Sri SAI RAM ENGINEERING COLLEGE
INSTITUTE OF TECHNOLOGY
West Tambaram, Chennai - 44

Sairam INSTITUTIONS

SAIRAM DIGITAL RESOURCES

YEAR II | SEM IV

GE8291

ENVIRONMENTAL SCIENCE AND ENGINEERING

UNIT NO 1

ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY

1.3 Introduction to biodiversity definition: genetic, species and ecosystem diversity

1.3.1 Biogeographical classification of India

1.3.2 Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values

SCIENCE & HUMANITIES

4 QUALITY EDUCATION

NBA NATIONAL BOARD OF ACCREDITATION | NAAC A+ | nirf NATIONAL INSTITUTIONAL RANKING FRAMEWORK | BUREAU VERITAS Certification

1.3 BIODIVERSITY

INTRODUCTION

- Bio means life and diversity means variety, hence Biodiversity refers to the variety of life on the earth.
- It is virtually synonymous with “Life on earth”.
- The biodiversity found on Earth today consists of many millions of distinct biological species, which is the product of nearly 3.5 billion years of evolution.
- Planet earth (biosphere) contains more than 20 million species of organisms. They differ widely from one another.
- Diversification in the species is influenced by various physical and climatic factors, resulting in the production of new subspecies.

DEFINITION

- Biodiversity is defined as, “the variety and variability among all groups of living organisms and the ecosystem in which they occur”.
- Biodiversity is the variety and differences among living organisms from all sources, including terrestrial, marine, and other aquatic ecosystems and the ecological complexes of which they are a part.

SIGNIFICANCE OF BIODIVERSITY

- Biodiversity is very important for human life, as we depend on plants, micro organisms, earth’s animals for our food, medicine and industrial products.
- Biodiversity protects the fresh air, clean water and productive land.

- It is also important for forestry, fisheries and agriculture, which depend on a rich variety of various biological resources available in nature.
- Loss of biodiversity has serious economic and social costs for any country.

IMPACT OF BIODIVERSITY LOSS

- The farmers prefer hybrid seeds, as a result, many species become extinct.
- For the production of drugs the pharmaceutical companies collect wild plants, so several medicinal plants now become extinct.
- Tropical forests are the main sources of the world's medicine.
- Every year these forests are disappearing due to agriculture, mining, logging.

e.g.,Taxus baccate, a tree growing in sub himalayan regions, once believed to be of no value is now found to be effective against cancer. However, this plant has become an endangered species now.

LEVELS OF BIODIVERSITY

1.Genetic diversity

★ Genetic diversity is defined as genetic variability present within species.

★ The genes found in organisms can form an enormous number of combinations each of which gives rise to some variability.

★ For example,

(i) Different varieties of rose flower, wheat, etc.

(ii)There are more than 50,000 varieties of rice and more than a thousand varieties of mangoes found in India.

(iii) Rice belongs to the species Oryzasativa which has many varieties that differ in size, shape, aroma etc.

The Types of Biodiversity

Genetic Diversity

2. Species diversity

★ A discrete group of organisms of the same kind is known as species.

★ Species diversity is defined as the number of different species present in an ecosystem.

★ This is the variability found within the population of a species or between different species of a community.

★ It broadly represents the species richness and their abundance in a community.

★ Example,

(i) Plant species: Apple, Mango, Grapes, Wheat, etc.,

(ii) Animal species: Lion, Tiger, Elephant, Deer,etc.,


Ecosystem Diversity-
Desert
Coral Reef
Prairie
Tundra

3. Ecosystem diversity

★ Ecosystem Diversity can be defined as the variety of different habitats, communities and ecological processes.

★ A large region with different ecosystems can be considered as Ecosystem Diversity.

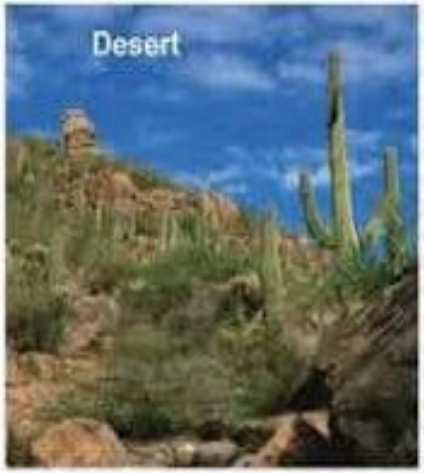
★ This is the diversity of ecological complexity showing variations in ecological niche, trophic structure, food webs, nutrient cycling etc.

★ The ecosystem also shows variations with respect to physical parameters like moisture, temperature, altitude, precipitation etc.

★ Example,

★ River Ecosystem - The river which includes the fish, aquatic insects, mussels and a variety of plants that have adapted.

Ecosystem Diversity-



1.3.1 BIOGEOGRAPHICAL CLASSIFICATION OF INDIA

- India has different types of climate and topography in different parts of the country and these variations have induced enormous variability in flora and fauna.
- It occupies tenth position among the plant rich nations of the world.
- Biogeography deals with the study of distribution, evolution, dispersal and environmental relationship of plants and animals in time and space.
- In our country, it has been classified into ten biogeographic zones.
- Each of these zones has its own characteristic climate, soil, topography and biodiversity.
- Biogeographic classification of India is the division of India according to biogeographic characteristics.

- Our country can be divided into ten major regions based on the geography, climate and pattern of vegetation seen and the communities of mammals, birds, reptiles, amphibians, insects and other invertebrates that live in them.

- Each of these regions contain a variety of ecosystems such as forests, grasslands, lakes, rivers, mountains and hills which have specific plant and animal species.

India's Biogeographic Zones

1. The cold mountainous snow covered Trans-Himalayan region of ladakh
2. The Himalayan ranges and valleys of Kashmir, Himachal Pradesh, Uttarakhand, Assam and other North-eastern States.
3. The Terrain, the low land where the Himalayan rivers flow into the plains
4. The Gangetic and Brahmaputra plains.
5. The Thar Desert of Rajasthan
6. The semi- arid grassland region of the Deccan plateau, Gujarat, Maharashtra, Andhra Pradesh, Karnataka and Tamilnadu
7. The North eastern States of India
8. The Western Ghats in Maharashtra, Karnataka and Kerala
9. The Andaman and Nicobar Islands
10. The long western and eastern coastal belt with sandy beaches, forests and mangroves.

1.3.2 VALUES OF BIODIVERSITY

1. CONSUMPTIVE USE VALUE

- These are direct use values where the biodiversity product can be harvested and consumed directly e.g. fuel, food, drugs, fibre etc.
- **Example**
- ★ **Food:**

i A large number of wild plants are consumed by human beings as food.

ii About 80,000 plants are from the wild.

iii About 90% of crops are domesticated from tropical forests.

iv A large number of wild animals are also our sources of food.

morphine from seeds

★ **Drugs and medicine:**

i Many plants are used in primary health care.

ii About 75% of the population depends upon plant or plant extracts for medicine.

Penicillin – fungus is the source – Antibiotic
Quinine – Cinchona bark - Malaria treatment
Morphine – Poppy bark – Analgesic

★ **Fuels:**

i Fire woods are directly consumed by villagers.

ii The fossil fuels coal, petroleum and natural gas are also the products of fossilised biodiversity.

2. PRODUCTIVE USE VALUE

i Biodiversity products have commercial value. These products are marketed and sold.

ii These are derived from animals and plants.

Animal products: Silk from silk worm, tusks of elephants, Wool from sheep, Musk from musk deer, Leather from animals

Plant Products: Wood for paper and Plywood, Cotton for textile industry, Pearl for pearl industry.



Productive use value and
Social Value


3. SOCIAL VALUE

i These are the values associated with the social life, religion and spiritual aspects of the people.

e.g., Holy plants : Tulsi, Lotus, Neem trees

Holy animals : Cow, snake, bull, peacock

ii Many of the plants are considered holy and sacred in our country like Tulsi, peepul, Mango and Lotus etc.

iii The leaves, fruits or flowers of these plants are used in worship or the plant itself is worshipped.

iv Many animals like Cow, Snake, and Peacock also have significant places in our psycho-spiritual arena.

v It refers to the manner in which the bio-resources are used in the society.

vi The tribal people are very closely linked with the wildlife in the forest.

4. ETHICAL VALUE

i It is also sometimes known as existence value. It involves ethical issues like "all life must be preserved".

ii The ethical value means that we may or may not use a species, but knowing the very fact that this species exists in nature gives us pleasure.

iii We are not deriving anything directly from Kangaroo, Zebra or Giraffe, but we all strongly feel that these species should exist in nature.

iv For the survival of the human race, all biodiversity has to be protected because biodiversity is valuable.

5. AESTHETIC VALUE

i The beautiful nature of plants and animals insists us to protect biodiversity.

e.g., : Eco-tourism, colour of butterfly, flowers etc.

No one of us would like to visit vast stretches of barren lands with no signs of visible life.

ii People from far and wide spend a lot of time and money to visit wilderness areas where they can enjoy the aesthetic value of biodiversity and this type of tourism is now known as eco-tourism.

iii Ecotourism is estimated to generate about 12 billion dollars of revenue annually.

Aesthetic Value

Source: Brumbaugh © AMNH-CBC

6. OPTIONAL VALUES

i These values include the potentials of biodiversity that are presently unknown and need to be explored.

ii There is a possibility that we may have some potential cure for AIDS or cancer existing within the depths of a marine ecosystem, or a tropical rainforest.

iii Thus option value is the value of knowing that there are biological resources existing in this biosphere that may one day prove to be an effective option for something important in the future.

iv The optional value of biodiversity suggests that any species may be proved to be a valuable species after someday

e.g., Medicinal plants and herbs play a very important role in our indian economic growth.

VIDEO LINK

https://youtu.be/GK_vRtHJZu4

THANK YOU