

Unit - I

Environment and Biodiversity

1.1 INTRODUCTION

The word environment is derived from the French word “Environ” meaning “Surroundings”. Each and everything around us is called as environment.

Every organisms is surrounded by materials and forces which constitute its environment, from which it must derive its needs. Environment creates favourable conditions for the existence and development of living organisms.

Example

Cow eats plants for its survival. The plant requires nourishment from the soil. Nourishment is provided by nitrogenous mater excreted by animal (or) by the dead bodies of other plants and animals.

Thus for the survival of an animal (or) a plant, (or) a microbe, it requires a supply of materials and removal of waste products from its environment.

The degradation of the environment has become a serious problem. The pollution of soil, water and air leads to loss of valuable natural resources.

1.2 DEFINITIONS

1. Environment

Environment is defined as, "*the sum of total of all the living and non - living things around us influencing one another.*"

2. Environmental Science

Environmental science is the *study of the environment, its biotic (ie., biological) and abiotic (ie., non biological) components and their interrelationship.*

3. Environmental Engineering

Environmental engineering is *the application of engineering principles to the protection and enhancement of the quality of the environment and to the enhancement and protection of public health and welfare.*

4. Environmental Studies (or) Environmental Education

Environmental studies are *the process of educating the people for preserving quality environment.*

1.3 TYPES OF ENVIRONMENT

Environment can be divided into two categories

1. Natural environment
2. Man - made environment

1. Natural environment

Natural environment is characterized by natural components. All biotic (living) and abiotic components (non-living) are created through a natural process. Creation of these biotic and abiotic components do not require any human support.

Examples Soil, water, air, trees, radiations, noise, etc.,

2. Man - made environment

Man is the most powerful environmental agent. He modifies the environment using modern technologies, according to his needs to a great extent. Thus the man-made environment is created by man.

Examples House, road, schools, railway lines, parks, etc.,

1.4

COMPONENTS OF THE ENVIRONMENT

The environment consists of the following three important components.

1. Abiotic (or) Non-living components.
2. Biotic (or) Living components.
3. Energy components.

1.4.1 Abiotic (or) Non - Living Components (or) Physical Components

The non - living components of the environment are called abiotic components.

Example Air, water, soil and minerals.

These abiotic components enter the body of living organisms directly (or) indirectly, take part in metabolic activities and then return to the environment.

Abiotic components are sub divided into three categories

1. Atmosphere
2. Lithosphere
3. Hydrosphere

1. Atmosphere

The cover of air, that envelopes the earth is known as the atmosphere. The atmosphere extends upto 500 kms from the earth surface.

The atmosphere is essential for all living organisms. It comprises 78% of nitrogen, 21% of oxygen and 1% of other gases.

Structure of atmosphere

Atmosphere consists of following five concentric layers

(a) **Troposphere (0 - 18 kms):** It is the lower portion of the atmosphere and extends from 0 - 18 kms. It contains 75% of the atmospheric air mass. The temperature of troposphere changes from 15°C to 56°C and the chemical constituents are O₂, CO₂, N₂ and water (clouds).

(b) **Stratosphere (18 - 50 kms):** It lies above the troposphere and extends from 18 - 50 kms. The temperature of which changes from -2°C to -56°C and the main chemical constituent is ozone.

(c) **Mesosphere (50 - 85 kms):** It lies above the stratosphere and extends from 50 - 85 kms. The temperature of which drops to about -95°C. The main chemical constituents are N₂, O₂, O₂⁺ and NO⁺.

(d) **Thermosphere (or) Ionosphere (85 - 500 kms):** It lies above the mesosphere and extends upto 500 kms above the earth surface. The temperature of which raises upto 1200°C. It contains the charged particles like O₂⁺, O⁺, NO⁺ etc.,

(e) **Exosphere:** It is the upper most layer of the atmosphere and extends upto 1600 km. The temperature of which is very high due to direct solar radiation. The chemical constituents are only H₂ and He.

Table 1.1 Regions with temperature change and chemical species of atmosphere

Region	Altitude in km	Temperature change in °C	Chemical species
1. Troposphere	0-18	15 to -56	N ₂ , H ₂ O, CO ₂ , O ₂
2. Stratosphere	18-50	-56 to -2	Ozone
3. Mesosphere	50-85	-2 to -92	NO ⁺ , O ₂ ⁺
4. Thermosphere	85-500	-92 to 1200	NO ⁺ , O ⁺ , O ₂ ⁺

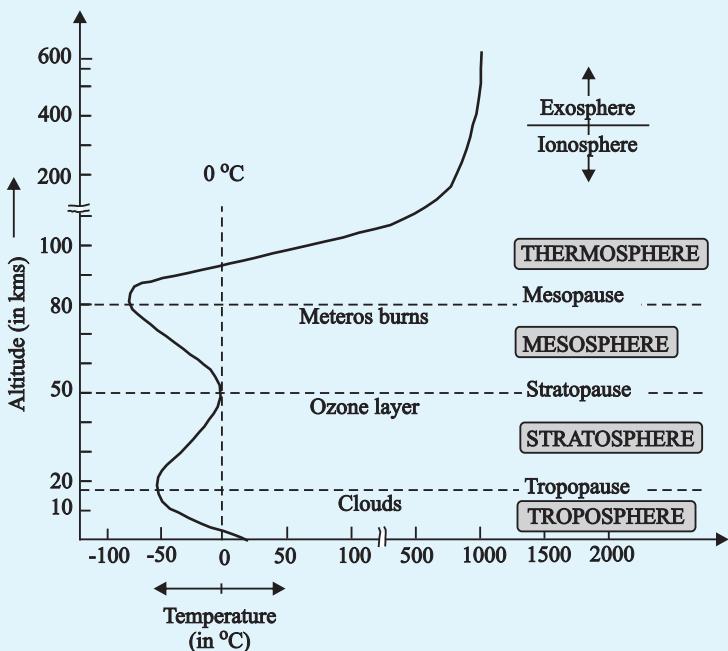


Fig. 1.1 Structure of atmosphere with temperature

Functions of atmosphere

1. It maintains the heat balance on the earth by absorbing the IR radiations.
2. The gaseous constituents play an important role in sustaining life on earth.

Gaseous Constituent	Functions
Oxygen	supports life of living organisms.
Carbon-dioxide	essential for photosynthetic activity of plants.
Nitrogen	essential nutrient for plant growth.

2. Lithosphere

The soil and rock components of the earth is called lithosphere.

Functions of lithosphere

1. It is a home for human beings and wildlife.
2. It is a storehouse of minerals and organic matters.

3. Hydrosphere

The aqueous envelope of the earth (ie., 75% of the earth surface) is called hydrosphere. Oceans, lakes, streams, rivers and water vapour constitute hydrosphere. About 97% of earth's water is in oceans, which is too salty and not fit for drinking. Only 3% is available as fresh water.

Functions of hydrosphere

1. It is used for drinking purpose and also supports the aquatic life.
2. It is also used for irrigation, power production, industries and transport.

1.4.2 Biotic (or) Living Components

The living components of the environment are called biotic components.

Examples *Animals, plants and micro organisms.*

Biosphere: The biological environment, where the living organisms live and interact with physical environment (soil, water and air) is called biosphere.

Functions of biosphere: Plants through photosynthesis produce oxygen in the atmosphere. Animals inhale oxygen during respiration and give out carbondioxide, which is again utilised by plants during photosynthesis.

1.4.3 Energy Components

The components of energy flows across biotic and abiotic components, which play an important role to maintain the life of living organisms.

Examples *Solar energy, nuclear energy, geochemical energy, thermo electrical energy.*

1.5

SCOPE OF ENVIRONMENTAL STUDIES

Environmental study is an important tool to educate the people for preserving quality environment. The main scope of environmental studies include

1. To get an awareness and sensitivity to the total environment and its related problems.
2. To motivate the active participation in environmental protection and improvement.
3. To develop skills for identifying and solving environmental problems.

4. To know the necessity of conservation of natural resources.
5. To evaluate environmental programmes in terms of social, economic, ecological, and aesthetic factors.

1.6**IMPORTANCE (or) SIGNIFICANCE OF ENVIRONMENTAL STUDIES**

The air we breathe, the water we drink, the food we consume and the land we live on are all contaminated by the industrial activities. There is no zero pollution industry. Because of the lack of self discipline and not worrying about our future generation, the valuable resources are polluted.

To solve the above problems, the knowledge of environmental studies is very important.

1. By environmental studies, people will understand the concept of “need of development without destruction of environment”.
2. Through environmental studies, people can gain the knowledge of different types of environment and the effects of different environmental hazards.
3. Environmental studies inform the people about their effective role in protecting the environment by demanding changes in laws and enforcement systems.
4. Environmental studies have a direct relation to the quality of life we live.
5. Environmental studies develop a concern and respect for the environment.

1.7**NEED FOR PUBLIC AWARENESS**

Increasing population, urbanisation and poverty have generated pressure on the natural resources and lead to a degradation of the environment. To protect (or) prevent the environment from the pollution, Supreme Court has ordered and initiated the environmental awareness to the public through Government and Non - government agencies to take part to protect our environment.

1.7.1 *Importance of Public (or) Community participation*

Environmental pollution cannot be removed by the laws alone. The proper implementation and especially public participation are the important aspects, which should be given importance and stress. The public participation is useful in law making process and controlling the pollution activities. Thus the public participation plays a major role in the effective environmental management.

1.7.2 *Types of Public Participation*

Public participation in the decision making process can be at any stage and of various forms.

1. Pressure Group: The public “Pressure group” may be formed to influence the government on one hand and the industries on the other hand.

2. Watch dog: The public can act as “watch dog” to protect the interests of public against environmental hazardous activities.

3. Advisory council: The public can also act as advisory council and agencies, which is constituted to keep the environment suitable for living.

4. Enforcing the environmental laws: The services of public can be utilized to enforce the environmental laws. If necessary the member of public should conduct public interest litigations.

Thus many countries have accepted the concept of public participation in environmental management.

1.8 ECOLOGY

All living organisms, whether plant (or) animal (or) human being is surrounded by the environment, from which it derive its needs for its survival. Each living component interacts with non-living components for their basic requirements form different ecosystem.

Definition

Ecology is the study of interactions among organisms (or) group of organisms with their environment. The environment consists of both biotic components (living organisms) and abiotic components (non-living organisms).

(or)

Ecology is the study of ecosystems.

1.9 ECOSYSTEM

Ecosystem is the basic functional unit of ecology. The term ecosystem is coined from a Greek word meaning study of home.

Definition

A group of organisms interacting among themselves and with environment is known as ecosystem. Thus, an ecosystem is a community of different species interacting

with one another and with their non-living environment exchanging energy and matter.

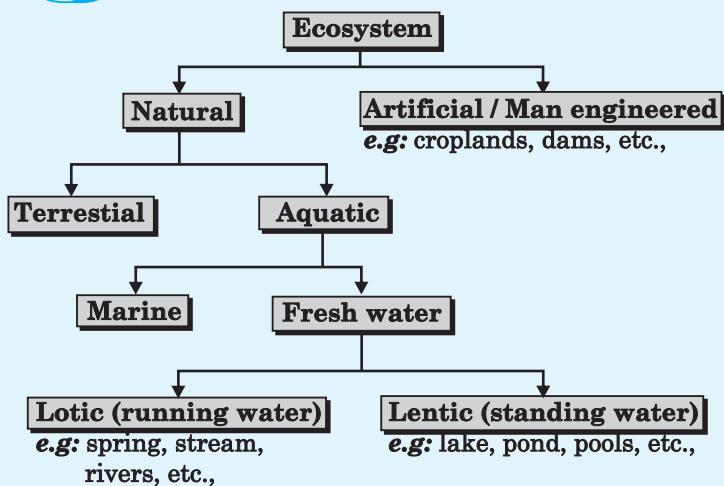
Examples Animals cannot synthesis their food directly but depend on the plants either directly (or) indirectly.

1.9.1 Biome (Small Ecosystem)

The kind of organisms which can live in a particular ecosystem depends on their physical and metabolic adoptions to the environment of that place. On earth *there are many sets of ecosystems which are exposed to same climatic conditions and having dominant species with similar life cycle, climatic adoptions and physical structure. This set of ecosystem is called a biome.*

Thus the biome is a small ecosystem with in an ecosystem.

1.10 TYPES OF ECOSYSTEM



1.10.1 Natural ecosystem

Natural ecosystems operate themselves under natural conditions. Based on habitat types, it can be further classified into three types.

1. Terrestrial ecosystem

This ecosystem is related to land and types of vegetation.

Examples *Grassland ecosystem, forest ecosystem, desert ecosystem, etc.,*

2. Aquatic ecosystem

This ecosystem is related to water, it is further sub-classified into two types based on salt content.

(i) Fresh water ecosystem.

(a) Running water ecosystems.

Examples *Rivers, streams.*

(b) Standing water ecosystems.

Examples *Pond, lake.*

(ii) Marine ecosystem

Examples *Seas and sea shores.*

1.10.2 Man-made (or) Artificial ecosystems

Artificial ecosystem is operated (or) maintained by man himself.

Examples *Croplands, gardens.*

1.11 STRUCTURE (OR) COMPONENTS OF AN ECOSYSTEM

The term structure refers to the various components. So the structure of an ecosystem explains the relationship between the abiotic (non-living) and the biotic (living) components.

An ecosystem has two major components

1. Abiotic (non-living) components.
2. Biotic (living) components.

1.11.1 Abiotic (non-living) components

The non-living components (physical and chemical) of an ecosystem collectively form a community called abiotic components (or) abiotic community.

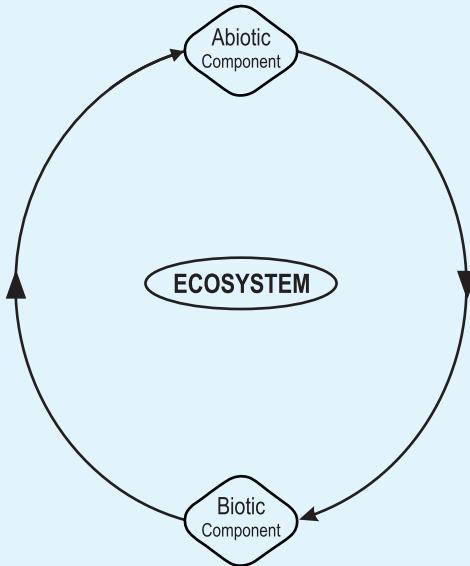


Fig. 1.2 Components of an ecosystems and their relationship

Examples Climate, soil, water, air, energy, nutrients, etc.,

1. Physical components: They include the energy, climate, raw materials and living space that the biological community needs. They are useful for the growth and maintenance of its member.

Examples Air, water, soil, sunlight, etc.,

2. Chemical Components: They are the sources of essential nutrients.

Examples

(i) **Organic substances:** Protein, lipids, carbohydrates, etc.,

(ii) **Inorganic substances:** All micro (*Al, Co, Zn, Cu*) and macro elements (*C, H, O, P, N, P, K*) and few other elements.

1.11.2 Biotic components

The living organisms (or) living members in an ecosystem collectively form its community called biotic components (or) biotic community.

The living components are made of many different species. These species are distinguished on the basis of their nutritional (feeding) relationship. It includes

1. Autotrophic components: *The members of autotrophic components are producers*, which are autotrophs (self-nourishing organisms). They derive energy from sunlight and make organic compounds from inorganic substances.

Examples Green plants, algae, bacteria, etc.,

2. Heterotrophic components: The members of heterotrophic components are consumers and decomposers, which are heterotrophs (dependent on others for food). They consume the autotrophs (producers). The heterotrophs are

- (a) **Macro consumers:** They are herbivores, omnivores (or) carnivores.
- (b) **Saprotrophs (micro consumers):** They are decomposers (bacteria, fungi, etc).

Members of biotic components of an ecosystem (or)

Classification of biotic components

The members of biotic components of an ecosystem are grouped into three groups based on how do they get their food.

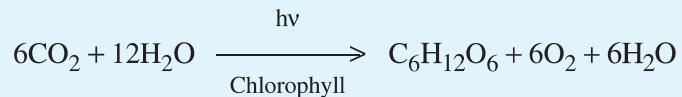
1. Producers (Plants).
2. Consumer (Animals).
3. Decomposers (Micro-organisms).

1. Producers (Autotrophs): Producers synthesize their food themselves through photosynthesis.

Examples All green plants, trees.

Photosynthesis

The green pigments called chlorophyll, present in the leaves of plants, converts CO_2 and H_2O in the presence of sunlight into carbohydrates.



This process is called photosynthesis.

2. Consumers (heterotrophs): Consumers are organisms, which cannot prepare their own food and depend directly (or) indirectly on the producers.

They cannot make organic compounds, but can transform one form of organic compounds into other form of organic compounds.

Examples

(i) Plant eating species

Insects, rabbit, goat, deer, cow, etc.,

(ii) Animals eating species

Fish, lions, tiger, etc.,

Types of consumers

Consumers are of the following types.

(i) Primary consumers (Herbivores) (plant eaters)

Primary consumers are also called herbivores, they directly depend on the plants for their food. So they are called plant eaters.

Examples *Insects, rat, goat, deer, cow, horse, etc.,*

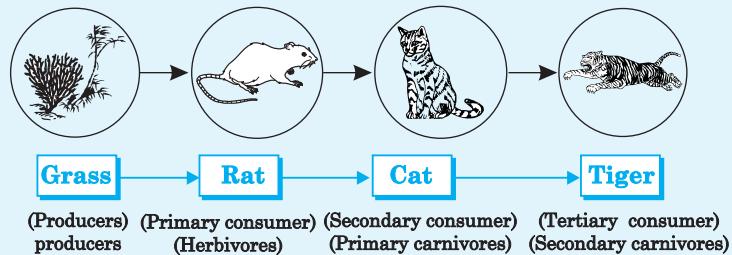
(ii) Secondary consumers (primary carnivores) (meat eaters)

Secondary consumers are primary carnivores, they feed on primary consumers. They directly depend on the herbivores for their food.

Examples *Frog, cat, snakes, foxes, etc.,*

(iii) Tertiary consumers (Secondary carnivores) (Meat eaters)

Tertiary consumers are secondary carnivores, they feed on secondary consumers. They directly depend on the primary carnivores for their food.



Examples *Tigers, lions, etc.,*

3. Decomposers: Decomposers are those organisms which feed on dead organisms plants and animals and decompose them into simpler compounds. During the decomposition inorganic nutrients are released. These inorganic nutrients together with other organic substances are then utilized by the producers for the synthesis of their own food.

Examples *Microorganisms like bacteria and fungi.*

Meanings

- (i) **Herbivores:** Animals that eat only plants are called herbivores. (vegetarian)
- (ii) **Carnivores:** Animals that eat other animals are called carnivores. (non-vegetarian)
- (iii) **Omnivores:** Animals that eat both animals and plants. (Vegetarian and non-vegetarian)

1.12 FUNCTION OF AN ECOSYSTEM

To understand clearly the nature of ecosystem, its functioning should be thoroughly understood. The function of an ecosystem is to allow flow of energy and cycling of nutrients.

1.12.1 Types of Functions

Functions of an ecosystem are of three types.

1. Primary function (or) primary production

The primary function of all ecosystems is manufacture of starch (photosynthesis).

2. Secondary function (or) secondary production

The secondary function of all ecosystem is distributing energy in the form of food to all consumers (or) the energy stored by the consumer.

3. Tertiary Function

All living systems die at a particular stage. These dead systems are decomposed to initiate the third function of ecosystems namely “cycling”.

The functioning of an ecosystem may be understood by studying the following terms.

- (a) Energy and material flow.
- (b) Food chains.
- (c) Food webs.
- (d) Food pyramids.

1.13 ENERGY FLOW IN THE ECOSYSTEMS

Energy is the most essential requirement for all living organisms. Solar energy is the only source to our planet earth. Solar energy is transformed to chemical energy in photosynthesis by the plants (called as primary producers). Though a lot of sunlight falls on the green plants, only 1% of it is utilized for photosynthesis. This is the most

essential step to provide energy for all other living organisms in the ecosystem.

Some amount of chemical energy is used by the plants for their growth and the remaining is transferred to consumers by the process of eating.

Thus the energy enters the ecosystem through photosynthesis and passes through the different tropic levels (feeding levels).

1.13.1 Energy flow through atmosphere to an ecosystem

Sun is the ultimate source of energy, its radiations travel through the space in the form of waves and reaches the earth's atmosphere. The atmosphere absorbs 50% of the radiations and allow the remainings to reach the earth surface. Of the solar radiations, reached the earth's surface, some of which is absorbed by organisms (primary producers) to produce organic matter through photosynthesis.

Photosynthetic equation



The plants (producers) are used by herbivores and herbivores are used by carnivores as their food. In this way energy is transferred from one organism to another and so on. The conversion of solar energy is governed by law of thermodynamics.

1. 1st law of thermodynamics

It states that, “energy can neither be created nor destroyed, but it can be converted from one form to another.”

Illustration: Energy for an ecosystem comes from the sun. It is absorbed by plants, wherein it is converted into stored chemical energy.

i.e., Solar energy is converted into chemical energy.

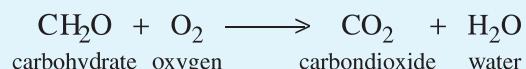
Solar energy → Chemical energy (plants)

2. 2nd law of thermodynamics

It states that, “whenever energy is transformed, there is a loss of energy through the release of heat.”

Illustration: This occurs when energy is transferred between trophic levels. There will be a loss of energy (about 80-90%) in the form of heat as it moves from one trophic level to another trophic level. The loss of energy takes place through respiration, running, hunting etc.,

Respiration equation



The net production of biomass is only about 0.5% of the total incident radiation ($3000 \text{ k.cal/m}^2/\text{day}$) and 1.0% of energy absorbed and the remaining gets wasted.

1.13.2 Relationship between structure and function (flow model)

From the above it is clear that, the biotic components and abiotic components are linked together through energy flow and nutrient cycling as shown in the following figure 1.2

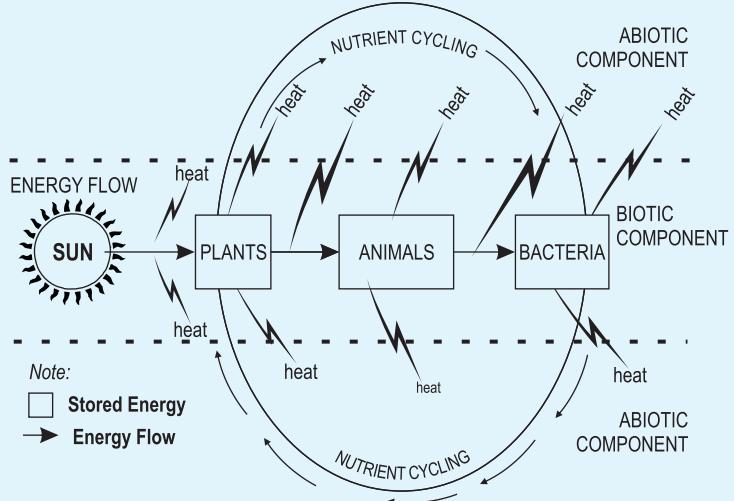


Fig.1.3 Flow of energy and nutrient cycling from abiotic to biotic and vice versa.

1.14 ECOLOGICAL SUCCESSION

In an area one community may be replaced by another community (or) by a series of communities. Thus *the progressive replacement of one community by another till the development of stable community in a particular area is called ecological succession.*

1.14.1 Stages of ecological succession

- Pioneer community:** The first group of organism, which establish their community in the area is called 'Pioneer' community.
- Seres (or) Seral stage:** The various developmental stages of a community is called 'seres'.

Community

It is the group of plants (or) animals living in an area.

1.14.2 Types of ecological succession

Ecologists recognize two types of ecological succession, based on the conditions present at the beginning of the process.

1. Primary succession: It involves the gradual establishment of biotic communities on a lifeless ground.

(a) **Hydrarch (or) Hydrosere:** Establishment starts in a watery area like pond and lake.

(b) **Xerarch (or) Xerosere:** Establishment starts in a dry area like, desert and rock.

2. Secondary succession: It involves the establishment of biotic communities in an area, where some type of biotic community is already present.

1.14.3 Process of Ecological Succession

The process of ecological succession can be explained in the following steps.

1. Nudation

It is the development of a bare area without any life form.

2. Invasion

It is the establishment of one (or) more species on a bare area through migration followed by establishment.

(a) **Migration:** Migration of seeds is brought about by wind, water (or) birds.

(b) Establishment: The seeds then germinate and grow on the land and establishes their **pioneer communities**.

3. Competition

As the number of individual species grows, there is a competition with the same species and between different species for space, water and nutrients.

4. Reaction

The living organisms, take water, nutrients and grow and modify the environment is known as reaction. This modification becomes unsuitable for the existing species and favour some new species, which replace the existing species. This leads to **seral communities**.

5. Stabilizations

It leads to stable community, which is in equilibrium with the environment.

1.15 BIODIVERSITY

Bio means ‘life’ and diversity means ‘variety’, hence, biodiversity refers wide variety of life on the earth.

Our planet-earth (biosphere) contains more than 20 million species of organisms. But, of which only 1.4 million species have been identified so far. These species differ widely from one another. This variation in living organisms is called biodiversity.

Diversification in the species is influenced by various physical and climatic factors, resulting in the production of new sub-species. The species which are unable to adjust with the new environment gradually become extinct.

Definition

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

1.16**CLASSIFICATION (OR) LEVELS (OR) TYPES OF BIODIVERSITY**

Biodiversity is generally classified into three types

1. Genetic diversity.
2. Species diversity.
3. Community (or) Ecosystem diversity.

1.16.1. Genetic diversity

Genera: A species with different genetic characteristics is known as sub-species (or) “genera”.

Genetic diversity is the diversity within species ie., variation of genes within the species

Within individual species, there are number of varieties, which are slightly different from one another. These differences are due to differences in the combination of genes. Genes are the basic units of hereditary information transmitted from one generation to other.

Examples

1. Rice varieties: All rice varieties belong to the species “*oryzasativa*”. But there are thousands of rice varieties, which show variation at the genetic level differ in their size, shape, colour and nutrient content.

2. Teak wood varieties: There are number of teak wood varieties found available.

Examples *Indian teak, burma teak, malasian teak etc.*

1.16.2 Species diversity

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

Species diversity is the diversity between different species. The sum of varieties of all the living organisms at the species level is known as species diversity.

The biotic component is composed of a large number of species of plants, animals and micro organisms, which interact with each other and with the abiotic component of the environment.

Example

1. Total number of living species in the earth are about more than 20 million. But, of which only about 1.5 million living organisms are found and given scientific names.
2. **Plant species:** Apple, mango, grapes, wheat, rice, etc.,
3. **Animal species:** Lion, tiger, elephant, deer, etc.,

1.16.3 Community (or) Ecosystem diversity

Community

It is a set of biotic components (plants, animals and micro organisms) interacting with one another and with abiotic components (soil, air, water, etc.).

The diversity at the ecological (or) habitat level is known as ecosystem diversity. A large region with different ecosystems can be considered as ecosystem diversity.

Example River ecosystem.

The river which include the fish, aquatic insects, mussels and variety of plants that have adapted.

Thus, the ecosystem diversity is the aggregate of different environmental types in a region. It explains the interaction between living organisms and physical environment in an ecosystem.

1.17 VALUES OF BIODIVERSITY

Biosphere is a life supporting system to the human beings. It is the combination of different organisms. Each organisms in the biosphere has its own significance. Biodiversity is vital for healthy biosphere. Biodiversity is must for the stability and proper functioning of the biosphere.

We get benefits from other organisms in number of ways. Sometimes we realize the real value of the organism only after it is lost in this earth.

CLASSIFICATION AND IMPORTANCE OF VALUES OF BIODIVERSITY

Various uses of biodiversity are classified as follows

1.17.1 Consumptive use value

These are direct use values, where the biodiversity products are harvested and consumed directly.

Examples Food, drug, fuel, etc..

1. Food

A large number of wild plants are consumed by human beings as food. Nearly 80 - 90% of our food crops have been domesticated only from the tropical wild plants. A large number of wild animals are also consumed as food.

Examples

- (a) *Ceropegia bulbosa*: in central India and Western Ghats.
- (b) *Codonopsis*: in Himalayan region.
- (c) *Cicer microphyllum*: in Kashmir
- (d) *Insects*: molluscs, spiders, and wild herbivores are consumed by many tribal and non-tribal communities in India.

2. Drugs

Around 70% of modern medicines are derived from plant and plant extracts. 20,000 plant species are believed to be used medicinally, particularly in the traditional system of Unani, Ayurveda and Sidha.

Examples

- (i) Germany alone uses more than 2,500 Species of plants for medicinal purposes in Homeopathy and other systems of medicines.
- (ii) India uses 3000 Species of plants in Ayurveda, Homeopathy and Unani system of medicines.
- (iii) According to research about 85% of global community use plants for primary health care.
- (iv) According to latest medical sciences, bee-sting venom is used for treating arthritis.
- (v) Life saving drugs like quinine (Malaria), reserpine (hypertension), penicillin (antibiotic) and morphine (pain kill) are all of plant origin.
- (vi) The peepal tree leaves, trunk and roots are used as effective medicines for curing disease like fever, cough, stomach and skin diseases.
- (vii) About 30 medicines have been prepared from neem tree which have been proved to be very effective for

stomach oilments, eye irritations, skin eruptions and diabetics.

- (viii) Maxican yarn has been proved as a versatile boon to produce birth control in human beings.

Table 1.2: Medicinal products from Natural Resources

Product	Source	Use
Penicillin	Fungus	Antibiotic
Streptomycin	Actinimycete	Antibiotic
Tetracycline	Bacterium	Antibiotic
Digitalis	Foxglove	Heart stimulant
Quinine	Cinchona Bark	Malaria treatment
Diosgenin	Mexican your	Birth control drug
Cytarabuine	Sponge	Leukemia cure
Reserpine	Rauwolfa	Hypertension drug
Bee venom	Bee	Arthritis relief
Morphine	Poppy	Analgesic

3. Fuel

Firewoods are directly consumed by villagers, tribals. The fossil fuels like coal, petroleum and natural gas are also the products of fossilized biodiversity.

1.17.2 Productive use values

Biodiversity products have obtained a commercial value. These products are marketed and sold. These products may be derived from the animals and plants.

Table 1.3: Animal products

Animal product	Animal
Silk	Silk - worm.
Wool	Sheep.
Musk	Musk deer.
Tusk	Elephants.
Leather	All animals.
Food	Fish and animals.

Many industries are dependent upon the productive use values of biodiversity.

Table 1.4: Plant and animal products for various industries

Plant product	Industry
Wood	Paper and pulp industry, plywood industry railway sleeper industry.
Cotton	Textile industry.
Fruits, vegetables	Food industry.
Leather	Leather industry.
Ivory	Ivory - works.
Pearl	Pearls industry.

- (a) Rice accounts for 22% of the cropped area and Cereals accounts for 39% of the cropped area.

- (b) Oil seed production also helped in saving large amount of foreign exchange spent on importing edible oils.

1.17.3 Social Values

Social value of the biodiversity refers to the manner in which the bio-resources are used to the society. These values are associated with the social life, religion and spiritual aspects of the people.

Examples

- 1. Holy plants:** Many plants are considered as the holy plants in our country.

Examples *Tulsi, peepal, lotus, bael, etc.,*

The leaves, fruits of these plants are used in worship.

- 2. Holy animals:** Many animals are also considered as holy animals in our country.

Examples *Cow, snake, bull, peacock, rat, etc.,*

1.17.4 Ethical values (or) Existence value

It involves ethical issues like “all life must be preserved.”

In India and in other countries biodiversity is considered to have great value on religious and cultural basis.

Our rich heritage teaches us to worship plants, animals, rivers and mountains. The ethical value means that a species may (or) may not be used, but its existence in nature gives us pleasure.

Examples

1. *The river Ganga is considered as holy river.*
2. *Vembu, Tulsi, Vengai are same of the trees, worshipped by the Tamilians.*
3. *We are not deriving anything directly from Kangaroo, Zebra (or) Giraffe, but we feel that these should exist in nature.*

Thus, there is an ethical value (or) existence value attached to each species.

1.17.5 Aesthetic value

The beautiful nature of plants and animals insist us to protect the biodiversity. The most important aesthetic value of biodiversity is eco-tourism.

Examples

1. **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.
2. The pleasant music of wild birds, colour of butterfly, colour of flowers, colour of peacocks are very important for their aesthetic value.

1.17.6 Option values

The option values are the potentials of biodiversity that are presently unknown and need to be known. The optional values of biodiversity suggests that any species may be proved to be a valuable species after someday.

Examples

1. *The growing biotechnology field is searching a species for causing the diseases of cancer and AIDS.*
2. *Medicinal plants and herbs play a very important role in our Indian economic growth.*

1.18

INDIA AS A MEGA-DIVERSITY NATION

India is one among the 12 mega-diversity countries in the world. It has 89,450 animal species accounting for 7.31% of the global faunal species and 47,000 plant species which accounts for 10.8% of the world floral species. The loss of biodiversity (or) endemism is about 33%.

Table 1.5. Distribution of species in some groups of flora and fauna in India

Group-wise species Distribution			
Plants	Number	Animals	Number
Fungi	23,000	Mollusca	5042
Bacteria	850	Lower groups	9979
Algae	2500	Arthropoda	57,525
Bryophytes	2564	Amphibia	2546
Gymnosperms	64	Birds	1228
Pteridophytes	1022	Reptiles	428
Angiosperms	15,000	Mammals	372

1.18.1 Endemism (or) Endemic species

The species which are confined to a particular area are called endemic species. Our country has a rich endemic flora and fauna. About 33% of the flowering plants, 53%

of fresh water fishes, 60% amphibians, 36% reptiles and 10% mammalian are endemic species.

1. Plant diversity

Nearly 5000 flowering plants and 166 crop plant species have their origin in India.

2. Marine diversity

More than 340 coral species of the world are found here. Several species of mangrove plants and seagrasses are also found in our country.

3. Agro-biodiversity

There are 167 crop species and wild relatives. India is considered to be the centre of origin of 30,000 to 50,000 varieties of rice, mango, turmeric, ginger, sugarcane, etc.

4. Animal biodiversity

There are 75,000 animal species including 5,000 insects. India is a home to about nearly 2,00,000 living organisms.

1.18.2 ‘RED’ Data book (or) Red list

Red book is a catalogue of taxa facing risk of extinction. The purpose of preparation of red list is to

- (i) provide awareness to the degree of threat to biodiversity.
- (ii) provide global index on already decline of biodiversity.
- (iii) identification of species at high risk of extinction.

- (iv) help in conservation action.
- (v) information about international agreements.

India's biodiversity is threatened due to habitat destruction, degradation, fragmentation and over exploitation of resources.

According to 'RED' Data book 44 plant species are critically endangered, 54 endangered and 143 are vulnerable (exposed to damage).

India ranks 2nd interms of the number of threatened mammals and 6th among the countries with the most threatened birds.

Examples

1. *Pitcher plant* has become endemic in Eastern Himalayas.
2. *Taxus wallichina* has come under red dad category due to its over exploitation.

1.19

HOT-SPOTS OF BIODIVERSITY

The most remarkable and threatened areas, many of them have been reduced to less than 10% of their original vegetation. These areas are called hotspots of biodiversity.

The hot spots are the geographic areas which possess high endemic species.

At the global level, these are the areas of high conservation priority, if these species lost, they can never be replaced (or) regenerated.

1.19.1 Criteria for recognising hot spots

1. The richness of the endemic species is the primary criterion for recognising hot spots.
2. The hot spots should have a significant percentage of specialised species.
3. The site is under threat.
4. It should contain important gene pools of plants of potentially useful plants.

1.19.2 Reason for rich biodiversity in the tropics

The followings are the reasons for the rich biodiversity in the tropics.

1. The tropics have a more stable climate.
2. Warm temperatures and high humidity in the tropical areas provide favorable conditions.
3. No single species can dominate and thus there is an opportunity for many species to coexist.
4. Among plants, rate of out-crossing appear to be higher in tropics.

1.19.3 Area of hot spot

These hot spots covering less than 2% of the world's land are found to contain 50,000 endemic species. According to myersetal (2000), an area is designated as a hot spot when it contains atleast 0.5% of the endemic plant species.

About 40% of terrestial plants and 25% of vertebrate species are endemic and are found in these hot spots. These

are the areas of high diversity, endemism and are also threatened by many human activities.

Table 1.6. Global hotspots of biodiversity

Hotspots	Plant species	Endemic Plants	% of Global Plants	Vertebrate Species	Endemic Vertebrates	% of Global Vertebra tes
1. Tropical Andes	45000	20000	6.7	3389	1567	5.7
2. Mesoamerican forests	24000	5000	1.7	2859	1159	4.2
3. Caribbean	12000	7000	2.3	1518	779	2.9
4. Brazil's Atlantic Forest	20000	8000	2.7	1361	567	2.1
5. Panama Western Ecuador	9000	2250	0.8	1625	418	1.5
6. Brazil's Cerrado	10000	4400	1.5	1268	117	0.4
7. Central Chile	3429	1605	0.5	335	61	0.2
8. California Floristic	4426	2125	0.7	584	71	0.3
9. Madagascar	12000	9704	3.2	987	771	2.8
10. Eastern Arc and Coastal Forest of Kenya	4000	1500	0.5	1019	121	0.4
11. Western African Forests	9000	2250	0.8	1320	270	1.0
12. Cape Floristic Province	8200	5682	1.9	562	53	0.2
13. Succulent Karoo	4849	1940	0.6	472	45	0.2
14. Mediterranean Basin	25000	13000	4.3	770	235	0.9
15. Caucasus	6300	1600	0.5	632	59	0.2
16. Sundaland	25000	15000	5.0	1800	701	2.6
17. Wallacea	10000	1500	0.5	1142	529	1.9
18. Philippines	7620	5832	1.9	1093	518	1.9
19. Indo-Burma Eastern Himalayas	13500	7000	2.3	2185	528	1.9
20. South-Central China	12000	3500	1.2	1141	178	0.7
21. Western-Ghats Sri Lanka	4780	2180	0.7	1073	355	1.3
22. South-western Australia	5469	4331	1.4	456	100	0.4
23. New Caledonia	3332	2551	0.9	190	84	0.3
24. New Zealand	2300	1865	0.6	217	136	0.5
25. Polynesia/Micronesia	6557	3334	1.1	342	223	0.8
Total	-	133,149	44.4	-	9645	35.3

1.20**HOT SPOTS OF BIODEVERSITY IN INDIA****Fig 1.4 Hot spots of Biodiversity in India**

Myers et al recognized 25 hot spots in the world as shown in table 1.7. Two of which are found in India.

Table 1.7 Biodiversity hot spots in India

1.	Eastern Himalayas	Indo - Burma region.
2.	Western Ghats	SriLanka region.

1.20.1 Eastern Himalayas

Geographically these area comprises Nepal, Bhutan and neighboring states of Northern India. There are 35,000

plant species found in the Himalayas, of which 30% are endemic.

The Eastern Himalayas are also rich in wild plants of economic value.

Examples: *Rice, banana, citrus, ginger, chilli, jute and sugarcane.*

The taxol yielding plant is also sparsely distributed in the region.

- (a) 63% mammals are from Eastern Himalayas, and
- (b) 60% of the Indian Birds are from North East.
- (c) Huge wealth of fungi, insects, mammals, birds have been found in this region.

1.20.2 Western ghats

The area comprises Maharastra, Karnataka, Tamilnadu and Kerela. Nearly 1500 endemic, dicotyledone plant species are found from Western ghats. 62% amphibians and 50% lizards are endemic in western Ghats.

It is reported that only 6.8% of the original forests are existing today while the rest has been deforested (or) degraded.

Some common plants: Ternstroemia Japonica, Rhododendron and Hypericum.

Some common animals: Blue bird, lizard, hawk.

1.21 THREATS TO BIODIVERSITY

Any disturbance in an natural ecosystem tend to reduce its biodiversity. The waste generated due to increase in human population and industrialisation, spoils the environment and leads to more diversity in biological

species. Any change in the system leads to a major imbalance and threatens the normal ecological cycle.

CAUSES FOR LOSS OF BIODIVERSITY (OR) VARIOUS THREATS TO INDIAN BIODIVERSITY

1.21.1 *Habitat loss*

The loss of populations of interbreeding organisms is caused by habitat loss. Habitat loss threatened a wide range of animals and plants.

Factors influencing Habitat loss

- 1. Deforestation:** The loss of habitat is mainly caused by deforestation activities. Forests and grasslands have been cleared for conversion into agricultural lands, (or) settlement areas (or) developmental project. The forest and grasslands are the natural homes of thousands of species, which disintegrate due to loss of their natural habitat.
- 2. Destruction of wetlands:** The wetlands, estuaries and mangroves are destroyed due to draining, filling and pollution, which causes huge biodiversity loss.
- 3. Habitat fragmentation:** Sometimes the habitat is divided into small and scattered patches. This phenomenon is known as habitat fragmentation. Due to this many wild animals and songbirds are vanishing.
- 4. Raw material:** For the production of hybrid seeds, the wild plants are used as raw materials. As a result, many plant species become extinct.
- 5. 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.

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

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

1.21.2 Poaching (over harvesting) of wildlife

Poaching means killing of animals (or) commercial hunting. It leads to loss of animal biodiversity.

1. Subsistence poaching: Killing animals to provide enough food for their survival is called subsistence poaching.

2. Commercial poaching: Hunting and killing animals to sell their products is called commercial poaching.

Factors Influencing Poaching

1. Human population: Increased human population in our country has led to pressure on forest resources, which ultimately causes degradation of wildlife habitats.

2. Commercial activities: Though international ban on trading the products of endangered species, smuggling of wildlife products continues. Since the trading of such wildlife products is highly profit, poaching makes the poachers to just hunt these prohibited wildlife and smuggle it to other countries.

Wild life products: Furs, horns, tasks, live specimens, herbal products.

Wealth of wildlife: The developing nations in Asia, Latin America and Africa have richest source of biodiversity.

Importers of wild life: The rich countries in Europe and North America, Japan, Taiwan, Hong Kong are the major importer of wildlife products (or) wildlife itself.

Examples

1. **Male gorilla:** In Rwanda and Zaire, it is hunted for its body parts, head and hands.
2. **Blue morpho butterfly:** In Brazil, it is poached for making attractive trays and other objects.
3. **Snowy large egret:** In U.S, it is poached for its white plumes, so as to keep it in ladies hats.
4. **Blubber:** It is used to prepare lamp oils and lubricating oils.
5. **Baleen:** It is used to prepare combs and other similar articles.
6. **Elephant feet:** It is used to make Ash trays.
7. **Elephant:** It is killed for ivory.
8. **Bengal tigers:** Its fur sell is more than \$1,00,000 in the foreign market.
9. **Bush meat:** It is an important source of protein for many local people in west and central Africa.
10. **Dynamite fishing:** It is “high - tech fishing”, which have exhausted the ocean marine life.
11. **Seahorses, Star turtles:** These valuable species are also illegally sold into the foreign market for want of money.

Remedy measures

1. Illegal hunting and trade of animals and animal products should be stopped immediately.

2. We should not purchase furcoat, purse (or) bag (or) items made of crocodile skin (or) python skin.
3. Bio-diversity laws should be strengthened.

1.21.3 *Man - wildlife conflicts*

Man - wildlife conflicts arise, when wildlife starts causing immense damage and danger to the man. Under such condition it is very difficult for the forest department to compromise the affected villagers and to gain the villagers support for wildlife conservation.

Examples for man - wildlife conflicts

1. In Sambalpur, Orissa, 195 humans were killed in the last 5 years by elephants. In retaliation, the villagers have killed 98 elephants and badly injured 30 elephants.
2. In the border of Kote - Chamarajanagar, Mysore, several elephants was killed because of the massive damage done by the elephants to the farmer's cotton and sugarcane crops.
3. The agonized villagers sometimes hide explosives in the sugarcane fields, which explode when the elephants enter into their fields.
4. It has been reported that a man - eating tiger killed 16 Nepalese people and one 4 - years old child inside the Royal Chitwan National Park, Kathmandu. Now the park has became a zone of terror for the locals.
5. Very recently, two men were killed by leopards in Powai, Mumbai.
6. A total of 14 persons were killed during 19 attacks by the leopards in Sanjay Gandhi National Park, Mumbai.

Factors influencing (or causes) man - animal conflicts

1. Shrinking of forest cover compels wildlife to move outside the forest and attack the fields and humans.
2. Human encroachment into the forest area induces a conflict between man and the wildlife.
3. Injured animals have a tendency to attack man. Usually the female wildlife attacks the human if she feels that her newborn cubs are in danger.
4. Earlier, forest departments used to cultivate sugarcane paddy, coconut trees, in the sanctuaries. When the favourite food of elephants (i.e., bamboo leaves) were not available, they feed them to the elephants. But, now due to lack of such practices the wild animals move out of the forest for searching food.
5. Often the villagers put electric wiring around their crop fields. The elephants get injured, suffer in pain and start violence.
6. The cash compensation paid by the government for the damage caused by the wild animals, is not enough. Therefore the agonized farmers gets revengeful and kill the wild animals.

Examples A farmer, in Mysore, gets a compensation of Rs.400/- per quintal, but the market price is Rs.2400/- per quintal.

7. Garbage near human settlements (or) food crops near forest areas attracts wild animals.

Remedial measures (or) Conservation of biodiversity

1. Adequate crop and cattle compensation schemes must be started.

2. Solar powered fencing must be provided along with electric current proof trenches to prevent the animals from entering into the fields.
3. Cropping pattern should be changed near the forest borders.
4. Adequate food, and water should be made available for the wild animals within forest zones.
5. The development and constructional work in and around forest region must be stopped.

1.22

ENDANGERED AND ENDEMIC SPECIES OF INDIA

According to International Union of Conservation of Nature and Natural Resources (IUCN) the species are classified into various types.

- 1. Extinct species:** A species is said to be extinct, when it is no longer found in the world.
- 2. Endangered species:** A species is said to be endangered, when its number has been reduced to a critical level. Unless it is protected and conserved, it is in immediate danger of extinction.
- 3. Vulnerable species:** A species is said to be vulnerable when its population is facing continuous decline due to habitat destruction (or) over exploitation. Such a species is still abundant.
- 4. Rare species:** A species is said to be rare, when it is localized within restricted area (or) they are thinly scattered over a more extensive area. Such species are not endangered (or) vulnerable.

1.22.1 Endangered Species of India

A species is said to be endangered, when its number has been reduced to a critical level. Unless it is protected and conserved, it is in immediate danger of extinction.

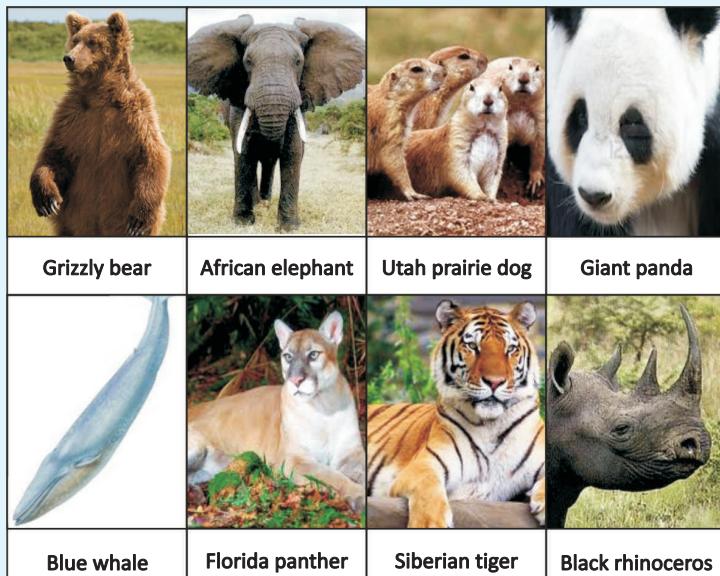
In India 450 plant species have been identified as endangered species. About 100 mammals and 150 birds are estimated to be endangered species. But India's biodiversity is threatened due to habitat destruction, degradation and over exploitation of resources.

Table 1.8. Number of threatened species of India.

Group of Threatened species	Number of Threatened species
Plants	250
Birds	70
Mammals	86
Reptiles	25
Amphibians	3
Fishes	3
Molluscs	2
Insects	50

Important endangered Species

A few species of endangered reptiles, mammals, birds and plants are given below.

**Fig. 1.5 Some endangered species**

1.	Reptiles	Tortoise, green sea turtle, gharial, python.
2.	Birds	Peacock, siberian white crane, pelican, Indian bustard.
3.	Mammals	Indian wolf, red fox, sloth bear, tiger, Indian lion, golden cat, desert cat.
4.	Primates	Hoolock gibbon, lion-tailed macaque, capped monkey, golden monkey.
5.	Plants	A large number of medicinal plants (like rauvol fia serpentina), sandal wood tree (like santalum, cycas bed donei).

RED - data book: RED - data book contains the list of endangered species of plants and animals. The RED - data gives the warning signal for those species which are endangered and if not protected they become extinct in near future.

Factors affecting Endangered species

- 1. Pollution:** Humans dispose their waste products on nature. So, the land, river, and air get polluted severely. These pollutants enter our environment and travel through the food chain and accumulate in the tissues of the living things, finally it leads to death.
- 2. Over - exploitation:** Over - exploitation of the natural resources and poaching of wild animals also leads to extinct of wild animals.
- 3. Climate change:** Climate change is brought about by the accumulation of greenhouse gases in the atmosphere. Climate change threatens organisms and ecosystems, which cannot accommodate the change of environmental conditions.

Remedial measures

International treaties on Endangered Species (ITES)

Several international treaties and conventions help to protect endangered wild species. One of the most reaching treaty is, “Convention on International Trade in Endangered Species 1975 ” (CITES). This treaty is now signed by 160 countries.

1. This treaty lists some 900 species that cannot be commercially traded as live specimens (or) wildlife products, because they are in danger of extinction.
2. The treaty also restricts international trade of 2900 other species, because they are endangered.

Draw backs of this treaty

1. The bad news of this treaty is that the effect of this treaty is limited because enforcement is difficult and convicted violators often pay only small fines.
2. Also, member countries can exempt themselves from protecting any listed species.

1.22.2 *Endemic Species*

The species, which are found only in a particular region are known as endemic species. In India of 47,000 species 7000 plants are endemic. Nearly 62% of our endemic species are found available in Himalayas and Western Ghats.

1. Fauna

Animals present in a particular region (or) period.

Examples for endemic fauna species

Sapria himalayana, Ovaria lurida, Nepenthes khasiana, Pedicularis Parrotier, etc.,

Out of 81,000 species of animals in our country a large number is endemic. The Western Ghats are particularly rich in (a) amphibians (frogs, toads, etc.,) and (b) reptiles (lizards, crocodiles, etc.,).

About 62% amphibians and 50% lizards are endemic to Western Ghats.

2. Flora

Plants present in a particular region (or) period.

It also refers to friendly bacteria which helps to protect the human body against invasion by pathogens.

Examples for endemic flora species

Monitor lizards (varanus), reticulated python, Indian salamander and viviparous toad (Nectophryne).

Endemic species in India

The following species are considered as endemic in India.

Table 1.9 Endemic Species of Plants

Group	No. of Species
Pteridophyta	200
Angiosperms	4950

Table 1.10 Endemic Species of Animals

Group	No. of Species
Land	878
Freshwater	89
Insecta	16214
Amphibia	110
Reptilia	214
Aves	69
Nannakua	38

Factors affecting endemic species

There are number of factors, which affect amphibians (frogs) at various points in their life cycle.

1. Habitat loss and fragmentation, because of the draining and filling of inland wetlands.
2. Pollution also play an important role.

Examples

1. Frog eggs, tadpoles and adults are very sensitive to many pollutants especially pesticides.
2. Overhunting of frog legs in Asia and France.

3. Populations of same can also be reduced by introduction of non-active predators and competitors (like fish) and disease producing organism.

1.23**CONSERVATION OF BIODIVERSITY**

Biodiversity is one of the important tool for sustainable development. The enormous value of biodiversity due to their commercial, medical, genetic, aesthetic and ecological importance emphasizes the need to conserve biodiversity.

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.*

1.23.1 Factors affecting biodiversity

1. Biodiversity is generally disturbed by human activities such as construction of dams in forest areas, release of industrial wastes, using pesticides and insecticides in the crop fields, urbanisation, etc..
2. Poaching of wild animals, over exploitation of natural resources, degradation of habitats, affect biodiversity.
3. The marine ecosystems are also disturbed due to oil spills and discharge of effluents.
4. The climatic factors like global warming, ozone depletion, acid rain also affect the biodiversity.

1.23.2 Advantages (or) need of biodiversity conservation

1. It provides immediate benefits to the society such as recreation and tourism.
2. Drugs, herbs, food and other important raw materials can be derived from plants and animals.
3. It also preserves the genetic diversity of plants and animals.
4. Ensures the sustainable utilization life supporting systems on earth.
5. It leads to conservation of essential ecological diversity and life supporting systems.
6. Since the biodiversity loss results in ecological and environmental deterioration, it is essential to conserve the biodiversity.

1.24

TYPES (OR) STRATEGY OF BIODIVERSITY CONSERVATION

There are two types of biodiersity conservation.

1. In-situ conservation (within habitat)
2. Ex-situ conservation (outside habitat)

1.24.1 In - situ conservation

In - situ conservation involves protection of fauna and flora within its natural habitat, where the species normally occurs is called in - situ conservation.

The natural habitats (or) ecosystems maintained under in-situ conservation are called “**protected areas**”.

Important In-situ conservation

Biosphere reserves, National parks, wildlife sanctuaries, Gene sanctuary etc.,

Methods of In-situ conservation

Around 4% of the total geographical area of the country is used for in-situ conservation. The following methods are presently used for in-situ conservation. It is the best method for the long term protection of biodiversity.

In-Situ conservation	Numbers available
Biosphere reserves	7
National parks	80
Wild - life sanctuaries	420
Botanical gardens	120

1. Biosphere Reserves

Biosphere reserves cover large area, more than 5000 sq. km. It is used to protect species for long time.

Table 1.11. Some important Biosphere Reserves in India

Name of Biosphere	State
Nanda Devi	U.P
Nokrek	Meghalaya
Manas	Assam
Sunderbans	West Bengal
Gulf of Mannar	Tamil Nadu
Nilgiri	Karnataka, Kerala, Tamil Nadu
Great Nicobars and Similipal	Orissa

Role of biosphere reserves

1. It gives long - term survival of evolving ecosystem.
2. It protects endangered species.
3. It protects maximum number of species and communities.
4. It serves as site of recreation and tourism.
5. It is also useful for educational and research purposes.
6. It remains and functions as an open system and changes in land use are not allowed.

Restriction: No tourism and explosive activities are permitted in the biosphere reserves.

2. National park

A national park is an area dedicated for the conservation of wildlife along with its environment. It is usually a small reserves covering an area of about 100 to 500 sq. kms. Within the biosphere reserves, one (or) more national parks are also exists.

Table 1.12. Some important National parks in India

Name of National Park	State	Important Wildlife
Kaziranga	Assam	One horned Rhino
Gir National Park	Gujarat	Indian Lion
Bandipur	Karnataka	Elephant
Dachigam	J & K	Hangul
Corbett	U.P	Tiger
Kanha	M.P	Tiger
Periyar	Kerala	Tiger, Elephant
Dudwa	U.P	Tiger
Sariska	Rajasthan	Tiger
Ranthambore	Rajasthan	Tiger

Role of a national park

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

Restrictions

1. Grazing of domestic animals inside the national park is prohibited.
3. All private rights and forestry activities are prohibited within a national park.

3. Wildlife Sanctuaries

A wildlife sanctuary is an area, which is reserved for the conservation of animals only. At present, there are 492 wildlife sanctuaries in our country.

Table 1.13. Some Important Wildlife Sanctuaries in India

Name of Sanctuary	State	Major Wild Life
Hazaribagh Sanctuary	Bihar	Tiger, Leopard
Ghana Bird Sanctuary	Rajasthan	300 species of birds
Sultanpur Bird Sanctuary	Haryana	Migratory birds
Abohar Wildlife Sanctuary	Punjab	Black buck
Nal Sarovar Bird Sanctuary	Gujarat	Water birds
Mudumalai Wildlife Sanctuary	Tamil Nadu	Tiger, Elephant, Leopar

Name of Sanctuary	State	Major Wild Life
Vedanthangal Bird Sanctuary	Tamil Nadu	Water birds
Wild Ass Sanctuary	Gujarat	Wild ass, Wolf, Chinkara
Jaldapara Wildlife Sanctuary	W.Bengal	Rhinoceros, Elephant, Tiger

Role of wildlife Sanctuaries

1. It protects animals only.
2. It allows the operations such as harvesting of timber, collection of forest products, private ownership rights and forestry operations provided it does not affect the animals adversely.

Restrictions

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

4. Gene Sanctuary

A gene sanctuary is an area, where the plants are conserved.

Examples

In Northern India, two gene sanctuary are found available.

- (a) One gene sanctuary for citrus (Lemon family), and
- (b) One gene sanctuary for pitcher plant (an insect eating plant).

5. Other projects for conservation of animals

For the protection and conservation of certain animals, some special projects are framed in our country.

Examples Project Tiger; Gir Lion project; Crocodile Breeding project; Project Elephant, etc.,

Advantages (or) merits of In-situ Conservation

1. It is very cheap and convenient method.
2. The species gets adjusted to the natural disasters like drought, floods, forest fires.

Disadvantages (or) limitations of In-situ Conservation

1. A large surface area of the earth is required to preserve the biodiversity.
2. Maintenance of the habitats is not proper, due to shortage of staff and pollution.

1.24.2 Ex-situ conservation

Ex-situ conservation involves protection of fauna and flora outside the natural habitats.

This type of conservation is mainly done for conservation of crop varieties and the wild relatives of crops.

Role of Ex-situ conservation

1. It involves maintenance and breeding of endangered plant and animal species under controlled conditions.
2. It identifies those species which are at more risk of extinction.
3. It prefers the species, which are more important to man in near future among the endangered species.

Important Ex-situ conservation

Botanical gardens, seed banks, microbial culture collections, tissue and cell cultures, museums, zoological gardens.

Methods of Ex-situ Conservation

The following important gene bank (or) Seed bank facilities are used in Ex-situ conservation.

(i) National Bureau of Plant Genetic Resources (NBPGR)

It is located in New Delhi. It uses cryo preservation techniques to preserve agricultural and horticultural crops.

Cryo preservation technique: It involves the preservation of seeds, pollen of some important agricultural and horticultural crops by using liquid nitrogen at a temperature as low as - 196°C. Varieties of rice, pearl millet, Brassica, turnip, radish, tomato, onion, carrot, chilli, tobacco, etc., have been preserved successfully in liquid nitrogen for several years.

(ii) National Bureau of Animal Genetic Resources (NBAGR)

It is located at Karnal, Haryana. It preserves the semen of domesticated bovine animals.

(iii) National Facility for Plant Tissue Culture Repository (NFPTCR)

It develops the facility for conservation of varieties of crop plants (or) trees by tissue culture. This facility has been created within the NBPGR.

Advantages (or) merits of Ex-situ Conservation

1. Survival of endangered species is increasing due to special care and attention.
2. In captive breeding, animals are assured food, water, shelter and also security and hence longer life span.
3. It is carried out in cases of endangered species, which do not have any chances of survival, in the world.

Disadvantages (or) limitations of Ex-situ Conservation

1. It is expensive method.
2. The freedom of wildlife is lost.
3. The animals cannot survive in natural environment.
4. It can be adopted only for few selected species.

1.25 PART B QUESTIONS

1. Explain briefly the structure of atmosphere.
(A.U. Dec-2005)
2. What are the components of environment. Explain their role.
3. Explain the scope and significance of environmental studies.
4. Write briefly on the community participation in environment management programmes.
(A.U. Dec-2005)
5. Explain the importance of environmental protection and justify the needs for public awareness.
(Mdu. AUT. Nov. 2011)
6. Explain ecosystem.
(A.U. Dec-2005)
7. What is an ecosystem? Describe the structure and functions of various components of an ecosystem.
(Coim AUT Dec 2009, A.U. June 2016, Jan-2006, May 2008)
8. Discuss the components of ecosystem.
(A.U. May 2007, Dec-2005)
9. State the four components of ecosystem.
(A.U. Dec 2006)

10. Describe the structural features of ecosystem.
(Chennai A.U. Dec 2009)
11. Describe the biotic component of an ecosystem.
(Chennai A.U. Dec 2009)
12. Briefly explain the energy flow through ecosystem.
(A.U. Dec-2005)
13. Discuss energy flow in ecosystem.
(A.U. Dec 2015, TCY AUT, Dec 2011)
14. Explain the stages in ecological succession using appropriate terminology.
(AU. Nov/Dec 2016)
15. What is biodiversity? How is it classified? Explain the values of biodiversity.
(TCY AUT June 2009)
16. What is biodiversity? Discuss the genetic biodiversity and values of biodiversity.
(AU Dec 2014)(TCY AU Dec'08)
17. Write the uses of biodiversity to mankind.
(TNV AUT Dec. 2010)
18. What are the values of biodiversities? Explain.
(Chen AUT Dec. 2010)
19. Classify and explain the value of biodiversity.
(Chen AUT Dec. 2010)
20. Discuss the importance of biodiversity.
(Che A.U. Dec 2009)
21. Discuss the status of India as a mega diverse nation of biodiversity.
(TCY A.U. Dec 2009) (AU Dec 2016, May 2017)
22. What are the various hot spots of Bio Diversity in India?
(Che AU Dec'08, Dec 2012)
23. Describe the term hot spot in biodiversity.
(A.U. Dec 2007)

24. What do you understand by 'Hot spots of biodiversity'? Name and briefly describe the two hotspots of biodiversity that extend into India.
(TCY A.U. Dec 2009), TNV AUT Dec 2005)
25. Which are the biodiversity hotspots in India? What are the threats they face?
(AU. Nov/Dec 2017)
26. What do you understand by hot spots of biodiversity? Name and briefly describe two hot spots of biodiversity that extend in India.
(A.U. May 2008)
27. Discuss the biodiversity hot-spots identified in India.
(TNV AUT June 2010)
28. Identify and explain the present day major threats to the biodiversity of India.
(TNV A.U. Dec 2009)(TCY AUT June 2011)
29. What are the major causes of man-wild conflicts? Discuss the remedial steps that can curb the conflict.
(Coim AUT Dec 2011, AU. May 2015, Dec. 2015)
30. Explain the factors that give threat to biodiversity.
(AU. May/June 2016)
31. Discuss the human-animal conflict with special reference to media coverage.
(AU. Nov/Dec 2017)
32. Discuss the endangered and endemic species of India.
(Che AU Dec'08)
33. Write a note on endangered and endemic species of India.
(Coim AUT May 2011)(Che A.U. Dec 2009)
34. List the important sites in India identified for the conservation of endemic species. Mention the major endemic species of India.
(TNV AUT June 2010)

35. What are the main objectives of conservation of biodiversity? Discuss the strategies for conservation of biodiversity. *(AU. Dec. 2013)*
36. Explain the strategy adopted to conserve biodiversity. *(A.U. Jan-2006)*
37. Briefly explain the conservation of bio-diversity. *(TCY AUT Dec 2010)(A.U. May 2006)*
38. How is biodiversity conserved in India? Explain. *(Che AU June 2016, Dec'08)(Coim AUT June 2010)*
39. How is conservation of biodiversity achieved? Give details. *(TNV AU Dec'08)*
40. Write a note on importance of conservation of biodiversity. *(Che A.U. Dec 2013, June 2010)(Coim AUT Dec 2010)*
41. What do you mean by conservation of biodiversity? State and explain the basic approaches to wild life conservation. *(AU. Dec. 2014)*
42. Suggest suitable steps that should be taken to conserve biodiversity in India. *(TNV AUT June 2010)*
43. Explain any one of the strategy adopted to conserve biodiversity. *(Coim A.U. Dec 2009)*
44. What do you understand by conservation of biodiversity? Explain the Insitu and Exsitu conservation along with their merits and limitations. *(TCY AU May 2010, Dec'08) (AU Dec 2016)*
45. Write informative notes on ‘Insitu’ conservation. *(Che A.U. Dec 2009)*
46. Explain different methods of In-Situ conservation of Biodiversity. *(Chen AUT Dec. 2011)*

