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Biodiversity and Sustainable Development in North East India

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ABSTRACT

For thousands of years biodiversity has been an integral part of our culture. . Our ethnic, cultural, and linguistic diversity has been greatly influenced by the unique features of our land, climate and geography, as well as the forces of migration and evolution. North-East India has its own development of a vernacular architecture that has evolved through the ages and is sensitive to its local climate, inhabitants, and materials as the environment has been an integral part of their lifestyles. Sustainability and its development have always remained an issue of utmost importance.

As human beings, we are an integral part of such biodiversity. This biodiversity provides us a unique cultural shape and specific customs, rituals, ceremonies, food habits, clothing habits, all are dependent on biodiversity. There have been various challenges to sustain the bio-diversity such as land tenure system, smuggling, inter-state disputes etc. To overcome all these disputes various initiatives have been through regulatory provision and guidelines.

Keywords: *North-East, Bio-diversity, Sustainable development, Challenges, Provisions.*

I. INTRODUCTION

For Indian culture, the diversity is not new. For thousands of years biodiversity has been an integral part of our culture. The accommodation of various cultures and various plants, trees, animals, and creatures has been the fundamental characteristic of Indian culture for a long time. This is the reason for richness in biodiversity as well as cultural diversity in India. For Indian context the words 'diversity' and 'India' have become synonymous. Our ethnic, cultural, and linguistic diversity has been greatly influenced by the unique features of our land, climate and geography, as well as the forces of migration and evolution. All these forces have been enriching the biodiversity of India through the species of plants, animals, and other organisms.

North-East India has its own development of a vernacular architecture that has evolved

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North-Eastern Region of India consists of Arunachal Pradesh, Assam, Tripura, Meghalaya, Manipur, Mizoram, Nagaland and Sikkim, covering an area of 262,179 sq kilometers with a population of 45 million as per 2011 census. The region lies between 22º N and 29º 5′ N Latitudes and 88º 00' E and 97º 30′ E longitudes, and shares international border with five countries viz., Nepal, Bhutan, China, Myanmar and Bangladesh. Therefore, the entire region is strategically very significant.

The North-Eastern Region can be divided into the eastern Himalayas, the North-Eastern hills, and the Brahmaputra and Barak valley plains. At the confluence of the Indo-Malayan and Palearctic bio geographical realms, the region contains unique habitats characterized by diverse flora and fauna with a high level of indigenousness. The region is also home to more than 200 out of 450 of India's tribes with the culture and customs intricately linked to biodiversity conservation (World Bank, 2007). North East States are one of the most ethnically and linguistically diverse regions in Asia with distinct cultures and traditions in each state. The people of NER is composed of various racial stocks namely Mongoloids, Indo-Aryan, Austric (Australoids) and Dravidians (Dikshit and Dikshit, 2014; Gajrani, 2004). Mongoloids were the original settlers in the region (Dikshit and Dikshit, 2014); and the rest migrated later. In the NE, STs comprised of 27.29 percent of the total population in 2011

II. A BRIEF OVERVIEW OF THE NORTH-EASTERN REGION

Arunachal Pradesh is the largest state (area-wise) in the North-Eastern Region with rich alpine geographical diversity and a wide variety of wild life- flora and fauna. The population of Arunachal Pradesh depends mainly on agriculture and about 17% of total cultivated area is under irrigation. Deposits of dolomite ore, limestone, graphite, quartzite, kyanite, mica iron-ore, copper ore have been reported (Behera, 2004). The state can be divided basically into five river valleys: the Kameng, the Subansiri, the Siang, the Lohit and the Tirap. The Arunachal Pradesh can be divided into three cultural groups on the basis of their socio- politico-religious affinities.

Assam is very well known for its wide rolling plains, rarest of flora and fauna, lofty green hills, mighty waterways and a land of fairs and festivals. Mainly, the inhabitants of Assam can be divided into three categories, namely the tribal population, the non-tribal population and the scheduled castes. About 63% of the state's population is engaged in agriculture and allied

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activities. About one sixth of the world's entire tea production comes from the state of Assam and the tea gardens contribute over half of the country's tea production. The state has large deposits of oil, coal, limestone, refractory clay, dolomite and natural gas. The oil reserves were discovered in the 19th century and Digboi became Asia's first oil refinery (Sadangi, 2008)

Meghalaya has historic, geographic and strategic significance for India. It is lies on north and east of the state of Assam, and on south and west by Bangladesh. The three physical divisions in the state are Garo (Western), Khasi (Central) and Jaintia (Eastern) hill divisions. The forest cover in the state is 76.45% of the state's geographical area (FSI, 2017). Meghalaya is basically an agricultural state with about 80% of its total population being dependent on agriculture for livelihood. The state has a potential for developing horticulture due to agro-climatic variations, which offer much scope for the cultivation of temperate, sub- tropical and tropical fruits and vegetables.

Manipur is the land of rich valleys surrounded by beautiful hills and lakes. The valley of Manipur spreading over an area of 22,327 km. is an isolated hill state. The natural vegetation occupies an area of nearly 67% of the total state geographical area (FSI, 2017). Its economy is primarily agriculture, fisheries, cottage and forestry driven (Gonmei, 2013). Manipur has the highest number of handicrafts units as well as the highest number of craft persons comprising skilled and semi-skilled artisans in the entire North-Eastern region. Handloom is the largest cottage industry in Manipur and the state ranks among the top five in terms of the number of looms in the country (IBEF, 2018).

Mizoram is bounded by Tripura and Bangladesh to its west, the Chin hills of Myanmar to its east and south and by Manipur and Assam to its north The literacy rate in Mizoram is the second highest in the country. Agriculture is the mainstay for about 55-60% of the population of the state. Maize, paddy, pulses, oilseeds, millets are the crops grown in the state.

In Nagaland, almost all areas are in hilly region which is a continuation of the Burma Arc being joined with the Sub-Himalayan ranges in the north and stretching into the hills of Manipur. Unlike other NE states, the absence of Lakes and waterfalls in Nagaland can be conspicuous with some areas where water accumulates during rainy season and dries up in lean season. Life in Nagaland abounds with festivals throughout the year as all the tribes have their own festivals, which they greatly cherish. Most of these festivals revolve around agriculture, which is still the mainstay of the Naga society. Over 85% population of Nagaland is directly dependent on agriculture. Naga inhabits the wild, wide-open pastoral countryside.

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Tripura is situated between the river valleys of Myanmar and Bangladesh. Encircled almost on the three sides by Bangladesh, it is linked with Assam and Mizoram in the northeast. Tripura lacks an industrial base except for some cottage industries (handicrafts and handloom) and small scale manufacturing units.

Sikkim is the second smallest state of India bordering Bhutan, Tibet and Nepal. This Himalayan state has a landscape that includes India's highest mountain, the Kangchenjunga (8,586 m). The Mt. Kangchendzonga, Rivers Teesta and Rangit are significant assests of Sikkim with their deep ravines and valleys. The economy of Sikkim is mainly based on agricultural and animal husbandry. Agriculture is of the mixed type and still at the subsistence level rather than commercial level. There is a vast potential for hydro- electric power generation for which many river valley projects around Teesta and Rangit rivers have been established (ENVIS Centre Sikkim, 2007).

III. IMPORTANCE OF THIS ECOLOGICAL REGION

The land area in Arunachal Pradesh is surrounded by mountains with the Himalayan range along the northern borders criss-crossed with ranges running north-south. The state has more than 500 species of birds h of which several birds are highly endangered and endemic e.g. white winged duck, Sclater monal, Bengal florican, etc. The rich and varied wildlife available in the state are Elephants, Tigers, Leopards, Jungle Cats, White Gibbon, Red Pandas, and Musk. The "Mithun" (Bos forntails) is domesticated in large numbers as well as available in the wild.

In Assam, endangered species of wildlife found includes Golden Langur, Hoolock Gibbon, Pygmy Hog, Hispid Hare, White-Winged Woodduck, Tiger, Clouded Leopard, Swamp Deer, Gangetic Dolphins (Sadangi, 2008). During winter season, flocks of resident and migratory birds make Assam their natural habitat. Guwahati, on bank of the Brahmaputra, is the city which is regarded as the commercial capital of the North-East. Kaziranga, the world-renowned ecosystem in Golaghat and Nagaon district is the home of the great Indian one-horned Rhino. Manas National Park is the only Tiger Reserve of Assam and is also a UNESCO's world heritage site. The Hoolock Gibbon, the Slow Loris, the clouded Leopard, the spotted Linsang, Tragopan, and four different types of Hornbill are part of the rich natural heritage of Manipur.

The available records on biodiversity of Meghalaya revealed the occurrence of about 3,128 species of flowering plants which contribute to about 18% of the total flora of the country, including 1.237 endemic species (Khan 1997). A wide variety of wild and cultivable plants,

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edible fruits, leafy vegetables and orchids are found in the forests of Meghalaya. Meghalaya is endowed with a rich orchid flora of nearly 352 species belonging to 98 genera representing 27.08% of the country's orchid flora. A botanical wonder, the pitcher plant (Nepenthes khasiana) an insectivorous species, is found in Jaintia hills, West Khasi hills and South Garo hills of the state (http:// megbiodiversity.nic.in/floral-biodiversity.html). The wild animals and birds of the state include elephants, tigers, bear, wild buffalo, Hoolock Gibbon etc. (Choudhury, 2003). In Mizoram, forest accounts for nearly 26.76 % of its geographical area (FSI, 2017). The tropical forest of Mizoram has rich variety of flora and fauna. The bamboo groves dominate the lower altitude and orchids of various hues, pinkish-white Bauhinia, sparkling Rhododendrons, yellow sunflowers and many other colourful wild flowers are found in the state. Nagaland abounds in serene natural beauty and panoramic views of the hills which in fact are the eastern offshoots of the mighty Himalayas (Sadangi, 2008)

According to the State of Forest Report (FSI, 2017), 59.96 percent of the total geographical area of the state of Tripura is forest, which can roughly be divided into four types, viz. Sal, Garjan, Bamboo and miscellaneous species. The State has rich natural resources. There are 90 mammal species in Tripura and in the aquatic ecosystem 47 species of fish have been found. Endangered species like spectacle monkey, or Chasma Bandar which the state boasts of, is found only in Sepahijala Wild life Sanctuary in Tripura (MoEF&CC, 2012).

Sikkim is the storehouse of natural beauty and unique ecosystems like glaciers, alpine meadows and thousands of varieties of wildflowers. Sikkim forest and wilderness areas are inhabited by the Snow- Leopard, Yaks, Bharal or Blue Sheep, Shapi. Sikkim is a multi-ethnic state. Broadly, the population can be divided into tribal and non- tribal groups. Lepchas, Bhutias, Sherpas are categorized as Scheduled Tribes. Sikkim is a part of hot spot zone, gifted with abundant natural resources and is enriched with about 4500 species of flowering plants, 363 species of ferns and its allies, 11 species of oaks, 28 species of bamboos, 550 species of orchids and 36 species of Rhododendron. The state is also rich in fauna with 144 species of mammals, 550 species of birds and over 600 species of butterflies.

Challenges to Conservation of Biodiversity in Northeast

i. **Land tenure issues:** Land tenure systems vary widely among different North-Eastern states. The complexity in land ownership and tenurial rights makes it difficult for survey, demarcation and consolidation of land. Therefore, cadastral survey and land demarcation are completely absent in the hill areas of northeast.

ii. **Major differences in Forest Administration:**

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- Forests in Arunachal Pradesh, Manipur, Meghalaya, and Nagaland mainly belong to private individuals, communities, and clans.
- Their ownership is safeguarded by the sixth schedule of the Indian Constitution, making state and national regulations inapplicable.
- Due to inadequate enforcement personnel, district council acts have limited efficacy.
- Consequently, many northeast community forests lack management and law enforcement.

iii. **Major issues in natural resources and diversity management:** Unequal distribution of land resources is responsible for increasing dependence on forests by certain sections of society leading to degradation of biodiversity in the region.

iv. **Inter-departmental coordination:** lack of a comprehensive and holistic approach which addresses the interdependent threats to biodiversity. E.g., use of diclofenac leading to death of cultures.

v. **Smuggling across the international border:** The illicit felling of trees and timber smuggling across the international borders has been the most important cause of forest degradation in border areas of northeast.

vi. **Shifting cultivation:** Unregulated shifting cultivation by the local tribal populations has been a major threat to sustainable diversity management.

vii. **Inter-state border dispute:** Most of the border areas in northeast are forest lands and because of boundary disputes, such lands are often declared as 'no man's land' and hence, do not come under any form of management. This leads to the degradation of diversity in such areas.

viii. **Insurgency:** The long insurgency problem in some states such as Assam and Tripura have considerable impact on diversity conservation.

ix. **Deforestation and Degradation:** Cutting down trees is the primary issue faced by various wildlife resources. With deforestation, the forest cover is disappearing gradually.

x. **Encroachment:** Encroachment of forestland for the developmental purposes and creation of infrastructure e.g., tourism infrastructure is a serious threat to forests and their conservation. This is not only leading to the loss of the forest areas, but also of wildlife.

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xi. **Forest Fire:** Forest fires are now common and have a terrible impact on the forest cover of the Northeast. Wildlife is also affected negatively by this issue.

xii. **Commercial Plantation:** This is leading to the homogenization of biodiversity landscape.

xiii. **Human-Wildlife Conflict:** Natural corridors of movement for the animals are not well made and protected which leads to regular encounters and conflict between humans and wildlife.

xiv. **Replacement of Indigenous Species with Exotic Species:** Due to increasing demand of food and other products exotic species are bought in. These species give high yield thus eradicate the use of local species. E.g., in Tripura more than 280 plants have been introduced to increase the yield, In Mizoram exotic fish species have been introduced.

xv. **Bad Policy Making in Infrastructure Development:** Due to lack of proper information, coordination and planning the construction of infrastructure has become a great threat to biodiversity.

- Mining in these areas for coal, minerals and oils has also caused a reduction of the species richness.
- e.g., In Arunachal Pradesh a species called Sapria himalayana has become extinct due to the development of roads.
- Construction near Eagle nest foothill is causing the extinction of some species of plants. A rare species of epiphytic plant called Agapetes is also in danger.

xvi. **Immigration and Unintended Consequences:** Immigrants from outside are changing the beliefs and customs of the native people. E.g., The sacred grooves of Meghalaya and Manipur are decreasing due to the reducing beliefs of people

IV. INITIATIVES TAKEN FOR CONSERVATION AND SUSTAINABLE DEVELOPMENT

Development and Research Infrastructure:

A. The Institute of Biodiversity and Sustainability Development (IBSD), Imphal, Manipur was established in 2001 under the Department of Biotechnology, Ministry of Science and Technology. Government of India with the main mandate of research on conservation and sustainable utilization of bioresources for the socio-economic development of the region.The institute has now established its research centres in the states of Sikkim, Mizoram and Meghalaya.

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B. The CSIR- North East Institute of Science and Technology (NEIST), Jorhat was established in the year 1961 as one of the multidisciplinary laboratories of Council of Scientific & Industrial Research (CSIR) and has been engaged in multidisciplinary R&D work.

C. The North Eastern Region Community Resource Management Project (NERCORMP) is a rural development project for six districts of three states of North-East India viz., Assam (Karbi Anglong and North Cachar Hills), Manipur (Ukhrul and Senapati) and Meghalaya (West Garo Hills and West Khasi Hills) with the overall objective of improving the livelihood of vulnerable groups in asustainable manner through improved management of resources.

D. The State Forest Research Institute (SFRI) of Arunachal Pradesh was established at Itanagar in 1993 with an aim to increase the understanding and information levels on biodiversity, its conservation and sustainable use recognizing the contributions of local and indigenous communities to the conservation and sustainable utilization of biological diversity through traditional knowledge, practices and innovations.

E. ICAR Research Complex for North Eastern Hill Region (ICAR RC NEH), Umiam, Meghalaya was established in1975 by the Indian Council of Agricultural Research (ICAR). Its mandate includes the improvement and development of sustainable farming systems for different agro-climatic and socio-economic conditions of the region, to improve crops. livestock, fishery and to impart training for development of local competence for management of resources to enhance agricultural productivity, to maintain, analyse and project data base resources for perspective planning, to collaborate with the state departments of the region for testing and promotion of improved farming technologies.

F. The North Eastern Regional Institute of Science and Technology (NERIST) is a science and technology oriented higher education institute in Nirjuli, Itanagar, Arunachal Pradesh funded and controlled by the Ministry of Human Resource and Development, Government of India.

Regulatory provisions and guideline for conservation and sustainable development

1. **Protected areas:** Under the Wildlife Protection Act, 1972 government has made provision for national parks, wildlife sanctuaries, and other types of reserve, through which many parks and sanctuaries have been established in Northeast region. E.g., Kaziranga National Park.

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2. **International Cooperation:** India has signed or became part of many international initiative that conserve the biodiversity in northeast region e.g., UN Convention on Biodiversity.

3. **Role of Ministry of Home Affairs (MHA):** MHA has taken many initiatives to resolve the border dispute between the state and reduce the insurgency in the region which in turn created the available space for the conservation of biodiversity. E.g., resolution of dispute between Assam and Mizoram.

4. **Role of Non-Government Organisations (NGOs):** Many NGOs in northeastern region has promoted the conservation of biodiversity in the region e.g., "Hargila army", a group of rural women in the Indian state of Assam worked for the protection of the greater adjutant (Leptoptilos dubius) locally known as Hargila.

5. **Promotion of Organic:** States like Sikkim which became completely organic by reducing the use of chemicals in agriculture have also decreased the associated negative effects on biodiversity.

6. **Institutional Measures:** Botanical Survey of India, Zoological Survey of India, Indian Council of Agricultural Research, National Bureau of Plant Genetic Resources and many other central government organizations are directly involved in inventorization, conservation and propagation of biodiversity.

7. **Role of Judiciary:** Judiciary in many cases took the initiative for the conservation of biodiversity e.g., National Green Tribunal (NGT), took cognizance of the environmental degradation caused by coal mining in Meghalaya and issued several orders to address the issue.

8. **Community Efforts:** Sacred forests of Meghalaya i.e., Law Lyngdoh, Law Niam and Law Kyntang and sacred groves of Manipur, including Nag Vans are the examples of forest management practices based on the traditional religious beliefs.

9. **Notified Forest Areas:** The government owned forests have been classified into Reserved Forests (RF), Protected Forests (PF) and Proposed Reserve Forests (PRF) to protect and control their management and rational exploitation. Activities harmful to forest flora and fauna have been prohibited in these areas.

10. **Policies and Legislation:**

    a) For forest areas, the National Forest Policy of 1988 has been adopted in the region. To ensure policy implementation, appropriate forest legislation and instructions have been

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brought in.

b) The central legislations such as Indian Forest Act, 1927; the Wildlife (Protection) Act, 1972; the Forest (Conservation) Act, 1980; and the Environment (Protection) Act, 1972 have been enacted in the region.

c) Besides, many state legislations are in force in each state for regulation of forest extraction.

11. **Education for Biodiversity Conservation**: Apart from in-situ conservation efforts, each state has tried for ex-situ conservation such as Captive breeding programme on selected animals such as leopard cat, binturong, spotted deer and primates.

12. **Conservation Hot Spots:** Many projects with specific objectives of biodiversity survey and conservation were undertaken in different north-eastern states to survey and identify biodiversity rich locations referred as "Conservation Hot Spots (CHS)" in the region with funding support from WWF – India and other funding agencies.

13. **Joint Forest Management (JFM):** The programme of JFM has been adopted in 7 states (except Meghalaya) of the eco region to regenerate, protect and manage the degraded forest lands with the involvement of local communities with or without the help of NGOs.

14. **Afforestation Programmes:** There are state specific programmes for bringing the vacant and Jhum fallow lands belonging to small and marginal farmers under vegetation cover. E.g., the "Apna van scheme" in Arunachal Pradesh and "Angan Ban Prakalpa" in Tripura.

V. Conclusion

As human beings, we are an integral part of such biodiversity. This biodiversity provides us a unique cultural shape and specific customs, rituals, ceremonies, food habits, clothing habits, all are dependent on biodiversity.. For the last several decades it has been observed that, because of climate change and global warming, biodiversity is continuously declining. One side, in northern India, excess heat became the reason for the loss in biodiversity while another side flooded the biodiversity in northeast India (Assam and Meghalaya). However there are several solutions to protect biodiversity, but the nature based solution is the most appropriate solution. In this way, we could enrich biodiversity.

Today, climate change is the big challenge to protect biodiversity. This climate change should be tackled through maximum forestation, so that we would protect the land from degradation.

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Once the land is protected from degradation, the life of the plants of various species would be protected easily Therefore, it can be said that biodiversity is not essential only for the environment perspective and for sustainable development but also it is significant for economic benefits of the contemporary period. Environment is closely related to our culture, to our economy, to our survival. So, the protection of the diversity, on side will enrich the endogenous characteristic of Indian culture on other side through it many other contemporary issues of economy would be tackled

To preserve biodiversity, we should be aware of biodiversity science. Government has launched National Mission on Biodiversity and Human Well-Being conceived and planned by the Biodiversity Collaborative pulling together public and private institutions. This mission is associated with the various sectors of agriculture, health, bio-economic, ecosystem services, and climate change mitigation and hence definitely this initiative of the government will enrich the biodiversity and the cultural diversity both as well as it will brimming the UN's Sustainable Development Goals closer to achieve.

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