



## BIODIVERSITY: KEY TO SUSTAINABLE DEVELOPMENT

**Dr. Neel Kant Sharma**

Associate Professor, Government College Nalagarh, Himachal Pradesh.

**ABSTRACT**

Biodiversity means the variability in all forms of life. It encompasses the diversity among different species on earth, genetic variation within species as well as diversity in different terrestrial and aquatic ecosystems supporting life. The biodiversity provides a variety of ecological, economical and societal services. It holds the key to sustainability and is fundamental to achieving the sustainable development goals. However, the rich biodiversity is being lost at rapid rate because of many unsustainable development activities and poor understanding of relationship between different life forms. The current paper discusses the concepts of biodiversity and sustainable development, and the relationship between the two; causes of biodiversity loss; global efforts and future steps that can be taken to conserve the biodiversity and achieve the sustainability of development.

**KEYWORDS** : Biodiversity; Sustainable Development; Ecosystem; Conservation

**INTRODUCTION**

"Biodiversity or Biological diversity" means the variability among living organisms from all sources including, inter alia, 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 [1]. Biodiversity is inheritably multidimensional having multiple elements of variability of life be it taxonomic, functional, phylogenetic, genetic, trophic or other ways that life's forms and functions vary [2].

The planet earth is unique being endowed with life and bountiful natural resources to sustain it, the biodiversity being one such resource. The loss of existing and appearance of new forms of life has been a regular feature of consequence of evolutionary processes. However, the rate at which many of the existing species have dwindled in last few decades is alarming and jeopardizing the sustainability of life itself as various life forms are very intricately connected with each other and we do not understand many of these intricate relationships.

**BIODIVERSITY IS ESSENTIAL FOR SUSTAINABLE DEVELOPMENT**

The term 'Sustainable Development' was used extensively in the report of the World Commission on Environment and Development (WCED, 1987) entitled *Our Common Future* [3] and defines it as 'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs'. It provides a mechanism through which society can interact with the environment without damaging the resource for the future [4]. With poverty eradication, the change in unsustainable patterns of patterns of production and consumption and the protection and management of natural resources, as the overarching objectives and essential requirements, the sustainable development integrates- economic, social and environmental development [5].

Biodiversity features prominently across many of the Sustainable Development Goals (SDGs) and associated targets in the 2030 Agenda for Sustainable Development, that sets out an ambitious framework of universal and indivisible goals and targets to address a range of global societal challenges [6]. Biodiversity plays a prominent role in achieving following goals of sustainable development [7]:

- End poverty in all its forms everywhere.
- End hunger, achieve food security and improved nutrition; promote sustainable agriculture.
- Ensure healthy lives and promote well-being for all at all

ages.

- Achieve gender equality and empower all women and girls.
- Ensure the availability and sustainable management of water and sanitation for all.
- Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
- Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
- Make cities and human settlements inclusive, safe, resilient and sustainable.
- Ensure sustainable consumption and production patterns.
- Take urgent action to combat climate change and its impacts.
- Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
- Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification and halt and reverse land degradation and halt biodiversity loss.
- Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels.
- Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Globally, nearly half of the human population is directly dependent on natural resources for its livelihood, and many of the most vulnerable people depend directly on biodiversity to fulfill their daily subsistence needs [6].

Biodiversity also provides a variety of ecosystem services like maintaining soil fertility, pollination and seed dispersal, detoxification and decomposition of wastes and regulating climate. The ecosystem services are result of many natural processes occurring in nature which are complex and interrelated and are not fully understood. Therefore the impact of losing anyone of these processes as a result of loss of any species is not understood. [8]

Further, biodiversity safeguards the functioning and sustainability of ecosystems and ecosystem services against natural or anthropogenic changes and degradation and its loss can permanently reduce future life options [9]

Biodiversity is crucial to the sustainability of human societies as it contributes to ecological, economical and social well being, enhances the abilities of ecosystems to cope with climatic and environmental shocks, supports food security by

providing raw genetic material for improved crop and livestock varieties and provides opportunities for indigenous and other communities to cultivate market niches based on traditional knowledge and livelihood practices [10]

### THREATS AND RISKS TO BIODIVERSITY AND DEVELOPMENT SUSTAINABILITY

The biodiversity is undoubtedly essential for sustainability. However, many species have been lost and the existence of many current life forms is facing threat due to various factors and reasons. Today, extinction rate is hundreds, or even thousands, of times higher than the natural baseline rate which is about one species per every one million species per year [11]. The primary drivers for biodiversity loss are:

**Habitat loss and fragmentation:** Habitat loss from exploitation of resources, agricultural conversion, and urbanization is the largest factor contributing to the loss of biodiversity. Ecosystem conversion and ecosystem degradation contribute to habitat fragmentation that cannot maintain populations of species into future. [12]

**Invasive Alien species:** Invasive alien species are plants, animals, and other organisms that are non-native to an ecosystem, and which may cause economic or environmental harm. In particular, they impact adversely upon biodiversity, including decline or elimination of native species and the disruption of local ecosystems and ecosystem functions. Invasive alien species, introduced and/or spread outside their natural habitats, have affected native biodiversity in almost every ecosystem type on earth and are one of the greatest threats to biodiversity [13]

**Over-exploitation of Biological Resources:** The overexploitation results when harvesting exceeds the rate that can be sustained by the natural reproductive capacity of the population being harvested. The rising human population and resource exploitation for profit has led to overfishing, overhunting, excessive logging and excessive extraction of medicinal herbs and as a consequence has contributed to species extinction and biodiversity loss [14, 15]. In the wider landscape, conflicts between development and biodiversity arise as a consequence of the over-exploitation of natural resources bringing about a direct loss of wildlife species and habitats [16].

**Pollution:** Atmospheric and water pollution pose serious threat to biodiversity. The atmospheric pollutants reaching the ground and water in the form of acid rain that causes acidification of lakes, streams and forest soils and herbicides and pesticides leaching into soil and water make many species vulnerable [12]

**Climate change:** The ecosystems are rapidly changing in response to climate change. The changes in ecosystems are threatening biodiversity worldwide [17].

### GLOBAL EFFORTS FOR BIODIVERSITY CONSERVATION

**Convention on Biological Diversity (CBD):** The Convention on Biological Diversity is dedicated to promoting sustainable development, conceived as a practical tool for translating the principles of Agenda 21 into reality. The convention recognizes that biological diversity is about more than plants, animals and microorganisms and their ecosystems- it is about people and need for food security, medicines, fresh air and water, shelter and a clean and healthy environment in which to live [18] CBD has 3 main objectives:

1. The conservation of biological diversity.
2. The sustainable use of the components of biological diversity.
3. The fair and equitable sharing of the benefits arising out of the utilization of genetic resources.

**Other International Agreements:** In addition to CBD, a wide range of international agreements have been negotiated with a focus on biodiversity conservation; the major ones include the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on the Migratory Species of wild animals (CMS), the International Treaty on Plant Genetic Resources for Food and Agriculture (ITPGRFA), the Convention on Wetlands (also known as Ramsar Convention), the World Heritage Convention (WHC), the International Plant Protection Convention (IPPC).

**International Union for Conservation of Nature (IUCN):** The IUCN is a democratic union composed of both government and civil society organizations. The IUCN is addressing the global challenges- biodiversity loss and climate change, being the prominent ones, and helping guide a transition towards a just global society and sustainable development. [19]

**Man and Biosphere Programme (MAB):** Under MAB programme of UNESCO, Biosphere reserves are designated and solutions reconciling the conservation of biodiversity with its sustainable use at local and regional scales are promoted [20]. At present there is a world network of 727 reserve sites spread in 131 countries including 22 transboundary sites [21]

**Biodiversity Hotspots:** The biodiversity hotspots are places on earth which are biologically very rich and home to a large number of native species not found anywhere else but many of them are endangered or threatened. 36 regions on earth have been recognized as biodiversity hotspots covering 2.4% of earth's surface to which more than 50% of plant species and about 43% of birds, mammals, reptiles and amphibian species are endemic [9]

**Protected Areas:** A protected area is a clearly defined geographical space, recognized, dedicated and managed, through legal or other effective means, to achieve the long term conservation of the nature with associated ecosystem services and cultural values. Protected areas which include national parks, wild areas, community conserved areas and nature reserves are a mainstay of biodiversity conservation in addition to their contribution to people's livelihoods, particularly at the local level. [22]

**Intergovernmental Science-Policy Platform for Biodiversity and Ecosystem Services (IPBES):** The Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) is an independent intergovernmental body established by States to strengthen the science-policy interface for biodiversity and ecosystem services for the conservation and sustainable use of biodiversity, long-term human well-being and sustainable development [23].

**World Wide Fund (WWF):** It works to help local communities conserve the natural resources they depend upon, transform markets and policies toward sustainability and protect and restore species and their habitats [24].

In addition to these organizations, the biodiversity is protected by communities across the world through "Sacred Natural Sites (SNS)", which refer to areas recognized as sacred by indigenous and traditional peoples and recognized by religions and faiths as places of worship and remembrance [25]. These are the oldest form of habitat protection in human history and these have gained recognition from conservationists. There are different studies that points out the positive effects of SNS on biodiversity and calls for official recognition of these positive effects in conservation framework and to fill the geographical and taxonomic gaps in addition to advancing knowledge of SNS through systematic research [26].

## STEPS TO PROTECT THE BIODIVERSITY AND ACHIEVE SUSTAINABLE DEVELOPMENT

The tremendous diversity of life on earth- a result of more than three billion years of evolutionary history –is facing an uncertain future [27]. Biodiversity is currently being lost at unprecedented rate. Despite an increase in the total number of protected areas in the world, biodiversity continues to decline. [20]

Many international treaties and agreements have been signed to reverse the loss of biodiversity. However, the effectiveness of such international treaties is a subject of concern and biodiversity decline remains a key issue on the global environmental policy agenda [28]. Further, future population growth and economic development are forecasted to impose unprecedented levels of extinction risk on many more species worldwide [29]

To protect and conserve the rich biodiversity of earth and ensure sustainable development, we should be committed to use natural resources sustainably based on scientific management focusing on habitat conservation vis-à-vis needs of local communities. Besides the landscape and ecosystem management has to be part of strategy for conservation, as over the past decades there has been a shift in emphasis among conservation biologists from managing populations of threatened species at a single site to considering larger landscapes as conservation units as landscape scale approaches to conservation make sense because the drivers of biodiversity loss- land use and land cover change, fragmentation, overexploitation, and climate change- tend to operate at large scales [30].

Keeping in view the above scenario, the following measures can be taken to conserve biodiversity [31, 32, 33]:

- Increase in Protected Areas.
- Significant improvement in implementation of conservation programs.
- Boost in funding for biodiversity programs-Financial support should come from all sectors including Governments, Businesses and Philanthropy.
- Attitudinal change and moderation in the consumption and lifestyles.
- Empowering local communities and their governments to manage their resources.
- Campaigning and training in communities with tools and skills to promote local biodiversity protection.
- Capacity building and technical and financial resources to support innovative solutions.
- Development of wildlife/ habitat corridors to allow movement between habitats to maintain genetic diversity.
- Multiple inter-linked repositories of the biological information at international level.
- Special information centers and repositories for conservation of oceanic diversity, microbial diversity and fragile habitats such as the Arctic and Antarctic regions, Himalayas and Tropical rain forests.

## CONCLUSION

The biodiversity provides a variety of ecological and economical services and is essential to achieve sustainable development. The biodiversity is being lost at an unprecedented fast rate due to many reasons. The factors responsible for loss of biodiversity need to be understood fully and remedial measures to be taken accordingly. Many efforts have been made to conserve biodiversity but the effectiveness has not been to satisfaction levels. The concerted efforts involving individuals, communities, researchers, governments and funding agencies should be made at local, national and global levels to achieve the targets of Biodiversity conservation and sustainable development.

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