Chapter – III

WATERSHED DEGRADATION AND ITS CAUSES

Watershed is not just a geographical area where water drains to a common point; it is also a landscape where communities living within make a living from the available local resources within the watershed. Everyone lives in a watershed. What one does is imprinted upon the watershed. Watershed degradation is a phenomenon by which the potentiality of the watershed is getting reduced, which can be confined to the forest loss and the rate of soil erosion increment, if other factors are negligible. There has been a global concern for environmental degradation especially in the present century and this has emerged as one of the major threats for human survival. In the Himalayas, out of 66 mha of forest land, 19.5 mha are seriously degraded. The dwindling forests are suffering serious losses at the hands of the local farmers, logging operators and charcoal makers. Out of the 6,75,339 km\(^2\) of the total geographical area of the hill districts in the country is 2,48,381 km\(^2\) (36.8\%) which is under forest cover (FSI, 1997). However, the term ‘degrade’ here actually means debase and degraded can be defined as land which has lost some or all its value for human use. Watershed degradation is the degrading the land from
its original use or natural use for example turning the densely forested tract into an open forest or an open forest into a shrub forest and vice versa.

Plate 4: Degraded land in Tuilak-Tuima Sub-Watershed (3C2F6f)

Land degradation is mainly caused by soil erosion and soil erosion is caused by deforestation. Watershed degradation varies the world over with slight regional differences. Degradation of watersheds has been a slow one but over the past one decade or so the degradation of the land has been rapid and fast, this is because of the continuous large scale, indiscriminate and unscientific exploitation of the natural resources thereby degradation and imbalances in the diverse ecosystems in all parts of the world. The basic cause of watershed degradation is a combination of ignorance and economic backwardness of people, outdated social systems and tilling of the land along with charcoal and fuelwood production by rampant cutting of trees. From these, it may be safely determine the following points:
• Cultivating the very steep slope land without adequate soil conservation and this leads to unsuitable agriculture in the region.

• The spread of shifting cultivation coupled with deforestation and charcoal production within the field is due to economic reasons.

• Overgrazing of forests and forest fires leads slow regeneration of trees and also leads to formation of ravines.

• Road-building and other land-changing public works without considering other bio-physical aspects initiates erosion and formation of gullies.
The problem chain of watershed degradation operates at the level of the wider region. Therefore, the main factors contributing to watershed degradation in the upper course of Tuivai Watershed are described and analyzed thereof, namely shifting cultivation, deforestation, weathering and soil erosion, depletion of forest resources.
3.1  Shifting cultivation

Nobody really knows how many people depend on the form of land use called shifting cultivation for their livelihoods. It has been estimated that globally it could be up to one billion. They live in tropical and subtropical countries and belong to at least 3,000 different ethnic groups. In Asia, around 400 million people live in and with the forest, and most of them practice some form of shifting cultivation. The majority of these people belong to what governments usually call “ethnic minorities” or “tribal people”. Today, however, many of these peoples prefer to be called indigenous peoples.

Plate 5: Slashed and Burnt Cultivation
The history of shifting cultivation is as old as the history of agriculture itself. Its origin, however, could be traced back to about 8000 BC, in the Neolithic period when man made an attempt to switch over to food production from food gathering activities. The pre-historic shifting cultivators used fire-stone, axes and hoes; as such, the clearing of forest for shifting cultivation with a primitive method was a historical phenomenon in the humid and wet areas of the world, particularly in the rain forest tropical region. Till today, shifting cultivators made their presence felt all over still in these regions and uses a slightly better form of tools like digging sticks, iron tools; iron digging sticks, daon, hoe and knives. Infertile soils in the humid lowlands of low latitudes are chiefly responsible for farming of a temporary or shifting, which otherwise is an upland cultivation and also generally known as slash and burn. This type of farming is the primitive form of soil utilization and is chiefly carried out in regions with a tropical forest climate. It is widely spread in and along its borders. The tropical regions of the Americas, Central Africa, and Southeastern Asia (including Indonesia) are the home of shifting cultivation.

Here, the farmers grow food only for his family in this agriculture system. Some small surplus if any are exchanged or bartered or sold for cash. They are self-reliant with a high degree of economic independence
and the resultant economic is almost static with little chance of rapid improvement. It is also known by different names in different parts of the world, e.g. Lading in Indonesia, Caingin in Phillipines, Milpa in Central America and Mexico, Ray in Vietnam, Conuco in Venezuela, Roca in Brazil, and Masole in Congo and Central Africa. It is also practiced in the highlands of Manchuria, Korea and Southwest China. Shifting cultivation is known as Jhum in northeast India, Nepal and Bangladesh, Kumari in western ghats, Watra in southeast Rajasthan, and Penda, Bewar or Dahia and Deppa in the Bastar district of Chattisgarh in India, Chera in Sri Lanka, Tsheri or Panshing in Bhutan. In the study area being dominated by the Kuki ethnic group is called Bu-lei or Chang-lei or simply “Lou”. They believed, this type of farming has been in existence since time immemorial and the tradition is still carried on till today in the hills as they believe that this is the only one source where they can base their main food supply.

Shifting cultivation has been described as an economy of which the main characteristics are rotation of fields rather than rotation of crops, absence of draught animals and manuring, use of human labour only, employment of dibble stick or hoe, and a short period of occupancy alternating with long fallow periods. After two or three years the fields are abandoned, the cultivators shift to another clearing, leaving the old one for natural recuperation. This explains the used of the term ‘shifting
cultivation’. Shifting cultivation, though a rudimentary technique of land and forest utilization, represents and intricate relationship between ecology, economy and society of a region, the jhum fields, their surrounding forests and natural areas provide two alternative sources of subsistence to the dependent population. In case the jhum crops are not good, the forests could be trapped by them for augmenting their food supplies. Moreover, the Shifting cultivators keep pigs and swines which feed on the vegetable wastes and inferior grains. The pigs function as the buffer stock which is used during the periods of scarcity and they are also used at the time of festivals and feasts. Shifting cultivation is a great catalytic force for community life. In such societies, their life and livelihood begins and ends with the bountiful nature i.e. the forests.

In the hilly tract of the northeast India, jhumming is the dominant economic activity. Over 86 per cent of the people living in the hills are dependent on shifting cultivation. In 1980, about 1326 thousand hectares were under jhumming which increased to 1685 thousand hectares in 1990. In 1994-95, about 1980 thousand hectares are affected by jhumming. Increasing trend have been noticed in 1999 based on Forest Survey of India that there was; out of which the extent of area was maximum in Nagaland (39,00,000 hectares) followed by Mizoram (3,80,000 hectares), Manipur (3,60,000 hectares) and Arunachal Pradesh (2,30,000 hectares). These four
states together accounted for about 78 per cent of the total area under shifting cultivation in the northeastern region of India. The remaining 22 per cent of the jhums were found in Meghalaya, Assam and Tripura. The above statement of the jhumming area extent is very high in Manipur compared to other state from the point of population composition. Excepting Manipur, the above mentioned states are tribal dominated state and comparing to the tribal population in the state of Manipur, the area under jhumming is thus to the maximum in Manipur. Again, in Manipur, Churachandpur has recorded the highest jhum area of 34% of the total district area. The study area is one part of the watersheds in Churachandpur district, where traditional jhumming is very high.

Fig. 3.2: Jhum Area in % to the Total District Area (2003) (Source: MARSAC, 2003)
The study area being located in the sphere of the chin+kuki ethnic group, the social organization of the people and the land is based on “chieftainship” where the chief is the owner of the land and all its resources. However, the people or the villagers are given the privilege of owning the field during the course of farming. Besides, community participation and communal responsibility exist in all forms for the welfare of the people. Thus, in the society of Shifting cultivators, the old, infirm, women, widows and children have an equal share, and each member of the society plays a role according to his physical and mental abilities. This holds true to other parts of the kuki ethnic group in all the northeastern states also.

Here in jhum cultivations, the agricultural operations are characterized by different forms and are adopted in the following stages in the study area:

(i) Selection of land for the field with ceremonies
(ii) Clearing the selected tract by cutting down trees and are dried by spreading
(iii) Dried twigs are collected and burnt
(iv) sowing seeds by dibbling method
(v) Weeding the field
(vi) Watching and protecting the crops

(vii) Harvesting and threshing the crops

(viii) Village celebrations and feast

(ix) Following the land

Of the numerous stages, the first one is the most important because it requires selection of the site for cultivation. This selection of the site is usually done from December to February by the village elders after due consent from the village chief and his village authority members. The fertility of the soil is judged by the colour and texture of the soil. In some tribes, community as a whole is collectively responsible for the clearing of the selected piece of land while in others the cutting down of trees and shrubs is made by the respective family to whom the land has been allotted. At the time of allotment of land the size and work force in the family are taken into consideration. The area allotted per family varies between half hectare to one hectare among the different tribes, region and states. The land is cleared of all its undergrowth and the branches of trees are cut off. The cleared growth is allowed to dry on the field. This process of clearing which takes over a month is labour intensive, being undertaken with indigenous and primitive equipments. The dried growth as well as the trees standing in the clearance is set on fire in March. The cultivators take care
that the fire are not spread into the forest. After the burning is complete, the unburnt debris is collected in one place for the complete burning. The fire kills the weeds, grasses and insects. Then, the ashes are scattered over the ground and dibbling of seeds begin in March before the advent of pre-monsoon rain.

Once the seeds are sown, the field is looked after by the farmers against the birds and animals throughout till they are harvested and taken home. By May and June, weeding is done in the entire field depending on the severity of weeds, if need be, weeding may be done twice a year. Come October, the farmers anticipate a good harvest to his yearlong labour. The tap sounds of the dried bamboo long with scare crow, the sound of the fielders are heard to warn the birds and animals about their presence. When the crop ripens, harvesting is done collectively in each field by the villagers and thus the festival of merry making begins.

The cropping pattern in jhumming:

The most commonly adopted form of cropping is mixed cropping. The mixture of cropping varies from tribe to tribe within a region. The shifting cultivators grow foodgrains, vegetables and also cash crops. In fact the growers aim at growing in his jhum land everything that he needs for his family consumption. In other words, the choice of crop is consumption oriented.
Among the foodgrains the most important is rice or upland paddy, followed by maize and millets. Cotton, ginger, linseeds, rapeseeds, sesameum, pineapple are important cash crops in jhum fields. Among the vegetables cabbage, alocasia, squash, soyabeans, pumpkin, potato, cucumber, yams, tapioca, chillies, ginger, beans, brinjal, are cultivated. In the mixed cropping, soil exhausting crops e.g. rice, maize, millets, cotton, etc., and soil enriching crops, e.g. legumes, are grown together. This practiced has many direct and indirect advantages. These crops harvest at different periods, thereby providing the tribes with varied food for nearly six to nine months in a year. The jhum land may be cropped by the jhumias for more than one to three years; thereafter the land is abandoned to regenerate itself and recover. Occasionally, some residual crops are collected from the abandoned fields in the later years.

**The jhum cycle:**

The jhum cycle is influenced by the pressure of population, nature and density of forests, terrain, angle of slope, texture of soil and the average annual rainfall. The length of time when jhumias are expected to come back to the initial clearing or the original plot cannot be worked out with any certainty because they usually have vast expanses of land to move about freely. In earlier times, when there was lesser population and the soil fertility was intact, jhum cycle used to be nearly forty to fifty years.
However, in recent decades, some regions have jhum cycle of 4 to 6 years and while others have 7 to 15 years in the northeastern India.

In the upper Tuivai watershed, the cultivators occupy the land for a year and would come back after 7 years if needed. Some come back to the same field and plough a small patch of land for growing vegetables but this is not much prevalent in the present day.

**Impact of Shifting Cultivation:**

Shifting Cultivation is a part of the very ethos of the tribal communities in the world. Their very existence of life has been sustained by this primitive method of cultivation since ancient time and still is expected to be; however, the population pressure on land and the present form of land use have caused serious concerns relating to deforestation, depletion of soil erosion and soil fertility.

**Plate 6:** Forest cleared for Shifting Cultivation, near Chiangpi Village in Tuilak-Tuima Sub Watershed
The clearance of the forested track is the prerequisite of shifting cultivation. The felling of trees and clearing of bushes accelerate soil erosion. The overall impact is the decline in soil fertility. The field loses their resilience characteristics because of soil erosion which is accentuated by the variability of rainfall. The dependent community on jhumming faces the shortage of food, fuel wood and fodder. Consequently, the nutritional standard goes down. These processes culminate into the social poverty and ecological imbalances. In the study area, unlike in the 1980s, when the mode of life was simple and all the natural resources were intact, the present generation is directly or indirectly affected by way of globalization that every nook and corner of the land, cutting down of trees is rampant and has been degraded in the name of shifting cultivation. The people obviously in need of more food for sustaining their lives are pushed to bear extra expenses and therefore are engaged in fire wood production and charcoal production within their field. It is a fact that the practice of shifting cultivation is correlated with charcoal production. Trees felled down to clear the grounds for cultivation are burned to make charcoal, which is commonly a source of income for poor cultivators during leaned period. Therefore cultivators usually selected areas with grown up trees or areas where maximum trees could be cut. This also attributed to the change in land use pattern. There has also been a loss of large tract of forests area
to the east of K.Tuiliphai, along the eastern bank of Tuili River, which is mainly due to deforestation in and around Tuiliphai area. Thus, the process of charcoal making lead to soil hazards as well as increasing the temperature locally. And this could be a disaster in the near future.

The impact of Shifting Cultivation on biomass and soil erosion is nonetheless alarming and this have led to environmental degradation in all its seriousness and therefore some are of the opinion that Shifting Cultivation may be stopped at the earliest possible time. The cycles of shifting cultivation have become shorter; the biomass which has depended on the humus of soil declines and the biodiversity is considerably reduced. The subsistence nature for sustaining livelihood of the people becomes invariably difficult. The transformation of natural vegetations occurred where bamboo and natural forests’ timbers transformed into deciduous scrubs and grasses. Thus, it gradually reduces the forest wealth day by day. The jhumming area coverage, number of farmers practicing shifting cultivation and recurrence of cultivation in the same area are all increasing, resulting in progressive destruction of the ecosystem. Now the situation is such that, there exist a village like Muallum where more than 150 households could no longer get a patch of land even to grow vegetable. Where do these 150 households seek their sustenance is an interesting one and may be discuss later. An area of 0.5 km$^2$ east of Kailam village has
been brought under shifting cultivation in 2006-07. Based on observations and interviews, the findings of watershed degradation due to jhumming cultivation is bound by the web of many factors like the over exploitation of the natural resources in the selected tract for jhum land. The jhumias no longer just depend on the crops to be harvested from the field. Jhumming has practically become more like a hub for poor farmers who are living under abject poverty to sip in till the last straw in their fields. These have led to over exploitation and mismanagement of the natural resources thereby degrading the land, difficult to naturally regenerate and affecting the ecosystem. After the selection of the patch for jhumming, all the trees irrespective of sizes are cut down though in earlier times of jhumming, big trees were felt but never uprooted, roots and stump were intact which have hold the soils altogether from being eroded. But now, the cut trees and even its roots are pulled out either to produce as charcoal or as fuel wood to be sold. When charcoal are made manually, pits are dug depending on the logs of wood would accommodate and burnt. Thus, this process increases the soil temperature and its surrounding areas and thereby dried up the land. The loose soil without any support becomes highly vulnerable to soil erosion.
Table 3.1: Calculated Jhum Area of the Upper Tuivai Watershed

<table>
<thead>
<tr>
<th>No of village</th>
<th>No of households</th>
<th>Average area of jhum area /family</th>
<th>Calculated total area under jhum cultivation</th>
</tr>
</thead>
<tbody>
<tr>
<td>64</td>
<td>3416</td>
<td>0.52 hectares</td>
<td>1776.32 hectares</td>
</tr>
</tbody>
</table>

Source: Field Survey Report

In the study area, almost all the villagers are engaged in jhumming except one village called Muallum with 150 households. This case may be later discussed in deforestation part. So, there are 64 villages with as many as 3,416 households professing shifting cultivation. If the area of the field is approximately taken as 0.52 hac. per family, then 3,416 households 0.52 hac=1,776 hectares of the land are exploitatively cultivated annually (Table 3.1). Thus, we can easily assume the impact of the forested land in the hills. It can produce about 150 tins to 180 tins of rice (about 5 tins=1 phoupot) and is single crop in a year. If this trend continues then the desertification of this sub-tropical rainforest is not far behind. Some adverse environmental impacts were found to be a consequence of prolonged shifting cultivation that the composition and growth of the natural vegetation is gradually declining after each cycle of cultivation. The productivity of land is declining and thereafter productivity gradually
declines even if fallow periods are maintained in most part though Chiangpi, Tuima and Tuilak do still feel that the soil fertility is still intact and the consistent productivity is still maintained. But based on observation and interviews, these villages no longer support large households as it used to be ten years ago. Besides, many farmers reported that the damage to crops from wild animals is increasing every year, which could be the result of ecological imbalances created by watershed degradation. Sheet, rill and gully erosion are common due to high intensity rainfall just after clearing, burning and sowing. The scars of such erosion are conspicuous in all villages. Despite the fact that there is no monitored evidence, interviews with local farmers revealed diminished availability of water. They have observed that the water flow is decreasing and the length of the dry period is increasing in the local streams and springs supplying drinking water. In the past traditionally the Jhum cycle was used to be longer than 15 years and enabled regeneration of forests before the same land was cultivated again. However, in recent decades, due to increased population pressure and socio-cultural changes in traditional lifestyle of indigenous communities, the Jhum cycle has come down to 5-6 years and even 1-2 years in extreme cases. With this shortening of Jhum cycle, these Jhum sites are unable to regenerate and hence have become severely degraded.
3.2 Deforestation

Forest are invaluable assets to a nation because they provide raw materials to modern industries; timber for building purposes; habitat for numerous types of animals and micro-organisms; good friable nutrient-rich soils having high content of organic matter; often protection to soils by binding the soils through the network of their roots and by protecting the soils from direct impact of falling raindrops; they encourage and increase infiltration or rain water and thus allow maximum recharge of ground water resources; minimize surface run-off and hence reduced the frequency, intensity and dimension of floods; they help in increasing the precipitation; they are the natural ‘sink’ of cause carbon dioxide because they use carbon dioxide to prepare their food during the process of photosynthesis; they provide firewood to millions of people all over the world, and food and shelter to innumerable humans and animals. In fact, forests are ‘life line’ of a nation because prosperity and welfare of a society directly depends on sound and healthy forest cover of a nation concerned. Forests are main components of the natural environment and the stability of the environment and ecosystem/ ecological balance largely depends on the status of the forests of the region concerned (Savindra Singh, 1995).

Deforestation has immediate adverse effects on soil and land because of exposure of ground surface to high intensity rainfall. Due to
lesser tree cover, the top soils are easily carried away by the rain water. India has also not been exception to the present global trend of rapid rate of deforestation. The underlying causes of deforestation are rooted in a complex web of social, economic and institutional problems both within and outside the forestry sector. They include the combined effect of poverty, skewed land distribution, insecure land tenure, low agricultural productivity, rising population pressure, increasing demand for tropical timber, fuel wood, fodder and food grains (Dent, 1990). In Manipur, degradation of forest cover is on the rise with an annual average loss of 75.9 km$^2$. The total forest coverage was 17,685 km$^2$ in 1989 and gradually declining since 1997 but recorded its lowest coverage in 2001 by 16,926 km$^2$. It is estimated that forest cover of about 20 hectares is being destroyed daily in Manipur (FSI, Dehra Dun).

Fig. 3.2: Trends of Forest Cover in Manipur (1987-2005). Source: MARSAC
Causes of deforestation:

The major causes of deforestation at global and regional levels are conversion of forested land into agricultural land, shifting or jhumming agriculture, forest fires, timber operation, road building, multi-purpose projects, mining, cattle rearing, charcoal production, firewood collection, etc. Logging operations, which provide the world’s wood and paper products, also cut countless trees each year. Loggers, some of them acting illegally, also build roads to access more and more remote forests—which lead to further deforestation. Forests are also cut as a result of growing urban sprawl. In the study area, deforesting (is people made phenomena of clearance) the naturally occurring forests for many reasons like the need for more agricultural land, the need for selling the cut-trees or derived charcoal to be sold for fuel or a commodity to be used by humans, also the use of the trees for heating in domestic uses. Forests are destroyed and trees are cut down for many reasons, but most of them are related to generate cash income to provide for their families’ need. The biggest drivers of deforestation are shifting cultivation, logging operations and charcoal production. Often many small farmers each will clear a few acres to feed their families by cutting down trees and burning them in a process known as “slash and burn” agriculture. Besides, a combination of human and natural factors likes forest fires and subsequent overgrazing, which may prevent the growth of young trees.
Shifting or jhumming cultivation:

Plate 7: Jhum Cultivation in Tuilaphai Sub-Watershed

Jhum cultivation has now become the major cause of forest loss in this hilly watershed. This is because of the fact that additional profits are made from firewood and charcoal production in the field thereby totally wiping out for easy regeneration of trees growth. The increasing population with the unceasing jhumming of the land by every household every year to feed their families is the main economic factor behind deforestation. Approximately 3,416 households are engaged in shifting their agricultural land every year. Therefore, approximately 1,776 hac. of land are deforested every year for agricultural expansion. Shifting cultivation and deforestation are like the two sides of the same coin. Shifting cultivation cannot be carried out without cutting the woods and this have been discussed in the earlier part.
Timber Production and Firewood Production:

The demand for timber and firewood in both the urban and rural areas is on the rise for industrial and domestic purposes. The study area was one of the major sources of timber goods until recent times. From the socio-economic survey conducted by forest department personnel, per capita requirement of timber was worked out. The average requirement is 0.2496 cum per family per annum and therefore, the average requirement of timber per annum is $3,566 \times 0.2496 = 890.7$ cum. Timber production is mainly done in villages like Vokbolin Phailon-Phungchongjang Sub-watershed, Moukot, Moulzin, Khuaithum and

Plate 8: Timber and Firewood Production
Tangprijol in Likhai Sub-watershed, Boulkot and Sialsi villages in Tuivai Sub-Watershed, and also in Lhungthul villages in Tuilak-Tuima Sub Watershed.

The study area which was once the major source of timber has now become the major source of fuelwood in the entire states of Manipur this is due to the degrading forest cover. The demand for firewood is also increasing because of the demand for fuelwood by brick manufacturers in the valley districts and also in Churachandpur town. Villages like Zabellei in Singtam sub-Watershed, Likhai and Khuaithum in Likhai Sub-Watershed, Boulkot and Sialsi in Tuivai sub-watershed are the major producing fuelwood for brick factory. On the other hand, in the study area, considering the size of family as 06 members and the per capita consumption of 8.5 kgs for rural, the requirement of firewood is 1.106 lakh MT per annum. At present Tuilum-Dumdei Watershed (3C27f) is the most exploited one followed by Tuivel-Likhai Watershed (3C2F7e) and Singtam Watershed (3C2F7a). These watersheds are dominated by forest-scrub forest. Tuima–Tuilak Watershed is a recent addition to timber production since the 1990s and remains now as the most important economic activity of the people living within this watershed. Muallum in Tuilum-Dumdei Sub-watershed is the transit point for this and the woods are coming from the neighbouring villages like Buksao, Phaimol, Simbuk, Tuijang,
Hengmol, Dumdei, Chaknou, Buangmun and Mollen. Timber and Firewood are commercially thriving in this area which is proven by the fact that none of the villagers in Muallum are engaged in agriculture or other activities relating to farming. The 150 odd households sustain their livelihood by earning daily wages mainly from loading and unloading of wood in this village, they also earned daily wages from the neighbouring villages in the form of wood cutting, loading and unloading the wood. One load of truck is 4 kila the cost is Rs 21,000/- at Muallum. One interesting fact also emerged from the fact that in Tuilumjang, Mongken and Moukot, although it is approx. 30 kms away from Muallum, one load of truck cost rupees 25 thousand. This is because the standard sizes of the firewood are better as one move farther away from Churachanpur town. In Muallum10-15 trucks are engaged daily for the collection of firewood from the neighbouring areas. Between three to ten trucks leave everyday with full load of wood to be sold in Imphal. None of the villagers are employed in any government sector however; their income is mainly based on activities relating to cutting of trees, loading and unloading of firewood and timber. Besides, income is also supplemented by the wages earned in MGNREGS. Forest depletion is alarmingly high especially in recent years although this trade has been in practicing since 1958 when its households were around 20-30 households. Firewood collection for commercial purpose is carried out everywhere on a seasonal basis but it thrives throughout the year in
Muallum and its neighbouring villages. People are aware of the rapid deforestation taking place but this is subject to their livelihood as they had not much choice!

**Forest fires:**

Of late, forest fires create havoc almost in all parts of the watershed. Besides, the wild fires, there has been report of forest fires caused by negligence with fire. Forest fires are set for the purposes of hunting of wild animals, clearing of vegetation for cultivation, protecting homesteads/villages area from fire and for regeneration of fodder grasses. Every year particularly during the dry season, large tract of forest areas are set to fire in an uncontrolled manner and causing maximum damages. Potentially good forest areas are reduced into scrubby conditions on account of repeated fires. When forest fire occurs, it usually burnt the whole of meso-watershed which have led to drying up of the forested tract, loss of biodiversity, retardation in the growth of the plants, susceptible to disease, insect attacks and other infection from fungus, etc. The study area is very much affected by forest fires every year. Hypothetically we may say that the impact of forest fires in the years to come to be as bad, as it could very much lead to watershed degradation. Besides, the cattle grazers are usually the Nepali people who settled in the village on a temporary basis with just two or three households but with 50-100s of goats and 30-80
cows. And they are a yearly tenant on payment of one cow each year. Other than the natural fires and other negligence, it has also been reported that forest fires are intentionally done by the cattle grazers especially nearby the village settlement in order to foster the growth of grasslands in the following year to feed their cattle. The village Chief would permit them for another year in order to prevent the increase and nuisance of pests like snakes, rat, etc.

Plate 9: Degraded Forest due to forest fire
The construction of highways is the infrastructure development or an asset for growth and development. However, in the study area it contributes most to deforestation because roads encourage a more easy access to the interior forests which otherwise hampered the movements of trucks to collect the wood, charcoal, etc. Fire woods are also used in large amount for the construction of roads. In other words, the inlaid of roads have accelerated the rate of deforestation. At the same time, huge amount of natural soil is being dig up and thousands of trees are uprooted thereby accelerated the pace of weathering and erosion since as the general slope of
the land is very steep of >35% in all the watersheds. Where ever, trucks like shaktiman can drive in, it is seen that large scale deforestation are taking place. Even, the south-western part of the study area i.e. Tuilak-Tuima Watershed also started to show rapid deforestation since the 1990s after the partial improvement of Guite Road. The dense good forest areas where there are good growing stocks at present are mostly limited to inaccessible areas, steep slopes and in particularly in and around the slopes of rivers/stream banks and are found in small areas. They have been spared at least for the time being from extraction only because of off-road extraction difficulties.

**Charcoal Production:**

Charcoal manufacture is very destructive to our forests and land. In the study area, almost all the jhumias are also engaged in charcoal manufacturing because it is from their field where they could produce the charcoal. Every household could produce 100 bags of charcoal on an average. There are some which could produce as many as 300-500 bags. Besides, there are also some who are engaged in this charcoal business so they bought the trees from a patch of land specially for producing charcoal. This causes rapid deforestation in the watershed because any wood or trees are converted into charcoal. There is a wide market for charcoal throughout
the year because of the frequent shortages of LPG and erratic power supply in all parts of the state and main markets are in Churachandpur and Imphal. For example, every jhumia are producing charcoal in their jhum field during the “slash and burnt” period. This is the easiest mode of getting immediate returns from their field within the shortest span of time. Based on field survey reports, the charcoal bag produced per field varies from field to field. There are some which could gather only 20 to 30 bags of charcoal and there are also some which could produce as many as 80-100 bags of charcoal from their field. Table 3.2 shows the average charcoal bag produced for the entire study area taking 50 bags on an average per field by each family. Each bag of charcoal is sold at Rs 200 depending on the quality of the charcoal and the middleman would come and buy from them. Thus, we may also calculate the immediate monetary returns each family can get in the study area by simply multiplying the money per bag and the total number of households, it comes to about Rupees 3,41,600,00.00 only.

To produce a bagful of charcoal, one has to cut down as many as 8-10 standing trees. So it is imaginable as to how much of the trees are being cut every day and every year. The production of charcoal is ecologically disastrous, in situ destruction of its biosphere, health hazards for the charcoal makers as they are directly exposed to dust and smokes of the burnt woods and from the charcoal itself while collecting from the source.
till they sell it off by cutting and uprooting the trees, then digging of pit to burnt the cut fallen trees, taking out the charcoal from the pit the next day. Thus, it’s a disastrous activity all along. The main villages who are also commercially engaged in charcoal production are Thenjol and Zabellei in Singtam Sub-watershed, vokbol in Phailon-Phunhongjang Sub-watershed, Likhai in Likhai sub-Watershed, Boulkot and Khuaithum villages in Tuivai Sub-watershed.

Table 3.3: Estimated Charcoal Production of the Upper Tuivai Watershed

<table>
<thead>
<tr>
<th>No of village</th>
<th>No of households</th>
<th>Average charcoal bag produce/field</th>
<th>Average total no of bags</th>
<th>Annual monetary return in rupees</th>
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</thead>
<tbody>
<tr>
<td>64</td>
<td>3416</td>
<td>50</td>
<td>170800</td>
<td>3,41,60000.00</td>
</tr>
</tbody>
</table>

Source: Field Survey Report

Thus, we see that the sale of forests produce and other commodities are at Tuima, Aina, Muallum, etc. the main consumers of timber and fuel wood are the people in the valley area. Only a negligible quantity is utilized locally. Charcoal has now officially replaced kerosene oil as fuel of the poor and low income group of people.
Impact of deforestation:

The impact of deforestation on the environment can be seen in the form of micro-climatic change, increase in temperature and decrease in humidity/rainfall, soil erosion in the form of sheet, rill and gully erosion, increase in the frequency of landslides, loss of soil fertility, water scarcity, etc. All these lead to unaccountable destruction and also pose serious ecological problems. A problem of water scarcity occurs in all the villages in the watershed and this problem is mainly because they settled along the top of the hills or along the slope near the highways. Population growth put unremitting pressure on the land. Eventually, erosion washed away much of the topsoil and much of the rainwater could not percolate beneath the topsoil. Water was the not the major problem in the past unlike the present time. This is becoming because of the high rate of deforestation mainly in the upper reaches of the watershed. The sources of drinking water are mainly from springs and streams which were perennial a decade before but now become a seasonal one. Usually all the villagers would tap the water from the springs, built a small reservoir and laid a pipe till the village. Muallum tapped the water through a pipeline in the forest of its neighbouring village Simbuk 2 kms away from its village but this also get dried up in winter season and the villagers would collect water from a spring, one km away from its village. Now these sources of drinking water
have all dried up and villagers would travel for 5 kms in Muallum for a pot of water. The acute water shortages is proven by the fact that on Sundays when the trucks are not on their usual routine would be hired for carrying water from the emerging water of Khuga Dam water by the villagers. Even in Tuilaphai, the lowest elevation in the watershed would harvest drinking water through a pipe of 1 km long from the Doldung Lui. Mollen water source is close by to the village. In Chiangpi village in Singhat subdivision, the souce of drinking water is a spring, 200 metres away taken through a pipe; its volume is not larger than the size of a straw but somehow manageable by the people throughout the year because of its less population. Thingkeu villagers would even travel for 2 odd hours to fetch a pot of water. Therefore, Tuilum –Dumdei Watershed, Singtam Sub Watershed, Tuivai sub-watershed and Likhai sub watershed have become highly deforested. The decreasing non-vegetative cover has intensified soil erosion and is prominent along the eastern part of the study area. This forests area has been subjected to exploitation. Rampant clearing of forest for timber, shifting cultivation, production of charcoal and fuel wood in the past are easily recognizable. Regeneration of the forest is slow and takes time mainly due to over utilization. These watersheds are located over strongly sloping (10-15% slope) to very steep slope (>35% slope) in areas near Hiangtam, Boulkot and Likhai. It is also interesting to note that almost
all the areas covered by these watersheds have been highly eroded by numerous streams and gullies locally called “Luis”. These areas have been over exploited at one point of time and erosion activities have been taking place unceasingly to date. Smaller areas are also found in areas with very steep slope (>35% slope) in Thenjol, and in areas around Tanglon, Tanglon and Tuiyang, Pangsang, Vungbuk and Tuilaphai villages.

The villagers are all aware of the water scarcity due to deforestation and degradation in the upper reaches but they cannot help stop cutting the wood as their immediate need for food is more important. All these human forces interact with the natural forces to directly shape the condition of the land and water. For example, the deforested land areas could no longer percolate or seep through the rainwater as it would have but rather the rainwater become the agent of eroding the top-soil and thus gullies are formed.

**Forest resources (biotic and abiotic):**

Forests, biodiversity and other natural resources merge into one in this region to become the foundation of people’s sustenance. The study area belongs to the Southern Forests Division, Churachandpur in Manipur. In spite of its smallness in size, the area is rich in flora and fauna and varied in character. This is because of the different climatic conditions
found in the state and its peculiar physiography being the Indo- Malayan realm and contains the flora and fauna elements of other parts of India. The distribution of natural vegetation is controlled by factors like the sunlight, slope, temperature, rainfall, humidity and moisture of the soil. The natural drainage system also exerts influence on the distribution pattern of the vegetation. The forest area consists of four types of forests viz. Tropical Semi-Evergreen forests, Tropical Moist Deciduous Forests, Wet Hill Forests and Sub-tropical Pine Forests. Subsidiary Edaphic type i.e. bamboo forest is also found. Botanical Survey of India has published Flora of Manipur (vol I) in the Year 2000 which contains information about the availability of various species in the division. There are dominant and co-dominant trees like Albizzia spp., Lagerstroemia spp., Sterculia urens, Ficus spp., Toona ciliata (Tairel), Cordia dichotoma (Lamuk), Quercus spp (Uyung), Alnus spp.(Pareng), Canarium resiniferum (Mekruk), Schima Walliechii (Usoi) to mention a few. Besides, the species diversity of different forests types of Southern division Churachandpur conducted by Biodiversity Characterization of Landscape, level using Remote sensing and GIS, National remote Sensing Agency (NRSA 2002) wherein ascertained that Moist Deciduous forests is richest in terms of species diversity followed by semi-evergreen forests and secondary moist mixed deciduous( Wet Hills forests). However, the general condition of the
forests flora may be said to have become very poor. The Very dense forests crown density above 70% is very very less and is found only in the northwestern part of the study area i.e, Keilam Range and also in Sinjawl. The dense forest areas where good growing stocks at present are mostly are limited to inaccessible areas, steep slopes and particularly in and around the slopes of rivers/streams banks. They have been spared at least for the time being from extraction only because of offroad extraction difficulties.

**Forest Products:**

Since the area is richly endowed with varieties of forest products, the resources have been extracted and utilized unceasingly. The products which are mainly extracted are timber, fuelwood and charcoal. These are extracted by the people on almost daily basis to generate income to sustain their livelihood. Bamboo and brooms are also available in sizeable quantities. Honey, wax, horns and hides are also found in small quantities. Some of the important produces are dalchini and is found in the dense forest areas epiphytic and terrestrial orchids are plenty. Other marketable products collected from the forests by the people are Haiba mana (young leaves of Ficus auriculata), leaves and fruits of of Samba (Oroxylum indicum), young tender leaves of heimang (Rhus succedanea), mukthrubimaton (young tender leaves of Xanthoxylum acanthopodium),
inflorescence/fruits and barks of ushingsha (cinnammum zeylanicum), Manahi (fruit of Terminalia citrine), heikru (Emblica officinalis), Tokningkok (Houttuynia cordata), Ushoi maton (young tender leaves of schima wallichii), yendung (Cycas pectinata), leaves of Moirang- Khanam (Clerodendron serratum), Yaipal (Curcuma angustifolia), Lohlei (Alpinia allughus), Pullei (Alpina nigra), Kwamanbi (Smillex spp.), Lemra, Ching yensil, myrobulans (fruits of manahi/ phyllanthus or emblica), bamboo shoots, kanglayen (Wood lichens), some edible fungi, mushroom are also found and collected by the people from the forests.

The marketable timber species are Terminalia myriocarpa (Tolhao), Albizia lebbeck (Uiel), Duabanga grandiflora (Tal), Pinus kesiya (Uchan), Michelia champaca (Leihao), phoebe hainesiana (Uningthou), Alnus nepalensis (Pareng), Toona ciliate (Tairen) etc. they all find an easy sale in Kumbi, Moirang, etc. next in order of importance is Quercus spp. (Uyung), the piles and posts of which are in great demand. Other species of great economic value are Castanopsis spp. (Shahi/Kuhi, Manahi, Thangji, uchan) is sometimes converted to timber of various sizes. Coppice of Uyung, shahi and Kuhi are rather pollarded repeatedly and exploited for fuel. Bamboos are found in the catchment areas of rivers/ streams and other areas of the forests.
The study area being in the junction of the Himalayan region and the Malayan Hotspots, so much of faunal diversity is also available such as monkeys, gibbons, wild cats, goats, pigs, porcupines, pangolins, foxes, sambar, sabeng, hog deer, slow loris, clouded leopard, the Himalayan black bear, the barking deer, etc. Among reptiles, snakes, lizards, etc are common. Fishes are also found in wide variety and number like pengba, tharak, ngaton, carps, anabas, clarius, lata, etc

Classification of forests:

Forests of the Southern Sub-Division may be characterized in the following different types:

(i) **Tropical Semi-Evergreen Forests:** this type of forest is in the localized pockets, where rainfall is heavy (200-300 cm) at elevation not exceeding 900m. as the number of rainy days are more the forest remain wet for longer period and evergreen species dominate the forests. This type of forest is characterized with three storeyed of vegetations. The undergrowth is thick. The regeneration of main species is poor due to lack of proper openings.

(ii) **Tropical Moist Deciduous Forests:** this forest is confined to an altitude of 900m at and in Thanlon, Pansang and Henglep Block where annual rainfall is 150-225m. This type is not
typical natural deciduous forests but only sub climax or manmade forests. These are characterized by seasonal leaf shedding, profuse flowering of the trees and are subjected to extensive anthropogenic pressures. Secondary mixed species are usually regenerated. These forests are as much extensive in distribution as well.

(iii) **Wet Hill Forests:** this type of forest is found in the upper hill slopes and hill tops between the elevation of 900-1700m above msl. mainly in Thanlon, Parbung range, Pansang and Henglep block of Churachanpur range. Crop combination is more or less similar to moist deciduous forests but the growth rate is slow and top height does not exceed 23m.

(iv) **Sub-Tropical Pine Forests:** it is found at an elevation of 900-1800m where moderate rainfall occurred. The forest is interspersed with grasses where dominant species of pine is absent.

(v) **Bamboo:** Bamboo dominates and are evenly distributed throughout the study area. However with recent flowering of the bamboo brakes have been either harvested or decayed. Besides, being an important forest product bamboos are also planted for domestic purpose around one’s house.
Ecological hotspots:

The study area is in fact lying in the junction of two ecological hotspots, the Northeast India and the Malayan Hotspot and is so much so that the biodiversity is at best in its flora and fauna characteristics but variety of endemic species of this region has been threatened and few also have been extinct. Northeast India is often quoted that it continues to be a forest surplus region. However, the forest cover is rapidly disappearing from the entire region. The study region, because of its terrain and its remoteness posed hindrance in proper documentation of all the species. In recent times, due to the continuous deforestation and hunting of wild animals, it started to imbalances the ecosystem which have led to the extinct of some species and endangering many more other species. However, today one faces the prospect of these resources being depleted and the Northeast becoming a biodiversity hotspot. Therefore, conservation measures in situ should be taken up to preserve the rich biodiversity.

3.3 Weathering and Soil Erosion

Throughout history, human activity has from time to time caused disastrous erosion and consequential land degradation and loss of land productivity, sometimes over extensive areas. This process is called “accelerated erosion or simply” soil erosion”. Soil erosion is widespread
and most serious problem of land degradation. It occurs at many locations throughout wherever deforestation, land clearing or agricultural activities are taken along the steepland. The most serious consequence is a reduction in the productivity of crops and other forests products in which the local people depends for its food and fibre needs.

Plate 11: River Tuila before the Onset of Monsoon (April Month).

In the study area, being hilly and deforestation being actively carried out, the most widespread form of soil erosion is water erosion. Water erosion is a complex process involving the detachment of particles from the soil, followed by their transportation and subsequent deposition. The process is an intermittent and episodic one, occurring principally at the time of heavy rainfall, overland flows and stream flooding, the rate at which it occurs depends upon many factors, which include climate, weather, soil characteristics, topography, plant cover and land use. In all
the sub-watersheds, it is the traditional farming system, cultivation land on steep hill slopes coupled with deforestation of varying degrees have accelerated the rate of erosion and degradation.

Plate 12: Weathering and Erosion in Tulim –Dumdei Sub-Watershed

It is due to the presence of steep slopes, thin or erosive soils; the situation is further compounded by heavy and high intensity rains in the upper watershed areas. These natural conditions of instability are aggravated by the inappropriate use of slopes. Surface runoff is greatly increased due to excavation of slopes, diminished vegetation cover, compacted soils, and many other activities that reduce water intake to the soils. In recent times, this has become a disaster since it started causing
losses of lives and affecting the standing crops whose top-soil has been removed by rainwater and later exposed to heat. And in the study area moderately sheet erosion is highest in Tuilaphai Sub-Watershed (3C2F7g) and which is visible in 3,539.1 hectares and least in Tuiliphai Sub-Watershed (3C2F6l) which is visible in 266.95 hectares of land. Moderately erosion is found throughout the study area but it is visible more along the areas close to the highway, especially along Singhat-Behiang Road (Table 4.2). Severe sheet erosion is highest in Tuilak-Tuima sub-watershed (3C2F6f) and accounts for 264.87 hect. of land. Severe sheet erosion is found in all parts of the study area except in Likhai Sub-Watershed (3C2F7e).

### 3.4 Depletion of forest resources

The ignorance of man and its greed on the nature have led to the depletion of forests resources. Man has become the worst enemy of the forests. Human being causes maximum injury to the forest. The people in the vicinity of the forests clear forest for jhumming, firewood collection, Minor Forest Products collection and for hunting. The jhumming has become the most unscientific and improper land use practices. Trees are cut down without observing any rules and regulations which will otherwise allow retaining its productivity. The cleared patches for jhumming and improper land use practices are scattered here and there as such depleting
the forest resources. Survival compulsions have forced the poor people to do jhumming or resort to illicit felling of trees. People collect pine torchwood from standing/growing pine trees. In some other areas charcoal business making make considerable damages by destroying rootstocks. There the actions of timber traders, dealers of NWFPs (Non-wood Forest Produces) and middleman cannot be ignored. They tried to extract as much possible during a specific period of time, unmindful of the sustainable yield. Thus, the entire forest area crop is not free from the injuries inflicted by the actions of man. In the study area, very dense forests are found only in Keilam and Sinzawl in Thanlon sub-division.

Table 3.4: Number of stems in Dense Forest in selected blocks of Upper Tuivai

<table>
<thead>
<tr>
<th>Blocks/sub-division</th>
<th>Total area in hectares</th>
<th>Number of stems</th>
<th>Area in hectares covered by the stems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pangsang/Henglep</td>
<td>227.8</td>
<td>100-140</td>
<td>108.07</td>
</tr>
<tr>
<td>Simbuk/Singhat</td>
<td>715.5</td>
<td>20-80</td>
<td>669.6</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&gt;160</td>
<td>0.29</td>
</tr>
<tr>
<td>Chekla RF/ Singhat</td>
<td>510</td>
<td>20-80</td>
<td>465</td>
</tr>
<tr>
<td></td>
<td></td>
<td>161-180</td>
<td>0.49</td>
</tr>
<tr>
<td>Sinjol/Thanlon</td>
<td>447</td>
<td>&gt;160</td>
<td>14.93</td>
</tr>
</tbody>
</table>

Source: Southern Forest Division, Manipur 2010.
Dense forest are found throughout, examples of the number of stems per hectares may be cited for our assessment based on the above table: Pangsang block in Henglep sub-division has an area of 227.8 hac. of dense forests where 100-140 stems are found in 108.07 hac. of land. In Singhat, out of the 715.5 hac. of dense forest land in Simbuk Block, 20-80 stems are found in 669.6 hac. of land and more than 160 stems are found in 0.29 hac. of land. And in Chekla RF, 510 hectares are under dense forests, 20-80 ranging stems are found in 465 hac. of land and 161-180 stems in 0.47 hac. of land. The irony is that this is the only RF where deforestation is to the maximum. In sinzawl in Thanlon sub-division, 447 hac.of land are under dense forests, out of which 14.93 hac. of land has more than 160 stems above in per hac. of land and the rest of the areas have a good distribution of trees throughout.

Moreover, extensive grazing by domestic animals by the people without control and these causes maximum damage or destruction to the forests by destroying regeneration. Moreover, there is also the practice of allowing Nepali cowherds to raise quite big cattle population in unregulated/uncontrolled manner and this contributes significantly to the conversion of potentially good forest crop area into highly degraded and unproductive land.
Forest depletion is also caused by forest fires. Forests fire are set for the purpose of hunting of wild animals, clearing of vegetation for cultivation, protecting homesteads/village area from fire and regeneration of fodder grasses. Every year during dry season, large tract of forest areas are set to fire in an uncontrolled manner and causing maximum damages. Potentially good forest areas are reduced to scrubby condition on account of repeated fires. The harmful effects of uncontrolled forest fires among others are resultant lower biomass production, and prevention of regeneration. Young regenerated areas are not free from fire and damage as a result there is retardation in the growth of the regenerated seedlings and the burnt portions of the growing wood are susceptible to disease, insect attacks and other fungus.

Even the fire wood for local consumption is getting scarce that the womenfolk have to walk long distances to gather wood for cooking. Every household depends on firewood for cooking and also to keep themselves warm during cold season. Based on interviews and observations, the average consumption of dried firewood per day is approximately 300 kilogrammes, which is very much close to the average consumption per family given by the forest department i.e. 0.2496 cum.
Overexploitation of forest wealth:

Upland cultivation has never exploited the land and the forest in the past but the recent trends is such that people clear the land completely for cultivation. People used firewood but never overexploited as they would rely only on the twigs and dried trees. Even if the trees are cut on selection basis for sustaining forests. The complete clearance of the land for jhumming cultivation, indiscriminate in cutting down of trees for logs and timber, charcoal making, cutting down of the trees for its barks, flowers and fruits rather than harvesting or plucking have led to decline of edible bearing plants. The shoots of bamboo and its trunk are also exploited. Throughout the study area, big trees are nowhere to find. Many commercial trees such as Thingkang, Moulgieu, Hol/Uningthou, Dol (Teak), Thingdol, Tatpong (Harhkohthoum), Walnut (Makhaga), Lhonglhi (Mahagony), etc. are endangered because of over-exploitation. Hence, the habitat for wild animals and birds are also threatened.

Endanger species of flora and fauna:

Plate 13: The Skulls of Wild Animals-a trophy!
Although the area is rich in biodiversity, ignorant, poverty and unscientific utilization of the land, forest fires, varieties of flora and fauna have been endangered. The changes in local climate due to deforestation in particular have threatened so many floras such as Thingkang, Moulgieu, Hol/Uningthou, Dol (Teak), Thingdol, Tatpong (Harkhothoum), Walnut (Makhaga), Lhonglhi (Mahagon), etc. As for fauna, due to decimation of the game animals and birds carried out through the ages, hunting for meat and trophy and intolerance of people to wild life and the progressive destruction of habitat, several species like Clouded leopard, Barking deer, sabeng, Siel (Mithun), Sakhi (Deer), Sasan (Wild goat), Sajuh (Deer), Sagoul (Wild Boar), etc. which was once abundant have now become rare. Besides, the bears, leopards, civet cats are no longer seen in these forests. Even the monkeys are also no longer seen except in small pockets in the secret grooves. The endangered birds are Vaso, Vahai (Hornbill), Langke, Vakhopi, etc. Vaphoul species is no more found in the study area but the local people believe that this bird might have migrated to Jiribam and Silchar side of Assam areas because of the mass destruction of Thingdol tree.

**Biodiversity:**

The region is rich in flora and fauna diversity. The remoteness and difficult terrain has, however, resulted in poor documentation of the faunal diversity in the study area. Types of forest range from tropical to sub-
alpine. Though small in area, the forests of Manipur represent all types of forest in the northern hemisphere except that of the Tundra. Manipur is located at the confluence of two tectonic plates (the Burmese and Indian). The region has been recognized as a Vavilovian center of origin for a variety of angiospermic plants. It has also been much enriched by the considerable inflow and outflow of flora and fauna between the Southeast Asian countries and the Indian subcontinent through this region. Frequent and large consumption of wild edibles, the poor tribal communities of NE region meets their protein, carbohydrate, fat, vitamin and mineral requirements. Other reports suggest wild edibles also generate substantial income to the poor rural populace in the region. Based on the report given by the Southern Forest Department, Manipur, 2010, the highest biological richness in Manipur is in Chiangpi in Churachandrapur District. Despite the richness of biodiversity reported, the local people are at the receiving end that most of the wild edibles like plants, mushrooms, wild animals, and fishes are much on the decline and is not easily available anymore.

Problems related to biodiversity, as identified in the state biodiversity strategy and action plan, which may also found to be in existence in the study area are:

- There is a wide information gap pertaining to biodiversity management and conservation between the poaching, and destruction of habitat (including chemical poisoning), or to
conserve specific biodiversity areas, are seen as either irrelevant to local commitments or unnecessary hindrances to their activities.

- The various provisions and implications of the Indian Wildlife Act (1972), the Manipur Rules (1974), the Forest Conservation Act (1980), and the Environment Protection Act (1986) fail to reach every corner of the state, and seem applicable only to urban and suburban populations. The people of remote areas, particularly in the hills, have little knowledge of rules and regulations to protect wildlife.

Key threats to Biodiversity of NE region may be mentioned which is very much applicable to the study area. Among the major threats to biodiversity of the target region following deserve mention:

1. The primary vegetation in extensive areas of the Northeast India has been disturbed and modified both through natural and anthropogenic causes. However, the first one has contributed only marginally to the change in vegetation type; human induced activities have led to unprecedented loss of dense forest and other natural assets and resulted loss of biodiversity in the study area. The region has witnessed excessive logging since 1950s and charcoal making since the 1990s.
2. Shifting agriculture or slash-and-burn agriculture is the major land use. This traditional practice has now become a catalyst in logging and charcoal making, keeping aside the poor management of the cultivated land area leading to deforestation in the region.

3. Grazing pressure on forests and grassland is one of the major factors for degradation of forests. Grazing therefore constitutes a threat to forest conservation and biodiversity in the State. Enforcement of strict control or imposition of restriction to such disturbance under existing socio-economic conditions is practically impossible.

4. Forest fires are common and frequent in the region. The fires at the end of winters are a rule rather than exception. The villagers set fire to forest floor, which is littered with inflammable dry leaves and twigs. Regeneration (natural as well as artificial), is affected and wildlife is impacted negatively. The hill forests also get burnt due to jhum fires going out of control and spreading to the surrounding areas.

5. Towards meeting the increasing demand of certain products, in some cases, the indigenous varieties have been altogether ignored. The current dominance of HYV seeds and nurseries
have led to significant reduction in the genetic diversity of these species. Similarly, new varieties of poultry, livestock and fruits have been brought in the region.

6. Unplanned activities of development infrastructure are resulting into a great pressure on fragile ecosystems in the region. The adequate facilities for monitoring, baseline data, impact assessment and threat or risk assessment still need to be developed. Lack of coordination between developmental departments and proper planning may be taken as major factors.

7. The traditional wisdom of indigenous communities contributed greatly for the management of biodiversity. However, with increasing disparity between the haves and have-nots led to disruption to this tradition. Their values for nature took a backstage due to the poor socio-economic conditions of the local people. In addition, the exposures to globalization have largely impacted negatively as of now but the real assessment will be seen later.