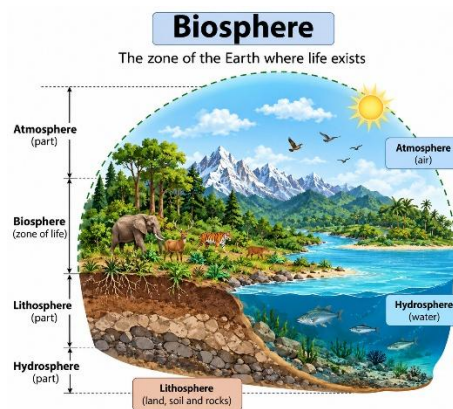


Fundamental Concepts in Biogeography: Biosphere, Ecology, Ecosystem, Biodiversity

The study of biogeography is based on several fundamental concepts that help us understand the distribution, relationships and diversity of life on Earth. The important concepts include biosphere, ecology, ecosystem and biodiversity.

Biosphere

The biosphere is the narrow zone of the Earth where life exists. It includes parts of the atmosphere, hydrosphere and lithosphere that support living organisms. Plants, animals, microorganisms and humans interact with the physical environment within the biosphere. The biosphere includes diverse environments such as forests, oceans, grasslands, deserts, wetlands and mountains. It is therefore considered the global zone of life and forms the broadest spatial unit of study in biogeography.



Ecology

Ecology is the scientific study of the relationships between living organisms and their environment. The word Ecology is derived from the Greek words “Oikos” meaning house, home or dwelling place and “Logos” meaning study or knowledge. Thus, ecology literally means the study of the home or living environment. The term “Ecology” was coined by the German biologist Ernst Haeckel in 1866. He used the term *Ökologie* to describe the study of the relationships between organisms and their environment. It examines how plants, animals and microorganisms interact with one another and with non-living components such as air, water, soil, temperature and sunlight. Ecology helps explain how organisms survive, adapt and maintain relationships within their surroundings. In biogeography, ecological principles help explain why particular species and communities occur in specific geographical areas.

Ecosystem

An ecosystem is a functional unit in which living organisms interact with one another and with their physical environment. It consists of both biotic and abiotic components. Biotic components include producers, consumers and decomposers, while abiotic components include soil, water, air, sunlight and temperature. Examples of ecosystems include forests, ponds,

rivers, grasslands and wetlands. Energy flows through ecosystems, while nutrients are continuously circulated between living organisms and the physical environment.

Components of an Ecosystem

1. Producers

- Producers are **autotrophic organisms** that prepare their own food.
- They mainly use **sunlight, carbon dioxide and water** through photosynthesis.
- Green plants, algae and phytoplankton are examples.
- They form the **first trophic level** of an ecosystem.

2. Consumers

- Consumers are **heterotrophic organisms** that depend on other organisms for food.
- **Primary consumers** are herbivores that eat plants, e.g., deer and grasshopper.
- **Secondary consumers** eat herbivores, e.g., frog and small fish.
- **Tertiary consumers** are higher-level predators, e.g., tiger and eagle.

3. Decomposers

- Decomposers break down **dead plants, animals and organic matter**.
- They return nutrients to the soil and make them available to producers.
- **Bacteria and fungi** are the main decomposers.

They are essential for **nutrient cycling** in ecosystems.

Food Chain

A food chain is a linear sequence through which food, nutrients and energy pass from one organism to another. It generally begins with producers and moves through different levels of consumers.

Example:

Grass → Grasshopper → Frog → Snake → Eagle

Food Web

A food web is a network of interconnected food chains within an ecosystem. Since most organisms consume more than one type of food, several food chains are linked together to form a food web.

Simple example:

Grass → Grasshopper → Frog → Snake → Eagle

Grass → Rabbit → Snake → Eagle

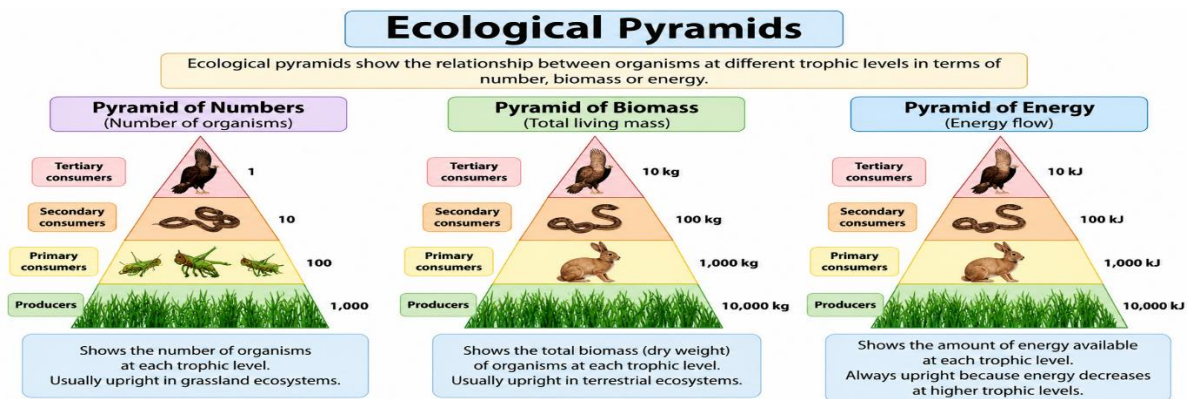
Grass → Mouse → Snake → Eagle

Ecological Pyramid

An ecological pyramid is a graphical representation of the relationship between organisms at different trophic levels. It shows the number of organisms, biomass or amount of energy present at each trophic level.

The three main types are:

- Pyramid of Numbers – shows the number of organisms at each trophic level.
- Pyramid of Biomass – shows the total living mass at each trophic level.
- Pyramid of Energy – shows the amount of energy available at each trophic level. It is always upright because energy decreases as it moves to higher trophic levels.



Biodiversity

Biodiversity refers to the variety and variability of living organisms found on Earth. It includes diversity at three main levels: genetic diversity, species diversity and ecosystem diversity. Genetic diversity refers to variations within a species, species diversity refers to the variety of species in an area, and ecosystem diversity refers to the variety of ecosystems. Biodiversity is important for maintaining ecological balance and providing resources such as food, medicine, fuel and other ecosystem services. Biogeography helps us understand the spatial distribution of biodiversity and the factors responsible for its variation across different regions.

1-Mark Questions

1. What is the biosphere?
2. Which three major spheres of the Earth are associated with the biosphere?
3. What is Ecology?
4. From which Greek words is the term Ecology derived?
5. Who coined the term Ecology?

6. In which year was the term Ecology coined?
7. What is an ecosystem?
8. What are biotic components?
9. What are abiotic components?
10. Who are producers in an ecosystem?
11. Who are consumers?
12. What are decomposers?
13. What is a food chain?
14. What is a food web?
15. What is a trophic level?
16. What is biodiversity?
17. Name the three levels of biodiversity.
18. What is genetic diversity?
19. What is species diversity?
20. What is ecosystem diversity?