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Deforestation in Garo Hills and its impact

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Abstract

The state was declared a full-fledged state of the Indian Union on January 21, 1972. The state of Meghalaya comprises Khasi, Garo and Jaintia hills. The scheduled tribe populations (mainly belonging to khasi, Jaintia and Garo tribes) constitute 85.53% of the total population. The Garos inhabit western Meghalaya, the Khasis central Meghalaya and the Jaintias eastern Meghalaya. This topic will be confined to the issue of deforestation which is considering as the major cause of degradation of environment in Meghalaya especially in East Garo Hills district. For our study we will consider both primary as well as secondary data. This research topic will deal with the objectives like, causes of deforestation, its impact on eco-system, effect on socio-economic condition, implementation of Government policies etc. According to the State of Forest Report, the actual forest cover of the state is 15,584 sq. km in 1991 which has come down to 15,584 sq.km. in 2001. This accounts for around 69.5% of the state's geographic area. Per capita forest area in the state is 0.64 hectares compared to the national average of 0.11 hectares. However, the total recorded forest area is 9,496 sq. km. The Un-classed Forests, managed by Autonomous District Councils, village durbars and other traditional institutions, and private owners cover an area of 8,372 sq. km. It has been observed that, the area under forest has been decreasing at a faster rate in the Garo Hills due to many special reasons. The shifting cultivation is one behind it, for which there is a decrease in primary productivity of natural, agro-ecosystems, loss in fertility, soil etc. Again, the number of wood-mills are also increasing and cutting the trees for sale or plup. The previous cool weather is now transforming to hotter and hotter day by day, mainly due to deforestation and it is carrying some disease to the people.

The state Meghalaya was covered out from Assam as an Autonomous state on 2nd April, 1970 following the 22nd constitutional amendment act i.e. Assam Reorganization (Meghalaya) Bill of 1969 and turned into a full-fledged state on 21st January, 1972. At present there are ten districts in Meghalaya. The state has an area of 22,429 Sq. K. m. with eleven number of district.

Meghalaya is predominantly an agricultural state where more than 80

percent of total population live in rural areas and depend on agricultural sector for their livelihood. The state is mainly a tribal state. The Khasis, Jaintias and Garos are the major tribes of the state. The other tribes found in the state like Rabhas, Boros, Hajongs, Kochs, Dalu etc. are minor in number. Meghalaya has recorded the highest decadal growth of 27.82% among all the seven North-Eastern states, as per the provisional report of census 2011. The

population of Meghalaya as of 2011 has been estimated at 2,964,007 of which females comprise 1,492,668 and males 1,471,339. As per the census of India 2011, the sex ratio in the state was 986 females per 1,000 males which were far higher than the national average of 940. The ration of females has grown steadily from a 1981 level of 954 per 1,000 males. Traditionally the female sex ratio in the rural areas has been higher than that in the urban areas. However, as per the census figures for 2001, the urban female sex ratio of 985 was higher than the rural sex ratio of 972. This has often been attributed to the belief that, unlike most other parts of India, there is no special preference for male children in Meghalaya.

According to Garos tradition they came originally from Tibet and after wandering long time in North Bengal and Brahmaputra valley they finally settled down in Garo Hills. They entered to the Garo Hills under the leadership of Abong- Naga and his wife Silme-Doka and first settled at Nokrek peak, after which, they scattered to the different parts of Garo Hills to earn their livelihood from agriculture and its allied activities. Now at present there are five Garo clans, namely, Sangma, Shira, Momin, Marak and Areng; where each clan having a number of sub-clans. The Garo people have been practicing matrilineal form of society.

Socio-economic and cultural patterns

According to 2001 census, the population of the state is 2,306, 069 with a density of 103 persons per square km. The scheduled tribe populations (mainly belonging to Khasi, Jaintia and Garo tribes) constitute 85.53% of the total population. The Garos inhabit western Meghalaya, the Khasis, central Meghalaya and the Jaintias, eastern Meghalaya. In the interior of the state (excluding urban populations), the tribal population percentage increases to

97.3% in Garo hills, 77.4% in the Khasi hills and 95.1% in the Jaintia hills. The decennial growth rate (1991-2001) of the tribal elements in the population has been 29.40%. Region wise, it was 24.50% in the Garo hills; 29.50% in the Khasi hills and 36.50% in the Jaintia hills. The literacy rate is 63.31%

Political and Governance Structure

The state of Meghalaya has been divided into 7 districts. These are: East Khasi Hills, West Khasi Hills, East Garo Hills, WestGaro Hills, South Garo Hills, Ri Bhoi, and Jaintia Hills. The total number of villages in Meghalaya is 5780.

There are three Autonomous District Councils (ADCs) in Meghalaya. They are Khasi Hills Autonomous District Council, Jantia Hills Autonomous District Council and Garo Hills Autonomous District Council.

Economic base

Agriculture is the main occupation of the people of Meghalaya. The Garos practice shifting (jhum) cultivation. They are also good fishermen but indifferent hunters. The Hajongs however, do not practice 'shifting' cultivation. The Khasi have four main types of land uses.

- (1) the forest land for jhum cultivation
- (2) wet paddy land
- (3) high grass land
- (4) homestead land which is situated close to their courtyard.

The clearing of forests across the earth has been occurring on a large scale basis for many centuries. This process, generally known as deforestation, involves the cutting down, burning, and damaging of forests. Thus deforestation refers to the loss of forest cover, land that is permanently converted from forest to agricultural land, golf courses, cattle pasture, homes, lakes, or desert. The

Food and Agriculture Organization of UN (FAO) defines tropical deforestation as, “change of forest with depletion of tree crown cover more than 90%.” Depletion of forest tree crown cover less than 90% is considered forest degradation. Logging most often falls under the category of forest degradation and thus not included in deforestation statistics. Therefore forest degradation rates are considerably higher than deforestation rates. According to Brewbaker, the total forest area of the world estimated in 1900 was about 7000 M.ha. By 1975, it was reduced to 2890 M.ha. and this trend led to about 2370 M.ha. in 2000. Deforestation is one of the major causes of environmental degradation, which is considered as a crucial problem for the human civilization as well as one of the root causes of losing biodiversity.

ENVIRONMENT

The word environment comes from the French word ‘environer’ which means ‘to surround’ or ‘to encircle’. The dictionary meaning of the word ‘environment’ is a surrounding; external conditions influencing development or growth of people, animals or plants; living or working conditions etc. Environment, is generally, equated with nature wherein physical components of the planet earth, viz. land, air, water etc. support and affect life in the biosphere. Environment can be defined as the circumstances or conditions that surround an organism or a group of organisms, or the complex of social or cultural conditions that affect an individual or community. Environment also refers to the categories of forces and influence acting upon an organism and in relation to which the organism is capable of reacting and in return influencing.

ENVIRONMENTAL DEGRADATION

Utilization of natural resources is interaction between two systems—the

natural and human. In course of utilization, sometimes the very resource base is eroded leading to devaluation or diminution of environment, or some sort of disturbance is triggered in the ecosystem functioning and structure causing ecological imbalance. Thus environmental degradation refers to the deterioration in its physical component brought in by the deterioration in its physical component brought in by the biological processes mainly by human activities to such an extent that it cannot be set right by the self-regulatory mechanism or homeostatic mechanism of the environment. In other words, Environmental Degradation simply means overall lowering of environmental qualities because of adverse changes brought in by human activities in the basic structure of the components of the environment to such an extent that these adverse changes adversely affect all biological communities in general and human society in particular. Environmental degradation leaves direct impact on the ecology and thus causes ecological imbalances because of marked reduction in the ecosystem and ecological diversity. Both natural and human causes are responsible for environmental degradation. The major natural causes are included— floods, earthquakes, forest fires, climate changes, cyclones, storms, diseases in man, plants, animals, soil erosion and deposition by water and wind, soil salinity and landslides. But it is true that, some of these natural processes are induced or accelerated by human activities.

SIGNIFICANCE AND OBJECTIVES OF THE STUDY

The present study has assumed a great significance in the form of improvement of environmental picture of Meghalaya, because there is necessary to have a proper study about its current environmental issues. Based on that urge,

this present paper is trying to deal with one basic cause of environmental degradation created by human being which is called “DEFORESTATION”. Here we are conferring our field of study with referring to GARO HILLS DISTRICTS OF MEGALAYA. The paper is dealing with the following objectives:

- i) to know about the trend of deforestation in Meghalaya as well as in the districts.
- ii) to find out various causes of deforestation
- iii) to clarify about different affect for deforestation in the environment as well as in the society.
- iv) to explain various policies adopted by the central and state government to prevent deforestation and to examine how far those policies are practically applied in the study area.

METHODOLOGY OF THE STUDY

Both primary and secondary data is used in our study. The primary data are collected at the field level through interview. The secondary data are collected from census reports, annual reports, newspapers, journals, references books, various published and unpublished official and non-official documents.

FOREST AND ITS IMPORTANCE

Forest is a vast fallow tract of terrain covered with trees and Underwood. Forest includes tree lots, grasslands, fodder and fuel plantations, shelter belts, strips and avenue plantation etc.

Ecologically, forest is not the result of only trees and other plants by chance but it is a gradually developed community of complex organism with specific biological laws. Forest covers much of the planet's

land area. They are extremely important to humans and the natural world. For humans, they have many aesthetic, recreational, economic, historical, cultural and religious values. Timbers and other products of forest are important economically both locally and as exports. Forests provide employment for those who harvest the wood or products of the living forest. Other non-wood forest products come in the form of medicinal compounds, dye sand fabrics. There are many people who are dependent on forests for their livelihoods. One-third of the world's population depends on wood for fuel as a significant energy source. Some indigenous people completely depend on forest as it is their home. The forest environment provides a perfect opportunity for ecotourism, which includes hiking, camping, bird watching and other outdoor adventures or nature study activity.

FOREST COVER

According to the State of Forest Report (FSI 2001), the actual forest cover of the state is 15,584 sq. km. This accounts for around 69.5% of the state's geographic area. Per capita forest area in the state is 0.64 hectares compared to the national average of 0.11 hectares. However, the total recorded forest area is 9,496 sq. km. The area of reserved and protected forests under the control of the state government is only 1,124 sq. km. The Un-classed Forests, managed by Autonomous District Councils, village durbars and other traditional institutions, and private owners cover an area of 8,372 sq. km. During 1985-87, 73.41% (16,466 sq. km) of the total geographical area of the state was under forest cover. It decreased to 69.75% (15,645 sq. km) by the year 1987-89 and then increased to 69.48% (15584 sq. km) in 1999-2001. The forest cover in different districts is given in the following table:

Forest cover (%) in different districts of Meghalaya

Districts	Forest Cover(in %)
East Khasi Hills	35.34
West Khasi Hills	53.52
Jaintia Hills	46.13
West Garo Hills	54.45
South Garo Hills	64.11
East Garo Hills	58.38
Ri-Bhoi	50.24

Change in forest cover (sq. km) in the state since 1991 (FSI report, 1999

State	1991	1993	1995	1997	1999
Meghalaya	15,875	15,769	15,714	15,657	15,633

Source: *State of the Environment Report 2005: Meghalaya*

The forest cover of Meghalaya decreased from 1981 to 1999; it was highest during 1980-89. **53.52**

FOREST RESOURCES

Besides timber, a number of non-timber forest produce including cane, bamboos, broom-grass, mushrooms, orchids, commercially important grass species, and oil yielding trees, honey and wax are extracted from the forests every year in large quantities. Important medicinal plants are found in the forests. Gums, resins, edible wild fruits and tubers and cinnamon, large cardamom are other important non-timber forest resources of the state.

FOREST OWNERSHIP

Unlike the rest of the country where forests are mostly owned by the state and managed by the state forest department, in Meghalaya substantial forest areas are under the un-classed category, and are Mixed Pine owned by private individuals, clans, village councils, district councils and other traditional community

institutions. The Autonomous District Councils control the un-classed forests of 8,503 sq. km (96%).

FOREST ADMINISTRATION

Besides the State Forest Department and Autonomous District Councils, private individuals, communities and clans own the forests in Meghalaya. The ownership rights over land and resources are further protected by the sixth schedule of Indian Constitution. The acts and rules framed by the state and national governments are therefore not applicable to such forests. The district council acts are too weakly enforced, as there are not adequate forest personnel in the district council to enforce them. Hence, most community forests are virtually under no management and do not come under the effective enforcement of any of the forest laws. Unregulated shifting cultivation by the local tribal populations has been a major

threat to forest particularly in un-classed and community forests. In spite of the efforts of many state and national agencies, a viable land-use option to shifting cultivation is yet to be found. There is a need to work out a regulatory mechanism to control over-exploitation of forests, where the landowners themselves will be legally bound to sustainable harvest and manage their own forests.

CAUSES OF DEFORESTATION

Shifting agriculture, logging, mining and other human activities have been responsible for fragmentation, destruction and degradation of the forests in the state. High rainfall and hilly terrain have further accentuated the impact of human activities

Annual area (Sq.km.) under Jhum in different districts of Meghalaya

Districts	Area (sq.km.)
East Khasi Hills	6.2
West Khasi Hills	46.19
Jaintia Hills	11.74
West Garo Hills	155.45
South Garo Hills	67.87
East Garo Hills	117.15
Ri-Bhoi	27.4

No of Population dependent on Jhum Cultivation in Meghalaya.

Districts	No of person
East Khasi Hills	3,605
West Khasi Hills	26,870
Jaintia Hills	6,830
West Garo Hills	90,430
South Garo Hills	39,500
East Garo Hills	68,150
Ri-Bhoi	21,755

Commercial logging: This is another common form of deforestation in cutting trees for sale as timber or pulp. In Garo Hills, lots of legal as well as illegal wood-mill has been increasing in recent times for

on the forest. As a result, the forests are getting fragmented into small patches. As a whole we can forward the following main reasons for deforestation in Garo Hills:

Agriculture: Most of the forest is clearing for agricultural purposes (grazing cattle, planting crops etc.) Poor farmers cut down small areas and burn the trees and proceed with agriculture. Especially the Jhum Cultivation which is mostly practiced in Garo Hills destroys forest on a large scale, sometimes destroying several square kilometers at a time. The following tables are given to explain the extent of Jhum Cultivation in the area.

which we are losing very valuable trees at a faster rate. Again, huge rate of forest are cutting down to build roads. Logging roads enable landless people to access the interiors

of the forest, which in turn results in further deforestation and poaching.

Population growth: The rapid increase of population in Garo Hills is another cause of deforestation as they are cutting the trees without limit to construct their house, to earn money to live. Here we can point out that ,the lack of social awareness and ignorance of the people is also one major cause of deforestation.

The cash crop economy: The cash crop economy is an integral part of Third World “Development and a major cause of deforestation. The best land is taken to earn export income, which is very often used to pay the foreign debt. Farmers are forced onto marginal lands, resulting in deforestation, land degradation and poverty. In Garo hills this condition is occurring for rubber plantation, orange garden, battle nut garden etc.

Mining: Mining, is also playing an significant cause of deforestation in Garo Hills. Meghalaya has an estimated coal reserve of 559 million tones, which are spread over in an area of 213.9 sq. km covering approximately 1% of the total geographical area of the state. The Garo Hills district has the highest coal reserve of 390 million tones, followed by West Khasi Hills (98 million tons), Jaintia Hills (39 million tons) and East Khasi Hills districts (31 million tons)

Natural Causes: In Garo Hills nature itself is also another cause of deforestation, as around 90% bamboo plants has spoiled within recent two years by giving flower again many varieties of plants are affected and damaged due to some unknown diseases.

ENVIRONMENTAL EFFECTS OF DEFORESTATION

The major effects of deforestation are:

- The continuous cutting of forest in the area results an insecure future for forest workers.
- Heavy rainfall and high sunlight quickly damage the topsoil in clearings of the tropical rainforests. In such circumstances, the forest will take much longer to re-generate and the land will not be suitable for agricultural use for quite some of time.
- Where forests are replanted, their replacement can mean a loss of quality and due to this the productivity of agricultural goods especially vegetables are decreasing and hence the prices of such items are high in Garo Hills.
- The destroying of forest in Garo Hills is a big loss of future markets for ecotourism. The value of the forest is often higher when it is left standing than it could be worth when it is harvested.
- Deforestation can cause the climate to become extreme in nature.
- It has been observed that the weather which was very soft during the summer time, now becoming hotter and hotter.
- The sudden occurrence of flood in the plain region mainly in Assam is also another major effect, which is only due to lack of water capturing capacity in the hilly areas. The heavy rain in one part and droughts in another part of the same region is also mainly due to deforestation which is affecting the economy.
- The process of deforestation in this region is destroying this unique environment. Consequently, many

animals and plants that live in the rainforests face the prospect of extinction. The extinction of the plants and animals leads to diminished gene pool. The lack of biodiversity and a reduced planetary gene pool could have many unforeseen effects, some of which could be fatal to the future of humanity.

- Since the planetary gene pool continues to diminish in Garo Hills, there are fewer opportunities for advancements in many fields. Garo hills, which is rich in local medicine, is becoming poor due to loss of certain plants that grow only in forests. Furthermore, if the forests are destroyed in this way in this area the opportunity to explore that possibility would be lost forever. The effect of that it would have on future generation is unpredictable.
- Different people have different uses of forests. Indigenous Garo people who live in the forests, the forest is their home, source of food, shelter, nourishment, recreation, culture, and lively hood. The forest provides the materials for their homes, wood for their fires, the fish, the edible plants, and many more necessities as well as amenities. There are people who see the forest as a source of money. They cut down trees and sale it at high price. In the short-run, they can make huge profits for them. If this is continued unchecked, there will be no more trees to cut down. People who make their living by cutting and selling trees will go bankrupt.
- Because of the exposure to the sun, the soil gets baked and the lack of

sunshade by trees causes the moisture to quickly evaporate into the atmosphere. Thus, previously moist soil becomes dry and cracked.

- Moisture from the oceans fall as rain and the moisture is soon sent up to the atmosphere through the transpiration of foliage to fall again on inland forest areas. This cycle repeats several times to rain on all forest regions; with the disappearance of forest this process will stop.
- Less carbon dioxide and nitrogen exchange.
- Frequent shifting from one land to the other for practicing Jhum has adversely affected the basic life support systems like vegetation and soil. The decline in the area under natural forest, the fragmentation of habitat, local disappearance of native species and invasion by exotic weeds plants are some of the ecological consequences of shifting agriculture. Due to shifting cultivation on steep slopes, down-stream siltation of the water bodies is apparent in many districts.
- Deforestation is known to contribute to increased run-off of rainfall and intensified soil erosion in the region. Landslide is very common in the area for which the communication problem arises frequently during the rainy seasons.
- There are many rewards such as clean air and clean water, perhaps the two most important, that forest provide. Forests also provide many aesthetic, recreational and cultural rewards. If the forest is destroyed,

then these rewards disappear from this region which will be the great social loss for the entire world.

GOVERNMENT OF MEGHALAYA AND ITS POLICIES

The National Forest Policy 1988 is the guiding policy of the forest management in the state. The Forest (Conservation) Act, 1980, The Wildlife Protection Act, 1972 and JFM Guidelines, 1990, 2002 are some of the national legislations/policies that guide the management of state's forest. Other acts and rules impacting the extraction of forest produce in Meghalaya are:

- Meghalaya Forest Regulation, 1980 (Adapted from Assam Forest Regulation, 1890)
- The Garo Hills Regulation, 1882 (Regulation 1 of 1882)
- Meghalaya Forest Regulation (Application and Amendment) Act, 1973
- Meghalaya Forest (Removal of Timber) Regulation Act, 1981
- Meghalaya Tree Preservation Act, 1976
- Meghalaya Protection of Catchment Areas Act, 1988
- The Meghalaya Wild Animal and Birds Protection Act, 1971 (Act 9 of 1971)
- The Elephant Preservation Act, 1879 (VI of 1879) ,etc.

Besides, Joint Forest Management Guidelines of 2003 and Guidelines for Forest Development Agencies, 2003 have also direct impact on the sharing of usufructs and benefits out of plantation forestry.

Although there is no formal forest policy adopted yet in the state (a draft policy paper was prepared in 1980 but not yet approved), the policy of the state forest department has been to increase the forest cover of the state by discouraging and regulating the felling in all categories of forests and greening barren areas which are under the constitutional jurisdiction of the District Councils. Attempts are also being made to streamline the administration of the forest and forestland under a single umbrella christened as 'unified control and management of the forests' of District Councils and the state forest department. Many rounds of discussions have taken place between the authorities of the District Council and the state government but there has been tangible result yet. Besides, it is also the intention of the department to create village reserve forests all over the state, in the same manner as the erstwhile village forests established by the people themselves during the pre-British period.

The existing Assam Forest Regulation adopted by the state as the Meghalaya Forests Regulation is far from adequate to achieve the aims and objectives of the policy. Therefore, a few other acts have been legislated like the Meghalaya Removal of Timber Regulation Act, the Meghalaya Tree Preservation Act etc. The Meghalaya Tree Preservation Act was legislated with the prima facie objective of preventing the felling of trees within a radius of 10 km from the heart of Shillong. There is also an enabling provision to extend the same to the other district headquarters. However, the enforcement of the provisions of most of the Acts has been far from satisfactory.

Normally, as per provision of the Sixth schedule of the constitution of India, it is not possible for the State Government to interfere with the administration of forests in

the Sixth scheduled areas. But through separate legislation, the State Government acts and rules can supersede the existing District Councils Acts also. Therefore, to discourage the felling of small trees in the District Council areas, the Acts attempt to regulate the marketing of the forest produce outside the state. This has been done based upon the logic that about 80 per cent of the timbers extracted from these forests go outside the state and the people of the state utilize hardly 20 per cent. Likewise, to conserve and preserve the forests in the critical catchment areas of the important rivers of the state, it is contemplated to legislate an Act, which will ban tree felling in these forests.

District Council Forest Acts

The District Councils have legislated separate forest acts and rules more or less in line with and in the same pattern as that of the State Forest Regulation. The Garo Hills Autonomous District Council Forest Act, 1958 are applicable in their respective jurisdictions. Unfortunately, this provision of the Acts could not be enforced and implemented in the true sense of the term. The Acts are self-contained with all the relevant desirable provisions, but the enforcement is not satisfactory. As a result of this, these forests have been subjected to indiscriminate felling during the last four decades.

Traditional Community Forest Laws

Most of the acts and laws passed by the Govt. of India, Govt. of Meghalaya and Autonomous District Councils remained less effective in managing the forests of the state. Contrary to this, the traditional institutions such as Nokmaship have been forceful and effective till recently in managing the forests under their jurisdiction following customary laws.

Supreme Court Orders

In addition to the above policies, rules and acts, the supreme court orders (dated 12 December, 1996, 15 January, 1998 and 12 May, 2001) have direct or indirect relevance to the forests, shifting cultivation and biodiversity conservation in Meghalaya.

SOLUTIONS TO THE PROBLEMS OF DEFORESTATION

Deforestation is a serious problem, but humans can make a difference. An individual as well as a society can practice green consumerism. The following actions could serve as effective solutions to the problem of deforestation.

- Reduce the consumption of forest and related products.
- Avoid harmful products by consumer boycotts, such as tropical rainforest wood, old-growth wood from the tropical rainforest.
- Boycott products of companies involved in deforestation.
- Compel government and industry to make changes in the forest policies.
- Individuals may communicate their uncertainty about the future of the world's forests to politicians, corporate executives and non-governmental organizations through personal communication or in groups using petitions and rallies.
- Environmental conservation may be given importance in school curricula.

None of these activities can occur without the raising of public awareness to inform consumers about the environmental effects of their products. One of the most important ways for a person to have a positive effect is to reduce his or her consumption of forest and related products. An increase in the participation of the public

and the availability of facilities for reducing, reusing and recycling is necessary.

Education is one of the most effective catalysts for change. Society should undertake to educate the people of today to change their ways and the younger generations to have respect for nature. In forest regions, the young people should receive knowledge about the biological, social and economic values of forests. Workers should be taught to use technology to enhance forest ecosystems instead of destroying them and for reforestation and afforestation projects. If humans are able to see themselves as part of nature, they will

also respect forests as living communities, not just resources to be exploited.

There are indigenous people who have lived in the forests for a long time. They have managed to use the forests sustainably while practicing shifting cultivation or hunting and gathering. Some of them still live in relative isolation in the forests. Human kind should protect their rights and preserve their cultures. They should be models for sustainability in the future. Indigenous people can show us what forest products to use and how to use them properly. They deserve to continue their ways of life.

BIBLIOGRAPHY

- (1) District statistical book, East Garo Hills, Willimnagar, Meghalaya (1999- 2000).
- (2) A pocket handbook of Meghalaya Shillong, Meghalaya (2000-01).
- (3) Sherwn May Sungoh "An introduction to environmental education".
- (4) Zahid Husain "Environmental degradation and conservation in North East India".
- (5) Benny Joseph "Environmental Studies"
- (6) Karpagam M. "Environmental Economics"
- (7) Dr. P. A. Koli "Economic Development and Environment Issues"
- (8) State Of The Environmental Report ,2005. Meghalaya.