

# Spatial Organization of Settlements: A Case Study of Hathras District, Uttar Pradesh, India



## Geography

**KEYWORDS :** Spatial organization, Settlement, Distribution

Sana

Research Scholar (Corresponding Author), Department of Geography, Aligarh Muslim University, Aligarh, 202002, Uttar Pradesh (India)

Ateeque Ahmad

Professor, Department of Geography, Aligarh Muslim University, Aligarh, 202002, Uttar Pradesh (India)

### ABSTRACT

The word 'settlement', in its broad sense denotes the humanization of physical milieu. In settlement geography, it is defined as a cluster or a group of man-made houses and associated structures of various types. The term 'spatial organization' the fundamental concept is used in a broad sense. It means organization of space or interrelated locations of things and activities. The present paper examines spatial organization of settlement in Hathras district. The study is based on the district level compiled from secondary sources of data and statistical techniques have been used to find an uneven distribution of settlement in the district.

### INTRODUCTION

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. It occupy a very small percentage of the earth surface but exert a far greater influence on the world's culture. Infact settlement in any particular region reflects man's relationship with his natural environment. Geographically speaking, the study of the growth, size, and space patterns of settlements on the one hand, and the functional structure on the other, are the two important aspects for identifying the state of spatial organization of settlements of a region, area or country.

The study of spatial organization of settlements was founded by Demangeon (1920) who developed the concept of spatial organization in terms of spatial morphological structure and produced regional classification of rural settlements types.

Schaefer (1953) initiated the study of spatial organization of phenomena in modern trend. The significance of the settlement study refers to provides better understanding for the location and employment of new facilities, close interrelation between spatial structure and gives comprehensive evolution of condition for better quality of life regarding housing, sanitation and environment as a whole. In the initial stages settlement features bear simple forms and have close relationship with the environment.

### Data base and methodology

The present paper examine the nature of spatial distribution of settlement in Hathras district (25°27'N to 26°11'N latitudes and 75°26'E to 76°37'E longitudes) located in the north western part of Ganga Yamuna doab of the state of Uttar Pradesh. The study is based on secondary sources of data. It has been collected through census record (2001), District statistical magazine (2001) etc. The

methodological principles adopted for the present study is both qualitative and quantitative. They are as follows.

- i) For examine the distribution of settlements and population based on density and average space size of settlements has been used.
- ii) To analyze the relationship between density and space size of settlements using Karl Pearson's technique of coefficient of concentration
- iii) Mean spacing of settlement has been estimated on the bases of Mather's model of mean spacing, which is as follows.  
 $D = 1.0746 \sqrt{A/N}$

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

A= area of given region

N= number of settlement in a given region

1.0746= spacing constant

### RESULTS AND DISCUSSION

#### Density and Size of settlement:

Density of settlement is a better measure for understanding the variation in the distribution of settlement. In the present study the analysis of density of settlement is based on the number of settlements at per 10 sq. km. The analysis reveals that the district has 3.61 average settlements at per 10 sq. km. and average space size of settlement is 2.77sq.km respectively (Table 1)

Hathras district

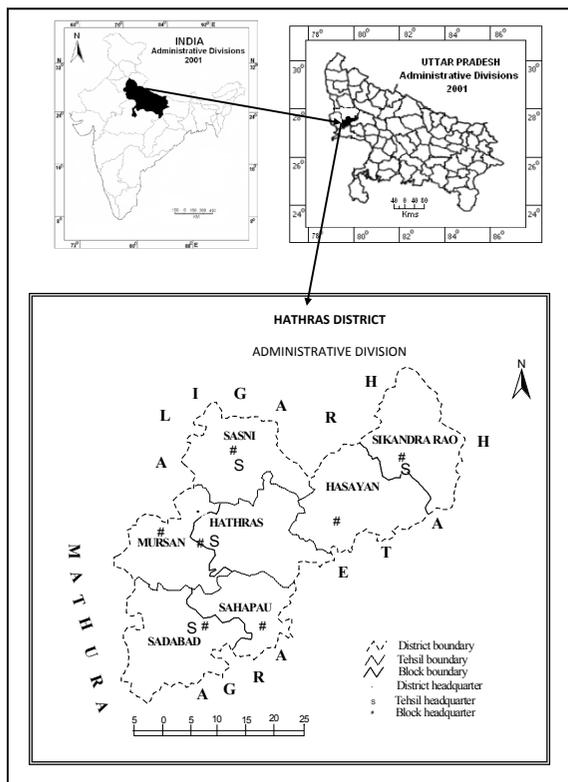


Fig 1

**Table 1: Density and Space size of settlement 2001**

Block	Density of settlement/10 sq km	Average space size of settlements (area in sq. km.)
Sasni	4.33	2.31
Sikandra rao	2.55	3.92
Hasyan	3.06	3.26
Hathras	3.73	2.68
Mursan	6.32	1.58
Sadabad	2.43	4.12
Sahapau	3.38	2.96
Hathras district	3.61	2.77

Source: Computed from census of India, District census hand book, village directory 2001

Among blocks Mursan show highest density of settlements (6.32 setts./10 sq km.) Followed by Sasni (4.33 settlement /10 sq.km.), Hathras (3.73 settlement/10sq.km.) and lowest density of settlements (2.43 sett./10 sq km.) is marked in Sadabad. Average space size of settlement is also important aspect of settlement system to identify the nature of spatial organization of settlement. An average space size of settlement in the district is 2.77 sq km. It varies from 1.58 to 4.12 sq. km. Table 1 reveals that Sadabad (4.12 sq km ) shows higher space size of settlement, while lowest average space (1.58 sq.km.) is recorded in Mursan block, followed by Sasni block (2.31 sq.km.) and Hathras (2.68 sq.km.) block.

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

Using the Karl Pearson’s technique of Coefficient of Correlation, the analysis reveals that there is a high degree of negative relationship ( $r = -0.948$ ) between density and size of settlement.

**Relationship between Density and Space size of Settlements**

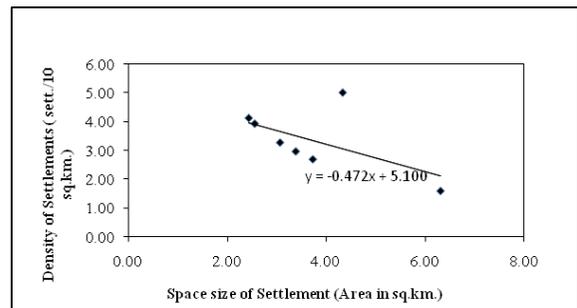


Fig 2

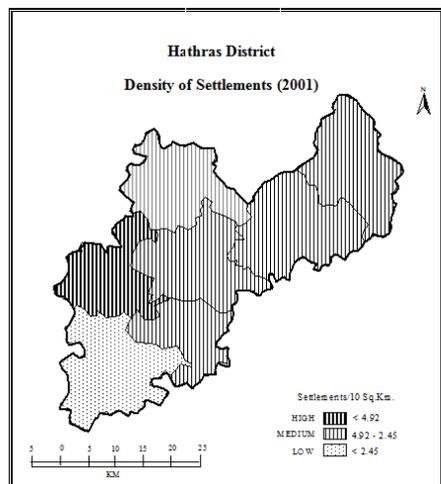


Fig 3

Their correlation is significant at 1 percent level. The inverse relationship infers the fact that small size of settlement records higher density, while low density is found among the large size of settlements. Furthermore density may increase with the decreasing of size of settlements in terms of area. The equation,  $y = -0.472x + 5.100$  gives the best fit regression line to determine their linear relationship

**SIZE OF SETTLEMENTS (in terms of population)**

Size of settlements is another important aspect to analyses the settlement distribution .Table 2 reveals that 3.61 per cent of the total settlements are small in size having population less than 200 persons in each and accounts only 0.20 per cent of the total population. There are only 9 settlements (1.35 per cent) with their size of population more than 10,000 persons in each but such settlements accommodate 21.07 per cent of total population. A highest settlement 176 is lying in the population size group of 500 – 999.

**Hathras district**

**Table 2: Distribution of Settlements and population 2001**

Population size group (persons)	Settlements			Population		
	No.	Percent	Cumulative %	No.	Percent	Cumulative %
< 200	24	3.61	3.61	2617	0.20	0.2
200 -499	74	11.13	14.74	25073	1.88	2.08
500 - 999	176	26.47	41.20	131282	9.83	11.90
1000 - 1499	129	19.40	60.60	154313	11.55	23.45
1500 - 1999	80	12.03	72.63	137127	10.26	33.72
2000 - 4999	149	22.41	95.04	442932	33.15	66.87
5000 -9999	24	3.61	98.95	161173	12.06	78.93
> 10000	9	1.35	100.00	281514	21.07	100.00
Total percent	665	100.00	--	1336031	100.00	--

Source: Computed from census of India, District census Hand book, Village directory.2001

It covers 26.47 percent of the total settlements while it accommodates only 9.83 percent of the total population. Fig 4 depicts that the cumulative frequency curve of population does not correspond to that of settlement curve, which means both settlements and population have registered disproportional distribution among the size group of settlements in the district.

**Hathras District Cumulative Frequency Distribution of Settlements and Population (2001)**

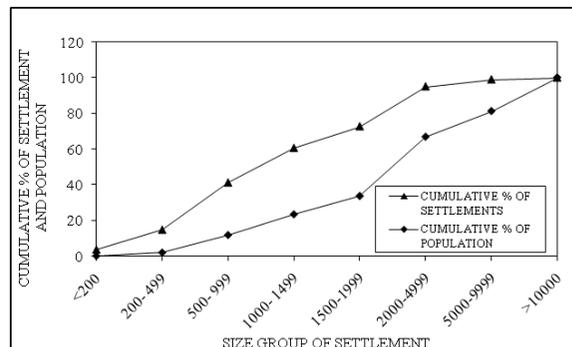


Fig. 4

**Spacing of settlements**

Spacing is one of the most important attribute of settlement. It is defined as the locational arrangement of settlement with respect to one another. On the basis of above equation the average spacing of the district is 2.97.As per the table four block show spacing more than the district average i.e.Sadabad (4.42),

Sikandra rao (4.21) Hasayan (3.51) and Sahapau (3.18) remaining three blocks show lesser than the average spacing (Table 3). Mean spacing may be grouped into three categories.

**Low spacing (< 1.54 km.)**

Low spacing of settlements is shown by only one block of the district namely Mursan (1.85 km). It covers 12.39 per cent (228 sq.km.) area and have 21.65 per cent settlement of the district. This block is lying in the western part of the district and contains 12.68 per cent population of the district. Fertility of soil over the region is the causative factors for the development of compact settlements.

**Moderate spacing (2.12- 1.54 km.)**

This category contains four development blocks i.e. Hasayan (1.94 km.) Sahapau (1.85 km.)Hathras (1.76) and Sasni (1.63). It covers 57.44 percent (1056.836 sq.km.) of the total area and 58.59 percent of total population of the study area.

**Hathras district**

**Table 3: Mean spacing of settlements 2001**

Block	Area in sq. km.	No. of settlement	A/N	$D=1.0746\sqrt{A/N}$
Sasni	267.68	116	2.31	2.48
Sikandra rao	258.8	66.00	3.92	4.21
Hasyan	310.12	95	3.26	3.51
Hathras	289.8	108	2.68	2.88
Mursan	228	144	1.58	1.70
Sadabad	296.37	72	4.12	4.42
Sahapau	189.23	64	2.96	3.18
Hathras district	1840	665	2.77	2.97

Source: Computed from District Census Handbook, 2001

**High spacing (> 2.12 km.) :**

Two development blocks of the district registered high spacing of settlements i.e. Sadabad (2.18 km.) and Sikandra rao (2.13 km.).It covers 30.17 per cent (555.17sq.km.) of total area and 20.75 percent of the total settlement of the study area.**Relationship between size and spacing of settlements:**

With the help of Karl Pearson technique of coefficient of correlation the analysis reveals that there is a high degree of positive relationship ( $r = 0.99$ ) between the average space size of settlement and mean spacing. By applying student 't' test technique, the calculated 't' value of 3.05 is lesser than the tabulated 't' value of 3.75 ( 5 percent level of significance) but greater than the tabulated 't' value of 2.57 ( 2 percent level of significance) at five degree of freedom. This proves their correlation is significant at 2 percent level.

**Table 3: Correlation (r) between size and spacing of settlements 2001**

Block	Average space size of settlements ( area in sq. km.) x	Mean spacing (km.) y
Sasni	2.31	1.63
Sikandra rao	3.92	2.13
Hasyan	3.26	1.94
Hathras	2.68	1.76
Mursan	1.58	1.35
Sadabad	4.12	2.18
Sahapau	2.96	1.85
Hathras district	2.77	1.79
Total	2.31	1.63

Source: computed by author using census data 2001

**Conclusion**

After going through the quantitative and qualitative analysis, the following conclusion can be drawn that spatial organization of settlement exhibit an uneven distribution of settlement in the district.Mursan block has recorded highest density of settlements i.e.6.32 sq.km.per settlement. However, Sadabad block has recorded lowest density of settlement i.e., 2.43 settlement per 10sq.km. but highest average size of settlement i.e.,4.12 sq.km per settlement.Therefore,an inverse relationship between density and average size of settlement has been observed in the study area. A wide variation in the distribution of population among different size group of settlement exists in the district. While, large number of small size settlement accommodates lesser population, few number of bigger size settlements accommodates larger population. For example, 3.61 percent of settlements having population less than 200 persons in each accommodate only 0.20 percent of population of district, while 1.35 percent of settlements having population more than 10,000 persons accommodate more than 20 percent of population. Highest i.e., 33.15 percent population are accommodate in the settlement of population size group 2000 to 4999 persons. Settlements in the district are located at 2.97 km. apart from each other, while highest (4.21 km.)and lowest (1.70km) spacing among settlement has been recorded in Sikandra rao and Mursan blocks respectively. Correlation (r)value 0.991 at five degree of freedom significant at 5 percent level infers the fact that spacing is the function of settlement or bigger size settlement are located at higher distance from each other.

**REFERENCE**

1. Demangeon, A., L.(1920), Habitation Rural in France, Annales de Geographie, Vol. 29, pp.352-357. | 2. Schaefer, F.K.(1953) , Exceptionalism in Geography, Annals of the Association of American Geographers. Vol.55, pp.549-577 | 3. Jordan, T.G. (1966),On the Nature of Settlement Geography, Professional Geographer,Vol.18 | 4. Sharma, R.C.( 1989 ) Regional Planning for Social Development, Criterion Publications ,New Delhi. pp.43