

Conservation of Biodiversity for a Sustainable World: A Mini-Review

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Importance of biodiversity conservation

The term biodiversity is derived from “bio” and “diversity,” which refer to life and variety, respectively. The concept of biodiversity conservation is developed to protect, preserve and manage biological components, including plant species, animals, and natural resources. Biodiversity conservation is essential to protect endangered and threatened species and preserve natural resources for sustainable development and present and future generations. Scientists believe that only 50 per cent preservation of protected areas (PAs) area can ensure the current level of biodiversity (Wilson, 2016). The signatory parties to Convention on Biological Diversity (CBD) pledged to preserve 17 per cent of the PAs by 2020 (CBD, 2020). Similarly, Aichi Target 11 also emphasises preserving 10 per cent of marine and coastal areas by 2020 (Wang et al., 2023). In order to achieve this goal, biodiversity conservation underpins three key objectives: preservation of species diversity, sustainable protection of species and ecosystems, and promotion of life-supporting systems. Biodiversity often describes biological diversity or variety in the species, including plants, animals, fungi, humans, and all other living organisms and the habitats in which they dwell on.

The role and function of biodiversity are inevitable for maintaining a sound ecosystem. It helps regulate climate change issues, control water quality, and prevent disease. Humans are connected to the biodiversity system; therefore, it provides numerous benefits like food, shelter, medicine, oxygen, livelihood, etc. Biodiversity evolves from the local to the global level. Local-level biodiversity conservation includes setting up protected areas, engaging local communities in the conservation process, and improving local people’s livelihood by creating more sustainable employment opportunities instead of relying on harvesting forest resources. Successful implementation of national laws and policies ensures

the conservation process at the country level. Global agreements like Ramsar Convention and Convention on Biological Diversity promote biodiversity conservation at the international level. The consideration of biodiversity at all levels can ensure its successful conservation.

Types of biological variation

Biological variation usually occurs from three aspects: genetic diversity, species diversity, and ecosystem diversity. Genetic diversity refers to the diverse presence of the gene pool of a certain species within the species and can be determined through the deoxyribonucleic acid (DNA) assessment of a species (Poommouang et al., 2021). These genes provide biochemical information about the external appearance, behavior, and lives of an organism. Genetic diversity helps a population to adapt to the varied environment. Studies show that population species with more diversity have higher chances of survival. It is because a genetically diverse population is more invincible to handle changes (Banks et al., 2013). A genetically diverse population is likely to survive well even if the disease strikes.

Species variety plays a significant role in maintaining biological diversity. Scientists predict that about 8.7 million plant species and animals exist on Earth, but only 1.2 million species' information has been recovered so far (National Geographic, 2023). Species diversity implies the existence of a wide variety of species in an ecosystem or environment and their relative abundance. In other ways, it reveals the number and kind of different animals and plant species at local, regional and global scales. Every ecosystem contains a number of different species, which is called species richness. This species richness may vary from ecosystem to ecosystem or region to region. Tropical regions enjoy having high species richness as their environment is conducive to the habitats of various species. For example, the northern and southern tropical regions of America remain nearly 85,000 individual flowering plant species, and the tropical and subtropical regions of Asia and Africa have about 50,000 and 35,000 individuals, respectively. In contrast, around 11,300 vascular plants exist in the whole of Europe (Earth eclipse, 2023). A relative abundance of each species is important for sustainable ecosystem persistence. The constant figure of an individual species within an ecosystem indicates a high evenness, whereas the variation of the species denotes low evenness. For instance, the presence of a large volume of different species in a forest indicates high species richness; in contrast, having a limited section of each species denotes low species evenness. Maintaining species

diversity and abundance in the natural ecosystem is important because all species are interrelated. Despite having a potential role of maintaining a sound and healthy ecosystem, species diversity has faced numerous threats, e.g., natural and human-caused events. Natural events like storms, floods, earthquakes, volcanoes, diseases, etc., are unpredictable, but the destruction of natural resources and other human activities disrupt the ecosystem chain. In our ecosystems, the contribution of species is inevitable. Any kind of loss of these species, locally and globally, threaten our ecosystem services as humans rely on this ecosystem.

Ecosystem diversity describes the combination of various habitats, biological communities (all living components in the ecosystem), and ecosystems in a particular area. The ecosystem diversity varies according to geographical region. It may be large or small. A forest is a large ecosystem area; on the contrary, a pond is an example of a tiny ecosystem. Ecosystem diversity adopts variability of living and non-living components, such as microorganisms, plants, insects, temperature, and sunlight (Alsterberg et al., 2017). Highly diverse ecosystem areas are usually less affected during natural events occurs. All the species in an ecosystem equally contribute to maintaining the ecosystem services.

Biodiversity conservation methods

Mainly two methods are employed to conserve biodiversity: in-situ and ex-situ conservation. In in-situ conservation, species are protected in their natural habitats or ecosystems, such as national parks, biosphere reserves, game reserves, marine protected areas, and wildlife sanctuaries. By contrast, under the ex-situ conservation method, species are shifted to other specialised areas such as botanical gardens, zoological parks, and safari parks from their original habitats, where they will be properly taken care of. In ex-situ, the genetic resources of species are also cultivated. It reduces the stresses of the living organism, where habitat, food, and water scarcity are the main obstacles to survival. The in-situ conservation approach helps conserve species on an abundance scale, whereas the ex-situ approach is applied when species are found endangered or extinct.

Threats to biodiversity

Growing human pressure on the natural environment puts magnificent biodiversity at stake and increases a potential threat to biodiversity conservation all around the world. There are several reasons for losing biodiversity, such as habitat destruction, which is the main reason for biodiversity loss. Human aggression toward nature in various forms, such as destroying forests, building roads and

highways, and conducting other human activities, affects the ecosystem services of various species (Romero-Munoz et al., 2021). Climate change caused by human interventions in nature also leads to the loss of biodiversity and the extinction of species. Other reasons for biodiversity losses are the over-exploitation of natural resources and invasive species.

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