

**Nalanda Open University**

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M.A. / M.Sc. Environmental Science,

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**Short description of the suggested Topics**

**Theory Paper – IV**

**(BIODIVERSITY, ITS CONSERVATION & MICROBIOLOGY)**

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**1. Introductory note and definition of biodiversity. Value of biodiversity; Important economic commodities that humans derive from biodiversity.**

**Introduction:**

Biodiversity is a shortened form of two words - Biological and Diversity. So it refers to all the variety of life that can be found on earth including plants, animals, fungi and microorganism as well as the communities that they form and the habitat in which they live.

So, popularly it is said that biodiversity is the variety and variability of life on earth. It is typically a measure of variation at genetic, species and ecological level.

Actually it is variability among living organism from all sources including diversity within species between species and of ecosystem.

- If diversity is within species - it is called genetic diversity.
- If between species then called species diversity and
- If between ecosystem then ecological biodiversity

**Considering the above facts biodiversity can be defined as follows:**

**Definition:**

Biodiversity is a term which describes every living organism within a single ecosystem or habitat including number of diversity of species and all environmental aspects such as temperature, oxygen and carbon dioxide level and climate.

However, more simply it can be defined as “Biodiversity is the variety and variability of life on earth”. The term biodiversity was coined by W Rosen (1985).

**Value (Importance) of Biodiversity:**

- Without biodiversity the health of the planet is at stake.
- Every single species has a role to play its role in ecosystem.
- For a healthy ecosystem, a rich level of biodiversity is must. The less inhabitable an ecosystem the less life it can support.

- In Terrestrial, Aquatic and Marine environments a lack of biodiversity of plant life (producers) means the numbers of consumers are limited.
- The value of biodiversity can be well recognized that - it increases the soil formation, nutrients storage, energy storage, recycling and breaking down toxins and pollutants.
- Rich biodiversity will speed the recovery of the environment after natural disaster.
- It has a role and major value in the stability of ecosystem and global climate - for example deforestation removes trees responsible for the conversation of CO<sub>2</sub> into oxygen. This increase in CO<sub>2</sub> level in air is responsible for global warming. Deforestation also leads to soil erosion forming a desert like area thus harming both locally and globally.

#### **Economic commodities that humans drive from biodiversity.**

**The values of biodiversity can be shortlisted as given below:**

- Biological value – Its components are the source of our all food, medicines, fuels and industrial products.
- Biodiversity and wild systems - Biodiversity in Pharmaceutical and Biotechnology industry.
- Its major role in bioremediation.
- Ecosystem services.
- Risk management
- Social and cultural values.
- Values in transformation.
- Aesthetic values.
- Religious values etc.

#### **Economic commodities that humans derive from Biodiversity:**

**Some of the important economic commodities that biodiversity supplies to humans are:**

1. **Food** - Biodiversity provides food of high variety. Crops, livestock, forest products and fish are important source of food for human species.
2. **Biological Pest Control** - The control species can be used to protect the crop against pest and weeds. The economic loss due to the loss of crops/ food can be reduced with the use of the control species.
3. **Medication** - A wide variety of plants, animals, fungi and bacteria are used as medicine. Over 60% of world population depends upon the plant medicines for their Primary Health Care. According to National Cancer Institute, over 70% of promising anticancer drugs come from plants. Animals also play major role as their extracts are used to kill parasitic worms, against tumor etc.
4. **Industry** - Fibres for clothing, wood for shelter and different hybrid variety of food (crops and fruits) are main source of biodiversity. Other industrial products are - oils, perfumes, dyes, papers, waxes, resin, poison, cork etc. are

obtained from plant species. Animal products may include wool, silk, leather and lubricants.

- 5. Tourism and Recreation** - It is source of natural resources such as parks and forests. Eco tourism in particular is growing outdoor recreational activity.

**Ref. -**

- i. N. A. Campbel – 1996 (Biology Forth Edition)
- ii. Ecology by P. D. Sharma
- iii. NOU Study Material

## **2. Description of status of India on the scale of Mega biodiversity.**

India is one of the 12 mega biodiversity countries in the world. Following are the scales and status. The Ministry of Environment, Forest and Climate Change records show 47000 plant species and 89000 animal species.

- A large number of the India's biodiversity is still unexplored.
- Due to diverse climatic conditions, there is a complete rainbow spectrum of biodiversity in our country.
- Centre of origin of many flowering and crop plants.
- Great marine diversity due to 7500 km long coast line.
- India is source of traditional crop variety ranking first amongst 12 regions of diversity and seventh in the contribution of Agricultural species.
- India gets tenth place in the world and forth in Asia among 12 mega diverse countries in terms of plant diversity.
- India has 10 bio-geographical zones and it is among top ten nations of world for its great diversity of plant life especially flowering plants in India. 70% of the world total flowering plant occurs in India.
- India occupies 2.4% of the total land area of the world but India contributes 8.22 % of the known Global biodiversity.
- In terms of species contributed to animal husbandry it ranks seventh in the world.

**Endemism** - India shows good number of endemic species. About 62% of amphibians and 50% of lizards are endemic to India. Western Ghats of India are the site of maximum endemism.

**Centre of origin** - One can well imagine the status of India on the scale of mega diversity that a large number of species both (Plant + Animals) are known to be originated in India. Record shows that nearly 70% species of flowering plant had their origin in India.

**Conclusion** - India being one of the mega biodiversity countries is also one of the densely populated region of the world. Conservation of this natural wealth is of paramount importance in the face of increasing pressure on the plant diversity in the form of land use, land cover change, global warming, nutrient deposition and climate change. Proper documentation of biological mega diversity in India is

essential for conservation and sustainable use of this natural wealth for the benefit of mankind. Biological richness of Indian landscape which is key to mega diversity must be restored and maintained. There is urgent need to collect all information on biodiversity from Botanical Survey of India, Zoological Survey of India and various other Universities and Institutions on one common platform which will act as a node for web portal in the form of IBIN (Indian Bio-resource Information Network)

**Reference:**

Ecology by - E. P. Odum

Ecology and Environment by P. D. Sharma

Study Material of N.O.U, Patna

**3. Major reasons for loss of biodiversity; Different methods of conservation of biodiversity.**

The main cause of loss of biodiversity can be attributed to the influence of human beings on the world ecosystem. In fact, human beings have deeply altered the environment by exploiting species directly for example – Hunting, Fishing etc. Deforestation, Industrialization and Pollution are the major reasons for loss of biodiversity.

**It can be summarized in the following points:**

- **Habitat loss and Destruction** - Any given habitat supports the availability of water, air, soil, food and nutrition for biological organisms. When a habitat is destroyed either by natural or human activities then biodiversity is lost as the ecological systems supporting biological survival is taken away.
- **Over exploitation** - Activity such as over hunting, over fishing, over mining, over deforestation and excessive logging have greatly reduced biodiversity level. Some species of plants and animals are on the verge of extinction.
- **Pollution** - The various forms of pollution like water pollution, soil pollution, air pollution, land pollution and noise pollution simply destroy animal and plant habitats due to toxic substances and chemicals released into the biological systems. Marine and Freshwater life forms are most affected by pollution.
- **Climate change and Global warming**  
These are the principal contributors to biodiversity loss. The present rate of rising global temperatures is destroying coral reefs and mountain regions which are biodiversity centres.
- **Human overpopulation** – Over population has witnessed continued encroachment into forest, heightened pollution and destruction of Natural resources.
- **Genetic Pollution** –It refers to hybridization of species. It is mainly used to increase high yields and disease resistant variety. It brings unique genotypes which can replace the original genetic material.

- **Control of Pests and Predators** - It generally kills predators that are a component of balanced ecosystem and may also kill non-target species.
- **Natural Calamities** – Floods, drought, forest fire, earth quakes, volcanic eruptions, epidemics etc. are also the reasons for loss of biodiversity. Other ecological factors may also contribute to extinction of plant and animal life.

### **Conservation of Biodiversity**

“Biodiversity Conservation refers to the protection, upliftment and management of biodiversity in order to derive sustainable benefits for present and future generation.”

It has three main objectives:

- To preserve the diversity of the species.
- Sustainable utilization of species and ecosystem.
- To maintain the life supporting system and essential ecological processes.

#### **Methods of conservation of biodiversity:**

Biodiversity can be conserved in the following ways:

- i. In – situ Conservation
- ii. Ex – situ Conservation

#### **(i). In – situ Conservation:**

In such type of conservation the species are conserved within their natural habitats. In this method, the natural ecosystem is maintained and protected.

#### **In such type there are several advantages as:**

- It is cost effective and convenient method.
- A large number of living organisms can be conserved.
- Since the organisms are in natural ecosystem, they can involve better and can easily adjust to different environmental condition.

Certain protected area where the in – situ conservation take place include:

- ❖ National Park - Like Kanha, Bandipur.
- ❖ Wildlife Sanctuaries - These are regions where only wild animals are found.
- ❖ Biosphere Reserve – They are multipurpose protected areas. Tourism and Research activities are permitted here.

#### **(ii). Ex – situ conservation**

It involves the breeding and maintenance of endangered species in artificial ecosystem such as Zoos, Nurseries, Botanical Gardens, Gene Banks etc.

There is less competition for food, water and space among the organisms. Ex – situ conservation has the following advantages:

- ❖ The animals are provided with longertime and for breeding activity.
- ❖ The species bred can be reintroduced in the wild.
- ❖ Genetic techniques can be used for the preservation of endangered species.

References:

- ❖ Environment and Ecology by P. H. Collin
- ❖ Principles of Environment Sciences by William P. Cunningham.
- ❖ You may consult the Study Material of N. O. U, Patna.

#### **4. Endemism, Endemic and Endangered species of India.**

Species which are restricted only to a particular area of geographical region because of its isolation, soil and climatic condition are known as Endemic Species. Endemism is the ecological state of species being unique to a defined geographical location. India shows good number of endemic species. About 62% amphibians, 50% lizards, 53% fresh water fishes, 36% reptiles, 10% mammals and 33% flowering plants are endemic to India.

Western Ghats are site of maximum endemism.

##### **Endangered Species**

“These are species whose numbers are critically low and their habitat is so drastically reduced that they are in danger of extinction”.

At present, approximately –

- 81 – Species of Mammals.
- 38 – Species of Birds.
- 18 – Species of Amphibians and Reptiles  
are considered endangered in India.

##### **Causes:**

- Changing Environment
- Exploitation
- Pollution

##### **Effects:**

- Disruption of food chains and food webs.
- Affects National Biodiversity.
- Ecological Imbalance.

##### **Conservation techniques for Endemic and Endangered Species:**

- Proper planning and management should be made to preserve wildlife in their habitat (In - situ) and in zoo & sanctuaries (ex-situ).
- The feeding, breeding and nurshing of the species should be safe guarded.
- Establishment of sanctuaries and National parks with optimum living conditions is necessary.
- Proper legislative and administrative measures should be taken to regulate international trade of species in India.

##### **Endangered species in India:**

Plants, Animals or Microorganism that is in immediate risk of extinction are called endangered species.

In India, 450 plant species, 100 mammals and 150 birds are estimated to be endangered.

The RED-data book contains a list of endangered plants and animals. Some of rarest animals found in India are:

- i. Asiatic Cheetah
- ii. Asiatic Lion
- iii. Asiatic Wild Ass
- iv. Bengal fox
- v. Gaur
- vi. Indian Elephant
- vii. Indian Rhinoceros
- viii. Marbled Cat
- ix. Markhor etc.

**Location of Endemic species of India:**

Almost 60 % of endemic species in India are found in:

- i. North East India
- ii. North west Himalayas
- iii. Western Ghats
- iv. Andaman and Nicobar island etc.

**Some Endemic (flora) plants species include:**

- i. *Sapria himalayana*
- ii. *Ovaria luridia*
- iii. *Nepenthes species*

**Some Endemic Fauna (Animals) include:**

- i. Lion tailed Macaque
- ii. Nilgiri langur
- iii. Nilgiri tahr etc.

**References:**

- i. Endemic species of India – Wikipedia
- ii. Importance of Endangered species – by Graham
- iii. Study Material of N. O. U, Patna.