

# North-East India: A Unique Biodiversity Paradise Unexplored or Lost?

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**Abstract-** The North-East India region is the “gateway” for much of India’s flora and fauna as the ecosystem components exhibit great dynamism and has a relatively complex biogeography. It is considered as a genetic treasure house of plants, animals and microbial resources. The region fills in as a rich archive of plant and animal riches in different biological frameworks. Forests in this area vary from tropical, temperate to alpine meadows and cold deserts, having highest diversity of biomes. These biological communities mirror a mosaic of biotic communities at different spatial and hierarchical levels and also show high evolutionary activities. The North-East (NE) region contains more than one-third of the country’s total biodiversity and the extent of endemism is exceptionally high in both flora and fauna. The NE region forms a part of Indo-Burma hotspot which is amongst the 34 globally identified hotspots in the world and also four global priority ecoregions are located in this region. This paper aims to highlight the extent of biodiversity of flora and fauna in the North-Eastern region of India, since most of the biota is unexplored or underexplored due to the remoteness of the area and troublesome landscape and has led to poor documentation of the floral and faunal diversity. New species that are being continuously discovered, justify that much is yet to be identified, and studied here. Further the emphasis is placed on the deteriorating condition of the flora and fauna and the measures taken for conservation at national and global levels.

**Index Terms-** Ecosystem, Biodiversity, Flora and Fauna, Biotic community, Conservation and Endemism

## I. INTRODUCTION

North-East India covers the eight sister states which include Assam, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim and Tripura. It is geographically nestled in one of the most biodiversity-rich regions of the world [1]. The tremendous assortment of the climatic, altitudinal and soil varieties in this area pays the route for an incredible scope of natural habitats for the biotic communities. North-East India dwell a wide variety of flora and fauna. Additionally, it has extensive variety of physiographic, economic and social diversity region indicating wide land varieties that differ from the surge field plains of Assam to most noteworthy mountain pinnacles of Khanchanzenga (8586 m) in Sikkim. Also, it is portrayed by highest precipitation territories like Cherrapunji in Meghalaya and the state like Mizoram has most noteworthy level of forest cover with few steep slopes [2]. The North-East region fills in as a rich archive of plant and animal riches in different biological frameworks. These biological communities mirror a mosaic of biotic communities at different spatial and hierarchical levels. Biodiversity means variety of life. Biological diversity is that part of nature which includes the differences in genes among the individuals of a species, the variety and richness of all the floral and faunal species at different scales in space, locally, in a region, and various types of ecosystems within a defined area [3]. On the basis of variation and distribution there are four types of biodiversity (Table 1).

**Table 1: Types of Biodiversity [3]**

Types of Biodiversity	Definition
i) Species Biodiversity	It is the change occurring in the variety of different types of flora and fauna present in different places in the same geographical area.
ii) Genetic Biodiversity	It deals with the genetic makeup of species and the variation in the genes of the species
iii) Ecological Biodiversity	The variation in the ecological area or environment such as forests, deserts, grasslands, streams and coral reefs etc.
iv) Functional Biodiversity	It refers to study of various types of chemical processes of species like cycling of matter, energy flow etc.

The distribution and extent of the biodiversity that exists today has developed over more than 3.5 billion years because of speciation, migration and as of late human impacts amid the years causing extinction. These procedures predominantly worked in vegetated territories and in this manner, the forest ecosystems have been the significant archives of biodiversity.

## II. FLORA

The North-East India, having high precipitation and great climatic conditions, has 7.7% of India's total geographical region encouraging nourishment of the flowering plants (ca. 8000 species), of which 2526 species are endemic [4]. Amongst the 9 essential vegetation sorts of India, 6 are found in the North Eastern area, namely, the tropical wet deciduous forests, tropical semi evergreen forests, tropical wet evergreen forests, subtropical forests, temperate forests and alpine forests are found in this area [5]. The region is delineated as the 'cradle of flowering plants' a consequence of its expanded angiosperm and various essential created plant species [6,7]. Diversity of Orchidaceae, the most entrancing and exceedingly advanced group of plants is about more than 57% of total orchids in India. Specifically, Arunachal Pradesh with 545 species of orchids holds an extraordinary position [1]. Out of 60 species of cane occurring in India, the NE Region has more than 26 species. Likewise, of 150 species of bamboo found in India, 63 species are found in North-East region. Around 25 species of bamboo are viewed as uncommon in NE locale. The assessed diversity in some major crops incorporates more than 9650 rice varieties, 15 varieties of maize, 14 species of banana, 17 of citrus, 15 of sugarcane and their wild relatives and 60 of bamboos [8,9]. Among the non-flowering plants like greeneries, half of the aggregate recorded in the nation are found around this region.

The area, being remote and difficult to reach as a rule has not been investigated totally and holds awesome potential for new plant disclosures. Amid most recent ten years numerous new plants species has been portrayed from the North-Eastern parts of India which mirrors the biodiversity abundance of the area. For an occurrence, amid year 2010, two new genera and 24 new plant species have been found/portrayed by various labourers from NE area of India.

## III. FAUNA

The various atmosphere, fluctuating vegetation and diverse sorts of soil seen in North-East India aid a rich assortment of endemic fauna. North-Eastern areas of India are wealthiest in mammalian fauna. Out of 300 species of mammalian fauna above 10 species are endemic to North-Eastern India. Having about 65 species, bats dominate the mammalian fauna of North-East India. Of the 25,000 wild elephants in India, about 33% are found in North-East India. In fact, Assam alone accounts for more elephants than Myanmar, Thailand, Indonesia or any other country in Asia. India harbours six largest cats of the world and the State of Arunachal Pradesh prides itself for sustaining four large cats of Asia – the Tiger (*Pantheratigris*), Leopard (*Pantherapardus*), Snow Leopard (*Unciauncia*) and the Clouded Leopard (*Neofelisnebulosa*). The Brow-antlered Deer (*Cervuselieldi*) is endemic to the State of Manipur, and was reported to be extinct in 1951. The alpine Scrub and grasslands support some of the most unique fauna of the planet, the Yak, the Tibetan Wild Ass, Markhor, Ibex, and Blue Great Tibetan Sheep, are some of the examples. All the bear species that are found in India are recorded from the northeastern locale of the nation. The Golden Langur is one of the most localised species, recorded in the Himalayan lower regions along the Assam - Bhutan fringe area. Seven types of primates can be seen in Tripura. Great Indian Rhinoceros is the biggest of rhinos that are discovered as of now on the planet [9]

North-East India boasts of a rich variety of amphibians and reptiles. Of the total 342 known Amphibians species from India, 16% of it is from northeast India. The region has 8 species of Bufonids, 6 Dicroglossids, 7 Megophryids species, 6 Ranidae, 17 Rhacophorids species and 9 Caecilian species [10]. In Assam 58 species of snakes have been recorded. Around 34 species of snakes are recorded from Manipur. Previous records indicate 20 lizard species from Assam, and 18 species from the tiny state of Manipur. North-East India is exceptionally rich in freshwater fishes, and it is heartening to note that the region has been extensively surveyed, and accounts for 236 species [10].

Also 3,624 species of insects, 50 molluscs and 689 species of butterflies were recorded in this region of the country. Though the region remains largely unexplored, conservative estimates suggest that it has about 836 of the 1225-odd bird species reported from the Indian subcontinent, several of these being globally threatened and restricted range (endemic) species.

## IV. MICROBIAL RESOURCES-BACTERIA AND FUNGI PEER REVIEWED

In the north-eastern India there are a variety of microorganisms. Manipur has a vast variety of microbes residing in the lakes, salt springs, wetlands etc. 156 actinomycetes were isolated from Nambul river of Manipur. Some of them showed antifungal activity against the human and plant pathogens. *Brevibacillus laterosporus* strain BMP3 was isolated from Assam. It showed antifungal

behaviour against a number of phyto pathogenic fungi. *Streptomyces manipurensis*, *Rhodococcus canchipurensis*, are extremophiles found in limestone quarry of Manipur. *Aquimonas voraii*, *Aeromonas sharmana* etc are found in hot springs of Assam. Fluorescent *Pseudomonas aeruginosa* and three metal tolerant *Serratia* spp. were isolated from the sediments of pre mined Uranium ore deposit of Meghalaya. Many more bacteria were also found in soil samples, crude oil refinery etc [11].

There are around 703 fungal endophytes associated with the sacred forests of Meghalaya. The wood rotting fungi is a kind of fungi which decomposes wood causing its rottenness. These are found in the Bamboo vegetation of North-East India and constitute a major 10% of all kinds of fungi taxa found in this region. In Meghalaya, 78 wood rotting fungi were found. *Heterobasidion perplexais* rare wood rotting fungi which was first discovered in the NE region of India. *Cryptosporiopsis ericae* is a rare endophytic fungus found in northeast region and it is used in biosynthesis of silver nanoparticles. An endophytic fungus associated with the medicinal plant *Osbeckia stellata* aids in techniques like thin layer chromatography (TLC) and gas chromatography (GC). The ethanolic extraction of *Aspergillus* sp. and *Sirococcus conigenus* show antioxidant activity and anti-inflammatory activity [11]. Thus, NE region has bio-spectrum of microbial resources.

## V. SOCIO-ECONOMIC AND ENVIRONMENTAL ISSUES IN NORTH-EAST INDIA

The tribal population of the northeast India constitutes around 30% of the aggregate populace and settled in slopes with skewed way. A greater part of the clans is having own wood land and they have set apart as a private land with aim to make permanent limit. In such condition the tribal community relies upon the timberland assets for the job and other essential prerequisites. As of late, environmental deterioration particularly by the anthropogenic effect has gone through changes in the physical and organic angles in relatively every territory conditions and prompting living space debasement. Endemics can without much of a stretch end up imperilled or wiped out if their limited living space experiences division and degradation, particularly by the human-initiated exercises, including the acquaintance of new living beings with the local normal biological systems/natural surroundings [1]. The significant foundations for natural surroundings debasement and changes in a biological community are - increasing urbanization, opencast mining and oil boring, extraction of metals and minerals, present day horticultural practices, excess destruction of forestland, slash and burn cultivation and so forth, which are increasing exponentially on daily basis for sake of growth and development for the prosperity of the quick emerging human populace. One major activity of this locality which impacts the natural cover is Shift cultivation or Jhum or slash and burn farming to acquire income for managing the life. Jhum is a conventional arrangement of farming completed without working on the soil, is frequently referred to as a purpose behind the loss of timberland front/ forest cover of the area. Jhum cultivation is one of the major capable driver of deforestation and debasement in North-East India [12]. As indicated by FSI around 2 Mha territory of NE India has influenced because of shift cultivation. The greater part of the condition of north-eastern India, essential thick woodland wind up debased into open field or scrubland within a short span of time, which prompts biodiversity misfortune basically in light of the jhum cultivation. Based on 2007 evaluation, FSI has announced green cover loss of 201 km<sup>2</sup> in Nagaland during the year 2005-2007, trailed by Arunachal Pradesh, Tripura and Assam losing green cover to Jhum, timber extraction and fuel wood collection. The reason of the increased jhumming in most recent three decades is the non-attendance of viable land utilization strategy. Currently, the land use policy is on the roots of traditional methods which give clear character of land possession to do anything for occupation. Forest fires are normal and occur often, particularly toward the finish of the winter season, influencing about 20 percent of the aggregate forest zone.

Commercial plantations supplant the native vegetation and flora and add to the harm to forests by drawing in a vast flood of individuals and by adding to contamination through the expansive amounts of chemicals, insecticides, and fertilisers used in the plantations. In Lohit District, vast regions of tropical evergreen forests have been cleared to make area for tea plantations. Forest based businesses were supported for income without considering biodiversity hotspot regions. The saw mills and factories have expanded five times in two decades which has additionally led to cutting/logging of essential woods of blue pine and tropical evergreen backwoods of Arunachal Pradesh, Tripura, Manipur and Assam [13]. Infringement of forest cover has promoted corruption in woodland territory which is completely impacted by political issues. A few biodiversity hotspot zones over the outskirts and in catchment territory have been completely wiped out through unlawful cutting by migrating community from the neighbouring nation over the border zone. The endemic creatures having poor strength require uncommon, dire and stringent protection measures to guarantee their survival. Additionally, the survivability of the endemic species in the characteristic living spaces turns out to be very basic attributable to specific territory utilized by the endemic creatures. Environmental centrality of each endemic species should be surveyed appropriately towards detailing of compelling techniques for giving full security to the delicate biological systems containing the endemics. It is vital accordingly to record the endemic floral and faunal assortments of an area like North-East India in order to work up the various preservation methods in the endemic-rich territories and understand all the provided review comments thoroughly. Now make the required amendments in your paper. If you are not confident about any review comment, then don't forget to get clarity about that comment. And in some cases there could be chances where your paper receives number of critical remarks. In that cases don't get disheartened and try to improvise the maximum.

## VI. BIODIVERSITY CONSERVATION

North-East India has possessed the capacity to hold a noteworthy extent of its biodiversity, conceivably because of a very long time of isolation and the troublesome landscape, yet it is presently under expanding strain to release its assets for economic advancement. However, human activities like slash and burn farming, oil drilling, and modern agricultural practices and introduction of foreign species in the native habitat has proved to be a threat to the endemic species of this region. It is important to draw the attention of the government authorities, NGOs, and common people towards the conservation of biodiversity. To protect biodiversity quick assignment must be formulated and authorized in a period headed program for conserving floral and faunal species and their natural habitat. Activity for conservation must be coordinated towards safe guarding the domesticated plant and animal species keeping in mind the end goal to save indigenous genetic variety, protection and sustainable use of genetic resources/germplasm through appropriate laws and practices, and multiplication and breeding of threatened species through modern techniques of tissue culture and biotechnology. Also, laws should be made to restrict the introduction of exotic species without adequate investigation, to control grazing areas, forest fire, illicit felling, etc. Awareness should be created among people to promote eco-friendly alternatives to reduce pressure on environment and forests. Research scholars should be encouraged to work on forestry, wildlife, biodiversity etc. by setting up more number of State Botanical Garden & State Forest Research Institute. Forest personals can be given required training and education in various fields of specialisation for better maintenance of law and order.

Any improvement procedure that neglects to set up natural protections may make irreversible harm to the area. The problem for the mankind isn't to spare biodiversity for its own particular purpose, but to guarantee that biodiversity is utilised reasonably and fairly for human advancement. Henceforth, both global and national major priority-setting practices have been done to feature the biodiversity criticalness of the region. The priority-setting procedures can help recognise key destinations and species that are naturally remarkable or essential from a cultural, social, or ecological viewpoint [14, 15].

### 1. National Priority-Setting Exercises

#### A. Protected area

Since a long time, the Himalaya including the NE region, a worldwide protection need has progressively gotten consideration of Government of India. The Government has propelled diverse projects now and again for the in-situ conservation of biodiversity through protected area systems. Till date, 55 Wildlife Sanctuaries, 16 National Parks have been formed in various NE states covering a region of 6912 sq. km and 11,261 sq. km, separately.

**Table 2: Summary of Protected Area in North-East India (State-wise) [1, 2]**

State	Total Protected Area (km <sup>2</sup> )	Number of Biospheres	Number of National Parks	Number of Wildlife Sanctuary
Arunachal Pradesh	5000	1	2	11
Assam	3010	1	5	18
Manipur	2500	-	1	1
Meghalaya	3500	2	2	3
Mizoram	2200	-	2	8
Nagaland	2250	-	1	3
Sikkim	4500	1	1	7
Tripura	1600	-	2	4
<b>Total</b>	<b>24560</b>	<b>5</b>	<b>16</b>	<b>55</b>

Building up Protected areas is continuous process and accordingly more territory will be canvassed later on. Most protected areas are having little areas and are under the pressure of over-use and misuse of assets by the neighbouring human settlements.

*B. The Biodiversity Conservation Prioritization Project*

The Biodiversity Conservation Prioritization undertaking of WWF-India (1997– 2000) was the main exercise of its kind that endeavoured to recognise priority sites and species on the basis of different ecosystems like mountains, grasslands and wetlands and to develop strategies for their conservation.

*C. National Biodiversity Strategy and Action Plan*

India is a signatory to the United Nations Convention on Biological Diversity and has guaranteed to set up a National Biodiversity Conservation action plan on state level which adds up to form a national plan. The state biodiversity procedure strategy and action plan were created independently for the states, unlike the Biodiversity Conservation Prioritization venture, which endeavoured identification of biodiversity-rich locales under various environments (woods, grasslands, mountains, and wetlands) individually for the states.

**2. Global priority-setting exercise**

A biodiversity hotspot is a biogeographic area with a huge store of natural assorted variety that is under threat from people and their exercises. All the worldwide hotspots must satisfy two principle criteria: species endemism and level of danger. To qualify as a biodiversity hotspot on Myers 2000 edition of the hotspot-map, a region must have [16]:

- i) Atleast 0.5% or 1,500 of the world’s 300,000 plant species as endemic
- ii) And, it has to have lost at least 70% of its primary vegetation.

*A. Indo-Burma Hotspot:*

Enveloping 2 million sq.km of tropical Asia, beginning from eastern Bangladesh and stretching out crosswise over northeastern India, south of the Brahmaputra river, to include almost all of Myanmar, some portion of southern and western Yunnan Province in China, the greater part of the Lao People’s Democratic Republic, Cambodia and Vietnam, by far most of Thailand and a little piece of Peninsular Malaysia. Indo-Burma hotspot is among the 34 all around recognized hotspots on the planet. Indo-Burma is still revealing its biological treasures. Six large mammal species have been discovered in the last 12 years: the large-antlered muntjac, the Annamite muntjac, the grey-shanked douc, the Annamite striped rabbit, the leaf deer, and the saola. This hotspot likewise holds noteworthy endemism in freshwater turtle species, the vast majority of which are debilitated with eradication, due to over-utilisation and loss of natural surroundings. Bird life in Indo-Burma is diverse, holding nearly 1,300 species, including the threatened grey-crowned crocias, the orange-necked partridge and white-eared night-heron [10].

Indo-Burma is a standout amongst the most debilitated biodiversity hotspots, because of the rate of asset abuse and natural habitat loss is too high. Just around 5% of the natural surroundings remain in immaculate condition, with another 10% to 25% of the land is harmed, but still it is in functional condition. The increasingly high value of products derived from some species has put them at risk even within strictly protected areas. Aquatic ecosystems are also under intense development pressure in many areas. Damming a river section not only transforms that section into a large pond, but also reduces the temperature and oxygen content, and increases river-bed erosion and water turbidity downriver. Over-fishing and the expanding utilization of damaging fishing systems is a major issue in both coastal and marine biological communities. As the endemic species are essential, endemism shows the uniqueness of a region [17], which has been recorded in the table beneath:

TAXONOMIC GROUP	SPECIES	ENDEMIC SPECIES	ENDEMISM
MAMMALS	433	73	16.9
BIRDS	1266	64	5.1
REPTILES	522	204	39.1
AMPHIBIANS	286	154	53.8
FRESHWATER FISHES	1262	553	43.8

### Species Diversity and Endemism

Until recent times the struggle for conservation in the hotspots have been localised and scattered. To work for the process of conservation and make it more noteworthy, the need was felt for bigger and more hearty projects through multi-partner association. The procedure included an extensive variety of partners, especially nongovernmental associations, who mutually shared their skills to organise and prioritise species and locales for protection. The Critical Ecosystem Partnership Fund report, arranged in April 2004, highlighted the important landscapes keeping in mind the scattered faunal species and underscored the significance of corridors, which are the key factors for the survival of wild fauna.

#### *B. Global ecoregions of WWF in Northeast India:*

Biodiversity is not spread equitably over the earth and follows trends set by atmosphere, geography and evolution of the planet. These trends or patterns are called "ecoregions". WWF characterizes ecoregions as an "expansive unit of land or water containing a geologically particular gathering of species, natural groups, and surrounding conditions". These ecoregions are categorised into two: terrestrial ecoregions and freshwater ecoregions.

Here, we build on previous efforts to assess terrestrial biodiversity threats at the global scale by focusing on one of these prioritization efforts: the terrestrial component of the WWF "Global 200". In the year 2000, WWF recognised 200 global priority ecoregions. Of them, those that are located in the North-East India are:

- **Brahmaputra valley semi-evergreen forests:**

Covering 21,900 sq.miles, this ecoregion lies along the alluvial fields of the Brahmaputra river, which courses through Assam and West Bengal before it ends up intersecting with the Ganges river and heads south to the Bay of Bengal. This ecoregion accommodates India's biggest elephant community, the world's biggest great one-horned rhinoceros population, tigers (*Pantheratigris*), and wild water bison (*Bubalusarnee*). It is also a home to 122 species of mammals. There are numerous threatened mammal species in the region, including the greater one-horned rhinoceros, tiger, Asian elephant, Asiatic black bear (*Ursusthibetanus*), capped leaf monkey (*Semnopithecuspileatus*), pygmy hog, swamp deer (*Cervusduvaucelii*), gaur (*Bos gaurus*), clouded leopard (*Pardofelisnebulosa*), hispid hare, and sloth bear (*Melursusursinus*) [18,19,20,21].

- **Eastern Himalaya broadleaved forests**

This ecoregion is globally exceptional in terms of species wealth and levels of endemism and extends over a territory of 32,100 square miles. This zone likewise assumes an essential part in keeping up altitudinal network between the environments that makes up the bigger Himalayan biological system. The ecoregion is a home to many threatened species, which include the tiger (*Pantheratigris*), takin (*Budorcastaxicolor*), serow (*Capricornissumatraensis*), Vespertilionidae bat (*Myotis sicarius*), clouded leopard (*Pardofelisnebulosa*), Assamese macaque (*Macacaassamensis*), stump-tailed macaque (*Macacaarctoides*), red panda (*Ailurusfulgens*), wild dog (*Cuonalpinus*), back-striped weasel (*Mustelastrigidorsa*), and Irrawaddy squirrel (*Callosciuruspygerythrus*)[18,19,20,21].

- **Eastern Himalaya subalpine coniferous forests:**

This region covers 10,600 square miles, from the forested ecoregions of the Himalayas to treeless snow-capped glades and stone strewn alpine scree. These forests are majorly covered by fir (*Abiesspectabilis*), larch (*Larixgriffithii*), Juniperusrecurva, hemlock (*Tsugadumosa*), and Juniperusindica. A few vivid rhododendrons (*Rhododendron hodgsonii*, *R. barbatum*, *R. campylocarpum*, *R.*

campanulatum, *R. fulgens*, *R. thomsonii*), alongside *Viburnum grandiflorum*, *Lonicera angustifolia*, *Betula utilis*, *Acer* spp., *Sorbus* spp., *Juniperus indica*, and *J. recurva* [11]. The mammalian fauna of the area comprises of eighty-nine species. The fourteen protected areas located in the ecoregion cover a region of 6,000 sq.km [18,19,20,21].

- **India–Myanmar pine forests:**

This ecoregion covers only about 3,700 square miles and thus contains moderate levels of biological diversity. Several distinctive birds were found in the region, including the babblers (Timaliidae), silver-breasted broadbill (*Serilophus lunatus*), beautiful nuthatch (*Sitta formosa*), rufous-vented tit (*Parus rubidiventris saramatii*), stripe-throated yuhina (*Yuhina gularis*), grey-sided laughingthrush (*Garrulax caerulatus*), leafbird (*Chloropsis* spp.), white-naped yuhina (*Yuhina bakeri*), rufous-chinned laughingthrush (*Garrulax rufogularis*), cochoa (*Cochoa* spp.), striated laughingthrush (*Garrulax striatus*), sultan tit (*Melanochlora sultana*), and white-browed fulvetta (*Alcippe vinipectus*). The major danger to the uprightness of this territory is from jhum. This activity leads to afforestation of hills, causing disintegration and sedimentation of waterways, also takes away the habitat of the creatures living there [18, 19, 20, 21].

WWF plans to put in the majority of conservation effort in the priority ecoregions.

### *C. Endemic Bird Area (EBA)*

An Endemic Bird Area (EBA) is a zone of land recognized by Bird Life International as being critical for environment-based bird preservation since it contains the natural surroundings of confined range bird species, which are in this way endemic to them. The important bird areas designated were based on one or more of the following criteria: habitat for globally threatened species of birds (critically endangered, endangered, vulnerable, conservation-dependent, data-deficient, and near-threatened species),

area coverage of restricted-range species of birds, and areas having a significant assemblage of biome-restricted bird species and a significant assemblage of congregator species. Important bird areas are not always protected areas, but sometimes constitute part of such areas within this region [22]. Of the seven EBA's identified in India, 2 are present in the North-East India. The international council for bird preservation, UK identified the Assam plains and the eastern Himalaya as an endemic bird Area (EBA). The EBA has an area of 220,000 sq. km following the Himalayan range in the countries of Bangladesh, Bhutan, China, Nepal, Myanmar, and eight Indian NE states. The distinctly different climatic conditions of this region support rich array of restricted range bird species, having more than 5 endangered species and 14 vulnerable species of birds. 22 restricted range bird species have been identified and recorded; of which 19 are confined to this area (11 out those are considered as threatened). From Kaziranga National park alone 400 species of birds have been recorded. And Arunachal Pradesh roughly has around 665 species individually [22].

## VII. CONCLUSION

North East India includes an assortment of forests (like tropical, subtropical, deciduous, alpine and so forth) because of a varied range of temperature and precipitation. Climatic varieties make this area rich in vegetation making it a 'mega biodiversity area' on the planet. New species of plants and animals are continuously recorded from the region, proving the region has endless unexplored biodiversity and hence needs to be conserved. Threats largely emanate from the concerted push for further economic development of the region, which, if not planned with long-term biodiversity values in mind, could lead to irreplaceable losses. Although, the intensity of threats varies from state to state, there is considerable similarity in the nature of threats to biodiversity across the North-eastern region, large-scale infrastructure development, agricultural expansion, and industrial growth, and the increasing population leading to unsustainable use of forest resources for livelihood. Since the wealth of the area lies on its biological diversity, documentation and efficient investigation of that field is a key component to a comprehension of the connections between landscape variables and species composition, the effects of habitat division, and the working of biological corridors, which are crucial for deciding biodiversity administration systems and alternatives. A vital finding of this foundation record is that there have been generous endeavours at both global and national scales to distinguish biodiversity-rich areas over the NE region. We also come in terms with the fact that the conservation plans for the protected areas don't exist and are still being formulated. The state biodiversity strategy and action plans which have been created through a participatory procedure in every state should be operationalized. While the plans have the support of the separate state governments, they are yet to become part of the National Biodiversity Strategy and Action Plan.

Also with the expanding infrastructure advancement happening in the area, there is a need to create thorough models and standards to minimize environmental and social impact. There is a need to additionally comprehend main drivers of biodiversity misfortune so as to define suitable mediations. To have entire data about the biodiversity of the area requires utilization of progress mechanical devices like remote detecting and GIS along with the field information. Appropriate arrangements/techniques must be adopted for preservation and administration of biodiversity to check the eradication/decay of species especially the endemic ones. In such manner an all-encompassing approach of the concerned officers and departments, policy makers, non-government organisations and resident individuals are required, wherein all together we should work towards conserving the biodiversity paradise before it is lost. Thus, to experience "treasure of nature" visiting North-East India is a must at least once in a lifetime.

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