

Chapter 2

The Hindu Kush-Himalayas: Searching for Viable Socioeconomic and Environmental Options

MAHESH BANSKOTA
Deputy Director General
ICIMOD, Kathmandu

2.1 Introduction

The Hindu Kush-Himalayan Region has experienced both continental as well as cultural collisions between mainland Asia and the Indian sub-continent. It is one of the most diverse physical and cultural landscapes in the world. Within very short distances, components of almost all the principal ecosystems and a wide range of cultural systems of the world are found. In response to different environmental factors, each has also developed its own unique features. Yet, for all its biological and cultural diversity, it is among the least known of the world's mountain systems. For centuries the only information coming out of these mountains was the experiences or impressions of a few travellers who were migrants, invaders, traders, or missionaries (Fürer-Haimendorf 1975; Hammerton 1984; Biddulph 1986). Mountain people themselves knew very little about each other. Barricaded by high mountains, swift rivers, and an array of dialects and customs, with the added impact of fierce competition for limited resources, they were also strangers to each other. The long history of isolation and conflicts in the region has made its inhabitants highly suspicious of outsiders and their motives. This is also experienced at times by central governments when they try to implement their development activities (Clarke 1987; Shrestha 1993; Bahuguna 1994).

The traditional isolation of mountain areas is being increasingly broken by the wheels of technology, the increasing education of mountain people, and the expansion of modern commerce and communications. These have brought with them many new opportunities for mountain communities, but they have also introduced new challenges (Banskota and Sharma 1994).

The Hindu Kush-Himalayas are facing new problems and opportunities in almost every aspect of the economy, the environment, and the society. Unprecedented economic, environmental, and cultural changes have been brought about by different agricultural, commercial, and developmental activities. While many continue to struggle with subsistence farming on their small sloping farms, others, albeit a few, are beginning to receive attractive returns from commercial crops, tourism, and new economic activities. If in the past local communities collectively regulated the harvesting of different natural resources, today, many new organisations, laws, and practices have been introduced.

Although the influence of modern education and health care is mainly concentrated in accessible urban and rural mountain areas (UNICEF 1996), it has been phenomenal throughout the mountains. In great haste to catch up with their contemporaries in the plains, mountain people are unhesitatingly embracing all-round change, sometimes even at the cost of their unique environment and cultural heritage. Urbanisation has been limited in scale in the past, but more recently there has been rapid growth throughout the mountains – mostly sporadic and unplanned, but nevertheless economically dynamic (Sharma and Partap 1994). Government activities and influence have also expanded considerably, reaching many communities that have been isolated for a long time. Governments have brought with them a huge development agenda which, while raising expectations, has been greatly wanting in effective implementation and delivery. Development has resulted in an unrestrained use of the environment, a rapidly depleting stock of natural wealth, and creation of new problems of pollution of many natural resources: mainly air, water, and soil.

There is indeed a vast array of environmental, economic, and social issues that need to be taken into account before introducing change to mountain societies of the Hindu Kush -Himalayas. With increasing interaction with the rest of the world, mountain areas are also recognising their comparative advantages in environmental endowments and cultural resources. The challenge for the architects of mountain development is to pursue a realistic but affordable path of development that will improve the quality of life and provide future generations with adequate options in building their own futures without burdening them with huge economic, social, and environmental costs.

This paper provides an overview of the Region—drawing upon the available information to describe its distinguishing features, its environment, and its economy. The next section provides background information on the Hindu Kush Himalayan mountain chain. This is followed by a discussion about the environment and the economy. The last part looks at the experience in mountain development of more

advanced countries in Europe, followed by suggestions about priority areas for the future.

2.2 Background to the Region

The Hindu Kush-Himalayas (Figure 2.1) are not a single continuous range or chain of mountains. They consist of a series of ranges running roughly parallel for long distances, separated by deep rivers fed mostly by mountain glaciers. The westernmost part of the HKH, located in Afghanistan and Pakistan, consists of the Hindu Kush, the Karakoram, and western most parts of the Himalayas. Close by are also other important ranges such as the Kunlun, TienSien, Mustag Ata, and Altai, all extending out of the Pamir Plateau into Central Asia and China (Figure 2.2).

Hindu Kush mountains

The Hindu Kush Mountains, which are considered a part of the great Himalayan mountain chain, extend east-west over an area of approximately 456,000 sq.km in the centre of Afghanistan and touching parts of North Western Pakistan. They separate the Northern Plains from the Southern Plateau in Afghanistan and the Weran Pass (5,000m) connects the Valley of the Kunar River in the south with the Kokcha River in the north. The eastern Hindu Kush is a cold desert highland with snow-covered peaks and practically no vegetation, whereas the climate of the Central Hindu Kush is less severe and parts are forested. The Salang Pass (5,000m) on the main road from Kabul to the Northern Plains lies in the Central Hindu Kush (Hassanyar 1995).

Karakoram range

The main parts of the Karakoram lie in Northern Pakistan and along the border with China. The eastern boundaries, however, extend into eastern Ladakh in India. Its western boundary touches the Hindu Kush. K2, the second highest peak in the world, is in the Karakoram. It has twelve out of the thirty top peaks with elevations over 7,500m. It contains some of the largest glaciers outside the polar region. As it is unaffected by the monsoon, the valleys are mostly dry except in irrigated areas.

Himalayas

The Himalayas are the highest mountain chain of all and form a great arc of 2,700 km from the Indus River in the west to the Brahmaputra River in the east. Transversally they have been classified according to the rivers, and these are listed below (Table 2.1).

Table 2.1: The Himalayas classified according to rivers

Different Rivers	Himalayan Group	Length (miles)
From the Indus to the Sutlej	Punjab and Kashmir	350
From the Sutlej to the Kali	Kumaon	200
From the Kali to the Tista	Nepal	500
From the Tista to the Brahmaputra	Assam	450

Source: Joshi, et al. 1990

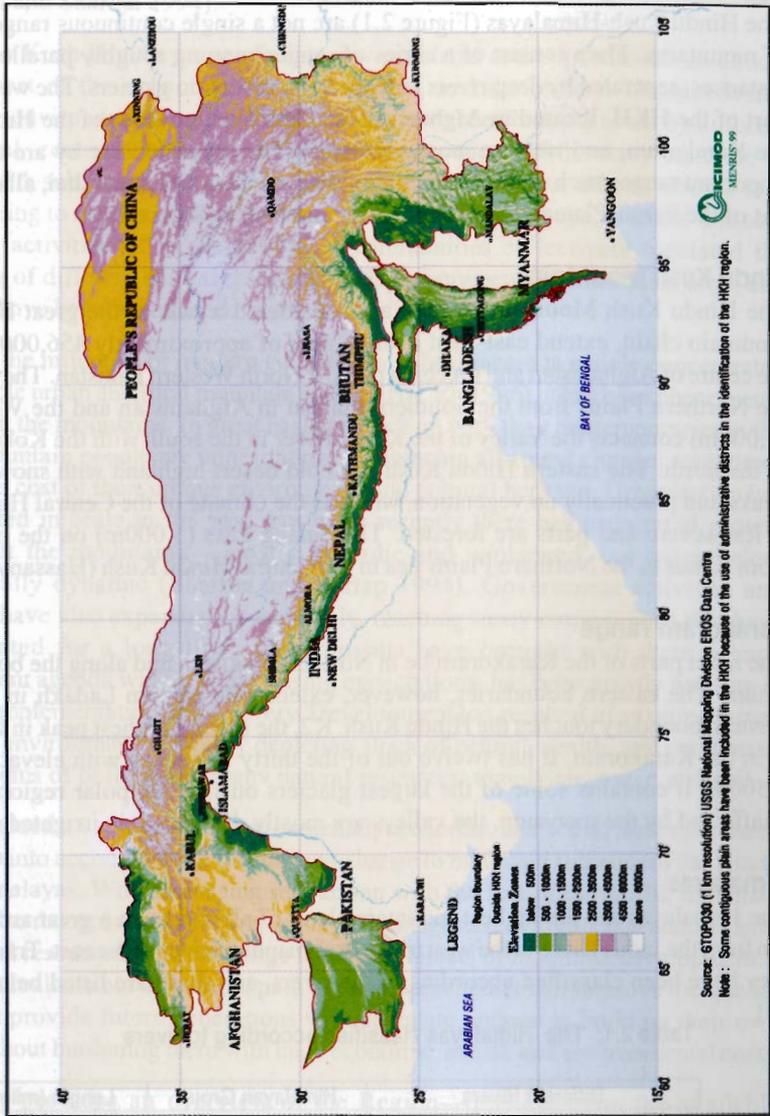
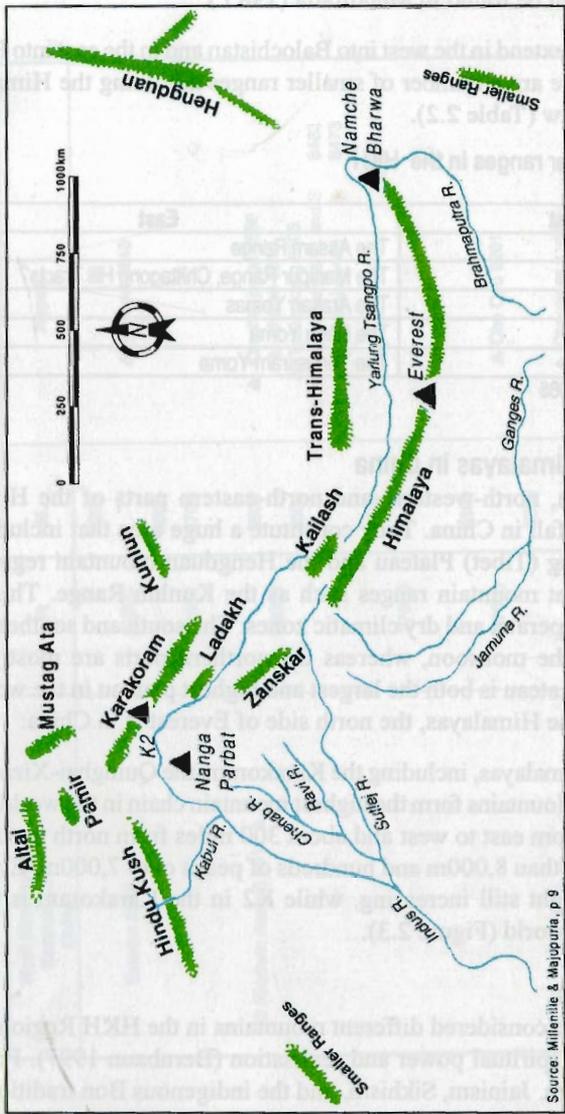


Figure 2.1: The Hindu Kush-Himalayas



Source: Millenille & Majupuria, p. 9

Figure 2.2: The Himalayas and related mountain systems extend to about 2,800 kilometres

They have also been classified longitudinally as the Outer Himalayas - consisting of the Siwaliks rising from the plains and going up to 3,500 ft and the Lesser Himalayas - going up to the snowline. Above the snowline lie the Great Himalayas covered with perma-snow and ice, and these include the Tibetan Plateau. Geological classifications of the Himalayas can be found in Mehdiratta (1985).

The Himalayas also extend in the west into Balochistan and in the east into Bangladesh and Myanmar. There are a number of smaller ranges adjoining the Himalayas, and these are given below (Table 2.2).

Table 2.2: Smaller ranges in the HKH

West	East
The Salt Range	The Assam Range
The Suleiman Range	The Manipur Range, Chittagong Hill Tracts?
The Bugh Range	The Arakan Yomas
The Kirthar Range	The Regu Yoma
The Mekran Range	The Tenassram Yoma

Source: Mehdiratta 1985

The Hindu Kush-Himalayas in China

The entire northern, north-western, and north-eastern parts of the Hindu Kush-Himalayan Region fall in China. They constitute a huge area that includes most of the Quinghai-Xinjiang (Tibet) Plateau and the Hengduan mountain regions, linked with other important mountain ranges such as the Kunlun Range. This vast area covers tropical, temperate, and dry climatic zones. The south and southeastern parts are influenced by the monsoon, whereas the northern parts are mostly dry. The Quinghai-Xinjiang Plateau is both the largest and highest plateau in the world. Along the main range of the Himalayas, the north side of Everest is in China.

The Hindu Kush-Himalayas, including the Karakoram, the Quinghai-Xinjiang Plateau, and the Hengduan Mountains form the highest mountain chain in the world, extending to over 3,500 km from east to west and about 300 miles from north to south. There are 14 peaks higher than 8,000m and hundreds of peaks over 7,000m. Everest is the highest with its height still increasing, while K2 in the Karakoram is the second highest peak in the world (Figure 2.3).

Sacred mountains

Many religions have considered different mountains in the HKH Region to be very sacred as places of spiritual power and realisation (Bernbaun 1997). Followers of Hinduism, Buddhism, Jainism, Sikhism, and the indigenous Bon tradition (in Tibet and parts of Nepal) have long standing spiritual association with these mountains. Even today there are important locations where thousands of pilgrims undertake long and arduous journeys in order to offer their prayers to the gods and goddesses that have become identified with the mountains.

	West Himalaya Karakoram China	Ft	M.	Nepal
	Everest 8848 ▲	29000	8900	▲ Everest 8848
	K2 (Godwin Auster) 8611 ▲	28500	8600	▲ Kanchenjunga 8586
		28000	8500	▲ Lhotse 8516
				▲ Yalung Kang 8505
				▲ Kanchenjunga C, and S 8483
		27500	8400	▲ Makalu 8463
				▲ Cho Oyu 8201
	Nanga Parbat 8125 ▲	27000	8300	
	Gasherbrum I 8068 ▲		8200	▲ Dhaulagiri 8167
	Board Peak 8036 ▲	26500	8100	▲ Manaslu 8163
	Gasherbrum II 8036 ▲			▲ Annapurna 8091
	Board Peak Central 8000 ▲		8000m	

Source: Milleville & Majupuria P11

Figure 2.3: Peaks above 8,000 metres

Mount Kailas, located in Xinjiang (Tibet) Province in China, is considered to be the most sacred peak in the Himalayan Region. The Hindus maintain that this is the location where Lord Shiva stayed on this earth. Shenrab, the legendary founder of the Bon religion, also introduced his religion from this area. Hemkund, a mountain lake near the source of the Ganges, is the location where Guru Govinda Singh, the last of the principal teachers of the Sikhs, is supposed to have practised meditation in a previous life. In another cave the Tibetan yogi, Milarepa, also meditated and attained enlightenment.

Mount Everest is referred to as Chomolungma by Tibetans and Sherpas. While there are various explanations of its precise meaning, one common reference is to the goddess in the mountain. Mount Nanda Devi in Garhwal (India) is seen as the Goddess of Bliss and next to the mountain are the two holy pilgrimage sites of Kedarnath and Badrinath where hundreds of thousands of pilgrims visit every year to offer their prayers. There are also many very old monasteries throughout the Himalayas.

In Nepal there are many other mountains, such as Annapurna and Machhapuchhre, that also have religious significance. Similarly, Kanchenjunga plays a central role in the religious life of the Sikkimese who regard the peak as their divine protector. Buddhist shrines and monasteries are found in the mountains in Bhutan, China, and Myanmar, and many of these are in daily use as sites of prayer for local people.

Rivers and glaciers

The Hindu Kush-Himalayas are the sources of a number of major rivers in Asia (Figure 2.4). In fact many of the rivers are older than the mountain systems – particularly those in the north of the Himalayas. The major rivers, some of which are among the longest in the world, include the Indus, the Ganges, the Brahmaputra, the Mekong, the Yangtze, and the Yellow rivers (Myint 1998). The Yangtze is the third longest and the Yellow River is the seventh longest river in the world. Another interesting aspect of these rivers is that only 30% of the total drainage area is in the lowlands, i.e., below 1,000ft, emphasising the rugged nature of most of the watersheds of these rivers (Table 2.3).

Table 2.3: HKH rivers and their watersheds

River	Length	Watershed Size (sq.km)	0-1,000 ft Elevation (% in watershed)	Countries Sharing River
Indus	3,200	945,000	34.97	China, India Afghanistan and Pakistan
Ganges	2,950	1,050,000	48.58	China, India, Nepal, Bangladesh
Brahmaputra	2,880	580,000	18.78	China, India, Bhutan, Bangladesh
Mekong	4,800	795,000	31.47	China, Myanmar, Laos, Thailand
Yangtze	6,290	1,808,500	33.39	China
Yellow	5,464	752,443	7.06	China

Source: Myint and Hofer 1998



Source: 810P030 (1 km resolution) USGS National Mapping Division EROS Data Centre
 Note: Some contiguous plain areas have been included in the HKH because of the use of administrative districts in the identification of the HKH region.

Figure 2.4 Rivers of the HKH Region

Another important feature of these river systems is that annual rainfall increases from the Indus to the Brahmaputra catchments. The Indus has a higher winter precipitation with dry conditions in the lowlands: The Yellow River catchment has dry conditions on the highland plateau. All the rivers are very important for agriculture in downstream areas. The total population of all these watersheds is reported to be about 700 million, while the population in the mountains is about 150 million (Myint 1977, Table 15). These rivers are part of a vast life-supporting system, but annually they also cause substantial loss of life and property by flooding. In June 1998 major flood events occurred in the Yangtze River Basin, resulting in 3,656 dead and direct economic loss of 248 RMB¹ (UNEP 1999). Floods have also become a regular part of summer life in Bangladesh and Northeast India.

The HKH Region has a very large number of glaciers – particularly in the Karakoram and the Himalayas. The longest of the glaciers is about 72 km (Siachen). There is concern about retreating glaciers throughout the region. However, there has been no systematic evaluation on a regional basis, and it is difficult to generalise.

The glaciers are an important ever-renewing source of fresh water for the millions living in the mountains and plains. Any significant reduction in the size of these glaciers could have serious repercussions on the supply of fresh water in the region. It is therefore an important topic for further study on a regional basis.

Many ecoregions

The HKH stretches 3,500 km from Afghanistan in the west to the subtropical forests of Myanmar in the east. Within this area, there are many ecoregions-areas of land or water that share a large majority of their species, dynamics, and environmental conditions. Based upon biological distinctiveness, 16 ecoregions have been identified (Dinnerstein 1998). These ecoregions are given below.

- a) Himalayan Subtropical Pine Forest, Western Himalayan Alpine Shrub/Meadow, Eastern Himalayan Alpine Shrub/Meadow, and Eastern Himalayan Subalpine Conifer Forest.
- b) Himalayan Subtropical Broad-leaved Forest, Eastern Himalayan Broad-leaved Forest, Eastern Himalayan Broad-leaved Forest, Western Himalayan Subalpine Conifer Forest, North-western Himalayan Alpine Shrub/Meadow, and the Tibetan Plateau.
- c) Western Himalayan Broad-leaved Forest, Terai-Dual Savannas and Grasslands, Northern Triangle Subtropical Forests, and Northern Triangle Temperate Forests.

The first group is relatively well known and well protected by current protection and conservation activities. The second and third groups have received little attention and are in varying stages of degradation.

¹ There are 8.28 RMB to a US dollar.

Figure 2.5 provides a more detailed description of the different agro-ecological zones found in the HKH Region. Other parameters associated with these agro-ecological zones are also provided in the accompanying Figure 2.6.

Major farming systems

The HKH Region is also characterised by different farming systems. Over the years mountain farmers have developed unique approaches in order to adapt to the various environmental conditions and take advantage of the endowments available to earn their livings. While each system is broadly distinguishable, these are not static by any criterion, and there are many examples of adaptation (Rhoades 1997).

Specialised pastoralism

In the HKH, above 4,000m, groups are living in the pastoral zone. These groups rely on grazing animals more than on sedentary agriculture. They engage in long- distance migration of livestock as well as trade – although more recently many changes have been seen in these traditional practices.

Mixed agro-pastoralism

Agro-pastoralism is very common throughout the mountains. Mountain farmers raise crops wherever possible and support their agriculture with livestock activities.

Cereal-based hill farming systems

Found below 2,500m, cereal production is the most common farming system and involves large numbers of mountain households. Agriculture is intensive, with use of irrigation. Terraces are very common. Livestock are used to support soil fertility, and extraction of forest resources for supporting and crop-livestock production activities is very extensive.

Shifting cultivation

Also called swidden, this is very common in eastern parts of the HKH. In the past farmers practised long fallow periods of 15-20 years, but as forest areas have diminished, fallow cycles have been drastically reduced. In some areas, farmers have been forced to settle permanently, resulting in serious decline of soil fertility.

Specialised commercial farming

This is becoming more common throughout the Region as market opportunities and technology become available. Commercial farming endeavours are being adopted, ranging from commercial production of cereals (and for export) to horticulture, floriculture, commercial livestock raising, and even commercial forestry and medicinal herbs. Figure 2.7 shows the distribution of these five major farming systems.

Eight countries and their population

There are eight countries in the HKH Region. From the perspective of sustainable development, a country focus provides the most practical way of looking at the

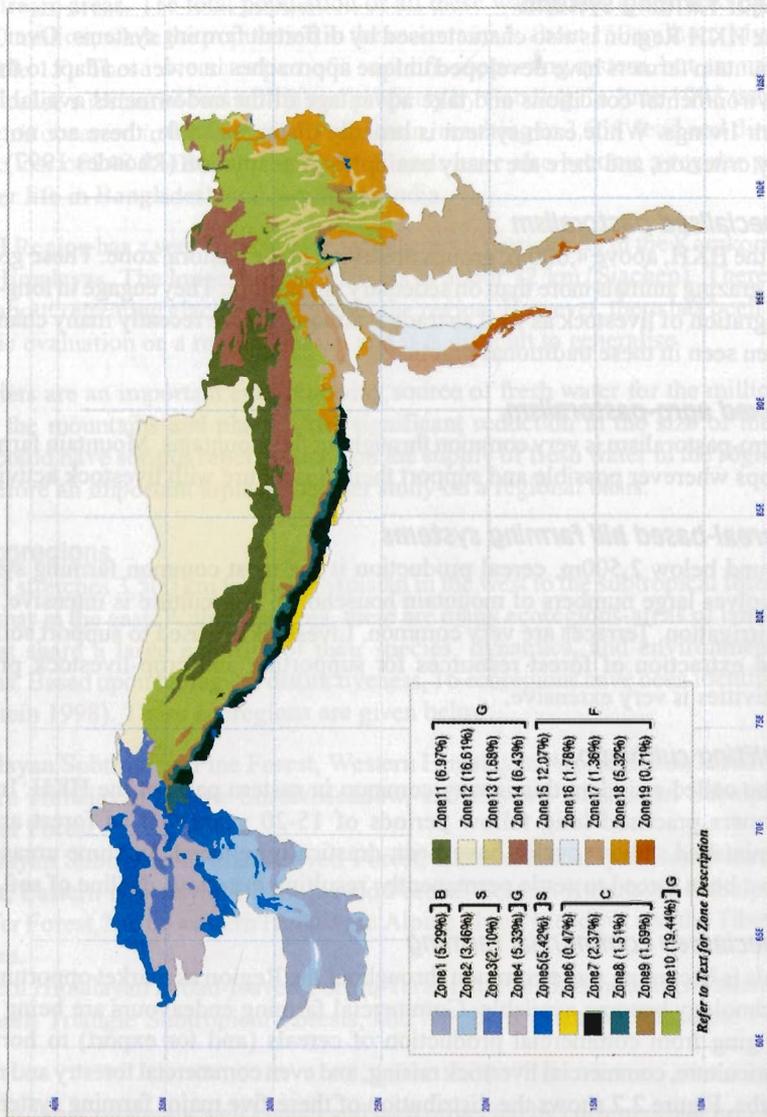


Figure 2.5: Agro-ecological zones of the HKH

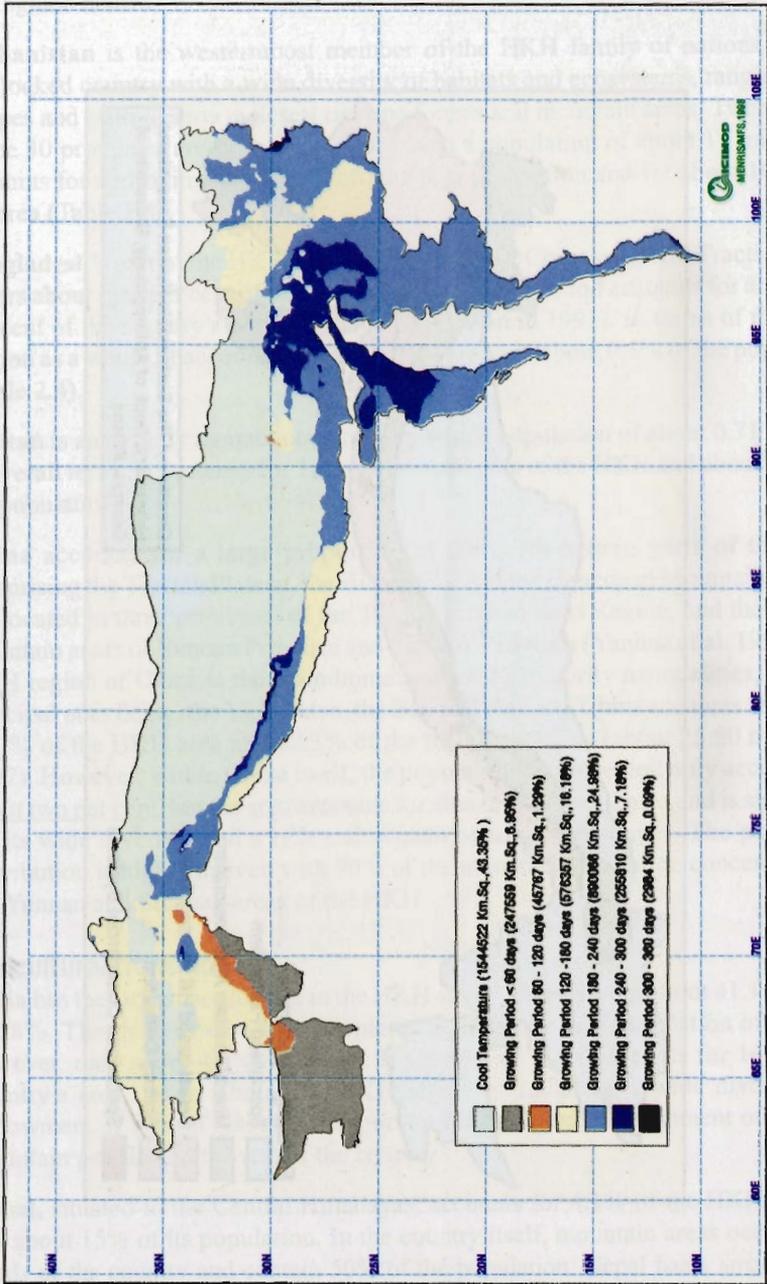


Figure 2.6. Possible breakdown in regions for the Hindu Kush-Himalayan area

Figure 2.7. Farming systems in the Hindu Kush Himalayan Region: the development of a prototype

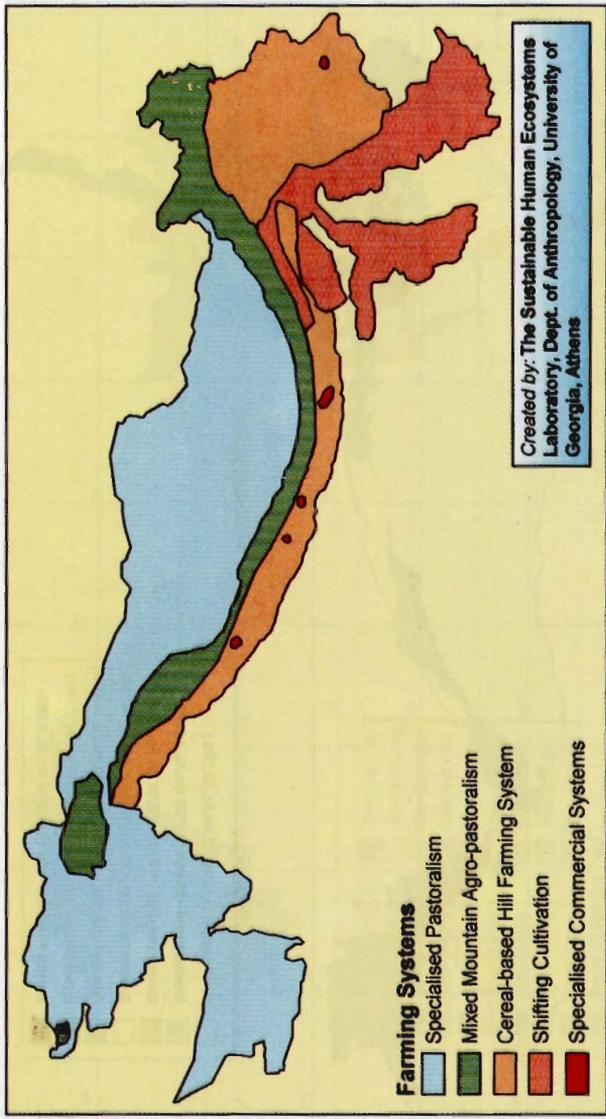


Figure 2.7. Farming systems in the Hindu Kush Himalayan Region: the development of a prototype

mountains. For each country, the prevailing situation in mountain areas is briefly highlighted below.

Afghanistan is the westernmost member of the HKH family of nations. It is a landlocked country with a wide diversity of habitats and ecosystems, ranging from steppes and semi-deserts to desert riverine forests and mountain areas. Twenty-five of the 30 provinces are part of the HKH, with a population of about 17 million. It accounts for approximately 10.6% of the HKH population and for about 10.9% of the area (Table 2.4).

Bangladesh's part of the HKH Region, known as the Chittagong Hill Tracts (CHT), covers about nine per cent of the land area of Bangladesh and accounts for about one per cent of the country's population (or 1.0 million in 1991). In terms of the HKH Region as a whole, it accounts for 0.7% of the area and about 0.8% of the population (Table 2.4).

Bhutan is an entirely mountainous country with a population of about 0.71 million. In overall terms, it accounts for 1.3% of the total area of the HKH and about 0.4% of the population.

China accounts for a large proportion of the north-eastern parts of the HKH comprising the Tibetan Plateau, the Himalayas, and the Hengduan Mountains, which are located in three provinces of the Tibetan Autonomous Region, and the western mountain areas of Yunnan Province and Sichuan Province (Yanhua et al. 1997). The HKH region of China is the main homeland for 25 minority nationalities, the four principal ones being, the Yi, Tibetan, the Bai, and the Lisu. China accounts for almost 47.7% of the HKH area and 17.3% of the total population (about 25.50 million in 1997). However, within China itself, the population of this region only accounts for about two per cent, but the area accounts for almost 17.7% of China and is significant for its wide diversity and a rich endowment of natural resources. The population distribution is highly uneven with 90% of the mountain population concentrated in the Yunnan and Sichuan areas of the HKH.

Agricultural transition

India has the largest population in the HKH area countries, with about 41.16 million or 28%. The share of mountain people in terms of the total population of India is, however, only about 4.5%, while the HKH area of India accounts for 14% of the country's area. As in China, the HKH region of India has a wide diversity and endowment of natural resources, important for the future development of both the mountain people and the rest of the country.

Nepal, situated in the Central Himalayas, accounts for 4.1% of the HKH area but has about 15% of its population. In the country itself, mountain areas occupy two-thirds of the country and contain 50% of the population. Nepal has a small strip of plains called the Terai; and these plains are becoming increasingly important for their potentials for development. Rising population pressure on the land and deterioration

Table 2.4: Mountain area, population and their respective shares in the HKH countries

Country	Total Area (sq km.)	Total Population (millions) 1997 estimates	Mountain Areas (Inclusions)	Area (Mountains)		Population (Mountains)	
				Total (sq.km)	% of HKH Total	Total (million)	% of Country Total
1. Afghanistan	648,000	17.4 (estimated)	Includes 25 of the 30 Provinces	390,475	10.9	15.54	10.6
2. Bangladesh	144,000	117.7	Chittagong Hill Tracts	13,295	0.73	1.14	0.77
3. Bhutan	46,500	0.71	Entire Territory	46,500	1.30	0.71	0.48
4. China	9,607,000	1208.8	All of Tibet and parts of Yunnan and Sichuan	1,700,266	47.7	25.50	17.3
5. India	3,287,300	918.6	All of 8 and parts of 3 Northern States	461,139	12.9	41.16	28.0
6. Myanmar	676,300	45.6	Includes all districts in the 4 States of Kachin, China, Shan and Rakkhain	317,629	8.9	10.10	6.9
7. Nepal	147,181	21.66	Entire Territory	147,181	4.1	21.66	14.7
8. Pakistan	796,100	126.6	NWFP, FATA, Northern Areas, AJK and 12 Districts of Balochistan	489,988	13.7	31.13	21.2
Total	15,352,381	2,457.07		3,566,473		146.94	

Source: 1) Sharma, P., 1998, "Revised Estimates of the Area and Population of the HKH", (internal)

2) Statistical Year Book for Asia and the Pacific, 1995, Bangkok: ESCAP, UN

3) Human Development Report, 1997, New York: UNDP

of the mountain environment are the main challenges to future development. Poverty is seen as the root cause of environmental problems such as soil erosion, soil fertility decline, flooding, landslides, and pollution of resources (HMG/EPC 1993).

Myanmar has a number of states in the HKH region. These are the four states of Kachin, Chin, Shan, and Rakhain. It has 8.9% of the area and almost 7% of the population (Table 2.4). A total of 135 ethnic groups are located in these states. They practise shifting cultivation, which is reported to be severely damaging to the mountain environment (NCEA n.d.).

Pakistan's mountain areas occupy more than half of the country. The HKH region in Pakistan, however, accounts for about 13.7% of the area and almost 21.2% of the total population in the region. Within the country itself, the HKH part of the population accounts for about 24.6% (Table 2.4).

The mountain areas of Pakistan are critical habitats for ecological balance in the country - especially for the sustainable use of water resources. The mountains of the North Western Frontier Province (NWFP), Northern Areas, and others comprise the watersheds of all the principal rivers of Pakistan and contain the entire hydropower and much of the water for irrigation in the country (ICIMOD 1997).

2.3 Environmental Overview

Environmental change is an inevitable consequence of active natural processes with or without human influence. These changes have resulted in fertile plains as well as deserts, mountains, and various types of water bodies as well as all flora and fauna. For a long period of time, humans, who were few in number, with only primitive tools had to adjust to the ebb and flow of natural cycles. At the best of periods they harvested huge surpluses that helped establish civilisations in fertile river valleys. At the worst of times, devastated and distraught by drastic natural events, they picked up their remaining belongings and moved on to new locations for a fresh start. As human numbers increased and technology and commerce grew, the adverse impacts on the environment resulting from overexploitation and misuse also increased. On the doorstep of the 21st century, humanity stands threatened by its own actions as environmental capital, consisting of species, habitats, ecosystems, and stock of different natural resources, is rapidly depleted. At present humanity is literally borrowing from future generations and once this crosses a critical threshold, depletion of environmental capital could result in unprecedented changes. Global warming may already be a natural warning to humanity!

However, there are also good reasons for hope. With an increasing improvement in understanding of natural processes and with measures to promote decentralised, participatory, equitable, and gender-sensitive development that is environmentally friendly, many degraded ecosystems are being turned around. While positive changes are still only a faint glimmer of hope in a vast sea of destruction, there are good reasons to believe that these isolated flickers will grow in the future.

The story of the change in mountain environments is also very similar. With more energetic natural processes, changes in mountain areas may be somewhat more dramatic in terms of both frequency and intensity. HKH mountain environments are characterised by steep slopes, active tectonics, heavy precipitation for limited periods with a long dry season, and marked seasonality. These conditions have given rise to frequent extreme weather and geophysical events such as earthquakes and regular flooding, landslides, mudflows, debris flows, and soil erosion. Water plays a dominant role in many of these weather events throughout the HKH region as witnessed by the floods, hailstorms; droughts, avalanches, glacial lake outbursts, river denudation, and mass wasting. The role of wind is limited to some parts in the west and the north. Tectonic activities are also spread throughout the HKH with many locations experiencing regular earthquakes.

Resource endowments

The rich endowments in mountain areas are often overlooked and undervalued (Banskota and Sharma 1999). Directly and indirectly the HKH mountains support 150 million people and many times this number in the plains.

Different types of natural resources are distributed widely throughout the mountains (Table 2.5), and many underground resources are not even well surveyed so far. For most of the population, the most precious resources are their agricultural land, the forests, the pastures, and the water. Mountain farmers over the centuries have carved out extensive systems of terracing. Where this is not feasible, different types of slope management practices involving various mixes of crop and water management have been used. Where agriculture is limited by climatic considerations, livestock-based farming systems have been developed to a very sophisticated level. More recently, as older systems have been unable to keep pace with the rapidly growing demand for food and other resources, the comparative advantages of mountain areas in horticulture, floriculture, and tourism are also being developed rapidly.

Water is life. Because it is not uniformly or easily available, high priority has been given to its proper storage, transport, and regulated use. Complex institutional mechanisms have been developed to facilitate the movement of water to where it is needed and to its allocation between users. While governments are preoccupied with discussions about rapidly harnessing the rich mountain waters, promising rich dividends, the financial and environmental costs of these proposals are likely to be huge and require careful examination. The priorities of the people, however, are for meeting their immediate needs for water for both drinking and irrigation. Small water projects are readily beneficial to the local people, but they are costly on a per unit basis. As water scarcity increases, the water debate is likely to be more sensitive and controversial, just as deforestation was in the seventies and eighties.

The limitations of arable land in the mountains have been well compensated by forest and pasture lands. It has been estimated that to support one hectare of farmland

Table 2.5: The geographical spread of the HKH region showing areas of forests, pastures (inclusive of national parks/protected areas), agriculture, population and livestock (area in '000 ha, population and livestock in '000 numbers)

Country (1)	Regions, Parts Included (2)	Geogra- phical Area (3)	Agricultural Area and % of (3) (4)	Forest Area and % of (3) (5)	Pasture Area and % of (3) (6)	National Parks/Protecte d Areas and % of (3) (7)	Approximate Population & Forest Area/Per Capita (8)	Approximate Livestock Numbers (9)
Afghanistan	25 Provinces out of 30	39,047	3905* (10.0)	1,138* (2.0)	17,970 (46.0)	85* (0.2)	13,800	21,037
Pakistan	2 Provinces and parts of 3 out of 6	44,438	3466* (7.8)	3,077 (6.9)	4,479 (10.1)	2,339 (5.3)	24,885* (0.12)	14,489
India	9 States, parts of 3 out of 32	52,819	4384* (8.3)	21,648 (41.0)	18,012 (34.1)	2,256 (4.3)	35,000* (0.61)	14590*
Nepal	Entire country	14,718	2653 (18.0)	5424 (36.9)	1,745 (11.9)	1,315 (0.9)	18,500 (0.34)	15,232
Bhutan	Parts only (3 districts)	4,700	356 (7.6)	2765 (58.8)	75 (1.6)	876 (18.5)	1,200 (2.30)	475
Bangladesh	Parts only (3 districts)	1,318	103 (7.8)	866 (65.7)	29 (2.2)	11 (0.8)	1,000 (0.89)	227
Myanmar	3 States out of 6	28,086	2159* (7.7)	14,297 (50.9)	76* (0.3)	354* (1.3)	5,600* (2.55)	1,627
China	1 Province and parts of 2 out of 31	168,907	2027* (1.2)	36,240 (21.5)	90,226 (53.4)	1613 (0.9)	20,269 (1.79)	2513
		354,033	19053 (5.4)	85455	132,612 (32.5)	8,849	120,254 (0.69)	70,190

Sources: Table prepared by B.R. Bhatta, CIMOD, 1992 based on:

1. FAO (1989), Ahmadyar (1989)
2. Jan (1989), Spooner and Jones (1983)
3. Forest Survey of India (1989), Planning Commission Government of India (1985).

4. Master Plan for Forestry Sector, Nepal (1988)
5. Negi (1983), CSO (1986).
6. Bangladesh Bureau of Statistics (1983), FSI (1982).
7. Forest Department, Myanmar (1991).
8. Han Yufeng et al. (1988).

Notes*: denotes figures estimated on the basis of national/adjoining area figures.

- Population figures estimated for 1991, based on Sharma (1993), estimated figures vary because of varying geographical area coverage.
 - Livestock numbers include cattle, buffaloes, goats, and sheep.
1. The 5 provinces excluded are: Kandahar, Helmand, Nimroz and Heart.
 2. The 2 provinces are the Northern Areas: Azad Kashmir, parts of 2 Divisions- Hazara and Malkand - a Division of the North West Frontier Province: the Murree Hills of Punjab Province: the 4 Districts excluded are: Nasirabad, Kachi, and Lasbella and Guadur of Balochistan Province:
 3. Nine provinces: Jammu and Kashmir (Western Himalayas), Arunachal, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura, parts of 3 provinces are: North Cachar and Karabi Anglong Districts of Assam State: the Darjeeling district of West Bengal State (Eastern Himalayas): Uttar Kashi, Chamoli, Tehri Garhwal, Pauri Garhwal, Pithoragarh, Almora, Nainital, Dehradun- 8 Districts of Uttar Pradesh State.
 6. Chittagong Hill Tracts, the 3 Districts of Rangamati, Khagrachari, and Bandarban
 7. The 3 States of Kachin, Chin, and Shan.
 8. One Autonomous Region of Tibet: 5 prefectures: Aba, Ganzi, Liangshan, Yaan and Dukou of Sichuan State: 6 prefectures: Lijiang, Diquing, Nuikjainag, Dali, Baoshan, and Chuxiong of Yunnan State.

at least three hectares of forest and grassland are necessary to sustain certain levels of productivity (Wyatt Smith 1982). Whatever this ratio, mountain people have used their forests and grasslands to the fullest extent possible. Today, excessive use of forest resources has become a serious problem. In response to these problems there are also examples of many mountain communities beginning to adopt practices that are more sustainable. The inherent diversity and genetic resource base of the mountains is increasingly being recognised to be of value globally. Materials traditionally used in mountain areas or available in mountain areas are finding new modern applications in medicine and in related fields.

Forest resources

Bhutan has over 15 forest species' types, China 80, India 221, Myanmar 43, Nepal 72, and Pakistan over 100. On the basis of ownership, forests have been classified as State or Government Forest, Community or Village Forests, and Private Forests. A separate category that is becoming important is that of National Parks/Protected Areas (ICIMOD 1994). Increasing pressures are being exerted on the limited forests and pastoral resources. Table 2.5 gives an idea of the remaining forests in different countries. In the past pressures were few and well within the renewed stock in terms of prevention of degradation - but today removals are much in excess and forest stocks are declining rapidly.

Biodiversity

The HKH flora and fauna are among the richest on this planet, given the wide range of micro-climatic variations within a fairly limited area. The mountains host rich forests of over a thousand different species of trees, shrubs, herbs, and grasses. The nature and type of the forests found vary according to the climate, altitudes, aspect, soil, and other biotic influences. More recently, human influence has become very significant.

In terms of fauna, the mountains are equally rich, hosting a large variety of mammals, reptiles, birds, and insects – ranging from wild asses of the cold deserts to the rhinoceros, the snow leopard, elephants, and tigers. Fauna are also distributed according to different geographic areas (Shengji 1995).

Many of the flora and fauna are under serious threat from different human activities—subsistence, development, and commercial. While various measures to reduce pressure on forests have been implemented and certain areas are experiencing some regeneration of forests (both natural and newly planted ones), other areas are still being rapidly denuded. The same is the case with fauna. As habitats become destroyed so do the animals. Protected areas have provided temporary respite in a few locations, but the overall pressure of human activities has taken a heavy toll on the rich fauna of the HKH region (Shengji 1995).

Agricultural systems²

Recent work carried out by ICIMOD (Mountain Environment and Natural Resources' Information Systems [MENRIS] and Mountain Farming Systems [MFS]) has resulted in new maps on regional agricultural systems. By translating the seasonal greenness classes into seasonal land-cover regions and regrouping or aggregating these, it is possible to derive map units for agricultural systems in the HKH. There are 183 distinct seasonal land-cover classes in the HKH region identified from a total of 255 seasonal land-cover classes. Out of the 183 classes there are 109 classes that represent the seasonal distribution of crop plantation. This clearly shows the diversity of different cropping patterns and agricultural practices throughout the region. Based on these seasonal attributes one can reclassify areas into a number of generalised groups to improve understanding of comprehensive cropping systems in the region. Five of these major classes were found to be significant in the HKH. These are: Shifting Agriculture, Irrigated Cropland, Rainfed Marginal Farmland, Fruit Plants/Orchard, Non-agricultural (Pasture/Range) (Figure 2.8).

The work at MENRIS/MFS has other interesting findings. By using a simple water balance model comparing data for precipitation and evaporation, information about humidity in the HKH can be obtained. The length of growing period is considered as the period (in days) during the year when precipitation exceeds half the potential evapotranspiration, but excluding the areas in which temperatures are too low for crop growth. The moisture conditions in the thermal zone with a mean annual temperature of more than 5°C was only considered for reference length of growing period. The growing periods were classified in groups of 30 days. The result shows that more than 43% of the HKH Region has a mean annual temperature of less than 5°C, i.e., unsuitable for crop growth, while only less than 38% of the area has a growing period of more than 150 days (Figure 2.9).

Increasing environmental problems

Barring a few exceptions, environmental problems, such as increasing loss of topsoil, deforestation, water shortages, flash floods, and degradation of large tracts of agriculture, forest, and pasture lands have increased considerably over the years.

The overall trends in almost all key aspects of mountain resource depletion may be summarised as follow.

Cultivated land

- Declining fertility, increasing soil erosion and landslides, problems of water management, reduced cropping intensity, increased monocropping and loss of crop diversity, increasing use of chemical inputs, and deteriorating soil quality in accessible areas

² I am grateful to Iftikar Uddin (formerly of ICIMOD-MENRIS) for contributing this section and Figures 2.5, 2.8 & 2.9.

Pastures

- Large-scale overgrazing and degradation of pastures, focusing on numbers rather than on quality.

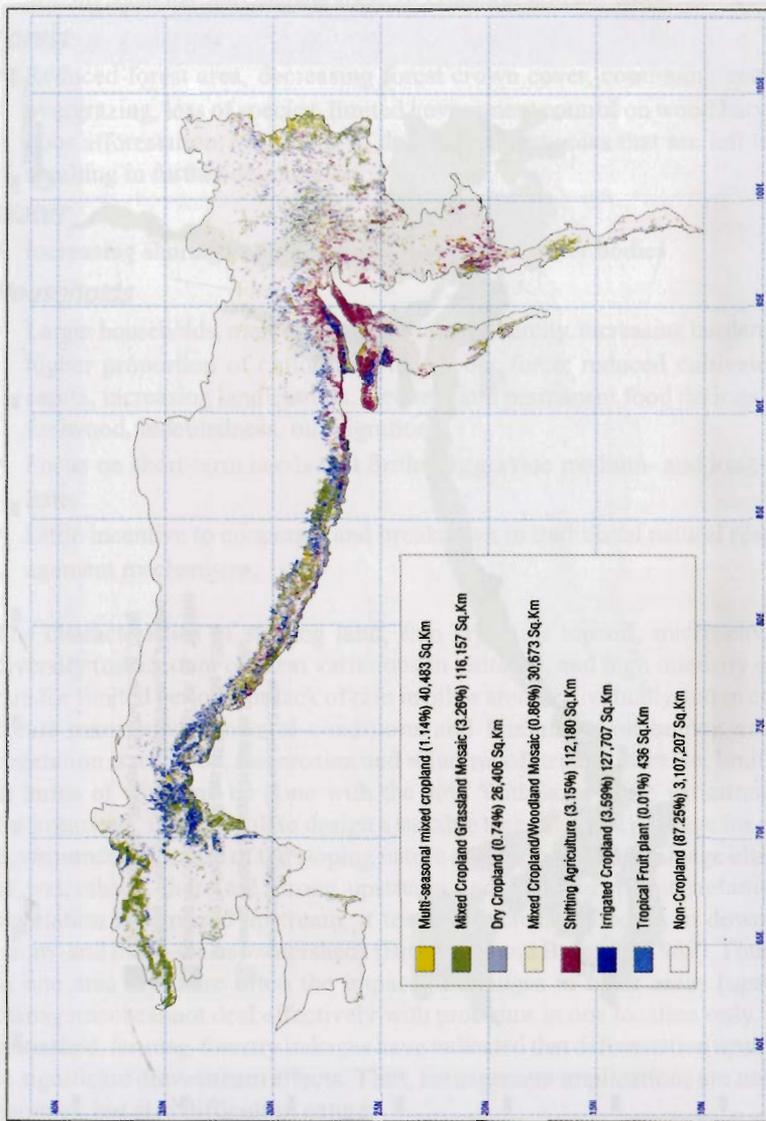


Figure 2.8. Cropland distribution in the Hindu Kush-Himalayan Region

Pastures

- Large-scale overgrazing and degradation of pastures, livestock management focussing on numbers rather than on quality, breakdown in traditional rotational grazing systems, and management of common grazing lands

Forest

- Reduced forest area, decreasing forest crown cover, continuing encroachment, overgrazing, loss of species, limited government control on wood harvested, very poor afforestation; vast areas of degraded forest areas that are left unmanaged, resulting in further degradation

Water

- Increasing shortages, flash floods, pollution of water bodies

Households

- Larger households, more dependents, labour scarcity, increasing burden on women, higher proportion of children in the labour force, reduced cultivated area per capita, increasing landlessness, frequent and permanent food deficits, scarcity of fuelwood, indebtedness, outmigration
- Focus on short-term needs that further aggravate medium- and long-term problems
- Little incentive to cooperate and breakdown in traditional natural resource management mechanisms.

The characteristics of sloping land, thin layers of topsoil, micro-environmental diversity (on account of great variations in altitude), and high intensity of monsoon rain for limited periods, or lack of rain in other areas individually and in combination create many environmental conditions and limitations on human activities. As vegetation is removed, soil erosion and water runoff tend to increase, limiting options in terms of what can be done with the soil. With large-scale variations in micro-environments, it is difficult to design a suitable technological package for each micro-environment. Because of the sloping nature of terrain and the drainage characteristics of watersheds, there are strong upstream and downstream interrelationships. As vegetation is removed upstream, it tends to increase flooding in downstream (on micro- and meso-scales) watersheds (Bruijnzeel and Bremmer 1989). Thus, problems in one area are more often the impact of changes in other areas (upstream) and management cannot deal effectively with problems in one location only. Within one watershed, farming-forestry linkages have indicated that deforestation upstream results in significant downstream effects. Thus, management implications are not only more complex but also difficult in nature.

The environmental consequences of construction activities that are not properly planned and managed in mountain areas are becoming more and more evident. Soil erosion, landslides, and damage from rapid runoff have created serious maintenance problems for roads and power projects. Without far greater care in construction

activities in the hills, huge investments can be and have been easily damaged. There is a critical need for greater understanding of mountain geology, geomorphology, and bio-engineering approaches in construction activities in mountain areas (Li Tianchi 1998).

It is generally agreed that forest areas in the mountains are disappearing rapidly. Many factors have been responsible for deforestation. Historically, with the rise in population, the area under cultivation has been expanded by clearing forest land. This is still continuing in many mountain areas. Collecting firewood and fodder is common throughout the mountains, not only because of the lack of other energy alternatives (particularly for cooking and heating) but also because of the nature of agricultural practices.

Cutting timber and collecting other forest products have taken place to an extensive degree. Timber has been one of the main exports from many mountain areas until recently. Efforts to harvest forest products scientifically have been limited. The amount harvested often greatly exceeds the licensed figures (Bhatta 1992). Uncontrolled grazing is another serious contributory factor to the degradation of forest areas and ranges that occupy large portions of mountain areas. Stall feeding of livestock is limited. Uncontrolled grazing destroys all the young plants and grasses, allowing little or no regeneration and damaging plant genetic resources. Most of the feed also comes from the forests, wherever forests still exist. Loss of biodiversity through depletion of natural resources, such as native plant species and wildlife, has also been noted to be significant, but this has not been well documented.

Toxic pesticides and other chemicals are being used widely without restriction throughout the mountains, and these are already reported to be causing serious problems in many areas. Pesticide management programmes are ineffective and patchy. The dangers posed to all categories of suppliers and users are very real, as few of the needed precautions are observed (Schreier 1995).

Natural resources' related disasters, such as forest fires, landslides and floods, debris flows, and so on have been reported to be increasing (Li Tianchi 1998) (Table 2.6). It is not clear to what extent these are due to various actions upstream, but their overall effects are far reaching. While it is well known that natural hazards are common in mountain areas, population pressure, poverty, and development activities are forcing people to move into high risk zones, increasing their vulnerability to many of these naturally occurring events. There has been little effort to look into this problem, and it warrants greater attention in future.

The Living Planet Index (LPI) of WWF measures the area of the world's forests and populations of different marine and freshwater species. The LPI declined by 30% from 1975 to 1995, implying that the world has lost 30% of its natural wealth in the space of one generation. For the HKH region, it declined by about five per cent on the average for India and less than one per cent for the other countries. The number of threatened plant species was 1,236 for India, 23 for Bhutan, 20 for Nepal, and 14

Table 2.6: Deaths and damage from (debris flows, landslides, floods, avalanches) natural disasters in parts of the HKH region

Period/ Countries	China (Sichuan & Yunnan)	India (NE/Jammu & HP)	Nepal (Entire Country)
1990	332 Sichuan and Yunnan	30 Nilgiri	307
1991	24	300 (Assam hills HP Road closed for 40 days)	93
1992	NA	Road and property damaged in Nilgiri	71
1993	NA	40 Nilgiri Hills 200 houses destroyed in Nagaland	1,336
1994	50	Kashmir highway damaged	49
1995	NA	63	246
1996	Over 200	NA	262
1997	Over 356	NA	87

Source: Li Tianchi 1998

for Pakistan (WWF 1999, 2-3). The figures for the loss of original forest cover are even more striking. Pakistan has lost about 90% of its original forest cover, while the percentage for other countries is between 80-90% for China and Bangladesh, 70-80% for India, and less than 50% for Bhutan, Nepal, and Myanmar (WWF1999, 4-5).

Environmental approaches

It will not be an exaggeration to say that there are as many environmental positions as there are different environmental problems. Rapid population growth and the increasing demand for natural resources have been considered a major factor behind environmental degradation. However, given instances of resource deterioration, even in sparsely populated areas and where population growth has been fairly negligible, poverty has been considered as an even more important factor. In many of the HKH countries poverty is considered to be a critical factor behind both rapid population growth as well as the changes in the condition of the environment. Additional research and studies have introduced other factors such as inequality of access to resources and lack of empowerment. Both of these appear to contribute to all three aspects of population growth, poverty, and environmental deterioration. With few mountain households possessing or having access to livelihood assets, the majority of people are forced to depend upon their own resources and public resources such as forests and grasslands. Conditions of inequality, whether in the context of income, wealth, assets, access to natural resources, or gender, will not alter without substantial changes in the empowerment of weaker, poorer, and underprivileged groups. The influence of such factors makes it both complex and extremely difficult to separate environmental problems from the issue of overall development. The problem with regards to most environmental problems is not the absence of technical solutions: it

is more related to social, economic, political, and institutional factors. Even when finances are available or can be mobilised, problems on the social and institutional sides have proven to be quite intractable. Increasingly, solutions are being examined from this multi-dimensional perspective. There are a few instances in which some degree of success has been seen, at least for the time being (ICIMOD 1994).

2.4 Development Overview: Transition of the HKH

Mountain economies are displaying a mixture of traditional and modern activities. Ranging from subsistence agriculture to sophisticated tourist resorts, mountain areas are not only making the most of their age-old technologies and practices, but are also quickly exploiting new opportunities. The key word is change. In the past also, there were changes, but these were over long periods of time. This slow pace of change was determined by nature and natural cycles. Only occasionally did humans make important breakthroughs such as introduction of irrigation, fertilisation, or crops from the new world – potatoes and maize. Today, the pace of change is driven by development of human resources, the wheels of technology, the skills of organisations, and external linkages. Many new projects in mountain areas are feasible only because of the new linkages with larger economic systems. If mountain households desire to catch up with the rest of the world, there is also a concern that this rapid change is having undesirable impacts on the mountain environment and the rich cultures of mountain people (Sharma 1995).

Encouraging signs of change

The most **visible change** has been **population growth** (Table 2.4). Mountain areas have been registering growth rates of above two per cent. The mountain population is predominantly young. The population of 15 years and younger accounted for over 30% in China's HKH and about the same per cent in Nepal (Sharma and Partap 1994). For a long time populations in mountain areas were virtually stable or grew only slowly. However, with the health revolution brought about by the control of killers like smallpox and malaria, improvement in hygiene and sanitation, and better health facilities, particularly for childbirth, populations have increased rapidly.

While there is a lot of debate about the causes of population growth, the growing scale of demand in mountain areas has become a matter of serious concern. In response to this, efforts are being made to expand economic opportunities and educational and health services in the region (NPC and UNICEF 1996). In the early years of development, the priorities were for controlling the main killers, today the priority is on reducing overall population growth rates and improving the quality of life in the Region. South Asia as a whole ranks lowest in the scale of human development in the whole world with the exception of Sri Lanka. Mountain areas in these countries are the most deprived in terms of all the major indicators of quality of life.

The **second aspect** of change is seen in the increasingly poor performance of **traditional agriculture and livestock activities**. If agriculture is suffering from

declining productivity, livestock receive inadequate nutrition, and there are problems of inbreeding and disease (ICIMOD-MFS 1990). Improved technologies have been introduced in many areas, but the extent of diffusion has been strongly influenced by the availability of access, markets, and related support services (Chand 1997). Wherever these factors have been reasonably well established, mountain farmers have switched over to the use of high-yielding varieties of rice, wheat, and maize and use many different types of external inputs. The primary concern is how to provide access to sufficient food. There was little awareness of the consequences of the increasing use of chemical inputs. Today, as we see the impacts of these chemicals, the emphasis is more on balanced use (Schreier et al. 1995). Nonetheless, people seem to be more concerned about increasing food outputs at any cost. Some mountain areas are beginning to show signs of heavy soil and water pollution (Brown 1998). Despite this rather dismal performance of the agricultural sector, there are also some positive developments in specific sub-sectors.

Horticultural development has radically transformed some mountain areas (Teaotia 1993). Mountain areas provide ideal climatic conditions for a variety of crops such as fruit, vegetables, potatoes, mushrooms, flowers, spices, and medicinal plants. So far, only fruit and vegetables are being grown commercially. Apples grow well above 2,000m and have received high priority. The principal citrus fruits cultivated are mandarin oranges. On account of the high initial investments needed, small and marginalised farmers do not find these crops attractive. Improved dairy farming on smallholdings has also become a significant source of income for many mountain households. Rearing livestock has always been important. In the colder climates at high altitude, livestock herding is the main economic activity. At lower altitudes, livestock are important for draught power and manure. Today, much of this is changing and the supply of fresh milk from stall-fed cattle is becoming very popular as well as economically rewarding across the region (Tulachan and Neupane 1999). In all of these developments, access to markets and support services has played a critical role (Banskota 1993).

The **third** aspect of change is the **development of urban areas**. Urban areas in the mountains were few and far between for a very long time in the past. In recent years, however, the pace of urbanisation has accelerated (ICIMOD 1986). This has been brought about by many 'rural-push' and 'urban pull' factors. The most important urban pull factors have been the expansion of education, infrastructure, availability of basic services, and an expanding urban economy providing new economic opportunities.

Urban development has been important in generating some of the new economic activities in mountain areas (urban pull factors). Government jobs and establishment of industries and services have mostly been in urban areas. Easy access to education and health services in urban areas has been a very important factor in attracting rural people. In addition, there are various opportunities for both unskilled and skilled people from rural areas (Shrestha and Manandhar 1994). They also play a key role

in rural development as markets for food and other rural products. Most rural areas close to growing urban areas appear to be doing fairly well in economic terms. Urban areas will continue to be the hub of future mountain development activities, providing their immediate hinterlands with opportunities for many high-value activities and specialised services.

Urban areas in mountain locations are beginning to impinge on renewable natural resources (NPC/IUCN 1991). Many urban areas are already facing shortages of water. Mounds of garbage and pollution of rivers are a common sight. Mining and uncontrolled land use have created many problems (Bandyopadhyay 1989). Efforts to contain and manage these problems are quite inadequate as continued pollution of air, water, and soil is severely threatening the quality of life in urban areas in the mountains.

The **fourth** aspect of change in mountain areas is the **development of tourism**. People have found a wide variety of tourism-related products to sell to the rest of the world - religion, culture, adventure, sports, health, wildlife, and (most definitely) the mountain peaks. Mountain resources are being packaged to suit different pockets and tastes. Development of physical infrastructure has been a critical factor in the development of tourism. Without reasonable access, by air or otherwise, the tourism industry suffers from uncertainty in terms of numbers of visitors. From barely a trickle in the 60s, the numbers of tourists are now reaching such levels in certain areas that special management efforts are called for (Banskota and Sharma 1995). There is also some concern about the benefits received by the local community. Different measures have been identified to improve the retention of local benefits from the growing tourism sector (Sreedhar 1995). Tourism will remain a powerful force for development in mountain areas. Experience indicates that marked seasonality itself is a unique mountain product that can be marketed innovatively in various parts of the world. Many countries can also tap their own domestic tourist market which may be fairly big.

The **fifth** dimension of change and one that is underlying most of the other changes is the growing extent of **external linkages**. External linkages are provided by markets, new technologies, new resources, opportunities for commuting and permanent migration, and communications with the rest of the world. Linkages with the outside—locally, nationally, and internationally are the biggest force for change in the mountain economy and environment. Most of the new physical and social infrastructure established in mountain areas reinforces these linkages. Clearly some of these linkages are quite beneficial to mountain people – particularly those that provide better economic opportunities, services, and markets. There are others that may not be so beneficial – those that only take away the resources of the mountain environment. Managing external economic linkages will be a difficult task for mountain communities in future (Banskota and Sharma 1999). The search for jobs outside the mountains and the remittances from these have been important in the past. Their significance has continued to increase as mountain economies are unable to absorb the vastly increased labour force.

The **sixth** aspect of change concerns **institutions**. Most mountain communities have moved from a condition of relative isolation to increasing interaction with the wider market economy. Governments have strengthened their presence in many ways – the introduction of various development interventions, transfer of certain types of traditional community-based authority to formal departments, use of administrative control, and making available development resources. The increase in the involvement of the private sector is also noteworthy. Commerce in mountain areas has always been limited. However, with the opening up of some areas, there has been a rapid increase in imports from the plains. Another important aspect of institutional change concerns the revamping of community organisations and their increasing role in local development and natural resource management.

Many mountain communities within countries are campaigning for recognition as separate entities, hoping to bring about advantages of specific entitlements of resources, institutions, identity, and independence in decision-making. In the countries of the Region, increasing attention is being given to mountain areas not only because of the important role of mountain resources, but also on account of the past neglect of mountain communities. To some extent this could be the result of an increasing awareness of and growing commitment to environmental problems. The UNCED Meeting in Rio provided a crucial impetus for the cause of mountain development, and this is now being sustained by a number of activities and organisations throughout the world (UN 1992), the most recent being the declaration of the Year 2002 as the International Year of the Mountains by the UN General Assembly.

Negative impacts of development: deforestation and road building?

Many of the changes in the mountains of the HKH have not been for the better. It was from the 70s onwards that the flow of information about the unhealthy state of the world environment started (Meadows et al. 1972, Schurr 1972, Roegen 1976). From agriculture to industry and from developing to developed countries, reports of both big and small environmental problems and hazards were brought to our attention. Among these – although not very prominent, was the so-called reckless destruction of mountain environments in the HKH Region, specifically in the Himalayas. Erik Eckholm's book 'Losing Ground' captures graphically the perception at that time: mass erosion of the Himalayas into the Bay of Bengal! Environmental catastrophes were being claimed throughout the mountain areas (Eckholm 1976).

The first of these environmental catastrophes was the reckless deforestation across the entire Himalayas. Mountain populations had grown so rapidly that large amounts of new land were needed to meet the agricultural needs of the population. There was a debate regarding whether the clearing of forests was for food or for fuel or for both (Bajracharya 1983). Researchers found good evidence for all positions. Many projections showed that most forests were being lost rapidly and that in ten to 15 years' time there would be no forests left (Eckholm 1976, Wyatt Smith 1982). How would poor people meet their energy needs? Use of available substitutes, such as

dung and crop residues, could adversely influence agricultural production. This was already being experienced in some areas (Makhijani 1975). With declining forests, decreasing productivity of agriculture, and increasing demand for food, the NeoMalthusians portrayed a hopeless scenario of large-scale famine and environmental collapse in mountain areas. Mountain areas needed draconian measures to control population and the destruction of forests (Rieger et al. 1976).

A related concern was the downstream impacts of reckless deforestation in mountain areas. Bangladesh experienced unprecedented floods in 1974 (Hofer and Messerli 1997). As experts began to look for reasons, many found the upstream damage in the Himalayas a plausible explanation (Hofer and Messerli 1997). As this view gained currency, further pressure was being generated internationally to control the rapid deforestation of mountain environments in order to reduce downstream floods and other adverse impacts. This resulted in a major effort to support the development of Forestry Master Plans (HMG/ADB/FINNIDA 1988). It also resulted in efforts to develop a better understanding of changing mountain environments, leading to the establishment of ICIMOD.

The next issue was based more on Nepal's experience and was concerned with the impacts of roads in mountain areas. One study raised some serious questions about the wisdom of road construction in mountain areas of Nepal. Roads were seen as facilitating exploitation, creating environmental damage, and accelerating economic crisis for a poor country like Nepal (Blaikie et al. 1976). Many donors, weary of the high costs of road construction in Nepal, found this confirming their own doubts about the wisdom of road construction in mountain areas. This was in stark contrast to intensive road construction activities carried out in other parts of the HKH – the 600km Karakoram Highway and many other roads in mountain areas of India, Bhutan, and China. Studies about the impact of mountain roads from countries other than Nepal have shown similar results—that building roads is very slow to bring about a positive effect in mountain areas (Joshi 1986).

As we review these issues, one finds that some of these are seriously questioned today. They appear to have been unrealistic extrapolations of events encountered in a few areas. Much of the evidence from the field does not confirm the prevalence of reckless deforestation and expansion of the plough on to marginal lands by mountain households. While deforestation in mountain areas continues, only some of it is caused by mountain households. There are other equally significant factors such as government policies, development projects, and commercial interests (Gilmour et al. 1988). Micro-level evidence indicates that mountain households are not only users of mountain resources but are also active protectors of the environment, with strong conservation ethics built into their everyday sociocultural lives (Chettri and Panday 1992). This fact has been known for a long time. It just took researchers a long time to discover it. Community forestry has been identified as a new type of development intervention, whereas many mountain communities have been practising it for a long time without much outside support (Karki et al. 1994).

New evidence indicates that rehabilitation and rebuilding of mountain slopes also take place. Some have argued that mountain communities have rehabilitated many landslide affected areas and made them productive once again (Ives and Messerli 1989). Areas abandoned by mountain households have been scarred extensively by runoff and erosion. What may be even more important is the identification of other actors, besides mountain households, who are playing an equally important role in changing the mountain environment. As one author put it some years back:

“the axe, the sickle and the plough appear to be far less dangerous for the mountain environments than the policies that design a scale of intervention never conceivable with the tools of the mountain households” (Banskota et al. 1991).

There was another area in which the findings were even more startling and seriously questioned some of the perspectives that are still being advocated even today. This is in respect to the downstream impact of upstream changes. It was commonly believed that flooding and sedimentation in the downstream Gangetic basin was the result of reckless destruction of the mountain environment in the upper Himalayas. Because of this connection, the downstreamers were portrayed as helpless victims of reckless upstreamers. Doubts developed when, in the late eighties, a research report revealed that, in downstream rivers, there was already a significant sediment load contributed by the river itself and not just from upstream areas (Bruijnzeel and Bremmer 1989). It found that peak rainfall periods in the upstream Himalayas did not match the periods of downstream floods. In other words, during the period of downstream high floods, the uplands had, in fact, received very little rainfall. It was therefore necessary to look closer at the distribution and amount of rainfall in the various catchments - the macro, the meso, and the micro. More recent studies have shown that, whereas there are strong up and downstream relationships in micro-watersheds, these become weaker as one moves to the meso and the macro- watersheds (Hofer and Messerli 1997). Relationships are always much stronger closer to home and weaken substantially with distance. These findings are based on a fairly long period of rigorous empirical research and suggest that more of these studies should be undertaken in order to avoid pursuing inappropriate policies and pinpointing convenient scapegoats.

Many silent crises emerging

As scholars began looking at mountain environments and communities more closely, they not only questioned some of the problems, but, in the process, discovered many silent crises in the mountain economy and the environment. Most of these were silent in the sense that there were apparently no visible signs of problems and, yet, the closer one examined them, the less acceptable the conditions became.

Poverty of mountain households

The first of these was the pervasive and entrenched poverty in mountain societies. Large sections of mountain people were relatively worse off in terms of the material standards of living than their counterparts in the plains. Mountain households had to migrate regularly in search of food, income, and employment opportunities outside

mountain areas. In addition, the physical hardships were also greater than in the plains, and these took a heavy toll on the well-being of mountain people. Despite rich and dynamic cultures throughout the mountains, the levels of well-being in all the countries are quite poor in general and are even worse for the mountain areas of these countries. One of the most obvious gaps was in the access to infrastructure and services (Yanhua et al. 1997). Because of the difficulties of the terrain, most of the basic services and infrastructures were very far apart, involving long travelling distances. This was a serious problem for many of the children going to school. It is only more recently that some attention is being given to locational aspects of services and infrastructure.

Other aspects of poverty in the region are distress employment, high levels of indebtedness, supplies of food for only some months of the year, and lack of education and skills (Singh 1992; SAARC 1992; Ruizhen 1992).

Burden on mountain women and children

The second dimension of this silent crisis was the pressure on mountain women. Pressure in terms of travelling long distances to fetch drinking water and collect firewood had been identified. However, mountain women were experiencing pressure in other aspects of life also. There was the pressure of frequent pregnancies along with the trauma of childbirth and shocks caused by the death of many children (UNICEF 1997). There was the pressure of day to day and dawn to dusk work in the household, some of which was extremely demanding. Next there was the pressure of farm work. Indeed it is only recently that careful attention is being given to the issue of mountain women as farmers (ICIMOD 1998). Despite so much stress and hardship, mountain women still find the time to engage in off-farm work, literacy programmes, and marketing and to continue to carry their children on their backs most of the time! Participation in economic activities, while important, is not enough and there are more demands for the empowerment of mountain women so that they can become equal partners in all aspects of development.

Children are also being involved in many subsistence and economic operations in order to support household needs when they should be in school or at play. More recently, the use of children in other activities, particularly in urban areas, has also grown and is now a source of great concern in the region (UNICEF 1997). All these items are aggravated by outmigration of male labour to the plains and urban areas.

Failure of government control of natural resources

While most of the attention focused on deforestation across the mountains, lesser known, but common to almost every village throughout the mountains, was the loss and degradation of communal natural resources. These included forests, grasslands, biodiversity, water, and open public lands (ICIMOD 1985, ICIMOD 1994, Schreier et al. 1995). Governments were using every possible source for generating revenue. In many instances, use of natural resources was arbitrarily removed from traditional managers and moved to departments that lacked both the expertise and the

commitment and support for managing these resources (Mahat et al. 1987). Government ownership and management were made to appear an inevitable part of development. It was argued that things would begin improving soon. However, the experience has been quite the reverse. It has taken the boldness of the community, or rather the helplessness of Government, to go back to the communities for their help in the management of many of these communal natural resources.

Another dimension in this process that has not been studied carefully is the privatisation of community resources. Outsiders have different ideas about use of resources from those of local communities. Loss of control over local resources has had adverse impacts on many of the poorer sections of the community.

Institutional gaps

The limited development efforts carried out in mountain areas have had little impact on poverty and worsened environmental conditions in many areas because of weak institutions. If there has been a failure to mobilise local community organisations, the expansion in central development bureaucracies has also been limited and has performed poorly. Strong local-level organisations are indispensable for successful management of development activities because of constraints in access and communications. It has been accepted that a decentralised and participatory organisational framework is needed, but efforts to promote these have not been sustained. The skills of the labour force are not well developed. Organisations working to develop education, functional literacy, and skill improvements; in accelerating women's access to education and training opportunities; and so on are still very limited. Situations in the fields of population, health, environmental sanitation, and other basic support services are also very similar. With few urban areas, agencies providing services for private business also need stronger development. Institutional gaps in many areas of development can therefore be seen as an important problem in mountain areas, meriting attention in future, as well as requiring commitment and support.

Given the numerous structural problems of the HKH Region that are not related to any specific deficiency in one sector, it is not surprising to find that many mountain areas are locked into a vicious cycle of rapid increases in population–poverty–resource degradation–marginalisation. While governments in the region have introduced various development interventions to spur socioeconomic development, changes in mountain areas are slow.

2.5 Increasing Vulnerability and Marginality

A critical concern about current development interventions in mountain areas and possibly in others also is that the very people who are supposed to be helped by development are becoming more and more vulnerable to economic, ecological, and socio-political changes. Changes have always occurred in every location and, with the exception of major disasters, people have adjusted reasonably well. However, at

present, even regular events appear to be creating problems of adjustment for some groups of people in the mountains – mostly the poor, those with limited or no assets, small farmers, artisans, women, children, and others who live in extremely remote areas. What are these shocks and why are they manifesting their impacts at present? Is this vulnerability on account of increasing frequency of non-regular ecological, economic, and socio-political events? Has the normal coping capacity of the mountain people been overstretched? Or are events more or less on a regular path and is it atrophy in terms of the capacity of mountain households (at least some of them) to deal with these events?

The first reason could be that in the past there was a ‘news’ blackout’ for mountain areas. The media and the information brought have now reached mountain areas also. Previously mountain people lacked access to news and events, unless the crises were substantial in proportion. The second reason could be that more households are now living in areas with frequent occurrence of special events: near landslides or in areas prone to hailstorms or in the flood plains and so on. In the past there was enough space for people to be selective regarding their location. This may no longer be so. Why some people have to live in or close to dangerous areas may not be so much a matter of choice. It could be related to the socioeconomic factors responsible for population growth, environmental damage, unequal distribution of resources, and lack of empowerment of weaker groups.

Poverty has forced many mountain households to move into areas that could be considered sensitive. The extent of cultivation on the steeper, less fertile slopes by poor households appears to be increasing.

Development activities have also displaced many households for one reason or another. The opening up of areas and the resulting flood of cheap imports have adversely affected many artisan classes who are forced to find land for cultivation and depend even more on common property resources (CPRs). Construction of hydroelectric dams, roads, and government offices and urbanisation and industrialisation have displaced households. While some of the displaced households succeed in finding new jobs and some may also be compensated, there are many who end up as ‘development refugees’. Many development projects appear to have displaced the poor and weaker sections, while conferring greater opportunities and benefits to those with skills and resources who are well off already. Thus, while in the past the poor had to adjust primarily to unexpected changes in biophysical forces, more recently adverse impacts of development forces have become additional problems for them.

The cumulative impact of these forces on the poor over time has been to make them more vulnerable to even slight increases in negative forces. In other words, security in a physical sense, i.e., safety of one’s life and property; security in an economic sense, i.e., ability to access one’s own resources; and security in a social sense, i.e., ability to access political and social resources appear to be decreasing for the poor.

The overall impact is on standards of living, which appear to be worsening over time. This is being seen in parts of Nepal with decreasing availability of food from subsistence agriculture, increasing dependence on handouts, and even greater susceptibility to health hazards. If adults are facing difficulties in coping with these problems because of deterioration in living conditions, the plight of children is much worse. The implications for the future of these children are even more distressing. It is said that this is happening at a time when development forces are supposed to be stronger than ever before. For some reason, development appears to be targetting others rather than the poorest.

Breakdown in security mechanism?

One important reason for increasing vulnerability may be the loss of different security mechanisms. Traditionally mountain households had different approaches to reducing risk. The agricultural household attempted to hold land in both the uplands and lowlands where different crops were raised. Events occurring on one type of land did not occur on another, providing a safety net. The cropping diversity on a parcel of land was often very high and, although it appeared uneconomical, it provided security against pests and diseases. Insofar as landless households were concerned, their lot was difficult and their aim was also to gain access to land whenever feasible. However, such households provided various types of services to the community – boatmen at river crossings, shoemakers, blacksmiths, tailors, and, at times, even temple priests, school teachers, and watchmen were paid in kind by all the households in the community. The amounts were not much but a minimum amount of cereals (and sometimes even other goods) was provided by the community. Some would look upon this as exploitation, but at present even this is not available.

The joint family system was an important mechanism in terms of providing security to the young, the old, widows, women, and children. However, it should also be noted that, if members of the households wished to live separately, there were legal provisions for separate ownership. If this had not been the case, one would not see the division and fragmentation of land that there is at present. There were community mechanisms as well for dealing with other social conditions such as death and other special occasions.

One by one each of these mechanisms has either disappeared or is in the process of doing so. In so many different ways, the bonds with the local community are breaking down, either because of the changed nature of work (from agriculture to paid office employment) or because of education in distant places, or seasonal migration, or new development activities, or the entry of new administrators and development people who lack familiarity with local conditions and introduce and establish new arrangements.

What is replacing these conventional practices? As a matter of fact, nothing. New forces have entered, but they do not support any of the security mechanisms that existed earlier. The most important new force is the market, and we know very well

how the market works. Individuals have to find security for themselves in the market and must be able to afford it. For those who lack the resources to afford these market services, they are without any security. It has little room for those who lack the means and resources to play by its rules. In many ways the market is quite ruthless.

The next important change has been the government and its rules. Most government presence in rural areas is largely negative in terms of new rules and regulations that are often overlooked for the rich but applied rigorously to the poor. There is a rule for everything these days and even for those activities that have been an integral part of their livelihood over the ages. There are a few development projects, but the impacts of most of these are limited. The other interesting aspect is that expansion in education has generated greater awareness about the poverty and differences in the community, including the feeling that it is government that should change the conditions.

Thus, while the breakdown in earlier security systems has affected the poorer sections of the community, the new forces have not succeeded in filling the vacuum created. As a matter of fact, some of the new forces are increasing the vulnerability of the economically weaker sections of the community by exposing them to the problems and not to the beneficial aspects that are usually limited and often taken over by those with skills, resources, and linkages. It is a tragic situation in which the economically weak sections are rapidly losing what they have (access to different types of security mechanisms) and the new forces of the market and development have failed to provide any help, but, in fact, exacerbated the insecurity of the poor.

What are the reasons for this growing insecurity of the poor? Why have they become more vulnerable to the negative impacts of socioeconomic change? Is this the inevitable price of development? Is this unique to mountain areas? Whose development are we talking about? How can we deal with these problems? Here it might be useful to refer to the process of marginalisation.

The Oxford Dictionary defines to marginalise as 'to make a person or group become or feel less important, powerful, and so on.' Certain groups of people are facing constant pressure that results in economic, political, social, and cultural marginalisation. Economic marginalisation results in loss of control over or access to assets over time, impoverishing the group. Political marginalisation is the absence of decision-making power over activities that influence their conditions or the environment. Social marginalisation is the inability of groups to participate in different community activities for one reason or another. Cultural marginalisation is a situation in which a certain group finds it difficult to express itself in terms of its cultural heritage, whether in terms of religion, language, music, or other social events.

In many instances, the different types of marginalisation generally work together, i.e., are mutually reinforcing. However, there may be instances in which one is more important than the other. One can find various groups experiencing all or some type of marginalisation process in Nepal.

The Chepang are a small group of forest dwellers. For a long time they have survived as nomads of the forests in the hills practising slash and burn agriculture. Today, as forests are cleared (by others) their traditional space and resources are rapidly declining. While their plight has been voiced, it is by and large ignored and the only option for them is to become dependent on the goodwill of the wider community, the government, and international donors. This can be seen as a process of economic marginalisation (loss of access to resources) leading to sociocultural and political marginalisation.

Political marginalisation is most evident in the case of women in which, in spite of declared statements about representation, different types of rights, and various support, little is done and there is no way one can force the implementation of these statements. There are certain groups of women who face serious economic marginalisation as well.

Sociocultural marginalisation is probably the most subtle, most common, and also the most difficult to deal with, as many mainstream activities such as education and development may in fact be contributing to it. It is also possible that a group may not be economically or even politically marginalised, but continue to experience cultural marginalisation. There are many groups who are struggling to preserve their languages, religious customs, and folk traditions in the process of national integration, commercialisation, and modernisation. Clearly this is an aspect that should receive greater attention in future.

2.6 Experiences of Mountain Areas in Advanced Countries

There are some similarities between the mountain areas of Europe and the HKH Region. First, mountain areas in both regions are endangered (Messerli 1984). Different types of pressure on the ecosystem are changing the mountain environment in many ways. Most of the pressure is on resources and fragile habitats. This pressure is coming from overuse to meet subsistence needs or to meet the needs of tourism. Both systems need to find ways of adjusting. In the advanced countries, mountain areas experienced rapid population growth during the 18th century and conditions at that time were quite similar in the two areas – factors such as subsistence agriculture, male outmigration and the key role of remittances from outside, important role of crafts, a strong dependence on livestock and forests, and heavy use of marginal lands were seen in the European mountains also. During the 18th century, Switzerland experienced large-scale floods that resulted in strong legal measures to protect upstream forests (Mauch n.d).

The main differences are related to external linkages. In the HKH Region, linkages are with those areas that are only marginally better off and are still considered to be in the early stages of development. In Europe in the late 18th and early 19th century, the linkages of the mountains were with those areas that were on the verge of an

industrial revolution and had already experienced a far-reaching agricultural revolution. In the non-mountainous areas of Europe, industrialisation had already begun to change production relationships and mountain areas benefited from this change.

Development in transport, both navigation and railways, facilitated long-distance trade. Large-scale outmigration to the new world helped to reduce demographic pressures to some extent. Unlike in most of the developing countries today, Europe at that time experienced faster growth in income than in population, permitting real standards of living to grow over time. Mountain areas of Europe had linkages with areas that were experiencing rapid growth in income and employment. This had a favourable impact on many aspects of the mountain economy, particularly on infrastructural development, employment opportunities for mountain people, and the development of education, skills, and tourism. Obviously, not all areas benefited to the same degree. However, the stronger the linkage with economically growing areas, the more favourable the effects on mountain areas. One crucial difference between the Alps and the HKH Region is the availability of infrastructure that helped mountain people to move out and also helped them to develop mountain resources fully.

While this is a generalised picture of a complex pattern of development over a hundred- year period, there are important variations in the underlying processes. Depending on the nature of the mountain area, even in Europe one finds both depressed and dynamic mountain areas (Batzing et al. 1996).

Areas of agricultural decline and depopulation

There are still some areas that are holding on to traditional agricultural systems, because alternative development innovations have not been forthcoming. As a result populations in these areas have been declining for a long time (French Alps, Italian Alps) and still continue to do so. If there were development possibilities, for example, in tourism and industry, these would have been in evidence already. The future for these traditional agricultural areas appears to be fairly dismal. In some areas, livestock-dominated agriculture is still practised. However, subsidies are being provided to them.

Areas with tourism development

Agriculture and tourism have co-existed in many areas. With the increase in mass tourism (both summer and winter) because of favourable locations, agriculture has gradually declined. Intense competition has been experienced between similar areas. There is constant pressure to modernise and create more attractive facilities. Over time the entire region has experienced a process of urbanisation induced by tourism. Tourism is growing and is relatively profitable. With intense competition, this almost total reliance on tourism is risky, as tourism is also a highly sensitive industry. In many areas, commuting to jobs in nearby urban areas has been increasing.

Industrialisation

Apart from small-scale agro-processing, which is seen in all agricultural communities, modern industrialisation in the Alps has been closely related to the development of hydropower, i.e., hydropower-based industries. During the Second World War(WWII), some areas benefited because of the overall shortage of labour. In some areas, continuing innovation and development of commercial services generated new jobs. In most areas, the industrialisation seen in the forties and fifties in mountain areas declined drastically. Commuting has become common in these areas also.

Urban and peripheral urbanisation

Urban development is probably the most significant change throughout the Alps. More than 50% of mountain people now live in urban areas. Urbanisation in the Alps is quite old, beginning in Roman times. The key impetus occurred with the development of railways and this increased rapidly after WWII. Today urban and suburban areas are common throughout the Alps. Some of these areas are also tourism centres, while other areas linked to big cities have large commuter communities.

Two important conclusions about the changes in the Alps are as follow: first, all traditional activities have declined and innovation and development have taken place and are playing a key role at present, although all the modern activities, such as services and tourism, are extremely dynamic and competitive.

Second, mountain areas have become peripheral regions of large metropolitan areas Mountain development is today greatly influenced by external forces, such as commerce, financing, and processing, generated from large urban and suburban areas.

2.7 Priority Areas for the Future

Mountain areas are not all the same in terms of opportunities and problems. Development approaches must be flexible enough to promote the available opportunities. At the same time, they should also be effective in containing and, in some cases, eventually reversing some of the current trends. In this respect, mountain areas of the HKH, although structurally different from the mountain areas of Europe, can still learn from the latter's experiences. First, the situation is dynamic. Economic activities are changing all the time. Old, profitable activities that demand too much labour are dying. New ones are surfacing throughout the mountains, but they require a different type of environment. These environments are those with better infrastructure, better services, and skilled human resources. As a matter of fact, with the revolution in information technology, the huge investments in transport infrastructure seen in the development of European mountain areas might not be needed. Probably a different mix of transport, communications, and service infrastructure will be needed in which the emphasis will be on human resources rather than on physical infrastructure alone.

Development of new opportunities

The **first** priority is to develop the opportunities available. The opportunities are evident in small pockets throughout the mountains depending on altitude, climatic conditions, access, and possible comparative advantages along with the appropriate support services and infrastructure.

- There are areas with the potential for increasing agricultural production in low-lying areas through use of improved seeds, irrigation, and integrated pest management. In many areas, better irrigation and improved seeds have helped to double outputs. Most areas with this type of potential are low-lying valleys and flat lands. The main needs are water for irrigation and good planting materials. Although markets for cereals are relatively well organised, occasional gluts and erratic prices will occur.
- **Livestock development** has gone hand in hand with improved agriculture. Improved livestock species are in great demand in the mountains. In the past, the main problems have been inadequate supplies of good feed and a poor marketing and service infrastructure.
- The **third potential** area is commercial gardening. The options available here are as varied as the climatic conditions and the markets. As most of the production of fruit, vegetables, nuts, and flowers, including many herbs and wild fruit, are for non-local markets, access to markets and delivery of products in good condition are very important. This makes modern support services and infrastructure far more essential for development of this area than for the first two. Experience again shows that this is a very dynamic situation with products changing all the time in response to new market conditions. Investment costs are quite high. Participation by many of the poorer farmers as hired workers may provide better rewards than working on their own farms.
- Mountain areas all over the world have been **sources for fresh water**. The development costs for using fresh water in downstream areas are quite substantial. Sometimes poor mountain households cannot even afford the electricity provided from harnessing mountain rivers in their villages. While the potentials for development of mountain water resources are vast, the technical, economic, social, and environmental dimensions must be carefully studied with the full participation of the local people.
- Another area that is intrinsically mountain specific is **mountain tourism**. These days it can be packaged to meet any taste and pocket. The more complex issues are those of local benefits and costs. However, these are not insurmountable issues and tourism in mountain areas should be developed, as it is among the few relatively clean industries that can be established in the mountains.
- The next area of development is in **urbanisation** and **industrialisation**. There are already many rapidly growing cities in the mountains. These urban areas are critical for the creation of non-agricultural jobs for mountain people. Urbanisa-

tion will continue to become an even greater force in the future and countries will have to find ways to create jobs for those leaving mountain agriculture.

Expanding basic infrastructure and communications

The **second** area of priority is the expansion of basic infrastructure, and it is clearly related to the development of opportunities.

Without improving communications substantially, mountain people will always find it difficult to participate in new development activities. Lack of infrastructure will also adversely affect various development opportunities in agriculture and natural resources, including tourism. Careful analysis of the emerging spatial dynamics and settlement patterns must be carried out in order to identify priority areas for infrastructural linkages. Reliable connections to markets are crucial for development of gainful employment opportunities in both agricultural and non-agricultural activities. The process of urbanisation has already begun, and it should be guided by a policy to promote a hierarchy of different urban areas. Infrastructural investment should be used to optimise the development of these urban areas in the mountains.

Human resource development

The **third** priority area is human resource development (HRD). Without expansion in basic physical and social infrastructure this is difficult. Innovation in communications, education, and adult learning should be emphasised to support the development of human resources.

Regeneration of mountain resources

The **fourth** priority area is improvement in the condition of natural resources in mountain areas — particularly soil, forests, and water. For many years into the next century, availability of natural resources will be critical for sustaining the livelihoods of many mountain households. The loss of these resources will lead to a process of mountain desertification.

Capacity building

The **fifth** area is improvement in the capacities and capabilities of organisations and communities in mountain areas. Such improvements can take many forms, ranging from better management of mountain economies and environments to promotion of appropriate skills and technologies and greater participation and empowerment. In the longer term, the capabilities of these local communities and organisations will determine whether or not mountain communities can live in harmony with their environment. This was achieved in the past at low levels of subsistence and population density. Today, the situation has changed. Whether it will change in the future depends on the skills of development organisations in the mountains. Thus, while there are many opportunities in mountain environments and for mountain people outside mountain environments, the road so far has gone uphill for mountain environments and downhill for most mountain people.

References

- Bahuguna, S.L. (1994) *Save Himalayas*. Tehri Garhwal: Chipko Information Centre, Parvatiya Navajivan Mandal
- Bajracharya, D. (1983) 'Fuel, Food or Forest? Dilemmas in a Nepali Village'. In *World Development*, 2 (12): 1057 –74
- Bandyopadhyay, J. (1989) *Natural Resource Management in the Mountain Environment: Experience from the Doon Valley, India*. ICIMOD Occasional Paper 14. Kathmandu: ICIMOD
- Banskota K.; Sharma, B. (1999) *Traded Resource Flows from Highland to Lowland- Understanding Economic Linkages*, pp17-55. Kathmandu: ICIMOD
- Banskota, K.; Sharma, B. (1995) *Carrying Capacity of Himalayan Resources for Mountain Tourism Development*. MEI Discussion Paper No. 95/14. Kathmandu: ICIMOD
- Banskota, M. (1993) 'Marketing Development and High Value Agriculture: Some Observations on the Experience in the Bagmati Zone, Nepal'. In Teaotia, S.S. (ed) *Horticultural Development in the Hindu Kush– Himalayan Region*, Proceedings of the International Expert Meeting on Horticultural Development in the Hindu Kush–Himalayan Region (19-21 June 1989). New Delhi: ICIMOD and Oxford IBH Publishing Co Pvt. Ltd
- Banskota, M.; Sharma, P. (1994) *Development of Poor Mountain Areas. Proceedings of an International Forum*. Beijing, March 22- 27 1993. Kathmandu: ICIMOD
- Banskota, M.; Singh, R.J.; Shepherd, K.R. (1991) *Watershed Management Experiences in the Hindu Kush-Himalayan Region*. Theme Papers. Mountain Environmental Management Discussion Paper 2. Kathmandu: ICIMOD
- Batzing, W.; Perlik, M.; Dekleva, M. (1996) 'Urbanisation and Development in the Alps' (with 3 coloured maps). In *Mountain Research and Development*, volume 16, number 4, November 1996, pp 335 – 350
- Bernbaun, E. (1997) *Sacred Mountains of the World*. Berkeley: University of California Press
- Bhatta, B.R. (1992) *Management of Forest Resources in the Hindu Kush-Himalayas* (Background Paper). Kathmandu: ICIMOD
- Biddulph, J. (1986) *Tribes of Hindu Kush*. Lahore: Ali Kamran Publishers
- Blaikie, P.; Cameron, J.; Seddon, D. (1976) *Regional Inequality and the Provision of Roads in West Central Nepal*. Norwich: University of E. Anglia

- Brown, S.J. (1997) *Soil Fertility, Nutrient Dynamics and Socio- Economic Interactions in the Middle Mountains of Nepal*. Ph.D. Thesis. Canada: University of British Columbia
- Bruijnzeel, L.A.; Bremmer, C.N. (1989) *Highland-Lowland Interactions in the Ganges Brahmaputra River Basin. A Review of Published Literature*. ICIMOD Occasional Paper No. 11. Kathmandu: ICIMOD
- Chand, R. (1997) *Agricultural Diversification and Development of Mountain Regions*. New Delhi: M D Publications Pvt. Ltd
- Chettri, R.B.; Pandey, T.R. (1992) *User Group Forestry in the Far Western Region of Nepal, Case Studies from Baitadi and Achham*. Kathmandu: ICIMOD
- Clarke, G.E. (1987) *China's Reforms of Tibet and Their Effects on Pastoralism*. Brighton: Institute of Development Studies , University of Sussex
- Dinnerstein E. (1998) 'A Biodiveristy Assessment and Gap Analysis of the Himalayas'. In *UNDP Ecoregional Cooperation for Biodiversity Conservation in the Himalaya*. Kathmandu: UNDP
- Eckholm, E.P. (1976) *Losing Ground: Environmental Stress and World Food Prospects*. New York: W. W. Norton and Company
- Fürer-Haimendorf, C.von (1975) *Himalayan Traders*. London: Cox & Wyman Ltd
- Gilmour, D.A.; King, ??? Hobley, G.C.; Hobley, M. (1988) *Management of Forests for Local Use in the Hills of Nepal. Changing Forest Management Paradigms*. Kathmandu: Nepal Australia Forestry Project
- Hammerton, J.A. (1984) *Tribes, Races and Cultures in India and Neighbouring Countries*. Delhi: Mittal Publications
- Hassanyar, A.S. (1995) 'Biodiversity Conservation and Management in Afghanistan: A State -of-the-Art Review Paper'. In Pei Shengji (ed.) *Banking on Biodiversity*. Report on the Regional Consultation on Biodiversity Assessment in the Hindu Kush-Himalayas. December 19-20, 1995. Kathmandu: ICIMOD
- HMG/ADB/FINNIDA (1988) *Master Plan for the Forestry Sector: Forestry Development Plan for the Supply of Main Products*. Kathmandu: Ministry of Forests, His Majesty's Government of Nepal
- HMG/EPC (1993) *Nepal Environmental Policy and Action Plan*. Kathmandu: Environment Protection Council
- Hofer, T.; Messerli, B. (1997) *Floods in Bangladesh-Process Understanding and Development Strategies*. Interlaken: Institute of Geography, Hallerstrasse 12 CH 3012 Berne and Schlaefli & Maurer

- ICIMOD (1997) *Sustainable Development in the Mountain Areas of Pakistan*, Report submitted to Asian Development Bank (internal document)
- ICIMOD-MFS (1990) 'Agricultural Development in the Mountains', Report of the *International Symposium on Strategies for Sustainable Mountain Agriculture*. Sept 10 – 14, 1990. Kathmandu: ICIMOD
- ICIMOD (1986) *Towns in the Mountains*, Report of the International Workshop on 'Planned Urbanisation and Rural–Urban Linkages in the Hindu Kush-Himalayan Region'. Kathmandu: ICIMOD
- ICIMOD (1995) *An Overview*. Kathmandu:ICIMOD
- ICIMOD (1998) *Situation of Women in the Hindu Kush–Himalayan Region* (Draft of the Fact Finding Mission)
- ICIMOD (1994) *International Symposium Mountain Environment and Development. Constraints and Opportunities*. Kathmandu: ICIMOD
- Ives, J.D.; Messerli, B.; Thompson, M. (1987) 'Research Strategy for the Himalayan Regional Conference, Conclusions and Overview'. In *Mountain Research and Development*, Vol 7, No. 3, pp 332 -344
- Joshi, B.K. (1986) 'Infrastructure and Development in the Hill Areas'. Paper Presented at the International Seminar on *Off farm Employment Generation in the Hindu Kush – Himalayan Region, Dehradun*. Kathmandu: ICIMOD
- Joshi, M.P.; Allen, C.F.; Brown, C.W. (1990) *Himalaya: Past and Present*. Almora: Shree Almora Book Deport
- Karki, M.B.; Karki, J.B.S.; Karki, N. (1994) *Sustainable Management of Common Forest Resources: An Evaluation of Selected Forest User Groups in Western Nepal- Case Studies of Palpa District and the Phewa Watershed*. Kathmandu: ICIMOD
- Li Tianchi (1998) *Mountain Hazard Mitigation and Risk Engineering in the Hindu Kush-Himalayas* (Internal document). Kathmandu: ICIMOD
- Mahat, T.B.S.; Griffin, D.M.; Shepherd, K.R. (1984) *An Historical Perspective in the Forests of Sindhu Palchowk and Kabhre District of Nepal*, Paper Presented at the International Union of Forest Organisations (3-7 September) Zurich
- Makijani, A. (1975) *Energy and Agriculture in the Third World*. Cambridge, Mass: Ballinger Publishing Company
- Mauch, U. (n.d.) *Switzerland and Her Forests. A Historical Perspective*. Zurich: INFRAS

- Meadows, D.H.; Meadows, L.D; Randers, J.B. III; William, W. (1972) *The Limits to Growth*. London: Pan Books Ltd
- Mehdiratta, R.C. (1985) *Geology of India, Pakistan, Bangladesh and Burma*. Delhi: Atma Ram and Sons
- Messerli, B. (1984) 'Stability and Instability of Mountain Ecosystems: Introduction to the Workshop'. In *Mountain Research and Development*. Volume 3, Number 2, pp81 – 94
- Millerille, R. de.; Majupuria, T.C. (1991) *Magnificent Nepal Himalaya*. Bangkok: Tec Press Services LP
- Myint, A.K.; Hofer, T. (1998) *Forestry and Key Asian Watersheds*. Kathmandu: ICIMOD
- NCEA (National Commission on Environmental Affairs, (n.d.) *National Report on Environment and Development of the Union of Myanmar*. Yangoon: NCEA
- National Planning Commission (NPC); UNICEF (1996) *Children and Women of Nepal. A Situation Analysis 1996*. Kathmandu: UNICEF
- NPC/IUCN, Nepal National Conservation Strategy Implementation Programme (1991) *Environmental Pollution in Nepal. A Review of Studies*. Kathmandu: NPC/IUCN NCS Implementation Programme in August 1991
- Rhoades, R.E. (1997) *Pathways Towards a Sustainable Mountain Agriculture for the 21st Century The Hindu Kush-Himalayan Experience*. Kathmandu. ICIMOD
- Rieger, H.C.; Bieri, F.; Eggers, H.; Goldschalt, W.; Steiger, J. (1976) *The Himalayan Ecosystem Research Mission*. Heidelberg: South Asian Institute, University of Heidelberg, Germany
- Roegen, N.G. (1975) *Energy and Economic Myths: Institutional and Analytical Economic Essays*. New York: Pergamon Press Inc
- Ruizhen, Y.; Yuan, W. (1992) *Poverty and Development A Study of China's Poor Areas*, Beijing: New World Press
- SAARC (1992) *Report of the Independent South Asian Commission on Poverty Alleviation: Meeting the Challenge*. Kathmandu: SAARC Secretariat
- Schreier, H.; Shah, P.B.; Brown, S. (1995) *Challenges in Mountain Resources Management in Nepal. Processes, Trends, and Dynamics in Middle Mountain Watersheds*. Proceedings of a Workshop held in Kathmandu, 10-12 April, 1995. Kathmandu: ICIMOD and UBC
- Schurr, S.H. (1972) *ENERGY, Economic Growth and the Environment*. Baltimore: The Johns Hopkins University Press

- Sharma, P. (1998) *Revised Estimates of the Area and Population of the HKH* (internal memo). Kathmandu: ICIMOD
- Sharma, P.R. (1995) *Culture and Tourism: Defining Roles and Relationships*. MEI Discussion Paper 95/02. Kathmandu, ICIMOD
- Sharma, P.; Partap, T. (1994) 'Population, Poverty and Development Issues in the Hindu Kush-Himalayas'. In Banskota, M., and Sharma, P., (eds) *Development of Poor Mountain Areas*, pp 61 -78. Kathmandu: ICIMOD
- Shengji, P. (1995) *Banking on Biodiversity. Report on the Regional Consultation on Biodiversity Assessments in the Hindu Kush– Himalayas*. December 19 – 20 1995. Kathmandu: ICIMOD
- Shrestha, B.K. (1993) *A Himalayan Enclave In Transition. A Study of Change in the Western Mountains of Nepal*. Kathmandu: ICIMOD
- Shrestha, C.B., and Manandhar, M.S. (1994) *Settlement System, Small Towns and Market Centres in the Bagmati Zone Subregion*. ADPI Discussion Paper 5. Kathmandu: ICIMOD
- Singh B. (1992) 'An Overview of Hill Regions of India'. In *Social Change*, March 1992; Vol. 22, No. 1, pp 68-80
- Sreedhar, R. (1995) *Mountain Tourism for Local Community Development: A Report on Case Studies in Kinnaur District, H.P. and the Badrinath Tourist Zone*. MEI Discussion Paper 95/10. Kathmandu: ICIMOD
- Teaotia, S.S. (1993) *Horticultural Development in the Hindu Kush – Himalayan Region*. Proceedings of an International Expert Meeting June 19 – 21, Kathmandu. New Delhi: Oxford& IBH Publishers Pvt Ltd
- Tulachan, P.M.; Neupane, A. (1999) *Livestock in Mixed Farming Systems of the Hindu Kush-Himalayas: Trends and Sustainability*. Kathmandu: ICIMOD
- UN (1992) *Earth Summit Agenda 21 The United Nations Programme of Action from Rio*. New York: UN
- UNEP (1999) *Report of Scoping Mission on 1998 Flood in the Yangtze River Basin, China*. Nairobi: UNEP
- UNESCO (1984) *MAB International Coordinating Council Programme on Man and the Biosphere (MAB)*. Eighth Session Final Report. Paris: UNESCO
- UNICEF (1996) *Children and Women of Nepal: A Situation Analysis*. Kathmandu: UNICEF
- WWF (1999) *Living Planet Report*. Gland: WWF International

- Wyatt-Smith, J. (1982). *The Agricultural System in the Hills of Nepal. The Ratio of Agriculture to Forest Land and the Problems of Animal Fodder*. Kathmandu: Agricultural Projects Services' Centre
- Yanhua, L.; Changhe, L.; Gaohuan, L.; Fanghong, H.; Qi, T. (1997) *The State of Environment and Development for The HKH Region Of China*. Report prepared for ICIMOD by the Institute of Geography, Chinese Academy of Science, Beijing, (being processed)

