

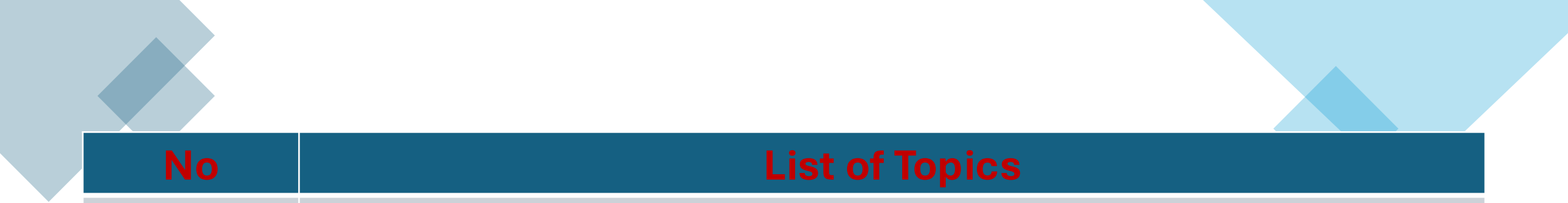


BOT 641	BASIC CHARACTERISTICS OF HABITATS & THEIR PLANTS IN SAUDI ARABIA	2(2+0+0)
Natural, regenerated resources. Endangered and rare plant taxa in various habitats in the Kingdom of Saudi Arabia. Reserves and their types. Conserved areas and the plant communities they harbor. Example of selected high altitudinal locations with special references to some their distinctive taxa. Ecological evaluation of botanical data gathered under natural and experimental conditions.		

BOT 641: Basic Characteristics of Habitats and their Plants in Saudi Arabia

Course Main Objective(s):

- **Natural, regenerated resources.**
- **Endangered and rare plant taxa in various habitats in the Kingdom of Saudi Arabia.**
- **Conserved areas and the plant communities they harbor.**
- **Example of selected high altitudinal, locations with special reference to some their distinctive taxa.**
- **Ecological evaluation of botanical data gathered under natural and experimental conditions**



No	List of Topics
1.	Introduction
2.	Natural, regenerated resources.
3.	Endangered and rare plant taxa in various habitats in the Kingdom of Saudi Arabia
4.	Reserves and their types.
5.	Conserved areas and their plant communities.
6.	Examples of selected high altitudinal, locations with special reference to some of their distinctive taxa.
7.	Ecological evaluation of botanical data gathered under natural and experimental conditions.



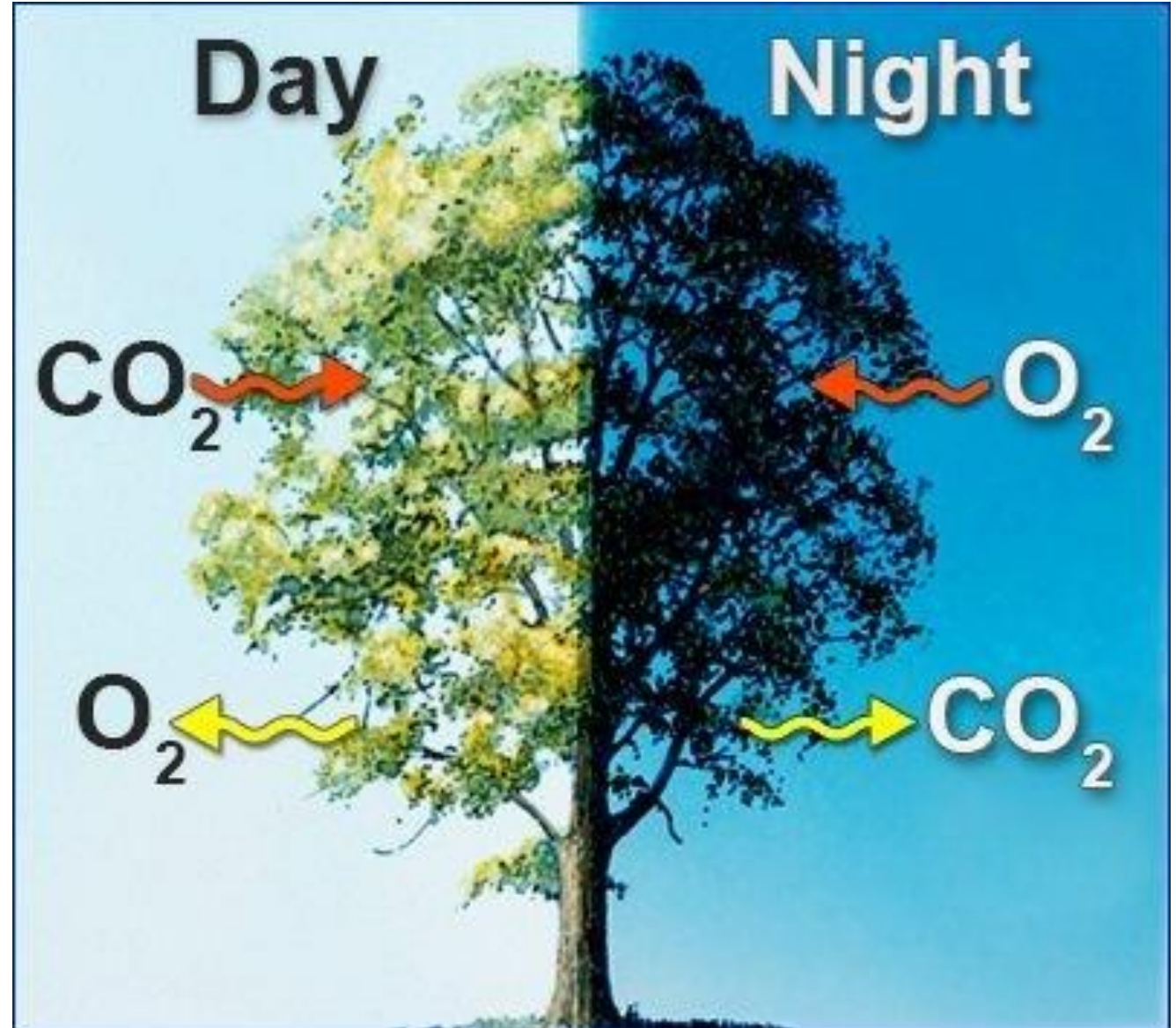


Why study Plants?

Studying plants is crucial because they provide the oxygen, food, and resources essential for most life on Earth, including humans. Research into plant biology helps address global challenges such as food security, developing new medicines, understanding and mitigating climate change, and creating sustainable energy sources, ultimately improving human health and the environment.

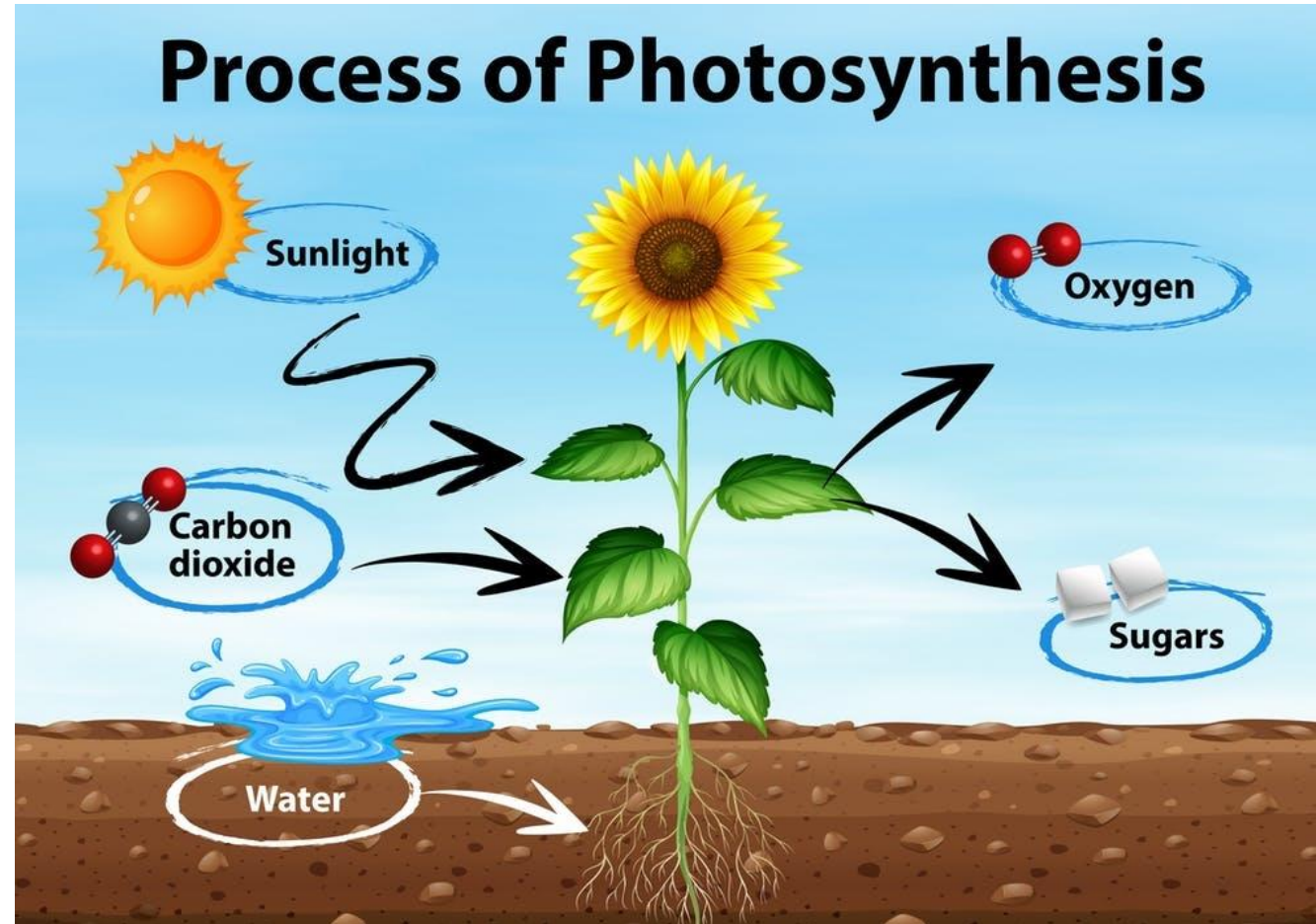
Plant Importance

- Plants produce most of the **oxygen** we breathe.



Plant Importance

Plants convert/fix **Carbon di oxide** (CO₂) gas into **sugars** where human & animals can use as food (energy- rich molecules), through the process of **photosynthesis**.



Plant Importance

- Every things we eat comes directly or indirectly from plants.
- Plants produce most of the chemically stored energy we consume as food and burn for fuel.



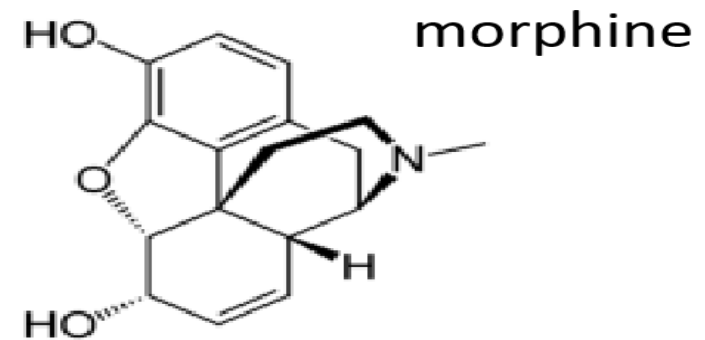
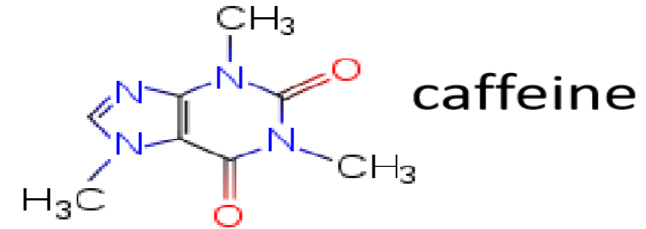
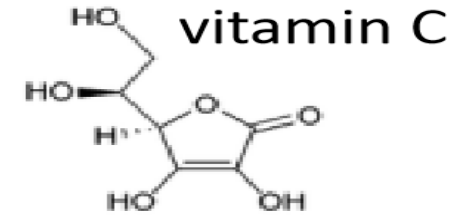
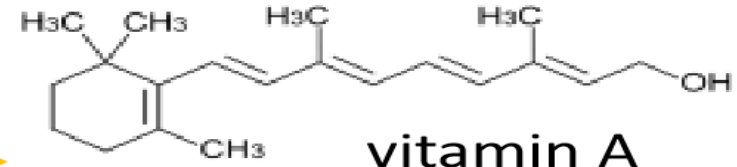
Plant Importance

- Many chemicals produced by the plants used as medicine.



Plant Importance

- Plants can produce an amazing and useful assortment of chemicals

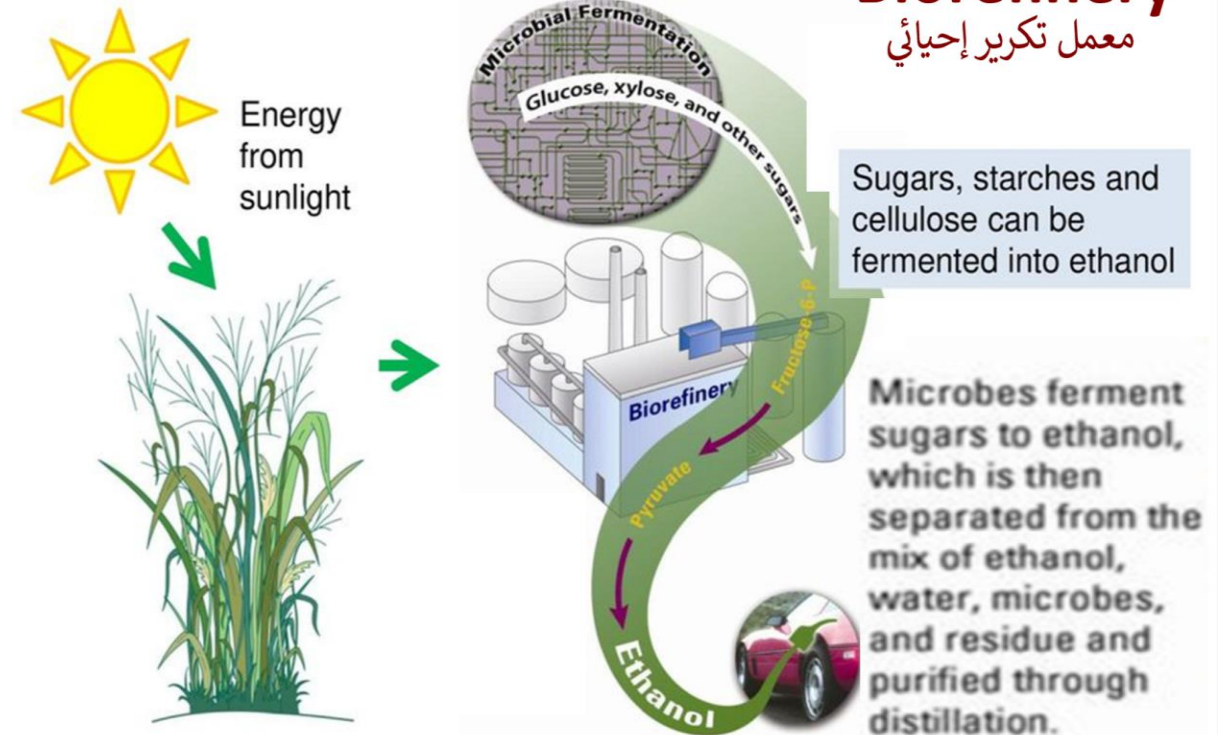


Plant Importance

- Plants can be a source of biofuels. Sugars, starches and cellulose can be fermented into ethanol. Ethanol is used as fuel.

Plants can be a source of biofuels **Biorefinery**

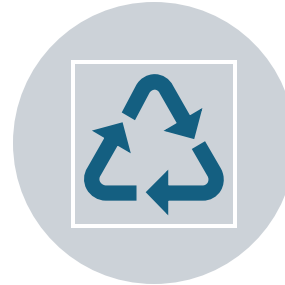
معمل تكرير إحيائي



Here are some ways plants replace petroleum:



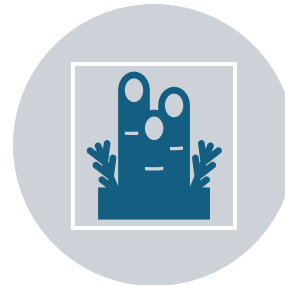
Biofuels – Plants like sugarcane, corn, and algae can be turned into ethanol or biodiesel, which are used as alternatives to petrol and diesel.



Bioplastics – Plant starches, cellulose, and oils are used to make biodegradable plastics instead of petroleum-based plastics.



Chemicals & Materials – Plant oils (like soybean or castor oil) can replace petroleum in making lubricants, paints, adhesives, and foams.



Fibers & Packaging – Plant fibers (like hemp, jute, & bamboo) can substitute for petroleum-based synthetic fibers & packaging materials.

👉 In simple terms: **Plants grow back every season, while petroleum cannot. That's why plants can provide a sustainable, renewable replacement for petroleum in many areas.**

Introduction: Habitat

A habitat is the natural environment where an organism or a community of organisms lives, grows, and reproduces. It includes both living (biotic) and non-living (abiotic) elements that provide the necessary resources for survival, such as food, water, shelter, and space.



Components of a Habitat



- **Biotic factors:** The living components of a habitat. These include plants, animals, and microorganisms that interact with one another. For example, predators and prey, parasites, or even potential mates are all biotic factors.
- **Abiotic factors:** The non-living components of a habitat. These are the physical and chemical conditions of the environment, such as sunlight, temperature, soil, water, and climate.

Plant Habitat

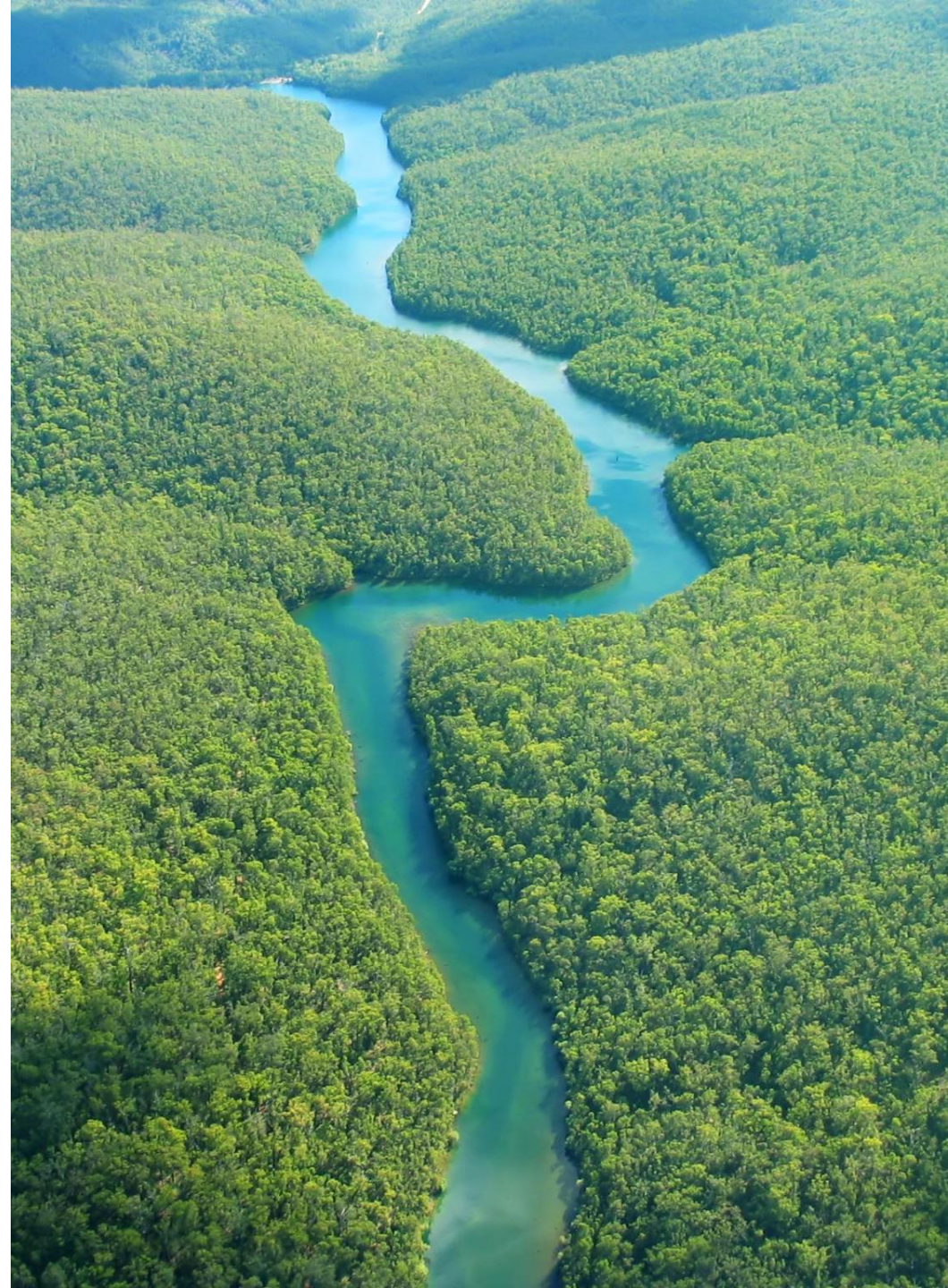


A **plant habitat** is the specific place or natural environment where a plant lives and can find the necessary resources for survival, such as food, water, and space. Plants are found in various habitats like forests, deserts, and aquatic environments, each with distinct conditions that require plants to develop specific adaptations to thrive. These adaptations allow plants to survive in their unique surroundings, leading to specialized features for different habitats.

Types of Plant Habitats

Terrestrial Habitats: These are land-based habitats, including:

- **Forests:** Diverse habitats with varying conditions, from temperate to tropical rainforests.
- **Grasslands:** Areas dominated by grasses, often with low rainfall.
- **Deserts:** Dry, arid regions where plants have adaptations to store water and reduce water loss.
- **Mountains:** Areas characterized by different elevations and microclimates.
- **Tundra and Polar Regions:** Cold environments where plants have adapted to harsh conditions.



Aquatic habitats:

Marine: Saltwater environments, including oceans, seas, coastal areas, coral reefs, and the deep sea.

Freshwater: Inland water bodies like rivers, streams, lakes, ponds, and wetlands.



Microhabitats: A microhabitat is a small, specialized, and localized environment within a larger ecosystem that has distinct conditions affecting the organisms that live there. Despite their size, microhabitats are crucial for local biodiversity, providing unique resources like shelter, food, and specific microclimates.

Microhabitats can be found all around, from a forest floor to a garden.

Examples:

- Under a rotting log: This moist, dark microhabitat is home to insects, fungi, millipedes, and other decomposers.
- Inside a tree hollow: Tree cavities offer shelter and a stable temperature for birds, bats, and other small animals.
- Within leaf litter: The layer of dead leaves on the forest floor is a home and food source for worms, snails, and other invertebrates.



HABITAT, BIOME, OR ECOSYSTEM



HABITAT

A habitat is the natural environment of a plant or an animal or the place that is normal for the life and growth of an animal or a plant. This habitat is the place that the plant or animal calls home.

BIOME

A biome describes the world's major communities of living things. Biomes are classified according to the plants that are found there. The five major biomes are aquatic, desert, forest, grasslands, and arctic (or polar).

ECOSYSTEM

An ecosystem is an environment where plants and animals interact with each other. For example, within the larger forest biome, you have the taiga forest ecosystems, the temperate forest ecosystems, and the tropical forest ecosystems.

Habitat vs. Ecosystem

While often confused, a habitat and an ecosystem are not the same.

Habitat: The "address" of an organism—the specific place where it lives.

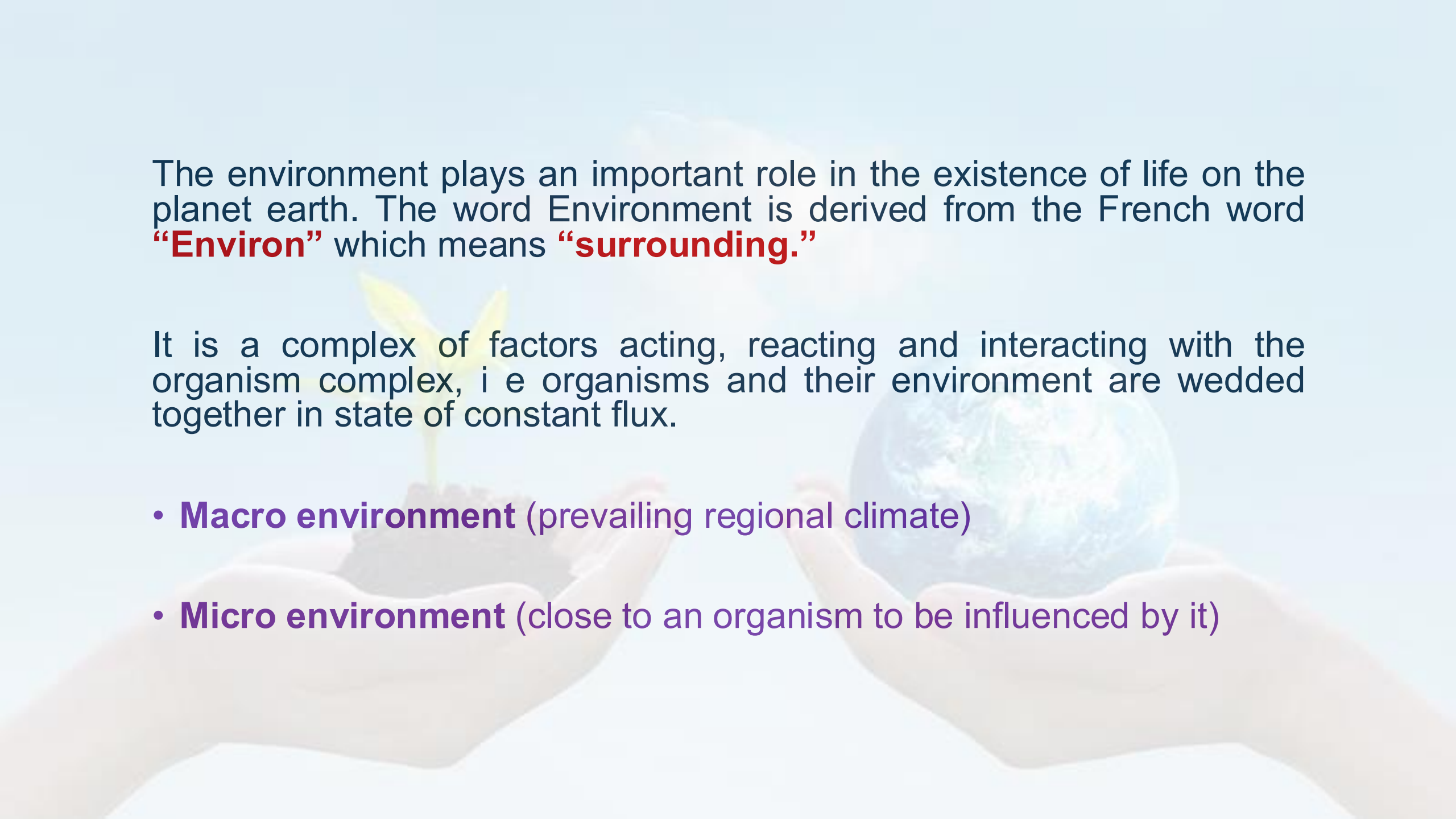
Ecosystem: All the living and non-living things in an area interacting with each other. It includes all the habitats within it.

What is the environment and what are its components?

An environment is everything that is around us, which includes both living and nonliving things such as soil, water, animals and plants, which adapt themselves to their surroundings. It is nature's gift that helps in nourishing life on earth.

Summation of all biotic (living) and abiotic (non-living) components that surround or potentially influence the organisms and their habitats



The background of the slide features a soft-focus image of two hands. The left hand is cupped and holds a small globe of the Earth. The right hand is also cupped and holds a small green seedling with two leaves, growing out of a mound of dark brown soil. The overall tone is light and hopeful, with a pale blue background.

The environment plays an important role in the existence of life on the planet earth. The word Environment is derived from the French word **“Environ”** which means **“surrounding.”**

It is a complex of factors acting, reacting and interacting with the organism complex, i.e. organisms and their environment are wedded together in state of constant flux.

- **Macro environment** (prevailing regional climate)
- **Micro environment** (close to an organism to be influenced by it)

Micro-environment vs. Macro-environment

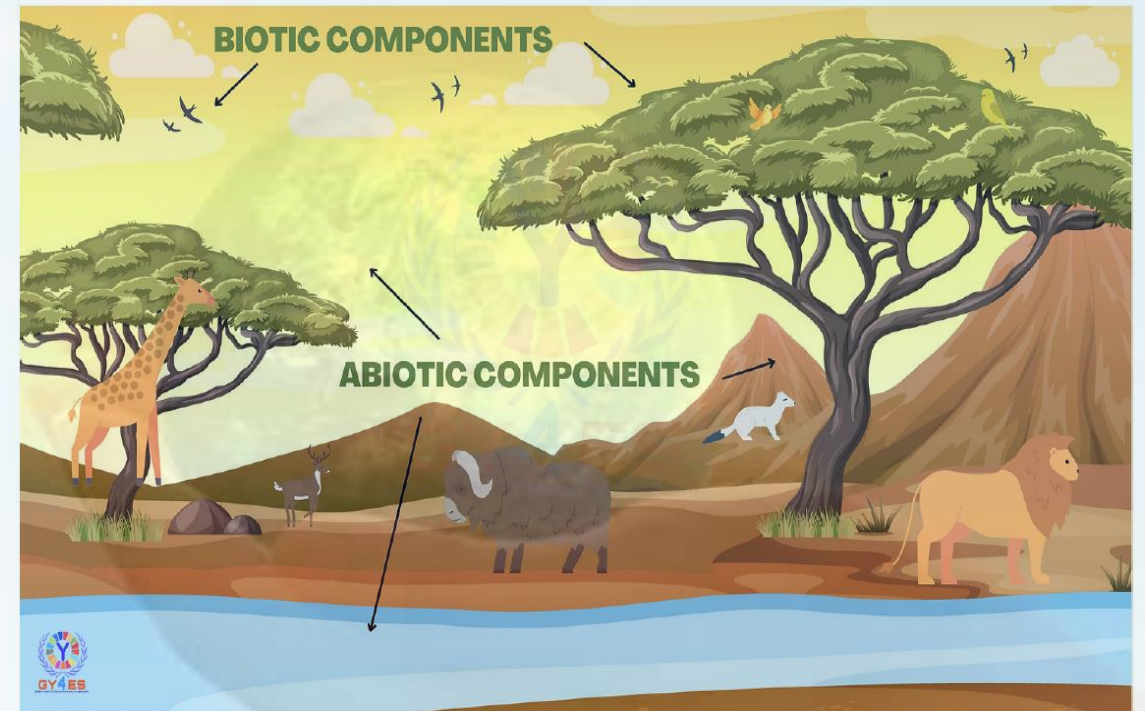
We can frequently differentiate the macro-**environment** from the micro-environment. Macro-environmental factors are those that are common to a given location at a given time. Examples are the amount of rainfall and average temperature during a season.

Micro-environmental factors are those that are unique to a single plant or to a small group of plants. An important example of a micro-environmental factor is plant-to-plant spacing in a row. In **Figure**, the plants in the two rows have different micro-environments resulting from different plant spacings, and this difference will affect numerous phenotypes later in development. For example, the plants with greater spacing likely will produce larger leaves and better growth than those with less spacing because of reduced competition for light, water, and nutrients.



The environment is a complex and dynamic system composed of diverse elements that interact and influence one another. The components of environment is comprises of two major factors, which are Abiotic and Biotic Factors

1. **Abiotic Factors:** Abiotic factors refer to the non-living components of the environment that influence the survival, distribution, and behaviour of organisms. These factors include various physical and chemical elements that interact to create diverse habitats and ecosystems.
2. **Biotic Factors:** Biotic factors encompass all living organisms within an ecosystem.



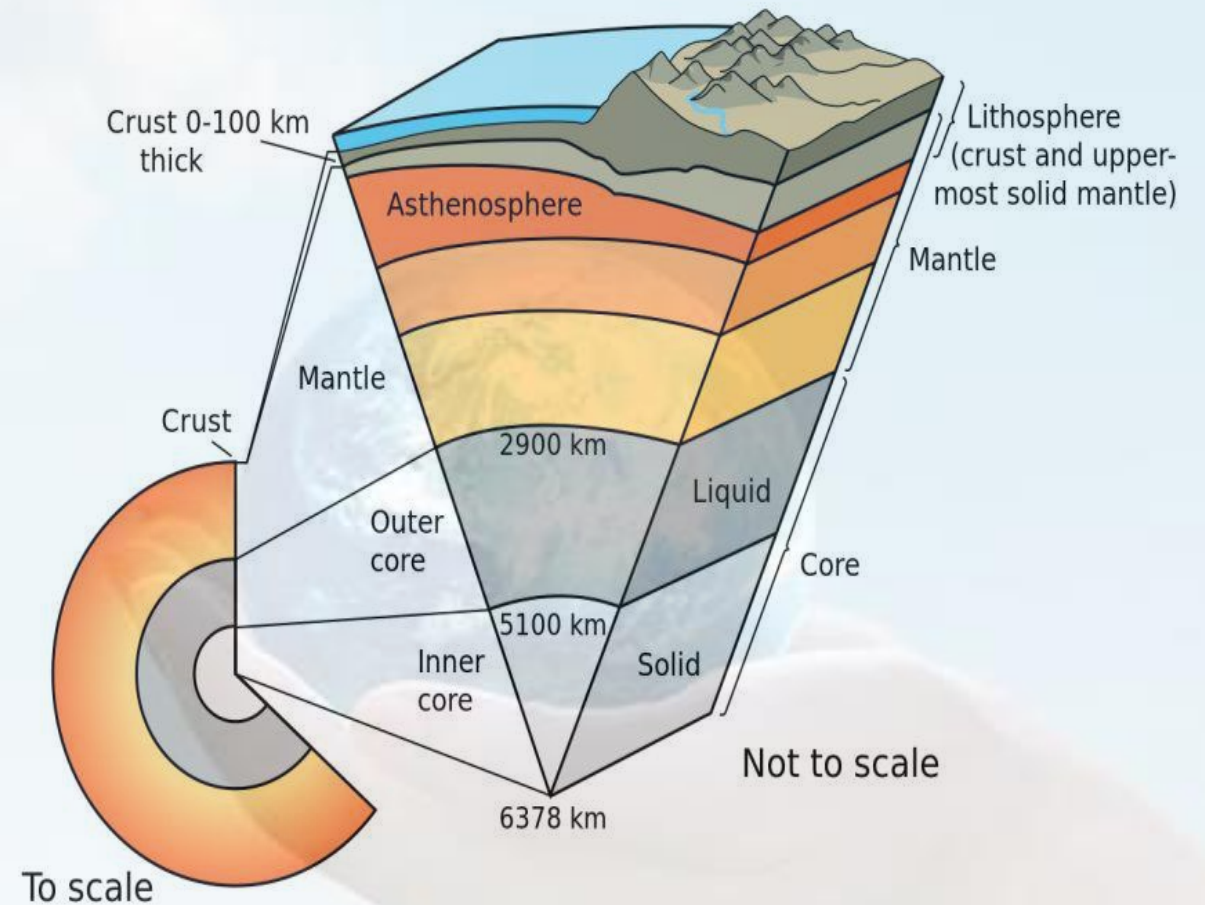
Components of Environment

- Lithosphere or the rocks
- Hydrosphere or the water
- Atmosphere or the air
- Biosphere



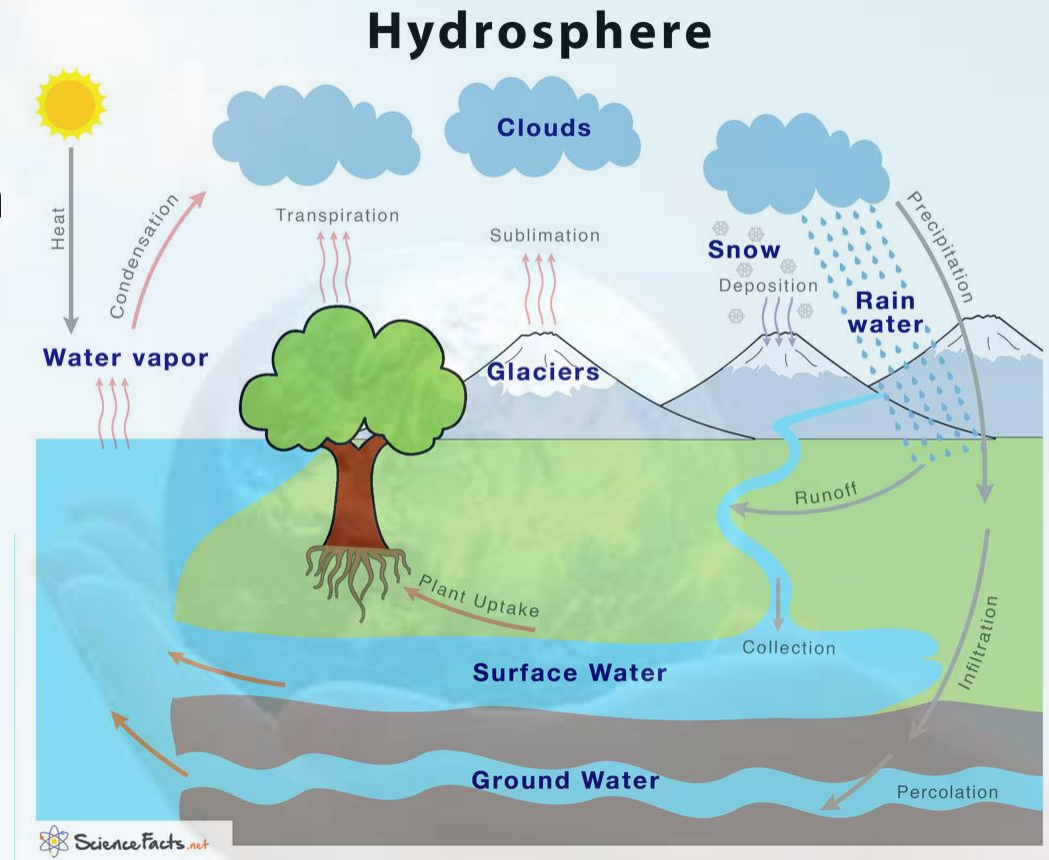
Lithosphere

- Greek word: *Lithos* meaning rock
- Earth structure can be stratified into outer crust, middle mantle and inner core regions.
- Lithosphere is the outermost layer of the crust which represents the land mass of the planet.

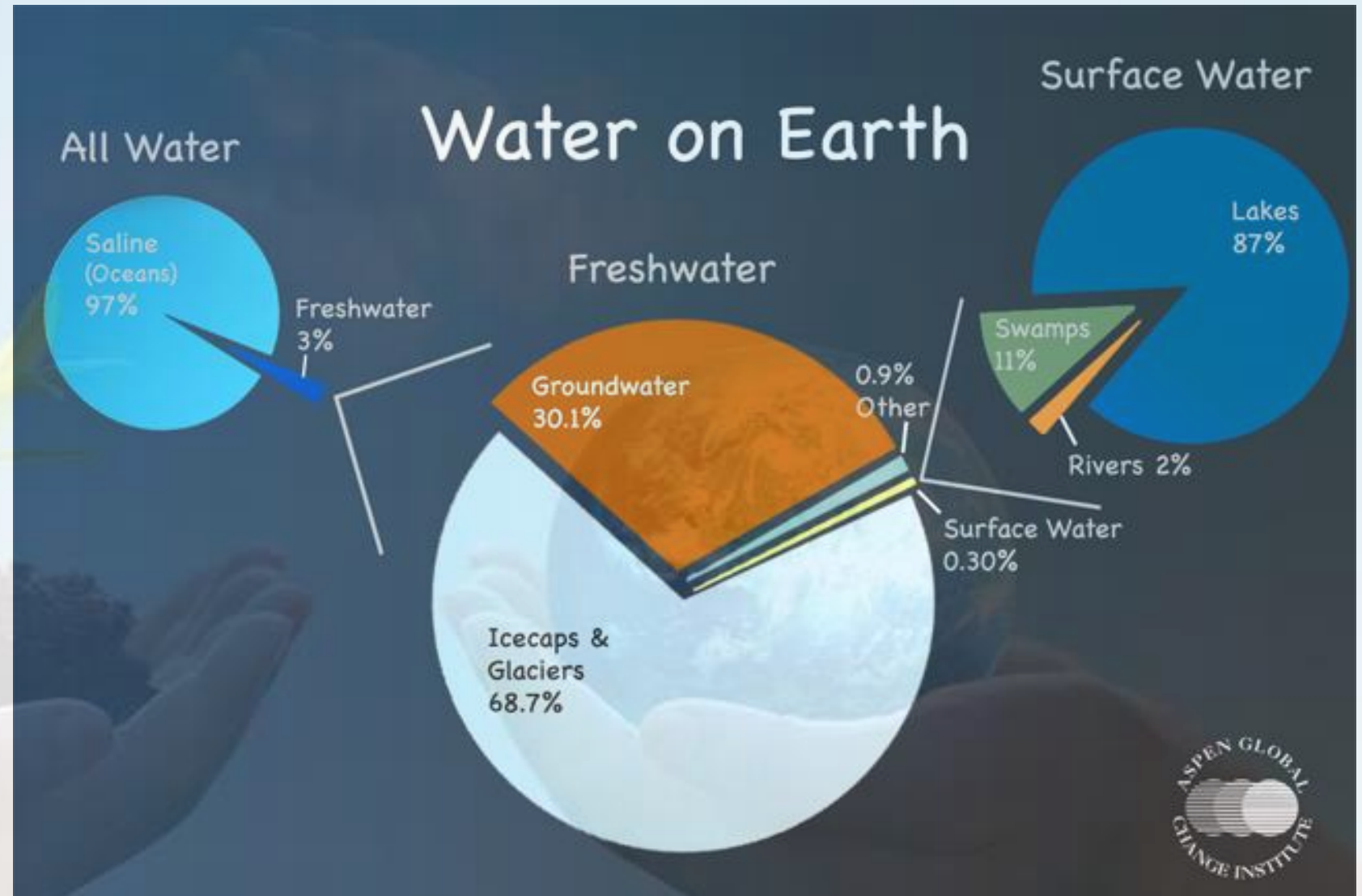


Hydrosphere

- Greek word: *Hydor* meaning water
- Hydrosphere consists of water masses on the planet present in solid (ice cover, glaciers etc.) liquid (water bodies) and gaseous (water vapours) phase.
- Hydrosphere covers almost three-fourth of the total surface area of the earth.



Hydrosphere



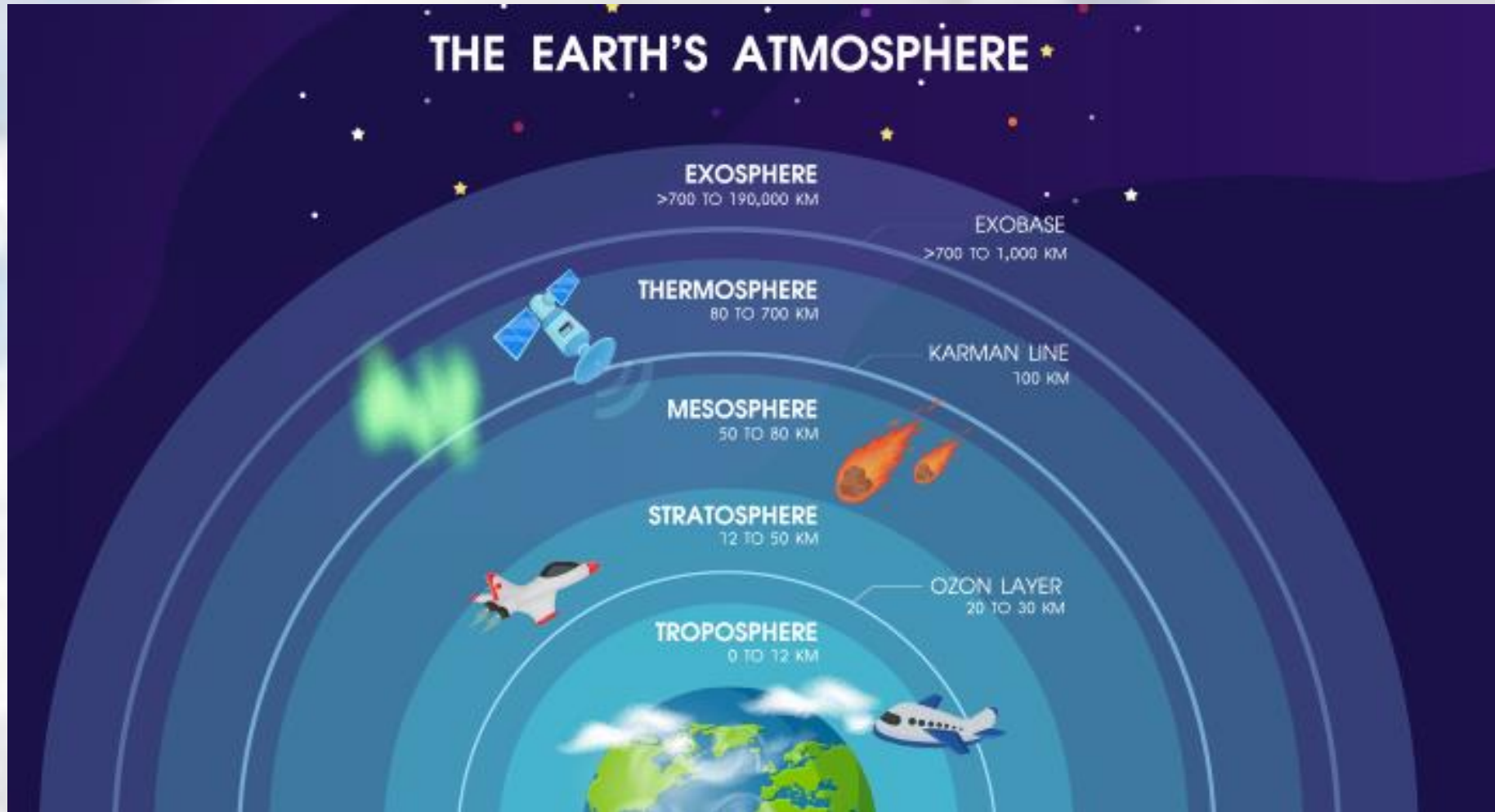
Atmosphere

One of the main components of Earth's interdependent physical systems is the atmosphere. An atmosphere is made of the layers of gases surrounding a planet or other celestial body. Earth's atmosphere is composed of about 78% nitrogen, 21% oxygen, and one percent other gases.

The atmosphere has five distinct layers that are determined by the changes in temperature that happen with increasing altitude.

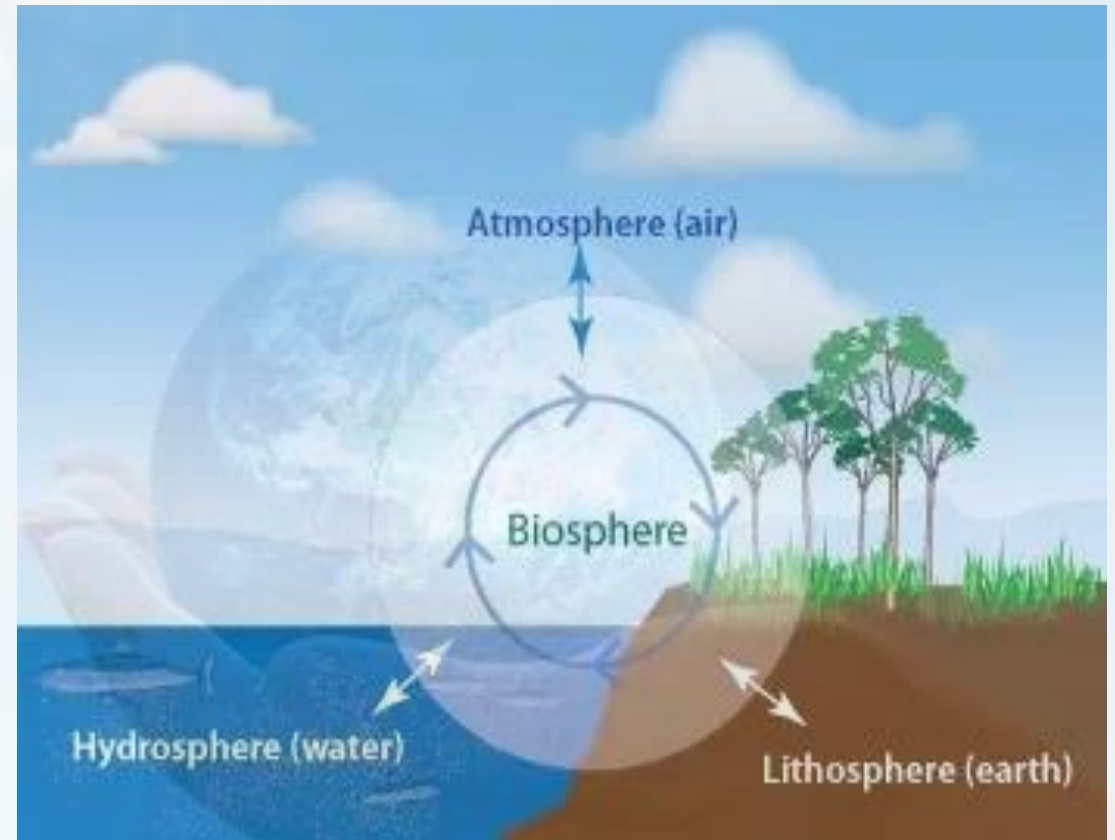
- Exosphere
- Thermosphere
- Mesosphere
- Stratosphere
- Troposphere

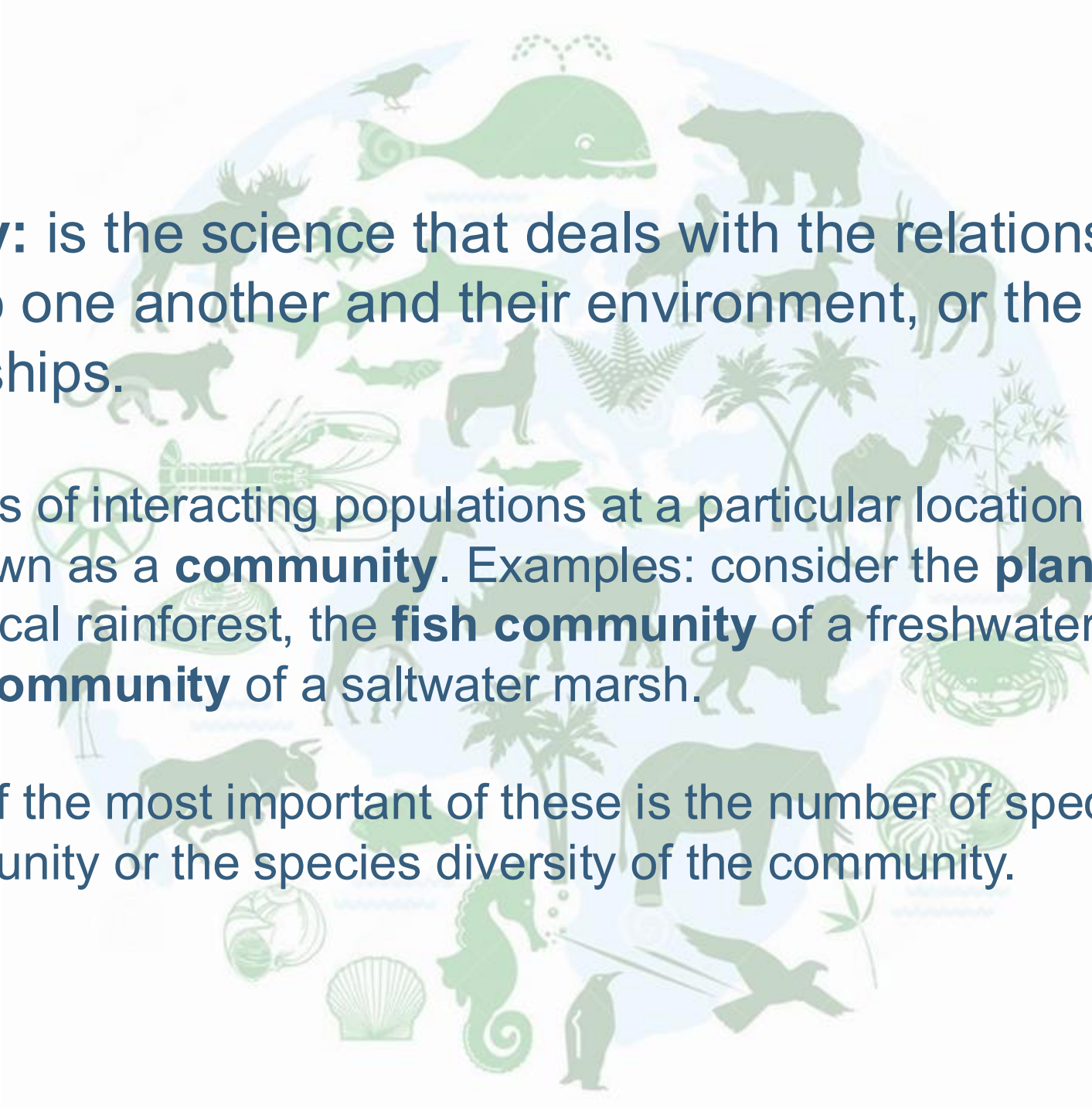
Atmosphere



Biosphere (Sphere of Life)

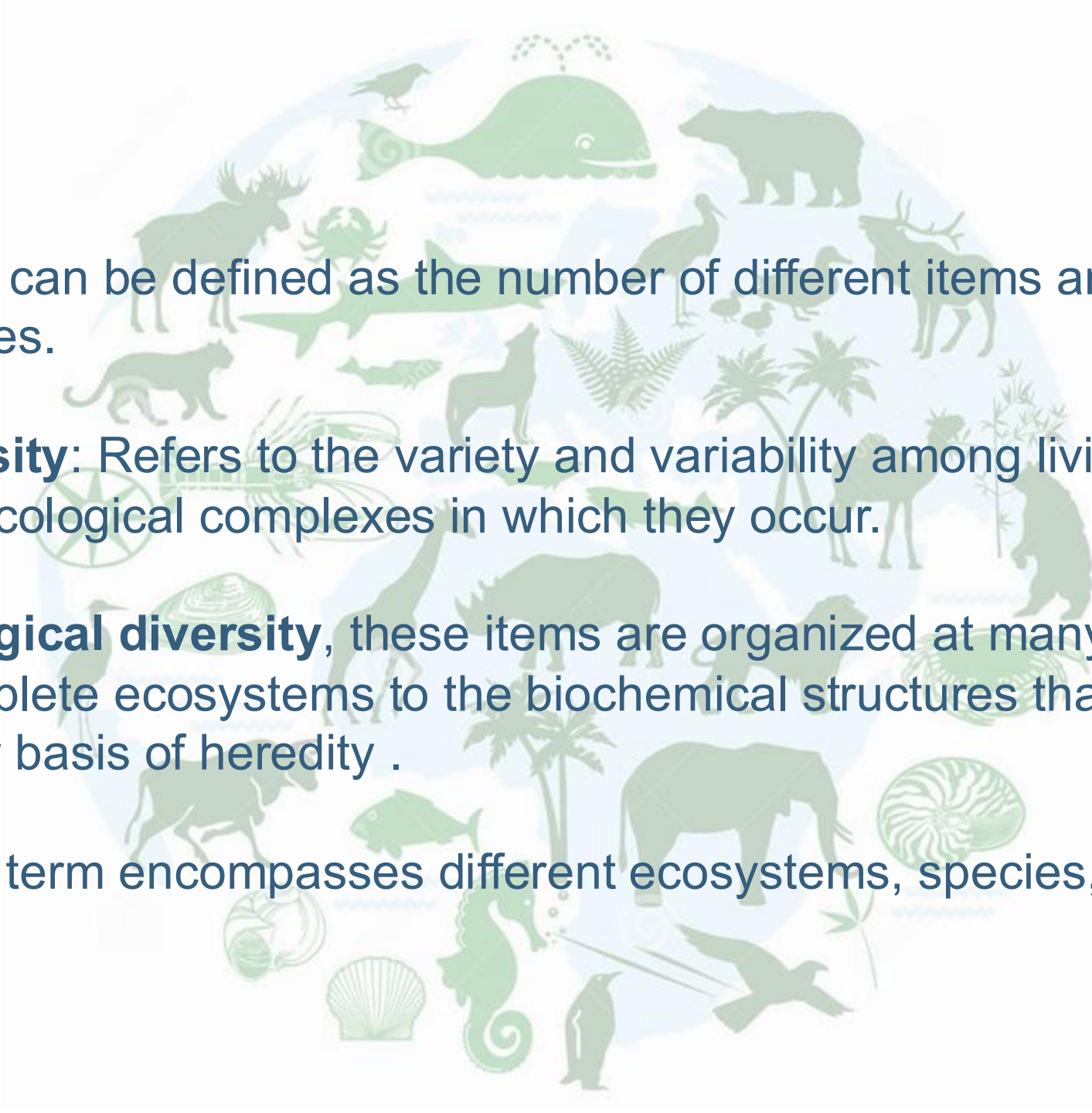
- Greek word: *Bios* meaning life
- Biosphere is the self-regulating overlapping region of atmosphere, lithosphere and hydrosphere in the environment where life exist, nourished and flourish by the healthy interaction between biotic and abiotic components of nature
- Total portion of lithosphere, hydrosphere and atmosphere that supports the life of organisms.





Ecology: is the science that deals with the relationship of living things to one another and their environment, or the study of such relationships.

- Groups of interacting populations at a particular location comprise what is known as a **community**. Examples: consider the **plant community** of a tropical rainforest, the **fish community** of a freshwater lake, or the **bird community** of a saltwater marsh.
- One of the most important of these is the number of species present in a community or the species diversity of the community.



Diversity can be defined as the number of different items and their relative frequencies.

Biodiversity: Refers to the variety and variability among living organisms and the ecological complexes in which they occur.

For **biological diversity**, these items are organized at many levels, ranging from complete ecosystems to the biochemical structures that are the molecular basis of heredity .

Thus, the term encompasses different ecosystems, species, and genes.



Plant biodiversity refers to the variety of plants on Earth, encompassing the different species, the genetic diversity within those species, and the ecosystems they form. It is crucial for ecosystem health, providing services like biomass production, soil carbon storage, and erosion control. Threats to plant biodiversity include habitat loss, pollution, and climate change, while conservation efforts focus on preserving diverse plant collections and studying genetic resources.

Levels of Plant Biodiversity

- **Genetic Diversity:** The variety of genes within a single plant species.
- **Species Diversity:** The number and variety of different plant species in a given area or globally.
- **Ecological Diversity:** The variety of habitats, communities, and ecological processes that plants are part of.

Importance of Plant Biodiversity

- **Ecosystem Stability:** Diverse plant communities are more productive and resilient, able to withstand disturbances like droughts or pests.
- **Ecosystem Services:** Plants provide essential functions such as food, fiber, medicines, fuel, and shelter for other organisms.
- **Soil Health:** Plant diversity promotes soil fertility, increases microbial activity, and enhances soil carbon storage.
- **Water Management:** Diverse plant cover helps protect watersheds and mitigate soil erosion.
- **Climate Regulation:** Plants play a role in moderating local and global climates.



Threats to Plant Biodiversity



- **Human Population Growth:** Increasing human populations lead to greater demands on land and resources.
- **Habitat Destruction and Modification:** Deforestation and other habitat changes reduce the space available for plants to thrive.
- **Pollution:** Contamination of air, water, and soil can harm plant life.
- **Climate Change:** Changing environmental conditions can stress plant species and disrupt ecosystems.
- **Agricultural Practices:** The widespread cultivation of a few major crops has led to a significant reduction in the diversity of agricultural plants.

Conservation Efforts

- **Seed Banks:** Preserving heirloom seeds and wild plant genetic resources in collections ensures their future availability.
- **Genetic Resource Management:** Studying and managing plant genetic resources is vital for improving cultivated plants and maintaining food security.
- **Global Initiatives:** Strategies like the Global Strategy for Plant Conservation aim to coordinate international action to protect plant life.



The Global Strategy for Plant Conservation (GSPC) is an international framework adopted by the Convention on Biological Diversity (CBD) to prevent the ongoing loss of plant diversity and to promote sustainable plant use.



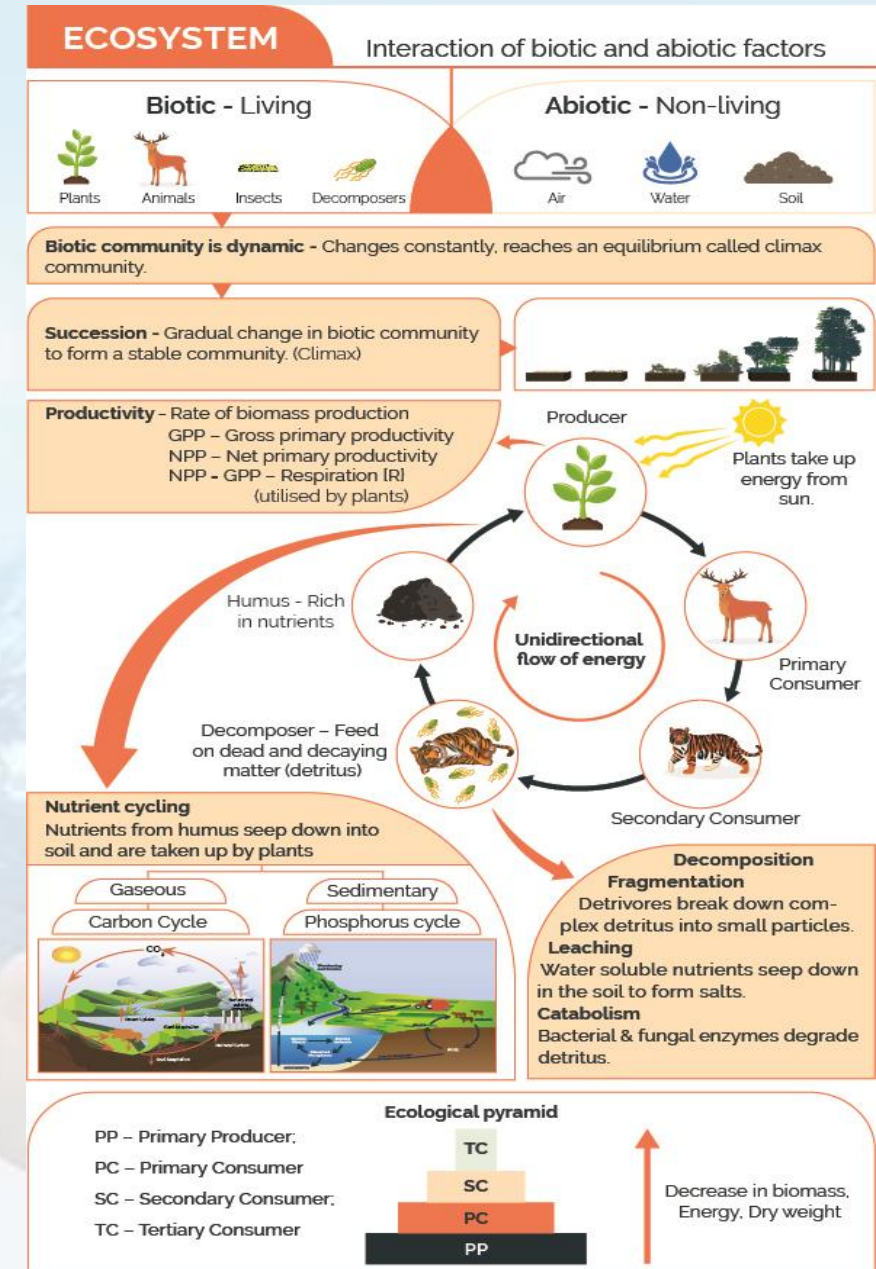
- **What is an ecosystem and what are its components?**
- An **Ecosystem** is a community of living organisms, referred to as biotic components, interacting with their non-living surroundings, known as abiotic components. These interactions create a delicate balance where energy, nutrients, and materials flow through various pathways, supporting the functioning and survival of the ecosystem as a whole.
- All organisms and their physical environment in a single location.
- Self sustaining and self-regulating communities of organisms interacting with one another and with their environment

Types of Ecosystem

There are two main types of ecosystems;

1. Natural ecosystem – It is a naturally produced biological environment found in nature. It includes deserts, forests, grasslands, lakes, mountains, ponds, rivers, oceans, etc.

2. Artificial ecosystem – It is an artificial environment which is created and maintained by man. It includes an aquarium, crop fields, gardens, parks, zoo, etc.



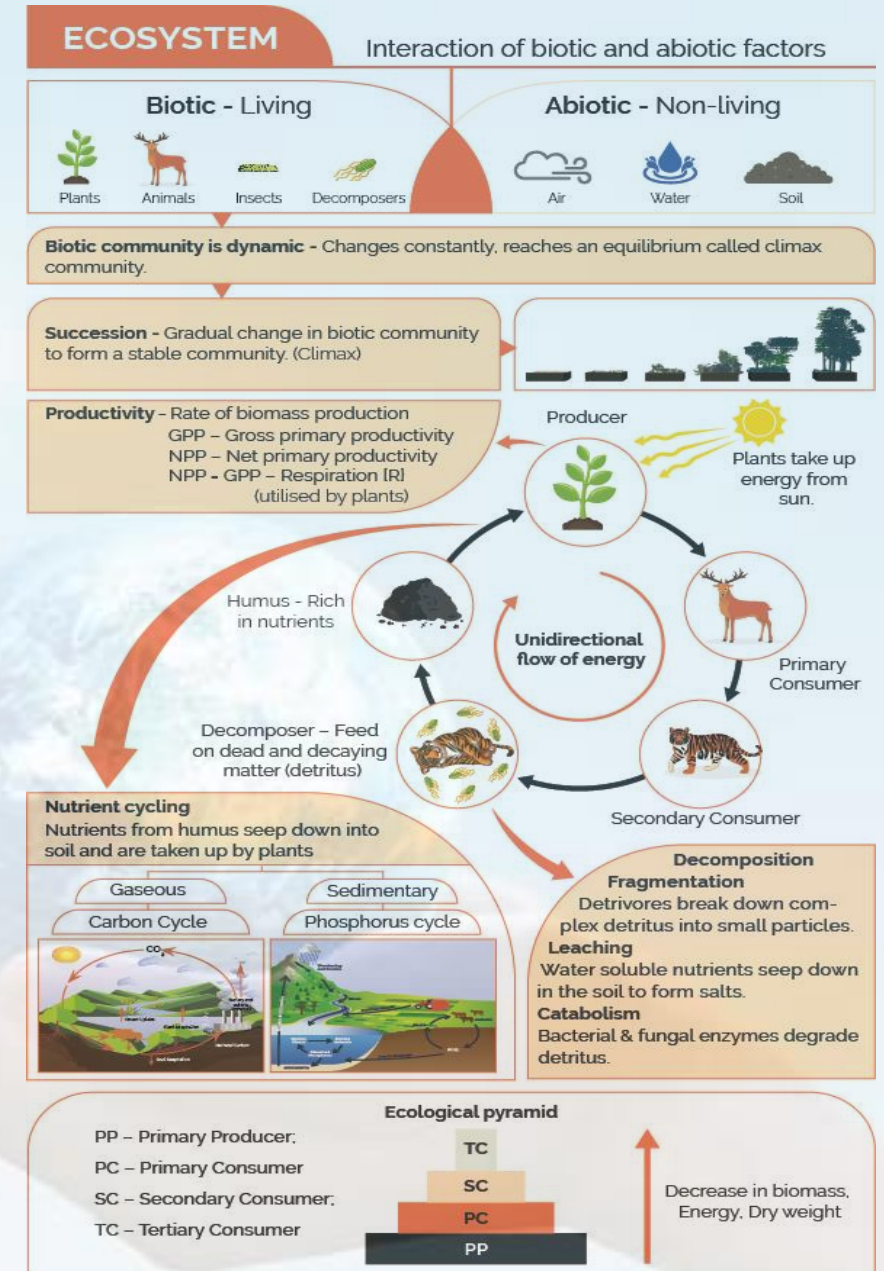
Ecosystem Structure

1. Abiotic components:

- Energy solar energy
- Physical factors: Temperature, light, wind, etc.
- Chemicals factors:
 - Inorganic: substances (oxygen, carbon, etc.)
 - Organic substances (carbohydrates, proteins, etc.)

2. Biotic components:

- Producers: green plants (autotrophs)
- Consumers: animals (heterotrophs)
 - Herbivores: (primary consumer)
 - Carnivores (primary, secondary, tertiary, etc.)
 - Omnivores (can feed on both plants and animals.
- Scavengers (top utilize the dead remains of animals
- Decomposers (saprotrophs) bacteria and fungi



1. Forest Habitat 🌳

- Forests have **dense tree cover** that creates a canopy.
- They receive **high rainfall** and maintain **high humidity**.
- Sunlight is **abundant at the top** but limited on the forest floor.
- Forests are rich in **biodiversity** with many layers of vegetation.





2. Grassland Habitat 🌾

- Grasslands are **open areas dominated by grasses** with very few trees.
- They get **moderate rainfall**, not enough to support dense forests.
- These habitats often face **grazing and natural fires**.
- Grasslands support **large herbivores and predators**.



3. Desert Habitat 🌵

- Deserts receive **very little rainfall** and are mostly dry.
- They have **extreme temperatures**: very hot during the day and cold at night.
- Soil is mostly **sandy or rocky** with poor water retention.
- Sunlight is **intense** with little shade.



4. Mountain Habitat

- Found at high altitudes with **cold climate and snow** in higher regions.
- The air is **thin**, and the soil is **rocky**.
- These areas face **strong winds** and have a **short growing season**.
- Vegetation decreases as altitude increases.

5. Aquatic Habitat

- Aquatic habitats include **freshwater** (ponds, lakes, rivers) and **marine** (seas, oceans).
- The soil is **submerged in water**, and light availability **decreases with depth**.
- Oxygen levels vary in different water bodies.
- Conditions differ greatly between shallow water and deep oceans.





6. Coastal / Mangrove Habitat 🌴

- Found along **sea-coasts** and **river deltas**.
- Soil is **salty, swampy, and waterlogged**.
- These areas face **tidal flooding** and **high humidity**.
- They provide a transition zone between land and sea.

Summary Table

Habitat	Characteristics	Example Plants	Adaptations
Forest 	Dense trees, high rainfall, shade	Teak, Sal, Ferns	Broad leaves, drip-tips
Grassland 	Open, moderate rain, grazing	Grasses, Sunflower	Deep roots, narrow leaves
Desert 	Hot days, little rain, sandy soil	Cactus, Aloe, Date palm	Water storage, spines, waxy coating
Mountain 	Cold, snowy, rocky soil	Pine, Cedar, Moss	Needle leaves, conical shape
Aquatic 	Water-covered, less oxygen	Lotus, Hydrilla, Seaweed	Floating stems, air spaces
Coastal 	Salty, swampy soil, tides	Mangroves, Coconut	Breathing roots, salt tolerance