RELATIONSHIP BETWEEN LANDFORM AND SETTLEMENT IN BANKURA DISTRICT, WEST BENGAL.

SUMMARY

The geomorphological analysis, both qualitative and quantitative, of any area exposes the various environmental attributes where human adjustment with the former has resulted into the development of the ultimate cultural landscape. Hence, all the concrete expressions of humanised landscape including human habitation are, thus, correlated with the landform.

Landform is the basic expression of the past physiographic history which is significant in relation to the biological phenomena. Therefore, a thorough and careful study of landform relating to the settlement is essential particularly in an agro-based economy. The present work relates to an identified backward area (Bankura District, West Bengal) - characterised with predominance (more than 92%) of rural population (rural settlement) and agricultural activities.

The district of Bankura (22°38' to 23°38'N Lat. and 86°36' to 87°46'E Long.) has a total area of 6882.00 Sq.Km. (7.75% of the total area of the State) and supports a population of 2,374,815 (rural population being 2,193,568 in 1981). Lying between the rice-producing alluvial plains of Bengal to the east and the Chotanagpur plateau on the west, the district forms an intermediate tract. From the central part of the district, ground surface rises gradually in western
undulating plain, the elevations becoming more pronounced towards the west where the land is interspersed with hillocks and broken up into low ridges and valleys. Towards the extreme north-west, the undulation becomes more pronounced as the Chotanagpur Plateau is reached.

Because of the diversified terrain ranging from hills, rolling undulations to plains and monotonously flat plain, settlement in the district is unevenly distributed. Accordingly, the density of settlement, spacing of settlement, dispersion of settlement and so on are not uniform in character throughout the area. Therefore, a causative relationship may be revealed between the landform and settlement in the district which will ultimately be helpful for future planning and development.

The greater part of the district is covered by laterite and alluvium, while the gneissose and schistose rocks of Archaean age occur in the western part which extends to the east. In addition, sedimentary rocks of the Gondwana system forms the southern part of the area.

Damodar, the most important river of the district separating it from the district of Barddhaman, flows along the northern boundary. Dwarakeswar is the second important river which flows through the middle part of the district.

The climate of the district is characterised by an oppressively hot summer, high humidity (nearly all the year round) and
relatively scanty rainfall during the monsoon months. The winter starts from mid-November and lasts till the end-February.

The soils of the district are multi-faceted - laterite and lateritic (west), red (centre) and alluvial (east). In general, the uplands, the hill slopes and the ridges are forest-clad (Dry Sal) while the lowlying areas and the gentle slopes with a deep soil cover have been brought under the plough. Old records show that the forests of the district were once a great abode of wild-life. Today wild life is practically extinct here. The extension of cultivation in haphazard manner has cut up the forests into small blocks and dressed the width of forest belts.

The study area is dependent, for its transport system, more on its road network rather than the railways. Large-scale industrial units are not found in the district. A few small and medium-sized industries have come up, which are mostly engaged in the processing of agricultural products or engineering job work. In fact, cottage and household units constitute the basic framework of industrial activity in the district.

The origin of the district of Bankura as single administrative unit does not, however, date earlier than 1765, the year of the grant of the Diwani to the East India Company. But the district attained its present dimension in the year 1879 and it was not until 1881 that a separate District judgeship was created for Bankura exclusively.
Landform character of any region may be dismantled into a number of morphometric attributes, e.g., absolute relief, dissection index, drainage density, slope, ruggedness index and so on. Likewise the settlement of any area may be understood by studying different aspects of settlement i.e., density of settlement, types and pattern of settlement, population growth, occupational structure, spacing of settlement, nature of dispersion, siting and spatial distribution of settlement and so on.

The knowledge of relief and forms as well as the knowledge of spatial arrangement of landforms facilitate a better planning and more rational use of a particular area. To get an idea about different morphometric attributes for the macro-level study, the district has been divided in 6,940 grids (1 Sq.Km each).

Absolute relief analysis of the district reveals that 67.55 percent of the total area lies within 30 to 110 metre height group whereas the distributional patterns of different relative relief show that the lower relative relief categories appear mostly in areas of lower elevations. Actually, the hills with higher elevation and comparatively steep slopes are responsible for the development of comparatively higher range of relative relief found scattered in the north-western and south-western parts of the district. The absolute relief and relative of any region do not reveal the sharpness and the nature of relief of that region. The picture grained from relative altitudes only is static for it fails to take into account the vertical distance from the erosion base. That is why a ratio between the relative relief and absolute relief, within a definite
area known as 'Dissection Index' has been taken into consideration. The relation between absolute relief and dissection index in the study area is highly remarkable. More than 68 percent of the total area of dissection index categories is within the height group of below 70 metre to 110 metre (covering 67.55%). The coefficient of correlation is +1 which indicates direct and positive control of absolute relief on dissection index.

The slope characteristics of the area have been analysed based on Wentworth’s method. The spatial distribution of different slope categories in the area reveals mainly the process of slope development rather than the altitudinal character in the area. In general, the north-western and south-western sections of the district possess comparatively steeper slopes. The degree of inclination on the surface gradually decreases from west to east. It is revealed that relative relief categories of below 15 metre and 15 to 30 metre together account for 93.09 percent of the area whereas slope categories below 2° and 2° to 4° together account for 92.44 percent of the area. The distributional characteristics of average slope and relative relief shows a positive and direct correlation.

The drainage density provides a better quantitative expression to the dissection and analysis of landform. A good proportion (74.20%) of the areal extent of the district is within very low to low (below 2 to 4 km per Sq.Km) drainage density category.

Ruggedness index is the product of relative relief and drainage frequency for the area concerned as a whole. It shows a combined
expression of relief, texture and slope. It (index number) increases with corresponding increase in relative relief. From the overall distributional pattern of ruggedness index it is revealed that the district has great share (93.27%) of extremely low (below 0.01) to Low (0.01 to 0.05) ruggedness number and it is also interesting to note that the number like other morphometric attributes increases from east to west.

The topographical characteristics, morphometric attributes of terrain (relative relief, dissection index, slope, drainage density etc) and the field studies have helped to divide the district into four different morphological units, namely (I) North-Western and South-Western hilly terrain, (II) West-Central terrain, (III) Bankura Bishnupur gently sloping terrain and (IV) Joypur-Kotalpur plain.

The ultimate development of the forms (Landform) and the associated characteristics in the area under study are the products of geology, structures, tectonic, relief, drainage, climate, soil, vegetation and geomorphic processes, operation through time. The evidences of these are found in the form of narrow to wide valleys, river terraces, floodplains and depositional features.

One of the most important cultural features on the terrestrial surface created by human interference is the settlement, the group of human dwellings providing shelter against wild animals and elements of weather. Considering human-nature interrelation, efforts have been made to discuss the distributional aspects of population and settlements in respect of geomorphic attributes.
Since Independence about 80 percent of the total population of the study area depends on agriculture. During 1872 to 1901, the population of the district could not grow fast enough due to the widespread prevalence of malaria, occurrence of cholera, general deterioration in the conditions of the Damodar and the Dwarakeswar rivers and continued scarcities. During 1931-41, the district recorded a population growth of 16 percent notwithstanding the combined onslaught of flood and drought in 1934. In the next decade, however, the population increased only nominally by 2.30 percent due to the great famine.

Since 1901 the rural population of the district shows a high positive decadal growth. During the period from 1961 to 1981 the rural population witnessed abnormally high growth rate. This is due to marked improvement in hygienic conditions, better agricultural harvests, improved transport and communication facilities and growing trends of urban and industrial development in the region, particularly after independence. According to 1971 census the district recorded an average rural density of 277 persons per Sq.Km. in 1981. The district has registered 38.33 percent as literates which is lower than the State’s proportion of 40.94 percent. The proportion of workers (1981) in the district is higher than the State (W.B) average.

The site characteristics of settlement in the study area exhibit two tendencies - (i) tendency to avoid and (ii) tendency to prefer. Unfavourable tracts of the major river banks, flood-plains, dense forest tracts, laterite and lateritic tracts are largely
repulsive to human settlements in the study area. Typical river-side settlements are to be seen in the areas of high relief where the valley offers the only line of movement and penetration of the people. The fertile soil of the plain favouring agricultural and other socio-economic activities is the main attractive force in siting of human settlements in the area. There are some village sites (north-western and south-western parts of the district) which occupy hill slopes almost parallel to contour lines. There are some village sites located mainly near water sources (rivers, wells etc) are found throughout the district. Some village sites around agricultural fields (flood-plain settlements) are also noticed along the eastern part of the district.

The types of settlement which evolve are related to the process of occupance and the manner in which the territory was originally settled. The process of occupance, because of variable relief and agricultural conditions has been selective and discriminating. In the actual distribution of rural settlements two characteristic types with many intermediate stages are generally distinguished: (a) Compact and (b) dispersed settlements. Both the physical and cultural factors have combined to create variations in these two extreme forms in the area. Practically, three broad types of settlement can be recognised in the district - (1) agglomerated/nucleated, (2) semi-compact/fragmented and (3) sprinkled/dispersed.

The geometrical shape of habitation and its internal morphology are referred to as settlement patterns. The dominant controlling factors for settlement patterns are surface water, terrains and nature of stream channels (physical elements), layout of the
plots, religious centres, street to house and house to house relationship, and so on. In the study area mainly four settlement patterns - (1) rectangular, (2) linear, (3) polygonal and (4) circular are clearly discernible.

There is no exact relationship between the population and the areal size of villages. Therefore, it is convenient to study the density of residential houses which are directly related to the degree of cohesion and compactness of settlement. The north-western hilly areas of Biharinath-Susunia hills, Ranibandh-Khatra uplands and laterite/lateritic parts of Onda have less than 50 houses per Sq. Km. Eastern alluvial tracts of Patrasair, Joypur, Indas and Kotalpur have moderately high to high density (60 to above 65 houses per Sq. Km) of residential houses. The overall picture of the density of residential houses is comparatively low to moderate.

Another significant measure in distributional analysis is based on the spacing of rural settlements which study the locational arrangement of villages vis-a-vis one another. In the area under study spacing pertains to the relative distance between settlements over an area i.e., the linear distance. Moderate and moderately low (1.00 to 1.15 Km and 1.15 to 1.30 Km) spacing together covers 45.19 percent of the total area.

An attempt has also been made to measure the degree of dispersion on the basis of the 'nearest neighbour method' taking into account the mean of nearest inter-village straight-line distance, settlement density and expected distance. Low regularity (0.80 to
covers 51.41 percent of the total area. Upland areas with rugged topography, laterite/lateritic soils, lack of communication, low rainfall, non-perennial rivers are mainly responsible for such dispersion.

A quantitative approach has been adopted to examine the impact of landform (morphometric) attributes on settlement distribution and finally to establish the relationship between them. The distributional pattern of different settlement frequencies with respect to absolute relief reveals that maximum number of settlements belongs to the areas of low height group i.e., below 70 to 110 metre. The overall distribution of settlements appears to have a negative relationship with the relative relief, the coefficient of correlation being -0.81. The maximum number of settlements belongs to the areas of less than 15 metre relative group and moderate to gentle slope group i.e., less than 2° and 2° to 4°. The coefficient of correlation is -0.75 i.e., number of settlement decreases with higher values of slope.

For studying (visual) correlation between landform (morphometric attributes) and settlement, four morphological units (as stated earlier) are taken into consideration and settlement maps (density of residential houses, spacing of settlements, dispersion of settlements etc.) have been superimposed over the map of morphological units. This superimposition gives a clear idea about the relationship between landform and settlement in each of the units identified. It is observed that the density of residential houses increases from north-western and south-western hilly terrain (Unit-I) to Joypur-Kotalpur Plain (Unit-IV). It is inversely related with
landform (physical) attribute values. On the other hand, the spacing and dispersion (of settlement) values increase with the increase in landform attributes. They increase from Unit-IV to Unit-I.

The Saltdora (from Unit-I i.e., Biharinath-Susunia hilly area) and Patrasair (from Unit-IV i.e., Joypur-Kotalpur plain area) police stations have been taken into consideration for micro-level study. The method as adopted at the macro-level study (District as a whole) has also been applied to for micro-level (Case studies) studies to find out the relationship between landform and settlement. It is observed that a negative (inverse) correlation (in varying degrees) also exists between landform attributes and settlement frequencies in these case studies. Finally, it may be inferred that the low values of different landform attributes are more convenient for human habitation.

On the basis of this relationship between landform and settlement, as is traced in the district, some developmental strategies have been suggested which may be executed in the existing sites of settlement, otherwise that would create a number of additional difficulties involving huge expenditure.