Biodiversity: Types, Importance and Conservation Methods

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. In other words, biodiversity is the occurrence of different types of ecosystems, different species of organisms with the whole range of their variants and genes adapted to different climates, environments along with their interactions and processes.

Biodiversity includes the genetic variability (for which different varieties of spices have appeared in the course of evolution) and diversity of life forms such as plants, animal microbes, etc. living in a wide range of ecosystems.

The diversity may be interspecific (within species) and interspecific (in between the species) but these are well supported by ecosystem. It is seen that the diverse living forms of the ecosystem are modulated with the global environmental changes.

Types of Biodiversity:

There are three interrelated hierarchical levels of biodiversity namely, genetic diversity, species diversity and community or ecosystem diversity.

1. Genetic diversity:

It describes the variation in the number and types of genes as well as chromosomes present in different species. The magnitude of variation in genes of a species increases with increase in size and environmental parameters of the habitat.

The genetic variation arises by gene and chromosome mutation in individuals and in sexually reproducing organisms and it is spread in the population by recombination of genetic materials during cell division after sexual reproduction.

Genetic diversity has the following importance:

(i) It helps in speciation or evolution of new species;
(ii) It is useful in adaptation to changes in environmental conditions;
(iii) It is important for agricultural productivity and development.

2. Species diversity:

It describes the variety in the number and richness of the spices with in a region. The species richness may be defined as the number of species per unit area. The richness of a species tells about the extent of biodiversity of a site and provides a means for comparing different sites.

The species richness depends largely on climatic conditions. The number of individuals of different species with in a region represents species evenness or species equitability. The product species richness and species evenness give species diversity of a region. When a species is confined entirely to a particular area, it is termed as endemic species.

3. Ecosystem diversity:

It describes the assemblage and Interaction of spices living together and the physical environment a given area. It relates varieties of habitats, biotic communities ecological processes in biosphere. It also tells about the diversity within the ecosystem. It is referred as Land escape diversity because it includes placement and size of various ecosystems.

For example, the landscapes like grass lands, deserts, mountains etc. show ecosystem diversity. The ecosystem diversity is due to diversity of niches, trophic levels and ecological processes like nutrient cycling, food webs, energy flow, role of dominant species and various related biotic interactions. Such type of diversity can generate more productive and stable ecosystems or communities capable of tolerating various types of stresses e.g. drought, flood etc.

According to Whittaker (1965), the community diversities are of three types:

(i) α-Diversity: It tells the species diversity in a given community. It depends upon species richness and evenness.

(ii) β-Diversity: It describes a range of communities due to replacement of species which arises due to the presence of different microhabitats, niches and environmental conditions.
(iii) γ -Diversity: It describes diversity of habitat over a total land escape or geographical area.
Biodiversity of India:

As per available data, the varieties of species living on the earth are 1753739. Out of the above species, 134781 are residing in India although surface area of India is 2% of the earth's surface. Wild life Institute of India has divided it into ten biogeographical regions and twenty five biotic provinces.

Biogeographical regions are:

(i) Trans Himalayas,
(ii) Gangetic plain,
(iii) Desert,
(iv) Semiarid zone;
(v) Western Ghats;
(vi) Deccan peninsula,
(vii) North eastern zone,
(viii) Coastal lands
(ix) Himalayas,
(x) Islands.

Importance of Biodiversity: The living organisms on earth are of great diversity, living in diverse habitats and possessing diverse qualities and are vital to human existence providing food, shelter, clothing's, medicines etc.

1. Productive values: Biodiversity produces a number of products harvested from nature and sold in commercial markets. Indirectly it provides economic benefits to people which include water quality soil protection, equalisation of climate, environmental monitoring, scientific research, recreation etc.
2. Consumptive value: The consumptive value can be assigned to goods such as fuel woods, leaves, forest products etc. which may be consumed locally and do not figure in national and international market.
3. Social value: The loss of biodiversity directly influences the social life of the country possibly through influencing ecosystem functions (energy flow and biogeochemical cycle). This be easily understood by observing detrimental effects of global warming and acid rain which cause an unfavorable alteration in logical processes.
4. Aesthetic value: Aesthetic values 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.
5. Legal values: Since earth is homeland of all living organisms, all have equal right to coexist on the surface of earth with all benefits. Unless some legal value is attached to biodiversity, it will not be possible to protect the rapid extinction of species.
6. Ethical value: 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.
7. Ecological value: Biodiversity holds great ecological value because it is indispensable to maintain the ecological balance. Any disturbance in the delicately fabricated ecological balance maintained by different organisms, will lead to severe problems, which may threaten the survival of human beings.
8. Economic value: Biodiversity has great economic value because economic development depends upon efficient and economic management of biotic resources.
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.

Uses of Biodiversity:

Biodiversity has the following uses for the development humanity:

(i) It provides food of all types.
(ii) It provides fibers, sources for the preparation of clothes.
(iii) It provides different types of oil seeds for the preparation of oils.
(iv) It provides new varieties of rice, potato etc. through the process of hybridization.
(v) It provides different drugs and medicines which are based on different plant products.
(vi) It is very essential for natural pest control, maintenance of population of various species, pollination by insects and birds, nutrient cycling, conservation and purification of water, formation of soil etc. All these services together are valued 16.54 trillion dollars per year.

Threats to Biodiversity:

Biodiversity is considered as a reservoir of resources to be used for the manufacture of food, medicine, industrial products, etc. But with an increased demand of rapid population growth, biodiversity is gradually depleting. A number of plants" and ani¬mal species have already become extinct and many are endan¬gered.

The different factors responsible for causing threat to biodiversity are as follows:

1. Habitat destruction: The primary cause of loss of biodiversity is habitat loss or destruction which is resulted due to the large industrial and commercial activities associated with agriculture, irrigation, construction of dams, mining, fishing etc.

2. Habitat fragmentation: With increased population, the habitats are fragmented into pieces by roads, fields, canals, power lines, towns etc. The isolated fragment of habitats restricts the potential of species for dispersal and colonization. In addition, the habitat fragmentation also brings about microclimatic changes in light, temperature, wind etc.

3. Pollution: The most dreaded factor inducing loss of biodiversity is environmental pollution which include air pollution, Water pollution, industrial pollution, pollution due to chemical Pastes, pesticides radioactive materials etc.

4. Over exploitation: The natural resources are over exploited to meet growing rural poverty, intensive technological growth and globalization of economy. All these factors together may be responsible for the extinction of a number of species.

5. Introduction of exotic species: The introduction of exotic species are due to:
(i) horticulture
(ii) agriculture;
(iii) European colonisation and
(iv) accidental transport.

It is seen that some exotic species may kill or eat the native species thereby causing its extinction.

6. Diseases: Since the animals are more vulnerable to infection, the anthropological activities may increase the incidence of diseases in wild species, leading to their extinction.
7. Shifting or Jhum cultivation: The shifting or Jhum cultivation by poor tribal people greatly affects the forest structure which is a store house of biodiversity.
8. Poaching of wild life: A number of wildlife species are becoming extinct due to poaching and hunting.

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.

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

Strategies for Conservation of Biodiversity: The following strategies should be undertaken in order to con¬serve biodiversity:
(1) All the possible varieties (old or new) of food, forage and timber plants, live stock, agriculture animals and microbes should be conserved.
(2) All the economically important organisms in protected areas should be identified and conserved.
(3) Critical habitats for each species should be identified and safeguarded.
(4) Priority should be given to preserve unique ecosystems.
(5) There should be sustainable utilisation of resources.
(6) International trade in wild life should be highly regulated.
(7) The poaching and hunting of wildlife should be prevented as far as practicable.
(8) Care should be taken for the development of reserves and protected areas.
(9) Efforts should be made to reduce the level of pollutants in the environment.
(10) Public awareness should be created regarding biodiversity and its importance for the living organisms.
(11) Priority should be given in wildlife conservation programme to endangered species over vulnerable species and to vulnerable species over rare species.
(12) The habitats of migratory birds should be protected by bilateral and multilateral agreement.
(13) The over exploitation of useful products of wild life should be prevented.
(14) The useful animals, plants and their wild relatives should be protected both in their natural habitat (in-situ) and in zoological botanical gardens (ex-situ)
(15) Efforts should be made for setting up of National parks and wild life sanctuaries to safeguard the genetic diversity and their continuing evolution.
(16) Environmental laws should be strictly followed.

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

1. Protected areas: The protected areas are biogeographical 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.

Some important national Parks of India are:
(i) Biological Park, Nandankanan, Orissa,
(ii) Corbett national Park Nainital, U.P. (First national Park)
(iii) Koziranga national Park, Jorhat, Assam
(iv) Tudula national Park, Maharashtra
(v) Hazaribagh national Park, Hazaribagh, Bihar
(vi) Band havgarh national park, M.P.
(vii) Bandipur national park, Karnataka.
(viii) Kanha National Park, M.P.
(ix) Reibul Lamjao National Park, Manipur

(x) Nawgaon National Park, Maharashtra

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.

Some important sanctuaries of Orissa are as follows:

(i) Nandankanan Zoological Park
(ii) Chandaka Elephant reserve
(iii) Simlipal Tiger Reserve
(iv) Bhitarkanika Wild life Sanctuary
(v) Gharial project at Tikarpada
(vi) Chilika (Nalaban) Sanctuary

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.

(a) These help in the restoration of degraded ecosystem.

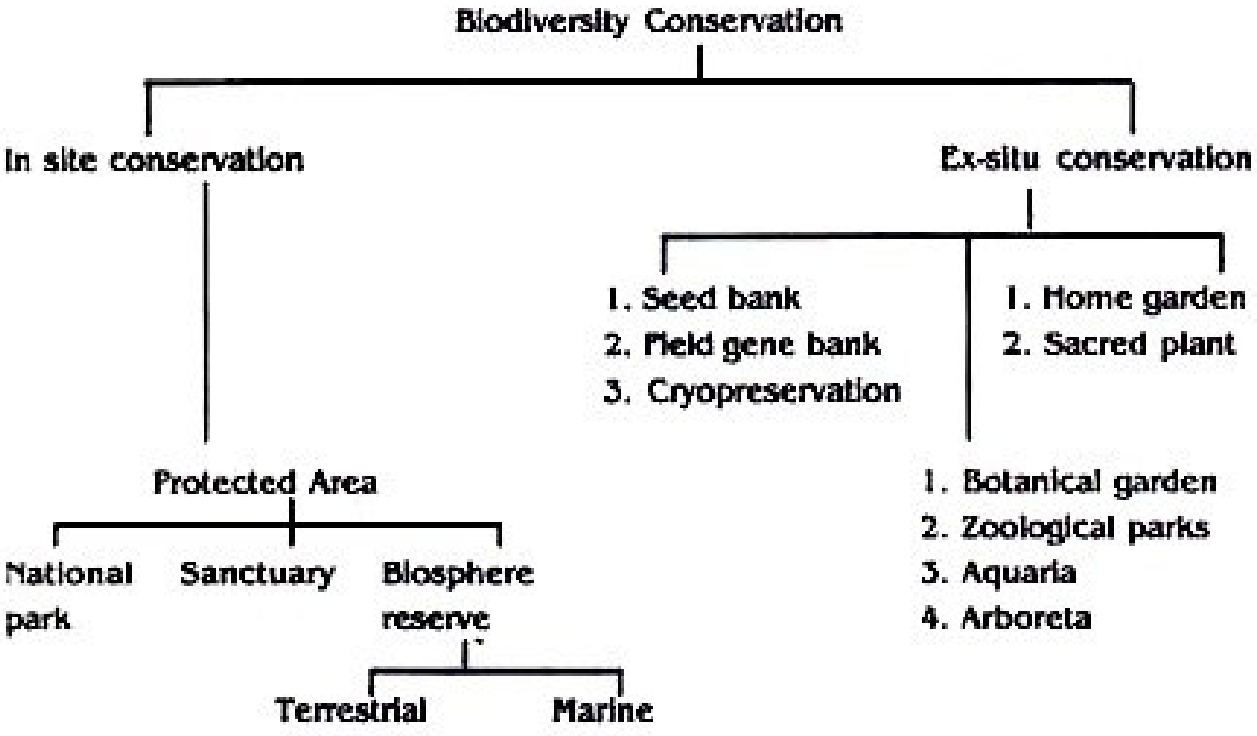
(b) The main role of these reserves is to preserve genetic resources, species, ecosystems, and habitats without disturbing the habitants.

(c) These maintain cultural, social and ecologically sustainable economic developments.

(d) These support education and research in various ecological aspects,

Some important biosphere reserves are:

Simlipal, (Orissa), Sunderban (West Bengal), Kanha (M.P Kaziranga (Assam) etc. The biosphere reserve net work was intro¬duced by UNESCO 1971.



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