The Living World: Tropical Rainforests Knowledge Organiser

Physical Characteristics of a Tropical Rainforest

Climate	Water	Soils	Plants	Animals
• hot (20-28°C) • Sun is overhead all year round so there is no seasonal variation. • wet (2000mm per year) • Convectional rainfall every day.	• The roots of plants take up water from the ground. • Rain is intercepted as it falls - much of it at the canopy level, this will evaporate as it heats up to form convectional rainfall.	• Rain washes away nutrients from soil. • Soil is not very fertile. • Humus layer of rotting leaf-fall is very thin (heat speeds up decomposition).	• Most trees are evergreen. • Continual growing season. • Five layers: forest floor, shrub later, under-canopy, canopy (30m) and emergent. • Epiphytes (plants that feed off other plants and take moisture from the air) e.g. ferns. • Absorb CO2 and release oxygen.	• Many species of animals live in the tropical rainforest. • Food is plentiful and grows all year. • Hundreds of different types of monkeys, snakes and birds. • Thousands of insect species live in the tropical rainforest.

Issues Relating to Biodiversity

- Tropical rainforest ecosystems contain more species than any other ecosystem. Brazil's rainforests are thought to contain 59,851 species!
- Tropical rainforests cover less than 2 per cent of the planet, but contain an estimated 50 per cent of all life on earth's land masses.
- Habitat loss is the main cause of extinction. Deforestation (at a rate of about 300,000km2 a year) has been caused by commercial logging, mineral extraction, commercial farming and subsistence farming.
- Many organisms have adapted and evolved to depend on a few species for survival. They may only be found in a very specific area. If something changes, that species will quickly become extinct e.g. golden poison frog.
- Sumatran orangutans exist only on the Indonesian island of Sumatra. Over the last 75 years, their population has diminished by 80 per cent due to human encroachment of their forest habitat, especially for timber and agriculture.

Global Distribution of Tropical Rainforests

- Most of the world's tropical rainforests lie between the Tropic of Cancer and the Tropic of Capricorn.
- Tropical rainforests are found on either side of the equator in South America, Central Africa, South East Asia and Northern Australia.
- The world's largest tropical rainforest (the Amazon) is found in South America.

How Plants and Animals Adapt to Tropical Rainforests

Plants adapt to cope with the high temperature, rainfall and competition for light.

Trees:

- grow tall in search of light. Most trees grow to 30m and form the canopy, where most photosynthesis takes place;
- have large buttress roots to support the trunk and to absorb nutrients from the thin leaf layer;
- have thin bark because they do not need to be kept warm;
- have smooth bark so water can run off easily;
- have thick, waxy leaves which repel water;
- have leaves with drip-tips so water can run off easily so leaves do not get too heavy.

Some plants on the **forest floor** hardly receive any sunlight and adapt to these conditions. The forest floor may flood for several months each year, so plants may adapt to survive this too.

Epiphytes or air plants (e.g. strangler fig) start to grow when a seed uses rotting plant debris in the nook of a tree for nutrients. It will send aerial roots down the trunk of the host tree which root in the ground and its branches will grow to catch the sunlight. The epiphytes' roots steal the host's nutrients. Eventually the host will die and as it decomposes will release more nutrients to feed the epiphyte.

Animals adapt to find food and escape predators.

- Many animals live in the canopy their entire lives as this is where most fruits and flowers are.
- Some have strong limbs for climbing and leaping e.g. howler monkeys.
- Some have suction-cups for climbing e.g. red-eyed frogs.
- Some have flaps of skin for gliding between branches e.g. flying squirrels.
- Some are camouflaged to hide from predators e.g. leaf toad.
- Many animals have adapted by learning to eat a food eaten by no other animal, e.g. toucans have a long, large bill to reach fruit on branches that are too small to support the bird's weight. The bill also is used to cut the fruit from the tree.
- Many animals are only active at night (nocturnal) when it is cooler e.g. sloths.
- Many can swim, allowing them to cross rivers or escape a flood e.g. jaguars.
- Some animals increase their sense of hearing, smell and even taste to help escape from predators in the dark of the forest floor e.g. carpet python.

The Interdependence of Climate, Water, Soils, Plants, Animals and People

Climate, water, soil, plants, animals and people are interdependent/have a symbiotic relationship in tropical rainforests (they depend on each other). For example:

1. warm, wet climate ➔ plants grow ➔ decomposition of dead plant material ➔ nutrients released ➔ plants grow
2. trees intercept water ➔ water evaporates ➔ clouds form ➔ rainfall ➔ plants grow

If climate, water, soils, plants, animals or people change, so will the tropical rainforest.

For example:

more people ➔ more deforestation ➔ more CO2 ➔ global warming ➔ species extinction

Structure of a Tropical Rainforest

Emergent Layer (50m)
- tallest trees

Canopy (30m)
- engine of the rainforest
- captures most sunlight

Understorey (20m)
- younger trees

Shrub Layer (2-5m)
- ferns, bushes etc.

Forest Floor (0m)
- dark and quiet
- decomposition.
- sometimes flooded

An example of a small scale ecosystem: Deciduous Woodland.
Key Terms:
Ecosystem: A community of plants and animals that interact with each other (biotic) and their physical environment (abiotic).
Consumer: A creature that eats animals and/or plant matter.
Producer: An organism or plant that is able to absorb energy from the sun through photosynthesis.
Decomposer: An organism such as a bacteria or fungus which breakdown dead tissue, which is then

Case Study: Amazon Rainforest

Deforestation has Economic and Environmental Impacts

Causes of Deforestation in the Amazon

- ranching
- logging
- small-scale farming
- Large-scale farming, e.g. Brazil is the world's second largest soya bean producer.
- Road building opens up the rainforest to further development.
- Dam building to produce HEP, e.g. Belo Monte dam complex is under construction and will be the world's fourth largest HEP dam complex.
- Mining, e.g. the Carajas complex in Brazil is the world's largest iron ore mine. It produces 109 million tonnes of iron ore a year.

Economic Impacts

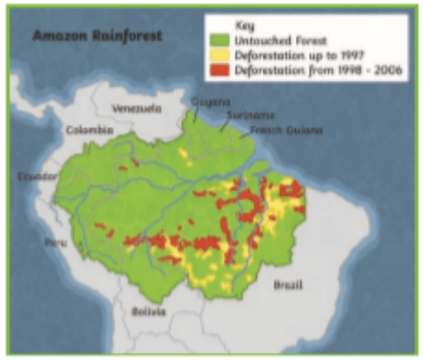
- Farming significantly contributes to the economy, e.g. ranching earns Brazil over $6.9 billion a year.
- Logging contributes to the economy, however, it is estimated that 80 per cent of Brazilian hardwood is from illegal logging.
- Mining provides many jobs, e.g. the Carajas complex provides upto 3000 jobs.
- Indigeneous people lose their traditional farming and hunting lands.

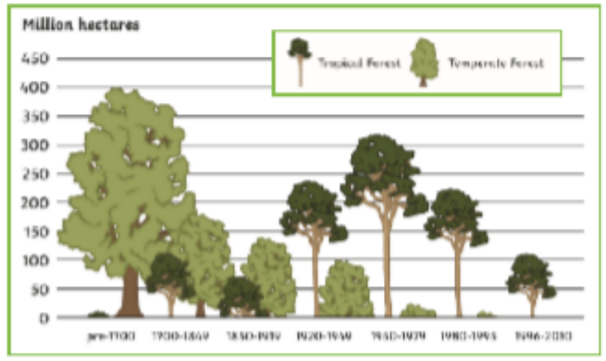
Environmental Impacts

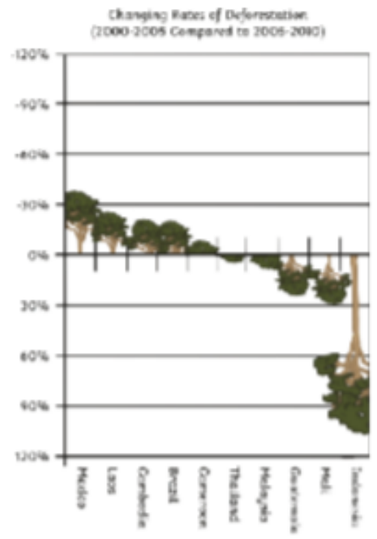
- Deforestation of the Amazon could release 100 billion tonnes of carbon, resulting in increased atmospheric CO_2 and global warming.
- Deforestation means there area fewer trees to absorb CO_2 from the atmosphere, resulting in global warming.
- Mining releases dangerous toxins into the soil and rivers.
- 80 per cent of land animals live in tropical rainforest ecosystems, so deforestation will reduce earth's biodiversity.
- Removing tree cover will leave soil exposed to heavy rainfall causing soil erosion. Soya bean farming alone is responsible for the loss of 55 million tonnes of topsoil each year in Brazil.
- Deforestation could affect the water cycle, causing changes to weather patterns.

Changing Rates of Deforestation

Deforestatation of tropical rainforests has been an issue for over 50 years and is still occuring. However, the overall rate of global deforestation in the tropical rainforests is slowing down (e.g. Brazil's rate of deforestion decreased by 21% in 2005-2010 compared to 2000-2005). Unfortunately, some countries still have an increasing rate of deforestation (eg Indonesia's rate of deforestation increased by 107% in 2005-2010 compared to 2000-2005).







Tropical Rainforests need to be Managed to be Sustainable

Sustainability – meeting the needs of today, without compromising the needs of tomorrow.

Education
Indigenous people can be made more aware of the impacts of deforestation and encouraged to alter their activities.

The international community can be educated about the impacts of deforestation. Greenpeace launched a campaign recently to increase public awareness of the impacts of palm oil production.

Afforestation (Replanting)
Logging companies must replant two or three trees for each tree felled.

Forest Reserves
Biodiversity and indigenous peoples' territories are protected against deforestation in areas designated as forest reserves by the government.

Company Policy
Companies can ban the sale of rainforest products that are not produced in a sustainable way. For example, in 2009 the Body Shop promised to ban the use of palm oil that was not produced in a sustainable way.

Companies can commit to Fairtrade farming which is more environmentally-friendly. For example, Tate and Lyle, the UK-based sugar company, converted its entire sugar range to Fairtrade by the end of 2009).

Reducing Debt
In 2008, the governments of US and Peru struck a deal. Peru's national debt was reduced by $25 million in return for their promise to conserve their rainforest.

International Agreements
International agreements try to reduce illegal logging and encourage the trade of rainforest products from sustainably managed rainforests.

For example, the Forest Stewardship Council identify timber which has come from sustainably managed rainforests.

Selective Logging
Logging companies should select and only cut down specific trees (e.g. mahagony) and leave the other trees standing.

Companies use 'horse-logging' or 'heli-logging'; dragging the felled trees out of the rainforest with horses or helicopters. This reduces the amount of damage caused.

Case Study Detail:

You have studied the Amazon Rainforest (mostly in Brazil) but there are areas within the forest which you can include for further detail e.g.

Eco Lodge: Araras Eco Lodge in Brazil.

Rainforest Road: Trans Amazonian Highway.