SPACING OF RURAL SETTLEMENTS

In the study of distribution pattern of settlements, the spacing or distance between them has much importance. In the study of spacing of rural settlements, by geographers, following three methods (indices) have been commonly used : (1) Relative spacing, (2) Village density, and (3) Dispersion of rural settlements.

(1) Relative Spacing of Villages

The areal analysis of rural settlements denotes their relative locational arrangement and is inseparably inter-related to areal extent. The relative or average distance between two settlements depends upon the density of settlements in an area. To measure the distributional pattern of settlement in any region, Mather's formula (Mather, 1944), commonly known as hypothetical distance method is given below :

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

where,

D = Relative spacing,

A = Total area of the region, and

N = Total number of inhabited villages in the region.

1.0746 = Constant.

C.E. Mather had applied this formula for the calculation of spacing between farmsteads in the United States of America in 1944. A.B. Mukherjee (1970) studying the rural settlements in Assam used this formula in revised form which is :
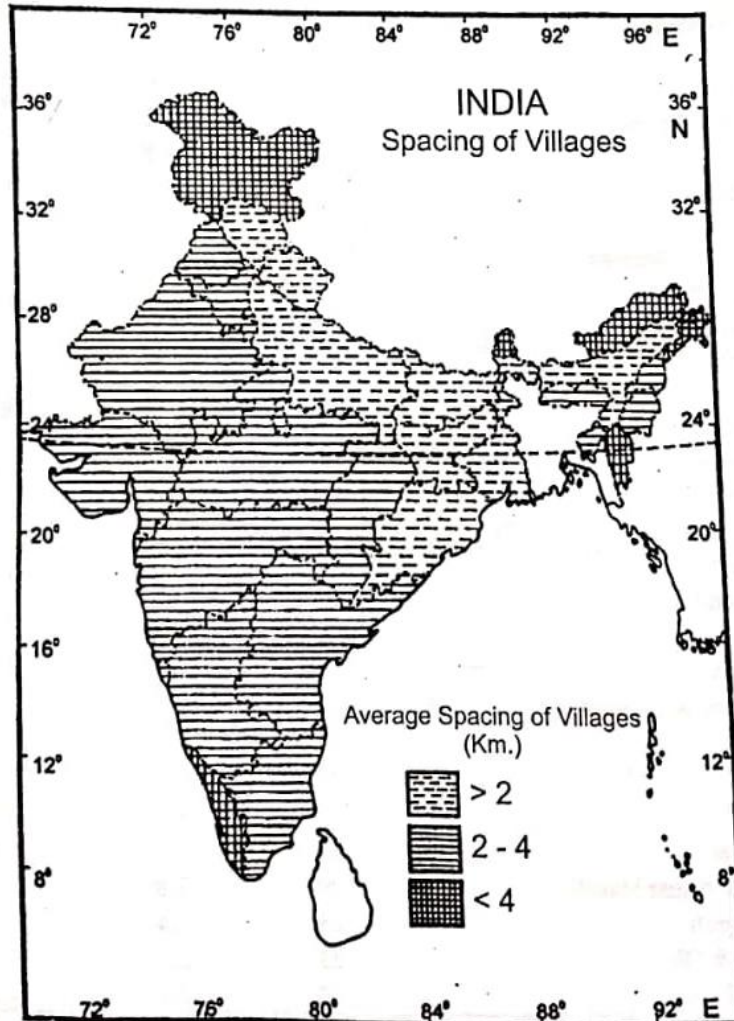
$$D = 1.1284 \sqrt{\frac{A}{N}}$$

INDIA
Spacing of Villages

Average Spacing of Villages (Km.)

> 2

2 - 4

< 4

Fig. 4.3 : Spacing of Rural Settlements in India.

Table 4.2
Spatial Attributes of Spacing of Villages in India (2001)

States/Union Territories	Number of villages	Average spacing of villages (km)	Village density (per 100 sq. km.)
Uttar Pradesh	97,942	1.7	41
Madhya Pradesh	52,117	2.6	17
Odisha	47,529	2.0	31
Maharashtra	41,045	2.9	13
Rajasthan	39,753	3.2	12
Bihar	39,032	1.7	41
West Bengal	37,955	1.6	43
Jharkhand	29,354	1.8	37
Karnataka	27,481	2.8	14
Andhra Pradesh	26,613	3.4	10
Assam	25,124	1.9	32
Chhattisgarh	19,744	2.8	15
Gujarat	18,066	3.5	9
Himachal Pradesh	17,495	1.9	30
Uttarakhand	15,761	2.0	29
Tamil Nadu	15,400	3.1	12
Punjab	12,278	2.2	24
Haryana	6,764	2.7	15
Jammu & Kashmir	6,417	6.3	3
Meghalaya	5,782	2.1	26
Arunachal Pradesh	3,863	5.0	5
Manipur	2,199	3.4	10
Kerala	1,364	5.7	4
Nagaland	1,271	3.9	8
Tripura	858	3.8	8
Mizoram	707	5.9	3
Andaman & Nicobar	501	4.4	6
Sikkim	450	4.3	6
Goa	347	3.5	9
Delhi	158	3.3	11
Puducheri	92	2.5	19
Dadra & Nagar Haveli	70	2.8	14
Chandigarh	23	2.4	20
Daman & Diu	23	2.4	21
Lakshadweep	8	2.1	25
India	**5,93,643**	**2.5**	**18**

Spacing of rural settlements belongs to relative locational arrangement of villages. It is an important base for analysis of distributional pattern of villages in a region. The spacing between two settlements is generally derived by nearest neighbour analysis method. This method was introduced by Swainson in 1935 and followed by Barnes and Robinson (1940) and Mather (1944) with simple modifications. In the field of geographical studies it has become most common after its application by M.F. Dacey in 1965.

Table 4.2 shows the average inter-village distance (average spacing of villages) in India. The country's average spacing of villages comes to be 2.5 km. States and union territories may be classified into following three categories on the basis of average spacing of villages.

(a) **Low Spacing Regions :** The average spacing of villages in highly populated areas is low and very low (below 2 km.). Minimum village density is found in West Bengal which is 1.6 km. followed by Uttar Pradesh (1.7), Bihar (1.7), and Jharkhand (1.8).

(b) **Medium Spacing Regions :** States and union territories having spacing from 2.0 to 3.0 are grouped in this category. Jharkhand (2.0), Odisha (2.0), Meghalaya (2.1), Lakshadweep (2.1), Punjab (2.2), Chandigarh (2.4), Daman and Diu (2.4), Puducheri (2.5), Madhya Pradesh (2.6), Haryana (2.7), Karnataka (2.8), Chhattisgarh (2.8) and Maharashtra (2.9) have average village spacing below 3.0 km.

(c) **High Spacing Regions (3.0 – 5.0 km.) :** High spacing between villages is found high in Tamil Nadu (3.1), Rajasthan (3.2), Delhi (3.3), Andhra Pradesh (3.4), Manipur (3.4), Gujarat (3.5), Goa (3.5), Tripura (3.8), Nagaland (3.9), Sikkim (4.3) and Andaman and Nicobar Islands (4.4 km.)

(d) **Very High Spacing Regions (5.0 km. and above) :** Highest average spacing of villages is recorded in Mountainous states of Jammu and Kashmir (6.3 km.) followed by Mizoram (5.9), Kerala (5.7), and Arunachal Pradesh (5.0 km.).

(2) Village Density

Density of villages or rural settlements is one of the closely interwoven attributes of their spatial patterns. It relates the distribution of rural settlements to the expansion of total rural area of the region. The density of villages tends to decrease with the increasing distance as well as size of villages. This may be judged on the basis of area and population both. Following formula is used to calculate the village density :
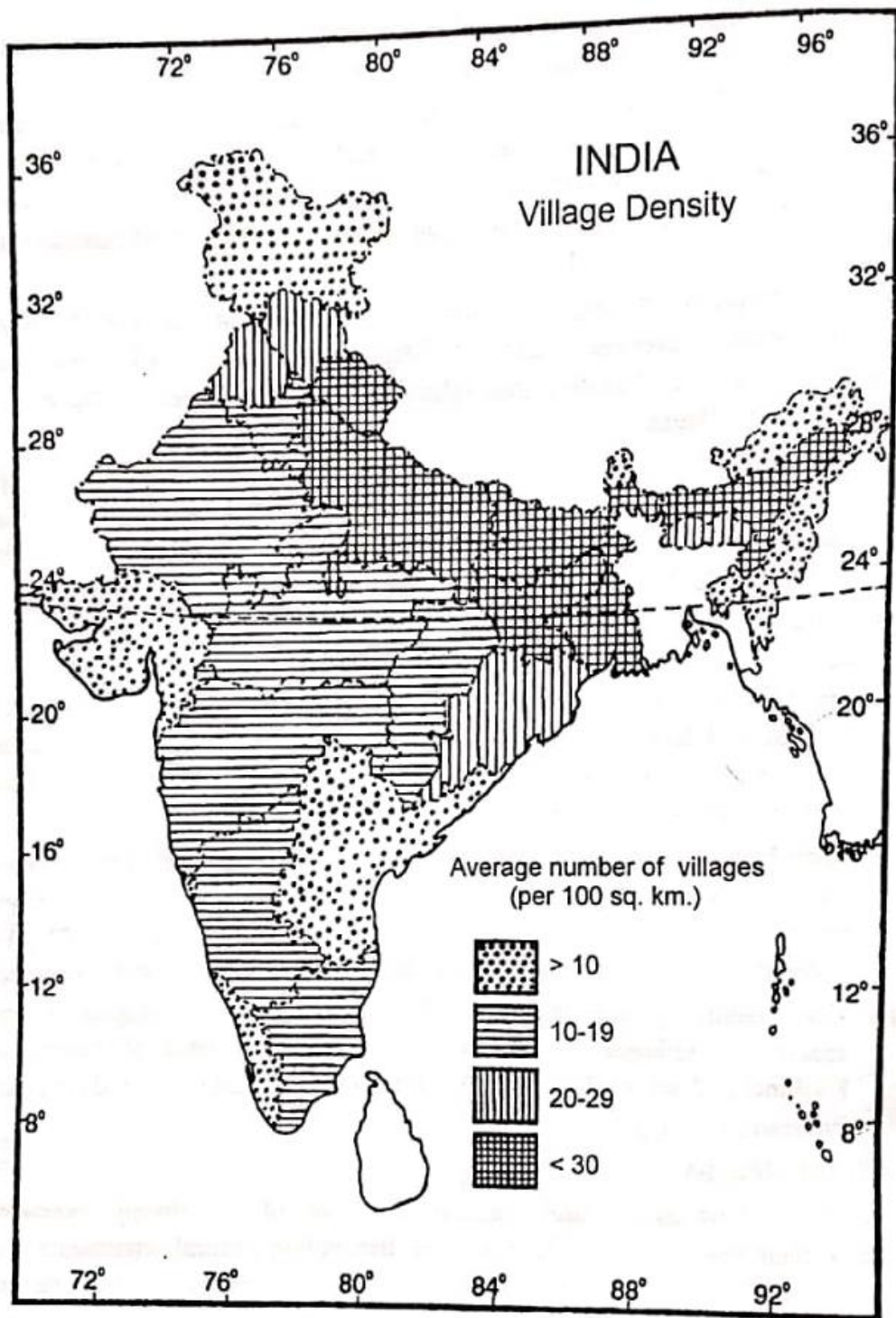
$$D = \frac{N}{A} \times 100$$

where,

D = Village density,

A = Total rural area of the region,

N = Total number of villages in the region.

INDIA
Village Density

Average number of villages
(per 100 sq. km.)

> 10
10-19
20-29
< 30

Fig. 4.4 : Village Density in India.

The result denotes average number of villages per 100 km. area in a specific region.

It is quite evident from Table 4.2 that village density for India as a whole is 18 village per 100 square kilometre area. In the plain fertile areas, high village density is a common feature. Highest village density is found in West Bengal (43), followed by Bihar (41), Uttar Pradesh (41), Jharkhand (37), Assam (32), Odisha (31) and Himachal Pradesh (30).

Village density between 10 and 30 per hundred sq. km. may be regarded as medium density in the reference of India. States and Union Territories in descending order are Uttarakhand (29), Meghalaya (26), Lakshadweep (25), Punjab (24), Daman and Diu (21), Chandigarh (20), Puducheri (19), Madhya Pradesh (17), Chhattisgarh (15), Haryana (15), Dadra and Nagar Haveli (14), Karnataka (14), Maharashtra (13), Rajasthan (12), Tamil Nadu (12), and Delhi (11).

In mountainous and hill areas, village density is very poor (less than 10 per 100 sq. km.). Lowest village density is found in Jammu and Kashmir (3), and Mizoram (3), followed by Kerala (4), Arunachal Pradesh (5), Sikkim (6), Andaman and Nicobar Islands (6). Other regions having low village density are Manipur (10), Gujarat (9), Goa (9), Nagaland (8), and Tripura (8).

(3) Dispersion of Rural Settlements

For the analysis of spacing and dispersion of rural settlements, nearest neighbour method, introduced by J.P. Clark and F.C. Evance in 1954 is a favourite method. Applying this method, nearest neighbour ratio (Rn ratio) is calculated for a particular region which indicates the distribution pattern of the settlements. Obtaining this index, it is attempted to know that distribution pattern of rural settlements in a region is clustered or random or regular. Rn ratio may be calculated from the formula given below :

$$Rn = \frac{\overline{Do}}{\overline{De}} = \frac{\overline{Do}}{0.5\sqrt{A/N}}$$

where,

Rn = Nearest Neighbour Ratio.

$\overline{Do}$ = Average of observed nearest neighbour distances.

$\overline{De}$ = Average of expected nearest neighbour distances.

A   = Total area of the region.

N   = Total number of settlements.

This statistical test compares observed point patterns against theoretically derived random patterns. The average of the distances between each observed point and its nearest neighbour is divided by the expected random spacing to obtain nearest neighbour ratio. Rn values range from 0 (zero) to 2.149. Rn value 0 indicates complete clustered distribution, 1.0 presents random distribution and 2.15 is the indication of uniform or grid distribution. The use of Rn index is in describing, not explaining, a point pattern (Maurya, S.D., 2011).

Thus, Rn value below 0.5 indicates that the distribution is of clustered type, from 0.5 to 1.5 is the indication of random distribution, and above 1.5 presents the regular or uniform distribution.

(Source:Mourya,2014)

Reference:

Mourya,S.D (2014) . *Settlement Geography*.Sharada Pustak Bhawan.Allahabad,34-39