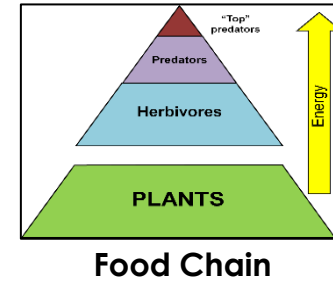
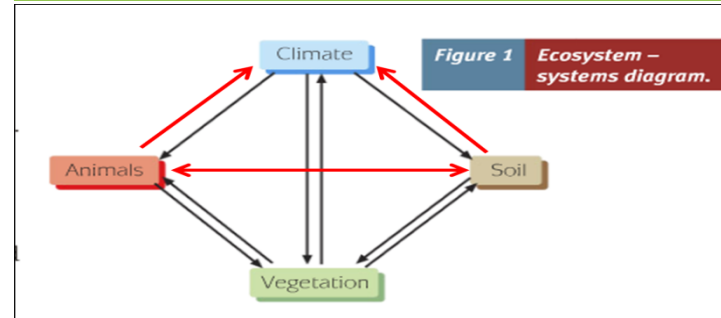


Sustaining Ecosystems

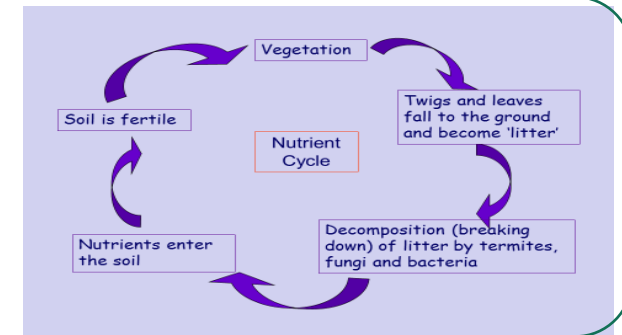
Glossary

Biotic	Living components of a community or ecosystem e.g. plants and animals
Abiotic	Non-living components of an ecosystem e.g. climate, soil/rock, water
Food Chain	A single line of links showing the transfer of energy from one organism to the next
Food Web	A complex series of links (more than one food chain) showing the transfer of energy from one organism to the next
Economic	Money and jobs
Environmental	Nature and the surrounding land, air and water
Social	People – their day to day lives – housing, travel, health
Sustainable	Making use of resources to enhance our lives but in such a way as to not ruin the opportunity of those in the future

An ECOSYSTEM is a community of BIOTIC and ABIOTIC parts that interact with each other and with their environment.

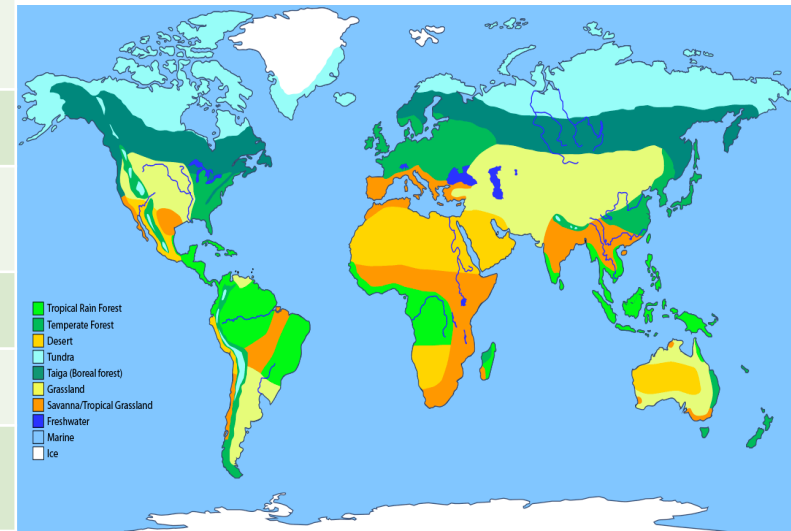


Nutrient Cycle

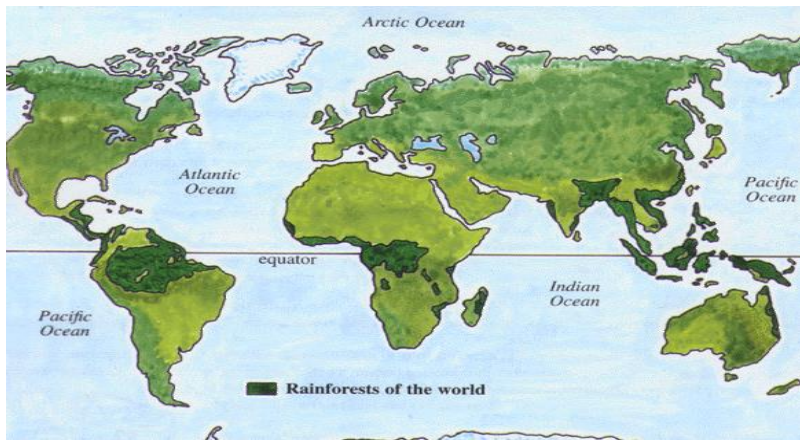


Biome's climate and plants			
Biome	Location	Temperature	Rainfall
Tropical rainforest	Centred around the Equator between the two tropics	Hot all year (25-30°C)	Very high (over 200mm/year)
Tropical grasslands	Between latitudes 5°- 30° north & south of Equator.	Warm all year (20-30°C)	Wet + dry season (500-1500mm/year)
Hot desert	Found near the tropics of Cancer and Capricorn around 30° N and S.	Hot by day (over 30°C) Cold by night	Very low (below 3250mm/year)
Temperate forest	Between latitudes 40°-60° north of Equator.	Warm summers + mild winters (5-20°C)	Variable rainfall (500-1500m /year)
Tundra	Far Latitudes of 65° north and south of Equator	Cold winter + cool summers (below 10°C)	Low rainfall (below 500mm/ year)
Coral Reefs	Found within 30° north – south of Equator in tropical waters.	Warm water all year round with temperatures of 18°C	Wet + dry seasons. Rainfall varies greatly due to location.

A BIOME is a large ecosystem of distinctive plant and animal groups, which are adapted to that particular environment..



Tropical Rainforest Biome



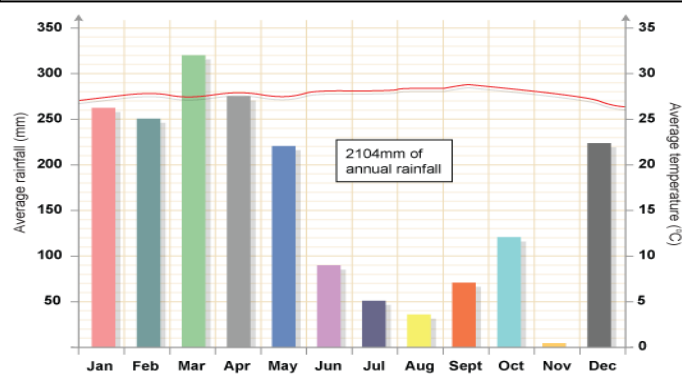
Biome	Location	Temperature	Rainfall
Tropical rainforest	Centred around the Equator between the two tropics	Hot all year (25-30°C)	Very high (over 200mm/year)

Distribution of Tropical Rainforests

Tropical rainforests are centred along the Equator between the Tropic of Cancer and Capricorn. Rainforests can be found in South America, central Africa and South-East Asia. The Amazon is the world's largest rainforest and takes up the majority of northern South America, encompassing countries such as Brazil and Peru.

Climate of Tropical Rainforests

- Evening temperatures rarely fall below 22°C
- Due to the presence of clouds, temperatures rarely rise above 32°C
- Most afternoons have heavy showers
- At night with no clouds insulating, temperature drops



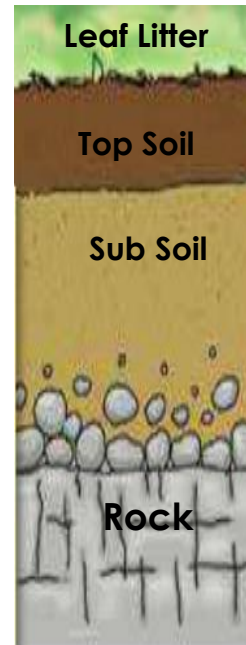
Rainforest nutrient cycle & Rainforest Soil

The hot, damp conditions on the forest floor allow for the rapid decomposition of dead plant material.

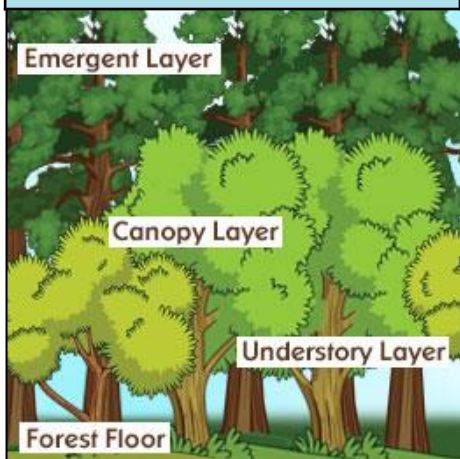
This provides plentiful nutrients that are easily absorbed by plant roots.

However, as these nutrients are in high demand from the many fast-growing plants, they do not remain in the soil for long and stay close to the surface.

If vegetation is removed, the soils quickly become infertile



Layers of the Rainforest



Adaptations

- **Drip tips** allow water to run to the ground
- **Buttress roots** are wide and support tall trees.
- **Lianas (vines)** wrap around trees to get to the sunlight
- Leaves have a **waxy surface** to get rid of water
- The soil is poor so roots are near the surface to get the nutrients
- **Shallow roots** – to absorb the nutrients from the very top layers of the soil

Tropical Rainforest Biome

Benefits of the rainforest - Goods

Raw Materials	Commonly used materials such as timber and rubber are found here.
Food	Important foods such as bananas, pineapples and coffee are grown there.
Health	25% of modern medicines are sourced from rainforest ingredients.

Benefits of the rainforest - Services

Flood prevention	Controls the flow of water to prevent floods/droughts regions.
Energy	Large dams generate 2/3 of Brazil's energy needs – Hydroelectric Power.
Climate	Acts as carbon sinks by storing 15% of carbon emissions. Produces oxygen
Tourism	People from all over the world visit
Habitats	Homes for animals, plants and people

Threats to the Rainforest (Uses and causes of deforestation)

Consequences

Rainforest clearance will lead to increased chances of flooding, soil erosion and loss of habitats

Threats to the Rainforest (Uses and causes of deforestation)		Consequences
Cattle Ranching	Beef exported around the world e.g. from ranches across the Mato Grosso	Huge areas cleared for pasture and grassland; cattle overgraze and land becomes like desert
Mining	Copper, gold and other metals e.g. Carajas Mine	Chemicals can enter water systems polluting them and killing wildlife and endangering humans
Settlement	Towns and cities expand into the rainforest areas and new towns built e.g. Manaus	People exploit the rainforest more; tribes come into contact with others and lose culture. Possible conflict too.
Farming	Soy and Palm Oil	Change of ecosystem; over-cultivation so soil loses nutrients and become desert like
Dams	Hydroelectric power generation requires huge areas to be flooded e.g. Tucuruí Dam	Tribes forced off land
Roads	Roads built to access the rainforest to exploit it e.g. Trans-Amazonian Highway	Open up even more areas of rainforest to be exploited
Logging	Trees used for wood (furniture); e.g. mahogany	Mahogany export now banned due to damage logging of it caused; others woods still taken and sold

Polar/Tundra Regions Biome

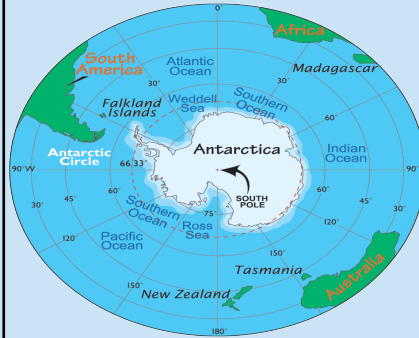
Distribution of Polar Regions

Arctic

Is the region north of latitude 60°N around the North Pole.

Antarctic

A continent south of latitude 60°S around the South Pole.



Climate

Polar areas are very cold with temperatures rarely reaching above 0 °C. Winters average below -40 °C with summers a maximum of only 10 °C. Precipitation is low throughout the year.

**The Antarctic is more extreme than the Arctic.
It is colder, drier and windier**

Land & Sea Features

Arctic

Large areas are permafrost. At sea, most of the region is frozen over.

Antarctic

Large and thick ice sheets. A mountain range crosses the continent.

Flora (Plants)

There are very few plants in polar areas – some lichens, mosses and grasses along the coastal areas. The edge of the Arctic Circle will have trees

Fauna (Animals)

Relatively few species of animals. **Polar Bears - Arctic, Penguins – Antarctic** and marine mammals like whales, seals and walrus are examples.

Climate Change - Polar Regions

Scientific reports indicate that global warming is leading to the melting of ice sheets and glaciers leading to fears of rising sea levels, coastal erosion and flooding and with it the loss of habitats. Thawing of permafrost is increasing methane emissions.

Arctic soil profile

Active Layer

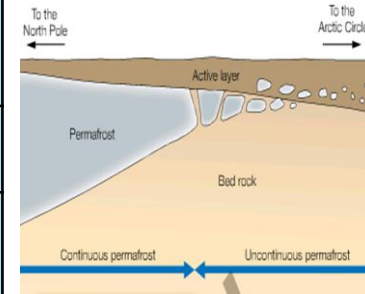
Thaws in the summer. Becomes deeper towards pole.

Permafrost

Permanently frozen all year.

Bed Rock

Low temperatures weathers rock slowly = less nutrients.



Effects of Human Activity in Polar Regions

Oil & Gas exploration – BANNED IN ANTARCTIC

- **Arctic** holds a large amount of untapped oil and gas.
- Oil spills would threaten ecosystems as clean up operations would be slow.

Whaling

- Hunting of whales is a major industry – this led to a rapid decline in whale population
- Many countries have banned whaling, but some still continue e.g. Japan

Fishing

- Overfishing and illegal fishing (Antarctic in particular)
- The polar areas are difficult to police due to harsh conditions.
- Collapse of the fish stocks might damage ecosystems.

Tourism

- The tourism industry is steadily growing within polar regions.
- Travel by tourists have increase emissions further.
- Wildlife may become disturbed by tourists getting up close.

Case Study- Sustainable Rainforest Management : The Amazon

Location & Background

It is located in south America mostly in Brazil and covers 2.1 million square miles of land. It has existed for 55million years and is home to a very diverse range of species.

Ecotourism – Cristalino Lodge

Lodge blends in with natural surroundings;
 locals employed as guides;
 Solar power heating;
 Biological waste treatment; educational and low environmental impact activities – treks, hikes; kayaking; small group sizes;
 Organic food where possible

Other strategies to consider: Agroforestry; Selective Logging; National Parks



Case Studies Sustainable Management –Polar Biome (Antarctica)

Small Scale UNION GLACIER

Features and Activities

A founding member of **International Association of Antarctica Tour Operators (IAATO)** which sets guidelines about how to visit and look after Antarctica e.g. no smoking; only 100 visitors on shore at a time, removal of all rubbish etc.

Sustainable Management

- Camp is solar powered and sleeping tents are heated by the 24-hour sunlight.
- Waste water is reduced through the use of sanitizing hand gel and sponge bathing.
- Spill mats prevent accidental snow contamination when refuelling vehicles and aircraft
- All rubbish is removed from Antarctica. Nothing is burned. Nothing is buried.
- All human waste is removed for appropriate disposal in Chile.
- Grey water is strained before disposal in designated sites
- We re-cycle aluminium cans and continue to explore re-cycling opportunities in Punta Arenas, Chile

Global Scale: The Antarctic Treaty System

Background

Signed by 50 nations in 1961, the Treaty sets aside Antarctica as a scientific reserve, establishes freedom of scientific investigation.

Basic Principles of the Antarctic Treaty

- Bans mining and resource extraction.
- Prevents territorial disputes of the continent.
- Promotes scientific research and co-operation.
- Ban on all military activity
- Protects the fragile environments and its wildlife by preventing and managing waste/pollution.

Links to **IAATO** –Guidelines for sustainable tourism in Antarctica

Successful?

- + Stayed in place for 50 years with more countries signing up to enforce strict controls and improve its stability.
- Some suggest it is just for the wealthy nations
- Can take a huge amount of time to make decisions