

Environment:

Environment is derived from the French word 'environ', which mean encircle or surrounding. Environment is a complex of many variables, which surrounds man as well as the living organisms. Environmental studies describe the interrelationships among organisms, the environment and all the factors, which influence life on earth, including atmospheric conditions, food chains, the water cycle, etc. It is a basic science about our earth and its daily activities, and therefore, this science is important for one and all.

Components of environment:

Lithosphere

1. The outermost part of the Earth which consists of Upper Mantle and Crust of the Earth is known as Lithosphere.
2. Tectonic plates are a subdivision of Lithosphere.
3. Lithosphere has rigid mechanical properties. Pedosphere is the uppermost part of the lithosphere which reacts chemically with other 3 other major domains of earth namely; hydrosphere, biosphere and atmosphere.
4. Thickness – about 100 km.

Atmosphere

- The earth is surrounded by a layer of gas called the atmosphere.
- The gaseous layers that surround the earth— where oxygen, nitrogen, carbon dioxide and other gases are found and interact
- **The changes in the atmosphere produce changes in the weather and climate.**
- The atmosphere **extends up to a height of about 1,600 kilometres.**
- **The gravitational force of the earth holds the atmosphere around it**
- The atmosphere is divided into five layers based on composition, temperature and other properties and they are:
 - the troposphere
 - the stratosphere
 - the mesosphere
 - the thermosphere
 - the exosphere
- About 99 per cent of clean and dry air in the atmosphere is composed mainly of nitrogen and oxygen. Nitrogen 78 per cent, oxygen 21 per cent and other gases like carbon dioxide, argon and others comprise 1 per cent by volume.

- The **density of the atmosphere: Maximum at the sea level and decreases rapidly as we go up.**

Hydrosphere

- The earth is called the blue planet.
- More than 71 per cent of the earth is covered with water and 29 per cent is with the land. Hydrosphere consists of water in all its forms.
- More than 97% of the Earth's water is found in the oceans and is too salty for human use.
- Hydrosphere consists of water in all its forms like running water in oceans and rivers and in lakes, ice in glaciers, underground water and the water vapour in the atmosphere.
- 97% of the Earth's water is found in the oceans and is too salty, the rest of the water is in the form of ice sheets and glaciers or under the ground and a very a small percentage is available as freshwater for human use

Biosphere – The Domain of Life

- The biosphere is the narrow zone of contact between the land, water and air.
- It is the zone where life exists that makes this planet unique.
- The organisms in the biosphere are commonly divided into:
 - the plant kingdom
 - the animal kingdom
- The three domains of the earth interact with each other and affect each other in some way or the other.

Ecosystem:

An **ecosystem** is a geographical region where plants, animals, and various species, as well as weather and topography, work together to form a living environment. Ecosystems encompass both living organisms and non-living elements, categorized into two types: Natural ecosystems and Manmade.

Components of Ecosystem

Biotic components are the living things that have a direct or indirect influence on other organisms in an environment. For example plants, animals, and microorganisms and their waste materials.

Abiotic components of an ecosystem include all chemical and physical elements i.e. non-living components. Abiotic components can vary from region to region, from one ecosystem to another. They mainly take up the role of life supporter. They determine and restrict the population growth, number, and diversity of biotic factors in an ecosystem. Hence, they are called limiting factors.

The energy flow from one level to another level in a food chain gives the trophic level of an ecosystem. The producers come at first trophic level followed by herbivores (primary consumers), then small carnivores (secondary consumers) and large carnivores (tertiary consumers) occupy the fourth trophic level.

- Food chain: **Food chain** is a **feeding hierarchy** in which organisms in an ecosystem are grouped into **trophic (nutritional) levels** and are **shown in a succession** to represent the **flow of food energy** and the **feeding relationships** between them
- A **food web** is the natural interconnection of food chains and a graphical representation of what-eats-what in an ecological community
- Food chains **intertwine** locally into a food web because most organisms consume more than one type of animal or plant.

- Major parts of Food Chain
 - **Sun:** This is the initial source of energy, which provides energy for everything on the planet
 - **Producers:** This is the first stage of Food Chain. These are any plant or other organisms that produce their own nutrients through photosynthesis
 - **Consumers:** These are all organisms that are dependent on plants or other organisms for food. This is the largest part of a food web, as it contains almost all living organisms
 - **Decomposers:** These are organisms that get energy from dead or waste organic material. This is the last stage in a food chain, and they convert organic waste materials into inorganic materials like nutrient-rich soil or land.

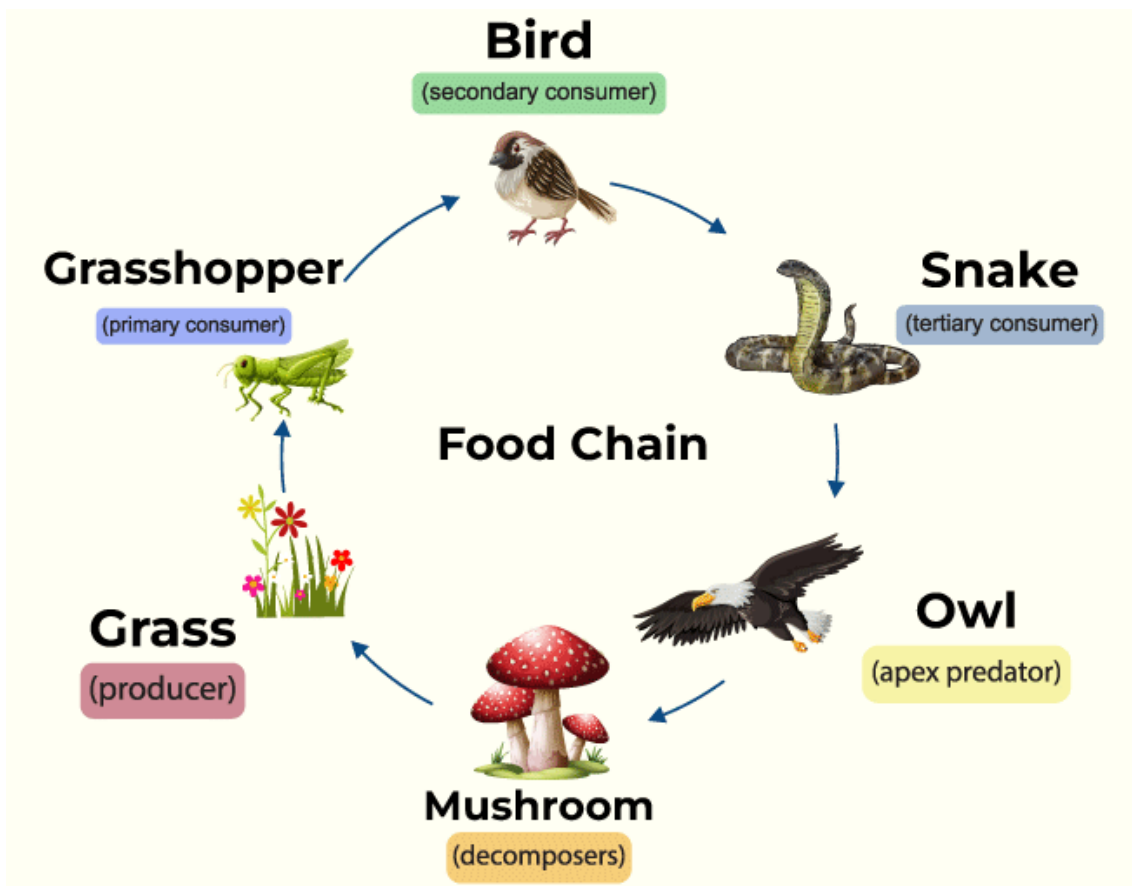


Fig: Food chain

Climate change:

Climate change refers to long-term shifts in temperature, precipitation patterns, wind patterns, and other aspects of the Earth's climate system. It poses significant challenges to both natural ecosystems and human societies, necessitating urgent action.

Definition and Causes:

Climate change is primarily caused by human activities, including the emission of greenhouse gases (GHGs) and deforestation.

GHGs trap heat in the Earth's atmosphere, leading to the greenhouse effect and resulting in global warming.

Implications on Global Ecosystems:

Rising temperatures and changing precipitation patterns affect ecosystems and biodiversity.

Increased frequency and intensity of extreme weather events impact habitats, species distribution, and ecological balance.

Melting glaciers and polar ice caps threaten marine ecosystems and contribute to sea-level rise.

- **Greenhouse gases (GHGs) are a group of naturally occurring and human-generated gases** present in the Earth's atmosphere.
 - These gases have the unique property of absorbing and emitting heat, trapping thermal energy within the atmosphere.
- They **act as a thermal blanket, allowing sunlight to enter the atmosphere** while preventing a significant portion of the absorbed heat from escaping back into space.

Burning fossil fuels, cutting down forests and farming livestock are increasingly influencing the climate and the earth's temperature.

The Primary **Greenhouse gases** GHGs are:

1. Water Vapour
2. Carbon dioxide
3. Methane
4. Nitrous oxide
5. Ozone

Other GHGs are carbon monoxide, fluorinated gases, chlorofluorocarbons (CFCs), black carbon (soot), and brown carbon.

Among the greenhouse gases, only water vapour can absorb both incoming (UV) and outgoing (infrared) radiation.

AIR POLLUTION

Air pollution refers to any physical, chemical or biological change in the air. It is the contamination of air by harmful gases, dust and smoke which affects plants, animals and humans drastically.

There is a certain percentage of gases present in the atmosphere. An increase or decrease in the composition of these gases is harmful to survival. This imbalance in the gaseous composition has resulted in an increase in earth's temperature, which is known as global warming.

Types of Air Pollutants

There are two types of air pollutants:

Primary Pollutants

The pollutants that directly cause air pollution are known as primary pollutants. Sulphur-dioxide emitted from factories is a primary pollutant.

Secondary Pollutants

The pollutants formed by the intermingling and reaction of primary pollutants are known as secondary pollutants. Smog, formed by the intermingling of smoke and fog, is a secondary pollutant.

Causes of Air Pollution

Following are the important causes of air pollution:

Burning of Fossil Fuels

The combustion of fossil fuels emits a large amount of sulphur dioxide. Carbon monoxide released by incomplete combustion of fossil fuels also results in air pollution.

Automobiles

The gases emitted from vehicles such as jeeps, trucks, cars, buses, etc. pollute the environment. These are the major sources of greenhouse gases and also result in diseases among individuals.

Agricultural Activities

Ammonia is one of the most hazardous gases emitted during agricultural activities. The insecticides, pesticides and fertilisers emit harmful chemicals in the atmosphere and contaminate it.

Factories and Industries

Factories and industries are the main source of carbon monoxide, organic compounds, hydrocarbons and chemicals. These are released into the air, degrading its quality.

Mining Activities

In the mining process, the minerals below the earth are extracted using large pieces of equipment. The dust and chemicals released during the process not only pollute the air, but also deteriorate the health of the workers and people living in the nearby areas.

Domestic Sources

The household cleaning products and paints contain toxic chemicals that are released in the air. The smell from the newly painted walls is the smell of the chemicals present in the paints. It not only pollutes the air but also affects breathing.

Effects of Air Pollution

The hazardous effects of air pollution on the environment include:

Diseases

Air pollution has resulted in several respiratory disorders and heart diseases among humans. The cases of lung cancer have increased in the last few decades. Children living near polluted areas are more prone to pneumonia and asthma. Many people die every year due to the direct or indirect effects of air pollution.

Global Warming

Due to the emission of greenhouse gases, there is an imbalance in the gaseous composition of the air. This has led to an increase in the temperature of the earth. This increase in earth's temperature is known as global warming. This has resulted in the melting of glaciers and an increase in sea levels. Many areas are submerged underwater.

Acid Rain

The burning of fossil fuels releases harmful gases such as nitrogen oxides and sulphur oxides in the air. The water droplets combine with these pollutants, become acidic and fall as acid rain which damages human, animal and plant life.

Ozone Layer Depletion

The release of chlorofluorocarbons, halons, and hydrochlorofluorocarbons in the atmosphere is the major cause of depletion of the ozone layer. The depleting ozone layer does not prevent the harmful ultraviolet rays coming from the sun and causes skin diseases and eye problems among individuals.

Effect on Animals

The air pollutants suspend in the water bodies and affect aquatic life. Pollution also compels the animals to leave their habitat and shift to a new place. This renders them stray and has also led to the extinction of a large number of animal species.

Air Pollution Control

Following are the measures one should adopt, to control air pollution:

Avoid Using Vehicles

People should avoid using vehicles for shorter distances. Rather, they should prefer public modes of transport to travel from one place to another. This not only prevents pollution, but also conserves energy.

Energy Conservation

A large number of fossil fuels are burnt to generate electricity. Therefore, do not forget to switch off the electrical appliances when not in use. Thus, you can save the environment at the individual level. Use of energy-efficient devices such as CFLs also controls pollution to a greater level.