Ecology

Ecology - is the study of interactions between living things and their environment.

Biosphere - is the part of the planet containing living things.

Ecosystem - a group of organisms that interact with their environment together.

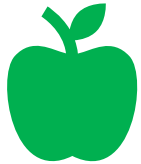
Habitat - the place where an organism lives.

Population - members of the same species living in an area.

Community - all the different populations (species) in an area.

ENVIRONMENTAL FACTORS

1. **Biotic factors** - **living** factors. Examples - **Food**, competition, etc.



e.g. If there is more food available, then more animals survive or animals might compete for scarce resources.

2. **Abiotic factors** - **non-living** factors. Examples - **Altitude**, Aspect.

e.g. Higher altitudes are colder and can be harsh to live in.

3. **Climatic factors** - weather over a long time. Examples - **Temperature**, rainfall.

e.g. Temperature, rainfall and daylength can affect organisms.

4. **Edaphic Factors** - Factors to do with **soil**. Examples - pH, temperature.

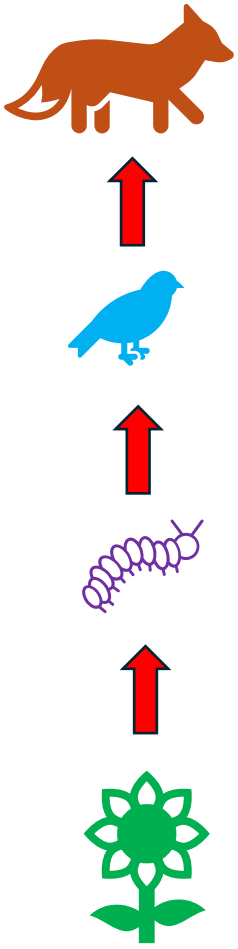
e.g. Some plants can only live is alkaline soils.

Energy Flow

Producers - Organisms that carry out photosynthesis, e.g. plants.

Consumers - take in food from another organism, e.g. animals

Food Chain - the order in which an organism is eaten by the next one in the chain.

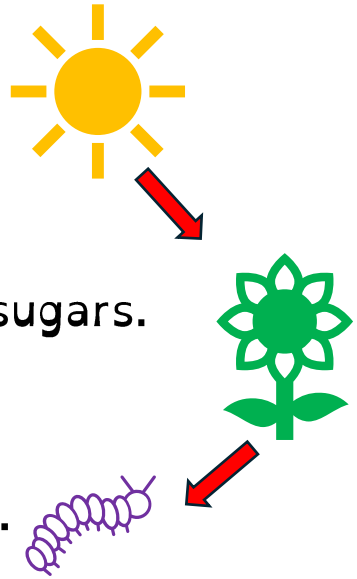


In a **grassland habitat** an example of a food chain is:

Buttercup → Caterpillar → Thrush → Fox

The arrow shows the direction of **energy flow**.

Almost all energy for food chains comes from the sun.



Plants (**producers**) catch the energy and change it into sugars.

The energy in the plants is then passed into **consumers**.

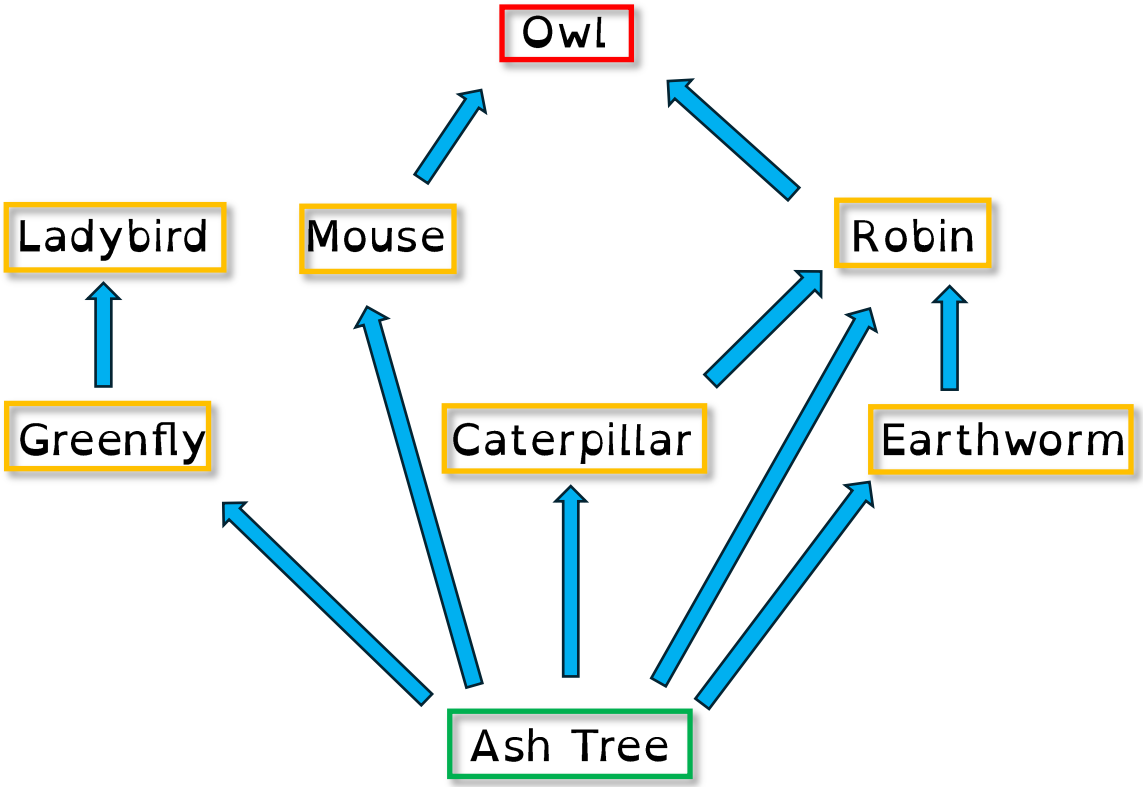
These consumers only get around **10%** of the energy from the plant.

If these consumers are eaten, they only pass on about **10%** of their energy.

Typical Exam Question: Why are food chains usually of a certain length?

Food chains can only be a certain length as the energy eventually runs out.

Food Web – Interconnected Food Chains



Primary consumer = Caterpillar **Herbivore** = Mouse **Omnivore** = Robin

Ecological niche - is the role an organism plays in the community.

2 organisms with the same niche must compete. An example is how birds eat.

Magpie eats from **fences**, gutters - insects

Swallow eats in **flight** - insects

Thrush eats from the ground/**soil** – e.g. snails.

Pyramid of numbers

This represents the number of organisms at each trophic level in a food chain.

The number of organisms at each level normally decreases as you go up.

This is due to the **decrease in energy**.

In the examples above, there is lots of grass, less rabbits, and even fewer foxes.

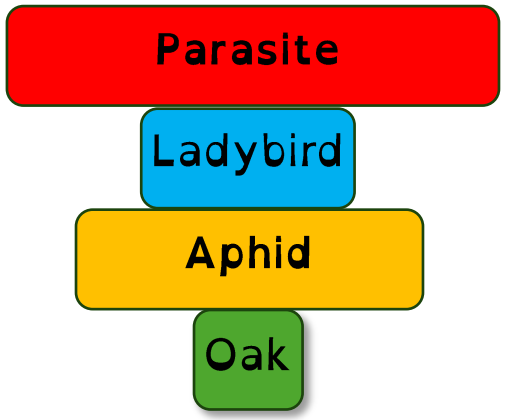
Sometimes you can have an **inverted pyramid of numbers**.

This is where the number of organisms may increase as you go up.

An inverted pyramid can result from having

1. **Parasites** or

2. By having all the organisms in **one tree**.



Questions on this topic

Q.1 What is a population?

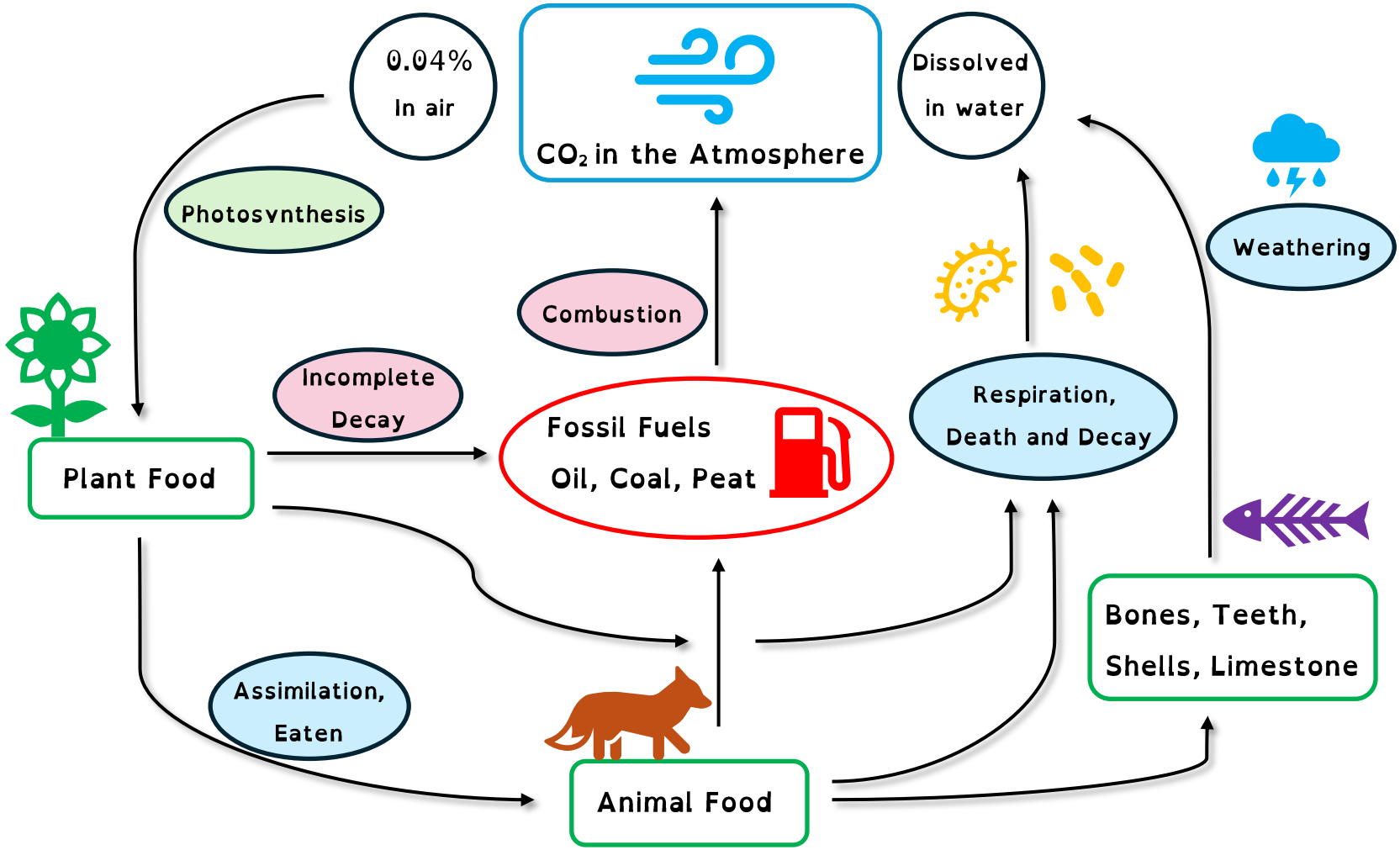
Q.2 Give an example of 2 abiotic factors and 2 biotic factors?

Q.3 What does Edaphic mean?

Q.4 What is a food chain?

Q.5 Give an example of one from a habitat you studied.

The Carbon Cycle



There is 0.04% CO_2 in the air.

Plants take in Carbon Dioxide and make plant matter (e.g. wood).

When they respire, they release carbon dioxide.

Animals are made of carbon.

They get carbon from eating other organisms.

When they respire, they release carbon dioxide.

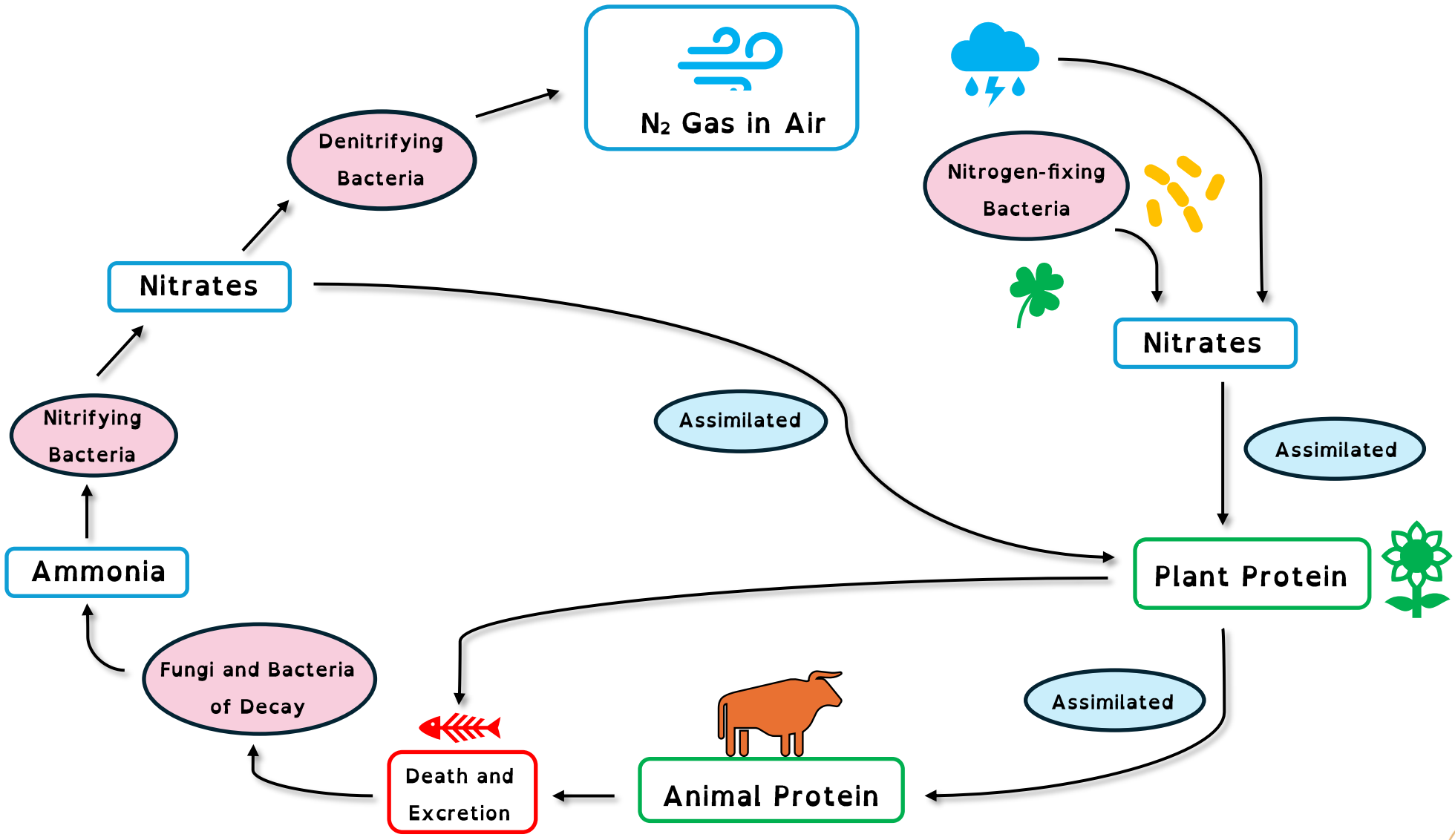
When animals die, their bones, teeth, shells contain Carbon. These are slowly weathered back into the atmosphere.

Micro-organisms, like fungi and bacteria return carbon dioxide to the air by decomposing dead plants and animals.

Partially decomposed plants and animals are turned into **fossil fuels**.

When we burn coal, peat or oil products then we release CO_2 back into the air.

The Nitrogen Cycle



The Nitrogen Cycle

There is 78% Nitrogen gas in the atmosphere. Life can't use this form of Nitrogen, so it must be turned into a useable form by **lightening** or **Nitrogen-fixing bacteria**. These are found in **Clover** and in the **Legumes** family.

The bacteria live on the roots of plants. They get food from the plants, and they give the plants Nitrates taken out of the air. This type of relationship is called **symbiotic** as both organisms benefit. The Nitrogen is now in the form of **Nitrates** and used in **DNA** and **proteins**. **Animals** assimilate the plant protein to make their own proteins.

Eventually the plants and animals are broken down and **recycled** by **fungi** and **bacteria**. This releases **Ammonia**, which can be poisonous. Bacteria can change this Ammonia back into Nitrates, and this can be reused or converted back into N_2 gas.

Global Warming

Since the early 1970's, scientists have realised that the world's CO_2 has been increasing. CO_2 is produced mostly from burning fossil fuels.

In the atmosphere CO_2 traps heat and warms up the planet.

That's why it is called a **'greenhouse'** gas.

Only some of the heat radiated from the earth escapes into space.

Warming oceans store the heat and ocean currents change.

When the currents heat and change, they also change the wind and rain patterns.

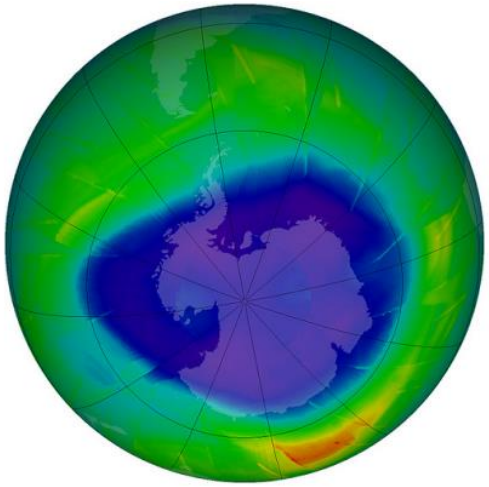
This causes floods and droughts, stronger hurricanes and storms.

The year 2023 was the warmest year since global records began in 1850 at 1.18°C above the 20th-century average of 13.9°C. The 10 warmest years in the 174-year record have all occurred during the last decade (2014–2023).

Ozone

Ozone depletion is an example of **air pollution**.

Ozone (O_3) is a gas that absorbs harmful ultraviolet (UV) light. A hole was first noticed in 1984 over Antarctica. There is also a hole at the Arctic, Australia and sometimes over Europe. Ozone loss is caused by **CFCs** (Chlorofluorocarbons) in aerosols, freon gas in fridges and others.



A decrease in Ozone causes, skin cancers, damage to crops, damage to animals, Plankton reduction - which affects birds, fish, whales and Oxygen levels.

Control of Ozone loss

CFCs were banned in 1986, and fridges are recycled carefully and not just dumped. The holes should be repaired by around 2050.

Pollution

Pollution is any harmful addition to the environment.

Pollutants are substances that cause pollution.

Types of pollution:

- **Domestic pollution** - from houses, must be collected.

- **Agricultural pollution** - sprays, slurry on fields and in rivers.

- **Industrial pollution** - smoke and fumes, acid rain etc.

Conservation

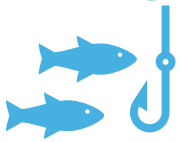
Conservation is the wise management of our existing natural resources.

We use natural resources every day. These include oil for plastics and fuel, gas for heating and cooking. Coal, peat and others for electricity.

We also use fish for food, grasses and cereals, especially corn.

We also change the landscape for roads and houses and other buildings.

Conservation practices



Fisheries

- The use of small-mesh nets can result in too many young fish being caught.
- Using larger meshed nets to allow the young to escape, mature and reproduce.
- Square mesh- does not alter its shape under tension allows young fish to escape.
- Diamond mesh netting - closes under tension and prevents young fish escaping.

Waste Management in Agriculture

The main problems here are the waste products from farms, i.e.

- slurry
- silage effluent
- overuse / incorrect use of chemical fertilisers and animal manures - excess of these may enter watercourses and cause algal blooms. This is called **Eutrophication,** a condition where lakes become over-enriched with nutrients, from artificial fertilisers washed into rivers and lakes.

Agriculture Solution

Spreading the slurry on the land as a fertiliser, must be managed accurately to maximise the crop production and minimise their impact on the environment.

Soil Nutrient Programmes aim to ensure optimum crop amounts and rotation of crops so that soils don't use up all their nutrients.

Waste Management in Domestic Setting

- Lack of availability of suitable landfill sites.
- The toxic fumes from incineration (CO_2 and other oxides).
- Decaying waste produces methane gas which contributes to the "greenhouse effect".
- Harmful substances may leak into groundwater supplies (wells, lakes, reservoirs).
- Plants and animals in rivers and lakes are killed through direct poisoning or eutrophication.

Domestic Solution

Micro-organisms in Waste Management.

Composting is a process during which micro-organisms decompose organic matter into compost. This recycles all the nutrients required for plant growth.

Fungi break down the 'tougher' materials in the waste such as cellulose. They penetrate the composting material and help improve aeration and drainage in the compost heap. Temperatures within a compost heap can reach 70°C as the bacteria and fungi work to breakdown the material.

Waste Minimisation

Reduce - use less, minimise waste.

Reuse - use again for different purpose.

Recycle - recover some material and use again.