

# *Chapter - 9*

# THREATS AND CONSERVATION OF THE FLORA

## 9.1. IMPORTANCE OF THE FLORA

Richness, assets and property of a country depends upon its natural resources and its economy is always determined by these natural resources found in endless forms in the nature. In these sense, the flora or the plant resource is one of the most highly valued natural resources which directly affect our lives and the nation in various from the points of usage and application of it.

The district of Darjeeling, though being a small in area, but has a very dense and diverse flora, having two National Parks and three Wildlife Sanctuaries and many other reserved, unreserved and social (including plantations) forests. These houses a large number of economically important plants those may be useful to human as timber yielding, food producing, ingredients for medicine, ornamentals of horticultural value, etc. In the same sense, the rich vegetation of Darjeeling district is an asset for the country. In the context of West Bengal, only along the southern and northernmost portions of the state only few forests and vegetation have been left in their near natural condition. The northern forests are falling mainly in the district of Darjeeling and in the Dooars area of Jalpaiguri district. But, this little forest area of the state is the store house of vast natural resources. Unfortunately, only a small or insignificant fraction of this is being used by a handful of people in the present situation. These plant resources have tremendous economic, scientific and environmental values. Vegetation, its generic and specific composition etc. of a floristically important place like Darjeeling are equally very important for the scientists, particularly to botanists and environmentalists around the world. The Darjeeling district flora has a great significance as it represents an excellent state for its virginity and preservation as well as an immense beauty to add charm to the country. Due to its beauty the district with the silvery background of Kanchanjungha Mountain, with its scenic beauty and rich biodiversity draws a lot of domestic and foreign tourists to this Queen of the Hill stations in the country. In this sense, the biodiversity of this land also plays a vital role in the tourism.

In the present scenario, when the earth is facing innumerable problems regarding environmental crisis, it is now imminent to conserve the entire bulk of the remaining natural tracts of the vegetation. However, such tracts are now available only in few restricted areas like Neora Valley National Park, Singalila National Park, Mahananda Wildlife Sanctuary, Senchal Wildlife Sanctuary and some other reserved forests where the plants are conserved *in situ*.

The flora of the district houses many plant species rated as threatened or atleast rare. Some such species include *Aristolochia griffithii*, *Balanophora polyandra*, *Diplomeris hirsuta*, *Nervilia plicata*, *Lecanorchis sikkimensis*, *Monotropa uniflora*, *Panax pseudoginseng*, *Rhopalocnemis phalloides* etc. are nicely surviving here and enjoying the natural protection (Rai 2001, Rai & Das 2013).

The importance of the flora of the district also reflects in the endemicity with respect to the flora having 15.79 % dicot (Das 1995, 2004; Bhujel 1996; Bhujel & Das 2002) and 14.32 % monocot flora endemic atleast

upto the Himalayas. The representation of the large number of economically important plants of both the indigenous and exotic origin in the flora of Darjeeling district is a crucial factor as a significance of the flora. The outcome of the present floristic studies of Darjeeling district provided a checklist of the angiospermic plants of the virgin forests of the district, which, with the detailed taxonomic description on the other hand, will also help the policy makers, administrators, leaders and planners to strategise their future actions on the district for its protection and the development.

The area falls within the area where the “*Sanjiwani*” were found in ancient time, it is possible that the occurrence of floristic resources from which a number of drugs or medicines might be formulated through extensive research to fight against many dreaded human diseases like Cancer, Hepatitis, AIDS etc. for which the science is yet to succeed to develop any satisfactory medicine even to-day.

In summary, the importance of the flora of Darjeeling district may be recognised as under:

- i. Helps in sustainable development towards the conservation programmes through the establishment and maintenance of Protected Areas like National parks, Wildlife Sanctuaries, etc.
- ii. Scope for protection and culture of economically important and endangered plant resources
- iii. Plan for sustainable development different modes of eco-tourism
- iv. *In situ* and *ex situ* conservation of threatened elements
- iv. Occurrence of wild relatives of cultivated plants and their conservervation, scientific evaluation and effective utilization
- v. Looking after the maintenance of a healthy proportion of the local elements vis-à-vis exotics in the flora, etc.

Besides these, some places of the district like Neora Valley National Park have almost uninterrupted natural vegetation that remained undisturbed for millions of years through long duration changes in climatic conditions and is conserving elements passing through this region following distinct climatic bands for migration along the Himalayas.

## 9.2. THREATS TO THE BIODIVERSITY & ENVIRONMENT

The natural beauty and the rich biological resources of Darjeeling and its adjoining areas [including Sikkim, Nepal, Bhutan, etc.] has attracted general tourists, plant lovers, botanists and plant hunters almost from all parts of the world atleast for the last three centurie (Das 1995, 2004). Divine view of Mt. Kanchanjunga, National Parks like Singalila and Neora Valley, Wild Life Sanctuaries like Mahananda and Senchal, rivers like Tista, Rangit and Rammam are the basics of its natural wealth. To be too beautiful has been proved as not too good for existence neither in nature nor in the society. Her beauty is gathering huge revenue in one side but she is getting naked on the other.

Human interference and disturbance to the nature has been crossed the limit of tolerance in the district today that is easily reflected during monsoon when even the rivers and rivulets of third category (as described in Chapter 1) are seriously over flooded and even the small rivulet too can be dangerous to wipe out the roads, bridges and villages. Again, in the late winter and in summer when not even single drop of water will be available. Both the situations arose due to the decrease in catchments area, when less absorption of rain water occurs due to non-availability of absorbing plants leading to draught in summer on one hand, major part of the rain water run away without absorbing. This is resulting flood and landslides on the other hand. As a result of unplanned road and other constructions including house buildings, plastic pollutions and deforestation, landslides are the frequent scenario in the Darjeeling hills. Some of the major destructive landslides due to heavy rainfall that occurred in the recent past are in September 1899, June 1950, October 1968, September 1980, AILA cyclone 2009, etc.) Bhattacharya 2012). The main threat for the flora and fauna of the district may be listed as:

### 9.2.1. TEA GARDENS:

The district is famous for natural wealth called 3 T's- Tea, Timber and Tourism. But in pressure of first and the third Ts, the middle one is facing a great trouble. During the 19<sup>th</sup> century various British companies cleared up the dense forests from the vast hill areas and from the rolling plains of Terai and Duars for harvesting timber and for planting tea, now Tea Gardens form the major landscape of the district. Unfortunately, even with the existing ban on the fresh establishment of Tea Gardens, new gardens are still appearing, almost every day. The tea gardens do not have forests of their own but majority of them possess social forestry or Khasmahal lands with few trees. But today's scenario has almost changed and are mostly collecting timber from nearby forests to run their processing factories.

### 9.2.2. POPULATION EXPLOSION:

The fast increasing population structure in the entire district, even in high altitude areas, creating intolerable anthropogenic and other biotic pressures on the wilderness including forests and other open areas have resulted serious problems for the existence of numerous species of plants and animals. As increase in population is inversely proportional to the degradation of biodiversity, increasing number of forest villages and villagers are becoming threats for the forests including animals living in such habitat. There are atleast 91 forest villages within the district, forest division wise 36 in Darjeeling, 26 in Kurseong (including forest villages lying in Terai) and 29 in Kalimpong. These villages retain 0.9 – 1.0 % of total population. Despite of that 86 % of the total population of the district are living in villages, where extreme poverty, illiteracy and ignorance compel the villagers to be dependent upon forests for most of their requirements to sustain. The economy and living standard of villagers can not be assessed by the external appearance, concrete and roadside structures of few townships. In this regards the growth chart of population of Darjeeling district reveals the problem. The population of Darjeeling town was around 19,000 in 1850 and 22,000 in 1869, as the then Superintendent of Darjeeling reported, which has just reaching the figure of 30,00,000 in year 2111 [Census of India 2011]. As per the 2001 census, the total population of the district was 1,609,172; with population density 511 per km<sup>2</sup> and the decadal (1991 – 2001) population growth rate 20.43 %. The figure reached 1,846,823 total populations with population density 585 per km<sup>2</sup> and the decadal (2001 – 2011) population growth rate 14.77 % upto 2011. (Source: Administrative Report of Darjeeling District, 2011–12, <http://darjeeling.gov.in>). One can imagine it easily, under such extremely high anthropogenic pressure how the flora and fauna of the area can survive. The following diagram (Figure 9.1) shows the drastic situation of population explosion in the district.

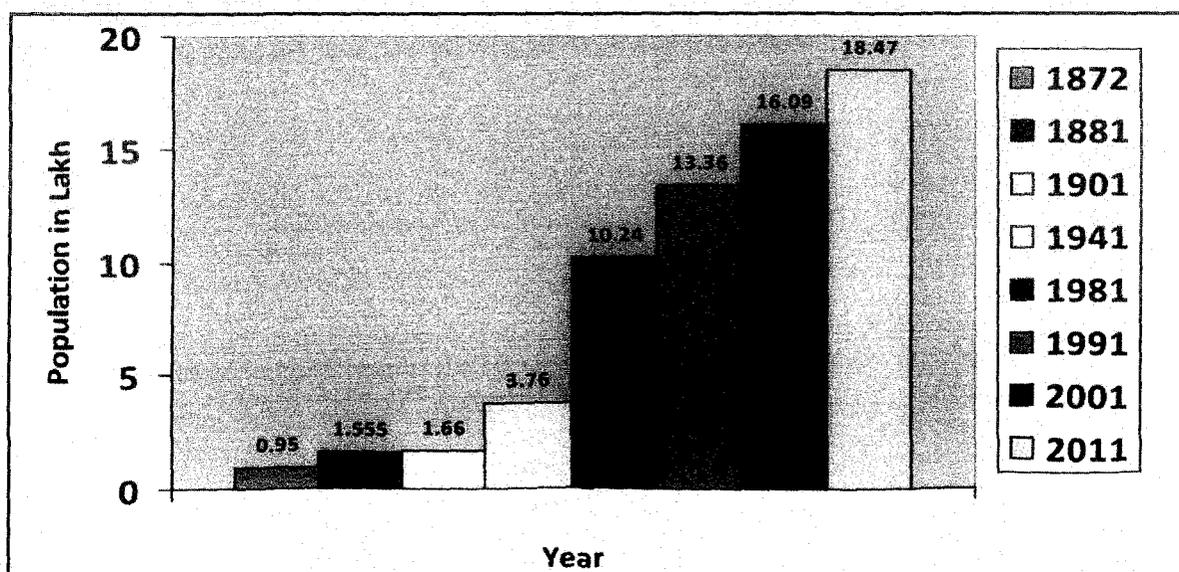


Figure 9.1. Diagrammatic representation of population increase in Darjeeling district.

### 9.2.3. DEFORESTATION AND ILLEGAL TIMBER EXPLOITATION

Large scale deforestation for extension of human habitation, cultivation etc, grazing of domestic animals and other uses of forest and undisturbed lands, etc have resulted the rapid change in the vegetation composition and structure during last few decades (Bhujel 1996; Das 1995, 2004; Das & Lahiri 1997). The scale of deforestation that occurred in the background of political agitation during 1986 was so intense that many reserved forests of the district have totally been cleared. Abundant sal forest of Gok-Karmatar, Singla, forests along Rammam and Little Rangit rivers, Panighatta, Soom, Northern face of Lepchajagat etc. were so cleared within 2–3 years that not a single tree can be observed in these places today. More recently in 2010, same tendency was repeated in the Kumani forest. To fulfill the demand of numerous illegally grown furniture manufacturing shops in Siliguri area, smuggling of valuable timber is a daily routine. In the year 1911, the forest cover of the district was 55.33 %, which decline down to 38.23 % in 2011 (Source: State of Forest Report 2011) and if the situation remains unchanged, the whole forest will be vanished within next 50 years. The policy of Indian forestry that the hills of the nation to be kept 60 % forest covered, is far from being implemented.

### 9.2.4. THE POWER COMPANIES

Good looking but the danger—most threat not only for the flora but for the environment as a whole, the district, in my opinion, the use of big rivers or river valleys for power generating industries. This is not only the problem for the Darjeeling district but the entire Himalayan range and rivers of Northeast India are facing facing the same problem. It is one of simpler ways of earning money in terms of utilization of natural resource for the power generating companies like NHPC, NTPC, WBSEDCL etc. in recent years. It may be termed as “*Khubshurat dhokha*” (Beautiful fraud), if taken carefully and think up to the future. The main practices, which the NHPC and NTPC applying along the river Tista, Rangit and Rammam are (1) Boring of long distance tunnels under the hills to flow water, and (2) blocking the river with transverse dams for the water accumulation.

The bad result which the first practice gives in turn is that the underground water which is absorbed and stored within the rocks of hills during rainy season and comes out regularly as spring water from different marshes and spring sides in different places of these hills, but if a tunnel is bored at the bottom of the hill that stored water will obviously leak down as it is in lower position, resulting draught on the hills above the tunnel. It has been practically seen on the hills of Gumbadanra, Sepi villages of Rimbick, where tunnel was bored during 1980’s for hydro-electricity production. A 32 KV power is generating regularly these days from that power station but the poor villagers of the villages above the tunnel have to give off their occupation of cultivation forever and even they are shifting elsewhere because almost all the sources of drinking water have been dreid off, and their land if cultivation is facing draught.

Blocking the way of a river as the second practice that these companies are doing results in landslides and loss of many flora and fauna that resides along the rivers. A distinct result is clearly showing by a dam constructed at 27-Mile area on Tista river. The whole area is sinking yearly, and it is reaching the villages like Deorali, 27-Mile, Geil etc. above the dam. It is the scene before the completion of the dam, what happens later in its full swing. The project may vanish the rare flora like *Diplomeris hirsuta*, *Ariopsis protanthera* which are found only some places of Tista river.

### 9.2.5. EXISTING RAIL-TRACK THROUGH MAHANANDA WILDLIFE SANCTUARY; PROPOSED ALTERNATE ROAD FOR SIKKIM THROUGH NEORA VALLEY AND PROPOSED RAIL-TRACK FOR SIKKIM AT RANGPO

A broad-guage rail-track penetrating deeply through the dense forest like Mahananda WLS is carrying large numbers trains every-day round the clock has become a great killer of areas rich biodiversity.

Fragmentation of the natural habitat, killing of gem wild animals by trains are daily news for different news media. Will there be any other painful news than killing of as much as eight big Elephants at a time and in a single accident, which was occurred on 22.9.2010 at Moraghat crossing of Gorumara forest? Similar accident occurred on the Jaldhaka river bridge in Chapramari WLS adjacent to the district, killing seven Jumbos at a time on 13.11.2013. The picture will be clearer with the help of the table below (Table 9.1) that how the situation has become dreadful due to rout of this railway tract and how severe the matter is!! The government is ready to flow hundreds of crore rupees to do the funny things like making watch towers and further cutting of trees along the tract to widen it, but no body is thinking that all these efforts are not the actual solutions. Two alternative tracts might have been created in this expenditure through densely human populated places if the existing tract be shifted just slightly southwards, which will not pass through the jungles. Further, people are dancing in joy that new alternative roadways through Neora Valley and railways for Sikkim are going to be built in near future, penetrating and clearing the dense forests, but only the people who think and understand the impacts of such so called developments can imagine where our future is going to!

**Table 9.1.** Killing of Elephants by Trains in Darjeeling and Jalpaiguri district in the recent years.  
(Sources: The Statesman, July 2, 2011; Railnews, November 14, 2013)

Date	Place	Number of Elephants Killed
11.04.2007	Garopara Kalchini Tea Garden	1
25.07.2007	Gulma Forest (Mahananda WLS)	1
22.07.2008	Mahananda Wildlife Sanctuary)	1
05.10.2008	Rajabhatkhawa Reserved Forest	1
27.05.2009	Jaldapara WLS	1
31.05.2010	Red Bank Tea Garden	1
03.06.2010	Buxa Tiger Reserve	1
19.07.2010	Gulma Forest (Mahananda WLS)	1
09.08.2010	Champramari Reserved Forest	1
22.09.2010	Moraghat crossing of Gorumara WLS	8
15.11.2010	Ethelbari	1
26.06.2011	Red Bank Tea Garden, Daina	2
13.11.2013	Jaldhaka River Bridge in Chapramari WLS	7

### 9.2.6. TOURISM AND ITS RELATED IMPACTS

Being a tourist's target, large numbers of domestic, international and local tourists throng into different corners of the district every year. The increased movement of tourists towards its natural pockets certainly have negative impact on the ecology and environment. Huge depositions of plastic and other non- or very slowly degradable waste materials even in remote places are creating hazards against the conservation of biodiversity. In shadow of the authorized tourists many unauthorized local or other domestic tourists, the orchid collectors, hunters, travelers, etc. get chance to trek to various parts of the restricted areas of the district and their non-ecofriendly activities have been identified as one of the serious threats. (Paria and Pal, 1983).

### 9.2.7. INDISCRIMINATE COLLECTION OF NTFPS

Rampant illegal timber extraction, indiscriminate collection of valuable orchids, medicinal and ornamental plants and other NTFPs pressure on the vegetation and the biological diversity are affecting almost

beyond control. There is legal ban on such ecological crime but in practice there is almost no control over it in the area. This illegal practice is not only the problem of our district but the whole of Himalayan region is suffering from this symptom. Exploration of wild species for drug and other commercial use has already wiped out many of such valuable and endangered plant species and some are ready to be extinct.

### 9.2.8. OTHER CAUSES

Other causes that also heavily threat the natural vegetation include:

#### 9.2.8.1. Defence Activities

As Darjeeling is one of the most peculiar district of the country that there hardly be any such district which possess more international boundaries than interstate or inter-district boundaries. It is in contact with 3 neighboring countries, viz, Nepal, Bhutan and Bangladesh; two states Sikkim and Bihar and two districts, Jalpaiguri and Uttar Dinajpur. More over China is standing over the head. With the view point of sensitivity of the place, many Military Stations have been established within the jurisdiction of the district. Major permanent Military Stations include Sukna, Bengdubi, Lebong, Takdah, Durbin, Shalugara etc. with numerous other minor camps of military and para-military forces like SSB, BSF etc. especially along the international border. A notable area of forest have been taken for this purpose hampering the environment in one way, and damage of ecosystem, cutting trees for their uses etc. by the military personnel in the other way.

#### 9.2.8.2. Hunters

The practice of unauthorized hunting is still going on within the remote and dense forests of the district. It is an ideal place for shooters and hunters to move around without any fear and obstacle of the forest personnel. Such forest poachers are out of reach of the security personnel. Many species of animals might have been extinct as a result of such hunting activities.

#### 9.2.8.3. Over-grazing by domestic livestock

Cattle grazing is also one of the major causes of damaging the vegetation and affecting the flora. Grazing by domestic animals is a regular practice especially for the villagers of Terai and the villages adjoining to forest and even in the National Park areas. Over-grazing at a same place frequently withheld the growth of plants, as they cannot attain their maturity and cannot flower and fruit in normal manner. If this practice be continued for many generations of plants or if a plant become rare and of restricted distribution that may vanish from the area for ever.

#### 9.2.8.4. Activities of Forest Department

The Forest Development Corporation itself sometimes perform some unusual practices like clearing of some areas of forests to fill the area with monoculture of the tree species of high economic values, which is unsuitable for maintaining the forest diversity. Plantation of *Cryptomeria japonica* along the upper hills and *Shorea robusta* and *Tectona grandis* in the foothills and Terai are the most prominent examples of such monoculture. However, these kinds of activities have at present been stopped and/or modified.

Construction of more and more roads within the forest areas by Forest Department itself is on one hand is benefecial for proper maintenance and proper development of the forest but it facilitate the easy access to the unauthorised visitors, poachers, cowboys, timber thieves on the other hand.

**9.2.8.5. Traditional Cultivation Practices** are also responsible for the deterioration of natural flora as that encourage the soil erosion leading to landslides.

### 9.3. PROPOSED MEASURES FOR CONSERVATION

Man is the only creation in this world that is never satisfied with the things what he gets in the nature. He always modifies those according to his will, atleast up to the degree which he can do, why not the thing to be deteriorate is the nature itself. Since his origin the human being is depleting and deteriorating his natural wealth with unbound misuse of them till few years ago. However, very recently human being has open his eyes and realised the degree of loss of biodiversity what he had done in the past resulting the extinction of numerous species of plants and animals from the earth. Tough the sense of conservation of the natural resourcrres, biodiversity and the environment has arise a century back, but the knowledge of fruitfulness of tasks done together has come in force very recently. The *Rio de Genero Convention* (1992) was a major breakthrough towards jointly working at the global level for the conservation of biodiversity. Foundation of International Union for Conservation of Nature and Natural Resources (IUCN) is a milestone for the purpose, which is working forcefully on the conservation strategy in these days. In this regard, IUCN has demarcated, so far, 35 regions (distributed in 17 megadiversity countries) having very rich biodiversity habitats over the globe and designated those as *Biodiversity Hotspots*. *Himalaya* is one among those and the district of Darjeeling forms a part of it. (CI 2005)

Government of India has also taken up appropriate steps to conserve the biodiversity. Declaration of Biosphere Reserve Areas, National Parks and Wildlife Sanctuaries etc. are some of such major steps. However, just by declaring a place as a *Biodiversity Hotspot* or any form of Protected Area is not the end of the problem. The Protected Areas are also equally under adverse environmental implications due to destructive human nature. The actual goal is only will achieved when proper management of these protected areas with effective monitoring and strong enforcement of laws will be possible. The people concerned do not know what the endangered species are or what their scientific importance is or even what the conservation is. They should have to be aware giving proper knowledge as they are the weak points and act as hurdles towards achieving the intended goal of conservation.

It is very difficult or often impossible to restore to its original form, what we have been lost in the past, yet some methods could be suggested atleast to retain whatever we have today. Some proposals for developing conservation strategies have been put forward below, which might be helpful for Development-Planners and the Managers of the Darjeeling district:

1. Tourism activities in the hill regions should always be efficiently managed with strict and definite guidelines. For every tourism activity, eco-friendly initiatives and procedures should be made through a controlled system or mechanism. All the visitors, whether foreigners or domestic tourists, researchers and trekkers etc. visiting the protected areas like NPs and WLSs should properly guied and scrutinised by the management concerned they are to be clearly conveyed with the rules and regulations at the time of entrance in such areas. Entry of any sorts of unauthorized people into these areas to be strictly prohibited by any means.
2. Traditional methods of cultivation in the hill areas need to be modified thoroughly, for this purpose, regenerative technology sustainable in the villages of hills by slope engineering cultivation practice should be introduced with encouragement of crop selection measures. Any sort of cultivation should not be allowed inside the National Park and Sanctuary areas:-
3. To check the landslides and large-scale soil erosion in the hilly regions, an appropriate strategy needs to be developed with the help of the opinion of geologists.
4. Tea garden coverage of the district is 202.16 sq. km which is almost 6.42 % of the total area have replaced the natural flora. What so ever happened till date, no more tea plantations should be permitted.
5. Like the plantations and Tea Gardens, the Military Stations are also the permanent settlements. All concerned authority should think for no further activity to continue the same blunder. Army

stations are also one kind of human settlements. Actually any sort of military operations or training should not be permitted within the Protected Areas like National Parks and Wildlife Sanctuaries or any forest areas which affect the flora or environment, though for the security reasons, if they are permitted to exercise their activities, they also have to follow conservation related rules and regulations very strictly.

6. Any sorts of developmental activities, if really necessary, especially within forests and Protected Areas should always be made eco-friendly. Clearing of any plant species from its natural habitats and felling of trees for the construction purpose under different projects including the NHPC activities should immediately be reviewed and further, such activities should not be allowed.
7. Unwilling operations of the Forest Development Corporation itself, like construction of buildings and jeepable approach-roads within the protected forests and the monoculture type of replantation etc. should not be continued any more.
8. Creation of forest corridors to connect the different Protected Areas is a needful matter, the villages falling in between may be shifted if necessary (Das *et al* 2008). If the project be taken sincerely not much trouble should have been arise, some villages in Mongpu and Rangli-Rangliot are to be shifted to connect extension of Mahananda WLS to that of Senchal-Jorepokhari WLS. There are atleast some connections between Singalila National Park and Senchal-Jorepokhari WLS through Sukey pokhari, Plungdung and Pusimbeng villages which need slight correction. Similarly the Neora Valley National Park is almost connected with Mahananda WLS except the barrier of the Tista River.

Further the blank patches and wiped out forests during the agitation periods should immediately be reconstructed.

9. Railway is meant for the human development but not for wildlives including plants and animals. The railway tracts those are passing through the Mahananda WLS [and from all other Protected Areas in the area] be immediately shifted through the human populated areas of Jalpaiguri such as through Mainaguri-Gairkata rout. Proposals regarding further construction of new roadways or railways should immediately be stopped and/or modified; instead, broadening of existing NH 31A is suggested.
10. There is huge scope for the cultivation of wild plants of medicinal, ornamental or other economic values, if the practice be done in sustainable and legal ways, it will obviously fruitful in both the economic and conservation points of view. For this purpose gardens or nurseries for the high valued plant species of different altitudes should be established respective places in parallel tiers to ensure their propagation, further sustainable exploitation or reintroduction. Habitat preservation for the survival and conservation of rare and endangered taxa is extremely needed. Several other Protected Areas are needed to be formed in various places for these purposes.
11. The methods of cattle rearing in the district is done even today in old and conservative traditional ways, scientific methods of cattle rearing should be implemented to stop grazing of domestic livestock within the natural vegetation.
12. One of the most important causes for dependence of the village people is their immense poverty, therefore, appropriate measures to be taken to improve their economy and standard of living. This may be done through different self-employment schemes, house hold industries etc, so that they become self sufficient and to reduce their dependence on forests.
13. The local people should be taught about the importance of environment management and biodiversity conservation, about nature and ecological balance and various other aspects of nature, forests and wildlives and need of their conservation.

14. Knowledge regarding family planning should be given to the lower section of the villagers where the population growth rate is still a great problem.
15. The authority concerned of different protected areas like National Parks, Wildlife Sanctuaries and Reserved Forests should promptly and strictly enforce their respective laws, rules and regulations within their area of jurisdiction despite of resistance from the people with vested interest.
16. Illegal felling of trees and timber exploitation should be checked with immediate effect, for this purpose more security prersonals, if needed, should be employed and they have to be equipped with more and properly efficient equipments and arms.
17. A common practice prevalent in different protected forest areas is that the security personnels and other forest employs belong to the same village where they are employed. This types of home recruitment should be stopped because being the resident of the same place the illegal poacher will obviously be the known persons to them or most often may be his own relatives, in this case he cannot do anything, therefore at least inter division recruitment should be made and also the staffs should frequently be transferred from place to place.
18. Unauthorised and illegal collection of all sorts of NTFPs especially for commercial purposes should strictly be stopped from the different forests and Protected Areas. The rules are to be strictly enforced for this purpose, poachers, hunters and plant collectors involved in such crime should be strictly punished.
19. Encroached areas and illegal settlements of any kind by people neither in the periphery nor in the fringe areas of these protected areas should be allowed. Friendly steps are to be imitated immediately to shift such existing settlements.
20. Assessment of the diversity of whole bioresources of the district of Darjeeling including including other vascular and non-vascular plant, fungi and other microbial groups and also the animals are to be surveyed immediately giving more emphasis on RET species, which will create a data bank to assist in drawing or formulating conservation strategies for the district.

Darjeeling has lost a lot of its biological treasure in the past and the process is still going on. It will remain no more the *Queen of Hills* because of its ornaments are disappearing one by one, and now it is the turn of its crown to be lost. Biodiversity has so degraded at present that regeneration is almost impossible. In the light of present study out of the recorded 768 species of monocotyledonous plants the list of recognized threatened species is not ignorable. Most striking fact is that many flora recorded by J. D. Hooker over one hundred and fifty years ago are not available today in their previously known habitat. More severe situation is seen in case of orchids, many orchids of ornamental values recorded by King and Pantling (1898), are almost vanished from their natural habitats. The alarming fact that have arose by the present work sincerely invites a great attention and concern of all those related with the conservation of Biodiversity of this small Himalayan pocket.

### 9.3. CONSERVATION STATUS:

The District of Darjeeling is falling within the area of the IUCN recognized Himalaya Hotspot for Biodiversity Conservation. This itself speaks for the importance of its vegetation and the need for taking proper conservation measures.

Conservation is essential in both ways, *in situ* conservation where numerous local elements will survive in their natural home and, expected, in complete undisturbed conditions. At the same time, it is also essential to establish good number of *ex situ* conservatories to protect numerous species of Rare, Endemic

and Threatened plants and commercially and scientifically useful plants.

**9.3.1. *In situ* Conservation:** Some conservation measures has been initiated by the national and state governments. That is reflected in the establishment of a goof of Protected Areas (PA) in the line of IUCN guideline. These include:

**9.3.1A. *Biosphere Reserve:*** Hills of Darjeeling are contiguous with the Kanchanjangha Biosphere Reserve in the Sikkim. There is a long standing proposal for the establishment of Singalila Biosphere Reserve, covering wide areas of Darjeeling Hills. However, the proposal is yet receive the formal approval from the government.

**9.3.2B. *National Parks:*** There are two National Parks located within this district. (1) Siggalila National Park, and (2) Neora Valley National Park. Both of these are situated in temperate hills and the first one in extending to the sub-alpine regions of Tonglu, Sandakphu and Phalut.

**9.3.2C. *Wildlife Sanctuaries:*** Untill recent past there were three such sanctuaries located within the Darjeeling district. (1) Mahananda WLS is located in tropical Terai but extending to sub-tropical hills; (2) Senchal WLS in the temperate hills of Senchal Lake - Tiger Hill region. The thirrd WLS, the Jore-Pokri Salamander Sanctuary has recently been de-recognized as no more salamander are living there.

**9.3.2D. *Reserve Forests:*** There are numerous such forests all most in all regions of the district.

**9.3.3. *Ex situ* Conservation:** Three *ex situ* conservatories can be recognized as useful. These are (1) Lloyd Botanic Garden; (2) Takda Orchid Sanctuary; and (3) NBU Garden of Medicinal Plants.

The LBG is a very old garden in the temperate hills of Darjeeling. This garden is associated with conservation of local species as well as for the introduction of numerous useful exotics.

TOS is now working well towards the conservation of Orchids, facing much disturbances and needs much improvement including advance propagation and cultural facilities.

NBU-GMP is located within the campus of the University of North Bengal and is conserving well over 600 species of Medicinal and other interesting plants. Recently, the University authority has declared this conservatory as a Centre of Medicinal Plants. The Centre has enough potentiality to conserve a large number of species vis-a-vis multidimensional research activities.

**9.3.4. *Further Conservation:*** From the present distribution of natural vegetaton in the district, the status of *in situ* conservation may be considered as sufficient. But, many more scientifically designed and maintained *ex situ* conservatories shold be developed in different climatic regions with proper weitage to temperature tires.