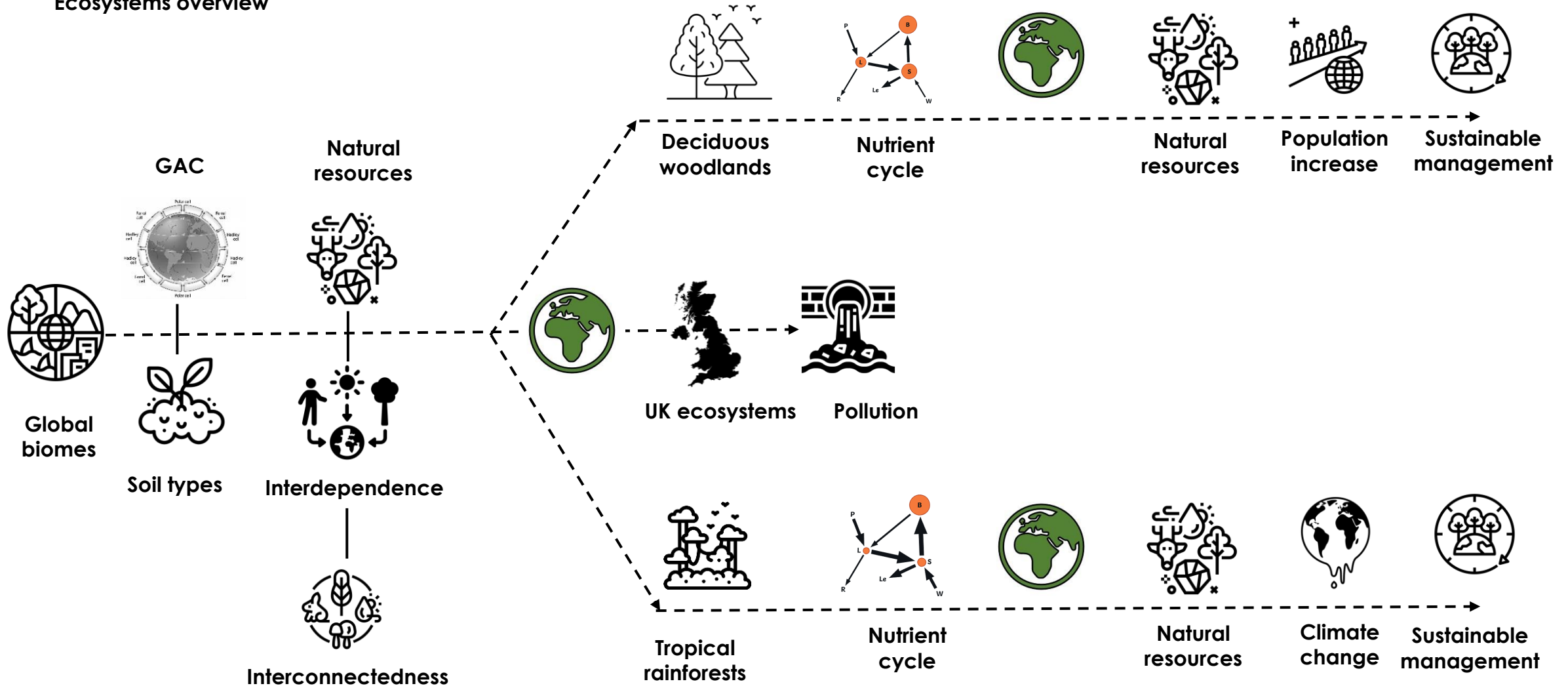




Paper 1 Topic 3 Ecosystems, biodiversity and management

Ecosystems overview

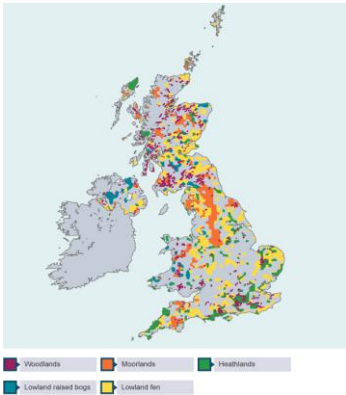
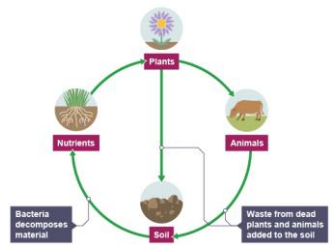


Paper 1 Topic 3 Ecosystems, biodiversity and management

An **ecosystem** is a natural environment and includes the **flora** (plants) and **fauna** (animals) that live and interact within that environment. Flora, fauna and **bacteria** are the **biotic** or **living components** of the ecosystem. Ecosystems are dependent on the following **abiotic** or **non-living components**:

- **climate** - the temperature and amount of rainfall are very important for determining what **species** can survive in the ecosystem
- **soil** - the soil type is important as this provides nutrients that will support different plants
- **water** - the amount of water available in an ecosystem will determine what plants and animals can be supported

The biotic parts of the ecosystem, which include bacteria, flora and fauna, have a complex relationship with the abiotic components - changing one will lead to a change in the other.



Ecosystems are very sensitive to change. The **living** and **non-living components** of the ecosystem can be altered by either **natural factors** or **human management**.

Changes to the ecosystem caused by **natural factors** include:

- drought
- flood
- fire
- disease

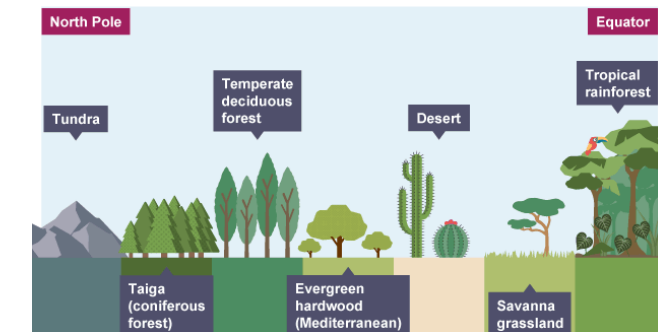
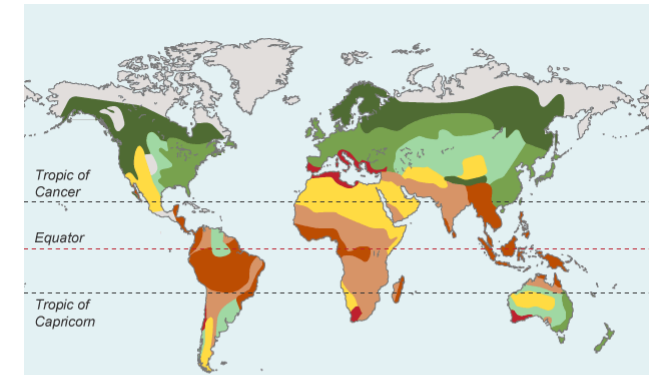
Changes to the ecosystem caused by **human management** include:

- introducing more fish (fish stocking)
- altering the drainage of the land which may influence the amount of water
- changing the **pH level** of the water
- altering the nutrient levels of the water if fertilisers are **leached** into the water resulting in **eutrophication**

Any of these changes can have a negative impact on the ecosystem and could result in the collapse of a **food chain**.

Only 12% of the land area of the UK is made up of woodland. 80% of these are less than 100 years old and only 5% could be considered 'ancient' woodlands. In England they are mainly made up of broadleaf **deciduous** trees such as oak and ash, whilst in Wales, Scotland and Northern Ireland the trees are mainly **coniferous** such as firs and pines. The largest forests are Galloway Forest Park in Scotland, Kielder Forest Park in north-east England and the New Forest in southern England.

The UK has some of the best **marine ecosystems** in Europe, with a wide diversity of underwater habitats and species. Many of our marine habitats and species are particularly rare and therefore of international importance, for example, the bottlenose dolphin. These marine ecosystems are under threat from bycatch, overfishing, pollution and shipping



Paper 1 Topic 3 Ecosystems, biodiversity and management – tropical rainforests

Tropical rainforests have distinct characteristics that support a wide variety of different **species**. This means that they have a high **biodiversity**. The **biotic** or living components of the ecosystem and the **abiotic** or non-living components of the ecosystem depend on one another - a change in one leads to a change in the other.

Climate

- Very wet with over 2,000 mm of rainfall per year.
- Very warm with an average daily temperature of 28°C. The temperature never drops below 20°C and rarely exceeds 35°C.
- The atmosphere is hot and **humid**.
- The climate is consistent all year round. There are no seasons.

Soil

- Most of the soil is not very **fertile**.
- A thin layer of fertile soil is found at the surface where the dead leaves decompose.
- It is red in colour because it is rich in iron.
- Due to heavy rainfall the nutrients are quickly washed out of the soil.

Plants and animals

- The warm and very wet climate provides perfect conditions for plant growth.
- The wide range of plant **species** supports many different animals, birds and insects.
- Species have **adapted** to the conditions of the rainforest, eg trees and plants have shallow-reaching roots to absorb nutrients from the thin fertile layer in the soil.

Structure of a tropical rainforest

A tropical rainforest is made up of the following layers:

- ground level
- shrub layer
- under canopy
- (main) canopy
- emergents

Tropical rainforests act as life support systems for the planet as they:

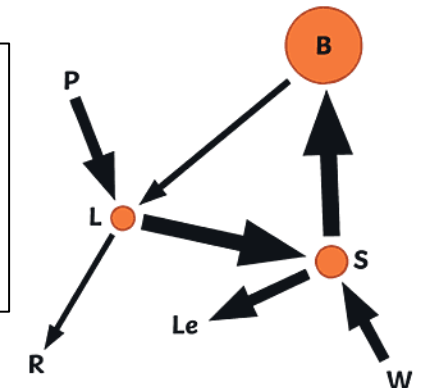
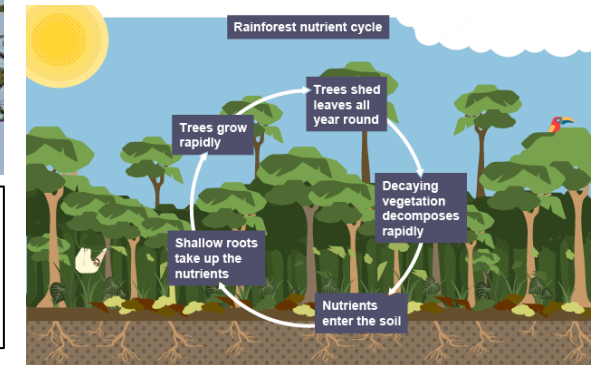
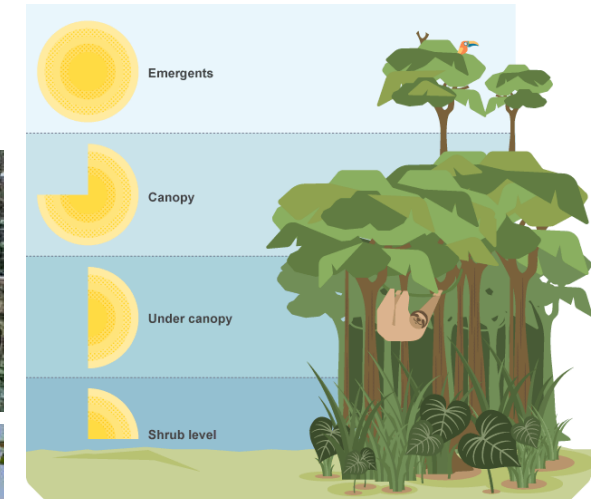
- **regulate the atmosphere**
- **maintain soil health**
- **influence the hydrological cycle**
- **Provide food, cash crops, medicines and raw materials**

Threats to the tropical rainforests through deforestation include:

- **agriculture**
- **logging**
- **mining**
- **roads**
- **HEP**
- **population growth**



Both plants and animals have adapted to live in the tropical rainforest but climate change threatens their habitats



Paper 1 Topic 3 Ecosystems, biodiversity and management – Case Study Ecuador

Since the 1960s millions of hectares of rainforest have been cut down to make way for oil and mineral extraction, logging, cattle ranching and plantations. Today deforestation continues at an alarming rate – an area the size of Wales is lost every year. The promise of riches has also brought millions of new workers and colonists to the Amazon changing the lives indigenous peoples forever.

Threats and challenges

Political and economic primary causes - Government sanctioned oil extraction from 1960's by PetroAmazonas (TNC) was expected to increase GDP but each oil well needs around 2 hectares of forest to be cut down, waste products were pumped to the surface to mix with waste water creating toxic soil, liquid leeches through the soil into rivers leading to no fish, destroying the food chain.

Political and economic secondary causes - creation of roads through the rainforest led to barriers for movement of animals reducing breeding spaces, population increase of 'colonists' (described as neo-colonial environmentalism) into the rainforest who removed the smaller trees for building and using 'slash and burn' techniques for small-scale farming, leading to nutrient-poor soil commercial loggers removed larger trees, often illegally, poor soil led to large-scale cattle ranchers rearing beef for sale in in Europe and the US.

Palm oil plantations (cash crop) - in many products used world-wide are not native to the rainforest and so require very large areas of rainforest to be cleared, reducing biodiversity (monoculture) (130 000 hectares cleared for palm oil production) and using pesticides to control plagues, which further leeches into the water system. Oil has increased Ecuadorian economy but more than 80% of indigenous people in the oil producing areas live below the poverty line.



Political sustainable management

Government policies - creation of Yasuni National Park - proposed the international community pay Ecuador 3.6 billion US\$ to leave the oil and it's carbon emissions in the ground which would be used to help indigenous communities and reforest the area but limited economic response from other governments and oil extraction began in 2014. Following decline in oil prices Ecuadorian government sanctioned Fruta Del Norte to mine for gold in attempt to reduce poverty. Signed global agreements such as the Paris Agreement to limit CO² emissions.

Large-scale NGOs - RAMSAR sites - Limoncocha National Park and Nature Reserve attracts 10,000 tourists a year allowing protection of endangered species, protecting the forest against development, protecting biodiversity and local communities

Small-scale NGO's - Sumak Allpa - conservation and protection of, for example, Woolley monkeys and red-tailed Boa Constrictor funded by private individuals, or NGOs like the WWF

Economic policies - Yachana Lodge - sustainably built log cabins using solar panels to generate electricity and rainwater collections for showers and toilets, tourists are confined to guided trails

Microfinance - small scale loans to assist individuals to start up sustainable logging and agriculture businesses

Education policies - Yachana Foundation - runs residential training courses for local communities providing further employment opportunities, training courses in sustainable crop management and Forest Stewardship courses in sustainable logging

Paper 1 Topic 3 Ecosystems, biodiversity and management – deciduous woodlands

Deciduous woodlands have distinct characteristics that support a variety of different **species**. This means that they have a moderate **biodiversity**. The **biotic** or living components of the ecosystem and the **abiotic** or non-living components of the ecosystem depend on one another - a change in one leads to a change in the other.

Climate

- no extremes of temperature or rainfall - 4 seasons
- average summer temperature 15-17° C, winter is cooler but usually above freezing, leading to long growing season
- rainfall quite high, about 1000mm a year.

Soil

- fallen leaves decompose quite quickly forming thick layer of organic matter (humus) enriching the soil
- earthworms and other decomposers mix humus with minerals from bedrock to create thick, rich soil called brown

Plants and animals

- dominated by tall, broad-leaved trees - leaf loss in autumn, stratified layers
- stratified layers provide a variety of habitats for birds, insects and small mammals, larger animals such as foxes and rabbits burrow in the ground under the trees
- ancient woodlands used by humans for wood fuel, nuts, fruit, tree sap, timber and recreation

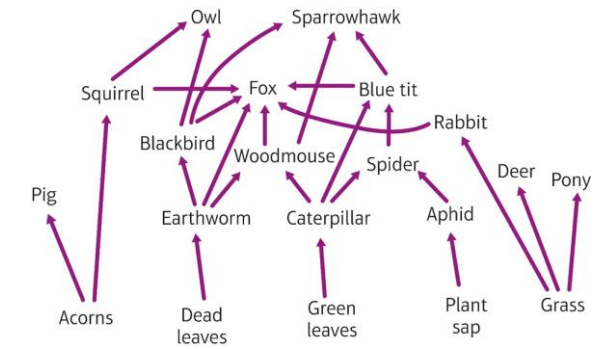
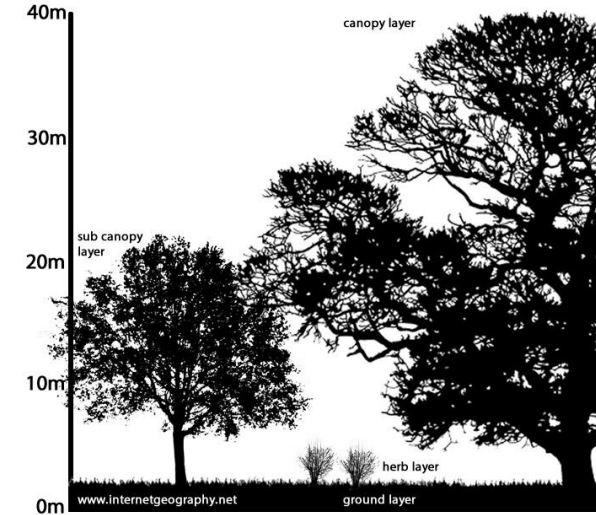
Structure of a tropical rainforest

A deciduous woodland is made up of the following layers:

- ground level
- herb layer
- sub canopy
- (main) canopy



Both plants and animals have adapted to live in the deciduous woodlands but climate change and population growth threatens their habitats

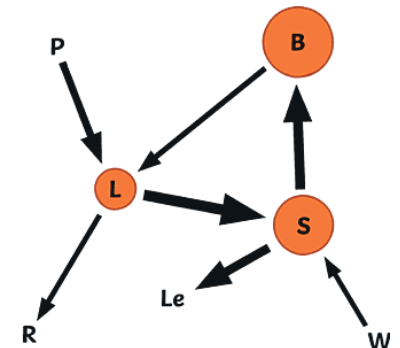


Deciduous woodlands provide many natural resources including:

- **timber**
- **fuel**
- **conservation**
- **recreation**

Threats to deciduous woodlands through deforestation include:

- **agriculture**
- **population growth**
- **urbanisation**
- **timber extraction**
- **HEP**
- **population growth**



Paper 1 Topic 3 Ecosystems, biodiversity and management – Case Study The New Forest

The New Forest is a National Park in Hampshire, south east England, awarded status in 2005. About 175,000 people live in the area and up to 15 million people visit the area annually.

Threats and challenges

Social causes of deforestation

Increasing population numbers in the UK means that more land is required for housing. The government need to build around 240,000 homes a year to cope with demand. Forests are cleared in order to accommodate this

Increasing urbanisation in the UK has led to forested areas being converted for additional land use including the expansion of cities to create jobs for people

Traffic congestion is an increasing problem and so areas of woodland are cleared to make carriageways wider

Economic causes of deforestation

Tourists can damage plants by trampling, footpaths are eroded by walking, cycling, horse-riding and car parking on verges and risk of starting fires with barbeques

Timber is extracted from both softwood (coniferous) and hardwood (deciduous) trees. Non-native conifers are easier and faster growing which means a faster profit.

Over 40% of the New Forest is **privately owned** and not managed.

Pesticides and herbicides used to control weeds in agricultural areas damages edges of woodlands

Sustainable Management

Controlled tree felling - trees are selectively cleared and replaced by other deciduous species in higher numbers

Limit pesticide use to prevent damage to plant and animal species

National Park Authority set up to raise awareness through campaigns

Landowners funded to plant trees, encourages better use of the land

Sustainable transport schemes – electric scooters, bikes and tour buses

Green leaf tourism – limits tourists numbers, ensures hotels operate in a 'greener' way, promotes use of local products

Restrict logging April-August to protect nesting birds

