GCSE Biology Complete Revision Summary

Homeostasis and Response

Inheritance, Variation and Evolution

Ecology

Key Ideas

Ecosystems

- Communities
- Abiotic Factor
- Biotic Factor
- Adaptations
- Carbon Cycle
- Waste Cycle
- Climate Change
- Biodiversity
- Waste Management
- Land Use
- Deforestation
- Global Warming
- Food Chain
- Pyramids
- Food Production

ECOLOGICAL HIERARCHY

Organismal

Individual Species

Population

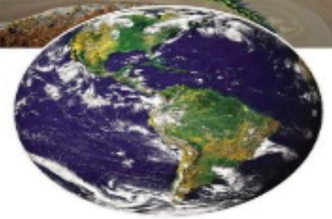
Groups of similar organisms living in the same area.

Community

Groups of population living in a defined area

Ecosystem

Groups of communities with its living and non living factors

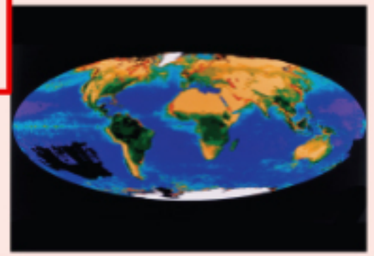


Biosphere

Groups of different Ecosystem

Organisms, Populations, and Communities: In a forest, each pine tree is an organism. Together, all the pine trees make up a population. All the plant and animal species in the forest comprise a community.

Ecosystems: This coastal ecosystem in the southeastern United States includes living organisms and the environment in which they live.



The Biosphere: Encompasses all the ecosystems on Earth.

Source: Wikimedia Commons

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ECOSYSTEM

Ecosystem is the group of communities interacting with the biotic and the abiotic factors.

BIOTIC FACTORS

- Pathogens
- Parasites
- Predators
- Prey
- Mutualism
- Competition

ABIOTIC FACTOR

- Light
- Soil pH
- Temperature
- Water
- Wind
- Air
- Minerals

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ABIOTIC FACTORS

Most of the abiotic factors affects photosynthesis which affects the producers which inturn affect the complete food chain.

Light

Less light limits the photosynthesis and affect the entire food chain.

Plant in low light have broader leaves to increase surface area for absorption

Water

Water is required for growth. Less water limits the photosynthesis and affect the entire food chain.

pH

The low pH makes the soil acidic and linits the growth of plants and affect the entire food chain.

Temperature

Temperature also limits the rate of photosynthesis wich affects the food chain

Oxygen

The oxygen is required for the growth of the plant. In low levels of oxygen the organisms cannot survive.

Carbon Dioxide

Carbondioxide is required for growth. Less water limits the photosynthesis and affect the entire food chain.

Wind

Plants growing in high wind adapt different shapes.

Wind also affects the rate of transpiration.

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BIOTIC FACTORS

FOOD

Food availability helps the species to grow and reproduce.

PATHOGENS

A pathogen can cause infectious disease and affect the growth of the population and can also wipe the whole population

PARASITES

Parasites can limit the growth of the host and affect the population of the community.

COMPETITION

Increasing competition can affect the growth of the population and can outcompe the individual of a population.

PREDATORS

Increase in predition can decrease the population of the prey.

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INTERDEPENDENCE

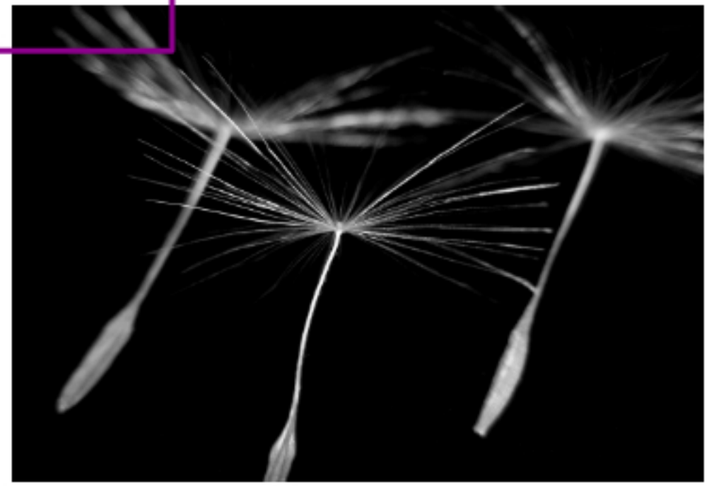
Pollination

One species is dependent on other.

Like plants are dependent on insects for seed dispersal and pollination.

Herbivores are dependent on plants for food.

If one species is removed it affect the other species.



Seed Dispersal

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COMPETITION IN PLANTS and ANIMALS

INTERSPECIFIC COMPETION

It is the competition between the members of different species.

- Food
- Territory
- Resources

It leads to the movement of species to a new place, adaptation or extinction

INTRASPECIFIFC COMPETION

It is the competition between the members of the same species.

- Food
- Territory
- Mating

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ADAPTATIONS

Special Features that give the organisms the survival advantage and helps the organism to survive in the extreme conditions.

PLANT REQUIRMENTS	ANIMAL REQUIREMENTS
Water, space, minerals, carbon dioxide for photosynthesis	Food to survive
Oxygen for respiration.	Oxygen for respiration
Major adaptations they have make them successful in getting these components from the environment	Mate to reproduce.

Adaptations can be structural, behavioural and functional adaptations.

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PLANT ADAPTIONS

PLANT CHALLENGES	PLANT ADAPTATIONS	EXAMPLE
Water loss and dry conditions in desert	Small leaves, Leaves reduced to spines to decreases the surface area for water less. Extensive root system to absorb maximum water and succulent stems to store water. Plants are also covered with waxy cuticle to limit water loss.	Cactus where leaves are reduced to spines. Marram grass which has curled leaves and sunken stomata to trap moist air to limit water loss.
Lots of rain and water with less light in rainforest	Leaves are broad to trap maximum sunlight. They have thin cuticle.	Epiphytes like Lianas
Plant growing in low nitrogen soils.	The plants trap insect and digest them to fulfil their nitrogen and mineral requirments	Carnivores plant like Venus Flytrap
Plants prone to insect attack .	These plants secrete chemicals like alkaloids or tannins to repel insect.	Tobacco produced Nicotine.
Aquatic Plants growing in excess water and less light	Flexible stem to withstand water current. Broad leaves to absorb maximum light. They have hair spaces in leaves	Water Lillies

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ANIMAL ADAPTATIONS

	DESERT ANIMALS Hot, dry conditions	ARCTIC ANIMALS Extreme cold
Structural	They have large ears to give off maximum heat. They are small with large surface area to volume ratio.	They have small surface area to volume ratio to prevent heat loss. They have fur or thick fat deposit to provide insulation. White fur also comouflage with the ice.
Behavioural	They are more active during early morning and evening. When it is too hot or too cold they rest in burrows.	Polar bears form big dens and are strong swimmers and can swim through ice.
Functional	Produce very concentrated or no urine.	The fur or the coat change colours in summer and winters.

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EXTREMOPHILES

EXTREME TEMPERATURE

They have enzymes that work at high temperature and do not get denatured.

EXTREME SALT

They have salt glands expel exsses salt

They also have adaptations inthe cytoplasm so that they cannot gain or loose water .

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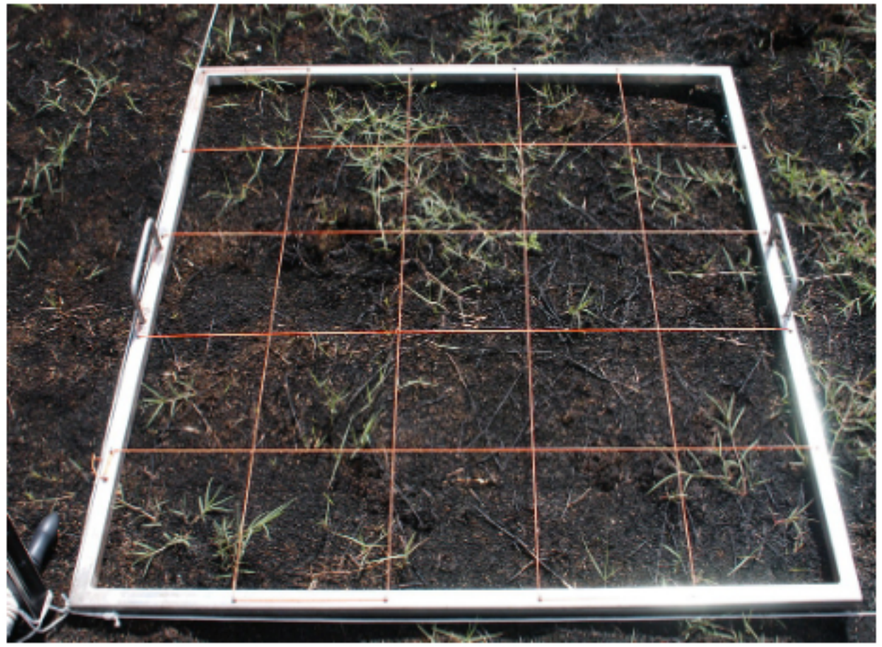
STUDYING COMMUNITIES



Quadrat Method

Random squares are placed at different point and the species within that squares are counted.

Transect Method

A line is placed and the species that are within this line or few cm above or below this line are counted and recorded.

Sample Size
The sample to be take for observation.

Mean
It is the statistical value calulate by adding all the values divided by total number of values.

Median
It is the middle value of the data.

Mode
The value that has the greatest frequency.

Range: It is the highest value take away the lowest value.

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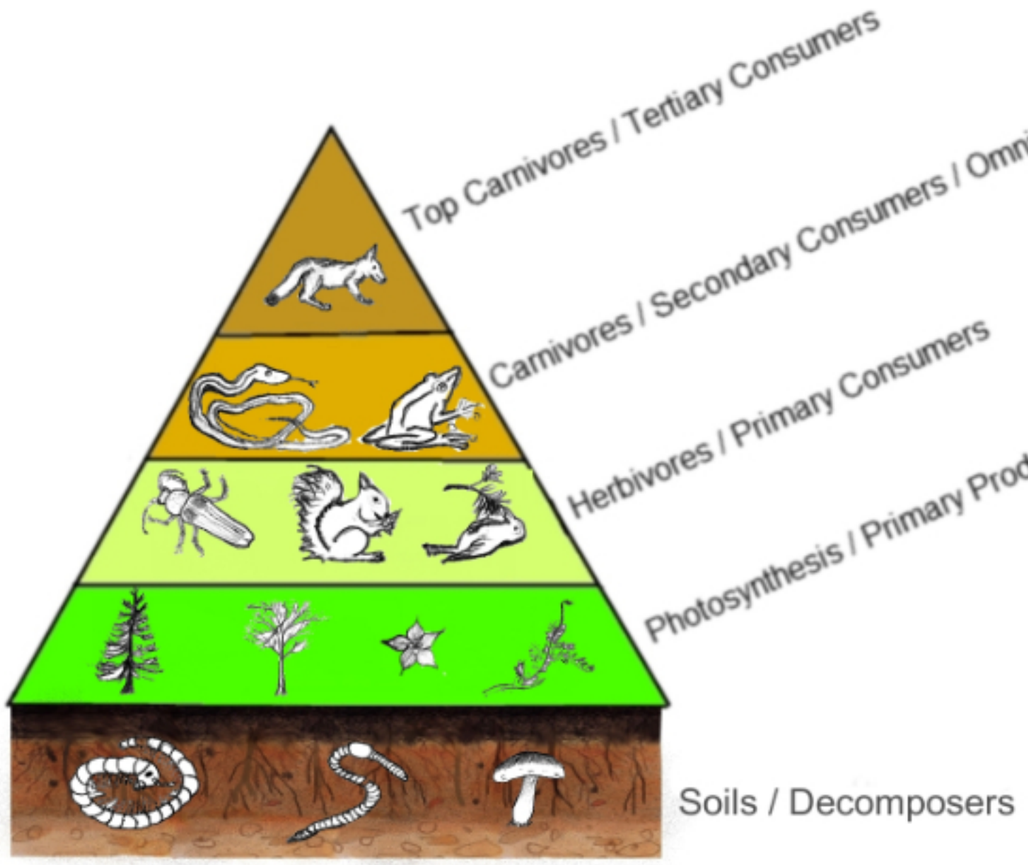
TROPHIC LEVELS



Trophic Levels

Producers: They produce their own food as they can photosynthesize and converts Sun's energy to chemical energy.

Primary Consumers
They are herbivores which feeds on plants.

Secondary Consumers
They are carnivores or omnivores which feeds on herbivores.

Tertiary Consumers
They are at the top of food chain

Decomposers
Feed on dead and decay matter.

FOOD CHAINS

It is the relationship of who eats whom.

Leaf → Caterpillar → Chameleon

(Producer)

(Herbivore)
Primary Consumer

Carnivore
(Secondary Consumer)

Mongoose → Snake

(Top Carnivore)

Carnivore
(Tertiary Consumer)

Source: Flickr.com

At each level there is a loss of energy and only 10% is transferred to the next trophic level so the food chains are mostly restricted to 3-4 tropic levels.

Sun is the principal source of energy driving the whole food chain.

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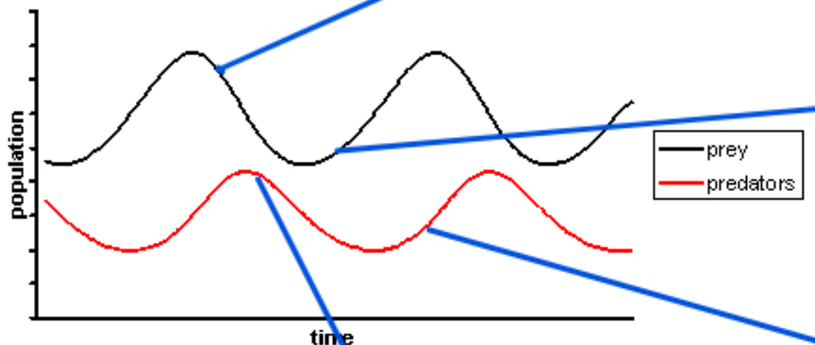
PREDATOR- PREY RELATIONSHIP



Source: Wikimedia Commons

Increase in prey due to more food available for them

Fall of prey due to increase in population of predators as there are more preadators to eat them.

Fall of predator to fall in prey population less food is available to them.

Increase prey population results in increase in predator population as more food is available for them.

- Prey increases
- Predator increases
- Prey Decreases
- Predaor decreases

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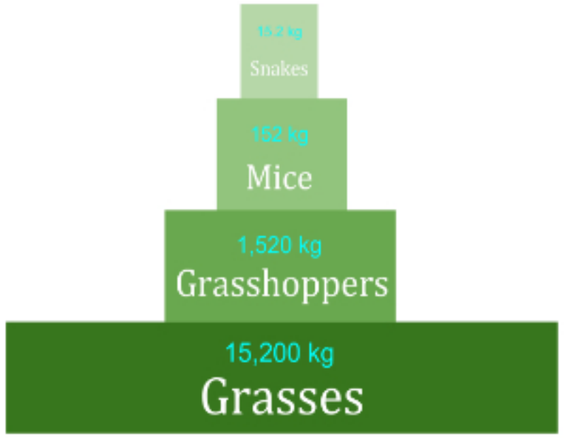
PYRAMIDS OF BIOMASS

Aquatic Ecosystem



Terrestrial Ecosystem

Source: Wikipedia

Biomass is the mass of the materials contained in the living organisms.

Graphical representation of the mass of the living organism at each level.

It is upright as :-
a) Not all the biomass is eaten by the next trophic level

b) Some of the biomass is lost as energy at each trophic level.

c) Some of the biomass is lost as waste product at the trophic level.

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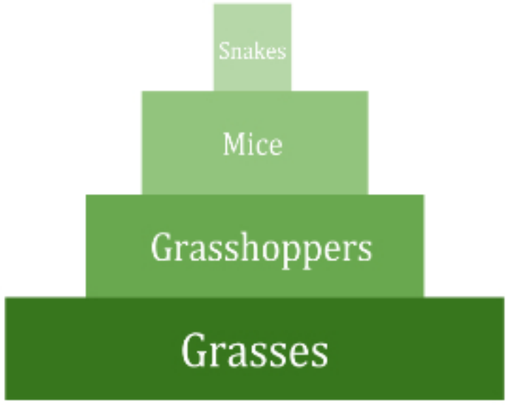
PYRAMIDS OF NUMBERS

It is the graphical representation of the number of organisms at each trophic level.

It can be upright, inverted or upside down.

Aquatic Ecosystem



Terrestrial Ecosystem

Source: Wikipedia Commons

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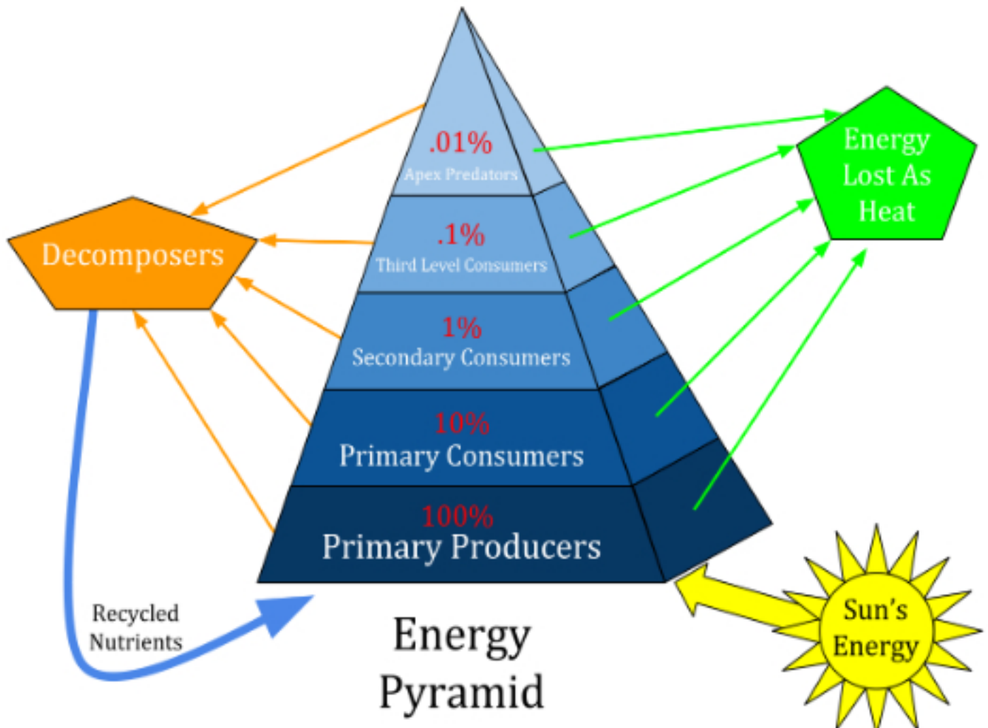
ENERGY TRANSFER PYRAMID

It is the graphical representation of energy at each trophic level.



Energy Pyramid

Source: Wikipedia Commons

Energy Lost at Each trophic Levels

a) Energy is required for movement, growth and repair

b) Energy is lost in digestion

c) Energy is lost in maintaining constant body temperature

d) Energy is lost as heat during respiration.

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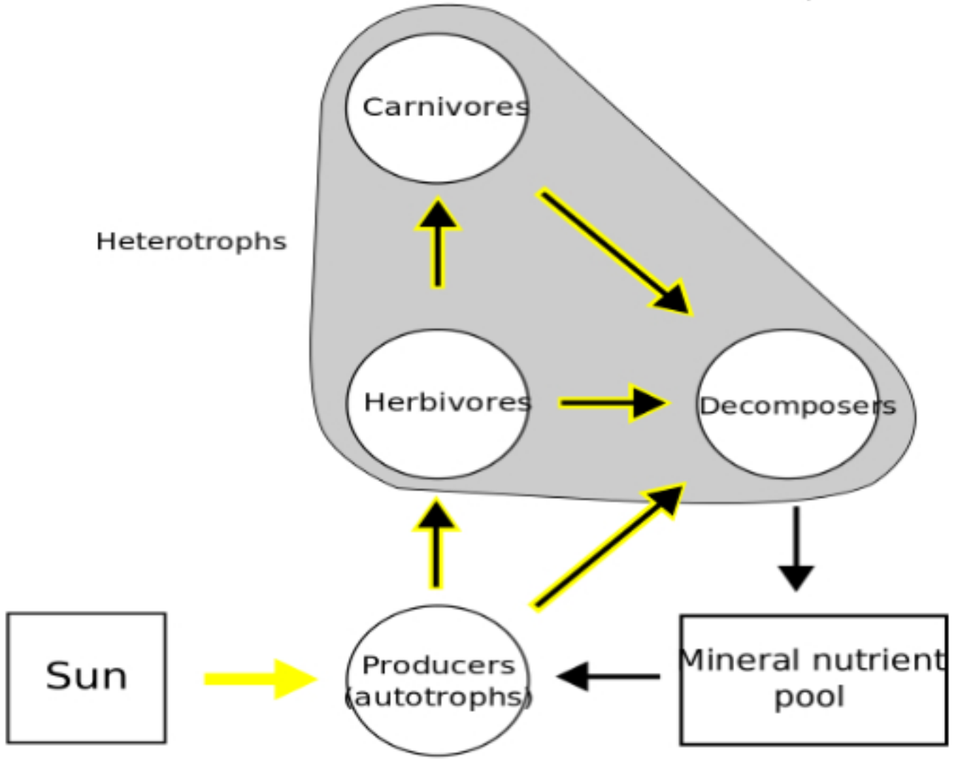
CYCLING OF MATERIALS



Source: Wikimedia Commons

Decomposers Play an important role in material recycling

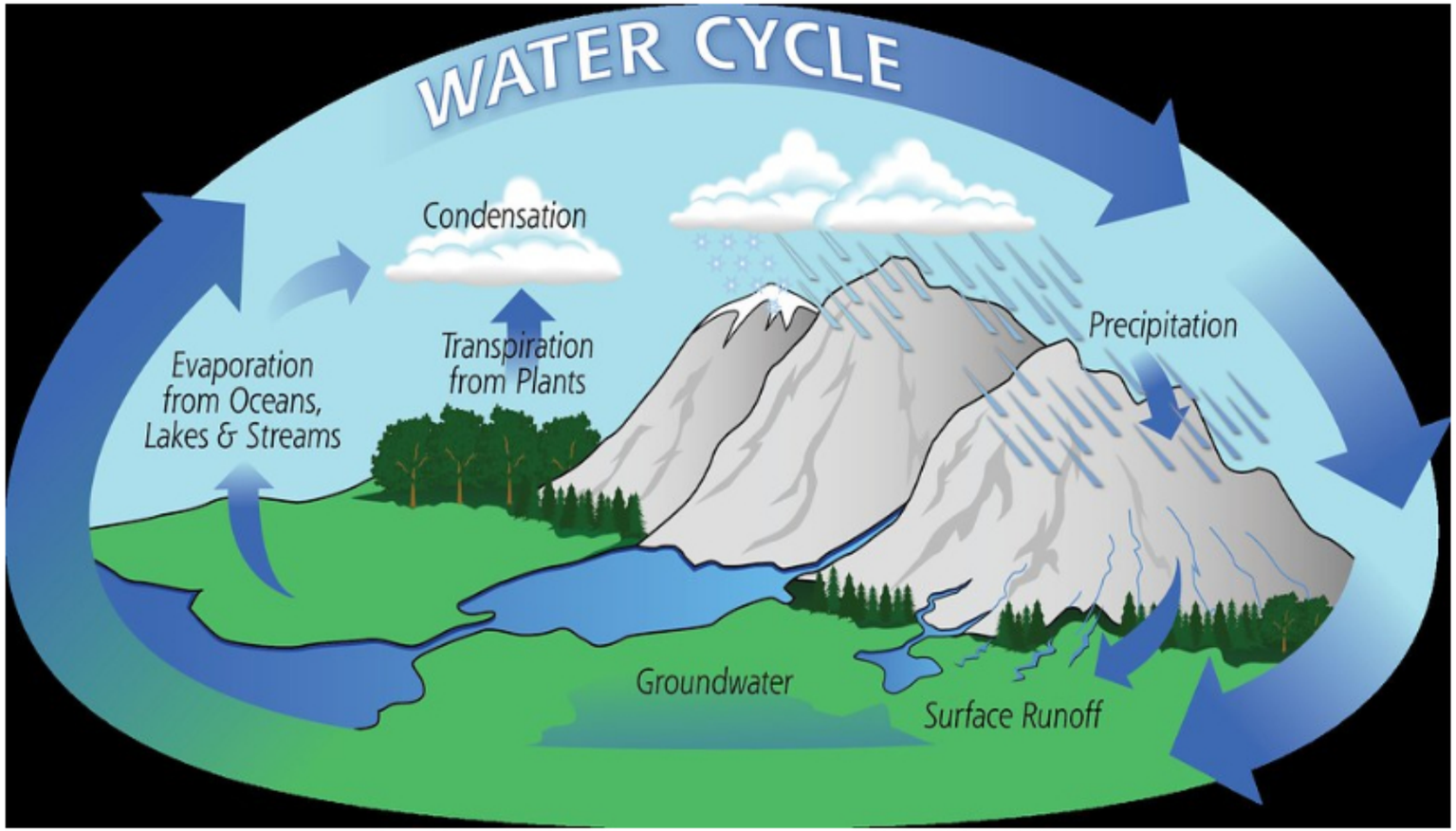
Bacteria and Fungi

Decomposers feeds on dead and decay matter. They break the organic matter into simple components and return them to soil.

The products carbon dioxide into the atmosphere by the process of decomposition.

Proteins in the dead and decay matter is converted into nitrates and returned to soil.

WATER CYCLE



Evaporation

Water is evaporated from the water bodies like sea, lakes etc and form water vapours.

Transpiration

The water vapurs are also lost from the surface of the plants.

Respiration

Respiration produced water vapur and it is lost in the form of water vapours

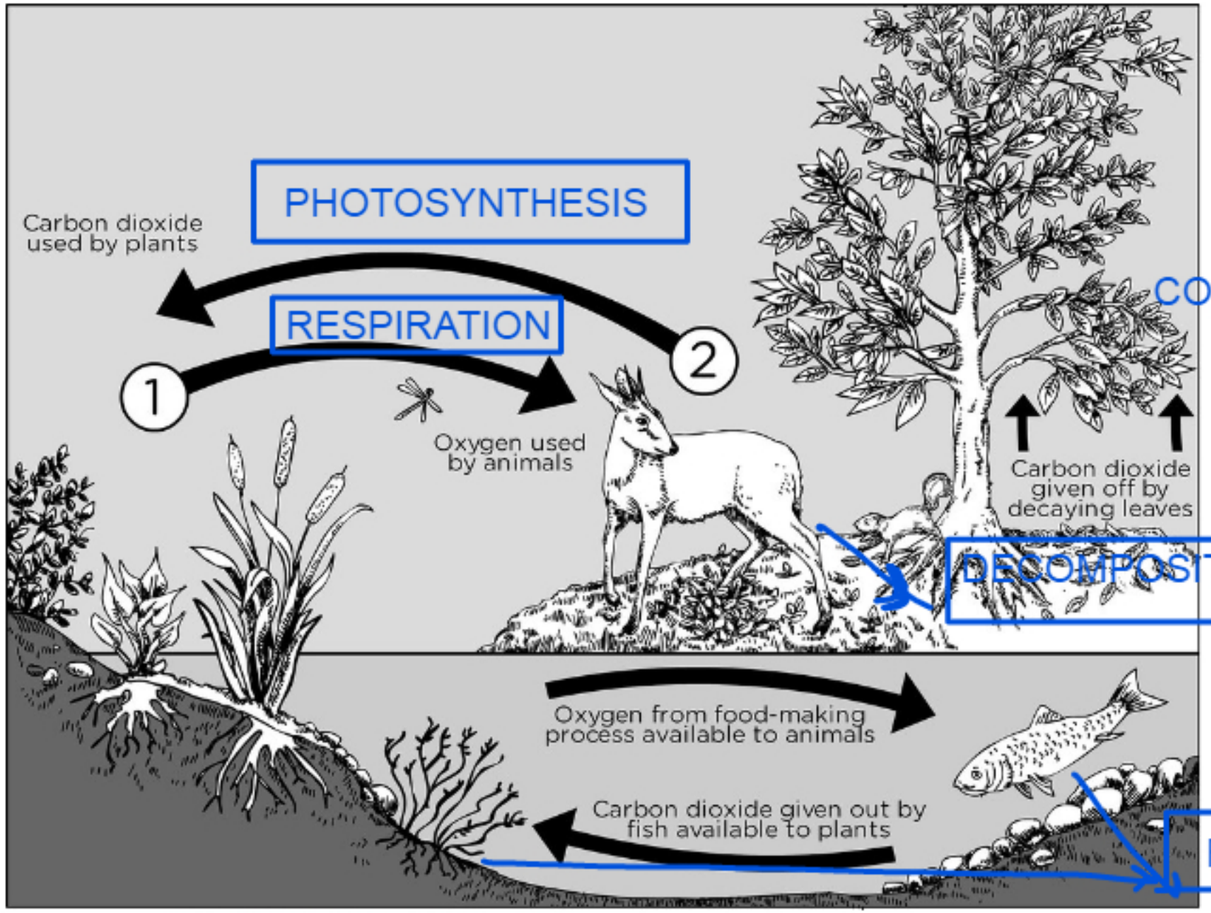
Condensation

The water vapour from all the above source cools and condense to form clouds.

Precipitation

When clouds get full the fall of as rain and the cycle continues.

CARBON CYCLE



SOURCE: FLICKR.COM

COMBUSTION

DECOMPOSITION

FOSSILISATION

Photosynthesis

It is the process by which green plants take in carbon dioxide from the atmosphere

Respiration

The carbon dioxide is returned back to the atmosphere

Combustion

The fuel burns releasing carbon dioxide into the atmosphere

Decomposition

It is the process by which decomposer decay dead material and release carbon dioxide into the atmosphere

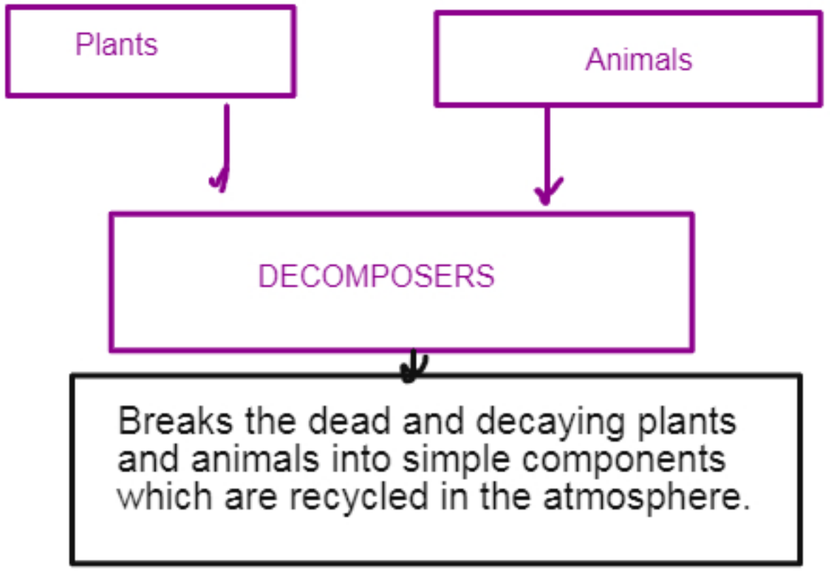
Fosslization

Dead Plants and Animals form fossil fuels which burns to release carbon dioxide into the atmosphere.

DECOMPOSITION

They are the microorganisms that breaks the dead and decay materials into simpler components.

They are very important as they return the nutrients and minerals back into the atmosphere.



Condition required for decay

a) Oxygen

b) Warm Conditions

c) Moist Conditions

Decay process forms methane which can be used as fuel.

Decay process also produce compost which can be used as a manure.

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BIODIVERSITY

It is the measure of number of difference species in an area.

Greater the biodiveristy more stable is the ecosystem and less dependency on other organisms.

Uses of Biodiversity

It is required to make the ecological balance as one species is dependent on the other.

It is required for medicine like medicinal plants.

It is required for agriculture and poultry.

It is required to maintain ecotourism.

Species are dependent on one another. So if one species is affected it can affect the entire population.

Threats to Biodiversity: All factors are interconnectedf

Deforestation : Rapid population growth causing clearing of forests and making industries and home causing climate change and global warming.

Population Growth

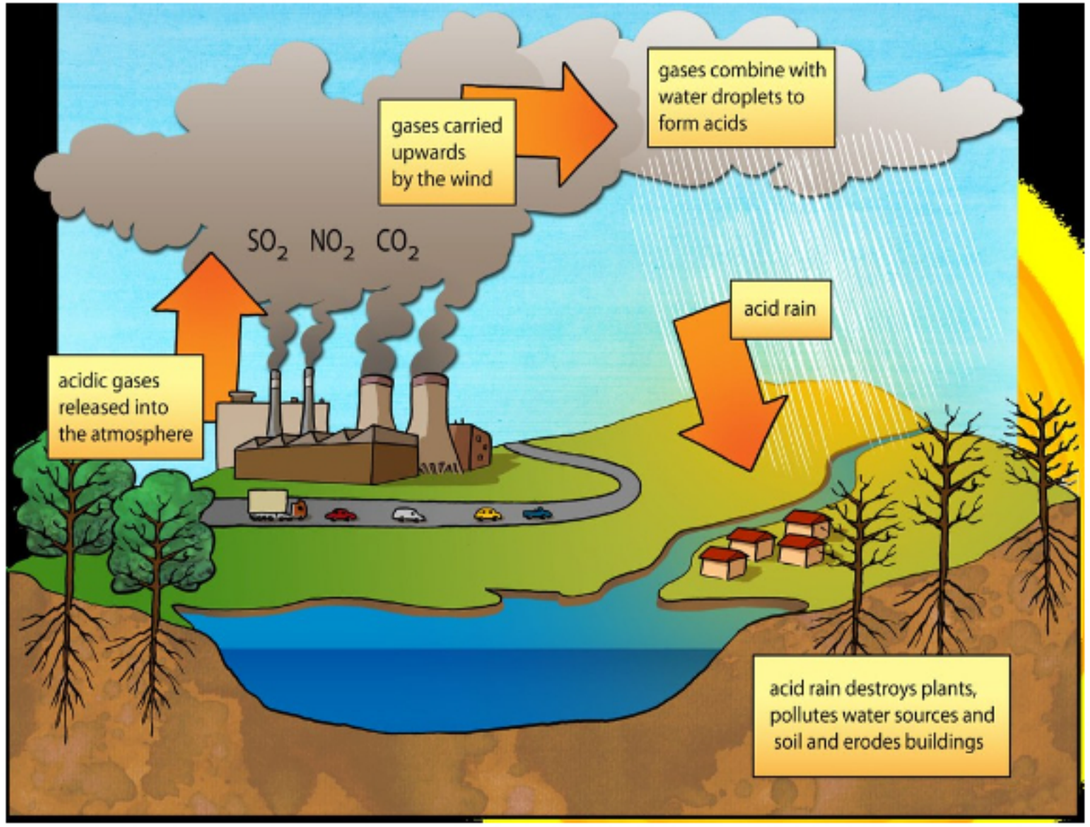
Leading to deforestation, monoculture

Agriculture

Industrialization

AIR POLLUTION

ACID RAIN



Formation

Sulphur and nitrogen present in fossil fuels forms carbon dioxdie and sulphur dioxide by combustion.

Carbon dioxide and sulphur dioxide combine with rainwater forming nitric acid and sulphuric acid and falls as acid rain.

Effects

a) Makes soil acidic

b) Damage trees and aquatic life

c) Corrossion of building

d) Errodes building and rocks

Prevention

a) Decrease in use of fossil fuels.

b) Treat the waste to remove nitrogen and sulphur before evolving.

c) Use alternative source of energy.

SMOG

Source: Wikimedia Commons

Mixutre of nitrogen dioxide and sulphur dioxide particulates in the lower atmosphere.

Depletes ozones layer, cause dimming effect.

Lowers the Earth's temperature

If inhaled causes damage to lungs, respiratory problems and cardiovascular diseases.

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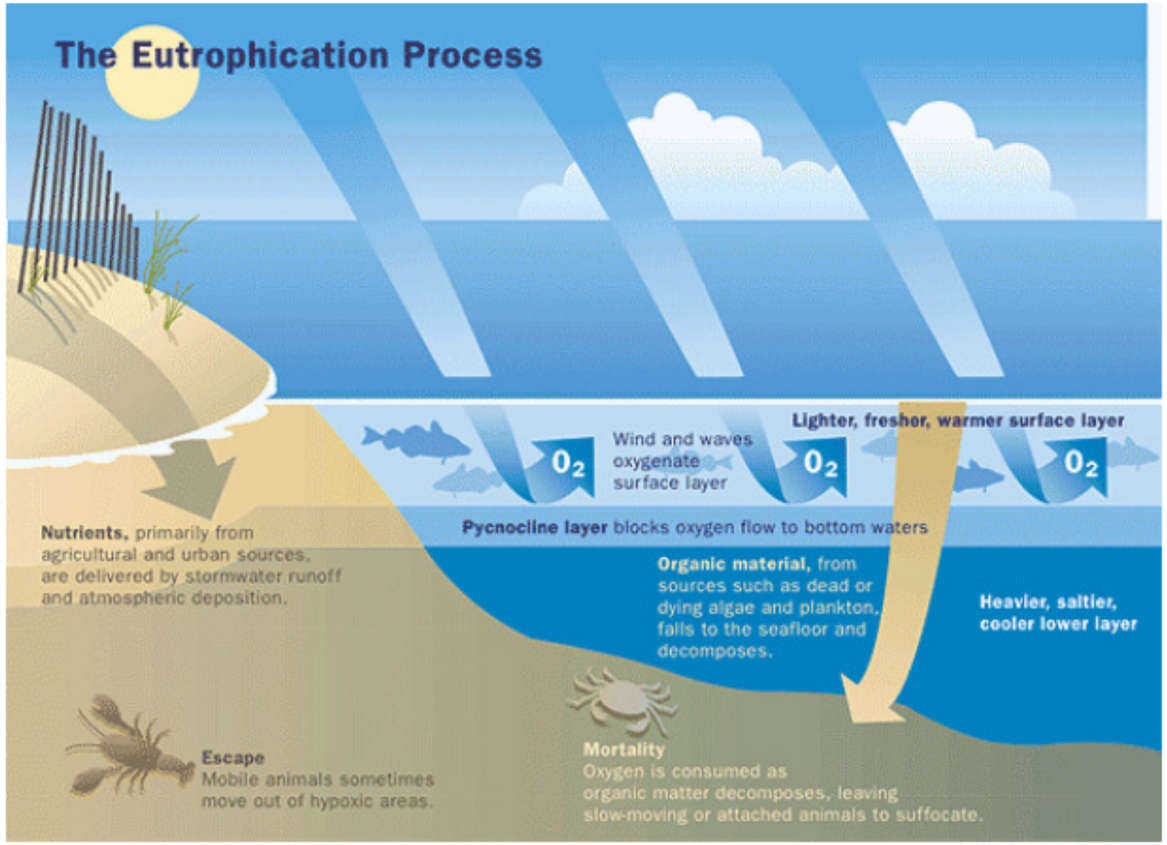
WATER POLLUTION



Fertilizers washed away

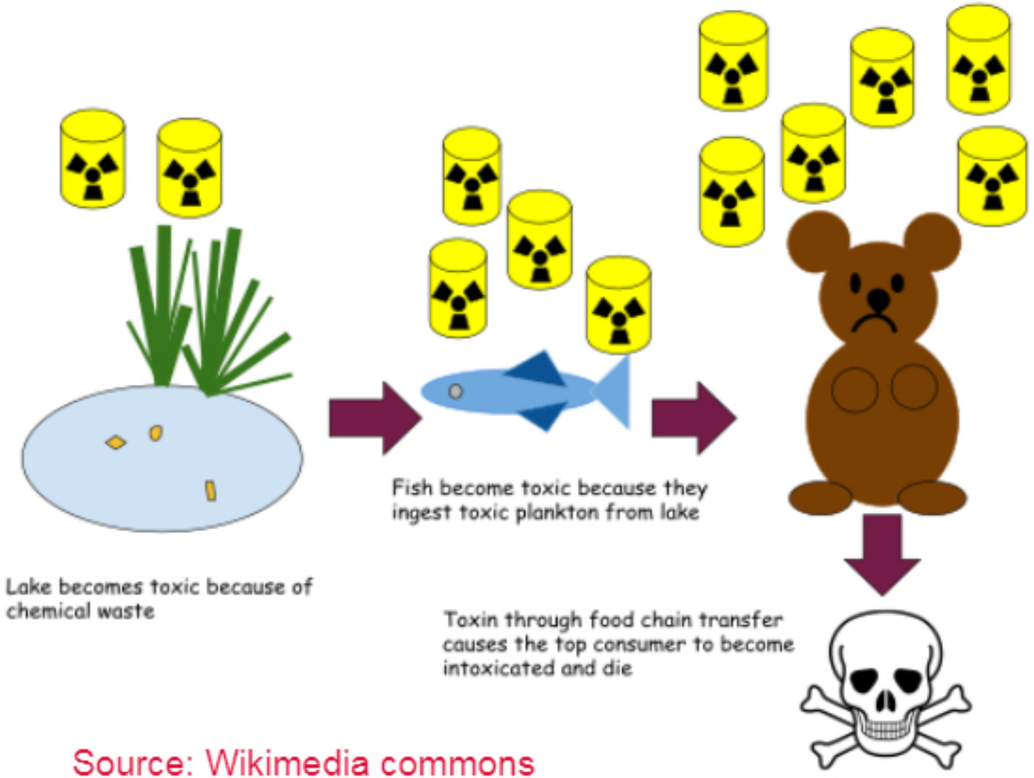
Increases the nutrient content of water causing algal bloom

ALGAL BLOOM

Forms green layer, block sunlight

Death of plants, decreasing oxygen in water. Death of other species. Decomposers increasing further decreasing oxygen.

BIOMAGNIFICATION



Source: Wikimedia commons

As the toxic products go along the food chain the concentration of the toxic chemicals increases

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LAND POLLUTION

Solid Waste

Plastic, metals and other man made chemicals fills the landfill sites

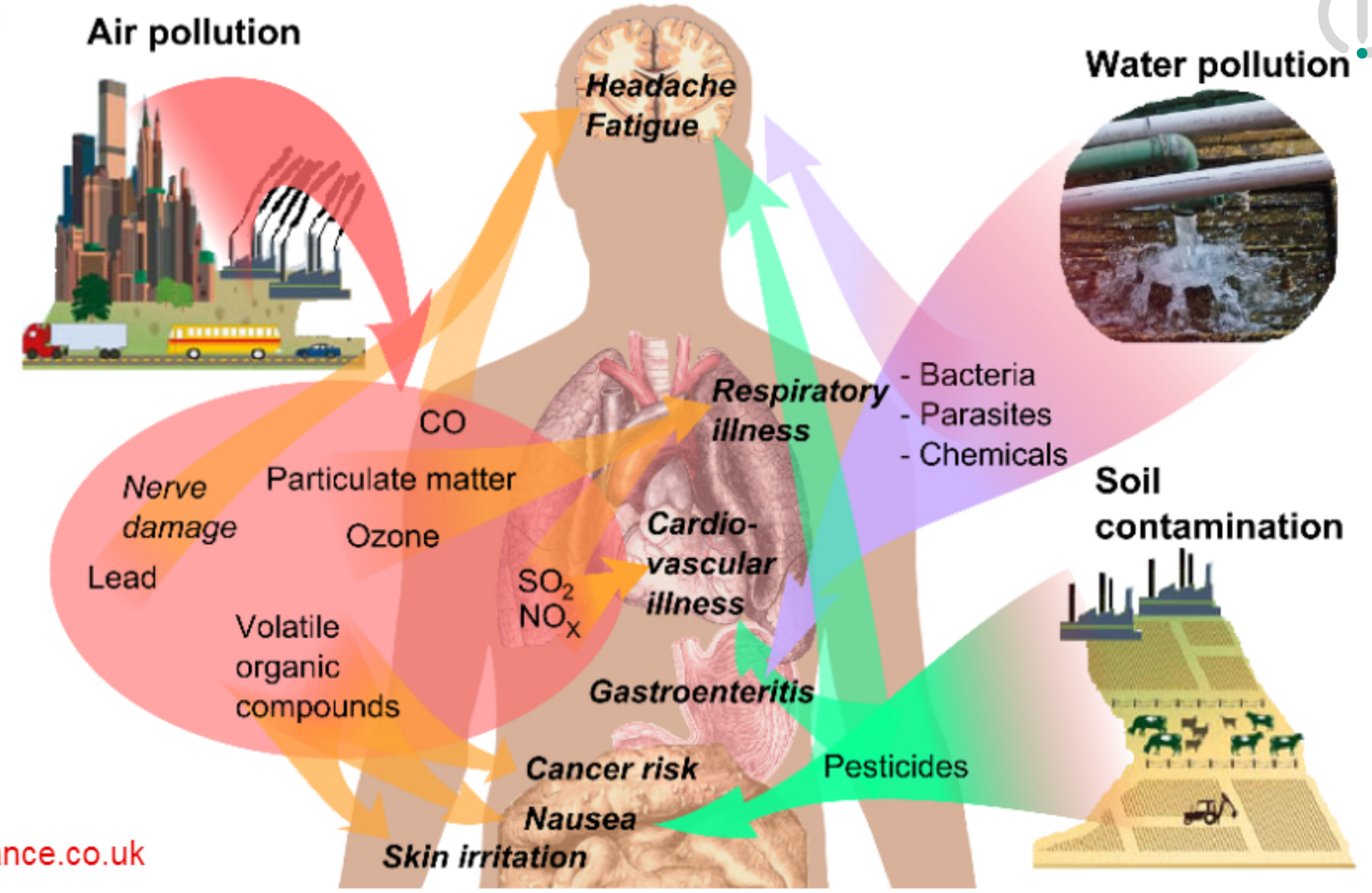
Chemicals

Toxic Chemicals come from industries and agricultures sites.

Agriculture Waste

Spray of insecticides, pesticides and weedicide contributes to land pollution.

Health effects of pollution



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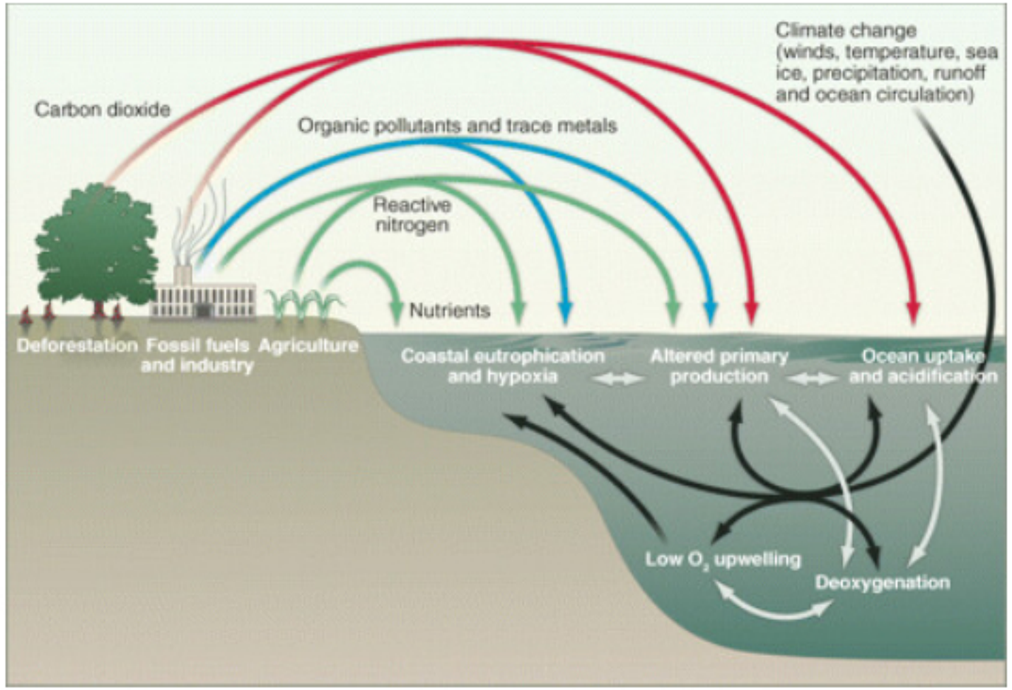
DEFORESTATION



Source: Flickr.com

Causes

Rapid industrialization, population growth and urbanization. Clearing of forests form making home and industries. Increase in agriculture to grow food and fuel crops.

Effects

a) Increase in carbon dioxide levels causing global warming and climate change.

b) Loss of biodiversity by causing habitat destruction

c) Causing extinction of species.

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PEAT BOG DESTRUCTION

What is Peat ?

It is a plant material that is not decayed due to acidic conditions.

Forms peatlands and peat bogs and are massive storehouse of carbon and host many organisms.

Uses of Peat

a) Unique carbon store
b) Habitat for many microorganism, plants and animals that can survive in acidic conditions.
c) Used as fuel

Effect of Peat Bog Reduction

Causes loss of biodiversity.

Takes millions of years to form.

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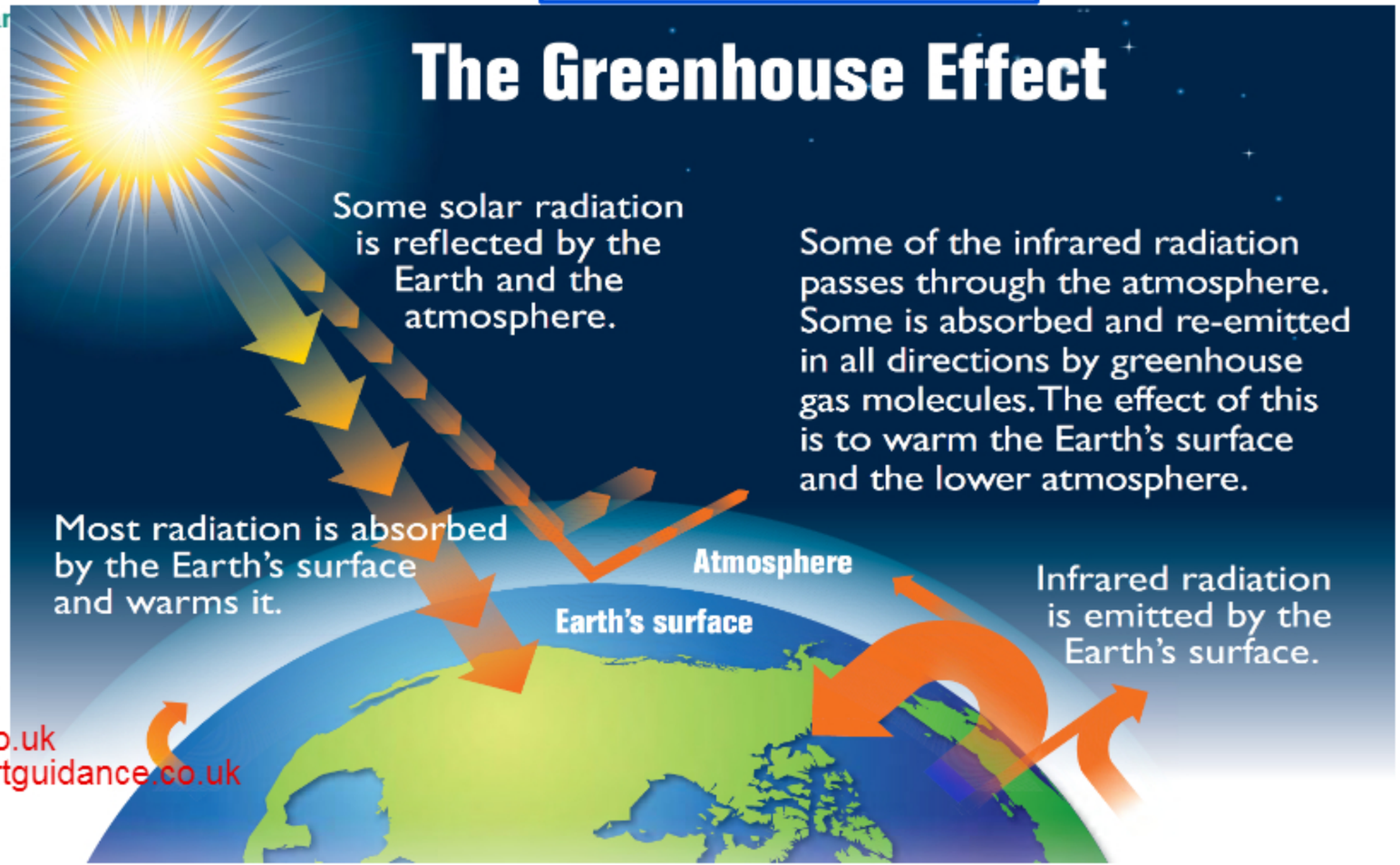
GREENHOUSE EFFECT



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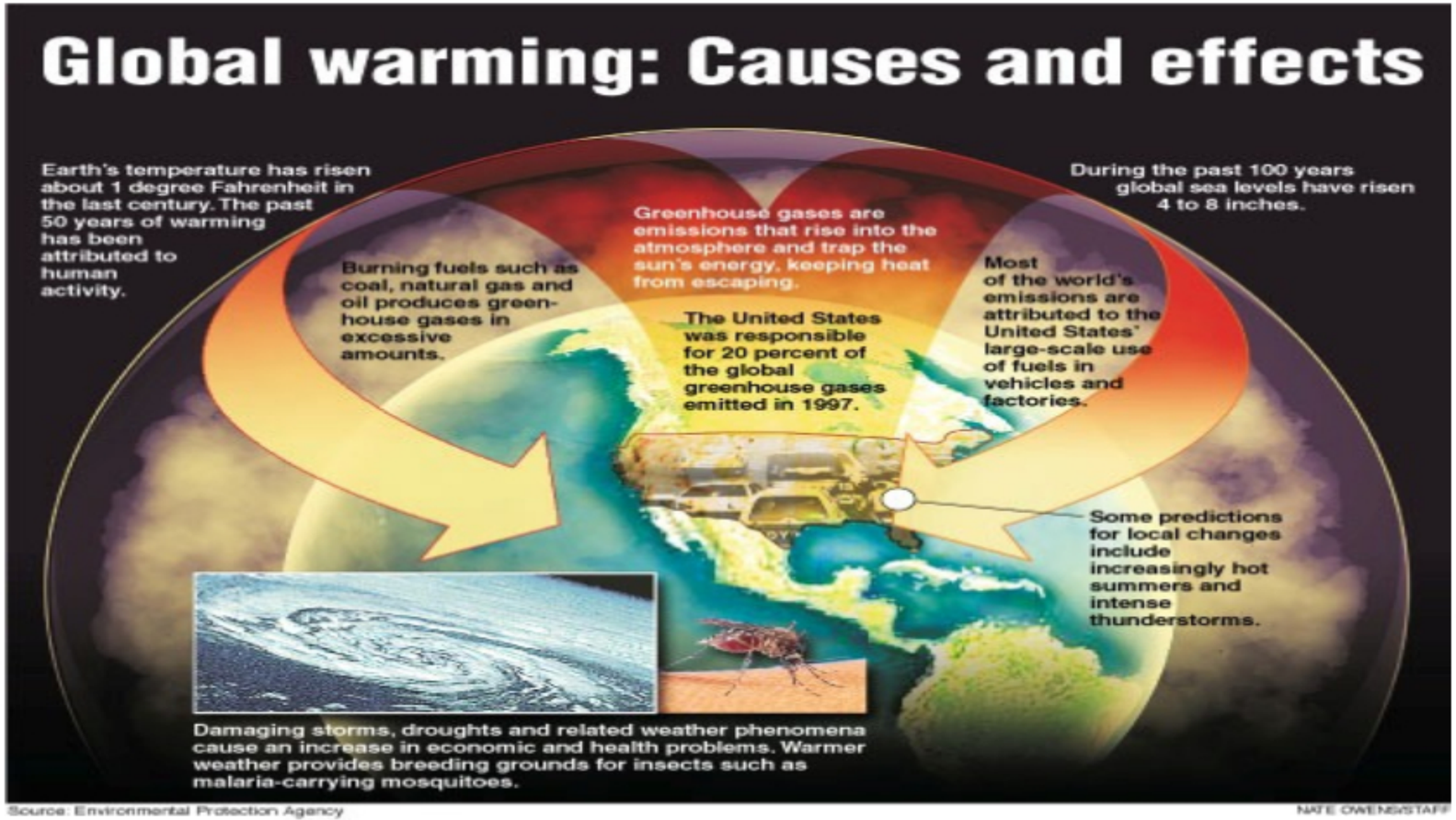
Source: Wikimedia Commons

GLOBAL WARMING



- Climate Change
- Habitat Loss
- Floods
- Change in Migration of Birds
- Change in distribution of plants and animals
- Change in seasonal pattern
- Loss of Biodiversity causing extinction of species.

Source:
The Wheezer Place

In situ Conservation

It is the protection of endangered species in their own natural habitat like making national partks, wildlife sanctuary and making biosphere reserves.

Breeding programmes are also carried in these areas to increase the population of endangered species.

Ex Situ Conservation

Preserving the biodiversity outside their natural habitat like Zoos, botanical garden, tissue culture, seed banks and gene bank.

Preventing Deforestation and Combustion

Preventing deforestation and planting more trees can reduce the carbon emissions and can prevent global warming and climate change

Recycling and using alternative sources of energy

Recyclining and using alternative sources of energy can reduce the dependency on fossil fuels causing reducing the carbon emissions preventing global warming, climate change and its effects.

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FOOD SECURITY

What is Food Security ?

Growing sufficient healthy food to
feed the population and accessibility of the population to grow or buy the healthy food.

Factors Affecting Food Security

a) Population Growth

b) Inclination toward unhealthy and easy to cook foods

c) Spread of Disease

d) Pest and Insect attack to the crop.

e) Climate Change

f) Acid Rain and Polluation

g) Water Polluation

h) Increase in cost of agricutural supplies

i) Food versus Fuel Issue

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EFFICIENT FOOD PRODUCTION

Increasing more plant based products

When plant based products are used they have the highest biomass and maximum energy as they are at the initial level of food chain.

Plant based product reduces the dependency on animal products.

Reducing the level of food chain

At each trophic level, there is energy loss.

So if the food chain levels are reduced maximum energy and biomass can be obtained.

Source: Wikimedia Commons

Intensive Farming

In intensive farming the animals are grown to limit energy loss and produce maximum biomass by

a) Restricting Movement

By restricting movement energy loss in movement is prevented.

b) Rearing them at constant temperature

Energy loss in maintaining body temperature is prevented.

c) Giving them easy to digest food

It reduced energy loss in digestion.

d) Giving them protein rich diet.

It helps to grow more biomass

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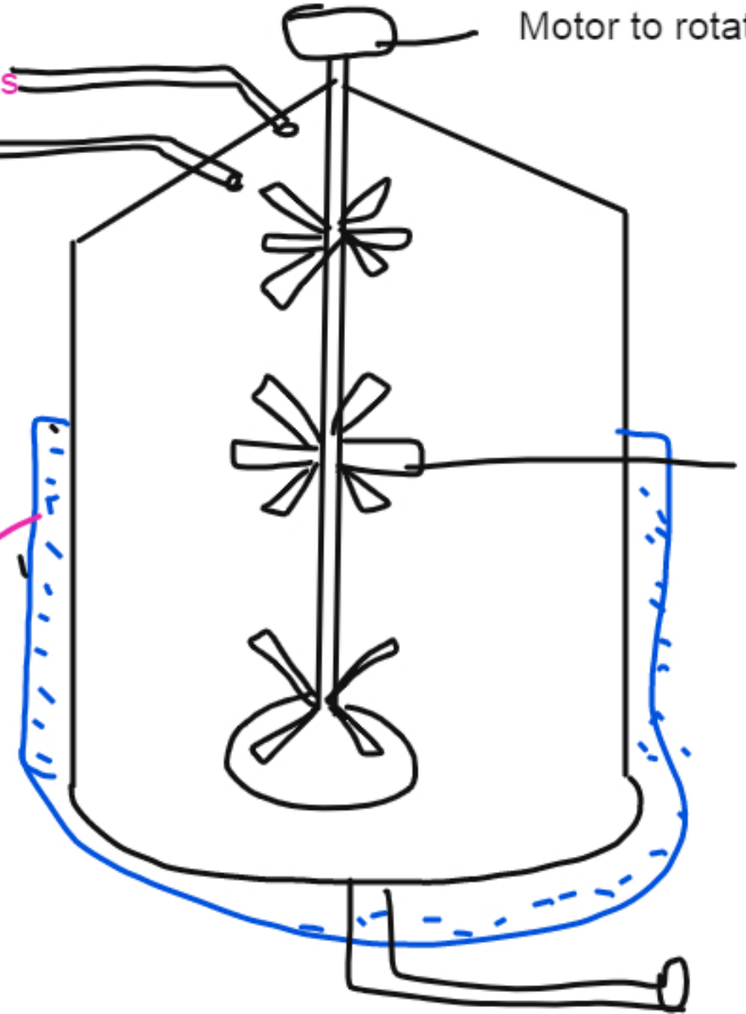
SUSTAINABLE FOOD PRODUCTION

a) Use of genetic engineering to increase the yield of the crops and making more disease resistant and high yield variety.

b) Use of microorganisms for food production

Mycoprotein are the proteins source from fungi. It is excellent food source and is sustainable grown in fermenter.



KEY TERMS

a) Communities
b) Ecosystem
c) Interdependence
d) Stable Communities
e) Abiotic Factor
f) Biotic Factor
g) Predator
h) Prey
i) Pathogen
j) Parasite
k) Competition
l) Abundance
m) Distribution
n) Quadrat
o) Sample Size
p) Mean
q) Quantitative Sampling
r) Range
s) Median
t) Mode
u) Transect
v) Adaptation
w) Biomass
x) Producers
y) Consumers
z) Water Cycle

a) Precipitation
b) Condensation
c) Evaporation
d) Transpiration
e) Photosynthesis
f) Respiration
g) Combustion
h) Decomposition
i) Decay Cycle
j) Biodiversity
k) Acid Rain
l) Smog
m) Eutrophication
n) Biomagnification
o) Global Warming
p) Greenhouse Effect
q) Trophic Level
r) Pyramids of Biomass
s) Pyramids of Number
t) Food Security
u) Fermenter
v) Biotechnology
w) Mycoprotein

NEXT STEP

CHECK SPECIFICATION

EXAM QUESTION ON THIS TOPIC

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