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Biodiversity: Importance, Loss and Conservation Strategies

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Biodiversity refers to the vast range of biological forms found on Earth because "bio" implies life and "diversity" indicates variation. In 1968, Raymond F. Dasmann coined the term "biological diversity," which gained widespread acceptance in the 1980s. Numerous physical, chemical, and climatic elements influence biodiversity and encourage the emergence of new species. On the other hand, organisms that are unable to change with their surroundings eventually go extinct.

Significance of Biodiversity

Maintaining clean water, pure air, and fertile land all depend on biodiversity. It sustains important industries like agriculture, forestry and fisheries, all of which rely on a wide range of biological resources (Delgado-Baquerizo *et al*., 2025). For any nation, the loss of biodiversity has serious negative effects on the economy and society. Given that humans depend on plants, microbes and animals for food, medicine and other industrial goods, it is crucial to our survival.

Values of biodiversity

Numerous environmental benefits are provided by biodiversity on a local, regional, and global scale. It is essential for preserving the water cycle, stopping soil erosion and guaranteeing the stability of ecosystems. Along with aiding in soil formation and water balance, it also promotes nutrient fixation and recycling, which assist preserve soil fertility. Biodiversity is extremely significant to humans since it provides necessities including food, clothes, housing, energy and medications. It enhances productivity, sustainability and resilience in agriculture by assisting farmers in growing a variety of crops appropriate to regional conditions.

Uses of biodiversity

Biodiversity serves several vital purposes. Direct uses including food, fuel, fiber and medications are included in the consumptive use value; examples include quinine from Cinchona, vincristine from *Catharanthus roseus*, and penicillin from *Penicillium*. Commercially significant items like wood, honey, silk, wool, gums and resins are included in the productive use value. The social value represents religious and cultural significance, where animals like cows and peacocks and herbs like tulsi and pipal are revered. The ethical value is founded on the idea of "live and let live," which acknowledges every organism's right to survive. Recreation and ecotourism, which offer pleasure and financial advantages, are highlighted by the aesthetic value.

Biological Diversity in India (National Level)

India's various climate and ecosystems contribute to its enormous biological diversity. Nearly 7-8% of all known species are found there, although making up only 2.4% of the planet's geographical area (Kumar *et al*., 2025). Numerous agricultural crops have their origins and diversity in India. The country exhibits high levels of endemism, especially in areas like

North-East India, the Himalayas, and the Western Ghats. As a result, India is acknowledged as one of the megadiverse nations.

India as a Mega-Diverse Country

India's high biodiversity has earned it the title of mega-diversity nation. It contains over 91,000 animal species and 45,000 plant species, accounting for 7-8% of the world's biodiversity (Goswami, 2024). There are many different types of habitats throughout the nation, including marshes, deserts, coastal ecosystems, tropical forests, and alpine regions. Additionally, it serves as a significant center of origin for numerous crops and their wild cousins. India is therefore regarded as a mega-diverse nation due to its great diversity of species, ecosystems, and crops.

Hotspots for biodiversity in India

Currently, there are 36 biodiversity hotspots on Earth, which support over 50% of all plant species while occupying less than 3% of the planet's surface area (Merritt *et al*., 2019). The Himalaya, Indo-Burma, Western Ghats, and Sundaland (Nicobar Islands) are India's four main hotspots. Because they are home to numerous endemic and endangered species, these areas are crucial for conservation. Endemic plants and fauna, such as the red panda and snow leopard, abound in the Himalaya hotspot. There is a great variety of orchids, reptiles, amphibians, and freshwater animals in the Indo-Burma hotspot in northeastern India. High endemism, particularly in plants and amphibians, is well-known in the Western Ghats. Tropical rainforests with several unusual indigenous birds, reptiles, and plants can be found in the Sundaland hotspot (Nicobar Islands).

Reasons for Loss of Biodiversity

Human activity and inadequate resource management are the primary causes of biodiversity loss. Habitat destruction, the conversion of natural ecosystems into urban, industrial, or agricultural areas, is the primary cause. Another major factor is over-exploitation through excessive fishing, hunting, and forestry. Ecosystems are also disrupted by pollution, invasive species, and climate change, and the loss of biodiversity is accelerated by rapid population increase and lax environmental regulations.

Biodiversity conservation

Conservation is the appropriate control of human activity to prevent habitat degradation and biodiversity loss. There are two primary approaches to biodiversity conservation. In-situ conservation, which protects plants and animals in their natural habitats (Mestanza-Ramón *et al*., 2020) and ex-situ conservation, which uses tools like gene banks, seed banks, zoos, and botanical gardens to conserve species outside of their natural habitats (Lee, 2023).

1. In-situ conservation

a. National Park

Plants, animals, and entire ecosystems are preserved in their original habitats in national parks, which are a crucial component of in-situ conservation. Private ownership is not permitted, and human activities like farming, grazing, hunting, and settlements are severely forbidden. The Wildlife Protection Act of 1972 grants the government legal protection for these locations. Examples are Kaziranga National Park, which is well-known for safeguarding the one-horned rhinoceros, and Jim Corbett National Park, which is recognized for the conservation of Bengal tigers.

b. Wildlife Sanctuaries

Wildlife sanctuaries are a crucial in-situ conservation strategy that safeguards wild animals and their natural habitats. In contrast to national parks, government regulations may permit certain human activity, such as tourism and research. Private rights may exist in certain situations, but they are tightly regulated. Examples include Vedanthangal Bird Sanctuary, which is well-known for migratory birds, and Periyar Wildlife Sanctuary, which is home to tigers and elephants.

c. Biosphere Reserves

Large protected areas designed to preserve biodiversity and promote sustainable resource use are known as biosphere reserves. They are separated into three zones: the transition zone (where human settlements and sustainable activities are permitted), the buffer zone (where research, education, and tourism are restricted), and the core zone (which is carefully protected) to create peace between humans and environment. Gulf of Mannar Biosphere Reserve, Sundarbans Biosphere Reserve, and Nilgiri Biosphere Reserve are a few examples.

d. Sacred Groves

Sacred groves are traditional methods of in-situ conservation that are safeguarded by local populations on the basis of their religious and cultural beliefs; hunting and tree cutting are typically forbidden. Particularly in places like Meghalaya, these habitats aid in the conservation of uncommon and endangered plant species. The Khasi and Jaintia Hills, the Aravalli Hills, the Western Ghats, and the Bastar and Surguja regions are some of India's key sites.

2. Ex-situ conservation

a. Seed gene bank

In order to preserve plant genetic diversity, seed gene banks are a crucial ex-situ conservation technique that keeps seeds viable for extended periods of time at controlled temperatures, often about –18°C. This technique aids in the preservation of significant wild plant species and agricultural variants for upcoming breeding and study. Svalbard Global Seed Vault and the National Bureau of Plant Genetic Resources are examples.

b. Gene Banks

Through the regulated storage of germplasm, such as seeds, tissues, pollen, or DNA, gene banks help maintain the genetic variety of plants and animals outside of their natural habitats. This makes it easier for scientists and breeders to use these resources for study and agricultural development. The International Maize and Wheat Improvement Center, the International Rice Research Institute Gene Bank, and the National Bureau of Plant Genetic Resources are examples.

c. Tissue Culture Banks

In order to conserve plant genetic material in a lab setting, tissue culture banks are a crucial ex-situ conservation technique. To create disease-free plants, plant parts such as meristems, roots, or shoots are cultivated in nutrient media and can be cryopreserved at extremely low temperatures for long-term storage. This technique is particularly helpful for vegetatively propagated, rare, and endangered plants. Examples are the International Potato Center and the Tissue Culture Facility of the National Bureau of Plant Genetic Resources.

d. Botanical gardens

Botanical gardens are significant ex-situ conservation facilities that preserve a broad range of plant species for scientific research and conservation, including rare and exotic plants. In addition to offering a comfortable setting, they promote public awareness, education, and research. The Royal Botanic Gardens at Kew, the Indian Botanic Garden, and the Lalbagh Botanical Garden are examples.

e. Zoological gardens

Zoological gardens, which house wild animals in safe settings for research, breeding, and conservation, are a significant ex-situ conservation strategy for animals. To boost the numbers of endangered species, many zoos run captive breeding programs. The oldest zoo in the world, Schönbrunn Zoo, and one of India's first zoos, Alipore Zoo, are two examples.

Conclusion

Maintaining ecological equilibrium and sustaining human life through a variety of goods and services depends on biodiversity. However, because of environmental changes and human activity, it is seriously threatened. Therefore, in order to preserve biodiversity for current and future generations, effective conservation using both in-situ and ex-situ techniques is essential.

References

1. Delgado-Baquerizo, M., Eldridge, D. J., Liu, Y. R., Liu, Z. W., Coleine, C., and Trivedi, P. (2025). Soil biodiversity and function under global change. *PLoS biology*, **23**(3): e3003093.
2. Kumar, V. M. S., Kumar, A., and Patel, M. C. (2025). Advancing biodiversity research in India through Cybertaxonomy and artificial intelligence: A review. *Journal of Geography, Environment and Earth Science International*, **29**(2): 1-10.
3. Goswami, R. (2024). Conserving India's Natural Heritage: A Legal Analysis of Biodiversity Protection and Management. *African Journal of Biological Sciences*, **6**(12): 3039-3051.
4. Merritt, M., Maldaner, M. E., and de Almeida, A. M. R. (2019). What Are Biodiversity Hotspots? *Frontiers for Young Minds*, **7**(29), 7.
5. Mestanza-Ramón, C., Henkanaththegedara, S. M., Vásconez Duchicela, P., Vargas Tierras, Y., Sánchez Capa, M., Constante Mejía, D., and Mestanza Ramón, P. (2020). In-situ and ex-situ biodiversity conservation in ecuador: A review of policies, actions and challenges. *Diversity*, **12**(8), 315.
6. Lee, H. (2023). Ex situ conservation efforts for plant diversity protection with a focus on seeds. *The Open Agriculture Journal*, **17**(1): 1-8.