SUBREGIONALIZATION OF THE INDIAN HIMALAYA

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INTRODUCTION

Regionalization is an exercise in aggregation of small unit areas having certain similar characteristics into larger units, or disaggregation of larger areal units, such as continents or countries, into smaller units. The essential principle of the process of aggregation and disaggregation is that of maximum homogeneity or similarity in the characteristics among the areal units forming regions and sharp contrasts (or heterogeneity) between the regions thus delineated.

Homogeneity and heterogeneity are relative terms and have to be used with caution because of the ambiguity involved in the regional concept itself. For example, a formal region delineated on the basis of similarity in one or more physical characteristics (rock types, topography, rainfall, etc.) can and should be divided and regrouped to form a functional region which has properties of similarity on the basis of organization of its sociocultural and economic activities by the people inhabiting the region. The organization of these activities manifests itself in the emergence of a few human settlements as nodes or focal points with their relatively distinct spheres of influence. This process by which formal regions are tranformed into functional regions sets the stage for economic development.

Delineation of regions and subregions into formal and functional characteristics, and their characterization, becomes essential in understanding and evaluating their natural characteristics and human responses. Thus, while preparing a regional perspective of development for a 15- to 20-year period, the natural environment and its relationship to physical and human resources have to be kept in view. Terms such as ecology and environment, in the context of development, have to take into account this dynamic aspect of man-environment relations rather than treating man and environment in isolation. Such an approach is appropriate for regionalization of the Himalaya.

In addition to the concept of homogeneity, the concept of hierarchic interdependence is equally important because all the related elements that lend distinctiveness to the region are not uniformly distributed and they exert their influence over areas of different scale--macro, meso, and micro. For example, while the major natural regions of India are delineated on the basis of climate, subregions within them are identified on the basis of topography, soils, and vegetation. This is true of the Himalaya as well, with an added feature of ecological hierarchy of regions on account of vertical zonation of land use, as well as horizontal variations in the formation of complex drainage systems

and tributary valleys of large rivers. In the context of economic interdependence, depending on the nature of the resource base, levels of its utilization, and socioeconomic development of the people, small areal units tend to establish space relations with continous neighbors whose economic activities are complementary. This principle of continuity is also relevant in the context of integrated development of the Himalaya.

In regionalization, measurement of association among different elements of the regional structure should be attempted qualitatively and quantitatively. Large-scale topographical maps, aerial photographs, and satellite imageries are indispensable tools for generating a wealth of information about topographical features, water, mineral, and forest resources, broad land use, distribution of human settlements, and infrastructure such as roads. This information can be quantified and the data aggregated to the level of administrative units by adapting the natural boundaries to those of the nearest boundary of the administrative unit. Scales of maps and the choice of administrative unit (e.g. village, village clusters, *tahsil* (revenue unit) or Development Block, District, and so on) would depend on the objective of the study. Thus, to enhance the operational utility of the exercise in regionalization, the boundaries of regions, subregions, and within them small tracts, should be adapted to the administrative boundary.

Regionalization, once attempted, should be tested for its accuracy or validity once in at least five to ten years as the regional boundaries are subject to change due to changes in man-environment relations with advances in technology. In the initial stage of development, the influence of the natural environment is somewhat deterministic. Cultivated areas are mostly in small patches of valley plains or clearings around human settlements, and the settlements themselves are distributed in conformity with the pattern of drainage and terrain conditions. Subsequently, transport routes develop within and between regions, and the utilization of resources makes it possible to overcome the deterministic influence of the natural environment, resulting in the emergence of functional-economic regions which cut across physical barriers. The linkage between Jammu and the Kashmir Valley provides the best example of the impact of technology on natural environment. Likewise, in the northeastern region, the economic focus is the Assam Valley, though the smaller states and Union Territories are distinct in their physiographic characteristics. Even though metaphysical dubiety may surround the whole concept of the region, for practical purposes regions exist, and if they did not they would have to be invented.

NEED FOR SUBREGIONALIZATION OF THE HIMALAYA

The Himalaya comprises a vast system of mountain ranges, highly dissected, having deep gorges and narrow valley plains, and in certain areas too complex to be amenable to regional differentiation from the macro to micro levels. As Ogilvie observes, "nowhere in the world are the small natural regions more sharply separated than in the

Himalaya" (Ogilvie 1938). Because of the distinct differences in geological structure, heights, slope, and natural vegetation, the approach to subregionalization becomes exceedingly complex and challenging. The approach can be one or all of the following considerations, depending on the objective of the study:

- Subregionalization on the basis of altitude and slope
- Longitudinal differentiation of mountain ranges and valleys
- Latitudinal differentiation on account of the width of the Himalaya

In all the attempts toward regional delineation of India, the Himalaya stands out as a distinct major region which is marked off from the northern alluvial plains of the Indus, the Ganga, the Brahmaputra, and their tributaries. Further subdivision has been attempted rightly on the basis of natural factors giving weightage to geological structure and topography, and drainage within the overall influence of climate. Such an approach can be considered an attempt to evaluate the impact of physical factors and human response, such as land slope and bringing those lands under cultivation, soil erosion and creation of embankments, spatial arrangement of human settlements, efforts to provide infrastructure facilties and amenities, and so on. Characterization of natural regions and subregions also provides a basis for an assessment of physical resources of the area and to prepare a strategy for development appropriate to those regions and subregions. Under conditions of extremely rugged terrain and temperate climatic conditions, human settlements are small and scattered, and population density is low. Such areas of small settlements distributed within drainage basins of tributary streams should be the lowest order areal units for integrated development of land use, human settlements and infrastructure such as transport, power, and other energy resources.

Second, the vast east-west expanse of the Himalaya falls within the jurisdiction of different political administrative frameworks--international, interstate, and intrastate. As a result, the development of water and power resources, land use and soil conservation, utilization of forest and minerals, and the problems of environment, need coordinated development. These aspects of development should be dovetailed within the overall strategy for the development of the Himalaya with that of the concerned political administrative unit.

It is possible to measure intraregional and interregional variations in overall levels of economic development, with the help of a variety of socioeconomic variables related to the development process. The Himalayan region, with its sharp variations in levels of interregional transactions, presents evidence of the emergence of function-economic subregions. Boundaries of these subregions would be nearly coterminus with those of natural boundaries, such as the major and minor water-sheds which insulate the human settlements in performing their socioeconomic activities.

An important aspect to be dealt with in subregionalization is the identification of the elements of the regional structure and their distributional pattern. Boundaries are then drawn according to variations in intensity of occurrence, such as high, medium, and low. These elements and their relative importance at the local, regional, national, and international level also need to be evalutated, so that the subregions can then be arranged in a hierarchic order. For example, scattered human settlements and cleared patches of cultivation or grassland mostly to suit the local needs are important at the local level. Areas suitable for the development of major hydroelectric projects or of economic minerals are of national and international importance. The Karewas (plains fringing the Jhelum River in the Kashmir Valley) are of regional importance for rainfed crops in unirrigable parts, and for the cultivation of rice, maize, and saffron.

Precise delineation of subregions of different orders is exceedingly complex because of the sharp differences in physical characteristics and the vast extent of the Himalaya. Even when these boundaries are drawn closely following the physical characteristics such as slopes and natural vegetation, they tend to be smooth, unlike administrative boundaries of villages, *tahsils* or districts. Subregions bounded on these considerations are very valuable to begin with, as they serve to characterize these subregions according to their inherent characteristics. These characteristics can be quantified by using small grids--squares or rectangles--and the groups of such grids falling within the administrative units are then used for quantification of the qualitative data relating to different characteristics of these subregions. It must be mentioned however that subregionalization and characterization of regions is only a beginning in understanding and evaluating those elements of the regional structure which influence, directly or indirectly, the problems of development of the region. The following stages in subregionalization are suggested, keeping in mind the strong bias toward physical planning approaches in the case of the Himalaya.

Macroregional Delineation

Delineation of regional boundaries should be attempted on the basis of the information available from small-scale maps of 1: 1,000,000 and satellite imageries with respect to topography, drainage, broad land use, locations of human settlements, transport lines, and so on. These boundaries are then adapted to those of the nearest district boundaries for grouping districts on the basis of these characteristics, and interpretation of the available secondary data on demographic, socioeconomic, and infrastructural facilities and amenities. Since these districts, and in turn the subregions comprising groups of districts, fall in different states and union territories, subregionalization would also serve to evaluate the problems of interstate and intrastate cooperation particularly in the context of development of water and power, forest, and mineral resources.

Mesoregional Delineation

Within the subregions identified on the basis of the above exercise, further refinement of the regional boundaries

becomes necessary to ensure that the subregions portray the ground reality to the extent possible. In this case, the large-scale topographical maps of the Survey of India (1: 200,000) and the satellite imageries would be valuable to identify smaller unit areas within the overall subregional framework. These boundaries should then be adapted to those of the *tahsil* or Development Block boundaries for data aggregation and analysis of the regional structure.

Microregional Delineation

Each areal unit comprising a narrow enclosed valley plain or a distinct natural unit can be considered a microregional unit for preparing an integrated development plan with energy as an important component.

For purposes of identification and adoption of the microregion as a unit for planning, a Development Block, or *tahsil* would be ideal. Large-scale maps (1: 50,000 scale) of the Survey of India, aerial photographs, and satellite imageries would be necessary to build an up-to-date resource inventory in its spatial framework.

SUBREGIONAL DELINEATION OF THE HIMALAYA

There have been attempts in the past--mainly by geographers--toward delineation of subregions of the Himalaya in the context of understanding the regional geography of India. In all those studies, the Himalaya is considered one of the macroregions marked off from the northern alluvial plains and having its own climatic, vegetal, sociocultural, and economic characteristics. The parallel mountain ranges and valleys have also been identified into three subregions, as the Himalaya varies in width from 150 km to 400 km.

South-North

The Siwaliks (up to 1830 meters). These are the southernmost foothills of the Himalaya, formed by river-borne deposits from the rising Himalaya. This area was subsequently folded and faulted by earth movements. The faulted edges are marked by abrupt slopes. The average elevation is about 600 meters, though internally the parallel ridges rise to about 1500 meters. To their north, the hill ranges descend to give rise to flat-floored valleys which are the main areas of intensive cultivation and dense population. These valleys are locally known as *duns* (e.g. Dehra Dun).

From the point of view of energy resources, an integrated approach is needed for the development of livestock, natural vegetation, tributary streams and their gradients, and the characteristics of land form and slopes. Within the Siwaliks subregion, there are a large number of valleys of small tributary streams where the population is scattered in small hamlets. These valleys are separated from the watersheds and often have no settlement on account of the steep gradient of tributary streams. The focus is on the settled valleys, while the Siwaliks and their role in development need to be assessed in the context of the overall strategy for the development of the states in which they form distinct subregions.

Lesser Himalaya (1830 to 3050 meters). These massive mountain ranges rise abruptly from the Siwaliks to a height of 5000 meters. Between 1000 to 5000 meters, this area is formed of more complex patterns of mountains and valleys, which run in all directions. The southern slopes in general are bare, while the northern slopes are covered with thick forests, possibly on account of their being insulated from the relatively densely populated valleys beyond which these ranges rise abruptly. There are patches of snow-covered peaks along the mountain ranges. The width of the region is about 75 km.

Population density is very sparse in this region, with scattered hamlets on patches of flatlands, mostly along the lower slopes of tributary valleys.

Greater Himalaya. The region is also known as *Himadri*, indicative of its being a permanently snow-covered mountainous region. Landforms, carved out of permanent snow-cover and glaciation, are characteristic convex slopes and hanging valleys with deposits of moraines. Erosion is therefore much less than in landforms carved by stream action. The western and eastern limits of the Greater Himalaya terminate abruptly, displaying the folded nature of the mountains and periodic uplift. The glaciers in the region are the largest in the world, particularly in the western part, or Karakoram area. Some of them are not only large, but descend to low levels as in Kashmir (2135 to 2440 meters). To the north, this region marks the edge of the massive northern plateau against which the folded mountains of the Himalaya have been thrust.

The rivers and their tributary streams in this region are marked by deep gorges and mature valleys in places, and showing distinct expressions of river capture and swift flow as a source of vast potential for hydropower and irrigation water.

Because of height and vertical zonation of vegetation from grassland to alpine forests, the variations in plant and animal resources also need intensive evaluation at the macro to micro level of land units.

West-East

Subregionalization of the Himalaya from west to east is more important because of the vast extent, stretching over 2500 km between the Indus and the Brahmaputra. In delineating these subregions, climate, topography, and vegetation are important. Climatically, the region varies from relatively drier areas in the west (Jammu and Kashmir) to the area having highest rainfall in the northeastern mountain areas. The following subregions are identified with certain evidence of the hierarchical role of rainfall, topography, and vegetation in their influence:

Western Himalaya. This subregion extends from Jammu and Kashmir to approximately the border of Nepal. The Kali river in Nepal is its eastern limit.

Central Himalaya. This comprises most of Nepal. Its eastern boundary is demarcated by the high transverse range--the Singalia.

Eastern Himalaya. More humid climate, lower heights, less snow-cover, and dense forests serve to demarcate the rest of the Himalaya. This comprises the Sikkim

Himalaya, Darjeeling Himalaya, Bhutan Himalaya, and Northeastern Himalaya, comprising the territories of Arunachal Pradesh, Nagaland, Manipur, Mizoram, and Tripura. Structurally, Meghalaya does not belong to the Himalaya ranges because it is a detached block of the peninsular plateau; yet on account of its situation and formation as the mountain mass of northeast India, it is included in the Himalaya region. The regional structure and development problems are similar, though genetically they are different.

Within the macroregions of the Himalaya identifiable on the basis of climate, macro-geomorphological features and natural vegetation, the following schemes of subregions have been identified in earlier exercises in regionalization using mainly landform features of the lower order (meso and micro). These subregions and their salient characteristics are enumerated below.

REVIEW OF PAST ATTEMPTS AT SUBREGIONALIZATION

O. H. K. Spate (1967) introduced the concept of macro, meso, and micro regions in subregionalization of India. Within the three macroregions of India (the coastal plains, the peninsular plateau, and the northern mountains) the Himalaya is subdivided into 6 first-order regions, 18 second-order regions, and 43 third-order regions. An attempt is also made to further subdivide them into distinctly identifiable land units (Appendix A).

On a less intensive scale, S. P. Chatterjee (1965) has identified three major regions--Western, Central, and Eastern--within which 11 second-order regions have been identified (Appendix B). Some of those correspond broadly with the second-order sub-regions delineated by Spate, though they correspond with mainly the political boundaries of states or parts of states (e.g. Kumaun Himalaya, Darjeeling Himalaya, Manipur Hills, Nagaland, and so on.) Some states in northeast India are comparable to the size of a district or group of smaller districts elsewhere; this may be an advantage for preparing the spatial and sectoral development plan for the state from below.

R. L. Singh (1971) has attempted a detailed scheme of sub-regions in which 14 first-order, 40 second-order, and within them 109 third-order, have been identified (Appendix C). Here again the principles of delineation are based on natural characteristics according to their relative importance and interrelations mentioned earlier. While the first- and second-order regions appear to be comparable, and reflect regional realities, the third-order regions are of varied scale. For example, in the Kashmir region apart from the two first-order regions, which distinguish the Kashmir Valley and the Jammu region, delineation of three third-order regions, such as the Jhelum Plain, the Karewas, and the mountainous rimlands are very important. The rimland has dense forest cover and along with the utilization of the Karewas for grass and grazing purposes in unirrigable parts, the region has potential for the exploitation of biomass energy. In the U. P. Himalaya, the third-order subregions are mostly the valleys of tributary streams, which are large in number and do not reflect the

relationship of several watershed areas which might show common characteristics in terms of slope and land use.

REGIONAL VARIATIONS IN LEVELS OF DEVELOPMENT (Table 1)

While the foregoing analysis provides subregions of different scales based on natural factors as they are relevant for the evaluation of physical resources, an attempt is made to identify regional variations in levels of development using 11 variables relating to demographic, social, and economic characteristics as available from census records (1971).[1] The district is adopted as the unit for compiling data and appropriate ratios have been used while ranking districts on the basis of each characteristic.

Composite rank scores are calculated and the districts within each state are grouped according to uniformity or similarity in composite rank score. Districts with low values on composite rank scores are considered relatively developed while those with higher values are treated as less developed.

Results of this study, despite limitations, provide certain valuable evidence of the underlying relations between the natural environment and human response derived from the variations in the values of socioeconomic variables used in this study (Appendix D). Population density and the size of human settlements reflect the influence of the natural environment, while other variables are related to socioeconomic characteristics. Salient features of the variations in levels of development are outlined below.

In Jammu and Kashmir, 10 districts fall into 4 levels of development, with Srinagar and Jammu occupying the relatively developed category; Ladakh and Doda are least developed. The three subregions from south to north which conform to sharp division according to topographical features are evident. Within Himachal Pradesh, Simla, as could be expected, belongs to the developed category in contrast to the contiguous northern districts of Chamba, Lahul, Spiti, and Kinnaur which are least developed. Incidentally, this subregion is also contiguous to Ladakh in Jammu and Kashmir as an extension of the same characteristics of the Lesser, and to some extent, the Greater Himalaya.

The hill region of Uttar Pradesh has three subregions, with Nainital and Dehra Dun belonging to the developed category, while Uttar Kashi, Chamoli, and Teri Garwal can be grouped into the least developed category.

Table 1: Indian Himalaya: Development Pattern
(Intrastate and Interstate)

Development Level	Jammu & Kashmir	H.P.	Hill Region of U.P.	North Bengal	Northeast India
I (Highest)	Srinagar (38)	Simla (35)	Nainital (32)	Darjeeling (17)	Tripura (26)
	Jammu (33)		Dehra Dun (22)	(30)	Mizoram
II	Anantnag (47)	Bilaspur (43)	Pithoragarh (46)	Cooch Bihar (26)	Manipur (36)
	Kathua (43)	Kangra (45)	Almora (44)	Jalpaiguri (23)	Meghalaya (38)
			Pauri Garwal (41)		
III	Udhampur (58)	Mandi (54)	Uttar Kashi (62)	-	Nagaland (44)
	Baramula (61)	Kulu (57)	Teri Garwal (62)		
	Poonch (61)	Sirmaur (58)	Chamoli (51)		
	Rajouri (65)				
IV	Ladakh (74)	Lahul (63)	-	-	Arunachal Pradesh (55)
	Doda (70)	Kinnaur (64)			
V (Lowest)	-	Chamba (76)	-	-	-

Note: Figures indicate composite score.

In North Bengal, Darjeeling District stands out in sharp contrast to Cooch Bihar and Jalpaiguri, the former being relatively developed. Entire North Bengal, in fact, forms a part of the Eastern Himalaya with Sikkim as its contiguous neighbor. The Tista and the Chimbu Valleys are ideal subregions for illustrating the need for integrated development of water and land resources.

In the northeast, the paucity of data limits subregionalization of the states and union territories, though contrasts in terrain, land use, water resources,

and socioeconomic characteristics are as conspicuous as in the relatively large subregions of Kashimir, Himachal, and the U.P. Himalaya (e.g. valley plain and tribal hills areas of Manipur or the Garo, Khasi, and Jaintia hill regions of Meghalaya).

ENERGY RESOURCE POTENTIALS OF THE HIMALAYA

The attributes of development, listed by district for each of the subregions, bring out certain common characteristics of the Himalaya region which have a bearing on the development of energy resources for the region's population and those required for development of other regions of the country.

The structural characteristics, landforms, and drainage, evolved out of continued uplift over 50 to 60 million years, have provided the region with vast potential for the development of water and power resources. There are possibilities for a large number of minihydel projects in Himachal and the U. P. Hill region for the benefit of the population living in the area, with a view to diversify the employment base which is still dependent largely on subsistence agriculture and livestock economy (Appendix D). Because of the slow uplift of the Himalaya, the drainage pattern in many places does not follow the normal pattern of parallel mountain ranges separated by river valleys. Innumerable river captures, steep-sided valleys, escarpments, and deep gorges extending to cover 6000 meters, and the ungraded streams marked by waterfalls and rapids need to be systematically evaluated for the purposes of preparing a strategy for the development of energy resources.

With regard to nonconventional energy resources available from biogas plants and conversion of woody biomass into solid, liquid, or gaseous fuels, physical planning of land use and settlements needs priority, for which the accompanying Table provides evidence of low levels of development (e.g. very small villages and low levels of literacy, urbanization, and employment). The population, under the deterministic influence of the natural environment, lives close to nature for meeting the minimum requirements of fuel, land cultivation, rearing animals and so on. Low levels of human resource development marked by low levels of literacy, inaccessibility, and isolation have to be assessed from the grass roots level.

SUGGESTED OUTLINE FOR FURTHER WORK

Against this background, an outline of study is suggested leading to the formulation of a spatial development model in which alternative sources of energy would be a built-in component.

Regional delineation and characterization of regions is only a beginning with a view to reorient and evaluate the available information on spatial considerations. This is necessary because the data generated by various organizations are mostly aggregated on the basis of administrative units falling within different states and union territories. Space affinity of such data has to be

assessed with reference to the objective mentioned above. From the first report, prepared by various contributors, a coordinated approach for the preparation of a normative energy-oriented development strategy for the Western, Central, and Eastern Himalaya and subregions, to the level of first- and second-order regions, needs to be formulated. This should be followed by case studies for selected microlevel regions comparable to the size of Development Blocks or microwatersheds.

The following design of the study is recommended in the second stage of the Project.

Development Strategy for a Microregion

Large-scale topographical maps (1:50,000 and 1:200,000), aerial photographs, and satellite imageries should be used. Evaluation of the relations between land cover and landforms, drainage pattern, and human settlements, their socioeconomic attributes, and their spatial organization is necessary; the existing source and level of use of energy and potential for development are some of the themes for detailed investigation. Field enquiry in sample households and sample survey of economic activities have to be conducted with the help of questionnaires. For sampling purposes, the subregions provide the area basis.

Development Strategy for Mesolevel Regions

The mesolevel subregions should comprise groups of Development Blocks, or in some cases districts, of relative homogeneity with respect to landform and land use. For mapping purposes, the scale of maps should be at least 1:200,000. Resource inventory based on the data obtained from topographical maps and satellite imageries at this scale would serve to evaluate the problems and potentialities for the development of physical resources and their impact on socioeconomic development of the subregions of the Himalaya. Microregional studies would provide a wealth of quantitative and qualitative data from which certain norms and coefficients relevant for the Himalaya region can be determined. Viewed from these considerations, microregional studies of the size of micro and mini watersheds, or of Development Blocks comprising several small drainage basins, should be initiated on a sample basis to build case studies relating to the development of the Himalaya region.

ENDNOTES

1. A similar exercise needs to be done more intensively using tahsil data for 1981 and also evaluating the pattern of changes in these characteristics. The variables selected are: population density, percentage of urban population, percentage of small-sized villages (less than 200to 500 people), literacy (total, female, rural, and urban), workers, percentage of workers engaged in secondary and tertiary activities (Appendix D).

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APPENDIX A

Subregionalization of the Himalaya according to O. H. K. Spate

I. KASHMIR

1. **Poonch and Jammu**
   - a) Siwalik zone
   - b) Sub-Himalayan zone
     - i. foothills: Jhelum gorge, Tawi Valley
     - ii. mid-Chenab Valley
2. **Pir Panjal Range**
3. **Vale of Kashmir**
     - i. border ranges and valleys
     - ii. vale: Karewas terraces, Jhelum marshes
4. **Main Himalayan Mass**
   - a) Nanga Parbat massif
   - b) Great Himalaya
   - c) Upper Chenab Valley
   - d) Zanskar Range
     - i. Range proper
     - ii. Deosai plains
     - iii. Rupshu
5. **Gilgit - Hunza**
   - a) i. Astor Valley
     ii. Indus Kohistan: Indus gorge
   - b) i. Gilgit-Hunza Valley
     ii. Hindu Kush

II. KARAKORAM

1. **Ladakh**
     - i. Indus furrow
     - ii. Ladakh Range
2. **Karakoram**
   - a) Baltistan (Northern Shigar Valley)
   - b) Shyok-Nubra Valleys
     - i. Main valley - Shyok dam
     - ii. Change-Cenmo Valley
     - iii. Harong Valley
   - c) Karakoram massif
   - d) Tibetan plateau
     - i. Depsang and Lingzi-tang plains
     - ii. Pangong rift

III. CENTRAL HIMALAYA

1. **Himachal Pradesh**
   - a) Siwalik zone: and the duns
   - b) Sub-Himalayan zone
     - i. main valleys - Chandra (Kulu)
       Beas (Mandi and Lahul)
     - ii. main ranges - Eastern Pir Panjal Dhaoladhar
     - iii. Sutlej valley
   - c) Upper Sut
     - i. Spiti
     - ii. Hundes - Rakas and Manasarowar lakes

2. **Kumaon** (Hill region of U.P)

a) i. Siwaliks
ii. Dehra Dun
b) Sub-Himalayan zone: Yamuna Ganga, Kali valleys
c) High Bhotiya valleys

3. **Nepal**

a) Siwalik zone
b) Pahar - Kathmandu Valley, minor duns
c) High Himalaya

IV. EASTERN HIMALAYA

1. **Kosi Basin**

i. Siwaliks and longitudinal valleys
ii. Arun gorge
iii. Everest massif

2. **Darjeeling - Sikkim**

i. Tista Valley: Singaliya ridge, Darjeeling Hills, Tista Valley proper Dongkhya range.

ii. Chumbi Valley

3. **Bhutan and Assam Himalaya**

V. ASSAM-BURMA RANGES

1. **Border Hills:**

i. Patkoi hills
ii. Naga hills
iii. Chin hills
iv. Lushai hills
v. Chittagong hills - Manipur basin

2. **Barail Range**

VI. SHILLONG PLATEAU

1. Garo hills
2. Khasi hills
3. Jaintia hills

Source: Spate, O. H. K. and A. T. A. Learmonth (1967), India and Pakistan, Methuen, London.

APPENDIX B:

Subregionalization of the Himalaya according to S.P. Chatterjee

I. WESTERN HIMALAYA

1. North Kashmir Himalaya
2. South Kashmir Himalaya
3. Himachal Himalaya
4. Kumaun Himalaya (Hill Region of U.P.)

II. CENTRAL HIMALAYA

1. Nepal Himalaya

III. EASTERN HIMALAYA

1. Sikkim Himalaya
2. Darjeeling
3. Bhutan Himalaya
4. Assam Himalaya (now-Arunachal Pradesh for the most part)
5. North-Eastern Range
   a) Purvachal
      i. Eastern part of Arunachal Pradesh ('Purva Nepal')
      ii. Nagaland
      iii. Manipur hills
      iv. North Cachar hills
      v. Mizo hills
      vi. Tripura hills
6. Meghalaya
   a) Garo hills
   b) Khasi-Jaintia hills
   c) Mikir hills

Source: Chatterjee, S. P. (1965) 'Physiography' Chapter II in Gazetteer of India, Vol. I - Country and People, Publication Division, Ministry of Information and Broadcasting, Govt. of India, Delhi, pp. 1-66.

APPENDIX C:

Subregionalization of the Himalaya according to R. L. Singh

I. KASHMIR REGION

1. **Kashmir Region South**
   a) Kashmir Valley
      i. The Jhelum Plain
      ii. The Karewas
      iii. The Rimlands
   b) Jammu-Mirpur Regions
      i. The Foothill Plains
      ii. The Siwaliks
      iii. The lesser Himalaya or Pir Panjal Region
2. **Kashmir Region North**
   a) Zaskar - Ladakh Region
      i. The Great Himalayan - Zaskar Region
      ii. The Sindhu Furrow
      iii. The Ladakh Range
      iv. The Upper Shyok Valley
   b) Deosai - Skardu Region
      i. The Deosai Highland
      ii. The Deosai Plain or Skardu Region
      iii. The Astor Valley
      iv. The Nanga Parbat
   c) Gilgit - Baltistan Region
      i. The Lower Shyok Valley
      ii. The Karakoram Range
      iii. The Shigar Valley
      iv. The Gilgit - Hunza Valleys
      v. The Hindukush Region
      vi. The Gilgit Massif - Sindhu Gorge
   d) Aksai Chin Region
      i. The Suget Range

ii. The Soda Plain
iii. The Ladakh Plateau
iv. The Kara Kash Valley

II. HIMACHAL REGION

1. **Himalayan Himachal**

a) Chandra-Bhaga Basin
i. Lahul
ii. Pangi

b) Ravi Basin
i. Brahmaur region or Ravi Chamba East Region
ii. Chamba region or Ravi Chamba West Region

c) Beas Basin
i. Kulu-Banjar Region or Kulu - Beas Region
ii. Mandi - Beas Region
iii. Dera - Gopipur Beas Region
iv. Kangra - Palam Region

d) Himalayan - Sutlej Basin
i. Simla - Rampur Region
ii. Bilaspur - Nalagarh Region

e) Yamuna Basin
i. Tons - Pabar Region
ii. Giri - Yamuna Region

2. **Trans-Himalayan Himachal (Spiti-Kinnaur Himachal)**

a) Trans-Himalayan Sutlej Basin or Spiti-Sutlej Basin.
i.Spiti Region
ii. Kalpa-Sutlej Region

b) Malung Valley

III. U.P. HIMALAYA

1. Himadri

a) Himadri Ranges
i. Bandarpunch Block
ii. Kedarnath-Badrinath Block
iii. Kamet-Hathiparvat Block
iv. Dronagiri-Nanda Devi-Trisul Block
v. Lipulekh-Kalapani Block

b) Himadri valleys
i. Upper Tons Valley
ii. Upper Yamuna
iii. Janhavi Valley
iv. Uppwer Bhagirathi Valley
v. Upper Billanga Valley
vi. Upper Mandakini Valley
vii. Vishnuganga Valley
viii. West Dhaulinganga Valley
ix. Goriganga Valley
x. East Dhaulinganga Valley
xi. Upper Kaliganga Valley

IV. HIMACHAL

a) Tons-Yamuna Basin
i. Eastern Tons Basin
ii. Yamuna Basin

b) Bhagirathi-Alaknanda Basin
i. Bhagirathi Basin
ii. Bhillanga Basin
iii. Mandakini Basin
iv. Alaknanda Basin
v. Pindar Basin
vi. Nayar Basin
vii. Ganga Basin

c) Ramganga-Kosi Basin
i. Ramganga Basin
ii. Kosi Basin
iii. Gola Basin

d) Sarju-Kali Basin
i. Sarju Basin
ii. Ramganga Basin
iii. Goriganga Basin
iv. Kali Basin (W)
v. Ladhiya Basin

V. SIWALIKS

a) Yamuna-Ganga Tract
   i. Dun Valley (Dehra Dun)
   ii. Yamuna-Ganga Tract
b) Ganga-Ramganga Tract
c) Ramganga-Kali Tract

VI. EASTERN HIMALAYA

a) Darjeeling - Sikkim
   i. Singalia Range
   ii. Donkhya Range
   iii. Darjeeling
   iv. Kalimpong
b) Bhutan
   i. Punaka-Thimpu region
   ii. Tongsa Region
   iii. Phuntsoling region
   iv. Devanagiri region
   v.Homolhari-Kulakangri region

VII. NORTH-EASTERN HIMALAYA (Arunachal Pradesh)

a) Dafla region
b) Miri region
c) Abor region
d) Mishmi region

APPENDIX D

Variations in Levels of Development According to Different Indicators

I. WESTERN HIMALAYA

1. Jammu & Kashmir

Density km^2 percent		Villages (<500 persons) percent to Total		Female Literacy (percent)	
1. Srinagar	274.70	1. Doda	72.5	1. Jammu	20.62
2. Jammu	231.18	2. Ladakh	70.21	2. Kathua	12.25
3. Anantnag	154.60	3. Jammu	68.30	3. Ladakh	7.81
4. Baramula	104.00	4. Kathua	65.64	4. Srinagar	5.83
5. Kathua	103.60	5. Udhampur	62.85	5. Rajouri	5.00
6. Punch	102.95	6. Srinagar	60.96	6. Anantnag	4.81
7. Rajouri	81.05	7. Rajouri	58.75	7. Doda	4.48
8. Udhampur	74.47	8. Anantnag	53.84	8. Baramula	3.87
9. Doda	28.60	9. Baramula	52.44	9. Punch	3.08
10. Ladakh	1.09	10. Punch	32.27	10. Udhampur	2.67

Urbanization percent to Total		Literacy (Total) percent		Rural Literacy (percent)	
1. Srinagar	51.12	1. Srinagar	82.69	1. Jammu	22.06
2. Jammu	26.14	2. Jammu	30.34	2. Kathua	19.48
3. Kathua	9.10	3. Punch	23.66	3. Anantnag	13.61
4. Anantnag	8.91	4. Kathua	21.62	4. Rajouri	13.26
5. Baramula	8.53	5. Rajouri	17.77	5. Udhampur	12.24
6. Udhampur	8.38	6. Anantnag	14.97	6. Doda	11.90
7. Punch	8.08	7. Doda	13.88	7. Punch	11.85
8. Ladakh	7.50	8. Baramula	13.16	8. Baramula	11.54
9. Doda	5.69	9. Udhampur	6.39	9. Ladakh	10.99
10. Rajouri	3.81	10. Ladakh	3.95	10. Srinagar	10.91

Urban Literacy (percent)	
1. Jammu	53.74
2. Udhampur	52.46
3. Doda	46.67
4. Punch	45.65
5. Rajouri	44.58
6. Kathua	43.20
7. Ladakh	34.18
8. Srinagar	32.04
9. Baramula	30.51
10. Anantnag	28.98

Workers in Industry to Total (percent)	
1. Srinagar	15.71
2. Kathua	7.08
3. Anantnag	6.17
4. Jammu	6.15
5. Udhampur	6.14
6. Baramula	4.39
7. Doda	2.58
8. Punch	2.31
9. Rajouri	2.15
10. Ladakh	1.94

Workers to Total (percent)	
1. Ladakh	43.82
2. Doda	36.09
3. Udhampur	31.19
4. Anantnag	31.11
5. Baramula	31.05
6. Srinagar	28.86
7. Punch	27.76
8. Rajouri	27.65
9. Kathua	26.68
10. Jammu	24.44

Workers in Services to Total (percent)	
1. Srinagar	36.57
2. Jammu	36.36
3. Kathua	21.26
4. Udhampur	16.57
5. Anantnag	16.28
6. Baramula	15.96
7. Ladakh	13.21
8. Rajouri	11.29
9. Punch	11.16
10. Doda	9.04

2. Himachal Pradesh

Density km^2 per cent		Villages (<200 persons) percent to Total		Literacy Total (percent)	
1. Bilaspur	166.92	1. Simla	90.25	1. Simla	38.55
2. Kangra	158.05	2. Lahul Spiti	82.35	2. Kangra	37.52
3. Simla	153.31	3. Mandi	70.67	3. Bilaspur	32.85
4. Mandi	128.22	4. Kangra	69.33	4. Mandigar	30.68
5. Sirmaur	86.72	5. Bilaspur	67.83	5. Lahul Spiti	28.51
6. Kulu	35.38	6. Sirmaur	63.83	6. Kinnaur	27.71
7. Chamba	31.14	7. Chamba	52.44	7. Kulu	24.37
8. Kinnaur	7.59	8. Kinnaur	9.09	8. Sirmaur	24.36
9. Lahul Spiti	1.95	9. Kulu	1.18	9. Chamba	18.88

Urbanization percent to Total		200-500 (Total) percent		Female Literacy (percent)	
1. Simla	31.82	1. Kinnaur	38.96	1. Simla	26.88
2. Mandi	9.35	2. Chamba	34.09	2. Kangra	26.67
3. Sirmaur	8.44	3. Mandi	25.85	3. Bilaspur	21.00
4. Chamba	7.36	4. Bilaspur	25.02	4. Mandi	17.16
5. Kulu	5.56	5. Sirmaur	24.97	5. Sirmaur	12.91
6. Bilaspur	4.88	6. Kangra	22.39	6. Kulu	11.06
7. Kangra	3.66	7. Kulu	18.34	7. Lahul Spiti	10.37
8. Kinnaur	0.00	8. Lahul Spiti	15.68	8. Kinnaur	10.37
9. Lahul Spiti	0.00	9. Simla	8.09	9. Chamba	9.12

Rural Literacy (percent)	
1. Kangra	37.03
2. Bilaspur	31.59
3. Lahul Spiti	28.51
4. Kinnaur	27.71
5. Mandiri	27.34
6. Simla	25.56
7. Kulukh	22.19
8. Sirmaur	21.36
9. Chamba	15.74

Workers (percent)	
1. Lahul Spiti	64.68
2. Kinnaur	60.64
3. Kulu	48.67
4. Sirmaur	42.48
5. Bilaspur	40.50
6. Chamba	40.32
7. Mandi	39.57
8. Simla	35.78
9. Kangra	27.47

Workers in Service (percent)	
1. Lahul Spiti	39.46
2. Simla	38.07
3. Bilaspur	22.67
4. Kangra	22.14
5. Kinnaur	19.85
6. Mandi	18.86
7. Sirmaur	15.05
8. Chamba	11.16
9. Kulu	10.44

Urban Literacy (percent)	
1. Simla	66.43
2. Mandi	63.28
3. Kulu	61.68
4. Bilaspur	59.57
5. Chamba	59.04
6. Sirmaur	57.49
7. Kangra	50.62
8. Kinnaur	.
9. Lahul Spiti	.

Workers in Industry (percent)	
1. Kangra	5.97
2. Simla	5.65
3. Sirmaur	4.99
4. Kinnaur	4.63
5. Bilaspur	3.92
6. Mandi	3.52
7. Kulu	2.23
8. Chamba	2.13
9. Lahul Spiti	1.30

3. U.P. Hill Region

Density km^2 percent	
1. Dehra Dun	186.94
2. Nainital	113.21
3. Almora	106.79
4. Pauri Garhwal	101.65
5. Tehri Garhwal	89.86
6. Pithoragarh	43.46
7. Chamoli	32.05
8. Uttar Kashi	18.43

Villages (<200 persons) percent to Total	
1. Pauri Garwal	73.66
2. Pithoragarh	66.54
3. Chamoli	65.05
4. Almora	63.06
5. Tehri Garhwal	61.90
6. Uttar Kashi	59.23
7. Dehra Dun	54.76
8. Nainital	51.16

Literacy Total (percent)	
1. Dehra Dun	43.71
2. Pauri Garhwal	32.00
3. Pithoragarh	31.87
4. Nainital	30.94
5. Chamoli	28.68
6. Almora	28.08
7. Uttar Kashi	22.05
8. Tehri Garhwal	19.28

Urbanization percent to Total	
1. Dehra Dun	47.06
2. Nainital	22.12
3. Pauri Garwal	6.29
4. Almora	5.21
5. Chamoli	4.17
6. Uttar Kashi	4.05
7. Pithoragarh	3.79
8. Tehri Garhwal	2.64

Villages 200-500 Persons (percent)	
1. Uttar Kashi	34.38
2. Tehri Garhwal	33.04
3. Almora	30.15
4. Chamoli	29.57
5. Nainital	28.97
6. Dehra Dun	27.25
7. Pithoragarh	26.72
8. Pauri Garhwal	23.64

Female Literacy (percent)	
1. Dehra Dun	33.40
2. Nainital	20.17
3. Pauri Garhwal	16.51
4. Pithoragarh	14.62
5. Almora	11.52
6. Chamoli	9.56
7. Uttar Kash	5.44
8. Tehri Garhwal	4.91

Rural Literacy (percent)	
1. Pithoragarh	30.75
2. Pauri Garhwal	30.13
3. Chamoli	27.47
4. Nainital	27.44
5. Dehra Dun	27.20
6. Almora	25.91
7. Uttar Kashi	20.32
8. Tehri Garhwal	18.10

Workers (percent)	
1. Uttar Kashi	63.53
2. Chamoli	58.02
3. Tehri Garhwal	51.50
4. Pauri Garhwal	48.41
5. Pithoragarh	40.13
6. Almora	38.84
7. Dehra Dun	34.83
8. Nainital	33.53

Workers in Service (percent)	
1. Dehra Dun	51.57
2. Nainital	23.80
3. Tehri Garhwal	21.28
4. Pauri Garhwal	17.57
5. Pithoragarh	15.91
6. Almora	13.93
7. Chamoli	10.77
8. Uttar Kashi	9.69

Urban Literacy (percent)	
1. Almora	67.52
2. Dehra Dun	62.35
3. Pauri Garhwal	59.77
4. Chamuli	55.74
5. Nainital	33.10
6. Uttar Kashi	11.68
7. Tehri Garhwal	8.71
8. Pithoragarh	7.20

Workers in Industry (percent)	
1. Dehra Dun	9.25
2. Nainital	7.17
3. Pithoragarh	2.62
4. Almora	2.61
5. Tehri Garhwal	2.15
6. Chamoli	2.06
7. Uttar Kashi	1.81
8. Pauri Garhwal	1.48

1. North Bengal

Density km^2 per cent	
1. Cooch Bihar	417.63
2. Jalpaiguri	280.24
3. Darjeeling	254.21

Urbanization percent to Total	
1. Darjeeling	23.05
2. Jalpaiguri	9.59
3. Cooch Bihar	6.83

Villages (<200 persons) percent to Total	
1. Jalpaiguri	16.00
2. Darjeeling	15.00
3. Cooch Bihar	3.00

200-500 persons (percent)	
1. Darjeeling	25.00
2. Cooch Bihar	23.00
3. Jalpaiguri	6.00

Literacy Total (percent)	
1. Darjeeling	33.06
2. Jalpaiguri	24.00
3. Cooch Bihar	21.92

Female Literacy (percent)	
1. Darjeeling	23.23
2. Jalpaiguri	15.01
3. Cooch Bihar	11.50

Rural Literacy (percent)	
1. Darjeeling	26.01
2. Jalpaiguri	20.62
3. Cooch Bihar	19.23

Urban Literacy (percent)	
1. Cooch Bihar	58.59
2. Darjeeling	56.65
3. Jalpaiguri	55.89

Workers (percent)	
1. Darjeeling	36.89
2. Jalpaiguri	31.12
3. Cooch Bihar	27.61

Workers in Industry (percent)	
1. Darjeeling	4.86
2. Jalpaiguri	4.30
3. Cooch Bihar	3.79

Workers in Service (percent)	
1. Darjeeling	28.54
2. Jalpaiguri	17.42
3. Cooch Bihar	11.83

2. North East India

Density km^2 percent		200-500 persons (percent)		Rural Literacy (percent)	
1. Tripura	148.54	1. Nagaland	33.85	1. Mizoram	51.36
2. Manipur	47.98	2. Manipur	24.42	2. Manipur	29.82
3. Meghalaya	44.98	3. Meghalaya	23.84	3. Tripura	27.13
4. Nagaland	31.24	4. Arunachal	13.89	4. Nagaland	23.69
5. Mizoram	15.75	5. Mizoram	.	5. Meghalaya	23.40
6. Arunachal	5.59	6. Tripura	.	6. Arunachal	9.79

Urbanization percent to Total		Literacy Total (percent)		Urban Literacy (percent)	
1. Meghalaya	14.54	1. Mizoram	53.80	1. Mizoram	72.48
2. Manipur	13.18	2. Manipur	32.91	2. Meghalaya	65.21
3. Mizoram	11.37	3. Tripura	30.97	3. Tripura	63.98
4. Tripura	10.44	4. Meghalaya	29.48	4. Nagaland	60.70
5. Nagaland	9.95	5. Nagaland	27.39	5. Manipur	53.21
6. Arunachal	3.67	6. Arunachal	11.29	6. Arunachal	50.58

Villages (<200 persons) percent to Total		Female Literacy (percent)		Workers (percent)	
		1. Mizoram	46.75	1. Arunachal	56.44
1. Arunachal	80.89	2. Meghalaya	24.56	2. Nagaland	50.76
2. Meghalaya	69.64	3. Tripura	21.20	3. Mizoram	45.61
3. Manipur	49.97	4. Manipur	19.53	4. Meghalaya	44.16
4. Nagaland	34.79	5. Nagaland	18.64	5. Manipur	34.56
5. Mizoram	16.16	6. Arunachal	3.70	6. Tripura	27.79
6. Tripura					

Workers in Industry (percent)		Workers in Service (percent)	
1. Manipur	10.94	1. Tripura	19.90
2. Tripura	3.54	2. Nagaland	19.59
3. Meghalaya	2.34	3. Arunachal	19.07
4. Nagaland	1.17	4. Manipur	17.67
5. Mizoram	0.39	5. Meghalaya	15.79
6. Arunachal	0.34	6. Mizoram	15.24