

Ecosystems

- An ecosystem is a natural system made up of plants, animals and the environment. There are often complex interrelationships between the living (biotic) and non-living (abiotic) components.
- Ecosystems can be identified at different scales:
 - Local small scale ecosystem- pond or woodland
 - Global scale ecosystem (biome)- tropical rainforest or tundra
- Within an ecosystem there are producers, consumers, and decomposers.
- A **food chain** shows the direct links between producers and consumers in the form of a simple line, a **food web** shows all the connections between producers and consumers in a complex way.
- Change can occur to an ecosystem due to human (deforestation, overfishing) and natural causes (volcanic eruptions).
- Nap Wood  is an example of a small scale ecosystem. Located in East Sussex, protected by National Trust. It is a temperate deciduous woodland, with four key layers.
- Yellowstone National Park  created in 1872. In the early 1900s wolves were introduced, they were seen as a danger so eradicated by 1926, ecosystem forced out of equilibrium. This caused the number of deer's to rise- led to overgrazing and soil erosion. 1995 reintroduction of wolves- deers decreased- range of benefits.
- Large scale ecosystems are known as biomes. These are defined by the dominant type of vegetation that grows in the region, such as tropical rainforest.

Tropical Rainforests

- Location: found in a broad belt through the tropics in: Central & South America, central Africa, South East Asia and northern Australia. They are found close to the equator.
- Climate: Equatorial zone which is characterised by high rainfall of over 2000mm a year and high temperatures averaging 27°C. There is high rainfall because the equator is found in an area of low pressure, this causes the rising air to create clouds and trigger heavy rainfall. There is high temperatures throughout the year because the powerful sun is overhead for most of the time.
- Soils: the soils of the tropical rainforest are surprisingly infertile, most nutrients are found at the surface, where dead leaves decompose rapidly in hot and humid conditions.

Adaptations

An adaptation is a mutation, or genetic change, that helps an organism, such as a plant or animal, survive in its environment.

- Plant adaptations: buttresses (massive ridges to support the base of tall trees and help transport water), epiphytes (plants which live on branches in the canopy to seek sunlight), drip tip (allow the heavy rain to drip off the leave, flexible bases (so they can turn and face the sun)
- Animal adaptations: sloth (huge hooked claws and long arms allow them to hang from trees, slow metabolism- need little food), dark green algae grows on back (helps them to camouflage), poisonous dart frog (smooth moist skin which is brightly coloured to detract predators, skin contains toxins), toucan (large beak to eat fruit, large flat tongue to eat insects, strong legs and feet to support body, first and fourth toe are backwards as they have poor wings due to weight of beak)

Deforestation

Deforestation is the removal of trees, on a very large scale. Deforestation means that the land can be used for profit making enterprises, like cattle ranching, commercial farming. Malaysia is a country in SE Asia, 67% of Malaysia's  land is covered by rainforest.

Causes of deforestation: logging, mineral extraction, population pressure, energy development (Bakun Dam), commercial farming, subsistence farming (slash and burn- using fire to clear the land)

Impacts: loss of biodiversity, contribution to climate change, economic development resulting in economic gains and economic losses.

Sustainable management of TRF

Tropical

rainforests once covered 15.5million km², now the figure is 6.2 million km². The rainforest should be protected as there is high levels of biodiversity, medicine, resources, water and indigenous tribes. Rainforests need to be managed sustainably to ensure rainforests remain for future generations and allow the resources to be used without damaging the environment.

Strategies:

- **Selective logging and replanting** (a sustainable approach to logging is selective logging, it was introduced in Malaysia in 1977. Trees are only felled when they reach a particular height. This allows young trees a guaranteed life span and the forest will regain full maturity.)
- **Conservation and Education** (use of national parks or nature reserves- these areas can then be used for education, scientific research and tourism: Givaudan is a Swiss Perfume company which works with Conservation International- it aims to protect 148000 hectares of rainforest in Venezuela)
- **Ecotourism**(aims to introduce people to the natural world, to benefit local communities and protect the environment for the future, happening in Costa Rica and Malaysia)
- **International agreements**, rainforests are considered to be of global importance and therefore international agreements have been made to protect them (Hardwood Forestry- Forest Stewardship Council (FSC) promotes sustainable forestry & Debt Reduction- some countries have borrowed money to fund development, to pay off these debts some have raised money from massive deforestation programmes. Organisations have reduced debts in return for rainforests not being deforested)

Hot Deserts

A desert

is an area that receives less than 250mm of rainfall per year. Average temperatures in a hot desert are 27 degrees Celsius. Hot deserts are mostly found in dry continental interiors, away from the coast, in a belt approximately 30 degrees north and south of the equator. The location of hot deserts can be explained by global atmospheric circulation. At these latitudes air that has risen at the equator descends forming high pressure. This is why there is lack of cloud cover and temperatures plummet at night. The difference between the day and night temperature is called the diurnal range. The soils in the desert are sandy and stony with little organic matter. They lack leafy vegetation (plants). Desert soils are not fertile.

Plants and animals in the hot desert

Hot deserts have a range of plants, animals and birds. They have adapted to their environment.

- Camels- large, flat feet to spread their weight on the sand. This means that walking is easier and takes less energy. To protect their faces they have slit-like nostrils and two rows of eyelashes to help protect their breathing and eyes from sand.
- Cacti- They have swollen stems that can store lots of water. The skin of a cactus is thick and waxy, which prevents water loss from the plant into the air (transpiration). They have long tap roots of 7-10 metres.
- Cottontail Rabbit- are entirely nocturnal. This means that they only come out during the coolest hours of the day, the desert has an extreme diurnal range. The rabbits create burrows underground where they can sleep out of the sun. The rabbits have light brown fur to prevent the absorption of heat from the sun. Their teeth continually grow; this is useful because their diet is made of hard, waxy vegetation which wears down their teeth.
- Dormancy flowers- These seeds can wait in the ground for years (stay dormant) until there is enough rainfall. They will then flower and grow for a short period of time. They avoid being alive during a drought. The plants can slow their growth to the point where development is temporarily stopped.

Opportunities for development in hot deserts- The Thar

The Thar Desert is one of the major hot deserts in the world. It stretches across North West India and into Pakistan. The desert covers 200,000km². It is the most densely populated desert in the world. Characteristics of the Thar: soils are sandy and not fertile, rainfall is low between 100 and 240mm per year, temperatures can reach 53 degrees Celsius in July.

- **Mineral extraction**- desert has valuable reserves of minerals which are used all over India and exported across the world (feldspar (used for ceramics), kaolin (used as a whitener in paper))
- **Tourism**- popular tourist destination, tens of thousands visit each year, desert safaris on camels at Jaisalmer are popular, there is an annual Desert festival)
- **Energy**- The Thar is a rich energy source: coal, oil (large oilfield in Barmer district), wind (Jaisalmer Wind Park), solar (ideal conditions for solar power generation)
- **Farming**- most of the people are involved in subsistence farming- they survive in the desert by grazing animals on the grassy areas and cultivating vegetables and fruit trees. Commercial farming has grown in recent decades.

Challenges for development in hot deserts- The Thar

- **Extreme temperatures**- suffers from extreme temperatures: can be difficult for people to work outside in the day especially farmers, high rates of evaporation lead to water shortages, plants and animals have to survive in the extreme heat
- **Water supply**- population is increasing and farming industry has developed placing stress on water shortages- some water can be obtained from aquifers (underground) but this water is salty and not of good quality. The Indira Gandhi Canal is the main form of irrigation in the desert- it helps to provide drinking water, was constructed in 1958 and is 650km, helps commercial farming
- **Accessibility**- due to the extreme weather and presence of vast barren areas there is a limited road network- high temperatures cause the tarmac to melt and strong winds blow sand, many places are only accessible by camels.

Desertification

Desertification happens where land is gradually turned into a desert. It usually occurs on the edges of an existing desert. This can occur when the land is overgrazed by livestock and stripped of vegetation. An estimated 1 billion people live in areas at risk from desertification.

Causes:

- Natural events such as droughts, poor land management, population pressure- land is being cleared of vegetation, farmers overgraze due to cash crops, soil erosion and climate change.

Desertification has occurred in the Badia in Jordan. It is a dry rocky desert in eastern Jordan. Its average rainfall is less than 150mm. The lack of water is a major problem affecting people who live there. Much of the land has been traditionally grazed by the nomadic Bedouin who herd sheep, goats and camels. An influx of sheep from Iraq following the 1991 Gulf War led to overgrazing and desertification.

Reducing desertification

- **Water and soil management**- irrigation, ponding banks, contour traps, National parks- The Desert National Park in the Thar, Tree planting in the Thar Desert, Appropriate technology- involves using methods and materials that are appropriate to their level of development. They may not have access to expensive machinery- magic stones have been used to reduce soil erosion, helps trap water and soil