



## BIODIVERSITY LOSS AND ITS ECOLOGICAL IMPACT IN INDIA

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### ABSTRACT

India has varied climate and terrain and characterised by at least 10 distinct bio-geographical regions, supports a huge variety of forest types and harbours three global terrestrial biodiversity hot spots. Most of the terrestrial biodiversity now resides in the forest, as other terrestrial habitats have lost their natural state. An impressive protected area network, comprising 514 wildlife sanctuaries, 99 national parks (including 18 biosphere reserves), and several sacred groves maintained by indigenous communities, is in place. However, despite a benign forest policy and a strong regulatory regime, forest degradation and biodiversity loss continue because of the increasing requirements of the burgeoning human population, land use change and spread of invasive alien species. The extent and loss of biodiversity must be continuously monitored and people attracted to participate in biodiversity conservation rehabilitation on a massive scale.

**Keywords:** Biodiversity, conservation, forest, hotspots, protected area network.

### INTRODUCTION

Biodiversity is formally defined by the Convention on Biological Diversity (CBD) as: “the variability among living organisms from all sources including, among others, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems”.

In simple terms, biodiversity is the number and variety of organisms found within a specified geographic region. It refers to the varieties of plants, animals and micro-organisms, the genes they contain and the ecosystems they form. It relates to the variability among living organisms on the earth, including the variability within and between the species and that within and between the ecosystems.

The biodiversity has already been detailed and described at several angles from time to time by a number of scientists

such as Kaushik et al, (2008), Odum (1971), Subba Rao (2001), Verma (2015, 2016a, 2016b, 2016c, 2016d, 2017a, 2017b, 2017c and 2017d), Verma et al, (2015, 2016a, 2016b, 2017a, 2017b and 2017c), Prakash et al, (2016 and 2017), etc. In present discussion, authors are trying to discuss the biodiversity loss and its ecological impact in India.

### BIODIVERSITY OF INDIA

1. With only 2.4% of the world's land area, its share of the global species diversity is an impressive 8.1 per cent. This includes 45,500 recorded species of plants and 91,000 recorded species of animals.
2. There is diversity of ecological habitats like forests, grassland, wetlands, coastal and marine ecosystems, and desert ecosystems.
3. India is considered one of the world's 17 “mega diverse” countries in terms of biodiversity.

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4. India has four global biodiversity hot spots (Eastern Himalaya, Indo-Burma, Western Ghats and Sri Lanka and Sunderland).

### MEGA DIVERSE COUNTRIES

The mega diverse countries are a group of countries that harbor the majority of the Earth's species and are therefore considered extremely biodiverse. Conservation International identified 17 mega diverse countries in 1998. Together, these 17 countries harbour more than 70% of the earth's species. All mega diverse countries are located in, or partially in, tropical or subtropical regions.

The identified Mega diverse Countries are: United States of America, Mexico, Colombia, Ecuador, Peru, Venezuela, Brazil, Democratic Republic of Congo, South Africa, Madagascar, India, Malaysia, Indonesia, Philippines, Papua New Guinea, China and Australia. The principle criterion is endemism, first at the species level and then at higher taxonomic levels such as genus and family. To qualify as a Mega diverse Country, a country must have at least 5000 of the world's plants as endemics and marine ecosystems within its borders. Despite endemism being the main criterion, thresholds for the criteria are flexible and countries have been considered individually based on all criteria.

### LEVELS OF BIODIVERSITY

Biodiversity is generally described at three levels: Genetic diversity, Species diversity and Ecosystem diversity.

#### 1. Genetic Diversity:

- Genetic biodiversity refers to the variation of genes within species.
- Groups of individual organisms having certain similarities in their physical characteristics are called species.
- Human beings genetically belong to the homo-sapiens group and also differ in their characteristics such as height, colour, physical appearance, etc., considerably. This is due to genetic diversity.
- The genetic diversity is essential for a healthy breeding of population of species.

#### 2. Species Diversity:

- This refers to the variety of species.
- It relates to the number of species in a defined area.
- The diversity of species can be measured through its richness, abundance and types. Some areas are richer in species than others. Areas rich in species diversity are called hotspots of diversity.

#### 3. Ecosystem Diversity

- The broad differences between ecosystem types and the diversity of habitats and ecological processes occurring within each ecosystem type constitute the ecosystem diversity.
- The boundaries of communities (associations of species) and ecosystems are not very rigidly defined.
- Thus, the demarcation of ecosystem boundaries is difficult and complex.

### IMPORTANCE OF BIODIVERSITY

Biodiversity has contributed in many ways to the development of human culture and, in turn, human communities have played a major role in shaping the diversity of nature at the genetic, species and ecological levels. Biodiversity plays the following roles:

#### 1. Ecological Roles

Species of many kinds perform some or the other functions in an ecosystem. Every organism, besides extracting its needs, also contributes something useful to other organisms. The species capture and store energy, produce and decompose organic materials, help to cycle water and nutrients throughout the ecosystem, fix atmospheric gases and help regulate the climate. Thus, they help in soil formation, reducing pollution, protection of land, water and air resources. These functions are important for ecosystem function and human survival.

#### 2. Economic Roles

Biodiversity is an important resource in day-to-day life. One important part of biodiversity is 'crop diversity', which is also called agro-biodiversity. Biodiversity is seen as a reservoir of resources to be drawn upon for the manufacture of food, pharmaceutical, and cosmetic products. This concept of biological resources is responsible for the deterioration of biodiversity. Some of the important economic commodities that biodiversity supplies to humankind are: food crops, livestock, forests, fish, medicinal resources, etc.

#### 3. Scientific Roles

Biodiversity is important because each species can give us some clue as to how life evolved and will continue to evolve. Biodiversity also helps in understanding how life functions and the role of each species in sustaining ecosystems of which we are also a species.

#### 4. Social/Cultural Services:

Diversity of nature provides us aesthetic pleasure. It provides us recreational avenues and rich biological

diversity encourages tourism in the region. Many communities and cultures have co-evolved with the surroundings and the resources provided by a biologically diverse environment. Hence, it performs an important social role as well. Important services which it provides are:

- Recreation and Relaxation
- Tourism especially eco-tourism
- Art, Design and Inspiration
- Spiritual experiences and a sense of place

It is our ethical responsibility to consider that each and every species along with us have an intrinsic right to exist. Hence, it is morally wrong to voluntarily cause the extinction of any species. The level of biodiversity is a good indicator of the state of our relationships with other living species.

### LOSS OF BIODIVERSITY

- The colonisation of tropical Pacific Islands by humans is said to have led to the extinction of more than 2,000 species of native birds.
- The IUCN Red List (2004) documents the extinction of 784 species (including 338 vertebrates, 359 invertebrates and 87 plants) in the last 500 years.
- Some examples of recent extinctions include the dodo (Mauritius), quagga (Africa), thylacine (Australia), Steller's Sea Cow (Russia) and three subspecies (Bali, Javan, Caspian) of tiger.
- The last twenty years alone have witnessed the disappearance of 27 species.

The biological wealth of the planet has been declining rapidly. Important causes are:

1. **Natural causes** like floods, earthquakes and other natural disasters.
2. **Habitat loss and fragmentation:** This is the most important cause driving animals and plants to extinction. The most dramatic examples of habitat loss come from tropical rain forests. Once covering more than 14 per cent of the earth's land surface, these rain forests now cover no more than 6 per cent.

Besides total loss, the degradation of many habitats by pollution also threatens the survival of many species. When large habitats are broken up into small fragments due to various human activities, mammals and birds requiring large territories and certain animals with migratory habits are badly affected, leading to decline of population. Habitat loss is caused by deforestation, over-population, pollution, global warming etc.

3. **Over-exploitation:** Over-hunting, over-fishing or over-collecting of a species can quickly lead to its decline. Changing consumption patterns of humans is often cited as the key reason for this unsustainable exploitation of natural resources. Many species extinctions in the last 500 years (Steller's sea cow, passenger pigeon) were due to overexploitation by humans.
4. **Alien species invasions:** When alien species are introduced unintentionally or deliberately for any purpose, some of them turn invasive, and cause decline or extinction of indigenous species.
5. **Co-extinctions:** When a species becomes extinct, the plant and animal species associated with it in an obligatory way also become extinct. When a host fish species becomes extinct, its unique assemblage of parasites also meets the same fate.
6. **Global climate change:** Both climate variability and climate change cause biodiversity loss. Species and populations may be lost permanently, if they are not provided with enough time to adapt to changing climatic conditions.
7. **Hunting and Poaching:** Because of this, not only the particular species become prone to extinction but also the other species dependent on that species.

### BIODIVERSITY CONSERVATION

Biodiversity is important for human existence. All forms of life are so closely interlinked that disturbance in one gives rise to imbalance in the others. If species of plants and animals become endangered, they cause degradation in the environment, which may threaten human beings own existence.

There are two approaches in biodiversity conservation:

**1. In situ conservation:** It is the approach of protecting an endangered plant or animal species in its natural habitat, either by protecting or cleaning up the habitat itself, or by defending the species from predators. Some methods under it are:

- Biosphere Reserves
- National Parks
- Wild-life Sanctuaries

**2. Ex-situ conservation:** In this approach, threatened animals and plants are taken out from their natural habitat and placed in special setting where they can be protected and given special care.

- Zoological parks, botanical gardens and wildlife safari parks serve this purpose.

- In recent years ex situ conservation has advanced beyond keeping threatened species in enclosures.
- Now gametes of threatened species can be preserved in viable and fertile condition for long periods using cryopreservation techniques, eggs can be fertilised in vitro, and plants can be propagated using tissue culture methods.
- Seeds of different genetic strains of commercially important plants can be kept for long periods in seed banks.

There is an increasing consciousness of the fact that such conservation with sustainable use is possible only with the involvement and cooperation of local communities and individuals. For this, the development of institutional structures at local levels is necessary. The critical issue is not merely the conservation of species nor the habitat but the continuation of process of conservation. The world conservation strategy has suggested the following steps for biodiversity conservation:

1. Efforts should be made to preserve the species that are endangered.
2. Prevention of extinction requires proper planning and management.
3. Varieties of food crops, forage plants, timber trees, livestock, animals and their wild relatives should be preserved;
4. Each country should identify habitats of wild relatives and ensure their protection.
5. Habitats where species feed, breed, rest and nurse their young should be safeguarded and protected.
6. International trade in wild plants and animals should be regulated.

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