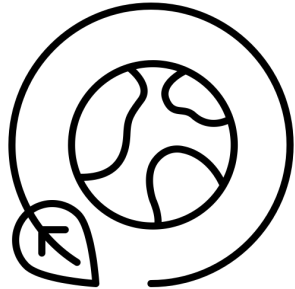


# T5

## Weather, climate and ecosystems



### Geography Knowledge Organiser

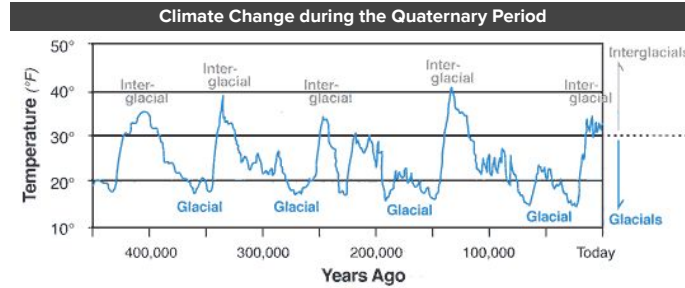
Find a playlist of explainer clips by scanning or clicking the QR code

CLICK ME



SCAN ME

### 5.1.1 - Climate change evidence



Over a long period of time (the last 400,000 years) there have been natural cycles of cooling and warming. The periods of time the average global temperature was below 15°C are known as **glacials**, and periods of warmth are known as **interglacials**.

**Evidence for climate change**

- Ice cores from the Antarctic show the amount of CO<sub>2</sub> and methane in the atmosphere have changed over the last 420,000 years
- Historical records, such as diary extracts
- CO<sub>2</sub> levels in the atmosphere
- Measurements by the met office show temperature has increased by 0.6°C over the past 100 years.

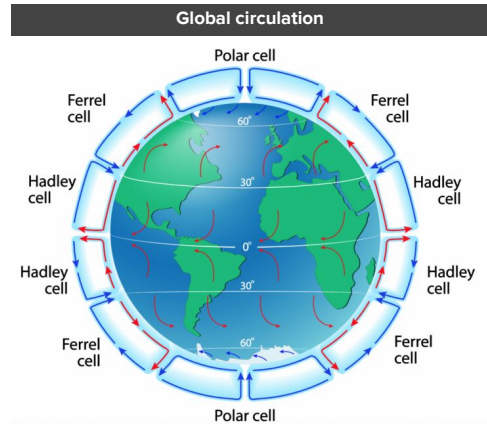
### 5.1.2 - Climate change causes

**Carbon cycle**

**Greenhouse effect**

The greenhouse effect is natural but humans have worsened the impacts. Carbon Dioxide and Methane are greenhouse gases which trap heat in the atmosphere. As more gases build up more heat is stored, warming the planet.

### 5.2.1 - Weather hazards



1. At the equator insolation heats the Earth which heats the air above
2. Hot air rises creating low pressure – as it rises it travels north and south
3. This air eventually cools and sinks at about 30° north/south of the equator – this creates high pressure
4. This air then returns to the equator (known as the intertropical convergence zone ITCZ)

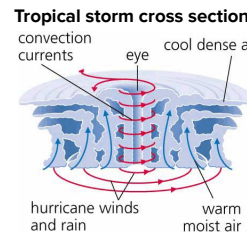
**Low pressure & tropical storms**

Warm air rises because it is less dense. When it reaches the edge of the atmosphere it cannot rise any further and moves north and south. The edge of the atmosphere is cold and so the air cools too. Low pressure can create a hazard called a tropical storm, which is also known as a hurricane, cyclone or typhoon

**Tropical storm causes (CYCLONE PAM 2015)**  
 Occurred near the island chain of Vanuatu in the South Pacific  
 Tropical storms can only form over large/deep oceans  
 Ocean temperatures of at least 27°C  
 Water depth of at least 50 meters  
 Gentle winds in the atmosphere to draw air up from water surface

**Tropical storm effects (CYCLONE PAM 2015)**  
 11 people died  
 90000 homeless  
 Hospitals and schools destroyed  
 Widespread destruction of fruits, vegetables, root crops and livestock  
 Stormsurge flooded coastal areas and contaminated freshwater supplies

**Tropical storm responses (CYCLONE PAM 2015)**  
 Emergency aid sent by Australia, Fiji, New Zealand and UK  
 153 temporary school built  
 Repairs to infrastructure to provide safe drinking water  
 Blankets & tents given to those made homeless  
 28 schools used as evacuation centres



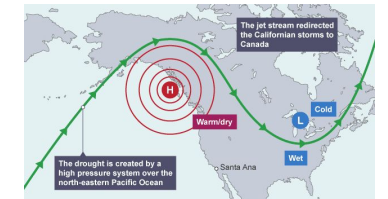
**High pressure & droughts**

As the air cools in the outer atmosphere it becomes heavier and starts to sink. This air moves back to the ground. This is called high pressure. As the air reaches the surface it starts to warm again and the cycle continues. High pressure can produce a hazard called a drought - a long period of no available water due to intense heat.

**Drought causes (CALIFORNIA 2012)**  
 The jet stream was further north than normal, pushing low pressure systems north and allowing high pressure systems to sit over the state creating a heat wave.

**Drought effects (CALIFORNIA 2012)**  
 A hosepipe ban was introduced  
 Homes were destroyed by wildfires  
 Hydroelectric power dams stopped producing electricity  
 Crops could not be grown and 17,000 agriculture jobs were lost  
 Fish died as high temps caused an oxygen decrease

**Drought responses (California 2012)**  
 12,500 water metres installed in homes  
 400,000 water saving toilets installed  
 3.2 million square feet of turf removed.  
 50% of Orange County's water supply is now imported from other areas.



## 5.2.2 - UK weather variations

**Weather** - the conditions of the atmosphere over a short period of time, often a day  
**Climate** - the weather of a place averaged over a period of time, often 30 years

### Factors affecting Climate in the UK



**Latitude** –the north of the UK has cooler temperatures than the south  
**Altitude** – mountain areas have cooler temperatures. Temperatures decrease by 1°C for every 200m of elevation.



**Ocean currents** – the North Atlantic drift brings warmer water to the UK, keeping the climate milder in winter and cooler in summer.  
 Different winds directions also bring different **air masses**:



- Pm** North westerly brings polar maritime air (cool and showery)
- Tm** South westerly brings tropical maritime (mild and wet)
- Pc** Easterly brings polar continental (cold and dry)
- Tc** South easterly brings tropical continental (warm and dry)
- Am** Northerly brings arctic air (cold and snow in winter)



### Low Pressure (depressions)

Begin in the Atlantic and move east  
 Brings rain, cloud and wind  
 Air rises, cools and condenses forming clouds

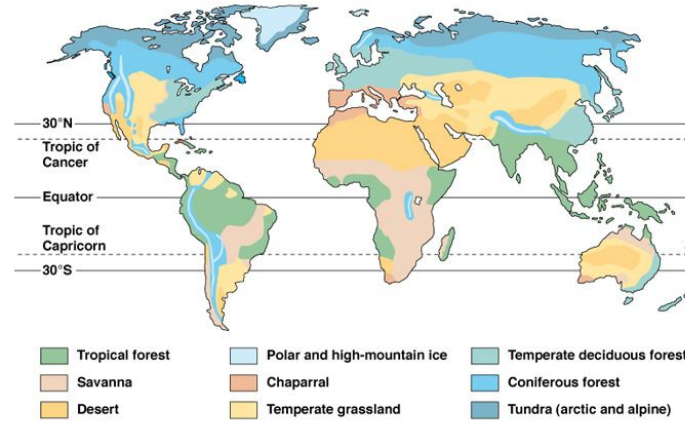
### High Pressure (anticyclone)

Low wind speed, stable conditions with no clouds  
 In summer they bring hot weather, which may lead to drought  
 In winter they bring cold (frosty) nights

### Microclimate

**Physical features** - hills, trees can block the wind and sun. Water cools the air  
**Shelter** - Buildings, trees and hills can shelter from the wind  
**Surface (albedo)** - dark surfaces heat up quicker than light surfaces  
**Buildings** - Buildings store up heat and redirect wind direction  
**Aspect** - locations facing south have sun all day, the north doesn't receive sunlight

## 5.3.1 - Ecosystems



Large scale **ecosystems** are known as **biomes**.

**Climate** – the most important factor in determining their distribution  
**Rainfall** – the amount and patterns determine the distribution of biomes  
**Temperature** – when rainfall is reliable and distributed evenly temperature becomes the most important factor

**Other factors can also have an influence e.g.**  
 Tropical rainforests are located either side of the equator where hot and wet conditions allow continuous growth of plants

## 5.3.2 - Ecosystem processes

### Tropical rainforest characteristics

**Shrub layer.** It is dark and gloomy with very little vegetation.  
**Under canopy.** It is the second level up. There is limited sunlight. Saplings wait here for larger plants and trees to die  
**Canopy.** This is where the upper parts of most of the trees are found. The canopy is typically about 65 to 130 feet (20 to 40 metres) tall.  
**Emergents.** These are the tops of the tallest trees in the rainforest. These are much higher, and so are able to get more light than the average trees in the forest canopy.



### Nutrient cycle

The rainforest nutrient cycling is rapid. 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.



### Water cycle

The roots of plants take up water from the ground and the rain is intercepted as it falls - much of it at the canopy level. As the rainforest heats up, the water evaporates into the atmosphere and forms clouds to make the next day's rain.



### Carbon cycle

Rainforests contain about 40 to 50% of the carbon in the biomass, and very little in the soil due to the rapid nutrient cycling



### Key services

- Regulating climate and air quality
- Preventing Soil Erosion
- Carbon Storage
- Provisioning Goods (food, fuel)
- Flood prevention

### Biodiversity

Biodiversity is the variety of plant and animal life in a particular habitat, a high level of which is considered to be important and desirable. The tropical rainforest has a higher level of biodiversity than savannah

## 5.3.2 - Ecosystem processes

### Savanna characteristics

**Grasses and trees** - The savanna is a grassland with scattered trees and shrubs.  
**Rainy and dry seasons** - Savannas have two distinct seasons in regards to precipitation. There is a rainy season in the summer with around 15 to 25 inches of rain and a dry season in the winter when only a couple of inches of rain may fall.  
**Large herds of animals** - There are often large herds of grazing animals on the savanna that thrive on the abundance of grass and trees.  
**Warm** - The savanna stays pretty warm all year.



### Nutrient cycle

Nutrients are cycled quickly during the dry season in the tropical heat. Wildfires are common and nutrients are returned to the soil when vegetation burns.



### Water cycle

All most all rain falls during the rainy season. Vegetation quickly absorbs and stores this water for the dry season. Little water is lost by transpiration due to waxy leaves and low surface area of the plants.



### Carbon cycle

Majority of carbon is stored in vegetation with a lesser amount in soil. During dry seasons, wildfires can burn vegetation, releasing CO<sub>2</sub> into the atmosphere.



### Key services

- Preventing Soil Erosion
- Carbon Storage
- Provisioning Goods (food, fuel)

### Small scale ecosystem: sand dunes

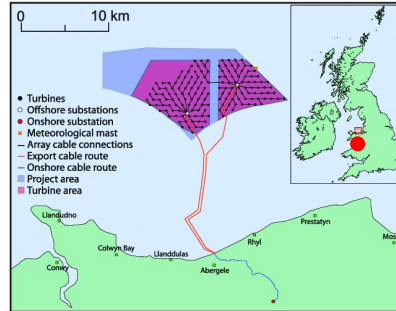
Sand Dunes are a build up of sand around vegetation. This requires loose sand and prevailing winds which blow on-shore. They are formed through a processes known as succession. As plants die and decompose it nourishes the soil making it better quality and now more fragile plants will start to grow.

## 5.4.1 - Human uses

### Gwynt y Môr offshore wind farm

Offshore wind farms are located in the sea close to the shoreline as winds are stronger, unobstructed and do not impose on cities/population as much. Gwynt y Môr is located 15km off the north coast of Wales

The demand for renewable energy is increasing as non-renewables such as coal and gas are depleting



### Advantages

Produces power for 400,000 homes

Creates 100+ jobs

Helps with global climate change efforts

### Disadvantages

RSPB says it affects bird migrations and their normal routines

National Trust has concerns over affecting heritage and tourism

Locals are opposed as it spoils the natural beauty

## 5.4.2 - Human impacts

### Tropical rainforest uses

**Advantages:**  
**Infrastructure,** hospitals and education can be improved  
**Raw materials,** eg tropical hardwoods such as ebony and mahogany, can be sold for a good price abroad.  
**Large-scale farming** brings money into the country and provides food and jobs.  
**Small-scale farming** provides food for rainforest communities.

**Disadvantages:**  
**Land clearance** for farming, transportation and mining can lead to **deforestation**.  
**Loss of fertile soils** that make farming possible are quickly washed away when the forest is cleared.  
**Loss of animal habitat** occurs when trees are cut down. Hence, deforestation can result in endangering animals and plant life, or even causing them to become extinct.

### Savanna uses

**Advantages:**  
**Small-scale farming** provides food for rainforest communities.  
**Raw materials,** eg fuel (firewood)

**Disadvantages:**  
 Large areas of grassland have been turned into **farmlands** for growing crops and for rearing cattle.  
 Animals have been **hunted** for their valuable body parts or for sport.  
**Loss of fertile soils** that make farming possible are quickly washed away when the forest is cleared.



## 5.4.3 - Ecosystem management

### Tropical rainforest management



**Selective logging** – only cutting down older trees and not rare species. The International Forest Stewardship Council makes people aware of products made from sustainable timber.



**Agro-forestry** – growing new trees alongside crops



**Wildlife corridors** – connecting separated areas of forest with strips of vegetation so animals can move between areas



**Eco-tourism** – encouraging small groups of sustainable tourism. Money made is used to protect the ecosystem and uses local tour guides and companies.



**Debt-swaps** – HICs cancel debts which LICs have, if they protect their rainforests from over-exploitation

### Savanna management



**Crop rotation** – growing different crops and giving the land time to rest between planting to allow soil to recover nutrients



**Afforestation** – planting more trees to protect the soil



**Drought-resistant crops** – Planting genetically modified crops which can withstand long periods of water shortage



**Population control** – Encouraging people to have fewer children so less crops and water are needed in the area



## Home study questions



### DEVELOPING

**Describe** the economic effects of a low pressure hazard [3 marks]

**Give** three ways that humans have influenced the carbon cycle [3 marks]

### SECURING

**Analyse** the pattern of temperature change over the last 450 million years (5.1.1) [6 marks]

**Explain** how low pressure systems forms [3 marks]

### MASTERING

**Discuss** how sustainable the use of one ecosystem is [8 marks]

**Explain** the factors that influence changes in weather for the UK [6 marks]

### CHALLENGE

**Decide** how deforestation would affect the nutrient, water and carbon cycles in the tropical rainforest - present your decision as a paragraph or concept map

**Evaluate** how successful you think management strategies for the savanna ecosystems are