

DISTRIBUTION OF RURAL SETTLEMENTS IN THE HIGH HIMALAYAN REGION: A CASE STUDY OF HAR KI DUN

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ABSTRACT

The distribution settlement in the high Himalayan region is governed by interacting factors of both nature and culture. These factors are both attractive and restrictive. Thus, these factors create constraints or offer opportunities and possibilities. A combination of all these factors affects the site (location) and distribution of the settlements. It also defines the size of settlements and the economy of settlements. Har ki Dun is one of the remote mountain valleys in the high Himalayan region. It is known as 'The Valley within Mountains'. It is a distinct geographical entity besides it has a distinct socio-cultural 'identity'. The land of Har ki Dun has a very thin population with few scattered settlements. About 47 settlements with an estimated population of 22000 are concentrated in this region. A few of these settlements are located even above 3000 m in height. Unfortunately, information about the spatial distribution of settlement in this region is not available adequately. This research is an attempt to measure the location and analyse the spatial distribution of settlements in this region. The present research reflects that the elevation and slope are the basic but influential factors that affect the distribution of settlements and its size. These factors also affect the nature and form (economic character) of settlements.

KEYWORDS: *Distribution of Settlements, Har ki Dun, High Himalayan Region*

INTRODUCTION

Human settlements can be defined as places of human habitation. These are the places where populations are concentrated and where people live and attain their livelihood. The environmental conditions surrounding a human settlement are an extremely important (decisive) factor for the development of the settlement and its associated economy.

The settlements are indicators of natural geography, available natural resources and the ecological carrying capacity of the land. Simultaneously, (but any) variations in the natural environment and the land use (the most suitable adaptation to local environmental conditions) result in differences in the spatial distribution of settlements. Thus, settlements and their location also reflect their relationship with the natural environment.

No single factor can be considered solely responsible for the concentration of the population. In fact, multiple environmental factors influence the location and spatial distribution of settlements. Most of the factors often act collectively to facilitate the (suitable) conditions of the development of settlements.

The scientific analysis of the distribution of settlements is a significant ingredient (or element) of geographical research. It is the foundation of the study of settlement geography. However, there is still a lack of (intensive/micro) research on the distribution of settlements, particularly in remote mountainous areas. The present research can provide a reference for the study of settlement geography of high mountain areas.

The high Himalayan region has been the least studied area for the distribution of human settlements. There are not many comprehensive accounts of the factors affecting the distribution of settlements in these areas. This research is an attempt to analyse the distribution of settlements in terms of their spatial location in the valley of Har ki Dun. It measures the size of the settlements. It presents an analysis of the settlements with respect to the factors affecting their distribution. This research aims to present the maps of settlement distributions of this remote region of the Himalayas at a finer spatial resolution than ever before. Thus, it presents comprehensive settlement geography of the valley of Har ki Dun.

Literature Survey

The study of the distribution of settlements refers to an interpretation of spatial phenomena. Many early geographers including Ratzel explored the distribution of settlements and their dependence on the natural environment. Brunhes also made a comprehensive study on the relationship between rural settlements and the environment. Few Indian geographers like Ahmad, Deshpande and others have worked extensively on rural settlements (**Ahmad 1952, O. H. K. Spate and C. D. Deshpande, 1952**) [1,8]. In a similar attempt, Dickinson presented a detailed study of the dispersed settlements (**Robert E. Dickinson, 1956**) [11]. The study of Chisholm is a classic work on rural settlements and land use (Chisholm 1962).

The spatial distribution of human settlements (within a region) reflects the effect of the environmental conditions of the region. The analysis of factors affecting the distribution of rural settlements was made by different geographers. A few geographers have analysed the significance of natural factors and a few others have analysed the significance of both natural and cultural factors (**Anabstani A.A., 2011, Azizpour, 2014**) [2,4]. Many other geographers have worked on types of settlements and their morphology. But there is an evident dearth of research on the distribution of settlements in the high Himalayan region. This is an endeavour to fill the existing gap of information about the spatial distribution of settlements in the high mountainous region of the Indian Himalayas.

Aim and Objective

The spatial distribution of human settlements (within a region) reflects the effect of the environmental conditions of the region. The study of the distribution of settlement of any region is important to give an understanding of its association with natural and cultural factors, existing or prevailing therein. This research explores the spatial distribution of human settlements in the valley of Har ki Dun; a remote high Himalayan region. It also identifies the natural and cultural factors that affect the distribution of settlements in such regions. It thoroughly examines the influence of those natural and cultural factors responsible for the existence of dispersed settlements in the valley region. Finally, the research explains the locational diversity of human settlements in the valley of Har ki Dun.

Methodology

The study area for this research constitutes the valley of Har ki Dun. It is located in the western part of the Garhwal Himalayas. This research draws data and information from every existing data source; such as elevation map, terrain map, drainage map, map of reserve forest and settlement map. The location and size of settlements are determined from remote sensing images. It is added by the GPS location of each settlement. The census data is used for information regarding the population of the area. The distribution pattern of settlements is defined according to landscape (altitude and drainage). The spatial distribution of settlements has also been analysed according to their spatial location in the GIS environment. The whole analysis leads to the classification and generalization of the pattern of settlement distribution in the high Himalayan region.

This is an empirical study based on descriptive-analytical research. A proposed hypothesis for this research is that the location and distribution of settlements in the high Himalayan region is a result of several environmental, social, cultural and historical factors. Several factors or critical resources influence the location and distribution of settlements.

It is further hypothesized that the variations in environmental conditions affect variation in human (adaptive) activities. It is also hypothesized that the variations in the spatial distribution of settlements across different altitudes exist in accordance with environmental conditions. The environmental conditions influence their spatial distribution.

Description of the Study Area

Har ki Dun is known as 'The Valley within Mountains'. It is a distinct geographical entity besides it has a distinct socio-cultural 'identity'.

Location;

Har ki Dun is situated in Mori Tehsil (subdivision) of Uttarkashi district in Uttarkhand. It is spread between 31°02' - 31°20' N latitude and 77°55' - 78°40' E longitude. The altitude of the area varies from 1290 m to 6323 m. (Arun Kumar, 2004) [3]. The highest point of this area is the Bander Punch peak.

Area;

Har ki Dun covers a total area of 953.12 sq. Km. It is bounded in the north by Bander Punch ridge and in the northwest by Changsil peak. It has the tribal land of Jaunsar Bawar in its south. In the east, it is bounded by Kedar Kanta and a chain of mountain peaks of Uttarkashi and in the west by hills and mountains of Himachal Himalayas.

Land and Landscape;

Har ki Dun is an intermountain valley. The area is entirely composed of a succession of hills and mountains. It consists of high mountains covered with snow and glaciers, steep peaks and narrow valleys. The entire landscape is rugged and highly dissected.

Climate;

A large part of the area of Har Ki Dun remains covered under snow, throughout the year. It gets a typical high Himalayan climate with extreme cold weather conditions. The area gets rainfall

during July-August at lower altitudes. The average rainfall varies from 1000 to 1500 mm annually (Sayantan Das, 2016) [12].

Drainage;

This is the upper drainage basin of the Tons River. Two mountain tributaries of the river; Rupin and Supin flow through this area. Both these mountain streams join at Naitwar to form the river Tons. The upstream portion of the Supin is drained by its tributaries; Har Ki Dun Gad and Ruinsara Gad. The other tributary of this river is Obra Gad. All these rivers have narrow valleys (Sayantan Das, 2016) [12].

Human Habitations;

Most of the settlements are located in the mountain valleys or on uplands with lesser slopes. All these settlements are dependent on agricultural activities. The people of this valley mainly sustain on crop cultivation and livestock (such as sheep, goats and cattle) rearing.

Settlement Geography and Geography of Settlements

The distribution of settlements in mountainous regions is greatly influenced by the factors of the natural environment. It is also influenced by social, cultural and historical factors. The influence of nature gets more pronounced in high mountain regions.

The settlements of the high Himalayan region are relatively small and simple. These are an agglomeration of houses at a favourable and convenient site (location). The distribution settlement is governed by interacting factors of both nature and culture. These factors are both attractive and restrictive. Thus, these factors create constraints or offer opportunities and possibilities. A combination of all these factors affects the site (location) of the settlement. It also defines the size of the settlements and the economy of the settlements.

Har ki Dun has a great diversity of landscapes. It has natural conditions (constraints) for human habitation. The settled areas are confined to a limited part of the Har ki Dun. A large area that remains covered with snow or dense forests is devoid of human habitation. Apart from this, extensive areas are not suitable for the existence of human settlements as well as settled agriculture due to high relief, as well as other topographical features (slope and aspect of the landscape). This explains why some places are settled and others are not?

Diversity of Settlements in the Valley of Har ki Dun

There is a great diversity of settlements in the valley of Har ki Dun. The diversity of landscape creates diversity in the spatial distribution of population and diversity in terms of human settlements. This diversity is caused by the verticality of the landscape and the variation of climate. Thus, the villages are distributed differently in the region.

Har ki Dun also has a diversity of agricultural landscapes. Where the lowlands (valley floors) are conducive for a settled life, the highlands are suitable only for animal husbandry. The diversity of the agricultural landscape in Har ki Dun creates diversity in the spatial distribution of settlements. It is due to the logic of natural suitability and economic feasibility.

Permanent and Temporary Settlements;

The distribution of human occupation on a landscape gives a lot of information about how people use the landscape, about patterns of economic activities and about cultural and social activities of the given communities (**Silbernagel et al., 1997**) [13].

In general, there are few villages or permanent settlements and there are few other seasonal or temporary settlements. The villages (permanent settlements) are mainly concentrated in areas with lower altitudes. These settlements have an agropastoral economy. The empirical results show that few villages even have summer settlements at higher altitudes. Taluka is summer settlement of Dhatmeer. There are many more summer and winter settlements. Only temporary settlements are located close to mountain pastures. Close to such places, people make temporary settlements and engage in livestock farming (sheep rearing) due to the availability of abundant open pasture lands. Seasonal migration to higher pastures is the basic adaptation of the people of this region.

Classification of Settlements according to Location

The site or location of the settlement may be thought of in two ways: 'from the viewpoint of an individual site in the landscape or from the viewpoint of the landscape which is partially occupied by sites' (**Perkins, 2000**) [9]. This research explains the location of settlements from both perspectives.

The unique mountain relief of Har ki Dun offers three locations for human settlements. In general, most of the settlements are situated in the mountain valleys, but few settlements are located on the ridges and the crests of mountains. Given the physical and geographic situation, to which human activities are added, there is a wide variety of terrain which can be used for agriculture (**Dumitrescu, 2013**) [6]. According to location, the settlements of the region are of the following types;

Valley Floor Settlements or Settlements on Lower Terrasses; Few settlements are located at the bottom of the valley. These settlements experience a less restrictive effect of terrain. In these valleys, the land is relatively flat and the soil quality is good. Here the cultivated land areas are large and have suitability for different land use. Maximum suitability for agriculture is found along river banks and on terraces (**Dumitrescu, 2013**) [6]. According to location few of these settlements are located (distributed) on both sides or one side of the river. Settlements are also placed on land, in between hills, where surfaces are relatively horizontal.

Settlements on Terraces; In high mountains, few settlements are located at places on terraces or almost on the gentle slope of the surface. The rolling lands drained by small streams and endorsed with fertile soil are the possible suitable settlement areas. In Har ki Dun particularly, settlements are placed on proper terrains. The size of these settlements is limited due to the limitation of topography. Here also the residents use the area with the lowest slope as cultivated land and choose the places with a certain slope as the area for habitation.

Ridgetop Settlements; With increasing altitude, the total amount of geographical area reduces and with it, gradually, reduces the opportunities for the development of settlements (**Rizah Murseli, 2016**) [10]. The ridge top settlements are located on an elongated ridge or on below the

summit. Because of the small area, these settlements are small in size and small in population concentration.

According to the topographical features, there are 9 settlements in the valley area on valley floor or **on Lower Terrasses**, accounting for 10 % of the total, while there are 23 settlements on the slopes (mid slopes) or terrace, accounting for 60 % of the total. 11 settlements are located on very high terraces. There are 4 ridgetop settlements.

The results of the analysis of the distribution and location of settlements according to the topography are shown in following table.

Types of settlements	No. of settlements
Valley floor settlements or Settlements on Lower Terrasses	9
Settlements on (medium) terraces and Settlements on higher terraces	23
Ridgetop settlements	4

The location settlements have been distinguished and classified on the basis of interpretation of remote sensing images of the area.

Regional Distribution of Settlements / Distribution of Settlements according to River Valleys

All these high-altitude settlements in Har ki Dun are spread in three areas – Rupin valley, Supin valley and Ruinsara Gad and Obra Gad valley. According to the location of rivers, there are 19 settlements in the valley of the Supin river. There are 7 settlements are in the valley of Har ki Dun, Ruinsara and Obra Gad. The combined total of these river valleys is 26 settlements. Only part of Rupin valley is in the valley of Har ki Dun. There are 11 settlements in the valley of Rupin and 7 settlements are in the valley of Tons. As analysed the spatial distribution of those settlements by broad river basins, nearly 60 percent of the total settlements are found in the Supin river basin.

Regional Distribution of Settlements

River valley	No. Of Settlements #
Har ki dun ruisara gad	7
Supin	19
Rupin	11
Tons	7

The location settlements have been distinguished and classified on the basis of interpretation of remote sensing images of the area.

The Vertical Spatial Distribution of Settlements

Settlements show a strong negative correlation with elevation(Tanovic, 2014).Sites (locations) at lower altitudes are convenient for human habitation. With the rising altitude, the settlements gradually become sparse. The places at higher altitudes have the most unfavourable conditions for agricultural production and even the development of the settlement.

In Har ki Dun settlements are located or distributed from 1500 m to 3500 m (main settlements lie below 3000 m). Naitwar is located at an altitude of 1500. It is a small settlement occupied by 65 families (houses). Naitwar has a population of 320 people. Only 14 settlements in Har ki Dun are located above 2500 m of height. Some of the high-altitude settlements are Osla, Rala and Lewari. These settlements are located above 3000 m. Osla is perhaps the highest permanent settlement in this region. It is located at an altitude of 3600 m. The life and livelihood of the inhabitants is extremely difficult in these settlements due to extreme cold. The livelihood of the people of Osla, Rala and Lewari is associated with activities based on animal husbandry and summer cropping.

The settlements above 3000 m are seasonal (both temporary and permanent). From these settlements, people shift downward to lower altitude settlements during the winter and upward during the summer in search of pasture for their livestock and thus build temporary huts (chhanis) for living. Such seasonal settlements (chhanis) are widely scattered at sites above 3500 m.

Distribution of Settlements by Altitudinal Zones

Elevation	No of Villages
Below 2000	8
2000 – 2500	24
2500 – 3000	11
3000 – 3500	2
Above 3500	1

Villages according to GPS Location and Elevation

The above table exhibits that only 20% of the settlements are located below 2000 m. The largest number of settlements of all sizes lie in the altitudinal zones of 2000 – 3000 m. This elevation offers the most suitable sites for human habitation. All 7 largest settlements are situated below 2500 m.

The number of settlements constantly decreases, as the altitude increases. Jakhol the largest settlement of the region is situated at 2850 m of height. On the other hand, Rala one of the smallest settlements is located at the height of 3100 m. Osla is situated at the highest elevation. It is located at the height of 3600m.

Type of Settlements according to Size

Settlements of Har ki Dun are generally small but still, there are differences in the size of settlements. The size of the settlement mainly depends on the land use of settlements and the carrying capacity of the cultivated land. Dhara occupies the smallest size of the area. It is spread over less than 30 hectares of land. Dhara, Sankari, Dewara and Suchan Gaon occupy less than 50 hectares of land. There are about 9 small (tiny) settlements. These settlements have less than 100 hectares of land.

Bhitari is the largest village in the region. It is located above 2750 m. It even has a large population (1100 population and 175 houses). Jakhol is the largest village with a 1600 population located at an altitude of 2850 m. Both the villages have favourable terrain, fertile soil, abundant water sources, convenient irrigation and better agroclimatic conditions. These villages

also have convenient transportation. The present settlement is a long (centuries-old) adaptation to the fragile environment.

Geographical Area (Hr)	No. of Settlements
Below 50	5
50 – 100	5
100 – 150	4
150 – 200	4
200 – 250	9
250 – 300	5
300 – 350	3
350 – 400	3
Above – 400	8

Source: Data calculated from census report, (2011)

Types of settlements according to the size of habitat

There are 47 settlements. They are both permanent and temporary. The settlements in Har ki Dun range from a single-house settlement to 300 houses. A large number of settlements contain less than 50 houses. Which can be classified as a 'small settlement'. An almost equal number of settlements have 50 to less than 100 houses. These settlements can be termed as 'medium-sized settlements'. The settlement with less than 100 houses constitutes nearly 70 percent of the total settlements. 50 percent of the villages have less than 70 houses. Deval, Gawalgaun, Dhara and Rala are the smallest of all the settlements whereas Jakhol and Nanai are exceptionally large settlements. Dhara is the smallest village according to area and Deval is smallest village according to population.

Village Size / No. of Houses	No. of Settlements
Below 50	14
50 – 100	17
100 – 150	7
150 – 200	6
200 – 250	0
250 – 300	2

Source: Data calculated from census report, (2011)

Settlements are not only geographical entity but also social, cultural reality. The location and distribution of settlements decides (and defines) the economy and every other aspect of human geography.

CONCLUSION

The spatial distribution of settlements in high mountains shows a spatial orientation to low altitude and to low slope. These settlements are located significantly close to the rivers; thus form a special pattern of 'dense in river valleys and sparse on mountains.

The spatial distribution settlement is closely related to topography, climate and resources. The geographic area of settlements gets reduced with increasing altitude. It gradually reduces the opportunities for the development of settlements. Thus, the population gets increasingly concentrated in settlements located at lower altitudes.

High mountains present the verticality of settlement distribution. The distribution of settlements in Har ki Dun greatly corresponds to the altitude. The majority of those settlements are found at the altitudinal zones ranging from 2000 to 2500 m. The number and the size of the settlements are found constantly decreased with increasing altitude. Small settlements are located at higher altitudes. There are 14 villages are located above 2500 of height.

The variations in environmental conditions affect variation in human (adaptive) activities. Besides these, the variations in the spatial distribution of settlements across different altitudes exist in accordance with environmental conditions. The environmental conditions influence their spatial distribution.

The present research reflects that the elevation and slope are the basic but influential factors that affect the distribution of settlements and its size. These factors also affect the nature and form (economic character) of settlements.

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