

CLASS X

OUR ENVIRONMENT

Environment: organisms immediate surrounding constitute environment.

Biogeochemical cycles: Cycling of materials through biotic and abiotic components of ecosystem is called biogeochemical cycles.

Major environmental problems: Waste accumulation and Depletion of ozone layer

Waste Generation: Waste produced by humans can be classified into two categories

Biodegradable and Non-biodegradable

Biodegradable wastes: *Substances that are broken down by biological processes are said to be biodegradable.*

Non-biodegradable substances: *Substances that are not broken down by biological processes are said to be non-biodegradable.*

Effect of Non-biodegradable substances in environment: *These substances may be inert and persist in the environment for a long time or may harm the various members of the eco-system.*

Biodegradable Plastics: (Refer)

Ecosystem

All organisms such as plants, animals, microorganisms and human beings as well as the physical surroundings interact with each other and maintain a balance in nature. All the interacting organisms in an area together with the non-living constituents of the environment form an ecosystem.

An ecosystem consists of biotic components comprising living organisms and abiotic components comprising physical factors like temperature, rainfall, wind, soil and minerals.

Components of an ecosystem

Abiotic and biotic

Abiotic Component: *The nonliving components of an ecosystem are called Abiotic components. (temperature, rainfall. Wind, soil, water)*

Biotic components: *The living components of an ecosystem are called biotic components. (Plants / producers, Animals / Consumers, Microorganisms/ Decomposers)*

Garden as an ecosystem: *In a garden we find different plants, such as grasses, trees; flower bearing plants like rose, jasmine, sunflower; and animals like frogs, insects and birds. All these living organisms interact with each other and their growth, reproduction and other activities are affected by the abiotic components of ecosystem. So a garden is an ecosystem.*

Types of ecosystem: *Terrestrial ecosystem and aquatic ecosystem*

Types of ecosystem: *Natural ecosystem and Artificial ecosystem (man made ecosystem)*

Aquarium, as an ecosystem (refer)

Natural cleaning mechanism in water bodies (rivers) (refer)

Organisms in an ecosystem:

Producers: *All green plants and certain blue green algae which can produce food by photosynthesis come under this category and are called the producers. These organisms can make organic compounds like sugar and starch from inorganic substances using the radiant energy of the Sun in the presence of chlorophyll.*

Consumers: *Organisms depend on the producers either directly or indirectly for their sustenance. These organisms which consume the food produced, either directly from producers or indirectly by feeding on other consumers are the consumers.*

Classification of consumers: *Consumers can be classed variously as herbivores, carnivores, omnivores and parasites.*

Decomposer: *The microorganisms, comprising bacteria and fungi, break-down the dead remains and waste products of organisms. These microorganisms are the decomposers as they break-down the complex organic substances into simple inorganic substances that go into the soil and are used up once more by the plants.*

Importance of Decomposers: *1. Help in the decomposition of dead remains
2. Help in natural replenishment of the soil*

Food Chain: *In an ecosystem, series of organisms are feeding on one another. This series of organisms taking part at various biotic levels form a food chain.*

Food Chain in a forest

Food chain in a grassland

Aquatic food chain

Trophic level: *Each step or level of the food chain forms a trophic level.*

The autotrophs or the producers are at the first trophic level. They fix up the solar energy and make it available for heterotrophs or the consumers.

The herbivores or the primary consumers come at the second, small carnivores or the secondary consumers at the third trophic level.

Larger carnivores or the tertiary consumers form the fourth trophic level.

Concepts related to the flow of energy in an ecosystem.

The interactions among various components of the environment involves flow of energy from one component of the system to another.

The autotrophs capture the energy present in sunlight and convert it into chemical energy. This energy supports all the activities of the living world.

From autotrophs, the energy goes to the heterotrophs and decomposers.

When one form of energy is changed to another, some energy is lost to the environment in forms which cannot be used again

⊕ *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 green plants are eaten by primary consumers, a great deal of energy is lost as heat to the environment, some amount goes into digestion and in doing work and the rest goes towards growth and reproduction. An average of 10% of the food eaten is turned into its own body and made available for the next level of consumers.*

⊕ *Therefore, 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. Since so little energy is available for the next level of consumers, food chains generally consist of only three or four steps. The loss of energy at each step is so great that very little usable energy remains after four trophic levels.*

⊕ *There are generally a greater number of individuals at the lower trophic levels of an ecosystem, the greatest number is of the producers.*

⊕ *The length and complexity of food chains vary greatly. Each organism is generally eaten by two or more other kinds of organisms which in turn are eaten by several other organisms. So instead of a straight line food chain, the relationship can be shown as a series of branching lines called a food web*

Food Web: *In an ecosystem each organism is eaten by two or more other kinds of organisms which in turn are eaten by several other organisms. This net work of food chain is called a food web.*

Important aspects of food chain

- 1. Flow of energy is unidirectional: 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. As it moves progressively through the various trophic levels it is no longer available to the previous level.*

Flow of energy in an ecosystem: *Refer figure 15.4 p 260.*

2. Biological magnification/ Biomagnification :

Food grains such as wheat and rice, vegetables and fruits, and even meat, contain varying amounts of pesticide residues

We use several pesticides and other chemicals to protect our crops from diseases and pests. These chemicals are either washed down into the soil or into the water bodies.

From the soil, these are absorbed by the plants along with water and minerals, and from the water bodies these are taken up by aquatic plants and animals. This is one of the ways in which they enter the food chain.

As these chemicals are not degradable, these get accumulated progressively at each trophic level.

As human beings occupy the top level in any food chain, the maximum concentration of these chemicals get accumulated in our bodies. This phenomenon is known as biological magnification

Pesticide levels in ready made food items (refer news paper reports)

Methods could be applied to reduce our intake of pesticides.(refer)

Human activities which affect the environment

*Depletion of the ozone layer and
Waste disposal*

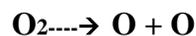
OZONE: *Ozone (O₃) is a molecule formed by three atoms of oxygen.. Ozone, is a deadly poison.*

OZONE LAYER IN THE ATMOSPHERE: *At the higher levels of the atmosphere, ozone forms a layer and performs an essential function. It shields the surface of the earth from ultraviolet (UV) radiation from the Sun.*

Harmful effect of UV radiation: This radiation is highly damaging to organisms,

,It causes skin cancer in human beings.

Formation of ozone layer: *Ozone at the higher levels of the atmosphere is a product of UV radiation acting on oxygen (O₂) molecule. The higher energy UV radiations split apart some molecular oxygen (O₂) into free oxygen (O) atoms. These atoms then combine with the molecular oxygen to form ozone as shown—*



Depletion of ozone layer: *The amount of ozone in the atmosphere began to drop sharply in the 1980s due to the increased use of synthetic chemicals like chlorofluorocarbons (CFCs) which are used as refrigerants and in fire extinguishers.*

CFCs: *CFCs are synthetic chemicals which are used as refrigerants and in fire extinguishers.*

UNEP: *In 1987, the United Nations Environment Programme (UNEP) succeeded in making an agreement to reduce CFC production at 1986 levels.*

CHEMICALS RESPONSIBLE FOR THE DEPLETION OF OZONE LAYER: (REFERR)

Effect of regulations put in place to control the emission of chemicals which damage the ozone layer(Refer)

Change in size of the ozone hole in recent years: (Refer)

Garbage Disposal OR Solid Waste Management

Landfills

Recycling of wastes

Preparation of compost

Vermicompost

Incineration or burning at high temperature

Production of biogas

Method of disposal of biodegradable waste and non-biodegradable waste by local bodies.

Harmful effects of biodegradable waste

Decomposition leads to foul smell.

Flies breed and spread diseases

Block drainage and cause breeding of mosquitoes.

Harmful effects of non-biodegradable waste

Persist for longer time

Harm the ecosystem

Enter the food chain (biomagnifications)

Affects soil fertility

Ways of dealing with biodegradable waste./Ways of dealing with domestic waste.

Sewage treatment

Local industries , polluting their waste .

E-pollution

Recycling

Impact of recycling process on environment.

Disposable paper cups.

Disposable cups are used in trains. When tea in trains was served in plastic glasses it had to be returned to the vendor. The introduction of disposable cups was done as a step forward for reasons of hygiene. The impact caused by the disposal of millions of these cups on a daily basis was not foreseen at that time. Later disposable cups made of clay called Kulhads, were introduced as an alternative. But a little thought showed that making these clay cups on a large scale would result in the loss of the fertile top-soil. Now disposable biodegradable paper-cups are being used.

Advantages of disposable paper-cups over disposable plastic cups:

Disposable paper cups are biodegradable does not harm the environment.

Use of plastic /thermocole plates for marriage parties should be stopped.