Geography Knowledge Organisers

Year 10

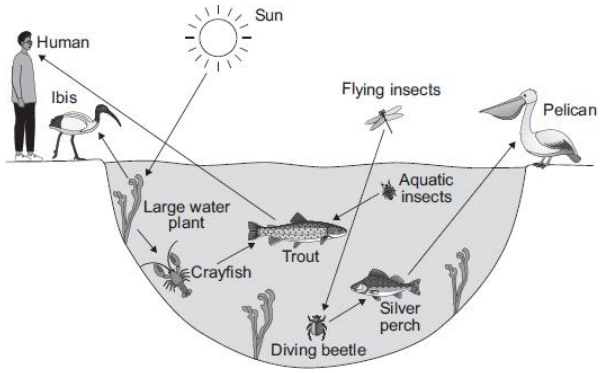
Ecosystems Year 10 HT1

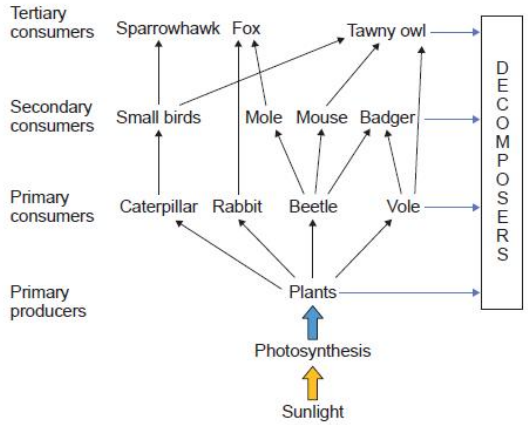
What is an Ecosystem?
An ecosystem is a community of **living** animals, plants, fish (biotic) and **non-living** temperature, light, soil, water pH (abiotic) components that interact with one another. Ecosystems exist at a range of scales, from a small pond to the entire tropical rainforest.

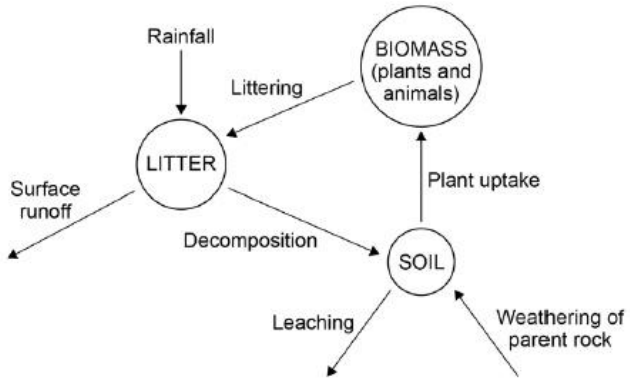
How Ecosystems Work?
Energy enters ecosystems through **producers** (plants), which use photosynthesis to make food. **Consumers** obtain energy by eating plants or animals, while **decomposers** (bacteria and fungi) break down dead material, returning nutrients to the soil through nutrient cycling. These interactions can be shown in **food chains** and more complex **food webs**.

UK Ecosystem Example
A **deciduous woodland** is a small-scale UK ecosystem. Oak trees are producers; insects, deer and squirrels are primary consumers; foxes and owls are secondary consumers; fungi and earthworms are decomposers. All organisms depend on one another to survive.

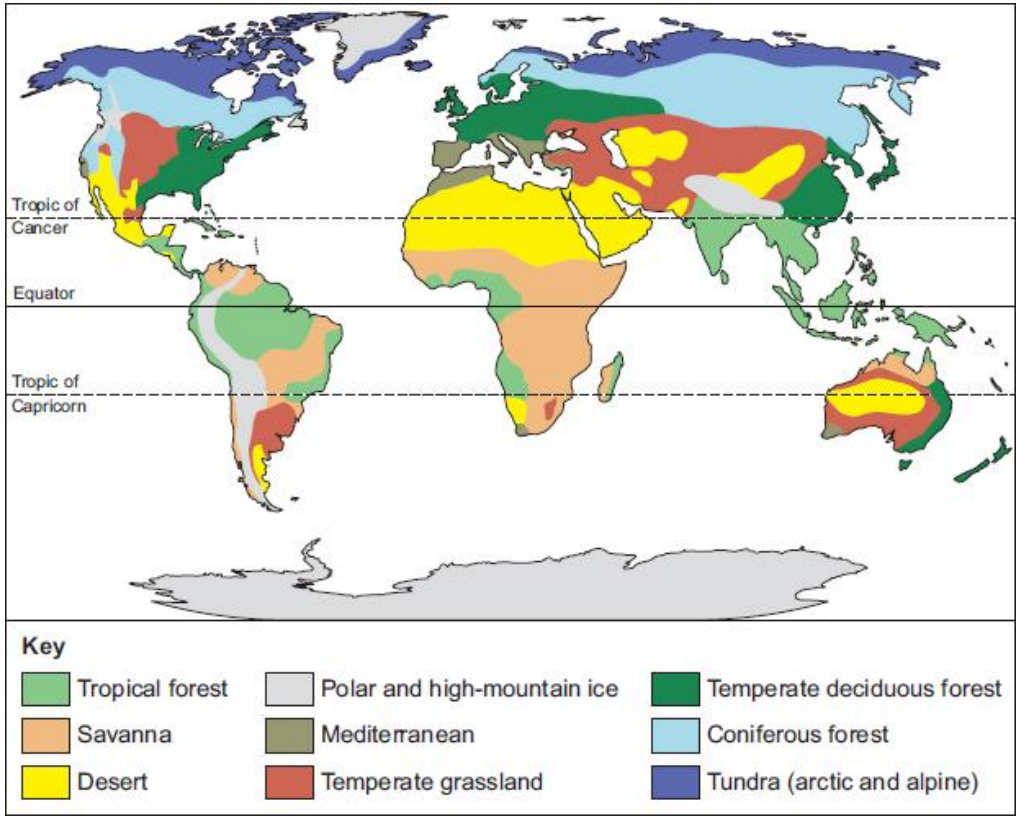
The balance of an ecosystem
Healthy ecosystems are balanced because all components are **interconnected**. A change to one part of the ecosystem, such as **habitat loss**, **pollution** or the **removal of a species**, can affect food chains, **nutrient cycling** and biodiversity.







Global Biomes

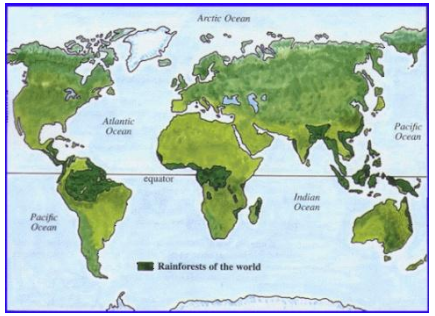


Large-scale ecosystems are called **biomes**. Their distribution is mainly determined by climate (temperature and rainfall).

- Tropical Rainforest – Hot and wet all year; very high biodiversity.
- Hot Desert – Very hot and dry; sparse vegetation.
- Temperate Deciduous Forest – Warm summers, cool winters; trees lose leaves.
- Coniferous Forest (Taiga) – Long, cold winters; evergreen trees.
- Tundra – Very cold with permafrost; few plants grow.
- Grassland – Moderate rainfall; dominated by grasses.

Tropical Rainforests Year 10 HT1

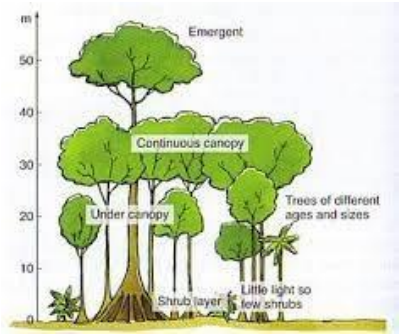
What is a Tropical Rainforest?
Tropical rainforests are found between the Tropics of Cancer and Capricorn, close to the Equator. They have a hot, wet climate all year, with temperatures of **26–28°C** and **over 2,000 mm** of rainfall annually. They are the most biodiverse ecosystems on Earth.



Characteristics of a Tropical Rainforest
The components of a rainforest ecosystem are interdependent.
Climate: Hot, wet and humid throughout the year, providing ideal growing conditions.
Water: High rainfall and humidity support rapid plant growth. Trees intercept rainfall, slowing surface runoff.
Soils: Soils are thin, acidic and infertile because heavy rainfall causes leaching. Most nutrients are stored in the living vegetation.
Plants: Dense vegetation forms four layers: emergent, canopy, understorey and forest floor.
Animals: The warm climate and abundant food support extremely high biodiversity.
People: Indigenous communities depend on the rainforest for food, medicine, shelter and income.

Biodiversity
Tropical rainforests contain **over 50% of the world's plant and animal species**, despite covering only **around 6% of Earth's land surface**. High biodiversity provides habitats, medicines and genetic resources but is threatened by deforestation.

Why are Tropical Rainforests Valuable?
Rainforests provide:
- Hardwood timber and food products.
- Medicines—around 25% of modern medicines contain ingredients originally found in rainforest plants.
- Habitats for millions of species.
- A major carbon store, helping reduce climate change.
- Water regulation and soil protection.
- Income through tourism and scientific research.



Plant Adaptations
Kapok Tree: Grows up to 60 m tall to reach sunlight. Buttress roots support the tree in shallow soils and absorb nutrients from the surface. Smooth bark helps rainwater run off quickly.
Lianas: Woody vines climb trees to reach sunlight without growing a thick trunk.
Drip-tip Leaves: Pointed leaves allow heavy rainfall to drain away quickly, preventing fungal growth.
Epiphytes: Grow on tree branches to access sunlight. Absorb water and nutrients directly from rainfall.


Drip tip leaves
Waxy surface


Smooth bark
Tall


Buttress roots

Animal Adaptations
Orangutan: Long arms (up to 2 m) help it swing through the canopy. Hook-like hands and feet grip branches. Spends most of its life in the trees to avoid predators.
Malayan Tiger: Striped coat provides camouflage in the forest. Powerful legs and jaws help it hunt deer and wild boar.
Flying Lizard (Draco): Skin flaps allow it to glide between trees. Avoids predators and searches for food without descending to the forest floor.
Poison Dart Frog: Bright colours warn predators. Sticky toe pads allow it to climb smooth leaves and branches.


The harpy eagle has a relatively short wingspan...


The sloth grows green moss on its fur...


The toucan has a long strong beak...


The spider monkey has long strong limbs...

Tropical Rainforests Year 10 HT1

Case Study: Malaysia

Malaysia (south east Asia) was once covered by tropical rainforest, but around one-third of its rainforest has been cleared since the 1950s.

Causes of Deforestation

- **Commercial Farming** - Malaysia is one of the world's largest producers of palm oil. Large areas of rainforest have been cleared to create oil palm plantations for products such as food, cosmetics and biofuels.
- **Logging** - Malaysia exports valuable tropical hardwoods including meranti, teak and mahogany for furniture and construction.
- **Road Building** - Roads are built to provide access for logging, mining and farming. New roads also encourage settlement deeper into the rainforest.
- **Mineral Extraction** - Malaysia mines tin, bauxite, copper and gold. Open-cast mining removes vegetation and damages habitats.
- **Energy Development -** The Bakun Dam in Sarawak is one of Asia's largest hydroelectric dams. It supplies electricity but flooded around 700 km² of rainforest and displaced approximately 10,000 indigenous people.
- **Population Growth and Settlement -** Growing populations increase demand for housing, farmland and infrastructure, leading to further forest clearance.

Impacts of Deforestation

- **Economic Benefits** - Creates employment in farming, mining and logging. Palm oil contributes billions of dollars to Malaysia's economy. Improves roads, electricity supply and trade.
- **Environmental Costs** - Loss of habitats for endangered species including orangutans, Malayan tigers and Asian elephants.
- Increased **soil erosion** after tree removal.
- Greater **flood risk** as less water is intercepted by trees.
- **Less carbon stored** by forests, increasing climate change.
- Indigenous communities lose land and traditional ways of life.

Sustainable Management in Malaysia

- **Selective Logging** - Only selected mature trees are cut down, reducing damage to the forest and allowing natural regeneration.
- **Replanting** - Trees are replanted after logging to replace those removed and restore habitats.
- **Conservation** - Malaysia has protected areas such as Taman Negara National Park, one of the world's oldest rainforests (over 130 million years old), protecting wildlife and biodiversity.
- **Ecotourism** - Visitors generate income while supporting conservation. Activities include wildlife watching, canopy walks and guided rainforest tours.
- **International Agreements** - The Forest Stewardship Council (FSC) certifies sustainably managed forests, encouraging consumers to buy responsibly sourced timber.
- **Debt Reduction** - Some tropical countries receive financial support or debt relief in return for protecting rainforest ecosystems (debt-for-nature swaps).

FSC

Bristol – a city in the UK Year 10 HT2

Location and Population
Bristol is located in the south-west of England, approximately 5km to the west of Swindon. Bristol has a population of 440,500 and is expected to reach half a million by 2029. It is the largest city in the south west.

The Importance of Bristol
Nationally:
- Two universities – attracts students from around the UK
- Two cathedrals – Bristol and Clifton
- Located on the M4 corridor with good road and rail links to London

Internationally:
- The largest concentration of silicon chip manufacture outside California
- Around 700,000 cars from Japan, Germany and Korea are imported to Bristol's docks each year
- Bristol airports links the city to major European centres
- The UK's eighth most popular city for foreign visitors

The impacts of national and international migration
In recent years' migration from abroad has accounted for about half of Bristol's population growth e.g. from EU countries such as Poland. Migrant workers are employed in a variety of sectors e.g. retail, health and manufacturing.

Positive Impacts	Negative Impacts
• Mainly young migrants help to balance and ageing population • Hard working, motivated workforce • Contributing to both the local and national economy	• Pressures on housing and employment • The need to provide education for children whose first language is not English • Challenge of integration within community

What changes are affecting Bristol?
- Bristol's population is growing rapidly
- The network of motorways, road, rail and air connections has made it more accessible
- There are more people under the age of 16 than over 65
- It's population is becoming more ethnically diverse

How can urban change create social opportunities in Bristol?
- **Culture** - Youthful population means there is a range of bars and nightclubs – The Bristol Beacon has concerts and entertainment by major names in rock, pop and jazz
- **Sport** – Bristol has two professional soccer teams – City and Rovers and a rugby union team - all teams are developing their stadiums to provide a range of leisure and conference facilities and accommodation
- **Shopping** – The city centre had become outdated and people had begun shopping in the out of town retail park at Cribbs Causeway. Developments to encourage people to shop in the CBD include; pedetrianising the area, providing a more attractive shopping environment (new street furniture floral displays and landscaping and improving public transport into the centre e.g. park and ride. **Cabot Circus** a £200 million shopping centre was built in 2008, it also has a cinema and 250 apartments

Bristol – a city in the UK Year 10 HT2

How can urban change create economic opportunities in Bristol?

- The major change in Bristol's industry has been the increased number of people working in high-tech companies. There are 50 microelectronic and silicon design businesses in Bristol. The following factors attract high-tech businesses to Bristol: a government grant of £100 million to become a super connected city with high broadband speeds, advanced research at the universities and an educated and skilled workforce.
- **Example** – Aardman Animations - based in Bristol. The studio has been well known for its films using stopmotion clay animation techniques e.g. Wallace and Gromit – its films have won an Oscar and many other award

How can urban change create environmental opportunities in Bristol?

- 2015 Bristol awarded **European Green Capital** with a plan to achieve the following by 2020, transport improvements, improved energy efficiency and development of renewable energy
- Bristol plans to develop an integrated transport system linking different forms of public transport within the city. The aim is to get people to travel using public transport instead of cars – reducing congestion and air pollution.
- The Rapid Transit Network consists of three bus routes from Temple Meads train station with the city's park and ride sites.
- **Urban greening** – 1/3 of Bristol's is open space and more than 90% of people love within 350m of parkland and waterways. Bristol has 8 nature reserves and 300 parks. Queen Square was once a dual carriage way but is now transformed into a cycle way with open space. Green initiatives include: 30% of city to be covered in trees.

How has urban change in Bristol created challenges?
Social and economic challenges:

- Urban deprivation – Filwood (south Bristol) is still in the 10% most deprived areas in England, with high levels of low income and child poverty.
- Inequalities in housing – Filwood has a high proportion of 1930s council housing and social housing, while Stoke Bishop has mostly owner-occupied homes and much higher house prices.
- Inequalities in education – GCSE attainment in Filwood remains below the Bristol average and lower than in Stoke Bishop, despite recent improvements.
- Inequalities in health – Life expectancy in Filwood is around 78 years, compared with around 83 years in Stoke Bishop, with higher rates of long-term illness.
- Inequalities in employment – Filwood has higher unemployment and more low-paid jobs than Stoke Bishop, where unemployment remains low and professional employment is common.

How has urban change in Bristol created challenges?
Environmental challenge

- **Dereliction** – Changes in the economy and industry in Bristol have led to many industrial buildings that are no longer being used becoming derelict. This is mainly in the inner city. When the port function moved downstream from the city many warehouses were abandoned and fell into decay. **Stokes Croft** in Bristol's inner city became notorious for its derelict housing and abandoned properties and many empty houses have been taken over by squatters and the area has suffered from anti-social behaviour.
- **Solution** - Bristol City Council has received lottery grants to help improve the poor economic activity and urban decay in the area. Artists wanted to improve the areas through public action and community art.

Bristol – a city in the UK Year 10 HT2

How has urban change in Bristol created challenges? Environmental challenges

- **Urban sprawl** – Urban sprawl has extended particularly to the north-west of the city. The new town of **Bradley Stoke** has extended the city to the north.

Solution - Between 2006 and 2013 only 6% of new housing developments were on greenfield land and by 2026 over 30,000 new homes are planned on brownfield sites. The green belt was set up to prevent urban sprawl on the rural-urban fringe and the merging of the cities Bath and Bristol. Towns to the north and south of the city, such as **Clevedon** has expanded to become **commuter settlements** so that people are able to travel from surrounding areas to work in the city.

- **Waste disposal** – The city produces half a million tonnes of waste per year. It is among the worst cities in the country in terms of the amount of food waste it creates.

Solutions - A range of strategies have been adopted to cope with the problem of waste disposal e.g. reducing the amount of waste that has to be sent to landfill and reducing the amount of waste generated per household by 15%. Bristol's population has increased by 9% since 2000 and the amount of household waste has reduced by 18% in the same period.

- **Atmospheric pollution** – Vehicle emissions are the main cause of air pollution in the city. Bristol is the most congested city in England and the main bus routes are often the most polluted. An estimated 200 people die in the city each year due to air pollution.

Solutions- Plans to reduce air quality include reducing speeds on motorways and residential areas and a smartphone app with information about public transport.

Named Example: The Temple Quarter Regeneration

Reasons why the area needed regeneration:

The Temple Quarter was very rundown. It gave a bad first impression to visitors, as it was the first part of the city seen by anyone driving from Wells or Bath. The Temple Quarter was developed as an industrial areas in 18th Century. The land was mainly disused and in a state of dereliction.

The main features of the project:

- Temple Quarter Enterprise Campus – A new University of Bristol campus opened in 2026, bringing thousands of students and staff to the area.
- Improved transport – Bristol Temple Meads station is being expanded and modernised, with better walking, cycling and bus links.
- New bridge built across the River Avon to the site of the former diesel depot – This was intended to give access to the New Bristol Arena (to be used for sporting events with up to 12,000 spectators) however the Arena is now being built outside of the city centre.
- Improved road layout with links to the rapid transport network and the Bristol Bath cycle network
- Enterprise zone status – 240,000m2 of either new or refurbished buildings, creating offices, homes and shops. The target is to create 4000 jobs by 2020 and 17000 by 2037 e.g. **Brunel's engine shed** - A £1.7 million innovation centre is being created – home to high-tech, creative and low carbon sector companies.

Potential Exam Questions on Bristol

Outline one way that international migration has led to change in the character of a named UK city. (2)

Suggest why there are inequalities in health in urban areas. (4)

Suggest reasons for inequalities in education in urban areas in the UK (4)

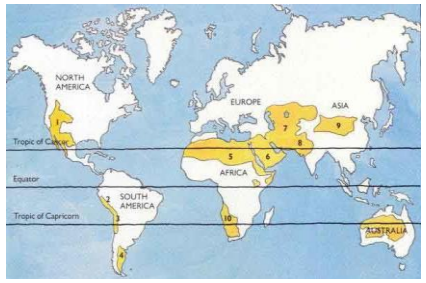
Discuss the effects of urban sprawl on people and the environment. (6)

To what extent has urban change created environmental challenges in a UK city you have studied? (9)

To what extent has urban change created opportunities in a UK city you have studied? (9)

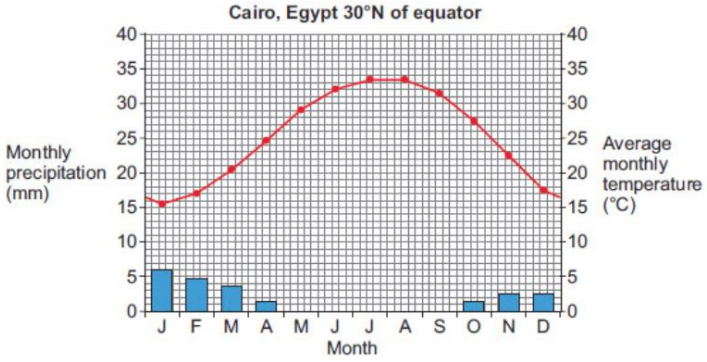
Hot Deserts Year 10 HT3

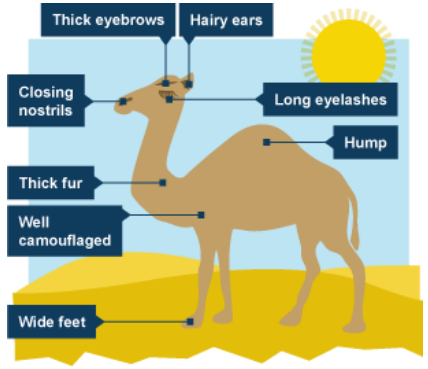
What is a Hot Desert?
Hot deserts are ecosystems that receive **less than 250 mm of rainfall** each year. They have very **high daytime temperatures**, **cold nights**, low humidity and sparse vegetation. Hot deserts are mainly found between **15° and 30° north and south of the Equator**, where descending air creates **high** pressure and dry conditions.



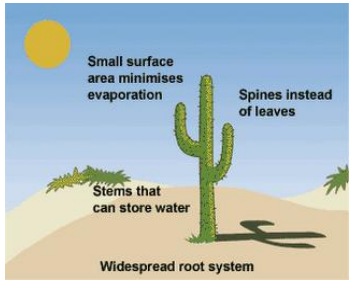
The different parts of a desert ecosystem are **interdependent**, meaning they rely on each other.

- **Climate:** Very hot days, cold nights and little rainfall. High rates of evaporation make water scarce.
- **Water:** Most rivers are seasonal (**ephemeral**) and only flow after heavy rain. Water is an important but limited resource.
- **Soils:** Desert soils are thin, sandy and low in nutrients because there is little organic matter. Some areas become salty as water evaporates.
- **Plants:** Vegetation is sparse and includes cacti, acacia trees and thorny shrubs.
- **Animals:** Common animals include camels, lizards, snakes, foxes and scorpions.
- **People:** Most people live near rivers or oases where water is available.
- **Biodiversity**
- Hot deserts have **low biodiversity** because harsh conditions limit the number of species. However, desert plants and animals are highly specialised, making them vulnerable to environmental change and human activity.





Plant Adaptations
Plants survive by storing water, having small or waxy leaves to reduce water loss, deep or widespread roots, and growing quickly after rainfall.
Desert plants are **xerophytes**, specially adapted to survive in dry conditions.
Cactus: Thick, fleshy stems store water. Spines replace leaves, reducing water loss and protecting against grazing animals. A waxy coating reduces evaporation. Shallow, widespread roots absorb rainwater quickly before it evaporates.



Resurrection Plant: Can survive long periods without water by drying out completely. Unfolds and becomes active again within hours of rainfall. Allows the plant to survive long droughts.
Other Adaptations: Small or waxy leaves reduce transpiration. Long tap roots reach underground water supplies. Many plants grow, flower and produce seeds rapidly after rainfall.

Animal Adaptations
Camel: Humps store fat (not water), which can be used for energy when food is scarce. Long eyelashes and closable nostrils keep out sand. Broad, padded feet prevent sinking into soft sand. Can survive for long periods without drinking
Desert Jerboa: Nocturnal, so it avoids daytime heat. Lives in underground burrows where temperatures are cooler. Gains most of its water from seeds and plants, meaning it rarely needs to drink. Long hind legs help it escape predators and move efficiently across sand.
Fennec Fox: Large ears help lose body heat and keep the fox cool in extreme temperatures. Thick, light-coloured fur reflects sunlight during the day and provides insulation against cold desert nights. Furry foot pads protect its feet from the hot sand and improve grip. Nocturnal, so it hunts at night when temperatures are much cooler. Gets most of its water from its food (such as insects, rodents and fruit), so it rarely needs to drink.
Reptiles have waterproof skin to reduce water loss.

Hot Deserts Year 10 HT3

Case Study: The Thar Desert (India and Pakistan)

The Thar desert is the worlds **most populated** desert. It lies on the border with India and Pakistan

Development Opportunities

Mineral extraction: Valuable minerals including **gypsum, feldspar, phosphorite and limestone**, which are used in fertilisers, cement and construction.

Energy: The desert has high levels of sunshine, making it ideal for **solar power**. Wind farms have also been developed. The **Barmer oilfields** produce over **175,000 barrels of oil per day**, while natural gas reserves provide jobs and energy.

Farming: The **Indira Gandhi Canal**, completed in **1987**, brings water from the Punjab rivers. Irrigation has allowed farmers to grow **wheat, cotton and mustard**, while livestock farming (especially goats, sheep and camels) remains important.

Tourism: Visitors are attracted by **camel safaris**, sand dunes, **Desert National Park**, and the historic city of **Jaisalmer**, known as the **'Golden City'** because of its yellow sandstone buildings.

Challenges

Extreme temperatures: Summer temperatures can exceed **50°C**, making work difficult.

Water supply: Rainfall is unreliable and water is scarce, increasing demand for irrigation.

Inaccessibility: Large distances and sandy terrain make transport and development expensive, although roads are improving.

Environmental impacts: Over-irrigation has caused **soil salinisation** in some areas, while increasing tourism, mining and farming put pressure on fragile desert ecosystems.

Desertification:

Desertification means the turning of semi-arid areas (or drylands) into deserts.

Where in the world is desertification happening?.

Along the fringes of the worlds major deserts. The **Sahel** is a semi-arid region south of the Sahara Desert that is at risk of desertification

Causes

- **Climate Change :** Reduce rainfall and rising temperatures have meant less water for plants.
- **Overgrazing:** Too many animals mean plants are eaten faster than they can grow back. Causing soil erosion
- **Over-Cultivation:** If crops are grown in the same areas too often, nutrients in the soil will be used up causing soil erosion.
- **Fuel Wood:** People rely on wood for fuel. This removal of trees causes the soil to be exposed.
- **Population Growth:** A growing population puts pressure on the land leading to more deforestation, overgrazing and over-cultivation.

Managing Desertification

- **Water management:** Small dams, stone lines and rainwater harvesting help retain water. growing crops that don't need much water. E.g. Atriplex
- **Soil management:** leaving areas of land to rest and recover lost nutrients or adding manure and building terraces improve soil fertility and reduce erosion.
- **Tree planting:** Projects such as the Great Green Wall reduce wind erosion and improve soil quality.
- **Appropriate technology:** Simple, low-cost methods using local materials help communities farm sustainably e.g. magic stones - Low stone walls are built along the contours of the land to trap water and soil

Weather Hazards – Tropical Storms Year 10 HT4

Global pattern of air circulation

Atmospheric circulation is the large-scale movement of air by which heat is distributed on the surface of the Earth.

Hadley cell

Largest cell which extends from the Equator to between 30° to 40° north & south.

Ferrel cell

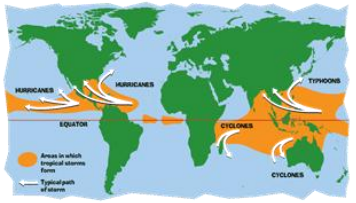
Middle cell where air flows **poleward** between **60° & 70°** latitude.

Polar cell

Smallest & weakness cell that occurs rom the poles to the Ferrel cell.

Distribution of Tropical storms

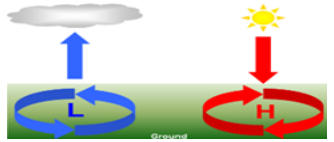
Hurricanes (North America), Cyclones (India) and Typhoons (Japan and East Asia). They all occur in a band that lies roughly 5-15° either side of the Equator.



High and low pressure

Low pressure: Caused by hot air rising. Causes stormy, cloudy weather. Found along the Equator where tropical rainforests are found. Found 60° N and S of the Equator (UK)

High Pressure: Caused by cold air sinking. Causes clear and calm weather. Found 30° and 90° N and S of the Equator



Formation of Tropical Storms

1. The sun's rays heats large areas of ocean in the summer and autumn. This causes **warm, moist air** to rise over the particular spots
2. Once the **temperature is 27°**, the rising warm moist air leads to a **low pressure**. This eventually turns into a thunderstorm. This causes air to be sucked in from the **trade winds**.
3. With trade winds blowing in the opposite direction and the rotation of earth involved (Coriolis effect), the thunderstorm will eventually start to **spin**.
4. When the storm begins to **spin faster than 74mph**, a tropical storm (such as a hurricane) is officially born.
5. With the tropical storm growing in power, **more cool air sinks** in the centre of the storm, creating calm, clear condition called the **eye of the storm**.
6. When the tropical storm hits land, it **loses its energy source** (the warm ocean) and it begins to lose strength. Eventually it will 'blow itself out'.

Primary Effects of Tropical Storms

- The intense winds of tropical storms can destroy whole **communities, buildings** and **communication networks**.
- As well as their own destructive energy, the winds can generate abnormally high waves called **storm surges**.

Sometimes the most destructive elements of a storm are these subsequent **high seas and flooding** they cause to coastal area

Secondary Effects of Tropical Storms

- People are **left homeless**, which can cause distress, poverty and ill health due to lack of shelter.
- **Shortage of clean water** and **lack of proper sanitation** makes it easier for diseases to spread.
- **Businesses are damaged** or destroyed causing employment.
- Shortage of food as **crops are damaged**.
-

Changing pattern of Tropical Storms

Scientist believe that global warming is having an impact on the frequency and strength of tropical storms. This may be due to an increase in ocean temperatures.

Management of Tropical Storms

Protection Preparing for a tropical storm may involve construction projects that will improve protection.

Aid Aid involves assisting after the storm, commonly in LICs.

Development The scale of the impacts depends on the whether the country has the resources cope with the storm.

Planning Involves getting people and the emergency services ready to deal with the impacts

Prediction Constant monitoring can help to give advanced warning of a tropical storm

Education Teaching people about what to do in a tropical storm.

Weather Hazards – Tropical Storms Year 10 HT4

Named Example: Cyclone Idai March 2019

Key facts:

- Africa's deadliest Tropical storm.
- Strom makes landfall In Mozambique at the city of Beira
- 4M storm surge
- 600mm of torrential rain
- Mozambique is one of Africa's poorest countries 24 million live below the poverty line

Causes: It began as a storm cell over Malawi that moved out to sea where it intensified and returned to land as a cyclone

Track: Beira was in the path as the storm reached its peak

Effects of Cyclone Idai

Primary Effects:

- 1300 people are killed
- 3 million are left homeless
- 90% of Beira is destroyed
- 17 hospitals are destroyed
- In Zimbabwe flash flooding killed 600 people

Secondary Effects:

- In Mozambique and Zimbabwe river flooding washed away roads and bridges
- 700,000ha of crops are lost
- In Zimbabwe landslides hampered rescue
- In Malawi 2 HEP dams broke affecting power

Responses to Cyclone Idai

Immediate Responses:

- Boats used in Mozambique to rescue people from roof tops
- 140 rescue centres set up
- In Malawi churches and schools are temporary shelters
- UN helicopters dropped food
- WHO provides 900,000 cholera vaccination kits

Long Term Responses

- In Beira Dutch engineers help to repair water supplies
- CAFOD give £2 million t help rebuild schools
- In Mozambique new homes are built stronger and away from high risk areas
- An improved early warning system is created

Monitoring and prediction

Developments in satellites allows storms to be tracked and flights with specialist planes into the storm can take readings to establish the strength.

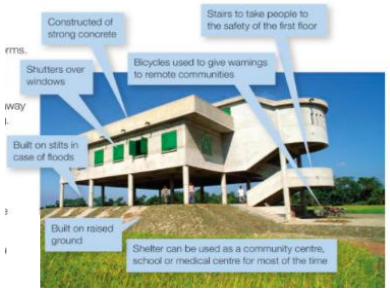
If the path and strength of the storm is known people can be warned and evacuated.

Protection

Sea walls can be built

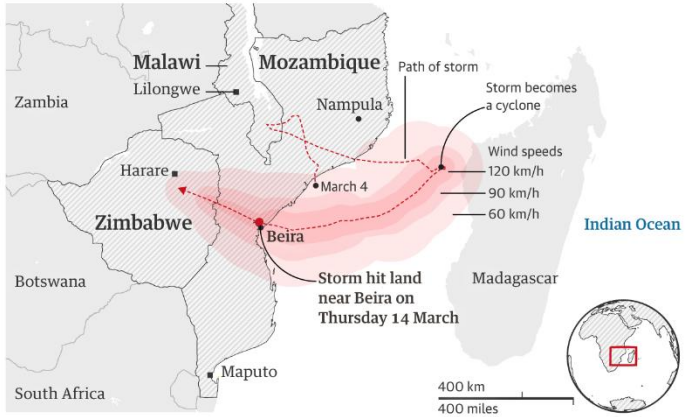
Strong buildings with shutters and reinforced walls.

Cyclone shelters can be built



Planning

Being prepared is important by being educated on how to stay safe and packing an emergency survival pack . Media campaigns can also be used to remind people of what to do



Guardian graphic. Source: Global Disaster Alert and Coordination System

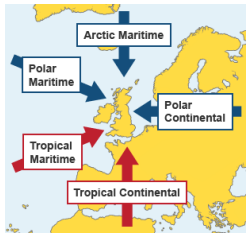
Weather Hazards – Extreme Weather in the UK Year 10 HT4

Definitions

Weather - the description of the day to day changes in the atmosphere

Climate - the average weather conditions taken over 30 years

Extreme weather - is significantly different from the usual weather and is severe and or unseasonal



Types of Weather Hazard in the UK

The UK experiences a range of extreme weather hazards because it lies where tropical and polar air masses meet.

- **Strong winds and storms** – can damage buildings, trees and transport.
- **Heavy rainfall and flooding** – caused by prolonged rain or intense storms.
- **Snow and ice** – disrupt transport and increase accident risk.
- **Thunderstorms** – bring heavy rain, lightning and flash flooding.
- **Heatwaves** – prolonged periods of unusually hot weather causing drought and health risks.
- **Drought** – long periods of low rainfall leading to water shortages.

Impacts of Extreme Weather

Extreme weather has **social, economic and environmental impacts**.

Social: Injuries and deaths, homes flooded, disruption to transport, schools and businesses.

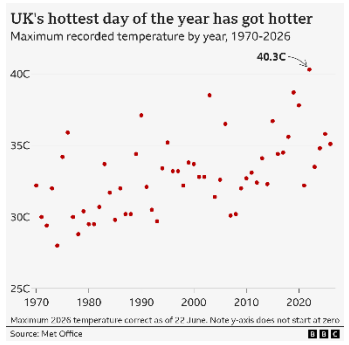
Economic: Damage to buildings, crops and infrastructure, expensive repairs and loss of income.

Environmental: Flooding of farmland, erosion, pollution of rivers and destruction of habitats.

Evidence that UK Weather is Becoming More Extreme

Scientists have found that the UK is experiencing more frequent and intense weather extremes as the climate changes. Recent evidence includes:

- 2025 was the warmest and sunniest year on record in the UK.
- The last three years are all among the UK's warmest since records began in 1884.
- Heatwaves are becoming more frequent, while heavy rainfall events are becoming more intense.
- Rising temperatures increase the risk of flooding, droughts and wildfires.



Named Example: Somerset Levels Floods (Winter 2013–2014)

The Somerset Levels are a low-lying area in south-west England that is naturally prone to flooding.

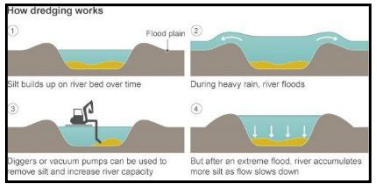
Causes

- The area experienced record rainfall during January 2014 after weeks of heavy winter rain.
- Rivers Tone and Parrett burst their banks. The rivers had not been dredged for 20 years, reducing their capacity.
- High tides (storm surge) prevented floodwater from draining into the Bristol Channel.
- The flat, low-lying landscape increased flood risk.

Social Impacts	Economic Impacts	Environmental Impacts
Over 600 homes were flooded.	Damage cost approximately £80 million	Wildlife habitats were damaged
Around 16 farms were evacuated.	Over 14,000 hectares of agricultural land were flooded.	Floodwater polluted rivers with sewage and chemicals.
Villages such as Muchelney were cut off for weeks.	Roads and railways were closed, affecting businesses and tourism.	Large areas of farmland remained waterlogged for months.

Management

- 8km of the Rivers Tone and Parrett were dredged, removing over 235,000 m^3 of sediment.
- River banks were strengthened and raised.
- Permanent pumping stations were upgraded.
- A 20-year Somerset Flood Action Plan was introduced.
- Construction of a tidal barrage at Bridgewater
- Improved flood warnings and emergency planning help reduce future risk.



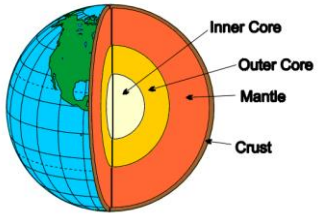
Tectonic Hazards Year 10 HT5

What is a Natural Hazard?
A natural hazard is a naturally occurring event that threatens people, property and the environment. A hazard only becomes a disaster when it affects people and causes significant damage.

Types of Natural Hazard
- **Tectonic:** Earthquakes, volcanic eruptions and tsunamis.
- **Atmospheric:** Tropical storms, heatwaves, droughts and extreme rainfall.

Factors Affecting Hazard Risk
Hazard risk depends on:
- **Urbanisation** – more people living in hazardous areas.
- **Poverty** – poorer countries often have weaker buildings and fewer emergency services.
- **Climate change** – increases the frequency and intensity of some hazards.
- **Population growth** – more people exposed to hazards.
- **Farming and economic opportunities** – people remain in dangerous areas because of fertile soils, jobs or tourism.

What is the Structure of the Earth?
The Earth has four layers:
The inner core The outer core
The mantle The crust

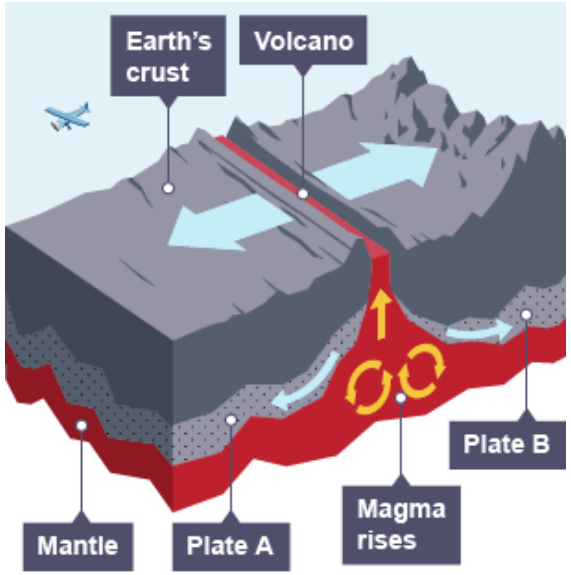


The crust is split into major fragments called **tectonic plates**.
There are two types: **Oceanic** (thin and younger but dense) and **Continental** (old and thicker but less dense)
These plates move and where they meet you get tectonic activity (volcanoes and earthquakes).
There are two theories of why plates move: **convection currents** and **ridge push, slab pull**
.

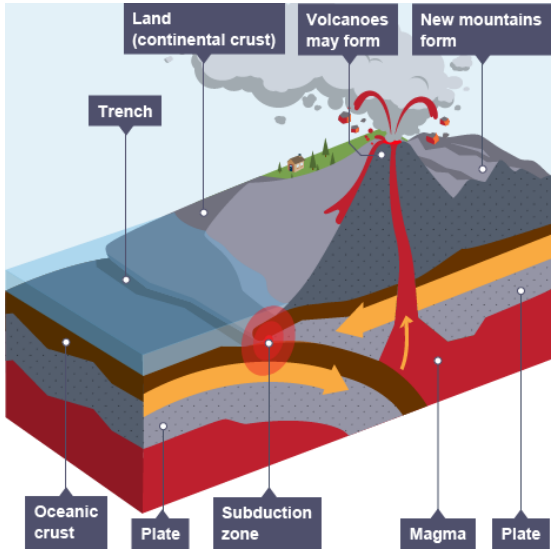
Global Distribution of Earthquakes & Volcanoes
- Most occur around the Pacific Ring of Fire.
- Volcanoes are mainly found at constructive and destructive plate margins.
- Earthquakes occur at constructive, destructive and conservative margins.

Plate Tectonic Theory
The Earth's outer layer is broken into large tectonic plates that float on the semi-molten mantle. Heat from the Earth's core creates **convection currents**, causing the plates to move. Most earthquakes and volcanoes occur where plates meet (plate margins).

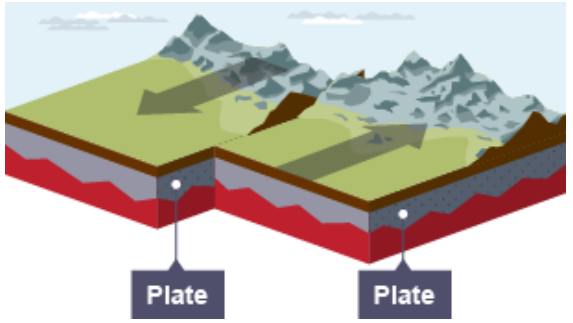
Types of Plate Margin
Constructive - Plates move **apart**. Magma rises to fill the gap, creating **shield volcanoes** and gentle earthquakes.
Destructive - An oceanic plate is forced beneath a continental plate (**subduction**). Melting rock forms **composite volcanoes** and powerful earthquakes.
Conservative - Plates slide **past each other**. Friction builds until it is released as an earthquake. **No volcanoes** form.



Constructive



Destructive



Conservative

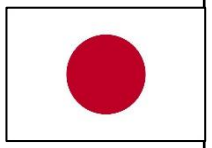
Tectonic Hazards Year 10 HT5

Named Example 1: Nepal Earthquake (LIC) – 25 April 2015
Magnitude: 7.8
Plate Margin: Destructive (Indian Plate colliding with the Eurasian Plate)

GDP: $1550
HDI 0.60

Primary Effects
•Nearly **9,000 people died** and over **20,000 were injured**.
•Around **3 million people were left homeless**.
•Over **7,000 schools** and many hospitals were destroyed.
•Historic buildings, including parts of **Kathmandu's Durbar Square**, collapsed.
Secondary Effects
•Landslides blocked roads and isolated villages.
•Avalanches on **Mount Everest** killed **19 people**.
•Food and clean water shortages increased the risk of disease.
Immediate Responses
•International search and rescue teams arrived.
•Emergency food, water and temporary shelters were provided.
•Helicopters rescued people trapped in remote mountain villages.
Long-term Responses
•Homes, schools and roads were rebuilt.
•Building regulations were strengthened.
•Tourism and historic sites were gradually restored.

Named Example 2: Japan (Tōhoku) Earthquake and tsunami (HIC) – 11 March 2011
Magnitude: 9.0
Plate Margin: Destructive (Pacific Plate subducting beneath the North American Plate)



GDP:$ 41,690
HDI: 0.919

Primary Effects
•Around **18,000 people died**.
•More than **6,000 people were injured**.
•Over **120,000 buildings** were destroyed.
•A tsunami over **10 metres high** struck the coast.
Secondary Effects
•The tsunami caused the **Fukushima nuclear power plant disaster**.
•Around **500,000 people** were evacuated.
•Total damage was approximately **US$235 billion**, making it the costliest natural disaster ever recorded.
Immediate Responses
•More than **100,000 members of the Japanese Self-Defence Force** were deployed.
•Emergency shelters, food and water were provided.
•International search and rescue teams assisted.
Long-term Responses
•Sea walls were rebuilt and made higher.
•Coastal communities improved tsunami evacuation routes.
•Buildings and infrastructure were reconstructed using earthquake-resistant designs.
•Nuclear safety regulations were strengthened.

Why Do People Live in Hazard Zones?
People continue to live in tectonic hazard areas because:
- Volcanic soils are fertile for farming.
- Geothermal energy provides renewable electricity.
- Valuable minerals can be mined.
- Tourism creates employment.
- Many people have family ties or cannot afford to move.

Managing Tectonic Hazards
- **Monitoring** - Scientists use seismometers, GPS, satellite images and gas monitoring to detect volcanic activity.
- **Prediction** - Volcanic eruptions can sometimes be predicted using warning signs such as earthquakes and ground swelling. Earthquakes cannot be predicted accurately.
- **Protection** - Earthquake-resistant buildings. Flexible pipes and automatic gas shut-off valves. Tsunami sea walls in coastal areas.
- **Planning** - Hazard maps. Evacuation routes and regular drills. Public education and emergency kits. Education helps people know how to respond

Coastal Environments Year 10 HT6

How do waves form?
Waves are created by wind blowing over the surface of the sea. As the wind blows over the sea, friction is created - producing a swell in the water

Types of Waves

- **Constructive Waves**

Low energy, gentle waves. Strong swash deposits material onto the beach. Build beaches through deposition. More common in calm weather.

- **Destructive Waves**

High energy, steep waves. Strong backwash removes material from the beach. Cause erosion .Common during storms.

Types of Weathering
Weathering is the breakdown of rocks where they are.
Mechanical – Rocks break apart without changing chemically (e.g. freeze-thaw weathering and salt crystallisation).
Chemical – Weak acids in rainwater dissolve rocks such as limestone.

Mass Movement
A large movement of soil and rock debris that moves down slopes in response to the pull of gravity in a vertical direction.

- Rockfall – Rocks break away from steep cliffs.
- Sliding – Large blocks move along a straight slip plane.
- Slumping – Saturated soft rock rotates along a curved slip plane.

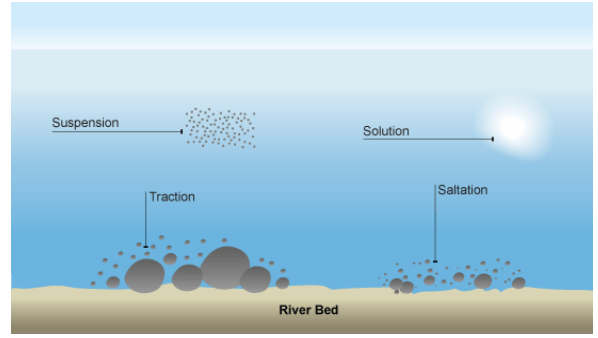
The debris at the base of the cliff is then removed and transported by waves or river.

How Geology Affects the Coast

- Hard rocks (e.g. limestone, chalk) resist erosion and form headlands.
- Soft rocks (e.g. clay, sand) erode quickly, forming bays.
- Discordant coastlines have alternating bands of hard and soft rock.
- Concordant coastlines have parallel bands of rock.

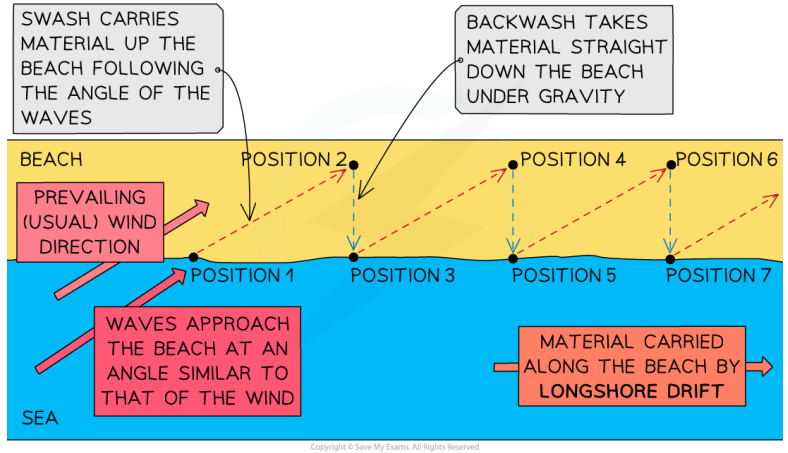
Types of Erosion: The break down and transport of rocks – smooth, round and sorted.
Attrition: Rocks that bash together to become smooth/smaller.
Solution: A chemical reaction that dissolves rocks.
Abrasion: Rocks hurled at the base of a cliff to break pieces apart.
Hydraulic Action: Water enters cracks in the cliff, air compresses, causing the crack to expand.

Types of Transportation: A natural process by which eroded material is carried/transported.
Solution: Minerals dissolve in water and are carried along.
Suspension: Sediment is carried along in the flow of the water.
Saltation: Pebbles that bounce along the sea/river bed.
Traction: Boulders that roll along a river/sea bed by the force of the flowing water



Longshore Drift: the zigzag of sediment along the coastline

.

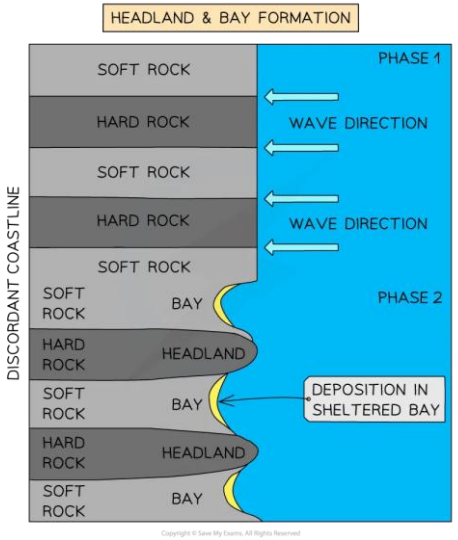


What is Deposition?
When the sea or river loses energy, it drops the sand, rock particles and pebbles it has been carrying.

Erosional Landforms

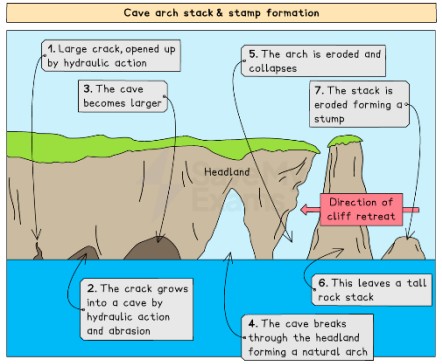
Headlands and Bays

Waves attack the coastline.
Softer rock is eroded by the sea quicker forming a bay, calm area cases deposition.
More resistant rock is left jutting out into the sea. This is a headland and is now more vulnerable to erosion.



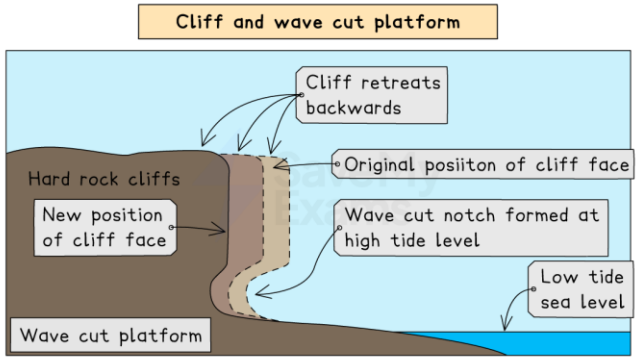
Caves, Arches and Stacks

Cracks are enlarged into caves, which develop into arches. When the arch roof collapses, a stack remains. Further erosion creates a stump.



Wave Cut Platforms

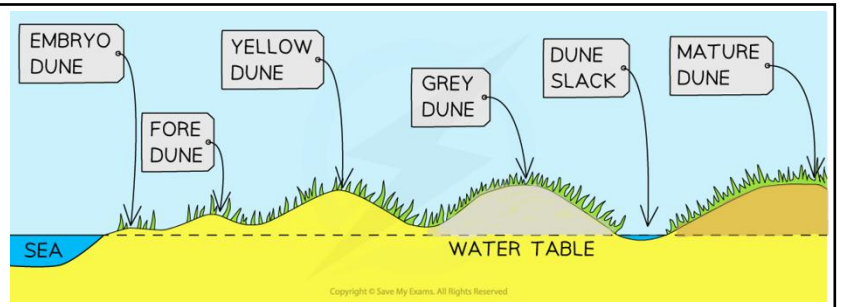
Repeated erosion undercuts cliffs, causing collapse. Retreating cliffs leave a flat wave-cut platform.



Depositional Landforms

Sand Dunes

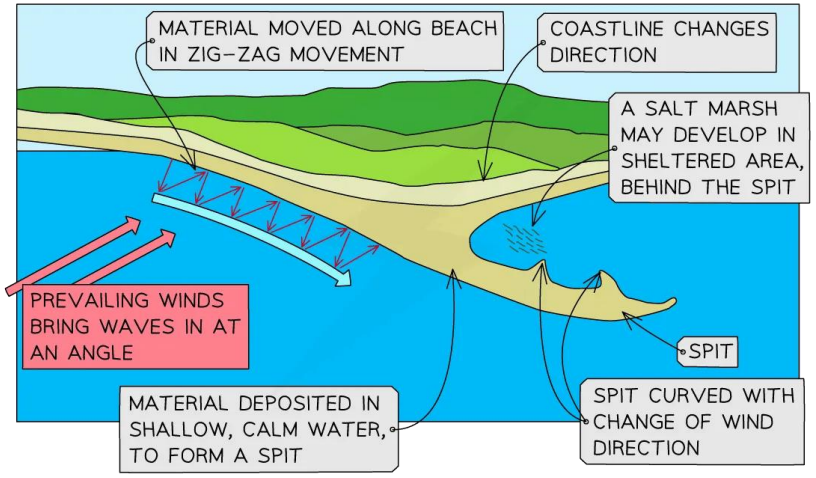
Form when wind blows dry sand inland. Marram grass stabilises the dunes.



Beaches: Sandy beaches are found in sheltered bays and are created by constructive waves. Along high energy coasts sand is washed away to leave a pebble beach

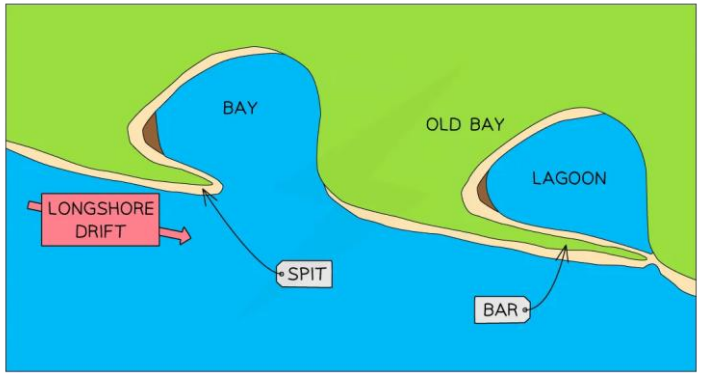
Spits -

Zigzag movement (Longshore Drift) transports material along beach.
Deposition causes beach to extend, until reaching a river estuary.
Change in prevailing wind direction forms a hook.
Sheltered area behind spit encourages deposition, salt marsh forms.



Bars

A spit can grow across a bay, forming a **bar** and trapping a lagoon behind it.



Coastal Environments Year 10 HT6

Management Strategy	Advantages	Disadvantages
Sea Wall (Hard Engineering)	Very effective at preventing erosion and flooding. Strong and long-lasting. Can include a promenade for tourism and recreation.	Very expensive to build and maintain. Reflects wave energy, increasing erosion at the base and nearby coastlines. Can be visually unattractive.
Rock Armour (Rip Rap)	Absorbs wave energy, reducing erosion. Cheaper than sea walls. Easy to maintain and provides habitats for wildlife.	Large boulders are often imported, increasing costs. Can make beaches difficult to access and may not suit all landscapes.
Gabions	Cheap and quick to install. Absorb wave energy and reduce erosion. Can become vegetated over time.	Wire cages rust and break over time. Less durable than other methods. Can look unattractive.
Groynes	Trap sediment moved by longshore drift, creating wider beaches that absorb wave energy. Can improve tourism by maintaining beaches.	Starve beaches further down the coast of sediment, increasing erosion elsewhere. Require ongoing maintenance.
Beach Nourishment (Soft Engineering)	Creates a wider, natural-looking beach that absorbs wave energy. Improves tourism and wildlife habitats. Relatively inexpensive.	Material is washed away by storms and must be replaced regularly. Ongoing maintenance costs.
Beach Reprofiling	Redistributes beach material to make beaches more effective at reducing wave energy. Maintains a natural appearance.	Needs to be repeated after storms as waves move sediment. Not suitable where there is little beach material.
Dune Regeneration	Low cost and environmentally friendly. Dunes provide a natural barrier against flooding and erosion. Creates valuable wildlife habitats.	Takes time for dunes to become established. Easily damaged by storms or trampling if not protected. Requires fencing and planting.
Managed Retreat (Coastal Realignment)	Creates natural salt marshes that absorb wave energy. Reduces long-term maintenance costs. Improves biodiversity and wildlife habitats. Sustainable in the long term.	Farmland and property may be lost. Compensation may be required. Some local communities oppose allowing land to flood.

Named Example Lyme Regis Coastal management Scheme
The issues are that the cliffs were unstable, erosion by powerful waves, sea walls breached.
Strategies: New sea wall and promenade, beach nourishment to create wide beach, extension of rock armour, cliffs stabilised.
Cost: £43 million
Positive Effects: new beaches have increased visitor numbers, new defences protect coast from increasing storms, harbour is better protected
Negative Effects: Increased visitors means more traffic, some defences soil the landscape, new sea wall could interfere with coastal processes

Named Example: Medmerry Coastal Realignment (West Sussex)
Why was it needed? The old sea wall was frequently damaged by storms and was expensive to maintain. Thousands of homes, farmland and the A259 road were at risk from coastal flooding.
Management Strategy: Allowed 183 hectares of low-value farmland to flood naturally. Created new saltmarsh habitats.
Benefits: Reduced flood risk to over 300 homes. Protected local businesses and infrastructure. Created one of the largest areas of intertidal habitat in south-east England. Saved money by reducing future sea wall repairs. Increased opportunities for wildlife and tourism.
Conflicts: Loss of farmland. Some landowners opposed the scheme. Initial construction costs were high (around £28 million

Fieldwork Year 10 HT6

Where is Llandudno?
A tourist town on the North coast of Wales
Why do we go there?
Human: The town is safe, there are many locations in walking distance to compare It's a busy place with lots of people to ask, it is a well established sea side town popular with tourists all year round

Physical: The beach is accessible and safe. There are a range of sea defences to consider, the town has ongoing plans to review and improve the current defences

What are the risks?
Human: Traffic, strangers, separated from team, trips on pavement
Physical. Waves, tides water, trips on beach, separate from team , strangers

Collecting data:
Primary data are the things that you collect first hand, ***Secondary data*** are those published by someone else
Quantitative data are 'hard' or 'objective data that come from collecting numbers like the size of pebbles.
Qualitative data are 'soft' or 'subjective data that you get from asking peoples opinions or taking photos

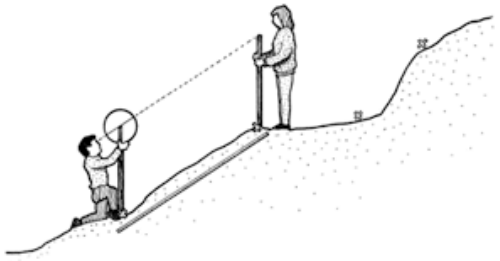
Sampling methods:
Random: Samples are chosen without any pattern
Systematic: Having a system like every 10 meters
Stratified: Means deliberately introducing bias for example deliberately selecting different pebble sizes so that the whole range is in the sample

Physical Enquiry Question:

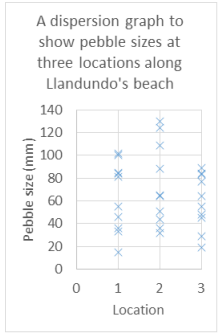
Longshore drift is happening at Llandudno beach

Physical data collection methods:
Beach Profiles and sediment samples

Beach profiles: Working in teams using the following equipment:
Ranging poles, Clinometer, Tape measure



Physical data presentation methods:
Line graphs and dispersion graph



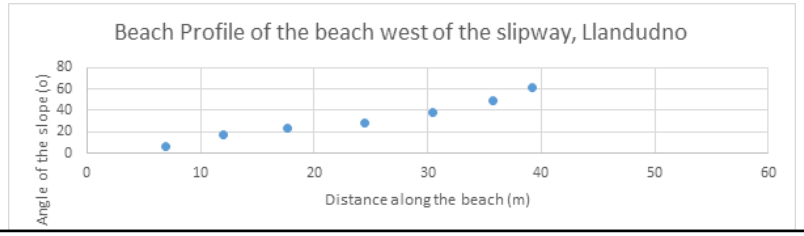
Benefits of the beach profile:
- ✓ Shows the shape of the beach.
- ✓ Helps to show changes in gradient,
- ✓ might suggest the impact of the sea defences

Disadvantages of the beach profile:
- Might not give an accurate gradient if measured badly
- Shape of the beach may have been altered(storm/beach re-profiling)
- Impact of sea defences may be inconclusive

Sediment sample: Select 10 stones at three locations across the width of the beach measure the size of the rocks using callipers.

Benefits of sediment sample:
- ✓ Will show changes in pebble size may indicate LSD
- ✓ May indicate re-profiling
- ✓ Combination of systematic and random sampling eliminates bias

Disadvantages of sediment sample:
- Human interference may alter sample
- Unconscious bias in the selection of stones



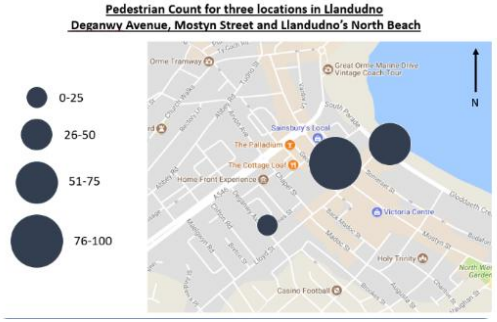
Fieldwork Year 10 HT6

Human Enquiry Question: Environmental quality in Llandudno changes as you move away from the north shore

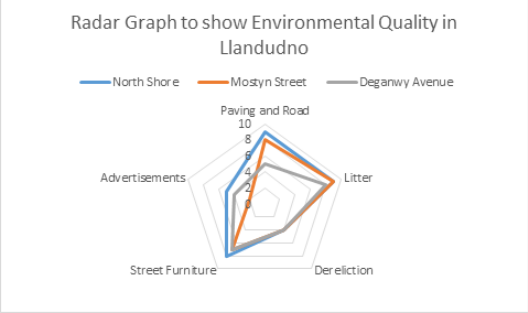
Data collection methods:
Pedestrian count (PC) and Environmental quality survey (EQS)

At three locations:
PC – Set timer for five minutes and record how many people walk past a point
EQS – score the location on a scale of 1-10 for dereliction, litter, noise, vegetation, street furniture

Data presentation:
Proportional symbols map used to show the pedestrian count data
Advantages: Easy to compare locations
Can show a wide range of data
Disadvantages: Symbols could overlap, maps can become cluttered, small values hard to see



Radar graph used to show the environmental quality survey
Advantages: Easy to compare locations and make comparisons, visually appealing and easy to spot patterns
Disadvantages: Can become cluttered, not suitable for large amounts of data



To analyse your data you need to look for patterns and trends, make links between sets of data, identify anomalies and suggest possible reasons for the patterns

Writing a conclusion:
- Refer back to the main aim of the study
- State the most important data that supports your conclusions
- Comment on any anomalies or unexpected results
- Comment on the wider geographical importance of your study

Evaluation
- **Reliability of the data**: Was enough data collected? Were measurements repeated? Were there enough sampling sites?
- **Accuracy of the methods**: Could equipment or human error have affected the results? Were the same methods used consistently at every site?
- **Sampling**: Was the sampling method appropriate (e.g. systematic or random)?Was the sample size large enough to represent the whole area?
- **Limitations**: Weather conditions (e.g. rain, wind, river level).Time of day or season. Access restrictions or safety concerns. Human error when recording measurements.
- **Improvements**: Collect more data from more sites. Repeat the investigation at different times of the year. Use more accurate equipment (e.g. digital measuring devices or GPS).Repeat measurements and calculate an average.

Potential questions:
1. State the title of your fieldwork enquiry in which **physical** geography data were collected. Explain the advantage(s) of the location(s) used for your fieldwork enquiry.[2]
2. Justify the use of maps **or** photographs **or** field sketches in your physical geography enquiry.[3]
3. To what extent were the data collected useful in satisfying the original aim(s) of the enquiry? [6]
4. With reference to your methods, results and conclusions, suggest how **one** of your geographical enquiries could be improved. [9]