Dynamic Earth

The Structure of the Earth

The Earth is made up of several layers. The diagram below shows a cut out diagram of what we think that the centre of the Earth looks like.

The Earth is one of 9 planets orbiting the Sun. The Earth was formed around 4600 million years ago.

At the centre of the Earth is the **core**. It is very dense and probably made of nickel and iron. The centre is thought to reach about 5500°C.

Outside the core, there is a liquid layer known as the **mantle**. The outside layer of this, where it meets the atmosphere, it cools and solidifies to form the **Crust**. Under the oceans the Crust is about 7 km thick. On the land it is about 20 km thick.

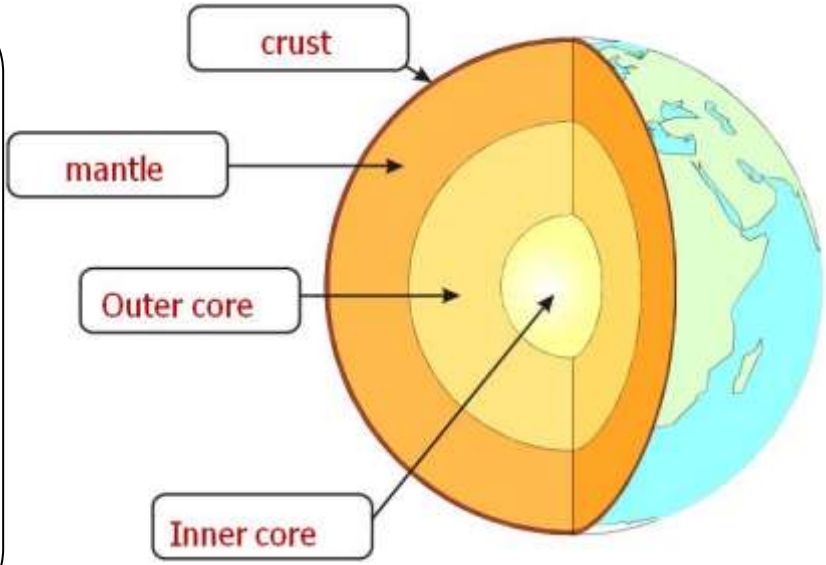
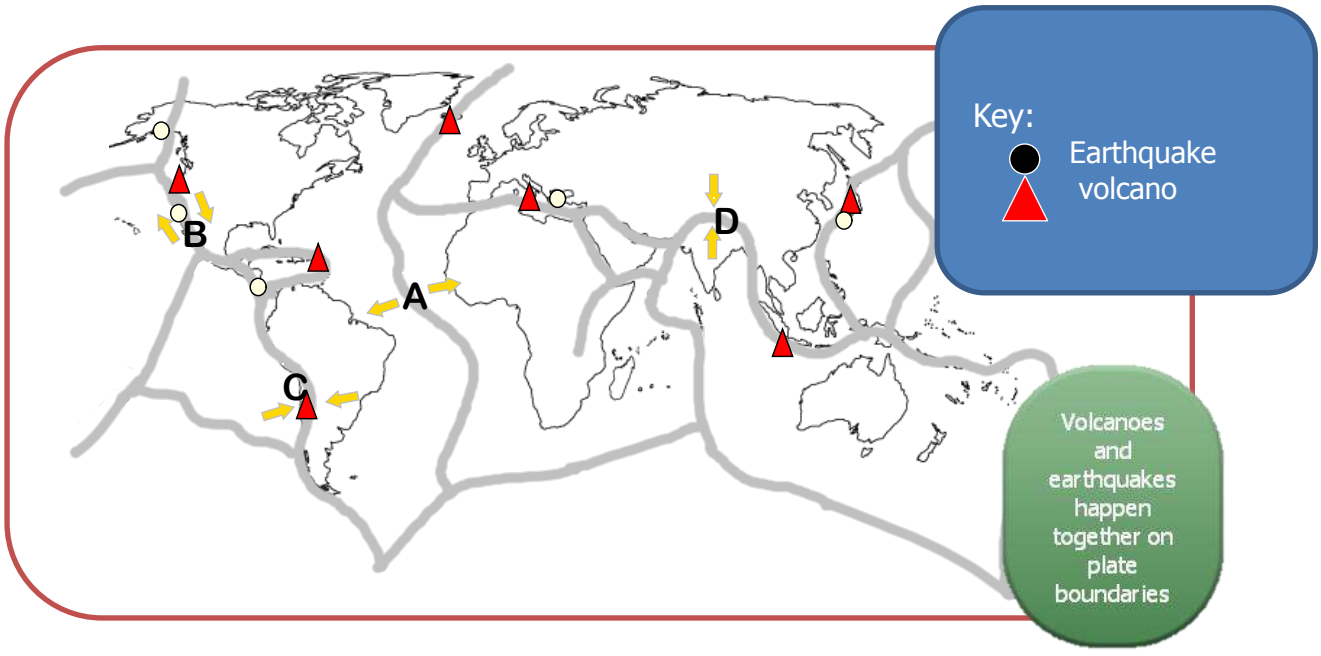


Plate Boundaries



The map above shows where the plate margins are in the world

The Earth's crust is divided into a series of pieces or **tectonic plates**.

Some of these plates are made of dense, igneous rock and form the ocean floor: these are **oceanic plates**.

Some of the plates are made of thicker, lighter sedimentary rock which form the major land masses or continents: these are **continental plates**.

The **convection currents** in the Earth's mantle drag the plates around on the surface.

Sometimes the plates are **pulled apart** and new land is formed: this is known as a **constructive boundary.** (Letter **A** on the map)

Sometimes two different types of plates are **pushed together** and some oceanic crust is forced back into the mantle where it melts and is lost: this is known as a **destructive boundary**. (Letter **C** on the map)

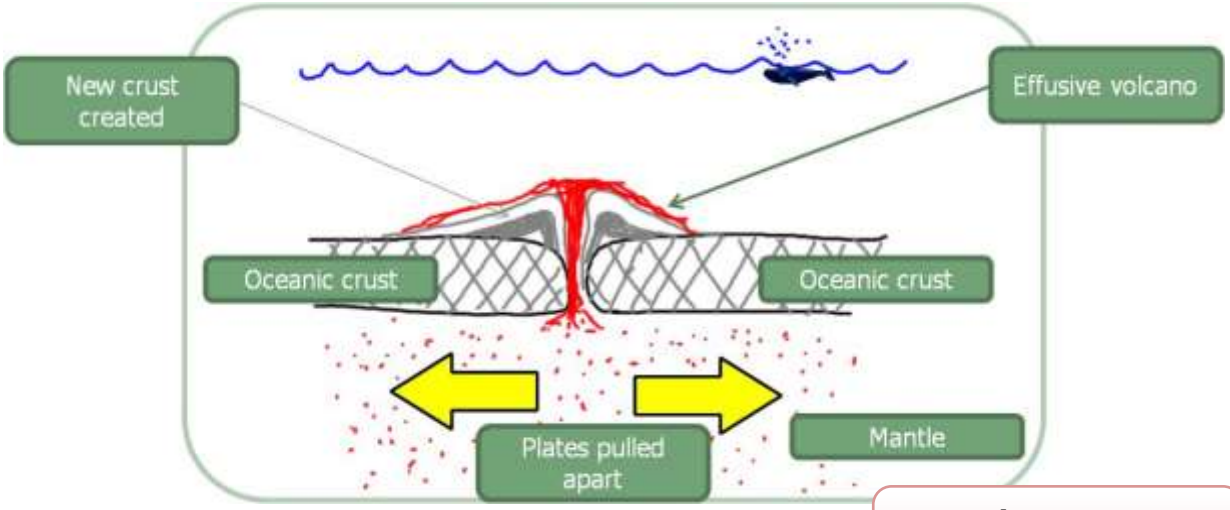
Sometimes the plates are **pushed together** and two pieces of continental crust collide and a mountain range is formed: this is known as a **collision boundary**. (Letter **D** on the map)

Sometimes the plates **slide past each other** and no new crust is created and none is lost: this is known as a **conservative margin**. (Letter **B** on the map)

Constructive Boundaries

These are places where two oceanic plates are being pulled apart by the convection currents in the mantle. As the plates move away from each other magma flows into the gap and new land is created. These areas have volcanoes with runny-lava (effusive volcanoes) and are prone to earthquakes. They often occur on the ocean floor, but occasionally, the new crust pushes through the surface of the water and new land is created.

A constructive margin

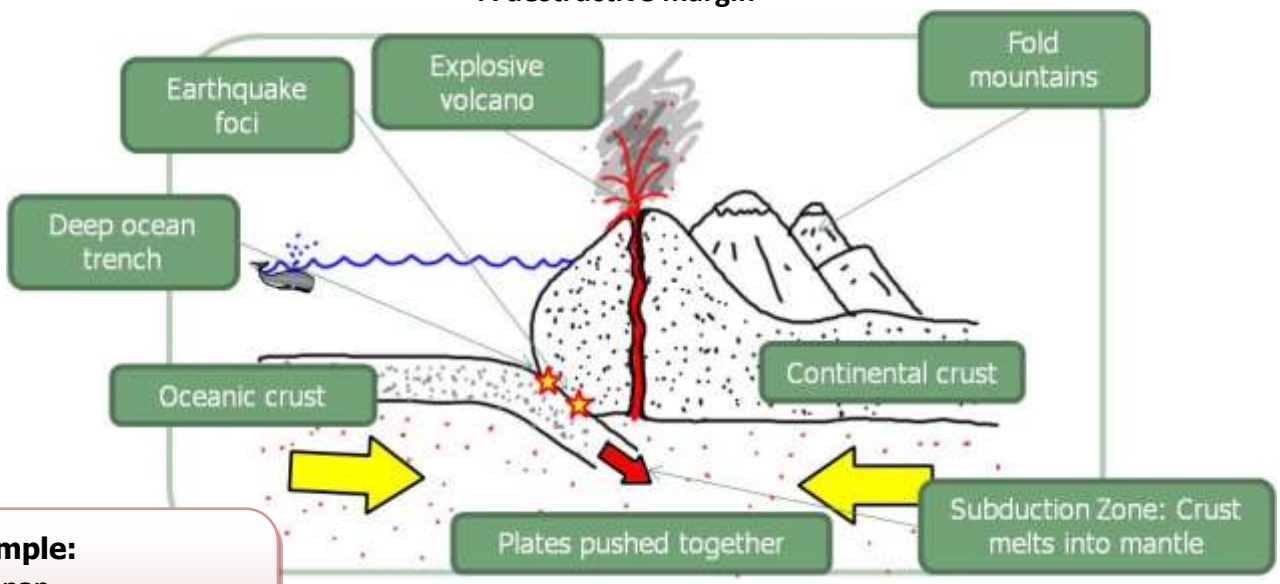


Example:
The Mid-Atlantic Ridge

Destructive Boundaries

These occur where a continental plate and an oceanic plate are forced together. The denser oceanic plate sinks underneath the lighter continental plate, forming a deep ocean trench. The oceanic crust melts into the mantle in process known as subduction. Where the two plates slip past each other there are a lot of earthquake foci. The oceanic plate brings water and other impurities from the ocean floor with it that melt into the mantle and make the magma sticky. Consequently, any volcanoes that occur in these areas tend to be explosive volcanoes. The continental plate buckles under the pressure of the impact with the oceanic plate and fold mountains are formed.

A destructive margin

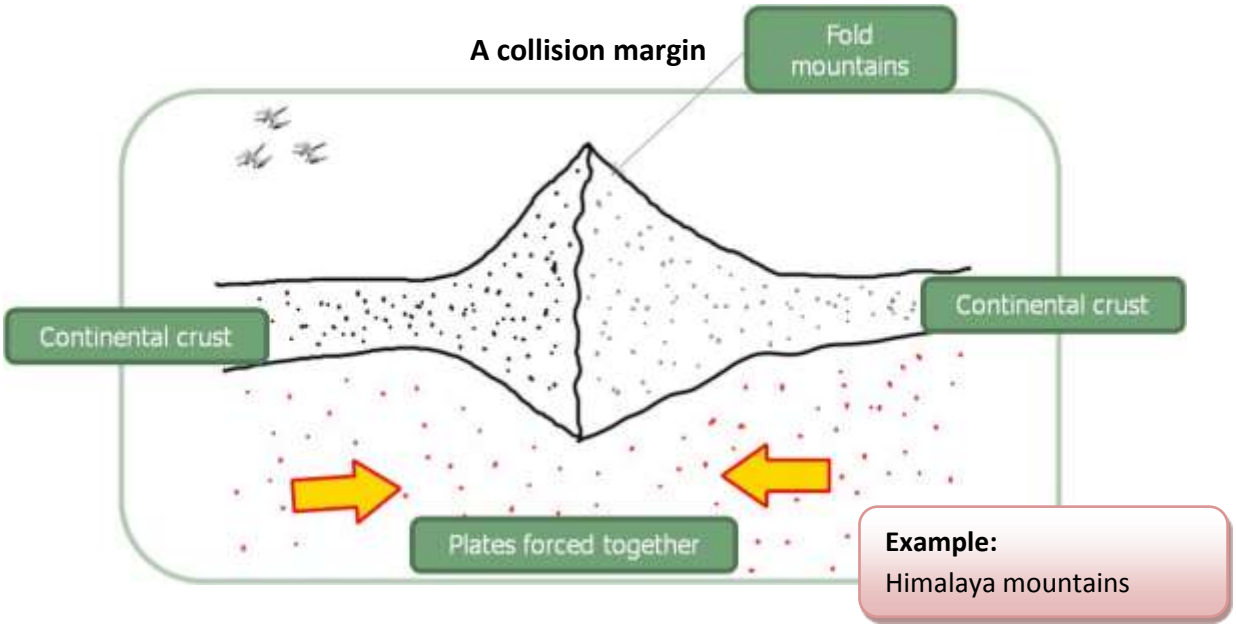


Example:
1. Japan
2. Indonesia
3. The Andes

Collision Boundaries

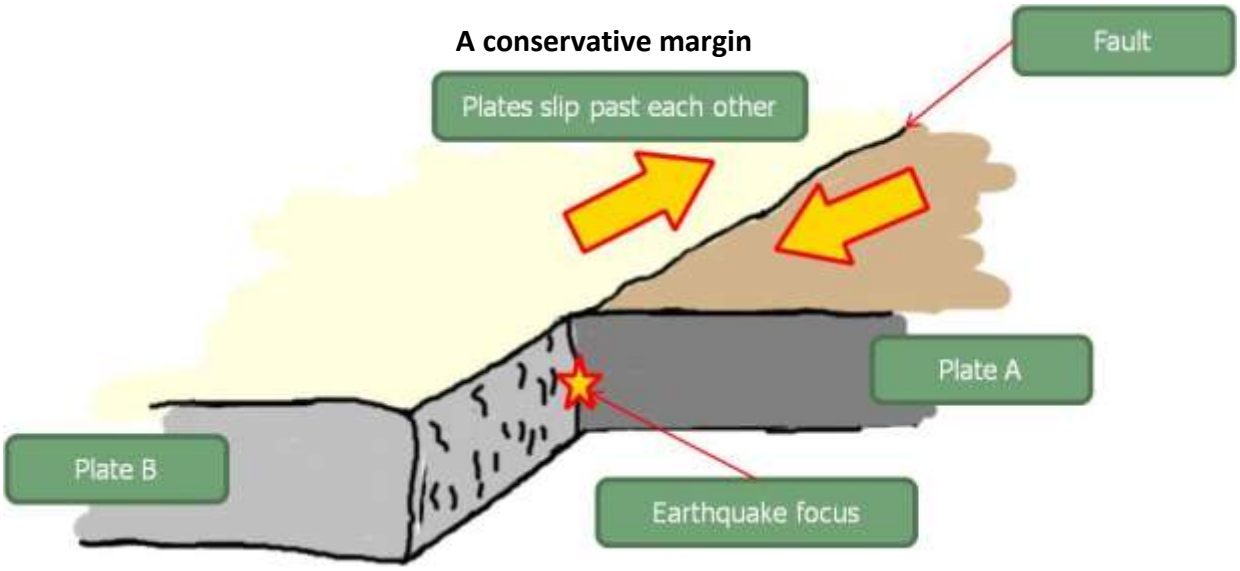
These occur when two continental plates are being pushed together by the convection currents in the mantle. As the plates collide, the crust is crumpled up and forms fold mountains. Some crust is lost at the base of the collision zone. Earthquakes are quite common in these areas.

These are sometimes known as destructive margins as some crust is lost at the foot of the fold mountains.



Conservative Boundaries

These are places where two continental plates are being pulled alongside each other by the action of convection currents in the mantle. As the plates slip past each other no land is lost or gained. These areas are prone to earthquakes. They are sometimes known as slip zones as the plates slip past each other.



Example:
San Andreas Fault, California, USA

Earthquakes

Earthquakes are movements in the Earth's crust.

They are normally caused by tectonic plates sliding past each other although there can be other causes such as collapsing cave systems or mines.

Earthquakes on the ocean floor can cause huge waves called tsunamis.

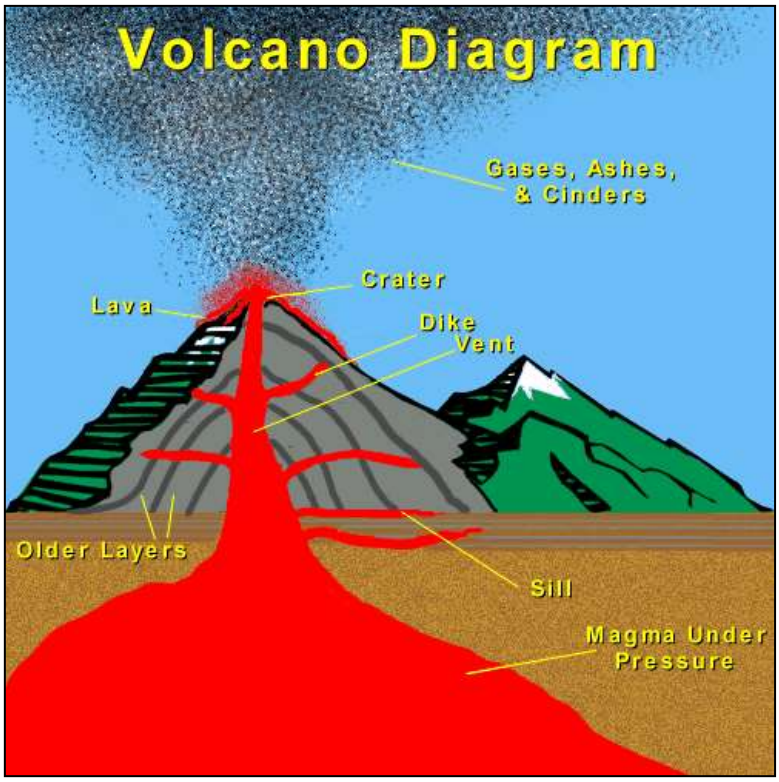
The **focus** (plural foci) of an earthquake is where the quake happens underground: where the plates actually slip past each other. The nearer the focus is to the surface, the stronger the quake is felt.

The **epicentre** of an earthquake is the point on the surface directly above the **focus**: the earthquake is felt strongest here.

Earthquakes give out **shockwaves**, known as **seismic** waves which travel through the Earth's crust. These shockwaves get weaker as they travel away from the epicentre: like ripples on a pond. The size, or **magnitude** of an earthquake of these waves is measured using a **seismograph.** The magnitude of an earthquake is measured on the **Richter Scale**, a logarithmic scale from 0-10 where 10 is the strongest and each point on the scale is ten times greater than the previous one: i.e. A quake registering 5 on the Richter Scale is 10x stronger than a 4, and 100x stronger than a 3.

Volcanoes

Volcanoes are mountains where molten rock comes to the surface.



There are several types:

Active: These are volcanoes that are erupting.

Dormant: These are volcanoes that have recently erupted and might erupt again.

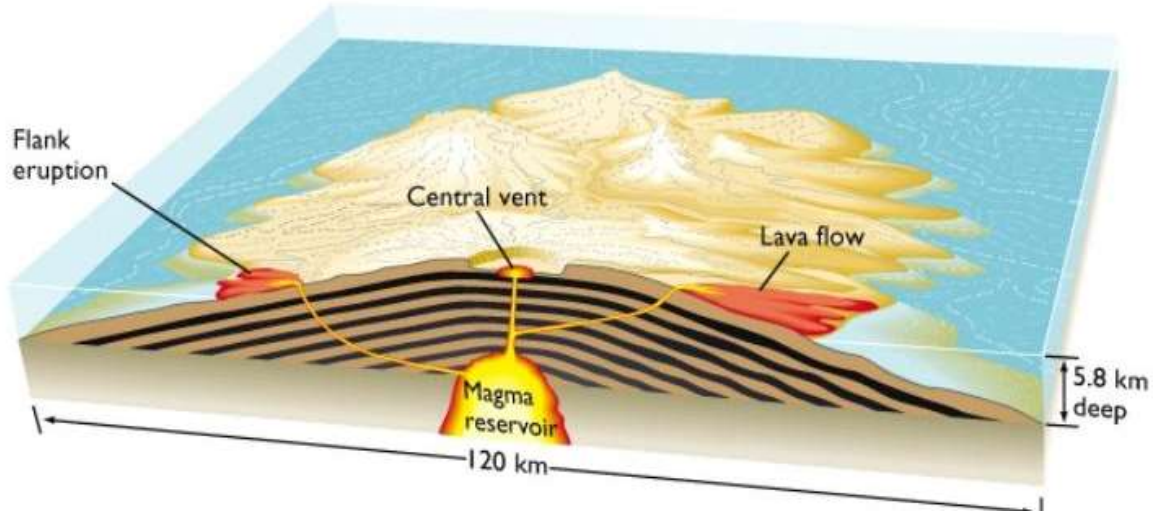
Extinct: These are volcanoes that erupted a long time ago, the area is no longer on a plate
margin and they will not erupt again. (e.g. Arthur's Seat in Edinburgh).

Molten rock underground is known as **magma**, when it comes to the surface it is known as **lava**. Most volcanoes are built from solidified lava flows and the shape of a volcano is dependant upon the type of lava created by the eruption:

Shield Volcanoes

Runny lava flows quickly and so travels a long way before cooling. The sides of the volcano, therefore, have a **gentle slope**s. These are often known as **shield volcanoes** as they look a little like a circular shield from above.

These generally occur on **constructive margins** where the magma is not mixed with sand and water from the ocean floor. They can occur, as is the case in **Hawaii**, over **hot-spots** in the middle of a plate.

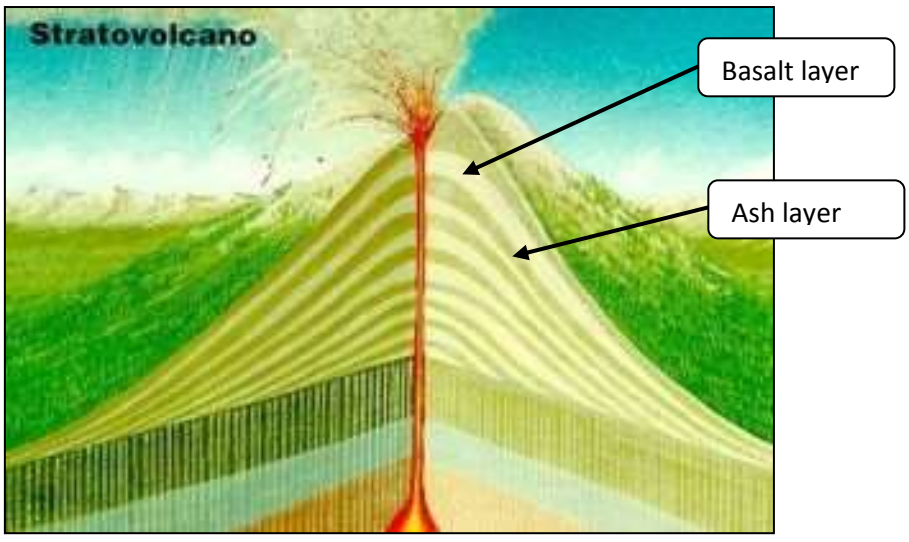


A typical shield volcano

These volcanoes tend to be **effusive**: that is they erupt continuously with long, fast-flowing lava flows. **Lava lakes** are often found in their craters.

Composite Volcanoes

Sticky lava flows slowly and so travels a long way before cooling. The sides of the volcano tend to be steep. Owing to the stickiness of the magma which regularly seals up the top of the **main vent** to form a **plug**, pressure often builds up inside these volcanoes and they are **explosive** and dangerously unpredictable.



A typical composite cone volcano

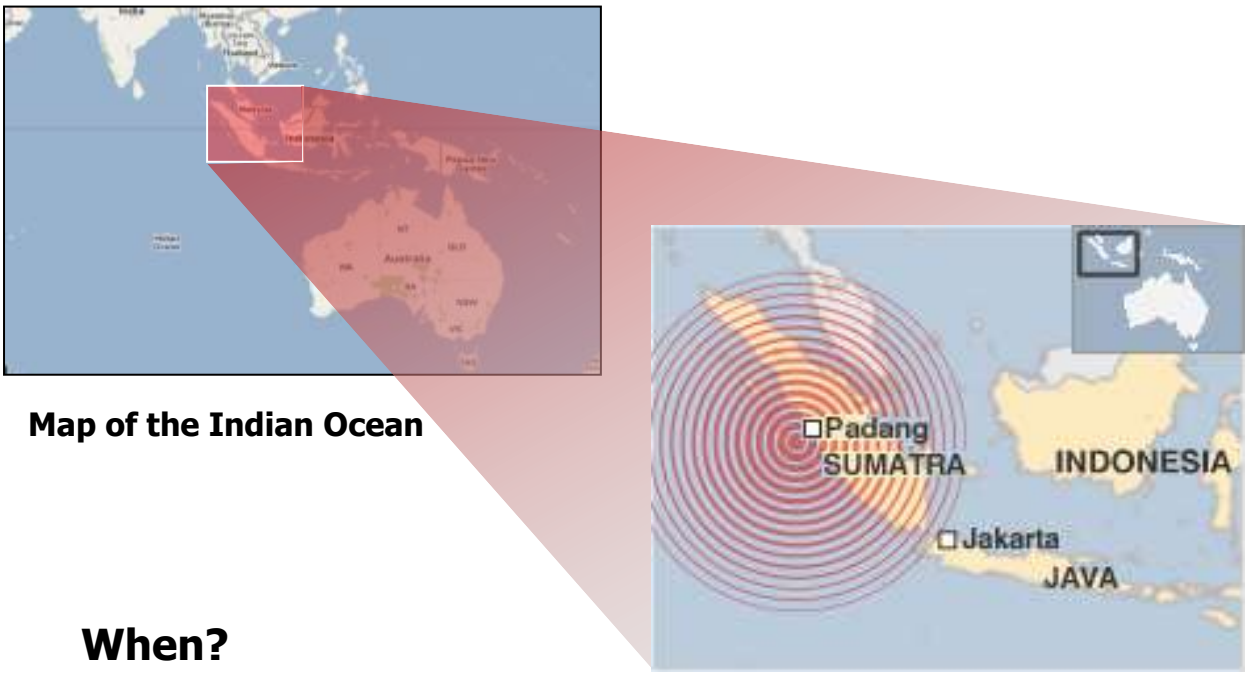
Each explosive eruption of the volcano can release ash clouds into the air and slow-moving lava flows. The ash settles onto the cooled lava (**basalt**) to form layers (or strata). Inside the cone of the volcano are layers of basalt and ash.

These are the most dangerous types of volcanoes and they cause massive destruction when they happen near to where people live.

Case Study: Sumatra Earthquake 2009

Where?

- Sumatra (sometimes spelt Sumatara) is one of the largest islands that make up Indonesia, an LEDC on the eastern side of the Indian Ocean.
- Western Sumatra is a mainly rural area with dense tropical forest.
- Padang is the main city in the region with a population of over 90,000 people.



Map of the Indian Ocean

When?

There were two Earthquakes:

- The first earthquake struck at 1716 local time (1016 GMT) on Wednesday 30th September 2009, some 85km (55 miles) under the sea, north-west of Padang (USGS)
- The second quake, a strong aftershock, was on land and struck at 0852 local time (0152 GMT) on Thursday 1st October 2009, about 225km south-east of Padang at a depth of about 25km.
- There were many smaller aftershocks.

What happened?

- Over 200 people died.
- Land slips happened in rural areas and many houses were lost.
- People panicked and ran out into the streets in Padang.
- Buildings collapsed in the town centre, trapping people.

- The roof of the airport collapsed.
- Power and phone lines brought down.
- Fires broke out across the city.
- Roads blocked or lost to land slips.
- Emergency services found it difficult to get to collapsed buildings to rescue people: there was very little heavy lifting machinery available.
- It took a long time to get aid to rural communities.

Pictures from the 2009 Earthquake in Sumatra

Rescuers dig in the wreckage for survivors by hand.

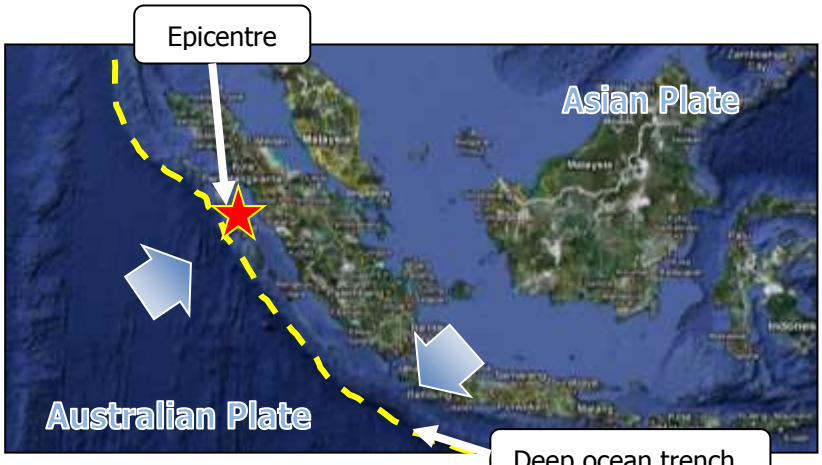
Buildings collapse as the walls gave way.

Makeshift hospital beds

Hospitals struggle to cope with the huge number of

Why?

- Sumatra is right on a **destructive plate boundary** where the Australian plate is going under the Asian Plate.



"We don't know the identity of the victims yet, it's night-time now so it's dark. People are trapped, hotels have collapsed, schools have collapsed, houses have collapsed and electricity has been cut off"

AFP news agency

Recent Indonesian Earthquakes:

26 Dec 2004: Asian tsunami kills 170,000 in Indonesia alone

28 March 2005: About 1,300 killed after a magnitude 8.7 quake hits the coast of Sumatra

27 May 2006: Quake hits ancient city of Yogyakarta, killing 5,000

17 July 2006: A tsunami after a 7.7 magnitude quake in West Java province kills 550 people

"The quake was followed by a very heavy rain. Many houses and some building are flattened in my area. But I cannot yet verify too much. We will try to compile the data and distribute aid once the rain subsides,"
Mukhlis Rahman,
Mayor of the Pariaman District

"This is a high-scale disaster, more powerful than the earthquake in Yogyakarta in 2006 when more than 3,000 people died,"

Siti Fadilah Supari
Health Minister

"We've heard that some of the roads to these areas have been cut off and there are concerns about communications - phone lines and electricity have also been cut off.

Indonesia is no stranger to disasters of this sort - the ability to reach people is often criticised and one of the hospitals nearest the epicentre has also collapsed, so there are real concerns about how to get to the places most affected.

At least six disaster management teams are on their way to the city of Padang. We've been told it will take up to 10 hours to get to the areas most affected."

Karishma Vaswani, BBC News, Jakarta

"There's quite a few people that have died. At first I was thinking it was going to be in the hundreds but it's going to be in the thousands of people that have been crushed or trapped."

A local doctor

"We need aid as soon as possible. We need food and medicine. Our houses have collapsed."

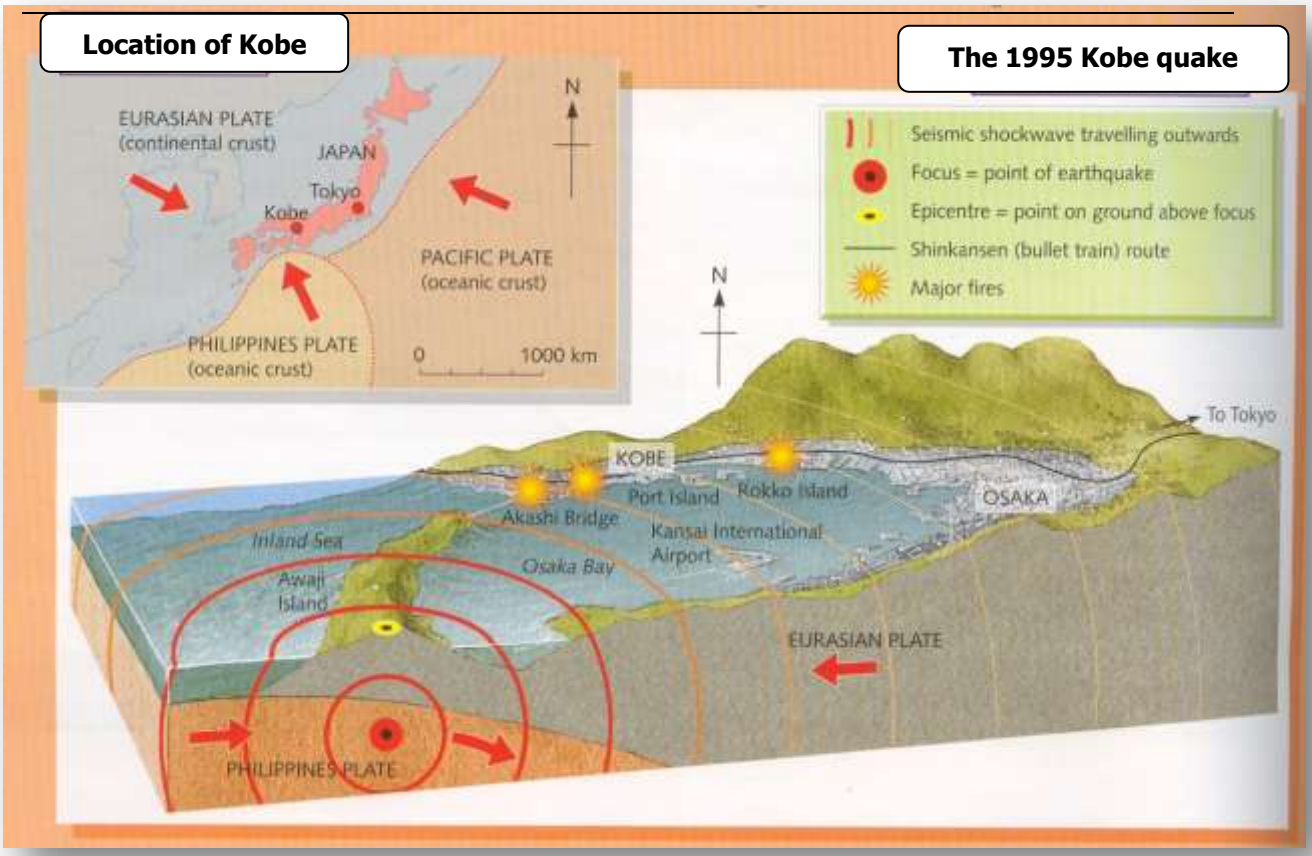
A resident of Padang

"The concrete buildings are all down, the hospitals, the main markets, down and burned"

Jane Liddon, an Australian businesswoman in Padang

Case Study: Kobe Earthquake 1995

Where?



When?

- 5.46am on the morning of 17th January, 1995.

What happened?

- The quake (7.2 on the Richter Scale) lasted for 20 seconds
- The ground moved 18cm horizontally and 12cm vertically
- There were many aftershocks (over 700, of which 74 were over 3 on the Richter Scale).

Primary Effects:

- Almost 200,000 buildings collapsed
- A 1km stretch of the elevated Hanshin Highway collapsed as well as numerous bridges along a 130km section of the Bullet Train route. Several trains on minor routes were derailed.
- 120 of the 150 quays in the Port of Kobe were destroyed.

NOTE: The newly constructed Kansai International Airport and Akashi Bridge were undamaged by the quake, presumably due to their 'quake-proof' designs.

The collapsed Hanshin Expressway

Fires spread across Kobe after the quake

Secondary Effects:

- Electricity, gas and water supplies disrupted.
- Fires raged for several days (see diagram above) and destroyed 7,500 houses (many of which were made of wood). They were caused by broken gas pipes and electricity cables.
- Roads were gridlocked which delayed the arrival of police, ambulances and fire engines.
- Over 230,000 people were made homeless and they had to live in temporary shelters (unheated school gyms or parks: remember this was January and it was cold, dropping below freezing at night)
- People were afraid to return to their homes due to the aftershocks.
- Many major industries (such as Mitsubishi and Panasonic) had to close their factories, costing them millions in lost earnings.
- In total 5,500 people died as a result of the quake and 40,000 people injured.

After the quake:

- Kobe's infrastructure was fully operational within 6 months (including telephone lines, power, water and gas)
- All railway services were back to normal by August (7 months)
- The port of Kobe was almost fully operational within a year (over 80%) but the Hanshin Expressway remained closed.
- All replacement buildings had to meet with much stronger earthquake-resistant standards.
    - Skyscrapers had to have flexible steel frames
    - Smaller, concrete buildings had to have extra iron reinforcement bars in their frame.
    - No buildings were to built of just brick which collapses easily
    - No buildings were to built of wood (fire-resistant materials were to be used)

    - New buildings were to be built on solid rock (buildings on clay collapse)
- There was an increase in the number of seismic recording stations in the area (which record earth movements).

Case Study: Eyjafjallajokull (Iceland) 2010

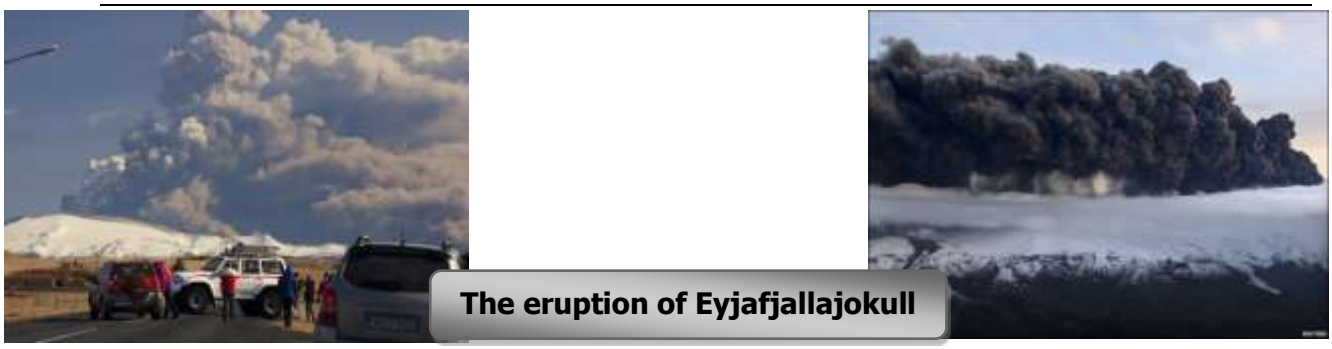
Where?

- Eyjafjallajokull is a relatively small volcano on the south coast of Iceland.

When?

- It erupted almost continuously for most of April and May 2010

What happened?

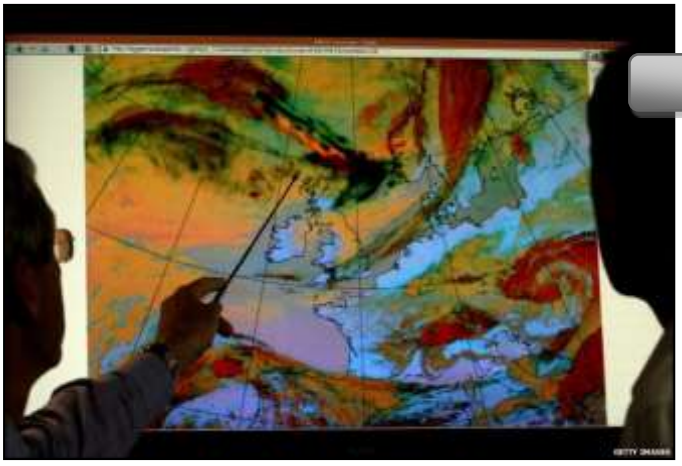


- The eruption was a 'grey' or 'dry' eruption for most of the first stage, shooting millions of tonnes of pumice and ash into the air.
- This ash column drifted over Europe.
- The second stage involved some lava flows.

Watching the eruption at night

The weather is important!

- The fine weather that we are having has been part of the problem.
- There is a high pressure system or anticyclone sitting over the UK at the moment. This means that the air is stable and there is little wind.
- Wind would break up the ash cloud.
- Air in an anticyclone moves clockwise: this has sucked the air towards us from the northwest – straight from Iceland.
- Anticyclones can stay in one place for many days – even weeks!



Tracking the ash cloud by satellite

How did the eruption affect people?

Local Effects

- The volcano is on the south coast and the wind carried the ash southeast towards Europe: away from the most inhabited areas of Iceland.
- The people living in the rural areas 'down wind' of the volcano had to wear goggles and facemasks as the ash was so thick.
- Visibility is down to a couple of metres.
- There was a serious risk to the local cattle farmers and local businesses were suffering.

The extent of the ash cloud

Flights grounded for the first 6 days of the eruption

- Hundreds of thousands of tourists were stranded overseas, unable to fly home.
- Tourists paid thousands of pounds to get home using alternative transport (taxi, hire car, coach, bus, ferry, train)
- Businesses lost money as their workers did not return to work.
- Airlines and associated businesses were losing about £200 million a day.
- Airlines could not resume schedule straight away as planes and crew were in the wrong locations.

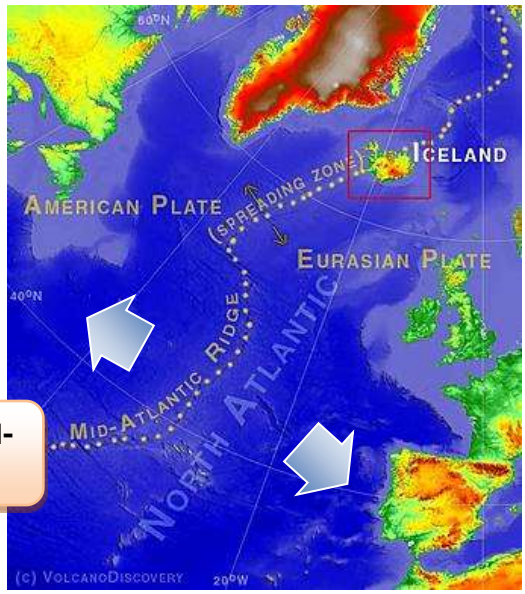
Stranded air passengers queued for ferries

Global Impacts: Kenya

- 20% of the Kenyan economy is based on the export of green vegetables (beans, sugar-snap peas and okra) and cut flowers to Europe.
- These are perishable goods and they are transported by plane to keep them fresh.
- No flights into Europe meant products returned unsold and destroyed.
- Over 1 million flower stalks were unsold in the first two days.
- Over 50,000 farmers were temporarily unemployed as their beans and peas could not be sold.
- The ash cloud has cost the Kenyan economy millions of pounds during the flight ban.

Why?

- Iceland is right on a **constructive plate boundary** where the Europe is moving away from North America.



Iceland is on the Mid-Atlantic Ridge

The Future …

- Eyjafjallajokull is a small volcano and it has caused much disruption.
- Katla, a much bigger volcano in the same area erupts every hundred years: it last erupted in 1918.
- What effect might the eruption of Katla have on the world?

Revising Dynamic Earth

1. Draw a clearly labeled diagram to show the structure of the earth.
   You should include the following labels:

Oceanic crust, continental crust, inner core, mantle, outer core.

2. What is a tectonic plate?

3. What is the relationship between where earthquakes occur and plate boundaries?

4. Draw a clearly labelled diagram of a destructive margin.
   You should include the following labels:

oceanic plate, continental plate, mantle, direction the plates are moving, fold mountains, subduction zone, earthquake foci, explosive volcanoes

5. Give an example of a place in the world where there is …
   a. A destructive margin
   b. A constructive margin
   c. A conservative margin
   d. A collision zone

6. For a volcanic eruption that you have studied …
   a. Name where and when it occurred.
   b. Why did it occur?
   c. What were the primary effects?
   d. What were the secondary effects?
   e. What did people do to minimise the effects of future eruptions?

7. Name three positive impacts of volcanic eruptions for the people who live nearby?

8. What piece of equipment measures the strength of an earthquake?

9. What scale do we measure earthquakes on?

10. For an earthquake that you have studied …
    a. Name where and when it occurred.
    b. Why did it occur?
    c. What were the primary effects?
    d. What were the secondary effects?
    e. What did people do to minimise the effects of future quakes?

11. What is a tsunami?

12. Why do earthquakes and volcanic eruptions seem to cause more damage in LEDCs than MEDCs?

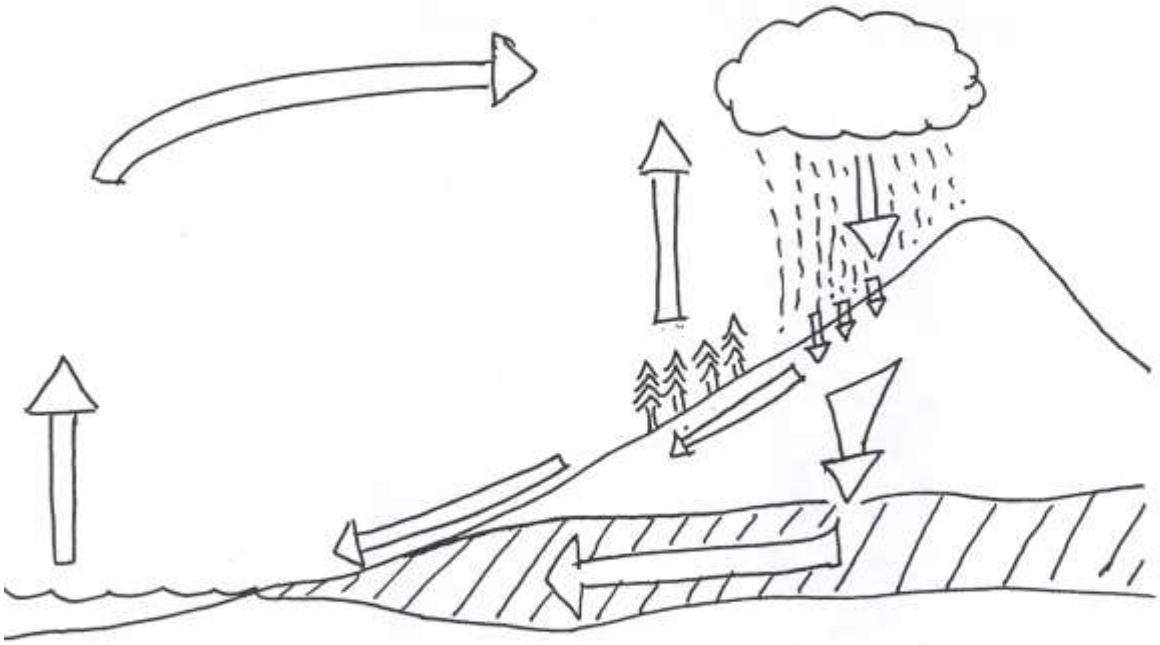
CE Rivers

1: The Hydrological Cycle

The hydrological cycle is another name for the **water cycle.**

Water is stored in many places, such as in the sea, the atmosphere and within the certain rocks. These are known as **stores**. It moves between these stores in a variety of ways: these movements are known as **transfers**.

Complete the diagram below using the words in the box provided.



Word Box

evapotranspiration	*evaporation*	*precipitation*
overland flow (run-off)	*throughflow*	*baseflow*
percolation	*infiltration*	*sea or lake*
atmosphere	*aquifer*	

Note: Do not confuse this diagram for the *Relief rainfall* diagram in the weather and climate section

2: The parts of the river basin

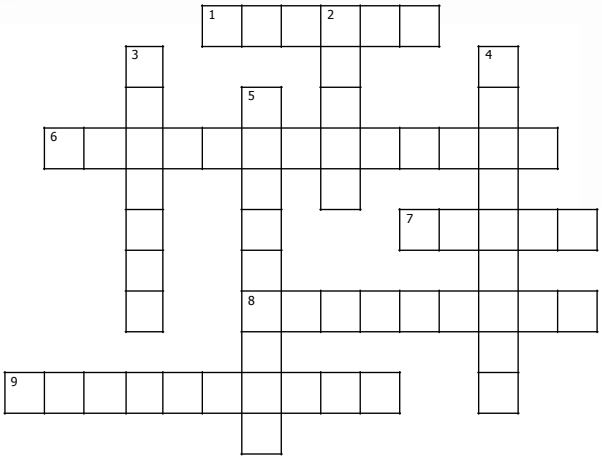
A river basin or **drainage basin** is the area drained by a river. This means that if a raindrop falls within this area it will end up (eventually) in the main river. The edge of the drainage basin is known as the **watershed**.

The river starts at the **source**, which is normally in an area of high land, and it flows to the **mouth** where it meets the **sea** (or lake). The river flows in a **channel** that it has cut away into the land. Where two streams join is known as a **confluence** as the two flow together. A small stream joining the main river is known as a **tributary**.

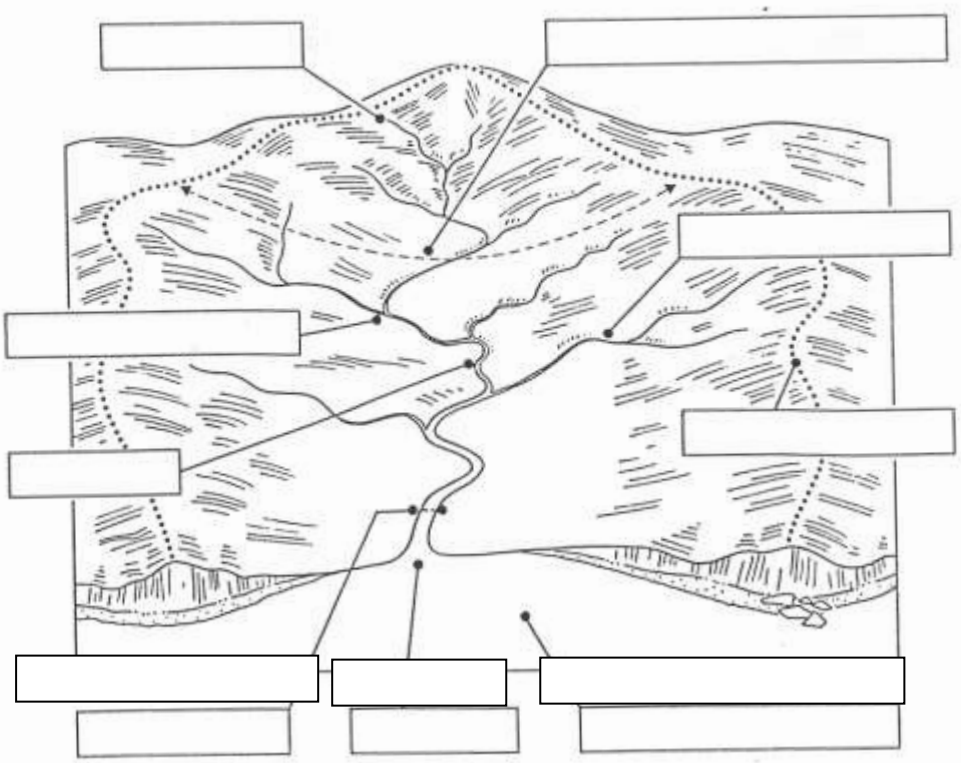
Solve the crossword using the clues below.

Across
1 Where a river starts (6)
6 An area drained by a river (8, 5)
7 The end of a river (5)
8 Where rivers flow into (3, 2, 4)
9 Where a small river joins a larger one (10)

Down
2 A large stream (5)
3 A river flows in this (7)
4 A stream or small river that flows into a bigger one (9)
5 The boundary between two river basins (9)



Use your answers to label the main river basin features in the diagram below.



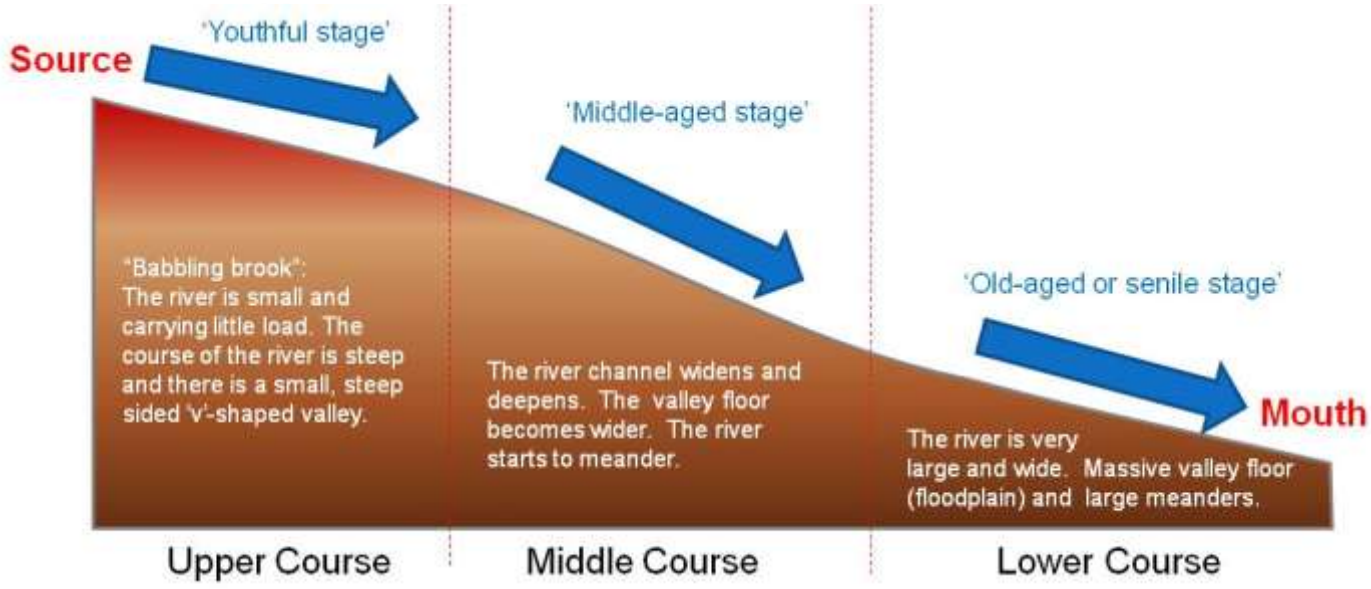
3: The long profile

As a river flows from the source to the mouth it changes. As more water drains into it, it often becomes wider and deeper. In other words, it's **discharge** (the amount of water that it is carrying) increases.

In the **upper course**, near to the river's source, the river is small and clear. It is sometimes called the **youthful stage** of a river because the river is small and full of activity. There is little sediment being carried by the river as it is so close to the source and there has not been much accumulation of sediment. As the upper course is usually in hilly areas, the **gradient of the river is quite steep**. This means that the river flows in quite a straight line **erodes** down quickly and the river cuts a distinctive **v-shaped valley** with a **narrow floor** and **steep sides**. River landforms that are frequently found in this part of the river's course include: **interlocking spurs, waterfalls, rapids,** and **gorges.**

In the **middle course,** the river is moving is gaining more water and becoming wider and deeper. It is sometimes known as the **mature stage** of a rivers course because it is a full grown river and all the processes of **erosion, transportation** and **deposition** occur in this stage. The **gradient of the river becomes more gentle**. The river starts to form a flat **floodplain** on the valley floor. The valley floor becomes **wider** and the sides become **less steep**. It can be quite a large part of the river's course and where it begins and ends can be indistinct. As the river is no longer flowing in really hilly areas, it's route becomes more curved and **meanders** or bends in the river appear. Many **tributaries** join the main river in this stage. Some upper course features and lower course features can occur here.

In the **lower course**, the river is very close to the sea. It is sometimes known as the **senile stage** of a river's course: the river is old and it meanders all over the place. The river is at its widest here and its **discharge is high** as there is a lot of water flowing in the channel. The river is also carrying all of the sediment that has been picked up in the upper and middle courses which makes the river often muddy in appearance. The river's **gradient is very gentle** (almost flat) and the main river process in this part of the river is **deposition**. There is a **wide, flat valley floor** with **very gently sloping sides**. The valley floor is a **floodplain** made up of **sediment** deposited by the river in times of flood. Along side the river channel there are often **levées**. The river **meanders** often in very tight bends across the flood plain, occasionally forming **ox-bow lakes**.



4: River Process (W)ETD

Rivers shape the land and produce a series of recognisable landforms. The processes that rivers use are ...

(W)eathering *the breaking down of rocks 'in situ'.*

NOTE: *This is not really a river process (hence the bracket around the W) but weathering often occurs before the other processes occur.*

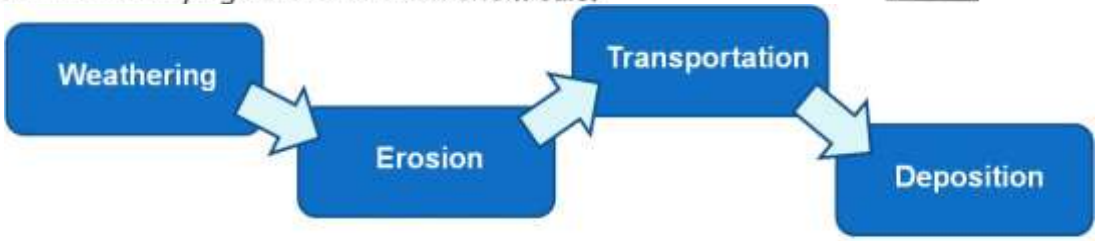
Erosion *the wearing away of the land my the movement of an agent of erosion such as the sea, wind or in this case, rivers.*

Transportation *The carrying of eroded material by the river.*

Deposition *The dropping of transported material.*

Which type of process are the following? Write down the correct letter (W, E, T or D) in the box at the end of the sentence. The first one has been done for you.

1. The breaking down of rocks by a tree root growing through it. [W]
2. The water in the river wearing away the banks as it flows past. [ ]
3. The river bouncing stones along its bed. [ ]
4. The stones being bounced along being broken into smaller pieces [ ]
5. The river dropping sediment on the inside of a meander. [ ]
6. The river dissolving the sides and bed of the channel as it flows. [ ]
7. The river carrying dissolved rock chemicals. [ ]



These processes ***always*** happen in this order: **Think WETD**

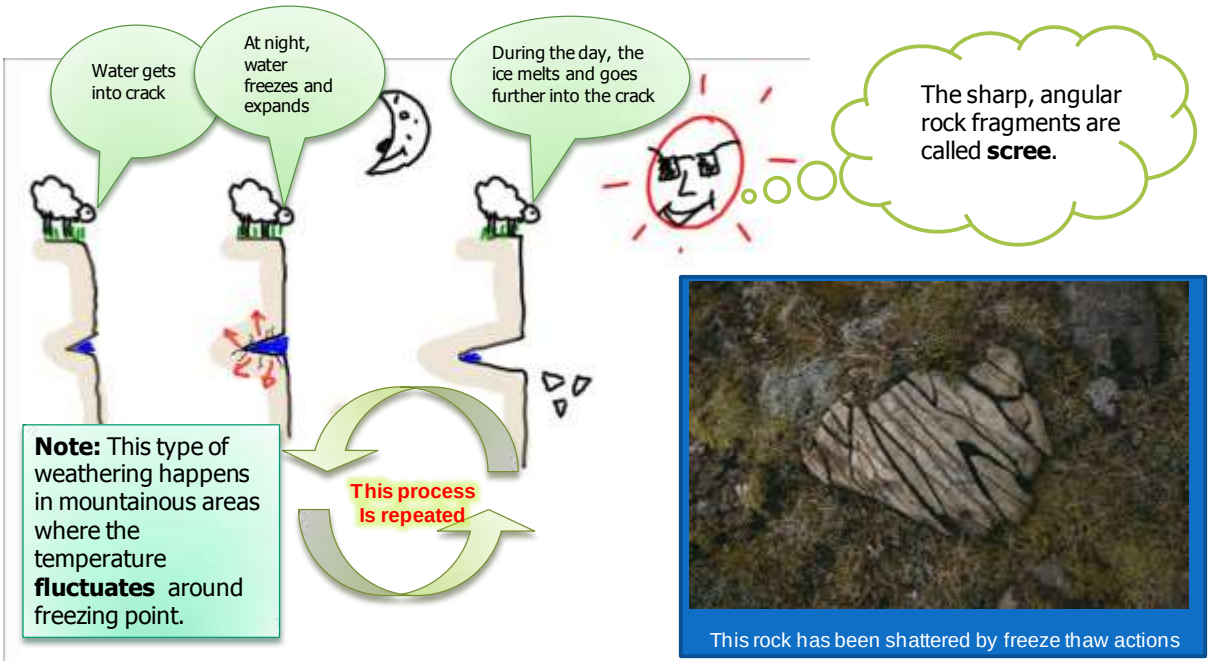
5: River Processes: Weathering

"Weathering is the breaking up of rocks *in situ*" (in one place).

There are four ways in which rocks become weathered …

A: Freeze-thaw weathering

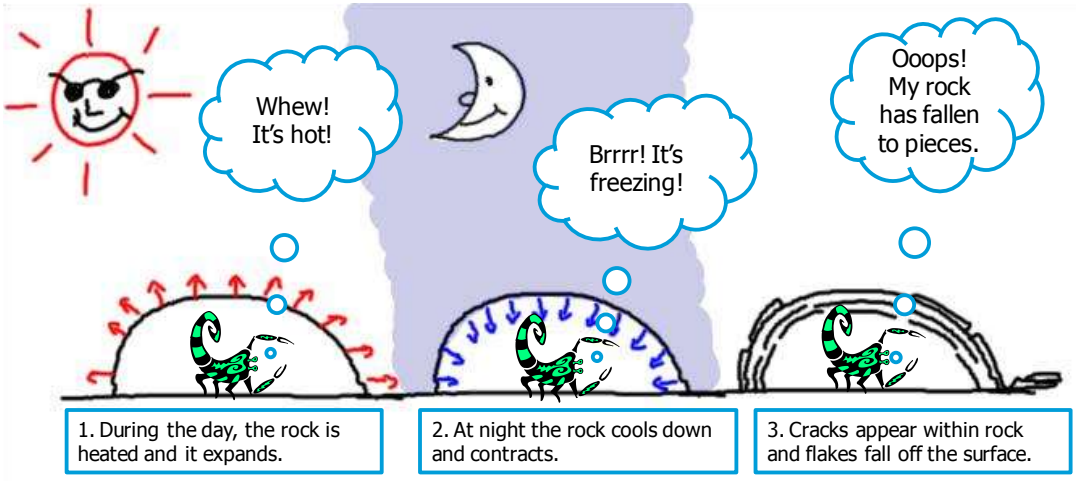
Freeze thaw weathering is sometimes known as *Frost Shattering.*



Note: This type of weathering happens in mountainous areas where the temperature **fluctuates** around freezing point.

This rock has been shattered by freeze thaw actions

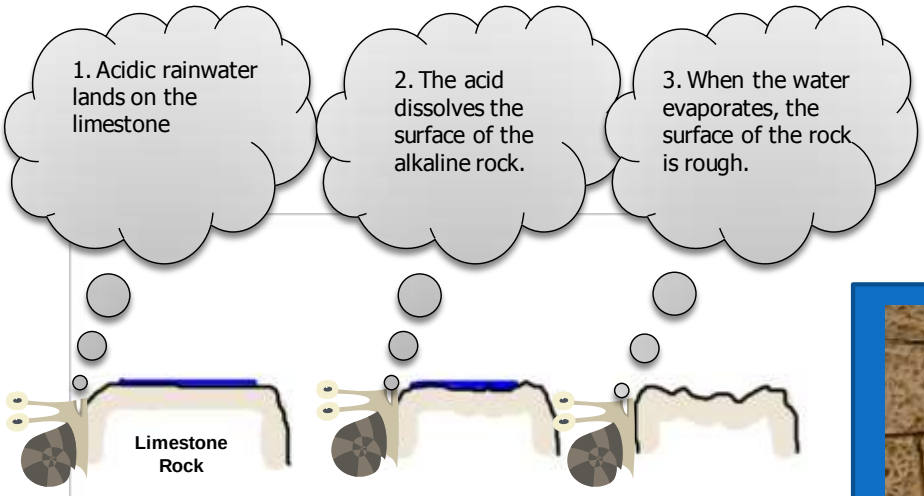
B: Onion skin weathering



Note:
Onion skin weathering happens mainly in desert areas where there is a large temperature range.

This rock has been subjected to onion skin weathering.
Note the flakes!

C: Chemical weathering

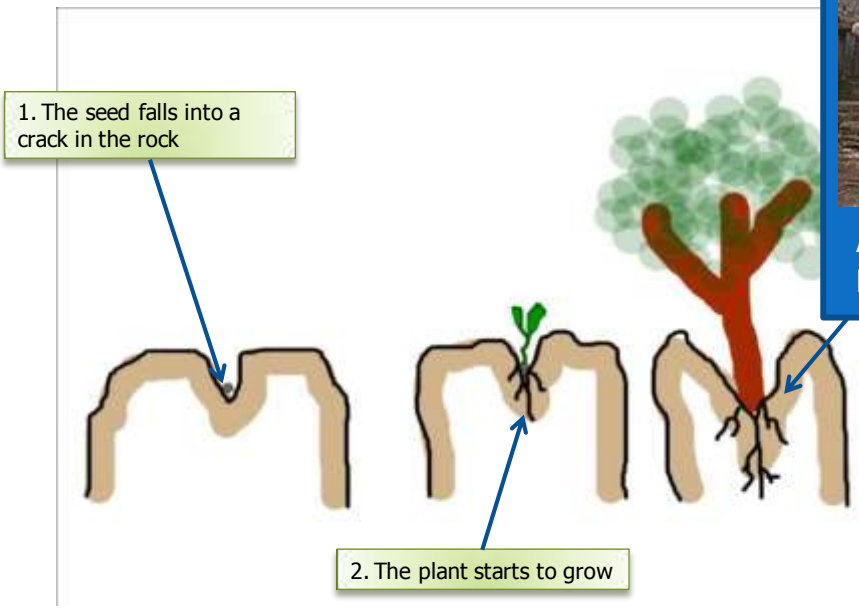


Note:
If there is a lot of air pollution then chemical weathering is more extreme. Look for evidence of this on buildings in large towns and cities.

These limestone bricks have been weathered by rainwater.

D: Biological weathering

Biological weathering is when a plant or animal breaks up the rock.



Angkor Wat in Cambodia is a great place to see biological weathering

Note:
You can see this where tree roots lift the pavement and tarmac on roads.

6: River Processes: Erosion

There are **four** main types of river erosion ...

1. Abrasion This is when rocks and stones being carried by the river scrape away at the banks and bed of the river, wearing them away.

Note: *This is sometimes known as* **corrasion**.

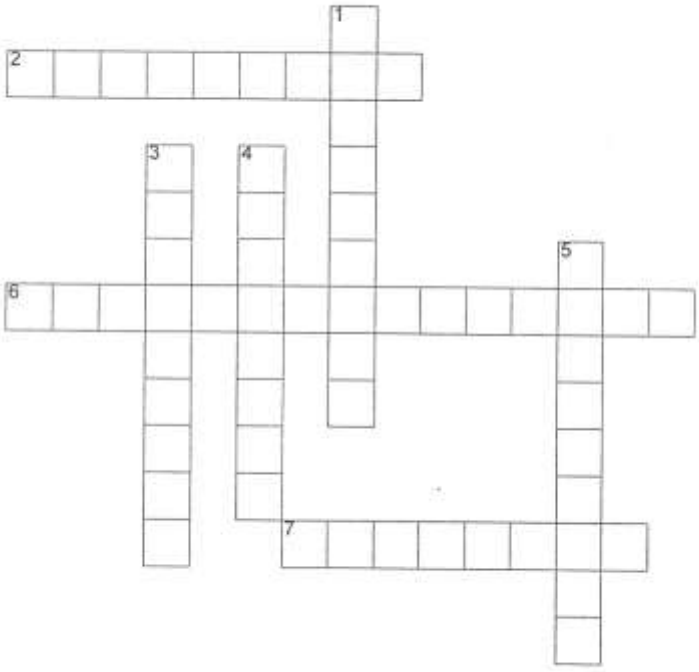
2. Attrition This when the material being carried by the river is worn away itself by the action of bouncing or rolling along the river bed. This happens at the same time as abrasion.

3. Hydraulic Action This is when the movement of the water flowing wears away the channel sides and bed.

4. Solution This is where the water dissolves the rocks as the river flows across them. Some rocks, such as limestone, are particularly susceptible to this type of erosion.

Note: *This is sometimes known as* **corrosion**.

Erosion Crossword



Clues

1 Another way of saying solution

2 Another way of saying abrasion.

3 Stones being carried by the river are rounded as they roll along the river bed.

4 The river dissolving the rocks in the channel sides.

5 A rock that is easily dissolved by river water.

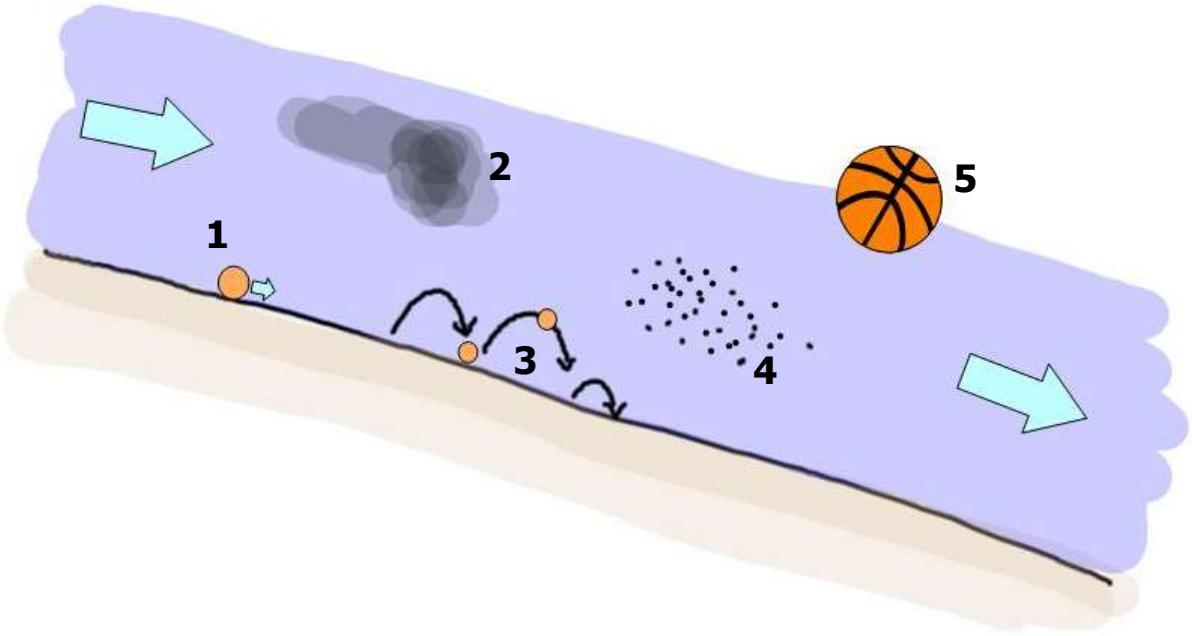
6 Water wearing away the river banks.

7 The river wearing away the river bed with stones that it is transporting.

7: River Processes: Transportation

As the river goes from source to mouth it collects a lot of material: this material is known as the river's **load**. The size of the load varies between massive boulders which roll along the river bed and invisible chemicals which are dissolved in the water. The more energy the river has, the larger the load that it can carry.

The river carries its load in five ways ...



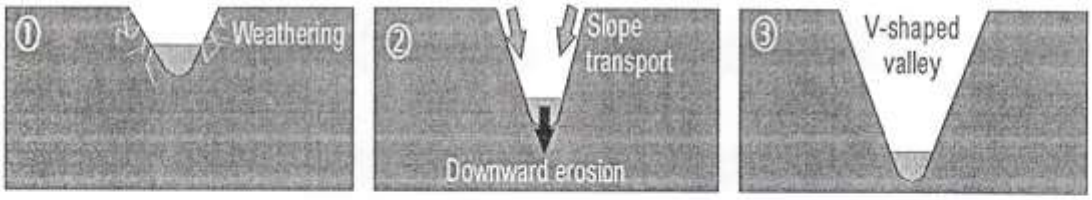
Which type of transport is which? Read the descriptions in the table below and put the correct number in the box. The first one has been done for you.

No.	Name	Description
5	Flotation	*Material floating on the water surface.*
	Saltation	*Material bouncing along the river bed.*
	Solution	*Material dissolved in the water.*
	Suspension	*Material being carried along by the river off the river bed*
	Traction	*Material rolling along the river bed.*

8: River Processes: Deposition

Deposition occurs when the river does not have enough energy to transport it's load. When the river is fast, little deposition occurs. In the **lower course**, where the river's gradient is gentle, the water does not travel very fast. Therefore it does not have very much energy and so a lot of deposition occurs.

9: River Landforms: V-Shaped Valley



Look at the diagrams above. Complete the passage below by using words from the word box at the bottom of the page.

The river _____ downwards as boulders, stones and rock particles are bounced and scraped along the channel _____. As the river cuts down, the valley sides are attacked by _____ which breaks up the rock in situ and loosens the soil.

The loosened material slowly _____ down the slope because of _____ or is washed into the river by rain water. The _____ carries it away.

The end result is a _____-sided valley that has the shape of a _____ .

Word Box:

weathering	V	steep	creeps
erodes	gravity	bed	river

10: River Landforms: Waterfalls

Factsheet: Waterfalls

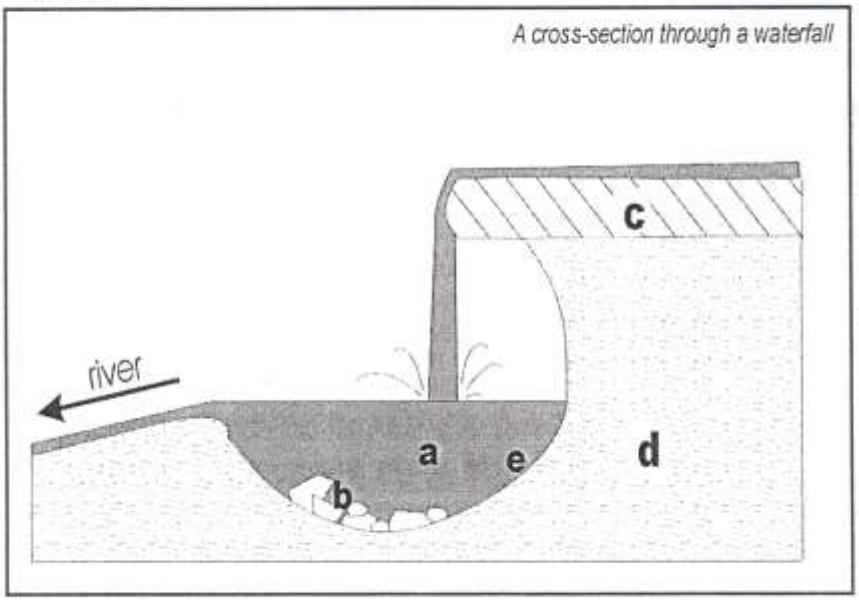
The highest waterfall in the world in **Angel Falls** (979m) in Venezuela. **Niagara Falls** on the USA-Canadian border is only 50m tall, but it is probably the most famous waterfall in the world. The tallest waterfall in the UK is **High Force**. It is just 20m tall.

Waterfalls are an attractive and often spectacular feature of a river. They are caused by erosion. The river flows over a layer of **hard rock** lying on top of a band of **soft rock**. The hard rock is more difficult to erode than the soft rock. The water flows over the edge of the hard rock and down a cliff. At the bottom of the cliff there is a really deep pool created by the **hydraulic action** of the water falling down and **abrasion** as material is swirled around. This deep pool is known as a **plunge pool**.

As the river continues to erode the soft rock, it undercuts the hard rock leaving a cap of hard rock jutting out and a space behind the falling water. The cap of hard rock is eventually not strong enough to support its own weight and it collapes into the plunge pool below. This provides new rock fragments to be swirled around in the plunge pool. Then the undercutting begins again.

Over time, the waterfall moves back upstream (this is sometimes known as **headward erosion**) and it leaves behind a vertical sided valley known as a **gorge**.

A cross-section through a waterfall



Complete the key below for the waterfall diagram on the left:

a .....

b .....

c .....

d .....

Draw an arrow to show which direction the waterfall is moving.

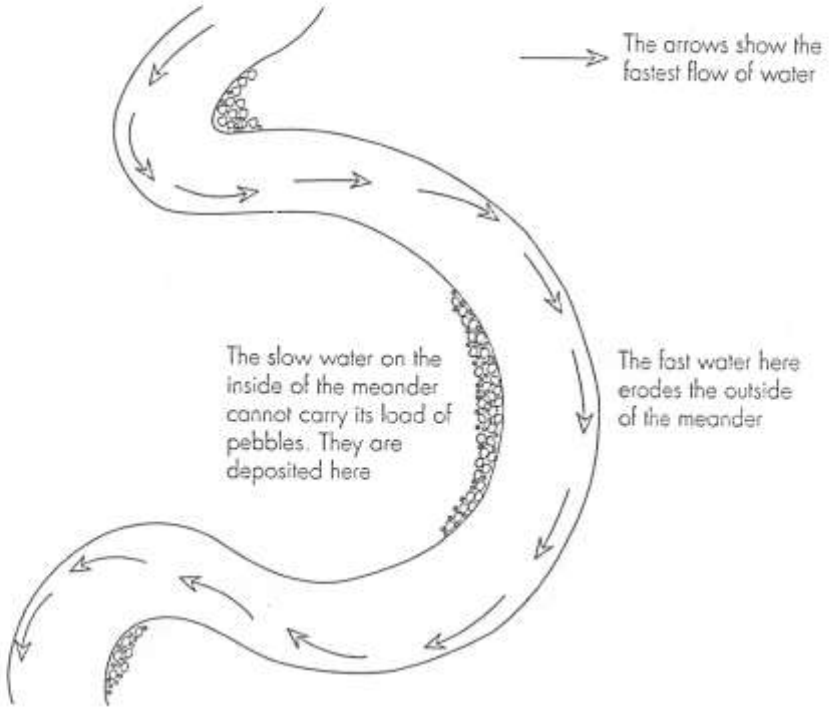
What process is happening at **e**? .....

(Hint: Try rearranging the letters **cut nude tring)**

11: River Landforms: Meanders and Ox-Bow Lakes

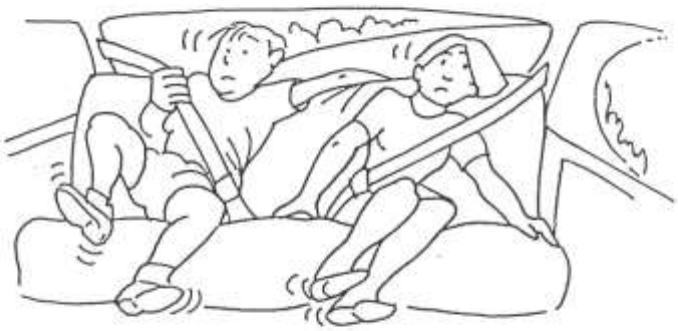
A bend in a river is known as a **meander**.

Let's take a closer look at what happens at a meander.



When a river flows around a meander, the fastest water is on the outside.

This is caused by the same force that pulls you towards the outside of a bend in a road when you are driven round it too fast.



The fast water at the outside of the meander washes against the bank. The load of pebbles and sand carried by the river, helps to erode the banks.

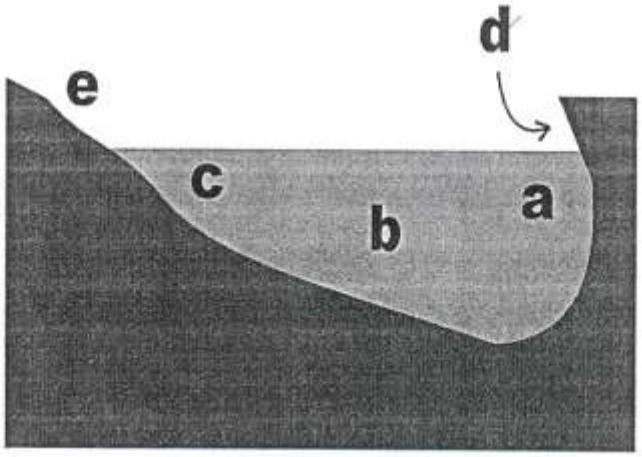
The slow water on the inside of the bend does not move fast enough to carry its load. The pebbles are deposited on the inside of the meander. Sometimes this looks like a little beach.

11: River Landforms: Meanders and Ox-Bow Lakes continued …

The fastest flow being on the outside means that meanders have a very definite shape.

The water is deepest where the river flows **fastest** as this is where erosion takes place. The **hydraulic action** causes the bank on this side to form a small cliff known as a **river cliff**.

On the other side of the river, where the water flows **slowest**, the river deposits its load. This **deposition** leads to the build up of fine beach-like material. This is known as a **river beach** (and sometimes as a **slip-off slope**). All this deposition and very little erosion makes this side of the river much shallower.



A cross-section through a meander

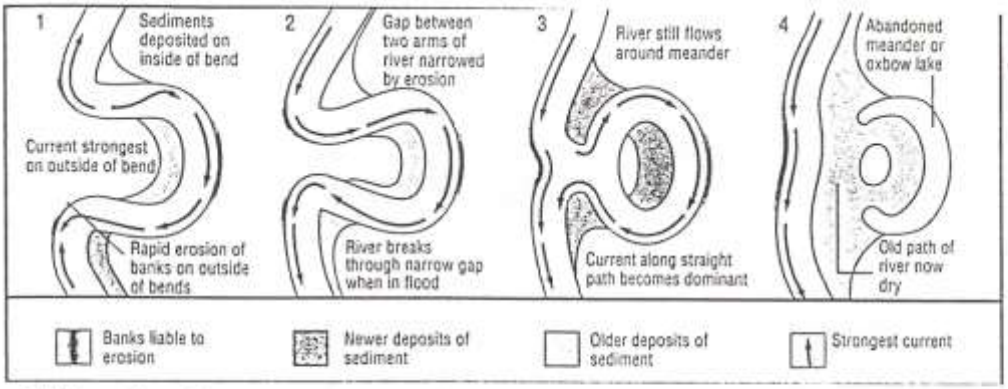
Look at the Cross-section through a meander above. Use this letters to answer the following questions.

1. Which letter shows where the slowest flow is occurring? _____
2. Which letter shows where the most erosion is taking place? _____
3. Which letter shows a river beach? _____
4. Which letter shows where the fastest flow is occurring? _____
5. Which letter shows a river cliff? _____
6. Which letter shows where deposition is taking place? _____

11: River Landforms: Meanders and Ox-Bow Lakes continued …

In the **lower course,** because the river's gradient is so gentle (often it is almost flat!), the river meanders become much bigger. As they do so, they sometimes cut back on themselves to form **ox-bow lakes**. An ox-bow is the horse-shoe shaped collar that oxen used to wear to plough the fields.

The diagram below shows how an ox-bow lake is formed.



Using the diagrams above to help you, write the sentences below out in the correct order. They explain how an ox-bow lake is formed.

A: Sediments build up, cutting off the meander. An ox-bow lake is formed.

B: The neck of the meander narrows because of erosion.

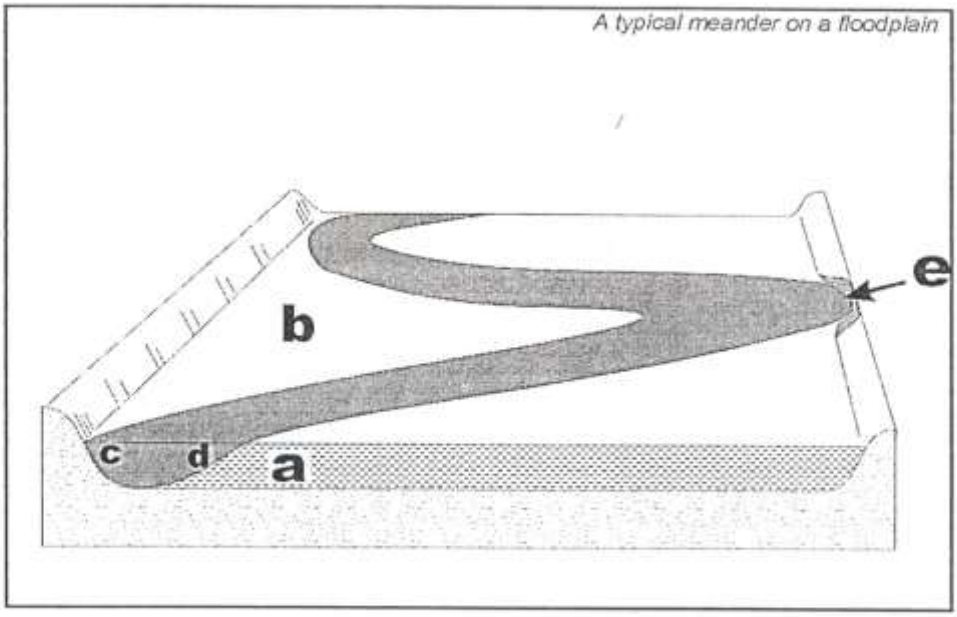
C: The river meanders across its valley. River cliffs and river beaches form. Over time the bends on the meander become larger.

D: Eventually, the river cuts through the neck. The river takes the shortest route. Deposition occurs at the ends of the old meander.

11: River Landforms: Floodplains

Floodplains occur in the **lower course**. They are flat valley floors, often several kilometres across, created by the river in times of flood (hence the name!). When the river floods and bursts its banks, the water looses all of its energy and movement. Consequently, the river, which is often rich in sediment at this point in the long profile, **deposits** the **sediment** or **silt**. The sediment is rich in minerals and this often makes them very **fertile** and excellent for farming. They are prone to flooding though!

11: River Landforms: Floodplains continued …



Look at the diagram above. Complete the key to the diagram below.

Key:

_____ Floodplain _____ River cliff _____ Silt

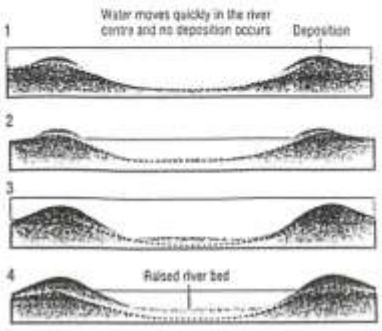
_____ Slowest flow _____ Fastest flow

Colour the diagram in using the following colours …

River – **blue**; Floodplain – **light green**; Valley sides – **dark green;**
Silt – **brown**; Base rock – **grey.**

Levées also occur on flood plains.

1 The river floods over its flood plain. It deposits a layer of silt and mud which makes a fertile soil called alluvium, which is mostly dropped next to the river bank.
2 The flood subsides, water flows more slowly and deposition occurs on the river bed.
3 Each time it floods, the banks (levees) and river bed build up.
4 Slowly, the river rises above its flood-plain. The levees, or embankments, protect the flood-plain from flooding.

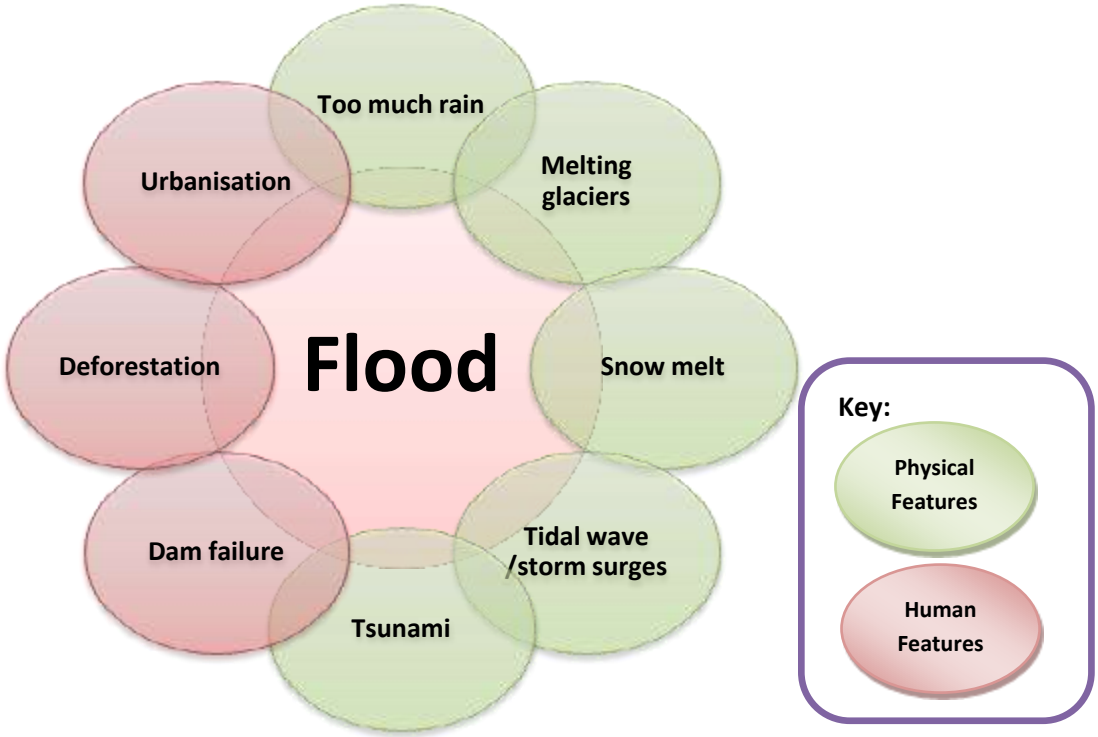


Floods

What is a flood?

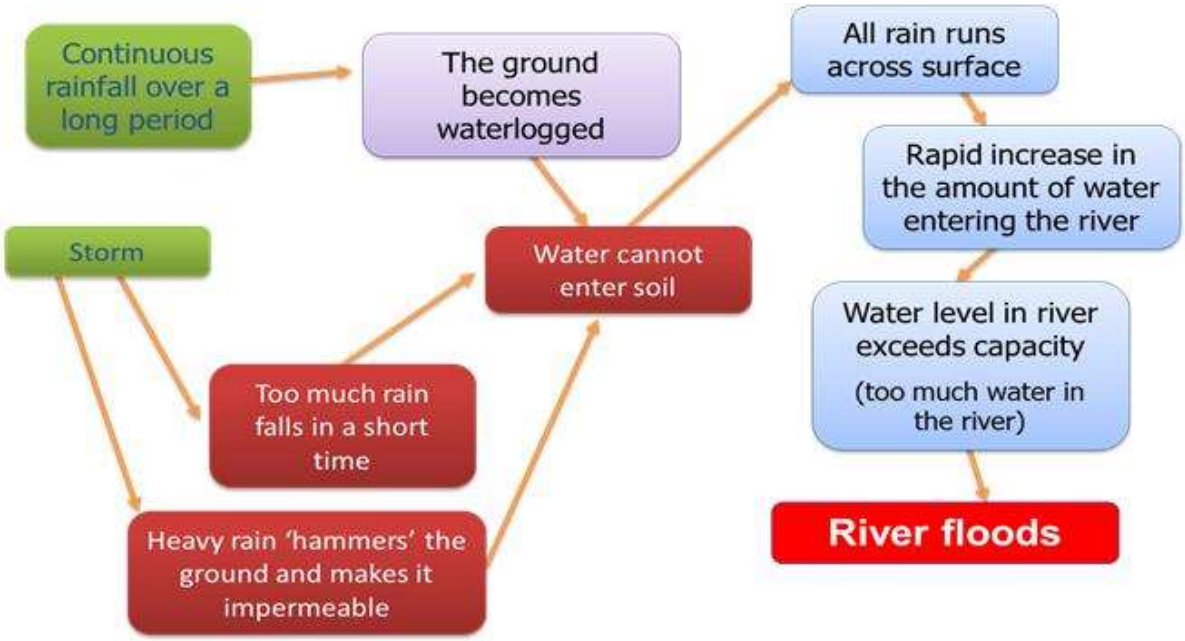
"A flood is when there is standing water in a place that does not normally have it."

There are several causes of floods:



Flooding rivers (Physical Causes)

Rivers generally flood naturally due to excessive rainfall: this can be over a long period of time or a storm event. Both of these lead to their being too much **run-off** (overland flow).



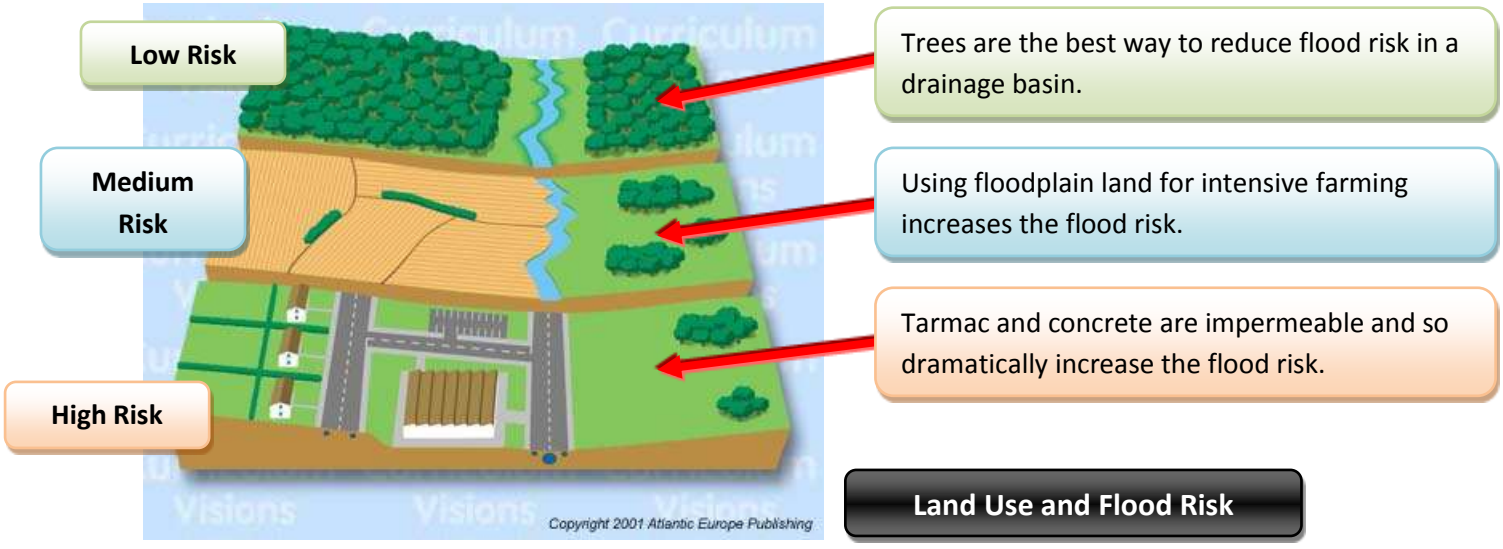
Flooding rivers (Human Causes)

People can increase the risk of flooding in an area by:

- **Decreasing the amount of vegetation**
  - This **reduces interception** of precipitation and means that more water gets into the river channel quickly: flooding!

- **Changing the land cover**
  - This creates 100% run-off (no **infiltration**) and so all of the water goes into the river channel quickly: flooding!!

- **Compressing soil**
  - Trampling by people, livestock or vehicles compresses the top layer of soil, removing the **pores** (small holes between soil particles) and making the soil **impermeable**; this **reduces infiltration** and makes almost all of the water flow across the surface (**run-off**) and quickly into the river: flooding!!!



Note: Changes to the land use in one place on the river will affect places further **downstream**. (E.g. Land clearance in Nepal has increased the flood risk in **Bangladesh** –see Case Study)

Case Study: Flooding in Bangladesh

Where?

Much of Bangladesh is situated on the **delta** of the **Ganges** and **Brahmaputra** rivers. The delta provides fertile land for rice-growing, but means that much of the country is very low-lying (less than 6 metres above sea level).

When?

Bangladesh suffers from severe flooding every year towards the end of the summer, during the **monsoon** season. Particular events include the floods of **August/September 1988** and those of **June 2009**.

What happened?

In August/September 1988:

- Over 60% of Bangladesh was covered in water.
- Over 2,000 people were killed
- Buildings and roads were destroyed
- Crop yields were drastically reduced.

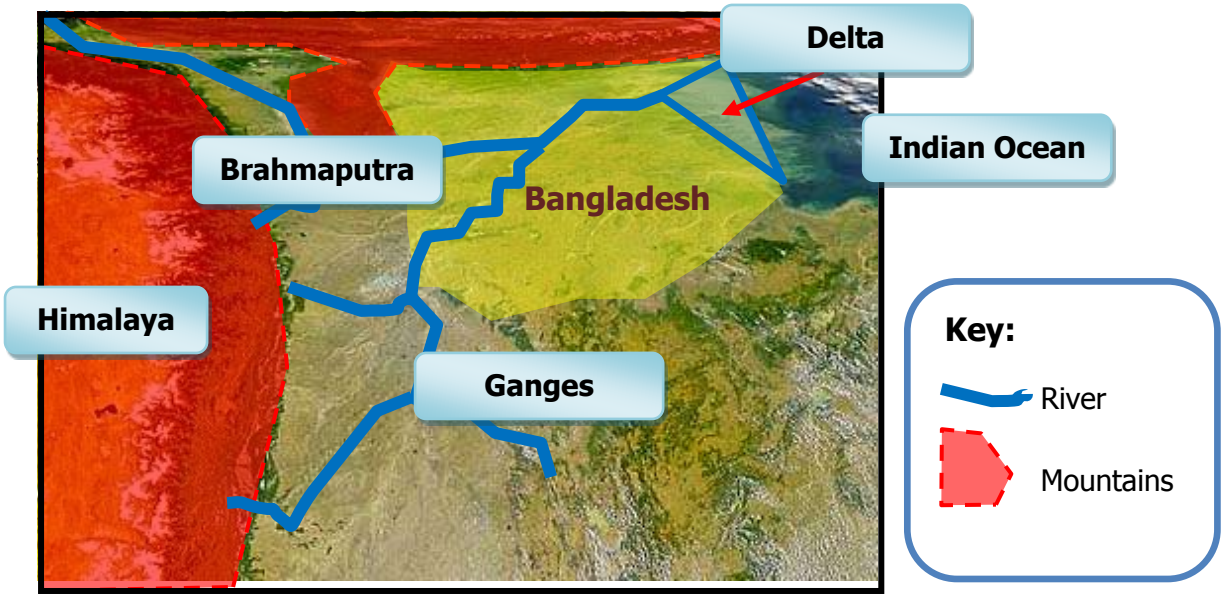
- **In May 2009 (Cyclone Aila):**
  - Huge tropical cyclone (Cyclone Aila) made landfall on 26th May 2009.
  - Over 200 people died
  - Over 500,000 people made homeless
  - Crops damaged
  - Landslides occur
  - Severe shortages of food and drinking water
  - Tidal surge covered agricultural land in saline (salty) water
  - World rice prices doubled during the summer of 2009.

Pictures from the 2009 floods in Bangladesh.

Why?

There are several key causes of the flooding:

- Much of the country is below 6m above sea level.



This image shows how low-lying Bangladesh is and its location on the confluence of the Ganges and Brahmaputra rivers.

- The region is hit by tropical cyclones every year:
  - The cyclones bring very heavy rainfall
  - The cyclones causes storm surges, pushing large (10m) waves ahead of the storm, which can lead to coastal flooding.
  - These storms are becoming more frequent and more severe (this is thought to be a result of global climate change).
- The river banks of the Brahmaputra and the Ganges are made up of clay and sand (deposited by the rivers) and therefore give way easily.
- Countries upstream of Bangladesh (such as Nepal) are rapidly clearing forests on the slopes of the Himalayas to create farmland and to sell the valuable wood. This reduces the amount of **interception** and consequently reduces the amount of water that can get into the soil (**infiltration**), which in turn, leads to most of the water flowing over the surface (**run-off**) straight into the rivers. The discharge in the rivers downstream has as a sudden 'bulge' after rainfall rather than a gradual rise and fall.
- This **deforestation** and **increased run-off** in the countries upstream, mean that there is a lot more **soil erosion** on the steep mountain sides. This soil is carried downstream by the rivers and **deposited** in the delta: choking the river channel with **sediment** (mud).

NOTE: This erosion, transportation and deposition of sediment is the reason that the land in Bangladesh is so fertile. The increased felling of trees, however, has put the whole system out of balance.

- Sea levels are rising gradually due to global climate change.

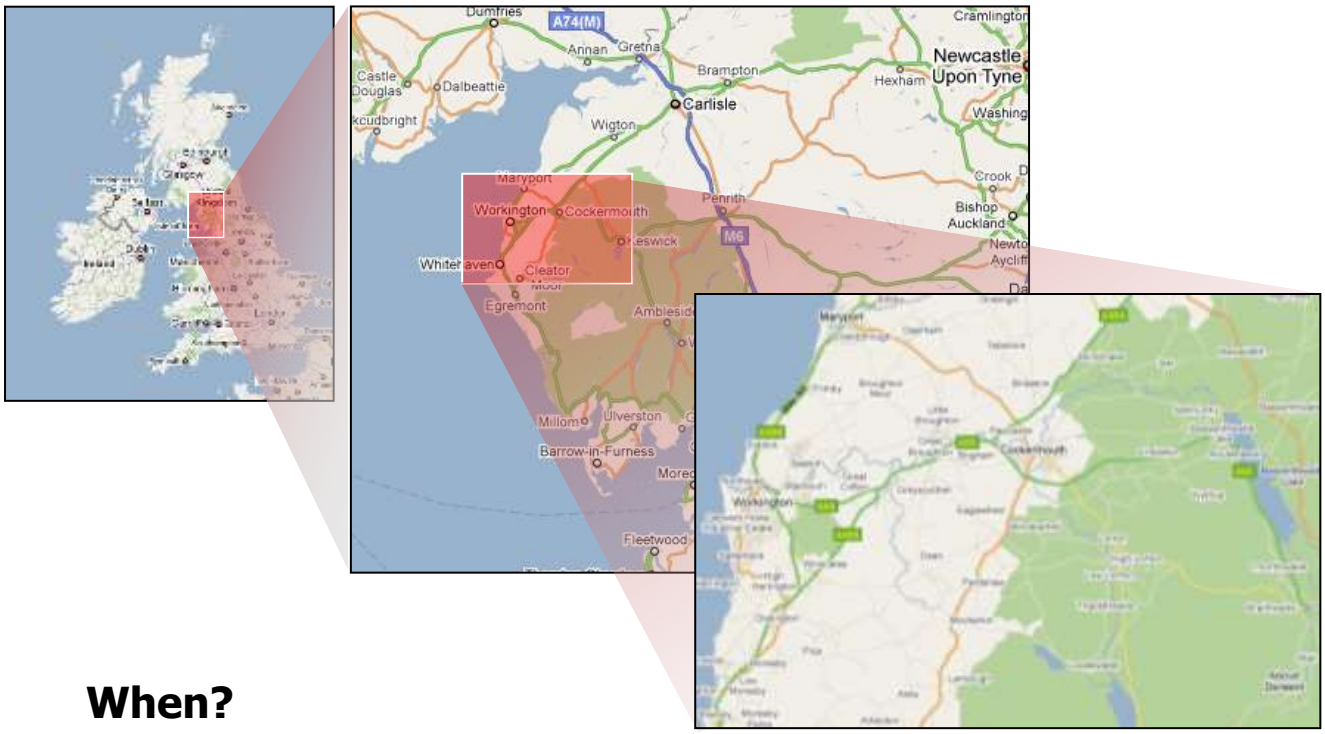
"I think it is not possible to live in this country any longer, we have to move."
Asma Khatun
Gabura Island resident

"The post-flood situation is extremely dangerous for the very poor because they have no income, no shelter, no assets and are vulnerable to disease."
Jorgen Lissner Coutts
UN representative in Dhaka

Case Study: Flooding in Cockermouth

Where?

Cockermouth is in the **Lake District National Park** in Cumbria, UK. It is on the confluence of two rivers: the Derwent (which flows out of Bassenthwaite Lake) and the Cocker (which flows from Crummock Water).



When?

- The floods happened at the end of November 2009. (20-24th November)
- The area has flooded previously in 2005 and 2007.

What happened?

- River Cocker/Derwent rose by over 2.5m
- Bridges washed away (some of them over 100 years old)
- A policeman (Pc Barker) was washed off a bridge whilst preventing cars crossing it.
- Loss of bridges meant that people had to make huge detours to get from one side of the river to the other (up to 90km). This had a massive impact on local businesses.
- After a week, the army built temporary footbridges.
- Electricity cut off for over 1,200 people
- Over 200 people were rescued by the emergency services (50 by RAF helicopters)
- The Armed Forces and RNLI (life boat service) were drafted in to help.
- 20 schools were closed and were used to shelter people whose houses were uninhabitable due to flooding.
- Hundreds of local businesses were flooded.
- Train lines closed and temporary stations built where stations flooded.

- The Prince of Wales visited Cockermouth.
- The cost of the flood damage was in millions of pounds.
- Tesco built a temporary store to serve the local area as one of their stores was flooded.
- Some looting occurred.

Pictures from the 2009 floods in Cockermouth.

Homes and streets are flooded.

The river Cocker burst its banks.

Businesses lost their stock as well as future trade in the run up to Christmas.

The water is not clean: sewage is mixed with the river water.

People salvage what they can from their ruined homes.

Local business and shops are ruined by the high water

Why?

- Cockermouth is on the confluence of two rivers.
- There was a lot of rainfall in early November.
- Very heavy rain on the 18th, 19th and 20th caused by an area of low pressure (a depression) coming from the Atlantic (over 370mm fell in some parts of Cumbria in these three days)
- The 24-hour total at Seathwaite (ending 0045 on Friday 20 November) of 314.4 mm is a UK record for a single location in any given 24-hour period (this is more rainfall than the area would normally receive in a month).
- The water from the storms went directly into the river channels as the soils in the areas were saturated from earlier rainfall.
- The area has flooded before.

Environment Agency chairman Chris Smith described the rainfall as "unprecedented".

FLOOD ADVICE

- Do not drive unless essential
- Do not walk through floodwaters
- Do not try and unblock drains yourself
- Look out for vulnerable friends and neighbours
- Have torches, waterproofs, water, radios, medication and other essential items at hand in case you cannot get home or need to be evacuated.
- Take essential items upstairs or to a high point in your property
- Listen to the emergency services and evacuate when told to

Environment Agency Notice on BBC Website *(November 2009)*

Cockermouth High Street looks more like a rapidly flowing river at the moment.

Shops that had just done up their fronts for Christmas are now only accessible by boat.

The RNLI, the fire service, mountain rescue and the police are all here working together to try to evacuate people from their houses.

Overhead, there's a helicopter from the RAF taking people off the roofs of their houses and from windows.

It looks very much like a disaster zone and it's feared that the river levels are still due to rise further.

The BBC's Laura Bicker, in Cockermouth

"I have worked in war zones and flood disasters before in the past, but I did not think I would need those skills here.

It is difficult mentally and physically for the victims of the floods. They have to pick themselves up off the ground. It can cause excess mortality. We have to be careful that no-one else dies as a result of this major catastrophe. Depression is a major issue in these situations".

Name:

Coasts

"A coast is where the land meets the sea"

Coastal Processes

Coasts are shaped by **erosion** and **deposition.**

Erosion is the wearing away of the land by an agent of erosion (sea, wind, rivers, ice, etc.)

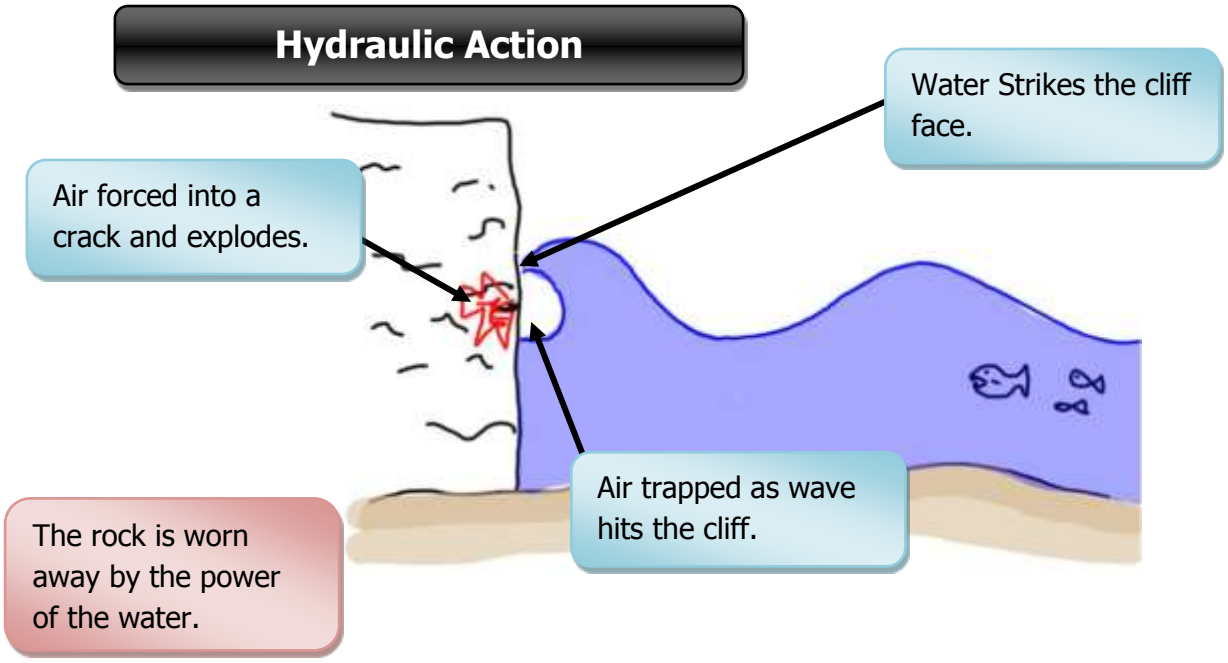
Deposition is the dropping of material carried by the agent of erosion when it runs out of energy.

Coastal erosion: Processes

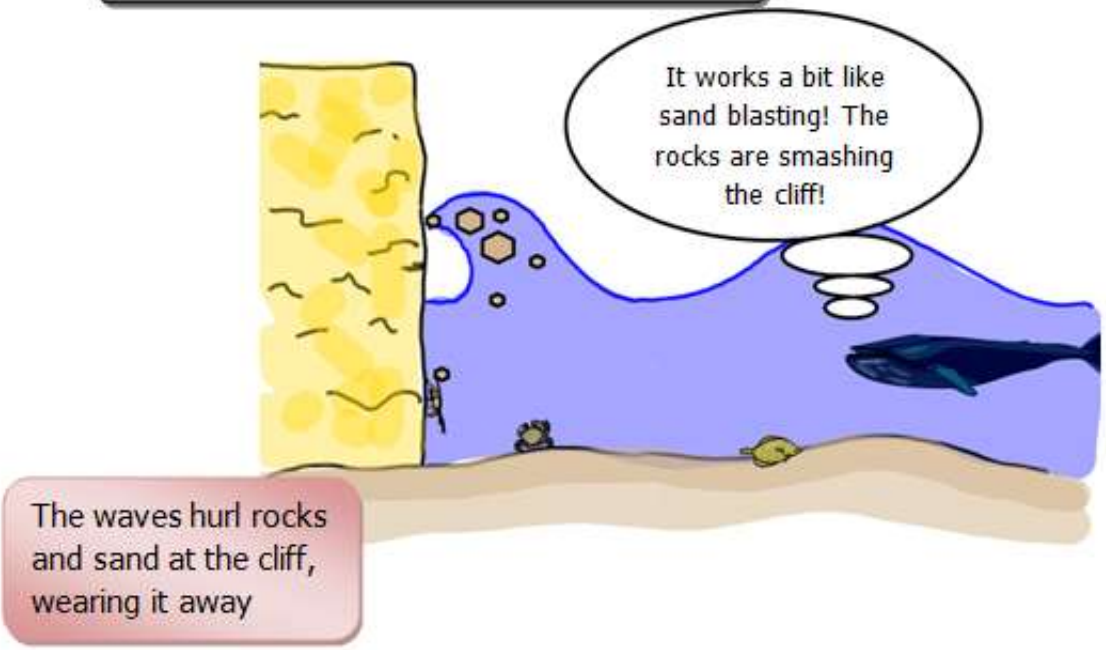
Coasts are eroded mainly by the action of the sea.

The sea erodes the land by …

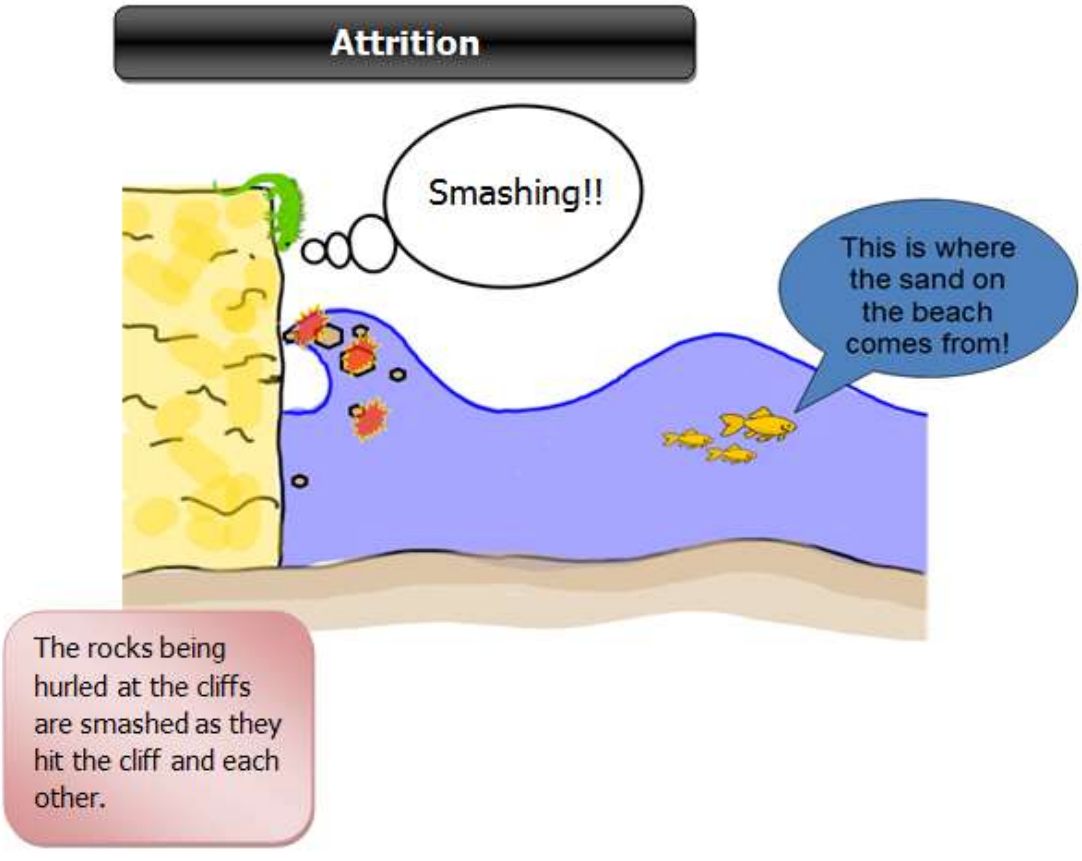
- **Hydraulic Action**
- **Abrasion (Corrasion)**
- **Attrition**
- **Corrosion (Solution)**

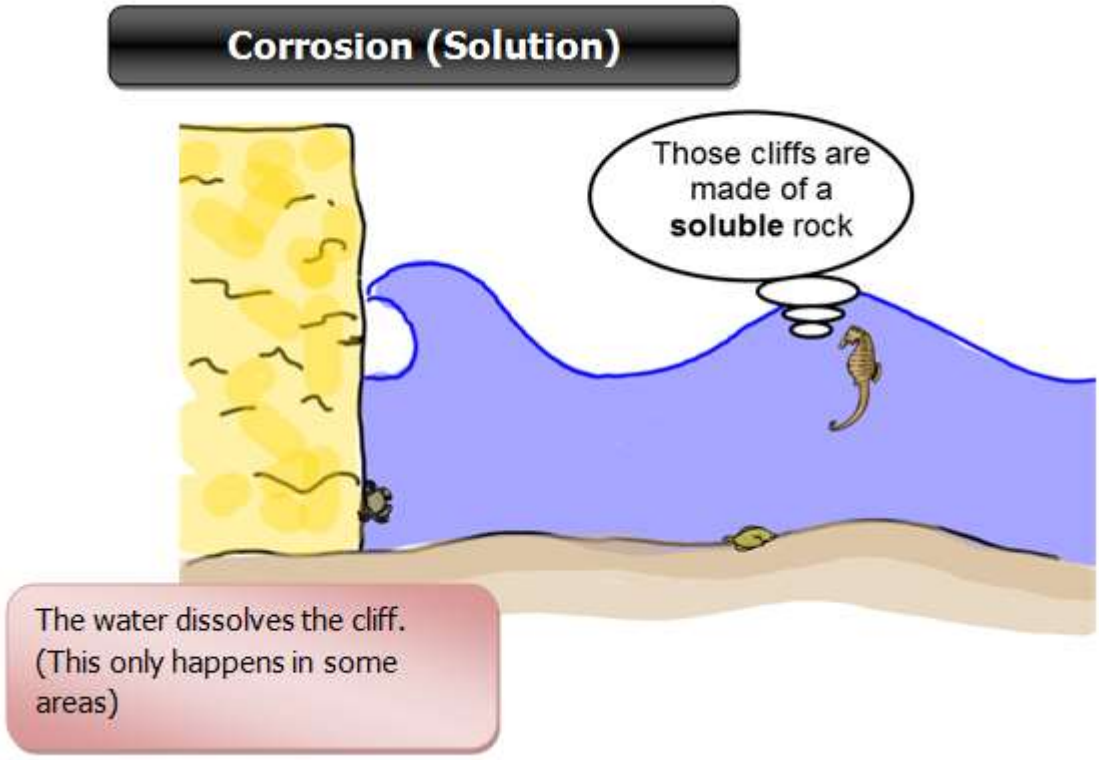


Abrasion (Corrasion)



Attrition

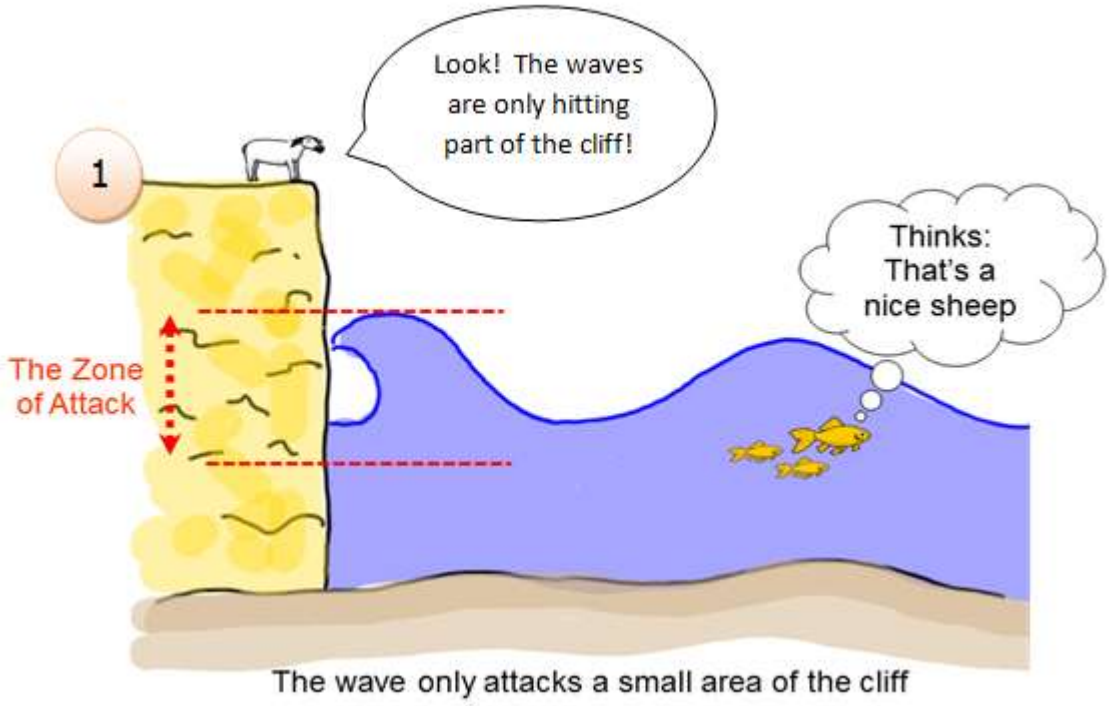


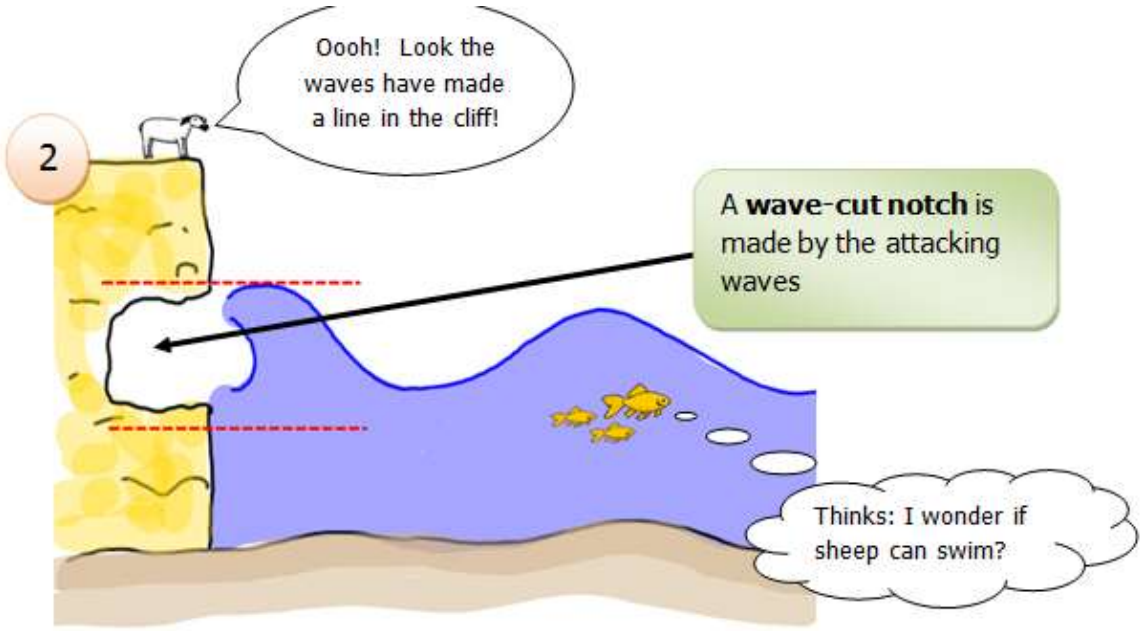


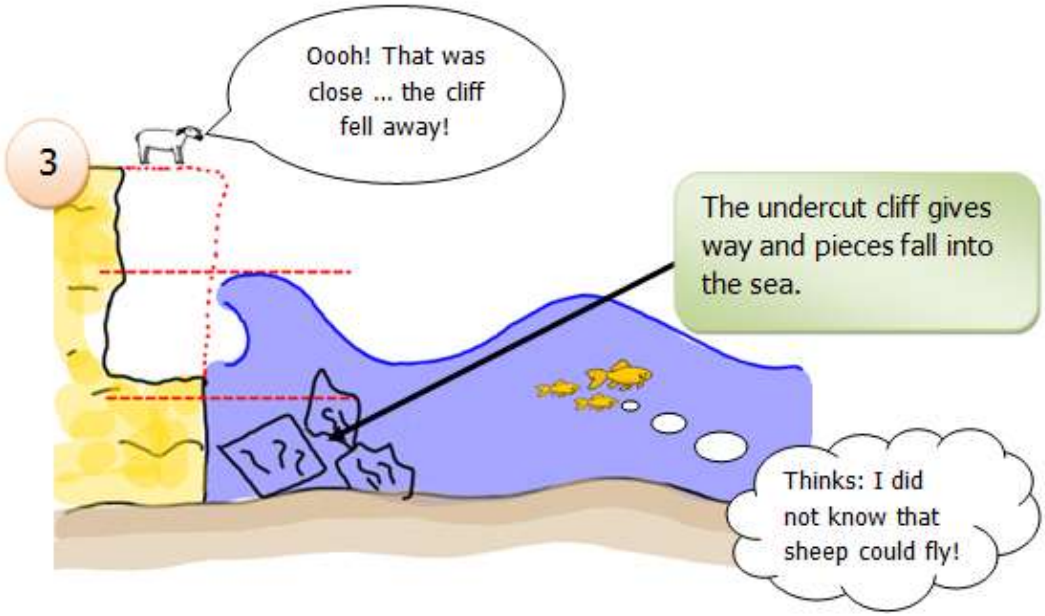
Coastal Landforms

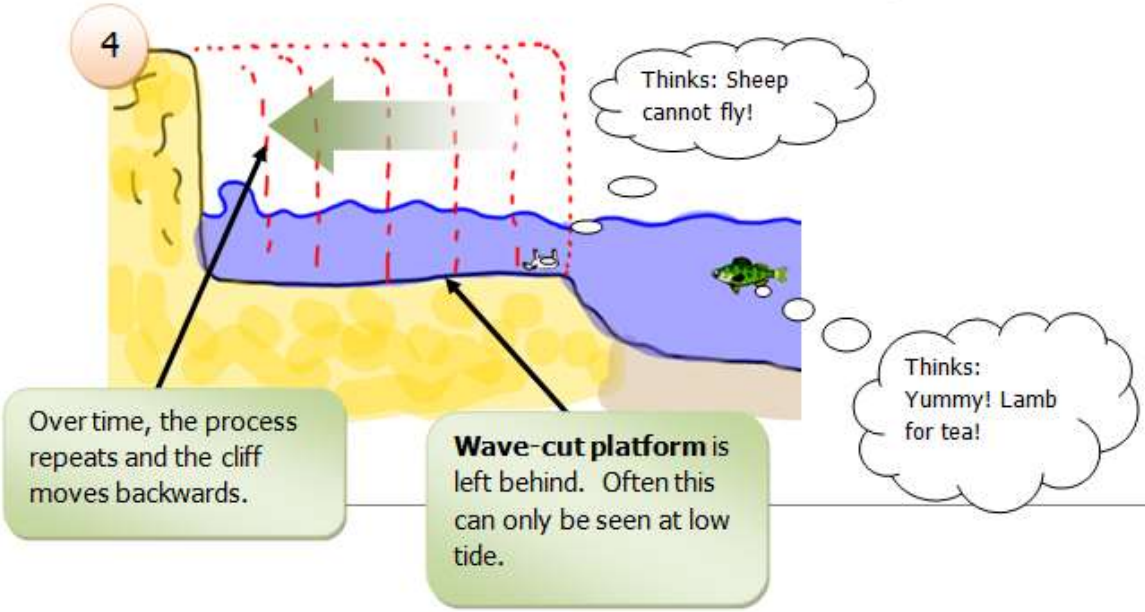
Wave-cut notches and wave-cut platforms

These are created by the way in which waves attack a cliff face.

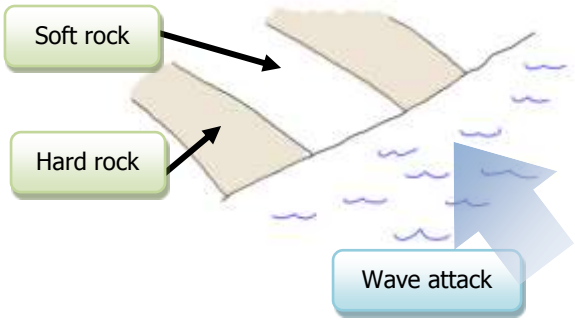



2
Oooh! Look the waves have made a line in the cliff!
A **wave-cut notch** is made by the attacking waves
Thinks: I wonder if sheep can swim?

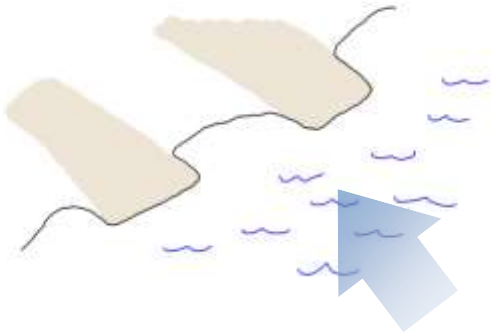

3
Oooh! That was close ... the cliff fell away!
The undercut cliff gives way and pieces fall into the sea.
Thinks: I did not know that sheep could fly!


4
Thinks: Sheep cannot fly!
Thinks: Yummy! Lamb for tea!
Over time, the process repeats and the cliff moves backwards.
Wave-cut platform is left behind. Often this can only be seen at low tide.

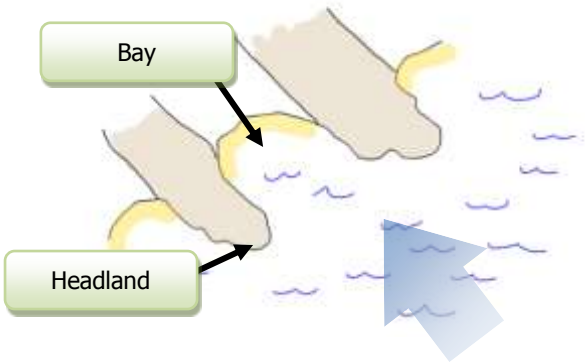
These are created by changes in rock type (**geology**) along a coast line. Hard rock erodes more slowly than soft rock.



1: The coastline is made up of alternate bands of **hard rock** and **soft rock**.



2: The **soft rock** is eroded faster than the **hard rock** by the attacking waves.



3: Eventually, **bays** are created where the soft rock used to be. The hard rock is left sticking out into the sea as a headland. The beaches in the bays are made from eroded soft rock.

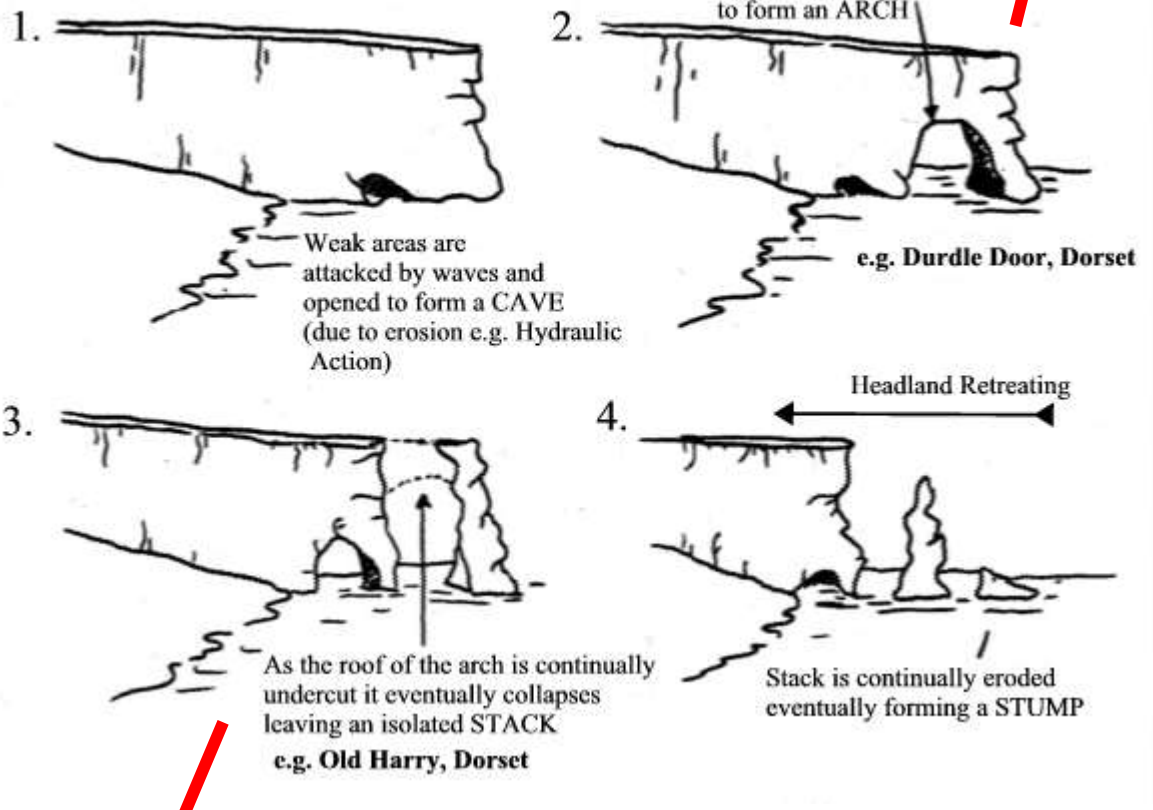
Cave, arch and stack

The headlands are now eroded from all sides creating a sequence of coastal landforms.

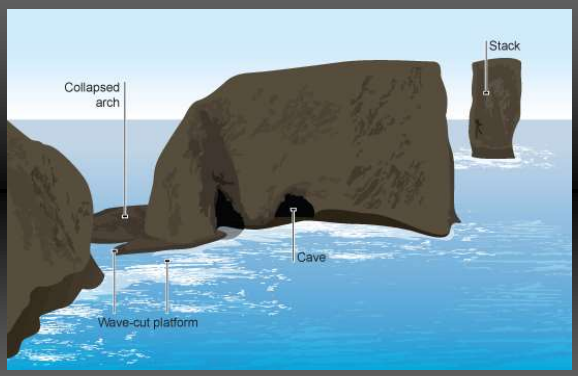
Faults are weak areas, or cracks in the headland or cliff.

Durdle Door in Dorset is one of the most famous arches in the British Isles.

EROSION OF A HEADLAND



Old Harry in Dorset is one of the most famous stacks in the British Isles.



The sea moves and deposits material that it has eroded by a processes known as **longshore drift**. This causes beaches to move and depositional landforms to be created.

The **beach material** is made up from the material **eroded** and **transported** by the sea. The local rock type will have huge affect as to whether the beach is. For example …

- **White sand** (coral reef or fine sandstone)
- **Black sand** (volcanic islands: such as can be found in the Canary Islands)
- **Pebbles** (hard rock, or chalk with flints such as can be found in the cliffs of the **South Downs**: the chalk gets dissolved leaving the hard flints)
- **Mud** (near to the mouth of a large river)

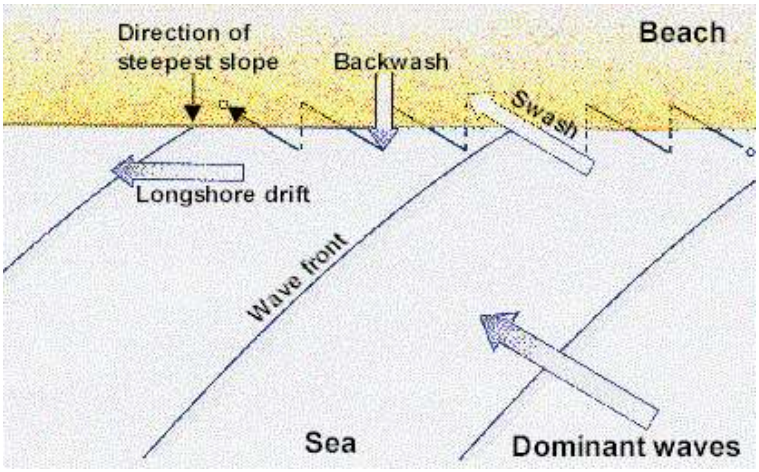
The sea also **sorts** beach material:

- The **largest material** is at the **top of the beach** where waves only reach during very high tides and storms.
- The **finest material**, pebbles, sand and mud, is **nearest the sea** where the sea reaches it most often.

Longshore Drift

Longshore drift moves material across a beach in the direction of the dominant or **prevailing wind**.

- The waves push material up the beach at the angle that they attack the beach (this is the **swash**)
- The retreating wave pulls material back down the beach under gravity, perpendicular to the sea (this is the **backwash**)
- The process is repeated and material gradually moves along the beach.



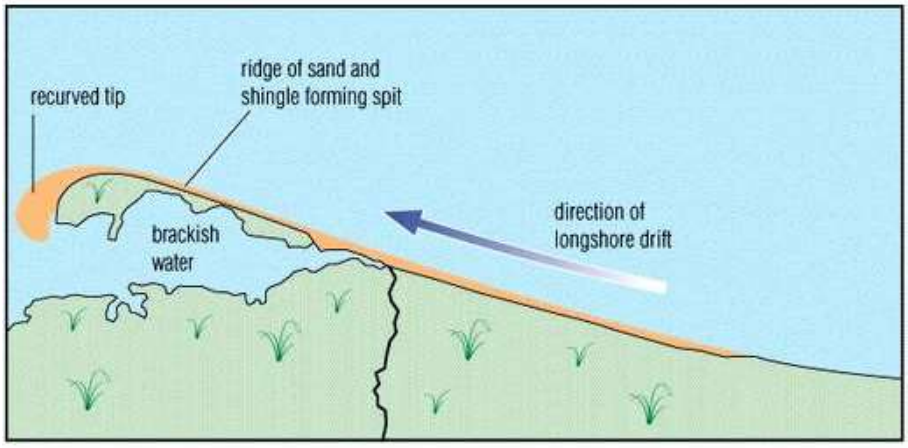
Now learn the song …

Longshore drift
Moves sand along the beach.
It goes up with the swash
And back with the backwash … (*repeat indefinitely*)

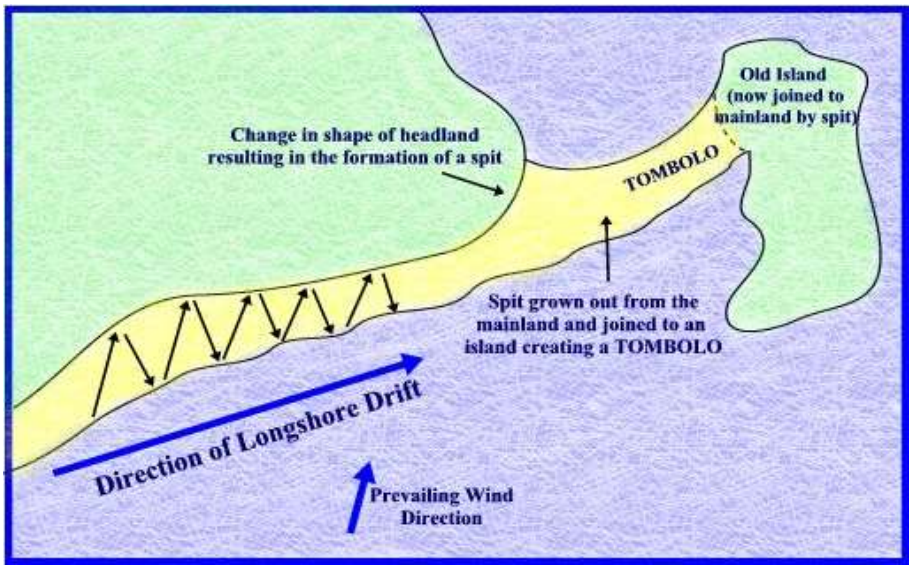
Coastal Deposition: Landforms

Longshore drift moves beach material and creates landforms such as **spits** and **tombolos**.

Spits and Tombolos:



Spits are tongues of beach that stick out into the sea. They are created by **longshore drift** carrying beach material along the coast: the coastline turns and the beach is built out into the sea.



Tombolos are beaches that join the mainland to an island. They are created in the same way as spits through the action of **longshore drift,** but the spit joins up with an island.

Coastal Protection

People live on the coast and make their living from the sea: from fishing, transport or, more recently, **tourism**. The sea attacking the coastline might put coastal settlements and businesses at risk and so people try to protect the coast from erosion. There are many ways in which people try to stop the sea eroding the coast:

Sea Walls:

The traditional 'hard' defence is the sea wall. In the past sea walls were vertical and deflected the energy of the waves away from the coast. In doing so, however, they suffer a lot of expensive damage in a short period of time. Modern sea walls have a slope and curved top which breaks up the energy of the wave and prevents water going over the top of the wall during heavy storms.

Breakwater:

A breakwater is often used to protect a harbour but may be used to protect a stretch of coastline. They are usually made of concrete or blocks of stone but recent cheaper alternative suggestions have included oil drums and used tyres. They have to be strong enough to take the full force of the waves. Since they have to be built in deep water they are, like sea walls, expensive to build.

The best form of natural defence is a beach which efficiently absorbs the energy of the waves. Along many coasts, however, **longshore drift** causes the beach to thin out in places and erosion of the land behind becomes a problem. Groynes are designed to slow down longshore drift and build up the beach. They are usually made of tropical hardwoods which are more resistant to marine borers and erosion. A few are made of concrete, steel or in more recent times large rocks. They are built at right angles to the shore and spaced about 50-100 metres apart. Groynes may have a life of 15-20 years but often have to be replaced rather than repaired.

Revetments:

A cheaper alternative to sea walls is the revetment (about £1200 per metre). This is a sloping feature which breaks up or absorbs the energy of the waves but may let water and sediment pass through. The older wooden revetment consists of posts fixed into the beach with wooden slats between. Modern revetments have concrete or shaped blocks of stone laid on top of a layer of finer material.

Gabions:

The gabion is a metal cage filled with rocks, about 1 metre by 1 metre square. They are stacked to form a simple wall. They are used to protect a cliff or area in the short term only, since they are easily damaged by powerful storm waves and the cages tend to rust quite quickly. Gabions have the advantage of ease of use and are relatively cheap but their life span is short.

Riprap:

Rock armour or riprap consists of layers of very hard rock with the largest, often weighing several tonnes, on the top. Riprap has the advantage of good permeability plus it looks more natural.

Beach nourishment:

Where longshore drift is a serious problem and the supply of beach material is poor, it may be necessary to supplement the natural system by adding lorry loads of sand and shingle to the beach. The natural processes will then spread the material along the coast to help build up the natural defences. This is called **beach nourishment**. Sometimes dredgers may be anchored offshore and the sediment sprayed on to the beach using high pressure hoses.

Other Coastal Terms:

Estuary	The mouth of a river where the water level rises and falls with the tides: i.e. a tidal mouth of the river. The water is brackish or a mixture of river water and sea water. Examples include the **River Thames in London** and the mouth of the **River Severn.**
Ria	'Drowned' river valley created when sea levels rise and the sea floods valleys created by rivers. Examples include the deep water terminal at **Milford Haven**.
River Bore	A 'tidal wave' of water that flows back up a river during particularly high tides. The **River Severn Bore** flows several miles upstream.
Fjord	'Drowned' glacial valley created when sea levels rise and the sea floods valleys created by glaciers. Examples can be found along the coast of **Norway**.

Coastal Crossword: Clues

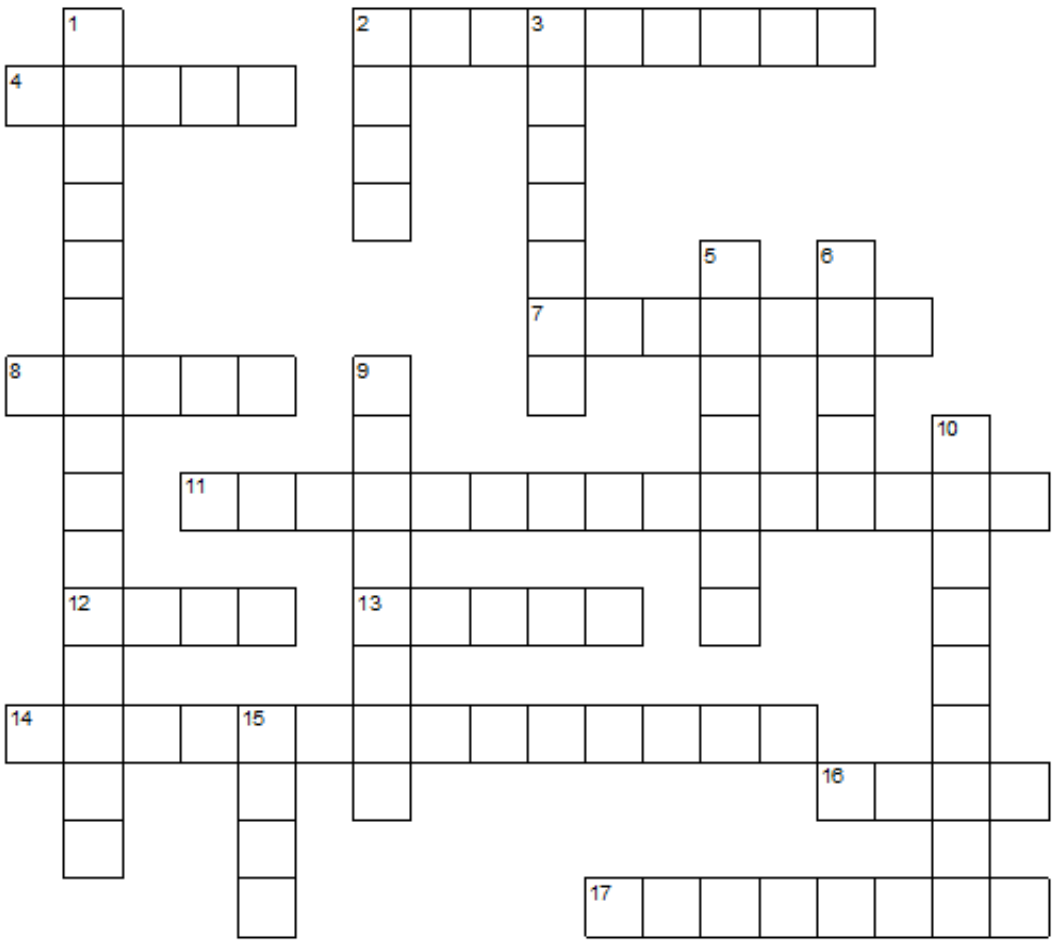
Across

2 The wearing away of rock fragments as they are thrown against a cliff (9)
4 A crack in a rock (5)
7 The wearing away of the land by the action of waves, wind, ice and rivers (7)
8 All that is left when ??? collapses (5)
11 The power of the waves wearing away the rocks (9,6)
12 The movement of the sea caused by the gravitational pull of the moon. (4)
13 What is left when the roof of ??? collapses! (5)
14 The process by which beach material is moved along a beach as waves carry it up the beach at an angle and it then rolls down perpendicular to the sea under gravity! (9,5)
16 Curved area of beach that extend out into the sea (4)
17 A piece of the coastline made up of hard rock that juts out into the sea. (8)

Down

1 Flat rock area left behind at the foot of a cliff when it erodes backwards. (4,3,8)
2 When a cave is eroded right the way through a head land it makes one of these (4)
3 "Rocks on a beach get smaller and more ?????? as you go move away from the cliffs at the back of the beach". (7)
5 Tidal part of a river where it meets the sea (7)
6 Where the sea meets the land (5)
9 The wearing away of a cliff by the waves hurling rock fragments at it. (8)
10 The sea dissolving the rock and wearing it away. (9)
15 Fine beach material! (4)

Coastal Crossword: Grid



Development

"Development is how countries change and improve, becoming richer over time"

What is 'development'?

- Some countries are richer than other countries and some are poorer.
- When we look at Development in Geography, we focus on the following questions:
  - Why are some countries richer than others?
  - How do countries become richer?
  - How can we compare countries which are totally different sizes?
  - How can 'development' happen without destroying the countries natural resources (**sustainable development**)?

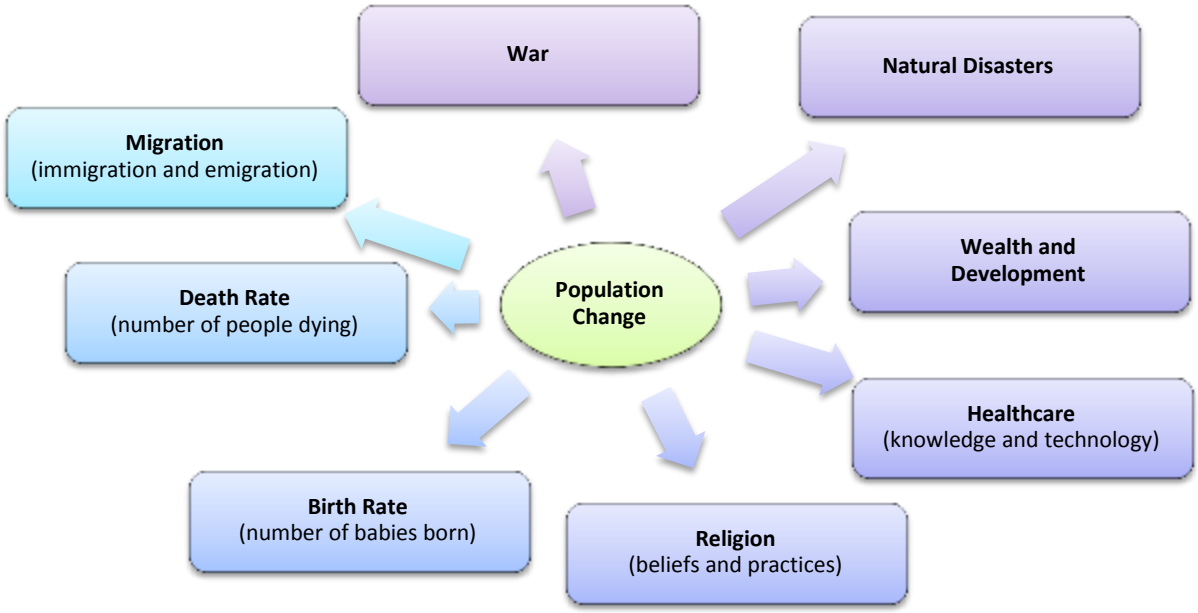
Development buzz words

- When we talk about development in Geography, we use particular terms many of which are shortened to acronyms:

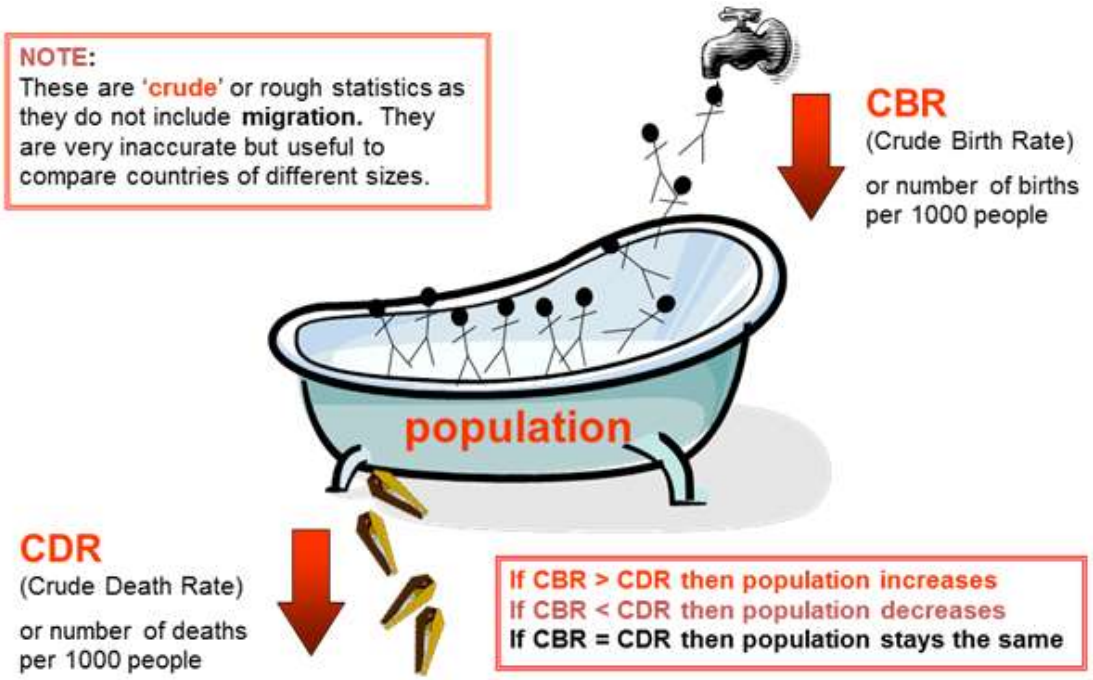
Acronym	Long Form	Definition
LEDC	Less Economically Developed Country	A poorer country
LLEDC	Least Less Economically Developed Country	One of a handful of the poorest countries in the world.
MEDC	More Economically Developed Country	A richer country
NIC	Newly Industrialising Country	A country that is becoming richer due to increasing amounts of Industry.
LIC	Less Industrialised Country	A more recent term for LEDC
MIC	More Industrialised Country	A more recent term for MEDC
GDP	Gross Domestic Product	The total value (normally in US$) of all of the goods and services produced by a country in a year (i.e. what that country has 'earned' in that year). It is often shown as '*per capita*' or 'per person' to allow countries to be compared.
GNP	Gross National Product	The GDP plus incomes earned from services and properties abroad.

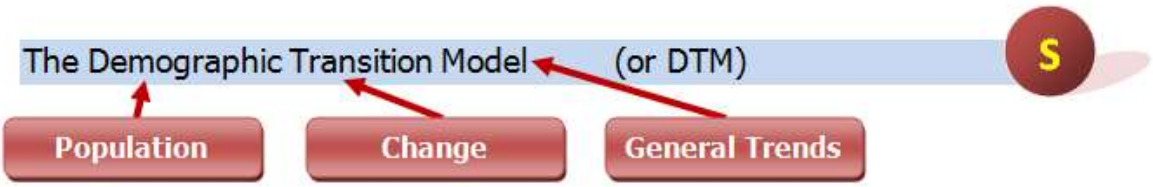
Population Change

Populations change over time and they grow or shrink depending on …

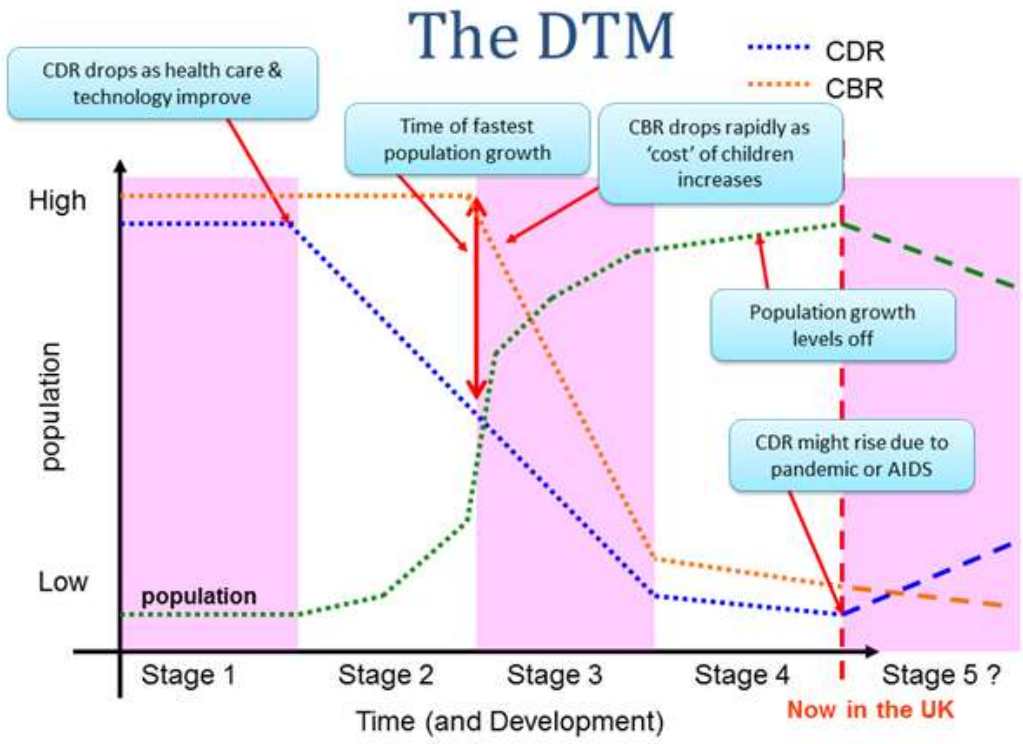


The population of a country can be thought of as a bath with the water level (population size) being dependent upon the rate of flow into the bath (the birth rate) and the rate of flow out of the bath (the death rate).

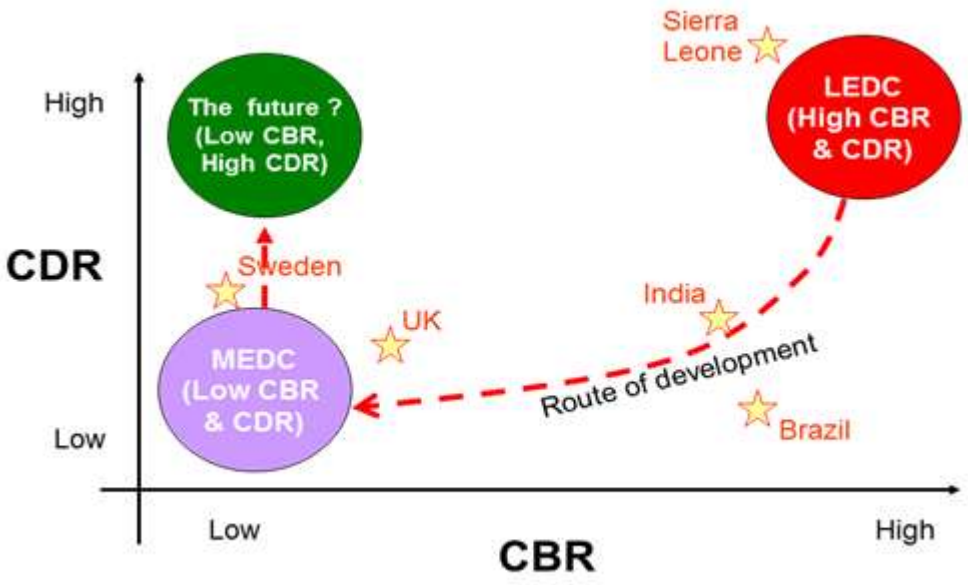




- The DTM shows how CBR and CDR change over time.
- It is based on what has happened in the UK.
- It can be used to show how countries 'develop' (an *Indicator of Development*)



You can plot countries CBR against their CDR as an indicator of development based on the DTM …



Settlements

"A settlement is a place where people live."

What are the different sizes of settlements?

- **Farmhouse**
- **Hamlet**
- **Village**
- **Town**
- **City**
- **Conurbation**
- **Megalopolis / Mega City**

Settlement hierarchies.

Settlements provide **services** for the people who live in them and in the surrounding area. These include shops, as well as hospitals, schools and post offices.

There are two types of service:

Low order services are those that are used daily (e.g. post box).
High order services are those that are seldom used (e.g. hospital).

Shops tend to specialise in either …

Low order goods (things that are inexpensive and bought daily: e.g. milk) or …
High order goods (things that are expensive and bought occasionally: e.g. cars)

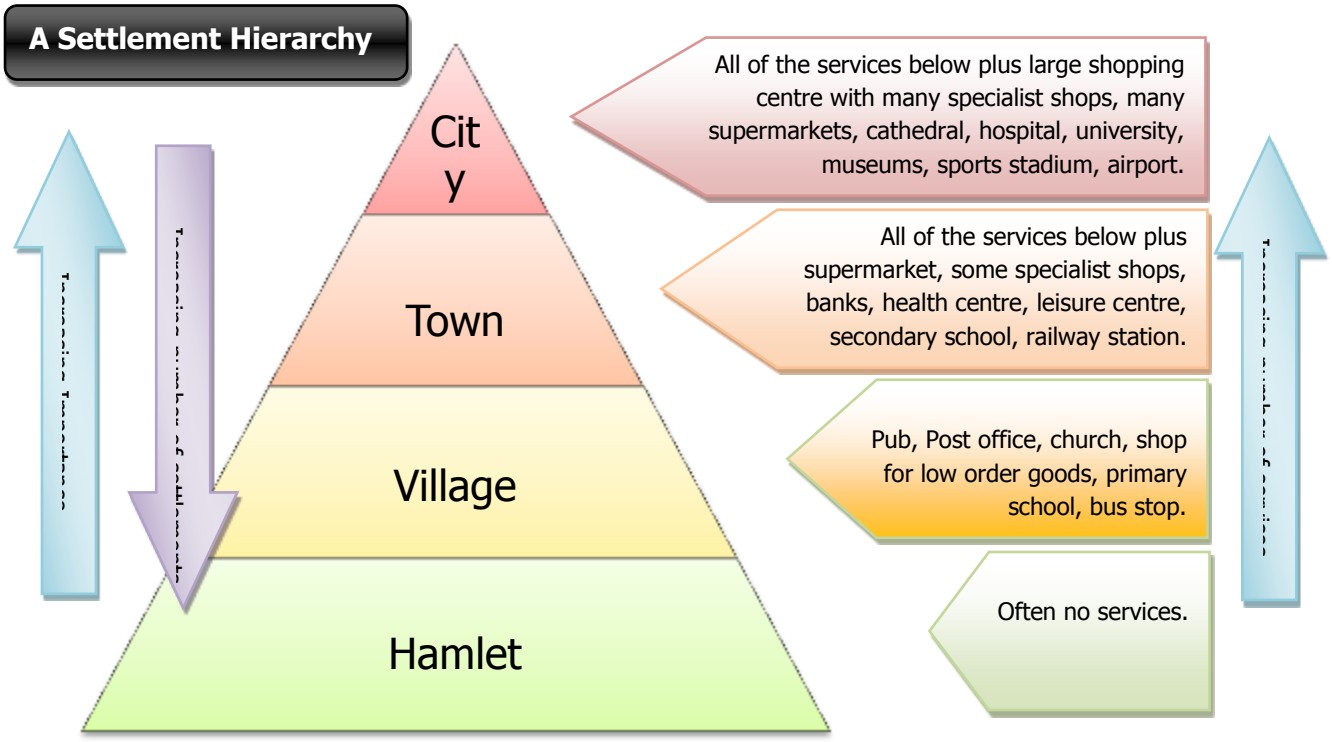
People tend not to shop around for **low order goods** and buy them from the nearest shop: they are **convenience goods.**

For **high order goods**, people generally shop around and compare process in a variety of shops: they are **comparison goods**.

Low order services and shops that sell low order goods tend to have a **smaller sphere of influence**: that is, the **threshold distance** that people are prepared to travel is **low**.

High order services and shops that sell high order goods tend to have a **larger sphere of influence**: that is, the **threshold distance** that people are prepared to travel to use them is **high**.

The larger settlements have more services than the smaller settlements. They also tend to have more **high order services** than the smaller settlements. You can arrange settlements in order of their size *and* importance. This is called a **settlement hierarchy**.



In an area, there will be **more low order settlements** and **fewer high order settlements**.

What are the different functions of settlements?

The **function** of a settlement is the main economic activity (type of employment) that happens there. Examples include …

- **Port** (e.g. Dover)
- **Tourist Resort** (e.g. Blackpool; Chamonix)
- **Government** (e.g. Canberra; Brasilia)
- **University** (e.g. Cambridge; Oxford)
- **Defence** (e.g. Durham; Edinburgh)
- **Industry** (e.g. Sheffield – iron and steel)

NOTE: The function of a settlement can change over time: e.g. mining villages in South Wales needed to change function when the coal started running out.

The Growth of Settlements

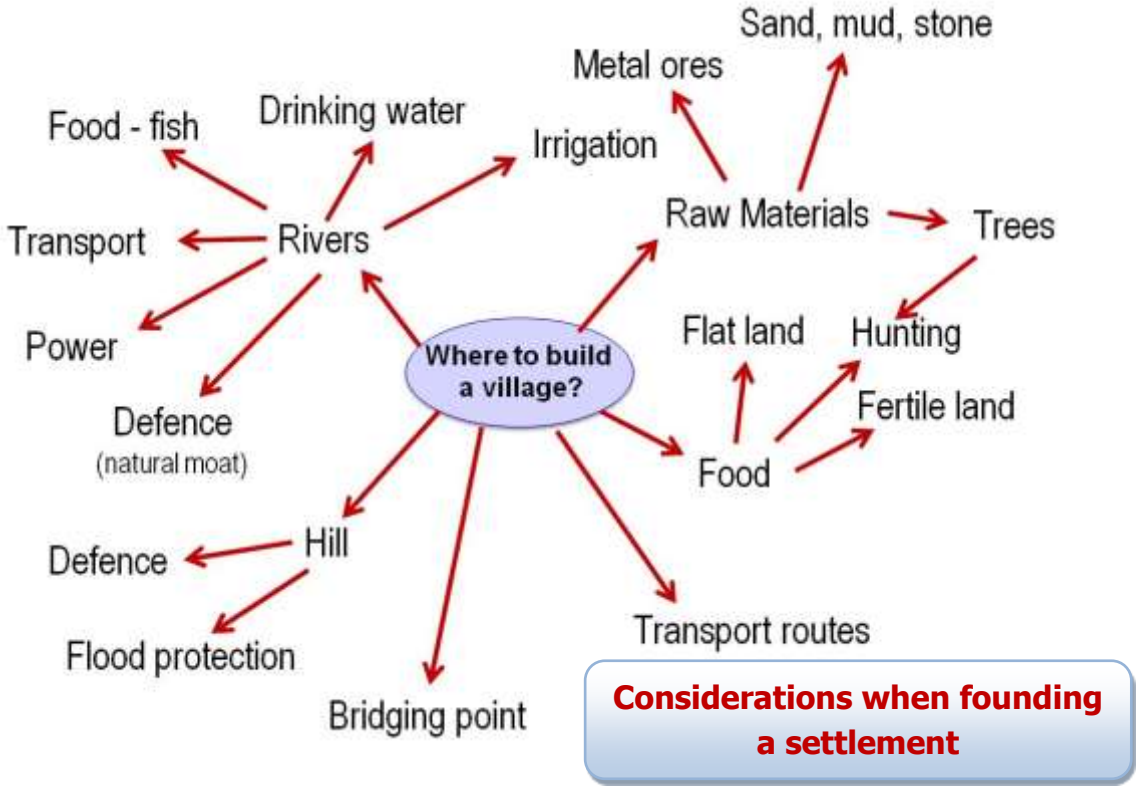
Remember, settlements grow over time: a city was once a town and that town was once a village and that village was once a hamlet ….

People began to settle in one place at about the same time that they stopped being **nomadic** and began farming in one place (**sedentary** farming).

Settlements develop in certain places because these **sites** and **situations** have certain advantages.

- **Site** is the actual place where the settlement is founded.
- **Situation** is the position of the settlement in relation to other settlements and transport routes.

Example: **London** was built at the **lowest bridging point** on the River Thames; i.e. the first place where it could be crossed.



Rural Settlement Patterns (Village patterns)

Villages (rural settlements) have three main patterns (or forms). These are often altered by the **relief** of the area. The three patterns are

- **Nucleated**
- **Linear**
- **Dispersed**

Nucleated Villages

A 'clustered' pattern around a central point (nucleus) such as a crossroads or village green.

Linear Villages

The buildings all follow a transport route (road, rail or river) in a line.

Dispersed Villages

These are spread out. Normally isolated farms surrounded by their land.

Urban Land Use Models

Models are a simplified version of reality. They are used to show the main trends and processes in a system or place.

Urban land use models try to show how and why similar patterns of land use occur in cities.

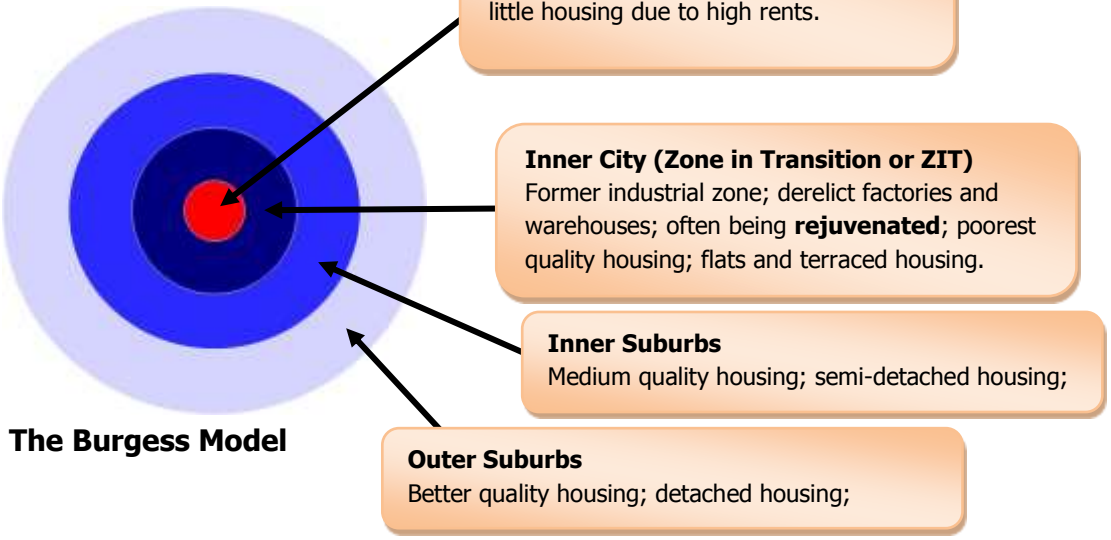
There are several and their layout depends upon which city the person who created the model was looking at and when they were looking. Below is a list of models that you might come across. You should be aware of the first two.

- **Burgess** (concentric rings)
- **Hoyt** (sectors)
- **Harris and Ullman** (multiple nuclei)
- **Mann** (sectors and concentric rings – based on UK cities)

Note: these models only apply to MEDCs, there are different ones for LEDCs.

The Burgess Model (Concentric Ring Model)

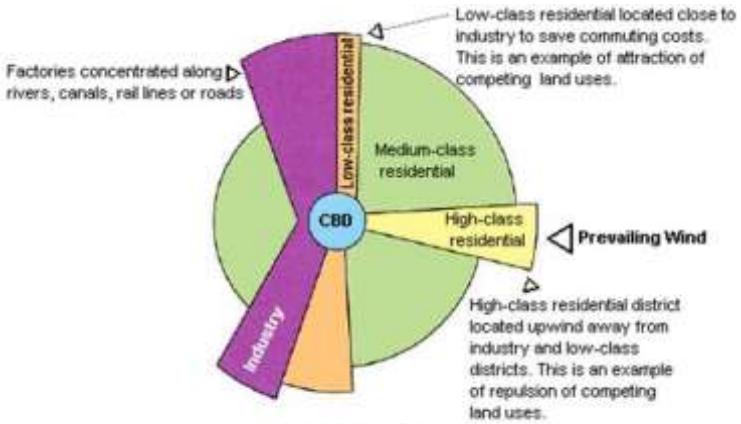
- The Burgess Model is a concentric ring model. (Rings sharing the same centre)
- It was based on Chicago in the 1920s.
- Cities grow outwards in rings (like trees) facilitated by the improvements in transport.
- The idea was that people aspire to have better housing and so move outwards to get more space and bigger houses.
- The worst housing is in the inner city zone which is noisy, dirty and polluted.



The Burgess Model

The Hoyt Model

Homer Hoyt suggested a variation to the Burgess Model, that urban growth would happen in sectors or wedges.



Hoyt Model

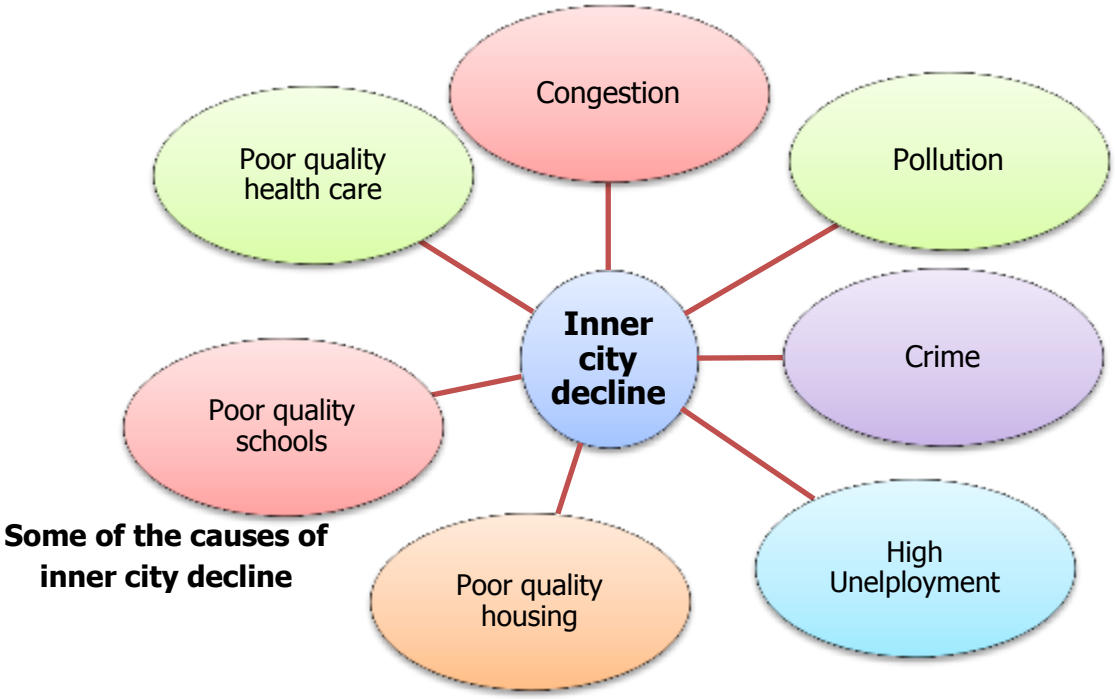
He said that the industry would grow in sectors along the main transport lines (road, rail and canal)

The poor quality housing would be close to the noise, dirt and grime of the industry.

The best quality housing would be up-wind of the industry and on the opposite side of the town.

Change in Cities

The Inner City is a zone which, after factories and warehouses are no longer needed due to changes in technology, has several problems:



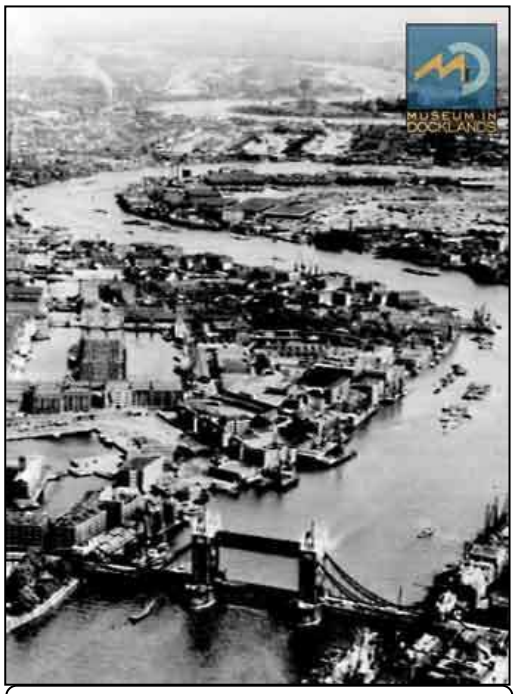
Some of the causes of inner city decline

This results in people who can afford to, **migrating** out of this zone and the problems getting worse.

The Government has tried to tackle some of these problems with **urban renewal schemes** which aim to **attract new industries** to the inner city, and **encouraging** investment in **new housing, services** and **jobs** for the local people.

Example: Docklands redevelopment on the Isle of Dogs, London.

- The docks were the centre of the British Empire in the 19th Century, importing and exporting goods around the world.
- The docks employed thousands of people: loading and unloading ships; ship building and repairs; crew; storing goods (warehouses); management and insurance; board and lodging for visiting crews; etc.
- The development of bigger steel ships and, in particular, massive container ships in the 20th Century, meant that the docks were too far up the Thames and inaccessible to this new ships. The new ships went to the new container docks at Felixstowe.
- The docks were totally derelict by the end of the 1960s



Docklands in the Early 20th Century

- In the 1980s, the Government (under Margaret Thatcher) set up the **London Docklands Development Corporation** (LDDC) which was set the task of **rejuvenating** this run-down part of the East End.
- The LDDC started numerous transport plans:
  - **The Limehouse Link**– a road tunnel linking the Docklands to the City of London.
  - **The Docklands Light Railway** (DLR) – a driverless electric train to carry commuters around the Docklands and too and from the City.
  - **The Jubilee Extension** – Extending the Jubilee line on the London Underground, taking it south of the River Thames and linking it up with the DLR.
  - **City Airport** – Converting the old docks into an international short-haul airport in the heart of the city.

The Canary Wharf development

- They encouraged **new developments** (buildings) with these transport links and by reducing planning restrictions and giving property developers tax breaks (they did not pay tax for several years):

  - **Office buildings**: e.g. Canary Wharf
  - **Housing**: luxury apartments and riverside developments.
  - **Sports and Leisure facilities**: e.g. marinas and the Docklands Arena (a venue for exhibitions and concerts)
- **Local inhabitants** complained that none of the new jobs or developments were for them: they were for rich city workers.
- Unfortunately the stock market crash at the beginning of the 1990s meant that the Docklands development went on hold for several years.
- By the early 2000s, the project was back on course and London had a new, second financial city centre.

Settlements in LEDCs

LEDC stands for **L**ess **E**conomically **D**eveloped **C**ountry (sometimes now referred to as LIC or Less Industrialised Country).

These are poor countries and the normally have:

- **Low GDP** (wealth)
- **A large proportion of people working in farming**
- **Poor services** (healthcare, etc.)

LEDCs tend to have one major city (the **Prime City** or Primate City) and very few towns. MEDCs (rich countries) tend to have several large cities.

Examples:

Ghana – Accra
Mexico – Mexico City
Venezuela – Caracas

This primacy of one city is caused by people from all over the country **migrating** to the city in search of a better quality of life.

Life in rural areas (the countryside) can be very hard and this might **push** people towards the city.

The centre of the city might be very rich. The bright lights of the city **pull** people towards the city.

When they arrive in the city they have nothing and join the millions of people living in the illegal squatter settlements or **shanty towns** on the edge of the city or next to dirty noisy transport routes or factories. These shanty towns are called **favelas** in Brazil and **bustees** in India. They have no services (running water, electricity and sewage, schools, hospitals, etc.) and often very high crime rates.

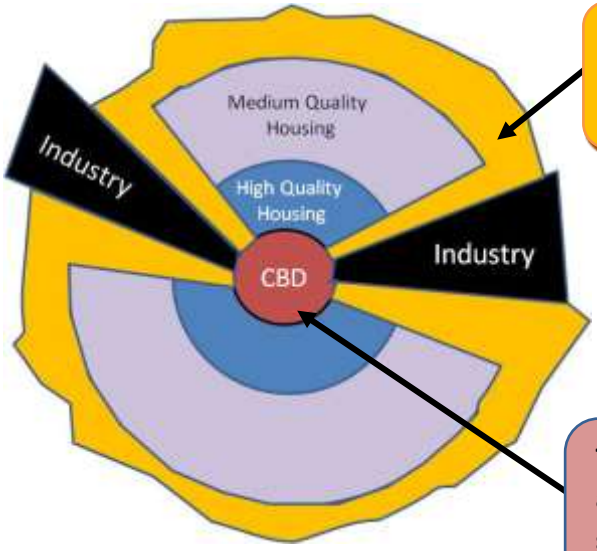
Land slips occur.

Shanty towns are often built on steep slopes that no-one else wants to build on.

There are no planning restrictions: people build on top of other houses; there is a lack of space so they build up.

A favela in Lima

Land use in an LEDC city



Shanty towns are found around the edge and next to the dirty, noisy factories.

Note that the model is the opposite of the Burgess Model in MEDCs in that the housing gets better in quality towards the centre.

The CBD contains the best housing as well as the offices and best shops. There are expensive apartments here.

Urban renewal in LEDCs

The shanty towns cause real problems to governments in LEDCs.

- They are over-crowded
- They lack sanitation – no sewage system. The sewage flows down the street and so disease is common.

- Crime levels are high: criminals hide away in the shanty towns and are untouchable by the police.
- Electricity and water are 'stolen' from the national grid and their provision is unsupervised and dangerous.
- There are no building regulations and so in the case of a natural disaster (hurricane, flood or earthquake), they are flattened and many of the inhabitants are killed.
- They have no state-provided health care or education.

So the governments have tried several ways to get rid of shanty towns:

- In Mumbai (Bombay), India, the slums are regularly cleared and peoples houses are flattened.
- The inhabitants are re-housed in new apartment blocks on the outskirts of the city in 'New Towns' – these are a long way from where employment opportunities and services are and so are not popular.

- In Rocinha (Rio de Janeiro, Brazil) the government has tried to encourage self-help building programmes where the government provides some of the materials and tried to formalise the buildings.

- Unfortunately, as soon as one part of the slum or shanty town is cleared, new migrants arrive from the countryside to take their place.

Economic Activities

"Economic activities are the things that people do to earn a living."

There are **four** types of economic activities:

1. **Primary Activities**
   These involve taking **raw materials** from the natural environment
   Examples:
   a. Mining
   b. Fishing
   c. Farming

2. **Secondary Activities**
   These are those that involve taking raw materials and, through some process, making a new product: i.e. **manufacturing**
   Examples:
   a. Oil refining
   b. Iron and steel
   c. Crisp factory

3. **Tertiary Activities**
   These are **service** activities: nothing physical is made as a 'final product'.
   Examples:
   a. Teaching
   b. Insurance
   c. Medicine
   d. Armed forces

4. **Quaternary Activities**
   These involve **research and development**.
   Examples:
   a. Software development
   b. Medical research
   c. Weapons research

Farming: A Primary Activity

"Farming is the growing of crops and raising of animals for food"

Farming has changed the landscape all over the world. There are three main types:

Arable: Growing crops only

Pastoral: Raising animals for meat

Dairy: Raising animals and getting a food product from them without killing them (e.g. milk and eggs)

NOTE: In **mixed farming**, the farmer practices two or more of the types of farming above.

There are many other ways to classify types of farming:

Subsistence is farming just for food the farmer and his family and not to sell.

Commercial is farming as a business and selling the crops/livestock/milk.

Nomadic is farming is where the farmer and his family move around from place to place in search of the best grazing for the animals or to take advantage of more fertile soil.

Sedentary is farming in one place: i.e. not nomadic.

Extensive is where the farmer puts a little amount of money or energy into the farm per unit of area. Extensive farms are normally large scale livestock farms (e.g. hill sheep farming in Wales).

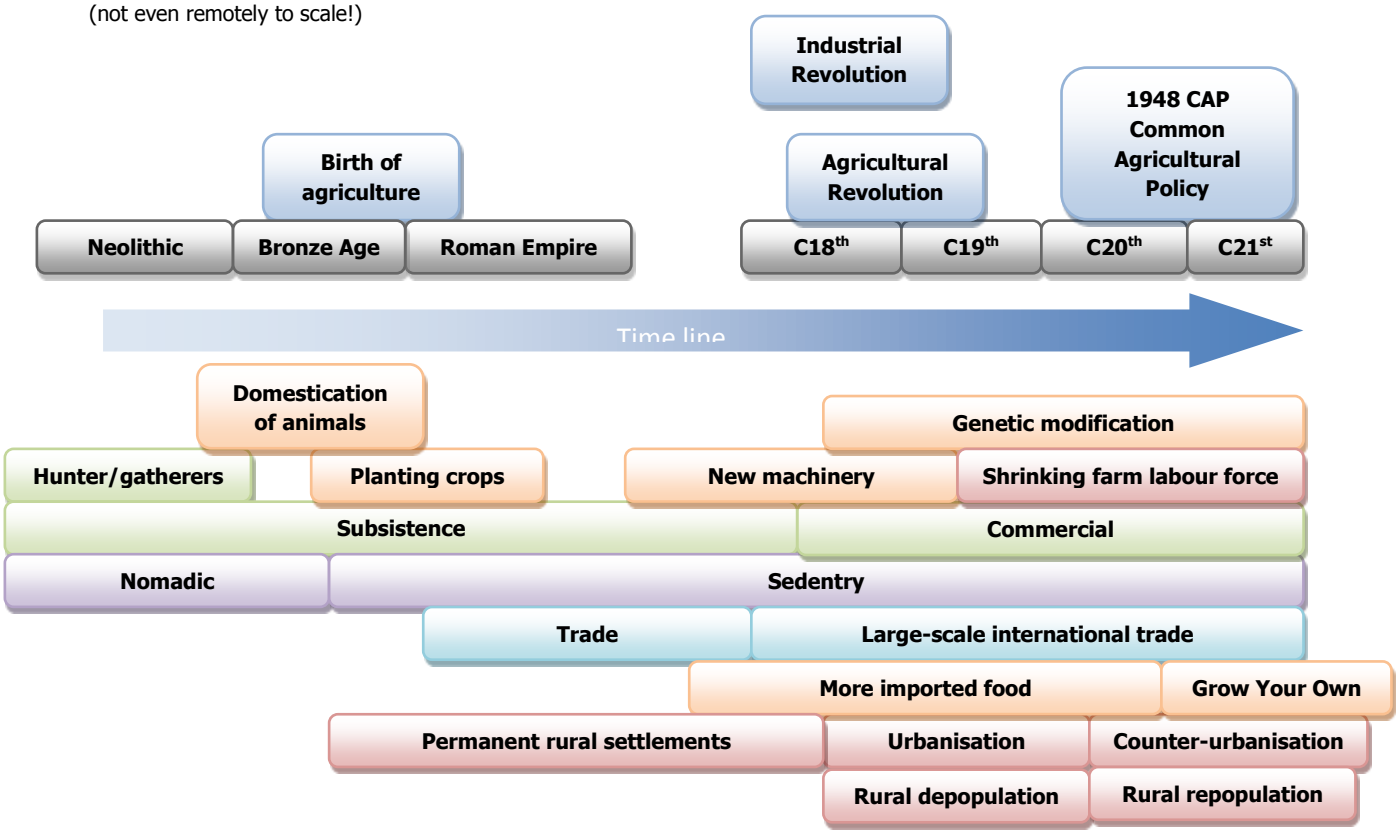
Intensive is where the farmer puts a lot of money or energy into the farm per unit of area. Intensive farms are normally on a smaller scale but have more delicate or expensive produce (e.g. market gardening in Kent)

Market Gardening is the intensive growing of fruit and vegetables (often under glass houses)

Farming in the UK (MEDC)

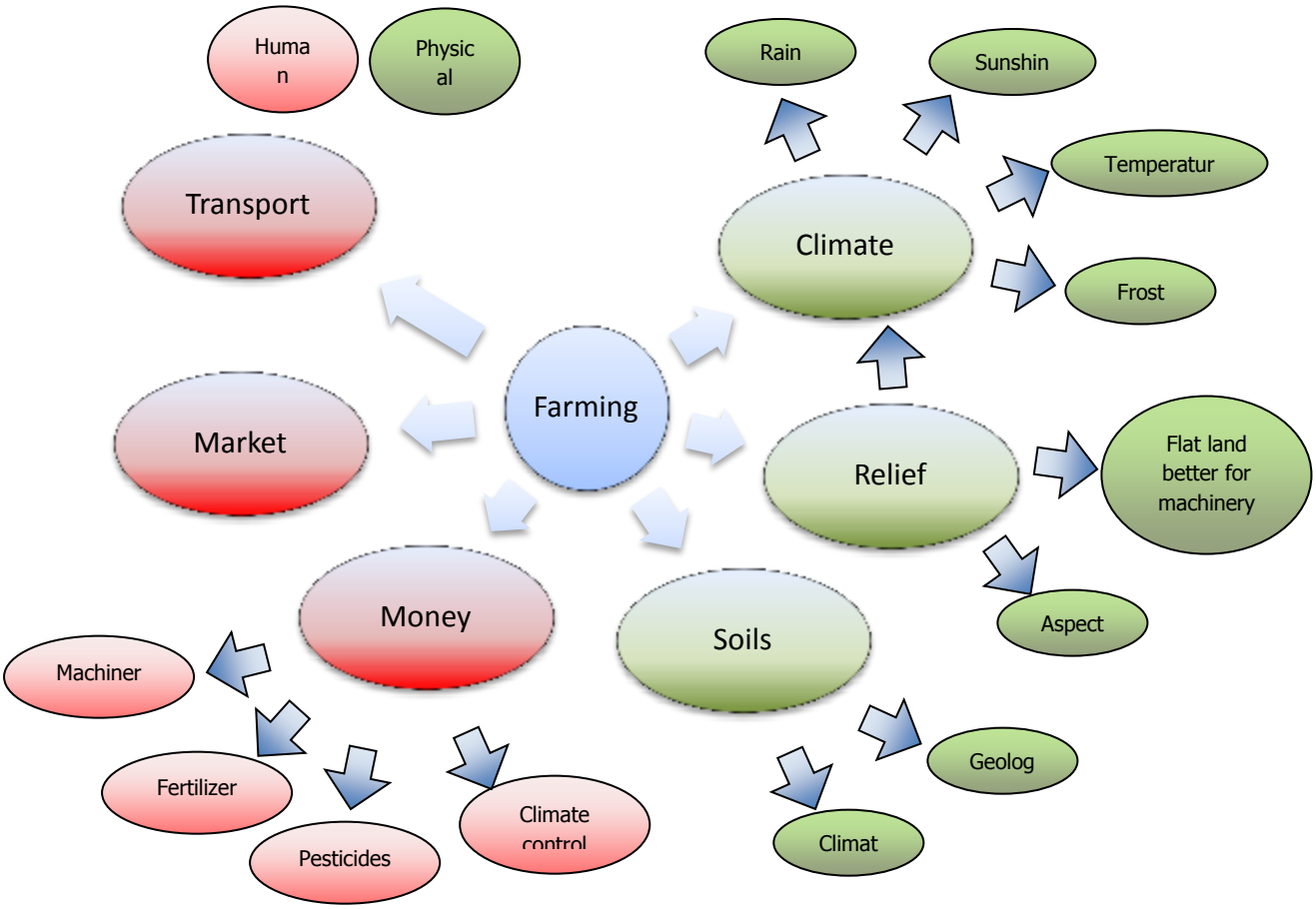
Historical context:

(not even remotely to scale!)



There are many types of farming in the UK today but the main types tend to fall into a regional pattern:

Why is there a regional pattern of farming in the UK?



If one compares the regional pattern of farming with a rainfall map and a relief map of the British Isles then the reasons for the pattern become clearer:

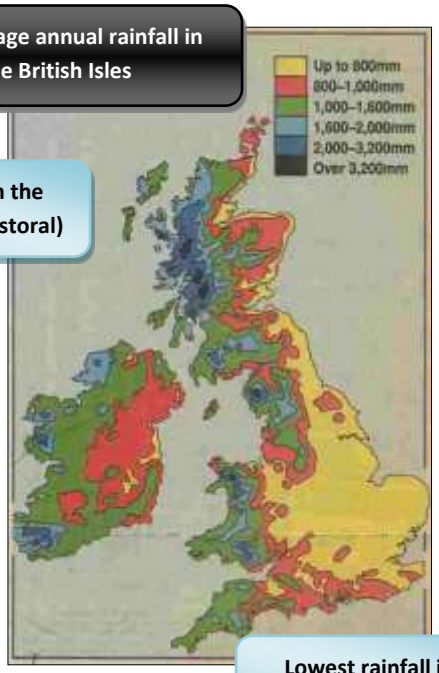
Highland to the north and west (pastoral)

The Relief of the British Isles

Lowland to the south and east (arable)

The average annual rainfall in the British Isles

Highest rainfall in the north and west (pastoral)



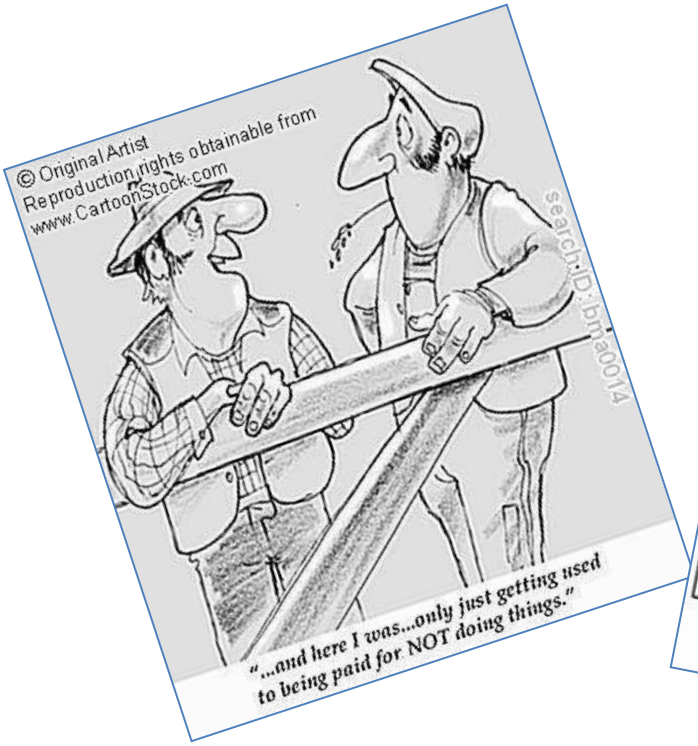
Lowest rainfall in the south and east (arable)

Changes in Farming in the UK

Farming is dynamic (it changes all the time) and there have been many changes in recent years in the way that people have farmed in the UK. These changes have been brought about by **changes in technology** and **government policies**.

- **Field sizes have increased:**
  - Especially in the flatter eastern parts of the country.
  - Farmers have **removed hedgerows** that made up traditional field boundaries so that they can use **larger modern machinery**.
- **Farms have become larger:**
  - Smaller farms that made less profit have been taken over by larger more profitable ones.
- **Fewer people working on the land:**
  - Due to **better machinery** fewer people are needed for farm jobs that previously needed a large labour force: For example, 2 people (one driving a *combine harvester* and one driving a tractor alongside to collect the grain) can harvest a huge field of wheat, separate the grain from the chafe and bale up the remaining straw in a couple of hours: this would have taken a large team of people a whole day in the past.
- **Common Agricultural Policy (CAP):**
  - Before 1992, farmers in the European Union (EU) were given *subsidies* which guaranteed them a minimum price for their crops.
  - This meant that farmers were assured an income and that farms would not go out of business: meaning that EU countries would still be able to provide food for themselves and not be dependent upon other countries (mainly Russia and the USA).
  - Farmers *overproduced* and this policy has been a huge drain on the EU finances and, as the EU promised to buy all that farmers could produce, it ended up with mountains of unwanted foodstuffs.
  - Since 1992, there has been a gradual reduction in EU farm subsidies.
- **Dairy Quotas:**
  - As part of the CAP, dairy farmers have been given a limit (or **quota**) by the EU for how much milk they are allowed to produce on their farm. Farmers still receive a subsidy but they are fined if they exceed their quota.
  - Quotas mean the UK produces less milk and dairy farms are struggling survive.
- **Set-aside:**
  - Quotas and CAP meant that farmers did not need to farm such large areas and so they were tempted to sell their land to developers for housing or businesses.
  - The EU wanted farmers to keep their land for farming in case it was needed in the future.
  - As part of the condition for receiving subsidies, farmers had to take 15% of their farm land out of cultivation: they are paid *not* to produce crops! They

can leave it **fallow** or use it for a non-agricultural purpose (see ***Farm Diversification***).
    - Set-aside was also seen as a way of helping to protect wildlife and their habitats.
- **Farm Diversification:**
    - As a result of *set-aside* and the general reduction in the amount of money that farmers were earning, a lot of farmers *diversified* or used their land in other ways to earn money.
    - The most popular types of diversification have been:
        - **Agri-tourism:** family farm parks; bed and breakfast; riding stables; nature trails; camping and caravan sites; etc.
        - **Recreation:** golf courses; horse riding; mountain biking; motorcross; water sports; etc.
        - **Wildlife:** restoring wetland ecosystems / forests / moors.
    - ***These changes often lead to conflict with local people and other countryside users.***
- **General decline**:
    - In addition to the problems created by reduction in subsidies from CAP and increased competition from other countries, farmers have seen a rapid decline in the amount of money that they ear over the last few years.
    - **Health scares** in recent years have led to export bans for UK produce: most noticeably **BSE** and **Foot and Mouth** outbreaks.
- **Farmers' Markets:**
    - There has been a recent trend for high-quality **local** and **organic** (no chemicals used) produce, driven by some of the major supermarket brands, TV chefs and local farmers' markets. Many farmers now cater for this and are doing very well.



Farming in the Bangladesh (LEDC)

Background:

The flag of Bangladesh

- Bangladesh is one of the poorest countries in the world.
- It is on the **confluence** of the Brahmaputra and Ganges rivers.
- **It is very low-lying**: much of the country is below 6m above sea-level.
- It is prone to **flooding** as a result of its **relief** and its position on the mouth of two major rivers as well as being hit by heavy **monsoon** rainfall every year.

The location of Bangladesh

Factsheet:

Religion: Muslim (83%)

Population: 156,050,883

Birth rate: 24.68 per1,000

Death Rate: 9.23 per1,000

GDP: US$ 1,500 per capita

Literacy rate: 47.5%

78% of the population live in the countryside.

63% of the population work in farming.

- The **climate** is **tropical**; mild winter (October to March); hot, humid summer (March to June); humid, warm rainy **monsoon** (June to October)
- Because of the regular flooding of the rivers, the soil in the delta region of the country is very **fertile**.
- The delta area is one of the most **densely populated** places on the planet.

Farming on the Ganges Delta:

- Most of the farming in this area is **subsistence,** growing mainly rice **intensively** in **padi fields**.
- There is **very little machinery** and most of the work is done by hand: it is **labour-intensive**: it takes a lot people to do it.
- During the **dry season** when there is often insufficient rainfall to grow padi rice, either **vegetables** or a **cereal** crop is grown.

Farming in Bangladesh: a systems approach

Human Inputs

- **Rice growing is very labour-intensive!**
- **There is almost no money to buy equipment / machinery.**
- **Bunds** (embankments) need to be built around the padi fields.
- **Irigation channels** need to be dug to move the water between fields.
- What little machinery that is used is pulled either by people or water buffalo.
- Water buffalo provide **manure** and are used in preparing the fields.

Physical Inputs

- Rich fertile soil
- Flat land beside the river (**floodplain**)
- Warm temperatures (over 21°C) throughout the year
- High rainfall: padi fields need to be flooded.

Processes

- Plant rice in nursery fields.
- Prepare fields as padis and transfer plants from nursery fields to padi fields.
- Weed and harvest rice.
- Plough fields in dry season.
- Sow cereal and vegetable crops
- Weed and harvets crops.
- looking after chickens.

Products

- **Rice**
- **Some wheat**
- **Vegetables**
- **Chickens (eggs / meat)**

Planting the rice in a padi field in Bangladesh

Changes in Farming in Bangladesh:

Changes in farming practices have not changed much in Bangladesh for hundreds of years, however, the **globalisation** of **trade** and **aid** has meant that new technologies have been introduced into Bangladeshi farming.

- **Land Reform:**
  - **Land reform means reorganising the land.**
  - Many of the farms in Bangladesh are very small and are broken up into several plots (or pieces) that can be spread over a wide area. This makes it difficult for farmers to farm their land efficiently.
  - Some wealthy people own most of the land whilst most people live in poverty and have no land at all.
  - Land reform aims to:
    - Increase the farm size for those with little land;
    - To give any surplus land to the landless farm workers;
    - To set an upper limit to the amount of land that a wealthy family can own.
- **The Green Revolution:**
  - **The Green Revolution refers to the introduction of modern, Western-type farming technology to LEDCs.**
  - It began with the development of **high-yielding varieties** (**HYVs**) of cereals; this crops where genetically designed to grow faster and produce a higher yield: more food.
  - These **HYVs** needed large amounts of **fertilizer** and, in some cases, **pesticides** and farm machinery, making farming **less sustainable**.

Padi fields in Bangladesh: note how flat the land is and how the road is raised.

- **Appropriate Technologies**
  - After some of the problems with HYV, new technologies were brought into the area that were **suited to the needs, skills, knowledge and wealth of the local people.**
  - In the Ganges Basin this includes:
    - Building simple, easy to maintain water pumps;
    - Projects that use human labour rather than machines such as tractors (for which cost is prohibitive and maintenance almost impossible);
    - Low cost, small-scale irrigation schemes rather than building huge dams;
    - Using animal manure rather than chemical fertilizers.
  - These schemes, because they are affordable and help to improve people's standard of living without harming the environment, are said to be **more sustainable**.

Was the Green Revolution a success?

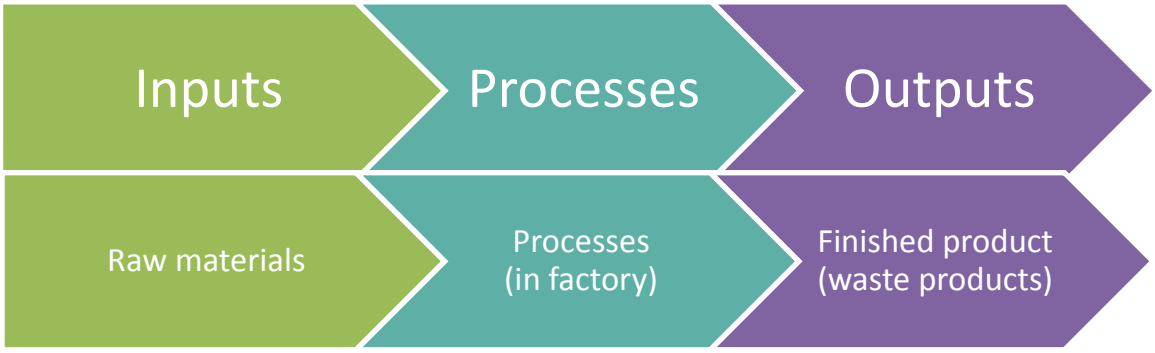
Manufacturing: A Secondary Activity

"Manufacturing is the making of a finished product from one or more raw materials"

- Manufacturing usually takes place in **factories.**
- **Assembling** and **construction** are also **secondary activities**.
- Britain was the first country in the world to become **industrialised**
- **Industrialisation** begun about 200 years ago after the discovery that coal could be burnt to produce steam and that steam could be used to work machines.
- Machines began to do many of the jobs previously done by people.

Manufacturing as a system

All secondary activities can be thought of as a system, a set of **inputs, processes** and **outputs**.



Industrial Location Theory

Before building a new factory, a manufacturer should try to work out the best **site.** It is very unusual for a site to be perfect: it is usually a compromise. When locating a new factory, the following should be considered …

Factors affecting the location of a new factory:

Traditionally, of all of these factors it is the **cost of**

transport that has the largest effect on where a factory will be built. There are three main 'types' of industrial locations:

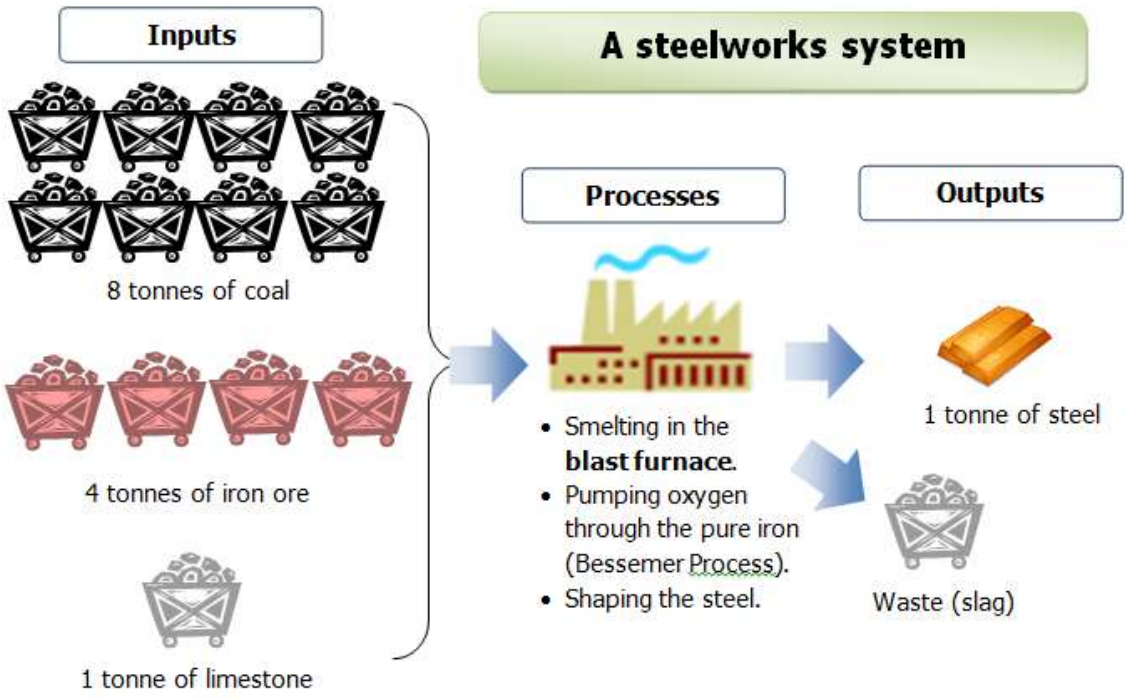
1. **Material-orientated**
2. **Market-orientated**
3. **Footloose**

1. Material-orientated industries:

- These are industries where moving the raw materials is more expensive than the finished product.
- Often they are **weight-losing** industries.
- Many of these industries were developed at the beginning of industrialisation, when transport was poor: there were no lorries, no motorways or railways.
- Raw materials such as coal were heavy, bulky and expensive to move.
- Early industries were started on the coalfields (South Wales, South Staffordshire, Yorkshire, etc.).
- The most important industry became the production of iron and, after 1856, steel.

Example: A steelworks

Three bulky raw materials are required to make steel: **iron ore**, **coal** and **limestone**. **Coke** (super heated coal) is used to **smelt** (melt) the iron ore. The iron ore contains many impurities. The limestone is added to help separate the pure iron from the impurities such as carbon.



- Because of the expense of moving the raw materials, iron and steelworks were normally built in areas with coal (iron ore and limestone were generally found nearby too)
- **When the coal began to run out many of the original steelworks closed or had to relocate.**

2. Market-orientated industries:

- These are industries where moving the finished product is more expensive than the raw materials.
- Often they are **weight-gaining** industries.
- Once raw-materials began to get used up and transport improved, factories began could move away from the coalfields and closer to the cities, which were large **markets** where the finished product could be sold.

Example: Car assembly

- The car industry is an example of an industry which has built factories near to markets.
- A modern car consists of many small parts.

All the parts that went into an Austin Metro

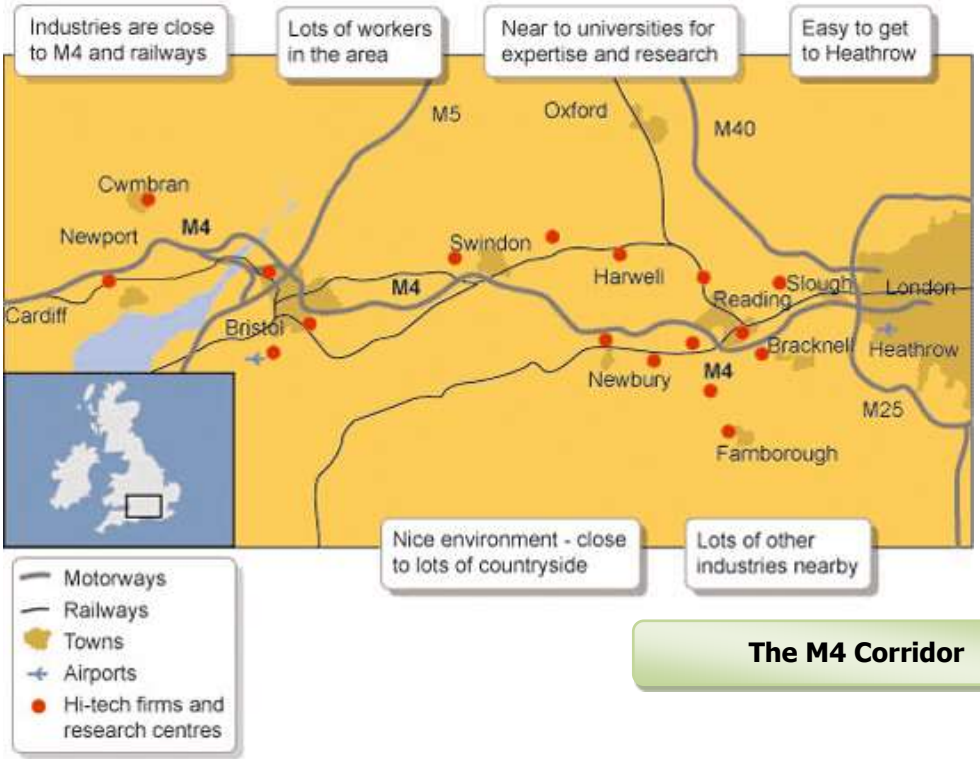
- Each part will be made in its own factory, often in different parts of the world.
- The car manufacturer **assembles** (put together) these parts.
- Locating next to a city also means that there is **labour force** to work in the factory.
- Transport is important for moving car parts, assembled cars and workers.
- The **mechanisation** of the car assembly **production line**, has meant that fewer workers are needed.

3. Footloose industries:

- These are modern industries which often make expensive, small items.
- It costs little to transport the raw materials or the finished product in a country with a good **transport network**.
- These factories can be built in places to benefit from local advantages such as:
  - A pool of highly-skilled labour
    - e.g. Silicon Glen in Scotland (along the M8 motorway) is near to the main Scottish Universities of Edinburgh and Glasgow.
  - A cheap labour force
    - e.g. Silicon Valley in California is near to the Mexican border, where there are immigrants seeking jobs
  - Government incentives
    - e.g. South Wales, where the iron and steel works closed down, the Government offered incentives for new firms to locate in the area and employ the local people.
  - To be near to similar industries and share information or facilities.
    - e.g. In **Science** or **Business Parks** (like **Aztec West** in Bristol – just off the M4 / M5 junction) located on the edge of cities, in **greenfield sites**.
- **High-technology industries** or information technology industries (**IT**) are examples of footloose industries.

Example: High-technology Industry in the M4 Corridor

- The M4 motorway runs from London, almost due west to Swansea in Wales.
- This motorway has a lot of High technology industries along it.
- There are a lot of reasons why IT firms tend to locate along this motorway …



How **The M4 Corridor** **he**

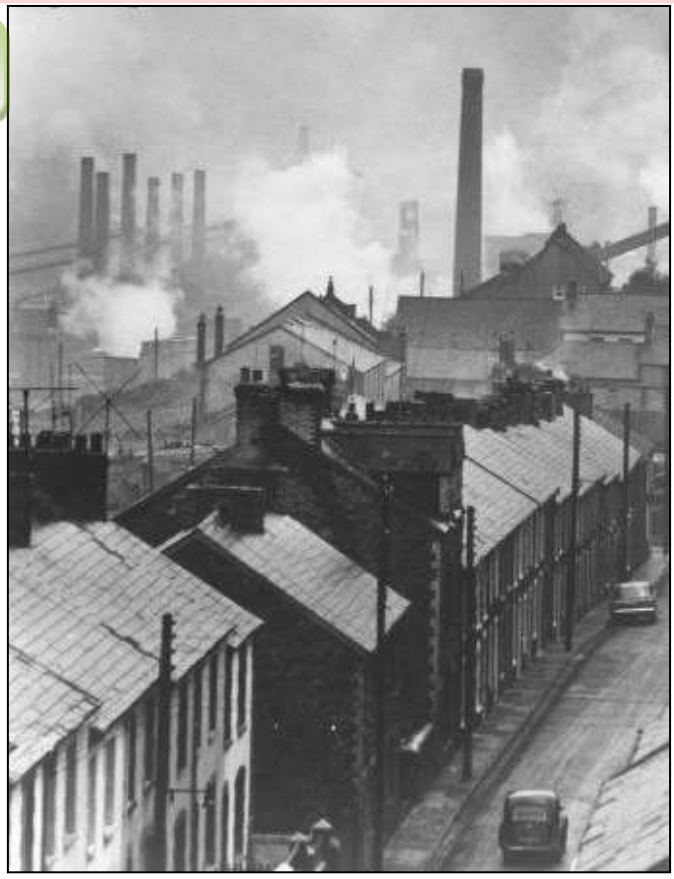
ideal site for an industry change?

- Factories are built to make a **profit**.
- If there is a change in technology (new machinery or improvements in transport) or the raw materials that drew the factory to that site, then the factory may not be in the best site to make the most profit.
- **Mechanisation** meant that many factories no longer needed the huge **labour force** that brought them to city centres.

Example: Iron and Steel in South Wales

1820s:

Steelworks in the Valleys of South Wales



- Iron and steel works (factories) were located **close to raw materials** such as iron ore and coal (see example of a material-orientated industry).
- The coal was **moved by horse and cart** along special railways straight from the mine to the works.
- **Canals** were built to carry the finished product (bars of iron and steel) away on **barges** to where it could be sold (market).
- The **cost of moving the heavy coal** was the most important factor in locating the factory.
- People moved into the area to work in the mines and steel works.
- Boys started working in the mine for the works when they were young (often 11 years old) and so they did not finish their schooling.
- The **railways were built in the 1850s** and these connected the steelworks to ports on the coast.

1990s:

Port Talbot intergrated steelworks

- **The coal was running out**. The coal that was left in the mines was very deep and so **very expensive to mine**.
- The works were no longer making a profit.
- Cheaper coal (and iron ore) could now be bought abroad and imported on the new huge bulk carrier ships.
- **Deepwater ports** were now needed for the big ships.
- **The works moved to the coast** and became **integrated** (producing shaped pieces rather than bars of iron and steel).
- The new sites were not the best for making profit but the government wanted the works to be located here (as there were a lot of unemployed miners and steelworkers) so they offered **incentives** for the new works to be built in the area.
- The local workers were **poorly educated** but were **skilled** at working with iron and steel.

Pictures of miners and steelworks in South Wales c1920

Tourism: A Tertiary Activity

"Tourism is travel for recreation or leisure"

- As transport has improved more and more people travel to distant places for their holidays.
- When tourists visit an area they bring **money** into the area which they spend in local restaurants and shops.
- They also want different things from the locals and often **conflict** can occur.

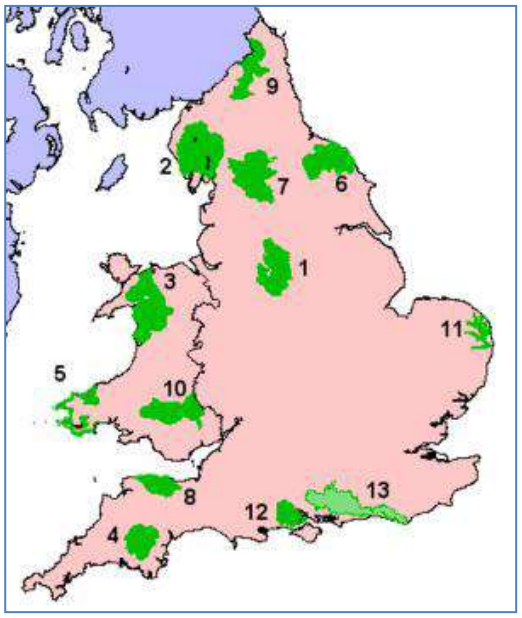
Example: National Parks in England and Wales

- National Parks are areas of 'protected' land in England and Wales.
- They are often in **Areas of Outstanding Natural Beauty (AONB)**
- There are now 13 National Parks in England and Wales.

The National Parks of England and Wales

Key:

1. The Peak District
2. The Lake District (Cumbria)
3. Snowdonia
4. Dartmoor
5. Pembrokeshire Coast
6. North Yorkshire Moors
7. Yorkshire Dales
8. Exmoor
9. Northumberland
10. Brecon Beacons
11. The Norfolk Broads
12. The New Forest
13. The South Downs (2008)



Why do we have National Parks?

- National parks were set up in 1949 (just after WWII).
- They were designated for two reasons:
  - To **conserve** and enhance the natural beauty, wildlife and cultural heritage of the area
  - To provide opportunities for the public to enjoy the countryside (**recreation**)

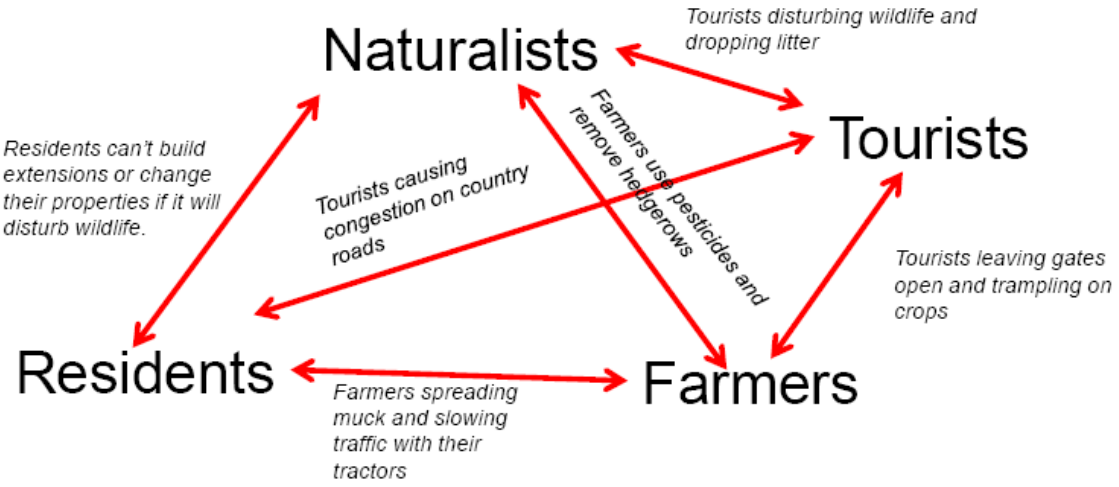
Who owns the National Parks?

- No-one owns all of the National Parks.
- They are 'protected areas' that owned by individual landowners.
- Most of the land is owned by farmers, the Forestry Commission and the army.

- The Parks are managed by a National Parks Authority which ensures that the land is looked after and promote tourism.

Conflict in National Parks

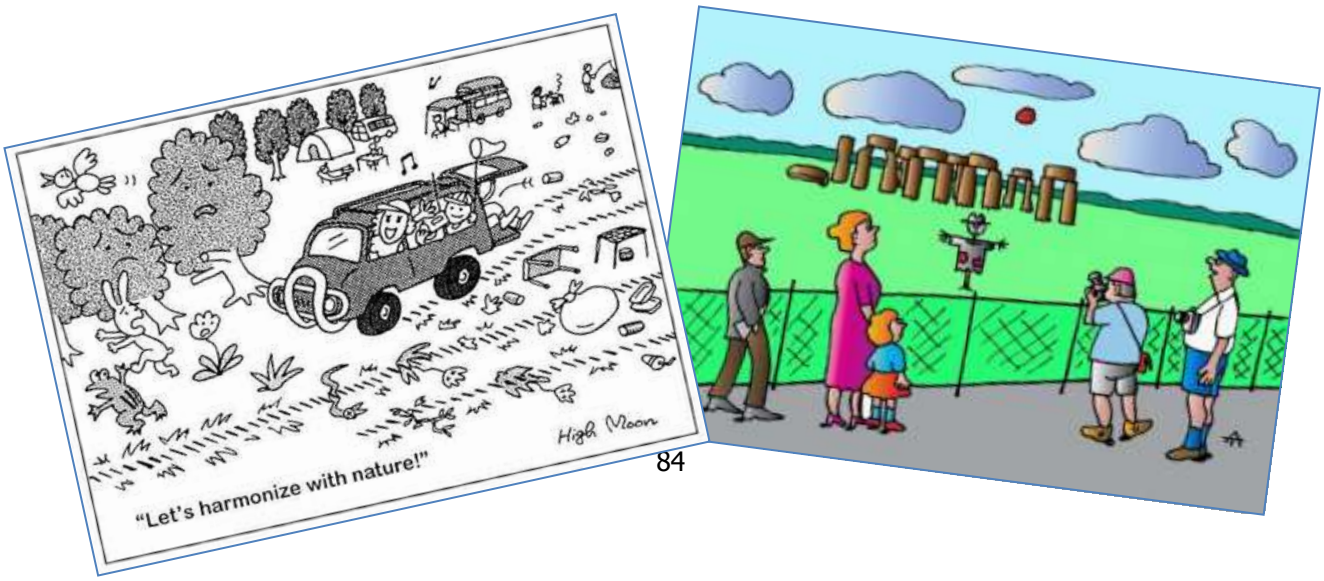
- A lot of different people want different things from the National Parks: this can lead to **conflict**.



- The **National Park Authority** tries to **protect** the landscape and **conserve** it for future generations to enjoy.
- They also try to manage the conflicting needs of these people in a way that is **sustainable**.

Honeypots in National Parks

- Often there are certain sites or places which attract a lot of tourists: these are known as **honeypot sites**.
- Honeypots often attract the strongest conflicts between local people and tourists.
- Often, as more money can be earned providing services for the tourists, the **function** of the settlement changes and becomes more of a **resort**.



Case Study: Dartmoor National Park

Where is Dartmoor?

- Dartmoor is a National Park in the south west of England.
- It is an **Area of Outstanding Natural Beauty (AONB)**

Remember:
National Parks were created after WW2 in order to provide recreation for people from the cities and to protect the natural environment.

The National Parks of England and Wales

Key:

1. The Peak District
2. The Lake District (Cumbria)
3. Snowdonia
4. **Dartmoor**
5. Pembrokeshire Coast
6. North Yorkshire Moors
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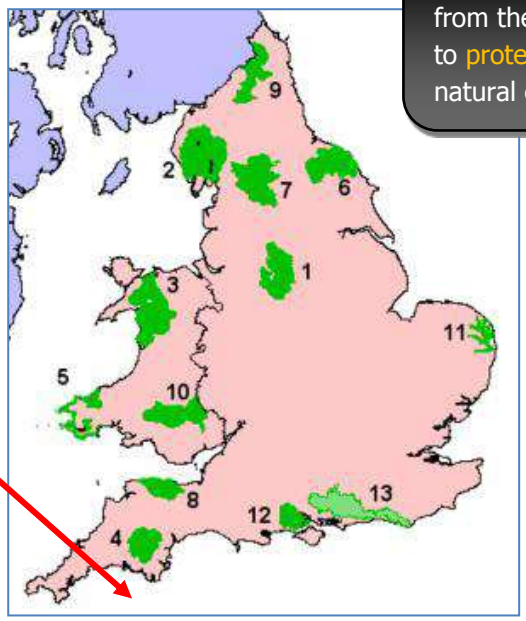


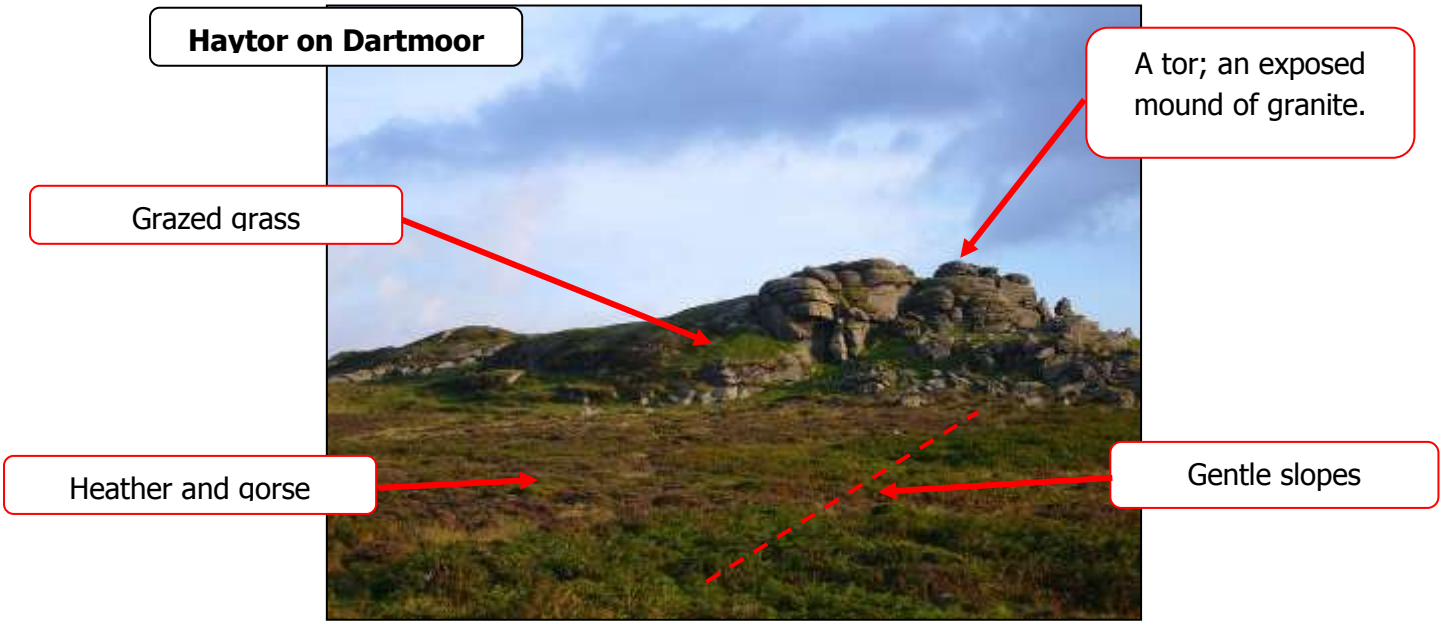
What is it like?

- Dartmoor is a large dome of granite (a *batholith*) that has been exposed as the rocks above it have been eroded.
- There are many types of vegetation on the moors: peat bog, heather moor, forests, etc.
- People have lived on the moor since the Bronze Age and there are many disused settlements from various points in history across Dartmoor.
- Heather moorland is not a natural landscape and it has to be managed to prevent it reverting to forest.
- Dartmoor has many *Tors* which are towers of granite such as Haytor.
- In the 19th Century, granite from Dartmoor was exported to London and around the world for building. There is an ancient granite railway and quarry near to Haytor.

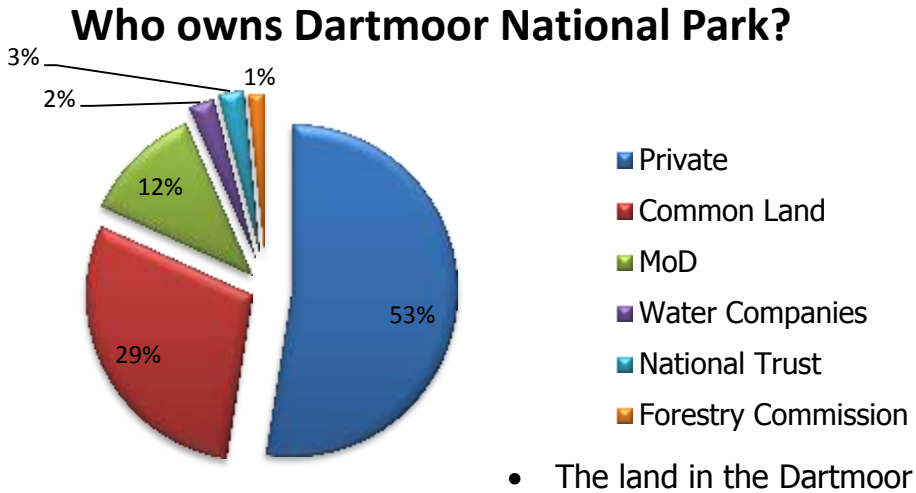
- Dartmoor wild ponies are world famous. They are 'farmed' but allowed to roam freely across the moors. Once or twice a year they are rounded up for a health check and to go to market.

Haytor: a honeypot

- Haytor is the tallest point on Dartmoor and it can be seen from the sea. The navy used to use is for target practice in WW2, firing shells from their warships just off the coast.
- Haytor is known as 'everyman's Everest' as it is a peak that almost anyone can scale.
- Haytor has become a **honeypot** site and it attracts tens of thousands of visitors each year.
- It is very accessible as it is close to a main road and has several car parks and a visitor centre (with toilet facilities) at the base.



How is the landscaped managed?



- The land in the Dartmoor National Park is owned mainly by private landowners (mainly farmers).

- Most of the park is 'Access' land in that the public are allowed to walk on it.
- The National Park Authority (NPA) manages the park. They try to balance the needs of visitors to the park with those of locals, whilst trying to ensure that the environment is conserved.
- Tourism is important for the local economy: it earns money for the local people.
- A team of Park Rangers manage the impact of tourism on the environment for the NPA in a variety of ways:
    - **Swailing** or the burning back of gorse and bracken on the moor in patches. This stops the bracken taking over the heather and gorse and ensures the moorland habitat is preserved for wildlife. For example, the **skylark** which will only nest in low-lying shrubs.
    - **Footpath erosion** is a real problem as tourists follow the same routes up and down tors such as Haytor. Swailing and strategically placing rocks encourages visitors to take alternative routes and allow popular tracks to recover. They also focus visitors onto particular routes by using signs and leaflets.
    - **Traffic congestion** is managed by only allowing coaches on certain routes (Black Routes) and channelling tourist traffic onto to certain routes using road signs. For example to Haytor and Widecombe-in-the-Moor.
    - To stop visitors **parking** wherever they like, the Rangers line routes with boulders and provide both permanent and seasonal car parks.
    - **Education**: the NPA provide a lot of information about the history and wildlife in the park both as leaflets and displays in Visitor Centres and on plaques around the park. The Rangers also talk to local and visiting school children about the moor and how they manage it.

National Parks Questions:

1. When were National Parks set up? _____
2. Why were they set up (2 reasons)
    a. _____
    b. _____
3. How many National Parks are there? _____
4. Where were the first 4 parks set up?
    a. _____
    b. _____
    c. _____
    d. _____
5. What does AONB stand for?

    _____
6. Who owns the land in National Parks? _____

    _____

    _____

    _____

    _____

    _____

    _____

7. Suggest ways in which the following people might come into conflict in National Parks:
    a. *Farmers and tourists*

    _____

    _____

    b. *Tourists and locals* _____

    _____

    c. *Farmers and Naturalists* _____

    _____

    d. *The Military and Locals* _____

    _____

8. What is a 'honeypot' site? _____

    _____

    _____

9. Why might honeypots be the focus of the most conflict in a National Park?

    _____

    _____

    _____

10. Where is Dartmoor? _____

11. Why is Dartmoor an AONB? _____

    _____

12. Who manages the National Park? _____

13. How is the park managed? _____

COMMAND WORDS

This is a list of words used in Common Entrance and Common Academic Scholarship questions.

annotate – add descriptive explanatory labels

choose – select carefully from a number of alternatives

complete – finish, make whole

define – give an exact description of

describe – write down in words the nature of the feature under consideration

develop – expand upon an idea

explain – write in detail how something has come into being and / or changed

give – show evidence of

identify – find evidence of

list – put a number of examples in sequence

mark and name – show the exact location of and add the name

name – give a precise example of

select – pick out as most suitable or best

shade and name – fill in the area of a feature and add the name

state – express fully and clearly in words

study – look at and / or read carefully

suggest – propose reasons or ideas for something

discuss (scholarship only) – present viewpoints from various aspects of a subject

elaborate (scholarship only) – similar to **expand** and **illustrate**

expand (scholarship only) – develop an argument and / or present greater detail on

illustrate (scholarship only) – use examples to develop an argument or a theme