Unit 1b The Living World

AQA

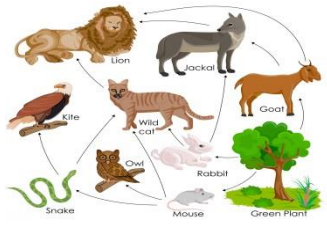
1..What is an Ecosystem?

An ecosystem is a system in which organisms interact with each other and with their environment.

2. Ecosystem's Components

Abiotic	These are **non-living**, such as air, water, heat and rock.
Biotic	These are **living**, such as plants, insects, and animals.
Flora	**Plant life** occurring in a particular region or time.
Fauna	**Animal life** of any particular region or time.

3. Food Web and Chains

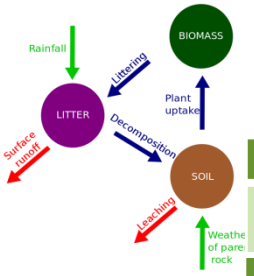


Simple **food chains** are useful in explaining the basic principles behind ecosystems. They show only one species at a particular trophic level. **Food webs** however consists of a network of many food chains interconnected together.

4. Nutrient cycle

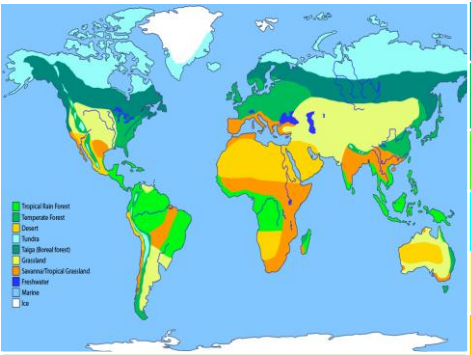
Plants take in **nutrients** to build into new organic matter. Nutrients are taken up when animals eat plants and then returned to the soil when animals die and the body is broken down by **decomposers**.

Litter	This is the **surface layer** of vegetation, which over time breaks down to become **humus**.
Biomass	The total **mass of living organisms** per unit area.



5. Biomes

A biome is a **large geographical area of distinctive plant and animal groups**, which are adapted to that particular environment. The climate and geography of a region determines what type of biome can exist in that region.



	Coniferous forest
	Deciduous forest
	Tropical rainforests
	Tundra
	Temperate grasslands
	Tropical grasslands
	Hot deserts.

The **most productive biomes** – which have the greatest biomass- grow in climates that are **hot and wet**.

6. Biome's climate and plants

Biome	Location	Temperature	Rainfall	Flora	Fauna
Tropical rainforest	Centred along the Equator.	Hot all year (25-30°C)	Very high (over 200mm/year)	Tall trees forming a canopy; wide variety of species.	Greatest range of different animal species. Most live in canopy layer
Tropical grasslands	Between latitudes 5°- 30° north & south of Equator.	Warm all year (20-30°C)	Wet + dry season (500-1500mm/year)	Grasslands with widely spaced trees.	Large hoofed herbivores and carnivores dominate.
Hot desert	Found along the tropics of Cancer and Capricorn.	Hot by day (over 30°C) Cold by night	Very low (below 300mm/year)	Lack of plants and few species; adapted to drought.	Many animals are small and nocturnal: except for the camel.
Temperate forest	Between latitudes 40°-60° north of Equator.	Warm summers + mild winters (5-20°C)	Variable rainfall (500-1500m /year)	Mainly deciduous trees; a variety of species.	Animals adapt to colder and warmer climates. Some migrate.
Tundra	Far Latitudes of 65° north and south of Equator	Cold winter + cool summers (below 10°C)	Low rainfall (below 500mm/ year)	Small plants grow close to the ground and only in summer.	Low number of species. Most animals found along coast.
Polar	Arctic/Antarctic	Winter temps -50°C	Low precipitation	Some lichens and mosses on the edge of the ice	Polar bears in the North, Penguins in the South

7. UK Example small scale Ecosystem: Avington Park Lake, Winchester, Hampshire

Avington Park is a country estate near Winchester in Hampshire. Lack of maintenance in recent years resulted in the accumulation of silt and vegetation.

Components & Interrelationships	
Pond margin	Plenty of oxygen and light. Shelter for plants and insects for small animals to eat
Pond surface	Animals breathe through gills, lungs or skin
Mid water	Fish are main predators. Feed on surface or in pond.
Pond bottom	Plenty of shelter. Decomposers and scavengers live here.

Management

- The lake is of historical and ecological importance
-Restoration of the lake was carried out in 2014
-The lake was desilted and redefined
-New waterside habitats created to attract nesting birds and waterfowl

8. Tropical Rainforest Biome

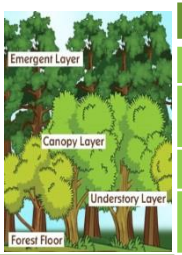
Tropical rainforest cover about **2 per cent** of the Earth's surface yet they are home to **over half of the world's plant and animals**.

9. Interdependence in the rainforest

A rainforest works through **interdependence**. This is where the plants and animals **depend on each other** for survival. If one component changes, there can be **serious knock-up effects** for the entire ecosystem.

10. 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.



12. Layers of the Rainforest

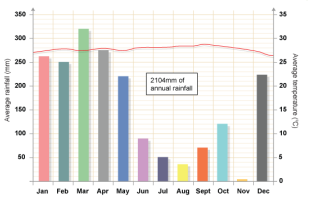
Emergent	Highest layer with trees reaching **50 metres.**
Canopy	Most life is found here as It receives **70% of the sunlight** and **80% of the life.**
U-Canopy	Consists of trees that reach **20 metres high.**
Shrub Layer	Lowest layer with **small trees** that have adapted to living in the **shade.**

11. Rainforest nutrient cycle

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**.

13. 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.



14. Tropical Rainforests: Case Study of Malaysian rainforest, S E Asia

Malaysia is in S E Asia. I is made up of Peninsular Malaysia and East Malaysia which is part of the island of Borneo. The natural vegetation is tropical rainforest. 67% of land in Malaysia is covered by rainforest.

Adaptations to the rainforest

Howler monkeys	Strong prehensile tails let them grip and hang from branches..
Drip Tips	Allows heavy rain to **run off leaves easily**.
Lianas & Vines	**Climbs** trees to reach sunlight at canopy.

Rainforest inhabitants

Many tribes have developed sustainable ways of survival. The rainforest provides inhabitants with…

- **Food** through hunting and gathering.
- **Natural medicines** from forest plants.
- **Homes and boats** from forest wood.

Issues related to biodiversity

Why are there high rates of biodiversity?

- **Warm and wet climate** encourages a wide range of vegetation to grow.
- There is **rapid recycling of nutrients** to speed plant growth.
- Most of the rainforest is **untouched.**

Main issues with biodiversity decline

- **Keystone species** (a species that are important of other species) are extremely important in the rainforest ecosystem. Humans are threatening these vital components.
- **Decline in species** could cause tribes being unable to survive.
- **Plants** & **animals** may become **extinct.**
- Key medical **plants** may become **extinct.**

Impacts of deforestation

Economic development

+ Mining, farming and logging creates employment and tax income for government.
+ Products such as soy beans provide valuable income for countries.
-.Soil is rapidly degraded making farming and cattle ranching unsustainable.

Soil erosion

- Once the land is **exposed by deforestation,** the soil is more **vulnerable to rain**.
- With **no roots to bind soil together**, soil can easily **wash away.**

Climate Change

-When rainforests are cut down, the climate becomes **drier.**
-Trees are **carbon 'sinks'**. With greater deforestation comes more greenhouse emissions in the atmosphere.
-When trees are burnt, they **release more carbon in the atmosphere**. This will enhance the **greenhouse effect.**

What are the causes of deforestation?

Logging

- Malaysia was the world's larges exported of tropical wood in the 1980s
- **Clear felling** – all trees in an area felled – resulted in total destruction of forest habitats.
- **Selective logging** has since replaced clear felling,

Agriculture

- Large scale **'slash and burn'** to provide nutrients for the soil.
- Increases **carbon emissions**.The fires can burn out of control destroying large areas of forest.
- Tribal people are subsistence farmers on a small scale which is sustainable.

Mineral Extraction

- **Mining (mainly tin and smelting)** is common
- Drilling for **oil and gas** has recently started on Borneo
- **Indigenous people** are becoming **displaced** from their land due to roads being built to transport products.

Population growth

- **Population growth and migration** are putting pressure on the rainforest.
- Between 1956 and the 1980s poor urban people were encouraged to **migrate** to the countryside. **15 000 hectares of rainforest** was felled for them

Energy Development

- The **high rainfall** creates ideal conditions for **hydro-electric power (HEP).**
- The **Bakun Dam** creates energy, but it flooded over 700 km2 of forests and farmland.

Road Building

- **Roads** are needed to bring supplies and **provide access** to new mining areas, settlements and energy projects.
- **Logging** needs roads to bring in machinery and take away logs.

Sustainability for the Rainforest

Uncontrolled and unchecked exploitation can cause irreversible damage such as loss of biodiversity, soil erosion and climate change.

Possible strategies include:

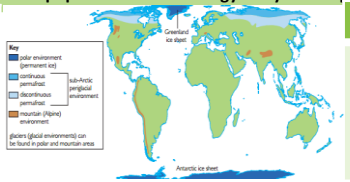
- **Agro-forestry** - Growing trees and crops at the same time. It prevents soil erosion and the crops benefit from the nutrients.
- **Selective logging** - Trees are only felled when they reach a certain height.
- **Education** - Ensuring those people understand the consequences of deforestation
- **Afforestation** - If trees are cut down, they are replaced.
- **Forest reserves** - Areas protected from exploitation.
- **Monitoring** - use of satellite technology and photography to check that any activities taking place are legal and follow guidelines for sustainability

15. Cold Environments: Case Study Svalbard

Svalbard is a Norwegian territory in the Arctic Ocean and is the most northerly permanently inhabited group of islands in the world. It has five major islands, 60% of which are covered in glaciers and the rest of the land is tundra. There are no trees – it's too cold! Most of the population lives in Longyearbyen on Spitzbergen, the largest island.

Distribution of cold environments

Most of the world's old environments (both polar and tundra) are found in high latitude areas and mountainous regions of the world.



Major characteristics of cold environments

- **Climate –** very cold winter temperatures below -20degC
- **Soils** - permanently frozen
- **Plants** - mosses and lichens in polar regions; some flowering plants and small bushes in tundra regions..

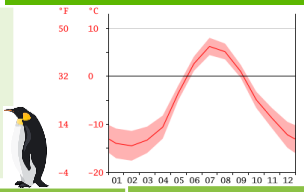
Cold environment inhabitants

- There is a serious risk of frost bite so people have become used to having to wear several layers to make it safe to work outside
-Water and sewage pipes are over ground and heated to prevent them freezing

Climate of cold environments

- At or below zero degrees Celsius for long periods
- The most extreme cold environments e.g. Antarctica, temperatures are below zero all year
- Less extreme environments e.g. Canada and parts of Iceland just have very cold winters.

Temperature graph Svalbard



Adaptations to cold environments

Polar bears	To retain heat they have **thick fur** and an **insulating layer of fat** with a **black nose and foot pads** to absorb sunlight.
Penguins	**Huddle together** in large numbers to keep warm Lay their eggs on land but **incubate them on their feet** and under their fur

Vegetation

Few plants are found in polar regions but a wide variety grow in the tundra. They are:
- Low growing to protect them from the wind
- Have thin, waxy leaves to prevent water loss

Opportunities and challenges in cold environments

Opportunities

- **There are valuable minerals e.g. coal for industries and construction.**
- **The coal mined on Svalbard is burned to generate electricity for the whole of the island**
- **The seas around Svalbard are one of the richest fishing grounds**
- **Tourists are attracted to Svalbard to explore its extreme natural environment**

Challenges

- **The extreme cold makes it dangerous to work outside**
- **Construction can only take place in summer when its warmer and the ground isn't frozen**
- **Most services e.g. water, sanitation are provided by overground pipes to prevent them freezing.**
- **Access is difficult and Svalbard can only be reached by plane or ship. There are few roads on the island and most people use snowmobiles to get around.**

Cold Environments under threat

Cold environments are extremely fragile and can easily be damaged by human activities.

Minor developments
Such as constructing a footpath can have serious long term effects. The fragile environments take a long time to recover

Off-road vehicle damage
A popular tourist activity in Alaska that takes place in summer when the snow has melted. Leaves deep tyre tracks and damage which will take years to recover

Economic development
Rich reserves of oil and gas are in high demand as energy sources. To extract the oil and gas, roads are built through forests and buildings constructed. This has a huge impact on the environment.

Managing cold environments

- Technology - Monitoring the trans-Alaskan oil pipeline to keep the oil moving
- Action by governments – Alaska - Ensures companies extracting oil protect the environment. They also protect fisheries and marine habitiats
- International Agreements – Antarctic Treaty - protects Antarctica by controlling tourism and preventing development.
- Conservation groups – WWF - works with local communities to manage critical ecosystems.