CHAPTER 4
Himalayan Environmental Degradation and Human Security Debate

4.1 Introduction

Environment and Ecology are closely related to each other. While environment refers to the sum total of conditions, which surround biotic and abiotic factors at a given space and point of time, ecosystem means the interdependent, mutually reactive and interconnected relationship between the organisms and their environment on the one hand and among the organisms on the other.

The status of environment and the level of human security in a particular region have intimate linkages with the level of development in that region. Synergy between environment and economic growth strengthens the process of human security and thereby sustainable human development. The problem however, arises when environmental resources are used more than the rate of their regeneration and the discharges of the economic activities are more than the abating capacity of nature. The result- environmental resources are degraded, depleted and polluted consequently putting limits on human security, sustainable economic growth and development.

The relationship between human and environment has been very close since antiquity. There had been a symbiotic and intimate relationship between man and environment over the ages. Initially human tried to adjust himself/herself with the environment but subsequently sought the adjustment of environment according to her/his needs. We have achieved success in almost every area and this has helped us make our lives more comfortable. However, the path which we sought to achieve our material comforts or what we also call today 'development' has not been in consonance with the environmental and ecological parameters but at the cost
of their degradation. This has resulted in the imbalances in the environment and the various ecological systems there-in thereby inviting several human made environmental insecurities. This is a very serious issue both for us and to our coming generations. It is important to understand that human and environment are intimately interrelated and a change in one will negatively affect the other.

The basic objective of this chapter is, therefore, be to identify, quantify and offer a general discussion on some of the major forces that have been largely debated as human made environmental insecurities and which often challenge human security in the Himalaya and its geographical milieu. While doing so, it is also attempted to critically review some of the debatable theories/findings put forward by some scholars/organisations and examine their relevance with the present reality in the area seeking the help of recently available data.

4.2 Growth of Human population

There has been an alarming rise in the size of Himalayan population in the last one-century. At the onset of 20th century the total population was a little less than 12 million. The figure went up to 19.3 million by 1951 adding a net 7.5 million in half century time. Between 1951-81 another 14.4 million souls were added, making a total of 33.7 million. During the period of 1981-2001 the population rose to 54.3 million and by mid-2006 total population of the Himalaya crossed 65 million. Overall, during 1901 and mid-2006 the Himalayan population rose by around 5.5 times. Across region, the population in Indian Himalaya rose by about 6 times from around 6 million to 34.6 million between 1901 and 2006. In Nepal Himalaya the degree of rise has been somewhat similar to its Indian counter part where population rose from 5.6 to 28.3 million between 1901 and mid-2006. A small and relatively isolated Bhutan saw an increase from 0.3 to 2.3 million in its population during the period- a rise of over 7 times. The figure of Bhutan is, however, to be used with caution as we seldom have the official figures. Majority of the population numbers pertaining to Bhutan are the estimates and hence debatable.
Table 4.1 POPULATION PROFILE IN THE HIMALAYA (million)

<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>Indian Himalaya</td>
<td>5.94</td>
<td>10.07</td>
<td>17.57</td>
<td>23.55</td>
<td>28.86</td>
<td>34.64</td>
</tr>
<tr>
<td>Bhutan Himalaya</td>
<td>0.30</td>
<td>0.80</td>
<td>1.16</td>
<td>1.45</td>
<td>2.23</td>
<td>2.28</td>
</tr>
<tr>
<td>Nepal Himalaya</td>
<td>5.64</td>
<td>8.47</td>
<td>15.02</td>
<td>18.49</td>
<td>23.21</td>
<td>28.29</td>
</tr>
<tr>
<td>Himalaya (Total)</td>
<td>11.88</td>
<td>19.34</td>
<td>33.75</td>
<td>43.49</td>
<td>54.30</td>
<td>65.21</td>
</tr>
</tbody>
</table>


Fig. 4.1 HIMALAYAN POPULATION: TREND AND PATTERN

The proportion of population shared by different Himalayan political units has not been the same over time - 1901 and 2006. The share of Indian Himalaya has fluctuated between 50 and 54 per cent while in case of Nepal the fluctuation has been between 43 and 47 percentage point. In fact, the share of Nepali population in the Himalaya has witnessed an increase of about 2 per cent in the last 16 years. The share of Bhutan Himalaya has been the minimum and has fluctuated between 3 and 4 per cent. At the other end, the share of land resource falling within Indian Himalaya covers over 70 per cent of the total Himalayan land while
Nepal’s share is only a little more than 22 per cent. About 8 per cent of the Himalayan land falls within Bhutan Himalaya. Hence, there is an appreciable mismatch between the share of population and land resource available among three regional political divisions of the Himalaya. The lowest per capita land availability is seen in Nepal Himalaya (0.005 sq km) followed by Indian Himalaya (0.013 sq km), while Bhutan boasts of the largest per capita land availability (0.021 sq km). Per capita land availability in the Himalaya (total) is computed at 0.010 sq km.

Fig. 4.2 TREND IN THE SHARE OF POPULATION

Trend in the Share of Populations

Source: based on table 4.1
Fig. 4.3 SHARE OF LAND RESOURCE AMONG THE HIMALAYAN GEO-POLITICAL UNITS

Share of Himalayan Land

![Chart showing the share of land among the Himalayan regions.]

Source: based on various sources

Fig. 4.4 PER CAPITA LAND AVAILABLE IN THE HIMALAYA (2006)

Per Capita Land available in the Himalaya (2006)

![Chart showing per capita land availability in the Himalayas.]

Source: population figures based on table 4.1; data on land obtained from various sources
The growth of population in the Himalaya comes to around 449 per cent between 1901 and 2006 while the growth was 93 per cent between 1981 and mid-2006. The decadal growth of Himalayan population between 1991 and 2001 was about 25 per cent while since 2001 till mid-2006 the growth has been 20 per cent. This, roughly, means Himalayan population is growing at the rate of 4 per cent per annum in the last five years. Across the regional divisions of Himalaya, the highest per annum population growth in recent times is seen in Nepal Himalaya (4.4 per cent/year) followed by Indian Himalaya (4.0 per cent/ year) while the Bhutan Himalaya shows the least (0.4 per cent/ year).

Rapid growth of population in the Himalaya highlights an increasing pressure on the resource bases and human security therein and in the adjacent lowlands. Appropriate policy measures and institutions need to be evolved by respective Himalayan political/administrative units in order to check unscientific growth of population.
4.3 Forest Degradation and Loss of Biodiversity

Himalayan forests, the major storehouse of biodiversity in South-Asia are now, allegedly, under threat. Biodiversity is the sum total of species richness (i.e. number of species of plants, animals and micro-organisms) living in a community or an ecosystem (Khoshoo 1993: 16). Today, forests have reduced drastically or completely vanished from many parts of the Himalaya. As back as in the early eighties an average of 1432 persons were relying on each square kilometer of cultivated land in the Indian Himalaya; the same figure for the plains was 483 (Tejwani 1984). Such a situation has over the years manifested itself through encroachments on virgin forestlands and degradation of community lands. The concept of Common Property Resources (CPRs) that was traditionally so relevant in the context of the Himalaya has been increasingly fading away with time. Their destruction is often the result of the limited development options available to the people who are dependent on them. Across the Himalaya, we observe high level of human and livestock population in relation to the available arable land. Forests are the major sources of firewood to the villagers and fodder to livestock.

Almost the entire energy needs of mountain people are met from fuel wood obtained from the felling of trees growing in the forests and near the agricultural field. Unscientific management of land resources further exasperates the situation. The rate of erosion in the catchment area of the Himalayan Rivers has increased five fold in the geological time scale, the present rate being upwards of 1 mm per year (Chadha 1989:5). It may be, however, mentioned that the share of mountain farmers in the overall degradation of Himalayan natural vegetation and biodiversity is minuscule (see among others Ives and Messerli 1989, Ives 2004) as compared to the gigantic share of development paradigm in the area. Unplanned urbanisation, commercial timber extraction, capitalistic development projects, mining & quarrying and such other forces of modern development are among the most pertinent factors that have led to deforestation with serious environmental, social, economic and biological consequences. This is essentially the result of unscientific and lopsided development policies of the respective governments encompassing the Himalaya. In the context of the sorry state of forest resources in Indian Himalayan region some of the veteran scholars may be quoted as under:
Unfortunately, after independence, particularly after the Chinese invasion, the rhododendron wealth has diminished substantially on account of defence activities where large chunk of mountain slopes had to be cleared. Today if one has to have an idea about diversity of Eastern Himalayan species of Rhododendron, one has to go the Royal Botanic Gardens at Kew and Edinburg, Botanic Garden at Berlin Dahlem and the Royal Horticultural Garden at Wisley. (Khoshoo, 1993:7)

Faulty policies on land, agriculture, forestry, grazing, animal husbandry, fishing, wildlife and tourism have resulted in habitat loss leading to the loss of biodiversity. Equally important has been the lack of trained manpower, public awareness and lack of financial support. (Khoshoo, 1993:16)

Right from 1949 onwards, year after year, I have been botanising in the environs of one or the other of the Himalayan hill stations. During the last forty years, vast changes have taken place in the forest or vegetal cover because of devastation brought about by road building activity, construction of hydro-electric dams, expansion of agriculture and horticulture with increasing population and tourist rush as well as deforestation brought about to meet the ever increasing demand for timber, fuel and fodder. Like other naturalists and botanists, I have helplessly watched the changes that are taking place in the Himalayan forest vegetation over the year. (Bir, S.S., 1993:77)

The issue of Himalayan forest degradation and biodiversity therein has attracted global attention ever since Eric Eckholm openly pointed his finger to the poor marginal mountain farmers of Nepal Himalaya and informed the world that they are the principal source of forest degradation and consequent environmental fallouts in his book Losing Ground (1976). Subsequently, the World Bank in its report (1979) predicted a total loss of accessible forest cover in Nepal by 2000. Several other reputed institutes, including the World Resources Institute (1985), Asian Development Bank (1982), and Centre for Science and Environment (1982, 1991) spoke with great authority in similar terms¹. Recently (2006), a group of researchers led by Maharaj Pandit, Senior Visiting Fellow with the NUS University Scholars Programme, as part of their larger research project on the ‘effects of large-scale deforestation

¹ The theory termed by Jack Ives as ‘The Theory of Himalayan Environment Degradation’ dominated environmental debate in major part of the 1980s.
in the tropical biodiversity hotspot\(^1\) conducted a study on the Indian Himalayan forests. Their study was based on satellite images dating from 1972-1974, 1980-1983 and 1999-2001\(^2\). A summary of their findings may be relevant to present here:

By 2000, the region had lost 15 per cent of its forest cover compared with the early 1970s. Only 10 per cent of land area of the Indian Himalaya will be left covered by dense forest by 2100 given the state of current deforestation. The Western Himalaya is expected to suffer higher losses in both total and dense forest cover than the Eastern Himalaya, because of higher human population densities. But Sikkim in Eastern Himalaya is likely to have the least forest cover in 2100 among all the Himalayan states, even though the rate of deforestation is much lower here than any of the Western states. This may be because forest loss and their impact get accentuated due to smaller geographic size of the state. Also, nearly 50 per cent of the geographic area of Sikkim lies above timberline where forest growth is not possible. Dense forest cover in Western Himalaya will decrease from 61 per cent in 2000 to 16.8 percent in 2100; and from 76.2 per cent in 2000 to 38.7 percent at Eastern Himalaya. Almost a quarter of the endemic species could be wiped out including 366 endemic plant species and 35 animal species.

Table 4.2 PROFILES OF FOREST AREA AND COVER

<table>
<thead>
<tr>
<th>Region</th>
<th>1995</th>
<th>2001</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jammu and Kashmir</td>
<td>09.1</td>
<td>09.1</td>
<td>09.1</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>22.5</td>
<td>66.5</td>
<td>66.5</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>44.3</td>
<td>64.8</td>
<td>64.8</td>
</tr>
<tr>
<td>Darjeeling</td>
<td>46.2</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sikkim</td>
<td>44.1</td>
<td>81.2</td>
<td>82.3</td>
</tr>
<tr>
<td>Arunachal Pradesh</td>
<td>64.2</td>
<td>64.2</td>
<td>64.2</td>
</tr>
<tr>
<td>Bhutan</td>
<td>32.7</td>
<td>27.3</td>
<td>25.4</td>
</tr>
</tbody>
</table>


\(^{1}\) For details, see: http://www.nus.edu.sg/corporate/research/gallery/research75.htm (accessed on 22 December 2006)
Table 4.3 TRENDS IN FOREST COVER (%)  

<table>
<thead>
<tr>
<th>Years</th>
<th>Indian Himalaya</th>
<th>Bhutan</th>
<th>Nepal</th>
</tr>
</thead>
<tbody>
<tr>
<td>1995</td>
<td>30.3</td>
<td>64.2</td>
<td>32.7</td>
</tr>
<tr>
<td>2001</td>
<td>31.0</td>
<td>64.2</td>
<td>27.3</td>
</tr>
<tr>
<td>2003</td>
<td>35.4</td>
<td>64.2</td>
<td>25.4</td>
</tr>
</tbody>
</table>

Source: Computed from Forest Survey of India, various years and State of World’s Forest, FAO 2001, 2003

Fig. 4.6 TRENDS IN THE FOREST COVER

Colossal media reports supporting the situation, often alarmist in nature, makes the state of affair murkier. The ground reality is, however, different. Although, much below the recommended level of 60 per cent of forest covers for hills and mountains, recent figures pertaining to Himalayan forest is not as gloomy as highlighted by many alarmist researchers and popular media. After a wanton forest degradation of the Indian Himalaya during the 20th century, more so during the second half, the forest figures across much of the Himalayan states are improving gradually after the 1990s. This is what the recent government figures highlight, thanks to the Joint Forest Management (JFM) system introduced in the early 1990s. Not surprisingly, the relatively isolated Bhutan has preserved its forest resource well above the recommended threshold level of 60 per cent. This has largely been possible for Bhutan due to its inward looking policies. The concern here, however, is with respect to the
ongoing degradation of forest resource in Nepal. The country has seen massive reduction in its forest cover in the last 100 years. The available figures reveal that in Nepal forest cover amounted to over 45 per cent in the early 1960s. It dipped down to about 30 per cent in the 1990s and by 2003 the forest cover of Nepal was just over 25 per cent to its geographical area. Nonetheless, Nepal’s forest cover was much more, at the turn of the century, contrary to what World Bank had predicted in 1979. The total forest cover of the Himalaya comes to around 35 per cent.

There is, however, no denial of the fact that Himalayan forest has degraded and depleted over the years. Vested interests and environmental politics kept aside, promoting optimum forest cover in the Himalaya needs serious attention as it is a source of biodiversity- vital medicinal plants, several food crops, animals and such other species of utter importance- many of which are endemic to the region, reduces the risk of breeding exotic pests and diseases, sustains food & water security of the poor mountain people and ensure sustainable geoenvironment and thereby sustainable development. Further, Himalayan forests confront the challenges posed by the global warming and consequent climate change. On the other hand, however, unscientific and reckless destruction of forest resources accelerate the process of global warming and further paves the ways to their own degradation and depletion of associated biodiversity. Forest degradation also leads to a variety of other geomorphic problems, including land degradation, soil erosion and landslides. The slopes without vegetation could not be expected to hold soil cover together.

4.4 Global Warming and Climate Change

Global warming and consequent changes in the climatic pattern across the geographies of the planet has been a hot topic in recent times across the disciplines- natural and social sciences-supported by undue hype of popular media. Many scientists firmly believe global warming is hurting our environment. Even politicians and diplomats have become an integral part of the debate. Hence, global warming has acquired global significance and has found its place in the regional and global geo-politics. The then Secretary General of the United Nations, Kofi Annan emphasised at the ‘Climate Change Conference in Nairobi’ in November 2006 that
climate change is not just an environmental problem, but also a health problem, a security problem and an economic problem for all nations. Today it is largely accepted that planet-wide environmental degradation has been occurring due to unscientific anthropogenic activities and such activities are to a large extent responsible for accelerating the process of global warming. The issue of global warming has become a serious concern for all of us. According to the Fourth UN report by the Intergovernmental Panel on Climate Change (2007), humans are very likely to be to blame for global warming and there is virtually no doubt it is linked to man’s use of fossil fuels. Ice core samples from the Antarctica have been used as proof of how warming over the centuries has been accompanied by raised CO2 levels.

However, there are many scientists like Ian Clark, Paul Reiter, Gary Calder, Philip Stott) who do not accept the theory that greenhouse gases cause global warming and subsequent global climate change. They state that there is little scientific evidence to support the theory. According to them, global warming could be caused by increased solar activity such as a massive eruption. Ian Clark claims, ‘...warmer periods of the Earth’s history came around 800 years before rises in carbon dioxide levels. After World War II, there was a huge surge in carbon dioxide emissions, yet global temperatures fell for four decades after 1940’. According to Philip Stott, ‘the system is too complex to say exactly what the effect of cutting back on CO2 production would be or indeed of continuing to produce CO2. It is ridiculous to see politicians arguing over whether they will allow the global temperature to rise by 2c or 3c’.

The UN report by the Intergovernmental Panel on Climate Change was published in February 2007. At the time, it was promoted as being backed by more than 2000 of the world’s leading scientists. But Professor Paul Reiter of the Pasteur Institute in Paris said it was a ‘sham’ as the list included the names of scientists who disagree with its findings. Professor Reiter’s

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3 United Nations Climate Change Conference was held at Nairobi from 6 to 17 November 2006. Details at: http://unfccc.int/2860.php (accessed 19 December 2006)


5 Ibid.
name was removed from an assessment only when he threatened legal action against the panel. According to him, that is how they make it seem that all the top scientists are agreed. It is not true.\(^6\)

The over dramatization of global warming message has more recently been termed as 'Hollywoodisation of Global Warming'. Scientists like Paul Hardaker and Chris Collier of the UK’s Royal Meteorological Society believe that scientists, campaign groups, politicians, and the media were all guilty of making out that catastrophic events were more likely to happen when this could not be proved by scientists. According to Collier, to make the blanket assumption that all extreme weather events are increasing is a bit too early yet. It is, however, firmly believe that global warming is happening and man-made emissions of greenhouse gases are partly to blame. Some scientists also acknowledge that dramatic warnings about climate change have helped generate public debate and support for action to reduce the threat. However, exaggeration of the problems often confuses the public and paves the way for skeptics to argue in a wrong perspective. According to Hardaker, scientists need to be more honest about the uncertainties surrounding climate change prediction to avoid losing public trust. Once we begin to exaggerate the science in either direction the debate gets out of control.\(^7\)

### 4.4.1 Situation in the Himalaya

Since the mid-1970s the average air temperature measured at 49 stations of the Himalayan region rose by 1°C with high elevation sites warming the most (Hasnain 2000, WWF 2005). This figure is twice as fast as the 0.6°C average warming for the mid-latitudinal northern hemisphere over the same time period (IPPC 2001, WWF 2005). Studies in Nepal (Shrestha et al. 1999) and Tibetan Plateau (Liu et al. 2002) indicate the rising temperature in recent times, with the warming being consistent and continuous after the mid-1970s in Nepal. The average warming in Nepal in its annual temperature between 1977 and 1994 was found to be

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0.06°C/year. Incidentally, in both the countries the rate of warming is found to be more pronounced in the high altitude regions than the lower ones. Similarly, the lowland areas of India do not show significant warming trend (WWF 2005) indicating that the Himalaya is more sensitive and affected by climate change. Similar analysis (Shrestha et al. 2000) on precipitation data, however, does not reveal any significant trends in Nepal.

The mercury is rising in Darjeeling. In one of the most striking revelations of recent times, the Queen of Hills has shown an increase of more than one degree Celsius in its mean annual temperature in the past 100 years. According to Subir Sarkar, the in-charge of North Bengal University weather station, 'hundred years ago, the mean annual temperature of the hill town stood at 13.45 degrees Celsius; at present it is 14.5. The rise has made both the summers and winters a wee bit warmer. The rise in the hills is twice that of the plains. While the global warming is said to be the main and obvious reason for the rise in the mercury level in the hill town, unplanned urbanisation and depletion of forest cover are two local reasons for the rise in the temperature.'

4.4.2 Glacial Retreat

One of the worst damages of global warming as revealed by various scientific studies has been the glacier retreat in the mountain regions and Glacial Lake Outburst Floods (GLOFs). While such phenomena have occurred due to geologic and geomorphic reasons in the past, scholars argue the rate and frequency of their occurrence have amplified severely in the last couple of decades, and sadly is increasing with time. Geoscientists have revealed a general shrinkage of mountain glaciers on a global scale and the trend was found to be more pronounced during the first half of the 20th century. After about 1950 mountain glaciers again started to grow. However, they again started to retreat with accelerating pace since the 1980s. Based on the scientific investigations, there have been forecasts that up to a quarter of the global mountain glacier mass could disappear by 2050 and up to half could be lost by 2100.

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5 Reported by Anuradha Sharma Lakhota, “Darjeeling warming up faster than world”, The Telegraph: North Bengal and Sikkim, 7 November 2006.
In the Himalayan region also glaciers have been found to be in a state of general retreat since 1850 (Mayewski and Jaschke 1979, WWF 2005).

In Nepal, the Khumbu glacier, a popular climbing route to the summit of Mt. Everest, has retreated over 5 km from where Sir Edmund Hillary and Tenzing Norgay set out to conquer Mt. Everest in 1953 according to research findings. Similarly, several other Nepali glaciers are fast retreating in recent decades (see among others Fujita et al. 1998, 2001, Kadota et al. 1997, Seko et al. 1998, WWF 2005). In India situation is no better. Recent scientific studies show that almost all the major Indian Himalayan glaciers are retreating at an increasing pace (see WWF 2005). Of particular importance is Gangotri glacier as it has attracted massive media attention in recent years. Latest data in this connection shows that Gangotri is retreating at the rate of 23 m/yr. Table 4.4 highlights the situation of some of the major glaciers in Indian Himalaya. According to the recent research findings, since the last inventory of glaciers and glacial lakes in Bhutan by the International Centre for Integrated Mountain Development (ICIMOD) in 2001, 120 additional glacial lakes have formed in the mountains (Penjor 2006: December 03), indicating a rapid pace of glacier retreat in Bhutan Himalaya. It also reveals that glacier retreat or advance is either caused by natural factors or global environmental changes and that local ecology has little control over it. This is so because Bhutan’s environment is relatively intact and the region still has over 64 per cent of its geographical area under forest.
<table>
<thead>
<tr>
<th>Glacier</th>
<th>Location</th>
<th>Period</th>
<th>Avg. retreat (m/year)</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kolhani</td>
<td>Jammu &amp; Kashmir</td>
<td>1857-1909</td>
<td>15.0</td>
<td>WWF, 2005:32</td>
</tr>
<tr>
<td>Machoi</td>
<td>Jammu &amp; Kashmir</td>
<td>1906-1957</td>
<td>08.1</td>
<td>WWF, 2005:32</td>
</tr>
<tr>
<td>Badashigri</td>
<td>Himachal Pradesh</td>
<td>1890-1906</td>
<td>20.0</td>
<td>WWF, 2005:32</td>
</tr>
<tr>
<td>Badashigri</td>
<td>Himachal Pradesh</td>
<td>1940-1963</td>
<td>44.3</td>
<td>Bahadur 2004:53</td>
</tr>
<tr>
<td>Chotasigri</td>
<td>Himachal Pradesh</td>
<td>1970-1989</td>
<td>07.5</td>
<td>WWF, 2005:32</td>
</tr>
<tr>
<td>Milam</td>
<td>Uttaranchal</td>
<td>1849-1957</td>
<td>12.5</td>
<td>WWF, 2005:32</td>
</tr>
<tr>
<td>Pindari</td>
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<td>1845-1966</td>
<td>23.0</td>
<td>WWF, 2005:32</td>
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<tr>
<td>Gangotri</td>
<td>Uttaranchal</td>
<td>1935-1976</td>
<td>15.0</td>
<td>WWF, 2005:32</td>
</tr>
<tr>
<td>Gangotri</td>
<td>Uttaranchal</td>
<td>1985-2001</td>
<td>23.0</td>
<td>WWF, 2005:32</td>
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<tr>
<td>Zemu</td>
<td>Sikkim</td>
<td>1909-1965</td>
<td>07.9</td>
<td>Bahadur 2004:53</td>
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<tr>
<td>Glacier AX010</td>
<td>Shorong Himal, Nepal</td>
<td>1978-1989</td>
<td>02.7</td>
<td>WWF 2005:16</td>
</tr>
</tbody>
</table>

**4.4.3 Glacial Lake Outburst Flood**

Glacial Lake Outburst Flood (GLOF) is primarily an outcome of glacial melting. They are catastrophic discharges of water resulting primarily from melting glaciers. According to WWF (2005), many of the big glaciers have melted and retreated rapidly and have given birth to the origin of a large number of glacier lakes. Due to the faster rate of ice and snow melting, caused by the global warming, the accumulation of water in these lakes has been increasing rapidly and resulting sudden discharge of large volumes of water and debris and causing flooding in the downstream. An accelerated retreat of the glaciers in recent times has led to an enlargement of several glacial lakes. As the glaciers retreat they leave a large void behind. The ponds occupy the depression earlier occupied by glacier ice. These dams are structurally weak and unstable and undergo constant changes due to slope failures, slumping, etc. and run the risk of causing GLOFs. Characterised by sudden releases of huge amounts of lake water, which in turn would rush down along the stream channel downstream in the form...
of dangerous flood waves, GLOF waves comprise water mixed with morainic materials and cause devastation for downstream riparian communities, hydropower stations and other infrastructure. Further, Glacial lake outburst flood (GLOF) causes disasters to life and property along the downstream, results serious death tolls and destroy valuable forests, and farms. In the long run, glacial retreat/melting and GLOFs tend to threaten regional environmental and human security.

On a clear blue morning of October 7, 1994, Dechen Tshering, a Class X student of Punakha High School, was standing at the confluence of the Pochu and Mochu rivers when he heard a rumbling sound. He didn't give it a second thought assuming that convoys of trucks was passing by but when the water level of the Punatshangchu touched the stones where he had positioned himself he literally flew to safety. All he could see was a river of logs, boxes, haystacks. In minutes the river ravaged everything on its way. It changed course, destroyed parts of the dzong, and flooded the school soccer field and ripe paddy fields with fish,” he said. The October flood had claimed more than a dozen lives, damaged acres of farmland, and government and private property worth millions of ngultrums. The flood was caused by a glacial lake that had burst high up in Lunana\(^9\) nine days walk from Gasa dzong.\(^{10}\)

Some of the worlds largest documented historical GLOFs occurred in Karakoram-Himalaya. The damming of upper Shyok River by chongkumdan glacier formed a lake. A sudden outburst from this lake occurred in 1929 and the flood wave traveled down the Shyok River into Indus creating a rise of 8 m, 740 km downstream from ice dam. In Nepal, thirteen GLOFs are observed since 1960 for 30 years duration giving a very high frequency of natural hazards (Yamada 1993, Bahadur 2004). In 1985, a bursting lake in Nepal destroyed 14 bridges and caused US$1.5 million damage to a power plant. According to the United Nations, nearly 50 high Himalayan lakes could flood their banks in the next 5 to 10 years, sending water crashing down the mountains and threatening thousands of lives (Koppel 2002: April17). GLOFs are not a new phenomenon across the Himalaya but their occurrence has become more frequent in the past couple of decades. UNEP scientists, working with the

\(^9\) located in Bhutan.

\(^{10}\) Reported by Ugyen Penjore. “Glaciers are retreating”, Kuenrel, 03 December 2006.
International Center for Integrated Mountain Development in Kathmandu, Nepal, have found at least 44 lakes in Nepal and Bhutan that were filling so rapidly they were in danger of bursting their banks (ibid). GLOFs are poorly documented but observed to create floods raising water levels up to 100 m (Bahadur 2004). It is considered necessary to have scientific GLOF analysis for design flood of projects in glacier dominated watersheds.

Table 4.5 STATUS OF GLACIAL LAKES IN NEPAL AND BHUTAN

<table>
<thead>
<tr>
<th>Country</th>
<th>Glacial Lakes</th>
<th>Number</th>
<th>Area (km²)</th>
<th>Potentially Dangerous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bhutan</td>
<td></td>
<td>2674</td>
<td>106.78</td>
<td>24</td>
</tr>
<tr>
<td>Nepal</td>
<td></td>
<td>2323</td>
<td>75.70</td>
<td>20</td>
</tr>
</tbody>
</table>

Mool et al. 2001:364

Table 4.6 LIST OF GLOF EVENTS RECORDED IN NEPAL

<table>
<thead>
<tr>
<th>Year</th>
<th>River Basin</th>
<th>Name of Lake</th>
</tr>
</thead>
<tbody>
<tr>
<td>450 yrs ago</td>
<td>Seti Khola</td>
<td>Machhapuchhare</td>
</tr>
<tr>
<td>1935</td>
<td>Sun Koshi</td>
<td>Taraco, Tibet</td>
</tr>
<tr>
<td>1964</td>
<td>Arun</td>
<td>Gelaipco, Tibet</td>
</tr>
<tr>
<td>1964</td>
<td>Sun Khola</td>
<td>Zhangzangbo, Tibet</td>
</tr>
<tr>
<td>1964</td>
<td>Trishuli</td>
<td>Longda, Tibet</td>
</tr>
<tr>
<td>1968</td>
<td>Arun</td>
<td>Ayaco, Tibet</td>
</tr>
<tr>
<td>1969</td>
<td>Arun</td>
<td>Ayaco, Tibet</td>
</tr>
<tr>
<td>1970</td>
<td>Arun</td>
<td>Ayaco, Tibet</td>
</tr>
<tr>
<td>1977</td>
<td>Dudh Koshi</td>
<td>Nare, Tibet</td>
</tr>
<tr>
<td>1980</td>
<td>Tamur</td>
<td>Nagmapokhir, Nepal</td>
</tr>
<tr>
<td>1981</td>
<td>Sun Koshi</td>
<td>Zhangzangbo, Tibet</td>
</tr>
<tr>
<td>1982</td>
<td>Arun</td>
<td>Jinco, Tibet</td>
</tr>
<tr>
<td>1985</td>
<td>Dudh Koshi</td>
<td>Dig Tsho, Nepal</td>
</tr>
<tr>
<td>1991</td>
<td>Tamo Koshi</td>
<td>Chubung, Nepal</td>
</tr>
<tr>
<td>1998</td>
<td>Dudh Koshi</td>
<td>Sabai Tsho, Nepal</td>
</tr>
</tbody>
</table>

Source: WWF 2005:25
Plate 4.1: Glacial Lake: Bhutan
[Source: Kuensel, 2006: 3 December]

Plate 4.2: Chandra Taal: Himachal Pradesh
Photo: Manish Thakre 2003]
While majority of the scholars link the retreat of glaciers and consequent GLOFs with the process of global warming, there are scientists who do not agree with this theory. In this connection it would be informative to look into the observations made by Jack D. Ives, a noted geomorphologist, communicated to this writer\textsuperscript{11}, in the context of Khumbu glaciers in Nepal Himalaya-

\begin{quote}
...it has been well documented that the Khumbu glaciers are thinning and retreating and that potentially hazardous glacial lakes are forming. At issue, however, is the degree of hazard, and this appears to have been grossly over-estimated. We must also ask how the occurrence of a natural event (ie jökulhlaup or glacial outburst floods) can be seen as “destroying the environment?” Jökulhlaup are known to have occurred in many glacierized mountain areas and have been documented in the Alps, Alaska, the Canadian Rockies, Karakoram, and Pamir, amongst others. In Iceland, where the actual term jökulhlaup originated, there is a reliable record of destruction of farms and villages extending over several hundred years. Thus, they are not specific to current global warming. So how can a natural process “destroy the environment?”
\end{quote}

More significantly, what can anyone, or any institution, do to protect Mount Everest from global warming? The BBC News/South Asia (18 November 2004, online) cautioned that Mount Everest “could one day become nothing but rock,” implying that all its ice and snow would melt. That would require such a large increase in temperature that the entire population of the subcontinent (at least) would likely have died from heat prostration long before Mount Everest were stripped of its ice and snow. In other words, by the time the mountain had been reduced to a bare rock far more serious extra-Himalayan problems would have diverted attention.

Of more immediate concern, however, is that this form of over-dramatic activism runs the risk of substantial misrepresentation. It may also deflect from some of the actual problems facing the Sagarmatha National Park and World Heritage site. These include:

\textsuperscript{11} The observation is also published in \textit{Mountain Research and Development}, 2005, 25 (4): 391-394
1. Severe damage to the upper timberline belt vegetation and the alpine meadows by large numbers of trekkers and their porters;
2. An excessive number of mountaineering expeditions permitted by the government;
3. Inefficient park management too closely controlled from Kathmandu;
4. Environmental damage perpetuated by the Nepalese military;
5. The Maoist Insurgency;
6. Over-dramatized reporting that may undermine the credibility of environmentalists.

Regardless of the above discussion, before any action is undertaken, the local people, the Sherpas, who have managed to survive quite successfully for several hundred years, need to be consulted. What are their views? How do they rank the problems, both environmental and socioeconomic, that they face? And can they advise all the many friends of the Khumbu worldwide if and how assistance can be provided?

According to Milap Chand Sharma, geomorphologist in Jawaharlal Nehru University, who has done extensive research on glacial geomorphology of the Western Himalaya, ‘glaciers are the most sensitive parameters of temperature change, both positive and negative. However, global warming is not the reason of glacial retreat. It is a simple cyclic episode’ (Down to Earth 2006, 15 December: 30). Further, recent analysis of temperature trends in the Western Himalaya over the past century by the scientists at England’s Newcastle University have indicated that global warming could be causing some glaciers to grow (BBC News 2006: 24 August; The Australian 2006: 04 September). They found warmer winters and cooler summers, combined with heavier snow and rainfall could be causing some mountain glaciers to increase in size. The findings are significant, because temperature and rain and snow trends in the area impact on water availability for several million mountain population. Their research focussed on the Upper Indus Basin. The findings are published in the American Meteorological Society’s Journal of Climate (BBC News 2006: 24 August; The Australian 2006: 04 September). It is also that, recent scientific studies in Bhutan have found out that 106 new glaciers have formed in Bhutan since the last inventory of glaciers in 2001 (Penjor 2006: December 3)
Our goal here is not to support or oppose any scientific perspective. Whether glacial retreat and GLOF observed in the Himalayan headwaters are natural cyclic episodes or results of global warming are matters of scientific debate. What matters is the fact that the air temperatures are rising, glaciers are retreating and there are increasing episodes of GLOF.

1. Climate change is having a strong affect on the Himalayan glaciers; most of the Himalayan glaciers are retreating at a faster rate.

2. As the glaciers retreat, lakes can form between the piles of rocks and stones (moraine ridge) that mark the earlier end of the glacier, and the new end of the glacier which is now higher up the valley. The debris acts like a dam ridge, but the wall is often loose and can break suddenly, leading to an outburst of water (glacial lake outburst flood or GLOF). ICIMOD identified nearly 15,000 glaciers and 9,000 glacial lakes, more than 200 of them potentially dangerous, in a survey of glaciers and lakes in Bhutan and Nepal, and selected (HKH) basins in China, India, and Pakistan.

3. If the glaciers continue to shrink, this could have a profound impact on the water flowing through the nine major river basins originating in the Hindu Kush-Himalayan region. The total amount of water in the rivers might increase as the glaciers melt, but when the total amount of ice in the glaciers drops below a critical level, the flow is likely to decline. The seasonal changes in the flow will also be affected. Some changes in the patterns of water flow have already been observed in some rivers of the Himalaya.

4. The permanent snowline has already moved higher, but as yet there are no scientific observations available that can be used to calculate the real reduction in snow and ice cover in the region.

5. Floods and droughts are likely to increase both because of the loss of glacier area, and because of increases in extreme rain and snowfall events.
These trends pose serious threats to the livelihoods and security of the people living in the Himalaya and its geographical milieu. Simplistic response measures like checking local deforestation and overgrazing are not sufficient. As the Bhutanese case points out, glacial retreat and GLOF are occurring even in regions with high forest and vegetative cover with stable land use patterns. From a human security point of view, it is important to ask: What are the impacts of retreating glaciers and drying up of mountain streams to the Himalayan farmers and pastoralists? How can they adapt to these changes more efficiently? How do we inform and prepare the more vulnerable communities about the risks of GLOF? 

4.5 Forest Fires

The Himalaya is one of the most vulnerable geographical units of the world susceptible to forest fires. Every year wildfires destroy considerable forest resources in the region. Forest fires occur due to a variety of reasons and may be both natural and human made. Many forest fires start due to natural causes such as lightning which set trees on fire. However, rain extinguishes such fires without causing much damage. Nevertheless, the forest or pasture may be deliberately set on fire by mountain people to induce succulent grass growth for domestic animals. In addition to this, natural vegetative systems sometimes get extensively damaged when fires spread uncontrollably from burning operations carried out in the adjoining agricultural fields. Another common practise is the burning of wild grass or undergrowth to search for wild animals. Unextinguished campfires of trekkers, shepherd camps or roadside charcoal panners may also spread and cause forest fires. Unextinguished cigarette butts and matchsticks are other important causes of accidental forest fires, especially in areas of dry forests. Besides, lightning or sparks from electric poles in dry areas also causes fires. Up to 90 per cent of the Himalayan forest fire is caused by reckless anthropogenic activities (Bajracharya [undated], Chetri 1994, HPDR 2005).

Forest fires occur annually in all the major physiographic/climatic regions of the Himalaya. With the recent large-scale expansion of chirr pine forests in many areas of the Himalaya the frequency and intensity of forest fires has increased. However, the forests of Western

12 Please also see annexure 1
Himalaya are more vulnerable to fires as compared to its Eastern counterpart. This is because forests of Eastern Himalayas grow in high rain density.

Forest fires generally occur from November to June. High atmospheric temperatures, dryness and at times prolonged winter offer favourable circumstance for a fire to start. The severity of the fire varies greatly depending upon fire weather, fuel conditions, and physiography. Once the monsoon is established, usually by the middle of June, the fire problem gradually disappears.

Table 4.7 FOREST FIRE IN THE HIMALAYA

<table>
<thead>
<tr>
<th>Region</th>
<th>Forest susceptible to fire (approx)</th>
<th>Tentative period of forest fire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jammu and Kashmir</td>
<td>40%</td>
<td>February to June</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>50%</td>
<td>February to June</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>69%</td>
<td>February to June</td>
</tr>
<tr>
<td>Nepal</td>
<td>90% (of Terai forest)</td>
<td>November to May</td>
</tr>
<tr>
<td>Sikkim</td>
<td>40%</td>
<td>November to May</td>
</tr>
<tr>
<td>Bhutan</td>
<td>50%</td>
<td>November to May</td>
</tr>
</tbody>
</table>

Source: based on literature review

Forest fires cause immense damage to the Himalayan forest and associated biota every year. They pose a threat not only to the forest wealth but also to the entire regime to fauna and flora seriously disturbing the bio-diversity and the ecology and environment of a region. As fires damage the vegetation, the soil is often exposed to and eroded by wind and water. Occasionally, embers from forest fires also cause fires in nearby mountain villages. Many villages are burned every year with loss of lives, cattle and other property. Forest fires also pose serious health hazards by producing smoke and noxious gases. The burning of vegetation gives off not only carbon dioxide but also a host of other noxious gases such as carbon monoxide, methane, hydrocarbons, nitric oxide and nitrous oxide, that lead to global warming and ozone layer depletion. As a result, often, mountain people suffer from serious respiratory problems due to these toxic gases. Burning forests and grasslands further, allegedly, accelerate the already serious threat of global warming. Recent scientific studies
suggest that biomass burning may be a significant global source of methyl bromide, which is an ozone depleting chemical.

Forest fires are usually seasonal phenomena, more often than not occurring during the dry season. They can be prevented by adequate precautions. As over half of the Himalayan forests are affected by annual forest fire, an effective policy on forest fire prevention and control becomes extremely important. While we do not have a comprehensive national policy in this regard successive Five Year Plans of India have provided funds for forests fighting. Surprisingly, in Nepal forest fire management is not in practice even at present times. The community forest user groups control forest fires in their own forests, although they do not have a plan for systematic prevention and control of fires (Bajracharya [undated]). With respect to Bhutan we do not have any reliable information towards this end.

It would be informative to note the recommendations of modern Forest Control Project that was taken up in five districts of Uttaranchal in early 1990s in view of the frequent and severe forest fires in the region. They include:

1. Development and demonstration of modern fire control techniques;
2. Preparation of division wise fire management plans;
3. Estimation of forest fires;
4. Development and application of a forest danger rating system;
5. Training of personnel;
6. Full fire protection of timber depots;
7. Manufacture of fire finders and hand tools within the country and standardisation of fire control equipment.
Plate 4.3: Forest Fire in Darjeeling Himalaya\textsuperscript{13}
[Photo: Vimal Khawas, May 2008]

\textsuperscript{13} This photograph was ranked among 60 best photographs in the Global Digital Photo Contest 2008 held to celebrate ICIMOD's silver jubilee and World Environment Day 2008
4.6 Unplanned Urbanisation

Urbanisation across the Himalaya has a long history that started before the advent of the British. The earliest urban characters were mainly the capital towns built by different rulers. They were essentially rural in character made up mainly of the palaces, high walls, temples, pavilions etc. With the advent of the British and subsequent colonization of the Indian soil, centers for collection and other related activities started along with the development of administrative activities. Partition of India affected the towns by changing the population size and area of the towns. In the post independence era under the planned effort of development, decentralisation activities started and administrative units were reorganized. The second half of the 20th century saw tremendous pace in the level of urbanisation and urban growth in the uplands of South Asia.

Today the Himalaya accommodates over 500 towns, mainly the small and medium towns. If we dissect the hill towns it is found that small chunk of large towns accommodate considerable urban souls. For instance, out of the total urban settlements class one towns comprise only about 4 percent but shelter over 28 per cent of the total urban population of the region. Over 70 percent of the hill towns are small in character but accommodate less than 40 per cent of the urban population. Such scenario does indicate that the distribution of urban population in the Himalaya is also top heavy as in mainland. Information available in the preliminary census reports of India reveal that urban population in our hill towns are unevenly distributed among the different size classes of towns and cities as also over space.

The implication of such a situation may, however, be different as against mainland. The hills with different environmental set up and geomorphic characteristics may not support the excessive concentration of urban population in its towns and cities. Further, the hilly terrain may not have the scope for lateral expansion of urban settlements as in the plain lands. Hence hill towns in the long run may create hosts of environmental problems and thereby impact the livelihood of the people. Moreover, majority of the urban settlements across the hills are not planned, they grew historically as a trade or administrative centers. Unplanned urban

14 Please also see annexure 2 and 3.
development across the Himalaya compounds the human security problem that concerns not only to 65 million people inhabiting the Himalaya but several times as many in the plains in the long run as a result of various environmental fallouts.

It is, therefore, necessary for policy makers and planners to revisit the urban situation across the settlements in the Himalaya. Class I towns in the region have very little scope for their spatial expansion in view of the physical limitations of the region. It is also that the geomorphic attributes of the region cannot sustain too many large towns. They need to be controlled and directed in a sustainable path. The medium and small towns particularly class III, IV and V towns are expanding with appreciable pace. They can be developed as major growth centres through appropriate planning and policy intervention in order to accommodate the rising urban population. Such intervention may also reduce the spatial disparity in the levels of urbanisation in the Himalaya.

4.7 Ambitious Development Projects

It is not new to us that development projects, particularly construction of roads and hydel dams, have always raised serious controversies in the context of the Himalaya, as they have tended to become a major source of environmental and other forms of conflict. The unnoticed character of development projects, as they are located in the remote villages, forests and such other locations, has been another critical feature, since they tend to destroy the environment and displace the indigenous people who have been the traditional agents of conservation. Undeniably, development is the most important aspect of human civilisation and Himalaya cannot be an exception in this regard. The point, however, is how sustainable has been a particular development venture. While we proceed ahead in the process of development we need to respect certain aspects concerning geographical locations, environment conditions, over all aspirations of the general public, cultural institutions to name only the important few. It is here we have failed and we have failed badly. With a rapid increase in the density of population and urbanisation in the Himalayan areas, the network of roads is increasing. Today the network of Himalayan roads is over 40,000 kms (Chadha 1989:6). It has been estimated that 2447.53 sq km forest area from 1951 to 1979 were utilised
in various development works in Uttarakhand Himalaya, while maximum area came under river valley project (see Negi and Pal, 1989: 101).

Table 4.8 DIVERSION OF FORESTLAND FOR NON-FORESTRY PURPOSES IN INDIAN HIMALAYA (1980-MARCH 2004)

<table>
<thead>
<tr>
<th>Region</th>
<th>No of Approved Cases</th>
<th>Area Diverted (Ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arunachal Pradesh</td>
<td>100</td>
<td>43,403.8</td>
</tr>
<tr>
<td>Himachal Pradesh</td>
<td>586</td>
<td>8,553.7</td>
</tr>
<tr>
<td>Jammu and Kashmir</td>
<td>8</td>
<td>1,500.1</td>
</tr>
<tr>
<td>Sikkim</td>
<td>157</td>
<td>1,429.1</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>2361</td>
<td>72,094.1</td>
</tr>
</tbody>
</table>

Source: Forest and Wild Life Statistics, India 2004

Mention should be made that there have been tremendous oppositions across the Himalayan Region of India with respect to several ambitious/capitalistic ventures, especially the construction of dams, of the Government of India. Questions have been raised on many fronts by voluntary organizations in and around the region, academia and activists with respect to socio-economic and ecological viability of the projects. It is imperative that all development projects in the Himalaya should take care of the following crucial parameters, among many others.

1. Geographical and geo-environmental set up of the region
2. Socio-economic and environmental viability of the projects
3. Natural Vegetation and Biodiversity
4. Traditional eco-cultural milieu of indigenous and tribal communities
5. Livelihood of indigenous and tribal communities
6. Adequate Participation of the local people

When no attention is paid by development projects to topography, geological structures, drainage patterns and slope studies it often results into chronic landslips, mud slips, and landslides. Proper planning and methodical construction is necessary for ecological balance and sustainability of any development venture.
Plate 4.4: Taming River Teesta
Teesta Hydel Project Stage III under construction.
[Photo: Vimal Khawas, October 2006]

Plate 4.5: Dynamics of Development
NH31A that run-along a little above the construction site of Teesta Hydel Dam [Stage III] was washed down during the monsoon of 2006
[Photo: Vimal Khawas, October 2006]
4.8 Environmental Politics

Every year during the monsoon Himalayan region appears in the headlines with stories of large scale flooding in the plains of Ganges and Brahmaputra and resultant human-monetary-environment tragedy therein. As usual, there has been the yearly practice of accusing farmers of the Himalaya, particularly the Nepal Himalaya, for sending down the floods in ever-higher volumes. Floods occur on the Gangetic plain and Bangladesh every year largely due to their geo-environmental locations. We have, however, never been clear as to what extent of floods occur due to natural phenomenon and to what extent human activities like deforestation in the upstream or building of embankments downstream are responsible for increasing the inundation and deteriorating the flood situation in modern times. It is also not clear whether the floods are increasing in frequency and intensity over the decades, as is strongly claimed. In fact, recent work (Hofer and Messerli 2006) indicates that there have been little or no increases in frequency or intensity of flooding over the past century.

Environmental gossipmongers over the last 3 decades have been, nonetheless, accusing the Himalayan environmental degradation as a pertinent factor resulting in the monsoon tragedy on the Gangetic plain and Bangladesh. They say wanton deforestation in the Himalaya by poor farmers is responsible for flooding, which has been allegedly increasing with time. Such a thesis, based not on scientific fact but on assumption and emotion, that ignorant mountain minority farmers are devastating the forests and consequently causing serious downstream environmental and socio-economic damage is popularly known as the *Theory of Himalayan Environmental Degradation*.

The Himalayan degradation theory proposes that increased devastating flooding on the Ganges and Brahmaputra lowlands is a direct response to extensive deforestation in the Himalaya. The deforestation is presumed as a result of a rapid growth in the mountain subsistence farming populations dependent on the forests for fodder and fuel and for conversion to terraced agriculture. As steep mountain slopes are demudded of forest cover, it is assumed that the heavy monsoon rains cause accelerated soil erosion, numerous landslides, and increased runoff and sediment transfer onto the plains inducing a progressive increase in
flooding of Gangetic India and Bangladesh and hence putting at risk the lives of several hundred million people (Ives and Messerli 1989, Ives 2004). Ives strongly criticizes this theory based on the 25 years of research that he and his team have carried out in the region. According to T. Hofer, 'such a supposedly scientific chain of events has served as an expedient tool for both the plains politician and his counterpart in the hills. For the former, it has been useful in times of flood-related crises to pin the blame on the peasantry of a remote region. His hill counterpart, meanwhile, was amenable to accepting the blame because bad science was presented to him as *fait accompli* and also because the aid agencies funded reforestation programmes in the bargain' (Hofer 1997)\(^5\).

**Fig. 4.7 THEORY OF HIMALAYAN ENVIRONMENTAL DEGRADATION IN A FLOWCHART**

Unscientific Population Growth in the Himalaya

Increasing demand for fuel wood, fodder, timber

Uncontrolled forest removal in more and more marginal areas

Intensified erosion and higher peak flows in the rivers

Severe flooding and siltation on the densely populated and cultivated plains of the Ganges and Brahmaputra

Source: developed by the author

The genesis of the theory can be traced to the GTZ-UNESCO conference of December 1974 in Munich, if not earlier. The summary report of the proceedings noted ‘these mountain regions are seriously and increasingly affected by processes of deforestation, soil erosion, improper land use, and poor water management. Overuse of mountain environments has a widening impact on the plains with downstream floods, the siltation of dams and harbours and on the damage of crops and of homesteads’. Eckholm’s paper published in *Science* (1975) and his book *Losing Ground* (1976) supporting the Himalayan Degradation Theory added fuel to the fire. His arguments dominated mountain environment and development thought for over 15 years and are influential even at present times in many areas of government and institutional decision-making. Subsequently, the World Bank in its report (1979) predicted a total loss of accessible forest cover in Nepal by 2000. Today intellectuals laugh at the predictions of the World Bank given the fact that Himalayan Kingdom of Nepal has a forest several times more than what was predicted. Several other reputed institutes, including the World Resources Institute (1985), Asian Development Bank (1982), and Centre for Science and Environment (1982, 1991) spoke with great authority in similar terms.

The *Bangladesh Observer* (June 2, 1990) under the headline ‘Deforestation in the Himalaya Aggravating Floods’ reported the comments of Dr. Tolba, then Executive Director, UNEP, stating ‘...the chronic deforestation in the Himalayan watersheds was already complicating and compounding seasonal floods in Bangladesh...700,000 people died in Bangladesh in 1970 because of flooding’. Many well-known academicians, foresters, environmentalists, journalists and technocrats were not behind in highlighting their points supporting the cause. As a result, the theory of Himalayan Environmental Degradation became all time strong in the 80s.

In the mean time, [donor] agencies, supported by the vested interests in government departments, NGOs, academics, media, and politics were busy repeating the same narrative over and over across the countries of the region. The lack of scientific confirmation did not deter them from engaging in passionate condemnation of upstream inhabitants for the inundation of South-Asian lowlands, particularly in years when the floods were high. Scholars argue today that it was nothing more than environmental geo-politics in order to
enlarge the development budgets and expand and prolong the development projects by vested interests, both from within and outside the region.

The theory of Himalayan degradation and consequent flooding of Gangetic India and Bangladesh started receiving critical review from the academics undertaking research in the Himalayan region from around mid-1980s. Several research groups and individuals began detailed studies and also became aware of each other’s work through research journals like Mountain Research and Development. Further, the Mohonk conference on the ‘Himalaya-Ganges Problem’ in May 1986 served as an initial platform to debunk the theory of Himalayan environmental degradation. The very objective of the conference was to discuss, debate and investigate the prevailing Himalayan environmental paradigm of the 1970s and 1980s. The conference paved the way for the publication of The Himalayan Dilemma: Reconciling Development and Conservation (1989) under the authorship of Jack D. Ives and Bruno Messerli, where they challenged the prevailing Himalayan environmental notion with several scientific evidences and asked for a more focused and rigorous empirical research in order to substantiate the many environmental issues that had been raised. Since 1989 a vast amount of related environmental research has been undertaken. Although scattered widely across the literature, majority of them support the findings of Ives and Messerli.

Among other scientific findings, data collected and analysed between 1992 and 1996 by a Bangla-Swiss team led by Bruno Messerli and Thomas Hofer provides scientific evidence to further disprove the Himalayan Degradation Theory and presents new suggestions as to the cause of Bangladesh floods. The study clarifies: ‘floods in Bangladesh and India are largely independent of human activities in the upper catchment areas. Neither the frequency nor the volume of flooding has increased in Bangladesh over the last 120 years. Precipitation and runoff in the Himalaya do not seem to be important causes of floods in Bangladesh’ (Hofer 1997)."16

It is now largely accepted by the researchers that there was hardly any rigorous environmental research carried out in the Himalayan region prior to 1980 and the account of

16 ibid
the alarmist Himalayan degradation discourse in both the academic and popular literature was based upon supposition and emotion that entered policy formulation. Such discourse subsequently entered into the environmental and development politics of the region. According to Professor Ives, 'examination of many of the reports prepared for aid agencies and local governments are particularly revealing- successive consultants simply reproduced the conclusions of their predecessors. There were exceptions although; the 'white noise' was almost overwhelming' (personal communication).

The objective of this critical assessment of 'Himalayan Degradation Theory' is not to claim that the Himalaya is as green and pure as it was. Environmental/ecological situations have been changing across spaces of the globe and the Himalaya cannot be an exception. In this connection, mention should be made that environmental problems in several parts of the Himalaya are serious and in some places severe needing immediate scientific attention. However, it is important also to understand that the environmental degradation theory, which openly blames poor subsistence mountain farmers for degrading the Himalayan environment and levels them as direct agents of Indo-Gangetic plain and Bangladesh floods is not true. Such a theory became prominent over the years due to vested interests, environmental politics, popular writings and massive media support without any scientific rigour. Today, it is accepted at least among researchers that the assumed environmental threat of the Himalayas on South Asian lowlands advocated by the Theory of Himalayan Environmental Degradation is far from truth. Rather, there are other pertinent forces including geomorphic, administrative/policy related, developmental, (geo)political, and ethnic/religious (including terrorism) that have played major role in directing the human security paradigm over the years and have acted as dominant factors of instability in the region. The tragedy of this situation is that poor mountain people, as in many other parts of the world, have become victims of convenience. This process has diverted attention away from the real problems – repression and/or neglect of minorities, social unrest and poverty, corruption, all of which contribute to the current violence that affects much of the region.
4.9 Unplanned Tourism

Tourism is a sector where Himalaya has a comparative advantage. It is a growing sector and is growing relatively faster. This sector is, however, yet to be properly regulated and efficiently diversified. Of late massive mass tourism pouring across the urban spaces of the Himalaya coupled with weak regulatory mechanism and inadequate institutions have been the cause of serious environmental concern. In order to accommodate the influx of mass tourists many new hotels, buildings, roads and such other infrastructure facilities are constructed in the hill towns like Gangtok, Darjeeling, Mussoorie, Nainital, Shimla, Malali etc. degrading the environmental situation therein.

The cases of Dal Lake in Kashmir and Nainital Lake in Uttar Pradesh\(^\text{17}\) are very alarming, because more and more sewer pipes have been emptying into these lakes. To promote tourism, ropeways are being introduced in many hills stations like Nainital and Mussoorie. This has made the hill slopes unstable and fragile. Some of the constructions are coming up on old landslides without adequate pretreatment and investments on hill side stability, compounding the problem. (Chadha 1989:7)

Diversification of the sector into eco-tourism, adventure tourism, cultural tourism, religious tourism, nature tourism etc is a welcome step provided such ventures are rationally planned and scientifically managed.

4.10 Inadequate Knowledge and Faulty Governance

For long the Himalaya was not seen by the governments as a separate and unique geographical unit needing different institutions and policies to govern them. Institutions and development policies of the mainstream ‘prime locations’ were extended to the ‘marginal locations’ like mountains and consequently several environmental and socio-cultural problems were invited. Although decision makers in recent times have perceived the

\(^{17}\) Now Uttarakhand
prevailing lacuna in their governance, Himalaya is still, largely, at the mercy of mainstream institutions. Development policies and programmes have consistently failed to identify and address the needs of the mountains and aspirations of the people therein. Even when attentions have been given, the mainstream approaches have at several cases proved inappropriate and thus have resulted many adverse impacts on the socio-economy and environmental set-up of the region. It is important for the development planners and policy makers to understand that mountains demand an individual approach. This becomes essentially imperative because the effects of slopes and elevation of the Himalaya add a unique dimension to the challenges in addition to such constraints present in the lowlands.

Unfortunately, understanding of the Himalaya and the intricate linkages between physical and socio-cultural dynamics are still limited to indigenous people of the mountains and few others outside the mountains. There is an appreciable gap in knowledge bases with respect to the socio-economic characteristics, traditional-institutional and ecological processes operating in mountain areas. Further, no serious and systematic attempts have been made to understand the various fallouts of modern development in mountain regions, like climate change, pollution, armed conflict, population growth, resource degradation, changes in agricultural patterns and practices, mining, unplanned tourism development, urbanisation and associated infrastructure development etc. and their impact on the overall environment and human security. A far greater effort, hence, needs to be invested in order to understand various challenges faced by mountains in the near future. There is a need for a more robust and science based research than a mere media reporting and popular write-ups that are often based on assumptions, emotions and suppositions in order to have sufficient and authentic database for effective policy formulation.

4.11 Conflict and Conflict Resolutions

One of the important challenges of human security in and around the Himalayan milieu is the disorder created by conflict and ethnic tension. Across the Himalayan region with the exception of Himachal Pradesh, Uttaranchal and Sikkim Himalaya all other locations, including Nepal and Bhutan, are presently infected with conflicts often violent in nature.
Table 4.9 CONFLICT SITUATION IN INDIAN HIMALAYA AND ITS SURROUNDING MILIEU

<table>
<thead>
<tr>
<th>States</th>
<th>Number of terrorist, insurgent and extremist groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>Assam</td>
<td>36</td>
</tr>
<tr>
<td>Jammu and Kashmir</td>
<td>36</td>
</tr>
<tr>
<td>Arunachal Pradesh</td>
<td>01</td>
</tr>
<tr>
<td>Manipur</td>
<td>39</td>
</tr>
<tr>
<td>Meghalaya</td>
<td>04</td>
</tr>
<tr>
<td>Nagaland</td>
<td>03</td>
</tr>
<tr>
<td>Punjab</td>
<td>12</td>
</tr>
<tr>
<td>Tripura</td>
<td>30</td>
</tr>
<tr>
<td>Mizoram</td>
<td>02</td>
</tr>
</tbody>
</table>

Source: Frontline 2006, 23(24): 44

The current ethnic tension in the Darjeeling Himalaya and its adjacent Terai/Duar region is relevant to briefly discuss here. The Indian Nepal speakers, or the Gorkhas as they prefer to be called, residing in the region have been fighting for a separate state (province) of Gorkhaland since beginning of the 20th century. Darjeeling was granted Autonomous Hill Council in 1988. However, that could not satisfy the aspirations of the Indian Gorkhas and other ethnic communities residing in the area. In recent times, the agitation for the separate state has resumed once again with renewed vigour.

Several factors can be attributed for the development of a need to carve out a separate state for the Indian Gorkhas residing in Darjeeling Himalaya. First and the most important factor in this respect can be attributed to the lack of desirable development and declining/degrading resource bases in the region. Deficiency of basic infrastructure facilities like adequate educational institutions, health centres, proper communication (roads), safe drinking water etc. can be taken as important indicators in this respect. It is surprising that over 45 per cent of the villages in the region still do not have electricity facility while over 40 per cent of the villagers still have to walk to their nearest town. The spatial distribution of health centres and primary schools is extremely poor. Rampant unemployment of Gorkha youths is another critical phenomenon that has contributed to the movement.
Unless the ethnic conflicts are successfully addressed, the prospect for sustainable development over much of the Himalayan region is seemingly bleak.

4.12 Conclusion

The chapter briefly navigated and discussed some of the important environmental insecurities that are largely considered as human made and their bearing on the overall human security in the Himalaya. Environmental insecurities across the Himalaya have been responsible in guiding and directing civilisations in the area over the millennia. The relationship between human and environment in the Himalaya had been very close since antiquity. There had been a symbiotic and intimate relationship between man and environment over the ages. However, more recently, things are changing for bad in this fragile resource zone. Originally, we adjusted ourselves with the complex geo-environmental set up of the region and hence environmental determinism was very strong. In recent times, however, we have been seeking to adjust the Himalayan environment according to our needs thereby making way for environmental possibilism in this otherwise susceptible region. It has resulted in imbalances in the environment and aggravated natural processes. This is a very serious issue having far reaching implications on the security of the Himalayan environment and human beings therein in the days to come.

Himalaya, often, regarded as the cradle of South Asian civilisation is at present suffering from various human onslaughts- in addition to numerous natural forces that have been acting and reacting in the region since geologic past- in the form of faulty development policies/ventures, population increase and degradation of its rich natural resource base. What is more, the situation is deteriorating with every passing day and the future of the Himalaya looks clearly grim given rate of onslaught the region is forced to tolerate. Further, the Himalaya has been a battleground between environmentalists/conservationists and commercial/vested interests since the last half century. Such a situation has only politicised pertinent environmental issues therein and hence have done little good to the region. In the process, the indigenous and tribal populations of the Himalaya have been sidelined and are often regarded as direct agents of 'Himalayan Environmental Degradation'
Environmental challenges faced by the region ranges from local to global as we noted in the chapter earlier and therefore it is next to impossible to outline a clear-cut mitigation plan (s) to reverse the ongoing trend. It is, further, important to note that Himalayan problems can neither be solved by adopting megabuck high tech approach nor by doomsayers’ dream that there is no longer hope at all for the environment (Bahadur 2004) and human well-being in the region. What we need is a cooperative and coordinated approach where there is a mixture of deep concern and cautious optimism. While indigenous mountain communities should have their major stake, avarice and indifference, both from within and outside the region, should not be allowed in such an approach.

While doing so, the foremost task would be to revisit all the development policies that are functional in the region and ratify them in order to make them region and people specific. Often, the Himalaya has been kept at the mercy mainstream development policies that have little or no relevance in the region given its geo-environmental and socio-cultural dynamics.

Secondly, Himalaya should not be treated as a physical entity only as it has vibrant living aspects. It can neither be independent of people living therein nor the inhabitants without their habitats. There are areas, which are quite rich in natural resources but are inhabited by poor people. The inhabitants have been suffering under harsh environmental conditions, carrying out subsistence economic activities, based primarily on animal rearing and rudimentary farming (Bahadur 2004). Such situation needs up-gradation. Promotion of adequate education, health and food security of the mountain people include important challenges in this respect.

Thirdly, development planners and policy makers should not regard Himalaya as an appendage to economic and political interest of the indo-Gangetic plains. It is high time they recognised the geo-political and geo-environmental significance of the region at local, regional and global levels.

Lastly, Himalaya deserves objective research based on proper methodology and database rather than mere environmental gossip mongering based often on assumption and emotion.
We cannot expect / accept such scholars (Fuyusawa 2001, 2001a) who fly from Bangkok to Kathmandu, observe the Himalayan environment on their way, write on Himalayan forest degradation, or theorise Himalayan environment (see among others Eckholm 1975, 1976) from miles away, and tell us that we are degrading our environment. We also cannot accept the institutions that often blame mountain minorities as the forces behind Himalayan degradation. This is an issue where we all are collectively responsible and we should address it collectively. Our scientific community should observe carefully the natural processes and anthropogenic activities over time, utilizing rigorous techniques for precise measurement and scientific understanding. Such knowledge will help us improve future assessments and policies and thereby the development paradigm in the region.