



# Weather and climate change

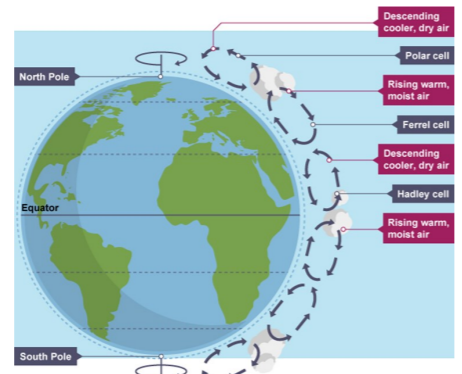
## GLOBAL CIRCULATION CELLS

There are three main cell movements within our atmosphere; Hadley cells (equator to 30°), Ferrel cells (30° to 60°), and Polar cells (60° to the pole).

They move the air in circular movements. The warm air rises and the cool air sinks in a continuous cycle. This creates areas of high and low pressure.

Areas of **low pressure** have warm air that rises. This means that the rises air will condensate and create clouds and rain-fall.

Areas of **high pressure** have cool air that sinks back to the earth. This creates hot/dry weather and cloudless skies.



## OCEAN CIRCULATION

The ocean currents are moved by the global circulation cells (wind blowing across the surface water). The currents are like rivers running through the ocean.

They take warm ocean water away from the equator towards 30° N or S; and they bring cooler waters back towards the equator.

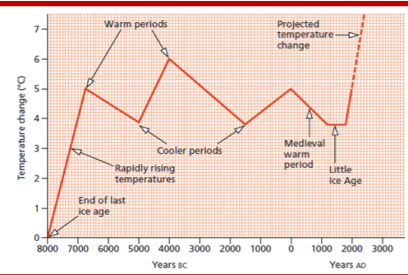
An example of an ocean current is the gulf stream. This takes warm ocean water from the Caribbean Sea, across the Atlantic to the UK.

Warm ocean current bring warm weather. Cold ocean currents bring cold weather

## JET STREAMS

In the upper atmosphere (about 10,000 metres in the air) there are jet streams, which are bands of extremely fast moving air. They move in a **westerly** direction around the earth. There are two jet streams around the globe;

- The polar jet stream (about 60° N or S of the equator; in between Ferrell and Polar cells)
- The subtropical Jetstream (about 30° N or S of the equator; in between Hadley and Ferrell cells)



## NATURAL CAUSES OF CLIMATE CHANGE

**Milankovitch cycle** - The earth's orbit varies from elliptical to circular and the earth's tilt affects how much heat we get from the sun

**Solar variation** - Sun spots give off more heat energy.

**Volcanism** - Sulphur dioxide released, this acts as a blanket around the earth and contributes to greenhouse gases.

## HUMAN CAUSES OF CLIMATE CHANGE

**Industry** - Many industries in the UK use fossil fuels to generate energy, or produce CO<sub>2</sub> as part of the production process.

**Transport** - Car ownership is very high in MEDCs and growing in LEDCs. The use of cars produces CO<sub>2</sub>.

**Energy** - Generating power in power station accounts for 25% of global CO<sub>2</sub> emissions.

**Farming** - Cattle and rice growing produces methane. As demand for western style diets increases so does the demand for cattle

## EVIDENCE FOR CLIMATE CHANGE

**Ice cores** - We can drill into the ice and measure how much carbon dioxide (CO<sub>2</sub>) was present in past years (high levels of CO<sub>2</sub> = hot temperatures)

**Tree rings** - Each year a tree grows by a single ring. If the ring is wide it shows that the temperature was warm that year.

**Historical records** - Old cave painting, diaries and stories from the past.

**Pollen records** - By digging into the ground, and looking at pollen in the ground, this shows the plants that were around in the past.

## NEGATIVE IMPACTS OF CLIMATE CHANGE

### Changing patterns of crop yields

- Countries close to the equator will experience longer periods of drought and shorter growing periods.

- It is estimated that about 50% of India's land for growing wheat will be destroyed due to hotter and drier weather.

- Countries like the UK will have to change the products that they grow due to the hotter weather

### Rising sea levels

- Melting polar ice caps has led to sea levels rising by approximately 3mm every 10 years.

- This will threaten large areas of low lying coastal areas like New York and Liverpool

### Retreating glaciers

- Glaciers all over the world are retreating (melting) due to warmer temperatures. For example 90% of glaciers in Antarctica are retreating.

- Glaciers in the Himalayas provide water supplies for people in India and Bangladesh, which will disappear.

### Migration

- As sea levels rise and land become unusable for farming people are forced out of their homes.

- For example in the Maldives 1600 had to be evacuated out of their homes due to coastal flooding caused by rising sea levels

### Increased storms

- Across the UK the increased temperature has led to an increase in the number of storms and floods

### UK CLIMATE

- Average temperatures of the UK increasing
- More storms are occurring coupled with rising sea levels
- Increased periods of dry weather (over a period of months)
- Increased periods of wet weather (over a period of months)

## UK RESPONSES TO CLIMATE CHANGE

**Government** - Electric car scheme, home insulation and solar panel grants.

**Local councils** - Oldham council, energy saving light bulb scheme.

**Schools** - sensor lights, solar panels.

## CLIMATE VARIATIONS IN THE UK

**Rainfall** - areas in the east of the UK receive less rainfall than those on the west. This is because the prevailing wind comes from across the Atlantic Ocean so contains a lot of moisture. The west coast of the UK has a much higher relief causing relief rainfall.

**Temperature** - The UK has moderate temperature throughout the year. The summers are warm (not hot) and the winters are cool (not cold). As the UK is in between the equator and the poles the heat received is very average. The North Atlantic Drift Ocean current. This current starts at the equator and crosses the Atlantic to the UK bringing warm waters, which also warms the temperature of the UK

**Wind** - When the winds come from different directions they bring different types of weather. Arctic maritime wind brings cold clear weather. Tropical continental wind brings warm dry weather. Tropical maritime wind brings warm wet weather.

## TROPICAL CYCLONES

Tropical cyclones occur in tropical and subtropical oceans between the tropic of cancer and Tropic of Capricorn

The most tropical cyclones occur in the North Pacific Ocean

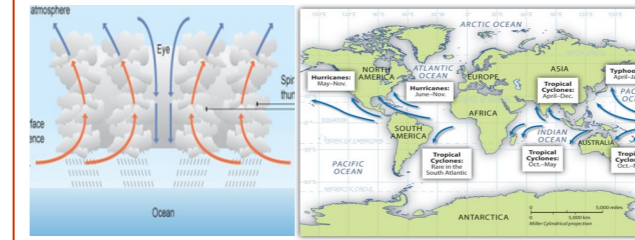
They only form over water temperatures of 27°C or higher.

The tropical cycles have average wind speeds of 120kph

The tropical cyclones usually move from east to west.

The centre of a tropical cyclone is known as the 'eye'. This is usually a calm area

Tropical cyclones usually form between the end of the summer and autumn



## HURRICANE SANDY, 2012—RESPONSES

	Cuba	USA
Individuals	- Many people in Cuba had no home insurance so had to rebuild their own homes - Many people have to move into the homes of friends or relatives, or state provided homes.	- Most American had home insurance so used local builders to rebuild their homes. - Many people have to move into the homes of friends or relatives.
Organisations	- The Cuban Red Cross approximately 25,000 families with basic resources, including clean drinking water, mattresses and kitchen kits - The UN provided US\$5.5 million to Cuba in emergency aid funds.	- The red cross used 17,000 trained staff to provide aid and relief to people in the affected areas. - AmeriCare (an American charity) provided US\$7.1 million in aid, in the two years after the Hurricane
Governments	- The government gave 50% price cuts for building material, such as corrugated iron and cement - The government provided interest free loans for people to repair the damage to houses - Military teams were mobilised to clear the streets of rubble	- The government approved over \$60billion of aid to be provided for the victims of the hurricane. - The government invested in improved weather forecasting and sea defences

## DROUGHT KEY TERMS

**Drought**-A drought is the reduction in the amount of available water supply (usually caused by below average rainfall). They occur unpredictably

**Arid Environments** - An arid environment is one where there is always only a small amount of rainfall

## NAMIBIA DROUGHT, 2013

### Effects

People were forced to leave their homes as their water supplies haddried up

Over 750,000 Namibians suffered from severe or moderate food insecurity

Trees and plants are killed. These are used locally as fuel and for houses.

Large areas of grassland have changed becoming deserts due to the lack of rainfall

### Responses

**Individuals** - In one village 350 people were forced to leave

**Organisation** - The international red cross sent out

## HURRICANE SANDY, 2012—EFFECTS

	Cuba (Developing)	USA (developed)
Social	- 11 people were killed - Approximately 250,000 homes were damaged or destroyed	- 117 people killed - 650,000 homes were damaged or destroyed
Economic	- Total loses estimated to cost US\$2 billion - Airports and roads were blocked or closed causing a further loss of money through tourism	- Insurance claims in New Jersey totalled US\$3.3 billion - The total damage cost in New York totalled US\$19 billion
Environmental	- Around 2,600 hectares of Banana crops were destroyed. - Many coastal areas had their beaches swept away, destroying natural habitats	- Approximately 1.5 billion litres of sewage was released into the River - 1.5 million litres of oil was released into water sources.

## Causes of drought

**Meteorological** - below average rainfall

**Hydrological** - reduction in the amount of water

**Agricultural** - water take to irrigate farmland

**Dam building** - reduction of water downstream

**Deforestation**—reduces amount of water intercepted

## CALIFORNIA DROUGHT, 2014

### Effects

Over 17, 000 people lost their job in the farming industry

Domestic water shortage lead to a hosepipe ban across California

Wildfires spread across California, destroying forests and natural habitats around San Diego.

Some river levels became so low that the water levels increased and the salmon were killed

### Responses

**Individuals** - People were asked to use water sparingly

**Organisation** - Hotels now ask guests to request the