

Erosion

Wearing away of rock along the coastline.

Hydraulic Action – the force of water pushes water and air into cracks in the rock and explodes.

Abrasion – rocks are thrown at the cliff. It has a sandpaper effect.

Attrition – rocks hit off each other. They become smoother, smaller and rounder.

Solution – rocks hit off each other. They become smoother, smaller and rounder.

Weathering

Weathering breaks down rocks by the action of rainwater, temperature and biological activity.

Mechanical/Physical – water is trapped in cracks in the cliff. It freezes and expands. When it thaws the water runs deeper into the crack. The process continues until parts of the cliff break off.

Chemical – the acid in the rain/seawater dissolve some rocks.

Biological – tree roots grow in the cracks in the cliff. The roots grow and break the cliff apart. Animals burrow in cracks in the cliff / rocks and break them apart.

Mass Movement

The downhill movement of sediment under the force of gravity.

Sliding – when rock, weathered or eroded material, or Earth moves down a slope. The material shifts in a straight line.

Slumping – where the river erodes the base of valley slopes, making it steeper. Material above slides downwards, particularly if it is saturated with rainwater. In slumps, the material shifts with a rotation.

Transportation

When a river no longer has enough energy to carry its load, deposition occurs.

Traction – larger material are rolled along the seabed.

Saltation – small pieces of shingle or large sand grains are bounced along the seabed.

Suspension – small particles such as silts are suspended in the flow of water.

Solution – when minerals in rocks are dissolved in sea water and carried in solution. The load is not visible.

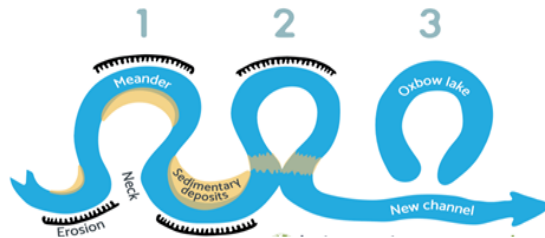
Waterfalls and Gorges



1. A band of more resistant rock sits on top of less resistant rock – which is easily eroded.
2. The less resistant rock is undercut by erosion leaving an overhang.
3. The more resistant rock will collapse and through the process of abrasion, a plunge pool will be created.
4. A steep-sided gorge forms as the waterfall retreats.

Meanders and Oxbow Lakes

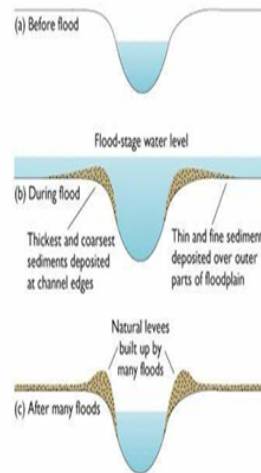
The water flows from side to side resulting in lateral erosion by undercutting and an outer, steep bank is formed (river cliff)..



Formation of an ox-bow lake

1. The narrow neck of the meander is gradually eroded bringing it closer together.
2. The flow of the river will take the fastest route. Deposition will seal off the old meander and its neck has been completely cut through.
3. An oxbow lake is left behind when the meander is cut off.

Flood plains and levees



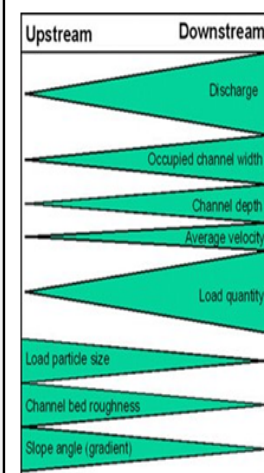
Flood Plains

A flood plain is the flat area of land either side of a river in its lower course. It is formed by erosion and deposition. Lateral erosion on the outside bends of meanders means they can migrate across the valley floor so it becomes wide and flat.

Levees

Levees are natural embankments of sediment found along the banks of rivers that carry a large load and occasionally flood. In times of flood, water and sediment come out of the channel as the river overflows its banks. As it overflows, the river immediately loses velocity and energy and deposits the larger and heavier sediment first on its banks. Repeated flooding causes these banks to get higher, forming levees.

Bradshaw Model



The Bradshaw Model shows how the river profile changes as it moves downstream.

Slope Angle – decreases as a river moves downstream due to the landscape changing (the source it is in higher land, the mouth in lower land).

Channel Depth – Increases due to increased erosion and increased river velocity.

Load Particle Size – Decreases due to increased erosion on sediment.

Location of the River Tees



The River Tees is located in the North East of England. It begins in Cross Fell in the Pennines and travels East towards its mouth joining the North Sea. It passes through several settlements such as Darlington, Yarm and Middlesbrough.

Long Profile of the River Tees

Upper Course

- Begins at Cross Fell in the Pennines.
- Vertical erosion leads to the formation of V-shaped valleys and interlocking spurs.
- England's highest waterfall, High Force is located in the upper course.
- High Force has retreated leaving a steep gorge.

Middle Course

- The valley widens out and channel slopes become much gentler.
- The river begins to meander near Barnard Castle as there is more lateral erosion.

Lower Course

- Near Yarm, the meanders are much larger and oxbow lakes have formed.
- In this area, there are also levees where the river has flooded.
- As the river meets the North Sea, deposition has created mudflats.
- The lower course is made up of less resistant sandstone.

Causes and effects of flooding

A **flood** occurs when a river bursts its banks and the water spills onto the floodplain. This occurs when a river's **discharge** becomes too **high**.

Physical Causes of Flooding

Intense Rainfall – During periods of heavy rainfall, the soil and rocks can quickly become saturated. As infiltration is reduced, water flows over the surface into the river at a faster rate.

Duration of rainfall – Long periods of rainfall cause the soil to become saturated leading to increased surface run off.

Snow Melt – In some places a lot of snow falls during the winter months. When temperatures rise above zero in the spring, all the snow that has built up melts, releasing large volumes of meltwater.

Rocks – Permeable rocks, such as chalk, allow water to soak in. Impermeable rocks, such as clay, do not allow water to pass through so rainwater will run off the surface and straight into the river channel.

Relief – Water reaches the river channel much faster where slopes are steeper.

Human Causes of Flooding

Deforestation – Vegetation collects, stores and uses water from rainfall; this is called interception. Plant roots also encourage water to pass into soil and rock, so vegetation reduces run off: if it is removed, more water can reach the river channel more quickly.

Urbanisation – In towns and cities, rainwater will not infiltrate the hard, impermeable surfaces of concrete and tarmac. This causes the water to run off immediately into drains and river channels.

Climate Change

Although a single flood event cannot be linked to climate change, warmer weather is making more extreme weather events.

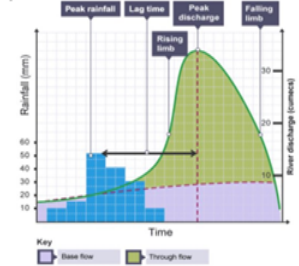
Jet Streams – The behaviour of the jet stream has changed which has brought more intense storms. It is predicted these will become more frequent storm events with intense, long rainfall.

Hydrographs

A **hydrograph** shows how a river responds to a period of rainfall.

Bar Graph – Shows the amount of rainfall

The Axis – Shows the discharge (the amount of water in the river)



Rising Limb – The rise in water after a period of rainfall.

Lag Time – The difference between the time of the heaviest rainfall and the point at which the river contains the largest amount of water.

Falling Limb – Shows the reduction in the amount of rainfall meeting the channel.

Management Strategies

Hard Engineering Strategies – This involves building artificial structures to try and alter natural processes. These can be very time extensive and expensive.

Advantages	Disadvantages
Embankments (levees)	
They stop water from spreading into areas where it could cause problems, such as housing.	Flood water may go over the top and then get trapped behind them.
Channelisation – this involves deepening and/or straightening the channel	
This allows water to run through the channel quickly.	It doesn't look natural.
Flood relief channels – extra channels can be built next to rivers	
The relief channels can accommodate high flows so that a river will not overflow.	Costs can be high.
Dams and reservoirs	
They are long lasting and can produce hydro-electric power.	They are expensive to build.

Soft Engineering Strategies – This does not involve building and is a more sustainable strategy for managing flood risk.

Advantages	Disadvantages
Washlands – areas on the flood plain that are allowed to flood	
These give a space for water to go and slow floodwater down.	Allowing land to flood, may limit the use of the land for recreation.
River restoration – restoring the river's original course	
Restoring rivers to a more natural course by taking away embankments aims to slow them down, for example by restoring meanders.	Some flood banks are often still needed.
Flood plain zoning – government allocates areas of land to different uses, according to their level of flood risk	
Flood risk management aims to prevent building homes and businesses in high risk zones. Here, uses such as open space for leisure and recreation are allowed because flooding would be less costly.	Flood plains are attractive places to build.

The atmosphere operates as a global system transferring heat and energy

As you move further away from the Equator, Earth receives less solar radiation. There is more heat at the Equator and less at the Poles. A Hadley cell, Ferrel cell and Polar cell in each hemisphere redistributes this heat energy.

1. At the Equator, warm air rises forming low pressure (causing rainfall). The air cools, diverges and moves 30° north and south of the Equator where the now cooler and dry air sinks to form high pressure (deserts).
2. Some of the cool air moves back towards the Equator (trade winds), the rest travels across the lower part of the Ferrel cell to 60° north and south of the Equator.
3. At 60°, the warmer air meets the cold polar air. The warmer air rises (forming low pressure and causing rainfall) and 13 travels towards the Poles. The now cold dry air sinks at the Poles forming high pressure

Ocean currents also transfer heat from the Equator. Surface currents move warmer water towards the Poles where the dense, salty water sinks. Deeper ocean current moves the colder water back towards the Equator. Oceans currents such as the North Atlantic Drift prevent the Poles from becoming too cold and the Equator too hot.

Global climate is now changing as a result of human activity

Human activity increases carbon dioxide and methane levels in the atmosphere, trapping heat energy from the sun and enhancing the greenhouse effect.

The list below includes examples of human activity.

Industry – Burning fossil fuels (coal, oil and gas) to produce consumer goods. Energy – Electricity produced from fossil fuels for a growing population.
Farming – A growing demand for more meat increases methane levels
Transport – Increased car ownership and air travel increase emissions

The list below includes negative impacts of climate change on the environment.

- Rising sea levels from melting ice sheets and glaciers. Melting ice could also cause the Gulf Stream (an ocean current) to move further south, cooling temperatures in Western Europe.
- Coastal flooding could contaminate ecosystems with salt water.
- Retreating glaciers contribute to rising sea levels.

The list below includes negative impacts of climate change on people.

- Unreliable rainfall in regions such as the Sahel (Africa) could cause drought and lower crop yields, leading to food shortages.
- Flood risk from rising sea levels in low-lying places such as the Maldives could force people to leave, losing their homes and livelihoods

Global climate was different in the past and continues to change due to natural causes

Earth's climate has naturally changed over time, creating both warmer and colder periods. Over the last 2.6 million years (the Quaternary Period), there have been more than 60 cold periods, lasting about 100,000 years each. Warmer interglacial periods (in between) typically last about 15,000 years. We are currently in an interglacial period. Over the last 200 years the Earth's temperature has risen quicker than it has before.

There are several natural causes for past climates.

Milankovitch cycles change how much solar radiation the Earth receives.

- The Earth's orbit changes from a circular orbit to a more elliptical (oval) cycle leading to greater seasonality. This is known as eccentricity.
- Axial tilt also changes: the greater the tilt, the greater the angle causing colder winters.
- Lastly, precession cycles, change the direction the axis is facing affecting seasonal temperatures.

Solar variation levels vary. Higher levels of solar radiation cause interglacial periods whereas lower levels cause glacial periods.

Volcanic eruptions emit ash and dust into the atmosphere blocking out the sun causing temperatures to fall.

The evidence for natural climate change includes: • fossilised animals • U-shaped valleys • samples from ice that contain trapped carbon dioxide • historical records such as old paintings or diaries.

The UK has a distinct climate which has changed over time.

The UK's climate has changed in the past. One thousand years ago, during the Medieval Warm Period (owing to increased solar radiation), higher temperatures meant greater crop yields. More recently, the Little Ice Age during the 1600s (owing to volcanic activity), temperatures were low enough to freeze the River Thames.

There are significant spatial variations within the UK:

North-west Britain has mild winters and mild summers.

North-east Britain has cold winters and mild summers.

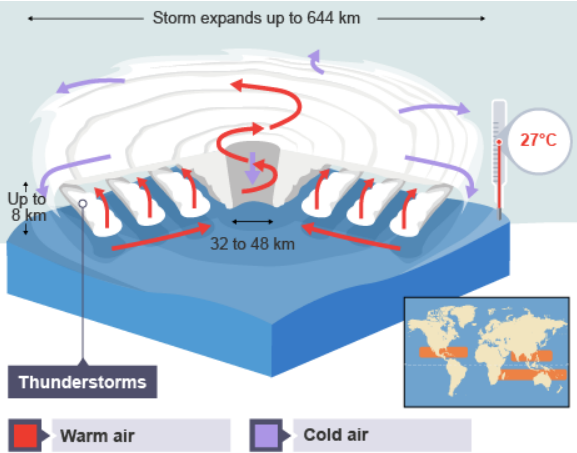
South-west Britain has mild winters and warm summers.

South-east Britain has cold winters and warm summers.

The UK lies between 50°N and 60°N of the equator. This and other factors affect its climate.

1. Maritime influence – As an island, the air around the UK contains lots of moisture, leading to rainfall all year.
2. Prevailing wind – South-westerly winds from the Atlantic Ocean bring moisture and rainfall.
3. North Atlantic Drift – This ocean current brings warm water and a milder climate to the UK for its latitude.
4. Atmospheric circulation – The UK sits between the Ferrel and Polar cells where air rises and forms low pressure bring rainfall.
5. Altitude – Higher regions in the UK (north and west) receive more rainfall

Tropical storms

Tropical cyclones are extreme weather events that develop under specific conditions and in certain locations Tropical cyclones (Indian Ocean), hurricanes (Atlantic Ocean) and typhoons (Pacific Ocean) need a source of warm water that is over 26.5°C. - This causes warm, moist air to rise forming thunderstorms. - Low pressure forms in the middle as the storms converge together. - The storms rotate owing to Earth's rotation (Coriolis effect). - As they rise inwards and upwards, tropical cyclones form. The characteristics off tropical cyclones are: 1. Low pressure 2. Rising rotating air surrounding a calm eye in which air descends 3. A width up to 400km and height up to 10km. 4. Tropical cyclones are more likely to happen from June to November in the northern tropics and November to April in the southern tropics. Tropical cyclone movement is determined by prevailing winds and ocean currents. A cyclone's track is influenced by how far it travels – they can travel up to 600 km a day. They are monitored using satellite images.	There are various impacts of and responses to natural hazards caused by tropical cyclones depending on a country's level of development. <u>The hazards listed below are associated with tropical cyclones.</u> A. Storm surges – Low pressure causes a large mass of water to surge inland. B. Landslides – Saturated soil becomes heavy and slides downhill. C. Coastal flooding – Damage to property and potential loss of life D. Intense rainfall – Heavy rainfall can lead to flooding, stranding people. E. High winds – Strong winds can uproot trees and damage buildings. 
---	--

Drought

The causes of droughts are complex with some locations more vulnerable than others. In arid areas, the climate is dry owing to high pressure. Arid environments have permanent low precipitation such as the Sahara Desert. Drought conditions occur when there are low precipitation conditions. In the UK, this is 15 consecutive days without rainfall <u>The list below includes natural causes of drought:</u> Meteorological – This is where an area receives less than average precipitation. Hydrological – This is where the hydrological cycle receives less rainfall than normal leading to less groundwater. <u>The list below includes human causes of drought.</u> Deforestation – Can reduce evaporation as there are less trees to transpire. Dams – Restrict water flow downstream causing drought conditions. Agriculture – Water extraction for irrigation Global circulation makes some locations more vulnerable to drought. At 30° north and south of the equator between the Hadley and Ferrel cells, air descends forming high pressure and little rainfall.	The impacts of, and responses to drought vary depending on a country's level of development. Droughts are hazardous to people. They can lead to crop failure and famine, water shortages and contamination of water and wildfires. <table><tr><td> California (western USA, a developed country) has been experiencing drought since 2012 Groundwater levels have fallen, land has been contaminated as salt is drawn in from the ocean and beneath, and wildfires have destroyed vegetation. The impact included: Low river levels for fish and breeding Habitats and people's property destroyed by wildfires Reduced crop production and incomes. The government have run water education programmes and imposed a law to cut water use by 25%. Farmers are encouraged to use drip irrigation and homeowners to repair leaks </td><td> Ethiopia, a developing country, often suffers from drought. In 2015, it suffered its worst drought since the 1980s. 85% of the population live in rural areas and rely on agriculture. The main hazards are a loss in crop yields, leading to malnutrition, and longer journeys to find water resulting in children not going to school. The impact included: • death of livestock and crop failure making the population weaker • girls missing out on education having to walk further to collect water • spread of diseases among humans and wildlife owing to a lack of clean water. The USA government gave over US\$100 million in food aid. Aid agencies like Oxfam have assisted in helping people obtain water and raise awareness and money. </td></tr></table>	California (western USA, a developed country) has been experiencing drought since 2012 Groundwater levels have fallen, land has been contaminated as salt is drawn in from the ocean and beneath, and wildfires have destroyed vegetation. The impact included: Low river levels for fish and breeding Habitats and people's property destroyed by wildfires Reduced crop production and incomes. The government have run water education programmes and imposed a law to cut water use by 25%. Farmers are encouraged to use drip irrigation and homeowners to repair leaks	Ethiopia, a developing country, often suffers from drought. In 2015, it suffered its worst drought since the 1980s. 85% of the population live in rural areas and rely on agriculture. The main hazards are a loss in crop yields, leading to malnutrition, and longer journeys to find water resulting in children not going to school. The impact included: • death of livestock and crop failure making the population weaker • girls missing out on education having to walk further to collect water • spread of diseases among humans and wildlife owing to a lack of clean water. The USA government gave over US\$100 million in food aid. Aid agencies like Oxfam have assisted in helping people obtain water and raise awareness and money.
California (western USA, a developed country) has been experiencing drought since 2012 Groundwater levels have fallen, land has been contaminated as salt is drawn in from the ocean and beneath, and wildfires have destroyed vegetation. The impact included: Low river levels for fish and breeding Habitats and people's property destroyed by wildfires Reduced crop production and incomes. The government have run water education programmes and imposed a law to cut water use by 25%. Farmers are encouraged to use drip irrigation and homeowners to repair leaks	Ethiopia, a developing country, often suffers from drought. In 2015, it suffered its worst drought since the 1980s. 85% of the population live in rural areas and rely on agriculture. The main hazards are a loss in crop yields, leading to malnutrition, and longer journeys to find water resulting in children not going to school. The impact included: • death of livestock and crop failure making the population weaker • girls missing out on education having to walk further to collect water • spread of diseases among humans and wildlife owing to a lack of clean water. The USA government gave over US\$100 million in food aid. Aid agencies like Oxfam have assisted in helping people obtain water and raise awareness and money.		

Knowledge Organiser: California (developed country)

Drought Case Study

Causes of drought in California	Effects of drought in California	Responses to drought in California
1. January 2014: state of emergency declared. 2. Lower than normal rainfall and snowfall in the west of the USA. 3. Colorado River supplies six states with water all of which extracted too much. 4. High levels of water wastage and over-use	<u>Social</u> 1. Lack of drinking water 2. Increased food and water prices	<u>Charities</u> 1. California Water Service Group: gave US\$600,000 2. Pacific Water Institute gave money to local people.
	<u>Economic</u> 1. Power supplies effected e.g. hydro-electric power, thermal power stations. 2. Farmers lost US\$1.8 billion. 3. 10,000 jobs lost in farming 4. Food prices increased.	<u>Government</u> 1. State of emergency declared 2. Limited flow of water in winter months 3. Reducing water supplies to the minimum for public health 4. Installing salinity points to stop seawater intrusion 5. Running education and information programmes 6. Increased monitoring of river water levels
	<u>Environmental</u> 1. Wildfires: ash and debris damaged water supplies and blocked rivers. Caused mudslides and flooding. 2. Seawater intrusion e.g. Santa Barbara 3. Farms affected by saltwater contamination and wildfires. 4. As acquirers empty of water, the structure of the land changes. It settles lower and this causes subsidence.	<u>Local people (individuals)</u> 1. Stop using hosepipes in gardens 2. Farmers pump groundwater from ever-deeper supplies or use only certain areas of their land.

Key Term	Vocabulary
Drought	An extended period of lower than normal rainfall causing water shortages
Aquifers	An underground store of water formed when permeable rocks lie on top of impermeable rocks.
Subsidence	Collapse of land

Key Facts about the Californian Drought

- California is one of the wealthiest states in the USA. It is located on the west coast bordering the Pacific Ocean - popular for tourists. I
- t has several large universities and industrial areas such as the Silicon Valley.
- In January 2014 a state of emergency was declared by the governor which meant that laws and regulations could be put in place to help deal with the impact of the drought.

Possible Exam Questions

- Assess the following statement. Drought presents a greater threat to people living in developing countries rather than those living in developed countries. (8)
- Explain one human cause of drought. (2)
- Suggest one impact of drought for people living in a developed country. (3)

Knowledge Organiser: Ethiopia (developing country) Drought Case Study

Causes of drought in Ethiopia	Effects of drought in Ethiopia	Responses to drought in Ethiopia
- Since the 1980s the short rain season has been getting shorter and increasingly delayed - The long rain season has become unpredictable. - Warming of the Indian Ocean means rising air loses more moisture as rainfall and dryer air moves westward over East Africa.	<u>Social</u> 85% of the population depend on farming. - Unreliable rains makes planning for farmers difficult. - People in rural areas rely on local trees for building materials - drought reduces availability and increases cost. - Hunger and malnutrition. - Only 57% of people have access to water: people have to walk several KMs to get water. Time collecting water takes children out of schools and women out of jobs. - Water sources often become polluted which leads to disease: typhoid, cholera, dysentery, - Causes rural to urban migration.	<u>Media</u> Band Aid 1985: 'Do they know it's Christmas?'
		<u>Charities</u> - NGO's (non-governmental organisations) like UNICEF and Oxfam work with local experts to help the worst affected people. Provide clean water, food and medical care. Help local people develop new farming techniques. - UNICEF: US\$60 million on aid - Red Cross: raised 1.4million Swiss Francs
	<u>Economic</u> - Increased cost of food as food supplies decrease. - Foreign trade affected e.g. selling coffee beans	<u>Government</u> Government organised relief programmes
	<u>Environmental</u> - Crops die - Ground dried and cracked - Water sources are polluted - Marshland dry out - Rivers polluted by dead animals	<u>Local people (individuals)</u> Educated on new farming techniques

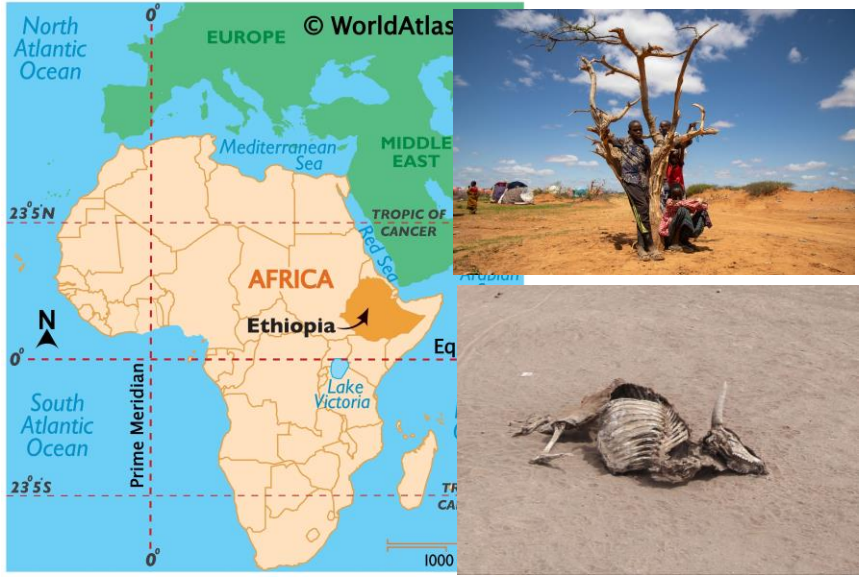
Key Term	Vocabulary
Drought	An extended period of lower than normal rainfall causing water shortages
NGO	A non-governmental organisation

Key Facts about Ethiopia

- Ethiopia is a developing country in Eastern Africa.
- It has suffered from many droughts which have led to famine and huge loss of life.
- The worst periods have been 1984, 1994, 2004 and 2014-16.

Possible Exam Questions

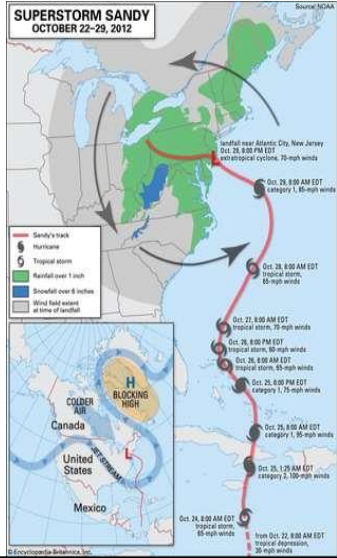
- Assess the following statement. Drought presents a greater threat to people living in developing countries rather than those living in developed countries. (8)
- Explain one human cause of drought. (2)
- Assess the different responses to drought in a named emerging or developing country. (8)



Knowledge Organiser: Hurricane Sandy, USA

(developed country) Tropical Storm Case Study

Causes of Hurricanes	Effects of Hurricanes	Responses to Hurricanes
When: 22-29 October 2012 Where: Cuba, Dominican Republic, Haiti, United States, Jamaica, The Bahamas, Size on Saffir-Simpson scale: Category 1 Wind speeds when it made landfall: 129km/h	<u>Social</u> 150 killed - Millions left without electricity - Transport links closed: more than 19,729 flights cancelled. New York's LaGuardia and Newark Liberty International Airport remain closed due to storm damage - Schools closed - Homes and businesses damaged 1 November: Manhattan public schools remain closed	<u>Media</u> - Played a large part in raising funds for example, charity concerts, telethons and corporate donations. - Posts on social media helped local people and the government assess the damage caused. <u>Charities</u> 9,000 people in 13 states spent the night in 171 Red Cross operated-shelters 4000 disaster workers provided by Red Cross.
	<u>Economic</u> - Damage: \$65-75 billion - New York Stock Exchange forced to close. - Petrol in short supply. - Tourism industry affected by the cancelling of the New York Marathon	<u>Government</u> - President Obama and New Jersey Governor Chris Christie tour the storm-damaged area near Atlantic City. - More than 1500 FEMA personnel used to support. - Changed legislation to provide billions of dollars to the affected states to help with rebuilding and supporting victims. - State of New York set up a local government office to co-ordinate rebuilding efforts. - Used satellite images to assess damage and respond to the worst-affected areas as quickly as possible.
	<u>Environmental</u> - Nature reserves were damaged by the storm surge e.g. Prime Hook National Wildlife Refuge. - Raw and untreated sewage was released into the waters around New York and New Jersey.	



Key Term	Vocabulary
Saffir-Simpson scale	Hurricane Wind Scale is a 1 to 5 rating based on a hurricane's sustained wind speed.
Storm surge	a rising of the sea as a result of wind and atmospheric pressure changes associated with a storm.
Stock Exchange	A stock exchange is a workplace where stock brokers and traders can buy and sell shares of stock, bonds, and other securities.
Sewage	Waste water and excrement conveyed in sewers.
Telethons	A very long television programme, typically one broadcast to raise money for a charity.
FEMA	(in the US) Federal Emergency Management Agency.
Legislation	Laws.
Landfall	When the hurricane arrives over land.

Key Facts about...

- The use of social media (Twitter and Flickr) helped assess the damage.
- Storm surges caused most of the damage to the East coast of the USA.

- Possible Exam Questions
- Explain one economic impact of tropical cyclones (hurricanes and typhoons) on a developed country. (3)
 - Evaluate different responses to the environmental impacts of tropical cyclones in a named developed country. (8)

Knowledge Organiser: Typhoon Haiyan, Philippines

(developing country) Tropical Storm Case Study

Causes of Typhoon	Effects of Typhoon	Responses to Typhoon
When: 2 November 2013 Where: South Pacific Sea, close to the Federation States of Micronesia Size of Saffir-Simpson scale: Category 5 Wind speeds when it made landfall: 300km/h Most of the damage on the islands of Samar and Leyte. Flooding and landslides reported across the Philippines.	<u>Social</u> 6000+ dead - Power was cut off - Aid could not reach some areas as they were blocked off by landslides. - Tens of thousands were made homeless.	<u>Media</u> - American band Journey donated \$350,000 to help relief efforts in the Philippines - The Coca-Cola Company says they \$2.5 million of their advertising budget to the relief efforts. - By mid-December FIFA donated \$1 million.
	<u>Economic</u> - Cost of damage was estimated to be US\$2billion. - Transport was disrupted.	<u>Charities</u> - Relief effort was slowed due to damaged infrastructure (roads/airports) <i>Buddhist Tzu Chi Foundation:</i> emergency cash aid of 8000, 12000 or 15000 pesos depending on family size for over 60,000 families and has been providing free clinics, hot meals, and temporary class rooms for over 15 schools in the area.
	<u>Environmental</u> - Across the islands mangroves were damaged and thousands of trees were uprooted. - Chemical leaks from damaged industrial facilities. - Tanker ran aground which caused oil spill.	<u>Government</u> 7 provinces placed under a 'state of national calamity': government gave these areas specific funding. - Residents evacuated from Tacloban but could only happen during daylight as there was no electricity in the area. This made people panic and rush at evacuation planes: people had to be held by police and the military.
		<u>Local people (individuals)</u> - Local people were evacuated. - Displaced (those who were forced to move) families helped rebuild their own homes.

Key Term	Vocabulary
Aid	financial or material help given to a country or area in need.
Mangroves	a tidal swamp which is dominated by mangroves trees.
Relief	financial or practical assistance given to those in special need or difficulty.
Infrastructure	buildings, roads, power supplies)
Displaced	Forced to leave their home
FIFA	Fédération Internationale de Football Association

Key Facts about

The track of Typhoon Haiyan ranged between 1-5.

£10 million package of aid (loans and grants) was given as well as emergency shelter, water and household items.



Natural Resources

Natural resources occur in air, water or on land and people use them to meet their needs.



Abiotic – Non-living resources.



Biotic - Living resources.



Non-renewable – Resources that cannot be replenished.



Renewable – Resources that can be replenished.

Resource Exploitation

Resource exploitation is over using a resource and can lead to negative impacts. Today we are exploiting around 50% more natural resources than we did 30 years ago, for food, energy and water.



Deforestation in Cameroon – Exploited for palm oil. Rainforests cover 48% of Cameroon. It has reduced biodiversity and increased soil erosion.



Oil extraction in Ecuador – Amazon Rainforest is home to 1 in 10 of the world's species. Pipelines are cracking which is leaking into local ecosystems and ending up in water supplies which animals and people rely on.



Overfishing in the North sea – Millions rely on fish for food and employment. Cod populations have reached critical levels.

Global Distribution of Natural Resources

Natural resources are not evenly distributed.



Forestry & Agriculture – High areas of Forestry in South America due to high rainfall and ideal climate. Low areas of Forestry in North Africa due to little rainfall.



Minerals and Fossil Fuels – Valuable minerals are found in areas of volcanic activity such as China/Brazil. India has the lowest levels of oil and gas.



Water – Only 2.5% of the Earth's water is fresh water and only 1% is available for human use. Lowest levels of access to fresh water at the Tropics.



Resources in the UK – Precipitation is higher in the North and West compared to the South. East Anglia has high levels of arable farming and Scotland is suitable for sheep farming. Oil and gas are found in the North Sea.

What causes global variations in the energy mix?

Population Size – More people means there is an increased demand in the amount of energy required for household usage.

Wealth – Less energy required in poorer countries. Wealthier countries with high levels of industry require more.

Technology – Technological advancement increases the amount of renewable energy used.

The Impact of Conflict on the UK's Energy Mix

War In Ukraine

Social Impacts –

- People are put under additional stress as they have to look for new energy suppliers/cannot afford their bills.

Economic Impacts –

- Some families cannot afford to heat their homes as energy bills have risen by £1000 per year for the average family.

Environmental Impacts –

- Development of more renewable energy in the UK to try and prevent household bills rising/dependency on oil from Russia is saving the average household £1750 per year.

Global Consumption of Food, Water and Energy

Food, water and energy are vital for human survival, but their usage and consumption are not evenly distributed. Factors affecting it are: wealth, climate, infrastructure and industrialisation.



Food – Wealthier countries consume more food than poorer countries e.g. in Ghana the average person survives on less than 2000 calories per day whereas in the USA they survive on 2700.



Water – Surplus in Tropical Forest. Developed countries have the infrastructure to transport and store water as well as to increase supply however they also consume more.



Energy – Highest in technologically advanced countries because lifestyles depend on additional technology and there is more industry.

Production of Different Types of Energy

Renewables i.e wind

Advantages	Disadvantages
Doesn't pollute the atmosphere	Only produces energy if there is wind
Cheap to run once set up	Is expensive to develop and wind farms can be considered ugly.

Non-Renewables i.e coal

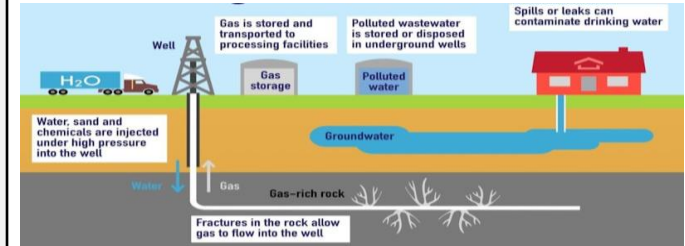
Advantages	Disadvantages
Generates large amounts of energy (and there are still large reserves remaining)	Releases CO ₂ into the atmosphere
	Is dangerous and is expensive to extract

Energy	How is it produced?	Advantage	Disadvantages
Solar	Energy from the sun, captured using photovoltaic panels.	- Renewable and abundant. - No greenhouse gas emissions. - Low maintenance costs.	- Expensive to install. - Inefficient on cloudy days/at night. - Large land area needed
Wind	Energy from moving air, harnessed by wind turbines.	- Renewable and sustainable. - No direct CO₂ emissions. - Can be built onshore or offshore.	- Intermittent (depends on wind). - Noisy and can be visually intrusive. - Risk to birds and wildlife.
Coal	Fossil fuel formed from ancient plant matter, burned to generate electricity.	- Reliable and high energy output. - Infrastructure already in place. - Relatively cheap.	- Produces high CO₂ emissions, contributing to climate change. - Causes air pollution and damage.
Oil	Liquid fossil fuel used for energy and transport.	- High energy density. - Can be used for transport and heating. - Reliable energy source.	- Non-renewable and polluting. - Risk of oil spills harming ecosystems. - Expensive and politically sensitive.
Gas	Fossil fuel (mainly methane) used for electricity and heating.	- Produces less CO₂ than coal and oil. - Efficient and reliable. - Flexible for power generation.	- Still a fossil fuel, contributing to emissions. - Extraction (fracking) can cause environmental damage. - Price fluctuations and supply risks.
Uranium	Radioactive metal used in nuclear fission to generate energy.	- No CO₂ during operation. - Very high energy output. - Reliable, not weather-dependent.	- Produces hazardous nuclear waste. - High initial costs. - Risk of accidents (e.g. Fukushima).
Hydroelectric	Energy from flowing or falling water, usually via dams.	- Renewable and clean. - Provides consistent power. - Can control water supply and prevent floods.	- Requires large land & water areas. - Can disrupt ecosystems and displace communities. - Expensive to build.

Fracking

How does it work?

Fracking involves drilling into the earth, injecting high-pressure water, sand, and chemicals to crack rock, and extracting trapped oil or gas.



Advantages

- Access oil resources which means our ability to use oil will last for a significant longer time.
- Oil prices decrease as more oil becomes available

Disadvantages

- Can cause tremors which could potentially damage buildings – most tremors are below a magnitude of 0.5 and if they reach above it, extraction stops.
- Chemicals may escape during drilling and contaminate groundwater which is used for drinking.
- Oil produced still gives off carbon dioxide contributing to global warming.

Perspectives of Energy Management

Homeowners Heating contributes 15% to an individual's carbon footprint and powering the home contributes 12%. Fossils fuels are cheaper than renewables.

Transport Transport contributes 10% to an individual's carbon footprint and this can be reduced through walking, cycling, buses etc. Electric vehicles also reduce but can be expensive.

Shell Shell are exploiting Antarctica for oil however they recognise the damage they cause but continue to invest in tar sands – dirtiest source of oil.

United Nations Pledge in 2015 to limit the global temperature rise to below 2 degrees. Each country has its own personal goals/aims.

Greenpeace Actively against oil/gas producers and argue that companies such as shell 'Greenwash' themselves.

Net Zero in the UK

Full Clean Energy by 2035

Aim to cut carbon emissions by 78% with the most focus being on investing in offshore wind. During sunny/windy spells renewables can power up to 80% of the UK.

Zero Emissions Cars by 2030

22% of all cars sold in 2024 must be electric. This will rise to 2% in 2028 and 80% in 2030.

Capturing 20-30 million tonnes of CO₂ by 2030
Plant and restore one trillion trees worldwide by 2030. The UK is also investing in the development of machines that can convert the CO₂ back into oxygen

Sustainable Management in China

Three Gorges Dam

Most powerful dam in the world (600km across). At its maximum it can produce energy to 4.5 million people. Prevents flooding in nearby areas such as Shanghai.

1.4 million people were forced to relocate when it was built due to flooding. During extreme rainfall, excess water still needs letting out causing flooding. The dam could be responsible for the extinction of the Chinese river dolphin.

Solar Energy in the Gobi Desert

Will supply energy to over 1 million households. It will cut coal usage by 4.26 million tonnes each year. It has created many job opportunities in the area.

Large-scale solar farms can disrupt desert ecosystems. Coal-fired power plants and electricity transmissions line are required to make the project work.

Knowledge Organiser: UK (developed country)

Energy Management Case Study

Responses to an increase in renewable energy: How the UK aims to achieve Net Zero

Why the UK wants to increase its use of renewable energy	Effects of an increase in renewable energy	Name of Strategy	Description of strategy
1. The UK is committed to reducing its greenhouse gas emissions to meet its net-zero targets. 2. Renewable energy sources produce less greenhouse gas emissions compared to fossil fuels 3. Transitioning to renewables is crucial for achieving these emission reduction goals and mitigating the impacts of climate change. 4. Energy Security – less vulnerable to global fluctuations in price 5. Economic Growth and Job Creation - investment in renewable energy can stimulate economic activity, create new jobs, and attract foreign investment. 6. The UK government has pledged to make Britain a "clean energy superpower" and has identified renewable energy as a key area for economic growth.	<u>Social</u> Health benefits - Reduced reliance on fossil fuels leads to cleaner air and water, improving public health and reducing pollution-related illnesses.	Full clean energy by '2035'	The shift aims to cut carbon emissions by 78%. Renewable energy sources, specifically a shift to offshore wind power, will be the backbone of the strategy. However, for this to be successful, the government will need to invest in additional energy storage facilities either in batteries or other methods such as liquid air. Currently, during spells of sunny and windy weather the makeup of solar and wind energy in the UK's energy mix can reach up to 80% - but this is just over small spells of time leaving the UK exposed to running out of energy without reliable storage or alternative sources. In 2020, investment into renewable energy was at its lowest in the UK since 2010. Additionally, an investment into building additional infrastructure such as airport expansion and rail expansion has created an additional demand for energy which needs to be offset by the policy.
	<u>Economic</u> Job creation - offers numerous employment opportunities Reduces fuel poverty by lowering costs of energy Increases economic growth of the UK – less dependant	Making 80% of car sales zero emissions by 2030	Under the long-awaited zero emissions vehicle (ZEV) mandate, 80% of sales must be fully electric, or another alternative, within seven years. Carmakers would have to pay £15,000 for each petrol or diesel engine above that threshold. Under the plans, 22% of sales in 2024 must be powered by batteries, compared with the actual figure of 20.1% in August this year. The proportion will rise annually, hitting 52% in 2028, two-thirds in 2029, and 80% in 2030. Alternatives such as hydrogen fuel cells will also count but in practice there is almost no market for them, and batteries are set to dominate. Previously the government had suggested a total ban and due to figures which had to be met being unachievable, the goal was reduced to 80%.
	<u>Environmental</u> Climate change mitigation - Transitioning to renewable energy is crucial for addressing climate change and its social consequences, such as extreme weather events and displacement.	Capturing and storing between 20 and 30 million tonnes of CO2 a year by 2030	The UK has announced several carbon capture projects as part of its pledge to capture and store 20-30 million tonnes of CO2 a year by 2030. There are two main approaches. Firstly, humans can try to increase the CO2 taken up by the natural world. For example, one global initiative aims to conserve, restore and plant one trillion trees worldwide by 2030. The land and ocean take up more than half the CO2 that humans emit anyway, so carbon removal refers to the extra CO2 that is taken up due to deliberate action by people. Secondly, there are "novel" human-designed methods to take CO2 out of the atmosphere, although these are at very early stages. These include machines to directly capture CO2 from the air, or processes involving growing plants, burning them or converting them into fuels, and capturing and storing their emissions. Neither approach is taking place at anywhere near the scale required to balance CO2 emissions from human activities, which exceeded 40 billion tonnes in 2022. In comparison, carbon capture and storage currently only captures around 45 million tonnes a year. Carbon dioxide removal by artificial methods takes up even less - around 2 million tonnes a year. Both remain very expensive. Based on projections of oil and gas use under current policies, the world would need these methods to capture and remove an "implausible" 32 billion tonnes of CO2 a year by 2050, according to the International Energy Agency. Carbon dioxide removal by enhancing natural sources - like tree planting - removes an estimated 2 billion tonnes a year. But even this is outweighed by the carbon emitted from the damage to the natural world, like continued deforestation, and there are limits to how much carbon trees can take up.

Possible Exam Questions

- Assess the impacts on people of developing non-renewable and renewable energy resources. (12)
- Explain one way a named developed country has attempted to manage its energy resources in a sustainable way. (4)
- Assess the reasons why the UK and other countries use a mix of different energy resources. (8)

Knowledge Organiser: China (emerging country)

Energy Management Case Study

Causes of unsustainable energy use	Effects of unsustainable energy use	Responses to unsustainable energy use.
- The rise in car ownership, heavy traffic congestion and the use of low grade gasoline are leading causes. - China contributes 29% to global carbon emissions - more than any other country. - Has seven out of ten of the world's most polluted cities. - China burns more coal than USA, Europe and Japan combined. 	Social - Air pollution can cause lung disease. - Cardiovascular disease, as well as cancer and birth defects.	The Three Gorges Dam - Generates 98.8 billion kilowatt hours, equivalent of 49 million tonnes of coal. - Preventing 100 million tonnes of CO2 emissions. - Cost US\$30 million although it should pay for itself in 10 years. - Construction forced 1.4 million people to be relocated from homes. - Flooded 632km2 of habitat.
	Economic - The government is trying to reduce coal consumption by closing polluting mills, factories and smelters. - Switching to other eco-friendly energy sources.	Gobi desert - Solar power - China has become one of the world leaders in generating solar energy. - It is currently building a giant solar power station in Gobi desert which could potentially produce enough energy to supply 1 million homes. - It will cover 10 square miles and generate 200MW of solar energy.
	Environmental Coal contains high levels of ash and Sulphur that when burned cause high levels of pollution.	

Key Term	Vocabulary
HEP	Hydro-Electricity Power - building a dam and the water flowing through turbines generates electricity
Congestion	Overcrowding of the roads.
Cardiovascular disease	relating to the heart and blood vessels.
Consumption	using up a resource.
HEP	Hydro electricity power
Generate	produce or create.
Relocated	Moved elsewhere
Smelters	an installation or factory for smelting a metal from its ore.

Key Facts
 Three Gorges Dam is the biggest producer of power in the world but still meets less than 2% of China's electricity needs.

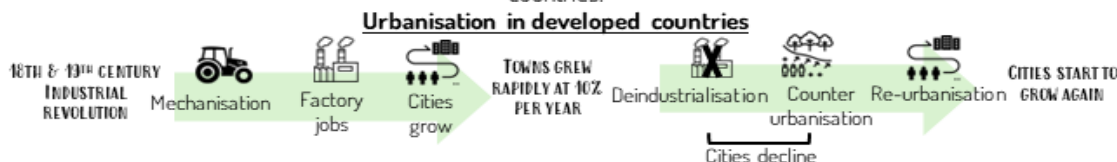
The dam has an impact on wildlife in the Yangtze and is threatening the lives of a huge number of animal species, including the Yangtze dolphins.

- Possible Exam Questions
- Explain one reason why the development of hydro-electric power (HEP) can have negative impacts on people and the environment. (4)
 - Evaluate different approaches used by either a named developing or emerging country to manage and use energy resources in a sustainable way. (8)
 - Assess the impacts on people of developing non-renewable and renewable energy resources. (8)
 - Assess the reasons why the UK and other countries use a mix of different energy resources. (8)

What is urbanisation?

Urbanisation is the increase in the proportion of people living in urban areas (towns and cities). More than half of the world's population live in urban areas.

Urbanisation has happened at different rates and in different ways in developed, emerging and developing countries.



Urbanisation in emerging & developing countries

Urbanisation in emerging & developing countries has mainly happened due to two reasons:

- Rural-urban migration** – people move to cities for better access to services (education, healthcare), as well as for job opportunities (work in TNCs).
- Natural increase** – birth rate is higher than the death rate, so population increases. Due to migrants being young.

What are the factors affecting rural-urban migration in emerging & developing countries?

Push factors

Encourage people to move away from the rural area.

- Mechanisation of farming** – results in less people needed to work on farms, so job opportunities are limited.
- Lack of services** – education and healthcare are often to a lower standard in rural areas.

Pull factor

Attracts people to the urban area.

- Job opportunities** – more jobs available, and more secondary sector jobs that pay more than primary.
- Better access to services** – education and healthcare are better in urban areas, as well as better infrastructure (supplying water and electricity).

What are the impacts of urbanisation?

The growth of urban areas has led to the creation of megacities (cities with a population of over 10 million), but there are significant impacts of urbanisation:

- Illegal / unplanned settlements.**
- Air/ noise/ water pollution.**
- Inequality increases.**
- Investment increases (TNCs).**
- Competition for jobs = longer working hours & less pay.**
- Services are put under pressure.**

Why does urbanisation differ in the UK?

A range of factors has caused the rate and degree of urbanisation to vary between different regions in the UK.

- Political:** London is the capital city and the centre of government. This is an important factor for people and businesses when choosing to locate here.
- Historic:** during the 19th century the industrial revolution led to factory towns (Central Scotland and Northern England). People moved for work.
- Economic:** 1950s onwards, economic growth focused on tertiary and quaternary sectors, which need access to transport and communications. London is the centre of these.
- Physical:** in Scotland, the colder climate makes living more difficult due to extreme weather. The south of the UK is flatter which makes building easier, and has fertile soil.

Knowledge Organiser: MUMBAI (emerging country)

Urbanisation Case Study

Causes of urbanisation	Effects of urbanisation	Responses to urbanisation
Push factor: Reasons for people moving out of (emigrate) from a place Pull factor: reasons that make people move into (immigrate) a place Push Factors 1. Pressure on the land so not enough for everyone to live off. 2. Poor quality housing 3. Mechanisation of farming 4. Over population 5. Hunger 6. Lack of education 7. Lack of healthcare 8. Lack of government support Pull factors 1. Wide range of job opportunities 2. Better schools and further education 3. Better health facilities 4. Good entertainment 5. Wages in Mumbai are higher	Social • Many people live in slums: the land is not suitable for building on as it is close to the railway lines, is too hilly or too marshy. • Rents in Mumbai are amongst some of the highest in the world. • Many people live in cramped, poor quality rooms which are expensive. • 3500 people die on Mumbai's railway each year. • Some people live in Chawls (old tenement buildings): overcrowded and are worse than living in the slums. They are unsafe and are in danger of collapse. • 60% of Mumbai's population use communal taps for water. In some slums water is only available for 30 minutes a day. • In Dharavi, 500 people share each public latrine. Economic • Employment in Dharavi is informal. This means low pay, no security and no tax. • In Dharavi, there are 15,000 factories but most of them are illegal. Some families make shirts at home which sell for 15p. Environmental • There are now 1.8 million cars in Mumbai which has led to gridlocked roads. • Rapid urbanisation has led to water pollution. • Factories dump untreated waste in to the Mithi River. The airport dumps oil into the river. 800 million litres of untreated sewage go into the river every day.	Top-down: Vision Mumbai Successes • 72 new trains were introduced. Platforms were raised to prevent people falling into the 'gaps' between trains and platforms. • 200,000 people were moved, and 45,000 homes demolished in Dharavi. New flats replaced slums. • Piped water and sewerage systems were established for new flats. Failures • New 14-storey apartment blocks have split communities. • Rents cost more than in the slums. • Small workshops would have to move or go out of business, affecting Mumbai's recycling industry. • Slums are growing so rapidly that improving sewerage treatment and disposal in line with population growth is a long way off Bottom-up: Agora Microfinance India Successes • Available for people of Dharavi • Can have a legal bank account • Gives people a loan for their business. • Education loans are also available to improve their skills. • People become more educated so in the long term can get a better job • Have more money available to improve their housing Failure • Interest rates are high this reduces the amount of profit people can make. • If they don't repay the loan, fined £150. • Maximum they can borrow is £300 Bottom-up: SPARC and community toilet blocks Successes • Toilet blocks are connected to city sewers and water supplies. • Local community build toilet block • Permits are 25p a month • Have electric lights which make them safe to use at night. • Separate toilets for children. Failure • The government aren't taking any action. • Many diseases are carried by not washing hands and clean water isn't always available. • The flush system doesn't always work.

Key Term	Vocabulary
Rates of natural increase	The difference between the birth rate and the death rate
Rural to urban migration	People leaving the rural areas for urban areas.
Informal economy	The part of the economy that is neither taxed nor monitored by the government
Top-down	Actions completed by the government or transnational corporations (TNCs).
Bottom-up	Actions completed by local people or non-governmental organisations - charities (NGOs).

Possible Exam Questions

- Explain two ways that bottom-up approaches have been used in a named major city in either a developing or an emerging country. (4)
- You have studied a major UK city and a major city in a developing or emerging country. Assess the impacts of migration on these cities. (8)
- Evaluate which of these cities have been most successful in improving the quality of life for its people. (8)
- Evaluate the ways that the challenges of rapid urbanisation have been managed to improve the quality of life. (8)
- Explain two negative impacts of rapid urbanisation on a city in a developing or emerging country. (4)

Knowledge Organiser: NEWCASTLE-UPON-TYNE

Example of a city in a developed country

What is the structure of Newcastle?

- **Inner City** - The area around the CBD – usually built before 1918 in the UK.
- **CBD** - The main shopping and service area in a city. The CBD is usually found in the middle of a city so that it is easily accessible.
- **Suburbs** - The area on the edge of the city. Many suburbs were built after 1945 and get newer as they reach the edge of the city.

SIMPLIFIED LAND-USE MODEL FOR NEWCASTLE-UPON-TYNE



What do the words urbanisation, suburbanisation, counter-urbanisation and re-urbanisation mean?

- **Urbanisation:** The **increase** in the percentage of **people living in towns and cities**, causing them to grow.
- **Suburbanisation:** The **outward spread of the built-up area**, often at a lower density compared to the older parts of town.
- **Counter-urbanisation:** The movement of people and employment from **major cities to smaller settlement and rural areas** located beyond the city or to more distant towns and cities.
- **Re-urbanisation:** The movement of people **back towards city centres** away from rural areas and suburbs.

How has Newcastle changed over time?

- Migrants arrived from Pakistan and lived with family and friends in **Elswick**. The mainly live in terraced housing.
- Many families lived in **Byker** as they once worked in shipbuilding.
- In the 1930's council estates were built in the suburbs for example in **Heaton**.
- In the 1960's the old 19th century terraces in the inner city were demolished and families moved to the suburbs for example **Fawdon**.
- Newcastle is popular with students. They live close to the CBD in areas such as the **Ouseburn**.
- More recently people have arrived to Newcastle from Syria. They are **refuges**.
- Old factories in the **inner city** have been redeveloped and turned into apartments. People are moving here from the suburbs.
- Some families who lived in **Jesmond** have now moved to the **Great Park** on the edge of Newcastle as the houses are larger, more modern and have bigger gardens.

How has deindustrialisation affected Newcastle?

Globalisation:

Cities have become part of a 'world market'. Industries, such as shipbuilding, have suffered badly from **competition from China and India**. Where production costs are much **cheaper due to low wages and less strict employment laws**. **Factories closed**, e.g. Swan Hunters shipyard (Wallsend), Vickers shipyard (Elswick) and Armstrong (arms factory) in Elswick. It left many **brownfield sites**, with **empty factories and warehouses** e.g. the Vickers factory site at Elswick.

There was some **large scale pollution** of the land where former industries had taken place, e.g. at the Tar Works in Walker. Workers were made **redundant** - employment in the shipyards fell by 22% in the 1970s.

De-centralisation:

During the 1970s, there was a period of de-centralisation where many **inner-city areas were re-developed and industry either closed or moved out of the city**. **New factories which opened tended to be in the suburbs**, e.g. Formica in North Shields, so **people in the inner-city areas find it hard to travel to them**.

Development of infrastructure: The development of the **Central Motorway and the Metro system in Newcastle in the 1970s led to the demolition of older factories and warehouses**. Some of these never reopened; others moved to the rural-urban fringe in more modern developments.

Knowledge Organiser: NEWCASTLE-UPON-TYNE

Example of a city in a developed country

How has migration affected Newcastle?	
Reason for moving to Newcastle	Impact on Newcastle
Commonwealth Migrants: In the 1950s, the government encouraged immigration from former colonies	- fill jobs that people no longer wanted to do in transport and industry - Made Newcastle more multi-cultural e.g Mela festival - Lead to decline in housing in Elswick and Byker as people were paid low incomes.
International migrants from Hong Kong	makes Newcastle more multi-cultural with Chinese restaurants and supermarkets .
Study -There are around 50,000 students in Newcastle.	- Using resources (healthcare, etc.) - can fill up part time/seasonal jobs - spending money which helps the economy
EU migration - Since 2000, many migrants have come from countries in Eastern Europe	- More competition for jobs - fills labour and less desirable jobs - people paying taxes to improve economy
Flight from conflict - refugees from Syria and Afghanistan	- Large number coming at once makes it difficult to prepare - Increase crime and tension - increases inequality - filling jobs with shortages

How has shopping changed in Newcastle?
- In the early 1990s, the CBD changed as a result of de-centralisation in the city. - The Metro Centre in Gateshead opened in 1986; this offered free parking and an under-cover, pedestrianised shopping centre with large department stores like House of Fraser and Debenhams. - Other out of town shopping parks developed, such as Silverlink in Wallsend, which offered larger retail units and easier access than the CBD. - Another factor affecting retail in the CBD has been the growth of internet shopping.

The CBD fights back

1. Pedestrianising areas of the CBD to make a more pleasant shopping environment
2. Redevelopment of Eldon Square, including a new food court, to provide a similar experience to the Metro Centre.
3. Redeveloping older, run down parts of the CBD such as Pilgrim Street, Stephenson Quarter and St James', to provide a more attractive environment
4. Encouraging stores to have late night opening.
5. Offering free parking on evenings and Sundays.
6. Having special offers such as 'Newcastle Restaurant Week' to attract people back to the city centre.





How is Newcastle becoming more sustainable?
Transport schemes - Car share schemes/Metro system/Park and Ride/Bus network. Go Zero Newcastle is heading towards a zero carbon future! Go Zero is Newcastle City Council's campaign to help reduce the city's carbon footprint by encouraging our residents to travel by more sustainable modes. Car Clubs Newcastle City Council is working with Co-wheels Car Club to offer a convenient greener and cheaper alternative to owning your own car. Electric Vehicles The North East is leading the way in the development of electric car use, and leading the charge when it comes to installing electric vehicle charging points. (80 charge points throughout the city) Impacts = Reduced levels of pollution due to less congestion (traffic jams). Quieter/Safer inner city roads/Reduced carbon emissions. Recycling Schemes - Residents have recycle bins allocated/Ban on open fires within inner city under clean air act. Reduces amount sent to landfill (20% reduction since 2000) Open Space/Green belt - Protection of habitats/More pollution absorbed by greenery (carbon sink) Linked to better of life.



Pearson
Edexcel

GCSE (9-1) Geography A

GCSE (9-1) Geography A
Knowledge Organiser
Paper 3: Geographical
Investigations
Issue 2





Key ideas and key content: a student guide

This guide is designed to support students on the key content of the GCSE Geography A specification for Paper 3 Geographical Investigations: Fieldwork and UK Challenges.

It covers:

- Topic 7A: Investigating physical environments (river landscapes or coastal landscapes)
- Topic 7B: Investigating human environments (central/inner urban or rural settlements)
- Topic 8: Geographical investigations – UK Challenges

It can be used to identify gaps in learning, as a personalised checklist to aid revision or as a knowledge organiser.

Paper 3: Geographical Investigations: Fieldwork and UK Challenges

This is assessed by Paper 3 (90 minutes). It contains three sections. In Section A, Geographical investigations – physical environments, you must choose one from two optional questions (Rivers or Coasts). In Section B, Geographical investigations – human environments, you must choose one from two optional questions (Central/Inner Urban Area or Rural Settlements). In Section C, UK challenges, you must answer all questions.

Topic 7A: Investigating physical environments (river landscapes OR coastal landscapes)	
Enquiry process point	General focus and details of fieldwork
River landscapes – investigation of change in a river channel	
1 Formulating enquiry questions	An enquiry question should relate to a geographical theory and/or example. A key question or hypothesis follows on from the enquiry to be tested. For example: • How do river channel characteristics change along the River Glaven? A key question that follows on from this could be: • Does the depth and width of the River Glaven increase from source to mouth? A hypothesis could be: • The depth and width of the River Glaven increase from source to mouth.
2 Fieldwork methods and techniques	Fieldwork data collection must include at least: • one quantitative fieldwork method to measure river discharge – quantitative methods record data that can be measured as numbers (for example, using a tape measure to measure river width) • one qualitative fieldwork method to record the landforms that make up the river landscape – qualitative methods



	record descriptive data (for example, constructing a field sketch).
3 Secondary data sources	Secondary data is data that somebody else has already collected. For example, a flood risk map from the Environment Agency and British Geological Survey.
Coastal landscapes – investigation of coastal processes through landscape evidence	
1 Formulating enquiry questions	An enquiry question should relate to a geographical theory and/or example. A key question or hypothesis follows on from the enquiry to be tested. For example: • Why does beach morphology Happisburgh change? A key question that follows on from this could be: • Does sediment size and shape change along the North Norfolk Coast? A hypothesis could be: • Sediment size increases from Happisburgh to Sheringham.
2 Fieldwork methods and techniques	Fieldwork data collection must include at least: • one quantitative fieldwork method to measure beach shape and sediment characteristics – quantitative methods record data that can be measured as numbers (for example, using ranging poles and a clinometer to measure beach gradient) • one qualitative fieldwork method to record the landforms that make up the coastal landscape – qualitative methods record descriptive data (for example, field sketch of the cliff line).
3 Secondary data sources	Secondary data is data that somebody else has already collected. For example, a geology map from British Geological Survey and Environment Agency.
Topic 7B: Investigating human environments (central/inner urban area OR rural settlements)	
Changing city environments – investigating change in central/inner urban area(s)	
1 Formulating enquiry questions	An enquiry question should relate to a geographical theory and/or example. A key question or hypothesis follows on from the enquiry to be tested. For example: • How does the quality of the urban environment vary along a transect through the south-west of Norwich? A key question that follows on from this could be: • Does environmental quality improve with increasing distance from the CBD? A hypothesis could be:



	Environmental quality improves with distance from the CBD.
2 Fieldwork methods and techniques	Fieldwork data collection must include at least: - one quantitative fieldwork method to measure the land use function (quantitative methods record numbers that can be measured as numbers for example, land use mapping) - one qualitative fieldwork method to record the quality of the environment (qualitative methods record descriptive data for example, field sketch).
3 Secondary data sources	Secondary data is data that somebody else has already collected for example, census data from the Office for National Statistics and Multiple Deprivation Index.
Changing rural environments – investigating change in rural settlements	
1 Formulating enquiry questions	An enquiry question should relate to a geographical theory and/or example. A key question or hypothesis follows on from the enquiry to be tested. For example: - Does the flow of traffic vary during the day Happisburgh? A key question that follows on from this could be: - Does the flow of people vary between 9:00am and midday? A hypothesis could be: - Traffic flows will peak between 8:00-9:00am.
2 Fieldwork methods and techniques	Fieldwork data collection must include at least: - one quantitative fieldwork method to measure the flows of people (quantitative methods record numbers that can be measured as numbers for example, a pedestrian count) - one qualitative fieldwork method to record the views of the quality of life (qualitative methods record descriptive data for example, interview).
3 Secondary data sources	Secondary data is data that somebody else has already collected. For example, census data from the Office for National Statistics and Multiple Deprivation Index.

Topic 8: Geographical investigations – UK challenges	
Specification key ideas	Key content
8.1 The UK's resource consumption and environmental sustainability challenge	The UK is becoming overpopulated. By 2030, the UK's population is expected to exceed 70 million owing to natural increase and migration. This will put further strain on natural resources and ecosystems.
	Pressure on ecosystems comes from: building on greenfield sites



	- the destruction of natural habitats and declining biodiversity - pressure on water supply and quality - increased food production intensifying agricultural practices. Solutions to tackling sustainable transport include: - increased public transport options - congestion charging and park-and-ride schemes - promoting the use hybrid and electric cars.		
8.2 The UK settlement, population and economic challenges	A 'two-speed economy' refers to the uneven growth of the UK economy, with the South East developing fastest. A possible solution to help close the gap between the South East and the rest of the UK is to improve transportation links. For example, HS2. Costs and benefits of greenfield development and the regeneration of brownfield sites are listed below. <table border="0"> <tr> <td> Greenfield benefits - Cheaper land to develop - More space Costs - Loss of valuable farmland - Disruption to wildlife habitats </td><td> Brownfield benefits - Infrastructure already exists - Improvement to landscape Costs - Restricted development - Land may be contaminated </td></tr> </table> UK net migration has increased since 1970. During 2015, net migration was over 300,000 people. However, it is difficult to collect data about migration accurately and data from different sources varies, so net migration statistics may not be reliable. Stakeholders have different views towards migration into the UK. - Some businesses welcome migrant workers to increase the workforce. - Local councils have concerns about providing healthcare and education. - Some people believe migrants reduce the number of jobs available. Note: research has shown that migration has had little or no impact on the average employment and unemployment of UK-born workers (Source: The Migration Observatory, University of Oxford)	Greenfield benefits - Cheaper land to develop - More space Costs - Loss of valuable farmland - Disruption to wildlife habitats	Brownfield benefits - Infrastructure already exists - Improvement to landscape Costs - Restricted development - Land may be contaminated
Greenfield benefits - Cheaper land to develop - More space Costs - Loss of valuable farmland - Disruption to wildlife habitats	Brownfield benefits - Infrastructure already exists - Improvement to landscape Costs - Restricted development - Land may be contaminated		
8.3 The UK's landscape challenges	The management of the UK's National Parks is divided into different categories – habitats, biodiversity, climate change and historical environments. Approaches to conservation and development include: - using renewable energy sources - river restoration projects - using electric bikes to reduce the number of cars on roads - extending National Parks – the Lake District National Park was expanded in 2016, for example, and there are plans for		



	further expansion. Views on this have been mixed though and some residents and community groups may be concerned about increased visitors and traffic pollution, as well as rising house prices due to the popularity of owning second homes in National Parks. However, the local economy may benefit from increased spending by tourists in local businesses, which could create more jobs for local residents.
	The Environment Agency is responsible for the management of the UK's rivers and coasts. Approaches to managing the UK's river and coastal flood risk include: • monitoring and early warning systems • soft and hard engineering • stricter building regulations • afforestation.
8.4 The UK's climate change challenges	The UK's future climate could see temperature rising between 2°C and 4°C, an increase in precipitation and more extreme weather events, although there is uncertainty around these projections.
	Climate change could result in rising sea levels causing coastal flooding. This will increase the rate of erosion on coasts, at a cost to the economy. Temperature increases could cause more frequent heatwaves, leading to longer periods of drought in the UK. This will affect food production and human health.
	UK responses to climate change • Local scale – Individuals can reduce their carbon footprint by walking more or using public transport, recycling waste and installing energy efficient devices. • National scale – The government can invest in more sustainable practices, such as renewable energy.

Erosion

Wearing away of rock along the coastline.

Hydraulic Action – the force of water pushes water and air into cracks in the rock and explodes.

Abrasion – rocks are thrown at the cliff. It has a sandpaper effect.

Attrition – rocks hit off each other. They become smoother, smaller and rounder.

Solution – rocks hit off each other. They become smoother, smaller and rounder.

Weathering

Weathering breaks down rocks by the action of rainwater, temperature and biological activity.

Mechanical/Physical – water is trapped in cracks in the cliff. It freezes and expands. When it thaws the water runs deeper into the crack. The process continues until parts of the cliff break off.

Chemical – the acid in the rain/seawater dissolve some rocks.

Biological – tree roots grow in the cracks in the cliff. The roots grow and break the cliff apart. Animals burrow in cracks in the cliff / rocks and break them apart.

Mass Movement

The downhill movement of sediment under the force of gravity.

Sliding – when rock, weathered or eroded material, or Earth moves down a slope. The material shifts in a straight line.

Slumping – where the river erodes the base of valley slopes, making it steeper. Material above slides downwards, particularly if it is saturated with rainwater. In slumps, the material shifts with a rotation.

Transportation

When a river no longer has enough energy to carry its load, deposition occurs.

Traction – larger material are rolled along the seabed.

Saltation – small pieces of shingle or large sand grains are bounced along the seabed.

Suspension – small particles such as silts are suspended in the flow of water.

Solution – when minerals in rocks are dissolved in sea water and carried in solution. The load is not visible.

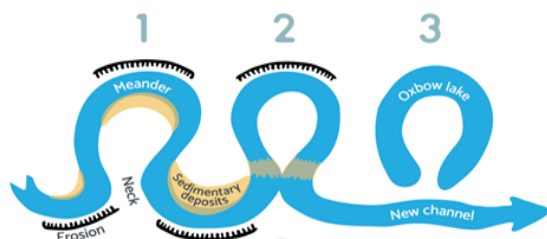
Waterfalls and Gorges



1. A band of more resistant rock sits on top of less resistant rock – which is easily eroded.
2. The less resistant rock is undercut by erosion leaving an overhang.
3. The more resistant rock will collapse and through the process of abrasion, a plunge pool will be created.
4. A steep-sided gorge forms as the waterfall retreats.

Meanders and Oxbow Lakes

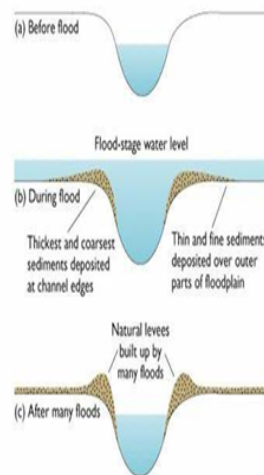
The water flows from side to side resulting in lateral erosion by undercutting and an outer, steep bank is formed (river cliff)..



Formation of an ox-bow lake

1. The narrow neck of the meander is gradually eroded bringing it closer together.
2. The flow of the river will take the fastest route. Deposition will seal off the old meander and its neck has been completely cut through.
3. An oxbow lake is left behind when the meander is cut off.

Flood plains and levees



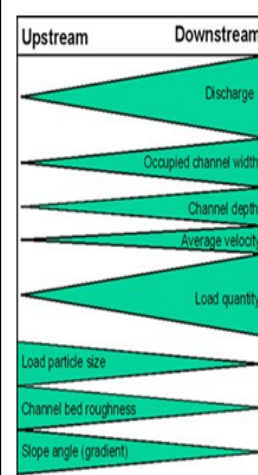
Flood Plains

A flood plain is the flat area of land either side of a river in its lower course. It is formed by erosion and deposition. Lateral erosion on the outside bends of meanders means they can migrate across the valley floor so it becomes wide and flat.

Levees

Levees are natural embankments of sediment found along the banks of rivers that carry a large load and occasionally flood. In times of flood, water and sediment come out of the channel as the river overflows its banks. As it overflows, the river immediately loses velocity and energy and deposits the larger and heavier sediment first on its banks. Repeated flooding causes these banks to get higher, forming levees.

Bradshaw Model



The Bradshaw Model shows how the river profile changes as it moves downstream.

Slope Angle – decreases as a river moves downstream due to the landscape changing (the source it is in higher land, the mouth in lower land).

Channel Depth – Increases due to increased erosion and increased river velocity.

Load Particle Size – Decreases due to increased erosion on sediment.

Location of the River Tees



The River Tees is located in the North East of England. It begins in Cross Fell in the Pennines and travels East towards its mouth joining the North Sea. It passes through several settlements such as Darlington, Yarm and Middlesbrough.

Long Profile of the River Tees

Upper Course

- Begins at Cross Fell in the Pennines.
- Vertical erosion leads to the formation of V-shaped valleys and interlocking spurs.
- England's highest waterfall, High Force is located in the upper course.
- High Force has retreated leaving a steep gorge.

Middle Course

- The valley widens out and channel slopes become much gentler.
- The river begins to meander near Barnard Castle as there is more lateral erosion.

Lower Course

- Near Yarm, the meanders are much larger and oxbow lakes have formed.
- In this area, there are also levees where the river has flooded.
- As the river meets the North Sea, deposition has created mudflats.
- The lower course is made up of less resistant sandstone.

Causes and effects of flooding

A **flood** occurs when a river bursts its banks and the water spills onto the floodplain. This occurs when a river's **discharge** becomes too **high**.

Physical Causes of Flooding

Intense Rainfall – During periods of heavy rainfall, the soil and rocks can quickly become saturated. As infiltration is reduced, water flows over the surface into the river at a faster rate.

Duration of rainfall – Long periods of rainfall cause the soil to become saturated leading to increased surface run off.

Snow Melt – In some places a lot of snow falls during the winter months. When temperatures rise above zero in the spring, all the snow that has built up melts, releasing large volumes of meltwater.

Rocks – Permeable rocks, such as chalk, allow water to soak in. Impermeable rocks, such as clay, do not allow water to pass through so rainwater will run off the surface and straight into the river channel.

Relief – Water reaches the river channel much faster where slopes are steeper.

Human Causes of Flooding

Deforestation – Vegetation collects, stores and uses water from rainfall; this is called interception. Plant roots also encourage water to pass into soil and rock, so vegetation reduces run off: if it is removed, more water can reach the river channel more quickly.

Urbanisation – In towns and cities, rainwater will not infiltrate the hard, impermeable surfaces of concrete and tarmac. This causes the water to run off immediately into drains and river channels.

Climate Change

Although a single flood event cannot be linked to climate change, warmer weather is making more extreme weather events.

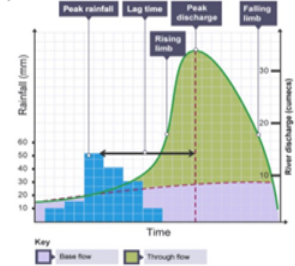
Jet Streams – The behaviour of the jet stream has changed which has brought more intense storms. It is predicted these will become more frequent storm events with intense, long rainfall.

Hydrographs

A **hydrograph** shows how a river responds to a period of rainfall.

Bar Graph – Shows the amount of rainfall

The Axis – Shows the discharge (the amount of water in the river)



Rising Limb – The rise in water after a period of rainfall.

Lag Time – The difference between the time of the heaviest rainfall and the point at which the river contains the largest amount of water.

Falling Limb – Shows the reduction in the amount of rainfall meeting the channel.

Management Strategies

Hard Engineering Strategies – This involves building artificial structures to try and alter natural processes. These can be very time extensive and expensive.

Advantages	Disadvantages
Embankments (levees)	
They stop water from spreading into areas where it could cause problems, such as housing.	Flood water may go over the top and then get trapped behind them.
Channelisation – this involves deepening and/or straightening the channel	
This allows water to run through the channel quickly.	It doesn't look natural.
Flood relief channels – extra channels can be built next to rivers	
The relief channels can accommodate high flows so that a river will not overflow.	Costs can be high.
Dams and reservoirs	
They are long lasting and can produce hydro-electric power.	They are expensive to build.

Soft Engineering Strategies – This does not involve building and is a more sustainable strategy for managing flood risk.

Advantages	Disadvantages
Washlands – areas on the flood plain that are allowed to flood	
These give a space for water to go and slow floodwater down.	Allowing land to flood, may limit the use of the land for recreation.
River restoration – restoring the river's original course	
Restoring rivers to a more natural course by taking away embankments aims to slow them down, for example by restoring meanders.	Some flood banks are often still needed.
Flood plain zoning – government allocates areas of land to different uses, according to their level of flood risk	
Flood risk management aims to prevent building homes and businesses in high risk zones. Here, uses such as open space for leisure and recreation are allowed because flooding would be less costly.	Flood plains are attractive places to build.

Ways to measure development:

Development can be measured using

- Economic indicators: Gross Domestic Product (GDP)
- Social indicators: life expectancy
- Political indicators: the Corruption Perception Index

Development indicators include:

- Gross Domestic Product (GDP) – the total value of goods and services produced by a country in a year; often divided by the population of that country to give GDP per capita (per person)
- Human Development Index (HDI) – puts together a country's Gross National Income (like GDP per capita), life expectancy, average length of schooling and expected years of schooling to produce an indicator of the country's development level
- The Corruption Perception Index grades the quality of governments from 'highly corrupt' to 'very clean'.

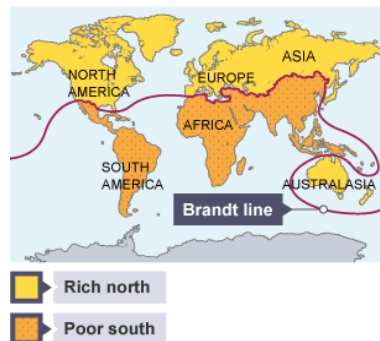
Factors which affect development:

- Economic – income, economic growth, types of industry, cost of living and employment rates
- Social – access to healthcare, education, housing, leisure and recreation
- Cultural – democracy and work-life balance
- Technological – internet access, mechanisation and electricity
- Food and water security – physical and economic access to food and water

Levels of development vary globally:

Globally, development is uneven.

Levels of development tend to be higher in the northern hemisphere and Australia (above the Brandt Line). Levels of development tend to be lower on the continents of South America and Africa (below the Brandt Line). These are generalisations, and something like the Brandt Line is an oversimplistic model compared with reality.



The idea of the Development Continuum is a better way of understanding global variations in development. Levels of development vary within the UK. In the South East and London, wages and standards of living are generally higher than the rest of the UK. However, even London has a homeless population.

Factors

affecting development:

Factors affecting levels of development globally include:

- **physical factors** – availability of natural resources, natural hazards, landlocked, climate
- **historical factors** – colonial links and trading relationships
- **economic factors** – type of economy and debt
- **social factors** – investment in health and education.

Factors affecting levels of development in the UK include:

- **physical factors** – remoteness or accessibility and industrial potential
- **historical factors** – impacts of **deindustrialisation**
- **economic factors** – employment rates and salaries, house prices and infrastructure.

Uneven global development has had a range of consequences.

- Health – Healthcare is limited in the developed world where there are fewer doctors per person and poor facilities.
- Education – Not all children attend school, which leads to lower literacy rates, earlier marriage and larger families.
- Employment – Wages in developing countries are lower and more labour intensive – many jobs exist in the informal sector (i.e, street stalls)
- Food and water security – A lack of clean water means that people struggle to grow food, leading to malnutrition and dehydration.
- Housing – Many people in the developing world cannot afford housing and are forced to live in unplanned settlements where a lack of sanitation causes diseases to spread.
- Technology – Few people have the skills to use technology so appropriate technology can be more effective.

How to address uneven development:

International aid involves one country voluntarily providing resources to another, like machinery/oil, or money to invest in infrastructure and industry.

Trade agreements such as removing tariffs (tax barriers) can reduce uneven development by helping countries increase trade. Fair trade producers work more directly with retailers, getting a better price for their goods.

Foreign direct investment (FDI) is when a company (Transnational Corporation (TNC)) invests in another country, potentially pushing up wages and bringing in investment to the developing country. However, the big brands can outsell local produce and there is often a lack of regulation.

Top-down development

Involves government and TNCs

These large-scale projects are expensive and require expertise. They open investment and can benefit large numbers of people. Local people may not benefit and TNC wages are often low.

Bottom-up development

Involves NGOs working with communities.

These are local scale projects, cheap and appropriate to the needs of local people. They target specific needs of local people, such as a wells providing clean water. Ddevelopment is slow and small-scale, and reliant on NGO support and solutions.

Knowledge Organiser: India (emerging country)

Development Case Study

Causes of development	Effects of development in India	Responses to development in India
- India is a member of global groups such as the World Trade Organisation. - India's globally spread population generates income in remittances. - Rapid increase in the tertiary sector from 27% in 1947 to 52% now. This has led to increased employment opportunities and a growth in India's economy. - Fastest growing telecom markets in the world. - Second largest wireless internet access in the world. - During the 1990's changes in India's trading policies led to rapid rise in imports and exports. 	Social - Increased population density in cities. - Breakdown of the traditional family unit as young people move to cities. - Widening development gap between urban and rural areas. - Widening development gap between rich and poor. - Continuing low status of women - Greater investment in schools and education - Literacy rate has risen - Better access to healthcare which has reduced infant mortality rate. - Increasing life expectancy from 54 years in 1985 to 68 years in 2015. - High levels of pollution in cities has led to poor public health. - Lack of housing means people live in slums.	The Smart Cities Mission is a new initiative by the government to improve equality and the quality of life. The project will run between 2015 and 2020 and cover 100 cities across the country. Its core infrastructure elements include: - adequate water supply - assured electricity supply - improved sanitation - affordable housing, especially for the poor - health and education - efficient public transport. Smart Cities Mission: A step towards Smart India National Portal of India
	Economic - Development has been uneven between the core and the periphery. - In the core, average income is 140,000 rupees per person this is due to investment in industry. - In the periphery, average income is 23,435 rupees per person this is due to harsh physical environments. - Over 1 million new ICT jobs created. - Growing consumer market. - Increase in tourism.	Role of Coca-Cola in India Advantages - Invested \$2billion until 2011 - Invested another \$5billion until 2020 - Created indirect employment for 150,000 people - Directly employs 25,000 people - Created community development programmes including: "support my school" - They have a women empowerment programme - Drip irrigation saves 1200kl/hectare of water - Holds awareness camps on sanitation. Sanitation is the key element to social and economic development - Re-built 18 schools as part of an aid programme after the Bihar floods - Provided schools with education materials, school uniforms and separate toilets for girls and boys.
	Environmental - Increase in secondary industry has led to rising air pollution - Deforestation - Increased CO2 emissions has contributed to climate change. - Increase in water pollution due to chemicals used in industry.	Disadvantages - Increased pressure on ground water due to high water requirements - Left land poisoned with sludge - Draining water that feeds into wells - farmers lose their job.

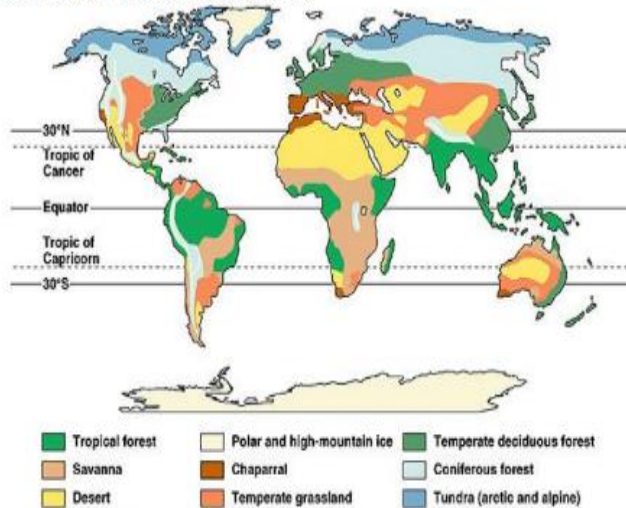
Key Term	Vocabulary
Development	The process where people, a place or a country change or make social or economic progress.
Core	Most economically advanced areas
Periphery	Parts of the country outside the core economic zone.
Remittance	Money sent back by migrants to their family in the home country.
Secondary industry	Manufacturing of raw materials
Tertiary Industry	Providing a service

Possible Exam Questions

- For either a named developing or emerging country, explain two negative impacts of growth in the secondary sector. (4)
- Assess the factors that have influenced the growth of core and peripheral areas within either a named developing or emerging country. (8)
- For a named developing or emerging country, explain two reasons the population structure has changed in the last 30 years. (4)
- Assess the social and economic impacts of private investment by TNCs in a named developing/emerging country. (8)
- Assess the positive and negative impacts of rapid development on either a named developing or emerging country. (8)

The world's ecosystems

An **ecosystem** is a natural environment and includes the **flora** (plants) and **fauna** (animals) that live and interact within that environment. They depend upon climate, soil and water.



The Biosphere

This is the part of Earth and its atmosphere in which living organisms exist or can support life. Resources gained from the biosphere include **food, medicine, fuel and building materials**.

Modern technologies have reduced our reliance upon the biosphere, we now **exploit** it. Such as:

- Exploitation of water for industry and agriculture.
- The creation of biofuels clears forests which has led to a decline in species e.g. Orangutans.
- Mining for minerals.

The nutrient cycle

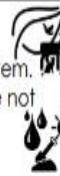
How nutrients are transferred around an ecosystem. Gersmehl's model shows three basic compartments: soil, litter and biomass. Each stores nutrients and there are transfers between them.



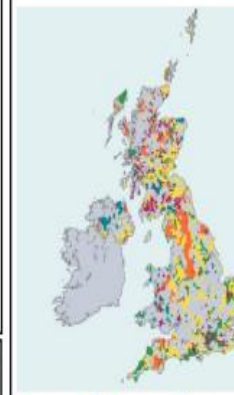
Abiotic and biotic

Biotic = the living components of an ecosystem.

Abiotic = the parts of an ecosystem that are not living but essential to survive e.g. nutrients. These are interdependent – closely linked.



UK's Ecosystems



Woodlands – 12% of the UK. Mostly deciduous in England but Scotland and Wales have coniferous.

Moorlands – located in upland areas. Characterised by peat, heather and low growing plants. Managed by burning practices.

Wetlands – Only a few still exist as most have been drained for arable land. Characterised by waterlogging, mosses, sedges, wading birds.

Heathlands – dry sandy areas with distinctive plants located in lowlands.

Marine Ecosystems

1. **Inshore habitats** – close to the shore and coastal margins.
2. **Offshore ecosystems** – away from the shoreline.

Benefits – tourism (contributes £3billion to the economy), fishing and energy (oil reserves enough for 30 years of production) (wind farms e.g. London Array).

Human damage – overfishing, eutrophication, removal of ecosystems, windfarms affect bird migration routes and cause noise disturbance.



Characteristics

Tropical rainforest – hot and wet all year, trees dominate, huge variety of broadleaved plants.

Tropical grassland – hot all year, has a dry season, tall grasses with scattered drought-adapted plants.

Desert – very hot and very low rainfall. Plants have water-storing features and extensive root systems.

Temperate grassland – hot in summer, cold in winter, most rain in summer. Few trees or shrubs.

Temperate forest – warm summers, cool winters and precipitation all year. Deciduous trees (shed their leaves).

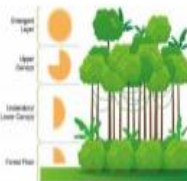
Boreal forest – warm summers, very cold winters, low precipitation. Coniferous trees.

Tundra – temperature mainly below 0°C. Few plants, mainly mosses.

Explaining distribution of ecosystems

- Temperature decreases with latitude due to changes in sunlight.
- High surface temperatures at the equator due to rising air.
- Cooling air over the tropics makes high pressures and precipitation.
- Earth's tilt creates seasons.
- Coastal areas experience temperature changes due to sea moderation.
- Mountainous regions force air to rise and cool. Lots of moisture here.

Tropical Rainforests



Characteristics

- Deciduous trees that shed their leaves at different points of the year.
- Tall trees (30-40m).
- **Stratification** – the forest has different layers.
- Soils are deep but low in nutrients.

Abiotic Components

Warm temperatures and moist conditions create chemical weathering which adds minerals to the soil. However, leaching (water washing away minerals) occurs making soils low in nutrients.

Biotic Components

Biomass is the largest store as leaves decompose quickly into the soil and trees take up nutrients quickly. Humans play an important role by hunting animals, spreading seeds for plants and damaging areas by fire.

Importance of TRF

Goods = drugs, oxygen, timber, clean water supplies, food.
Services = maintains biodiversity, buffers climate change, tourism, prevents flooding, a home.

Adaptations

Plants = Drip tip leaves, buttress roots.

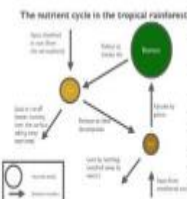
Animals = camouflage, gripped hands/feet, good eyesight.

Changes due to CC

Structure = trees drop their leaves in dry seasons allowing underbrushes to grow, animals now hibernate, tree trunks swell to store water.

Function = increase in surface run-off, less dense forest due to less precipitation, less CO₂ intake.

Biodiversity = migration of species, spread of pests.





Deforestation in TRF

Deforestation is the removal of forest. This occurs when areas are required for farming, mining etc.

Case Study – Madagascan TRF

Madagascar is the 4th largest island off the east coast of Africa. Half of the rainforest has been lost since 1950. But why has this occurred?

1. **Tavy** – 80% of deforestation has occurred due to this slash-and-burn agriculture.
2. **Population growth** – population has increased from 1950 from 4 million to 20.7 million in 2010.
3. **Logging** – first took place to pay off interest on international debt. Restrictions are now in place but illegal logging occurs due to high demand, corruption and how poor Madagascan people are.

Sustainable management - Association Mitsinjo

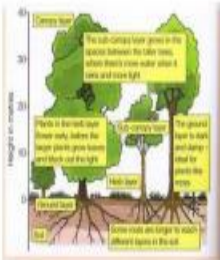
- **Government policies** – Schemes for local communities to manage their resources sustainably.
- **Ecotourism** – community based nature association to take tourists around Analamazotra reserve. Members also patrol to find illegal activities.
- **Services** – local farmers set aside land as a nursery for young rainforest trees. 1 million planted.
- **Agriculture** – instead of Tavy, System of Rice Intensification is being adopted to grow more food without clearing land.
- **Social benefits** – funds better healthcare and environmental education.
- **Problems** – 14,000 live in the area but most are in poverty. The association depends upon aid for 2/3 of its income.



Case Study – The New Forest

A national park on the south coast of England. Tourism brings £500 million to the region each year, this causes threats to sustainability of the area:

- Visitors do damage by trampling of plants, footpath erosion, fires from BBQs, litter, scaring wildlife.
- Livestock roam freely and can be run over by visitors driving too fast.
- Timber is extracted from the forest.
- Half of the woodland is privately owned so not managed.



Characteristics

- Tree species shed their leaves during cooler months.
- The canopy is not continuous and young trees grow to fill these gaps.
- Deep root systems to access water/nutrients.
- Humus layer on soils.

Deciduous Woodlands

Biodiversity

Dominated by four tree species that are well adapted to climate conditions. In the UK the main species is oak, which are large, broad and soft trees. Their leaves contain acid tannin (poisonous) to protect from animals. They support 200 insect species. Animals hibernate during the winter e.g. hedgehogs or store food to survive e.g. squirrels. Birds often migrate to warmer conditions in winter.



Food Web Example



Abiotic Components

Woodland soils are not as deep as TRF as they haven't existed as long. Deep roots break up bedrock and weathering adds nutrients to the soil. Less leaching occurs here due to less precipitation. Leaf litter and the plant layer prevents much surface runoff.

Importance of deciduous woodlands

Goods = timber, fuel used for wood-burning stoves and charcoal, non-timber products e.g. rearing birds for shooting and venison.

Services = recreation, carbon capture, conservation of rare species.

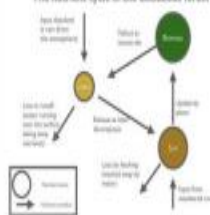
Deforestation

The UK is now one of the least wooded areas in Europe. After WW1, woodland was only 5% of the UK so the government encouraged planting of trees to get to the 13% coverage we are at today. However, most of this afforestation has been coniferous trees not native to the area.

Economic causes – timber extraction (coniferous trees grow quicker) and agricultural change (7% of ancient woodland has been cleared in 100 years).

Social causes – population increase means forests have been cleared to build houses and roads.

The nutrient cycle in the deciduous forest



Biotic Components

This is a productive ecosystem but less than TRF due to seasonality.

Humans manage these systems having a large impact.

Changes due to CC

1. **Milder winters** – this could spread pests, halt seed germination and prevent new species from growing.
2. Increased risk of **drought** – this causes a threat to Beech trees.
3. Increased risk of **fire**
4. Animals may have to **migrate** north for cooler temperatures.

Sustainable woodland management

Forestry is designed to ensure deforestation does not occur. This is through replanting native species when areas are cut down, using pesticides sparingly, minimised bird disturbance and providing courses in sustainable management for private owners.

Sustainable use of the forest

They encourage users not to damage the park by:

- Multiple car parks, cycle routes and paths to direct people away from vulnerable areas.
- Hotels provide sustainable transport schemes.
- Green leaf businesses which use local products
- Local landowners can receive grants to improve biodiversity.
- Visitor leaflets describing the importance of driving slowly.



Knowledge Organiser: The New Forest, UK (developed country) Deciduous Woodland Case Study

Causes of deforestation	Effects of deforestation	Responses to deforestation
<u>Population growth</u> 1. The movement of visitors in TNF is increasing litter, causing erosion of paths and increasing air pollution from traffic. 2. Higher car ownership - demand for wider roads to ease congestion. 3. Land to build news homes - pressure on green belt sites where houses can fetch higher prices.	<u>Social</u> 1. Visitors cause trampling of delicate plants, erosion of grass, start fires with BBQs and drop litter.	<u>National Park Authority</u> 1. Careful management by creating dedicated walking and cycling routes in delicate areas. 2. Awareness raising through leaflets and posters of the importance of sustainability. 3. Landowners funded to plant native species. 4. Pesticide use limited. 5. Work restricted between April -August to minimize disturbance to nesting birds. 6. New trees planted and tree felling controlled.
<u>Timber extraction</u> 1. Replanting with conifers - 38% of deciduous woodland cleared in 20th century. 2. Conifers are more economic - faster growing, easier to manage and quicker return of money.	<u>Economic</u> 1. Some forestry operations are not compatible with visitors using woodland for recreation	
<u>Agricultural change</u> 1. Pesticide damage - woods often border farmland so chemicals sprayed on crops can damage trees and wildlife.	<u>Environmental</u> 1. Conifers create a dense canopy which blocks light for other species. Its creates a monoculture. They are a non-native species. Reduces biodiversity. 2. Visitors scare livestock (ponies and pigs) by driving too fast. 3. Visitors scare young foals.	<u>Green Leaf Tourism Scheme</u> 1. Promotes the use of local products; businesses give percentage of land for wildlife and encourage visitors to walk or use bikes.
		<u>Sustainable transport schemes</u> 1. Tourists use bikes and electric vehicle hire to ease congestion and air pollution.

Possible Exam Questions

Explain one cause of deforestation in deciduous woodlands. (2)

Evaluate the different approaches used to manage the threats facing deciduous woodlands in a named region. (8)

Key Term	Vocabulary
Deciduous	trees that drop their leaves in Autumn
Agriculture	farming the soil for the growing of crops and the rearing of animals to provide food, wool, and other products.
Congestion	Overcrowded
Conifers	tree that bears cones and needle-like or scale-like leaves that are typically evergreen.
Pesticides	a substance used for destroying insects or other organisms harmful to cultivated plants or to animals.
Monoculture	the cultivation of a single crop in a given area.
Native species	An animal or plant indigenous to a place.
Sustainability	Able to continue without causing damage to the environment.

- Key Facts

- The New Forest is on the south coast of England.
 - The New Forest is 480 km².
 - Around 175,000 people life in The New Forest.
 - 15 million people visit The New Forest each year.
 - 40% of the woodland is privately owned and is often left unmanaged.

Knowledge Organiser: Amazon Rainforest in Costa Rica

(emerging country) Tropical Rainforest Case Study

Causes of deforestation	Effects of deforestation	Responses to deforestation
1. Mining - rising demand and rising prices for minerals in rainforest. 2. Road building - to transport resources like iron ore and timber, often built without proper controls. 3. Illegal logging - high demand in the Western world. 4. Rapid population growth - rising demand for housing and agriculture. 5. Oil palm plantations - in demand as ingredients in foods, cosmetics and as biofuel. 6. Cattle ranching - needs vast areas of land. 7. Subsistence agriculture - land cleared to grow crops quickly loses its nutrients so farmers clear more.	Social Loss of homes and livelihoods of local indigenous people.	Direct Government Action in Costa Rica 1. People did not pay as much tax if they conserved (looked after) the rainforest area. 2. The government give \$50 per hectare for forest that has been protected. The areas targeted for protection have high biodiversity. 3. Rainforest is divided into 11 eco-regions. Each area makes its own decisions.
	Economic Provides resources for people locally and worldwide, including food, water and timber.	Carbon Credits in Costa Rica 1. They sell the credits to countries who do make a lot of carbon such as China. 2. It has created \$20million dollars for Costa Rica.
	Environmental Loss of natural habitats home to a diverse range of plants and animals (1300 birds and 40000 plant species).	NGOs: Central Volcanic Mountains Development Foundation in Costa Rica 1. It works with 400 landowners who own 46000 hectares of land. 2. It has used a US\$10million dollar grant.
		Ecotourism in Braulio Carrillo National Park 1. It looks after 485 hectares of rainforest. 2. The employees are from a local village called Las Horquettas meaning locals are employed. 3. If the ecotourism site did not develop the trees would have been cut down.
		Private Reserve: Monteverde Cloud in Costa Rica 1. 10500 hectares was founded by Americans. 2. They have created a wildlife sanctuary to look after the animals and plants because it has high biodiversity. 3. It allows tourism, but only a few people at a time. 4. It has guided walks and trails so people do not wander off and do damage.

Possible Exam Questions

Explain two causes of deforestation in tropical rainforests. (4)
 Assess the role of biotic and abiotic characteristics in the functioning of tropical rainforests. (8)

Key Term	Vocabulary
Deforestation	permanently removing forest.
NGO	NGO's are similar to charities. They do not make any profit.
Cattle ranching	Grazing cows on grass
Ecotourism	tourism intended to support conservation efforts and observe wildlife.
Private reserves	those protected areas that are privately owned but are used for public benefit
Carbon credits	a permit which allows a country or organisation to produce a certain amount of carbon emissions.
Indigenous	People who originated from that particular place.

Key Facts

- Around the world 7.3 million ha is cleared each year.
- Destroyed 50% of TRF
- Soaks up 10% global CO2 emissions
- Brazil an area the size of Germany has been lost.

