

NOT FOR ISSUE

GEOMORPHOLOGY AND RURAL SETTLEMENTS IN KHASI AND JAIINTIA HILLS MEGHALAYA

Abstract

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ABSTRACT

In the present study, an attempt has been made to find out the influence of the regional geomorphological factors viz., Relief, slope, Drainage, soil etc. on the location and distribution of rural settlements in the Khasi and Jaintia Hills of the Meghalaya State. As the Khasi and Jaintia Hills presents a great variety of topography, lithology and structural characteristics of rocks, it has ample scope for the said investigation. It is also interesting to note that the location, structure of the house and distribution of rural settlements of the region have emerged under clear influence of the regional processes of landforms and their characteristic manifestations. The present study is a humble attempt in the same direction.

The study area lies between longitude $90^{\circ}40'E$ to $92^{\circ}45'E$ and latitude $25^{\circ}N$ to $26^{\circ}10'N$. The region is demarcated by Garo Hills in the West, Assam in the north and east, Bangladesh in the south. The total area of the region covers 14,463.6 sq.kms. with 2245 rural settlements scattered all over the region.

METHODS OF STUDY

For analytical purposes, various morphometric techniques have been used for example, hill-slope elements

and average slope analysis (Chapter V), superimposed, projected, composite and longitudinal profiles and altimetric frequency graph to identify erosion surfaces (Chapter IV). Various quantitative techniques viz., stream order, law of stream numbers, law of mean stream lengths, bifurcation ratio, sinuosity indices, drainage density, stream frequency, constant of channel maintenance and multiple correlation among selected morphometric variables have been done (Chapter VI). The above mentioned techniques have been used to compare the results and for further generalisation and correlation of accuracy, considerable field studies have been undertaken. The cluster analysis (Chi-square ' χ^2 ' test) has been used to find out the pattern of settlement distribution (Chapter VIII).

In Chapter I of the study the general introduction and a brief survey on available literatures have been attempted. Various studies on regional geomorphology in different climatic regions of the world as well as in the Indian context have been done. A general introduction about the study area, its location, salient features, sources of material methods of study and a brief plan of the said study have been done.

In Chapter II, the whole account of geology, structural characteristics of rocks, tectonic and geomorphic history of the region have been discussed. The structural characteristics of rock formations of the Khasi and Jaintia

Hills reveal that the region has witnessed a number of earth movements. The study area being in proximity to the Himalayan ranges, appears to be very much associated with Himalayan mountain movements. The region is the north-eastern extension of the Peninsular shield, as the rocks of the region have more in common with those of the Peninsular region, rather than those of the surrounding Himalayan ranges of the north-eastern part of India.

In Chapter III, different types of weathering, the intensity of impact of weathering on different rock formations and the factors which influence weathering have been discussed. The ancient rock cover, along with the intrusive rocks have been subjected to intensive weathering. The granite and gneiss of the region have been weathered to lateritic soil. The chemical weathering predominates mainly in the southern part of the region. The dissolution process is in active form in parts of Mawsynram and Cherrapunjee area. The oxidation process can be marked from the exposed rock surfaces, over which a coat of reddish-yellow colour may be noticed. In Mawsynram and Cherrapunjee, interesting characteristic cave deposits have been noticed. The Shillong group of rocks are generally composed of quartzite-schists, which show an interaction of mechanical and chemical weathering. Rock slides, Rock falls and Debris all are marked characteristic of the region mainly along the major road cuttings and steep hill slopes.

Chapter IV deals with the study of evolution of drainage and fluvial erosion. In the last part of this chapter erosion surfaces and fluvial cycle of erosion have been attempted. The sources of major rivers, (both north flowing and south flowing) and their character over different geological formations have been tried in this chapter. Different patterns of drainage have been identified and discussed. The adaptation of stream to its structure is also analysed. The region display erosion surfaces at different elevations from the sea level. Due to the presence of various rock types in the region and their differential resistance to weathering and erosion, the identification of erosion surfaces are rather more complex. The researcher has identified five erosion surfaces with the help of superimposed, projected profiles, longitudinal profiles and altimetric frequency graphs and with the help of field evidences.

Due to erosion, sedimentation, folding, faulting intrusions, movements of land and sea, the present landscape of the Khasi and Jaintia Hills are characterised by the following landform features : (a) the uplifted Shillong Plateau ending in scarps, unfurls the composite picture of the Khasi and Jaintia Hills, (b) the presence of scarps in the southern face of the Khasi Hills come under the sway of the summer monsoons, rendering highest rainfall (of the world) in Mawsynram-Cherrapunjee area,

(c) The break-in-slopes between different levels of the undulating terrain and presence of many waterfalls and rapids, define erosion surfaces of different periods. In some parts the undulating peneplains along with river valleys dominate the landscape.

The region is drained by large and small streams with their numerous tributaries. The drainage system is to a great extent controlled by the Central Plateau, which acts as the major water divide zone. From the central plateau the rivers flows down towards the Brahmaputra plain in the north and to the plains of Bangladesh in the south. The northern rivers have formed plain embayments at their entrance to the plain, thereby making the northern boundary of the region fairly irregular. The southern rivers are entering the plains of Bangladesh in deep gorges, with a number of waterfalls, varying in heights between 14 mts to above 400 mts. The patterns of drainage in the region reflect the influence of initial slopes, inequalities in rock-hardness and structural controls. The trellis, rectangular, radial andp parallel patterns of drainage are found extensively.

In Chapter V of this study various hill slope elements and an analysis of average slope of the region has been discussed. In the study of various hill slope profiles, it is interesting to note that the scarp face is

missing and the debris slope is more prominent. It may be stated here that in initial stage of the hill slope development the scarp might have been present, but gradually, because of heavy rainfall associated with erosion caused by 'jhumming', this face has been turned to a convex shape at the top and gradually a concave at the pediment zone. The hill slope profiles around Shillong indicate the intimate association of soils and gradient of slopes. The association of particular soils with distinct slopes demarcates - different zones for landuse. The agricultural practice around Shillong display striking varieties. It has been developed under the influence of rapidly changing socio-economic forces operating in the context of the limitations and potentialities of the physical environment.

The average slope of the Khasi and Jaintia Hills varies between 0 - 20 degrees and above. These variations in slopes are directly influenced by the nature of topography, lithology and structural characteristics of the rocks. It is interesting to note that in the region the slopes have greater influence on patterns of landuse and settlements. There are five slope categories as prepared by the author viz., (i) gentle (0-5), (ii) moderate (5-10), (iii) Mod. Steep (10-15), (iv) Steep (15-20) and (v) Very steep (20 and above degrees). These slope categories may further be analysed and useful informations may be gathered on the basis of slope sub-units for micro-regional studies.

In Chapter VI, the quantitative analysis of ten sample basins of the region have been discussed. In this chapter the researcher has discussed the morphometric techniques in two separate aspects, viz., the linear and the areal aspects. In the linear aspect, stream ordering, law of stream numbers, law of mean stream lengths, sinuosity indices, and in the areal aspects, drainage density, constant of channel maintenance, stream frequency have been discussed. In the last part of the Chapter multiple correlation among selected seventeen morphometric variables have been attempted.

The quantitative analysis of ten sample basins reveal that :

- (a) There is no direct relationship between area of the basin and number of stream segments.
- (b) The area of the basin is highly correlated with the length of the stream.
- (c) The hypothesis that 'bifurcation ratios within a basin decreases with the increasing order' has been confirmed.
- (d) Empirical data from the sample basins indicate that due to the recent uplift, the topography is not well developed, hence the valley network is not complete.
- (e) The organization of fluvial hierarchies, as manifested in the 'Laws' of stream numbers and mean stream lengths, in some basins are not functionally related.
- (f) The standard sinuosity index indicates that only Um Raling and Rashniang flow in a straight course while, rest eight stream flow in sinuous course.
- (g) The Um Raling, Rashniang and Wah Rashi basins with high topographic sinuosity indices indicate that these basins are still in their early stage of basin development.

- (h) The Umdkhar, Um Talang and Shillong sohoet, which are located in the periphery of the Central Plateau region, indicate their early mature stage of basin development.
- (i) It has been observed that a rise in the drainage density occurs with increasing relief. The relief supported by steep slopes, favourable lithology and abundant rainfall also affect the drainage density of the region.
- (j) The drainage density and constant of channel Maintenance show an inverse relationship, with a high negative coefficient of correlation (-0.99).
- (k) The area of the basin and constant of channel Maintenance show high positive correlation (+0.73).
- (l) Drainage density is negatively correlated with the area of the basin (-0.70)
- (m) Bifurcation ratios are highly correlated with the length of second and third order streams.
- (n) Topographic sinuosity index is negatively correlated with the hydraulic sinuosity index.
- (o) Number of first order is highly correlated with number of second order (+0.82) and number of second order is highly correlated with number of third order (+0.95).

In the Chapter VII of the study the general distribution as well as distribution at Thana-level, location of settlements, types of settlements and different house types with building materials have been analysed. The study brings out a marked variation of settlements and their distribution in space. It has been observed that in Jaintia Hills a large number of settlements are permanent nature. These are mostly located near the agricultural land. Most of the large settlements are located around the city of Shillong in Khasi Hills and around Jowai town in Jaintia Hills.

Along the Gauhati-Shillong road, Shillong-Cherra road and Shillong-Jowai road a large number of linear settlements are located. The present study brings out six important sites which have favoured in the location of settlements in the region. It has been found that the availability of drinking water and agricultural land acts as 'pull factors' in the location of settlements. A large number of settlements are also located along the ridge tops. The present study brings out five patterns of settlements in the Khasi and Jaintia Hills. Among these the linear, dispersed cluster and isolated households are striking.

The landforms, particularly, the micro-relief features are associated with micro-climates and the building materials are reflected in the house types and the house structure of the region. The researcher observed that most of the houses are constructed in accordance with the socio-economic and environmental conditions of the region. A marked variation in house types has been observed which ranges from the old types to the modern Assam types.

Chapter VIII deals with the influence of landforms on location and distribution of rural settlements. The study has been restricted to the ten sample basins. In this chapter effort has been made to explain the relationship between landform characteristics viz., relief, average slope, drainage and agricultural land with location and distribution of rural settlements. The study confirms the following hypothesis :

- (a) It confirms the hypothesis that larger settlements are located along the water shed zone.
- (b) It confirms the hypothesis that slope of the area controls the shape and architecture of houses. It has been noticed that the pillars on which the main house rests upon, increases in length with increase in gradient of the slope.
- (c) It confirms the hypothesis that the availability of water and fertile soil generates 'pull factors' on the location of rural settlements. In the region large number of 'wet-point' settlements (near springs and along the streams) are noticed.

And the study rejects the following hypothesis:

- (a) It rejects the hypothesis that number of settlements are uniformly distributed over the region. The researcher found with the help of the chi-square test, that the settlements are randomly distributed.

Apart from the topography, average slope, availability of drinking water and cultivable land, the effects of the micro-climatic elements on settlements are strongly directional. The orientation and design of the houses in the region are governed by wind force, rainfall, temperature and humidity etc.

It has been observed in the preceding discussion and in the last Chapter (IX) the summary and conclusion of the study that the human occupancy of the land, location, distribution of rural settlements and house types are to a great extent, related to the factors of physical geomorphological and to a certain extent the cultural controls of the area. The Khasi and Jaintia Hills is a land of

great inequalities. Great differences in elevation and relief brings about contrasts in climate, natural vegetation, surface drainage, underground water-supply and soil profiles. These in turn influence the variation in landuse pattern and various aspects of rural settlements.