



# **HOMEWORK**

<b>Big Question</b>	<b>Task</b>	<b>Due Date</b>
<b>3</b>	Revise pages 6-8	
<b>5</b>	Revise page 11-12	
<b>7</b>	Revise pages 15-16	
<b>9</b>	Revise for key terms test	
<b>12</b>	Revise pages 23-25	
<b>14</b>	Revise pages 28-29	






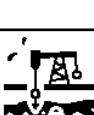
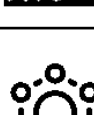





**Key terms found in the glossary on pages 4 – 5 will be tested throughout the unit**

# BIG QUESTIONS:


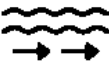






Big Questions that will help you to answer this enquiry question:

1. How does the global atmospheric circulation model work to transfer heat and energy?
2. How do ocean currents work to transfer and redistribute heat and energy?
3. How has our climate changed in the past?
4. What are the natural causes of climate change?
5. What role have human activities played in changing the natural climate?
6. What are the negative impacts of climate change on the environment and people?
7. How has the UK's distinct climate changed over time?
8. What specific conditions are required for the formation of tropical cyclones?
9. What were the effects and responses to Hurricane Sandy on Cuba and the USA?
10. What are the causes of drought and why are they described as 'complex'?
11. How is California impacted by drought and how well does it respond?
12. How is Ethiopia affected by drought and how well does it respond?

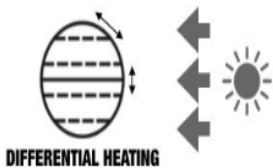
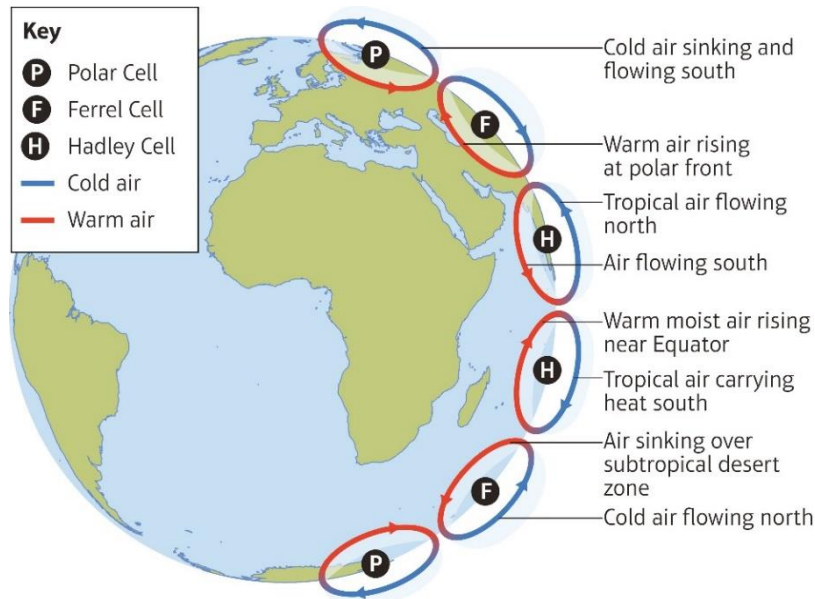
# GLOSSARY

Key term	Icon	Definition
<b>Atmosphere</b>		Thin layer of gases that surrounds the Earth. It seals the planet and protects us from the vacuum of space
<b>Climate</b>		The average weather conditions in a particular location based on the average weather experienced there over 30 years or more.
<b>Depression</b>		Air is rising, forming an area of low pressure at the surface. This rising air-cools and condenses and helps encourage cloud formation, so the weather is often cloudy and wet.
<b>Drought</b>		A period of unusually dry weather that persists long enough to cause problems such as crop damage and water supply shortages.
<b>Enhanced greenhouse effect</b>		Refers to human activities that are adding to the warming of the atmosphere due to the greenhouse effect—the presence of gases that increases the atmosphere's retention of the heat energy of the sun.
<b>Fossil fuels</b>		Fossil fuels are hydrocarbons, primarily coal, fuel oil or natural gas, formed from the remains of dead plants and animals.
<b>Global atmospheric circulation</b>		The large-scale movement of air by which heat is distributed on the surface of the Earth. The wind belts and the jet streams girdling the planet are steered by three convection cells: the Hadley cell, the Ferrel cell, and the Polar cell.
<b>Humanitarian aid</b>		Humanitarian aid is material and logistic assistance to people who need help. It is usually short-term help until the long-term help by government and other institutions replaces it.
<b>Ice cores</b>		Ice cores are cylinders of ice drilled from ice sheets and glaciers. Layers in ice cores correspond to years and seasons, with the youngest ice at the top and the oldest ice at the bottom of the core.
<b>Irrigation</b>		The supply of water to land or crops to help growth, typically by means of channels.
<b>ITCZ</b>		The Inter Tropical Convergence Zone, or ITCZ, is a belt of low pressure, which circles the Earth generally near the equator where the trade winds of the Northern and Southern Hemispheres come together.
<b>Jet stream</b>		A current of rapidly moving air that is usually several thousand miles long and wide but is relatively thin.

# GLOSSARY

Key term	Icon	Definition
<b>Latitude</b>		The angular distance of a place north or south of the earth's equator, usually expressed in degrees and minutes.
<b>Milankovitch cycles</b>		These cycles are caused by changes in the earth's orbit around the sun, like its shape or eccentricity, its precession or wobble, and the tilt of its axis or obliquity.
<b>Ocean current</b>		An ocean current is a continuous, directed movement of sea water.
<b>Pollen records</b>		Pollen grains and spores are the basis of an important aspect of paleo climatic reconstruction — pollen analysis, or. Palynology, the study of pollen and spores.
<b>Precipitation</b>		Precipitation is any form of moisture, which falls to the earth. This includes rain, snow, hail and sleet.
<b>Prevailing wind</b>		A wind that blows predominantly from a single general direction.
<b>Solar variation</b>		Solar Variation describes the change in the Sun's radiation output.
<b>Trade winds</b>		A wind blowing steadily towards the equator from the north-east in the northern hemisphere or the south-east in the southern hemisphere, especially at sea
<b>Tree rings</b>		Any of the concentric rings of the cross-section of a tree trunk, representing a year's growth, or the layer of wood produced by a year's growth in a woody plant; also called annual ring.
<b>Volcanism</b>		Volcanism is the phenomenon of eruption of molten rock (magma) onto the surface of the Earth or a solid-surface planet or moon, where lava, pyroclastic and volcanic gases erupt through a break in the surface called a vent.
<b>Weather</b>		Weather is the day-to-day condition of the atmosphere. This includes temperature, rainfall and wind.

# BQ1. HOW DOES THE GLOBAL ATMOSPHERIC CIRCULATION MODEL WORK TO TRANSFER HEAT AND ENERGY?

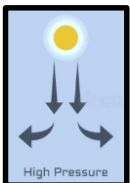


- The equator receives the most concentrated radiation because the sun's rays hit the surface at a right angle. This creates a **heat surplus** at the equator
- At the poles, the sun's rays reach the surface at a lower angle and have a large surface area to heat creating a **heat deficit**.



## **Hadley Cells**

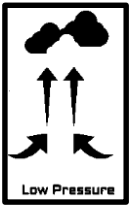
- At the **Equator**, warmed air rises causing **low pressure**. The air current divides, cools and moves towards **30°N and 30°S**.



- This cooled air sinks to the Earth's surface, warming and moisture is evaporated. This creates **high pressure** zones with cloudless skies = hot deserts in Sahara.
- Some of the cooled air moves back towards the equator as trade winds, the rest travels towards the Poles as part of the Ferrel cells

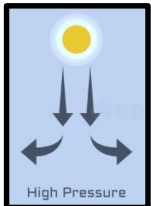
# BQ1. HOW DOES THE GLOBAL ATMOSPHERIC CIRCULATION MODEL WORK TO TRANSFER HEAT AND ENERGY?

## Ferrel Cells

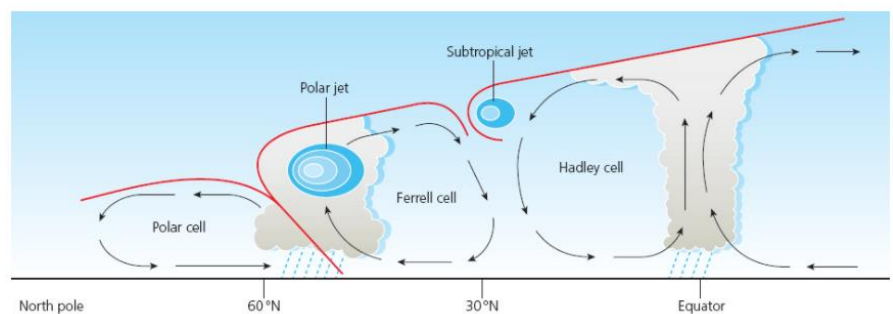


- Ferrel cells stretch from **30°N/S to 60°N/S**. Air on the surface is pulled towards the poles, collecting moisture as they blow over oceans.
- At 60°N and 60°S they meet cold air from the poles. Warm air rises over the cold air as it is less dense = **low pressure** and systems called depressions. Some of the air returned to the tropics and some is diverted to the poles as the Polar cells.
- In the northern hemisphere, the cell has a motion to the right and to the left if the southern hemisphere due to the spin of the Earth = **Coriolis effect**.

## Polar Cells



- Polar Cells stretch from **60°N/S to the north and south pole**. Air sinks over the poles creating **high pressure**.
- Air then flows toward the low pressure where it meets the warm air from the Ferrel cells.



## Role of Jet streams

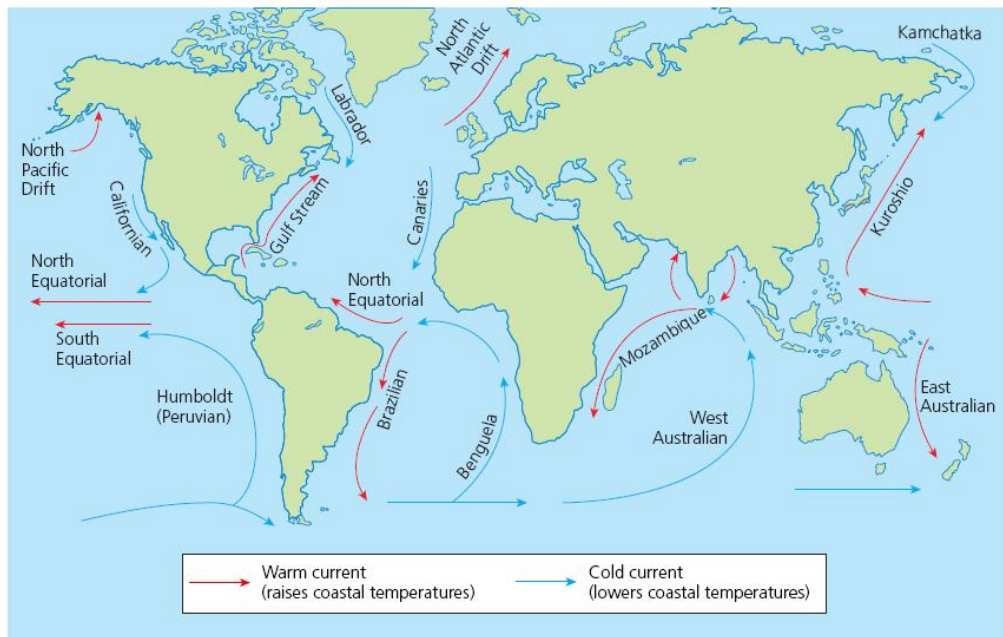
- In the upper atmosphere (10,000m), winds blow around the Earth in a westerly direction.

There are 2 areas:

1. Polar front jet stream → formed when cold Polar air meets warm Tropical air above the Atlantic Ocean between **40°N/S and 60°N/S**
2. Subtropical jet stream → in a westerly direction, found at **25°N and 35°S**.



## BQ2. HOW DO OCEAN CURRENTS WORK TO TRANSFER AND REDISTRIBUTE HEAT AND ENERGY?



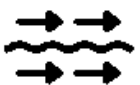
Ocean currents transfer 20% of the total heat from the tropics to the poles.



In the Northern hemisphere the currents move in a clockwise direction



In the Southern hemisphere the currents move in an anticlockwise direction



Surface ocean currents are driven by the movement of the wind across the top of the water

Deep ocean currents are driven by cold water (denser) sinking in the Poles and then rising at the tropics when it becomes warmer and more buoyant.

The Gulf stream (North Atlantic Drift) moves warm water from the Caribbean Sea across the Atlantic Ocean to the UK



# W&C HOMEWORK 1: ANSWER THE FOLLOWING

Define the term 'urbanisation'	
State one example of Bristol's connectivity	
How are metamorphic rocks formed?	
Define the term mass movement	
Explain one human cause of flooding (2)	
Outline one way that industrial sectors have changed in India	
Name two TNCs found in Mumbai (2)	
What process results in the formation of large clouds?	
Why is the insolation most concentrated at the equator? (2)	
What type of pressure is created when air rises from the ground?	
What altitude do we find the jet streams?	
Where are Ferrel cells found on the Earth's surface?	
Describe how air moves in a Hadley cell (3)	
Why are deserts found at approximately 25 °N and 25 °S of the Equator (2)	
	<b>Total out of 20:</b>

# W&C HOMEWORK 1: CHECK YOUR ANSWERS

Define the term 'urbanisation'	The increased proportion of people living in urban areas compared to rural areas.
State one example of Bristol's connectivity	<input type="checkbox"/> 18th century – involved in the slave triangle <input type="checkbox"/> Railways – Bristol Temple Mead accessing London, Scotland etc. <input type="checkbox"/> International airport flying to 112 countries. <input type="checkbox"/> Developed into ICT and electronics – linking via TNCs e.g. Orange.
How are metamorphic rocks formed?	igneous or sedimentary rocks are put under great pressure or are close to a source of heat
Define the term mass movement	movement of soil and rock debris down slopes in response to the pull of gravity
Explain one human cause of flooding (2)	Urbanisation – rainwater can't infiltrate impermeable surfaces/drains allow water to enter the river more quickly. Deforestation – interception is reduced so runoff increases
Outline one way that industrial sectors have changed in India	In 2012, agriculture accounted for 49% of the country's workforce, with 20% in manufacturing and 31% in the service sector and quaternary sector.
Name two TNCs found in Mumbai (2)	Bank of America/Bayer/GlaxoSmithKline /Volkswagen/ Walt Disney/ Citigroup
What process results in the formation of large clouds?	Condensation
Why is the insolation most concentrated at the equator? (2)	At the equator, where the sun's rays are most concentrated air is warmed because of the higher surface temperatures and begins to rise, as it is less dense than the surrounding air.
What type of pressure is created when air rises from the ground?	Low pressure
What altitude do we find the jet streams?	10,000m
Where are Ferrel cells found on the Earth's surface?	30°North and 30°south to latitudes 60°North and 60°south.
Describe how air moves in a Hadley cell (3)	<input type="checkbox"/> At the Equator, the trade winds meet. The warm air rises quickly causing thunderstorms. <input type="checkbox"/> An area of low pressure is formed in the ITCZ. <input type="checkbox"/> The air at the top of the cell moves towards 30°North and 30°south where it becomes cooler and starts to sink back to the Earth's surface.
Why are deserts found at approximately 25 °N and 25 °S of the Equator (2)	<input type="checkbox"/> As the air in the Hadley cell descends, it warms and any moisture is evaporated. <input type="checkbox"/> This creates high pressure with cloudless skies.
<b>Total out of 20:</b>	

# BQ3 & Q4. HOW HAS OUR CLIMATE CHANGED IN THE PAST?

**Quaternary period** covers the past 1.8 million years

Contains:

- **Pleistocene (2.6 million years ago to 10,000 years ago)** – most recent ice age which covered most of Canada, northern USA and the UK.
- **Holocene (10,000 years ago to present day)** – valley glaciers remain in mountain areas and ice caps are present in Greenland, Antarctica and the Arctic circle.

## **Key terms:**



**Climate** – The average weather conditions of an area occurring over 30 years

**Interglacial** – period of warmer global average temperature that separates consecutive glacial periods within an ice age



**Glacial** - A period of time with lower average temperatures causing widespread glaciations.



**Weather** – the day-to-day changes in temperature and precipitation

The last ice age to occur which affected the UK was the '**Loch Lomond Stadial**' around 10,000 years ago and covered most of Scotland and areas of Scandinavia.

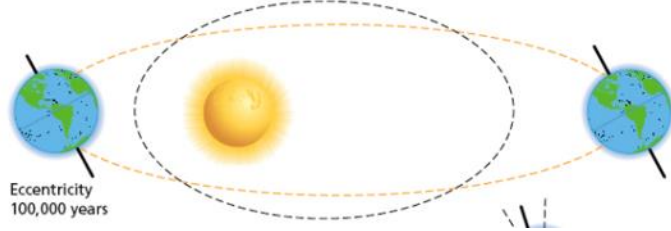


In the past 250 years, the Earth's temperature has risen significantly compared to before due to the production of greenhouse gases.

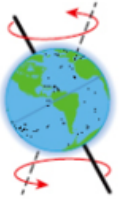
# BQ5 & Q6. WHAT ARE THE NATURAL CAUSES OF CLIMATE CHANGE?

## **Milankovitch theory:**

- a. Eccentricity of the orbit** → changes from being elliptical (interglacial/warmer) to more circular (glacial periods/colder) and back again over a period of 100,000 years. The changes occur due to the interaction with gravitational fields of Jupiter and Saturn.



- b. Axial tilt/Obliquity** → varies from  $21.8^{\circ}$  to  $24.4^{\circ}$  (currently  $23.5^{\circ}$ ) on a 41,000 year cycle. With increased tilt the poles, receive an increase in solar radiation, while lower latitudes receive a decrease.



- c. Wobble/Precession** → the earth wobbles on its axis changing the point in the year at which the Earth is closest to the sun over a 21,000 year cycle. This impacts the seasons and can cause warmer summers.



**Solar variation:** Energy emitted by the sun varies due to sunspots, varying every 11 years.

- 1645-1715 – Reduced sunspot activity created the Little Ice Age
- Suggested to account for 20% of warming in the 20<sup>th</sup> Century



## **Volcanism**

- Eruptions release ash and sulphur dioxide into the atmosphere
- Sulphur dioxide has a cooling effect of the climate – mixes with water to form sulphuric acid.
- This absorbs radiation from the sun, stopping the heat from reaching the earth's surface
- Example – Tambora in 1815 reduced temperatures by  $0.4-0.7^{\circ}\text{C}$

## W&C HOMEWORK 2: ANSWER THE FOLLOWING

Define the term 'development'	
Explain the process of mechanical weathering	
Name the economic core of India	
Name an area of periphery in India	
Name the landform created as a waterfall retreats upstream	
Which part of the meander bend will have the strongest current?	
Explain one historic factor leading to uneven development in the UK	
What type of pressure is created when air rises from the ground?	
Describe how air moves in a Polar cell (3)	
Name three cold ocean currents (3)	
What impact does the North Atlantic drift have on the climate of the UK ? (2)	
What is the main source of heat energy for the world?	
Name three warm ocean currents (3)	
Oceans transfer what percentage of the total heat from the tropics to poles?	
<b>Total out of 20:</b>	

## W&C HOMEWORK 2: CHECK YOUR ANSWERS

Define the term 'development'	Development is an improvement in the quality of life for the population of a country
Explain the process of mechanical weathering	Water gets into cracks in rocks. The temperature falls below freezing and the water turns to ice expanding the rock.
Name the economic core of India	Mumbai
Name an area of periphery in India	Bihar
Name the landform created as a waterfall retreats upstream	Gorge
Which part of the meander bend will have the strongest current?	Outside
Explain one historic factor leading to uneven development in the UK	The seat of government is in London so companies located close to where decisions are made/ During the colonial era all decisions were taken in London leading to development in the East
What type of pressure is created when air rises from the ground?	Low pressure
Describe how air moves in a Polar cell (3)	<input type="checkbox"/> Air sinks over the poles which causes high pressure. This means clear skies and no clouds. <input type="checkbox"/> The air then flows towards the low pressure in the mid latitudes. <input type="checkbox"/> Here it meets the warm air of the Ferrel cells. When air rises, clouds form.
Name three cold ocean currents (3)	Canaries/West Australian/ Peruvian/ Californian
What impact does the North Atlantic drift have on the climate of the UK ? (2)	The relatively warm waters moderate the <b>climate</b> of western Europe, so that winters are less cold than would otherwise be expected at its latitude.
What is the main source of heat energy for the world?	The Sun
Name three warm ocean currents (3)	Gulf stream/ North equatorial/ East Australian/Brazilian/North Pacific Drift/Gulf stream
Oceans transfer what percentage of the total heat from the tropics to poles?	25%
Total out of 20:	



# BQ5 & Q6. WHAT ARE THE NATURAL CAUSES OF CLIMATE CHANGE?

## **Evidence for natural climate change**



1. Ice cores → cores are drilled into ice areas in Antarctica to measure the amount of CO<sub>2</sub> trapped in the ice for the past 800,000 years. Levels of CO<sub>2</sub> tend to be lower during cooler periods.



2. Pollen records → used to show which plants were dominant at a particular time due to the climate. Pollen preserved in peat bogs and lake beds can show the change in species over time. Rare to find long pollen sequences and vegetation lags behind climate change.

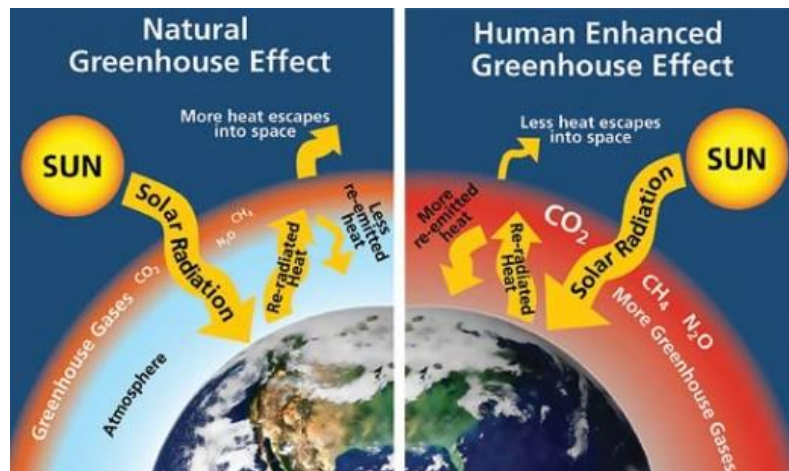


3. Tree rings → Each year of the tree's growth records the past climate. Narrow rings suggests a cooler, drier year and thicker means the temperature was warmer and wetter.



4. Historical sources → Includes cave paintings, diaries, poems etc. Daily weather records have been recorded since 1873.

# BQ7. WHAT ROLE HAVE HUMAN ACTIVITIES PLAYED IN CHANGING THE NATURAL CLIMATE?



## Human activities:



**Industry** - As levels of disposable income rise, increased demand for the production of consumer goods leads to industrial growth and the need for more energy, resulting in more fossil fuels being burnt.



**Transport** - With cars becoming more affordable and more people taking flights over long distances, huge quantities of fuel are used.



**Energy** - The demand for electricity is growing because of increasing population and new technologies. Most of our energy is produced through fossil fuels (coal, oil, natural gas), which produce greenhouse gases. Accounts for 25% of global carbon dioxide emissions.

## Farming



Increased demand for Western-style diets which contain meat. = Cattle produce methane as part of their digestion = 1/3<sup>rd</sup> of emissions from agricultural sector.



Mechanisation means more fuel is burnt



Rising populations in Asia = increase in rice production = methane

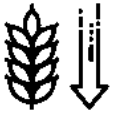
## W&C HOMEWORK 3: ANSWER THE FOLLOWING

Why did Cadbury move from Bristol in 2011? (2)	
What percentage of GNI have richest countries agreed to give in aid	
State one type of aid	
Name the period of time between peak rainfall and peak discharge	
Describe two factors leading to a flashy hydrography (2)	
Outline two characteristics of constructive waves (2)	
What is a concordant coastline?	
How does precession/wobble lead to changes in seasons? (2)	
How do pollen records from evidence of past climates?	
How can volcanism lead to changes in the global climate? (2)	
Why are deserts found at approximately 25 °N and 25 °S of the Equator (2)	
Oceans transfer what percentage of the total heat from the tropics to poles?	
Name two greenhouse gases (2)	
What would be the average temperature on the Earth's surface without the Greenhouse Effect?	
	<b>Total out of 21:</b>

# W&C HOMEWORK 3: CHECK YOUR ANSWERS

Why did Cadbury move from Bristol in 2011? (2)	Cadbury closed its manufacturing plant in Keynsham because Kraft brought the company. 400 jobs were lost as chocolate is now made in Poland and transported back to the UK to be sold.
What percentage of GNI have richest countries agreed to give in aid	0.7%
State one type of aid	Bilateral/ Multilateral aid/ official/ voluntary aid
Name the period of time between peak rainfall and peak discharge	Lag time
Describe two factors leading to a flashy hydrography (2)	Steep slopes so rapid run-off/ Impermeable rocks encouraging rapid overland flow/ Heavy or prolonged rainfall/ Saturated or frozen soils/ Deforestation encourages rapid transfer of water to rivers/ Urbanisation encouraging rapid overland flow
Outline two characteristics of constructive waves (2)	<input type="checkbox"/> The swash is more powerful than the backwash and therefore deposits sediment on beaches. <input type="checkbox"/> They break infrequently, at a rate of 10 or fewer per minute. <input type="checkbox"/> They are long in relation to their height.
What is a concordant coastline?	Rocks that lie parallel to the coastline
How does precession/wobble lead to changes in seasons? (2)	The Earth 'wobbles' on its axis when it rotates so the direction the axis is facing changes which can lead to smaller (or greater ) differences between winter and summer
How do pollen records from evidence of past climates?	Pollen, extracted from sediment cores in peat bogs and lake beds, record the ecology of the past.
How can volcanism lead to changes in the global climate? (2)	<input type="checkbox"/> Release particulate matter/ash into the atmosphere which can block incoming solar radiation through reflection/backscattering . This could lead to cooling <input type="checkbox"/> Sulphur dioxide is converted to sulphuric acid forming aerosols (causing more reflection and cooling)
Why are deserts found at approximately 25 °N and 25 °S of the Equator (2)	<input type="checkbox"/> As the air in the Hadley cell descends, it warms and any moisture is evaporated. <input type="checkbox"/> This creates high pressure with cloudless skies.
Oceans transfer what percentage of the total heat from the tropics to poles?	25%
Name two greenhouse gases (2)	Carbon dioxide/ water vapour/ methane
What would be the average temperature on the Earth's surface without the Greenhouse Effect?	-18c
<b>Total out of 21:</b>	

# **BQ8. WHAT ARE THE NEGATIVE IMPACTS OF CLIMATE CHANGE ON THE ENVIRONMENT AND PEOPLE?**



## **Changing crop yields**

Countries closest to the Equator will see their crop yields decrease  
African countries e.g. **Tanzania** will have longer periods of drought and shorter growing seasons = lose 1/3<sup>rd</sup> of maize crop.



## **UK**

Crops such as vines and olives will grow in Southern UK.



Growing seasons will increase across the UK, increasing food supply



## **Rising sea levels**

Global mean sea level predicted to rise of 0.8-2m by 2100.

A rise in global temperatures will cause the oceans to expand in volume  
**i.e. thermal expansion**, further adding to sea level rise.



Maldives – at its highest point is 2.4m above sea level – all predictions put the islands at serious risk. Groundwater supplies could be contaminated with sea water.

## **Retreating glaciers and melting ice sheets**



Land-based ice, melting and adding to the amount of water in the oceans. 90% of glaciers in Antarctica are retreating.



Arctic melting could cause the Gulf Stream to be diverted further South = colder temperatures for western Europe.



Melting of high mountain glaciers i.e. Himalayas, can lead to flooding of the local area in the short term.

# BQ9 & Q10. HOW HAS THE UK'S DISTINCT CLIMATE CHANGED OVER TIME?

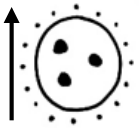
## The Medieval Warm Period (800-1300)



During this period, the temperatures in the UK were high enough to support the growth of grape vines as far north as York.



The population increased because of milder winters and a greater availability of food.



This period was caused due to increased solar activity and a possible period of low volcanic activity.

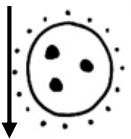
## The Little Ice Age (1300-1900)



During this time, temperatures in the UK were low enough for the River Thames to freeze enough for people to walk on.



The extended winters caused widespread crop failures.



This period was caused by some extreme volcanic eruptions as well as a decrease in solar activity.

## **UK Climate today:**



Maritime climate i.e. we are influenced by the sea, it is a temperate climate

Temperature changes gradually between the months

Summers are warm and winters are cool rather than cold.



Precipitation (mainly rain) falls every month

Little difference between the wettest and driest months of the year. 20



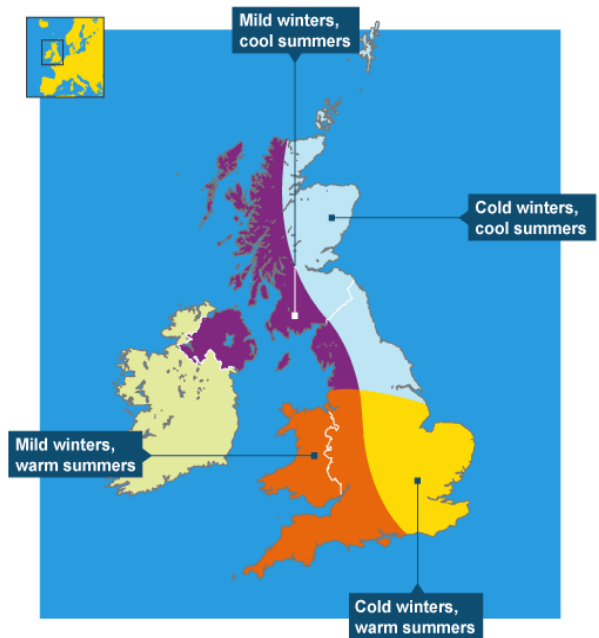
# W&C HOMEWORK KEY TERMS: ANSWER THE FOLLOWING

Define the term <b>'Climate'</b>	
Define the term drought	
Define the term <b>Enhanced greenhouse effect</b>	
Define the term <b>ITCZ</b>	
Define the term <b>Milankovitch cycles</b>	
Define the term <b>Prevailing wind</b>	
Define the term <b>Trade winds</b>	
Define the term <b>Volcanism</b>	
Define the term <b>Weather</b>	
	<b>Total out of 18:</b>

# W&C HOMEWORK KEY TERMS : CHECK YOUR ANSWERS

Define the term ' <b>Climate</b> '	The average weather conditions in a particular location based on the average weather experienced there over 30 years or more.
Define the term drought	A period of unusually dry weather that persists long enough to cause problems such as crop damage and water supply shortages.
Define the term <b>Enhanced greenhouse effect</b>	Refers to human activities that are adding to the warming of the atmosphere due to the greenhouse effect—the presence of gases that increases the atmosphere's retention of the heat energy of the sun.
Define the term <b>ITCZ</b>	The Inter Tropical Convergence Zone, or ITCZ, is a belt of low pressure, which circles the Earth generally near the equator where the trade winds of the Northern and Southern Hemispheres come together.
Define the term <b>Milankovitch cycles</b>	These cycles are caused by changes in the earth's orbit around the sun, like its shape or eccentricity, its precession or wobble, and the tilt of its axis or obliquity.
Define the term <b>Prevailing wind</b>	A wind that blows predominantly from a single general direction.
Define the term <b>Trade winds</b>	A wind blowing steadily towards the equator from the north-east in the northern hemisphere or the south-east in the southern hemisphere, especially at sea
Define the term <b>Volcanism</b>	Volcanism is the phenomenon of eruption of molten rock (magma) onto the surface of the Earth or a solid-surface planet or moon, where lava, pyroclastic and volcanic gases erupt through a break in the surface called a vent.
Define the term <b>Weather</b>	Weather is the day-to-day condition of the atmosphere. This includes temperature, rainfall and wind.
	<b>Total out of 18</b>

# BQ9 & Q10. HOW HAS THE UK'S DISTINCT CLIMATE CHANGED OVER TIME?

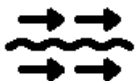


**Circulation cells** – The UK is located near the boundary between the northern Ferrel and Polar circulation cells.

**Air masses** – see diagram above



**Distance from the sea** – Settlements close to the sea have less extreme temperatures than places further inland.



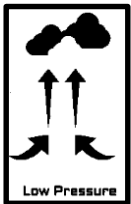
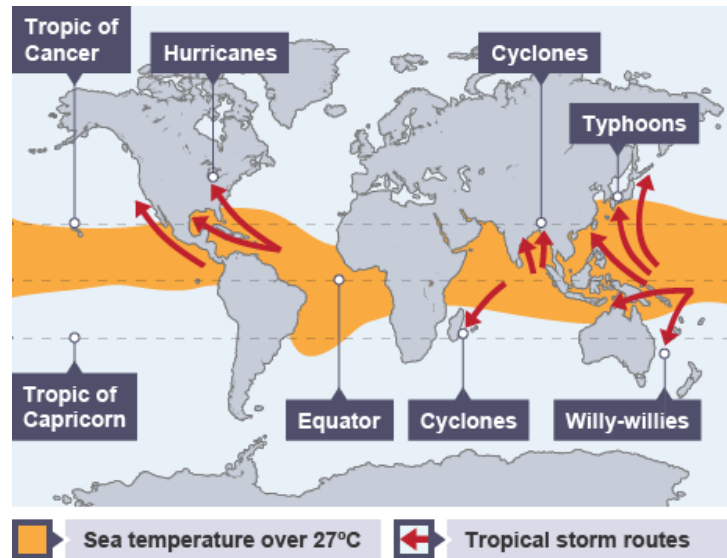
**Ocean Currents** – The North Atlantic Drift which brings warm water from the Gulf of Mexico, making the UK warmer than we would expect for our latitude.

**Prevailing wind** – In the UK it is from the Southwest – it has travelled over large expanses of warm ocean, so it is warm and contains a lot of moisture.



**Altitude** – 1°C lost for every 100m higher above sea level. Air is also forced to rise over the high land = cools and causes precipitation i.e. relief rainfall.

# BQ11. WHAT SPECIFIC CONDITIONS ARE REQUIRED FOR THE FORMATION OF TROPICAL CYCLONES?



## Formation

When the ocean surface waters reaches at least 27°C due to solar heating, the warm air above the water rises quickly = very low pressure.



As the air rises quickly more warm moist air is drawn upwards from above the ocean creating strong winds.

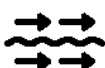


The rising warm air spirals upward and cools. The water vapour it carries condenses and forms cumulonimbus clouds.



These cumulonimbus clouds form the eye wall of the storm.

When tropical storms reach a land surface, they begin to lose their energy and die out. This is because they are no longer receiving heat energy and moisture from the ocean, which is needed to drive them.



Cyclones follow the direction of the local prevailing winds and ocean currents.

The Cyclone's **Track** is influenced by how far it travels over the ocean, the more heat and moisture it collects = increased strength.

# BQ12 & Q13. WHAT WERE THE EFFECTS AND RESPONSES TO HURRICANE SANDY ON CUBA AND THE USA?

On the **23<sup>rd</sup> October 2012**, the government of Cuba warned the eastern states of the USA about the imminent approach of Hurricane Sandy. The hurricane continued north affecting 24 states of the USA.

	Impact on USA	Impact on Cuba
<b>Social impacts</b>	<ul style="list-style-type: none"><li>• 117 people died</li><li>• 9 million homes had no power</li><li>• 250,500 homes destroyed</li></ul>	<ul style="list-style-type: none"><li>• No electricity or fresh water</li><li>• 11 people died</li><li>• 17,000 homes destroyed</li><li>• 55000 people evacuated because of storm surge</li></ul>
<b>Economic impacts</b>	<ul style="list-style-type: none"><li>• Insurance claims totalled US\$3 billion</li><li>• US\$1 billion spent on repairing damage to sewage and water pipes</li><li>• Total damage cost to New York was \$19 trillion</li></ul>	<ul style="list-style-type: none"><li>• Total losses were \$US2 billion</li><li>• Roads to the airport were blocked so no tourist movement</li><li>• 5% drop in Cuba's GDP</li></ul>
<b>Environmental impacts</b>	<ul style="list-style-type: none"><li>• Storm surge pushed salt water into freshwater habitats</li><li>• \$1.5 billion litres of sewage released into the Raritan river</li><li>• 90% of beaches in New York and New Jersey damaged</li><li>• 1.5 million litres of oil spilt into Arthur Kill damaging habitats.</li></ul>	<ul style="list-style-type: none"><li>• 2600 hectares of banana crops damaged</li><li>• Coffee plantations in the mountains were destroyed</li><li>• Coastal flooding destroyed habitats</li></ul>

# W&C HOMEWORK 4: ANSWER THE FOLLOWING

Define the term 'tertiary industry'	
Name one key factor has driven the increasing rates of urbanisation in emerging countries?	
How are limestone pavements formed? (2)	
What is a concordant coastline?	
What is the name of the sediment deposited onto a floodplain during a river flood?	
There are 4 sources of coastal sediment – Name 2 (2)	
What measurement is used to consider the level of inequality in a country?	
Name two greenhouse gases (2)	
What would be the average temperature on the Earth's surface without the Greenhouse Effect?	
What type of pressure system is a tropical cyclone?	
Where do tropical cyclones develop?	
What is the average wind speed of a tropical cyclone?	
What direction do tropical cyclones normally move in?	
What is the centre of the tropical cyclone called?	
Why do tropical cyclones lose energy over land?	

**Total out of 18:**



# W&C HOMEWORK 4: CHECK YOUR ANSWERS

Define the term 'tertiary industry'	Jobs in service industry such as in shops, transport, health and education.
Name one key factor has driven the increasing rates of urbanisation in emerging countries?	Natural increase/rural-urban migration
How are limestone pavements formed? (2)	Limestone contains blocks with planes and joints.. Rainwater passes into these lines of weakness causing a chemical reaction deepening the racks forming <b>grykes</b> .
What is a concordant coastline?	Rocks that lie parallel to the coastline
What is the name of the sediment deposited onto a floodplain during a river flood?	Alluvium
There are 4 sources of coastal sediment – Name 2 (2)	Rivers/ Cliff erosion/ constructive waves/ longshore drift
What measurement is used to consider the level of inequality in a country?	Gini Coefficient
Name two greenhouse gases (2)	Carbon dioxide/ water vapour/ methane
What would be the average temperature on the Earth's surface without the Greenhouse Effect?	-18c
What type of pressure system is a tropical cyclone?	<b>Non-frontal</b> intense low pressure
Where do tropical cyclones develop?	They develop over tropical and subtropical oceans between the Tropic of Cancer and Tropic of Capricorn
What is the average wind speed of a tropical cyclone?	120kph
What direction do tropical cyclones normally move in?	East to west with the trade winds
What is the centre of the tropical cyclone called?	The Eye
Why do tropical cyclones lose energy over land?	Need the latent heat from the ocean for energy
<b>Total out of 18:</b>	

# BQ12 & Q13. WHAT WERE THE EFFECTS AND RESPONSES TO HURRICANE SANDY ON CUBA AND THE USA?

Responses by	Cuba	USA
Individuals	<p>Many people moved in with relatives or friends; others took shelter in state workers' holiday homes where basic food was provided.</p> <p>They used materials provided by the government and other organisations to rebuild their own homes.</p> <p>The people of Cuba have no home insurance.</p>	<p>After the hurricane, people moved in with relatives and used shelters.</p> <p>People rebuilt their homes but used builders rather than doing it themselves.</p> <p>Americans have home insurance but those affected also received aid from the government and other organisations.</p>
Organisations	<p>The UN provided US\$5.5 million to Cuba from the CERF and US\$1.5 million in emergency funds.</p> <p>Venezuela sent 650 tonnes of aid, including non-perishable food, potable water and heavy machinery.</p> <p>Venezuela, Russia and Japan sent humanitarian aid.</p> <p>In the seven months following the hurricane, the Cuban Red Cross delivered support with the help of the Norwegian, Spanish and German Red Cross and Red Crescent Societies. The relief aid went to approximately 25,000 families and included roofing materials, mattresses, clean drinking water, and hygiene and kitchen kits.</p> <p>The World Food Programme responded immediately with US\$1 million to assist the 788,000 people in the worst affected areas of Cuba with a one-month food ration from December 2012 to February 2013.</p>	<p>Hurricane Sandy caused extensive erosion to the Delaware Bay beaches, which had an impact on the breeding grounds of horseshoe crabs. The Canadian Rivers Institute worked with a number of other NGOs and public agencies to restore these beaches by clearing rubble and replenishing sand to provide a nesting area for horseshoe crabs.</p> <p>The Red Cross had 17,000 trained workers, 90 per cent of them volunteers, providing over 300 response vehicles, 74,000 overnight stays, and 17 million meals and snacks, among other aid.</p> <p>AmeriCares, an American charity, responded quickly by sending teams of relief workers to hard-hit areas, sending aid shipments, providing funding and deploying a mobile medical clinic. In the two years following Hurricane Sandy, AmeriCares has provided US\$7.1 million in aid benefiting 450,000 people.</p>
Governments	<p>The government sent teams of electricians from all over the island to Santiago province within hours of the hurricane hitting.</p> <p>The government announced a 50 per cent price cut for construction materials and interest-free loans to repair the damage. The aid will be means tested and more subsidies will be available for the poorest or hardest hit.</p> <p>The government made building materials available to residents, including corrugated iron sheets, metal rods and cement.</p> <p>Local government officials compiled data from families about the damage they had suffered so that the government could send the appropriate help.</p> <p>Military teams were mobilised quickly to clear the streets of rubble and an estimated 6.5 million m<sup>3</sup> of felled trees.</p>	<p>The US government approved US\$60.3 billion in aid to the victims of Hurricane Sandy.</p> <p>The government promised that there would be improved weather forecasting, especially of storm surges.</p> <p>FEMA teams and resources were put in place to help people even before the hurricane had caused any problems. They were on hand to offer any help that was needed.</p> <p>FEMA and the Army Corps of Engineers worked with state and local governments to quickly reopen most of the beaches in New Jersey.</p> <p>The Department of Agriculture promised US\$6.2 million for emergency food assistance, infrastructure and economic programmes to help repair farmland and flood plains.</p>

# BQ14 & Q15. WHAT ARE THE CAUSES OF DROUGHT AND WHY ARE THEY DESCRIBED AS 'COMPLEX'?

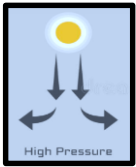
## **Characteristics of arid environments:**

Average rainfall between 100-300mm

Pastoral farming, by nomadic herdsman



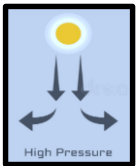
Natural vegetation is sparse – grasses, small shrubs and trees



High pressure conditions, no cloud cover

## **Characteristics of Drought areas**

'Prolonged period of abnormally low rainfall, leading to a water shortage'



High pressure conditions, no cloud cover

## **Physical causes of drought**



**Meteorological** - Reduced amount of precipitation an area received compared to its average. (most significant cause of drought)

**Hydrological** - Decrease in precipitation can impact on overland flow, reservoirs, lakes and groundwater.

## **Human causes of drought**



**Dams** - Places further downstream may suffer from drought because it is receiving reduced flow of water



**Deforestation** - Cutting down trees for fuel reduces the soil's ability to hold water. This can cause the land to dry out, which can result in drought in an area.

## W&C HOMEWORK 5: ANSWER THE FOLLOWING

Define the term 'natural increase'	
How did the process of globalisation impact cities such as Bristol?	
What is an escarpment?	
Outline a feature found on a discordant coastline	
Define the term 'discharge'	
Name three physical causes of flooding (3)	
Name two international organisations that India is a member of (2)	
Name one key evidence showing inequality of education in India	
What type of pressure system is a tropical cyclone?	
What direction do tropical cyclones normally move in?	
When did Hurricane Sandy strike Cuba and the USA	
Name two economic impacts of Hurricane Sandy on Cuba (2)	
Name two social impacts of Hurricane Sandy on the USA (2)	
Explain one way the USA government responded to Hurricane Sandy	
Explain one way the Cuban government responded to Hurricane Sandy	
	<b>Total out of 20:</b>

# W&C HOMEWORK 5: CHECK YOUR ANSWERS

Define the term 'natural increase'	When birth rates are higher than death rates so population grows.
How did the process of globalisation impact cities such as Bristol?	Better transport and communication systems have allowed companies to operate from different cities. Enabled countries to decentralise.
What is an escarpment?	<input type="checkbox"/> An area of the Earth where elevation changes quickly. The escarpment is a cliff or steep slope
Outline a feature found on a discordant coastline	Headland / Bay
Define the term 'discharge'	Amount of water passing a specific point at a given time, measured in cubic metres per second.
Name three physical causes of flooding (3)	Intense rainfall/ duration of rainfall/ snowmelt/ geology/ relief
Name two international organisations that India is a member of (2)	United Nations and World Trade Organisation
Name one key evidence showing inequality of education in India	Literacy rate of males is 82.3% compared to 65.7 % for females in 2018
What type of pressure system is a tropical cyclone?	<b>Non-frontal</b> intense low pressure
What direction do tropical cyclones normally move in?	East to west with the trade winds
When did Hurricane Sandy strike Cuba and the USA	October 2012
Name two economic impacts of Hurricane Sandy on Cuba (2)	Total damage to Santiago de Cuba was £50m Total losses were US\$2 billion 5% drop in Cuba's GDP
Name two social impacts of Hurricane Sandy on the USA (2)	117 people were killed 650 000 homes were damaged Streets of New York were flooded
Explain one way the USA government responded to Hurricane Sandy	Provided US\$60 billion in aid to victims FEMA put resources in place before the hurricane hit. Promised improved weather forecasting
Explain one way the Cuban government responded to Hurricane Sandy	50% price cut for construction materials and interest free loans. Military teams mobilised to clear streets Sent electricians to restore power
<b>Total out of 20:</b>	



# BQ16. HOW IS CALIFORNIA IMPACTED BY DROUGHT AND HOW WELL DOES IT RESPOND?

## **Causes:**



**Lower than normal rainfall and snowfall** in the west of USA caused a distinct drop in the water supplies from local aquifers.

**Shared water supply** – The Colorado river provides most of the water to California but it also supplies 6 other states.



**Dams** on the river. States in the USA have been allowed to **extract more** water than the river actually provides.

**Water wastage** – lots of water is wasted and there are no measures in place to prevent this.

## **Impact on people**



Farmers use 80% of the human usage of water – crops die resulting in less food for people

Loss of 17 100 jobs in farming



Prices of fruit and vegetables rose by 6%



In 2015, Californian farms lost \$1.8 billion



Power supplies affected where lower water levels reduce the output of HEP.

## **Impact on ecosystems**



Wildfires are common because of dry and dead wood.



If water levels drop, the water becomes warmer = young salmon unable to survive



# **BQ16. HOW IS CALIFORNIA IMPACTED BY DROUGHT AND HOW WELL DOES IT RESPOND?**

Responses by	
Individuals	<ul style="list-style-type: none"> <li>• Farmers have to pump more water, which will cost an extra \$453</li> <li>• People have been asked to use water more efficiently</li> <li>• Farmers are planting smaller crops and encouraged to use drip irrigation</li> </ul>
Organisations	<ul style="list-style-type: none"> <li>• New laws forbid restaurants from putting water on the table unless requested</li> <li>• Hotels must ask guests if they will reuse their linen and towels</li> <li>• Advanced forecasting models are being developed by NASA to help with the water shortage</li> </ul>
Governments	<ul style="list-style-type: none"> <li>• Fish rescues – capturing fish in shallow waters and transporting them closer to the ocean</li> <li>• State of emergency issued in January 2014</li> <li>• \$183 million given from federal government funds</li> <li>• Residents in Santa Clara Valley have been told to limit watering of lawns to twice a week or get a \$500 fine</li> <li>• \$14 million of federal funds given to farmers to conserve water and improve water management</li> <li>• Governor signed drought relief legislation worth \$687million for people such as farmers who are out of work.</li> <li>• Public education campaigns i.e. Save our Water</li> </ul>

## **Was the response effective?**

- ☐ Heavy government investment both at a state and national level.
- ☐ The responses by local people are down to choice so are unlikely to have a large impact
- ☐ Biggest focus should be farmers who use 80% of the water but again this is down to individual choice

# **BQ17. HOW IS ETHIOPIA AFFECTED BY DROUGHT AND HOW WELL DOES IT RESPOND?**

**Named example: Ethiopia, 1983 to present**

## **Causes:**



Ethiopia relies on **2 rainy seasons** – 1 long and 1 short. Since the 1980s, the shorter rainy season has been getting shorter and happening later. The long rainy season has become unpredictable.



The **Indian ocean is getting warmer** which means rising air loses more moisture as rainfall over the ocean. Drier air replaces it and moves westward over Africa and causes drought.



**Desertification** – The Sahara Desert is located to the North of Ethiopia and it is spreading. Local people cut down trees for farmland and firewood. This deforestation can lead to a lack of water.



## **Impact on ecosystems**

Increase in sand storms

Increased disease in wild animals due to reduced food and water supplies



Loss of 200 000 hectares of forest every year due to forest fires

## **Impact on People**



85% of the population live in the countryside and depend on farming  
Only 57% of Ethiopians have access to an improved water source = people have to walk up to 20kms to find water.



Water sources can be polluted so people drink unsafe water = cholera



Mass migration from rural to urban areas = pressure on houses, jobs etc

## **BQ17. HOW IS ETHIOPIA AFFECTED BY DROUGHT AND HOW WELL DOES IT RESPOND?**

Responses by	
Individuals	<ul style="list-style-type: none"> <li>• Live Aid charity event brought global attention to the drought – money raised</li> <li>• Farmers forced to sell their livestock</li> <li>• People migrated to towns in search of work</li> </ul>
Organisations	<ul style="list-style-type: none"> <li>• UNICEF spent \$16 million on aid</li> <li>• Oxfam work with experts in remote areas to support those most affected by the drought.</li> <li>• NGOs provide clean water, food and medical care for people</li> <li>• NGOs train farmers to develop new farming techniques and crop varieties</li> <li>• Education charities are trying to improve peoples chances of getting jobs in urban areas.</li> <li>• Government put £360m into emergency food supplies and medical care</li> </ul>
Governments	<ul style="list-style-type: none"> <li>• Overseas governments have given aid e.g. the USA gave \$128.4m in food aid in 2015</li> </ul>

### **Was the response effective?**

- ☐ Heavy reliance on overseas support and NGOs
- ☐ Ethiopia is rapidly developing and the government has been able to organise its own relief programmes
- ☐ Other crises e.g. Syria and migrant crises have sucked attention and resources away from Ethiopia. E.g. an international appeal for \$1.4 billion for food rations is still missing £600m.
- ☐ The 5kg of wheat currently supplied to each family in the drought zone is only 1/3<sup>rd</sup> of the nutritional requirement.

# SAMPLE ASSESSMENT MATERIAL

6 Extreme weather events can have serious impacts on people and the environment.

(a) Study Figure 7 in the Resource Booklet.

(i) Identify the range of deaths caused by hurricanes shown on Figure 7.

(1)

- ☐ A 17
- ☐ B 337
- ☐ C 30
- ☐ D 354

(ii) Calculate the mean number of deaths per hurricane shown on Figure 7.

You must show your workings in the space below.

(2)

(iii) Suggest **one** reason for the differences in the number of deaths shown in Figure 7.

(2)

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## Weather Hazards and Climate Change

Year	Number of hurricanes	Number of deaths
2012	8	354
2013	2	40
2014	6	17
2015	4	89

(Source: © National Oceanic and Atmospheric Administration/Department of Commerce.)

Figure 7

Number of hurricanes originating in the Atlantic Ocean, 2012–2015