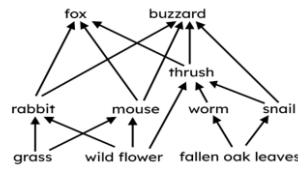


Year 9: Ecosystems and Rainforests topic knowledge organiser

An **ecosystem** is a community of organisms (such as plants and animals) that interact with one another and their non-living environment.

Ecosystems are made up of two parts:

- **Biotic components** (Living things).
- **Abiotic components** (non-living things).



Producer	These absorb energy from the sun through photosynthesis.
Consumer	These get their energy by feeding on other organisms: animals or plants, or both.
Decomposer	These recycle nutrients that the plants can use again.
Food chains	A sequence of organisms through which energy passes as one organism eats another.
Food web	In an ecosystem, food chains are connected within a complex food web.

Nutrients, such as nitrogen, cycle between **producers**, **consumers** and **decomposers** within an **ecosystem**.

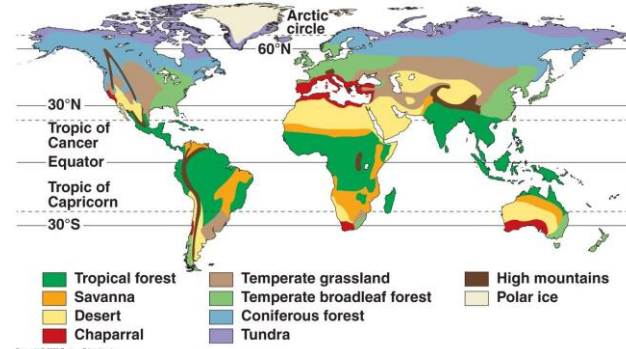
This natural system can be shown as the movement between three stores, nutrients continually move around these stores.

- biomass - living organisms
- litter - dead organisms such as leaves
- soil

Ecosystems can take hundreds if not thousands of years to develop. If an ecosystem is to be **sustainable** (keep going) it needs to be in balance. If there is a **change** to one of the components it might have knock-on effects for the rest of the ecosystem.

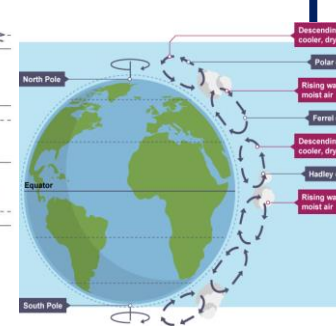
Changes to ecosystems can be **natural**, such as fires started by lightning but they are mostly **manmade**. These include the **removal of hedgerows**, **water pollution** and **eutrophication** (fertilisers run off from fields into freshwater and speed up the growth of algae which reduces oxygen needed for aquatic life).

Global ecosystems (biomes) are defined mainly by the dominant (most common) **type of vegetation** that grows in the region, such as **tropical rainforest** or **tundra**.



The Earth's climates are influenced by:

1. **Differential heating** - The curvature of the Earth means that insolation (incoming solar radiation) is more concentrated at the equator and spread out at the poles.
2. **Global atmospheric circulation**: Heat from the sun warms the earth **unevenly**. This heat is then circulated in **cells** with **hot air rising** and **cold air sinking**. The movement of air determines the **climatic characteristics** we see at different lines of **latitude**.
3. **Ocean currents**: Colder ocean currents create **arid** conditions due to less **evaporation**. Warmer currents increase evaporation and therefore moisture content increasing the chance of rain.
4. **Altitude**: The **lapse rate** is roughly -0.5°C for every 100m increase in altitude.
5. **Relief**: Mountains cause **relief rainfall** on one side of the range and a **rain shadow** on the other.



TOP (EMERGENT) CANOPY: Fast growing trees such as Kapok trees out-compete other trees to reach the sunlight- these are called 'emergent'.

MAIN (MIDDLE) CANOPY: The majority of plants and animals are found here. Many mammals and birds spend their entire lives here. The branches and leaves of this layer have an almost 'umbrella' effect on the layers below- blocking out lots of sunlight and intercepting rainfall.



LOWER (UNDER) CANOPY: Plants called epiphytes live on branches and try to seek sunlight- they obtain nutrients from water and air instead of soil. Lots of mammals like monkeys and sloths live in this layer.

SHRUB LAYER AND FOREST FLOOR: Here small shrubs compete for light and young trees fight for space and light as they become established. The forest floor is made up of dead plants which rapidly decompose. Nutrients are only found in the top layer of the soil.

- Average temperature 27°C
- More than 2000 mm rain per year
- Wet season (December to May)
- Vegetation has distinct layers
- Infertile soils
- Shallow roots
- Trees lose leaves all year

Biodiversity

Tropical rainforests contain half of all the plants and animals in the world. They are home to thousands of different species. Some plants may become extinct before they have even been discovered!

Climate change

Rainforests absorb and store carbon dioxide, a gas that is partly responsible for climate change.

Climate

Known as the 'lungs of the world', 28 per cent of the world's oxygen comes from the rainforests. They prevent the climate from becoming too hot and dry.

Medicine

Around 25 per cent of all medicines come from rainforest plants. More than 2000 tropical forest plants have anti-cancer properties.

Resources

Tropical rainforest trees provide valuable hardwoods as well as nuts, fruit and rubber.

Water

Rainforests are important sources for clean water - 20 per cent of the world's fresh water comes from the Amazon Basin.

People

Indigenous tribes live in harmony in the world's rainforests making use of the forest's resources without causing any long-term harm.



Rainforests are important both on a global and local scale

Year 9: Ecosystems and Rainforests topic knowledge organiser

PLANT ADAPTATIONS

- Tall and straight to reach the sun
- Buttress roots to support the tall trees
- Lianas use trees to reach the sun
- Drip tips so leaves don't rot
- Thick waxy eaves
- Smooth thin bark
- Epiphytes grow on trees and get nutrients from air and water



ANIMAL ADAPTATIONS

- Sloths – hook to grip branches
- Parrots – sharp beak for nuts and fruit; 4 toes per foot to clamber
- Long limbed spider monkey – sharp nails to peel bark to get to sap
- Flying frog – web like feet to glide through the air
- Harpy eagle – short pointy wings to manoeuvre

Environmental Impacts of deforestation in the Amazon

- Burning land releases CO₂, enhancing the greenhouse effect and climate change.
- Loss of tree canopy leads to more surface runoff, flooding, and soil leaching.
- Soil erosion occurs due to lack of roots, leading to river sedimentation and flooding.
- Reduced evapotranspiration lowers rainfall, increasing drought risk.
- River pollution from mining (e.g., mercury poisoning).
- Habitat loss reduces biodiversity; ~137 species lost daily in the Amazon.

Social Impacts

- Traditional livelihoods (e.g., rubber tapping) are lost.
- Native tribes are displaced (e.g., Gurani tribe); number of tribes has dropped.
- Conflicts arise between indigenous people, companies, and conservationists.
- Diseases brought by outsiders harm native populations (e.g., Nukak tribe).
- People relocate to rainforests for cheaper living and better quality of life

Economic Impacts

- Logging, farming, and mining create jobs (e.g., 50,000 in gold mining in Peru).
- Brazil earned \$6.9 billion from cattle trading in 2008.
- Infrastructure and services improve local quality of life.
- Long-term deforestation threatens future economic stability by depleting resources.

Since the year 2000 global rates of deforestation have fallen, however from 2015 they have slowly increased again, most of this deforestation has taken place in the world's largest rainforest, the Amazon in South America.

The rainforest is being exploited for economic gain. Reasons include:

Settlement and population growth

Economic development in rainforests attracts workers seeking jobs. As people migrate, housing and services expand, causing further deforestation to meet growing demands for space and infrastructure.

Logging

Commercial logging causes only 3% of deforestation, but forests are cleared for access. High-value trees like mahogany are selectively logged, while others are removed for fuel or pulp. Clear felling removes vast areas to reach valuable timber.

Mining

Gold is the main mineral mined in the Amazon, but iron, bauxite, and oil are also extracted. Mining clears forests, removes topsoil, and leaves large environmental scars on the landscape.

Energy generation

River conditions support hydroelectric power, but building dams floods rainforests. Rotting vegetation makes water acidic, corroding turbines. Silt from runoff also blocks dams, reducing efficiency and causing environmental damage.

Commercial farming- Cattle

Ranching is the main cause of deforestation in Brazil. Forests are cleared for cattle, but poor soil limits grazing. As pasture declines, cattle are moved, causing further deforestation elsewhere.

Commercial farming- Crops

Rainforests are cleared for plantations growing crops like soybeans, oil palm, and sugar cane. However, poor soil limits productivity, so land is quickly exhausted, leading to further deforestation for new farmland.

Subsistence farming

To address landlessness, Brazil encouraged settlement in the Amazon. However, poor soil and lack of nutrients led to infertile land, making farming unsustainable and the scheme largely unsuccessful.

Road building

Roads like the Transamazon Highway enable access to the rainforest, but clearing land for construction leads to settlement, farming, and further deforestation as people move in and exploit the area.



In parts of the Amazon, sustainable management ensures current resource use meets people's needs while protecting the ecosystem, so future generations can also benefit from its resources and biodiversity.

Governance: Rainforest governance includes protected areas like Brazil's CACC and local efforts, such as Colombia's Natütama, which educates and monitors to conserve wildlife and prevent illegal activities.

Commodity value: Sustainable forestry gives rainforests long-term value. Selective logging and certification (e.g., FSC) protect forests, while companies like Precious Woods Amazon manage resources responsibly.

Ecotourism: Ecotourism at Yachana Lodge supports conservation, educates locals, creates jobs, and funds forest protection through sustainable, low-impact tourism.