



UNIT-1

ENVIRONMENT, BIODIVERSITY

Environment(2mark)

Environment is defined as, *“the sum of total of all living & non –living things around us influencing one another.”*

Environmental Science (2mark) (8mark)

Hazard is any substance that can hurt or make ill. It is expressed in degree. Degree of hazard is the function of risk, exposure, vulnerability and response.

Environmental science is *“the study of the environment, its biotic and abiotic components and their interrelationship.”*

Scope of Environmental studies(2mark)

- To get an awareness to the total environment and related problems.
- To motivate the active participation in environmental protection
- To develop skills for solving environmental problems.
- To know the necessity of conservation of natural resources.

Ecosystem(2mark)

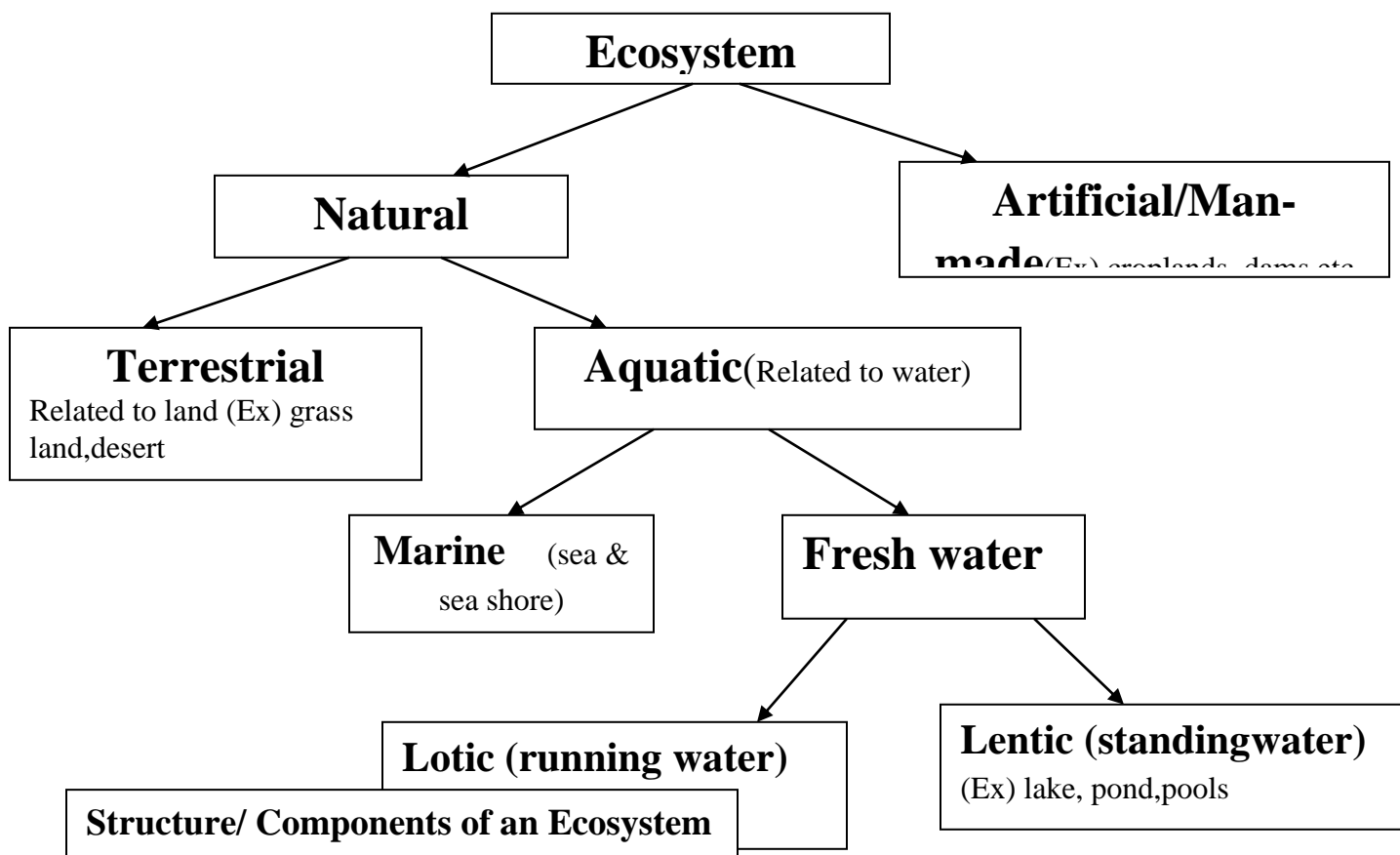
Ecosystem is defined as *“A group of organisms interacting among themselves and with environment is known as ecosystem.”*

Ecology(2mark)

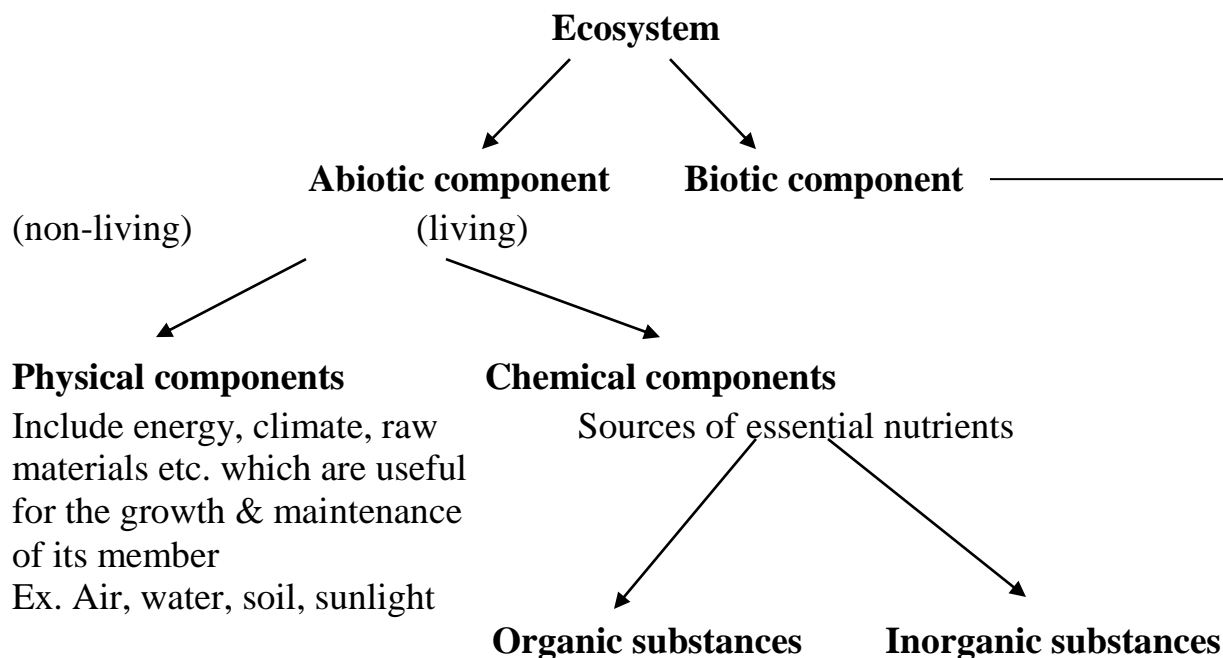
Ecology is *“the Study of interactions among organisms, with their environment and the flows of energy and materials between abiotic and biotic components of ecosystems.”*

The study of Ecosystem is known as **ecology**.

Types of Ecosystem:(2mark)



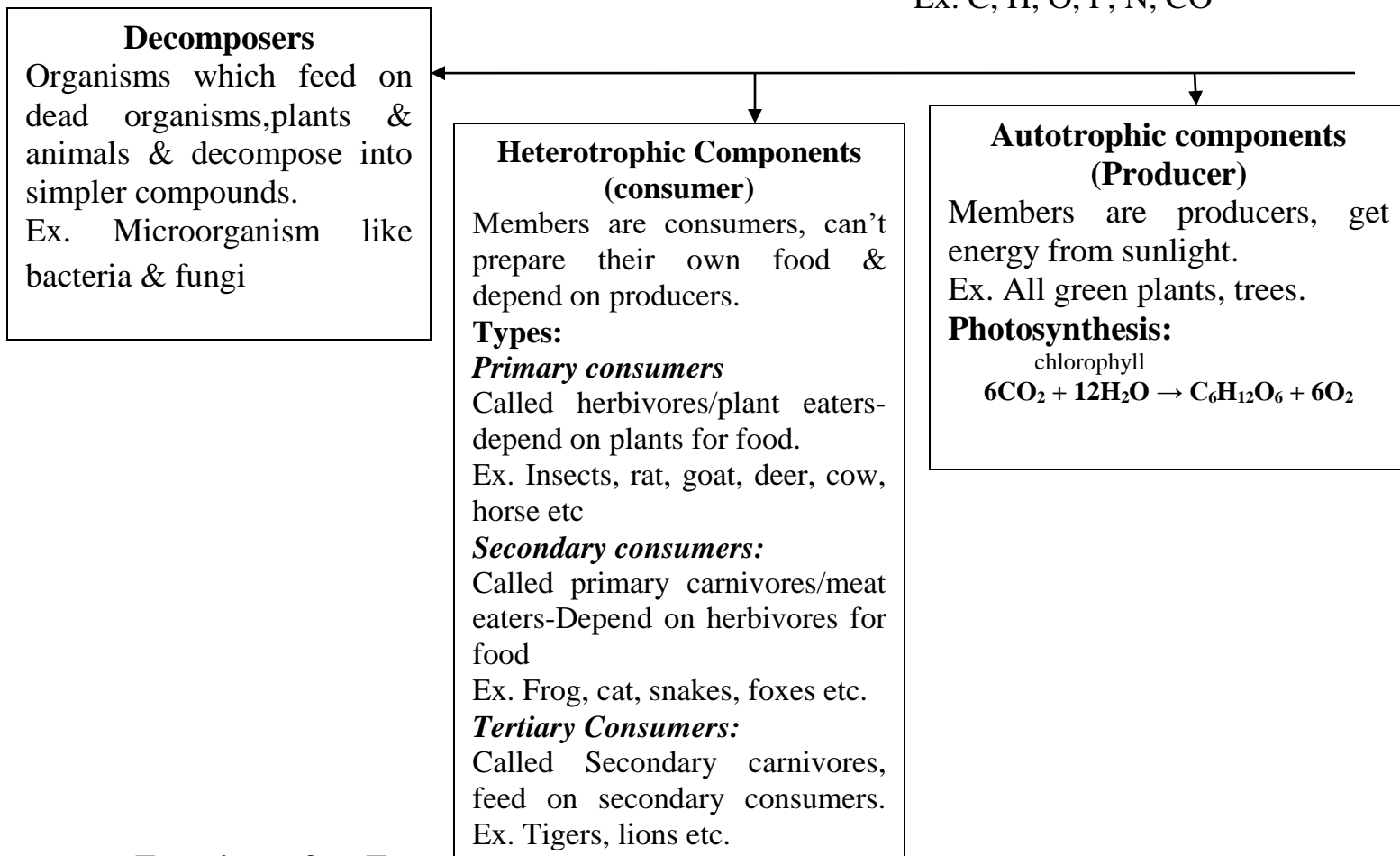
- The structure of an ecosystem explains the relationship between the abiotic (nonliving) and the biotic (living) components.





Proteins, lipids, All micro & macro
carbohydrates etc elements.

Ex. C, H, O, P, N, CO



Functions of an Ecosystem

The function of an ecosystem is to allow flow of energy and cycling of nutrients.

- Functions of ecosystem is three types they are,
 - **Primary function (primary Production):** Primary function of all ecosystem is manufacture of starch.
 - **Secondary function (Secondary Production):** Secondary function of all ecosystem is distributing energy in form of food to all consumers.
 - **Tertiary function:** All living systems die at a particular stage. These dead systems are decomposed to initiate the third function of ecosystems namely “cycling”.

Energy flow in the Ecosystem



(16 marks) or (8 mark)

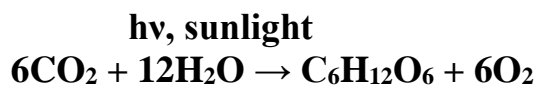
- Sun the ultimate source of energy is absorbed by producers (plants) to produce organic matter through photosynthesis.
- Only About 1% of energy from the sun is used by green plants & rest remains unutilized.
- Energy flow cannot occur in reverse direction.
- The conversion of solar energy is governed by law of thermodynamics.

Ist Law of Thermodynamics:

Energy can neither be created, nor be destroyed, but it can be converted from one form to another

(Ex) photosynthesis- solar energy converted to chemical energy.

Photosynthesis Equation:



Plants are used by herbivores. Herbivores are used by carnivores as their food. Thus energy is transferred & conversion of solar energy is governed by law of thermodynamics

IInd law of thermodynamics:

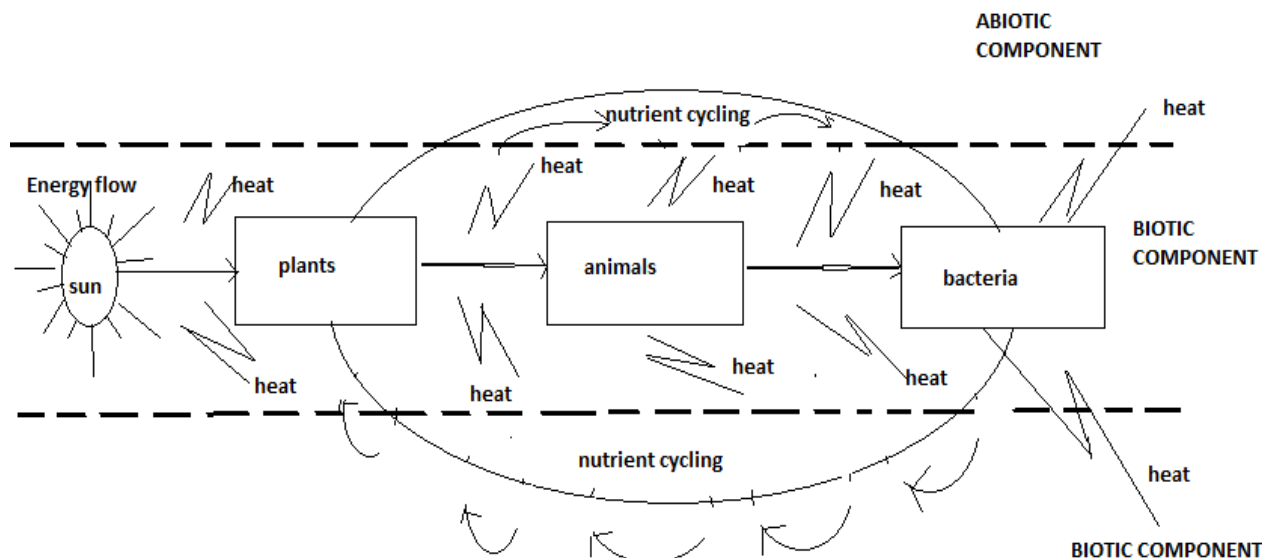
Whenever energy is transformed, there is a loss of energy through the release of energy in the form of heat.

(Ex) Respiration process:



Relationship between structure & function:

- Biotic components and abiotic components are linked through energy flow and nutrient cycle.



ECOLOGICAL SUCCESSION

“The progressive replacement of one community by another till the development of stable community in a particular area is ecological succession.”

Stages of ecological succession:

- Pioneer community → first group of organism in an area
- Seral stage → various developmental stages of community

Types of ecological succession:

- Primary succession → involves gradual establishment of biotic communities on a lifeless ground
- Secondary succession → Involves establishment of biotic communities in an area, where biotic community already present there.

Process of Ecological Succession:

The process of succession takes place in a systematic order of sequential steps as follows:

i. Nudation:

- It is the development of a bare area, without any life form.
- The bare area may be caused due to several man-made activities.

ii. Invasion:

- It is the successful establishment of one or more species on a bare area through migration, followed by establishment.



iii. Competition:

- As the number of individuals grows there is competition, for space, water and nutrition.

iv. Reaction:

- The living organisms have a strong influence on the environment which is modified to a large extent and this is known as reaction.

v. Stabilization :

- The succession ultimately culminates in a more or less stable community called climax which is in equilibrium with the environment.

BIODIVERSITY(2mark)

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

Significance (or) importance of biodiversity(2mark)

- It is Important for human life,as we depends on plants,animals for our food,medicine & industrial products
- It protects the fresh air,clear water and productive land
- It is important for forestry,fisheries & agriculture.
- Variety of biological resources available in nature.
- Loss of biodiversity has serious economic & social costs for any country.

Levels/Classification of Biodiversity (2mark)

- **Genetic diversity** → Diversity within the species is genetic diversity.**Ex.** teak wood varieties, Indian, Burma, Malaysian
- **Species diversity**→ diversity between different species. **Ex.** plant species = apple, mango, grapes, animalspecies = lion, tiger, elephant etc.
- **Community/Ecosystem diversity** → Diversity at the ecological or habitat level is ecosystem diversity. **Ex.**River ecosystem.

VALUE OF BIODIVERSITY

(16 marks) or (8 mark)

- The value of biodiversity in terms of its commercial utility, ecological services, social and aesthetic value is enormous.
- The multiple uses of biodiversity value have been classified as follows:

1. Consumptive use:

- **Drugs:** -Many plants are used in primary health care.



- 70% of modern medicines are derived from plant and plant extracts.
- (Ex)Penicillin – fungus is the source – Antibiotic
Quinine – Chincona bark - Malaria treatment
Morphine – Poppy bark – Analgesic
- **Fuels:** Fire woods are directly consumed by villagers.
- **Food:** A large number of wild plants and wild animals are consumed by human beings as food.

2. Productive use:

- Biodiversity products have commercial value.
- These products are marketed and sold. These are derived from animals and plants.
- **Animal products:** Silk from silk worm
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

3. Social value:

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

4. Ethical value:

- It is also sometimes known as existence value. It involves ethical issues like "all life must be preserved".
- It means that a species may or may not be used but its existence in nature gives us pleasure.
- e.g., Holy river: River Ganga

Holy tree: Tulsi, Vengai

5. Aesthetic value:

- The beautiful nature of plants and animals insists us to protect the biodiversity.
- Ex) eco-tourism, color of butterfly, flowers etc.

6. Optional value:

- The optional value of biodiversity suggests that any species may be proved to be a valuable species after some day.
- Ex) searching species for cancer & AIDS



Medicinal plants & herb

HOT SPOTS OF BIODIVERSITY

- Areas, which exhibit high species richness as well as high species endemism, are termed as **hot spots** of biodiversity.
- The term was introduced by Myers (1988).
- There are 25 such hot spots of biodiversity on a global level.
- Out of which **two are present in India**.
- Extending into neighbouring countries namely, Indo-Burma region (covering Eastern Himalayas) and Western Ghats – Sri Lanka region.
- 40% of terrestrial plants and 25% of vertebrate species are endemic and found in these hotspots.
- The Indian hot spots are not only rich in floral wealth and endemic species of plants but also reptiles, amphibians, swallow tailed butterflies and some mammals.

(a) Eastern Himalayas:

- a. They display an ultra-varied topography that fosters species diversity and endemism.
- b. Certain species like *Sapria himalayana*, a parasitic angiosperm was sighted only twice in this region in the last 70 years.
- c. Out of the world's recorded flora 30% are endemic to India of which 35,000 are in the Himalayas.

(b) Western Ghats:

- a. It extends along a 17,000 Km² strip of forests in Maharashtra, Karnataka, Tamil Nadu and Kerala and has 40% of the total endemic plant species.
- b. 62% amphibians and 50% lizards are endemic to Western Ghats.
- c. The major centers of diversity are Agastyamalai Hills and Silent Valley, the New Amambalam Reserve Basin.
- d. It is reported that only 6.8% of the original forests are existing today while the rest has been deforested or degraded.
- e. Although the hotspots are characterized by endemism, interestingly, a few species are common to both the hotspots in India.

THREATS TO BIODIVERSITY

- Any disturbance in a natural ecosystem tends to reduce its biodiversity.



- Various threats to biodiversity are:

1. HABITAT LOSS

- Loss of population of interbreeding organism.

Factors influencing Habitat Loss:

Deforestation:

- Forest & grasslands are cleared for agricultural lands or developmental projects.
- Many species disintegrate due to loss of natural habitat.

Destruction of wetlands:

- Wetlands are destroyed due to pollution, draining etc.

Developmental activities:

- Construction of dams in forest, industrial effluents kill birds & aquatic organisms.

Habitat fragmentation:

- Habitat is divided into small & scattered
- So, many animal & birds are vanishing.

Raw materials:

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

Production of Drugs:

- Pharmaceutical companies collect wild plants for drug production.
- So, no of medicinal plants are on the verge of extinction.

Illegal Trade:

- Trade on wild life reduces bio-diversity.

2. POACHING

- Killing / Hunting of animals is poaching.

Types:

- *Subsistence Poaching*- killing animals for surviving.
- *Commercial Poaching*- hunting animals for selling

Factors influencing Poaching:

Human Population: increase in population increases pressure on forest resources.

Commercial activities: Smuggling of wild life products for high profit.

Wildlife products: Furs, horns, tusk, live specimen, herbal products.

Importers of wild life: Europe, North America, Japan, Taiwan, Hong Kong

Examples:

- Male gorilla for its body parts
- Blue morpho butterfly – making attractive trays
- Snowy large egret – used for white feather in ladies hat
- Elephant feet – for making Ash trays
- Elephant – for ivory
- Bengal tiger – soled for \$1,00,000 in foreign Market



3.MAN-WILDLIFE CONFLICTS

- Wildlife causing damage & danger to man

Examples

- **Sambalpur – orissa:**195 humans were killed by elephants,In retaliation- 98 elephants were killed,30 injured by villagers.
- **Kote – Chamrajanagar –Mysore:**Sugarcane & cotton crop, explosives
- **Royal Chitwan National Park – Kathmandu:** Man-eating tiger killed 16 nepalese, 4 yrs child
- **Sanjay Gandhi National Park – Mumbai:** Leopards killed– 14 persons

Factors Influencing man-animal conflicts:

- Shrinking of forest compels wildlife to move outside the forest
- Electric wiring around crops
- Animals suffer pain and attack humans
- Female wildlife attack human more to safe its cubs.
- Forest dept. don't cultivate foods for wild
- Cash compensation by government for the damage is not enough

ENDANGERED SPECIES&ENDEMIC SPECIES OF INDIA

1. ENDANGERED SPECIES

- A species is said to be endangered when its number has been reduced to a critical level.
- Unless it is protected it is indanger of extinction.

No of threatened species of India:

Plants 250

Birds 70

Mammals 86

Reptiles 25

Amphibians 3

Fishes 3

Molluscs 2

Insects -50

Important Endangered Species:

Reptiles → Tortoise, green sea turtle, gharial, python

Birds → Peacock, Siberian white crane, pelican, Indian Bustard

Mammals → Indian wolf, red fox, tiger, Indian lion, golden cat, desert cat.

Primates → lion tailed monkey, capped monkey, golden monkey

Plants → medicinal plants, sandal wood tree



- **RED-data Book**= Data book which contains the list of endangered species of plants and animals.

Factors affecting Endangered Species:

- **Pollution:** Human disposal in nature. Travel through food chain and leads to death
- **Over-exploitation:** over usage of natural resources & poaching leads to extinct of wild life
- **Climate change:** ozone depletion, flood etc, threatens organisms and ecosystem

Remedial Measures:

- CITES – Convention on International Trade in Endangered Species is signed
- 2900 and other 900 endangered species are restricted for trade.

2. ENDEMIC SPECIES

- The species, which are found only in a particular region are known as endemic species.
- 62% of endemic species are found in Himalayas and Western Ghats

Fauna:

- Animals present in a particular region or period is Fauna.
- 62% amphibians & 50% lizards are endemic to Western Ghats.
- (ex) Monitor lizards, reticulated python, Indian salamander, viviparous toad.

Flora:

- Plants present in a particular region or period is Flora
- (ex) Sapria himalayana, ovaria lurida, pteridophyta, angiosperms etc.

Factors affecting endemic species:

- Habitat loss
- Fragmentation
- Pollution

CONSERVATION OF BIODIVERSITY

(16marks)or(8mark)

- Conservation is defined as, ***“the management of biosphere for the sustainable benefit to meet the needs of future generation.”***
- The enormous value of biodiversity due to their genetic, commercial, medical, esthetic, ecological and optional importance emphasizes the need to conserve biodiversity.



Types of Biodiversity:

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

IN-SITU CONSERVATION

- Involves protection of fauna & flora within its natural habitat.

Methods of In-Situ conservation:

- Biosphere reserves – 7
- National Parks 80
- Wildlife sanctuaries 420
- Gene sanctuaries 120

1. Biosphere Reserves:

- Covers area of more than 5000 sq. km.
- Protect species for long time
- **(ex)** Nanda devi U.P
Nokrek Meghalaya
Nilgiri Kerala, TN, Karnataka
Manas Assam
Sunderbans West Bengal
Gulf of Mannar TN
- **Role of Biosphere reserves**
 - Protects endangered species
 - Site of recreation & tourism
 - Useful for education & research purpose
 - Gives long term survival
- **Restriction**
 - No tourism & explosives are permitted.

2. National Park:

- Covers area of about 100 to 500 sq.kms
- Conserves wildlife & environment
- **(ex)** Gir National Park Gujarat
Periyar Kerala
Dudwa UP
Sariska Rajasthan
Ranthambore Rajasthan
Kaziranga Assam
- **Role of National Park**
 - For tourism without affecting environment
 - Protect, propagate & develop wild life



➤ **Restriction**

- Grazing of domestic animals is prohibited
- All private rights and forestry activities are prohibited.

3. Wildlife Sanctuaries:

- Conserve animals & Birds only
- (ex) Mudumalai wildlife sanctuary –TN
Vedanthangal Bird sanctuary - TN
Sultanpur Bird sanctuary - Haryana
Ghana Bird sanctuary - Rajasthan
Wild Ass sanctuary -Gujarat
- **Role of wildlife Sanctuaries**
 - Protects animals only
 - Harvesting of timber
 - Collection of forest products
- **Restrictions**
 - Killing, hunting, shooting of wildlife is prohibited
 - Grazing of domestic animals is prohibited
 - All private rights & forestry activities are prohibited.

4. Gene Sanctuary:

- Conserve Plants
- (ex) Citrus sanctuary – North India
Pitcher plant -North India

5. Other Projects for conservation of animals:

- (ex) Gir Lion Project
Crocodile Breeding Project
Project Elephant
Project Tiger etc.

Merits of In-situ conservation

- Very cheap & convenient method
- Species adjust to floods, drought, forest fires etc.

Demerits of In-situ conservation

- Large area is needed
- Maintenance is not proper due to pollution and lack of staff.

EX-SITU CONSERVATION



- Involves protection of fauna & flora outside the natural habitats.

Role of Ex-situ conservation:

- Maintenance of endangered plant & animal species under controlled conditions.
- Preserves more important species.

Methods of Ex-situ conservation:

1. NBPGR

- National Bureau of Plant Genetic Resources → uses cryo technique
- Cryo Technique: Preservation of seeds, vegetables, fruits, crops, etc by using liquid nitrogen at -196o C

2.NBAGR :

- National Bureau of Animal Genetic Resources → preserves semen of bovine animals.

3.NFPCR:

- National Facility for Plants Tissue Culture Repository → preserves crops or trees by tissue culture.

Meritsof Ex-situ conservation

- Survival / life span of species increase by special care
- Species are assured for food, water, shelter etc
- Endangered species are preserved

Demerits of Ex-situ conservation

- Expensive method
- Freedom of wildlife is lost
- Animal can't survive in natural environment

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