Chapter 2
South Asia

South Asia, corresponding to the Indian sub-continent, has three major physiographic components based on geologic structure and terrain. These are: (1) the Himalayan and associated fold mountains, (2) the ancient crystalline block of Peninsular India, and (3) the alluvial Indo-Gangetic lowland in between the two. The last component is an extensive plain and lies outside the mountain realm. Nevertheless, its genesis owes much to the deposition of materials from the adjoining highlands. The vast thickness of its sediments, up to 6,500 metres along the foothills, is indicative of the dynamic processes operating in the Himalayan Mountains. The mountain ranges of the first two physiographic components are grouped into five units: the Karakoram, the Himalaya, north-east ranges, peninsular ranges, and north-western ranges (Figure 1 and Annex A). They are described in a clock-wise sequence starting from the Karakoram in the extreme north.

2.1 The Karakoram

The name **Karakoram** (black gravel or stone) is derived from the Karakoram Pass (5,570m) which does not even cross the main range but lies further east. Although the crest zone of the Great Karakoram is conventionally so called, the individual sections of high mountains are known as *muztagh* (ice mountain). The Karakoram Range forms the water-parting between drainage into the Indian ocean and into the deserts of Central Asia. It is also an important geological link between the Hercynian Pamir and the Alpine Himalaya.

The Karakoram Range extends over 350 km in an east-south-east/west-north-west direction from the Siachen-Shyok confluence in the south-east to the Ishkuman River in the north-west. The high mountains are bounded by the Indus gorge and the Ladakh Range to the south, desolate plateau to the east, the Aghil Mountains to the north, and the Hindu Kush westwards beyond the Kurumbur River. Structurally, the Karakoram Range is composed of three units: the northern sedimentary zone, the central metamorphic zone with a plutonic core, and the southern volcanic schist zone.

"Still puzzling, and certainly one of the most fascinating future studies, are the connections of the N-S-striking Nanga Parbat elements of the Himalayas with the here almost E-W-striking Karakoram" (Gansser 1964, p38).

Such geological complexity is matched by extreme relief as the Karakoram Range has the greatest assemblage of giant peaks, with 33 over 7,325m, among which is K-2/Godwin Austin (8,611m). The area is the most heavily glaciated

Figure 1: South Asia

Author

2. Karakoram Landscape, Pakistan. Section of Indus River and Karakoram Highway, south of Gilgit. Hamlets are spread on two levels of talus terraces irrigated by long channels from tributary streams. The lowest terrace beside the Indus has an army camp for road maintainance.

outside sub-polar latitudes: 28 to 50 per cent compared to eight to 12 per cent for the Himalayas and 2.2 per cent for the Alps. Therefore, it contains some of the longest glaciers outside sub-polar regions.

Much of the area is wild and rugged. Westwards, in Gilgit and Hunza, settlements are located on river terraces and hanging valleys at elevations ranging between 1,850m and 2,200m (Plate 2). Higher up, pastures extend from 2,000m to 3,500m. Tiny fields and orchards are irrigated by elaborate channels of melt-water. Some Hunzakut terms for varied land use are *bassikish* (orchard), *harkish* (cultivated land), *ter* (high pasture), and *tog* (irrigated meadow)). Two-thirds of the population of Hunza is Burusho, the rest being Wakhi (19%) and Shinaki (13%) and a minority of Dom (1.1%) (Kreutzmann 1993). Originally a Shiite island in Sunni Pakistan, the area has become a stronghold of the Ismailiya faith. Fruit cultivation is of the utmost importance in these valleys. In Baltistan, further east, barley cultivation depends on the snow. The hot summer enables the cultivation of a wide variety of fruit species. Aksai Chin, the northern glacis of the Karakoram itself, merges into a harsh plateau where even pastoralism is difficult. In the past, the remote valleys of the Karakoram provided a passage for hardy traders and pilgrims across domains of feuding chieftains. Their turbulence has since been replaced by major rivalries between India and Pakistan in Kashmir, and China and India in Aksai Chin. These military conflicts have opened up the area with stupendous roads, such as the 753km Karakoram Highway, that also sustain the local economies through providing access to markets.

2.2 The Himalaya

The word Himalaya is a compound of Sanskrit words, hima for snow and alaya for abode, referring to the lofty range between the Indo-Gangetic plain and the Tibetan plateau. It extends nearly 2,400 km in a vast southerly arc between the bend of the Indus marked by Nanga Parbat (8,125m) on the west to the Brahmaputra bend around Namcha Barwa (7,755m) in the east. The Himalayan Range is the loftiest mountain complex on earth with 31 peaks exceeding 7,600m in height. The extreme elevation and rugged relief are the result of rapid mountain-building forces and vigorous erosion processes. Therefore, the Hima-

layan chains are not massive elevations but narrow ridges. In places, they are traversed by extremely deep river gorges resulting in great vertical contrasts over very short horizontal distances.

The Himalayan Range is a singular entity of immense physical dimension. Therefore, the use of its plural form, Himalayas, in geological and geographic context. The former pertains to the north-south transverse section of structural formation while the latter refers to the east-west longitudinal sections of regional units. The well-recognised geological units rising in echelon from the south to north are the Siwalik, the Lesser Himalaya, and the Great Himalaya. The Siwalik Range, also called the sub-Himalaya, is the youngest of all, and abuts the plains as foothills dipping to the north. It extends from the Indus almost to the Brahmaputra with one gap of over 300 km from the Sapta Kosi to the Manas River where the fierce monsoon erosion has almost worn it away completely. The second, the Lesser Himalaya, is older and higher than the Siwalik Range, but with the same strike alignment. The structure is more complex, being contorted by uplift into recumbent folds with older sedimentaries overthrusting younger ones. The Great Himalaya, the axis and crystalline core of the whole range, is composed mainly of intruded granites and gneisses with some sedimentary remnants on the summits. Apart from at river gorges and some passes, the crest of the Great Himalaya rarely falls below 5,500m. Between the Indus and the Brahmaputra, the main range has been breached by four rivers only: the Sutlej, the Karnali, the Kali Gandaki, and the Arun.

The above three-fold geological division of the Himalaya has a general consensus. In contrast, the division of the Himalaya into east-west sections is much at variance, according to authority and approach. Although most delimitations are based on major rivers and political units, the number of sections range from Burrard's four to Bose's nine (Table 2). A standard survey on Himalayan exploration recognised five sections (Mason 1955). These were (1) the Punjab Himalaya between the Indus and Sutlej rivers, (2) the Kumaon Himalaya between the Sutlej and Mahakali-Sarda rivers, (3) the Nepal Himalaya with three sub-sections between the Mahakali-Sarda River and Singalila ridge, (4) the Sikkim Himalaya corresponding to the Tista basin, and (5) the Assam Himalaya, east of Sikkim to the Brahmaputra-Dihang. Another authoritative regional study on the Indian sub-continent proposed eight sections (Spate 1957). It further designated Kashmir and the Karakoram as western;

Author

3. **Gurung Village, Nepal.** Naiche (1,402m) is a compact village of 54 houses perched on a ridge to save level ground for fields. The economy is based on maize and paddy cultivation along with sheep herding. Most households have a member serving in a foreign army.

Table 2: **Sections of the Himalayan Range**

Source	Western			Central			Eastern			No.
Bose (1972)	Jammu & Kashmir	Himachal Pradesh	Uttarakhand	Ghagra	Gandak	Kosi	Sikkim	Bhutan	Assam	9
Gansser (1964)	Punjab		Kumaon	Nepal			Sikkim/Bhutan		NEFA	5
Spate (1957)	Karakoram	Kashmir	Himachal Pradesh / Kumaon	Nepal		Kosi	Sikkim	Bhutan/Assam		8
Mason (1955)	Karakoram & Punjab		Kumaon	Nepal: Karnali	Gandaki	Kosi	Sikkim	Assam		5
Burrard (1907)	Punjab		Kumaon	Nepal			Assam			4

Km 0 870 1,670 2,470

Section Boundary

Primary ———————

Secondary – – – – – –

Tertiary .....


Madhukar Rana

4. Traditional Bhutanese Dance

Himachal Pradesh, Kumaon, and most of Nepal as central; and east Nepal, Sikkim, Bhutan, and the NEFA as the eastern Himalaya. A more logical division seems to be that of Bose (1972) which has nine sections (Table 2) grouped into three primary divisions, each with three secondary sections. Thus, (a)the Western Himalaya includes Jammu & Kashmir, Himachal Pradesh, and Uttarakhand; (b) the Central Himalaya includes the Ghagra (Karnali), Gandak, and Kosi basins of Nepal; and (c) the Eastern Himalaya, the sections of Sikkim, Bhutan, and Assam. The whole area hosts a variety of settlement patterns and peoples (Plates 3 and 4).

The Western Himalaya, extending 870 km from the Indus to the Mahakali-Sarda rivers lies in political India. West of the Ravi, the width of the mountain proper is close to 483 km with parallel ranges of the Siwalik, Pir Panjal, Main Himalaya, Zanskar, and Ladakh. The climate is influenced by the westerly cyclones and is markedly dry. The economy is partly agriculture with irrigation and partly nomadic. East of the Ravi, the range systems of the Siwaliks, Dhaula Dhar, and Main Himalaya are much more compressed than the 483km of the mountain proper. Crop cultivation is general, although the nomadic *Gaddi,* a group similar to the *Bakarwal* of Kashmir (Casimir and Rao 1986), practice seasonal transhumance (Box 1). Forest resources also become important. Culturally, Himachal Pradesh and Uttarakhand are decidedly Hindu in contrast to the predominance of Islam in Kashmir and Buddhism in Ladakh.

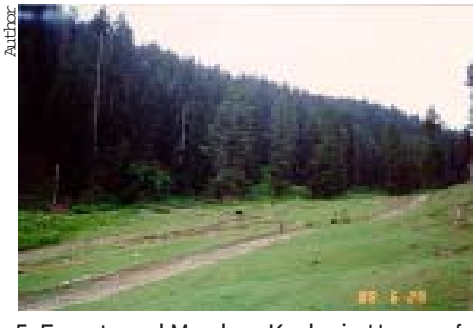
The Central Himalaya, extending 800 km from the Mahakali-Sarda to the Mechi rivers, corresponds to the longitudinal extension of Nepal encompassing the Karnali, Gandaki, and Kosi basins. The main ranges include the Chure (Siwalik), Mahabharat *Lekh,* Lesser Himalaya, and Main Himalaya. West of 80° longitude, a tributary range diverges north-west from the Himalayan axis to mark the watershed between the Ganges and the Tsangpo. Of the world's 14 peaks exceeding 8,000 metres, eight are in the Central or Nepal Himalaya. The climate is very much influenced by the rhythm of the monsoons. Subsistence crop farming is predominant and the humid east has a higher population density than the west**.** The ethnic interface is apparent with a predominance of caste Caucasoids in the western and lower zones and of tribal Mongoloids in the eastern higher zones.

The Eastern Himalaya, extending another 800 km east of Nepal, is mostly in political India, a gap being formed by Bhutan. The main axis is

Box 1
Land Use Diversity in the Himalaya

The Himalayan Range extends over nine degrees of latitude and 22 degrees of longitude. Thus, there is significant variation in ecological environment. The first variation is latitudinal in that the upper timber-line rises from 3,400 - 3,800m in the southern ranges to 4,400-4,600m in Tibet[1]. The second variation is zonal and related to altitude, from the tropical valley bottom to the alpine snow heights. The third variation is due to the climatic asymmetry from the humid south-east to the arid north-west. Land use is influenced by the biogeographical regime expressed in the type of flora and fauna. Transhumance, sedentary agriculture, and shifting cultivation are three types of divergent responses to highland use. They not only represent varied stages of land occupancy but can also co-exist as complementary economies.

1. Transhumance: The example of transhumance is from the Western Himalaya. The basic characteristic of the highland is vertical zonation of resources, and people have to be mobile in order to use them. This is best represented by the seasonal movement of people with their animals. This pattern of land use is particularly pronounced in the arid Western Himalaya. The Bakarwal, a nomadic group, practise sheep and goat husbandry, exploiting the various biotopes of different altitudes[2]. This extends over 250 km from Kathuwa in Jammu to Dras in northern Kashmir. They winter in the foothills in Jammu (500-1,000m) where their herds feed on Acacia-Carissa woodlands. The upward migration commences in mid-April and passes through sub-montane, montane, and alto-montane vegetation zones in succession. The summer pastures until the end of August are between 3,000-4,000m in elevation. En route, they have to contend with both settled agriculturalists and forest administration. Such an extended system of land use is a strategy to maximise a subsistence livelihood (Plate 5).



5. Forests and Meadow, Kashmir. Horses of Bakarwal herders grazing on the north slope of Pir Panjab. The main herd consists of sheep and goats that traverse seasonally between Dras in Summer and Jammu in Winter.

2. Sedentary Agriculture: The example of sedentary agriculture is from the Central Himalaya. Kakani area, north-west of Kathmandu, is at 1,250-1,650m and includes agricultural land of two types[3]. Lower irrigated fields have terraces with horizontal surfaces and bunds to retain water for paddy. The upper fields have outward sloping terraces and grow crops such as maize and millet (Plate 6). Still higher up are common shrublands for animal grazing. The most pervasive environmental risks are landslides on upper slopes and floods in the valley bottom. What farmers know about landslides is closely connected to their assessment of land for agricultural use. There are two divergent responses. One is de-intensification whereby irrigated land is used for dry crops with lower labour input and lower yield per unit of land. Decisions to intensify imply in-

creased hardship to the household and are made only in the face of lack of resources for restoration. On the other hand, pressing household needs induce the tendency to upgrade all land to its most intensive use. The more valuable the land and every practicable effort is expended to protect it. Encroachment on marginal land on higher and steeper slopes is one of the causes of erosion in the highlands of Nepal. Overall, the higher the productivity of the land, the greater the effort for maintenance to minimise environmental risks.


Phuntshok Tshering

6. Terraced Field on Mountain Slopes


Tariq Ya

7. Burning Fields for Shifting Cultivation (*Jhuming*)

3. Shifting Cultivation: The example of shifting cultivation is from the Eastern Himalaya where the humid climate supports luxuriant vegetation. Shifting cultivation or *jhum* (collective in Assamese) is the easiest, cheapest, and most profitable technique of land use available to tribal communities in north-east India[4]. A suitable patch of hill slope is selected for clearance based on type and growth of vegetation, depth and texture of soil, and exposure to sunshine. The vegetation is cut and left to dry before it is set on fire (Plate 7). Big trees are not felled. The alkali content of the ash neutralises the acidic content of the humid soil. No animal power is used and seeds are either dibbled with a stick or broadcast with little disturbance to the land surface. The method basically involves cultivating sloping ground without terracing and other permanent investments. What is exploited is the natural fertility of the land. When the soil loses its fertility, the patch is abandoned and another area is cleared for cultivation. Long rested *jhum* land is usually fertile and can be used for two to three years. A number of patches of land are thus locked under a *jhum* cycle. Environmental problems under shifting cultivation has generally to do with the length of the rest period: the shorter the cycle of *jhum* with population pressure, the greater the soil erosion.

Source: Harka Gurung. 'Mitigation of Environmental Risks in the Highlands'. Paper presented at IFAD Project Implementation Workshop for the Asia and Pacific Region, Chengdu, China, 22 Oct-2 Nov 1990

1. Troll 1967
2. Casimir and Rao 1986
3. Johnson et al. 1982
4. Barthakur 1981

emphatic despite being comparatively low where some of the lowest passes in the Himalaya occur. In this section, the Lesser Himalaya appear quite prominent in Sikkim and Bhutan. Further east, the range is more compact, scoured by only a few rivers. The climate is decidedly humid with rich vegetation, and shifting cultivation is common. Sikkim, enconsed between Nepal and Bhu-

tan, has three distinct population groups. The autochthonous Lepcha practice slash-and-burn agriculture following a seven-year rotation cycle (Bhasin et al. 1984). The Bhotia of the north engage in transhumance with herds of yaks and sheep. The southern area has been overwhelmed by migrants from east Nepal who practice sedentary cultivation of rice and maize. Cardamom, as a cash crop, was introduced at the beginning of this century. Bhutan is the least populated state in South Asia with much of its forests still in a pristine state. The population is predominantly Bhotia with some Monpa tribals in the south-east. The people of the East Himalaya are Mongoloid, practising Lamaist Buddhism in Sikkim and Bhutan while others are mostly animists. The tribal groups east of Bhutan are the Aka, Monpa, Nishi, Miri, and Abor (Rustomji 1971).

2.3 The North-East

The Himalayan wall, which runs due east-west from Sikkim through Bhutan, bends north-east culminating in the Namcha Barwa (7,755m). It is possible that the Himalayan fold systems extend eastwards into China. However, there is a sharp contrast in tectonic structure west and east of the Dihang-Brahmaputra gorge: south-west/north-east in the NEFA and distinctly north-south further east. This is expressed by a succession of ranges trending south along the Indo-Myanmar border.

The first section of mountain barrier between India and China, east of the Dihang Gorge, is the Mishmi Hills with a high point at Kadusam (5,106m). Drained by the Dihang and Lohit rivers, the area is rugged with dense forest. Then follow the Patkai, Naga, Chin, and Arakan Ranges along the Indo-Myanmar border. These form the great Arakan arc made up of tightly packed parallel ridges and valleys with trellis drainage patterns. Geologically, they are of Mesozoic formation in Arakan, Tertiary in the Naga hills, and Precambrian further north. The ridges rarely exceed 2,000 metres, although some peaks in the Chin, Naga, and Patkai Ranges exceed 3,000 m, the highest being Dalpha Bum (4,578m).

The area is mostly hilly and mountainous. With monsoon rainfall exceeding 2,000 mm, the ranges have dense vegetation of tropical evergreen and deciduous species. The people are a mosaic of Mongoloid tribes. Their villages tend to concentrate on ridge tops to avoid malarial valleys and for defence. Shifting cultivation, known as *jhum* or *taungya* (mountain field), is common for cultivating upland rice, maize, and millet with the aid of dibble sticks. Forest products, such as bamboo, honey, wax, and lac, are sources of supplementary income. Lying on the frontier of India and Myanmar, these lands once harboured raiding parties of rival head-hunters. Such rivalries have been superseded now by conflicts over ethnic nationalism (Lintner1996).

The Assam Plateau, more appropriately Meghalaya (Abode of Clouds), is a detached block of the Peninsula beyond the Ganges-Brahmaputra plain. It is formed mainly of pre-Cambrian crystalline rocks with granite intrusions. It extends 240km east-west with an average elevation of 1,830m. Its south flank of sandstones presents a steep slope scoured by the highest rainfall in the world (10,800 mm). Northwards are fragmented outliers of the Mikir and Rangma hills. The plateau is densely forested, although the lower ridges have been converted to secondary woodland through centuries of shifting cultivation. The main crops are maize and upland rice along with potatoes and oranges as cash crops. The people belong to the Garo, Khasi, and Jaintia tribes that speak Mon-Khmer or Tibeto-Burman languages. A matrilineal society persists despite exposure to missionary influence.

2.4 The Peninsula

The peninsular massif of India is made up of hard igneous and metamorphic rocks and generally has gentle gradients produced by prolonged weathering and erosion. Despite its vast expanse south of the Indo-Gangetic plain, ranges that exceed 1,000m in elevation are localised as residual plateaus. These are the Eastern and Western Ghats, Satpura-Maikal, Aravalli, and highlands of Sri Lanka.

The Eastern Ghats or uplands along the eastern side of Peninsular India have no structural or topographic continuity. Neither are they really ranges like the Western Ghats but rather uplifted plateaus separated by major basins. These have been recognised as being in four sections: (1) north of Mahanadi, (2) between Mahanadi and Krishna, (3) between Krishna and Penner, and (4) south of Penner converging to the Western Ghats. The northern section is formed of intrusive igneous rocks with a banded iron formation. The prominent ridges run north-south with heavily forested deep valleys. A few peaks are just over 1,000m. South of the Mahanadi, the Ghats run south parallel to the west coast. They comprise of metamorphosed sedimentaries giving rise to smooth, hummocky hills. In places, intrusive granites form rugged hills with surfaces covered with large blocks and tors. Their average elevation is 1,100m, the highest point being Mahendragiri (1,501m). The third section, the Nallamala Range, extends from Guntur to Cuddapah in an arcuate form with concavity to the east. Despite the low average elevation (760m), the range is rugged with jagged peaks and steep slopes. This is the home of the Chenchu, a primitive food gathering tribe. The fourth section, west of Madras, includes the Palkonda, Javadi, and Shevaroy hills. Mostly composed of charnockite massifs, they have steep sides with rolling topography on the top. North of the Cauvery River, the Shevaroy hills merge into the Nilgiri hills, a part of the Western Ghats.

Before turning to the Western Ghats, it seems logical to deal with the Sri Lankan highlands as they are a geological extension of the Peninsular system. This refers to the igneous intrusions of the Khondalite series of old gneisses and schists. The Central Highlands constitute a plateau of from 1,800-2,000m in elevation that extends over 70 km between the Hatton and Welimada peaks. The western section has a series of ridges, while the eastern section has gentle rounded forms with some deep gorges. Although their structure is complex, the highlands have two erosional surfaces, indicating successive uplift movements. The upper plateau or 'up country' becomes dominant south-west of Kandy where the prominent peaks include the Pidurutalagala (2,524m), which is the highest on the island, and the spectacular Adam's Peak (2,243m). The highlands have been much eroded by rivers that drain out in a radial pattern, and some have waterfalls that have been used for hydropower. The highest zones receive heavy rain from the south-west monsoon and originally had dense forest. Natural vegetation has been largely cleared since the early 19th century for plantation of cash crops. The sequence of plantation crops here is an interesting instance of the varying effects of physical and economic factors. The first cash crop to be introduced was cinnamon, then followed coffee, cinchona, and finally tea; the latter being the principal crop today.

The Western Ghats, *Sahyadri* in Sanskrit, run for about 1,600 km along the western border of the Deccan from Cape Camorin to the River Tapti. Their average elevation is 1,200m. They are not true mountains but rather the faulted edge of an upraised plateau. There is a contrast between the deep ravines and canyons along the scarp facing the Arabian Sea and the flat-topped spurs intersected by mature valleys to the east. The three sections of the Western Ghats roughly correspond to their extensions in the states of Kerala, Karnatak, and Maharashtra. The southern section, on either side of the Palghat Gap (300m), has the highest ranges in the Peninsula. Anai Mudi (2,695m), the highest peak, is a nodal point from which three ranges radiate - the Anaimalai to the north, Palni to the north-east, and the Cardamom hills to the south. The last range, approaching closely the southern tip of India, is also called the Southern Ghats. The heavy rainfall, averaging 5,000m per annum is conducive to the growth of rich forests. The Palni hills are much more accentuated towards the west, rising to 2,506m. The hill station of Kodaikanal (2,195m) stands at the southern edge of the central part. The Anaimalai Range is a series of plateaus intersected by deep valleys. Its forests contain large timber trees such as teak, ebony, and rosewood. These southern hills support large coffee plantations. The Nilgiri (Blue Mountain), a compact plateau north of

Palghat, is the point at which the Eastern and Western Ghats converge. The highest peak is the Dodda Betta (2,637m). Its rich vegetation has affinities to the humid flora of Assam. Plantation crops of tea and coffee dominate, while the tribal Toda tend buffaloes on the grasslands. Ootacamund in the Nilgiri hills is the leading holiday resort in south India.

The second section of the Western Ghats extends 650 km north from Gudalur to Belgaum. The rocks are mainly granitoid gneisses, and the range runs very close to the coast. The Jog Falls, with a sheer drop of 250m, are in this area as also the peak of Kudramukh (1,894m). Heavy rainfall favours dense forest growth. Much of this forest has been affected by shifting cultivation (*kumri*). The third section of the Western Ghats extends 650 km from 16° N latitude to the Chandor hills south of the Tapti. These are mainly composed of horizontal sheets of lava. They are 50 to 60 km from the coast and have an average elevation of 550m. Northwards, they show a monoclinal fold, the western limb of which dips gently towards the sea. Further south, the range steeply faces towards the coast and gently slopes eastwards. More important eminences include the Kalsubai (1,646m) in the Harishcandra Range and the Mahabaleswar (1,478m) which is on another range of the same name.

The Satpuras (Seven Folds) extend 900km east-west between the Tapti and Narmada rivers in central India. The western-most part, locally known as the Rajpipla hills, is a steep-sided Deccan lava block with a high craggy ridge. The more extensive central part has the Gawilgarh hills to the south and the Mahadeo hills to the north. The former is another Deccan lava horst and the latter is formed of Gondwana quartzite with precipitous scarps. The highest peak of the Satpuras, Dhupgarh (1,350m) near Pachmarhi hill station, lies in the Mahadeo hills. The eastern part of the Satpuras is known as the Maikal hills, crowned by the Amarkantak (1,065m). This plateau is tilted north-west and much dissected by streams draining into the Narmada. The upper slopes still carry forests that support lumbering and charcoal making. Shifting cultivation is practised by various Gond tribes who are also engaged as forest workers.

The Aravalli, the oldest mountain range in India, extends nearly 700km from Gujarat to Delhi. Its main south-west/north-east strike is remarkably regular, and it is marked by a central range of ancient gneisses and schists. The Aravalli Range culminates (1,315m) in the headwaters of the Sabarmati River near Udaipur. However, the highest point, Guru Sikhar (1,722m) on Mount Abu, lies off the main axis in the extreme south-west. The well-defined range near Udaipur, called the Mewar hills, presents a steep scarp on the western side. Then commence two ridges running parallel for 100 km, separating the Marwar (Region of Death) on the west and the Mewar on the east. Near Ajmer, they separate out into a number of jagged hills of quartzites. North of Jaipur, the range is marked by low ridges half-buried in the alluvium. On the frontier of the Thar desert, the land experiences frequent drought. The hill forests are xerophytic and degraded. The people on the west side are semi-nomadic and range widely to graze their cattle. In the comparatively more humid east, Bhil tribes practise shifting cultivation.

2.5 The North-West

West of the Indus, the mountain rim confining South Asia from the central mass turns south-west in a series of parallel ranges. This great bend, the western syntax, commences around Batura (7,785m) above Hunza and continues west and south. These can be described in three sections: the Hindu Kush, Northwest Frontier, and Balochistan Ranges. The Hindu Kush (Hindu Killer) turns south-west from the Pamir and forms the watershed between the Wakhan Corridor and the Chitral Valley. This used to be the great frontier where once the British, Chinese, and Russian imperial interests converged (Keay 1977). The highest peak in the Hindu Kush is Tirich Mir (7,690m) which, according to legend, is guarded by giant frogs (*boguzai)* and phantom maidens who meet climbers with bowls of milk or blood:

drinking the blood leads to certain death. The lower slopes have grasslands and forests and the tree-line is between 3,600 to 4,000m. The economy of Chitral is based on animal husbandry and fruit trees. The astonishing variety of people here includes descendants of Alexander's Greek army to newly arrived Afghan refugees. The inaccessible areas are the home of the Kafirs (infidels) with Indo-Aryan speech and a pagan religion. The range continues west as Koh-i-Baba (Grandfather), the central highlands of Afghanistan along the Kabul-Herat axis. These highlands, including well-wooded Nurestan, are conventionally considered to be part of South Asia. However, their geological structure and xerophytic environment are more in line with the features of West Asia.

The highlands of the North-West Frontier commence first as a watershed between the Gilgit and Yarkhun rivers in the extreme north. These highlands trend south-west as the Mohmand Hill and Malakand Ridge. This mountain area, mostly of gneiss and granite, has been eroded into deep narrow valleys. Local vegetation includes forests of pine and deodar as well as grasslands under the influence of the western precipitation. The people belong to at least a dozen tribes who speak Pushtu and practice transhumance. South of the Khyber Pass (1,067m), the north-east/south-west frontier ridge turns sharply east-west as the Safed Koh, culminating at Sikaram (4,761m). The hills trending south between Safed Koh and Bannu are mostly arid and are composed of bare limestones and sandstones. Further south, as far as the Gumal Gorge, the border range becomes arcuate and convex to the west. The sinuous strikes of the area between the Kabul and Gomal rivers express the buckling caused by the meeting of the alpine crust movement with the rigid peninsular block. The area is the habitat of ever-warring tribes whose political fragmentation corresponds to the extremely broken terrain (Spate et al. 1972, pp 490-491).

The mountain ranges of Balochistan are knotted together into the complex of the Quetta node where Zargun attains a height of 3,578m. The bifurcating ranges are the Toba Kakkar to the north-east, Sulaiman to the east, and Central Brahui to the south. The Toba Kakkar with Tanishpa (2,964m) demonstrates a slight convexity to the south-east. The Sulaiman Range is a series of north-south trending ridges that finally turn west towards Quetta as the Bugti hills. South of Quetta, the prominent north-south trending ranges are the Central Brahui adjoining the Kalat plateau and the Kirthar further south. The western half of Balochistan is traversed by two ranges with an east-west alignment: the Chagai in the north and Makran in the south. The leading features of the climate are aridity and great variation in temperature. The vegetation, mainly xerophytic, has been much reduced by overgrazing. In drier areas, water is brought down from the adjacent hills to settlements and fields by means of *karez* (underground channelled irrigation system) tunnels.

(see Figure 1)

Annex A: **Ranges of South Asia**			
S.N.	Range (Subsidiary)	Prominent Peak (Metres)	Location
1.	Arakan Yoma	Pauksa Taong (1,708)	India/Myanmar
2.	Aravalli Range	Guru Sikhar (1,722)	India
3.	Central Highlands	Pidurutalagala (2,524)	Sri Lanka
4.	Chin Hills	Mt. Victoria (3,053)	India
5.	Ghats, Eastern	Mahandragiri (1,501)	India
6.	Ghats, Western	Anai Mudi (2,695)	India
7.	Himalaya, East	Namcha Barwa (7,756)	China
8.	, , Central	Mt. Everest (8,848)	China/Nepal
9.	, , West	Nanga Parbat (8,126)	Pakistan
10.	Hindu Kush	Tirich Mir (7,690)	Pakistan
11.	Karakoram Range	K-2 (8,611)	China/Pakistan
12.	Malakand Range	Falaksir (6,257)	Pakistan
13.	Meghalaya	Shillong Peak (1,961)	India
14.	Mishmi Hills	Kadusam (5,108)	India/China
15.	Naga Hills	Saramati (3,826)	India/Myanmar
16.	Patkai Hills	Dalpha Bum (4,578)	India/Myanmar
17.	Safed Koh	Sikaram (4,761)	Afghanistan/Pakistan
18.	Satpura-Maikal Range	Dhupgarh (1,350)	India/China
19.	Toba-Kakar (Makran, Kirthar, Sulaiman)	Zargun (3,578)	Pakistan