Geography GCSE

The challenge of natural hazards: Tectonic hazards

Natural hazards pose major risks to people and property.

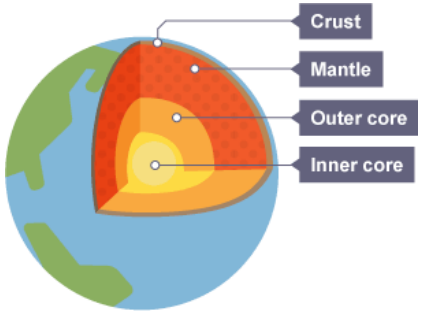
A **hazard** is something that poses a risk of damage to human life or property. Without people, hazards aren't dangerous, they are just events.

Hazards can be

- Biological e.g. covid 19.
- Meteorological (weather) e.g. hurricanes.
- Tectonic e.g. earthquakes.
- Hydrological e.g. flood.
- Geophysical e.g. landslide.

1. **Earthquakes and volcanic eruptions are the result of physical processes.**

Layers of the earth



Global distribution of earthquakes and volcanic eruptions and their relationship to plate margins

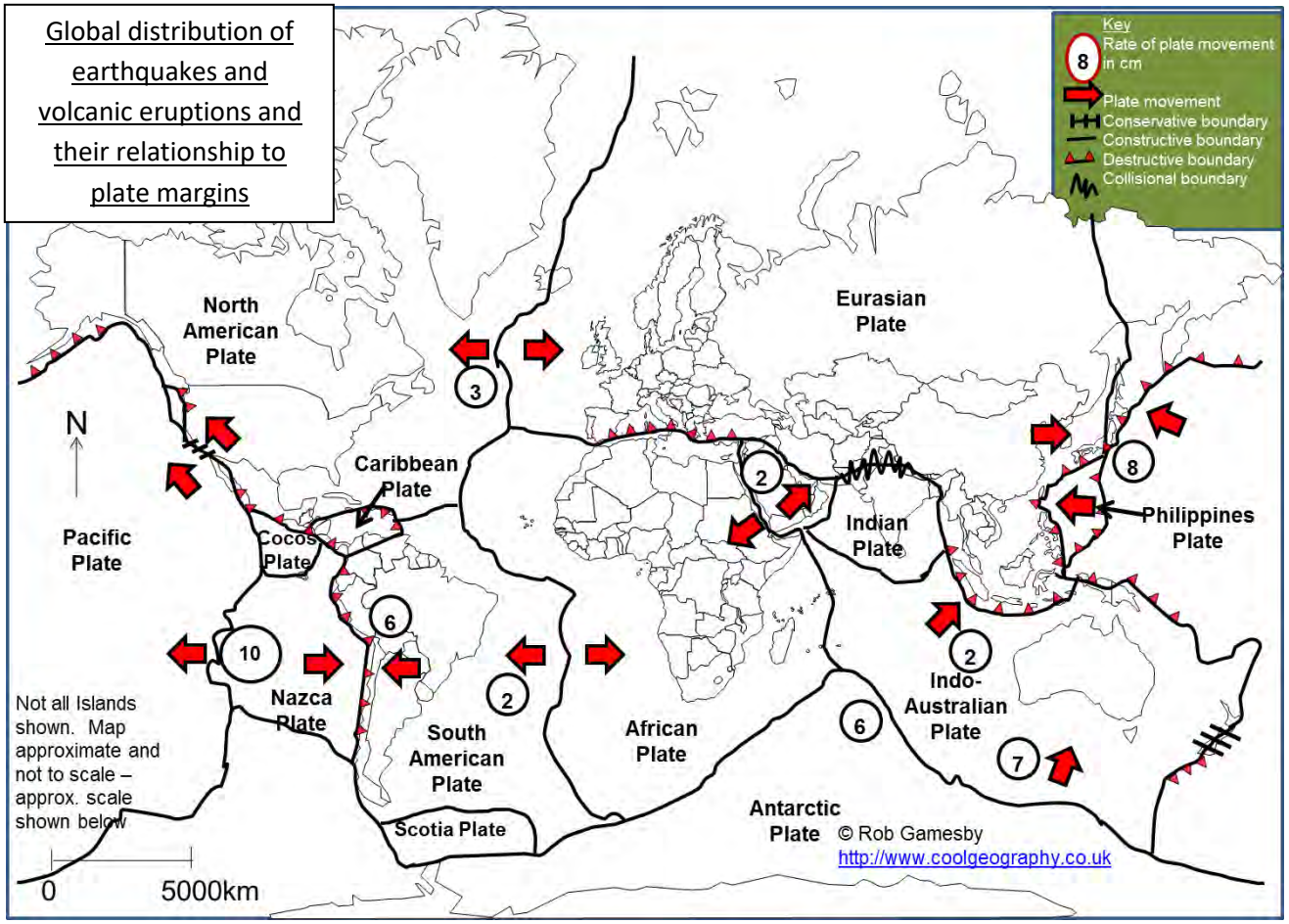


Plate tectonics theory - The crust is broken up into large slabs called tectonic plates. These plates float on the semi-molten rock of the mantle and are moved around by *convection currents.*

Continental plates: thick (30-50km) but light and old. Cannot be destroyed.
Oceanic plates: thinner (5-10km) but heavy/dense and younger. Sink more easily.

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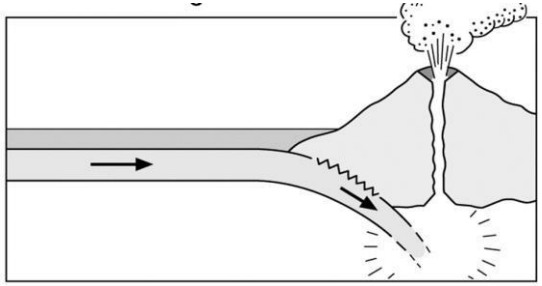
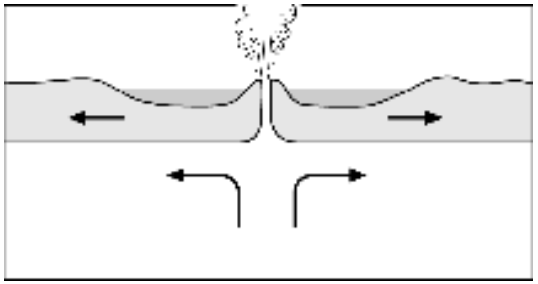
2. Physical processes taking place at different types of plate margin (constructive, destructive and conservative) that lead to tectonic hazards like earthquakes and volcanic activity. Tectonic hazard = A natural hazard caused by movement of tectonic plates (including volcanoes and earthquakes).

Destructive → ← Tectonic plate margin where two plates are converging or coming together and oceanic plate is subducted. (e.g. Nazca and South American plates) = earthquakes and volcanoes.



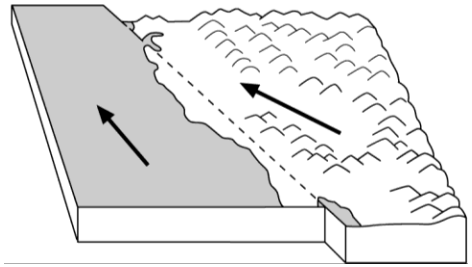
Features- volcanoes, fold mountains, ocean trench, Processes- strong earthquakes and volcanic eruptions, crust sinks and is destroyed.

Constructive ← → Tectonic plate margin where rising magma adds new material to plates that are diverging or moving apart. e.g. North American and Eurasian plate) = volcanoes.



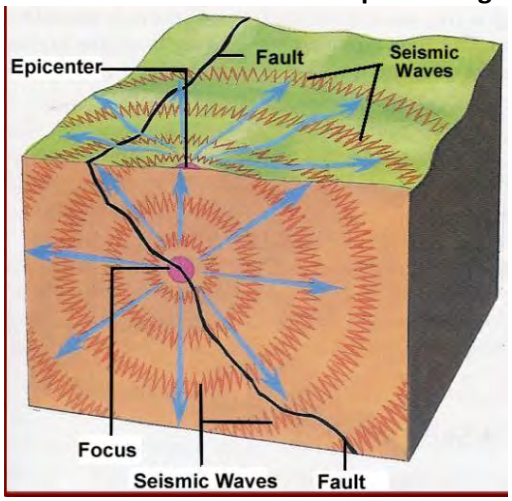
Features- mid ocean ridge of underwater mountains, volcanoes, small islands. Processes- gentle eruptions and earthquakes, new crust made.

Conservative ↑↓ Tectonic plate margin where two tectonic plates slide past each other. e.g. Pacific and North American plate creating San Andreas fault) = earthquakes.



Features- small fold mountains, sag ponds where crust sinks. Processes- strong earthquakes, no volcanoes, crust not created or destroyed.

3. Earthquakes occur at constructive, destructive and conservative plate margins.



An earthquake = a sudden or violent movement within the Earth's crust followed by a series of shocks.
Seismic waves = the vibrations of the crust's movement during an earthquake
Focus = the point in the earth's crust where seismic waves begin. Seismic waves are strongest and cause most damage nearest to the focus.
Epicentre = the point on the surface of the earth's crust directly above the focus.

Measuring earthquakes

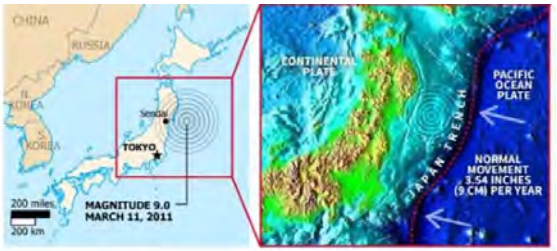
Richter scale – shows the magnitude (amount of energy released) of seismic waves on a logarithmic scale, 0-9+
Mercalli scale – shows the damage done by the earthquake 1 (very little damage) -12 (total destruction)

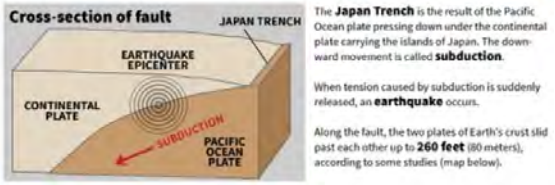
Cause of earthquakes

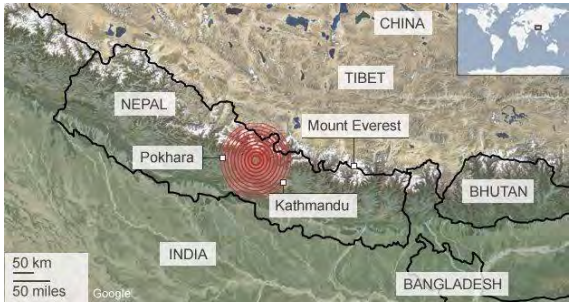
1. Convection currents move plates together (at a destructive boundary) or alongside each other (at a conservative boundary).
2. As the plates move past each other they lock together so tension builds between them.
3. Suddenly, this pressure is released so the earth's crust vibrates and seismic waves are released. This is an earthquake.
4. The seismic waves spread out from the focus.
5. At a constructive plate boundaries, as convection currents pull plates apart tension builds up in the plates.
6. Suddenly, the tension is released as seismic waves from the focus of the earthquake.

The challenge of natural hazards: Tectonic hazards

4. The effects of, and responses to, a tectonic hazard vary between areas of contrasting levels of wealth.







Primary effects: The initial impact of a natural event on people, caused directly by it, e.g. buildings collapsing.
Secondary effects: The after-effects that occur as indirect impacts of a natural event, sometimes on a longer timescale, e.g. fires due to ruptured gas mains resulting from the ground shaking.
Immediate responses: The reaction as the disaster happens and in the immediate aftermath e.g. evacuation.
Long term responses: Later reactions that occur in the weeks, months and years after the event e.g. rebuilding.

Use named examples to show how the effects and responses to a tectonic hazard vary between two areas of contrasting levels of wealth.

HIC: Tohoku, Japan, March 2011, Richter scale 9.0, plates Eurasian and Pacific

Primary effects

- 10m tsunami
- 16,000 people died, 6000 people were injured,
- Fukushima nuclear powerplant was damaged by the tsunami=blackouts for 4.4 million people.
- 11 hospitals destroyed
- 330,000 buildings destroyed or damaged

Secondary effects

- 131,000 were made homeless
- Nuclear reactor went into meltdown, area now uninhabitable.
- Damage cost $235 billion, most expensive disaster ever.
- There was a Nissan UK car parts shortage.

Immediate responses

Evacuation, putting out fires, rescuing people, army built camps for homeless. Medical staff flown in from rest of country.

Long term responses

- New 18m tsunami walls.
- Japanese red cross received $1billion, gave out 30,000 relief kits, 14,000 sleep kits.
- Reconstruction Design Council had a budget of over 23 trillion Yen to rebuild houses.

LIC: Gorka, Nepal earthquake, April 2015, 7.8 on Richter scale, near to Capital Kathmandu

Primary effects

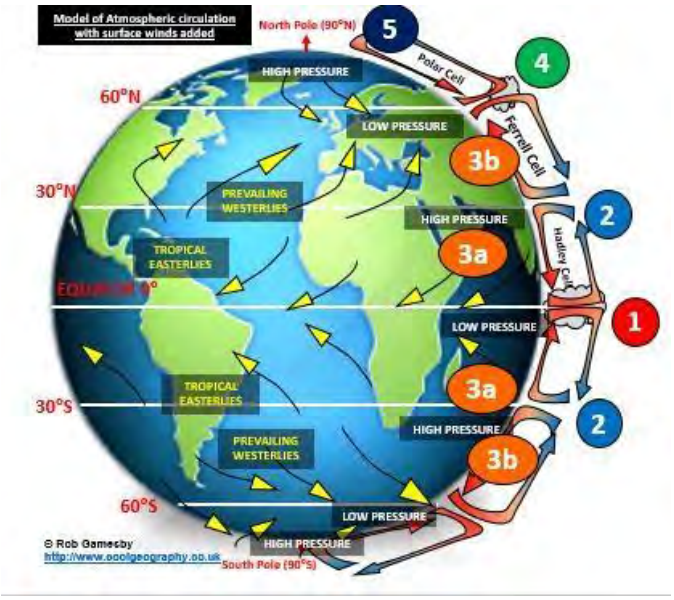
- 9000 deaths, 22 000 injured
- Avalanches on Everest, 18 climbers died.
- 130,000 homes destroyed
- 30,000 classrooms destroyed, 1 million children lost education.
- Monkey Temple and Golden gate monuments damaged.

Secondary effects

- 2.8 million homeless
- few hospitals open and emergency services overstretched

	• loss of tourism as climbing season stopped • $7billion of damage, half of total GDP lost (country's income). **Immediate responses** 9 helicopters for rescue (roads were blocked), government immediately asked for help, 60 doctors from China came and 30 from Pakistan as well as a pop up hospital. UK sent 100 rescuers. **Long term responses** $1 billion in aid from international community. Areas now zoned to assess future risk. People trained in earthquake drills. Plans to build stronger homes in future.
5. Reasons why people continue to live in areas at risk from a tectonic hazard.	**The advantages of living near volcanoes:** • Fertile soils e.g. around Vesuvius where much of Italy's tomato crop is grown. • Geothermal power is often a cheap and clean source of power – e.g. Iceland • Usually, there are sufficient signs to move to safer places, so while property could be as risk injury is less likely e.g. Mount Pinatubo in the Philippines in 1991 was the 2nd largest eruption in the 20th century but only 300 died because of mass evacuation of the area. • People have lived in the area for many years and are confident that there won't be a severe eruption. • Tourism e.g. in Uganda, the volcanic region around Mt Elgon or Mt Vesuvius near Naples in Italy. **The advantages of living in earthquake zones:** • Many earthquake areas are close to the coast – the climate is good, fishing and farming are easy. • Many of these places like Japan get daily earthquakes and they have learnt to deal with them. They cause little or no damage as they adjust building methods for example. • The big ones are very infrequent – 1906 and 1989 in San Francisco, so people believe they can manage
6. Management can reduce the effects of a tectonic hazard. **How monitoring, prediction, protection and planning can reduce the risks from a tectonic hazard.**	**Monitoring:** Recording physical changes, such as earthquake tremors around a volcano, to help forecast when and where a natural hazard might strike. *[seismometers to detect tremors, tiltmeters to detect bulges in volcanoes, monitoring of sulphur dioxide levels]* **Prediction**: Attempts to forecast when and where a natural hazard will strike, based on current knowledge. This can be done to some extent for volcanic eruptions, but less reliably for earthquakes. Prediction then allows people to evacuate and move belongings. **Planning:** Actions taken to enable communities to respond to, and recover from, natural disasters, through measures such as emergency evacuation plans, information management, communications and warning systems. **Protection:** Actions taken before a hazard strikes to reduce its impact, such as educating people or improving building *design [automatic shut off switches to gas and electricity supplies to prevent fires following earthquakes, rubber shock absorbers, interlocking bricks/steel frame, shatter proof windows to help buildings withstand earthquakes.]*

The challenge of natural environments: Weather hazards and Climate Change

1- Global atmospheric circulation helps to determine patterns of weather and climate.	General atmospheric circulation model: pressure belts and surface winds.  **Atmospheric circulation** = the movement of air around the globe that tries to balanceout temperature differences. **Step 1:** At the Equator temperatures are hot→stronger, more direct sun. This means that evaporation occurs and air rises, → low pressure, → condensation, → clouds → rain. **Step 2:** Air from the Equator has moved towards this point. It has now cooled. This meansit is more dense so sinks. This creates high air pressure and low rainfall. **Step 3a:** Some of the air now moves back towards the Equator in winds called trade windsto replace the air that has risen. **Step 3b:** Westerlies blow towards the poles. **Step 4:** Warm air from the Equator meets cold, dense air from the pole. The warm air rises. As it rises is becomes colder so clouds form. This leads to rainfall. **Step 5:** At the pole the temperatures are cold. This means that the air is denser so it sinksand moves at towards lower latitudes as surface winds.

The challenge of natural environments: Weather hazards and Climate Change

2- Tropical storms (hurricanes, cyclones,typhoons) develop asa result of particular physical conditions.

A tropical storm = a low pressure weather system with clouds that spiral around a central eye can carry heavy rain and winds.

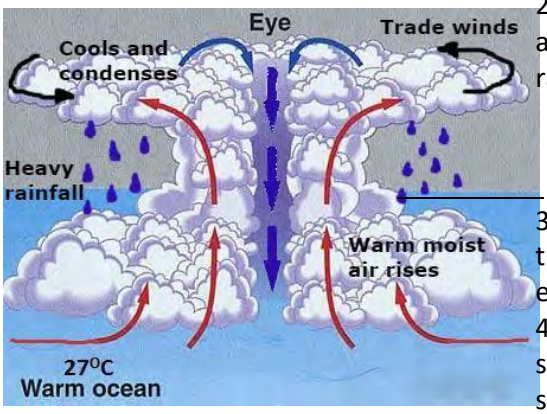
Global distribution of tropical storms (hurricanes, cyclones, typhoons).

- Between the Tropic of Cancer and Tropic of Capricorn, where ocean surface temperatures are over 27 degrees Celsius.
- The highest numbers of tropical storms occur in the North Pacific **Hurricanes =** Atlantic Ocean affecting the south coast of the USA, the Caribbean andCentral America

Typhoons = North west Pacific Japan and East Asia e.g. Philippines,

Cyclones = Indian Ocean.

Causes of tropical storms and the sequence of their formation and development



1. The surface temperature of the ocean reaches 27 ^{O} C→ evaporation.
2. The warm, moist air rises and then cools and condenses so clouds form leading to heavy rain. The clouds form the walls of the tropical storm.
3. Some of the cooled air sinks back down through the centre of the clouds forming an eye where there is no rainfall.
4. Air rushes in from outside of the storm system to replace the rising air, this creates strong winds.
5. The storm rotates because of the spin of the earth and the movement of trade winds.

An understanding of the relationship between tropical storms and general atmospheric circulation.

Tropical storms occur in the between the tropics because … high levels of solar radiation leading to rapid evaporation.

In the northern hemisphere tropical storms move… towards the west.

In the Southern hemisphere, tropical storms move … towards the east.

This is due to… the different directions of surface winds in each hemisphere.

How climate change might affect the distribution, frequency and intensity of tropicalstorms.

Climate change → air temperatures rise → sea temperatures rise → more areas are 27°C or higher for more of the year.

The *distribution* tropical storms … more areas will be vulnerable to tropical storms. Hurricane Catarina was the first hurricane to hit Brazil in 2004. In 2012, Hurricane Sandy reached as far north as New York.

The *frequency* of tropical storms has slightly increased since 1880. 1880-84 = 41 storms, 200-2004 = 54 2005-2008 = 47. Six of the ten most active years from tropical storms since 1950 have happened since 1995.

The *intensity* of tropical storms has increased in the last 20 years, however, more data is needed to know is this is a significant relationship.

The challenge of natural environments: Weather hazards and Climate Change

3- Tropical storms have significant effects on people and the environment. ***Case Study*** : Typhoon Haiyan. 8th November 2013. Affected the Philippines	**Primary effects of Typhoon Haiyan**  • 6300 dead; Flooding with a 6m high storm surge – this was the main cause ofdeath • Damage to Tacloban airport; 1 million homes damaged • 30 000 fishing boats destroyed; Crops and power lines damaged in winds **Secondary effects of Typhoon Haiyan** • Electrocutions due to electrical wires in water • Malaria due to stagnant water attracting mosquitos • Looting and violence in Tacloban • 6 million people lost their source of income – fishing/farming • Millions made homeless – over 1 million still homeless one year 1 later • Total costs $20billon **Immediate responses to Typhoon Haiyan** • 1600 evacuation centres set up • Military planes and helicopters used in the rescue and relief efforts • International governments and aid agencies came to help e.g. US aircraft carrier George Washington • Aid agencies helped e.g. the Red Cross delivered basic food aid including rice, canned food and sugar. **Long-term responses to Typhoon Haiyan** • Cash for work programmes • Fishing industry and rice farming recovered • Thousands of homes built further from flood risk areas • More typhoon shelters built to help shelter people in any future evacuations • Roads and the Tacloban airport rebuilt. **How monitoring, prediction, protection and planning can reduce the effects of tropical storms.** *Monitoring:* ocean temperatures, wind speed and direction → used to *predict* → when a tropical storm may start, its strength and path. *Protection:* tropical storm shelters – raised off the ground, strong foundations and rooves, water collection system for drinking water, cover glass windows, keep trees cut back away from buildings, flood defences and sea walls. *Planning:* use forecasts to help evacuate areas at risk, have evaluation plans in place, emergency kits in houses, education about how to protect your home.
4- The UK is affected by a number of weather hazards	**An overview of types of weather hazard experienced in the UK**.  • Rainfall → flooding • Snow and ice → injuries, closure of businesses and schools, roads closed, cropsharmed • Drought = lack of rain → crops die, hosepipe bans • Heat waves → heat exhaustion, disruption to some transport e.g. rail linesbuckling • Wind → uprooted trees, some damage to properties, airplane flights cancelled. **Why these weather hazards?** Warm air from the tropics meets cooler air from the poles at the edge of the Polar and Ferrell cells. UK is between these areas so gets both types.
5 - Evidence that weather is becoming more extreme in the UK.	**Temperatures are becoming more extreme** – December 2010 = coldest for 100 years. 10 hottest years all since 2002. **Rainfall is becoming more intense** – 2013 was the wettest year on record, December 2015 was the wettest month on record, 4 of the 5 wettest years on record occurred between 2000 and the present day → flooding is becoming more common e.g. winter 2013-14 in Somerset, 2012 in West Wales, 2005, 2009, 2015 in Cumbria.

The challenge of natural environments: Weather hazards and Climate Change

6- Extreme weather events in the UK have impacts on human activity. An example of a recent extreme weather event in the UK to illustrate:,

Case Study

Causes

UK Snow and Cold Weather December 2010 ***Case Study***

Cold air mass from Russia in the East leading to coldertemperatures and lots of snow. Average Temperature -8.7°C, 3rd sunniest and driest December on Record. (clear skies let the heat escape so it is cold. Days are short so less daylight).

Social impacts = several old people froze to death after falling or suffering heart attacks outside. Road crashes killed several in Aberdeenshire, Kent and Eastbourne, NHS cancelled operations, schools closed for up to 3 days. 16 peopledied. People stranded in cars/trains e.g. train near Dorset stranded overnight. People stuck in cars on M5 for 16 hours. 7000 schools closed including CHS. Pipes froze, 400,000 in Northern Ireland has no water.

Economic impacts = cost £13 billion as people didn't go Christmas shopping or couldn't get to work. UK GDP fell by 0.5%. Gas deficit as gas supplies ran low (usage doubled)– some large factories reduced their operations. Flights cancelled and one plane overshot the runway at Newcastle. Gatwick and Edinburgh airports closed. Councils doubled the amount they usually spend on grit for roads. £1billion/day of losses for businesses forced to close. Farmers' incomes fell as crops and livestock died.

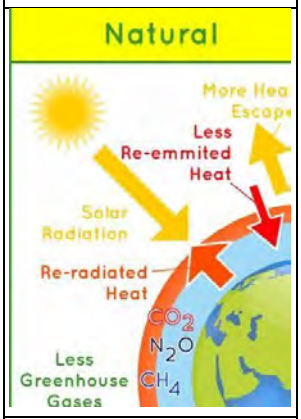
Environmental impacts = birds struggled to find food, 50cm of snow on hills, more CO2 pollution as gas use rose.

How management strategies can reduce risk of extreme weather hazards in the UK

Blizzards – weather warnings, gritting roads- councils stockpiled salt in 2010, emergency service planning, Cold December 2010-was forecast 1 month earlier.

Heavy rainfall – reservoirs to store water, dredging, weather warnings

7- Climate change is the result of natural and human factors, and has a range of effects.



Evidence for climate change from the Quaternary period to the present day

Ice cores, pollen analysis and tree rings give evidence of past climate.

Quaternary period = 2.6million years ago until the present day. The climate has varied over this time → cold glacial periods lasting 100 000 years and warmer interglacial periods lasting approximately 10 000 years.

Last glacial period - ended about 10 000 years ago. Temperatures are continuing to rise.

Recent temperature rise - 1 degree higher than 1850-1900 average.

Causes of climate change:

•• **natural factors** –

orbital changes → earth's orbit can be more elliptical (egg shaped) so the amount of solar radiation decrease and the climate cools;

volcanic activity → in the short term eruptions add ash and sulphur dioxide to the atmosphere which can cool the climate by reflecting the sun's rays;

solar output → the sun sometimes emits more heat over cycles of 11 years and several hundred years although this doesn't have a big impact.

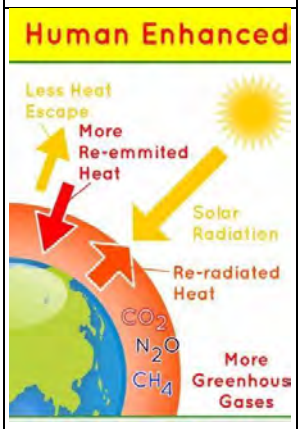
•• **human factors** –

use of fossil fuels → emits greenhouse gases like carbon dioxide which trap more heat within the atmosphere;

agriculture → rice paddies and cows produce methane which is a greenhouse gas;

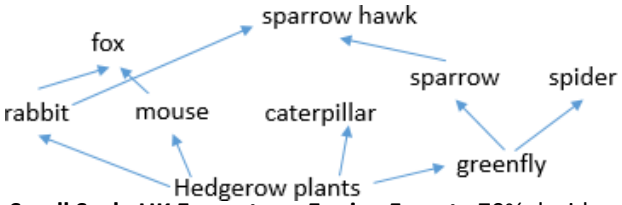
deforestation → deforestation means there are fewer trees taking in carbon dioxide through photosynthesis so the level of carbon dioxide in the atmosphere rises leading to an enhanced greenhouse effect.

The challenge of natural environments: Weather hazards and Climate Change

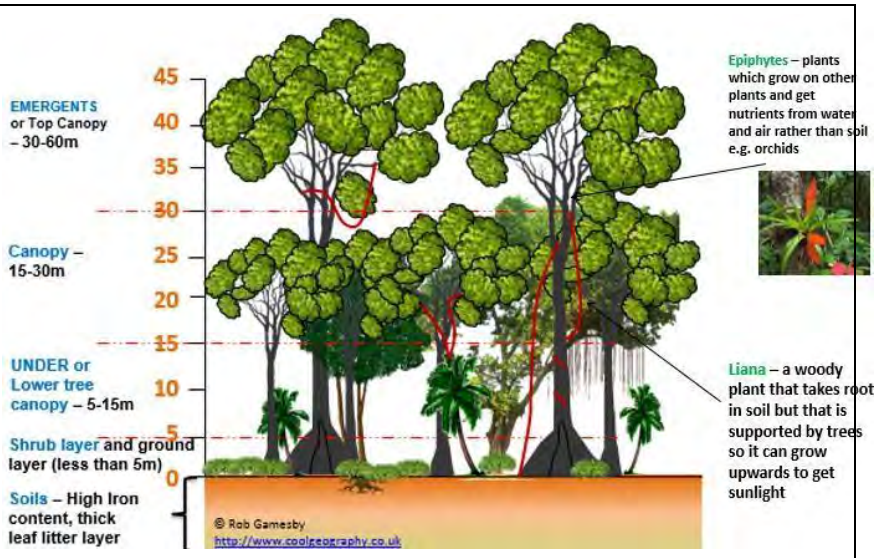


Overview of the effects of climate change on people	**Overview of the effects of climate change on the environment**
- Heat wave deaths -Flooding from sea level rise or intense rainfall → deaths, damage to property -Changes to farming → loss of crops in droughts, new species grown e.g. grapes in the UK -Reduced farming output → malnutrition e.g. sub-Sahara Africa More frequent wild fires e.g. California, Turkey, Siberian Arctic -Damage from increasingly extreme weather e.g. hurricanes, floods in Germany 2021. -Political problems e.g. fighting over water, deciding who is responsible for the damage caused by climate change.	-Melting of glaciers and ice sheets e.g. Greenland → sea level rise → flooding e.g. Maldives → loss of coastal habitats, people are displaced -Warmer seas → habitats change so species cannot survive e.g. coral bleaching, Great Barrier Reef has more frequent bleaching now. -Rainfall patterns are changing e.g. moreintense rainfall in the UK -Biodiversity is changing → some species are moving to higher latitudes as temperatures become warmer. Some species are no longer able to survive in their habitats so may become extinct.

8- Managing climate change involves both mitigation (reducing causes) and adaptation (responding to change).	**Mitigation** = the action of reducing the severity / amount of climate change → stopping temperature rises *Alternative energy production* → solar panels, wind turbines to reduce the amount of fossil fuels being burnt and the amount of carbon dioxide released; *carbon capture* → capturing carbon dioxide emitted by power stations and storing it underground; *planting trees* -> more photosynthesis so more carbon dioxide taken in from the atmosphere; *International agreements* → countries deciding to reduce carbon emissions e.g. 2015 Paris agreement **Adaptation** = Actions taken to help society to adjust to climate change. *Change in agricultural systems* → farming crops that can survive in warmer climates e.g. soya beans and grapes in southern England, creating new varieties which can be drought resistant e.g. millet in Kenya *Managing water supply* → water meters to reduce water waste, rainwater collection, pumping water from aquifers, desalination of sea water; *Reducing risk from rising sea levels* → building defences e.g. Thames barrier, modifying houses e.g. stilts in Bangladesh, creating shelters to cope with flooding.

Key idea	Specification content
1. Ecosystems exist at a range of scales and involve the interaction between biotic and abiotic components.	**Ecosystem:** A community of plants and animals that interact with each other and their physical environment. **Biotic:** living things. **Abiotic:** non living things **Producer:** An organism that uses energy from the sun to create its own food **Consumer:** An organism that eats other things in order to get energy **Decomposer:** An organism that breaks down dead material to get energy. Decomposition releasesnutrients into the soil that are taken up by plants. Decomposers operate at all levels in the food chain/web.  **Food chain:** The connections between different organisms that rely on one anotheras their source of food. *Hedgerow food chain = blackberry → mouse → fox* **Food web:** a complex hierarchy of plants and animals relying on each other for food. **Small Scale UK Ecosystem- Epping Forest.** 70% deciduous forest with birch, beech and oak. Also has grasslands, marsh. Bluebells grow under the canopy to catch light in Spring before leaves out. Av. Temp 14°C, total rainfall 780mm. Trees need lots of water and growth is faster where temperatures above 0°C. Foxes and owls are top predators. Large biomass and soil nutrient levels as decomposition is rapid. Pressure from tourism and urban sprawl.
	<u>The balance between components</u> **Components in an ecosystem =** the abiotic and biotic things in the ecosystem e.g. animals, plants, rainfall, soils. **The components interact with each other e.g** … the plants use the soil to obtain nutrients then when theplant dies its leaves decompose and the nutrients return to the soil. **<u>The impact on the ecosystem of changing one component</u>** **Components are dependent upon each other =** a change to one component will have an impact uponthe rest of the ecosystem. **Hedgerow example:** disease affects the population of foxes → fewer rabbits and mice eaten → numberof rabbits and mice increases →more animals eating hedgerow plants → amount of hedgerow plants decreases → population of mice and rabbits declines.
	<u>Section C.</u> **<u>An overview of the distribution and characteristics of large-scale natural global ecosystems.</u>** Very large ecological areas on the earth's surface (or biomes), with fauna and flora (animals and plants) adapting to their environment. Examples include tropical rainforest and hot desert.

Ecosystem	Location	Climate	Vegetation
Polar	North and south pole	Very cold winters and short cold summers, little precipitation.	2 month growing season, little vegetation mainly mosses.
Tundra	60 to 70 degrees north	Very cold winters, short summers, little rainfall	Permafrost. Mosses, grasses, low shrubs.
Temperate deciduous woodland	50 degrees north of the equator	4 seasons, warm summers, mild winter, rain all year	Deciduous trees = lose leaves inwinter to retain moisture.
Mediterranean	40 to 45 degrees north of the equator	Warm wet winters, hot dry summers	Shrubs and small trees e.g. olive, lemons and oranges.
Temperate grasslands	30 to 40 degrees north of the equator. Inland.	less rainfall but seasonal temperature variation, warm summers, cold winters.	Grasses no trees e.g. Central USA
Hot desert	30 degrees north and south of the equator	Little precipitation, very hot it the day, cold at night.	Few plants, all adapted to dry conditions
Savannah grasslands	15 to 30 degrees north and south of the equator	Hot all year. Wet and dry seasons but low total rainfall	Grasses with some scattered trees.
Tropical rainforest	Close to the equator	Hot and with high rainfall all year.	Dense, layered forests

2. Tropical rainforest ecosystems have a range of distinctive characteristics.	**<u>Section A</u>: The physical characteristics of the Amazon rainforest** <u>**Climate**</u> – Warm all year between 26 and 28 ^{O}C. Rainfall all year, highest between January and April (270mm/month), lowest in August (56mm). <u>**Soils**</u> – very thin and low in nutrients as the many plants take up the nutrients quickly. High iron content as rainfall removes nutrients.  <u>**Plants**</u> – dense vegetation as the climate is perfect for photosynthesis through the year. Layers of vegetation. Evergreen trees as the temperature range is so small so leaves can be grown easily all year round. <u>**Animals**</u> **-** There are lots of animal species as the vegetation layers create a range of habits and the climate is able to produce lots of vegetation through the year as food.
	<u>Section B</u>: The interdependence of climate, water, soils, plants, animals and people. <u>*Soil depends upon the climate*</u> –warm and humid conditions allow rapid decomposition to create soils. <u>*Soil depends upon plants*</u> – rapid uptake of nutrients and water, dead leaves decompose and become soil <u>*Plants depend upon the climate*</u> – determines the amount of photosynthesis, determine the adaptations <u>*Plants depend upon animals*</u> – eating them, distributing seeds <u>*Animals depend upon plants*</u> – provide habitats and food, animals adapt to live in a forest <u>*Animals depend upon the climate*</u> – animals adapt to the climate.
	<u>Section C</u>: How plants and animals adapt to the physical conditions <u>Plant adaptations</u> ***Buttress roots*** – to support tall emergent layer trees in shallow soils ***Waxy leaves with drip-tips*** – rain can run off without damaging the plant or creating standing water for fungi to grow in ***Climbing plants*** – so they can climb up high to reach more sunlight for photosynthesis e.g. vines <u>Animal adaptations</u> ***Gliding*** – flaps of skin so they can glide between trees and avoid the forest floor where there are predators e.g. flying squirrel. ***Camouflaged*** –Blue Morpho butterfly has brown wings underneath to blend in and avoid predators. **Poison**- the blue morpho releases poison that tastes bad to predators ***Swimming*** – can cross the many river channels to find new areas to hunt in e.g. jaguars.
	<u>Section D</u>: Issues related to biodiversity. **Biodiversity =** number of plants and animal species living in an area **Rainforests have a high biodiversity** – over 50% of the world's species live in rainforests that cover only 7% of the world's land. **Why?...**The hot, wet conditions make the rainforest very productive as photosynthesis occurs all year → large numbers of plants grow → species adapt to compete for light → layers of vegetation → animals evolve to become very specialised (particular habitat and food source → many animals can lives in the same area. **Issues…**Biodiversity is useful for humans as it provides medicines and food. Rainforest biodiversity is undertreat due to deforestation and climate change.
3. Deforestation has economic and environmental impacts	**<u>Section A</u>: Changing rates of deforestation** <u>Rate of deforestation today</u> = 300 000 km^2 per year <u>Change to deforestation rates over time</u> = the global deforestation rate has slowed, Brazil's deforestation rate has decreased significantly. Some areas including the Indonesia, Borneo and Nigeria have increased rates.

3. Deforestation has economic and environmental impacts	**<u>Section B</u>: Causes of deforestation in the Amazon:** *Since 1978, 750 000 km^2 has been destroyed by deforestation. Burning encouraged in 2019 by Brazilian president to improve economy.* ***Subsistence farming*** – A type of agriculture producing food and materials for the benefit only of the farmer and his family. Small areas of forest cleared and the trees burnt, allowed to regrow after 5-10 years. *e.g. in indigenous communities in Jau.* ***Commercial farming*** – Farming to sell produce for a profit to retailers or food processing companies soya beans and cattle e.g. *cattle ranching is responsible for 70% of the Amazon's deforestation* ***Logging*** – The business of cutting down trees and transporting the logs to sawmills. Often done illegally. ***Settlement*** – Brazil's population is increasing. Brazilian government offered poorer people in cities land in the rainforest e.g. Manaus ***Road building*** – leads to increased illegal logging as more areas of the rainforest are made accessible. ***Mineral extraction*** – The removal of solid mineral resources from the earth. Leads to roads and settlement. e.*g. Carajas, the world's largest iron ore mine.* ***Energy development*** – clearing land for hydro-electric power dams Also leads to more roads and settlement *e.g. Itaipu dam efect- made electricity 55% cheaper, 10,000 people had to leave* **<u>Section C</u>: Impacts of deforestation in the Amazon** • Soil erosion – trees removed → rainfall washes away nutrients through erosion and leaching → soil becomes infertile so farming stops → forest cannot regrow • Global warming – trees burnt down → CO^2 released + fewer trees → less CO^2 taken in through photosynthesis → more CO^2 trapping heat in the earth's atmosphere • Habitats lost → biodiversity decreases → giant anteater and Amazonian manatee become endangered • Economic development - Income for Brazil → $6.9billion from cattle trade. Employment → 7000 people employed by Carajas
4. Tropical rainforests need to be managed to be sustainable.	<u>Value of tropical rainforests to the environment.</u> • Trees lots of carbon helping to limit global warming • Regulates the water cycle by storing and transferring water – deforestation would lead to flooding and more variations in rainfall. • Habitats - over 50% of all species are found in rainforests <u>Value of tropical rainforests to people.</u> • Home to indigenous communities • Tourism • New medical resources using plant based chemicals
	<u>Section B</u> **Sustainable management** – using the rainforest in a way that doesn't damage it so the forest will last and meet the needs to society today and in the future. ***Selective logging*** – The cutting out of trees which are mature or inferior, to encourage the growth of the remaining trees in a forest or wood. Some trees remain so the soil is protected and there is still some habitat left. ***Replanting***- replacing habitats that have been destroyed ***Conservation***– Managing the environment to preserve, protect or restore it. E.g. Jau NationalPark, no new development, rangers to stop poaching and illegal logging. ***Education*** - Charities raising awareness about the need to protect the rainforest so they're more likely to buy sustainably sourced products and educating local people in less damaging ways to use the rainforest e.g. ecotourism, sustainable logging. ***Ecotourism*** - Responsible travel to natural areas that conserves the environment, sustains the wellbeing of the local people, and may involve education. It is usually carried out in small groups and has minimal impact on the local ecosystem e.g. *Mashpi ecotourism lodge in Ecuador*. ***International agreements about the use of tropical hardwoods*** – agreements between countries to protect the rainforest e.g. debt for conservation swaps, international standards for timer *e.g. Forest Stewardship Council mark to show that the timber is sustainably sourced.* ***Debt reduction***. Countries are relieved of some of their debt in return for protecting their rainforests. *E.g. USA cancelled $25million of Peru's debt in return for Peru spending some of the money on conserving the Amazon and the Amazon river dolphin.*

The Living World: Cold Environments Knowledge Organiser

The Physical Characteristics of Cold Environments

Climate	Water	Soils	Plants	Animals
• Polar areas are very cold (never normally more than 0°C) with winters below -40°C. • Tundra areas are cold. The summer maximum temperature is 10°C, and the winter temperature can reach -50°C. • clear seasons	• Rainfall is low. Less than 100mm in polar areas and less than 380mm in tundra areas. • Precipitation is mainly snowfall.	• Polar areas are covered in ice sheets. There is no soil. • In tundra areas there is a thin layer of acidic soil that is not very fertile. Underneath that is a layer of sub-soil that remains frozen (permafrost).	• Very few plants (e.g. lichens and moss) on the edge of polar regions where it is warmer. • Plants in tundra areas are low and grow slow (e.g. grass). • Small short trees grow occasionally in sheltered spots.	• few species • Polar areas have polar bears, whales, seals and walrus. • Tundra areas have lemmings, reindeer, wolves and Arctic foxes.

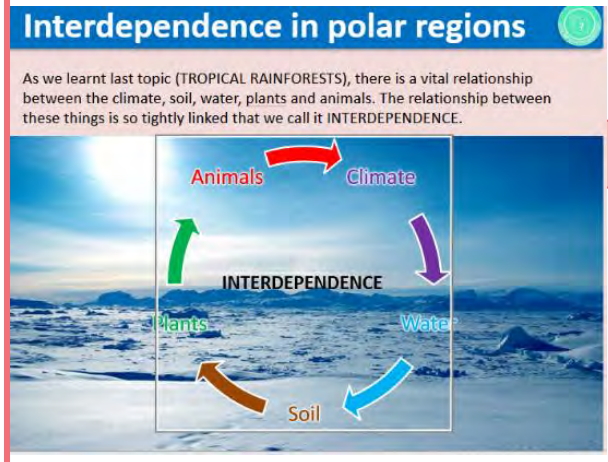
Issues Relating to Biodiversity

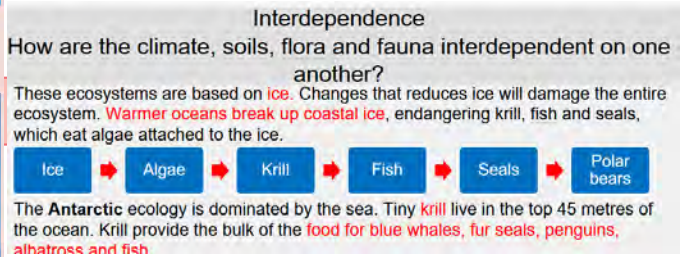
- Cold environments have a very low species biodiversity (especially in Antarctica).
- Low biodiversity means changes to one species can easily impact other species e.g. if lichen does not grow one year, reindeer will starve.
- Global warming is affecting biodiversity in two ways:

1. Some species are migrating towards the poles. They may become predators of the original inhabitants e.g. the red fox is stronger than the native Arctic fox.
2. Species that are adapted to cold environments may lose their natural habitats. The lemming population is declining in some areas due to changing conditions in their snowy habitat. This also results in less food for the Arctic fox, a natural predator of lemmings.

The Interdependence of Climate, Water, Soils, Plants, Animals and People

Climate, water, soil, plants, animals and people have a fragile and interdependent relationship (they depend on each other). For example:





Plant Adaptations

- Plants adapt to cope with the low temperatures, rainfall and high winds.
- Plants are small and round to survive high winds.
- Plants become dormant (stop growing) to survive the dark and cold winters.
- Most plants have shallow roots because of the thin soil and permafrost.
- Small leaves reduce the amount of water lost through transpiration.
- Plants can only grow in temperatures above 6°C and adapt to the short growing season (50-60 days) during the summer when the sun shines 24 hours a day.
- During summer the soil may be water-logged so plants must adapt to survive.
- Plants reproduce by growing runners and bulbs, rather than seeds. This is due to the high winds and short growing season.

Animal Adaptations

Animals adapt to find food and the harsh climate.

- Animals must be well insulated with a thick layer of blubber (e.g. seals). The musk ox keeps warm with its long, thick and hollow hairs which trap air close to the skin, insulating its body.
- Some animals huddle together to conserve heat (e.g. penguins) during the long winters.
- Many animals hibernate to survive the winter (e.g. Arctic ground squirrels line their burrows with insulators like musk ox hair, leaves, and lichens before winter. While they sleep, body temperatures drop to just above freezing, and breathing and heartbeat slows down to conserve energy).
- Some animals migrate to warmer areas in winter (e.g. caribou spend the summer months grazing in the tundra and migrate to warmer areas in winter.)
- Many animals are camouflaged to protect themselves from predators (e.g. Arctic foxes are white to blend in to the snow.)
- Polar bears have wide paws to stop sinking in the snow.

Case Study: Alaska

Development opportunities include:

Mineral extraction - silver, iron ore, copper and gold (Tintina gold belt) contributed $2.2 billion to the economy in 2013.

Energy - oil and gas account for over 50% of Alaska's economy. The Trans-Alaska oil pipe transports oil from the Prudhoe Bay oil field (which produces 400,000 barrels per day) to Valdez. Oil is shipped to mainland USA and around the world.

Fishing - 79,000 people are employed in Alaska's fishing industry. Fishing (for salmon, cod, pollock and crab) contributes $5 billion to the Alaskan economy.

Tourism - Alaska's scenery and wildlife attract 2 million tourists each year. This provides 1:8 jobs and brings $2.48 billion into the state each year.

Challenges to development include:

Alaska is the least populated state of the USA. It is large and remote, making prices and the cost of living high.

Extreme temperatures - death and injury can result from the extreme climate of Alaska. The lowest recorded temperature was -62.2°C in 1972 in Prospect Creek. The extreme north of Alaska has a tundra ecosystem with long, very cold winters and short, cool summers. Precipitation is low (less than 25cm per year), mostly as snow. Strong winds are also common.

Inaccessibility - the population of Alaska is very small but has the largest state by land area in the USA. About 50% of the population live in the Anchorage metropolitan area. The rest of Alaska is very remote.

In winter, roads become impassable due to snow and ice. Thawing permafrost in the summer months can also cause damage to roads.

Provision of buildings and infrastructure - building on tundra is difficult:

1. The permafrost can thaw easily, releasing CO^2. Any footprints/tyre tracks on the tundra will remain for several years. They allow more of the sun's heat to be absorbed by the ground, thawing out the permafrost.
2. There are 1000 earthquakes in Alaska each month and six magnitude 6-7 earthquakes a year.

The Trans-Alaskan Pipeline has overcome both of these issues. The pipe is on stilts to prevent the ground being heated up in some places and it is on sliders where the pipeline travels over a tectonic fault line.

Strategies to Balance the Needs of Economic Development and Conservation

Cold environments need sustainable management strategies, which allow development but do not damage the area for future generations:

Use of Technology - modern building methods can reduce the impact on the environment e.g. building on piles or stilts to prevent buildings thawing the permafrost.

Role of Government - governments must regulate development to prevent irreversible damage to the environment e.g. Russian and Canadian Biodiversity Action Plans (BAP) are internationally recognised programmes which protect/restore threatened habitats.

Laws/Acts can protect wilderness areas, for example the 1964 Wilderness Act protects large areas of Alaska from development.

International Agreements - agreements between countries to protect our planet, for example:

- Antarctic Treaty (1959) prevents large cruise ships (over 500 passengers) and nuclear testing in Antarctica.
- Kyoto Protocol (2005) has been signed by most countries to reduce global warming. This is important for the protection of tundra as global warming threatens this fragile ecosystem.

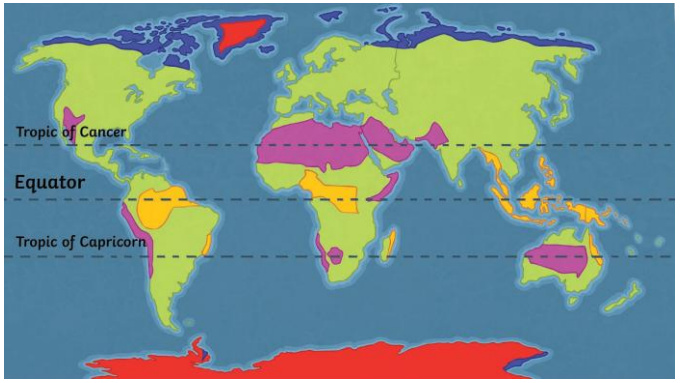
Conservation Groups - campaign for the protection of fragile ecosystems. In November 2017, Greenpeace took the Norwegian government to court over their plans to open up new areas of the Arctic to oil drilling.

The Value of Cold Environments andWhy They Should Be Protected

- Tundra is very fragile; small changes will destroy plant and animal life. Plant growth isvery slow; it takes a long time for Tundra to recover from any changes.
- Polar ice is melting. This provides hunting ground for predators (e.g. polar bears) which isbeing lost and these species face extinction.
- Melting polar ice causes sea levels to rise andcan change the temperature of the oceans.
- Oil spills can destroy habitats and kill animals
  e.g. the Exxon Valdez oil tanker spilt between 257,000 to 750,000 barrels of oil when it ran aground in Alaska's Prince William Sound. Up to 250,000 seabirds, 2,800 sea otters, 300 sealsand over 200 bald eagles were killed. The spill damaged over 1000 miles of Alaska's coastline.
- Tundra traps CO^2 in the permafrost. This is because the cold temperatures do not allow plants and animals to rot when they die, storingCO^2 in the ground. This CO^2 is released if the permafrost thaws, which could cause global warming.
- Tundra is a valuable wilderness area whichshould be conserved to protect the unique biodiversity found there.

Global Distribution of Cold Environments

- All of the world's tundra is found in the northern hemisphere (Antarctica is polar ice).
- Tundra is found within the Arctic circle (66°N).
- Polar ice ecosystems are found near the north pole (90°N) and the south pole (90°S).



Coastal Landscapes in the UK Knowledge Organiser

The Coast is Shaped by a Number of Physical Processes

Coastal Processes

Weathering Processes

Mechanical weathering - water expands when it freezes into ice, then contracts when it melts. This continual expansion and contraction can put pressures rocks and breaks them apart = frost shattering or freeze-thaw weathering.

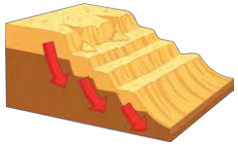
Chemical weathering - this is when water reacts with minerals in rocks and the chemistry of the rocks change e.g. solution.

Mass Movement (Sub-Aerial Processes)

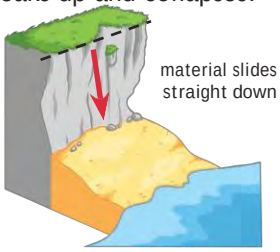
The shifting of loose material down a cliff. There are three main types:

Sliding - material shifts down a slope in a straight line.

Slumping - saturated soil and rock move down the slope (with rotation) over impermeable rock.



Rock falls - the base of the cliff is eroded, leaving the rock above unsupported. This breaks up and collapses.

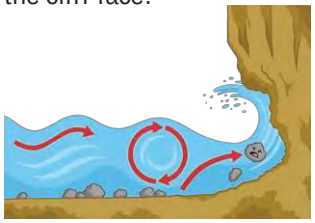


Erosion

Hydraulic power - as the powerful waves smash into cliffs, air is compressed in the small cracks in the rock. Tiny fragments of rock get blasted away as it repeats.

Attrition - eroded material in the sea bumps into each other and eventually wear each other down. Over time, the material becomes smaller and more rounded.

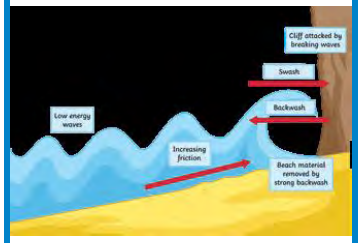
Abrasion - during storms, strong waves pick up rocks and sand. The material is then smashed into the cliff face. This can break off pieces of the cliff face.



Destructive waves carry out erosion.

Key characteristics:

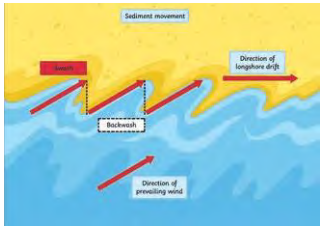
- steep and high waves;
- waves have a high frequency (10-14 waves per minute);
- the backwash is more powerful than the swash, removing material from the coast.



Transportation

Longshore drift - material is moved along the coast:

- waves travel in the same direction as the prevailing wind and hit the coast at an angle (swash);
- material is carried back down the beach at a right angle (backwash);
- material zig-zags along the coast.



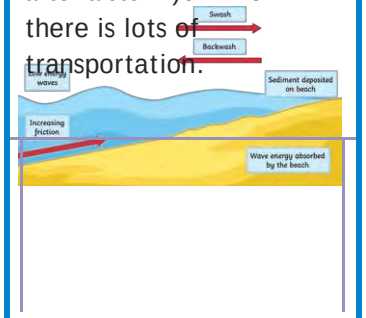
Deposition

Constructive waves deposit more material than they erode.

Key characteristics:

- low and long waves;
- low frequency waves (6-8 waves a minute);
- the swash is more powerful than the backwash, depositing material on the coast.

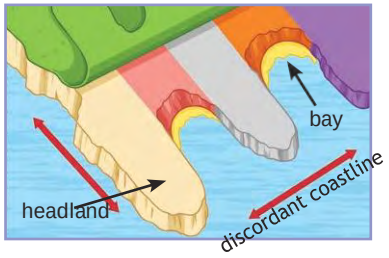
Material carried by seawater is deposited on the coast when it loses energy. More material will be deposited when there is lots of erosion (e.g. after a storm)or when there is lots of transportation.



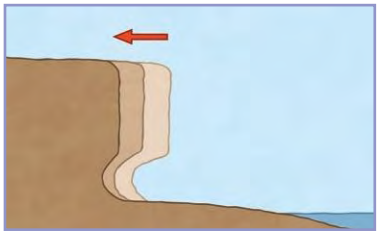
Distinctive Coastal Landforms - are the result of rock type, structure and physical processes.

Erosional Landforms

Headlands and bays - when a coastline is made up of different types of rock, they are called discordant coastlines. The rocks will erode at different speeds. The less resistant rock is eroded faster, forming a bay. The more resistant rock is eroded slowly, forming headlands at either side of the bay.



Cliffs and wave-cut platforms - waves cause most erosion at the foot of cliffs creating a wave-cut notch. The rock above will eventually collapse and the cliff will retreat, leaving a wave-cut platform in front of the cliff.



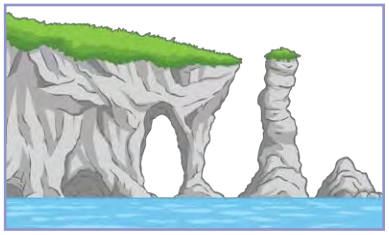
Headlands are normally made of resistant rock which do not erode easily, but cracks can develop into caves, arches and stacks.

Caves - hydraulic power and abrasion enlarge cracks in headlands creating caves.

Arches - caves continue to erode until they break through the headland creating arches.

Stacks - erosion will continue to weaken the rock supporting the arch until it collapses forming a stack.

Stumps - continuing erosion will lead to the collapse of the stack, leaving a stump.



Depositional Landforms

Beaches

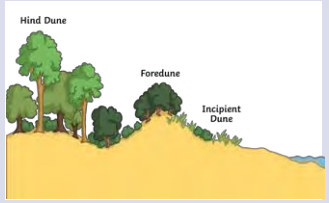
- In sheltered bays, deposition of sediment often leads to the formation of sandy beaches with a gentle slope.
- If cliffs are being eroded and there are high energy waves, this could lead to the formation of a pebble beach with a steep gradient.
- The profile of a beach is rarely smooth.
- At the top end of the beach you may find a storm beach where boulders and shingle have been deposited by the strongest waves in a storm. There may also be a line of shingle and sand below this called a berm - this marks the usual high tide.

Sand dunes - wind carries sand deposited by longshore drift up the beach to create sand dunes.

Incipent Dune - grass covered and changing

Foredune - larger vegetation and more stable

Hind Dunes - established soils, large vegetation, little affect from ocean spray/winds



Spits - form at sharp bends in the coastline. Longshore drift doesn't turn the corner so it takes the sediment out to sea forming a long, sandy ridge known as a spit. As the ridge extends into more open water, it is affected by waves and wind. This leads to the tip of the spit curving. Eventually, the sheltered area behind the spit can become a mudflat or salt marsh.

Bars - sometimes the ridge of sand can go all the way across the bay or river mouth; this is called a bar. A lagoon can develop behind the bar.

Example of UK Coastline

Chesil Beach

The Dorset coast has many features of coastal erosion:

A 30km tombolo (a type of bar which connects an island to the mainland) which encloses Fleet Lagoon.

Headlands and Bays

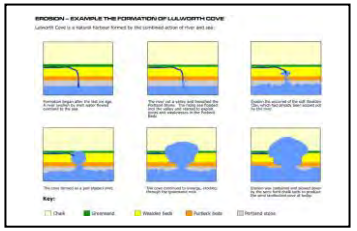
Formed along a discordant coastline, where resistant rock forms headlands (Ballard Point and Durlston Head) and softer rock erodes to form bays (Studland Bay and Swanage Bay).

Old Harry Rocks

A cave and a stack (Old Harry Rock) has been eroded from the chalk headland.

Lulworth Cove

A bay formed on a concordant coastline. Hard limestone has eroded at the front exposing soft clay behind which has eroded into a wide bay. Erosion at the back is prevented by harder chalk.



Different Management Strategies Can Be Used to Protect Coastlines from the Effects of Physical Processes

The Costs and Benefits of Management Strategies

Hard Engineering 1. Sea Walls

Made out of hard material (e.g. concrete) to reflect waves back out to sea.

Pros - prevents coastal erosion and flooding.

Cons - expensive to build and maintain. Can cause greater erosion downdrift due to waves reflecting off seawall.

2. Rock Armour

Large rocks dumped to absorb and reflect wave energy.

Pros - allows material to be deposited.

Cons - expensive. Boulders need to be transported long distances (e.g. from Norway).

3. Gabions

Wire cages filled with rocks to form a wall.

Pros - cheaper and easier than many other management strategies.

Cons - the wire cages corrode over time. Can be considered to be ugly structures.

4. Groynes

Wooden/stone fences built at right-angles to the coast.

Pros - traps material transported by longshore drift.

Cons - can be costly. Can cause greater erosion downdrift.

Soft Engineering 1. Beach Nourishment and Reprofiling Sand/shingle/pebbles shifted up the beach profile.

Pros - creates wider beaches which reduces erosion and flooding.

Cons - constant maintenance needed, especially after extreme weather/high tides.

2. Dune Regeneration

Creating/restoring sand dunes through beach nourishment or planting vegetation to stabilise sand.

Pros - provides a barrier between land and sea.

Cons - often limited to small areas as nourishment is expensive.

3. Managed Retreat - Coastal Realignment

Removal of sea defences to allow the formation of salt marshes.

Pros - cheap and easy. No maintenance. Prevents erosion and flooding elsewhere.

Cons - salt can alter ecosystems. Land and buildings will be lost - compensation cost could be high.

Example of a Coastal Management Scheme in the UK: Walton on the Naze, Essex

The town of Walton-on-the-Naze lies on the north-east coast of Essex, about 10 kilometres south of the port of Harwich. The town itself has a population of around 12,000 people although this increases with visitors during the summer.

The Reasons for Management

1. Tourist attractions- beach huts, Naze Tower, pier and promenade.
2. Houses worth over £500,000 on the sea front.
3. Cliffs are made of clay- London Clay and Red Crag so erode easily.
4. Longshore drift travels North East removing sediment from the town to the spit.

The Management Strategy

Rip Rap – Crag Walk- Placed in front of the Naze Tower lighthouse. Made from Leicester granite. Cost council £167,000 for 300 tonnes in 1998.

Groynes were used in front of Sunny Point Road, where houses are worth £400,000. Breakwaters, which are large groynes, were also placed at regular intervals.

Cliff regrading. The cliffs were bulldozed so they have a gentler slope. This prevents slumping. Drainage channels were added.

Managed Retreat- Do nothing approach in the north and land is less valuable and only Naze Tower is of value.

Effects and Conflicts

Do nothing was not an option in the south as the value of the town is too high. The groynes, sea wall, rip rap and cliff regarding have all slowed erosion to zero and made people feel safer. House prices continue to rise.

In the north Naze Tower erosion is 2m a year as sediment is trapped by groynes further south. The nature reserve there is under threat as will the sewage works in future decades.

The Naze nature reserve is a major tourist attraction so fewer people will visit. The high cost of defending this is not deemed worth it by the environment agency.

Geography GCSE: Paper 1 question 4.

Physical landscapes: River landscapes of the UK

1. Landscapes of the UK

2. The shape of river valleys change as rivers flow downstream

Section A

Fluvial processes = erosion, transportation and deposition

Processes of erosion in a river – HAAS

Hydraulic Action - The force of the river against the banks can cause air to be trapped in cracks and crevices. The pressure weakens the banks and gradually *wears it away*.

Abrasion - Rocks carried along by the river *wear down* the riverbed and banks by hitting against them.

Attrition - Rocks being carried by the river smash together and break into smaller, smoother and rounder particles. Rocks become smaller and rounder.

Solution - Soluble particles are dissolved into the river.

Vertical erosion – ↓downward erosion that deepens the channel, this is the main direction of erosion in the upper course.

Lateral erosion – ↔ horizontal erosion that widens the channel, this is the main direction of erosion in the lower course.

Section B

Processes of transportation in a river -

TSSS

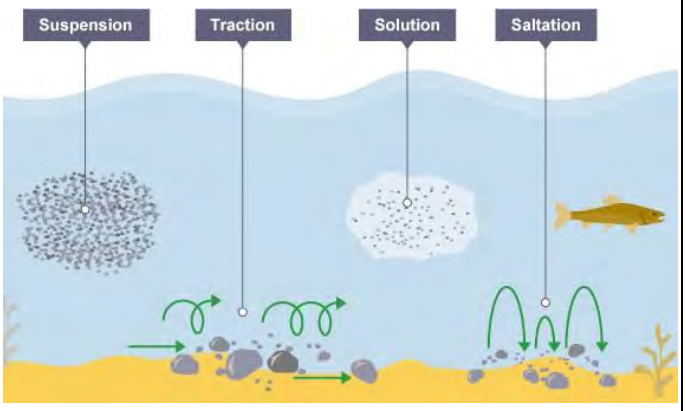
Transportation- carrying material

Traction - The rolling of boulders and pebbles along the river bed.

Suspension - Fine solid material held in the water while the water is moving.

Saltation -Particles bouncing down the river bed.

Solution - Soluble particles are dissolved into the river and carried downstream.



Process of deposition

Deposition – when a river drops the material it has been transporting.

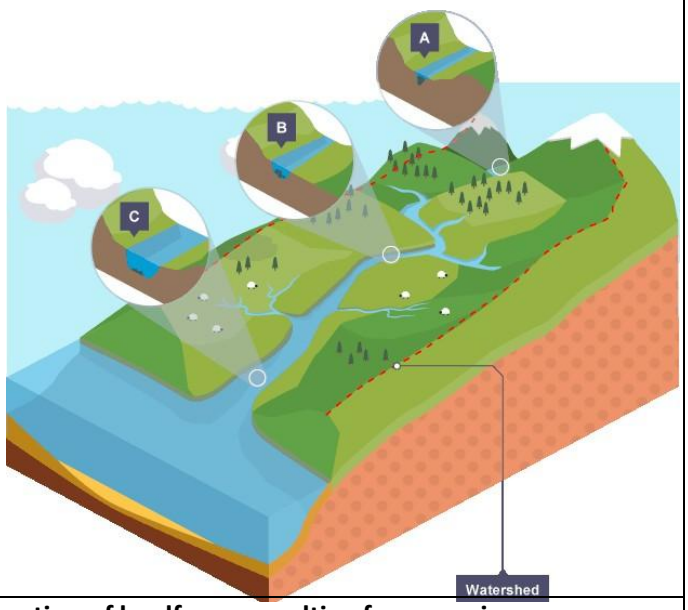
Why?- at meanders, the mouth and in shallow water the river's velocity slows → the river doesn't have the energy needed to transport material → large materials are deposited first as they are heaviest so need the most energy to transport → if the river becomes even slower small materials are deposited too.

Physical landscapes: River landscapes of the UK

Section C

The long profile – the line of the river from the source to the mouth
The cross profile – a cross section of the river's channel and valley.

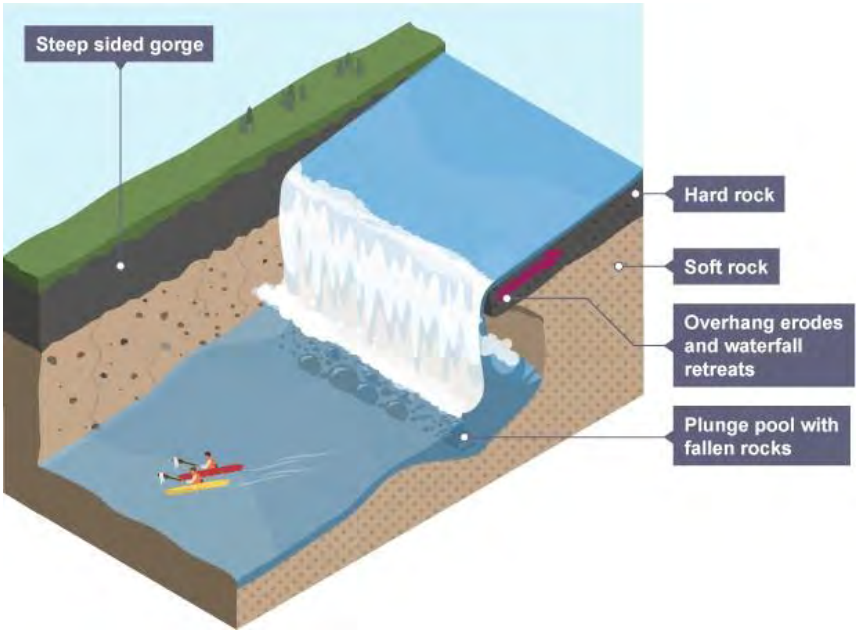
Long profile in the upper course – steep
Long profile in the lower course - gentle
Cross profile in the upper course – narrow and shallow channel with a V shaped valley
Cross profile in the lower course – wide and deep channel with an almost flat valley floor.



3. Distinctive fluvial landforms result from different physical processes.

Section A **Characteristics and formation of landforms resulting from erosion**

Waterfall.
Sudden descent of a river or stream over a vertical or very steep slope in its bed. It often forms where the river meets a band of softer rock after flowing over an area of more resistant material.

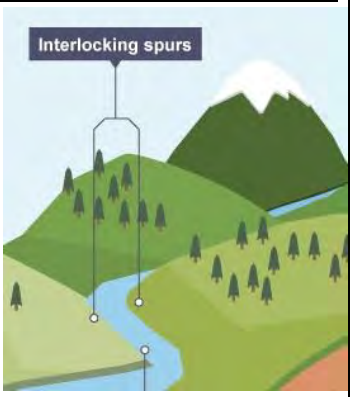


Formation

1. A river flows over hard and then soft rock.
2. Soft rock erodes away more rapidly → a step in the landscape forms.
3. The falling water erodes the base of the waterfall through hydraulic action → a plunge pool forms.
4. The falling water splashes backwards onto the soft rock → an undercut with an overhang above forms.
5. The undercut grows overtime → the overhang becomes too large to remain unsupported → the overhang collapses → the waterfall retreats upstream creating a gorge.

Section B

Interlocking spurs
A series of ridges projecting out on alternate sides of a valley and around which a river winds its course.



Formation

1. Vertical erosion occurs in the upper course but very little lateral erosion takes place→ the river cannot erode the hillsides
2. The river weaves around hillsides as it flows downstream → hillsides = interlocking spurs

Section C starts on the next page.

Physical landscapes: River landscapes of the UK

3. Distinctive fluvial landforms result from different physical processes.

Continued ….

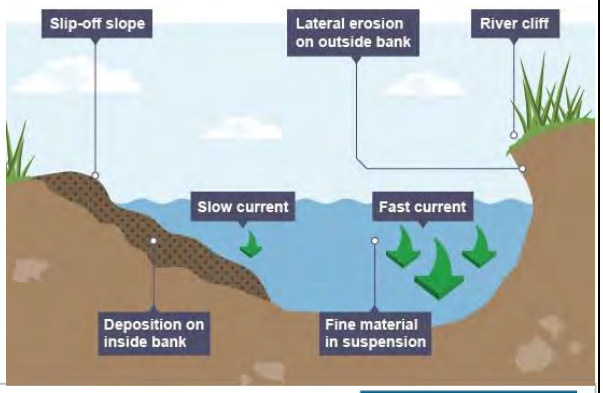
Section C **Characteristics and formation of landforms resulting from erosion and deposition**

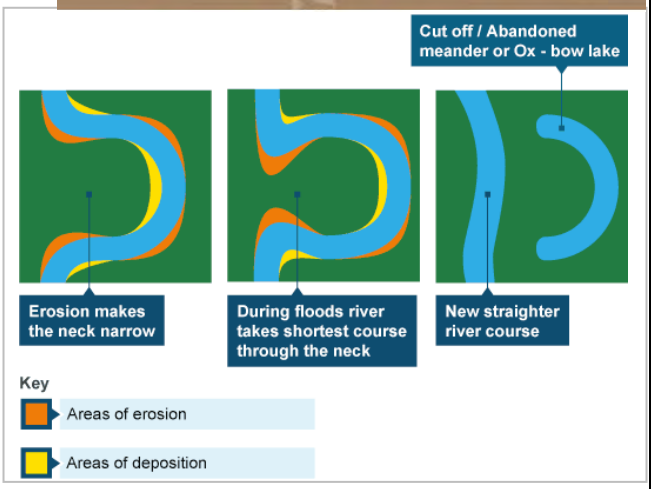
Meanders - A pronounced bend in a river.

Ox-bow lakes - An arc-shaped lake which has been cut off from a meandering river.

Formation

1. At a curve in a river, the water on the outside of the bend has a higher velocity.
2. More erosion occurs on the outside bends → creates a river cliff and narrows the meander neck
3. The velocity is slower on the inside bend →deposition occurs → slip off slope is created → a meander with an asymmetrical cross section is formed.
4. Erosion continues at the outside bends of a meander → overtime the neck of the meander becomes narrower
5. In a flood the water cuts through the neck → less water flows around the loop → the velocity is lower
6. Deposition occurs in the meander loop → it is cut-off to form an ox-bow lake while the river flows in a straight path.





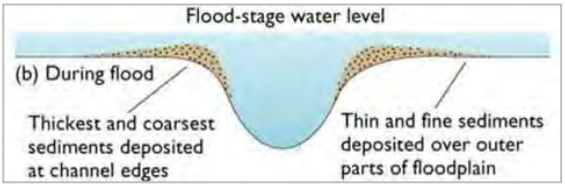
Floodplain - The relatively flat area forming the valley floor on either side of a river channel, which is sometimes flooded.

Formation

1. In the lower course the river erode laterally → interlocking spurs are removed to create a flat valley.
2. In a flood material is transported out of the river channel → the flood water has a low velocity → material is deposited
3. Over many floods layers of sediment build up → flat floodplains form either side of the river channel

Characteristics and formation of landforms resulting from deposition

Levees - Embankments of sediment along the bank of a river. They may be formed naturally by regular flooding or be built up by people to protect the area against flooding.



Formation

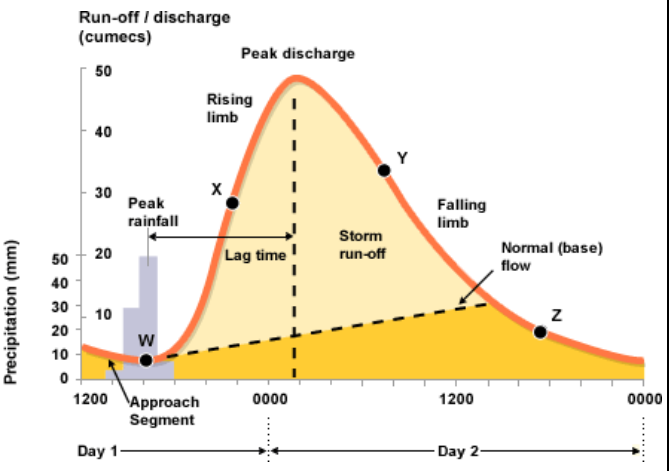
1. In a flood, material is transported out of the river channel.
2. The floodwater has a low velocity → A low velocity also means less energy to move objects → large material is deposited close to the channel and smaller material further away.
3. Over time, layers of sediment build up to create banks either side of the channel

Estuary - the tidal mouth of a river where it meets the sea; wide banks of deposited mud are exposed at low tide.

Formation

1. The river flows downstream carrying sediment
2. At high tide the sea enters the river → the river velocity slows → bedload is deposited towards the edges of the river channel
3. Large mud flats build up on the edges of the river channel and are visible at low tide.

Physical landscapes: River landscapes of the UK

4. An example of a river valley in the UK to identify its major landforms of erosion and deposition.	**<u>River Tees,. North East England</u>** ***Case study*///** **Source =** Cross Fell, Pennines 893m high. Moorland with 1200mm rain a year. **Mouth =** North Sea near Middlesborough. **V shaped Valleys =**around Cow Green Reservoir**.** **Waterfalls and gorge =** High Force, highest in England. 20m³ per second flow over it. 21m high. Hard rock on top is Whinsill. Soft limestone and sandstone underneath. **Meanders =** at Yarm. Some were cut off to make navigation easier by boats. **Floodplain =** Yarm and Stockton on Tees built on the flood plain. Levees also found along the banks. **Estuary** = wide estuary with mudflats and sandbanks. The estuary has industry with iron and steel, engineering and chemical works all along its length. However, parts of the estuary are very important sites for wildlife, such as seals, and migratory birds
5. How physical and human factors affect the flood risk – precipitation, geology, relief and land use.	**Human factors (land use):** <u>Urbanisation</u> – impermeable surfaces → no infiltration → more surface runoff AND drains → water goes directly to the river → ↑ flood risk <u>Deforestation</u> – less interception and transpiration → increased runoff to river →↑ flood risk **Physical factors:** <u>Heavy rainfall</u> – rain falls faster than it can infiltrate into the soil → more surface runoff →↑ flood risk <u>Prolonged rain</u> - Ground is saturated → no more infiltration → more runoff → increased flood risk <u>Relief</u> – steep relief → rapid surface runoff → ↑flood risk <u>Rock type</u> (geology) – permeability of rock affects percolation → affects volume of water entering the river. Impermeable = no percolation → more surface runoff →↑ flood risk
6. The use of hydrographs to show the relationship between precipitation and discharge.	**Hydrograph** A graph which shows the discharge of a river, related to rainfall, over a period of time. **Lag time:** the time between peak discharge and peak precipitation. It shows how long it takes for precipitation to reach the river. <u>A short lag time means</u>… there has been lots of fast surface runoff into the river instead of slow infiltration and percolation. **Peak discharge:** this is the highest discharge the river has during a storm event. <u>A high peak discharge means</u> … most of the precipitation reached the river rather than being stored in the soil and rocks, or on plants' leaves. 
7. Different management strategies can be used to protect river landscapes from the effects of flooding	***The costs and benefits of hard and soft engineering strategies:*** ***Hard engineering***: Involves the building of entirely artificial structures using various materials such as rock, concrete and steel to reduce, disrupt or stop the impact of river processes. <u>Dams and reservoirs</u> ☺ holds back water to prevent floods, last a long time, generate HEP, water storage for industry/locals ☹ expensive, eyesore, floods the land behind the dam, damages habitats <u>Straightening</u> ☺ increases river velocity so reduces flooding in that area, not an eyesore ☹ can damage habitats, passes problem on downstream, cannot be done where buildings already surround the river <u>Embankment</u> ☺ increase the river's capacity so reducing flooding in that area ☹ passes problem downstream expensive, can be an eyesore, if they break floods can be catastrophic <u>Flood relief channels</u> ☺ reduces the height of the river in the main channel, can create new wetland habits ☹ may flood where the relief channel re-joins the main channel (continued on next page)

Physical landscapes: River landscapes of the UK

7. Different management strategies can be used to protect river landscapes from the effects of flooding ***continued….***	***Soft engineering:*** Involves the use of the natural environment surrounding a river, using schemes that work with the river's natural processes. Soft engineering is usually much cheaper and offers a more sustainable option as it does not interfere directly with the river's flow. Flood warnings and preparation ☺ costs are reduced as people can evacuate and move belongings ☹ floods still happen so damage is still caused. Floodplain zoning ☺ reduces costs of floods, reduces flood water as infiltration can occur if there are fields around the river ☹ not possible in areas which have already been built on Planting trees ☺ increases interception and transpiration so reduces river discharge, creates habitats ☹ takes a long time to grow, takes up farm land River restoration ☺ creates new habitat, little maintenance needed, reduces flooding downstream ☹ may create new wetland areas so taking up land, not possible if urban areas have built up along the river.
8. An example of a flood management scheme in the UK	**Why the scheme was required Shrewsbury Shropshire .** Several floods in 2000. Has flooded to >5m before; only 1 road in during floods. Steep slopes and town inside a meander. **The management strategy** ***Case study*///** ***- Management:*** 1. Demountable defences Frankwell car park 2. Flood plain zoning Shrewsbury Park. 3. Catchment management- tree planting in Plynlimon (the source) Clywedog Dam.

Social issues	• Some residents dislike their views being spoiled by barriers. • Danger to life may still exist by 2050 when defences are worn out.
Economic issues	• 1 flood cost 8million • £605,000 to repair defences after a flood in 2019. • Catchment management cost £30million.
Environmental issues	• Dredging not used as it harm river wildlife. • New habitats created in the forest and reservoir.

AQA GCSE Geography Paper 1 and 2 Exam Question Structure and Advice

Multiple Choice (1 mark) • **Format:** Choose the correct option from 4 choices. • **Tip:** Read all options carefully before answering. • **Learn key words** to make it easier	*Using Figure 2, calculate the mean volume of Arctic sea ice in April from 1980 to 2020. Shade one circle only.* *[1 mark]* *A 24 100 km3* *B 25 400 km3* *C 26 300 km3* *D 27 200 km*
Short Answer (1–2 marks) • **Format:** Usually one or two sentences, a gap fill or a definition. • **Develop the point** if it is 2 marks i.e. say more about it. • **Tip: Use key terminology** and keep it concise.	*Define a natural hazard.* *Give two push factors that encourage people to leave rural areas in LICs/NEEs.* *Give one reason for reduced domestic supplies of gas in the UK.* *Using Figure 1, compare the extent of Arctic sea ice in September 2020 with the average from 1981 to 2010.* *Using Figure 5 or Figure 6, give two primary effects of either volcanic eruptions or earthquakes* *Figure 8 is an example of a food _____. Orchid plants are an example of a _____. An increase in the number of jaguars is likely to _____ the number of monkeys.*

Explain/Outline/Describe (2–4 marks)
 	
• **Format:** Requires a **short paragraph.**
• **Command words:** Describe, Explain, Outline.
• **Structure:**
  • **Point –** State the fact.
  • **Example –** If asked.
  • **Explain/Develop –** Add detail or reason.
• **Tip:** For 4 marks, give **two developed points.**
	Outline how globalisation has caused economic change in the UK.
	Outline one way in which your chosen country is regionally important.
	
	Suggest how changes in the extent of Arctic sea ice are evidence of climate change
	
	'International agreements are essential for managing climate change.' Do you agree?
	Explain your answer. Use Figure 3 and your own understanding
	
	You have studied a coastal management scheme in the UK.
	Explain the effects of the scheme.
	
	Using Figure 14, describe the size and shape of the spit.

6-Mark Questions • **Format:** Extended response, often with a resource (map, graph, photo). • **Command words:** *Explain, Assess, Discuss.* o **Structure: Introduction** – Brief context. o **Two or three developed points** – Each with explanation. o **Use data or examples** from the resource. o **Tip:** Link points to the question focus. o	*Discuss how changing demand for food in the UK creates opportunities and challenges.* *Use Figure 13 and your own understanding.* *Explain why people continue to live in areas that are at risk from a tectonic hazard.* *Explain how river features are created by erosion and deposition.* *Suggest how urban greening can create opportunities in UK cities. box* *Use Figure 5 and your own understanding.*

AQA GCSE Geography Paper 1 and 2 Exam Question Structure and Advice

6 / 9-Mark Questions (with 3 SPaG marks) **Format:** Longer essay-style question. • **Command words:** *Evaluate, To what extent, Discuss.* • **Structure:** o **Introduction** – State your overall view. o **Paragraph 1** – Argument for. o **Paragraph 2** – Argument against / alternative view. o **Conclusion** – Balanced judgment. **Tip:** Use **case study detail** and connect to the question.	*To what extent can water and energy conservation make cities more sustainable?* *Suggest how deforestation in the tropical rainforest can be caused by a range of different activities. Use a case study.* *'Plants and animals need to have special adaptations to cope with extreme environments.'* *Discuss this statement.* *Both immediate and long-term responses are needed after a tropical storm.' Discuss this statement.* *Use Figure 7 and an example of a tropical storm you have studied* *To what extent is managing environmental issues, such as waste disposal, a challenge in cities in LICs/NEEs?* *Use Figure 2 and your own understanding.*
Skills (Interpret, Analyse, Evaluate) • **What it tests:** Use of geographical skills and data. • **Question types:** o **Interpret graphs, maps, photos** (e.g., "Describe the trend shown in the graph"). o **Complete a graph or table** (e.g., plotting data). o **Calculate figures** (e.g., percentage change, mean, range). o **Compare data sets** (e.g., "Compare rainfall in two locations"). • **Marks:** Usually 2–6 marks. • **Structure for AO3 answers:** o **Step 1:** Identify the pattern/trend (increase, decrease, fluctuation). o **Step 2:** Use **data** (quote figures, dates, percentages). o **Step 3:** If asked, **give reason** for the pattern. • **Maths tips:** o Show **working out** clearly. o Units matter (e.g., mm, km, %).	*Calculate the median value for the GNI data in Figure 6.* *Using Figure 16 (an OS map), describe the relief and drainage shown in grid square 0870.* *Using Figure 16, measure the distance along the Old River Witham between point X and point Y* *Using Figure 3 and Figure 4, what direction was the photographer facing when the photograph was taken?* *Shade one circle only. [1 mark]* *A North* *B South* *C East* *D West* *Figure 8 is a graph showing the net migration for selected countries 2014–2019. box* *Complete Figure 8 below using the following data.* *[2 marks]* *Country Net migration* *(thousands)* *Spain +200* *Sudan −25*