

**BHARATHIDASAN UNIVERSITY TIRUCHIRAPPALLI- 620 024**

**ENVIRONMENTAL STUDIES 19UGCES**

**(Applicable to the candidates admitted from the Academic year 2019-20 onwards)**

**By**

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**Biodiversity and its conservation**

**Definition**

“Biodiversity is defined as “ the variety and variability among all groups of living organisms and the ecosystem in which they occur.”

**Significance of biodiversity:**

* Biodiversity is very important for human life, as we depend on plants, micro organisms and animals for food, medicine etc.
* It protects the fresh air, clean water, and protective land.
* It is also important for forestry, fisheries and agriculture which depend on various biological resources.
* Loss of biodiversity has serious economic and social costs for any country

 **Impact of Biodiversity loss**

* The farmers prefer hybrid seeds, so many plant species become extinct.
* For the production of drugs pharmaceutical companies collect wild plants, so many medicinal plants become extinct.
* Tropical forest is the main source of world medicine. But every year these forests are disappear due to agriculture, mining, logging etc.

**Classification Of Biodiversity**

**1.Genetic Diversity:**

* A Species with different genetic characteristics
* Variation of genes with the species
* Individual species have number of varieties
* Species are differs one to another due to combination of genes

**Eg:** Rice Varieties, Banana Varieties

**2. Species Diversity:**

* The sum of varieties of all living organisms at the species level such as plants, animals and microorganisms
* Here the diversity between different species
* Each species is differs one to another
* Different species are interact each other in ecosystem

**Eg:** Plant Species: Apple, Mango,

 Animal Species: Lion, Tiger

 Microorganism Species: Bacteria, Fungi, Virus

**3.Ecosystem Diversity:**

* It is the diversity of habitats, communities and ecological process within the ecosystem
* Set of Biotic components (Plants, Animals and Microorganisms) interacting with one another and with abiotic components ( Soil, air, water ,etc)
* Here large region with different ecosystem can be considered

Eg: River Ecosystem, Forest Ecosystem

**Value of Biodiversity**

Various uses of biodiversity are classified as follows

1. Consumptive use values
2. Productive use values
3. Social Values
4. Ethical Values
5. Aesthetic values
6. Optional Values
7. Ecosystem service values

**1. Consumptive use values**

* These are direct use values

**Eg:** fuel wood, food, drugs, fiber, etc.,

* Nearly 80,000 wild plants are consumed by humans.
* 90% of present day food crops have been from wild tropical plants.
* About 75% of the world’s population depends upon plants for medicines.

**Eg**: Penicillin- Penicillium

 Fungus- Antibiotic

**2. Productive use values**

* These are the commercial values where the product is marketed and sold.
* This include animal products like tusk of elephants, musk of musk deer, silk from silk worm, wool from sheep, fur and skin of animals.
* Plant products for various Industries like paper industry, silk industry, textile industry, Leather industry.

**3. Social Values**

* The values associated with social life, custom, religion and spiritual aspects of the people.
* Many of the plants like Tulsi, Mango, Lotus are considered as holy plants
* Many animals like cow, snake, bull and birds like peacock also hold special social importance.

**4. Ethical Values**

* It is also known as Existence value
* It involves ethical issues like “all life must be preserved” and “Live and Let live”, because biodiversity is valuable
* Biodiversity is considered to have great value on religious and cultural basis.

**Ex:** River Ganga is consider as holy river, Vembu, tulsi trees are worshipped by peoples

**5. Aesthetic values**

* Aesthetic value is attached with biodiversity because of beautiful nature of plants and animals
* The most important aesthetic value of biodiversity is eco-tourism

**Ex: Eco**-**tourism:**

People from far place spend a lot of time and money to visit the beautiful areas, where they can enjoy the aesthetic value of biodiversity. This type of tourism is known as eco-tourism.

**6. Option Values**

* The potentials of biodiversity that are presently unknown and need to be known
* There is something important in future
* There is a possibility of potential cure for AIDS or cancer may present in the deep marine ecosystem or in a forests
* Medicinal plants and herbs are play a very important role in our Indian economic growth

**7. Ecosystem service values**

* Biodiversity also regulates soil erosion, flood, soil fertility, cycling of nutrients, water cycle, pollution absorption.

**Role of Biodiversity at Global, National and Local levels**

* Total number of living species in the world is about 20 million. But 1.5 million species are found and given scientific names.
* Tropical deforestation is reducing the biodiversity 0.5% every year.

**Biodiversity at Global level:**

**Terrestrial biodiversity (or) Biomass**

It is the largest ecological units present in different geographic areas.

**Ex**: Tropical rain forests.

**1 Tropical Rain Forests:**

* It is the largest storehouse of biodiversity.
* It consists of millions of species of plants, insects, birds, amphibians and mammals.
* 50 to 75% of global biodiversity lies in the tropical rain forests.

**2.Temperate Rain Forests:**

* It has less biodiversity
* It consists of nearly 1,70,000 flowering plants, 30,000 vertebrates, 2,50,000 other group of species.

**Marine Diversity:**

* Marine diversity is much higher than terrestrial biodiversity but it is less known and described.
* Sea is the cradle of every known phylum.
* Out of existing 35 phyla multicellular animals, 34 are marine.

**Biodiversity at National Level:**

India is second largest nation containing 5% of world’s biodiversity and 2% of the earth surface.

**Rank of India in biodiversity:**

India has,

* 10th rank among the plant rich countries of the world.
* 11th rank among the endemic species of higher vertebrates.
* 6th rank among the centers of diversity and origin of agricultural crops.

**Biodiversity at Local Level:**

Based on spatial distribution it is classified into four types,

**1.Point Richness:**

It refers to the number of species that can found at a single point in a given space.

**2.Alpha richness:**

It refers to the number of species found in a small homogeneous area. It is strongly correlated with physical variables.

**3.Beta Richness:**

It refers to the rate of change in species composition across different habitats.

**4.Gamma Richness:**

It refers to the rate of change across large landscape.

**India as Mega Diversity Nation**

* India is one of the *12 mega diversity countries* in the world.
* India records *47000 species of plants, 81,000 species of animals.*
* This is nearly about *7% and 6.5% global flora and fauna*.
* About *62% of amphibian and 50% lizards* are endemic to India.
* India has a rich marine biodiversity- 7500 km long coastal line.
* India is the origin of *5000 flowering plants*.
* Due to *diverse climatic conditions* there is a complete spectrum of biodiversity in our country.

**Endemic Species**

* Endemic species can be defined as “those species which are confined only to a particular locality
* A large number out of a total of 81,000 species of animals in our country is endemic

Eg: Golden monkey, Indian Wolf, Red Fox.

**Factors affecting Endemic species:**

* Habitat loss and fragmentation because of draining and filling of inland wetlands.
* Pollution also play an important role.

**Endangered Species**

* A species is said to be endangered when its number has been reduced to a critical level.
* If such a species is not protected and conserved, it is in immediate danger of extinction**.**

**Eg:** Birds- Peacock, Siberian white crane, pelican,

Mammals-Indian wolf, red fox, tiger

Plants- sandal wood tree

**Factors affecting Endangered species**

i.Pollution:

Humans dispose their waste products on nature. So land, river and air gets polluted severly.These pollutants enter our environment and travel through food chain and accumulate in the tissues of living things finally leads to death.

ii.Over Exploitation:

Over exploitation of the natural resources and poaching of wild life also leads to extinction of wild animals.

iii) Climate change:

Climate change is brought by the accumulation of green house gases in the atmosphere. Climate change threatens organisms and ecosystems which cannot accommodate the change of environmental conditions.

**RED – Data Book**

* It contains list of endangered species of plants and animals
* It gives the warning signal for those species which are endangered and if not protected they become extinct in near future.

**Eg:** White tiger, red panda

**The purpose of preparation of Red list:**

* Provide awareness to the degree of threat to biodiversity.
* Provide global index on already decline of biodiversity.
* Identification of species at high risk of extinction.
* Help in conservation action.
* Information about international agreements.

**Hot-Spots of Biodiversity**

Hot spots are the geographical areas which possess high endemic species.

* An area is termed as a hot spot when it contains at least 0.5% of plant species as endemic.

**Criteria for recognizing hot spot:**

* The richness of the endemic species is the primary criterion for recognizing hot spot.
* It should have significant percentage of specialized species.
* The site is under thread.
* It should contain important gene pools of potentially useful plants.

There are 25 hot spots on a global level. Two are present in India.

These are:

**a. Eastern Himalayas**

**b. Western Ghats**

 **Eastern Himalayas**

* Geographically this area comprises Nepal, Bhutan & neighboring states of Northern India.
* This is one of the most threatened biodiversity hotspots, due to the rate of resource exploitation and habitat loss.
* Here 35,000 plant species are found, from that 30% are endemic species.
* Huge of fungi, insects, mammals & birds are found in this region.
* It gets good economic value.

**Eg:** Rice, banana, citrus, ginger, chilli, jute & sugarcane.

**Western Ghats**

* This area comprises Maharashtra, Karnataka, Tamilnadu& Kerala.
* Western Ghats includes 17,000 square km of forest cover.
* This hotspot includes Agastyamalai Hills and Silent Valley.
* Here 1500 endemic plant species are found.
* 62% of Amphibians & 50% of Lizards are found.

**Eg:** Lizard, Hawk, Asian elephant, Indian tigers

**Threats to Biodiversity**

* Extinction or elimination of a species is a natural process.
* Any disturbance in the natural ecosystem reduces its biodiversity.
* The waste generated due to increase in population, industrialization spoils the environment and leads to diversity in biological species.

**Various threats to Indian Biodiversity:**

**1. LOSS OF HABITAT**

* Habitat loss & degradation are major causes of species extinction.
* The main causes of habitat loss are agriculture activities, mining, development of human settlement, industry etc.

**Factors influencing habitat loss**

1. **Deforestation :**

The loss of habitat is mainly caused by deforestation activities

1. **Destruction of marine habitat:**

The wetlands estuaries and mangroves are destroyed due to draining, filling and pollution which cause huge biodiversity loss.

1. **Habitat Fragmentation:**

Sometimes the habitat is divided into small and scattered patches. This phenomenon is known as Habitat fragmentation.

1. **Raw Materials:**

For the production of hybrid seeds, the wild plants are used as raw material.

1. **Production of Drugs:**

Many pharmaceutical companies collect wild plant for the production of drugs. Therefore several medicinal plant species are on the verge of extinction.

1. **Illegal Trades:**

Illegal trade on wild life also reduces the bio-diversity and leads to habitat loss.

 **7.** **Development activities:**

Construction of massive dams in the forest areas, discharge industrial effluents which kill the birds and other aquatic organisms.

**2. POACHING OF WILDLIFE**

* Poaching means killing of animals (or) commercial hunting.
* Illegal trade of wildlife products by killing animals is called poaching.

**Subsistence pouching:** Killing animals for food.

**Commercial pouching:** Killing animals for commercial activities

**Ex:** Wildlife is sold and traded in many countries for live specimens, folk medicines, Skin, and other products such as horns

**Remedy Measures:**

* Illegal hunting and trade of animals and animal products should be stopped immediately.
* We should not purchase furcoat, purse or bag or items made of crocodile skin or python skin.
* Bio-diversity laws should be strengthened.

**3. Man- Wildlife Conflicts**

* Man – wildlife conflicts arise, when wildlife starts causing immense damage and danger to the man.
* The conflict between man and wildlife started with evolution of man
* The intensity increased due to the activities of modern man.
* Due to the lack of stable food and disruption of movement, wild animals came out of forest area and attack the agricultural field and humans and in turn got killed by the humans.

**Causes of Man-Wildlife conflicts**

1. Shrinking of forest cover because of human encroachment.
2. Ill and weak animals have a tendency to kill humans.
3. Elephant needs 2quintals of green fodder and 150 kg of clean water per day. Electric wiring around crop fields.
4. Disruption of wildlife corridors (seasonal migration) by human settlements.
5. Minimum compensation for crop damages**.**

**Remedy Measures:**

* Adequate crop and cattle compensation schemes must be started.
* Solar power fencing must be provided along with electric current proof trenches to prevent the animals from entering into the fields.
* Cropping pattern should be changed near the forest border.
* Adequate food and water should available in the forest zones.
* Development and constructional work must be stopped around forest region.

**Conservation Of Biodiversity**

**Conservation of Wildlife**

1. Setting up of sanctuaries and parks
2. Appointment for observes for wildlife
3. Shooting (or) hunting of animals are prohibited
4. Export and Import of animal skins and other products should be stopped
5. Conduct public programme about the importance of wildlife

**Conservation:**

Conservation is defined as the management of biosphere so that it will yield the greatest sustainable benefit to present generation while maintaining its potential to meet the needs of future generation.

**Types of Biodiversity Conservation**

1. In-situ Conservation (within habitat)
2. Ex-situ Conservation(outside of habitats)

**In-situ Conservation**

1. It involves protection of species (flora & fauna) within natural ecosystem or man made ecosystem
2. Important In-situ conservation: Biosphere reserves, national parks, wildlife sanctuaries.

**Methods of In-situ conservation**

**Biosphere Reserves**

This reserves cover large area, more than 5000sq.km

It is used to protect species for long time

Eg: Sunderbans(W.B), Gluf of Mannar (T.N), Nilgiri (Karantaka, Kerala, T.N).

**Role of Biosphere Reserves:**

* It gives long term survival of evolving ecosystem.
* It protects endangered species.
* Protects maximum number of species and communities.
* It serves as a site of recreation and tourism
* It is useful for educational and research purposes.

**Restriction:**

No tourism and explosive activities are permitted.

**National Park**

* It is an area dedicated for the conservation of wildlife along with the environment
* It is covering an area about 100 to 500 sq.km
* Within the biosphere one(or) more national parks are exit

**Eg:** Gir National park (Gujarat- Indian Lion),Periyar(Kerala- Tiger, Elephant)

**Role of a National Park:**

* Used for enjoyment through tourism without affecting the environment.
* It is used to protect, propagate and develop the wildlife.

**Restrictions:**

* Grazing inside the national park is prohibited.
* All private rights and forestry activities are prohibited.

**Wildlife Sanctuaries**

1. It is an area, which is reserved for the conservation of animals
2. At present , there is 492 wildlife sanctuaries in our country

Eg:Mudumalai (T.N-Tiger, Elephant),Vedanthangal (T.N- Water birds).

**Role of Wildlife sanctuaries:**

* It protects animals only.
* It allows harvesting timber, collection of forest products, private ownership without disturbing the animals.

**Restrictions:**

Killing, hunting, shooting or capturing of wildlife is prohibited except under the control of higher authority.

**Gene Sanctuary:**

Gene sanctuary is an area, where the plants conserved.

**Ex:** In Northern India two gene sanctuaries are present.

One for Citrus family and other for pitcher plant

**Advantages (OR) Merits of In-situ conservation:**

* It is very cheap and convenient method.
* Species gets adjusted to natural disasters like drought, floods, forest fires etc.

**Disadvantages (OR) Limitations of In-situ conservation:**

* Large surface area of the earth is required to preserve biodiversity.
* Maintenance of the habitats is not proper due to shortage of staff and pollution.

**Ex-situ Conservation**

1. It involves protection of flora & fauna outside the natural habitats
2. This conversion is mainly for conservation of crop varieties and the wild relative of crops

**Methods of Ex-situ Conservation**

**National Bureau of Plant Genetic Resources (NBPGR), New Delhi**

1. It uses cryo preservation technique to preserve agricultural & horticultural crops
2. Varieties of rice, pearl millet, Brescia, turnip, radish, tomato, onion, carrot, chilli, tobacco etc., have been preserved
3. **Cryo** **preservation**: Agricultural and horticultural crops are preserved by passing liquid Nitrogen at low temperature of −196°C.

 **National Bureau of Animal Genetic Resources (NBAGR), Haryana**

It preserves the semen of domesticated bovine animals

**National Bureau of Fish genetic Resources (NBFGR), Allahabad**

It preserves of genetic material of rare fishes.

**Advantages (OR) Merits of Ex-situ conservation:**

* Survival of endangered species is increasing due to special care and attention.
* In captive breeding, animals are assured food, water, shelter and security hence it has longer life span.
* Carried out endangered species do not have any changes of survival in the world.

**Disadvantages (OR) Limitations of Ex-situ conservation:**

* It is expensive method.
* Freedom of wildlife is lost.
* Animals cannot survive in natural environment.
* It can be adopted only for few selected species.

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