

# CHAPTER-13

## Our Environment

### Topic-1

### Ecosystem and Food Chain

**Concepts Covered** • Ecosystem and its components, • Food chain, food web, trophic levels, • Energy flow, • Ten percent law, • Biological magnification



### Revision Notes

- ▶ Everything that surrounds us is environment. It includes both living (biotic) and non-living (abiotic) components.



### Mnemonics

**Concept:** Major components of environment

**W:** Water

**A:** Air

**Mnemonics:** WASAP

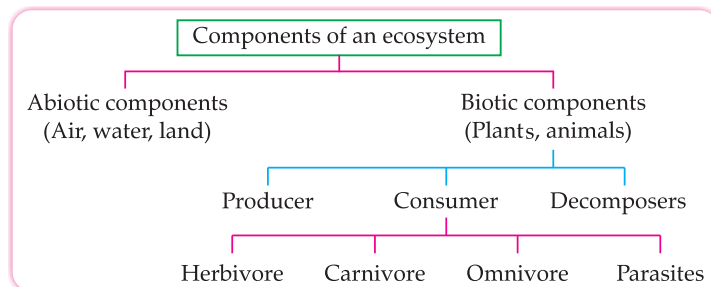
**S:** Soil

**A:** Animals

**Interpretation:**

**P:** Plants

- ▶ Interaction between these biotic and abiotic components forms an ecosystem.
- ▶ **Ecosystem:** All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem. e.g., forest, pond etc.
- ▶ **Types of Ecosystem:** It is of two types:
  - (a) **Natural Ecosystem:** The ecosystem which exists in nature on its own. e.g., forest, lake, ocean, etc.
  - (b) **Artificial Ecosystem:** Man-made ecosystem is called artificial ecosystem. Example:- crop field, aquarium, garden, etc.



- ▶ Producers includes green plants and algae. They contain chlorophyll pigment which helps them to carry out the process of photosynthesis in the presence of light. Thus, they are also called as converters or transducers.
- ▶ Herbivores, carnivores, omnivores and parasites are the various types of consumers.
- ▶ **Consumers** are those organisms which depend upon the producers for food, either directly or indirectly by feeding on other consumers for their sustenance. They are also called **heterotrophs**.
- ▶ **Parasites** are those organisms that live outside (ectoparasites) or inside (endoparasites) the body of another organisms, i.e., host. e.g., parasites of human include fleas and lice.
- ▶ **Decomposers** are those micro-organisms that obtain energy from the chemical breakdown of dead organisms or animals or plant wastes. Decomposers break down the complex organic substances into simple inorganic substances that go into the soil and are used up again by the plants. They help in the replenishment of natural resources.
- ▶ **Food chain** is the sequence of organisms through which food energy flows in an ecosystem. It is a succession of organisms that eat other organisms and may, in turn, be eaten themselves.

**Example:**

Grass → Grasshopper → Frog  
(Producer) (Herbivore) (Carnivore)  
→ Snake → Eagle  
(Carnivore) (Top Carnivore)

## Key Facts

- The first link in a food chain is always a producer (green plants) as they have the ability to trap solar energy with the help of chlorophyll. The last link is always a decomposer.
- Maximum concentration of such chemicals is found to accumulate in human body as human occupies the top level in any food chain.

- ▶ **Trophic Levels** are the various steps or levels in the food chain where transfer of food or energy takes place. Producers are the first trophic level, herbivores are the second trophic level, carnivores or secondary consumers are the third trophic level and large carnivores or tertiary consumers are the fourth trophic level.
- ▶ **Food Web** is the network of various food chains which are interconnected at various trophic levels. Since an organism can occupy position in more than one food chain, in a food web it occupies more than one trophic level. It represents the feeding relationship within the community.
- ▶ **Energy Flow:** The flow of energy through different steps in the food chain is unidirectional. This means that the energy that is captured by the autotrophs does not revert back to the solar input and the energy which passes to the herbivores does not come back to autotrophs.
- ▶ **The entire process of energy flow can be summarised in the following four steps:**
  - The flow of energy in an ecosystem is always linear or unidirectional. The energy captured from producers does not revert to the solar input. Also, the energy which passes to the herbivores does not come back to autotrophs.
  - At every step in a food chain the energy received by the organism is also used for its own metabolism and maintenance. The left over is passed to next higher trophic level. Thus, energy flow decreases with successive trophic levels.
  - The number of trophic levels in a food chain is restricted by 10% flow of energy, very less amount of energy is available to the last trophic level.

## Key Word

**Food chain** describes relationship of organism about 'who eats whom'.

- The number of steps is limited to four or five in a food chain for the transfer of energy.
- ▶ **10 Percent Law:** It states that only 10 per cent of food energy is transferred from one trophic level to the next level. The remaining 90 per cent energy is used in life processes (digestion, growth, reproduction, etc.) by the present trophic level.
- ▶ Due to this gradual decrease in energy, food chains contain 3 - 4 trophic levels.
- ▶ **Biological Magnification:** The concentration of harmful chemicals goes on increasing with every next trophic level in a food chain. This is called as biological magnification.

## Example-1

Suppose that 1000 J of solar energy is received by green plants then only 1% of solar energy available on earth is utilized by plants. So, only 10 J i.e. 1% of 1000 J is trapped by plants and rest 990 J of energy is lost to the environment. So, plants utilise only 10 J of energy. Next, only 10% of the 10 J energy of plant i.e. 1 J is available to the herbivores while 9 J is lost to the environment. Again, just 10 % of the 1 J of energy of herbivore is utilized by carnivore animals. Thus, carnivore animal have only 0.1 J of energy while 0.9 J is lost to the environment.



## Topic-2

## Biodegradable and Non-Biodegradable Substances and Global Warming

**Concepts Covered** • *Methods of waste disposal*, • *Environmental problems caused by humans*, • *Ozone depletion*.



### Revision Notes

- ▶ **Environmental problems caused by humans are:**
  - (i) Pollution due to mismanagement of waste disposal.
  - (ii) Depletion of the Ozone Layer and waste disposal.
- ▶ **Waste Materials:** Unwanted or unusable materials which are discarded after primary use, or is worthless, defective and of no use.
- ▶ **Garbage contains following type of materials:**
  - (a) **Biodegradable Wastes:** Substances which can be decomposed by the action of micro-organisms are called as biodegradable wastes. e.g., fruit and vegetable peels, cotton, jute, cow-dung, paper, etc.
  - (b) **Non-biodegradable Wastes:** Substances which cannot be decomposed by the action of micro-organisms are called as non-biodegradable wastes. e.g., plastic, polythene, metals, synthetic fibres, radioactive wastes, pesticides, etc.
- ▶ **Methods of Waste Disposal:**
  - (a) **Biogas Plant:** Biodegradable waste can be used in biogas plant to produce biogas and manure.
  - (b) **Sewage Treatment Plant:** The drain water can be cleaned in sewage treatment plant before adding it to rivers.
  - (c) **Land Fillings:** The wastes are buried in low lying areas and are compacted by rolling with bulldozers.
  - (d) **Composting:** Organic wastes are filled in a compost pit and covered with a layer of soil, after about three months, garbage changes to manure.
  - (e) **Recycling:** Non-biodegradable waste are recycled to make new items.
  - (f) **Reuse:** It is a conventional technique to use an item again e.g., newspaper for making envelopes.
  - (g) Biodegradable and non-biodegradable wastes should be discarded in two different dustbins. It is because:
    - (i) It saves time/ energy in segregation.
    - (ii) Biodegradable items can be sent directly for composting.
    - (iii) Non-biodegradable items can be sent for an appropriate reuse/recycle.
- ▶ **Formation of ozone in Atmosphere :**

Ozone is continuously formed by the action of UV rays on molecular oxygen, and also degraded into molecular oxygen in the stratosphere. The high energy ultraviolet radiations split ozone into molecular and atomic oxygen with release of large amount of heat. This heat is used in warming of the stratosphere.

$$\text{O}_3 \rightarrow \text{O}_2 + [\text{O}] + \text{Heat}$$

This oxygen atom then recombine with oxygen ( $\text{O}_2$ ) molecule to form ozone molecule.

- ▶ Ozone (O<sub>3</sub>) : It is a molecule formed by three atoms of oxygen. Ozone performs an essential function of shielding the surface of the earth from ultraviolet radiation of the sun.
- ▶ Ozone layer is a layer of the earth's atmosphere in which most of the atmosphere's ozone is concentrated.
- ▶ **Ozone Depletion** : Ozone depletion is the reduction in concentration of ozone layer.
- ▶ There are several reasons for depletion of the ozone layer.
- ▶ The foremost is the use of chlorofluorocarbons (CFCs). The other factor responsible for ozone destruction is the pollutant nitrogen monoxide (NO).
- ▶ When the harmful chemicals like chlorofluorocarbons (CFCs) are released into the air, it accumulates in the upper atmosphere and reacts with ozone resulting in reduction in thickness of the ozone layer.
- ▶ Thus, the ozone layer in the atmosphere becomes thinner and gets depleted allowing more ultraviolet rays to pass through it. This phenomenon is referred as the Ozone hole.
- ▶ The Antarctic hole in ozone layer is caused due to chlorine molecules present in chlorofluorocarbons (CFCs), that are used by human beings.
- ▶ **Ozone layer can be protected by :**
  - (a) Stopping the release of Chlorofluorocarbons (CFCs).
  - (b) Removing the pollutant nitrogen monoxide.
  - (c) Reducing the usage of air conditioners.
- ▶ The **Montreal Protocol** (an international treaty in Canada, 1987) was signed to control the emission of ozone depleting substances. Subsequently many more efforts have been made and protocols have been laid down to define roadmaps, separately for developed and developing countries, for reducing the emission of CFCs and other ozone depleting chemicals.  
United Nations Environment Programme (UNEP) succeeded in forging an agreement to stop CFC production at 1986 levels by all the countries. (KYOTO Protocol).

## 🔑 Key Facts

- Ozone is present in stratosphere part of the atmosphere i.e. 20- 30 km above the earth.
- The decrease in the thickness of ozone layer over Antarctica was first observed in 1985 and was termed as ozone hole.

