

**AN APPROACH TO DETERMINE TYPOLOGY OF SETTLEMENTS
IN HIMALAYA
A Case Study of Pithoragarh District**

Raghubir Chand and Gautam Bhattacharya, Nainital

ABSTRACT : Settlement clusters numbering 2256 were delineated from 18 toposheets Pithoragarh District. Observations of height, slope, location and aspect of slope were recorded. The main intention has been to decipher a general preferential pattern of settlement location out of a myraid of possibilities taking into account the four major categories as mentioned above, and their sub categories. The analysis has shown that out of a large number of theoretical possibilities only 12 categories are preferred by settlers.

INTRODUCTION

Various alternatives for classifying settlements are available such as population size, functions, site and situation, morphology, time and space relations of occupance unit in terms of their number and nature of occurrence. However, the broader classification of rural settlements into four types, i.e., compact, clustered, hamleted, fragmented or hamleted and dispersed (Ahmad, 1979, p. 79) has been generally followed by various researchers using different methods. The basic theme of these quantitative techniques is the relationship between settlements within space (Doxiades, 1968, p.33).

The sole purpose of the present study is to determine the typology of rural settlements of different physiographic units of Himalaya. Incidentally district pithoragarh ($29^{\circ} 3'45''$ N. to $30^{\circ} 48'30''$ N. and $79^{\circ} 48'$

$10''$ E to $81^{\circ} 5'55''$ East) embraces all three Himalayan sub units extending right from Siwalik hills in the South to Lesser Himalaya, Greater Himalaya beyond to Trans-Himalaya forming a part of U.P. Himalaya. It covers an area of 9075.83 sq. kms. inhabiting a population of 415163 persons in 2152 inhabited villages (Vide Census 1971). The area is bounded by Nepal in the East, China in the North, districts Chamoli and Almora in the West, and district Naini Tal in the South and South-West.

Keeping in view the relevance of geographical facts, the consideration of location which controls the spacing and size of rural settlements alongwith other factors such as height and slope aspect is much more important in such a hilly region. Therefore, the typology of rural settlements is derived with due consideration of these physical factors having looked their distributional trend in the study region.

TABLE I
BIVARIATE FREQUENCY DISTRIBUTION OF SETTLEMENTS IN VARIOUS HEIGHT AND SLOPE GROUPS

Slope in Degrees	Below 7	7 to 14	14 to 21	21 to 28	28 to 35	Above 35	Total
Height in meters							
Below 700	16(13.79) (13.91)	46(39.66) (5.21)	27(23.28) (5.20)	27(23.28) (4.55)	-	-	116(100) (5.14)
700 to 1400	39(3.37) (33.91)	470(40.62) (53.23)	300(25.83) (57.80)	297(25.67) (50.00)	21(1.82) (35.00)	30(2.59) (35.23)	1157(100) (51.29)
1400 to 2100	56(6.60) (48.70)	322(37.47) (36.47)	165(19.46) (31.79)	225(26.53) (37.88)	33(3.89) (55.00)	47(5.54) (55.29)	848(100) (37.59)
2100 to 2800	1(1.18) (0.87)	18(21.18) (2.04)	17(20.00) (3.28)	37(43.53) (6.23)	4(4.71) (6.67)	8(9.41) (9.41)	85(100) (3.77)
2800 to 3500	2(5.71) (1.74)	15(42.86) (1.70)	9(25.71) (1.73)	7(20.00) (1.18)	2(5.71) (3.33)	-	35(100) (1.55)
Above 3500	1(6.67) (0.87)	12(80.00) (1.36)	1(6.67) (0. 19)	1(6.67) (0.17)	-	-	15(100) (0.66)
Total	115(5.10) (100)	883(39.14) (100)	519(23.01) (100)	594(26.33) (100)	60(2.66) (100)	85(3.77) (100)	2256(100) (100)

Figures shown in Paranthesis refer to row and column percentages respectively.

The study area is covered by 21 survey of India toposheets of which only 18 could be available. The settlement patches were delineated in the toposheets according to their location and thus a village has been sometimes broken in many parts or a number of two to three villages have been counted in one patch if belonging to one location, and the following observations were made:

- | | |
|----------------------|--|
| Location | i) Valley sided
ii) Mid slope
iii) Ridge top |
| 2. Aspect of slope | i) East
ii) West
iii) North
iv) South
v) North East
vi) South West
vii) South East
viii) North West |
| 3. Height in metres. | |
| 4. Slope in degrees. | |

DATA ANALYSIS

Settlement patches numbering 2256 were delineated from the 18 toposheets of Pithoragarh district. The observation in accordance with the above mentioned categories were noted. The main intention has been to decipher a general preferential pattern of settlement location out of the optimum chances. The first and second categories in the list above encompass all the probable location that a settler can choose. The categories third and fourth are the two important factors that determine a settlers choice. A simple frequency count of settlements in various categories gives a good indication as to the preferences of a settler. Tables 1, 2 and 3 are an effort in that direc-

tion. Mean and standard deviation were calculated to measure variability in the data. Co-efficient of variability measure has been used to test the homogeneity of data in each category.

DISTRIBUTION OF SETTLEMENTS IN VARIOUS HEIGHT GROUPS

The height data has been classified with an interval of 700 metres. Frequency of settlements occurring in each height group were counted and presented in Table 1. A maximum of 1157 settlements are found to occur in the height group of 700-1400 metres; with the minimum of 15 in above 3500 metres group. The two height groups of 700-1400 metres and 1400-2100 have 56.33 per cent and 37.59 per cent of settlements respectively; and together account for 88.87 per cent of total settlements

DISTRIBUTION OF SETTLEMENTS IN VARIOUS SLOPE GROUPS

The slope data has been classified with an interval of 7 degrees. Frequency of settlements occurring in each slope class were counted and presented in Table 2. A maximum of 903 settlements are found to occur in slope category of 7-14 degrees; the minimum number of settlements are found in slope category of 28-35 degrees. The three slope groups of 7-14 degrees, 14-21 degrees and 21-28 degrees have in them 903, 518 and 602 settlements respectively; and together account for 89.72 per cent of total settlements.

BIVARIATE FREQUENCY ANALYSIS

The bivariate frequency matrix of slope and height categories present a very interesting picture (Table 3). The region of 7-14° and 21-28° slope category and 700-1400 metres and 1400-2100 metres of height category have the largest number of settlements. The three slope categories have

TABLE II
SLOPE AND HEIGHT DISTRIBUTION IN VARIOUS LOCATION-
ASPECT CATEGORIES IN DESCENDING ORDER

Location Aspect Categories	No. of Settlements	Percentage	Height in 00' Metres			Slope in Degrees		
			Mean	S.D.	C.V.	Mean	S.D.	C.V.
2.4	269	11.92	15.35	4.0	26.06	20.62	8.4	40.74
2.1	226	10.02	14.88	4.1	27.55	20.03	6.9	34.45
2.3	217	9.62	14.46	3.2	22.13	18.66	6.6	35.37
1.4	201	8.91	11.91	4.6	38.62	15.21	6.1	46.68
1.1	195	8.64	12.27	6.0	48.90	15.71	7.3	46.47
2.2	172	7.62	15.09	3.8	25.18	21.66	8.1	37.40
3.1	164	7.27	15.82	4.6	29.80	14.12	6.4	45.33
1.2	147	6.52	12.24	6.0	49.02	16.48	7.5	45.51
1.3	99	4.38	12.69	4.0	13.52	15.67	6.4	40.84
3.3	87	3.86	17.94	7.5	41.81	14.51	6.3	43.48
3.2	74	3.28	16.72	7.2	43.06	15.36	6.8	44.92
3.4	68	3.01	16.93	6.9	40.76	15.44	6.0	38.86
2.5	54	2.39	14.17	3.0	21.17	18.56	7.0	37.72
2.7	49	2.17	13.94	3.7	26.54	21.39	8.3	38.80
2.8	37	1.64	14.49	2.7	18.63	19.43	7.7	39.63
1.6	35	1.55	12.86	4.5	34.99	17.34	7.4	42.68
2.6	35	1.55	15.54	5.2	33.46	18.77	6.7	35.70
3.7	29	1.29	18.69	11.9	63.63	17.90	8.8	49.16
1.7	27	1.20	13.33	4.7	35.26	14.93	7.2	48.23
3.5	27	1.20	17.67	10.6	59.68	13.96	5.9	42.26
1.5	18	0.80	14.56	7.3	50.14	15.89	7.0	44.05
3.8	13	0.58	17.92	8.5	47.43	15.85	5.0	31.55
3.6	7	0.31	14.71	3.7	25.15	12.57	6.4	50.91
1.8	6	0.21	11.71	6.0	53.72	17.50	8.4	48.00

TABLE III
DISTRIBUTION OF RURAL SETTLEMENTS TYPES IN THREE BOARD
PHYSIOGRAPHIC DIVISIONS OF THE DISTRICT

Settlement Types	Greater Himalaya	Middle Himalaya	Siwalik Himalaya	Total District
2.4	27(13.43)	238(12.09)	4(4.65)	269(11.92)
2.1	44(21.89)	178(9.04)	4(40.65)	226(10.02)
2.3	8(3.98)	203(10.31)	6(6.98)	217(9.62)
1.4	10(4.98)	185(9.40)	6(6.98)	201(8.91)
1.1	29(14.43)	160(8.13)	6(6.98)	195(8.64)
2.2	10(9.96)	154(7.82)	2(2.33)	172(7.62)
3.1	10(4.92)	147(7.47)	7(8.15)	164(7.27)
1.2	20(9.95)	118(5.98)	9(10.47)	147(6.52)
1.3	3(1.49)	85(4.32)	11(12.79)	99(4.38)
3.3	3(1.49)	76(3.86)	8(9.30)	87(3.86)
3.2	1(0.50)	66(3.36)	7(8.14)	74(3.20)
3.4	6(2.79)	60(3.05)	2(2.33)	68(3.01)
Total of Twelve Categories	177 (88.06)	1676 (84.81)	72 (83.72)	1919 (85.06)
Total Settlements	201 (100)	1969 (100)	86 (100)	2256 (100)

DATA

39.14 per cent, 23.00 per cent and 26.33 per cent of settlements respectively; and accounting for a total of 88.47 per cent of settlements. The two height categories have 51.29 per cent and 37.59 per cent of settlements respectively and account for a total of 88.88 per cent of settlements. Some of the salient features of this matrix are listed below:

- i) In heights below 700 metres no settlement is found to occur in slopes steeper than 28° . The reason being: at lower height the chances of occurrence of gentler slope is higher. This can be seen from the matrix too. Out of a total of 116 settlements spread over in all the slope categories below the height of 700 metres nearly 62 (53.45%) settlements are found to occur in the gentler slopes.
- ii) The surface above 2800 metres records no settlement in slopes steeper than 35° ; and the surface above 3500 metres records no settlement in slopes steeper than 28° . At this height 80 per cent settlements are located in slopes ranging from $7^\circ - 14^\circ$. At such heights one normally expects a landform like ridge top and the chances of occurrence of steeper slopes on ridge tops are fewer.
- iii) In the surface between 700 metres - 1400 metres the largest share of settlements are found to occur in slope categories $7^\circ - 14^\circ$, $14^\circ - 21^\circ$ and $21^\circ - 28^\circ$ having 40.62 per cent, 25.95 per cent and 25.69 per cent of settlements respectively, totalling 92.22 per cent. In the surface between 1400 metres to 2100 metres in the slope categories same as above, the share of settlements are 37.97 per cent and 19.46 per cent and 26.53 per cent respectively, totalling

83.96 per cent.

- iv) The distribution of settlement seen vertically down the column in the same matrix reveals a few more facts.

The share of settlements in the slope categories of $7^\circ - 14^\circ$, $14^\circ - 21^\circ$ and $21^\circ - 28^\circ$ in the surface between 700-1400 metres are always higher than the number of settlements in the same slope groups at the next higher surface, i.e., between 1400-2100 metres. However, this pattern reverses in case of slopes gentler than 7° and steeper than 28° in the same height range as above.

DISTRIBUTION OF HEIGHT AND SLOPE - LOCATIONWISE

Table 4 summarises distribution of height and slope in various locations. There are three columns each for height and slope showing mean, standard deviation and coefficient of variability. The first and the last column show total number of settlements in each locational categories and their percentage share of total respectively. The settlements located in the mid slope are found to rank highest, followed by valley bottom. The ridge tops have the least number of settlements. The variability is in general low in any category for both slope and height data; the mean c.v. for height being lower than mean c.v. for slope. This indicates that preferences are conditioned more by height consideration than slope. The c.v. values for each category further lends strength to the preceding statement. The variability in height and slope data are higher in locational categories 1 and 3 and least in category 2. c.v. of height data in category 2 is lesser than the c.v. of slope data in the category. This shows that even in the preferred location of mid slope the

actual point of a settlement is governed more by height consideration than by slope. Had slope been important perhaps one could expect more settlements in categories 1 and 3 where the mean slope is much more gentler than in category 2. In fact, category 2 has the highest mean slope value but still has the largest number of settlements located in an average height of 1487 meters.

DISTRIBUTION OF HEIGHT AND SLOPE ASPECTWISE

Distribution of height and slope is shown in Table 5. The first four categories share in them nearly 85 per cent of the total settlements having east ranking top, followed by south, north and west in descending order. The distribution and variations pattern in height and slope are different here from the pattern seen in the previous sections. The mean slope is roughly 14.4 degrees and the average height being 1750 metres. The variability in slope data is lower than variability in height data. It can be generalized that a settlers choice ranges between 1693 metres to 1853 metres of height and 14.26 degrees to 14.77 degrees of slope. The settlements facing any of the eight aspects are scattered all over the three locations. Hence the average slope and height data are different from the Table . What is important in this table is that a settler prefers only the four aspects out of a total of 8 aspects of slope.

SLOPE AND HEIGHT DISTRIBUTION IN VARIOUS LOCATION ASPECT CATEGORIES

In the last two section we have seen the slope and height distribution in the location and aspect categories separately. In this section the attempt is to see the possible pattern when the two categories are combined together. This analysis would lead to identification of such location-aspect categories that are important factors in terms of a

settlements location. The mean, standard deviation and coefficient of variability of height and slope data for each location aspect category have been computed to describe the possible height slope relationship in each category. A total of 24 location aspect categories could be made and of which the first eight categories (Table) accounted for nearly 71% of total number of settlement, the rest 29 per cent settlement were found to be distributed in the rest 16 categories. This is in tune with our finding in the preceeding section. The location aspect categories also present a more or less similar pattern with minor change in their ordering.

It is interesting to note that the first four aspects : east, south, north and west when combined with three locations according to their preferential order may be seen containing the maximum number of settlements ranging from 3.01 to 11.92 per cent of total settlements. The combination of other aspect categories such as north east, north west, south east and south west with any of location categories is not so important due to a very negligible proportion of settlements in it .

TYPOLGY OF SETTLEMENTS

Now the attention shifts from the distributional context to the broader question of classifying settlements. The criteria of location-aspect categories may be finally adopted. First twelve categories from the table 6 have been identified as they explain the underlying dimensions of distribution by finding associate sets of characteristics. These twelve categories account for 85.05 per cent of total settlements and only 14.95 per cent is distributed in rest twelve categories. The average height and slope of first twelve categories ranges between 1191 to 1794 meters and 14.12 to 21.66 degrees. These height and slope categories

exactly correspond with the dominant height and slope categories of 700 to 1400 meters and 1400 to 2100 meters; and 7 to 14 degrees and 21 to 28 degrees, even if we split up the region into three broader physiographic sub divisions of Greater Himalaya, lesser Himalaya and Siwalik, the pattern is found again similar to the total data set of the region. The distribution of settlements in these twelve categories together account for 88.06 per cent, 84.81 per cent and 83.72 per cent of total settlements of Greater, Lesser and Siwalik Himalaya respectively. It makes the criteria of location and aspect categories more simplified and meaningful for the purpose of classification. Although the varying nature of topography of these sub divisions have distorted the sequence of the categories as found in Table . But the overall performance of these categories might be more representative than the observations are grouped between some areal

units. On the basis of above analysis the identified typology of settlements is given below:

1. Mid slope and south facing settlements
2. Mid slope and east facing settlements
3. Mid slope and north facing settlements
4. Valley side and south facing settlements
5. Valley side and east facing settlements
6. Mid slope and west facing settlements
7. Ridge top and east facing settlements
8. Valley side and west facing settlements
9. Valley side and north facing settlements.
10. Ridge top and north facing settlements
11. Ridge top and west facing settlements
12. Ridge top and south facing settlements.

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ADDRESS OF THE AUTHORS

Raghubir Chand & Gautam Bhattacharya
 Lecturer in Geography
 Kumaum University
 Nainital - 263002 (U.P.)