AQA GCSE Geography

Paper 1 – Living with the Physical Environment - Knowledge Organisers

Paper 1: Living with the Physical Environment - Overview

A - Natural Hazards

- ❑ Tectonic hazards (earthquakes, volcanoes – causes, effects, responses) ***CS - LIC – Haiti 2010 / HIC – NZ 2011***
- ❑ Weather hazards (tropical storms, extreme UK weather) ***CS – Cyclone Idai, 2019 / UK Heatwave 2022***
- ❑ Climate change (causes, impacts, adaptation & mitigation strategies)

B - The Living World

- ❑ Ecosystems (global biomes, small-scale UK ecosystem) ***CS – Formby Woods***
- ❑ Tropical rainforests (characteristics, adaptations, value, deforestation causes & impacts, sustainable management) ***CS – Malaysia TRF***
- ❑ Hot deserts (opportunities, challenges, adaptations, desertification) ***CS – Thar Desert, India/Pakistan***
- ❑ Cold environments (development opportunities, challenges, sustainable management) **X**

C - Physical Landscapes in the UK

- ❑ Coastal landscapes (processes, landforms, hard & soft management strategies) ***CS - The Dorset Coast / Holderness Coast, east coast of England***
- ❑ River landscapes (fluvial processes, landforms, flooding, hard & soft management strategies) ***CS – River Tees / Banbury Flood Management Scheme***
- ❑ Optional: Glacial landscapes (if studied) **X**

Total Marks - 88

Paper 1 – Section A – Question 1 - Knowledge Organiser - Geography – AQA GCSE Geography - The Challenge of Natural Hazards

Tectonic Hazards

What are Natural Disasters?

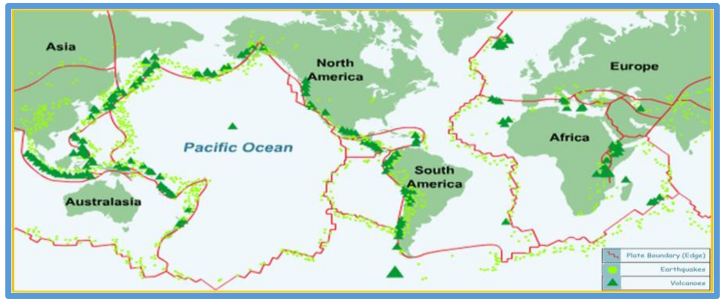
Natural disasters pose major risks to **people & property.** They are processes which cause **damage, injury & death.**

Types of Natural Hazards / Disasters:
Tectonic: earthquakes, tsunamis, volcanic eruptions
Atmospheric: Tropical Storms, Tornadoes
Geomorphological: floods, droughts, landslides, avalanches
Biological: forest fires

Factors Affecting Hazard Risk:
Population density: more people = higher risk;
Level of development: LICs less able to cope;
Urbanisation: more buildings & infrastructure at risk
Preparedness: planning reduces risk;
Poverty: limits ability to respond and recover.

Distribution of Tectonic Hazards

Earthquakes are found along all types of **plate margins** as shown on this map. Volcanoes, however, only occur at constructive and destructive plate margins.



Structure of the Earth

Crust: The thinnest layer, broken into tectonic plates.
Mantle: The thickest layer, composed of mostly solid rock that can flow very slowly.
Outer Core: A liquid layer composed of iron & nickel.
Inner Core: A solid sphere composed of iron & nickel.

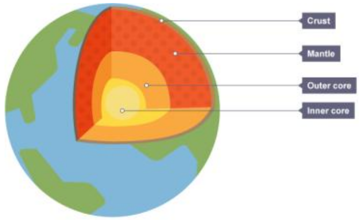
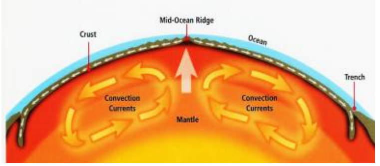


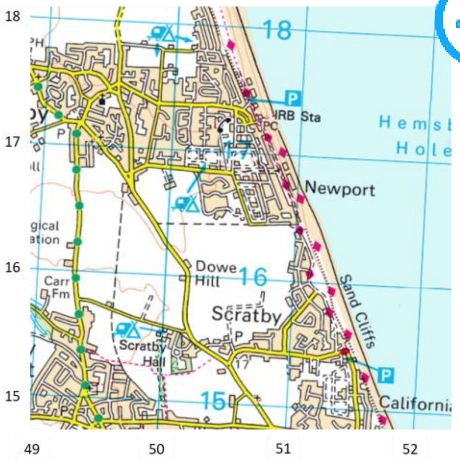
Plate Tectonics Theory

- The Earth's crust is split into **large slabs called tectonic plates**.
- These plates **float on the semi-molten mantle** & **move** due to **convection currents** in the mantle.



- Movement at plate boundaries causes **earthquakes**, **volcanoes**, and **mountain building**.
- The theory explains the **global distribution of tectonic hazards**.

Retrieval:



Causes of an Earthquake

Earthquakes take place along plate boundaries and major fault lines (cracks in the earth's surface).
An earthquake happens because of energy being released in the form of seismic waves after a build up of pressure at a tectonic plate boundaries.

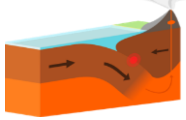
Primary (Effects During the Earthquake)

- Ground shaking
- Buildings collapse
- Ground splitting
- Liquefaction
- Deaths & Injuries
- Transport links damaged

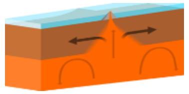
Secondary (Effects After the Earthquake)

- Landslides, Avalanches, Tsunamis
- Gas leaks & fires
- Power cuts.
- Contamination of water supplies
- Food Shortages
- Unemployment/damage to tourism industry

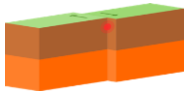
Different types of Plate Margins



Destructive Margins - The denser oceanic plate is forced down (subducted) into the mantle and destroyed. The melting plate is less dense than the surrounding mantle so rises to the surface to form volcanoes. A deep ocean trench is formed at the point of subduction. e.g. Nazca and South American Plates (creating The Andes).



Constructive Margins - As the two plates move apart, due to convection currents in the mantle, new magma rises from the mantle to fill the gap between them. It cools to create new crust and volcanoes. e.g. Eurasian and North American Plates (creating the Mid-Atlantic Ridge)



Conservative Margins - Two plates can move past each other either in different directions, or in the same direction but at different speeds. Crust isn't created or destroyed, so there are no volcanoes. e.g. North American and Pacific Plates.

Collision Margins - The two plates meet head on but are both the same density. This means no crust can be destroyed through subduction, so there are no volcanoes, and instead the plates are pushed upwards. e.g. Eurasian and Indo-Australian Plates (creating The Himalayas)

Management can reduce the effects of a tectonic hazard

Immediate Responses

- Warnings and evacuation if possible
- Rescue teams search for survivors/ bodies
- Treat injuries & Put out fires
- Provide shelter, food, water & medical supplies
- Aid from other countries/aid agencies
- Temporary shelters/water/electricity supplies

Long-Term Recovery

- Rebuild/repair damage
- Restore utilities
- Improve building regulations
- Promote economic recovery
- Rehome homeless people
- Improve monitoring/ prediction/warnings

How monitoring, prediction, protection and planning can reduce the risks

Monitoring - Earthquakes: Use **seismographs** to monitor tectonic movement (but harder to predict). **Benefit**: Gives early warning to authorities and the public.
Prediction - Earthquakes: **Hard to predict**, but historical data can identify risk zones. **Benefit**: Helps governments issue warnings and prepare emergency services.
Protection - Earthquake-proof buildings: e.g. shock absorbers, reinforced foundations. **Volcanic defences**: diverting lava (rare), designing roofs to withstand ash. **Benefit**: Reduces deaths and damage when hazards strike.
Planning - Evacuation routes, **emergency drills**, and **hazard maps**. Educating communities and training emergency services. **Benefit**: People know what to do, reducing panic and casualties.

Reasons why people live in areas at risk of tectonic hazards

Millions around the world live in areas of tectonic activity because:
- It is somewhere to live – family ties;
- Can provide economic opportunities;
- Can create tourism jobs;
- Can be rich in natural resources; and,
- People cannot move due to poverty.

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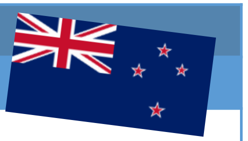
Paper 1 – Section A – Question 1 - Knowledge Organiser - Geography – AQA GCSE Geography - The Challenge of Natural Hazards

Management can reduce the effects of a Tectonic Hazard

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

HIC Case Study – Christchurch, New Zealand Earthquake 2011



Cause & Characteristics

Date: 22 February 2011 at 12.51pm.
Plates: Destructive boundary: Indo-Australian and Pacific plates.
Strength: Richter: 6.3 magnitude / **Mercalli:** 6 intensity.
Facts: 4% unemployed & $53,040 per capita

Primary Effects

Deaths & Injuries: 185 deaths and 2,000 minor injuries

Liquefaction: 400,000 tonnes of silt flooded homes and buildings.

Buildings collapsed: 10,000 houses damaged/destroyed. Canterbury television building and the spire of Christchurch Cathedral collapsed

Secondary Effects

Landslides: Landslides in some suburbs caused serious damage to buildings

Contamination of water supplies: Burst pipes have left many people without water supplies and usable toilets.

Power cuts: Power and telephone lines have been knocked out.

Gas leaks and fires: Fires contributed to many of the deaths in the Canterbury Television building and four died and could not be identified because the temperatures had been so high.

Cost of damage: total cost to insurers of rebuilding has been est. at $20–30 billion.

Immediate Responses

Search & rescue teams were deployed quickly, including from Australia, UK, USA, & Japan.
New Zealand Army helped with evacuations, cordons, and emergency aid distribution.
Emergency medical care was provided rapidly, including setting up field hospitals.
Christchurch's central business district (CBD) cordoned off to prevent injuries from collapsing buildings.
International aid and support were offered, although New Zealand had strong internal resources.
Temporary shelters set up for homeless.

Long-Term Recovery

$898 million NZD was provided by the New Zealand government for rebuilding.
Canterbury Earthquake Recovery Authority (CERA) established to manage reconstruction.
Building regulations were reviewed and strengthened to reduce future risks.
Infrastructure & housing rebuilt, with upgrades to make them more earthquake-resistant.
Psychological support services were offered to help people recover emotionally.
The **Red Zone** (badly damaged land) was designated as unsuitable for rebuilding, and people were relocated.

LIC Case Study - Haiti Earthquake 2010

Cause & characteristics

Date: 12 January 2010 at 16:53pm.
Plates: Destructive boundary : N. American & Caribbean Plates.
Strength: Richter: 7.0 magnitude / **Mercalli:** 8 intensity.
Facts: 40.6% unemployed & $1,800 per capita

Primary Effects

Deaths & Injuries - 316,000 killed and 300,000 injured.

Transport links damaged: The main port was badly damaged.

Buildings collapsing: 8 hospitals collapsed, 300,000 houses were either or damaged.

Secondary Effects

Homeless: 1.3 million people and many moved into temporary shelters.

Contamination of water supplies and Food Shortages: 2 million people were left without food and water.

Power Cuts: Frequent power cuts occurred.

Crime: increased - looting became a problem and sexual violence escalated.

Disease Outbreaks: By November 2010 there were outbreaks of cholera spread rapidly.

Cost of damage: $14 billion worth of damage

Immediate Responses

Search & rescue teams from countries like the USA, UK, and Dominican Republic were deployed.
Emergency aid (food, water, medical supplies) was flown in by international organisations.
Temporary shelters and tents were set up for the over 1.5 million people made homeless.
UN troops and police were sent to help keep order and distribute aid.
Field hospitals were established by countries such as France and Iceland.
Dead bodies were buried in mass graves to reduce the spread of disease.

Long-Term Recovery

Rebuilding of homes, schools, and infrastructure, often to improved standards – but 1 year on, over 1 million still living in temporary shelters.
Cash-for-work programs were introduced to help Haitians earn income while clearing rubble.
Support for agriculture and business development to rebuild the economy.
International aid commitments - $11.5 billion pledged by the UN and other countries.
Health care improvements and better training for local doctors and nurses.
Disaster risk reduction strategies, such as improved building codes and better preparation for future earthquakes.

Why the effects of, and the responses to, a tectonic hazard vary between areas of contrasting wealth: NZ vs Haiti.

- **Haiti suffered more** because it is a **LIC** with **limited resources**, **poor infrastructure**, and **weak government capacity**.
- **New Zealand** was better prepared with **strict building regulations**, **fast emergency response**, and **international support**.
- Even though Haiti's quake was only slightly stronger, the **socioeconomic context** made the disaster **far more deadly and damaging**.

Why Haiti Suffered More?

- Slightly stronger quake in Haiti.
- Haiti couldn't afford preparation or response.
- More people in poverty in Haiti = higher risk.
- Poor infrastructure and emergency services.
- Weaker building standards in Haiti.
- Haiti's infrastructure limited effective response.
- Haiti relied heavily on foreign aid, slow rebuild.
- Water and sanitation systems were worse in Haiti.

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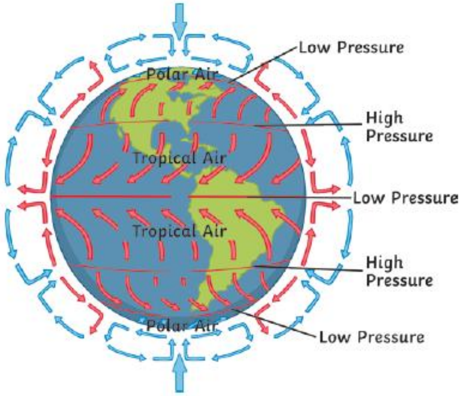
Paper 1 – Section A – Question 1 - Knowledge Organiser - Geography – AQA GCSE Geography - The Challenge of Natural Hazards

Weather Hazards

Global Atmospheric Circulation



Global atmospheric circulation causes tropical storms to develop in the tropics and depressions to develop in the UK.

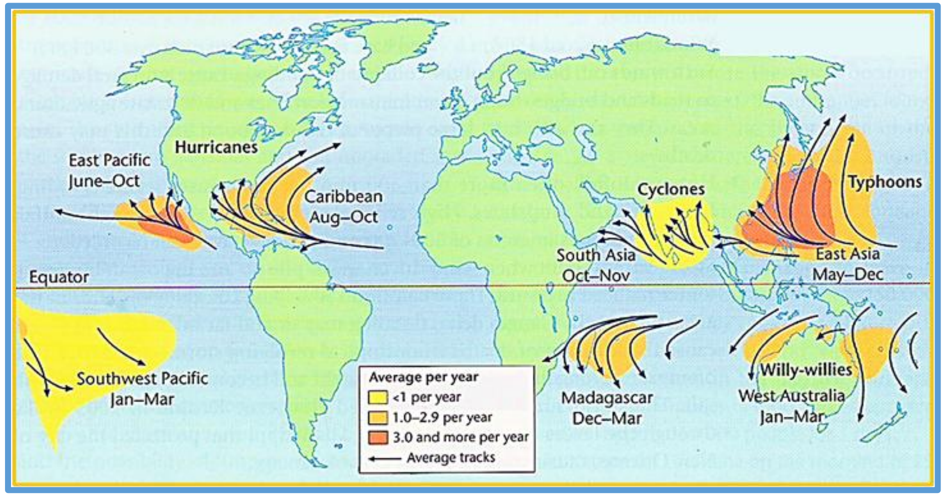
Monitoring Tropical Storms

Prediction / Monitoring – Scientists use satellite and aircraft data, to predict a path for storms.

Preparation - People use this information to prepare for the coming storm (e.g. boarding up windows and evacuating). Also, governments may plan and prepare for disaster scenarios with emergency services as well as plan evacuation routes from disaster-prone areas.

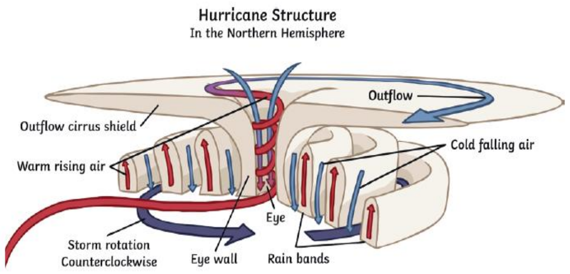
Planning - Future buildings can be protected from future storms by using reinforced concrete or by building on stilts. Flood defences and sea walls may also protect homes from future storms.

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



Tropical storms form near the equator, typically between **5° and 20° latitude** north and south.
Atlantic Ocean – called **hurricanes** (e.g., USA, Mexico, Caribbean islands)
Pacific Ocean – called **typhoons** (e.g., Philippines, Japan, China)
Indian Ocean – called **cyclones** (e.g., India, Madagascar, Australia, Mozambique)

The Structure & Features of a Tropical Storm

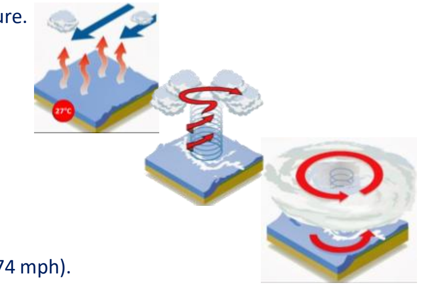


Tropical storms are circular (100 - 2000km in diameter).
The eye is an area of low pressure (sinking air) in the centre of the storm. It can be 30-300km wide.
The **eye-wall** consists of tall clouds that surround the eye of the storm. Here the air rises most rapidly, and the wind/rain is most severe.
Tropical storms lose energy as they travel over land or cooler water.

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

Warm Ocean Water: Sea surface temperatures must be at least **27°C** D
Deep Ocean Waters: Ocean depth of around 50 metres.
Coriolis Effect: Due to Earth's rotation, this causes the storm to spin. This effect is essential for the storm to develop a cyclonic structure and is why storms don't form near the equator (within about 5° latitude).

1. **Warm, moist air rises from the ocean**, creating low pressure.
2. **Air rushes in** to replace rising air, starting circulation.
3. **Coriolis effect** causes the system to spin.
4. **Storm clouds form** and grow as more air rises.
5. **Organised system develops** into a tropical depression.
6. **Strengthens into a tropical storm** (winds ≥ 39 mph).
7. **May intensify into a tropical cyclone/hurricane** (winds ≥ 74 mph).



Primary & Secondary effects of Tropical Storms

Primary effects (immediate impacts of the storm):
- **Strong Winds (≥ 74 mph)**
- **Heavy rainfall**
- **Storm Surges, leading to damage to buildings, infrastructure, and crops.**

Secondary effects (consequences after the storm):
- **Landslides**
- **Food & Water Shortages**
- **Spread of Disease**
- **Economic Disruption**

Immediate and Long-Term Responses to Tropical Storms

Immediate Responses
- **Emergency measures** designed to **search and rescue** people trapped by floods and debris and provide essential **medical care** for injured.
- **Evacuation** of people from danger zones
- **Rescue people** who have been cut off by flooding and treat injured people.
- **Set up temporary shelters** for people whose homes have been flooded or damaged.
- **Provide temporary aid supplies** of water, food, electricity, gas and communications systems.

Long-Term Recovery
- **Rebuilding** houses using strong, long-lasting materials.
- **Improved forecasting** and early warning systems to give people more warning in the future.
- **Stronger building regulations** and land-use planning designed to withstand tropical storms, e.g. by using reinforced concrete.
- **Buildings put on stilts** so they're safe from floodwater and storm surges.
- **Education** on storm preparedness

How climate change might affect tropical storms

Distribution - Storms may occur in new areas as oceans warm (further from the equator).
Frequency - Total number of storms may stay the same or decrease slightly.
Intensity: - More powerful storms (Category 4 & 5) due to warmer seas. Heavier rainfall and stronger winds expected. Slower-moving storms could increase flood risk.

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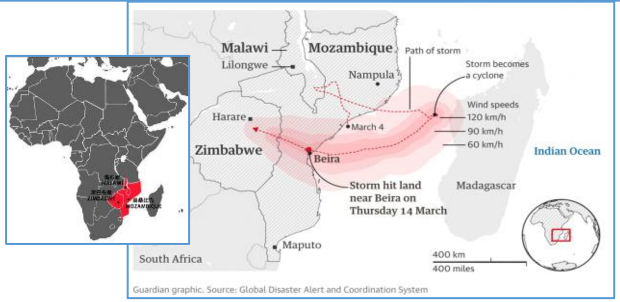
Weather Hazards

Tropical Storm Case Study - Cyclone Idai, 2019

Location – Southeast Africa - Mozambique, Zimbabwe & Malawi.
Landfall - Near the port city of Beira, Mozambique on 14 March 2019.
Saffir-Simpson scale - Category 2.
Overview - Despite not being the highest category, it caused catastrophic flooding and destruction, making it one of the deadliest and most damaging storms in African History.
Cost - Estimated damage of $3.3 billion.



Primary Effects (immediate impacts of the storm):

- Over 1300 **people killed**;
- **Winds** up to 120 mph **damaged buildings and infrastructure;**
- 90% of the Port city of Beira (Mozambique) severely damaged;
- **Power & communication lines damaged** in Beira;
- All 17 **hospitals and numerous schools damaged or destroyed** in Beira;
- **Flash flooding** destroy homes and roads crops, and livestock washed away in Zimbabwe.

Secondary Effects (consequences after the storm):

- **Mudslides** hampered rescue efforts in Zimbabwe.
- **Power cuts** as floods caused two hydro-electric power dams to collapse in Malawi.
- **Lack of clean drinking water** and sanitation
- **Cholera outbreaks** - 4000 cases in Beira.
- **Food shortages** caused by over 700 000ha crops destroyed by flooding & damaged transport routes in Mozambique & Zimbabwe
- **Homelessness** and 125,000 **displaced** in Mozambique= Over 3 million people were affected.

Immediate Responses

- **Emergency Measures** - State of Emergency was declared in Malawi.
- **Evacuation** - Over 140 **evacuation centres** were set up to cope with displaced people in Mozambique.
- **Rescue People** - Malawi Military deployed for search and rescue. Mozambique's National Disasters Management Institute used boats and helicopters to rescue people stranded.
- **Temporary Shelters** - Churches and schools acted as temporary shelters. Helicopters supported villages cut off by floods.
- **Aid** - The UK sent £18million of aid to Mozambique in the form of food, water and shelter kits.
- **Medical Care** - The WHO (World Health Organization) provided 900 000 cholera vaccinations and anti-mosquito nets (to tackle malaria) to Mozambique.

Long Term Recovery

- **Rebuilding -** CAFOD (Catholic Agency for Overseas Development) spent over £2 million supporting families and helping communities rebuild their lives. Schools were rebuilt, and seeds and agricultural advice provided for local farmers
- **Stronger building regulations -** Mozambique adopted the UN principle of 'Build Back Better' to ensure that all new buildings are constructed to withstand future disasters.
- **Improved forecasting -** New early warning system setup to increase awareness and preparedness.
- **Education** - In Beira, engineers restored water supplies and a strong pre-disaster WASH (WAter, Sanitation and Hygiene) campaign in rural areas limited the spread of disease.

Types of UK Extreme Weather Hazards

Flooding - Caused by prolonged rainfall, intense storms, or river overflow. **Examples:** Somerset Levels floods (2014) **Impacts:** property damage, transport disruption, contaminated water.

Storms - Strong winds and heavy rain from Atlantic low-pressure systems. **Examples:** Storm Eunice (2022). **Impacts:** fallen trees, power outages, travel disruption.

Snow and Ice Blizzards - Particularly in northern and upland areas during winter. **Examples:** "Beast from the East" (2018). **Impacts:** transport chaos, school closures, health risks (e.g., hypothermia).

Heatwaves - Extended periods of unusually high temperatures. **Example:** UK Heatwave (2022, 40.3°C). **Impacts:** dehydration, wildfires, strain on health services. **Drought** - Extended dry periods with low rainfall. **Impacts:** crop failure, hosepipe bans, water supply issues.

Fog - Especially common in autumn and winter. **Impacts:** Major travel delays and road accidents.

Thunderstorms - Short but intense, with lightning, hail, and flash flooding. Becoming **more frequent** due to climate change.

Extreme UK Weather Event Case Study

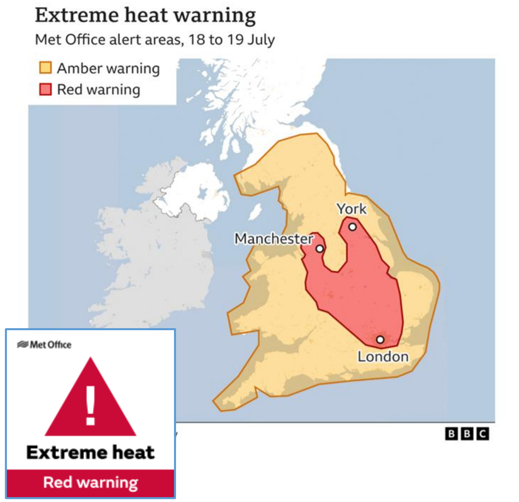
UK Heatwave - 16–19 July 2022

Causes
40.3°C temperatures recorded on 19 July – **new UK record**, beating 2019's 38.7°C. First time UK exceeded **40°C**, leading to **Red Weather Warning**

Social, Economic & Environmental Impacts
Social:
Red Warning Zone - **I**ssued from Manchester to South London
Transport Disruption - Trains cancelled as tracks buckled in heat.
School & Work Disruption - Pupils allowed to wear PE kits, leave early, or miss school. Some classrooms closed.
Health Impacts - Dehydration, heat stroke, breathing difficulties

Economic:
Cost - Estimated £77 million lost due to missed work.
Travel and infrastructure disruptions effecting trade links

Environmental:
Increased wildfires – especially in London, Yorkshire, and Norfolk. Fire services in London experienced their busiest day since WW2.
Crop failure – Heat stress reduced yields of key crops like wheat and barley.
Drought conditions – Low rainfall led to dry soils and water shortages.



How Management Strategies Can Reduce Risk.
- Government told people to **work from home**
- **NHS Response -** Most people **stayed at home**
- NHS brought in **extra staff** for heat-related cases / Advised drink lots of water / Shut windows and curtains / Use fans/unplug chargers / Keep bedding/pillows cool / Sleep on lower floors

Evidence That Weather Is Becoming More Extreme In The UK
- Caused by **rising greenhouse gas emissions**
- Scientists predict more frequent and intense heatwaves

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Climate Change

Causes of Climate Change:

Human Causes

Increase burning of fossil fuels for energy (coal, oil & gas): Give off CO2, Methane & Nitrous Oxide

Increase in Agriculture: Cows give off Methane gases which warms up the atmosphere.

Increase in Deforestation: More trees being cut down year on year meaning less trees to take in CO2.

Natural Causes

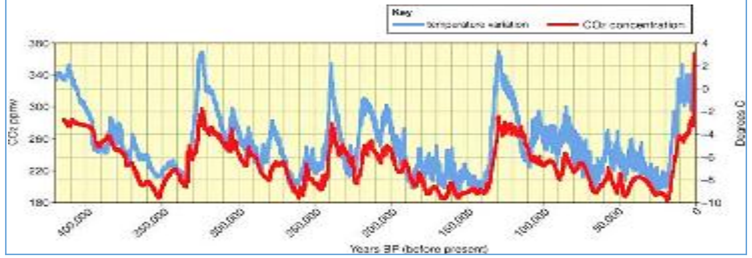
The earth's oceans are warming: This is releasing tonnes of Methane gases into the atmosphere.

Volcanic eruptions: Give off gases like sulphur dioxide which stay in the atmosphere for years.

***Milankovitch* fluxes in the Earth's orbit of the sun:** Cause eras of intense/short-term climate change.

Changes in Global Climate :

The Earth's climate has naturally fluctuated over this period between glacial (cold) and interglacial (warm) phases.



Effects of Climate Change:

Effects on People

Increase in malaria: morbidity, mortality, decrease in economic activity, poverty.

More Extreme Weather: Increases deaths from heatwaves, storms, and flooding.

Food Insecurity: Droughts reduce crop yields (e.g., in Africa and Asia).

Water Stress: Less rainfall in some regions = water shortages.

Health Issues: Rise in diseases like malaria and heat-related illnesses.

Migration: Climate refugees forced to leave homes due to rising seas or drought.

Economic Costs: Damage to homes, infrastructure, and loss of livelihoods.

Effects on the Environment

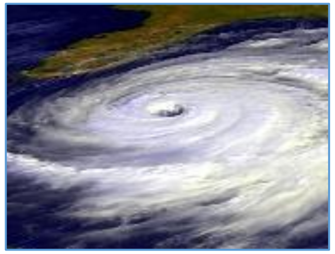
Sea Level Rise: Floods coastal habitats, submerges land (e.g., Maldives).

Loss of Biodiversity: Species struggle to adapt or migrate (e.g., polar bears).

Coral Bleaching: Warmer oceans kill coral reefs (e.g., Great Barrier Reef).

Melting Ice: Arctic and Antarctic ice is shrinking, affecting ecosystems.

Changing Ecosystems: Habitats shift, disrupting food chains and ecosystems.



Evidence for Climate Change:

Rising Global Temperatures - Average global temperature has increased by ~1.1°C since 1850.

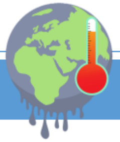
Ice Core Data - Ice cores show patterns of temperature and CO_2 levels going back 800,000+ years. Higher CO_2 = warmer temperatures.

Glacial Retreat - Glaciers worldwide (e.g., Alps, Himalayas) are shrinking. Arctic sea ice is decreasing in both thickness and extent.

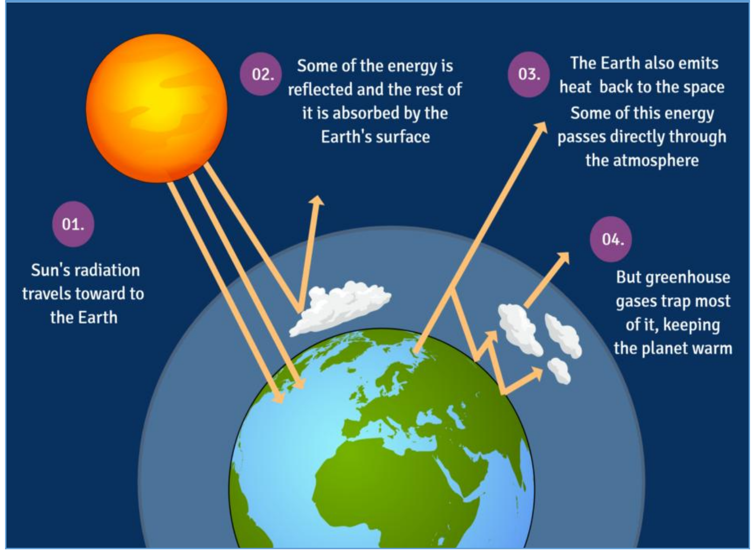
Sea Level Rise - Global sea levels have risen ~20 cm since 1900 due to melting ice and thermal expansion.

Seasonal Changes - Changes in animal migration, flowering seasons, and earlier springs.

Extreme Weather Events - Increased frequency of heatwaves, droughts, and intense storms.



The Greenhouse Effect:



Responses to Climate Change:

Mitigation (Stop the cause of the problem):

- **Alternative energy production (Renewables – Solar, Wind, Thermal)** – as there is no burning of fossil fuels therefore no CO2 in the atmosphere..
- **Carbon capture** - carbon dioxide is captured, compressed, transported and stored in underground reservoirs between layers of rock.
- **Afforestation (Planting trees)** - trees exchange oxygen for carbon dioxide reducing temperatures.
- **International agreements between all countries** – agree to reduce global greenhouse gas emissions.

Adaptation (Adjust and live with the problem):

- **Changes in agricultural systems:** Storing Grain or growing drought resistant crops.
- **Managing Water Supply** - water metres are installed in people's homes to discourage them from using too much water.
- **Flood Defences**: Reducing the risk from rising sea levels

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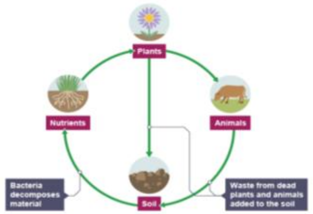
Paper 1 – Section B – Question 2 - Knowledge Organiser - Geography – AQA GCSE Geography – The Living World

Ecosystems

Ecosystems & Natural Systems

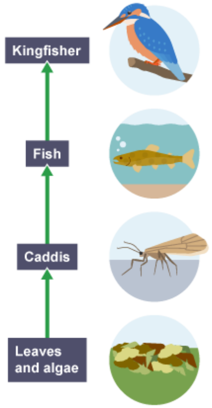
Ecosystem: A community of living (biotic) organisms interacting with non-living (abiotic) elements such as soil, water, & climate.
Biotic components: Plants, animals, fungi, microorganisms.
Abiotic components: Climate, light, water, rocks, soil, temperature.
Ecosystems can be **local** (e.g. pond) or **global biomes** (e.g. tropical rainforest).



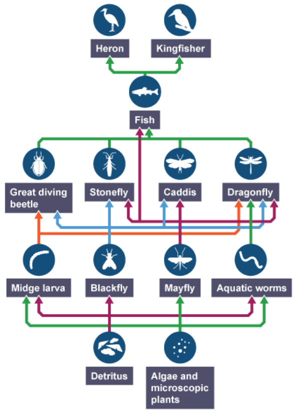
UK Small-Scale Ecosystem

Example: A UK lake ecosystem (e.g. Wicks lake, Formby Woods).
Producers: Pondweed, algae (make their own food via photosynthesis).
Consumers: Snails, insects, frogs, fish, birds.
Decomposers: Bacteria and fungi break down dead material and recycle nutrients.
Nutrient cycle: Nutrients are transferred through food chains & returned to the soil by decomposers.
Food chain & web: Show energy transfer and dependency between species.

Food Chain



Food Web



Ecosystem Balance & Disruption

Ecosystems are **interdependent** — changes in one part affect the whole system.
Example: Removing a predator may increase prey populations and reduce vegetation.
Human impacts: Introducing pollution, deforestation, or draining water can disrupt nutrient cycles or food chains.
Disease Outbreak: Squirrel pox disease wiped out many Red squirrels in Formby Woods.

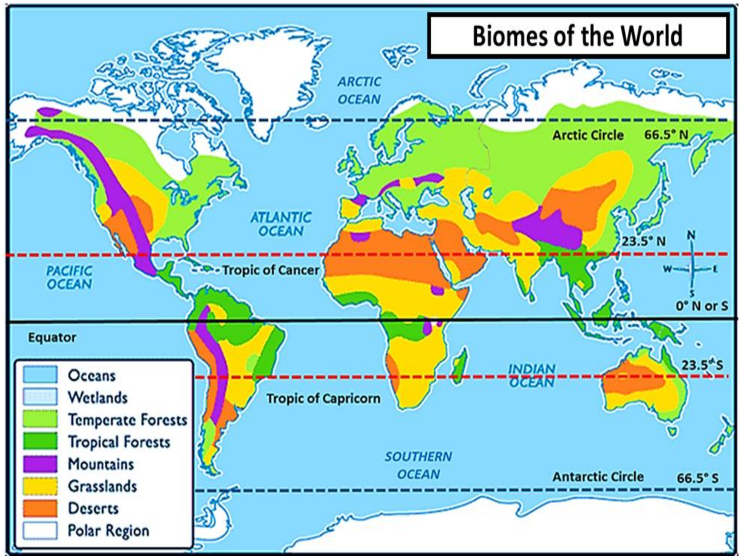
Global Distribution of Biomes

Biomes are large ecosystems defined by climate, vegetation, and animal life.

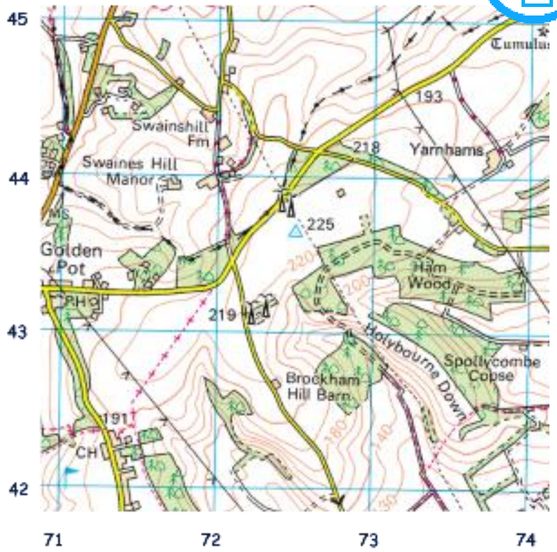
Hot Deserts: Found 15–30° N & S of the Equator, around the **Tropics of Cancer & Capricorn**.

Tropical Rainforests: Found near the **Equator**.

Other biomes: Tundra, temperate forests, savannah grasslands, taiga.
Distribution influenced by latitude, climate, altitude, and ocean currents.



Retrieval:



Tropical Rainforest

Tropical Rainforest Characteristics

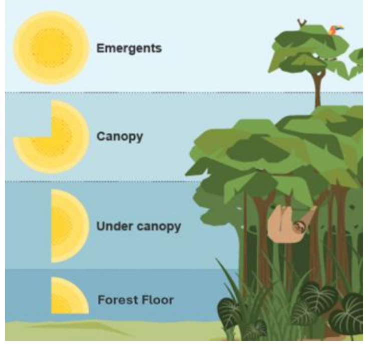
Climate: Hot all year (~27°C) / Very high – between 2000-3000mm / 80% Humidity, daily rainfall
High biodiversity: Many plant & animal species, rapid nutrient cycling.
Soils: Latosols — nutrient-poor due to leaching but thin topsoil is fertile from decaying organic matter.
Vegetation layers:

Emergent:
Tallest trees (up to 50m+)
Exposed to sunlight & wind

Canopy
Dense layer of trees (25–45m)
Most biodiversity (birds, insects, monkeys)

Under canopy
Shady, limited light (2–15%)
Large leaf plants to absorb sunlight

Forest floor
Dark, damp, rapid decomposition of leaf litter. Sometimes Floods
Poor, thin soil (latosol)

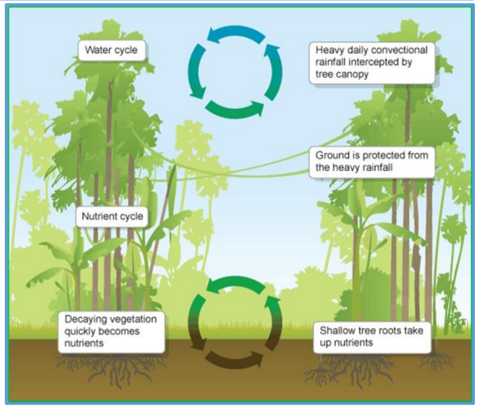


Interdependence in the Rainforest

Climate, water, soil, plants, animals and people are interdependent/have a symbiotic relationship in tropical rainforests (they depend on each other).

- Warm, wet climate supports dense vegetation, which in turn supports animals.
- Trees return moisture to the atmosphere through transpiration, driving the water cycle.
- Nutrient cycling is rapid but fragile.
- Indigenous people use rainforest resources sustainably, but commercial activity disrupts balance.

If climate, water, soils, plants, animals or people change, so will the tropical rainforest.
For example:
more people = more deforestation = more CO2 = global warming = species extinction



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Paper 1 – Section B – Question 2 - Knowledge Organiser - Geography – AQA GCSE Geography – The Living World

Tropical Rainforest

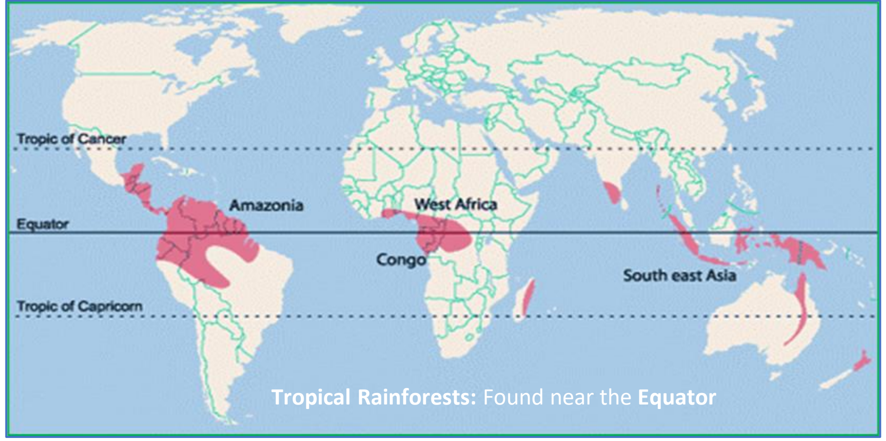
Adaptations in the Rainforest

Adaptations help species compete for **light, food, and space**.
Plants: Drip tips to shed water, buttress roots for support, thin bark, fast-growing species.
Animals: Camouflage, nocturnal behaviour, strong limbs for climbing (e.g. monkeys), slow metabolism (e.g. sloths).

Biodiversity Issues

High biodiversity is threatened by deforestation and climate change.
Loss of species leads to **ecosystem instability** and affects global gene pools.
Conservation is crucial for maintaining rainforest resilience.

Location

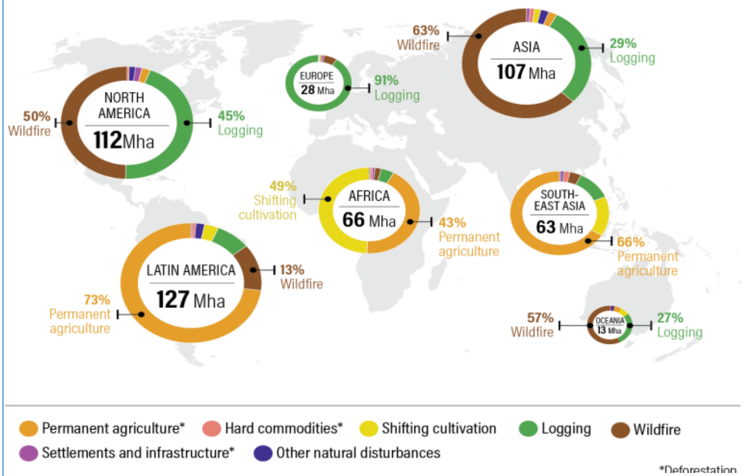


Tropical Rainforests: Found near the **Equator**

Deforestation Rates

Around 10 million hectares of tropical forest are lost each year (FAO, 2020 estimate).This is roughly an area the size of Iceland every year.
Highest rates occur in Brazil, Indonesia, DR Congo & Malaysia.
Some areas show slowing rates due to conservation efforts (e.g. Brazil after 2004), but there have been recent increases in parts of Africa and Southeast Asia.
Malaysia & Southeast Asia rates - Among the fastest deforestation rates globally due to palm oil plantations, logging, and mining. Malaysia lost about 30% of its rainforest cover since 1970.

Drivers of tree cover loss by region, 2001-2024



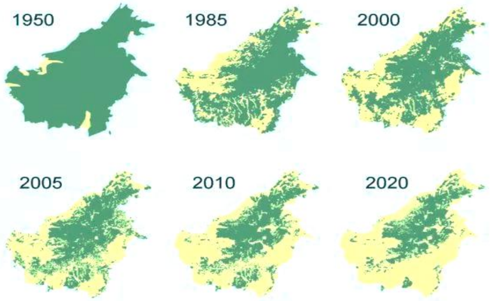
Case Study: Malaysia *(Tropical Rainforest)*

Malaysia is in southeast Asia.

At 192,838 km², the Malaysian rainforest is the 24th largest in the world.

Causes of Deforestation
Agriculture (commercial farming) – Malaysia is the second-largest producer of palm oil in the world.
Logging – Hardwood (mahogany & teak) valued for furniture. Small trees used for pulp/charcoal.
Road building – Increased accessibility encourages development e.g. in Sarawak.
Mineral extraction – Bauxite mined in Peninsular Malaysia. Oil and Gas in Borneo.
Hydroelectric Power Project– High rainfall creates ideal conditions for HEP e.g. Bakun Dam, Sarawak.
Population growth and settlement – Trans-migration Policy – 15000 ha rainforest cleared.

Impacts of Deforestation:
Economic benefits: Income from exports, job creation, Logging, farming (e.g. palm oil, cattle), mining, energy development, job creation.
Environmental Impacts: Loss of biodiversity, soil erosion, air pollution, disruption of water and nutrient cycle, contribution to climate change.



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Sustainable Rainforest Management

Value of rainforests:

- **Biodiversity hotspot**
- **Carbon storage (regulating climate)**
- **Water cycle regulation**
- **Medicinal plants**
- **Cultural and indigenous importance**

Sustainable strategies:
Selective Logging and Replanting - Only fully grown trees are felled, reducing damage to surrounding forest. Logged areas are replanted with native species (e.g. rubber trees), ensuring regrowth.
Conservation and Education - Areas like **Taman Negara National Park** are protected to preserve biodiversity. Education programs raise awareness of the rainforest's value and promote responsible land use.
Ecotourism - Small-scale, low-impact tourism (e.g. guided rainforest treks) creates income while encouraging conservation. Involves local communities and discourages deforestation.
International Agreements - Malaysia is part of **CITES**, which bans trade in endangered rainforest species.
•Agreements promote sustainable hardwood use and certification (e.g. FSC-labelled timber).
Debt Reduction (Debt-for-Nature Swaps) - Malaysia has received financial support in exchange for preserving rainforest areas. - This helps reduce national debt while promoting environmental protection.

Paper 1 – Section B – Question 2 - Knowledge Organiser - Geography – AQA GCSE Geography – The Living World

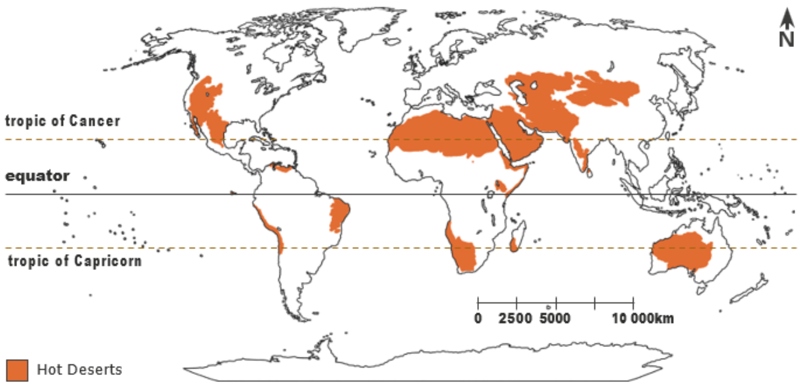
Hot Deserts

Hot Desert Characteristics

Climate: Very low rainfall (less than 250 mm per year), hot days (often over 40°C), cold nights.
Soils: Sandy or stony, infertile, dry, often salty with little organic matter.
Vegetation: Sparse, low-growing plants adapted to conserve water.

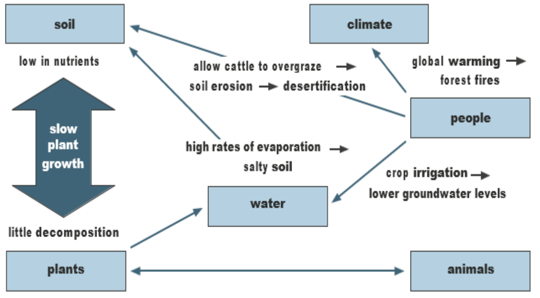
Location

Found around 30°N and 30°S (e.g. Sahara, Thar, Sonoran deserts).



Interdependence of climate, water, soils, plants, animals, and people:

Climate affects water availability and soil moisture.
Water scarcity limits plant growth, which in turn affects food availability for animals and people.
People depend on natural resources but also contribute to degradation (e.g. overgrazing).
Disruption to one component can impact the whole system.

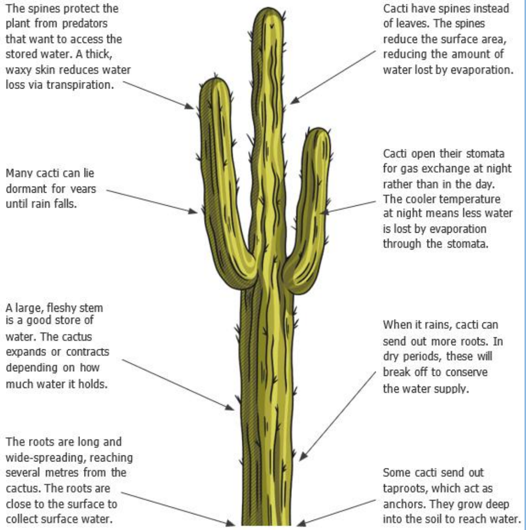


Biodiversity issues

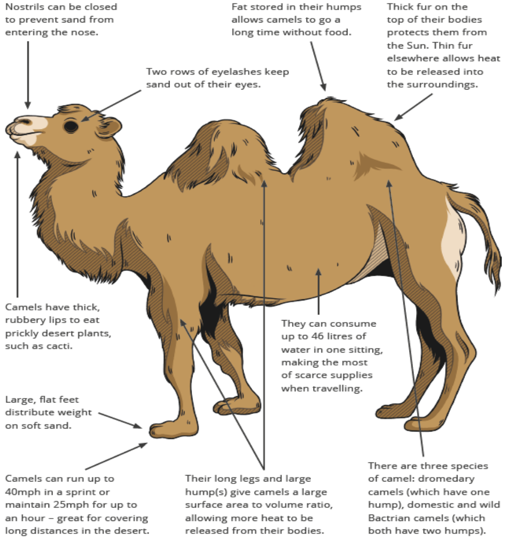
Low but fragile biodiversity; species are highly specialised. Threats include climate change, overuse of resources, and land degradation.

Plant & Animal Adaptations

Plants: Deep roots (e.g. acacia), water storage (succulents like cacti), Xerophytes, small/spiny leaves.



Animals: Nocturnal behaviour, water conservation (e.g. camels storing fat in humps), light-coloured fur for heat reflection.



Flora
Long roots go deep into the ground, spreading out to absorb more water.
Some plants have no leaves or only small leaves that grow after it rains. The lack of leaves helps with water retention.

A waxy coating on leaves and stems helps to reduce water loss. Spines or thorns on plants make it difficult for animals to eat them.

Fauna
Desert animals with highly evolved kidneys and other specialised organs adapt to minimise water loss.
Some desert animals burrow underground for protection from extreme temperatures, predators and sunlight.
Light-coloured fur or feathers reflect sunlight, so desert animals do not become too hot during the day.

Case Study: Thar Desert, India/Pakistan

Opportunities:
Mineral extraction (e.g. gypsum, feldspar, kaolin for industry).
Energy (e.g. solar farms in Rajasthan, wind energy).
Farming (e.g. commercial agriculture with irrigation from the Indira Gandhi Canal).
Tourism (e.g. desert safaris, camel rides, Jaisalmer fort).

Challenges:
Extreme temperatures (can exceed 50°C, health risks, limits working hours).
Water supply (scarce and unreliable; groundwater and canal use under pressure).
Inaccessibility (sand, poor roads, remote settlements make transport difficult).

Desertification and its management
Causes of desertification:
Climate change (less rainfall, higher temperatures).
Population growth (increases demand for food, fuel, water).
Removal of fuel wood (leads to soil exposure and erosion).
Overgrazing (animals eat vegetation faster than it can regrow).
Over-cultivation (soil becomes infertile due to nutrient depletion).
Soil erosion (wind and rain remove topsoil once vegetation is lost).

Strategies to reduce desertification:
Water and soil management (e.g. stone bunds, contour ploughing, drip irrigation).
Tree planting (e.g. Great Green Wall in Africa to bind the soil and provide shade).
Appropriate technology (e.g. solar cookers to reduce reliance on firewood, low-cost drip irrigation systems).

Water conservation: Using **drip irrigation** to reduce water waste on farms.
Afforestation: Planting trees to prevent soil erosion & reduce desertification.
Solar power: Using solar energy instead of fossil fuels to reduce carbon emissions.

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Paper 1 – Section C - Question 3 - Knowledge Organiser - Geography – AQA GCSE Geography – Coastal Landscapes in the UK

Retrieval:

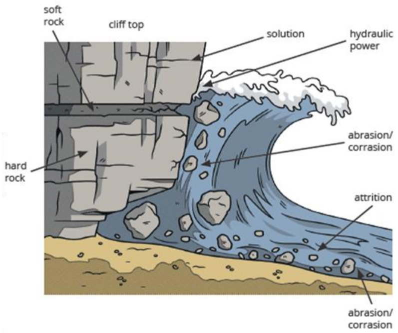
Coastal Processes

Erosion

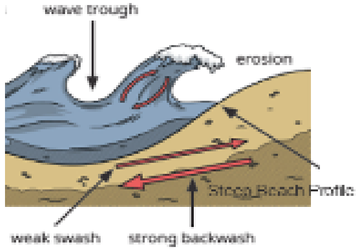
Hydraulic Power –where the power of seawater crashing against rocks forces air into the cracks in the rocks or land causing them to break apart.

Attrition – A type of erosion caused by rocks and boulders colliding and breaking each other apart into smaller pieces.

Abrasion/Corrasion – A type of erosion caused by sediment, flung by breaking waves, wearing away the cliff face.

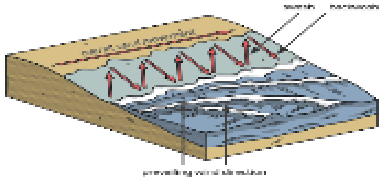


Destructive Waves – High- energy waves which remove material from beaches by dragging it into the sea. The backwash is stronger than the swash.



Transportation

Longshore Drift – The process by which material is transported along a beach through a combination of swash and backwash.

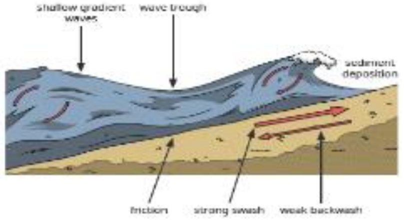


Deposition

Deposition – the process where the sea drops material it's carrying, leading to the formation of various landforms.

Constructive Waves – Waves which add material to beaches by carrying sediment onto the beach when the swash is stronger than backwash.

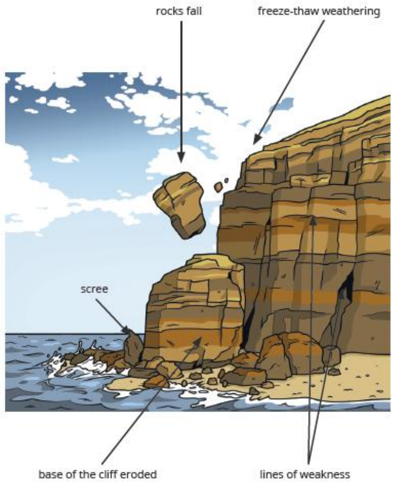
Key characteristics:
- low and long waves;
- low frequency waves (6-8 waves a minute);
- the wash is more powerful than the backwash, depositing material on the coast.



Mass Movement (Sub-Aerial Processes)

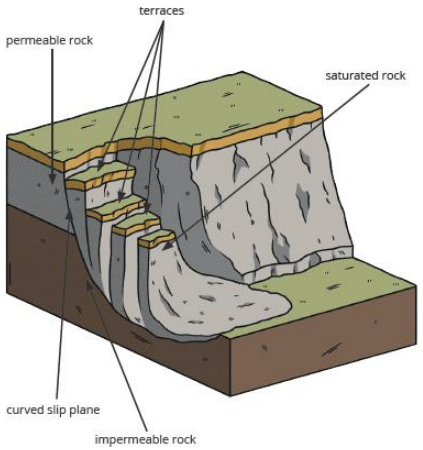
The downhill movement of sediment due to gravity. For example, rock falls, slumping, mudflows or landslides.

Rock Falls - where fragments of rock fall from the cliff face due to gravity and freeze-thaw weathering and then breaks down into smaller pieces.



Sliding – When loose surface material becomes so saturated after a period of heavy rain that the extra weight causes the material to become unstable and move rapidly downhill.

Slumping – A rapid mass movement of rocks and debris downslope (Right).

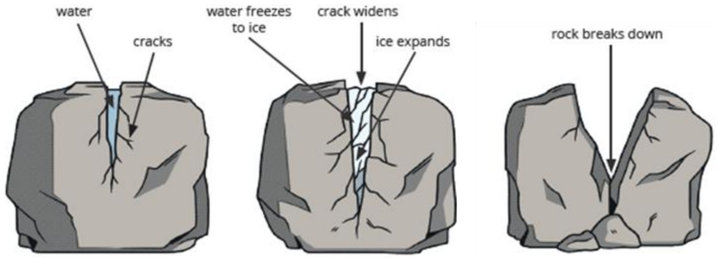


Weathering Processes

Chemical Weathering - The break-down of rocks caused by a chemical change within the rock (e.g. seawater dissolving the minerals in the rocks).

Biological weathering – The breakdown of rocks through the actions of living organisms. Examples include plant roots growing into rocks, animals burrowing, and lichens and mosses growing on surfaces.

Freeze-Thaw Weathering (mechanical) - occurs when water continually seeps into cracks, freezes and expands, eventually widening the cracks and breaking the rock apart (Below).



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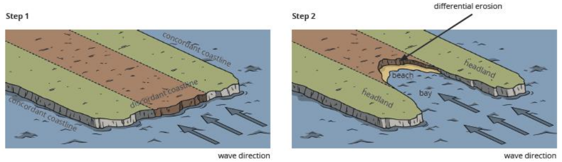
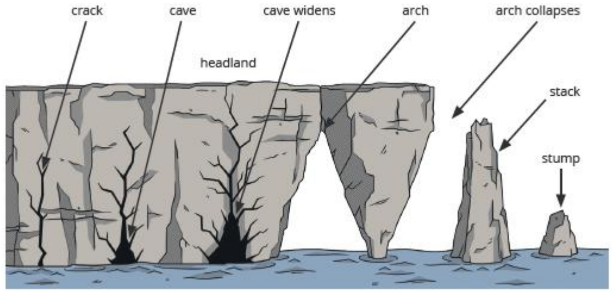
Paper 1 – Section C - Question 3 - Knowledge Organiser - Geography – AQA GCSE Geography – Coastal Landscapes in the UK

Erosional Landforms

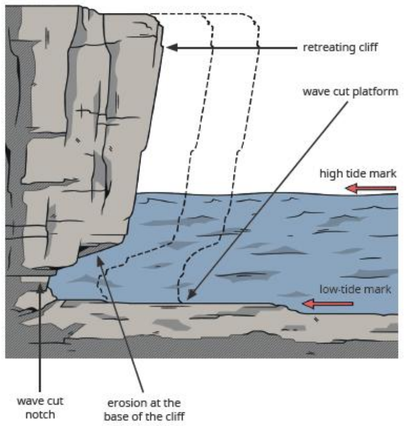
Headlands and Bays – Discordant coastlines formed of different types of rock, erode at different speeds. The least resistant rock is eroded fastest, forming a bay. The more resistant rock is eroded slowly, forming headlands on either side of the bay.



1. **Crack -** Waves hit the cliff and water gets into small cracks in the rock. The crack gets bigger over time due to hydraulic action and abrasion.
2. **Cave -** The crack becomes wider and deeper due to further erosion. This forms a cave.
3. **Arch -** The cave is eroded all the way through the headland, making an arch.
4. **Stack -** The top of the arch collapses due to freeze-thaw weathering. This leaves a tall column of rock called a stack.
5. **Stump -** Waves keep hitting the stack and it collapses leaving a stump.



Wave-Cut Platforms – Waves erode the base of cliffs creating a wave-cut notch. The rock above will eventually collapse and the cliff will retreat, leaving a large, flat horizontal platform rock in front of the cliff.

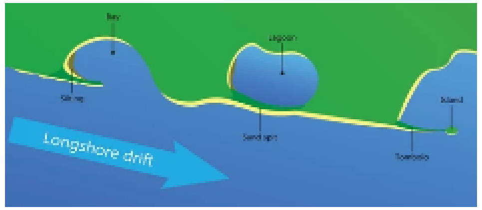


Depositional Landforms

Beaches – The zone of deposited material that extends from the low water line to the limit of storm waves. The beach can be divided into the foreshore and the backshore.

Spits – A narrow stretch of sand deposited by the sea, joined to the land at one end, usually forming where the coastline abruptly changes direction.

Bars – A strip of deposited material parallel to the coast. Formed when a spit grows across a bay, eventually enclosing the bay to create a lagoon. Offshore bars can develop because of breaking waves.

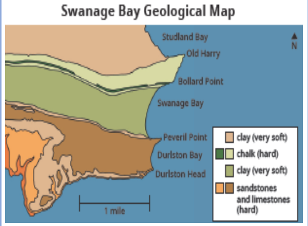


Examples of UK Coastlines – The Dorset Coast

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

Headlands & 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).

Swanage Bay Geological Map



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

Coastal Management Strategies

The Costs and Benefits of Management Strategies

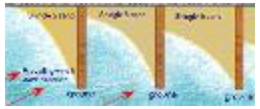
Hard Engineering

Sea Walls – A wall-like structure built at the edge of the land along the coastline to protect the land from the erosive force of the sea.
Pros: Coastal erosion and flooding is prevented.
Cons: They are expensive to build and maintain. Can cause greater erosion downdrift due to waves reflecting off seawall.

Rock Armour – Huge boulders of resistant rock, such as granite, placed in front of landforms to absorb and reflect wave energy.
Pros: Material is deposited.
Cons: They are expensive to build. Boulders need to be transported long distances (e.g. from Norway).

Gabions – Wire cages filled with boulders used as coastal defences.
Pros: They are cheaper and easier than many other management strategies.
Cons: The wire cages corrode over time. Can be ugly structures.

Groynes – Large wooden barriers built out into the sea to catch sand and material being moved along the beach by the sea via longshore drift.
Pros: Material transported by longshore drift is trapped.
Cons: They can be costly and cause greater erosion downdrift.

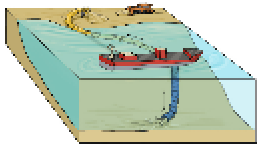


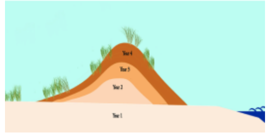
Soft Engineering

Beach Nourishment – Sand and shingle are dredged from offshore and added to the beach to make it larger and more effective at absorbing wave energy.
Pros: This creates wider beaches which reduces erosion and flooding.
Cons: Constant maintenance is needed, especially after extreme weather/high tides.

Dune Regeneration – The process which aims to strengthen sand dunes and protect them from excessive coastal retreat. Marram grass is planted to stabilise the sand.
Pros: They provide a barrier between land and sea.
Cons: This is often limited to small areas as nourishment is expensive.

Managed Retreat – The controlled and intentional removal of defences to allow areas of land to flood and erode naturally. This process often creates wetland areas or saltmarshes.
Pros: This is a cheap an easy option.
Cons: Land and buildings will be lost – compensation cost could be high.





An example of a coastal management scheme in the UK

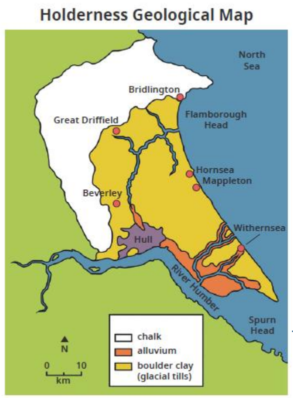
Case Study - Holderness Coast, east coast of England

The Reasons for Management
The Holderness Coast is the fastest eroding coastline in Europe. It is made of soft boulder clay, eroding at an average rate of 1.5-2.5 metres a year. The Golden Sands Chalet Park cliffs, near Withernsea, have retreated by more than 122 metres in 25 years.
26 villages mentioned in the Domesday Book have been lost to the sea along the Holderness Coast.
Prevailing winds and longshore drift in the North Sea erode and transport material downdrift, exposing cliffs to further erosion.
To protect settlements (e.g. Withernsea with over 6000 inhabitants) and infrastructure (e.g. B1242 road near Mappleton).

The Management Strategy
1.Withernsea is a popular tourist town. Over the last 100 years, various sea defences have been built at Withernsea. The sea defences include a sea wall (costing over £6.3 million) and rock armour to protect the promenade. Wooden groynes over one century old were also replaced.
2.In 1991, a £2 million scheme at Mappleton placed granite blocks (rock amour) at the cliffs' base to reduce erosion. Two rock groynes were also built on the beach to trap sediment. The groynes create a more expansive beach which prevents the waves from reaching the cliff.

The Resulting Effects and Conflicts
3.Groynes built to trap sediment on Withernsea's beach also protect the cliffs from erosion. The effectiveness of the groynes leads to a lack of sediment depositing at the Golden Sands Chalet Park (south of Withernsea) and the loss of land.
4.Mappleton village and the B1242 have both been protected. However, the area south of the sea defences has faced increased erosion (from an average of 1.7m a year to 3.3m a year). Farmland to the south of Mappleton has been lost, including the complete loss of Cowden Farm and Grange Farm.

Holderness Geological Map



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Paper 1 – Section C – Question 4 - Knowledge Organiser - Geography – AQA GCSE Geography – River Landscapes in the UK

The UK has a range of diverse landscapes

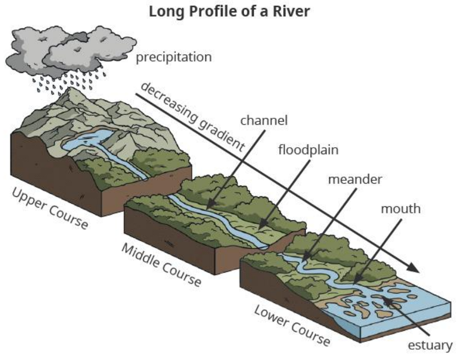
Upland = North & West (mountains, steep valleys)
Lowland = South & East (flatter land, wider valleys)

River sources often begin in upland areas and flow toward the sea through lowlands, creating distinct river landforms (e.g., waterfalls, meanders, floodplains).

Changing Long Profile and Cross Profile of a River

The long profile of a river shows how the gradient of the land changes from the source to the mouth of a river.
The cross profile of the river shows the cross-section of the river and the river valley.

Upper Course - steep gradient / low velocity / waterfalls, gorges, and rapids / narrow and shallow channel
Middle Course - gentle gradient / faster velocity / meanders, ox bow lakes, floodplains / wider and deeper channel
Lower Course - flat gradient / fastest velocity / floodplains, deltas, estuaries / widest and deepest channel



River Processes

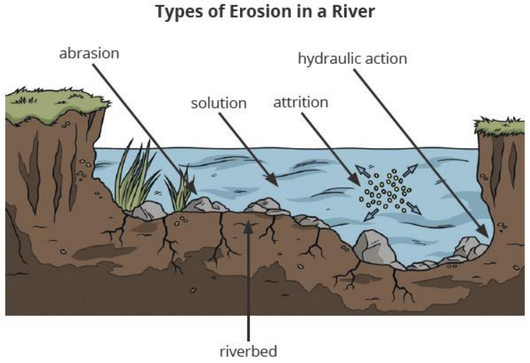
Erosion

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.

Attrition – rocks carried by the river smash together and break into smaller, smoother and rounder particles.

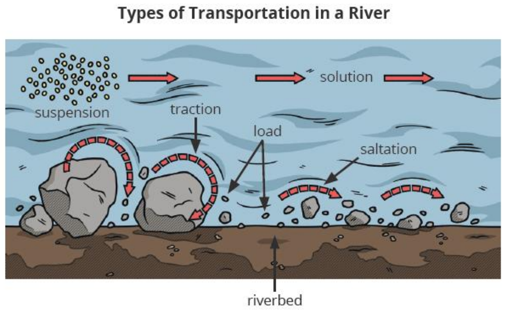
Solution – soluble particles are dissolved into the river.



Vertical erosion deepens the river, forming a V-shaped valley/channel. High turbulence carries material which wears away the riverbed, especially in the upper course.
Lateral erosion widens the river valley/channel, especially in the middle/lower course.

Transportation

Traction – boulders and pebbles roll along the riverbed.
Saltation – material carried by the river bounces along the riverbed.
Suspension – rocks carried along by the river wear down the riverbed and banks.
Solution – Soluble material is dissolved and carried by the river water.



Deposition

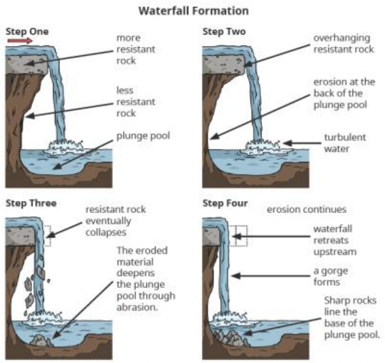
Deposition – River's deposit eroded material as they lose speed (velocity) when:
- the river becomes shallower;
- the discharge (volume of water) is reduced;
- the river reaches the mouth.

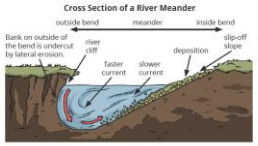
River Landforms

Upper Course – Landforms resulting from Erosion

Interlocking spurs where vertical erosion creates steep-sided V-shaped valleys. The river winds and bends; avoiding areas of hard rock creating interlocking spurs (which look like the interlocking parts of a zip).

Waterfalls a layer of hard rock overlays a layer of soft rock. The soft rock erodes at a faster rate than the hard rock. This leads to the hard rock overhanging the soft rock. Eventually the hard roc overhang becomes too heavy an collapses causing the river to retreat upstream.

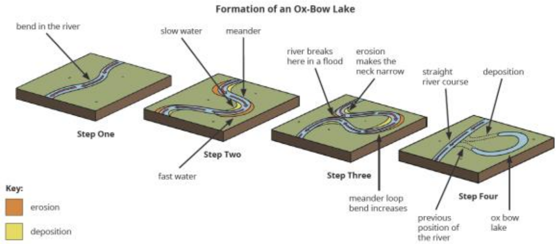




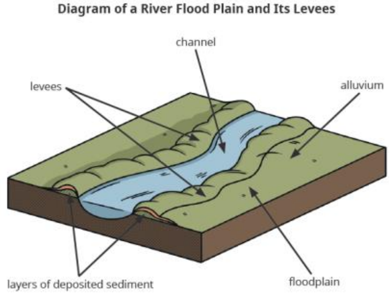
Gorges form where a waterfall has retreated upstream leaving behind a valley with steep sided walls.

Example – River Tees – Upper Course - At High Force waterfall, the River Tees drops 21m into the plunge pool.

Meanders form in the middle and lower course where lateral erosion causes the river to widen. The outside of a river bend will erode more quickly as the water is forced to the outside bend as it turns. The water on the outside bend is deeper and faster causing even more erosion, enlarging the bend.
The water on the inside bend of the river is much shallower and slower. As a result, material is deposited (forming a slip-off slope).



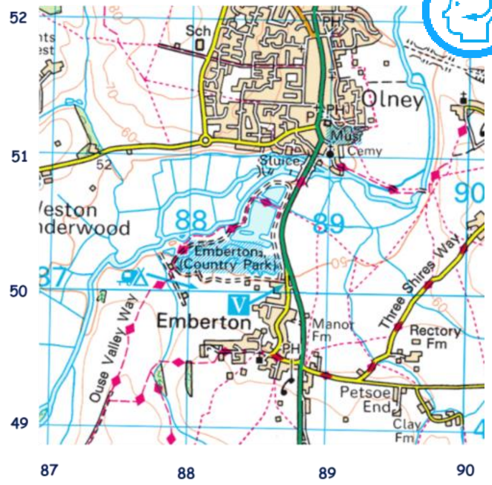
Ox-bow lakes form where meanders have become so enlarged that the river breaks through the narrow 'neck'. The river will flow along this new route as it is the shortest course. Deposition will eventually totally cut the old meander loop off from the river channel creating an ox-bow lake.
Example – River Tees – Middle Course - The town centre of Yarm is completely enclosed within the meander.



Levees form in the lower course of a river along the riverbanks due to repeated flooding. As water overflows the main channel, it loses energy, depositing material creating natural embankments.

Floodplains are the wide valley floor on either side of the river in the lower course. When the river floods and overflows its levees, the water loses energy once it hits the land. This sudden loss of energy leads to deposition of river sediment on the land close to the river channel.
Estuaries are in the tidal zone at the mouth of a river where the river meets the sea. The water level in the estuary rises and falls with the tide. During high tide, large areas of valley floor will be flooded. As the tide falls, material will be deposited, creating mudflats which will be exposed during low tide.
Example – River Tees – Lower Course - Mudflats have formed around the estuary of the River Tees. Material is deposited as the high tides fall.

Retrieval:



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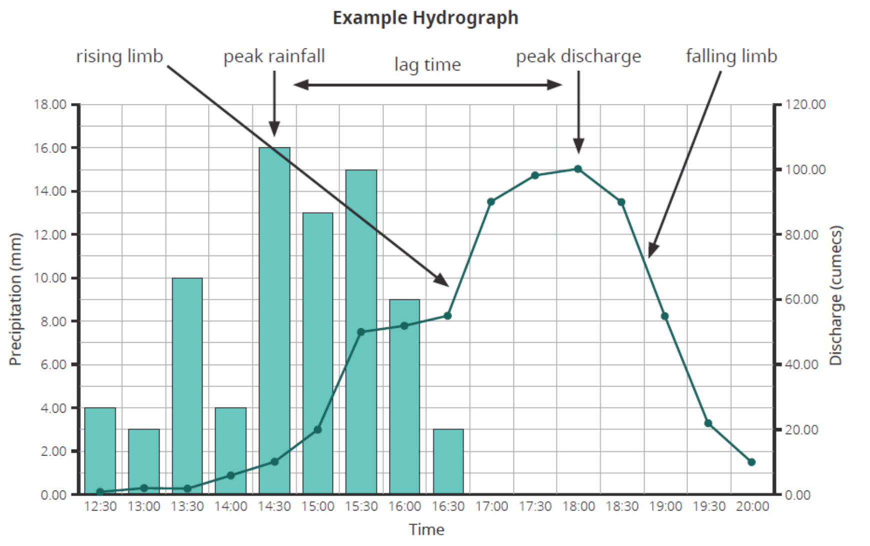
Paper 1 – Section C – Question 4 - Knowledge Organiser - Geography – AQA GCSE Geography – River Landscapes in the UK

The use of hydrographs to show the relationship between precipitation and discharge



Discharge – the volume of water which passes a given point in the river over a set amount of time. It is measured in cubic measures per second (cumecs).

Hydrograph – a graph which shows the rainfall (bar graph) and river discharge (line graph) of a river over a period.

Lag time – the time between the peak rainfall and the peak discharge.

Rising limb – the part of a hydrograph which shows the increase in discharge as rain enters the river channel. A steep rising limb indicates an increased flood risk as water quickly enters the channel. The lag time occurs because most rainwater does not land in the river and has to travel to the river overland (surface runoff) or slowly underground (after infiltration). The lag time can be sped up by steep slopes, saturated ground and impermeable surfaces.

Falling limb – the part of a hydrograph which shows the decrease in discharge as the river returns to its usual level.

How physical and human factors affect the flood risk

Precipitation - Prolonged, heavy precipitation will cause the soil to become saturated preventing further infiltration into the ground causing water to run over the land (increased surface runoff). Precipitation will therefore run over the land (increased surface runoff). If surface runoff is increased the discharge of the river will increase, increasing the likelihood of a flood.

Geology - Impermeable rocks (e.g. marble and granite) and clay soils do not allow precipitation to infiltrate; increasing surface runoff. If surface runoff is increased the discharge of the river will increase, increasing the likelihood of a flood. Permeable rocks allow precipitation to infiltrate through to the water table and decreases surface runoff rates.

Relief - Steep slopes will cause surface runoff to enter the river more quickly, less water will infiltrate and as a result more water will end up in the river. If the discharge of the river is increased, increasing the likelihood of a flood.

Land Use - Buildings and roads are often impermeable (e.g. concrete and tarmac) so less water will infiltrate, and more water will end up in the river and drains are designed to remove rainwater quickly from urban areas (reducing the lag time). This rainwater is normally directed towards rivers, increasing river discharge.

Afforestation - Trees intercept rainwater which can then evaporate and can soak up groundwater.

River Management Strategies

The Costs and Benefits of Management Strategies

Hard Engineering

Dams and Reservoirs - Reservoirs (artificial lakes) are formed behind a dam (a wall across a river) usually in the upper course. **Pros** – Reservoirs store water and provide a reliable water source. hydroelectric power (HEP) can be generated. Flood risk is reduced. **Cons** – They are expensive to build. Settlements and habitats are often flooded.

Channel Straightening - Rivers are artificially straightened. **Pros** – The flood risk is reduced as water is transported away from the area quickly. **Cons** – Water is carried downstream quicker. As a result, flooding and erosion is more likely downstream.

Embankments - Raised walls along the riverbanks. **Pros** – Flooding will be less frequent as the river channel can hold more water. **Cons** – If the river floods severely, flood waters will be trapped on the floodplain. Can be expensive.

Flood Relief Channels - Water is diverted from areas that are being protected. **Pros** – Water can be controlled by opening and closing flood gates. **Cons** – They are expensive to build. Water is carried

Soft Engineering

Flood Warnings and Preparations The Environment Agency alert the public with apps, radio and TV broadcasts. **Pros** – These reduce the impact of flooding by giving people time to prepare (e.g. evacuate and protect their homes/belongings). **Cons** – Flooding can still occur. Some people might not be alerted.

Flood Plain Zoning - Building is restricted in parts of the flood plain to reduce the impact of a flood. Hard surfaces would increase the likelihood of a flood. **Pros** – The impact of flooding is reduced. Floodplain retains its natural function. **Cons** – The development/economic growth of an area could be restricted. This offers limited help to areas already built on.

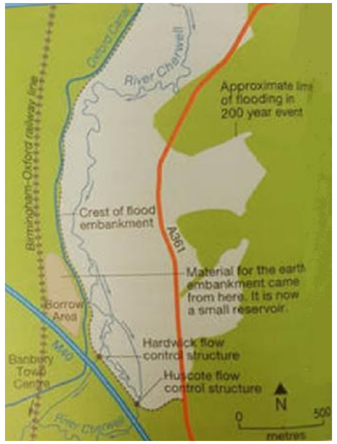
Planting Trees - Trees intercept precipitation, increasing the lag time and reducing discharge. **Pros** – This is a cheap management strategy. Soil erosion is reduced. Habitat creation increases biodiversity of the area. **Cons** – Less farmland is available.

River Restoration - Making the river more natural and allowing natural river processes to happen. **Pros** – This reduces flood risk downstream. Increases wildlife through habitat creation. **Cons** – Local flood risk is increased.

An example of a flood management scheme in the UK

Case Study - Banbury Flood Management Scheme

Location - Banbury is a market town in **Oxfordshire**, on the **River Cherwell** (a tributary of the River Thames). The area has a **history of flooding**, particularly in **1998 and 2007**.



Why the Scheme Was Required

In **1998**, flooding caused £12.5 million in damage, affecting homes, businesses, & disrupting roads and rail links.
Over **150 homes and businesses were flooded** in 1998.
Banbury lies on a **floodplain**, and development had increased the risk.

The Management Strategy

Completed in **2012**, the scheme involved a mix of hard & soft engineering:

1. **2.9 km earth embankment** (4.5 m high) built to create a flood storage area south of the town.
2. **Flood storage reservoir** holds 3 million m³ of water (equivalent to 1200 Olympic-sized swimming pools).
3. **Raising of the A361** road to stay open during floods.
4. **New pumping stations** to transfer excess water.
5. **Biodiversity action**: planting of trees & hedgerows to absorb more water (soft engineering)

Social, Economic, and Environmental Issues

Social - 480 homes and businesses protected, reducing flood anxiety. Roads like the A361 remain open in flood events, reducing disruption.
Economic - Scheme cost **£18.5 million but** expected to save millions in future damages. Funded by the **Environment Agency**, local council, & private investors.
Environmental - New **wetlands**, **ponds**, and **trees** improve local biodiversity.
Some farmland was deliberately allowed to flood as part of the storage plan.

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