Chapter 4

Natural Environment
Chapter – 4

NATURAL ENVIRONMENT

Environment is the source of life on earth and it not only directs
but also determines the existence, growth and development of mankind and
all its activities.

As society developed, man’s impact on environment grew in scope
and strength. Until very recently, we adhered to the following dictum: “we
cannot expect favours from nature, we must take them”. Mankind has long
trusted in nature’s potential and restorative powers, though there was no
reason to believe that these powers were inexhaustible, undoubtedly, this is
the result of revolution in science and technology, which has dramatically
increased man’s ability to use natural environment and its resources.
Nature has been increasingly damaged, restorative capabilities have
progressively weakened, and human environment is deteriorating day by
day to point of affecting not only the quality of life but even the very
existence of life. At this point, man realized the need to preserve and
improve his environment, which is now called as the ecological approach
(Saxena, 2006).

The word resource means “a source of supply or support generally
held in reserve”. A natural resource is the stock that can be drawn from
nature, i.e. air, water, land, vegetation, animals, solar energy and raw
materials, for supporting life. For man, resources are those materials which
are needed for survival and prosperity. The nature of resources varies from
society to society, depending upon culture, level of development and the
nature of work of that particular society.

A ‘reserve’ on the other hand is that portion of a resource which is
identified and from which usable materials can be legally and
economically extracted at the time of evaluation.
Natural resources can be classified as (i) renewable resources and (ii) non-renewable resources, on the basis of their abundances and availability. Resources that have the inherent capacity to reappear, or replenish themselves by quick recycling, reproduction and replacement within a reasonable time and maintain themselves, are called renewable resources, e.g. soil, water and living organisms. Resource that lacks the ability for recycling and replacement are called non-renewable resources, e.g. fossil fuels like coal, petroleum and minerals. Renewable resources can become non-renewable if used too rapidly by improper management (Rana, 2003).

4.1 FORESTS

Forests which are often considered to be the most splendid manifestation of plant life on earth, have played so important a role in the development of civilized man, providing him with materials for building his homes, for his furniture, fuel requirements, food material like berries and roots and so many other things, that it would have been difficult for man to make the rapid progress he has if they had been absent. In modern times forests have been increasingly, used as raw materials for paper and pulp and other industries. However, they have been the subject of such large scale exploitation that their very future is gravely imperiled. Perhaps because of a feeling that there were vast reserves of forests, exploitation has taken place on a reckless scale. While the commercial uses of timber have been recognized, their ecological value unfortunately has been largely overlooked. It is now increasingly appreciated that forests help to minimize soil erosion, have an important role in moderating climate and provide the habitants for large number of animal species. At the same time within the forest canopy many kinds of shrubs and other plants are to be found, many of them providing very useful substances like gums, resins, dyes and chemical substances of medicinal and industrial value. The tropical rain forests are particularly rich in plant and animal species and they are, sadly,
the ones in greatest danger. According to the National Forests Policy formulated in 1952, about 33 percent of the total land area should be maintained under forest cover but large scale deforestation has brought down the actually forested area to a considerably lower figure. (Pal, 1982)

Review of Literature

Any systematic survey of changes in structure and composition of forest of the area is not available. It has been mentioned that “great transformation has taken place in the Himalayan flora due to ravages caused by the tremendous biotic pressure, over exploitation of commercial tree species, the lopping felling of Oak species for fuel, fodder, timber, furniture and agricultural implements (Planning commission, 1985). It has also been mentioned that erosion, land-slides, floods and avalanches bring about changes in topography with consequent effects on the vegetation (Rau, 1981). It was in 1923, when Champion referred to the effect of fires, felling, grazing and removal of leaves in forest zone with particular references to the contact between the low level Chir Pine and the White Oak (Champion, 1923). It was stated that Chir Pine grows taller but is ordinarily prevented from regeneration by the thick under growth of Oak. The lopping and felling of Oak results in the soil becoming drier and thus, non favourable to Pine (Rau, 1981). Pine being a commercial species is subjected to heavy destruction and has led to replacement by scrub.

In one of the studies done in a part of present study area, it is found that “early successionals predominate forest and old growth forest are scarce. Unregulated exploitation of forests and faulty management practices seem to be largely responsible for this situation (Singh and Singh 1985). It was stated in 1882, that “formerly the greater part of Dun was covered by the forest of which the prevailing tree was Sal, but of later years much of the forest has disappeared and much of it has been invaded by tall coarse grasses” (Atkinson, 1973).
Thus human activity has had general effect of destroying climax Oak forest and creating conditions for replacing it either with conifers or open thorny shrubs, continued intense interventions destroy most of this shrub and brush growth and creates grassy meadows. At a final stage of forest destruction secondary tree and grass communities are characterized by xerophytic species and species avoided by grazing and browsing animals (Joel, 1966).

Tropical mountain forests are known for their ecological importance; most mountain forests in Ecuador have been converted to agriculture, and those that remain are concentrated on the eastern cordillera. Understanding of land use/land cover change in this ecological zone is inadequate. During the 1990s the region experienced a 0.58 per cent annual rate of deforestation but two areas in it show active signs of afforestation. Although conversion of forest to pasture for cattle grazing contributes, human migration to the United States is likely to affect the trajectory of future land use / land cover change (Brad and Bridget, 2002). Hazardous processes, including floods, land slides, soil erosion, and debris flows, are common in the Himalayas. Deforestation has been held responsible for increasing risk, from such hazards in the Indian context for more than a century. Evidences suggest that the extent of forest cover has altered little over 150 years and that hazardous processes recur in much the same, locations with similar frequency and magnitude, except where road construction has increased slope of instability. Nonetheless, population growth and economic development, especially since 1990, have increased vulnerability to hazards (Gardner, 2002).
Table 4.1(a)

Analysis of forest area based on the Satellite imageries done by forest survey of India

<table>
<thead>
<tr>
<th>District</th>
<th>Geographical area (sq.km.)</th>
<th>Dense forest (more than 40% crown density)</th>
<th>Open forest (between 10-40% crown density)</th>
<th>Total</th>
<th>Forest cover as percentage of Geographical area</th>
<th>Recorded forest area as percentage of geographical area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dehradun</td>
<td>3088</td>
<td>1239</td>
<td>331.00</td>
<td>1570</td>
<td>50.84</td>
<td>68.55</td>
</tr>
<tr>
<td>Uttranchal</td>
<td>53485</td>
<td>17849</td>
<td>5411</td>
<td>23260</td>
<td>43.49</td>
<td>64.81</td>
</tr>
</tbody>
</table>


The total forest cover which includes dense and open forest is estimated to be 23260 sq.km. This constitutes 43.49 per cent of state’s geographical area. Whereas the geographical area of Dehradun district is 3088 sq.km. of which 1570 sq.km area is covered with forest (dense and open forest type) which constitute about 50.84 per cent of total geographical area but the forest area recorded is 68.55 per cent (as shown in Table 4.1(i)).

Distribution of Forest

It is observed from the table 4.2(ii) given below, that the average distribution of forest in Dehradun district varies from 69.57 per cent to 66.96 per cent from 1981 to 2001. Where as distribution of groves ranges between 1.44 per cent and 2.09 per cent while the per capita forest share shows a decrease from 0.29 to 0.16 because of increase in population size and decrease in forest cover Chakrata Block has reported highest forest cover in all the three decades while Kalsi Block shows lowest forest cover. In terms of groves distribution, Raipur block shows highest percentage of 5.33 in 2001. Per capita forest share is maximum in Chaktata block because it is less populated block.
## Table 4.1(ii)

**Percentage Distribution of Forest and Groves and Per capita forest Share in Dehradun District**

<table>
<thead>
<tr>
<th>Blocks</th>
<th>1981 Percentage distribution of forest from reported area</th>
<th>1991 Percentage distribution of groves from reported area</th>
<th>2001 Percentage distribution of forest from reported area</th>
<th>Per capita forest share</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chakrata</td>
<td>78.89</td>
<td>0.22</td>
<td>1.20</td>
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<tr>
<td></td>
<td>80.84</td>
<td>1.79</td>
<td>0.99</td>
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<td></td>
<td>79.35</td>
<td>0.09</td>
<td>0.84</td>
<td></td>
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<tr>
<td>Kalsi</td>
<td>54.76</td>
<td>0.08</td>
<td>0.39</td>
<td></td>
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<tr>
<td></td>
<td>59.80</td>
<td>0.80</td>
<td>0.32</td>
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<tr>
<td></td>
<td>54.53</td>
<td>0.03</td>
<td>0.29</td>
<td></td>
</tr>
<tr>
<td>Vikas Nagar</td>
<td>61.49</td>
<td>1.01</td>
<td>0.34</td>
<td></td>
</tr>
<tr>
<td></td>
<td>64.53</td>
<td>0.37</td>
<td>0.25</td>
<td></td>
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<tr>
<td></td>
<td>65.69</td>
<td>0.43</td>
<td>0.19</td>
<td></td>
</tr>
<tr>
<td>Sahaspur</td>
<td>70.34</td>
<td>2.66</td>
<td>0.46</td>
<td></td>
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<tr>
<td></td>
<td>66.67</td>
<td>1.31</td>
<td>0.32</td>
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<tr>
<td></td>
<td>68.97</td>
<td>1.85</td>
<td>0.27</td>
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<tr>
<td>Raipur</td>
<td>62.37</td>
<td>4.98</td>
<td>0.07</td>
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<tr>
<td></td>
<td>59.90</td>
<td>4.00</td>
<td>0.05</td>
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<tr>
<td></td>
<td>47.13</td>
<td>5.33</td>
<td>0.04</td>
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<tr>
<td>Doiwala</td>
<td>79.96</td>
<td>0.21</td>
<td>0.39</td>
<td></td>
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<tr>
<td></td>
<td>75.43</td>
<td>0.14</td>
<td>0.23</td>
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<tr>
<td></td>
<td>75.73</td>
<td>0.31</td>
<td>0.18</td>
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<tr>
<td>Dehradun District</td>
<td>69.57</td>
<td>1.44</td>
<td>0.29</td>
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<tr>
<td></td>
<td>69.61</td>
<td>1.37</td>
<td>0.21</td>
<td></td>
</tr>
<tr>
<td></td>
<td>66.96</td>
<td>2.09</td>
<td>0.16</td>
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</tbody>
</table>


### Forest Cover

It is observed from composite score that out of six blocks of Dehradun district four blocks show negative score and two blocks reveal positive score (Table 4.1(iii)). The study concludes that within the Dehradun district the distribution of forest cover has registered the highest composite score in Chakrata block (+0.92) in 2001, where as the lowest composite score has been recorded in Kalsi block (-0.56). In Chakrata
block among the three variables two variables (distribution of forest from reported area and per capita forest share) show the highest scores, one of them show the lowest scores. The topography and climatic conditions are favourable for the growth of forests whereas Kalsi block is mainly an agricultural block which is responsible for the lowest forest growth.

Table 4.1(iii)

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</thead>
<tbody>
<tr>
<td></td>
<td>Distribution of forest from reported area</td>
<td>Distribution of groves from reported area</td>
<td>Per capita forest share</td>
<td>Composite mean Z-score</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Chakrata</td>
<td>1.31</td>
<td>-0.73</td>
<td>2.08</td>
<td>0.88</td>
<td>1.66</td>
<td>0.30</td>
<td>2.17</td>
<td>1.37</td>
<td>1.25</td>
<td>-0.66</td>
<td>2.16</td>
<td>0.92</td>
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<tr>
<td>Kalsi</td>
<td>-1.46</td>
<td>-0.81</td>
<td>-0.23</td>
<td>-0.83</td>
<td>-1.03</td>
<td>-0.47</td>
<td>-0.14</td>
<td>-0.55</td>
<td>-0.95</td>
<td>-0.69</td>
<td>-0.04</td>
<td>-0.56</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Vikas Nagar</td>
<td>-0.69</td>
<td>-0.29</td>
<td>-0.37</td>
<td>-0.45</td>
<td>-0.43</td>
<td>-0.80</td>
<td>-0.38</td>
<td>-0.54</td>
<td>0.04</td>
<td>-0.48</td>
<td>-0.44</td>
<td>-0.29</td>
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<td></td>
</tr>
<tr>
<td>Sahaspur</td>
<td>0.33</td>
<td>0.63</td>
<td>-0.03</td>
<td>0.31</td>
<td>-0.15</td>
<td>-0.07</td>
<td>-0.14</td>
<td>-0.12</td>
<td>0.33</td>
<td>0.27</td>
<td>-0.12</td>
<td>0.16</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Raipur</td>
<td>-0.59</td>
<td>1.94</td>
<td>-1.14</td>
<td>0.07</td>
<td>-1.02</td>
<td>2.03</td>
<td>-1.07</td>
<td>-0.02</td>
<td>-1.60</td>
<td>2.12</td>
<td>-1.04</td>
<td>-0.17</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Doiwalas</td>
<td>1.09</td>
<td>-0.74</td>
<td>-0.23</td>
<td>0.04</td>
<td>0.97</td>
<td>-0.98</td>
<td>-0.45</td>
<td>-0.15</td>
<td>0.93</td>
<td>-0.55</td>
<td>-0.48</td>
<td>-0.03</td>
<td></td>
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</tbody>
</table>
Fig. 4.1(i)
Spatial Distributional Pattern of Forest (1981)

(i) High concentration of forest cover (above +0.29)

This category consists of two blocks namely Chakrata (0.88) and Sahaspur (0.31). Chakrata is located in the uppermost portion of the district while Sahaspur block is situated in the central part of the district. Most of the parts of Chakrata block is covered with forests and mountains as well as the per capita forest share in this block is also highest. As far as Sahaspur block is concerned, forest cover is high but per capita forest share is not so much high because of its population density.

(ii) Medium concentration of forest cover (+0.29 to -0.29)

Two blocks come under this medium category viz. Raipur (0.07) and Doiwala (0.04). These blocks are located in the Southern portion of the district. In Raipur block, the distribution of forest cover is low but the distribution of groves is very much high in comparison to other blocks as shown in Table 4.1(iii), so because of this variable this block comes under the medium grade otherwise the other indicators show negative z-score. As far as Doiwala block is concerned, the distribution of forest cover is high because of its forest canopy while the other indicators show negative z-score.

(iii) Low concentration of forest cover (below –0.29)

Two blocks fall under this low category, they are Kalsi (-0.83) and Vikas Nagar (-0.45). These blocks are situated on the western part of the study area as shown in fig. 4.1(i). These two blocks are basically agricultural blocks because agriculture is the main occupation of these blocks, so the distribution of forest cover is low. More and more forests are being cleared for the cultivation of crops.
DISTRICT DEHRADUN
Distribution of Forest
1991

composite mean z-score
- High Above +0.35
- Medium -0.35 to 0.35
- Low Below -0.35

Fig. 4.1(ii)
Spatial Distributional Pattern of Forest (1991)

(i) High concentration of forest cover (above +0.35)

One block i.e. Chakrata (1.37) comes under the high grade of forest cover which is situated on the upper most or northern most part of the district as shown in fig. 4.1(ii). In Chakrata block the distribution of forest as well as the per capita forest share is highest while the distribution of groves is not so high. In 1991, the growth of forest shows a little increase as comparison to 1981 data (Table 4.1(iii)).

(ii) Medium concentration of forest cover (+0.35 to -0.35)

In 1991 three blocks come under the medium grade which forms a continuous belt from central to southern portion of the district as shown in Fig. 4.1(ii), these blocks are Sahaspur (-0.12), Raipur (-0.02) and Doiwala (-0.15). In 1981 the Sahaspur block was under the high grade where as Raipur and Doiwala were in the medium grade.

(iii) Low concentration of forest cover (below -0.35)

Two blocks namely Kalsi (-0.55) and Vikas Nagar (-0.54) come under this low category. In 1981 these two blocks were also in the low category. Kalsi is situated on the southern portion of the northern half while Vikas Nagar block is located on the western part of the central half as shown in fig. 4.1(ii).

Spatial Distributional Pattern of Forest (2001)

(i) High concentration of forest cover (above +0.25)

Only one block i.e. Chakrata (0.92) comes under the high grade as in 1981 and 1991 but the composite mean z-score increases in 1991 from 1981 and decreases in 2001 as shown in Table 4.1(iii). This block has high concentration of forest cover and low concentration of population because of its difficult terrain and topography.
DISTRICT DEHRADUN
Distribution of Forest
2001

composite mean z-score

High Above 0.25
Medium -0.25 to 0.25
Low Below -0.25

Fig. 4.1(iii)
(ii) Medium concentration of forest cover (+0.25 to -0.25)

Three blocks of Dehradun district fall under this medium category and they are forming a continuous belt from central to southern part of the district as they were making in 1991. except in 1981 one block out of these three blocks were in high grade i.e. Sahaspur block. These blocks are Sahaspur (0.16), Raipur (-0.17) and Doiwala (-0.03) (Table 4.1(iii)). In Sahaspur block the Queen of Hills i.e. Mussorrie hill is the main center of attraction for the tourist so from the last 20 years the tourism industry and development has been taken place so rapidly which is responsible for the degradation of the forest. In Raipur block the urbanization is spreading day by day and this block is highly populated and congested as well as the distribution of groves is much higher than the forest cover. Doiwala block has prominent forest canopy and covered with reserved forests

(iii) Low concentration of forest cover (below –0.25)

Two blocks i.e. Kalsi (-0.56) and Vikas Nagar (-0.29) are in this low category. In 1981 and 1991 they were also in low category, because in these two blocks agriculture is the main occupation and for this purpose more and more land is occupied by cutting down the forest. Therefore, the Agriculture sector is responsible for the degradation of forest in Kalsi and Vikas Nagar block.

Environmental Impact of Forest

It is well known that forests exert a profound influence on land, air and water but their effect is essentially at the micro level. It is on the integration of these micro influences over large areas and over long periods of time which results in macro effects on the environment as a whole.

Air and water are affected through the climatic influences because of the presence of forest cover modifies the climate markedly on a micro level
and to a greater extent on the macro level as the total effect is greater than the 
some of the parts. The intensity of solar radiation falling on the forest is 
markedly reduced, and this reduction leads to a modification of temperature 
and humidity, their vertical gradients, and the soil moisture regions, which in 
turn, reacts on the nature, density and structure of the vegetation itself. The 
zone of minimum temperature does not lie at the bottom, but at a height of 
about 1.5 m and the temperature of the air inside a forest is lower than that 
prevailing higher up, contrary to what happens in the open where the 
adibatic lapse rate is higher, resulting in temperature gradients in the lower 
layer of the atmosphere. Similarly, the range of the soil temperature is more 
equable both diurnally and seasonally. It also decreases with the depth of the 
soil, the main effective zone being up to 30 cm below the soil surface.

Humidity is higher in forest areas, being highest at the ground level 
at sunrise and as the temperature rises the gradual fall in humidity leads to the 
transfer of water vapour from the ground by the evening. Dew formation is 
affected, being more is open, and so are fog and mist which arise from 
radiation. This is a source of moisture directly absorbed by the leaves. 
Moisture evaporates less readily, although evapo-transpiration may deplete 
the soil moisture in a greater extent and to a greater depth, the effect varying 
with the soil moisture of the forest.

The velocity of wind is, markedly affected, a fact utilized to 
advantage in the creation of shelter belts and wind breaks. Soil erosion and 
wind blowing are controlled, the wind induced evaporation is diminished and 
the vegetation not only acts as a filter and cleanser, especially with respect to 
soil particles (dust, coal, ash etc) but also to polluting fumes and vapours. The 
efficiency is directly proportional to the physical structure, but the species 
also contribute to some extent. The role of vegetation as a producer and 
replenisher of oxygen needs hardly any emphasis, as virtually all life depends 
upon the oxygen layer produced and maintained through the functioning of 
the chlorophyll mechanism interception by tree cover on the average can be
assumed to be around 20 percent of the rainfall (Kaul, 1980). Though no detailed studies have been carried out on interception by the ground vegetation, it is estimated to be at least 10 percent on a conservative basis. Interception by leaf litter could be of the order of 5 percent of the gross rainfall. Thus, over 35 percent of rainfall is intercepted by the forest cover. In areas of high rainfall, this reduction assumes greater importance as there will also be a proportionate reduction in run off on the other hand, in areas of low rainfall, water yield calculation should take the forest cover also into consideration for a proper and reliable assessment.

One of the most important functions of forest consists in conditioning the soil to permit it to act as a reservoir for water. The forest floor consists of a large amount of decomposing organic matter which changes the physiochemical properties of the soil.

The effects on the land are perhaps more important in that land degradation is reduced to the minimum and thus condition, compounded with controlled stream-flow, emphasizes the importance of forests as the most efficient means of soil and water managements, especially in areas where other methods of conserving soil and water are not feasible owing to high cost and the present stage of technological development. (Dewan, 1988)

4.2 MINING

Mining may be defined as the removal of minerals from earth’s crust for the welfare and prosperity of mankind. Among the bounties of nature, mineral resources are for most valuable treasure to the society marching a head on the road of planning to achieve economic development and growth. Mineral products are beyond doubt backbone of industrialization. A rational utilization and adequate extraction of mineral resources through well directed exploration techniques is, however, an essential prerequisite.

As demands for minerals grow, the area of mining would expand at a faster rate, threatening increasingly larger areas of landscape.
Mineral Wealth

Dehradun and Mussoorie areas are well known for their economic potentiality due to abundance of economic minerals like limestone, limestone marble, phosphorite and gypsum. Other minerals have been also reported either in pockets or in veins like baryte, pyrite, galena and sulphur. All these minerals are located in the Krol belt viz Infra Krol, krol and Tal formations, but their economic potentiality is uncertain as the nature of these deposits are uncertain.

Limestone and Limestone Marble

These minerals are mainly exploited from Krol C member of the Krol Formations in Sahastra dhara, Jud, Kerwan, Oak Grove, Jharipani, Bhatta, Hathipao and Clouds End area. These limestones are generally dark, pale gray and light bluish in colour, occasionally microcrystalline and hard. They are of high grade passing even into chemical grade. These limestones do have some thin beds of shales. Perfect white and black microcrystalline variety of limestone is also quite common and has given rise to a marble variety of low-grade metamorphism. The limestones are quite pure, the percentage of CaCO₃ going as high as 99.8 per cent the concentration varies in stread, pockets and zones of magnesia limestone. High grade limestone in Sisai, Sahastradhara, Bhirtarli, Hathipao and Clouds End are well known. CaO contents is reported 55 per cent is Sisol area. The limestones are exposed on the slopes of the ridges and are being worked out by open quarrying and strip mining methods. The over burden is generally very thin, practically one. These deposits extend for 3.5 kms in length all along the southern units of the Mussoorie Syncline. The individual bed of limestone is generally 4-6 meters. Auden estimated the reserves to be approx 34 million tones and regarded them to be of metasomatics origin from the dolomite limestone (Pal and Sah, 1988).
In Dehradun district, Geology and Mineral development work was done by the Uttar Pradesh State Mineral Development Corporation and Directorate of Geology and Mining. During the year 1979-80, 61553 tonnes of high grade limestone was produced by the corporation.

Some of the Impact of Mining

1. **Loss of Forests:** Mining directly affects forests when located in a wooded area. There is loss of timber and fuel resources, useful minor forest produce and loss of habitat for wild life. The vegetation has to be cleared and this results in irregular exploitation of forest contrary to accepted principles of removal of wood equivalent in volume to that of increment put on by forests in a year. Mining also results in loss of genetic resources.

2. **Loss of Agricultural Lands:** Mining invariably, if forests are absent, affects agricultural lands.

3. **Loss of Homes**

4. **Air Pollution:** Mining results in serious disturbances of soil involving digging, transport and dumping. This leads to considerable dust generation at all levels inspite of the provisions of safeguards. Inhalation of the fine dust results in development of pulmonary diseases and the control of dust to be minimized to a great extent if it is possible to totally control it.

5. **Noise Pollution:** In quarries and mines explosives are being used in increasingly large quantities. This generates noise pollution. It also contributes to the destabilization of hill tops by opening out joints, fractures, fissures and cracks. In the Mussoorie hills on an average three blasts per day per quarry (in the eighty odd quarries) have greatly weakened the jointed and already brecciated rocks resulting in acceleration of incidences of mass movements and drying up of spring
feeding the streams such as Kakbare, Derinala, Murry, Dhabighat, Kempty and others (Negi, 1982).

6. **Water Pollution**: Mining some times destroys water sources. The soil is disturbed. In hilly terrain the loosened soil is not only washed downhill choking water courses or habitations and silting of tanks, reservoirs etc. the wash off soil also result in the raising of river beds and consequent flooding of agricultural, garden lands and villages.

7. **Unplanned Development**: The development of junggis/slums around mining complex is another impact.

8. **Transmission of Power**: Power lines riddle the country side and mining complexes and sometimes involve clearances of forests and trees which produce a dreary atmosphere.

9. **Blasting**: Quarrying locally and in wear forest areas or exavalation of tacking dams causes serious disturbances of soils, loss of vegetation and affect wild life of the forest in nearby.

10. **Infrastructural Facilities**: The construction of roads, establishment of colonies, processing plants, crushers, tackling dams cause destruction of vegetation, loosen the soil, especially in hill regions leading to soil erosion, requiring costly operations like stabilization of slopes and other works.

11. **On Quality of Life**: The establishment of mining industry results in life style of peoples especially tribals and this result in hitherto peaceful inhabitants resorting to fast life especially youth affecting their health (Joshi and Bhattacharya, 1980).

**General Issues**

Minerals are the foundation of human civilization and the raw materials for every article of human necessity. Besides industrial products, agriculture also depends upon the mineral content of the soil. The concept of
growth governed the mineral industry till the 80’s. Since 90’s the focus is on sustainable development.

Small scale mining was previously considered to be a wasteful mining due to its unsafe and unhealthy conditions, brutalizing labour practice, and damage to the ecology and environment, while in developing countries the small scale mining is playing a crucial role for the country’s economic development, because of their small investment, manageable environmental condition and more direct employment. These are the manifestations of the national concern for rural based strategy and to bridge the resource development in future.

Mining activity in hilly area is quite different from the mining in plain area with respect to all operational and environmental angles. Especially, mining in these areas require special technology to cope with the unique character of the region, such as intensive seismicity, geological and structural setting and other geo-mining conditions. Due to lack of proper planning and other unavoidable reasons, the Himalayan mining system witnessed a drastic amount of environmental degradation and ecological damage. Mining was done in a bottom top fashion proceeding upward from the base of the hill along a steep slope angle, creating large over hangings, which could fail at any moment. During the initial stage of mining, the debris produced water more and was strewn around, to be washed down by rains into rivers, other water regimes and fields because removal was otherwise expensive choked drainage channels caused flash floods. The erosive impact of mining was causing threat to the crops of ginger, paddy, potato and turmeric that are now becoming smaller. Illegal mining also contributed its mite to the debris problem. Instead of using the haulage roads, extracted material were thrown down the slope for collection from the lower roads in order to cut transportation costs. Proper check dams were not constructed to confine debris.
Haulage roads constructed were having steep gradients with no extra width and have quite unsafe curves. Blasting resulted in unstablized zones. As most of the lease holders were given small areas and they did not have the infrastructure facilities, blasting was the only stable operation left with them. According to IBM approved mine plans, they were required to use 32 mm dia drill rods to drill holes of 1.5 m with a spacing of 0.9 – 1.0 m and charge per hole as 140 g. But owing to quick quarry approach miners used to blast using 400-420 g of explosives per hole. In short, while there existed well designed and approved mine plans for most of the small mines, they mainly remained in paper. Actual practice varied widely from the specified guidelines. (Parmar, 1999)

The issue has now become more complex from socio-economic angle because of the disagreement between environmentalists and mine owners. Village communities were also divided, some arguing for badly needed income and others warning of dire consequences from the ecological point of view. Road building and other forms of construction activities were also blamed for creating land degradation in a large scale. In addition, lack of assured facilities for irrigation and need of sufficient rains has made agriculture less lucrative. The per capita income from agriculture was around Rs. 350-400 per month while the earnings from mines were Rs. 2500-3000 per month. The villagers who were directly benefited from the mining activities support the mining whereas those who did not derive any direct benefit were critical of the environmental degradation caused by mining like land degradation, drying up of spring, adverse impact on the fertility of croplands and the overall degradation in the quality of air and water (Parmar, 1999).