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India's Loss of Biodiversity and Ecological Consequences

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ABSTRACT

India has a diverse climate and topography, with at least ten unique bio-geographical regions, a wide range of forest types, and three worldwide terrestrial biodiversity hot spots. Because other terrestrial habitats have lost their native status, the forest currently houses the majority of terrestrial species. There is a vast network of protected areas in place, including 514 wildlife sanctuaries, 99 national parks, including 18 biosphere reserves, and several holy groves managed by indigenous groups. Despite a favorable forest policy and a strong regulatory framework, forest degradation and biodiversity loss continue due to rising human population demands, land use changes, and the introduction of invasive alien species. The extent and loss of biodiversity must be constantly monitored, and individuals must be encouraged to join in large-scale biodiversity conservation rehabilitation.

Keywords- loss of biodiversity, ecological consequences, biodiversity levels, biodiversity value.

I. INTRODUCTION

Biodiversity is a phrase that refers to the tremendous diversity of life on the planet. It can also be used to refer to all of the species in a certain location or environment. Every living thing, including plants, microorganisms, animals, and humans, is referred to as biodiversity. According to scientists, there are around 8.7 million plant and animal species on the planet. However, only about 1.2 million species, most of which are insects, have been recognized and described thus far. This indicates that the existence of millions of other creatures is unknown.

All of the species that are alive today have evolved distinctive features that set them apart from other species over generations. Scientists utilize these differences to distinguish one species from another. Different species are organisms that have developed to be so dissimilar from one another that they can no longer breed with one another. All organisms that can reproduce with one another are classified as a single species.

Given that there is still so much biodiversity to find, scientists are interested in how much biodiversity exists on a global basis. They also look at the number of species in a single environment, such as a forest, grassland, tundra, or lake. From beetles to snakes to antelopes, single grassland can support a diverse spectrum of animals. The warm and humid climate of tropical regions, for example, provides optimum environmental conditions for plant growth in ecosystems that contain the most biodiversity. Ecosystems can also house species that are too small to notice with the human eye. Using a microscope to examine soil or water samples reveals an entire universe of bacteria and other small organisms.

Biodiversity is higher in some parts of the planet, such as Mexico, South Africa, Brazil, the southwestern United States, and Madagascar. Hotspots are areas with extraordinarily high levels of biodiversity. Hotspots are also home to endemic species, or species that can only be found in one place.

To survive and preserve their habitats, all of the Earth's species collaborate. Cattle, for example, eat the grass in pastures. Cattle then create dung, which restores nutrients to the earth and encourages grass growth. This manure can also be used on farmland as a fertilizer. Humans benefit from a variety of species, including food, clothes, and medicine.

Human consumption and other activities that disrupt and even destroy ecosystems are jeopardizing much of the Earth's biodiversity. Biodiversity is threatened by pollution, climate change, and population increase. These dangers have resulted in an extraordinary increase in the rate of extinction of species. According to some scientists, half of all species on Earth will be extinct within the next century. To preserve biodiversity and protect endangered animals and their habitats, conservation measures are required.

Despite the fact that all of these insects have a similar structure and may be genetic cousins, the stunning range of colours, camouflage, forms, and sizes demonstrates the level of diversity that can exist even among closely related species. Frans Lanting took the photo.

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A number of scientists, including Subba Rao (2001), Kaushik et al. (2008), Verma (2015, 2016a, 2016b, 2016c, 2016d, 2017a, 2017b, 2017c, and 2017d), Prakash et al. (2016, and 2017, 2018), have detailed and described biodiversity from time to time. The authors are attempting to examine biodiversity loss and its ecological consequences in India in this conversation.

II. BIODIVERSITY OF INDIA

India is a mega diverse country, home to roughly 10% of the world's species. It also has a long and illustrious cultural history dating back thousands of years. Much of India's biodiversity is inextricably linked to the country's socio-cultural activities. In this post, we provide a comprehensive overview of India's biodiversity.

At the global, regional, and local levels, the environmental services provided by species and ecosystems are critical. India is a mega diverse country that is home to roughly 10% of the world's species. It also has a long and illustrious cultural history dating back thousands of years. Much of India's biodiversity is inextricably linked to the country's socio-cultural activities. Several species are threatened with extinction as a result of population growth, climate change, and the lax execution of environmental legislation. The following is a comprehensive overview of India's biodiversity:

2.1 India's Flora and Fauna

According to the International Union for Conservation of Nature (IUCN), India is a mega diverse country that accounts for 7–8 percent of all recorded species, including plant and animal species, but has only 2.4 percent of the world's land area.

1. Plants account for roughly 45,000 species, or about 7% of the world's total. About a third of them are endemic.
2. There are approximately 91,000 animal species on the planet, accounting for approximately 6.5 percent of total fauna.60,000 insect species, 2,456 fish species, 1,230 bird species, 372 mammals, over 440 reptiles and amphibians, 200 amphibians with the highest concentration in the Western Ghats, and 500 molluscs are among them.
3. There is a lot of variety in the livestock. India has 400 sheep breeds, 27 cattle types, and 22 goat breeds.
4. There are 15,000 flowering plants on the globe, accounting for 6% of the total. Approximately 1,500 plant species are on the verge of extinction.
5. It is also home to globally significant populations of Asia's rarest creatures, including the Bengal Fox, Asiatic Cheetah, Marbled Cat, Asiatic Lion, Indian Elephant, Asiatic Wild Ass, Indian Rhinoceros, Markhor, Gaur, Wild Asiatic Water Buffalo, and others.

2.2 India's Biodiversity Classification

1. **Malaya's Biodiversity**: Runs along the Eastern Himalayas' thickly forested sections and along the shoreline.
2. **Ethiopia's Biodiversity**: This type of biodiversity may be found in Rajasthan's dry and semi-arid regions.
3. **Europe's Biodiversity**: This type of biodiversity can be found in the upper Himalayas, where the climatic conditions are usually temperate.
4. **India's Biodiversity**: This type of biodiversity can be found in the deep woodland areas of the Indian plains.

III. BIODIVERSITY LEVELS

Genetic diversity, species diversity, and ecosystem diversity are the three layers of biodiversity.

3.1 Genetic Variability

- Species are groups of individual creatures that have certain physical characteristics in common.
- The variance of genes within a species is referred to as genetic biodiversity.
- Genetic variety is necessary for the healthy reproduction of a species' population.
- Humans are genetically related to the homo-sapiens group, although their physical traits, such as height, colour, and physical appearance, vary greatly. Genetic variation is to blame for this.

3.2 Species Diversity

- This refers to the wide range of species available.
- The richness, abundance, and kind of a species can all be used to determine its diversity. Some locations have a greater diversity of species than others. Hotspots of diversity are areas with a high diversity of species.
- It has to do with the number of species in a certain area.

3.3. Ecosystem Diversity

- Ecosystem diversity is defined by the wide variability across ecosystem types as well as the diversity of habitats and ecological processes that occur within each ecosystem type.
- As a result, defining ecosystem boundaries is tough and complicated.
- Communities (species relationships) and ecosystems have a lot of wiggle room when it comes to defining their boundaries.

This type of biodiversity can be found in the deep woodland areas of the Indian plains.

1. Trans Himalaya this zone is divided into three provinces: the Ladakh Mountains, the Tibetan Plateau, and Trans-Himalaya Sikkim.

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2. The Himalayas are divided into four provinces: the North-West Himalaya, the West Himalaya, the Central Himalaya, and the East Himalaya.
3. The Indian Desert is divided into two provinces: Thar and Kutch.
4. Semi-Arid: This category includes two states: Punjab and Gujarat, as well as Rajasthan.
5. The Western Ghats: This zone includes two provinces: Malabar Plains and the Western Ghats Mountains.
6. The five provinces that make up the Deccan Plateau are Central Highlands, Chhota Nagpur, Eastern Highlands, Central Plateau, and Deccan South.
7. The Coasts: The West Coast, East Coast, and Lakshadweep are the three provinces that make up the West Coast.
8. The Gangetic Plains: This zone is divided into two provinces: the upper and lower Gangetic plains.
9. North East India is covered, including the Brahmaputra Valley and the North-East Hills
10. This zone is made up of two provinces: Andaman and Nicobar. It's a biome with a lot of variety.

Although India is one of the world's most diverse countries, many plants and animals are threatened with extinction. The Wildlife Act lists 253 wildlife species as in need of protection, and the Botanical Survey of India has listed 135 plant species as endangered.

IV. THE VALUE OF BIODIVERSITY

Biodiversity has aided the development of human culture in a variety of ways, and human societies, in turn, have shaped natural diversity at the genetic, species, and ecological levels.

Biodiversity fulfills the following functions:

4.1 Environmental Functions

Many different species fulfill various services in an environment. Every organism gives something valuable to other organisms in addition to meeting its own needs. The species contribute to cycling water and nutrients across the ecosystem, fixing atmospheric gases and regulating the climate by capturing and storing energy, producing and decomposing organic materials, and helping to cycle water and nutrients throughout the ecosystem. As a result, they aid in soil formation, pollution reduction, and land, water, and air resource protection. These functions are critical for ecosystem health as well as human existence.

4.2 Functions of Science

Biodiversity is significant because each species can provide insight into how life has developed and will continue to evolve. Biodiversity also aids in the understanding of how life works and the significance of each species in the maintenance of ecosystems, of which we are a part.

4.3 Economic Activities

In everyday life, biodiversity is a valuable resource. Crop diversity, also known as agro-biodiversity, is an important component of biodiversity. Biodiversity is viewed as a resource reservoir from which food, medicinal, and cosmetic items might be derived. The degradation of biodiversity is due to this idea of biological resources. Food crops, animals, wood, fish, medicinal resources, and so on are some of the essential economic commodities that biodiversity provides to humanity.

4.4 Cultural and Social Services

Nature's diversity provides us with aesthetic enjoyment. It provides us with leisure opportunities, and the region's vast ecological diversity attracts tourists. A biologically diverse environment has allowed many tribes and cultures to co-evolve with their surroundings and the resources they provide. As a result, it plays an important societal role. It offers a number of important services, including:

- Tourism, particularly ecotourism,
- Leisure & Relaxation
- Spiritual encounters and a sense of belonging
- Inspiration, Art, and Design

It is our ethical responsibility to recognise that all species, including ourselves, have an inherent right to exist. As a result, intentionally causing the extinction of any species is unethical. The state of our relationships with other living species can be gauged by the level of biodiversity.

V. LOSS OF BIODIVERSITY

A decline in biodiversity within a species, an ecosystem, a certain geographic area, or the entire Earth is known as biodiversity loss. The amount of genes, species, individual creatures within a given species, and biological communities within a defined geographic area, ranging from the smallest ecosystem to the global biosphere, is referred to as biodiversity. (A biological community is a group of organisms that interact in a shared environment.) Biodiversity loss, on the other hand, refers to a decrease in the quantity, genetic diversity, and variety of species, as well as the biological communities in a specific area. This loss of diversity of life can lead to a breakdown in the ecosystem's functioning where decline has occurred.

A seascape with bleached coral

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In February 2016, a sea turtle swims over a bleached coral seascape at Heron Island Sea view Survey XL Catlin.

Because biodiversity is most generally connected with species richness (the number of species in a given area), biodiversity loss is sometimes interpreted as a loss of species from an ecosystem or perhaps the entire biosphere (see also extinction). However, equating biodiversity loss with species extinction ignores other subtle events that endanger ecosystem health in the long run. Sudden population decreases in some species may disrupt social systems, preventing surviving males and females from finding mates, leading to subsequent population declines. Declines in genetic diversity that follow significant population declines may encourage inbreeding (mating between closely related individuals), resulting in a further loss of genetic variation.

Even if a species does not disappear from the ecosystem or the biosphere, its niche (the role it plays in the habitats it inhabits) shrinks as its numbers decline. A rapid population decline could cause significant changes in the ecosystem's structure. Clearing trees from a forest, for example, removes the ecosystem's shading, temperature and moisture regulation, animal habitat, and nutrient delivery services.

5.1 Natural Biodiversity Loss

Natural cycles cause biodiversity to increase and decrease in a given area. Seasonal changes, such as the arrival of spring, provide chances for feeding and mating, resulting in increased biodiversity as many species' populations grows. The arrival of winter, on the other hand, reduces an area's biodiversity briefly when warm-adapted insects die and migrating animals leave. In addition, the biodiversity of an area is determined by the yearly rise and fall of plant and invertebrate populations (such as insects and plankton), which provide food for various types of life.

As a result of biodiversity loss, ecosystems, landscapes, and the global biosphere all experience more persistent ecological changes. Natural ecological disturbances like wildfires, floods, and volcanic eruptions radically alter ecosystems by eradicating local populations of particular species and changing entire biological communities. Natural disturbances are prevalent, and ecosystems have evolved to handle them. Thus, such disruptions are only temporary (see also ecological succession).

5.2 Biodiversity Loss Caused by Humans

Biodiversity losses induced by human perturbations, on the other hand, tend to be more severe and long-lasting. Humans (Homo sapiens), their crops, and their food animals are occupying a growing portion of the Earth's land surface. Half of the world's habitable land has been turned to agriculture (about 51 million square kilometres 19.7 million square miles, with 77 percent of agricultural land (about 40 million square kilometres 15.4 million square miles]) being used for grazing by cattle, sheep, goats, and other livestock. Since 1970, this huge conversion of forests, marshes, grasslands, and other terrestrial ecosystems has resulted in a 60 percent on average drop in vertebrate populations globally, with the highest losses in freshwater environments (83 percent) and in South and Central America (89 percent). The human population increased from around 3.7 billion to 7.3 billion individuals between 1970 and 2014. By 2018, human and livestock biomass 0.16 gigatonne had far surpassed the biomass of wild mammals 0.007 gigatonne and wild birds. (0.002 gigaton. According to researchers, the present pace of species extinction is between 100 and 10,000 times that of the background extinction rate (which is roughly one to five species per year when the entire fossil record is considered).

Forest cutting, wetland filling, stream channeling and rerouting, and road and building development are all common examples of a systematic endeavor that results in a significant alteration in a landscape's or regions ecological trajectory. Humans' attempts to acquire and produce food, adapt the terrain to human habitation, and create possibilities for trading with other people to build wealth may affect the terrestrial and aquatic ecosystems they use as human populations rise. Biodiversity loss is a common side effect of these activities.

VI. BIODIVERSITY CONSERVATION

Biodiversity is essential for human survival. Because all forms of life are so intertwined, a disruption in one causes an imbalance in the others. When plant and animal species become endangered, they degrade the ecosystem, potentially jeopardizing human existence.

In terms of biodiversity conservation, there are two approaches:

6.1 In-situ Conservation

This is a method of protecting an endangered plant or animal species in its natural home, either by protecting or cleaning up the area or by defending the species against predators. The following are some of the methods that fall under it:

- Reserves of Biosphere
- The National Park Service
- Wild animal sanctuaries

6.2 Ex-situ Conservation

Threatened animals and plants are removed from their native habitats and placed in a unique environment where they can be preserved and cared for.

- This is accomplished through zoological parks, botanical gardens, and animal safari parks.
- In recent years, ex situ conservation has progressed beyond the confinement of threatened species.
- Now, utilizing cryopreservation techniques, imperiled species' gametes can be kept viable and fruitful for long periods of time, eggs can be fertilized in

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vitro, and plants can be grown using tissue culture procedures.

- Seeds of various genetic strains of commercially significant plants can be stored in seed banks for lengthy periods of time.

There is a growing awareness that conservation with sustainable use is only achievable with the participation and collaboration of local communities and individuals. The creation of institutional institutions at the local level is required for this. The crucial issue is not just the preservation of species or habitat, but also the continuance of the conservation process.

The following steps for biodiversity conservation have been suggested by the global conservation strategy:

1. It is necessary to protect food crops, fodder plants, timber trees, livestock, animals, and wild relative varieties.
2. Extinction prevention necessitates careful planning and control.
3. Species should be able to forage, breed, rest, and nurse their young in habitats that are safe and protected.
4. Efforts should be made to save threatened and endangered species.
5. Wild plant and animal trading should be regulated internationally.
6. Each country should identify and protect the habitats of wild relatives.

VII. CONCLUSION

We are harmed in different ways as a result of the loss biodiversity. Our biological environment is firmly ingrained in our cultural identity. Plants and animals are emblems of our planet, immortalized in flags, sculptures, and other depictions that define us and our communities. We find inspiration simply by admiring nature's beauty and force. There is a need for comprehensive conservation project reporting and documentation, as well as the inclusion of pressures and responses in the study design of ecological studies. This evaluation, however, will not be possible without sufficient documentation and controlled settings. Finally, the individual citizen is the ultimate decision-maker in terms of biodiversity. Individual choices have a big impact since personal consumption fuels development, which in turn uses and pollutes nature. Biodiversity is necessary for human survival and economic well-being, as well as the function and stability of ecosystems. Because of the growing awareness of the importance of biodiversity and the high rates of loss, it is critical to assess and conserve biodiversity at both the regional and global levels. There are few effective techniques for involving people in biodiversity preservation. With increasing inputs from the government, scientists, and non-governmental organisations, India should take the lead in creating acceptable methodology and policies for biodiversity evaluation and protection.

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