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Biodiversity of Northeast India

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Abstract:

Northeast India, a biodiversity hotspot, is home to a diverse range of flora and fauna, contributing significantly to the country's biological wealth. This region, comprising the states of Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura, and Sikkim, covers 7.7% of India's geographical area and houses around 50% of the country's plant species, with over 31% being endemic. The region's rich biodiversity spans ecosystems from tropical rainforests to alpine scrubs, playing a crucial role in maintaining ecological balance. The traditional practices of local tribes are closely intertwined with the region's biodiversity, influencing the conservation and sustainable use of natural resources.

However, this biodiversity is increasingly threatened by human activities such as deforestation, shifting agriculture (Jhum cultivation), poaching, and encroachment on forest lands. Additionally, urbanization, infrastructure development, and the introduction of exotic species have contributed to the degradation of natural habitats. Despite these challenges, various legal frameworks, including the Wildlife Protection Act, 1972, and the Biodiversity Act, 2002, have been implemented to safeguard the region's biodiversity.

This study emphasizes the importance of understanding the region's biodiversity from both ecological and cultural perspectives, offering measures for sustainable conservation. It also highlights the need for enhanced community participation, environmental awareness, and the development of region-specific regulations to effectively manage and protect the unique biodiversity of Northeast India.

Northeast India not only either a place of rising sun or ethnic and cultural diversity but also a mega bio-diversity centre and a hotspot comprising of the states of Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Sikkim. Biodiversity embraces whole life of the earth shows variability among living organism from all sources which includes biodiversity within species, between species and of eco-systems.

The region occupies 7.7% of India's total geographical area supporting 50% of the Flora(8000 species)of which 31.58% (2526 species) is endemic. The region is rich in Orchids ,Ferns, Oaks, Bamboos, Magnolias and many other medicinal plants as well as rare and endangered animal species. The region supports rich biodiversity spanning from tropical rainforests to alpine scrubs which has a

significant role in the maintenance of ecosystem. Further, the biodiversity of the region is used ethnologically by locals for various socio-economic and developmental purposes. The culture and customs of local tribes have also an important role in understanding biodiversity and management issues.

The following figures highlighted the significance of biodiversity of the region and qualified it to be a biodiversity " Hotspot .

* There are 51 Forest types in the region which are broadly divided in to six categories.
* Out of 9 important vegetation types in India 6 are found in the NE region.
* The floral species contributed a lot to the richness of highest diversity in the NE states.
* 4.10% of the flowering plants in the country are endangered. Of the 1500 endangered floral species 800 is reported from Northeast.

STATES	Geographical Area of State (In Sq.Km)	Forest cover in 2003	Percentage Of Forest Cover	Forest cover in 2001
Assam	78,438	27,826	24.04%	27,714
Manipur	22,327	17,219	77.12%	16,926
Meghalaya	22,429	16,839	75.08%	15,584
Mizoram	21,081	18,430	87.42%	17,494
Nagaland	16,579	13,609	82.09%	13,345
Sikkim	7,096	3,262	45.97%	3,193
Tripura	10,486	8,093	77.18%	7,065

Forests, one of the most natural resources cover the earth like a green blanket. Forest not only produces innumerable material goods but also provide environmental services. But forests are disappearing at rapid pace in the region which directly affected the biological diversity of the region causing mass extinction of huge number of plants and animal species. There is an ecological crisis which has threatened the whole life support system and the large number of habitats and species.

The major threats to rich biodiversity of the region are as follows:

1. Deforestation and Degradation
2. Shifting agriculture (Jhum cultivation)
3. Over exploitation of forests for firewood
4. Encroachment in forest land
5. Poaching as well as illegal extraction of forest products.
6. Commercial plantation
7. Urbanization
8. Forest fire
9. Introduction of Exotic plants
10. Disturbance in migration routes (Human-wild life conflict)
11. Uncoordinated Infrastructure development
12. (Ill-managed road construction, Big Dams, Mining etc.)
13. In migration etc.

Northeast India has 64% (2,55,000 km) of the total geographic area under forest cover and it is often said that it continues to a forest surplus region. However, the forest cover is rapidly disappearing from the entire region. This has now come down to 25% only due to the wanton deforestation causing serious loss of habitat for many endangered and endemic species of wildlife. It is estimated that 1800 sq.km.in the forest cover between 1991 and 1999 has been decreased. (F.S.I, 2000).The most astonishing fact is that the quality of the forest is also deteriorating with the dense forest becoming degraded into open forest.

The following table reflects the lost of dense forest in the region.

State	2001 Assessment			2003 Assessment			Change		
	Dense	Open	Total	Dense	Open	Total	Dense	Open	Total
Arunachal Pradesh	55,932	14,113	68,045	53,511	14,508	68,019	-421	395	-26
Assam	15,830	11,884	27,714	13,042	14,784	27,826	-2788	2900	112
Manipur	5,710	11,246	16,926	6,538	10,681	17,219	828	-535	293
Meghalaya	5,681	9,903	15,584	6,481	10,348	16,839	810	445	1,255
Mizoram	8,936	8,558	17,494	7,488	10,942	18,430	-1448	2,384	936
Nagaland	5,393	7,952	13,345	5,707	7,902	13,609	314	-50	264
Sikkim	2,391	802	3,193	2,362	900	3,262	-29	98	69
Tripura	3,463	3,602	7,065	5,046	3,047	8,093	1,583	-555	1,028

Above table shows that four of the eight states Arunachal, Assam, Mizoram and Sikkim lost dense forest.

Extensive area of the Northeast has been disturbed and modified and, in some places, destroyed by seismic activities, frequent landslides and resulted soil erosion. While these natural calamities have contributed marginally to the change in vegetation type, human induced activities have led to irreversible transformation in the landscapes and resulted in colossal loss of biodiversity.

Agriculture is the main livelihood among the people of Northeast India. Along with the Settled agriculture (Paddy cultivation) the Shifting agriculture “jhum” is often carried out by many tribal groups which has adverse effects on ecology and conservation. Encroachment of forest land is a serious threat to forests and its conservation. The situation is alarming in some states of Northeast region and needs strong political will to address the problem. Encroachment not only caused of the loss of forest but also created a tool for perpetual degradation of forest resources. Poaching of wild animals takes place quite often in the forests of NE region because of availability of large number of rare and endemic species and also due to presence of several exits along the international borders with Bhutan, China, Myanmar and Bangladesh. Apart from Tiger skin and bones, Rhino horns and Elephant tusks, a large number of wild animals and their body parts are smuggled out of this region every year. The targeted species of poaching are python, monitor lizard, pangolin, hoolock gibbon ,capped langur, turtle, tortoise, lesser, cats, hill myna, hornbill etc. Illegal extraction of forest products resulting the total elimination of some of the richest forest products including plantations. Taxus baccata, a medicinal plant species known for the treatment of ovarian and breast cancer has been overexploited and smuggled heavily from western

Arunachal Pradesh (Chatterjee and Dey, 1997).

Lack of awareness among the people in general regarding conservation of nature and natural resources as well as environment is a major cause of destruction of forest of the region. In spite of the existence of several forest laws and regulations, the forest of entire region is decaying. Million tons

of timbers, plywood, canes and other forest resources are extracted from the forest for exporting outside the region and for raising ground for tea plantation. Plantation for commercial purposes not only replacing original vegetation and flora but also adding to pollution through the enormous chemicals fertilizers and pesticides in the plantation.

The faster growth rate of population has led to the rapid process of urbanization such as construction of new buildings, industrial complexes, extension of roads etc. These in turn have increased demand for forest products for which forest are destroyed indiscriminately which resulted in gradual disappearance of valuable species of flora and fauna of the region.

Forest fire sweeps a large area of forest floor every year, affecting regeneration in natural forest and young crop in the plantations. The villagers set fire to forest floor at the end of winters poses a serious threat to diversity. The hill forests get burnt due to jhum, fires going out of control and spreading to the surrounding areas causing immense harm in catchment area of major rivers. It is estimated by FSI In 1993 that around 6.16% of the forests are heavy to moderately degraded by fire.

Due to increasing demand of certain products such as food grain, vegetables, milk and meat some high yielding varieties of plants and animals have been introduced in some states of Northeast region leading to reduced propagation of indigenous varieties and in some cases indigenous varieties have been totally ignored.

Disturbance in migration routes of wildlife causing human wildlife conflict in the region. The NE region harbours important corridors for movement of wild animals like Elephants and human wildlife conflict is widespread in locations like the foothills of Assam, Arunachal Pradesh border along the north bank of Brahmaputra.

Uncoordinated infrastructure development also posed a serious threat to the degradation of forest area as

well as biodiversity in the region. Due to lack of deep environmental awareness in policy making many models of development are proving to be unsustainable. Road constructions as an essential component of development infrastructure have been at times roads to destruction of biodiversity in the region. “Rat hole mining” as primitive mining of coal extraction has been the cause of air, water and soil pollution.

Construction of mega dams spirals also generated controversies in the region. Sikkim Assam and Manipur witnessed mass protests from the citizens on the construction of Mega dams in Rothangchu Subansiri and Tipaimukh accordingly. All such activities have telling impact on the biodiversity of the regions.

The Northeast region is known for its age-old institutional mechanisms on cultural and social values for biodiversity conservation and they have managed biodiversity with the traditional wisdom. But influx of populations from the neighbouring states and countries mostly labourers will have scant regard for the local sentiments and values. We have bitter experience in where large influx of people from Bangladesh posed serious threat to the identity of the local people.

Measures for Conservation of biodiversity in India: The forests are sustainably managed. The area of forests, which is felled, is also subsequently replanted in order to maintain the equilibrium. During such management, in the post-independence period, it was observed that there was a lot of diversion of forestland for non-forestry purpose and the total area slowly dwindled. The total recorded forest area in India is 75 million ha. was found to get reduced to 63 million ha. in the year 1983 in the satellite imageries. Today, the situation has improved a bit and in the year 2001, the area has increased to 67.14 million ha. and tree cover outside forest is another 10.48 million ha. which is nearly 20.55% of the geographical area.

Forest Policy in India:

The first forest policy of 1894 focused the forests as a major source of Railway slipper supply. This was revised in 1952 with a more focused conservation approach but as a source of state exchequer. National Commission of Agriculture studied the forestry planning in the country in 1976 and made

recommendations for future action. Consequently, the forest policy was again revised in 1988 as the National Forest Policy, 1988. The new policy (1988) accords highest priority to the environmental role of forests. The policy states that the principal aim of the Forest Policy must be to ensure environmental stability and ecological balance including atmospheric equilibrium, which are vital for the sustenance of all life forms, human, animal and plant. The derivation of direct economic benefit must be subordinated to this principal aim. Industrial wood requirements are to be met from the farm forestry and private area plantations. In order to maintain the forest requirement during early 80s, it was felt that existing extent of national forest is unable to cater to the need of timber fuel and firewood. Concept of social forestry to raise forests outside forest area in the form of farm forestry in wasteland, strip plantations along canal banks, strip plantations along roadside, strip plantations along railway line etc. tree cover which today we find outside the forest areas to the extent of 10.48 million ha in the country.

India is strengthening its hold on biodiversity conservation by implementing the Indian Forest Act 1972,The wildlife (Protection)Act 1980,The Environment(Protection) Act 1986, The Biodiversity Act 2002etc. India became a party to convention on International Trade in Endangered Species since 1976 also signatory of convention on Biological diversity since 1992. A network of protected areas, biosphere reserves, Sanctuaries ,national parks, Botanical gardens etc. have been established throughout the country ,of which NE region had its share.

India was the first country to insert an amendment into its constitution allowing the state to protect and improve the environment for safeguarding the public health, forest and wildlife. In 1985, the Govt, of India created the Ministry of environment and forests (MoEF) for monitoring, enforcing, conducting environmental assessment and surveys and promotional works about the environment.

Bio-diversity is an international need for the mankind. Considering the importance in 1948 The International Union for Conservation of Nature and Natural resources (IUCN) was established with its Head Quarters at Switzerland. Separate Species Survival Groups were formed to look deep into the conservation issues. Major proximate causes of species extinction are habitat loss and degradation affecting 89 percent of all threatened birds, 83 percent of mammals and 91 percent of all threatened plants assessed globally (IUCN, 2000). The main causes of habitat loss are agricultural activities, extraction (including mining, fishing, logging and harvesting) and development (human settlements, industry and associated infrastructure). Habitat loss and fragmentation leads to the formation of isolated, small, scattered populations. These small populations are increasingly vulnerable to inbreeding depression, high infant mortality and susceptible to environmental changes, and consequently, in the end, possible extinction. Changes in forest composition and quality, and the resultant habitat type lead to declines in primary food species for wildlife. However, the conservation crisis was officially recognised first during the constitution of Man & Biosphere Committee in the year 1968. The Committee recommended the peaceful co-existence of man & nature for the benefit of both. The recommendations also included declaration of Biosphere Reserves in each of the specific biomes. Later in 1980, the World Conservation Strategy was formulated. This Strategy included 3 major points,

i) Maintain essential ecological process and life support systems (e.g. soil regeneration and protection, nutrient recycling, water cleansing, on which human survival depends).
ii) Preserve genetic diversity (range of genetic materials found in organisms).
iii)iii) Ensure sustainable utilisation of species and ecosystems (e.g. fish and other wildlife, forest areas and grazing lands).

During 1990 two major issues attracted international attention, they are i) Carbon sequestration need and ii) Biodiversity. World Bank created a special funding facility called Global Environment facility (GEF) which could grant money for third world on these two counts. This followed the identification of mega-diversity countries and Biodiversity 'Hot Spots' over the globe. Based on the diversity of Angiosperms and Butterflies 12 mega diversity countries and 24 Hot Spots were identified. India is one of the Mega diverse countries and Western Ghats and Northeast India are the 'Hot Spots'.

During the momentous occasion of Rio Earth Summit in 1992, luxury of Biodiversity in third world was recognized by the developed countries. The Biodiversity Convention Treaty was signed.

Objectives of CBD are :

- Conservation of Biodiversity
- Sustainable use of components of Biodiversity.
- Fair and equitable sharing of benefits arising out of the utilisation of genetic resources.

The last (7th) CBD conference was held at Kualalampur in February, 2004. Which discussed :

- Transfer of technology to developing countries and designating BD rich areas as Protected Areas.
- Biosafety to protect community interests.

This apart, the international treaties relating to Endangered species are also helping the conservation of Biodiversity. The Convention of International Trade in Endangered Species (CITES) for wild flora and fauna came into force from July 1975. Periodic additions are made in their Appendix - I e.g. The Tibetian Antelope (*Pantholops hogsonii*) was inluded in Appendix -I in 1979.

In the national scenario, in order to preserve the biodiversity, the Wildlife Action Plan was enunciated in the year 1982, which was subsequently amended in the year 2001

While Wildlife Protection Act, 1972 is the first comprehensive National Act to preserve the wildlife & biodiversity for wilderness, both within and outside forest areas. In the year 1991, it recognised plans also as wildlife and thus, all uncultivated life forms were defined as wildlife. The "Wetlands" were included in the definition of "Land" feeling importance of aquatic biodiversity.

The perception evolved even more when in 2002, the Wildlife Protection Act was amended to include protected areas outside the national forest areas. Thus, the conception of "Conservation Reserve" and "Community Reserve" came up. In fact, the conservation of bio-diversity poises lot of importance on endemism, rarity, higher taxa, and esthetics. On this consideration, the area lying outside forests like East Calcutta Wetland which contains "Marsh Mongoose" (*Herpestes palustris*) which is endemic to these wetlands. This copiously deserves to be declared as "Conservation Reserve". Similarly, the largest congregation of the country for White Ibis in Pupuria village of Birbhum district is protected by local people. This age-old protection deserves to be qualified with declaration of "Community Reserve". These are all legal tools applicable outside forest areas for preservation of important biodiversity.

A National Biodiversity Strategy Action Plan is also being formulated which among other things took attention in forming People's Biodiversity Register where indiginous wisdom has been given due importance. The latest perception was, however, to promulgate a separate Bio-diversity Act which particularly also took into account the genetically modified materials. This Act, although, does not contradict Wildlife Protection Act but brings some additionality like creation of *National Bio-diversity Authority, State Bio-diversity Board, and Bio- diversity Management Committee.* The Biological Diversity Bill was brought in the year 2000 and the Act was also called the *Bio-diversity Act, 2000* (published in 2002). In fact, biological resources in this Act also included microorganism, which has real potential value, the soil microbes, a number of which has been taken from India and patented in developed countries.

But the success of the environmental programs depends greatly on the awareness and consciousness of the common people of the region. Without participation of the people at the grassroot level, protection of environment is next to impossible So ,it is important to sensitize the common people of the region to the environmental problems and involve them to play an active role in preventing deforestation ,poaching and environmental pollution. NGO's also can play a great role in these Endeavours.

Beside these, following measures should be taken by the national government for conservation of biodiversity in the North East region:

1. Considering the unique forest ownership states in NE region, there has been a demand to consider having a separate regulation or Act apart from what exists at the national level which is designed for the NE region.
2. Proper understanding about the ground realities of NE states by policy makers at national level while preparing a separate regulation.
3. An urgent need to address the conflicts between customary and statutory laws and regulations related to forest ownership and natural resources use by local communities.
4. In order to appropriate steps for biodiversity conservation in the region, it is necessary to the enforcement mechanisms of the state to understand the root causes of biodiversity loss instead of dealing with symptoms.
5. .There is a need to develop rigorous models and standards for environmental and social impact assessment while dealing with infrastructure development in the region.
6. In many parts of the North East India, there is a great potential for developing and enhancing forest based livelihoods. To develop such kinds of mechanisms that can enable forest based livelihoods to play a role in economic development and conservation process.

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