

AQA GCSE GEOGRAPHY UNIT 1
Living with the Physical Environment Exam
REVISION RESOURCE 2

SECTION B

The Living World

Ecosystems

Ecosystem – A natural system made up of plants, animals and the environment.

There are often **complex interrelationships** between living and non-living components of an ecosystem.

Biotic – **living** features of the ecosystem (e.g. fish)

Abiotic – **non-living** environmental factors (e.g. soil)

Small-scale – a pond, hedgerow, woodland etc

Global-scale – tropical rainforest, deciduous woodland etc.

Global-scale ecosystems are called **biomes**.

Term	Definition
Producers	Convert energy from the environment (mainly sunlight) into sugars (glucose). E.g. plants.
Consumers	Get energy from the sugars created by producers. E.g. a pond snail eats plants.
Decomposers	Break down plant and animal matter and return nutrients to the soil. E.g. fungi and bacteria.
Food chain	Shows the direct links between producers and consumers in a simple line.
Food web	Shows all the connections between producers and consumers in a complex way.
Nutrient Cycling	Nutrients absorbed by plants and animals to grow. When they die, their nutrients are returned to the soil by decomposers. This recycles nutrients.



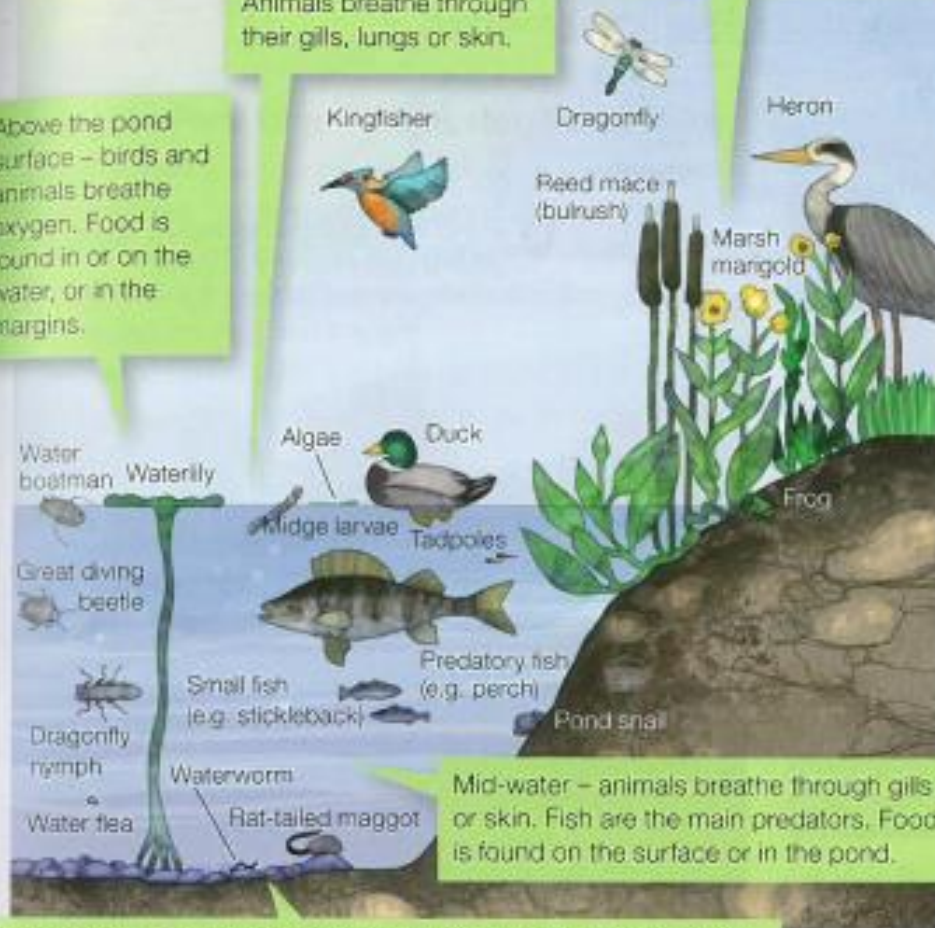
A freshwater pond ecosystem

Energy from the Sun

Pond surface – plenty of oxygen and light here. Animals breathe through their gills, lungs or skin.

Pond margin – plenty of oxygen and light here. Plenty of shelter for the plants and insects, for small animals to eat.

Above the pond surface – birds and animals breathe oxygen. Food is found in or on the water, or in the margins.



Pond bottom – little oxygen or light. Plenty of shelter (rotting plants and stones) and food. Decomposers and scavengers live here.

Ecosystems



Each of these environments is an important habitat and forms part of the pond ecosystem

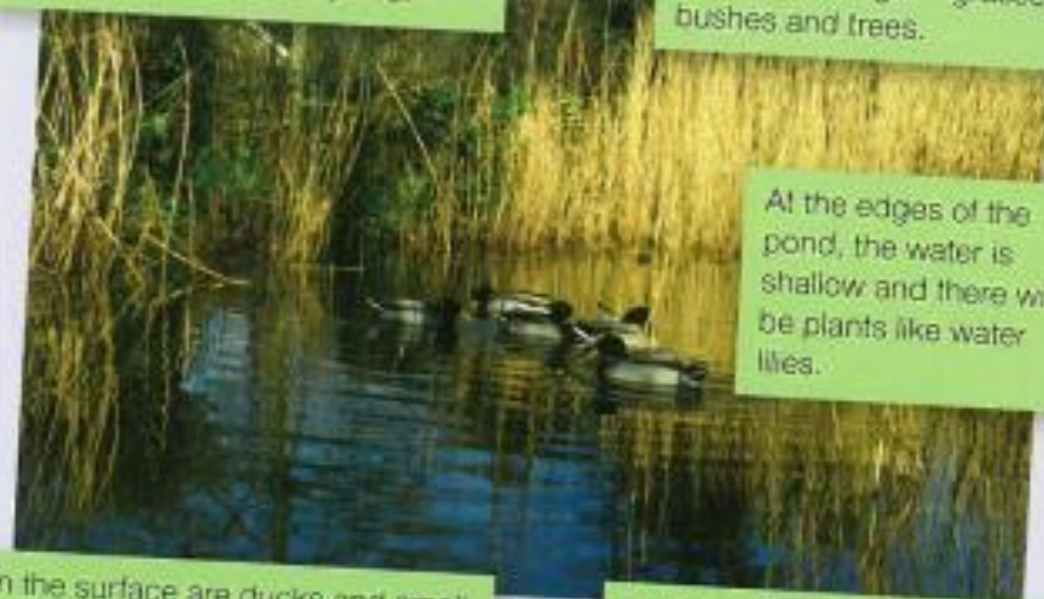
Plants like reeds grow in the water around the edge of the pond.

On the banks grow grasses, bushes and trees.

At the edges of the pond, the water is shallow and there will be plants like water lilies.

On the surface are ducks and small insects such as water boatman.

At the centre the water is deeper and there will be fish.



How does change affect ecosystems?

Ecosystems can take hundreds or thousands of years to develop so needs to be in **balance** to be sustainable. If there is a change to one component then it has a **knock-on effect** on the rest of the ecosystem.

Global-scale changes – e.g. climate change

Local-scale changes – e.g. when a hedge is removed

Impact of Human Changes



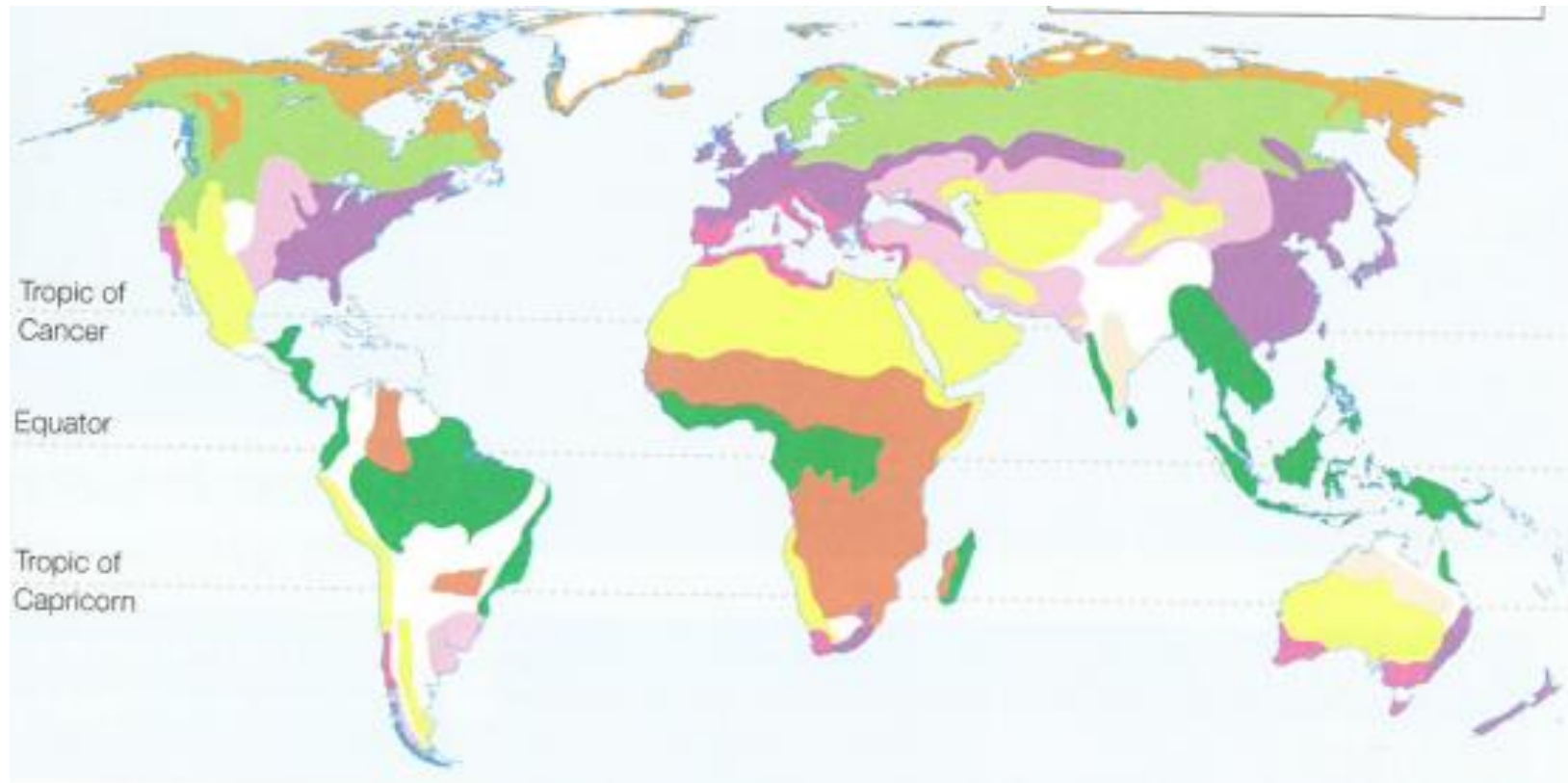
Natural Changes

- Ecosystems can adapt to **slow** natural changes with few harmful effects
- Rapid changes can have serious impacts
- **Extreme weather events** like droughts can be devastating to ponds and lakes
- Plants will dry up and starve
- This could dry up places which changes the **edge-of-pond** environment
- Fish, starved of oxygen, may not survive

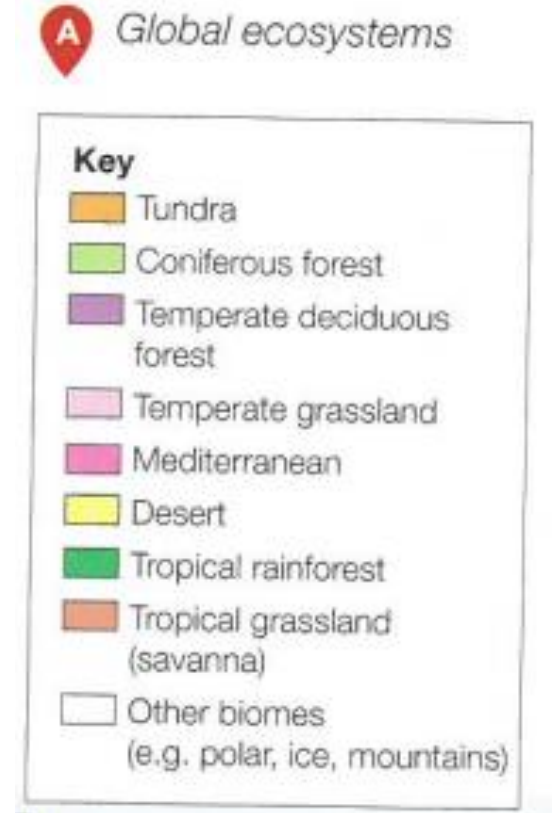
Global ecosystems (biomes)

Large-scale ecosystems are known as **global ecosystems** or **biomes**. They are mainly defined by the dominant type of **vegetation** that grows in the region.

They form **broad belts** across the world, parallel to the lines of latitude. This is because the climate and characteristics of ecosystems are determined by **global atmospheric circulation**.



Distribution of global ecosystems



Global ecosystems (biomes)

We will be focusing on the **desert** and **tropical rainforest** global ecosystems. Below are some other global ecosystems.

Temperate Grassland

- Experiences warm, dry summers and cold winters
- Grasses can tolerate these conditions
- Land mostly used to graze animals

Located – 30-40° north and south of Equator away from coasts



Arctic Tundra

- *Extremely Cold, desert-like conditions*
- Average winter temperature = -34°C (-30 F)
- Average summer temperature 3-12°C (37-54F)
- Rainfall may vary in different regions of the arctic.
- *Yearly precipitation, including melting snow, is 15 to 25 cm (6 to 10 inches).*
- Very Windy! 30-60 mph



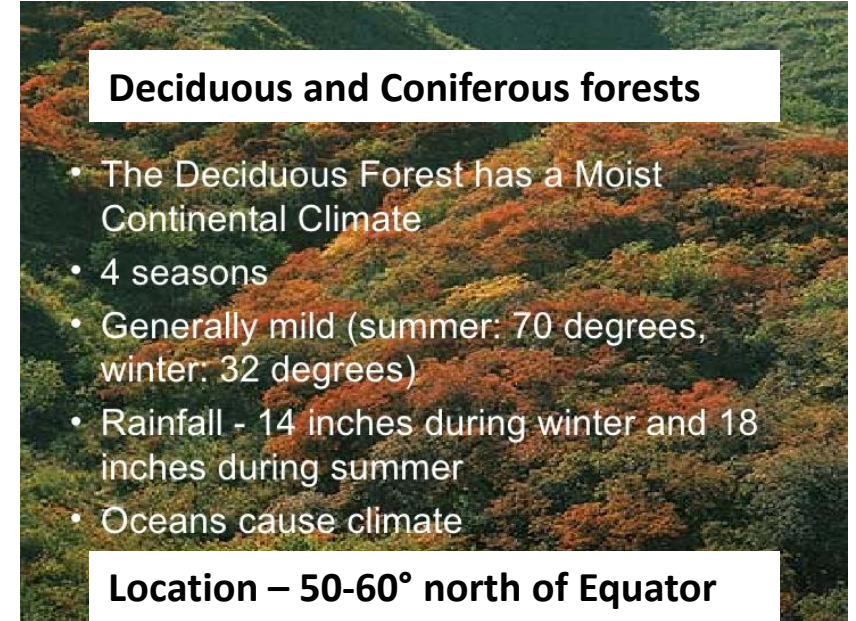
Photo Source:
http://biology.usgs.gov/ecosystems/global_change/climate_tundra.html

Located – from Arctic Circle to 60-70° north

Deciduous and Coniferous forests

- The Deciduous Forest has a Moist Continental Climate
- 4 seasons
- Generally mild (summer: 70 degrees, winter: 32 degrees)
- Rainfall - 14 inches during winter and 18 inches during summer
- Oceans cause climate

Location – 50-60° north of Equator



Polar

Located – Arctic/Antarctic

- Cold air sinks at north and south Poles
- Very low temperatures and dry conditions
- Temperatures as low as -50°C



Tropical Rainforests - Climate

Tropical rainforests are found in a belt around the **Tropics** in: Central and South America, central Africa, South East Asia and northern Australia.

Month	Temperature (°C)		Rainfall (mm)	Relative humidity	Sunshine (average hours per day)
	Max.	Min.			
January	31	24	249	89	4
February	31	24	231	89	4
March	31	24	262	89	4
April	31	24	221	90	4
May	31	24	170	89	5
June	31	24	84	87	7
July	32	24	58	87	8
August	33	24	38	85	8
September	33	24	46	84	8
October	33	24	107	85	7
November	33	24	142	86	6
December	32	24	203	88	5

They **thrive** in warm and wet conditions. The equatorial zone where they are found has high rainfall and temperatures.

The temperature is high and constant throughout the year.

- Powerful sun is overhead most of the time

Rainfall is high.

- **Global atmospheric circulation** causes an area of low pressure to form at the Equator
- Rising air creates **clouds** and triggers heavy rain

Rainfall varies throughout the year.

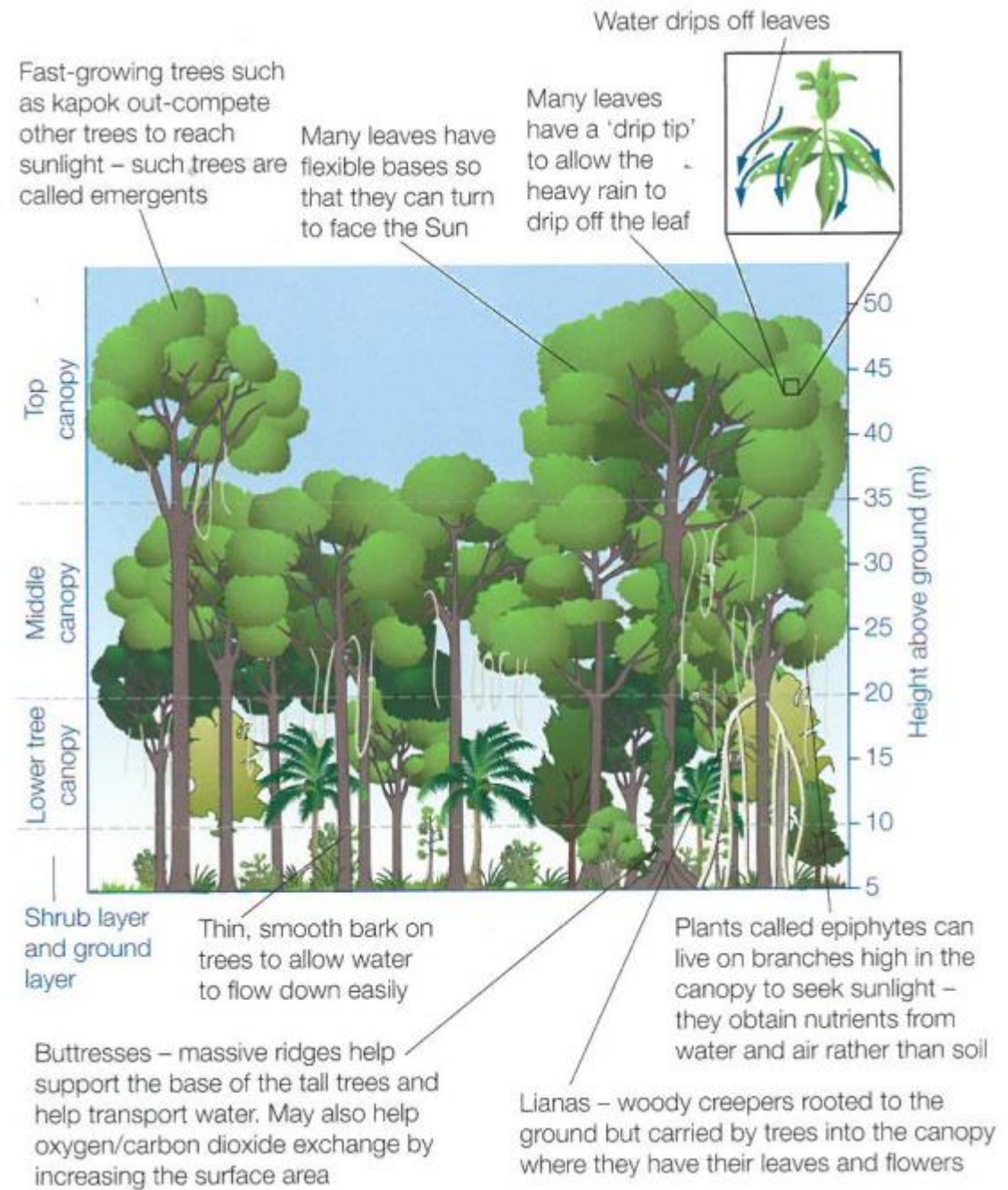
- Distinct **wet season** that lasts 6 months
- Period of intense rainfall when the equatorial low pressure area is directly overhead

Tropical Rainforests – Biotics and Abiotics

1. Soils are **infertile**.
2. Most nutrients found at surface where dead leaves **decompose**.
3. Trees and plants have **shallow roots** to absorb these nutrients.
4. Heavy rainfall can quickly dissolve and wash away nutrients (**leaching**).

Plants and Animals

1. Supports largest number of species in one biome.
2. Huge **biodiversity**.
3. Birds live in the canopy.
4. Mammals live in the trees and on forest floor.



Stratification and vegetation adaptations in a tropical rainforest

Causes of Deforestation in Malaysia



Located in South East Asia.
67% of land covered in tropical rainforest.

Deforestation – the cutting down of trees, often on a large scale.

- Timber highly valued **export**
- Land can be used for cattle ranching, farming and production of rubber and palm oil

- Rate of deforestation in Malaysia is **increasing faster** than any other tropical country in the world.

Population Pressure

- Poor urban people were encouraged to move into countryside by government (**transmigration**)

Commercial Farming

- **Largest exporter** of palm oil
- Plantation owners given 10 year tax **incentives** which encourages deforestation

Logging

- World's **largest exporter** of timber
- **Clear felling** was common (all trees in area chopped down)
- **Selective logging** in practice (only fully-grown trees are felled).

Mineral Extraction

- **Tin mining** is common
- Rainforest cleared for mining and road **construction**
- Drilling for oil and gas has recently started on Borneo

Subsistence Farming

- **Slash and burn** uses fire to clear land for local communities to grow small amounts of food.
- Fires can grow **out of control** and destroy whole areas of forest.

Impacts of Deforestation in Malaysia

Soil Erosion

- Removal of soil by wind and rain.
- Roots of trees and plants **bind** soil together.
- Deforestation means soil erosion is easier.

Loss of Biodiversity

- **Biodiversity** – measure of variety of plants and animals in a particular ecosystem.
- Deforestation **destroys** ecosystems and many habitats
- Plants and animals will die and this **reduces** biodiversity

Contribution to climate change

- Deforestation reduces **moisture** in the air from trees leading to a drier climate
- Less trees to act as **carbon sinks**
- Evaporation uses heat and cools air. This stops with deforestation.

Economic Gains

1. **Development of land for mining and farming will lead to jobs (direct and indirect).**
2. Companies pay tax to the government who can improve country's services.
3. **Improved transport infrastructure opens up areas for tourism and industry.**
4. Hydro-electric power is cheap and plentiful.
5. **Valuable minerals mined for = more money.**

Economic Losses

1. Pollution of water sources and increasingly dry climate will lead to water shortages.
2. **Fires cause harmful pollution and can destroy valuable areas of land.**
3. Rising temperatures can destroy valuable crops e.g. tea.
4. **Plants with high profits and medicinal benefits could become extinct.**
5. Number of tourists attracted to rainforest could decrease.



Why should we protect tropical rainforests?

Climate Change Trees absorb the greenhouse gases that fuel global warming. Fewer forests means larger amounts of greenhouse gases entering the atmosphere. ENVIRONMENT	Medicines Over 25% of the medicines (and 70% cancer medicines) we use today have their origins in the rainforests – and that's after only about 1% of rainforest plants have been examined for their medicinal properties. SOCIAL	Regulation of Water Cycle Trees play an important part in the water cycle, grounding the water in their roots and releasing it into the atmosphere. In the Amazon, more than half the water in the ecosystem is held within the plants. ENVIRONMENT
Biodiversity The Amazon rainforest is home to 70% of the world's animal and plant species. ENVIRONMENT	Endangered Species There are around 2633 threatened and endangered species living in the Amazon Rainforest. ENVIRONMENT	Natural Resources The world relies on key exports from the rainforest, for example coffee, bananas and timber. ECONOMIC
Oxygen 28% of the world's oxygen is produced in tropical rainforests/ ENVIRONMENT	Tribal Peoples The rainforest is the home many tribal people who live in the Amazon Rainforest and depend on its food and shelter. SOCIAL	Eco-Tourism Tourists to the Amazon bring money and jobs to local people. ECONOMIC

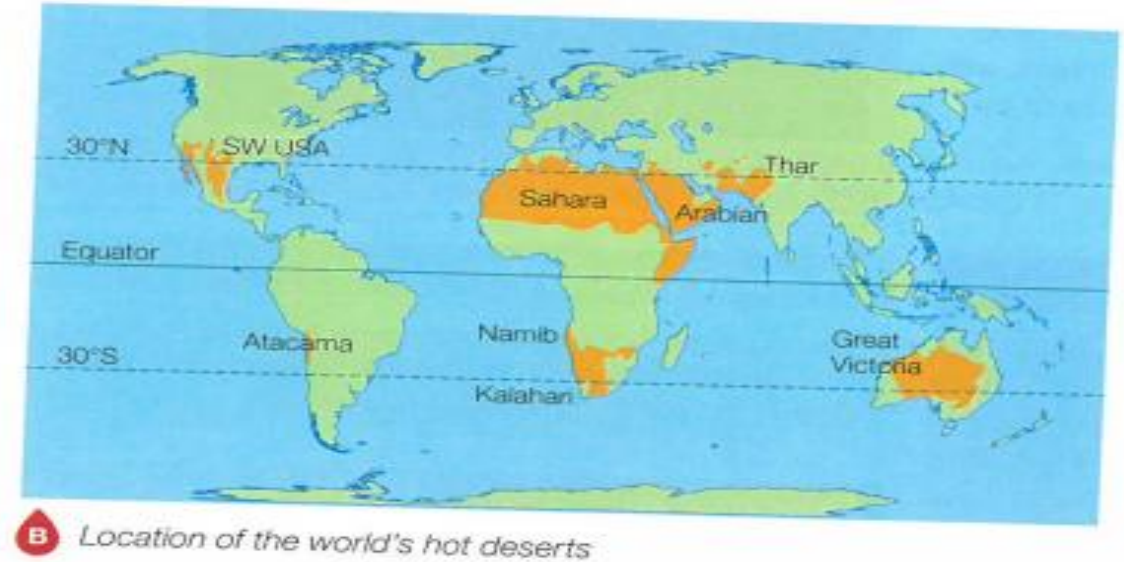
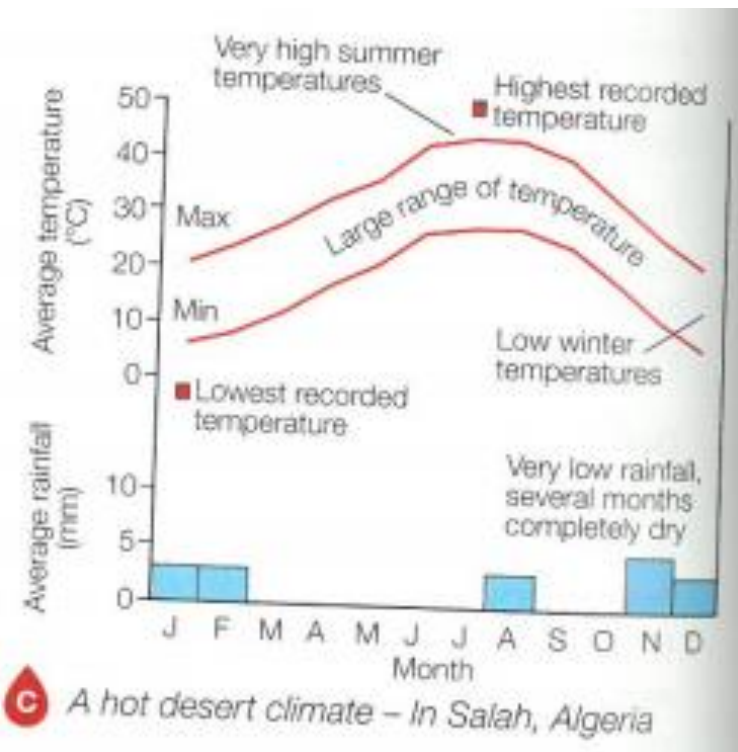
How can we reduce the rates of deforestation?

Method	Advantages	Disadvantages
Debt Reduction is when countries who have loaned tropical regions money reduce their debts if they do not deforest the rainforests. This is called 'debt-for-nature swapping'.	<ul style="list-style-type: none">1) Less debt for the country2) Trees promote very fertile land for crops3) Less forest is destroyed for farming4) More money for local people	<ul style="list-style-type: none">1) Only effective if local people listen to the government and conservation workers2) Subsistence farmers may be overlooked in these deals
Selective Logging and Reforestation is the only felling fully-grown trees and planting new trees to replace those that have been chopped down.	<ul style="list-style-type: none">1) Habitat is maintained so more animals live2) Reducing rate of deforestation	<ul style="list-style-type: none">1) Not actually stopping trees being chopped down in the first place
Public Education involves teaching people why the rainforest is important so they protect it	<ul style="list-style-type: none">1) Will encourage locals to stop chopping down trees2) People will buy sustainable goods	<ul style="list-style-type: none">1) Not everyone has access to this education2) Some people just don't care
Conservation make certain areas of the rainforest protected areas.	<ul style="list-style-type: none">1) In these areas logging is illegal2) Area is protected from deforestation	<ul style="list-style-type: none">1) Illegal logging still occurs in this area2) People want to clear land to make money and build homes

Hot Deserts - Climate

A **desert** is an area that receives **less than 250mm** rainfall a year.

Hot deserts are found in **dry continental interiors**, away from coasts. They are located 30°N and 30°S of the Equator.



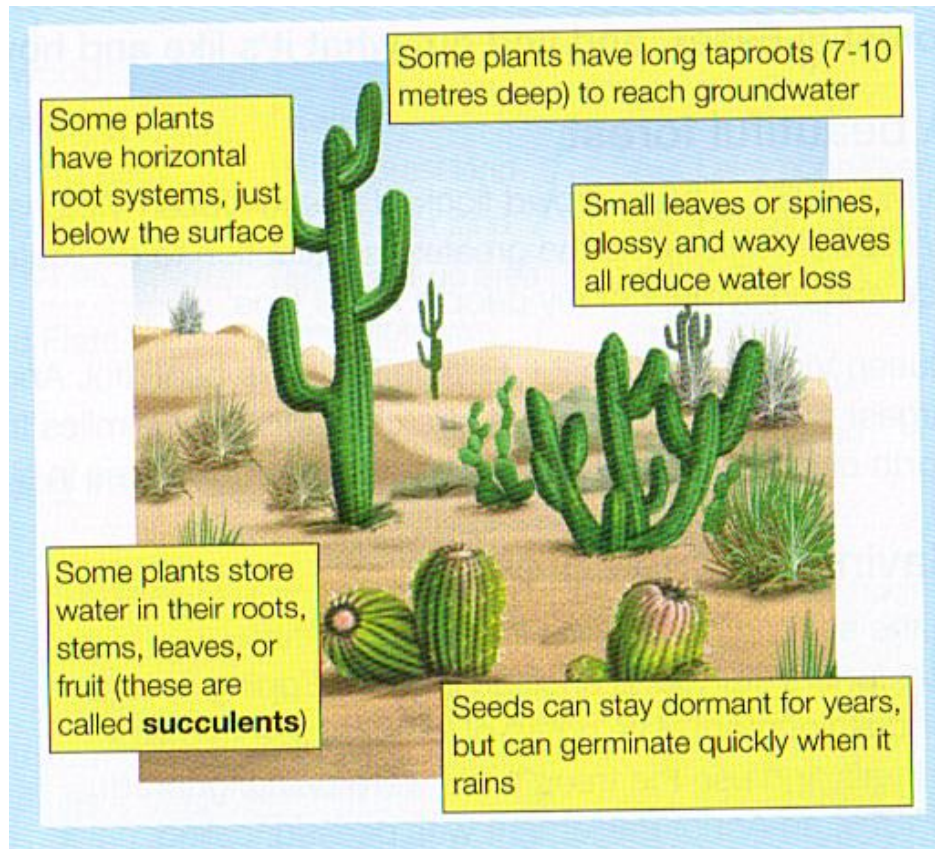
Due to global atmospheric circulation there is a persistent belt of high pressure. This means there is a lack of cloud and rain with high daytime temperatures.

The lack of cloud cover also means that temperatures can go below freezing during the night.

Hot Deserts - Adaptations

Hot deserts have a **diverse** range of plants, animals and birds.

Plants tend to have very **long roots** to reach underground water and **thin leaves or spines** to reduce water loss.



Animal adaptations- Fennec fox

Adaptation

burrowing and nocturnal lifestyle



Function

Cooler temperatures at night mean less water loss while carrying out activities.

large ears (about 15cm)



help dissipate excess body heat on hot days in the desert.

Thick, sandy fur



helps insulate them from the cold desert nights but also reflects heat, As well as providing excellent camouflage.

Opportunities for Development in Hot Deserts



Case Study – Thar Desert

1. Stretches across north-west **India** into **Pakistan**
2. 200,000km²
3. Most **densely populated** desert in the world

Mineral Extraction

- **Valuable reserves** of stones and minerals
- Used in India and **exported** globally
- Gypsum (making cement)
- Feldspar (making ceramics)
- Phospherite (making fertiliser)
- Kaolin (whitener in paper)



Tourism

- Has a beautiful landscape
- Increasing number of **tourists**
- Most tourists from Pakistan
- **Desert safaris** on camels popular
- Annual desert festival every winter
- Local people **benefit** by providing food, accommodation, acting as guides and rearing camels

Opportunities for Development in Hot Deserts



Case Study – Thar Desert

1. Stretches across north-west **India** into **Pakistan**
2. 200,000km²
3. Most **densely populated** desert in the world

Energy

- **Coal** – extensive deposits in parts of the desert and a **thermal energy plant** has been constructed
- **Oil** – large **oilfield** has been discovered
- **Wind** – Wind Park constructed in 2001
- **Solar** – Sunny, cloudless skies makes Thar a great place for **solar power** generation



Farming

- Most people living in Thar desert are **subsistence** farmers
- **Graze** animals on grassy areas
- Grow vegetables and fruit trees
- Commercial farming made possible by **irrigation**
- **Indira Gandhi Canal** constructed in 1958 which lets wheat and cotton grow

Challenges of Development in Hot Deserts – Thar Desert

Extreme Temperatures

- Suffers from extremely high temperatures
- Can **exceed 50°C** in the summer
- Working outside in the heat can be very hard, particularly for farmers
- High rates of **evaporation** leads to water shortages
- Livestock need **shade** to protect them from the Sun

Accessibility

- Very **limited** road network
- High temperatures cause tarmac to **melt**
- Strong winds blow sands across the roads
- Many places only accessible by **camel**
- Public transport involved very overloaded buses

Water supply has become a serious issue as population has increased and farming and industry have developed.

The desert has **low annual rainfall**, high temperatures and strong winds. This causes high rates of **evaporation**.

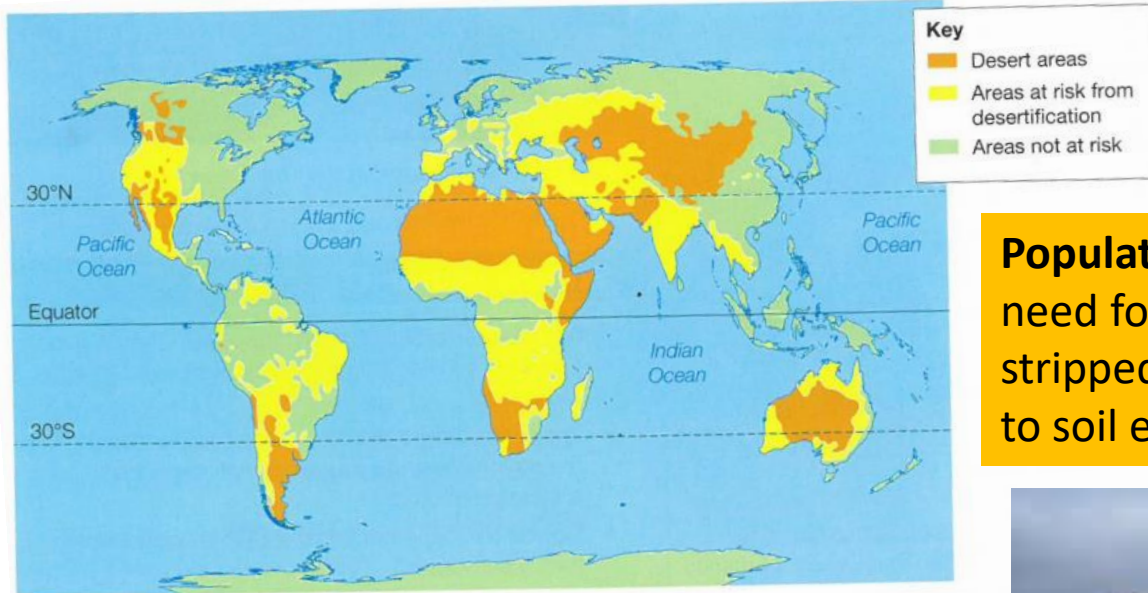
Sources of Water:

1. Man-made and natural **ponds** for drinking water.
2. A few **rivers** and streams, but most intermittent and flow only after rainfall.
3. Some water can be obtained from **aquifers** (underground water sources) using wells.



Causes of Desertification in Hot Deserts

Desertification – where land gradually turns into desert, usually on the edges of an existing desert.



Climate Change – resulting in **drier** conditions and **unreliable** rainfall. Rains less than it did 50 years ago in these regions.

Population Growth – increasing need for **fuelwood**. Trees are stripped until they die, leading to soil erosion.

Soil Erosion – when vegetation has been destroyed the soil is **exposed** to wind and rain, making it vulnerable to **erosion**.

Over-cultivation – resulting from need for more food. Soil will become exhausted and **infertile**.

Population Pressure – can result in land close to deserts being **overgrazed** i.e. too many animals for the limited vegetation. Leads to soil **erosion**.

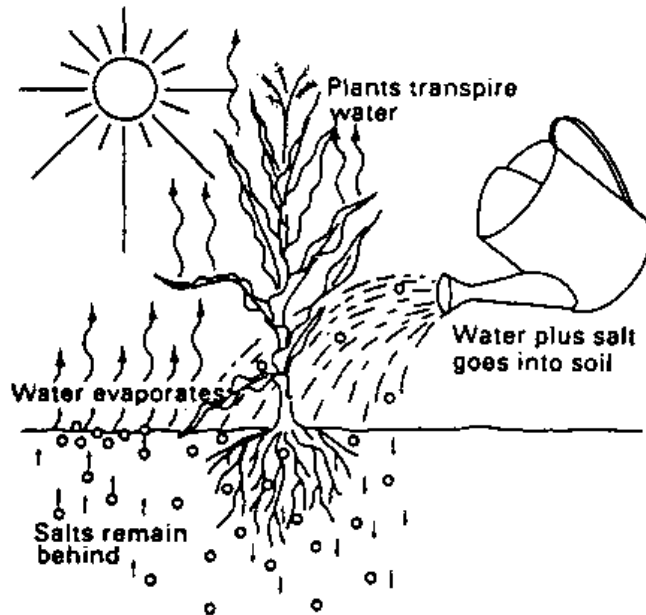
1. Most areas at risk are on the **borders** of existing deserts.
2. **One billion** people live in areas at risk.
3. Affects rich and poor countries.



Reducing Desertification in Hot Deserts

Water and Soil Management

Commercial farming involves **irrigation**, but too much can cause **salinisation**. The high rate of evaporation in hot deserts leads to a build-up of salts on the surface. This **reduces soil fertility** and kills plants.



Salinisation

Water Management – Australia

Local farmers encouraged to use following methods to prevent soil erosion:

- 1) **Ponding Banks** – areas of land enclosed by low walls to **store** water.
- 2) **Contour Traps** – **embankments** built along the contours of slopes to prevent soil being washed away due to **heavy rainfall**.

National Parks

Some areas at high risk of desertification have been **protected** by turning them into national parks.

Desert National Park – Thar Desert, India

Zion National Park – Las Vegas, USA

Reducing Desertification in Hot Deserts

Tree Planting in the Thar Desert, India

Tree roots **bind** soil together and leaves and branches provide shade and grazing for animals.

The **Prosopis Cineraria** provides:

- Plenty of **foliage** and seed pods for animals to eat
- Good quality **firewood**
- Strong wood for building material
- **Shade** and moist growing conditions for plants
- Roots to **stabilise** sand dunes



Appropriate Technology

Uses methods and materials that are appropriate to **level of development** of a country.

Sustainable approaches have to be practical and appropriate.

'Magic Stones' – Burkina Faso

- Local people have built **low stone walls**, 0.5m-1.5m high, along contours of slopes.
- When rain washes down, walls **trap** water and soil.
- Has **increased crops** by 50% and has reduced desertification.