

Chapter 7

Land Use Change and its Impact on Environment

7.1 Introduction

Before 1835, Darjeeling hill area was covered by natural forest, in 1835 there were about 20 huts with a population of 100 souls. The entire land was covered by natural vegetation, the most remarkable features of the forest of Darjeeling was the wonderful variety of species that they contained; there were in fact, probably few places in the world in which so many different types of forest exist within so small area. At the highest altitude from the elevation of 8000 to 12000 feet forest of silver fir were found interspersed with grassy slopes which were dotted here and there, with the whitened stems of dead trees.

With the introduction of tea plantation, the transformation of land use was started in Darjeeling hill areas in real sense. General Llyod was appointed local agent to deal with application for land which began to pour in from residents of Calcutta. Progress was rapid and further boosted by the early development infrastructure particularly with the completion of vital transport networks i.e., the Cart road and the Darjeeling Himalayan Railways.

7.2 Nature and extent of land use transformation

The history of land use transformation in Darjeeling district is necessarily linked with the settlement of the hill tracts by immigrants and the development of the region following the cession of certain tract by Sikkim Raja to the East India Company. The basic features of the land system in Darjeeling are different from those prevailing elsewhere in West Bengal. The cultivated lands are divided into tea and non-tea areas. Most of the non-tea areas fall under the category of *Khasmahal* and prior to the coming into force of the estates.

The tea plantation in the district goes back to the year 1834 when Lord William Bentinck appointed a committee to advise on the introduction of tea cultivation in India. Tea lease are granted and renewed under the provision of the Bengal waste land manual. Some of the important provisions governing these lessees include:

- ❖ that the leases would pay the rents in time,
- ❖ that the lessee or his manager would reside on or near the land,
- ❖ that the lessee would not divert the flow of any stream or spring with in the land without the previous sanction of the Deputy Commissioner,
- ❖ that the lessee would not set up any new market or hat without the permission of the Deputy commissioner,
- ❖ that the Lessee would erect and maintain boundary marks and lines,
- ❖ that the lessee would furnish to the Deputy commissioner full information about birth and death within his area,
- ❖ that the lessee would not subject the land,
- ❖ that the right conferred by the lease was heritable and transferable with the previous approval of the Deputy Commissioner and
- ❖ there was also a provision that in special circumstances a summary renewal for a period of one year would be granted.

The bulk of the revenue paying non-tea estates in the district were grouped under the following categories, (i) the Sadar and Kurseong *Khasmahal*, (ii) the Kalimpong Development area and Kalimpong Government estates and (iii) The Terai *Khasmahal*.

Table 7.1. Hilly area of Darjeeling district

Sub division	Tea Estates	Non Tea Estates Including Khasmahal & district improvement fund land	Total
Sadar	106.72	81.66	188.38
Kurseong	75.62	18.00	93.62
Kalimpong	11.55	171.61	183.16
<i>Total</i>	<i>193.89</i>	<i>271.27</i>	<i>465.16</i>

Under the then Revisional Settlement survey (1954-1955) the entire area of Darjeeling district excepting reserved forest was recorded as 202.37 sq. miles according to the *Touzi* Register. Three small blocks from the Duars area of the Jalpaiguri district covering an area of 0.09 sq miles were added to the district in 1944 and in 1959, 57 sq. miles transferred from the Purnea district, Bihar to Darjeeling. About 435 sq. miles of the district were accounted for by reserved forest and approximately 63 sq. miles were covered by the Mungpu Cinchona

plantation and Ranpo Medicinal plantation. The total hilly area area of Darjeeling district is shown in table 7.1.

7.2.1 Land use transformation in British Period

During British period the Darjeeling District was divided as (a) Government estates in the hills, (b) those in the Terai, (c) the strip of land lying to the North West of the Little Rangit and (d) the land granted for the cultivation of tea. Besides these four tracts however, there were reserved forest occupying an area of 415sq. miles and land reserved for Cinchona cultivation which was extended over 59 sq. miles.

The Kalimpong Government estate including the Government reserved forest and the few tea plantation interspersed in it comprised an area of 401 sq. miles to the east of the Tista. The reserved forest in that area comprised cover 200 sq. miles and the tea garden 10 sq. miles, and the actual area occupied by the tract managed direct by Government as a Government estate was 178 sq. miles. That tract was taken from Bhutan after the war of 1884 at the conclusion of which it was formed in to a sub-division called Dalingkot and finally transferred to the Darjeeling district in 1866.

For short time after the cession of the Darjeeling territory in 1835, there appeared to have been but little demand for land and the application which were made were dealt with by the superintendent at his direction, but by the year 1838 large number of applications for land for building sites led the then British Government to set rules for the grant of land. These rules provided that the condition of any grant made previously by the Superintendent would be binding on Government but that in future land would be given only as follows:

- land suited for building location for which purpose a space of 200 yards broad on either side of the principal road from Kurseong to Darjeeling was especially reserved.
- cleared spaces of undefined size to be reserved for Bazaars at Pankhabari, Kurseong, Maldhiram and Darjeeling and
- land not required for either of the above purposes, but available for farming leases.

There were also certain small areas held for special purposes since 1866 a strip of land on either side of the Cart road from siliguri to Darjeeling had been set aside for road purposes,

though in common places settlers had been allowed to build houses, a small revenue was derived from these persons who were more tenants-at-will. At Jalapahar, Katapahar and Lebong certain areas had been made over to the military department, an area of 116 acres below Darjeeling had been set apart for the jail and 622 acres, originally intended for grazing grounds had been retained by the Darjeeling Municipality. A return prepared in 1903 had given the following synopsis of the land tenures of the district and shown in table 7.2.

Table 7.2 Land Tenure system in Darjeeling during British period (1903)

Type of Land	Description	Area in Km ²
Revenue Paying Tenures	Location held in perpetuity under the building location rules of 1839	0.57
	Location for 99 years held under the above rules as modified by the court of Directorate in 1840	1.48
	Farming leases under the rule of 1859	6.30
	Cultivation leases for 30 years under the rules of 1864	211.01
	Chebu Lama's grant as then held by his heirs	128.06
	Tea cultivation leases under the waste land rules of 1882	25.78
	Other recent leases from 10 to 50 years	42.10
	Government Khas Mahal under direct management	894.80
	<i>Total</i>	<i>1310.07</i>
Free Hold Tenures	Location commuted into fee simple under rule 10 the rules of 1859	2.12
	Land brought under rule 1 of the above rules	196.22
	Land commuted under rules 9 of the above rules	122.15
	Lands brought under fee simple rules of 1862	45.18
		<i>Total</i>
Government Land	Land held by the forest department forest reserves	1126.95
	Land held by the military department	1.63
	Lands held by Government for Cinchona cultivation	152.62
	Lands held by Jail Deptt	0.47
	Municipal grazing land	2.51
	Other land (i.e waste lands Bazaar lands etc)	55.65
		<i>Total</i>
	Grand Total	6031.18

7.2.2 Land use transformation in Independent Period

The Darjeeling district has been broadly divided into two parts the hilly areas to the north forming its greater part and the alluvial plain to the south known as the terai. Altitude vary from 100 meter above sea level in the plains to about 3500 meter in the hill while the terai contains stretches of alluvial soil admirably suited for rice cultivation, there were also poor sandy tracts which could not be brought under the plough, nothing except scrub jungle grow on the stony soils, but the land was of good fertility on the gentler slopes and in the upper valleys. No part of the district laid above tree level, but no crops were grown beyond 3000 meter above sea level owing to the cold. The following table indicates the land use pattern existed in Darjeeling district during the beginning of Independence period (table 7.3).

Table 7.3 Land utilization pattern in Darjeeling district in the early independence period.

<i>Type of land use</i>	<i>1960-1961</i>	<i>1961-1962</i>	<i>1962-1963</i>
Area under forest	292400	292400	292400
Area not available for cultivation	180100	180100	180100
Cultivable wastes excluding current fallow	41700	38400	39500
Current fallow	11400	5700	9000
Net area shown	42200	251200	246700
Area shown more than once	38700	39500	38100
Total cropped area	280900	290700	284800
Total area of the District	767800	767800	767800

The area of cultivable wastes has remained more or less constant during the period of review. They are scattered throughout the district in hill blocks of various sizes. There has not been any appreciable change during the decades that have followed. In fact, expansion of cultivation in the district was rapid in the middle of the last century and since then there are few areas where land could be cultivated economically owing to adverse physical conditions such as steep slopes, heavy landslide and soil erosion etc. In fact, cultivation is carried out under great difficulties and at considerable input of manual labour. Some portions of such waste like land located in Rungli-Rungliot (2800 acres) and Gorubathan (1692 acres) could however be brought under cultivation.

Forest covers an appreciable areas of the district however, there is hardly any swamps which could be profitable utilized for agricultural purposes after recovery. The forests of the district were almost invariably reserved by the forest department except a few square miles in Kalimpong sub-division, which were controlled by the Deputy Commissioner. There were also large areas under tea and cinchona cultivation. The distribution of land for forest, cinchona, tea and other cultivation varies at different parts of the district and while the forest area under the *Khasmahal* administration was diminishing since 1907. Considerable area under tea estate has been utilized by lease holder for cultivation of various non-plantation crops.

The nature of the land has been changed due to major landslip in Darjeeling and surrounding areas. Major landslides have taken place in 1950, 1955, 1958 and 1968 caused massive destruction to all sphere of socio-economic fabric of Darjeeling hill areas. It is estimated that about 25% of land had been converted into waste land. The people could not bring back those lands in their original position till this date. Since then people have change their agricultural land to forest land under their physical possession. Most of the forest areas of the district were administered as reserved or protected forest by the directorate of forests Government of West Bengal. The following table (7.4) indicates the different categories of forest and their respective acreages in 1966.

Table 7.4 Classification forest area (in Acre) of the Darjeeling hills in 1963

<i>Forest Division</i>	<i>Reserved forest</i>	<i>Protected forest</i>	<i>Unclassified forests</i>	<i>Private/corporate Forest</i>	<i>Total</i>
Darjeeling	72,936	3,297	470	10,958	87,661
Kurseong	71,815	593	2,051	10,475	84,934
Kalimpong	143,957	285	1,870	-	146,112
Total	288,708	4,175	4,391	21,433	318,707

Previously many forest areas formed parts of tea estates. Such land as well as the *Khasmahal* forest vested in Government in 1953 under the estate acquisition Act and were subsequently notified as protected forest under the Indian Forest Act XVI of 1927. Forest demarcation and reservation proceeded fast after the inauguration of forest conservancy work in 1879, the total area of reserved forest in Darjeeling division was 27143 in Kurseong division 60,994 in Kalimpong division 27079 Acres.

Table 7.5 Tea gardens and total area occupied by the tea gardens in Darjeeling districts.

Year	Number of tea gardens	Total area in hectares under tea gardens
1861	22	1317
1871	56	6162
1881	155	11489
1891	177	18462
1901	170	20948
1911	156	20853
1921	168	23897
1931	169	24777
1941	136	25858
1951	138	25345
1961	145	27709
1966	144	28121

Besides that the position of land has been found change due to increase of tea garden in Darjeeling hill area. The table 7.5 shows the number of tea gardens and area occupied from 1861 to 1966. While the table 7.6 depicts the total area under tea cultivation in 1965 in three Darjeeling hill sub-divisions.

Table 7.6 Area occupied by the tea gardens in three hill sub-divisions.

Name of sub division	Area of the tea estate (hectares)	Area under tea including fallow (hectares)	No. of Estates	
			With tea factories	Without tea factories
Darjeeling Sadar	23770.94	11325.81	50	3
Kalimpong	2869.04	1,143.59	6	-
Kurseong	15943.41	6370.05	31	3
Small grower	21.44	19.74	-	-
Total	4,2604.83	18859.19	87	6

Due to rapid growth of population large tracts of agricultural land as well as barren lands have been converted into homesteads. Fragmentation of land over generations further

transformed arable and other land into homesteads. In spite of adverse physical set-up, the Darjeeling hills has been experiencing rapid and unplanned growth population along with residential use of land in the independence period. Darjeeling has been witnessing haphazard growth with high rise concrete structures which not only spoiled the aesthetic and picturesque view but posed risk with increased probability of landslides. The unplanned and rapid growth of town has further strained the already crippled infrastructural facilities and at present the system is on the verge of collapse.

The overriding priorities and the human activities modify the landscape to suit their own needs. The man’s uses of land in post British period have been found much illogical that dramatically alter the character of the environment of Darjeeling hills. The proximate and underlying drivers of human transformation of earth face affecting ecosystem organization and function are given in table 7.7. Deforestation is responsible for large scale species extinction that affects biological diversity in three ways i.e., habitat destruction, fragmentation of formerly contiguous forest and adverse physical and biological consequences in terms of buffer effects within a boundary zone between forest and deforested areas.

Table 7.7 Proximate and underlying drives for land use transformation

Nature of transformation	Proximate drive	Underlying drive
Land	Clearing, cutting & burning for agriculture, abandoning and subsequent degradation.	Demand for foods, goods and services, fragmentation leading to isolation of habitat and ecosystem
Piedmonts	Land cover conversion and water exploitation.	Decline in environmental quality followed by livelihood support.
Wetland	Land use alternation, modified drainage leads desiccation and eutrophication	Change in hydrological regimes, ground water depletion, alteration in food chain.
Biodiversity	Clearing of forest / natural ecosystem, introduction of alien species.	Risk to environmental and food security, landscape amenity and disappearance of habitats.

Darjeeling Himalayas has the forest cover 38%, 18% under tea cultivation 2% Cinchona. The rest i.e. 42% of the land is called *Khasmahal* area, which is the area left for the use of the people. This set up i.e. the land use pattern plays an important role in the concept of forest, management because the major portion of the land is allotted to tea and forest have left

little space for the expansion/ settlement of the people the forest area of Darjeeling hill are under different administration authorities (table 7.8).

Table 7.8 Administrative set-up of the forest area in Darjeeling hills

<i>No</i>	<i>Administrative set-up</i>	<i>Area in km²</i>
1	Forest Directorate	268.00 sq km
2	West Bengal forest dev. Corporate	457.38sq km
3	Wild life division	332.70 sq km
4	Darjeeling Gorkha Hill Council	69.50 sq km
	Total	1127.58

7.3 Nature and extent of human encroachment

The nature of man’s encroachment over the natural ecosystem in Darjeeling hills is controlled by the growth of population, infrastructural development and commercial activities as well as demand for forest produce and forest lands. Subsequently, development like roads, buildings, hydroelectric power projects and urbanization in the semi-urban area were pushed further encroachment. A number of roads were constructed through the forest to connect remote villages.

The cumulative effect is the tremendous demand for land and at such land is no more available. The option left virtually only the grabbing of forest and grazing lands. Land is require for living space, for construction of roads, hydroelectric power projects, industrial estates etc. In fact, agriculture has been pushing into what was earlier forest and grazing land primarily because good agricultural land is being consumed for commercial use including high value crops pushing cereal etc. into higher and marginal land. Land encroachment even in protected/reserve forests is on the increase. Flow of cash among the indigenous population has brought in a new perspective they look at land and forest as a goldmine rather a means of subsistence earlier.

Increasing demand for fuel wood has to be met locally and it is still the major source of energy. Fodder and grazing demands have also to be met from dwindling exhausted lands. Thus over exploitation of renewable natural resources leads irreparable damage to the delicate hill ecosystem of Darjeeling. Commercial demand for timber and other forest resources is another source of fast encroachment both inside and outside the region. There is tremendous demand for

timber and forest products for construction as well as for numerous wood based industries. These resources also form the major source of revenue for the hill areas. The hill people's rights for timber and other produce incorporated in the forest Act have brought in several malpractices. The "contract" system of working these resources is perhaps the most harmful of all. The forest has been woefully thinned by the axes and saw of the local people who has been cutting timber for building. The migrated people have encroached the forest land and constructed the dwelling houses in Algarah, Lava road, 14th mile Dalapchan area and Gumpa dara area in Kalimpong sub division.

7.3.1 Human encroachment in British period

The human encroachment in British period consists the following factors:-

7.3.1.1 Tea industry

The establishment of tea industry in Darjeeling due to the enterprise of Dr. Campbell who was appointed superintendent of Darjeeling at a time when attention was being attracted to the possibility of starting and developing the cultivation and manufacture of tea in the territories under the East India Company. In 1834, the Governor General Lord William Bentinck had appointed a committee for the purpose of submitting a plan for the introduction of tea culture in India. In 1840, Dr. Campbell started the experimental growth of tea since 1840 and soon found that the plant thrive readily at this altitude and other began to follow Dr. Campbell's example seed being distributed by Government to those who desired to cultivate the plant.

The tea industry actually began in 1856 on an extensive scale in Darjeeling till then Darjeeling was dense forest and nobody was encroached there. In the year 1858, the Alubari tea garden was opened by the Kurseong and Darjeeling Tea Company and another on the Lebong spur by the Darjeeling Land Mortgage Bank. In 1859 the Dhutaria garden was established and between 1860 and 1864 four gardens at Ging, Ambutia, Takdah and Phubsering were established by the Darjeeling Tea Company and two gardens at Takvar and Badamtam by the Lebong Tea Company. Other gardens which were started at the early period include Makaibari, Singel and Pandam situated in the hills and Champta in the Terai.

The development of the industry in the hills had been rapid as the suitability of the soil and climate to the growth of tea bush. Also Government offered land to investors on favourable terms and the industry rapidly developed. By the end of 1866 i.e., only ten years after the establishment of the industry on commercial basis there were no less than 39 gardens with 10000 acres under cultivation. In 1870, there were 56 gardens with 11000 acres under cultivation employing 8000 workers and by 1874, the number of garden had increased to 113 the area under cultivation to 18888 acres and the work force to 19000 souls. Thus between 1866 and 1874, the number of garden under tea was almost exactly trebled the area under cultivation increased by 82%. Since the time the Industry had progressed steadily and by the year 1905 the total number of tea gardens reach to 148 covering an area of 50600 acres or 79 square miles. In addition to the 50600 acres actually under tea which in themselves constituted one third of the total area under cultivation the tea estate in the district included 49300 acres which had been taken up by planters but had not been planted with tea.

7.3.1.2 Cinchona Industry

The cultivation of Cinchona in Darjeeling was commenced in 1861-1862 in Rangpo and Reyang valleys. It proved too small for the number of trees which were required to keep place with the increasing demand for febrifuge and Quinine. In 1883, the first out laying plantation of 300 acres was situated in the Ranjung valley in Kalimpong and in 1899 a fresh extension of about 900 acres and further extended to about 7000 acres in the Damsang forest situated about 15 km North east of Kalimpong known as Munsong division.

In the year 1906, the Government Cinchona Plantation comprised the following (i) the Rangpu valley block consisting of the Rangbi and Mangpu division which together measured about 900 acres containing nearly over 2 million plants; (ii) the Reyang valley block consisting the Sitong and Labdah division which together comprised an area of about 600 acres with over 200000 plants and (iii) the Rangpu valley block comprising the Munsong division. All these lands were occupied by dense jungle that was felled and burnt a year before planting operation were to be carried out. While clearing the forest and burnt the number of valuable trees bushes and plants were destroyed along with the precious wild animals in that locality. The British Government has also undertaken timber trading. A short account is given below of each division and the following table shows the average annual outturn revenue and expenditure during the year 1897 to 1907 (table 7.9).

Table 7.9 Timber trading and revenue expenditure of Forest divisions (1897-1907)

Division	Timber Cubic feet	Fuel Cubic feet	Minor produce (Rs.)	Revenue (Rs.)	Expenditure (Rs.)
Darjeeling	177330	986650	8100	91560	72860
Kurseong	203770	371480	2820	55900	38300
Tista	128630	630900	7800	34980	36600
Total	509730	1989030	18720	182440	147760

When the forest department took charge of the hill forest they had to allow felling of Sal trees in order to meet the demand of the railway for sleepers. When this ceased the felling remained unregulated except to a certain extent in the Baman Pokhari block and the Sukna forest until the introduction of Mr. Hatt's working plan in 1904. Unregulated felling were confined to the more accessible areas.

The railways were the market for wooden sleepers and the tea garden for fire wood. Box planking for the tea garden was converted by the agency of the managers. A certain amount of timber and fuel from the neighbouring hill forests was sold in Kurseong for local consumption and a little charcoal was made there. Grazing was regulated by the rules laid down for Darjeeling in 1884, by which about half of the forest was open to grazing not more than one head of cattle was being allowed for every ten acres of the open area.

Almost the whole of the yearly yield of Sal timber was extracted in the form of meter gauge railway sleepers for which the Eastern Bengal State Railway provided a practically unlimited demand also for the Darjeeling Himalayan Railway. In addition to this the British people emphasized to construct the wooden structure in hilly regions so that many matured trees were destroyed for the construction of houses. There was no question that large stretches of forest had been cleared away since the British first came into possession of the Darjeeling hills. As, all the early travelers were unanimous in describing the district as entirely covered by forest.

7.3.2 Human encroachment in Independent Period

During independent period, the construction of road and other infrastructure were indispensable for efficient transport and communication system for tourism development but

those unavoidable activities were mainly responsible for destruction of hill areas land resource along its vegetation and animal wealth. The use of powerful explosives and frequent heavy traffic creative vibrations which caused cracks on rocks and earth, which in turned lead to landslides and erosion along with adverse impact on the flora and fauna. The construction of roads along geologically active zone like at Sukhia-Simana-Manaybhanjyang, Tanglu, Sandakapu, Mirik road, Lava-Damdim road, Pedong-Rishi road, Bhalumarg road, Darjeeling-Singla road etc. caused major transformation of land use pattern in hill areas of Darjeeling. The construction for accommodation facilities like rest houses, tourist bungalows, buildings, tourist rest shed, private lodges and seasonal accommodation units, recreation centre etc. had posed the serious threat to the land resources and also accelerate soil erosion and caused to damage to crops, animals and plants. It was also contributory factors in causing landslides with heavy damaged of properties and lives.

The beautiful forest of Darjeeling hill areas and peaks was the main source of tourist attraction. The continual flow of tourists, mountaineers, trekkers etc. was likely to have positive as well as negative impact on those natural resources. To a certain extent mythological beliefs and tradition which were also prevalent in the hill region were also responsible for adverse effects on the flora, especially in those localities adjoining the shrines. Religious tourists collect flowers and colourful herbs to offer to temples as a results, many species became endangered.

The increasing influx of tourists exerted an adverse impact on the unique hill areas wild life. Tourist activities like invasion in wildlife habitat, close view watching and photography, hunting, poaching and other disturbances etc. had created problems for wild animal and birds were affected in large extent. Owing to the large interference of man in the habitat and life style of animals, especially in national park, wild life sanctuaries etc. the ferocity of animals was being lost. The habit of tourists to provide ready made food to wild animal was also responsible for loss of ferocity. For last 3 decades the monkeys of NH-31A from Sevok to Tista bazar has become domestic owing to the availability of ready-made foods i.e., bread, biscuits, fruits from tourists and also from other travelers.

During independent period a number of hydroelectric project were constructed with large land use transformation, The Jaldhaka hydroelectric project stage I and stage II caused transformation of large paddy field and forests. The project also caused the heavy landslide and flood almost in every monsoon. The Ramam hydroelectric project in Bijanbari also invited

heavy landslide in addition to large deforestation and damage to wild life and biodiversity. Similar story has been notice in the Tista hydroelectric projects. The hill area development council was set up in 1972-1973 and development works were taken up with the help of about 35 Government departments. The various developmental works were initiated in Darjeeling hills including construction of roads in remote village area, bridge, culvert, school building, playground etc. In fact, such developmental works ushered further degradation vis-à-vis land use transformation in Darjeeling hills.

7.3.3 Human encroachment since 1980s

It is matter of fact that large scale human encroachment vis-à-vis land use transformation was actually been started since 1980 especially with the beginning of GNLf movement in Darjeeling hills. The complete devastation of forest in the several ranges have lead to the crisis of drinking water as the perennial sources of water have been dried up since 1980. The temperate forest mainly of Oak, Uttish, Champ and Panisaj appear to have disappeared. The valley slopes and soil are naked and this has greatly affected the water regime of the region.

During Gorkhaland agitation in 1980's the road side trees were cut down to blockade the road for paramilitary forces who use to patrol in different parts of the hill area, where massive quantities of trees were cut down, it was estimated that 40% of forest cover had been destroyed in that agitation. The hill people deprived economically and they entered the forest of every range and began to start deforestation, most of the local youth as well as anti-social elements started sawing the timber and began to sell it in a usual way. The Government offices, forest department, police could do nothing for it. This practice is still continuing the forest department could not control it. The forest protection committees have been set up in hill areas to control illegal falling of trees but no effect is noticed till now.

In addition to this most of the Government land such as PWD land, municipal land, forest land, khasmahal land have been forcefully occupied by anti-social elements and miscreants. Many beautiful spaces of hill areas were destroyed by them, in some portion of forest area have settled the illegal village also. The DGHC itself started to construct heliport one at Sinchal forest area and another at Dhoteria, without getting clearance from the civil aviation as well forest and environment department. Large forest damaged and beautiful hill environment were destroyed for nothing.

The trend of encroachment unfortunately continued in the DGHC period, accentuated by indiscriminate quarrying of stone, sand, stone chips etc. The low dam construction over Tista river in two places with other activities which disturbed badly the land, water and vegetation of these areas. As a result a threat to the life and livelihood of people emerged in a significant number of hill villages. This led to considerable re-thinking among social workers and other concerned people about the way in which protection should be sought. Several lines of thought and action emerged, prominent one of which is an ecological movement seen more prominently in the hills of Darjeeling district but of course existing in other area also.

During 1980, the agitation of separate state was started by the Pranta Parishad and GNLF the agitation was reached in climax in 1986-1987, the Government was least bother about damaged of environment, the forest was badly destroyed. The un-employed youth of the hills became timber and firewood contractors and they used to sell all kinds of timber plank, battens and firewood without permit in a very illegal manner. The drastic environmental damage done since 1980 continued to till this date. During Gorkhaland agitation, the tree shed land i.e. both sides of the roads have been encroached by anti-social elements and also constructed house cum shops and other structures. Often they used to sell such lands and houses to outsiders though they don't have their documents of land and property and gradually transforming the very land use of Darjeeling hills.

During Gorkhaland agitation large scale destruction of public properties have been taken place including Kalimpong handicraft centre, BDO offices of Jorebungalow, Sukhiapokhri, Takdah, Kalimpong II, Gorubathan, BLRO Office Kalimpong II, Pedong, Libraies situated at Birch Hill Darjeeling, Forest Bungalow of Lepcha Jagat, Sukhiapokri, Rikisum, Dapalphan, Janta College Kalimpong, many GP Offices, Red Cross building Darjeeling, Dalapchan Beat Office, Khasmahal Bungalow etc. were burnt by the anti-social elements. All such acts in fact, lead to further degradation and transformation.

7.4 Spatial and temporal extent

Due to unabated migration population of Darjeeling hills have been increased very rapidly since the independence. People from Nepal, Bhutan, Tibet and Sikkim have been migrated by large number. The virgin forest, pasture and agriculture land have been converted in settlement as a result, green areas are fast disappearing. The migrated people have been given

the facilities of electrification, water supply, transportation, sanitation so that tremendous stress put on the existing infrastructure. Due to settlement of migrated people there has been hardly left any space. The road has been congested due to encroachment of road side, drainage have been blocked, the rain water use to flow every where in road surface causing landslide in municipal area too.

Darjeeling had rich and unique vegetation, comprising of *cryptogwms* (Non flowering plant) and *phanerogains* (flowering plant). In the surrounding areas of Darjeeling town a few species of rhododendron grown in plenty but in Kalimpong sub-division it was scattered. The most common species of this genus is Rhododendron arborcum locally known as *Lali Gurash* but nowadays it has been threatened. Many more species which were found in the hilly region of Darjeeling but the flowering plants are fast disappearing because of being ruthlessly felled for fuel and construction of houses. Prior to 1863, very little attention was paid to the conservation of forest. Since independence, due to rapid urbanization, the upper belt of the forest was taken for commercial use. Much of the natural forests in the Senchal, Ghoom Simana and Takdah ranges have been converted. Some patches of natural forest are still found in Reshop, Bara Senchal, Lopchu, Rongbong and Mirik and still a few natural forest patches are found in and around difficult terrains.

The growing pressure of population during the last two decades has left clear mark on the forest resources of the region. Marked decline in forest cover were observed in Takdah, Ghoom-Simana area of Darjeeling Sadar, Sukna, Pankhabari region of Kurseong and Chel-Jaldhaka catchment of Kalimpong. The forest cover of Darjeeling hill areas is decreasing at an alarming rate. Per capita forest area was 0.62 hectares in 1941 but now the situation has drastically changed to 0.02 hectares per persons.

Darjeeling was once considered as a health sanatorium for the tired British people working in the plains, Darjeeling has now turned in to a glorified slum with crumbling infrastructure because of population explosion. There are no provisions for the local people to take a stroll around the town and it is virtually impossible to drive around thanks to lack of parking space and narrow roads most of which have been further narrowed down by encroachment. Darjeeling today is one of the most densely populated hill-town at global scale.

The Darjeeling Himalaya constitutes a fragile and unique ecological system. The region is frequently plagued by environmental catastrophes. Among such catastrophes events landslide is perhaps the most rampant threatening the Darjeeling town itself. With the successful implementation of tea gardens in the Darjeeling hills, labourers poured in and phenomenal growth of population resulted. A considerable bulk in this growing population was contributed by the immigrants. In a desperate attempt to acquire as much arable land as possible extensive areas under forest cover were being gradually encroached upon. The ever increasing number of people haphazardly settled in every bit of land available. It was perhaps the rapid denudation of the forest cover, which aggravated the problem of landslip coupled with the geological, rainfall and slope characteristics.

During the British period, it was made a rule that forest at the upper part of the hills should not be brought under ordinary commercial forest management. But after independence, the demand for timber increased at an unprecedented scale and even the upper layer of the forest was not spared there was a desperate attempt to cut trees, without considering soil erosion, water supply and landslip even after mass afforestation programme have been implanted, a big gap remains between felling and replanting. It has been estimated that 70% of the cooking energy needs of the rural population is still being met by fire wood. This practice is likely to continue if they are not provided with some alternate source of fuel. Needless and reckless obliteration of forests, faulty agricultural method, unscientific use of slopes especially in construction works have change the scenario. The forest covers acted as blankets for tapping rain water and maintaining the perennial character of the springs.

The tea plantation has also contributed its share in bringing about ecological imbalance in the region. Nearly 80% of the tea bushes are over 50 years old and young bushes cover only 4% of the area. The tea bushes after 50 years are generally fail to protect soil from erosion. This is because of the fact that the old bushes tend to loosen the cohesive bond between the soil particles and fail to bind the soil against soil erosion. The bushes when young are allowed to spread horizontally so that all the bushes can touch each other forming a thick canopy, giving adequate protection against direct rain impact.

7.5 Misuse and overuse of fragile hill environment

Steady influx of population in the Darjeeling Himalaya under the back drop of severe topographic constraints, harsh climates, dense undergrowth infested with deadly animals and

incurable diseases, lack of easy movement, poor condition of agricultural operations etc. have restricted initial growth and development in some restricted sites. In fact, such a condition leads to over exploitation of natural resources. Excessive concentration of people around the towns like Darjeeling, Kurseong, Kalimpong and Mirik and major settlements like Tindharia, Mahanadi, Sukiapokri, Bijanbari, Manebhanjan, Goom, Sonada, Dilaram, Gurubathan etc. has caused indiscriminate deforestation along with the expansion of tea gardens, roads, buildings, agriculture field and other cultural landscapes have eaten up a considerable portion of the hills. Misuse and overuse of the steep slopes at the cost of environmental damages caused incalculable miseries to humanity.

The hill environment has been badly misused during construction of roads, community centres, development of settlements urban centres, development of public utility structures etc. especially rural roads have been constructed haphazardly without considering the environmental impact. The motive was only construction of roads from starting point to a particular destination through the ecologically vulnerable situation. As a result, wild animals and birds have been fled or died along with irreparable damage caused to the biodiversity. Mining and quarrying also caused environmental problem such as loss of valuable vegetation, loss of productive top soil, wild life and biodiversity in the hill areas. It has also been identified that such activities also caused water and air pollution, solid wastes leading to health hazards.

Large scale blasting weaken the rock and fine minerals and dust released during the process mixed in the atmosphere and pollute the air and have adverse impact on health. The toxic and harmful metals and minerals dissolved in the rain water percolate down to the aquifer in the mining area and also in the adjoining areas thereby deteriorating the ground water quality. Intense grazing has also accelerated the processes of soil erosion and this has made the slopes bare and barren and prone to sheet erosion and gully erosion. Enormous quantities of silt and sediments filled the river valleys and resulted in flash floods. The catastrophe of floods causes great loss of life and property.

7.6 Conclusion

Land use in Darjeeling hills still remained highly dynamic around large settlements and urban centres while, in the vast tracts of rural areas such changes are not prominently visible. Such changes can be attributed to the influence of human being. The land management process

often determines land use need and the complexity of such processes and their consequences at the local and regional levels indicates towards the diverse issues that are associated with agricultural land use. The study of agricultural land use and productivity limits to agricultural growth brings out food security issues. Combined with tremendous demographic pressure the questions of cropping intensity, physical and economic access to food and maintaining the productivity of land have gathered greater attention. Some of the other issues which have remained in the periphery of debate and discussion include impact of human resources on agricultural development consequences of local and regional conflicts on agricultural land use.

The land use transformations in Darjeeling hill areas faced the growing problem of haphazard growth, loss of land cover, decline in arable land and also decline in wildlife habitat vis-à-vis biodiversity. Most of the problems are attributed to increasing population pressure. The understanding of land use change in urban areas is the key to urban development programme. The temporal analysis provides in any given context the spatial patterns of land use. The emerged dynamism helps planners to delineate urban growth boundaries, land use zoning plans and infrastructure requirements. Socio economic development is inextricably linked with the current as well as past land use pattern and access to land determine the socio-economic development of vast stretches of rural areas. Village development is often connected to land use and type and intensity of agricultural practices.

Demographic trends become important features to understand the land use transformation at its present context. The details of demographic trends are useful in assessment of the impact of population growth on land use directly or indirectly, population growth is a powerful force to bring about a change in traditional methods and to transform the economy into rather advanced and productive stages.

Tremendous population concentration within a short span of few decades have created manifold problems including political, economic, social, cultural and ecological in this region. Accelerated population growth in limited available land has led to indiscriminate exploitation and ruthless destruction of natural resources. This has led to serious ecological damages of far reaching consequences, visible through bare hill slopes, stony and gravelly riverbeds, erratic river courses, changes in climate and hydrological regimes, landslip, loss of top soil, disappearance of rich flora and fauna etc.

At present the agriculture in Darjeeling hills is not sustainable. It is more of land and water mining than agriculture, similarly we are not using out water and energy resources in a sustainable manner. Utilization of land resources has never paid proper attention to sustainability. As a result, transformation of land has taken place rapidly and has been deteriorating rapidly, due to overgrazing, non-availability of irrigation, improper crop rotation, deforestation and extractive activities.

7.7 References

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