

OUR ENVIRONMENT

- The term environment means surroundings. It is sum total of all biotic and abiotic factors that surround and potentially influence an organism.
- The abiotic components are the physical factors and hence non-living, e.g. temperature, light, wind, humidity, precipitation, water, soil, minerals, pH, etc.
- The biotic components include all such living organisms with which the organism interacts.
- Both these biotic and abiotic components of environment interact and influence each other and maintain a balance in the environment in a natural way.
- Human beings change the environment to fulfil their pressing needs and in fact the uncontrolled activities of human beings are damaging the natural balance of the environment.

WHAT HAPPENED WHEN WE ADD OUR WASTE TO THE ENVIRONMENT?

- All the waste materials produced by the various activities of human beings and animals are poisonous to some extent and can be divided into two main groups:
 - Biodegradable wastes
 - Non-biodegradable wastes.

BIODEGRADABLE WASTES

- **Biodegradable wastes** are those materials which can be broken down into simpler, non poisonous substances by the action of various micro-organisms like bacteria, fungi etc. e.g. Food refuse, agricultural residue, domestic sewage, wood, paper, cow dung, etc.
- **Effects of biodegradable wastes:** It acts as pollutants only when their quantity becomes large and they do not decomposed by micro-organisms at the right time.
 - It gives foul smell on decomposition and makes the surroundings dirty. It also destroys the natural beauty.
 - It may block the sewage outlet and drains which create pool of water and become breeding site of mosquitoes and helps in spreading malaria and dengue.
 - Flies breed at huge heaps of solid wastes containing bio-degradable substances, carry the germs and spread diseases like diarrhoea, typhoid, tuberculosis etc.

NON-BIODEGRADABLE WASTES

- **Non-biodegradable wastes** are those which cannot be broken down into simpler, harmless substances easily in nature. e.g. Aluminium cans, silver foil, iron nails, plastics, glass, DDT, radioactive waste, polythene, mercury, etc.
- **Effects of non-biodegradable wastes:** It acts as pollutants even in the quantity are low because they are very harmful and poisonous and do not decompose easily.
 - They enter food chain and their concentration goes on increasing from one trophic level to the next. This lead to biological magnification and result in harmful effects in human beings and other organism.
 - These substances are inert and persist in the environment for a long time and harm the living components of the ecosystems.

- Dumping these wastes affects the soil fertility and reduces the crop yields.
- **Why some substances are biodegradable and some non-biodegradable?**
 - Decomposition of any materials by micro-organisms is a digestive process in order to get nutrition and energy. The micro-organisms like bacteria, fungi and other decomposers present in our environment are specific in their action. They have enzymes for degradation of natural matters like paper and clothes. But they don't have any enzyme for manmade materials like plastic. So, due to the specific enzymatic action of micro-organisms some waste materials are biodegradable and some are non-biodegradable.

ECOSYSTEM – WHAT ARE ITS COMPONENTS?

- **Ecosystem:** Ecosystem is a structural and functional unit of the biosphere comprising living organisms and their non-living environment.

TYPES OF ECOSYSTEMS

- **Natural ecosystem:** These ecosystems operate by themselves under natural conditions without any major interference by humans.
 - Terrestrial ecosystem: consisting of forest, grassland desert.
 - Aquatic ecosystem: consisting of pond, rivers, ocean, etc.
- **Artificial ecosystem:** These ecosystems are maintained artificially by man by addition of energy and planned manipulation.
- Croplands, orchards, garden, aquarium, etc are example of Manmade or Artificial ecosystem.

COMPONENTS OF ECOSYSTEMS

- An ecosystem consists of biotic components comprising living organisms and abiotic components comprising physical factors.
- **Abiotic components:** It includes all the non-living parts of the environment, air, water, soil and minerals. It includes the climatic and physical factors such as sunlight, temperature, rainfall, humidity, pressure, wind, etc.
- **Biotic components:** It includes all the living organisms of the environments, green plants, bacteria, microbes, fungi, animals, human beings, etc.
- On the basis of the mode of obtaining food, the organisms occurring in an ecosystem are classified into three main categories:
 1. Producers
 2. Consumers
 3. Decomposers
- **Producers:** Producers includes plants which can make their own food in the form of organic compounds like sugar and starch by the process of photosynthesis by using energy of sun in the presence of chlorophyll.
- **Consumers:** Those organisms which consume food prepared by producers are called consumers. All animals are consumers.
 - Herbivores directly depend upon plant by eating them are known as **primary consumers**.

- Carnivores indirectly depends upon plant by eating herbivores are known as **secondary consumers**.
- **Omnivores** and **parasites** are also consumers along with herbivores and carnivores.
- **Decomposers:** They are those organisms that obtain energy from chemical breakdown of dead remains and waste produce of organisms. They breakdown the complex organic substances into simple inorganic substances that goes into the soil and are used up again by the plants. e.g. bacteria and fungi.
- Decomposers are natural cleaning agent. They create a balance in the environment by recycling the materials and play an important role in the environment.

FOOD CHAINS

- The sequence of organisms in a community in which one organism consumes another organism to transfer food energy is called food chain.
- In an ecosystem various organisms are arranged in a series according to their food habit. This series or organisms taking part at various biotic levels form a food chain.
- Examples of food chain:
 - (a) In forest: Tree → Deer → Tiger
 - (b) In grassland: Grass → Grasshopper → Frog → Snake → Hawk
 - (c) In pond: Phytoplankton → Zooplankton → Fish → Bird
- **Significance of food chain:**
 - It helps in understanding the food relationship and interaction among various organisms in an ecosystem.
 - It helps in understanding the transfer of energy and nutrients though various trophic levels.
 - It helps in understanding the biological magnification.



Figure 15.1
Food chain in nature.
(a) in forest, (b) in grassland and (c) in a pond.

TROPHIC LEVEL

- Each step or level of the food chain forms a trophic level.
 - **First trophic level** always consists of autotrophs (producers) which can fix solar energy.
 - **Second trophic level** is that of herbivores (primary consumers) feeding on autotrophs (producers). e.g. cattle, deer, goat, rabbit.
 - **Third trophic level** includes small carnivores (secondary consumers) feeding on herbivores (primary consumers). e.g. cats, dogs, frogs.
 - **Fourth trophic level** includes larger carnivores (tertiary consumers) feeding on small carnivores (secondary consumers). e.g. wolves, snake, lion, tigers.

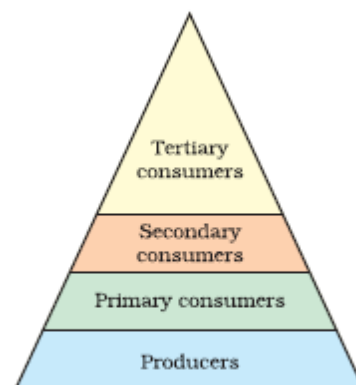


Figure 15.2
Trophic levels

FOOD WEB

- The network formed by various food chains which are inter-connected with each other is called a food web.

▪ **Significance of food web:**

- It is basic unit of ecosystem.
- It maintains the stability of an ecosystem.
- It provides alternative pathways of food availability.
- It helps in checking the over-population of certain species of plants or animals.

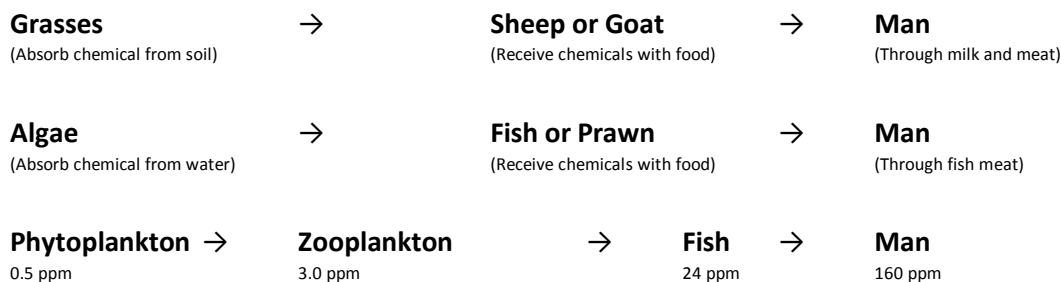
FLOW OF ENERGY IN AN ECOSYSTEM

- The interaction among various components of the environment involves flow of energy from one component of the system to another.
- The autotrophs capture solar energy and convert it into chemical energy. This energy supports all the activities of the living worlds.
- From autotrophs, the energy goes to the heterotrophs and decomposers. The energy moves progressively through various trophic levels.
- The green plants in a terrestrial ecosystem capture about 1% of the energy of sunlight that falls on their leaves and convert it into food energy.
- When the green plants are eaten by the primary consumers, a great deal of energy is lost as heat to the environment. An average of 10% of the food eaten is turned into its own body and made available for the next levels of consumers.
- Thus, 10% can be taken as the average value for the amount of organic matter that is present at each step and reaches the next level of consumers.
- As little energy is available to the next level of consumers food chains generally consists of three or four steps. The loss of energy at each step is so great that very little energy remains after four trophic levels.
- There are greater numbers of individuals at the lower trophic levels of an ecosystem; the greatest number is of the producers.
- **Flow of energy is unidirectional in an ecosystem:** 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. As it moves progressively through the various trophic levels, it is no longer available to the previous level. Thus, the flow of energy is unidirectional.

BIOLOGICAL MAGNIFICATION OR BIOMAGNIFICATIONS

- The increase in concentration of harmful and non-biodegradable chemical substances like pesticides in the body of living organism with increasing trophic level of a food chain is called biological magnification.
- Pesticides like DDT are toxic chemical substances, which are sprayed on crops to protect them from various pests. Some amount of these chemicals is washed down into soil or into water body.
- From the soil, these harmful chemicals are absorbed by plants (Producers) along with water and minerals. Similarly, from water bodies, these taken up by aquatic plants.
- When herbivore animals (Primary consumers) consume these plants as food, these chemical enter their bodies and get accumulated.
- When carnivores (Secondary consumers) eat these animals, these pesticides are transferred to their bodies

- In this way pesticides enter the food chain at producer level and get concentrated at each successive step in the food chain.



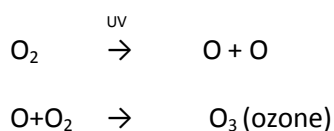
- Since humans occupy the top level in any food chain, so maximum amount of harmful chemical pesticides or pollutants get accumulated in our body and damage our health gradually. \

HOW DO OUR ACTIVITIES AFFECT THE ENVIRONMENT?

- Human beings are important part of the environment. Different activities of humans pollute and change the environment in adversely. Such unfavourable conditions created by humans threat the survival of humans and other living organism.
- Depletion of ozone layer and Disposal of waste are some of major man made environmental problems.

DEPLETION OF OZONE LAYER

- Around 23 km from the surface of the earth (in the stratosphere) there is a thick layer of ozone gas. It is formed by the action of ultraviolet rays of sun on oxygen. This thick layer of ozone is also called **Ozone blanket**.
- Ozone is a deadly poison. However, at higher level of atmosphere **it absorbs most of the harmful ultraviolet radiations** coming from sun and prevents them from reaching the earth.
- The ultraviolet radiations have extremely harmful effect on humans, animals as well as plant. It causes skin cancer, eye disease, damage immune system.
- In plants UV radiation adversely affects photosynthesis.
- Ozone is a form of oxygen. The high energy ultraviolet radiations split apart some molecular oxygen O₂ into free oxygen atoms O. This atomic oxygen is highly reactive and combines with the molecular oxygen to form ozone.



- The thinning of ozone layer is commonly called **ozone depletion**.
- The amount of ozone in the atmosphere began to drop sharply in the 1980s. This decrease has been linked to synthetic chemicals like **chlorofluorocarbons (CFCs)** which are used in refrigerators, air conditions, aerosol sprayers and in fire extinguishers.
- CH₄ and N₂O also cause ozone destruction through a complicated series of chemical reactions.
- **Montreal Protocol:** In 1987, the United Nation Environment Programme (**UNEP**) presented an agreement to protect stratospheric ozone layer by freezing CFC production at 1986 levels. 27

countries signed on the agreement that time, up till now more than 175 countries have signed the Montreal Protocol.

MANAGING OF GARBAGE WE PRODUCE

- Improvements in our lifestyle have resulted in greater amount of waste materials generation. Change in attitude and over consciousness of hygiene made us use more and more disposable daily items. Change in packaging, where we use more plastic and polythene led to production of more non-biodegradable wastes.
- The disposal of waste should be done in a scientific way. There are different methods of waste disposal which is categorised on the nature of waste to be disposed.
- **Recycling:** Some solid wastes like plastic, metals, and papers are recycled. Industrial wastes are treated in special plants and valuable wastes are recycled.
- **Preparation of Compost:** Biodegradable domestic wastes can be converted into compost by burying in a pit dug into ground and used as manure in the crop field.
- **Incineration:** It is burning of substances at high temperature over 1000°C to form ash. It reduces the volume of the wastes. It is used to destroy household waste, chemical waste, and biological waste (from hospitals). The reduced ash can be disposed by landfills.
- **Landfills:** Solids wastes can be disposed in low-laying area of ground and covered with it earth in urban area.
- **Sewage Treatment:** Domestic sewage is treated in treatment plant and cleaned before it is discharged into the river which does not pollute the river.