of Geographical Dimension', *the Geographer*, Vol.52, No.01, 2005, pp. 80-92.
- [13] Hoque, Jiyaul and Hashmi, S. N. I., (2020), 'Regional Desparity in the Levels of Educational Development in Uttar Dinajpur District of West Bengal, India', *IJSRD*, Vol.8, Issue.1, pp. 77-81.
- [14] Khan, S. and Ahmad, A., (2013), *Hierarchy of Rural Settlements: A Strategy for Balance Regional Development in Aligarh District*, *IJSR*, Vol.2, Issue.9, pp. 194-197.
- [15] Amani, A. Z. and Ansari, S. H. (1982), 'Spatial Analysis of Settlements in Ghazipur District, U.P', *The Geographer*, Vol.29, No.2, pp.36-46.

**APPENDIX**

\*3140 is the total geographical area of the district, but according to the District Census Handbook, Uttara Dinajpur, 2011, (Part B, P. 20.) when area under different C.D blocks, municipalities and CT are added together the total area of the district stands at 3126.89 sq.km. In the present study, the analysis in term of area at block level the mention area value i.e., 3126.89 sq.km in respective census hand book has been considered. The area 3140 has not been considered in the present study.