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Biodiversity conservation in Himalayan region

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Abstract

The Himalayas are our greatest heritage. They are storehouse of hundreds of endemic plants species and some world's rarest wildlife species. It is one of the world's richest ecosystems in terms of biological diversity. Biodiversity is the life support system of our planet we depend on it for the air we breathe, the food we eat and the water we drink. We literally need to conserve biodiversity like our lives depend on it. Biodiversity is threatened by a variety of global changes resulting from the combined action of human society. The most direct threats are overharvesting and loss/disturbance of habitat resulting from conversion of natural ecosystem to human use. However, other changes such as increased nutrient availability and elevated CO₂, with the resulting climate changes in the form of warmer climates, less snowfall, erratic rainfall, untimely hail, retreating glaciers, movement of plant species upward, soil erosion etc. are also long – term threats. Therefore, conservation of biodiversity has become a growing concern of central significance to all sectors of society. Ensuring conservation of biodiversity is one of humankind's important global responsibilities. It is important to conserve biodiversity for the sake of our own curiosity and aesthetic appreciation. While everyone agrees that conserving natural resources is a good idea, there is no consensus on how to go about it. Every group from governmental agencies to concerned individuals has their own idea of what measures should be taken to achieve it. Further, each group has its own agenda to pursue and may regard some factors of conservation of biodiversity as threats to those agendas. The conservation of diversity is a complicated matter. Yet if it is not resolved during our lifetime, the problems we leave our descendants will be even more complicated and harder to resolve.

“Peace of Sky, Peace of Mid-Region, Peace of Earth, Peace of Water, Peace of plants, Peace of Trees, Peace of All-Gods, Peace of Brahman, Peace of Peace, May that Peace come to me.”

Keywords: Biodiversity, conservation, Himalayan

Introduction

Over the last 50 years, humans have changed ecosystem more rapidly and extensively than in any comparable period of time in Human history. The race of modernization between the countries of the world has led to the excess growth in industrialization, urbanization, transportation that is causing the destruction of the environmental balance through climate change. The major consequences of climate change are green house effect, global warming, ozone depletion and epidemics which directly or indirectly affect the biological resources and life sustaining system of the nature.

It is clear that the Vedic vision to live in harmony with environment was not merely physical but was far wider and much comprehensive. The Vedic people desired to live a life of hundred years and this wish can be fulfilled only when environment will be unpolluted, clean and peaceful. Vedic message is clear that environment belongs to all living beings, so it needs protection by all, for the welfare of all.

Himalayan Region- A Unique Gift of Biodiversity

The Himalayas, which literally mean the abode of snow is the youngest and the highest range of Fold mountains in the world. The Himalayas consist of three parallel ranges, the Greater Himalayas known as the Himadri, the Lesser Himalayas called the Himachal, and the Shiwalik hills which comprise the foothills. It extends between 28°N- 36°N Latitude and 72°N- 96°N longitude run almost without break for about 2500km and with a width about 200-400km. Biogeographically, the Himalayan mountain range straddles a transition zone between the pale- arctic and Indo-Malayan realms. Species from both realms are represented in the hotspot. In addition, geological, climatic and altitudinal variations in the hotspot, as

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well as topographic complexity, contribute to the biological diversity of the mountains along their east-west and north-south axes. The flora and fauna of the Himalayas varies with rainfall, altitude and soils. The amount of yearly rainfall increases from west to east along the front of the range. This diversity of altitude, rainfall and soil conditions generates a variety of distinct plant and animal communities or eco-regions. Besides this the mighty Himalayas are the cradle of nearly 1500 glaciers covering an area of about 33000sq.km. They are the sources of water and many river valley project of sub-region. The Himalayas are the home of a great biological resources both flora and fauna species along with agricultural plant resources. The mighty Himalayas along with the extension act as an effective climatic barriers as it strikes the cold and chilly winds originated near the Arctic Circle and blow across the Central and Eastern Asia. The Himalaya gives the tropical climate to the country. The geology of the region supports many precious metals. Its glaciers, lakes, rivers, the main source of fresh water for the people of the region also provide irrigation sources to agriculture and power generation. The biological resources of the region are much diverse as there are about 35000 species of flora and fauna available over the Himalayan region. But these rich biological resources are deteriorating rapidly throughout the world, because of unsustainable approaches used in human activities such as blasting, dumping of debris, digging, excavation of the mountain side and heavy deforestation for the construction of dams, roads leading to ecological devastation in the Himalayan region. Ecological disturbance in the region can aggravate micro-climatic changes thereby further increasing its impact on people's lives and livelihood.

Concept of Biodiversity

One way of explaining biodiversity is the phrase-*'when one tugs at a single thing in nature, he finds it attached to the rest of the world.'* All creatures need other creatures and plants in one way or another- even if the connection is not so clear. Biodiversity is about the diversity- the range of different living things and systems in area. The term biodiversity was coined as a contraction of biological diversity by E.O. Wilson in 1985. Biodiversity may be defined as the variety and variability of living organisms and the ecological complexes in which they exist. The word Biodiversity originates from the Greek word BIOS which means Life and Latin word Diversitas means variety or difference. The whole word Biodiversity generally therefore means: Variety of Life. Biodiversity or biological diversity is the term given to the variety of life on Earth. It is the variety within and between all species of plants, animals and micro-organisms and the ecosystems within which they live and interact. It also refers to the multitude of different ecosystems in which species form unique communities interacting with one another and the air, water and soil.

The United Nations designated 2011-2020 as the United Nations Decade on Biodiversity. In biodiversity, each species, no matter how big or small has an important role to play in ecosystem. Various plant and animal species depend on each other for what each offers and these diverse species ensures natural sustainability for all life forms.

Elements of Biodiversity

Biodiversity has four essential elements:-

- 1) **Genetic Diversity** – Genetic Diversity is the variation in genes that exists within a species. A single species might

show high diversity at the genetic level over its distributional range. India has more than 50,000 genetically different strains of rice, and 1000 varieties of mango.

- 2) **Ecological Diversity** – It is the diversity of ecosystem, natural communities and habitats. In essence, it's the variety of ways that species interact with each other and their environment.
- 3) **Species Diversity** – Species Diversity is the variation in a group of living organisms that can interbreed.
- 4) **Molecular Diversity** – It is the fourth element of biodiversity without which evolution cannot occur either in the origin of a new species, its survival and development or its eventual extinction. It is distinct from genetic diversity though both ultimately depend on inheritable DNA. It occurs within one individual between individuals of the same species, between related species, within and phyla and ecosystem and throughout evolution.

"We should preserve every scrap of biodiversity as priceless while we learn to use it and come to understand what it means to humanity."

Importance of Biodiversity

Human derive many direct and indirect benefits from the living world. Biodiversity is the source of food, medicines, pharmaceutical drugs, fibers, rubber, timber etc. The biological resources contain potentially useful resources as well. The diversity of organisms also provides many ecological services free of charge that are responsible for maintaining ecosystem health. The importance of biodiversity is briefly described below:-

1. Ecological value of Biodiversity- Biodiversity is essential for the maintenance and sustainable utilization of goods and services from ecosystems as well as from the individual species. These services include maintenance of the gaseous composition of the atmosphere, climate control by forest and oceanic systems, natural pest control, pollination of plants by insects and birds, formation and protection of the soil, conservation and purification of water, and nutrient cycling, etc.

Loss of biodiversity may trigger large unpredictable changes in an ecosystem and some of these may adversely impact agriculture or human health perhaps through induced changes in hydrology and pest population.

2. Medicinal value of Biodiversity- Biodiversity is a rich source of substances with therapeutic properties. Several important pharmaceuticals have originated as plant-based substances. For instances Quinine (Chinchona ledgeriana) used for the treatment of malaria; and Taxol, an anticancer drug obtained from the bark of the yew tree (Taxus brevifolia, T. baccata). Currently, 25% of the drugs in the Pharmacy are derived from a mere 120 species of plants. But, throughout the world, traditional medicines make use of thousands of plant species

3. Existence value of Biodiversity – Biodiversity is essential for our existence because it is the life support system of our planet- we depend on it for the air we breathe, the food we eat and the water we drink.

4. Economic value of Biodiversity – Biodiversity has an economic value in following ways:-

- (a) It provide many industrial raw materials like fiber, oil, dyes, rubber, water, timber, paper, and food.
- (b) Biodiversity enhances recreational activities like bird watching, fishing, trekking, etc. Preservation of some charismatic species of birds and animals means that habitat protection for these species has a market demand and biodiversity conservation thus finds a source of finance.

5. Aesthetic value of Biodiversity- Aesthetic values of biodiversity such as refreshing fragrance of the flowers, taste of berries, softness of mossed, melodious songs of birds, etc. compel the human beings to preserve them. The earth's natural beauty with its colour and hues, thick forest, and graceful beasts has inspired the human beings from their date of birth to take necessary steps for its maintenance. Similarly botanical and zoological gardens are the means of biodiversity conservation and are of aesthetic values.

6. Ethical value of Biodiversity- Biodiversity must be seen in the light of holding ethical value. Since man is the most intelligent amongst the living organisms, it should be prime responsibility and moral obligation of man to preserve and conserve other organisms which will directly or indirectly favour the existence of the man.

“Yet, despite our many advances, our environment is still threatened by a range of problems, including global climate change, energy dependence on unsustainable fossil fuels and loss of biodiversity.”

Reasons for Loss of Biodiversity

Extinction is a natural part of life on earth. Over the history of the planet most of the species that ever existed, evolved and then gradually went extinct. Species go extinct because of natural shifts in the environment that take place over long periods of time, such as Ice ages.

Today, species are going extinct at an accelerated and dangerous rate, because of non-natural environmental changes caused by human activities. In the present era, human beings are the most dangerous cause of destruction of the earth's biodiversity. Factors identified by Edward Wilson are described by the acronym HIPPO standing for

H- Habitat destruction

I- Invasive species

P- Pollution

P- Human Overpopulation

O- Over-harvesting/ Over- Exploitation

1) Habitat destruction- Habitat destruction is a major caused for biodiversity loss. Habitat loss is caused by deforestation, overpopulation, pollution and global warming. Species which are physically large and those living in forests or oceans are more affected by habitat reduction. Some experts estimate that around 30% of all species on earth will be extinct by 2050. Even if small element of an ecosystem breaks down, the whole system's balance is threatened.

2) Invasive species- Invasive species refers to those that would normally remain constrained from an ecosystem because of the presence of natural barriers. Since these barriers are no longer existing, invasive species invade the ecosystem, destroying native species. Human

activities such as horticultural, agricultural, European colonization and accidental transport have been the major cause for encouraging invasive species.

3) Pollution- The most dreaded factor inducing the loss of biodiversity is environmental pollution which includes air pollution, water pollution, industrial pollution, pollution due to chemical Pastes, pesticides, radioactive material etc.

4) Human Overpopulation- Biodiversity is threatened by overpopulation. Because human population, which has doubled since 1970, is expected to reach 9 billion by 2050, the biodiversity crisis will only get worse as more people consume more resources. With the increased population the habitats are fragmented into pieces by roads, fields, canals, power line, towns etc. which cause climatic changes in the form of warmer climates, less snowfall, erratic rainfall, untimely hail, retreating glaciers, movement of plant species upward, soil erosion etc. are also long term threats.

5) Over-Harvesting/ Over- Exploitation – Over-exploitation is also becoming a major cause for loss of biodiversity. Over- exploitation is caused by activities such as over fishing, over hunting, excessive logging and illegal trade of wild life. Over 25% of global fisheries are being overfished at unsustainable levels.

All of these threats have put a serious stain on the diversity of species on Earth. According to International Union for Conservation of Nature (IUCN), globally about one third of all known species are threatened with extinction. If we do not stop the threats to biodiversity, we could be facing another mass extinction with dire consequences to the environment and human health and livelihood.

Conservation of Biodiversity

Conservation of biodiversity is protection, upliftment and scientific management of biodiversity so as to maintain it at its threshold level and derive sustainable benefits for the present and future generation. In other words, conservation of bio-diversity is the proper management of the biosphere by human beings in such a way that it gives maximum benefits for the present generation and also develops its potential so as to meet the needs of the future generations.

Mainly the conservation of biodiversity has three basic objectives

- (a) To maintain essential ecological processes and life supporting systems.
- (b) To preserve the diversity of species.
- (c) To make sustainable utilization of species and ecosystems.

Strategies for Conservation of Biodiversity

The following strategies should be undertaken in order to conserve biodiversity:

Strategy 1: Safeguard Our Biodiversity Strategy. 2: Consider Biodiversity Issues in Policy and Decision-making. Strategy 3: Improve Knowledge of Our Biodiversity and the Natural Environment. Strategy 4: Enhance Education and Public Awareness. Strategy 5: Strengthen Partnerships with All Stakeholders and Promote International Collaboration.

Strategy 1: Safeguard our biodiversity

This strategy aims at conserving Himalayan region habitats and ecosystems for long-term sustainability so that

Himalayan peoples' can benefit from their multiple functions. Concerted efforts should be made to protect existing native species, habitats and ecosystems, and to re-establish species that once existed.

Actions:

- Implement species conservation and recovery programmes
- Rehabilitate areas that have previously been degraded
- Extend green corridors to counter fragmentation
- Utilise parks for ex-situ conservation and to house or re-create ecosystems that have been lost

Strategy 2: Consider biodiversity issues in policy and decision-making

This strategy aims at conserving Himalayan region habitats and ecosystems for long-term sustainability so that Himalayan peoples' can benefit from their multiple functions. Concerted efforts should be made to protect existing native species, habitats and ecosystems, and to re-establish species that once existed.

Actions

- Governance approaches to support biodiversity conservation and sustainable use are required at all levels, with supportive laws and policies developed by central governments providing the security of tenure and authority essential for sustainable management at lower levels.
- More effort is needed in integrating biodiversity conservation and sustainable use activities within larger macroeconomic decision-making frameworks.
- Legal systems in countries are multilayered and in many countries, local practices or informal institutions may be much stronger than the law on paper.

Strategy 3: Improve knowledge of our biodiversity and the natural environment

Keen knowledge of how the key ecosystems respond to our activities will enable us to conserve and use them in a sustainable manner. It is essential that we support taxonomic studies, document our biodiversity and conduct ecological research.

Actions

- Encourage and facilitate research, in particular on ecosystem and species-specific biodiversity conservation, the interactions between the biological components and their physical environment, biodiversity valuation studies and the impact of climate change on biodiversity
- Monitor the health of ecosystems and species as part of the management process
- Develop and maintain a central information portal on biodiversity to facilitate more informed decision-making
- Maintain a list of species with their conservation status (red data list). The Red Data Book is a list, with photographs and descriptions, of the plant and animal species in Himalayan region that need their conservation status raised.
- Compile case studies on and assess best practices that have been implemented.

Strategy 4: Enhance education and public awareness

Knowledge and awareness are pre-requisites for action, hence communication on biodiversity issues, are critical in

driving public involvement. Effective communication will create greater awareness, interest in our natural heritage and instil a sense of national pride.

Actions

- Increase appreciation, awareness and understanding of people for nature through public seminars, road shows and events
- Promote volunteerism through biodiversity interest groups
- Incorporate elements of biodiversity conservation into the curricula of all levels of education

Strategy 5: Strengthen partnerships with all stakeholders and promote international collaboration

The most effective mode of operation for biodiversity conservation is to engage all stakeholders, including private, public and people sectors (government agencies, academia, schools, conservation groups, amateur naturalists and private corporations), in a comprehensive partnership. Such partnerships should be pursued domestically and internationally as biodiversity issues cut across sectors and transcend national boundaries.

Actions

- Encourage active participation in the stewardship of the environment for all sectors
- Promote partnerships with regional and international organisations, in particular the ASEAN Centre for Biodiversity and the Secretariat of the Convention on Biological Diversity, as an indication of our commitment to biodiversity conservation at the global level
- International cooperation through multilateral environmental agreements requires increased commitment to implementation of activities that effectively conserve biodiversity and promote sustainable use of biological resources.

“Biodiversity can't be maintained by protecting a few species in a zoo, or by preserving green belts or national parks. To function properly, nature needs more room than that. It can maintain itself, however without zoo keepers, park rangers, foresters or gene banks. All it needs is to be left alone.”

Conservation Methods

There are two types of conservation methods namely in-situ and ex-situ conservations.

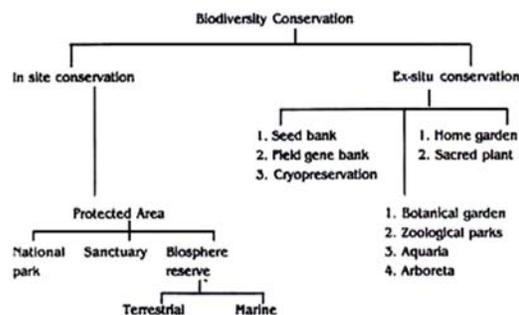


FIG. 5.1 : SCHEME SHOWING BIODIVERSITY CONSERVATION MANAGEMENT SYSTEMS.

Let us discuss the different conservation methods along with their importance.

(a) In situ conservation

The conservation of species in their natural habitat or natural ecosystem is known as in situ conservation. In the process, the natural surrounding or ecosystem is protected and maintained so that all the constituent species (known or unknown) are conserved and benefited. The factors which are detrimental to the existence of species concerned are eliminated by suitable mechanism.

The different advantages of in situ conservation are as follows

- (a) It is a cheap and convenient way of conserving biological diversity.
- (b) It offers a way to preserve a large number of organisms simultaneously, known or unknown to us.
- (c) The existence in natural ecosystem provides opportunity to the living organisms to adjust to differed' environmental conditions and to evolve in to a better life form.

The only disadvantage of in situ conservation is that it requires large space of earth which is often difficult because of growing demand for space. The protection and management of biodiversity through in situ conservation involve certain specific areas known as protected areas which include national parks, Sanctuaries and Biosphere reserves.

1. Protected areas

The protected areas are biogeographically areas where biological diversity along with natural and cultural resources are protected, maintained and managed through legal and administrative measures. The demarcation of biodiversity in each area is determined on the basis of climatic and physiological conditions.

In these areas, hunting, firewood collection, timber harvesting etc. are prohibited so that the wild plants and animals can grow and multiply freely without any hindrance. Some protected areas are: Cold desert (Ladakh and Spiti), Hot desert (Thar), Saline Swampy area (Sunderban and Rann of Kutch), Tropical moist deciduous forest (Western Ghats and north East) etc. Protected areas include national parks, sanctuaries and biosphere reserves. There are 37,000 protected areas throughout the world. As per World Conservation Monitoring Centre, India has 581 protected areas, national parks and sanctuaries.

2. National parks

These are the small reserves meant for the protection of wild life and their natural habitats. These are maintained by government. The area of national parks ranges between 0.04 to 3162 km. The boundaries are well demarcated and circumscribed. The activities like grazing forestry, cultivation and habitat manipulation are not permitted in these areas. There are about 89 national parks in India.

3. Sanctuaries

These are the areas where only wild animals (fauna) are present. The activities like harvesting of timbers, collection of forest products, cultivation of lands etc. are permitted as long as these do not interfere with the project. That is, controlled biotic interference is permitted in sanctuaries, which allows visiting of tourists for recreation. The area under a sanctuary remains in between 0.61 to 7818 km.

4. Biosphere reserves

Biosphere reserves or natural reserves are multipurpose protected areas with boundaries circumscribed by legislation. The main aim of biosphere reserve is to preserve genetic diversity in representative ecosystems by protecting wild animals, traditional life style of inhabitant and domesticated plant/ animal genetic resources. These are scientifically managed allowing only the tourists to visit.

Some importance of biosphere reserves are as follows

- (a) These help in the restoration of degraded ecosystem.
- (b) The main role of these reserves is to preserve genetic resources, species, ecosystems, and habitats without disturbing the habitants.
- (c) These maintain cultural, social and ecologically sustainable economic developments.
- (d) These support education and research in various ecological aspects,

(b) Ex-situ conservation

Ex-situ conservation involves maintenance and breeding of endangered plants and animals under partially or wholly controlled conditions in specific areas like zoo, gardens, nurseries etc. That is, the conservation of selected plants and animals in selected areas outside their natural habitat is known as ex-situ conservation. The stresses on living organisms due to competition for food, water, space etc. can be avoided by ex-situ conservation there by providing conditions necessary for a secure life and breeding.

Some important areas under this conservation are:

- (i) Seed gene bank,
- (ii) Field gene bank;
- (iii) Botanical gardens;
- (iv) Zoos

The strategies for ex-situ conservations are

- (i) Identification of species to be conserved. (ii) Adoption of Different ex-situ methods of conservation. (i) Long-term captive breeding and propagation for the species which have lost their habitats permanently. (ii) Short-term propagation and release of the animals in their natural habitat. (iii) Animal translocation. (iv) Animal reintroduction. (v) Advanced technology in the service of endangered species.

The different advantages of ex-situ conservation are

- (a) It gives longer life time and breeding activity to animals.
- (b) Genetic techniques can be utilised in the process.
- (c) Captivity breed species can again be reintroduced in the wild.

Some disadvantages of this method are:

- (a) The favourable conditions may not be maintained always.
- (b) Mew life forms cannot evolve.
- (c) This technique involves only few species. Hot Spots:

Hot spots are the areas with high density of biodiversity or mega diversity which are most threatened at present. There are 16 hot spots in world, out of which two are located in India namely North-East Himalayas and Western Ghats.

The hot spots are determined considering four factors

- (i) Degrees of endemism;
- (ii) Degree of expectation

- (iii) Degrees of threat to habitat due to its degradation and fragmentation and,
- (iv) Number of Species diversity.

Conclusion

Biodiversity is a global endowment of nature. Conservation of biodiversity includes all species of plants, animals and other organisms, the range of genetic stocks within each species and ecosystem diversity. Conservation of biodiversity has become a growing concern of central significance to all sectors of society. Ensuring conservation of biodiversity is one of humankind's important global responsibilities. In the day to day life, human beings are maintaining their lifestyle at the sacrifice of surrounding species which come from diversity of plants and animals struggling for their existence. So, it is highly essential for the human beings to take care of their surrounding species and make optimum use of their service, for better economic development. Thus, it is rightly told, survival of the man depends upon the survival of the biosphere. Since the human beings are enjoying all the benefits from biodiversity, they should take proper care for the preservation of biodiversity in all its form and good health for the future generation i.e., the human being should prevent the degradation and destruction of the habitats thereby maintaining the biodiversity at its optimum level.

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