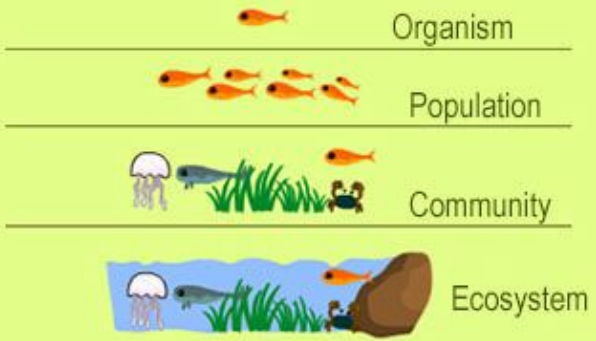
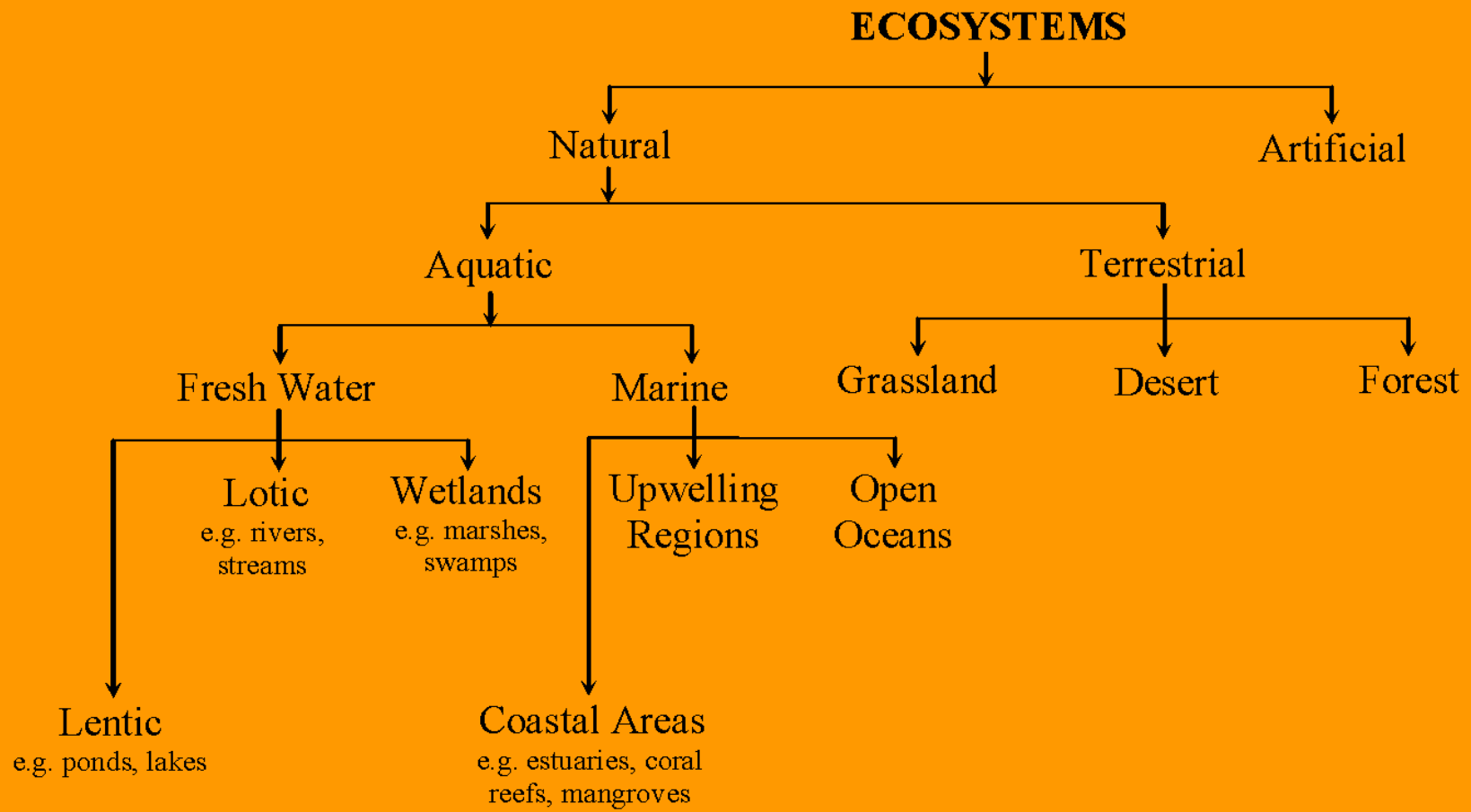
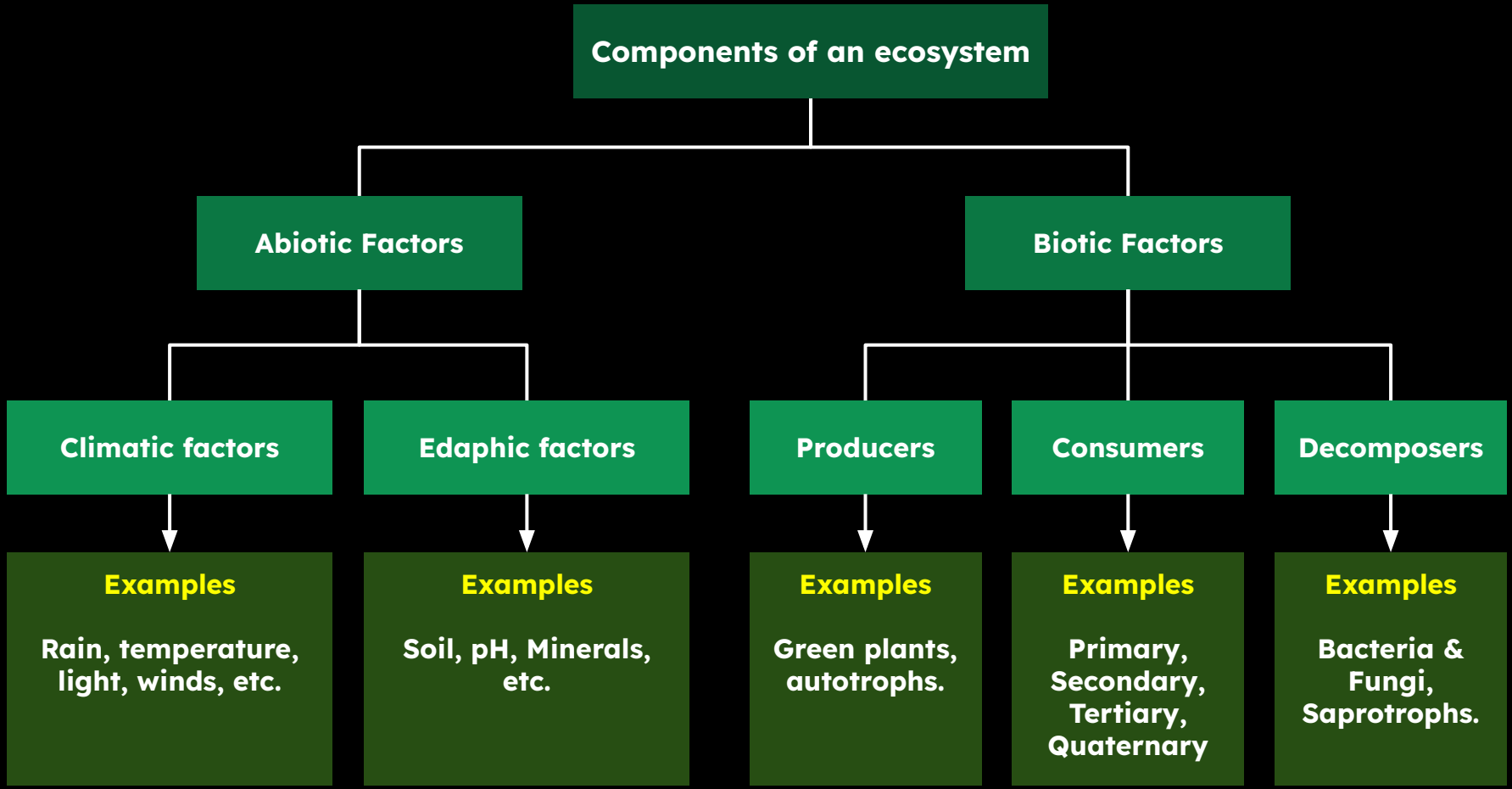
OUR ENVIRONMENT

Full Chapter

Environment	Eco-system
It is the surrounding where organisms live.	It is the community where the biotic and abiotic components interact with each other.
An organism's environment changes as it moves from one place to another.	The ecosystem remains the same no matter where the organism travels.
Environment is just a place in time.	Ecosystem depends upon all the essential life processes such as photosynthesis.




ECOSYSTEMS
Natural
Artificial
Aquatic
Terrestrial
Fresh Water
Marine
Grassland
Desert
Forest
Lotic
e.g. rivers, streams
Wetlands
e.g. marshes, swamps
Upwelling Regions
Open Oceans
Lentic
e.g. ponds, lakes
Coastal Areas
e.g. estuaries, coral reefs, mangroves


Components of an ecosystem
Abiotic Factors
Biotic Factors
Climatic factors
Edaphic factors
Producers
Consumers
Decomposers
Examples
Rain, temperature, light, winds, etc.
Examples
Soil, pH, Minerals, etc.
Examples
Green plants, autotrophs.
Examples
Primary, Secondary, Tertiary, Quaternary
Examples
Bacteria & Fungi, Saprotrophs.

ABIOTIC COMPONENTS

1. The non-living components of an ecosystem include the physical environment the soil, water and air along with the inorganic substances like carbon dioxide, nitrogen, oxygen etc.

2. The physical factors or climate factors like light, temperature, pressure and humidity are also considered abiotic components.

BIOTIC COMPONENTS

The biotic components of an ecosystem (or the living components of an ecosystem) is a community of organisms (like plants & animals), which is made up of many different inter-dependent population. The biotic community includes three types of organisms:

1. Producer organisms (or Autotrophs) which synthesize their own food. All the green plants are producers.

2. Consumer organisms (or Heterotrophs) which are dependent on others for food. All animals are consumers.

3. Decomposers organisms (or Saprotrophs) which consume the dead remains of other organisms. Certain bacteria and fungi are decomposers.

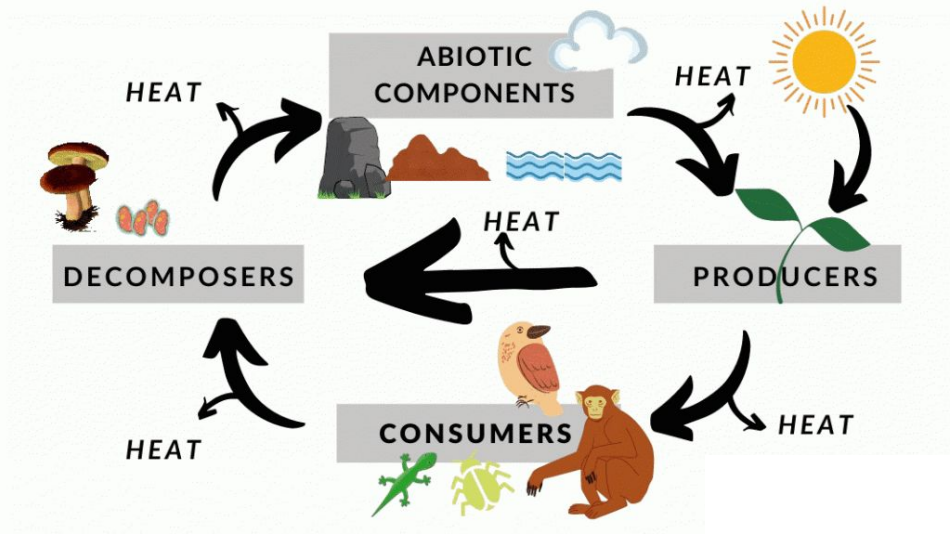
The Functioning of Ecosystem

Ecosystem functions as a self-sufficient or independent unit in nature.

All the non-living & living components makes the ecosystem function as follows:

- From the nutrient pool of the earth (soil, water and air), carbon dioxide, and water are absorbed by the producer organisms (green plants).
- With the help of sunlight energy, the producer organisms convert these inorganic substances into organic compounds like carbohydrates which act as food.
- The consumers derive their energy directly or indirectly, from producers. When the producers and consumers die, then decomposers act on their dead bodies to return the various elements back to the nutrient pool (soil, water and air).

An ecosystem involves input of energy and matter which are exchanged between living and nonliving components in a cyclic process.



Organisms can be grouped according to the manner in which they obtain their sustenance from the environment.

- Producers or Autotrophs
- Consumers
- Decomposers

PRODUCERS/ AUTOTROPHS

All green plants and certain blue-green algae which can produce food by the process of photosynthesis.

These are the source of nutrition for rest of ecosystem. They take up CO_2 and release oxygen in turn into environment, thus balance the composition of air.

CONSUMERS

Those organisms which are unable to synthesise their own food & consume the food produced by producers or eat other organisms as food.

They can be classified variously as:

- ➔ Herbivores;
- ➔ Carnivores;
- ➔ Omnivores;
- ➔ Parasites.

DECOMPOSERS

- These are microorganism which feed on decaying and dead organic matter.
- Micro-organisms which break down the complex organic compounds into simple inorganic substances.
- Examples: Fungi, and bacteria.

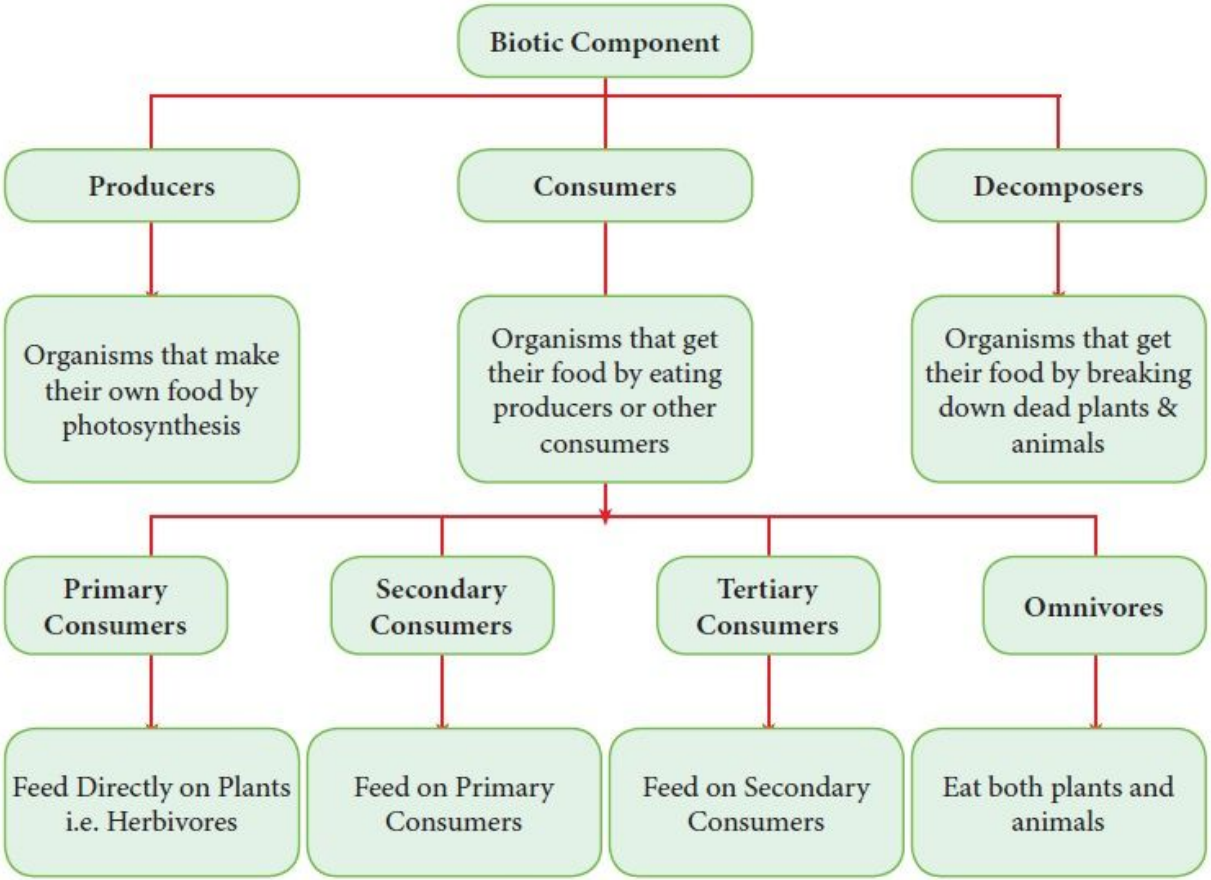


Figure 7.2 Biotic Components

FOOD CHAIN

A food chain is the flow of food energy from one organism to the next and to the next and so on.

Each organism stands at a particular level, which is known as TROPHIC LEVEL.

DEF : The **trophic level** is the position an organism occupies in the food chain. The producers form the first **trophic level**

TROPHIC LEVEL

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

First Trophic level: The autotrophs or the producers. They fix up the solar energy & make it available for heterotrophs or the consumers.

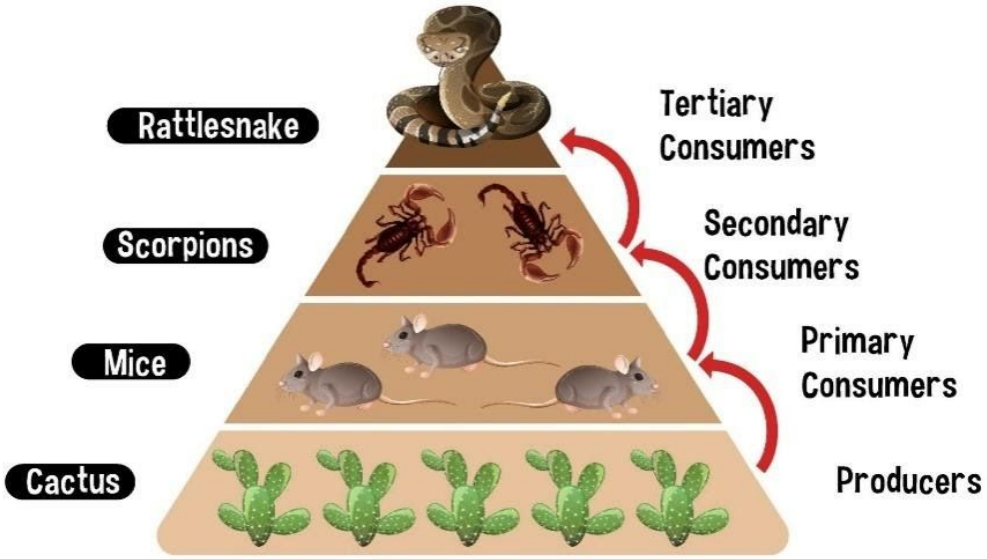
Second Trophic level- The herbivores or the primary consumers.

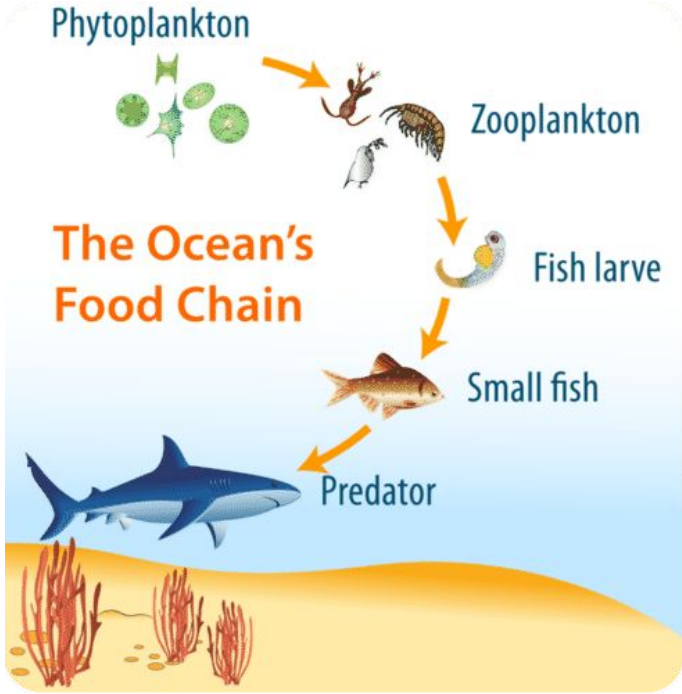
Third Trophic level- Small carnivores or the secondary consumers.

Fourth Trophic level- Larger carnivores or the tertiary consumers.

EXAMPLES OF FOOD CHAINS

GRASS → DEER → LION



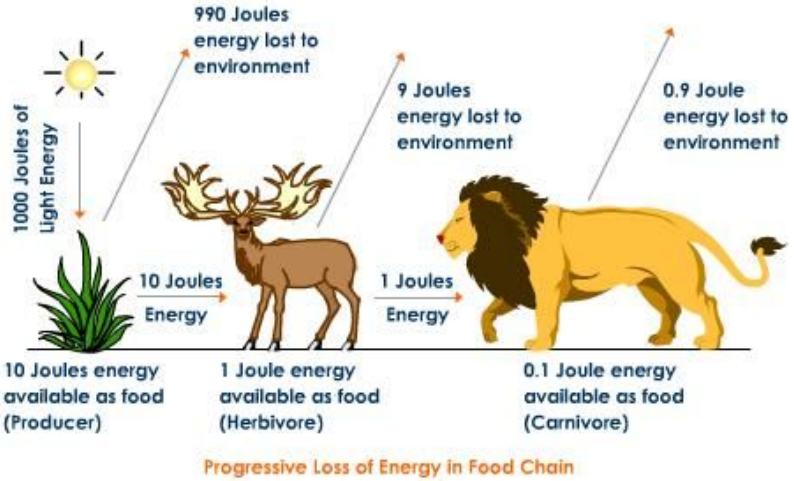


Loss of energy in an ecosystem: The 10% Law

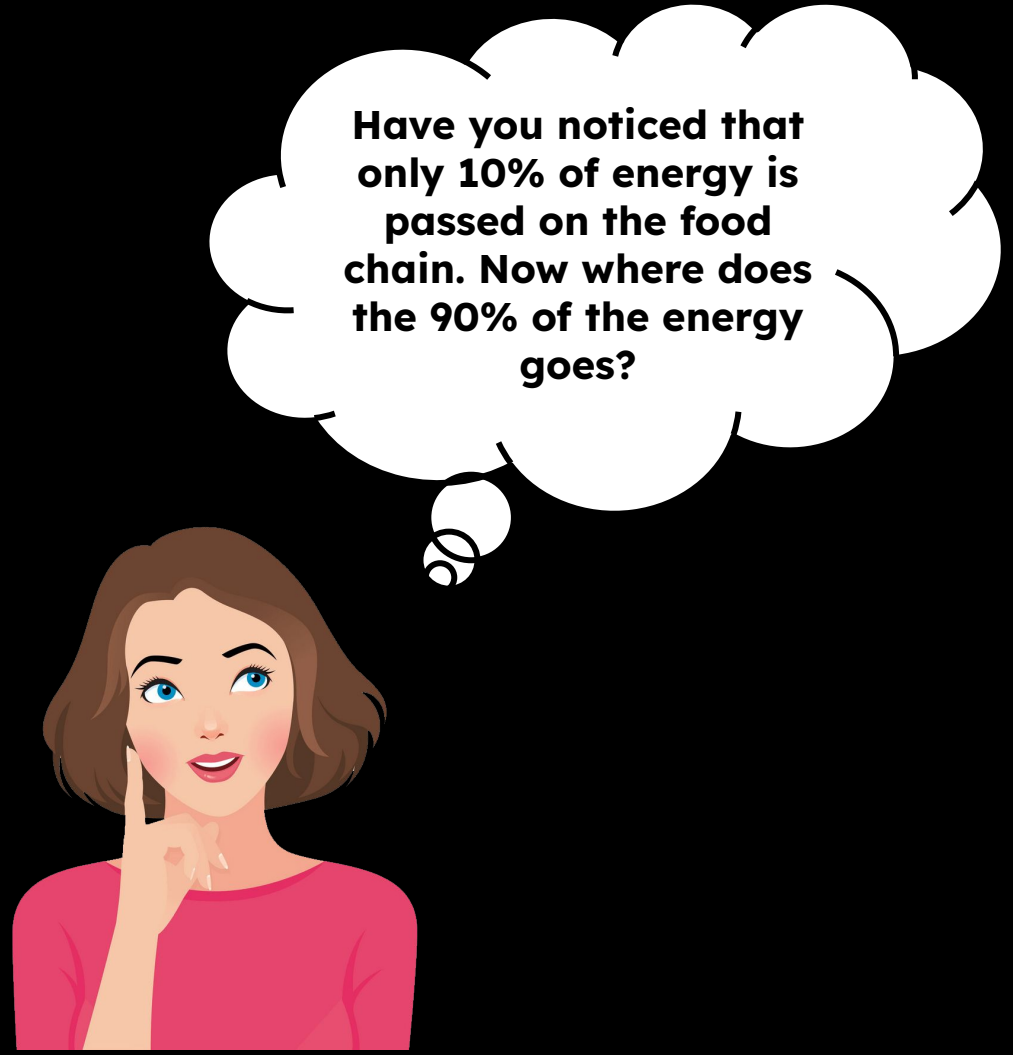
- When one form of energy is changed to another, some energy is lost to the environment in forms which cannot be used again.
- The green plants in a terrestrial ecosystem capture about 1% of the energy of sunlight that falls on their leaves and convert it into food energy.
- When green plants are eaten 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.

Loss of energy in an ecosystem: The 10% Law

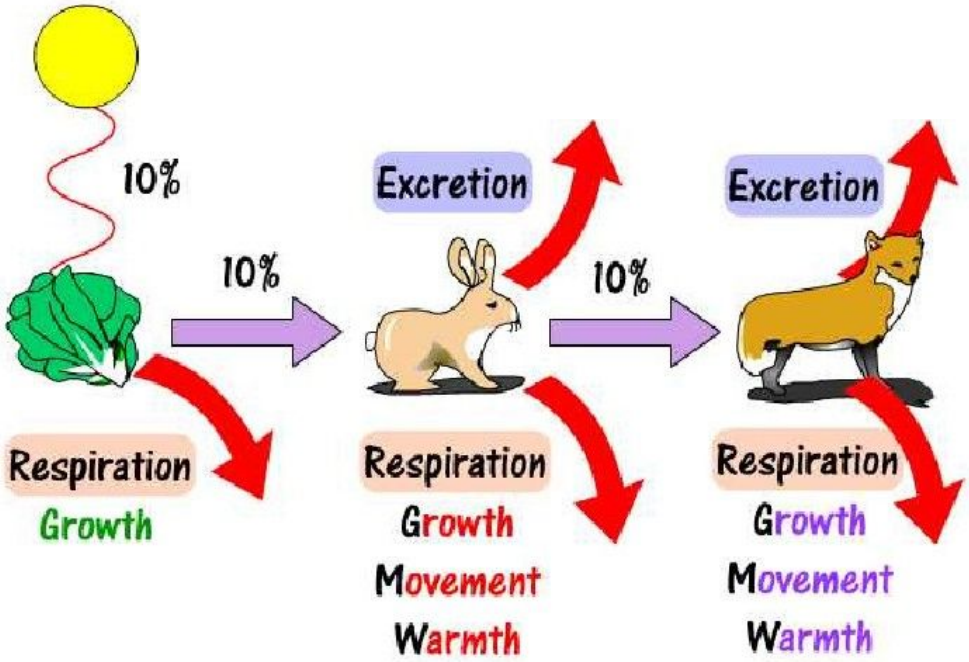
- An average of 10% of the food eaten is turned into its own body and made available for the next level of consumers.
- Therefore, 10% can be taken as the average value for the amount of organic matter that is present at each step and reaches the next level of consumers.



Progressive Loss of Energy in Food Chain


Have you noticed that only 10% of energy is passed on the food chain. Now where does the 90% of the energy goes?

Only 10% of the energy is passed on from one trophic level to another.



90% energy is lost in the form of heat, only 10% energy is transferred to the successive trophic levels.

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.

At which trophic level would you find a greater number of organisms?

Since there is a progressive loss of energy at the successive trophic levels, there are generally greater number of individuals at the lower trophic levels of an ecosystem, the greatest number is of the producers.

From the energy flow diagram two things become clear.

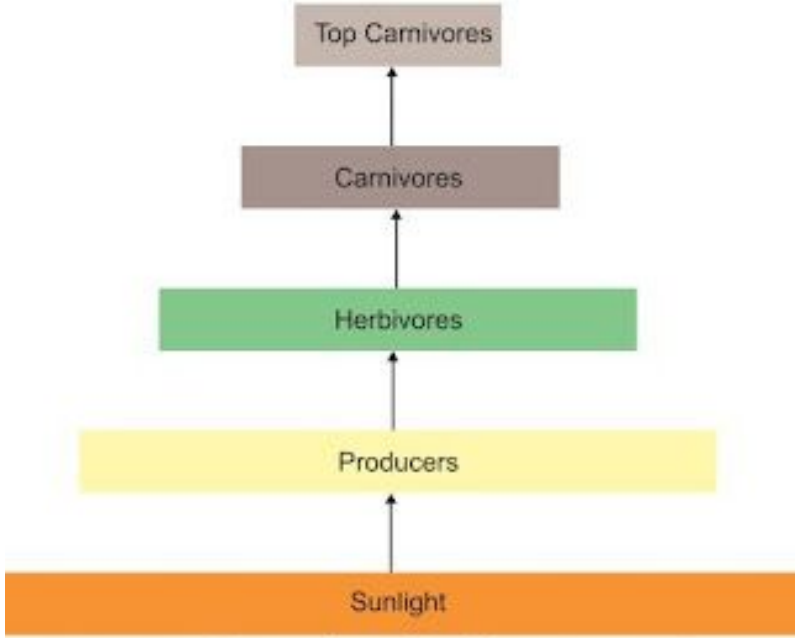
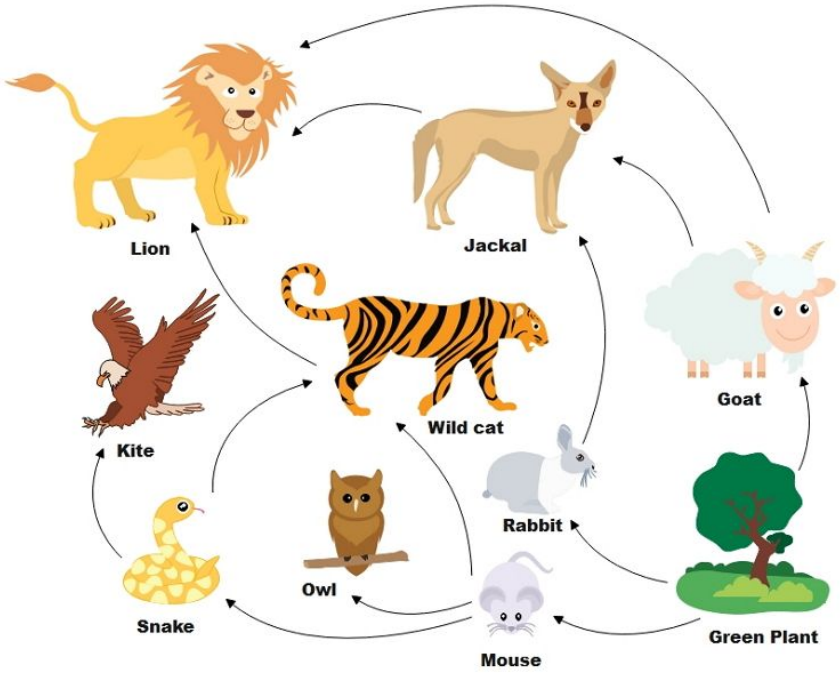


Diagram showing flow of energy in an ecosystem



FOOD WEB

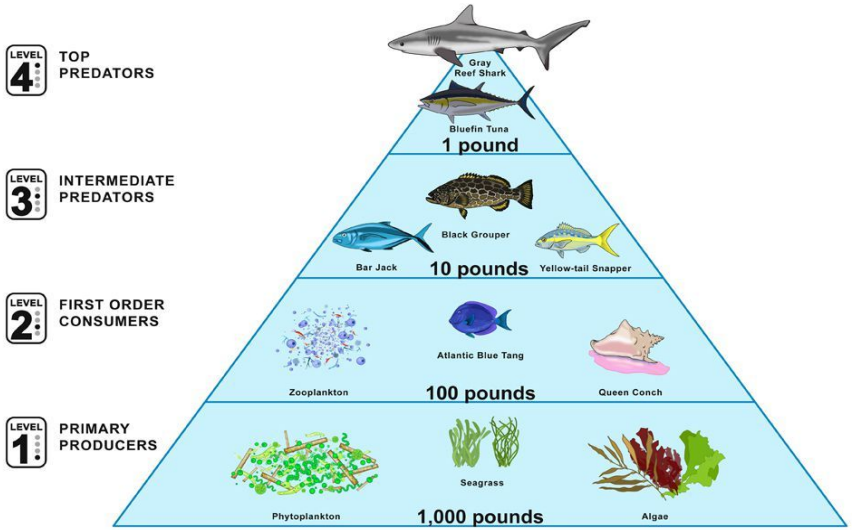
A group of several interconnected food chains, where an organism gets food from more than one group of organisms.

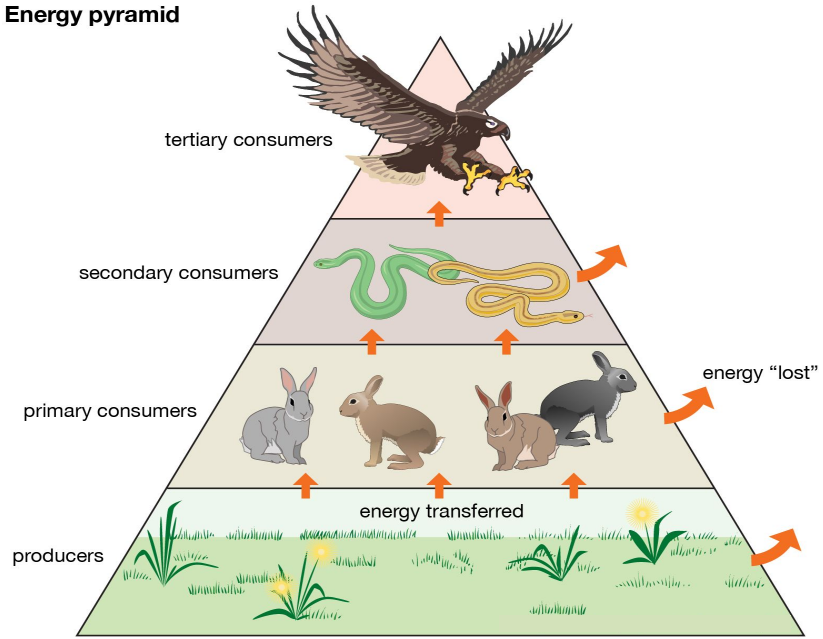
Each organism is generally eaten by two or more other kinds of organisms which in turn are eaten by several other organisms.

So instead of a straight line food chain, the relationship can be shown as a series of branching lines called a food web.

FOOD PYRAMID

An ecological hierarchy of food relationships in which a chief predator is at the top, each level preys on the next lower level, and usually green plants are at the bottom





SUMMARY

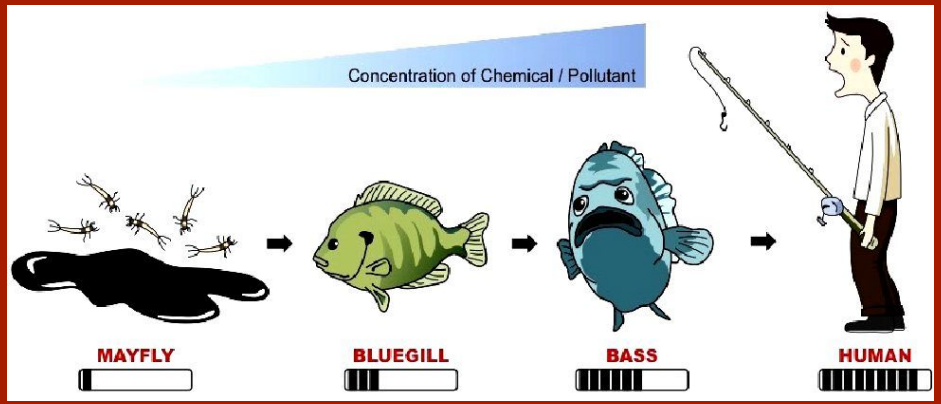
- A food chain is always straight, which means it is unidirectional flow of energy. It involves producers, consumers, and decomposers.
- It utilises energy from the sun (photosynthesis).
- A food chain follows 10% energy law, for the same reason there are 3-4 trophic levels in a food chain.
- It is the basis of flow of energy (food) in any ecosystem.

As energy moves progressively through the various trophic levels it is no longer available to the previous level.

BIOMAGNIFICATION

- An interesting aspect of the food chain is how unknowingly some harmful chemicals enter our bodies through the food chain.

DEF : the process by which a compound (such as a pollutant or pesticide) increases its concentration in the tissues of organisms as it travels up the food chain.

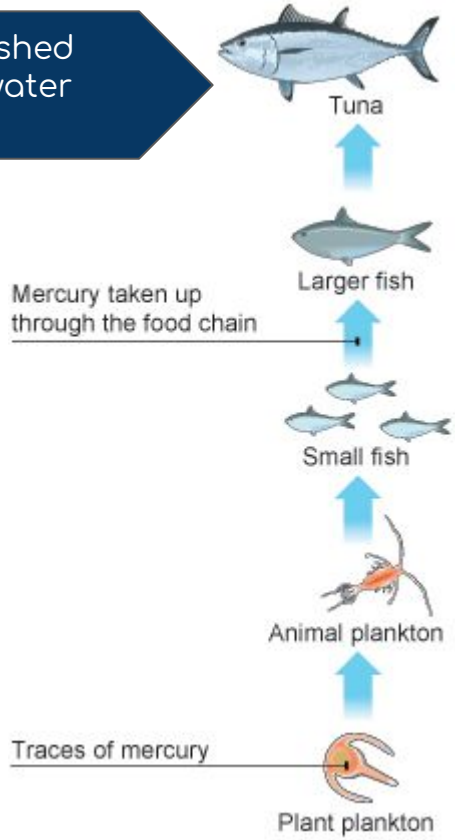


Water bodies are polluted by industrial, agricultural, and human wastes.

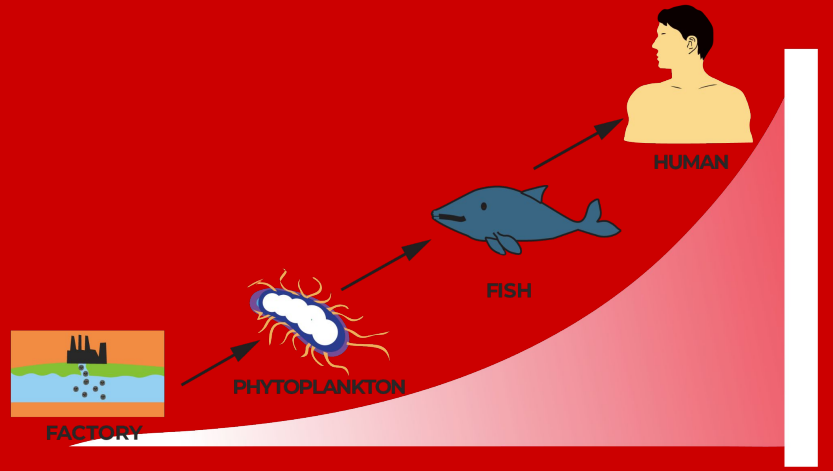
These chemicals are either washed down into the soil or into the water bodies.

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

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

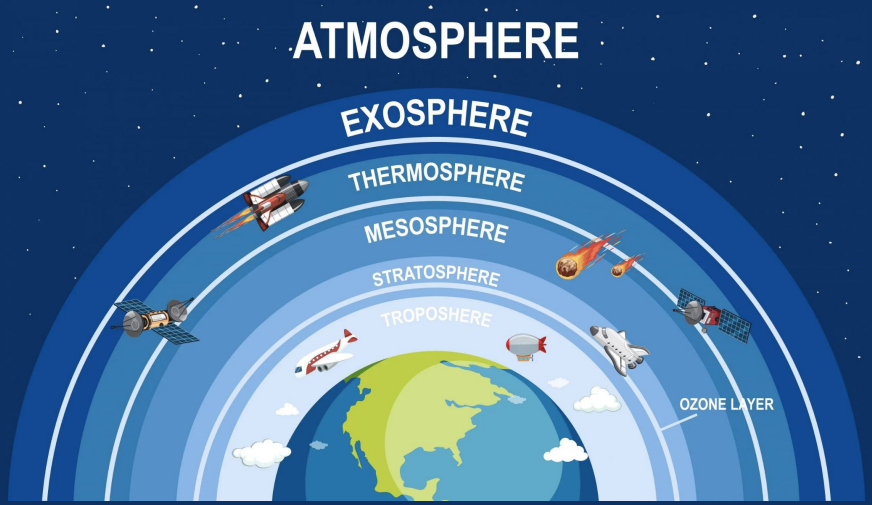


- As human beings occupy the top level in any food chain, the maximum concentration of these chemicals get accumulated in our bodies
- This is the reason why our food grains such as wheat and rice, vegetables and fruits, and even meat, contain varying amounts of pesticide residues.
- They cannot always be removed by washing or other means.



HOW DO OUR ACTIVITIES AFFECT THE ENVIRONMENT?

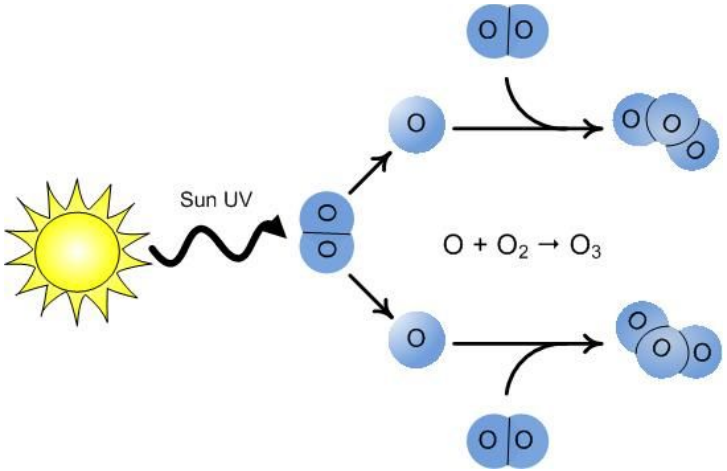
- In the troposphere, ozone is a deadly poison.
- However, at the higher levels of the atmosphere,that is, in the stratosphere, ozone performs an essential function.
- It shields the surface of the earth from ultraviolet (UV) radiation from the Sun.
- This radiation is highly damaging to organisms, for example, it is known to cause skin cancer in human beings.



$$O_2 \xrightarrow{UV} O + O$$

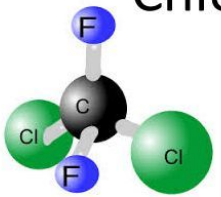
$$O + O_2 \rightarrow O_3$$

(Ozone)



Depletion of ozone layer in the atmosphere

Chlorofluorocarbons (CFCs)



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 as refrigerants and in fire extinguishers.

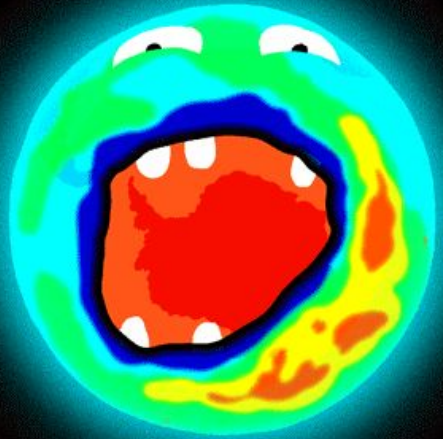
DID YOU KNOW?

Ozone hole is a region of exceptionally depleted ozone in the stratosphere over the Antarctic that happens at the beginning of the Southern Hemisphere spring (August–October).

In 1987, the United Nations Environment Programme (UNEP) succeeded in forging an agreement to freeze CFC production at 1986 levels. It is now mandatory for all the manufacturing companies to make CFC-free refrigerators throughout the world.

UNEP

GOOD JOB



EVERYBODY!

Types of Garbage

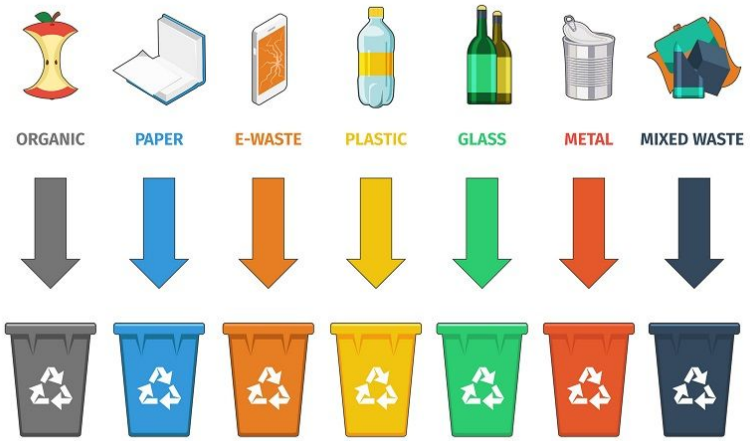
- Based on matter
  - Solid
  - Liquid
  - Air emissions
- Based on degrading feature
  - Biodegradable
  - Non-Biodegradable
- Based on environmental impact
  - Hazardous
  - Non-Hazardous
- Based on source
  - Household
  - Industrial
  - Radioactive
  - Electric
  - Medical
  - Nuclear

Managing the Garbage We Produce

The household waste is called garbage. Some of the garbage is biodegradable and some are non biodegradable.

Garbage causes pollution of air, water and soil.
So it should be disposed of properly.

‘Disposal of waste’ means ‘to get rid of waste’. The disposal of waste should be done in a scientific way. There are different methods of waste disposal/ The method to be used depends on the nature of the waste.



METHODS OF WASTE DISPOSAL

Landfill

Incineration

Waste Compaction

Biogas Generation

Composting

Vermicomposting

RECYCLING

Process of converting waste materials into new materials and objects.

It reduces the amount of non-biodegradable waste.

Materials like tin, cans, metallic articles, rags, paper, glass etc., are recyclable.

LANDFILL

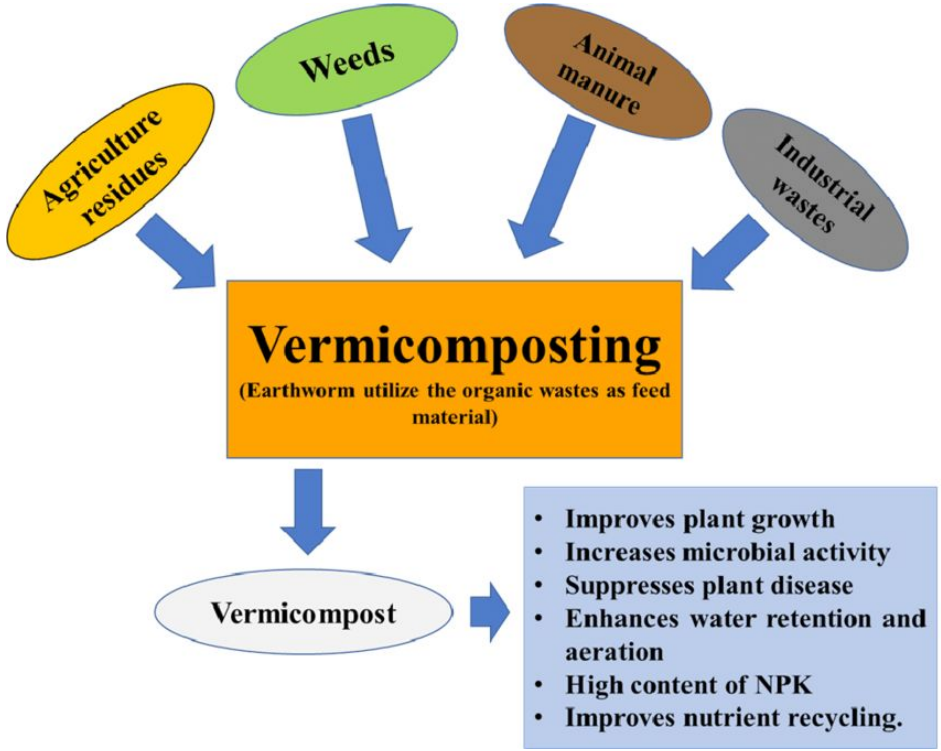
In this process, the waste that cannot be reused or recycled are separated out and spread as a thin layer in low-lying areas across a city.

A layer of soil is added after each layer of garbage.

Such land or area is declared unfit for construction of buildings for the next 20 years.


How to Make
COMPOST
1
Choose a place
Ideal compost area is a dry, shady spot near a water source, with dimensions of 3 × 3 × 3 feet.
2
Add the ingredients
The ingredients are those rich in carbon (brown materials) and those rich in nitrogen (green materials). Make sure large materials are chopped or shredded.
3
Add water as needed
Make sure the pile stays moist, but not too wet (it should feel like a damp sponge).
4
Keep things moving
Turn your compost mixture to add air to the mix. This helps speed up the composting process.
5
Wait a while
When the compost no longer gives off heat and becomes dry, brown and crumbly, it's fully cooked and ready to be fed to the garden.
Image Credit: istockphoto.com/artisticco

COMPOSTING

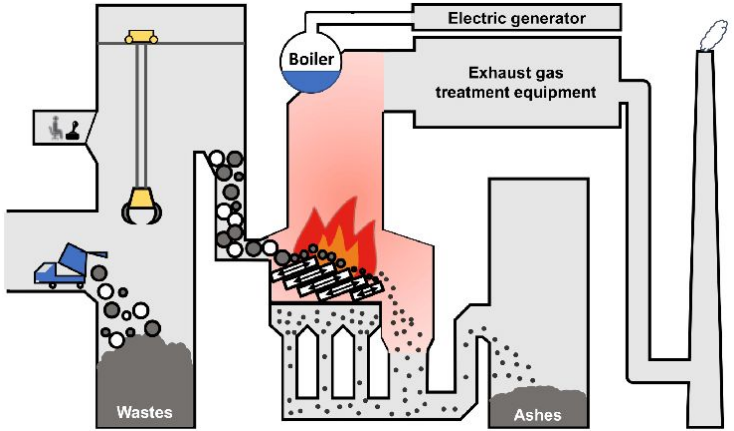

Agriculture residues
Weeds
Animal manure
Industrial wastes
Vermicomposting
(Earthworm utilize the organic wastes as feed material)
Vermicompost
• Improves plant growth
• Increases microbial activity
• Suppresses plant disease
• Enhances water retention and aeration
• High content of NPK
• Improves nutrient recycling.

INCINERATION

Burning of substance at high temperature to form ash.

It reduces the volume of the waste considerably.

Commonly used to dispose hospital waste.

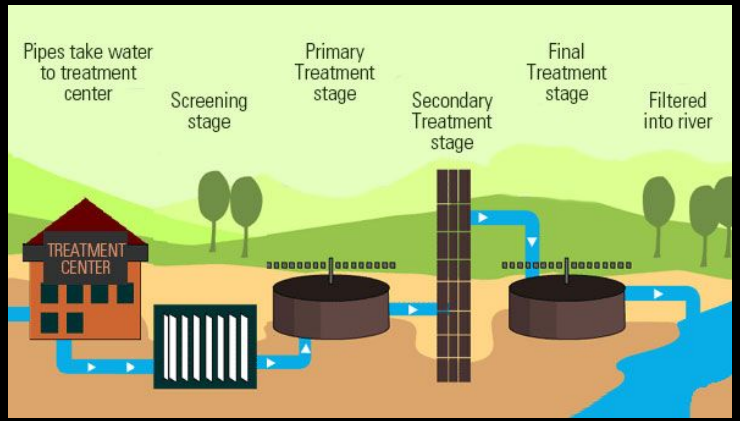


SEWAGE TREATMENT

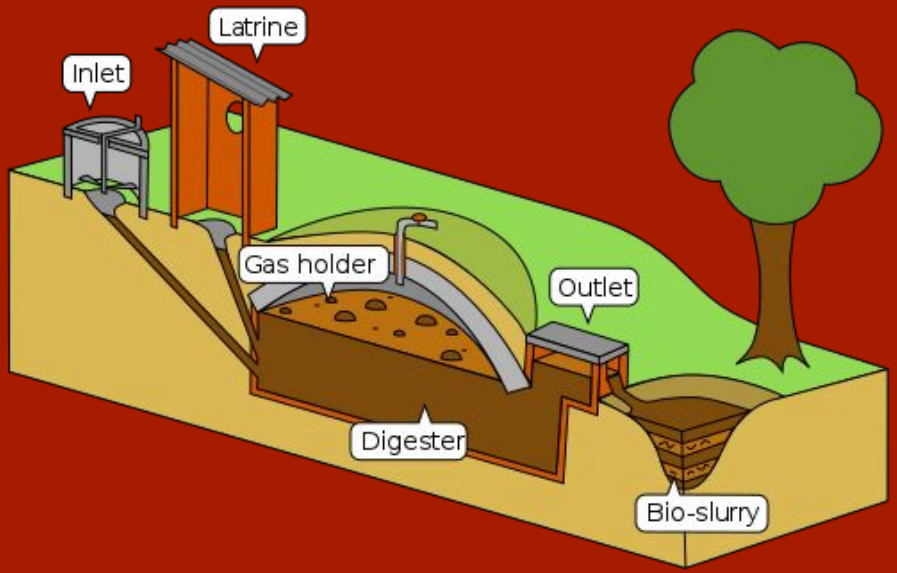
Sewage treatment carried out by Sewage Treatment Plants (STPs), where sewage is filtered.

Organic material in the sewage is allowed to settle down and decompose in large tanks.

The water from these tanks is cleaned and is released into water bodies.



BIOGAS PRODUCTION



Biodegradable waste, such as food items, animal waste or organic industrial waste from food packaging industries are sent to bio-degradation plants.

In bio-degradation plants, they are converted to biogas by degradation with the help of bacteria, fungi, or other microbes.

Here, the organic matter serves as food for the micro-organisms.

The degradation can happen aerobically (with oxygen) or anaerobically (without oxygen). Biogas is generated as a result of this process, which is used as fuel, and the residue is used as manure

NCERT QUESTIONS

What is the role of decomposers in the ecosystem?

ANSWER

Organisms that feed on dead plants and animals are called decomposers. They breakdown the complex organic compound present in the dead remains into simpler substances and obtain nutrition from them.

Thus, they play the following role:

- Help in recycling of materials, replenishment of the soil's nutrients, etc.

- They clean our surroundings by decomposing dead organisms and organic wastes.

Give any two ways in which non-biodegradable substances would affect the environment.

ANSWER

- Their degradation may release certain gases in the atmosphere thereby, polluting the environment.
- They may become breeding places of flies and many other pests, thus causing diseases.

What is ozone and how does it affect any ecosystem?

ANSWER

Ozone (O_3) is a molecule formed by three atoms of oxygen. It can affect any ecosystem in the following ways:

- It protects against the UV rays, if, present in stratosphere.

- If this layer gets depleted, the UV rays can cause cancer in human beings and also some plants and animals.

Homework Questions

1. If the energy available at the producer level in a food chain is 150 J, how much energy will be transferred to tertiary consumer?

A. 15 J

B. 10 J

C. 1.50 J

D. 0.15 J

2. The depletion of ozone layer in the upper atmosphere is mainly due to the emission of:

A. Unburnt Hydrocarbons

B. Chlorofluorocarbons

C. Greenhouse Gases

D. UV Radiations


Thank
You

TYPES OF ECOSYSTEM

NATURAL

Forests, ponds & lakes.

ARTIFICIAL

Gardens & crop - fields

Flow of energy in an ecosystem: