

2017-2018 GCSE Geography Revision Guide- Paper 1 - Physical Geography

How to use this revision guide:

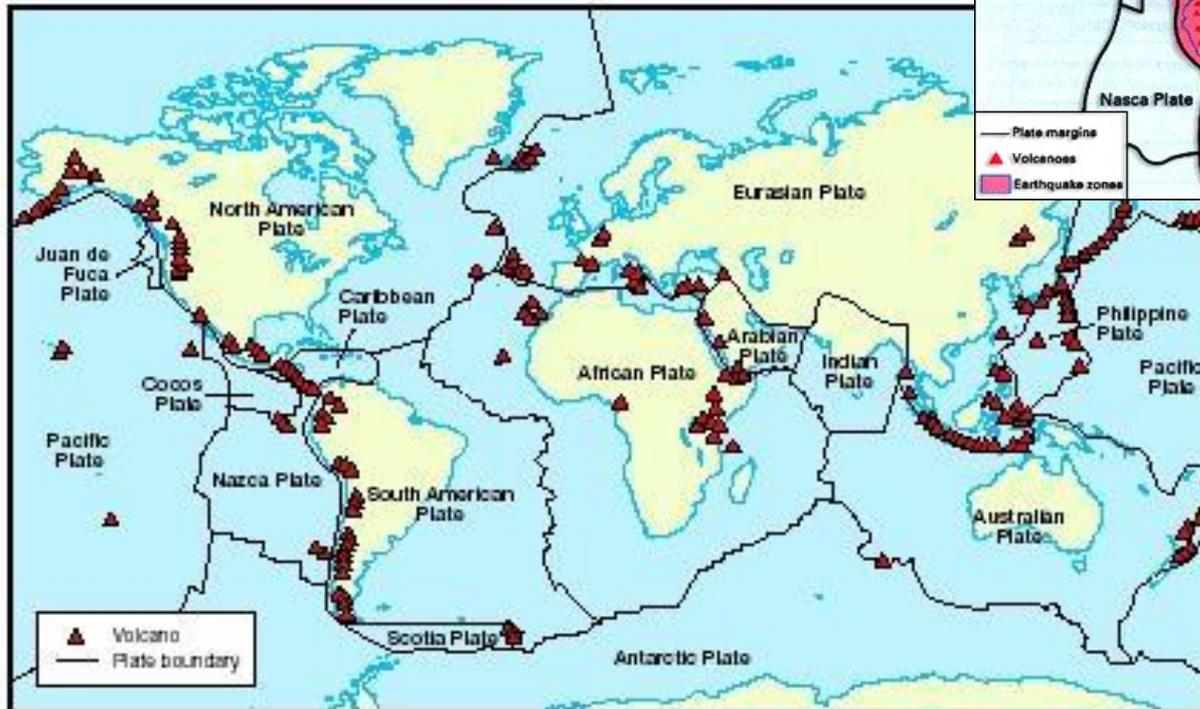
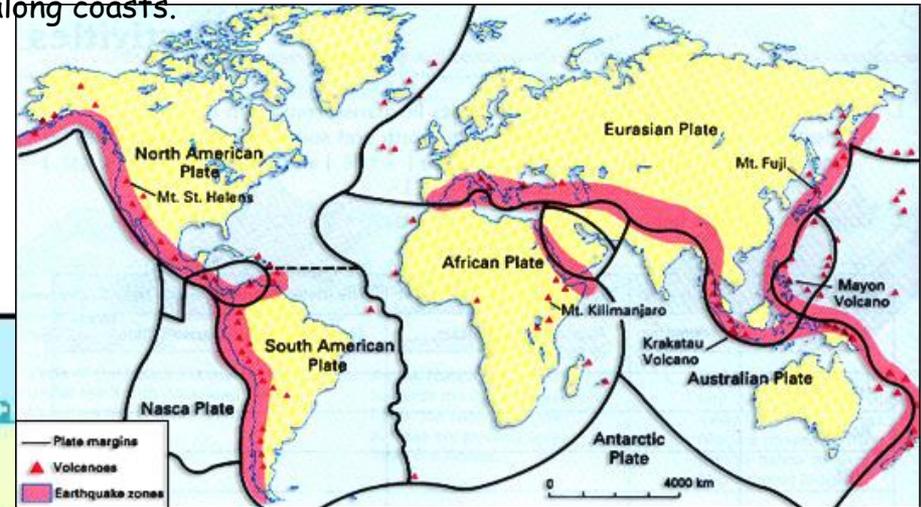
- Look at the topic outline on the next page, identify the areas you are weakest at and concentrate your revision on them.
- Answer the test yourself questions - read the page and answer the questions from memory and then repeat. Create mindmaps/flashcards with answers to the test yourself questions.
- Think about your target grade and be realistic - if something is really challenging you perhaps leave it and ask a teacher for help. If your target is 6 and above you should try and learn everything here.
- Look out for the 9 mark indicators in the test yourself questions, practising these would be a good idea. They are also underlined on the next page to indicate there could be a 9 mark question in the exam on this.

Section 1 - Hazards	Section 2 - Living World	Section 3 - UK Physical Landscapes: rivers and coasts
<p><u>Tectonics 1.1</u></p> <ul style="list-style-type: none"> - Earthquake/volcano distribution in relation to plate boundaries - Types of plate boundary and landforms that occur there - Earthquake impacts and responses. - <u>Case study- causes, impacts and responses to New Zealand and Nepal Earthquake</u> - <u>Monitoring, prediction, protection and prevention minimise impacts.</u> 	<p><u>Ecosystems</u></p> <ul style="list-style-type: none"> - Components of an ecosystem - Interdependence in ecosystems Example Of a UK ecosystem - Epping Forest. - How and why ecosystems change - How the balance of ecosystems can be restored - Wolves in Yellowstone. 	<p><u>Rivers</u></p> <ul style="list-style-type: none"> - 4 types of erosion and transportation - How long profile and cross sections change downstream. - Landforms of erosion - waterfall,s v-shape valleys, interlocking spurs, meanders, ox-bow lakes. - Landforms of deposition - floodplains, levees, estuaries. Methods of hard and soft engineering. - Example of UK river management- Boscastle - why needed, how was it done, was it successful?
<p><u>Weather hazards 1.2</u></p> <ul style="list-style-type: none"> - Global atmospheric circulation model - Tropical storms - distribution, structure and how they are occur, what will happen to them in the future - Tropical storms - impacts and responses - Tropical storm case study - Haiyan - <u>impacts and responses</u> - <u>Monitoring, prediction, protection and prevention minimise impacts.</u> 	<p><u>Tropical rainforests</u></p> <ul style="list-style-type: none"> - Characteristics of TRFs - Plant and animal adaptations to TRFs - Biodiversity in TRFs - <u>Causes of deforestation in the Amazon</u> - Value of TRFs for environment and humans - <u>Impacts of deforestation in the Amazon</u> - <u>Strategies to sustainably manage the Amazon</u> 	<p><u>COOAs</u></p> <ul style="list-style-type: none"> - 4 types of erosion and transport - Constructive vs destructive waves - Landforms of erosion - headland and bays, crack>stump, wave cut platfora and cliff. - Landforms of deposition - beaches, bars, spits, sand dunes. - Hard and soft engineering methods - Example of UK Coast - Holderness - why is management needed, how has it been done, is it successful?
<p><u>Climate change 1.3</u></p> <ul style="list-style-type: none"> - Evidence for climate change oin last 10,00 years - Human and natural causes of climate change - Impacts of climate change on people and the environments - <u>Mitigating climate change</u> - <u>Adapting to climate change</u> 	<p><u>Cold Environments</u></p> <ul style="list-style-type: none"> - Characteristics of cold environments - Plant and animal adaptations in cold environments - <u>Opportunities for development in cold environments</u> - <u>Challenges for development in cold environments</u> - <u>How cold environments are under threat</u> - <u>How to manage cold environments for economic development and environmental protection</u> 	<p>READ THROUGH THIS TABLE, ANYUTHING YOU ARE WEAK ON CONCENTRATE YOUR REVISION ON</p> <p>REMEMBER TO PRACTICE YOUR 9 MARK QUESTIONS</p> <p>EXAM = 22ND MAY PM</p>

Tectonic 1.1.1 - World distribution of earthquakes and volcanoes.

The Earth's crust is broken up into pieces called plates. Heat rising and falling inside the mantle creates **convection currents** generated by radioactive decay in the core. The convection currents move the plates. Where convection currents diverge near the Earth's crust, plates move apart. Where convection currents converge, plates move towards each other. The movement of the plates, and the activity inside the Earth, is called **plate tectonics**. Plate tectonics cause earthquakes and volcanoes. The point where two plates meet is called a **plate boundary**. Earthquakes and volcanoes are most likely to occur either **on or near plate boundaries**. The distribution of tectonic activity is uneven. The majority of activity can be found along coasts.

Plate tectonics cause **earthquakes and volcanoes**. The point where two plates meet is called a plate boundary. **Earthquakes and volcanoes** are most likely to occur either on or near plate boundaries. The map shows the world's tectonic plates and the **distribution of earthquakes and volcanoes**



Test yourself

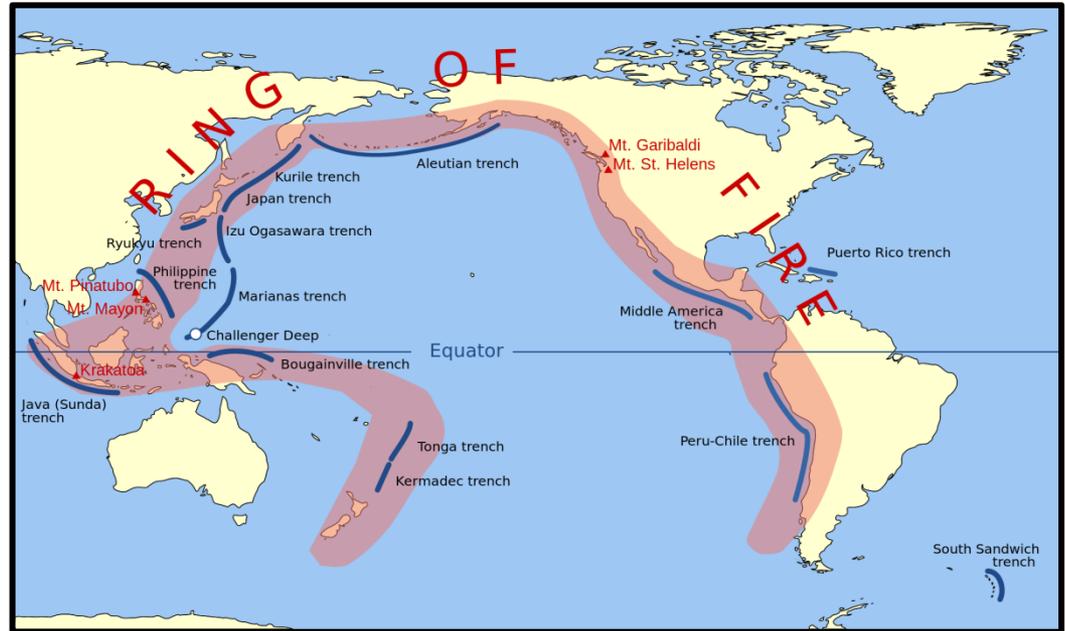
1. Name the 7 largest plates.
2. Name 2 plate margins where earthquakes occur.
3. Name 2 plate margins where volcanoes occur.
4. Describe the distribution of plate tectonic activity around the world.

Tectonic 1.1.2 The reasons why earthquakes and volcanoes occur where they do.

The Pacific ring of fire

The Ring of Fire is an area in the basin of the **Pacific Ocean** where a large number of earthquakes and volcanic eruptions occur. In a 40,000 km (25,000 mi) horseshoe shape, it is associated with a nearly continuous series of oceanic trenches, volcanoes and earthquakes. Countries affected include Japan, Indonesia, USA and Chile.

The Pacific plate is surrounded by destructive plate boundaries resulting in Tsunami's, earthquakes and frequent volcanic eruptions.



Test yourself

1. Which countries are affected by the ring of fire?
2. Which plate boundary is responsible for volcanoes along this ring? Why?
3. What is meant by the 'ring of fire'?

Tectonic 1.1.3 The characteristic features of constructive plate boundaries.

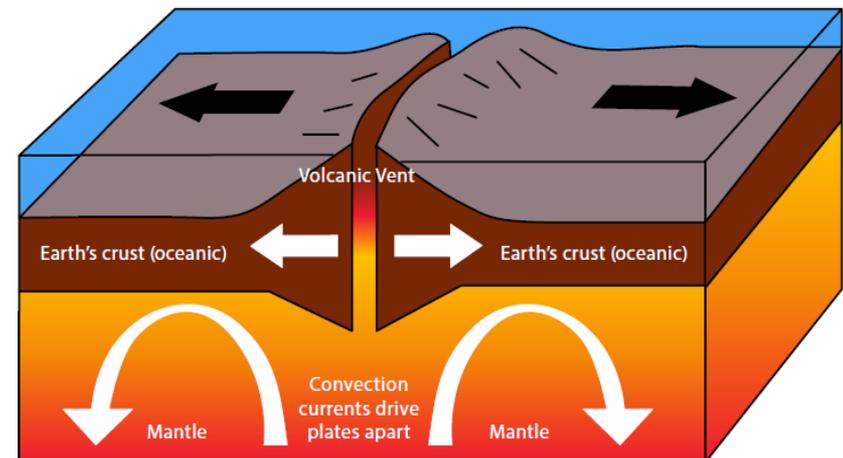
At **constructive boundary** the *plates* are moving apart. The plates move apart due to *convection currents* inside the Earth. As the plates move apart (very slowly), *magma* rises from the mantle. The magma erupts to the surface of the Earth. This is also accompanied by earthquakes. When the magma reaches the surface, it cools and solidifies to form a new crust of **igneous rock**. This process is repeated many times, over a long period of time.

Eventually the new rock builds up to form a volcano. **Constructive boundaries** tend to be found under the sea, eg the Mid Atlantic Ridge. Here, chains of underwater volcanoes have formed along the *plate boundary*. One of these volcanoes may become so large that it erupts out of the sea to form a volcanic island, eg Surtsey and the Westman Islands near Iceland. The diagram below to see how magma pushes up between the two plates, causing a chain of volcanoes along the constructive plate boundary. The volcanoes tend to be large and gently sloped due to runny magma.



The Helgafjell volcano on Westman Island, Iceland

Constructive Plate Figure



Test yourself

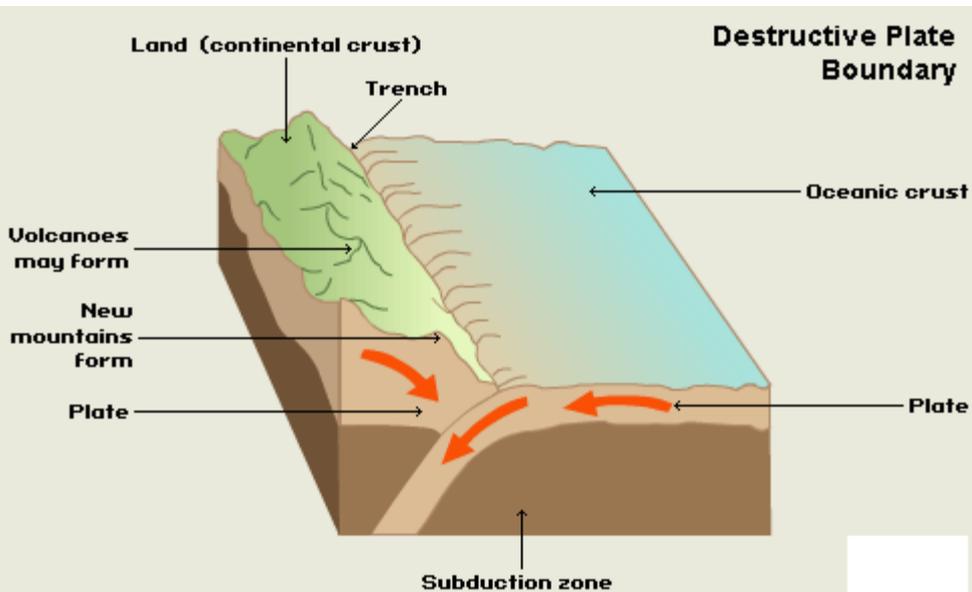
1. Can you give an example of a constructive plate margin? What plates are separated?
2. Explain the processes that occur and landforms created at constructive plate boundaries.

Tectonic 1.1.4 The characteristic features of Destructive plate boundaries.

Destructive boundary - the plates are moving towards each other. This usually involves a **continental plate** and an **oceanic plate**.

The oceanic plate is **denser** than the continental plate so, as they move together, the oceanic plate is forced underneath the continental plate. The point at which this happens is called the **subduction zone**. As they move past one another, pressure builds up and earthquakes occur,

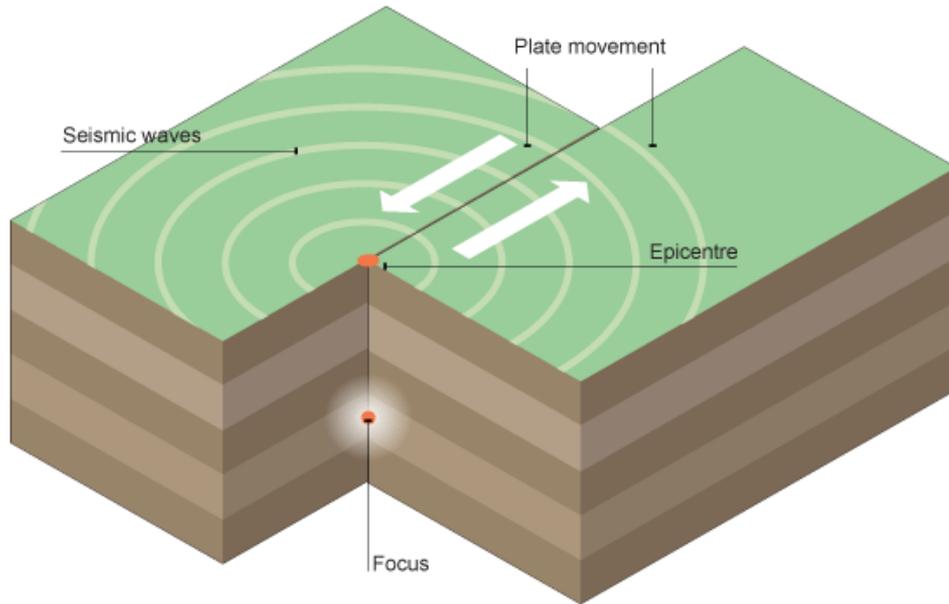
As the oceanic plate is forced below the continental plate it melts to form magma and the magma collects to form a *magma chamber*. This magma then rises up through cracks in the continental crust and rises to the surface creating volcanoes - they are often steep and have explosive eruptions. . The diagram below shows how the oceanic plate is pushed underneath the continental plate, causing fold mountains and an ocean trench to form.



Test yourself

1. Describe the movements of plates at a destructive plate boundary with an example.
2. Explain the processes and landforms that occur at a destructive plate margin.
3. 7-9: explain ocean trenches and fold mountains. Also the type of volcano found here.

Tectonic 1.1.5 The characteristic features of Conservative plate boundaries.



Conservative plate boundaries describe the boundary of two plates passing each other in different directions, or in the same directions but at different speed. An example is the San Andrea fault line which separates the North American and Pacific plate margin.

An **earthquake** is the shaking and vibration of the Earth's crust due to movement of the Earth's plates (plate tectonics). Earthquakes can happen along any type of plate boundary. Earthquakes occur when tension is released from inside the crust. Plates do not always move smoothly alongside each other and sometimes get stuck. When this happens pressure builds up. When this pressure is eventually released, an earthquake tends to occur.

The point inside the crust where the pressure is released is called the **focus**. The point on the Earth's surface above the **focus** is called the **epicentre**.

Earthquake energy is released in seismic waves. These waves spread out from the focus. The waves are felt most strongly at the epicentre, becoming less strong as they travel further away. The most severe damage caused by an earthquake will happen close to the **epicentre**.

Test yourself

1. Draw from memory, an annotated earthquake zone. (Fully labelled).
2. Explain how earthquakes occur at a conservative plate margin.

Tectonic 1.1.6 The measurement of earthquake magnitude (the Mercalli and Richter scales)

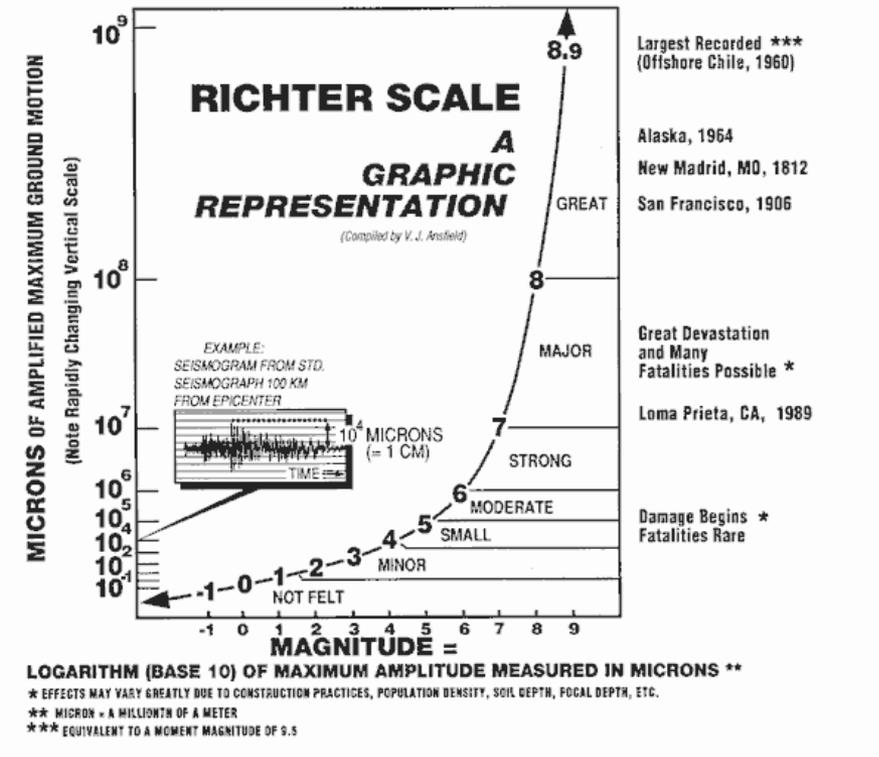
An earthquake's power is measured on the *Richter scale* using an instrument called a 'seismometer'. The power of an earthquake is measured using a seismometer. A seismometer detects the vibrations caused by an earthquake. It plots these vibrations on a seismograph.

The strength, or magnitude, of an earthquake is measured using the Richter scale. The Richter scale is numbered 0-10.

Earthquakes measuring just one or two on the scale are very common and can happen everyday in places like San Francisco.

These earthquakes are so small that people cannot feel them, they can only be picked up by a seismometer.

Earthquakes measuring around 7 or 8 on the Richter scale can be devastating. The earthquake in China's south-western Sichuan province in May 2008 measured 7.8 on the Richter scale.



The **Mercalli intensity scale** is a seismic scale used for measuring the intensity of [an earthquake](#). It measures the *effects* of an earthquake, and is distinct from the moment magnitude.

Test yourself

1. What are the two methods used to measure an earthquake?
2. What is the difference between the Richter scale and the Mercalli scale?

Tecotnics 1.1.7 The Primary and secondary effects of an earthquake in an HIC - Japan



Effects are often classified as **primary and secondary impacts**. **Primary effects** occur as a direct result of the ground shaking, eg buildings collapsing. **Secondary effects** occur as a result of the **primary effects**, eg tsunamis or fires due to ruptured gas mains.

Primary impacts

Ground shaking: parts of Japan were shifted 2.4 metres further east

Ground subsidence: a 400 km stretch of coastline dropped vertically by 0.6 metres, which allowed the tsunami to overtop defences and travel further and faster inland.

Secondary impacts

The yen fell sharply but recouped most of its decline several hours later. Tokyo stocks fell

15,845 killed • 3,375 missing • 5,894 injured

530,000 people displaced, staying in 2,500 evacuation centres, such as schools and public halls

These events have caused many problems and explosions at nuclear power plants along the East coast which supply 30% of Japan's electricity. There adbeen further explosions and harmful radiation leaks.

582 roads cut off (Earthquake and Tsunami).

a tsunami which spread 10km in land and devastated everything in its path. Water could be seen rising over cars and pouring into warehouses at Onahama port in Fukushima Prefecture, with five deaths reported in Fukushima.

Tokyo's major airports halted flights, though Haneda Airport was later reported to have reopened several runways. All Tokyo area trains were halted, while the shinkansen bullet train service was suspended.

Aftershocks were continuing, with one hitting magnitude 7.1, according to the USGS. Tall buildings swayed violently in central Tokyo as the aftershocks hit.

Radiation releases caused large evacuations, concern over food and water supplies, and treatment of nuclear workers.

Test yourself

1. What is the definition of a primary impact?
2. What is the definition of a secondary impact?
3. Explain the 2 primary impacts - how they occurred or what their impact is.
4. Explain the 2 secondary impacts - how they occurred or what their impact is
5. Are the primary or secondary impacts worse? Why? 9 markers

Tectonic 1.1.7 The Primary and secondary effects of an earthquake in an HIC – Christchurch NZ

Effects are often classified as **primary and secondary impacts**. **Primary effects** occur as a direct result of the ground shaking, eg buildings collapsing. **Secondary effects** occur as a result of the **primary effects**, eg tsunamis or fires due to ruptured gas mains.

Primary impacts

181 killed and 2000 injured

50% of cities buildings severely damaged

Liquefaction damaged roads and infrastructure

100s of kilometres of sewage pipes were damaged.

Secondary impacts

Schools had to combine to share classrooms and schools due to damage caused.

Businesses put out of action for long periods of time

Christchurch could no longer host rugby world cup - loss of income

80% of the city was without electricity

People needed mental support in the months after the earthquake

Test yourself

1. What is the definition of a primary impact?
2. What is the definition of a secondary impact?
3. Explain the 2 primary impacts - how they occurred or what their impact is.
4. Explain the 2 secondary impacts - how they occurred or what their impact is
5. Are the primary or secondary impacts worse? Why? 9 markers

Tectonic 1.1.7. The Primary and secondary effects of an earthquake in an LIC – Nepal



Effects are often classified as **primary and secondary impacts**. **Primary effects** occur as a direct result of the ground shaking, eg buildings collapsing. **Secondary effects** occur as a result of the **primary effects**, eg tsunamis or fires due to ruptured gas mains.

Primary impacts

Number of hospitals damaged: 26

Number of people affected: 5.6 million

Number of people killed: 8,617

More than 800,000 homes were damaged or destroyed by the earthquake

Secondary impacts

Number of people displaced: 2.8 million

the Langtang valley located in Langtang National Park, 329 people were reported missing after an avalanche hit the village of Ghodatabela and the village of Langtang. The avalanche was estimated to have been two to three kilometres wide.

Concern was expressed that harvests could be reduced or lost this season as people affected by the earthquake would have only a short time to plant crops before the onset of the Monsoon rains.

It was reported that the survivors were preyed upon by human traffickers involved in the supply of girls and women to the brothels of South Asia. These traffickers took advantage of the chaos that resulted from the aftermath of the earthquake.

Test yourself

What is the definition of a primary impact?

2. What is the definition of a secondary impact?

3. Explain the 2 primary impacts - how they occurred or what their impact is.

4. Explain the 2 secondary impacts - how they occurred or what their impact is



Nepal response

Short term responses

For the first 24 hours survivors were left to fend for themselves, moving rubble with bare hands to try to reach relatives and friends.

With only 9 functioning helicopters, the Nepal Army could only reach a few of the badly injured victims standing in remote mountainous villages.

Relief was sent rapidly when the government eventually asked for help. This included a 30-bed mobile hospital from Pakistan. India sent its military to assist with rescue efforts.

Tent cities sprung up in Kathmandu, the capital of Nepal

Responses were criticised as slow - the hardest hit Gorkha-Lamjung epicentre area was visited by helicopter the day after the earthquake and hundreds were feared dead in this area

90 percent of soldiers from the Nepalese army mobilised to worst hit areas, but efforts were hampered by landslides and damaged infrastructure

On May 1st international aid agencies like Médecins Sans Frontières (Doctors Without Borders) and the Red Cross were able to start medically evacuating the critically wounded by helicopter from outlying areas.

Long term responses

The Asian Development Bank (ADB) provided a USD\$3 million grant to Nepal for immediate relief efforts; and up to USD\$200 million for the first phase of rehabilitation.

Aid was donated by a huge number of countries. The UK gave £73 million, of which £23 million was donated by the government and £50 million was donated by the public. The UK also provided 30 tonnes of humanitarian aid and 8 tonnes of equipment. Finally, the UK offered expert help by sending around 100 search and rescue responders, medical experts, and disaster and rescue experts deployed by the Department for International Development; engineers from the British Army's Brigade of Gurkhas (ironically, Nepalese soldiers working in the British Army); three Chinook helicopters (returned unused by the Nepali government).

Test yourself

List the short term responses in 4 bullet points

List the Long term responses in 4 bullet points

Can you repeat this from memory?

Tectonic 1.1.7 What were the short term and long term responses to these Earthquakes?

Christchurch, NZ responses to earthquake

Short term responses

Provided temporary housing and ensured all damage were kept water tight

30,000 chemical toilets provided for residents

Elderly and most vulnerable people immediately evacuated and cared for

City divided in to zones to classify damage and some areas sealed off from the public

Japanese rescue teams sent to help search



Long term responses

Water and sewage restored by August - 5 months after for all

Roads and houses cleared of silt by August, 80% of roads were repaired,

\$898million in building claims paid out

Test yourself

List the short term responses in 4 bullet points

List the Long term responses in 4 bullet points

Can you repeat this from memory?

Tectonic 1.1.7 What were the short term and long term responses to these Earthquakes?

Potential EQ 9 markers:

TO what extent are primary effects worse than secondary impacts.

Evaluate the response of an earthquake or both earthquakes you have studied. Which was better?

To what extent are the impacts of EQ worse in LICs compared to HICs.

Tectonic 1.1.8 The reasons why people continue to live in areas of volcanic activity.

Test yourself

1. Name 4 hazardous location where people live.
2. Explain 4 reasons why people live in hazardous area.
(2 economic/1 social/1 environmental).

Kilauea Volcano, Hawaii
Volcanoes are attractive to tourists, with many visiting active areas such as Iceland, creating a demand for jobs in hotels and as tour guides.



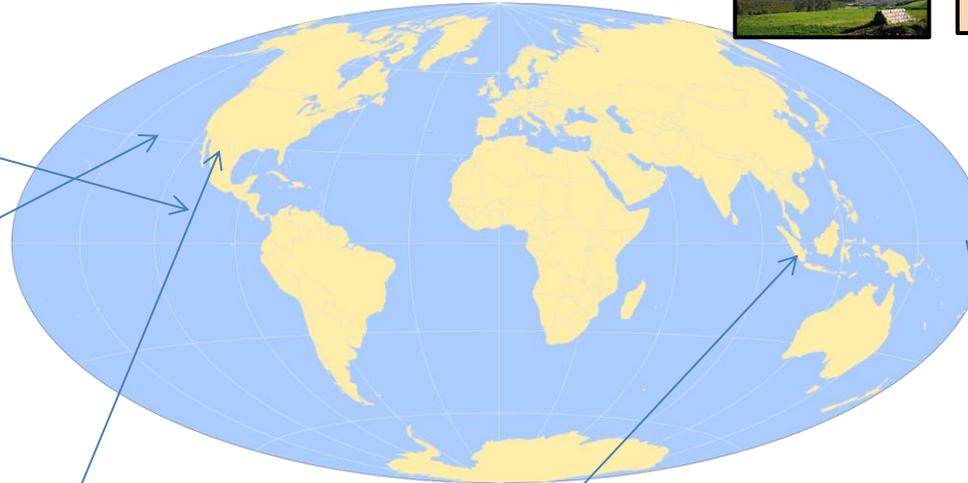
People are attracted to live and work in California by the attractive landscape and the pleasant environment. The coast provides beautiful beaches and opportunities for surfing.



mount Etna, Sicily
Volcanoes can provide good environments for farming because some volcanic lava weathers to produce very fertile soils. In Sicily for example, many farmers grow olives, grapes and citrus fruit on the slopes of mount Etna.



Indonesia = religiona nd cultuire



Mount Merapi, Indonesia
Many people who live here worship ancient spirits and ancestors. They believe that their spirits watch over the peak and will warn them of an eruption. They believe this will enable live them to live nearby safely, and evacuate at times of danger.



Several hundred men work in the heart of Ljen volcano in East Java, Indonesia. Minerals such as Tin, silver, gold, copper and diamonds can be found in areas of volcanic rocks. The money that can be made by mining these precious materials often outweighs the risks of volcanic activity.



Methods of preventing the effects of earthquakes

Monitoring

Planning

Prediction

Protection

What methods are there to reduce the effects of an earthquake?

Think, pair, share- what methods can be used to reduce the effects of an earthquake?

Tectonic 1.1.9 Managing earthquakes: Prediction and monitoring, planning and protection.

Method	How	Good	Bad
Prediction	Using technology to guess where and when Eqs will happen	Can be used to give warning and make plans	CANNOT guess to the minute and location - impossible
Monitoring	Using past data to try and guess when and where earthquakes will happen.	Can provide time for people to plan	Won't be overly accurate eg can predict in years
Protection	Building so that buildings don't fall down: - rubber foundation to absorb shock - weighted rollers on top to counteract rolling - pyramid structure to give strong base	Very effective at saving lives - no building collapse	Very expensive and hard to do in LICs
Planning	- Plan for the event and have aid and search and rescue teams, as well as supplies ready. - People can have drills so they know what to do	Can be effective at saving lives and helping afterwards Doesn't cost LICs much money so effective there	



San Francisco showing the Transamerica Pyramid



The preparedness drills are held every year on Sept. 1, the anniversary of the Great Kanto Earthquake that killed 140,000 people in the Tokyo area in Japan..

Test yourself

1. Explain how each method works.
2. Explain the procs and cons of each methods.
3. 9 MARKER - Which method is most successful? Evaluate the use of each method.

Living with the physical environment
:Weather hazards

Weather Hazards 1.2.1 Global atmospheric circulation model - COME ON!! LOVE IT!!!

Hadley Cell

Air rises at the equator because this is where the sun's energy is greatest causing evaporation causing rain. Once air has risen here it cannot fall back down to earth because air below is constantly rising so it spreads out in the upper atmosphere. It has lost its moisture and falls back down to earth and roughly 30° N/S at the sub-tropical high pressure zone, bringing dry weather.

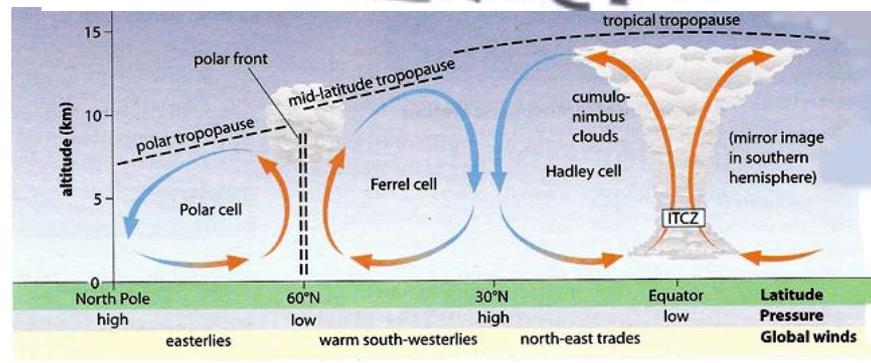
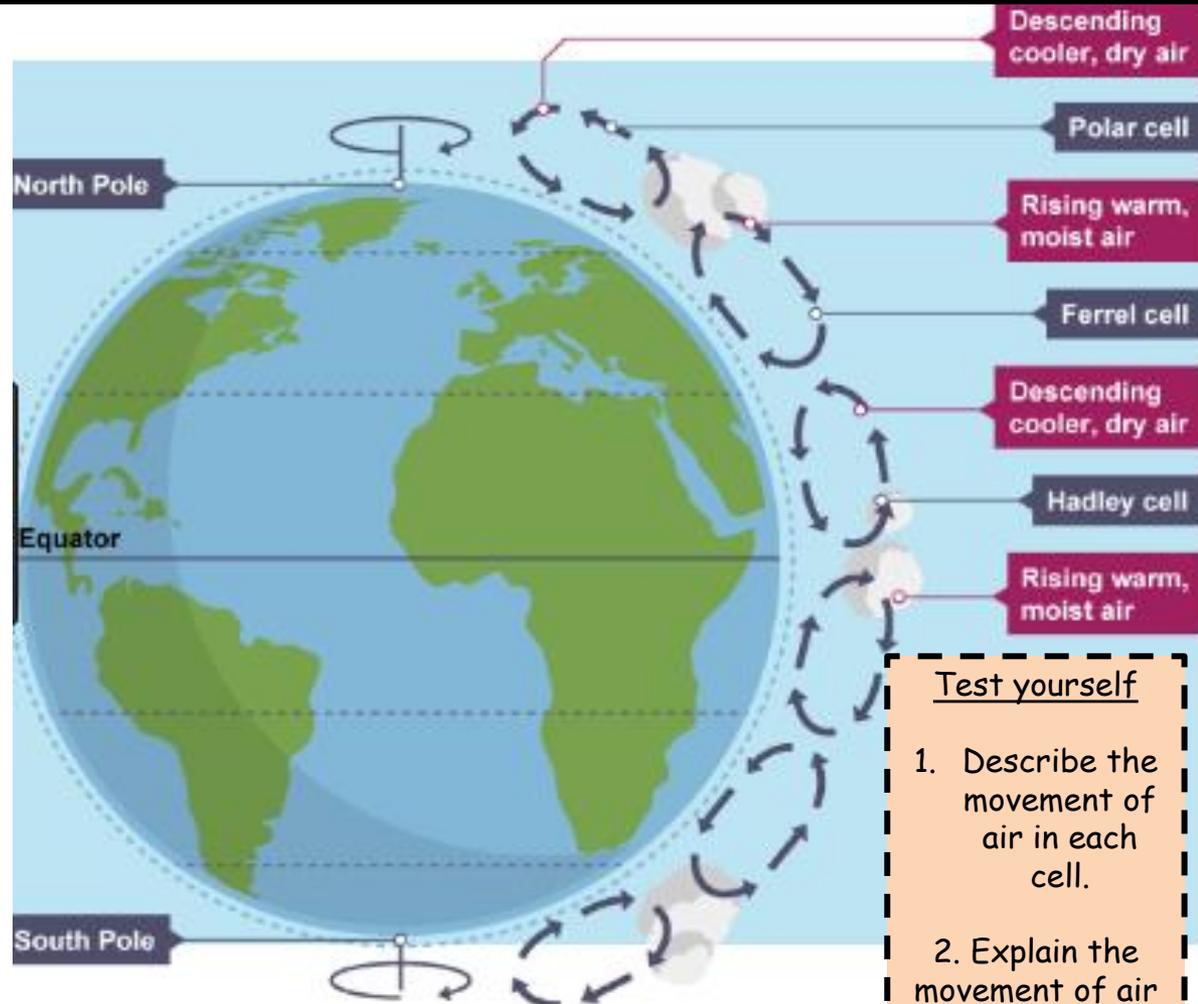
From here it returns to the equator from an easterly direction due to the Coriolis force, this completes the Hadley Cell.

Polar Cell

Air sinks at the north and south pole because it is so called, sinking air is called high pressure. Once it hits the surface it travels towards 60° N/S from an easterly direction towards the polar front. Here it meets air travelling from.....

Ferrell Cell

.....The sub-tropical high (air that didn't go back to the equator). This air has travelled from a westerly direction and is warm (from the equator) and meets the cold air from the poles. They collide at the surface and rise creating low pressure and clouds and rain. This is the polar front (the UK sits here, hence our weather). Once this air has risen it either fans out in the upper atmosphere to the sub-tropical high where it falls, completing the Ferrell Cell OR it fans out to the poles where it falls, completing the Hadley Cell

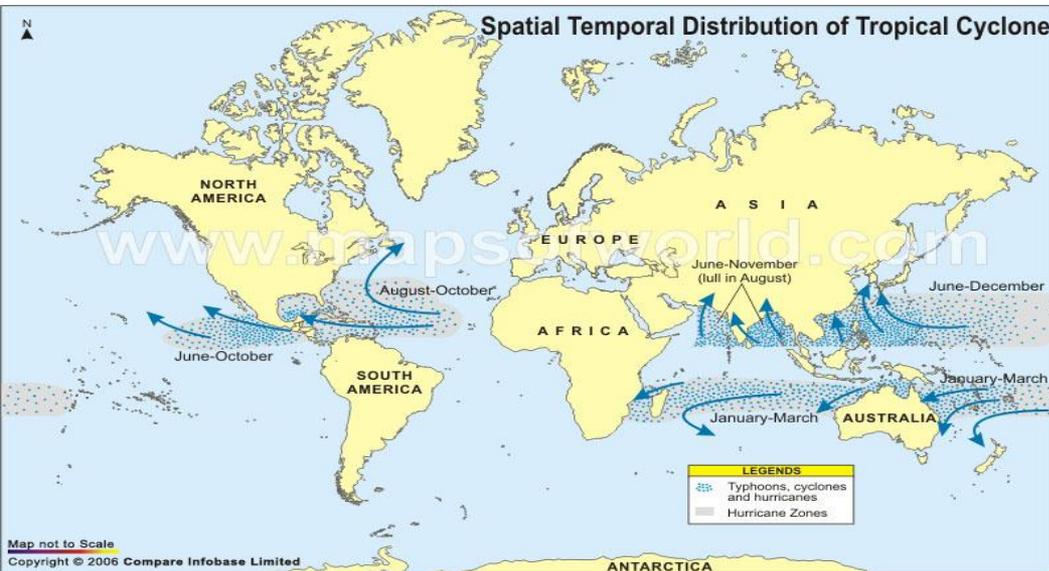


Test yourself

1. Describe the movement of air in each cell.
2. Explain the movement of air in each cell.

YOU MAY FIND IT HELPFUL TO DRAW IT OUT AND ANNOTATE

Weather Hazards 1.2.2 Tropical storms - locations, requirements and future



Test yourself

- 1) Describe the location of tropical storms.
- 2) Explain what they require to form.
- 3) Explain how they might change due to climate change.

Location

Tropical storms are located:

- between 5 and 20° North and South of the equator (if they were closer to the equator the winds would not be strong enough)
- In the **Atlantic, Pacific and Indian Oceans.**
- Through the **Caribbean, Southern USA, Mexico, South East Asia, India, Australia.**
- **North hemisphere = June to December.**
- **South hemisphere = January to March**

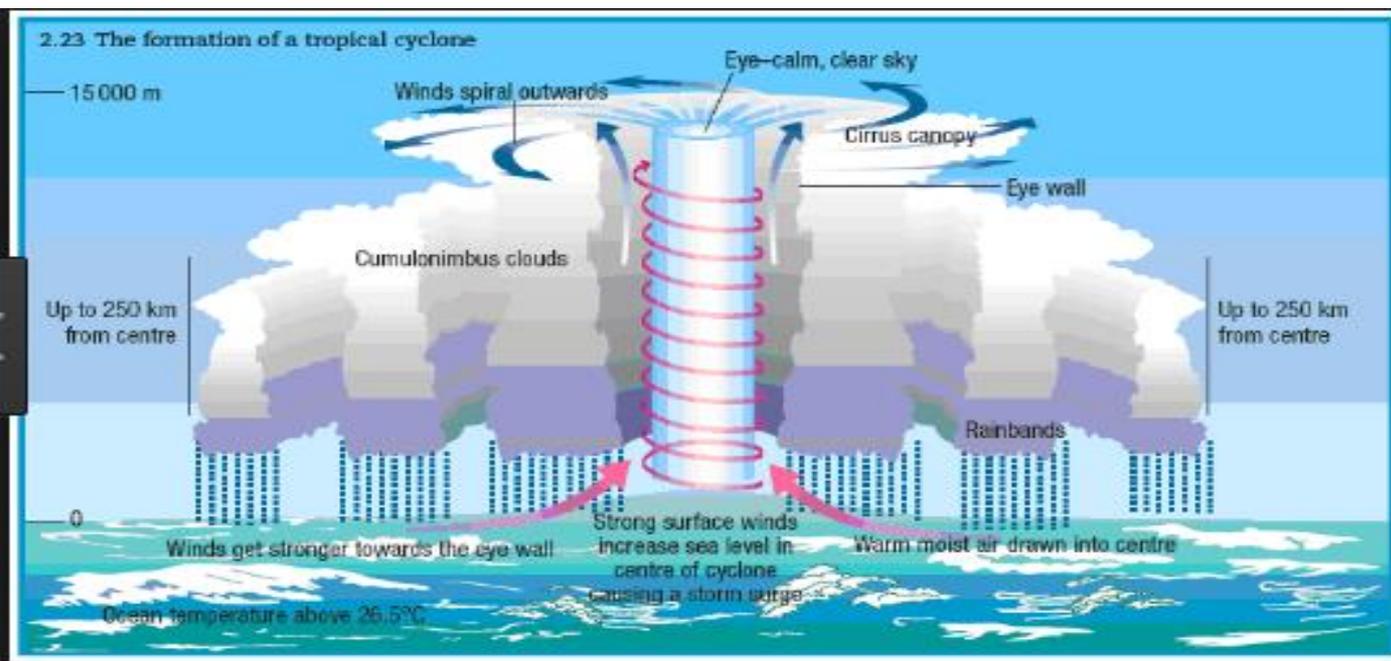
Climate change and tropical storms

Climate change is expected to affect tropical storms in the following ways:

- **Frequency and distribution** - due to warmer oceans the number of **very strong** tropical storms are expected to increase because the oceans have more energy.
- **Distribution** - it is believed that hurricanes could happen further than 20° North and South because oceans at higher latitudes will be warmer and therefore have enough energy to create hurricanes.

Ingredient	Explanation
Low pressure	So that air can rise to create thunderstorms and clouds
Large ocean - at least 70m deep	To provide a huge supply of water to evaporate to create the clouds
Ocean to be warm - 26.5°C	So it is warm enough to evaporate all the water required and the hot temperature gives the storm lots of energy
Earth's rotation	So that winds spin as they move into the centre of the storm
Winds blowing in the same direction	So that the initial storm clouds are not blown apart

Weather Hazards 1.2.3 Tropical storms - development and causes



Test yourself

1. Describe the steps in the formation of a tropical storm.
2. Explain the steps in the formation of a tropical storm.
3. Label the sections of a tropical storm.

- 1) Tropical storms form between approximately 5° and 30° latitude. Because of easterly winds they initially move westward.
- 2) The air above the warm ocean is heated. Once the ocean water reaches at least 27°C, the warm air rises quickly, causing an area of very low pressure.
- 3) As the air continues to rise quickly it draws more warm moist air up from above the ocean leading to strong winds.
- 4) The rapidly rising warm air spirals upwards, cools, condenses and large cumulonimbus clouds form. These clouds form the eye wall of the storm and produce heavy rainfall and extremely strong winds. It is the most dangerous part of the hurricane.
- 5) In the centre of the storm, cold air sinks forming the eye of the storm - here, conditions are calm and dry.
- 6) As the storm hits land it causes heavy rain, strong winds and a storm surge which washes up on land.

Weather Hazards 1.2.4 Tropical storms - impacts and responses

Primary impacts - the immediate impacts which are caused by strong winds, heavy rain and storm surges.

- Buildings and bridges destroyed.
- Rivers and coastal areas flood.
- People drown, injured, or killed by debris and flood waters.
- Infrastructure damaged - roads, railway, ports, airports.
- Electricity cables are damaged.
- Sewage overflows.

Immediate responses - action taken before, during or immediately after to lessen the impacts.

- Evacuations
- Rescue people cut off by flooding
- Set up temporary shelters
- Provide supplies of food, water, electricity, gas and communications.
- Recover dead bodies
- NGOs and governments send Aid teams and supplies.

Secondary impacts- the long term impacts which happen in the days or time after due to the primary impacts.

- People are left homeless which can cause stress, poverty, diseases, death.
- No clean water or sanitation because, diseases spread.
- Roads blocked meaning aid cannot get through, business and emergency vehicles can't function.
- Food shortages due to damaged or killed crops and animals.

Long term responses - actions that restore areas to the condition before the storm struck and reduce damage in the future.

- Fully repair homes, buildings and infrastructure
- Repair and improve flood defences
- Improve forecasts for the future
- Provide aid for residents to repair and strengthen homes
- Encourage economic recovery to for people to return to the area
- Build stronger buildings or change planning rules.

The impacts of tropical storms tend to be more severe in LICs because:

HICs have more money to create:

- Storm proof buildings to resist strong winds eg winds not blowing off.
- Evacuation plans and teams to ensure people leave areas and can be rescued afterwards.
- The money to invest in monitoring technology to forecast and track storms so people can be warned.
- The money to build defences such as sea walls.
- The money and organisation to educate people.

Test yourself:

1. Define primary/secondary impacts and immediate/long term solutions
2. Give 2-3 examples of each and explain how/why they occur OR why they are bad.
3. Explain why the impacts and responses of storms tend to be worse in LICs rather than HICs (9 marker)
4. Explain whether you think primary or secondary impacts are worse (9 marker)

Weather Hazards 1.2.5 Typhoon Haiyan - Example of a tropical storm - effects and responses

MOST POWERFUL STORM EVER RECORDED AT LANDFALL

- Winds up to 314km an hour
- 6,190 people died
- 1.1mil tonnes of crop destroyed
- 1.1mil houses damaged, over 500,000 destroyed
- Boats and fishermen docks destroyed.

Immediate responses -

Good

President televised a warning, 800,000 people evacuated.

Government distributed emergency supplies and equipment.

US\$1.5bn dollars in foreign aid from 33 countries and organisations.

1million food packs and 250,000 litres of water distributed a week later.

- Vaccinations handed out so disease did not spread.

Bad

Some emergency aid took as much as 5 days to arrive -

Tacloban because roads/ports/airports were destroyed.

Stadium in Tacloban where people fled to was flooded and they were drowned.

A lot of people were not evacuated in coastal areas due to a lack of knowledge, warning or ability.

£1m worth of food aid thrown away because it had not

days or time after due to the primary impacts.

- 4.1 million made homeless
- US\$12bn damage
- Farmers lost crops - especially coconut, rice and sugar which are main exports - meaning long term income reduced and there was unemployment.
- Three quarters of farmers and fishermen lost their income

Long term responses - actions that restore areas to the condition before the storm struck and reduce damage in the future.

Good

- No new buildings to be built within 40m of the shore

- New homes to be off a better quality and stronger

- \$400 cash gifts to people in areas which were worse affected

- New storm surge warning

- Mangroves replanted (to help lessen the power of the storm)

- Local residents involved in the rebuilding of new homes to create jobs

Bad

- Corruption - areas that did not vote for the president felt they recieved less help

- A year later less than 1% of people affected were back in

Test yourself:

2. Give 2-3 examples of each box with evidence

3. Explain why the impacts and responses of storms tend to be worse in LICs rather than HICs, with reference to the example. (9 marker)

4. Explain whether you think primary or secondary impacts are worse (9 marker)

5. Explain whether you think the responses were overall GOOD or BAD (9 marker)

Weather Hazards 1.2.6 Typhoon Haiyan - Example of a tropical storm - effects and responses

the storm will go and how intense it will be, this can save lives.

- Satellites - these can monitor cloud patterns and identify which storms are likely to become hurricanes and when.
- Aircraft - purpose built planes can fly through hurricanes which collect air pressure, rainfall and wind speed. They can monitor storms to see if they are becoming more intense.

Monitoring allows for scientists to see how a storm is developing and how strong it will be.

Protection - strengthening/adapting buildings to lessen the impacts of tropical storms.

- shutters on windows close to prevent them breaking in wind
- secure roofs to walls with strong metal to prevent them flying off
- emergency generators#

Houses can also be built with stilts so they are out of flood water's way. Sea walls and other defences hold back storm surges and limit erosion, but they must be big and strong enough.

Salt marshes and wetlands can act as natural barriers which help to absorb the power of tropical storms floods and waves.

which "model" where storms will go and how strong they will be.

The national hurricane centre in Florida predicts a storms path and intensity for up to seven days. It uses a cone which gets wider from the hurricane. It is accurate 70% of the time.

In 2013 Cyclone Phailin was predicted and 1.2 million people evacuated, 21 people died. In 1999 a similar cyclone killed 10,000 people.

Planning - taking steps before a tropical storm to lessen their impacts.

- Land use management - not allowing new buildings to be built in areas which are at particular threat from hurricanes.
- Emergency services can train for disaster.
- Governments can plan evacuation routes.
- America National Hurricane Preparedness weak means people can plan what to do in the event of a hurricane:
 - prepare emergency supply kit
 - know where shelters are
 - know evacuation routes
 - store loose objects

Test yourself:

1. Define each methods.
2. Give an example of each methods and explain how it works
 - reducing damage or reducing deaths.
3. Are any of the methods more effective than the others at reducing deaths or damage - (9 marker).
4. How do these vary between HICs and LICs.

Weather Hazards 1.2.7 Weather hazard in the UK - types

Wind - strong winds occur as a result of storms that hit the UK every year. The impacts they can have are:

- damage buildings and disrupt transport
- Cause large waves to hit and damage the coast
- Debris and falling trees can kill people

Rain - every winter prolonged rain brings flooding while in the summer flash flooding occurs. This can cause

- damage to homes and business
- Deaths through drowning
- Homelessness
- Transport disruption due to damage
- Business close
- Millions of £ of damage
- - destroy crops and land

Snow and ice - during the winter freezing temperatures hit the UK causing:

- People (especially old) to die due to lack of heating
- Travel and business chaos as roads and rail are closed
- Schools close
- Damage to plants and crops

Heatwaves and drought - prolonged periods of hot and dry weather in the summer can lead to the above. Drought can also be caused due to a lack of rainfall in the winter meaning reservoirs are not topped up. The impacts can be:

- Death due to heat exhaustion (Heatwave)
- Breathing difficulties due to more pollution (heatwave)
- Disruption to transport due to melting roads and rail (heatwave)
- Crop failures
- Water shortages (Droughts)

Test yourself:

1. Describe/briefly explain each weather hazard.
2. Split the impacts of the hazards into social, economic and environmental. Be confident in explaining these.

Weather Hazards 1.2.8 UK Weather - Is it becoming more extreme?

YES! The UK weather is becoming more extreme, most people would say this is as a result of climate change. However some people would argue that it is natural for our weather and climate to have extreme periods.

Temperature

December 2010 was the coldest December for 100 years, but April 2011, for months later, was the warmest April ever recorded.

Rainfall - we are experiencing more and more rain

There has been more rainfall records broken in 2010-2014 than in any decade on record (records started in the 1800s) and this is just 4 years.

- **2013** one of the wettest years on record.
- **December 2015** one of the wettest months ever on record.

Floods are increasing

Major floods have occurred in:

- Cumbria - 2005, 2009 and 2015/16
- West Wales - 2012
- Somerset Levels - 2012

Test yourself:

1. Describe and give evidence for each box as to how UK weather is getting more extreme. Ensure you can compare to "records".
2. Justify an opinion on it, recognise that some people disagree. (9 marker).

Weather Hazards 1.2.9 UK Extreme Weather Example - Storms of Winter 2013/14

Causes

A number of deep depressions (low pressure systems that bring strong winds and lots of rain) hit the UK from the Atlantic Ocean .

These may have been caused because southern England was very warm while northern Scotland was very cold, meaning hot and cold air mixed together.

Impacts

The storms brought **strong winds and flooding** to many parts of the UK. Below are some of the impacts:

Social

- In Scotland the rail network shut down and the planes were cancelled from Glasgow and Edinburgh. Over 100,000 homes lost power.
- Flooding in Southern UK in Dorset, Hampshire, Surrey and Kent. 50,000 people were without power.

Economic

The estimated cost of the storms was £1.1bn , this included £446 for homes and business that were flooded.

The transport chaos and flight cancellations would have had large effects also as business, trade and deliveries were interrupted. People could not get to work.

Environmental - crops destroyed due to flooding and severe coastal erosion in some areas due to storms.

How did management reduce the risks?

National

COBRA - government emergency committee - met twice to discuss and coordinate response accorss the country.

Regional

-15,000 people advised to evacutate homes on the east coast.

- Emergency shelters set up for those who were evacuated including churches, schools and sport centres.
- The army helped Somerset council set up and coordinate flood defences and rescue efforts.
- The Thames Barrier was raised a record number of times that year to prevent London from flooding.

Test yourself:

1. Describe the causes of the storms.
2. Explain, with evidence the environmental, social and economic impacts of the storm.
3. Explain the response. How did they reduce deaths and limit economic damage?

Paper 1

Living with the physical environment

:Climate change

3.1.1.4 Climate change

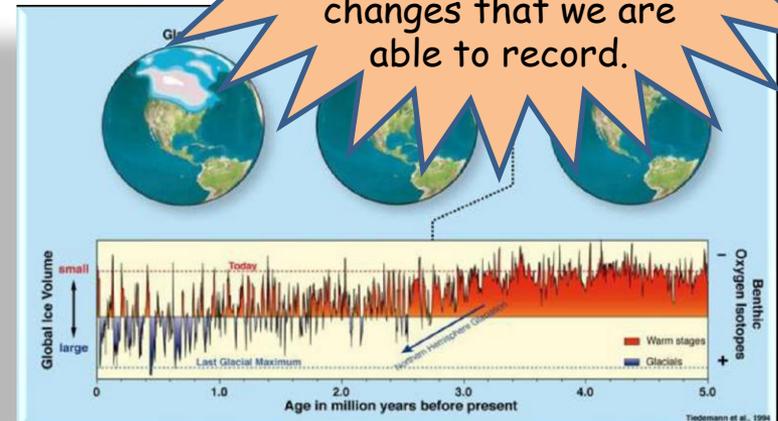
Key idea	Specification content
<p>Climate change is the result of natural and human factors, and has a range of effects.</p>	<p>Evidence for climate change from the beginning of the Quaternary period to the present day.</p> <p>Possible causes of climate change:</p> <ul style="list-style-type: none">- natural factors – orbital changes, volcanic activity and solar output- human factors – use of fossil fuels, agriculture and deforestation. <p>Overview of the effects of climate change on people and the environment.</p>
<p>Managing climate change involves both mitigation (reducing causes) and adaptation (responding to change).</p>	<p>Managing climate change:</p> <ul style="list-style-type: none">- mitigation – alternative energy production, carbon capture, planting trees, international agreements- adaptation – change in agricultural systems, managing water supply, reducing risk from rising sea levels.

The Quaternary period



The Quaternary is the last 2.6 million years of Earth history. It is marked by the presence of large ice-sheets in the northern hemisphere, which expand when climate is cold (glacials) and retreat when climate warms (interglacials). We are currently in the Holocene interglacial which began about 10,000 years ago. It is important to understand the Quaternary climate system because changes in global climate that have occurred during this period offer important insights into how and why the climate changes.

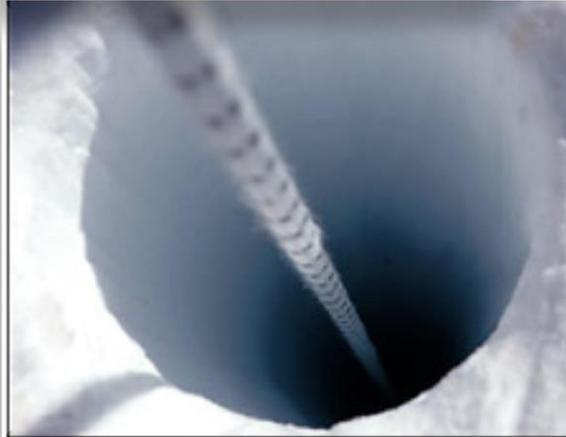
It is also the time interval during which humans and their civilisations evolved, which may have been driven by environmental changes that we are able to record.



Ice cores



Ice cores are drilled in glaciers and on ice sheets on all of Earth's continents. Most ice cores, however, come from Antarctica and Greenland, where the longest ice cores extend to 3 km—over 2 miles—or more in depth. Ice cores from the cold interior regions of polar ice sheets provide exceptionally well-preserved and detailed climate records. This is because the lack of melt at these locations does not corrupt the record of trapped gases or blur the record of other impurities. The oldest continuous ice core records extend to 130,000 years in Greenland, and 800,000 years in Antarctica.



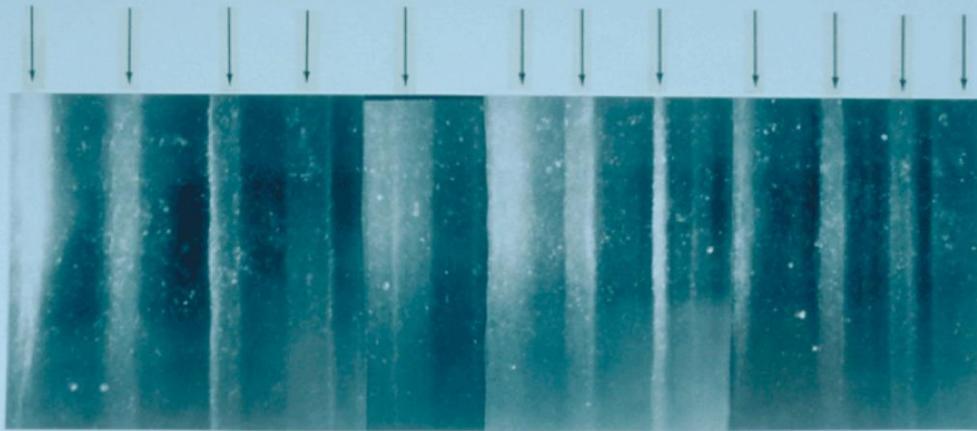
To examine the methods used by humans to understand long term climate change.

TEST YOURSELF!!! Can you:

1. Define what Ice cores are? . (2)
2. Write a PEE paragraph explaining how they measure climate change? (4)

[://www.youtube.com/watch?v=8BgD9xul16g](https://www.youtube.com/watch?v=8BgD9xul16g)

<https://www.youtube.com/watch?v=oHzADL-XID8>



19 cm long section of GISP 2 ice core from 1855 m showing annual layer structure illuminated from below by a fiber optic source. Section contains 11 annual layers with summer layers (arrowed) sandwiched between darker winter layers.



To examine the methods used by humans to understand long term climate change.

The way ice core dating is typically explained is that ice cores have dark rings and light rings, just like trees rings. In the summer, when it's warm, the ice melts a little making a clear layer and when it freezes, it creates a clear layer of ice. In the winter, the snow does not melt since it is cold, but instead, snow presses down and you get a compressed layer of snow and it turns into what is called "milky ice" which also has air bubbles trapped in it. So as you look at the core you see clear and milky, clear and milky, etc. Each of these they claim are annual rings (see image and caption above)

Tree rings

To examine the methods used by humans to understand long term climate change.

Dendrochronology (or **tree-ring dating**) is the scientific method of **dating tree rings** (also called **growth rings**) to the exact year they were formed in order to analyze atmospheric conditions during different periods in history.



Other ways to determine absolute age

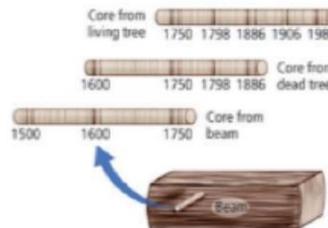
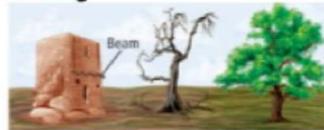
Tree rings

- Many trees contain a record of time in the rings of their trunks (annual tree rings)
- Each annual tree ring consists of a pair of early season and late season growth rings

Science of using tree rings to determine absolute age is called **dendrochronology**

- helps confirm the results from radiocarbon dating

Matching tree rings from different wood samples

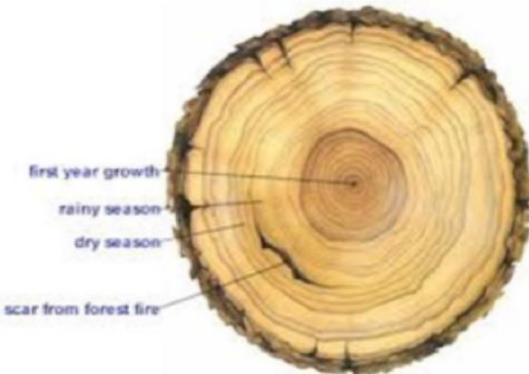


Using rings from ancient trees such as the Bristlecone pines which live for 6000 years or more in California give a great deal of information about climate.

The rings are wider in wet and warm years!

TEST YOURSELF!!! Can you:

1. Define what tree rings are? (2)
2. Write a PEE paragraph explaining how they measure climate change? (4)

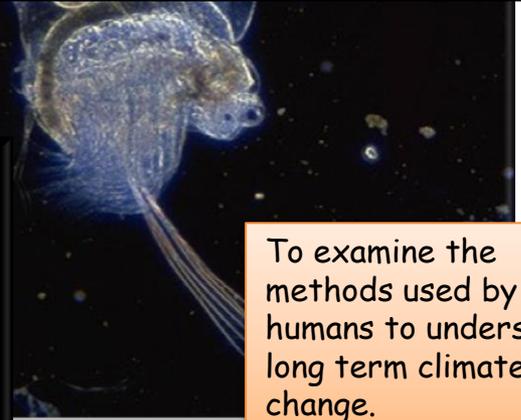


Plankton particle size

There is increasing evidence that plankton particle size is affected by climate change induced warming. In general, larger size species are better adapted to colder environments, while species of smaller sizes are more often found in warmer regions. According to the species shift hypothesis, global warming will likely cause decreasing body-size and an overall increase in the proportion of smaller size species. This evidence dates climate change as far back as 450,000 years.

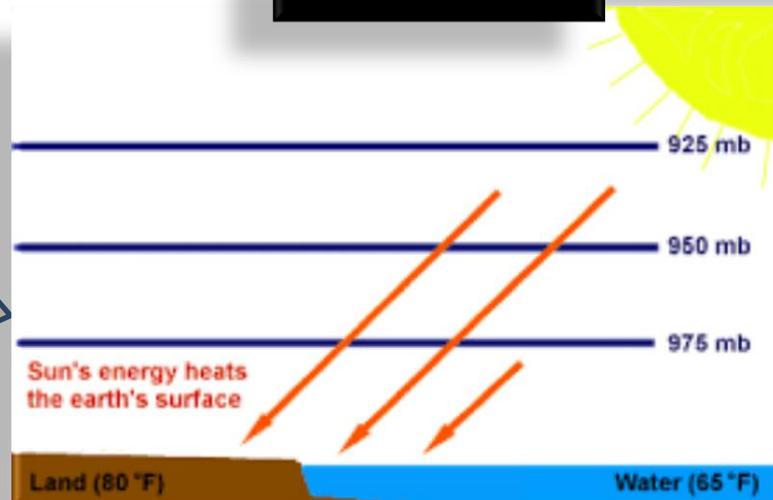
TEST YOURSELF!!! Can you:

1. Define what plankton particle size describes? (2)
2. Write a PEE paragraph explaining how they measure climate change? (4)



To examine the methods used by humans to understand long term climate change.

The Baltic Sea and Black Sea are areas where the sea bed is tested for Plankton fossils as they are two of the oldest seas on the planet.



Therefore we can measure relative warm and cool periods depending on the size and numbers of Plankton found in the Sea bed.

Climate Change - 1.3.2. What are the natural causes of climate change? ?

External Factors Affecting Climate:

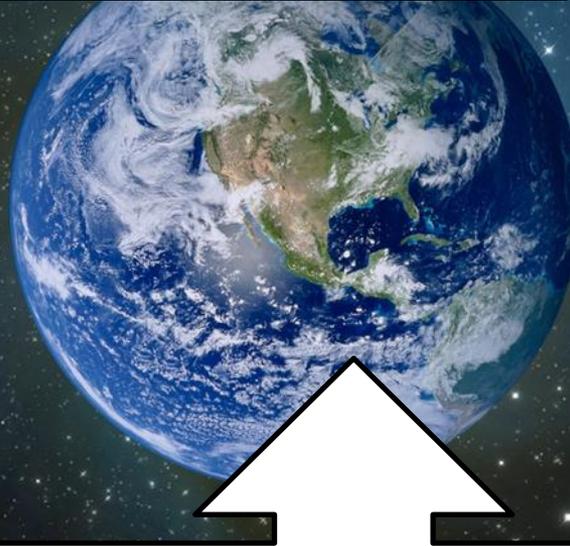
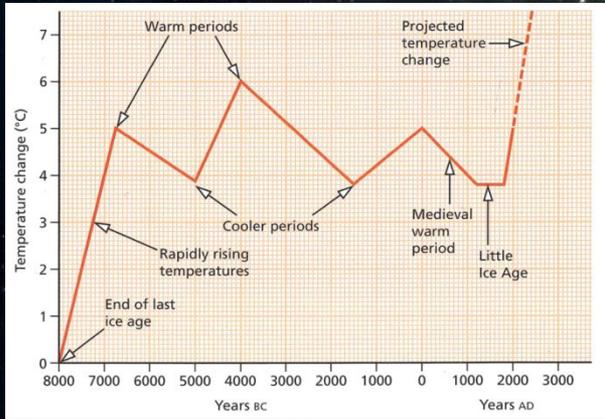
Solar output - The amount of energy that comes from the sun

Orbital geometry :

- The **changing orbit** of the earth around the sun
- The **tilt of the earth's** axis which changes over time. The greater the angle of the tilt, the hotter the summers and the colder the winters are.

TEST YOURSELF!!! Can you:

1. Describe the overall pattern of how the climate has changed since the last ice age, giving details of 2 warmer periods and 2 colder periods (4).
2. Explain the following causes of climate change since the last ice age (6):
 - a) Solar output
 - b) Orbital geometry
 - c) Volcanic activity
 - d) Changes in atmospheric gas
 - e) Surface reflection
 - f) Tectonic activity



This graph shows how the planet's climate has changed since the end of the last ice age. It is important for you to know that temperature has gone up and down (fluctuated) over the past 10,000 years.

Internal Factors Affecting Climate:

Volcanic activity - Volcanic eruptions release sulphur dioxide and ash into the atmosphere increasing the layer of insulation coming into the earth = increased temperatures

Surface reflection - Lighter colours reflect more heat. When there is more snow temperatures drop even more due to reflection.

Changes in atmospheric gas - The more carbon dioxide in the atmosphere the greater the temperatures

Tectonic activity - The movement of the continents caused by plate tectonic movements affects the ocean circulation, winds and ocean currents. This has a very small effect on the climate over time.

Climate Change - 1.3.2. Human causes of climate change

The 6 key causes of current climate change:

1. Burning of fossil fuels
2. Increase in methane in atmosphere.
3. Industrial activity
4. Increased car ownership
5. Deforestation
6. Energy producers

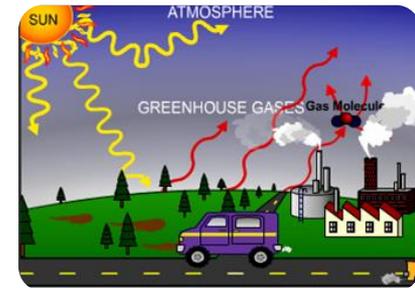


TEST YOURSELF!!! Can you:

1. Explain what the greenhouse effect is and how it is made worse by human activity. (3)
2. The names of 3 key greenhouse gases (3)
3. Write a PEE paragraph about each of the 6 key causes of climate change (6).
4. Give 6 ways in which methane is released into the atmosphere (6).

INDUSTRIAL ACTIVITY AND ENERGY PRODUCTION:

Major industrialised economies around the world use massive quantities of fossil fuels and are major emitters of carbon dioxide. China produces more CO₂ than any other nation on earth and 75% of all of its energy comes from burning coal. On average, China is opening 3 new coal fired power stations every week. Coal is the most polluting of all fossil fuels.



DEFORESTATION:

Forests store enormous quantities of carbon, both in the trees and vegetation itself and within rotting plants in the soil. **Forests in areas such as the Congo and the Amazon are some of the world's largest carbon stores on land** (the sea stores a lot of carbon too).

When forests are logged or burnt, that carbon is released into the atmosphere, increasing the amount of carbon dioxide and other greenhouse gases and accelerating the rate of climate change. So much carbon is released that they contribute up **to one-fifth of global man-made emissions.**

INCREASING LEVELS OF METHANE IN THE ATMOSPHERE:

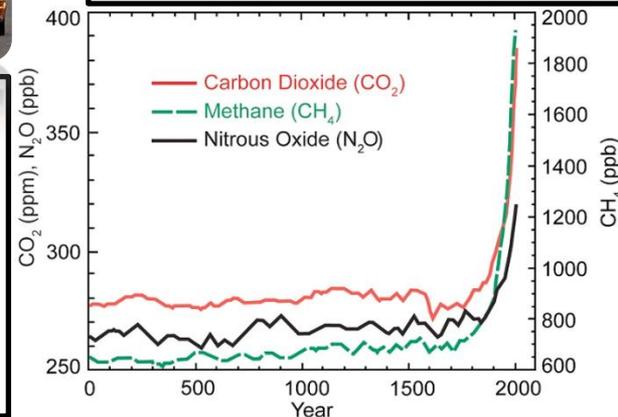
Methane is also an important greenhouse gas that contributes to global warming. It makes up 20% of the greenhouse gases in the atmosphere and is **20 times more powerful than carbon dioxide.** Methane comes from **organisms that were alive many years ago**, recently dead **rotting organisms** and those **alive today.** Methane comes from fossil fuels, farming rice, landfill sites and flatulence from cows and sheep.



CAR OWNERSHIP:

The burning of petrol/diesel (ie. oil) in cars is a major source of carbon emissions. The number of cars around the world is constantly growing. **In China, the number of cars owned increased from just 8 million (for 1 billion people) in 2000 to 30 million by 2008.**

The increase of greenhouse gases in the atmosphere has a huge impact upon the climate. Much of this comes from the burning of fossil fuels.



Climate Change - 1.3.3. Impacts of climate change on people and environment

1. The changing pattern of crop yield

Villagers in Northern China are suffering from declining crop yields due to poor rainfall (there has been no rain for three years and no harvest). Sand is engulfing the village and people are being forced to move to the cities to survive.



3. The Negative Effects of Climate Change on people and the environment

TEST YOURSELF!!! Can you:

1. Explain the 5 key impacts (5)
2. Give a fact to support each one? (5)
5. Split into human and environmental impacts.



Mountain glaciers are retreating all over the planet. In Patagonia in Argentina, the Neff Glacier has retreated by 3 miles since the 1930s. This leads to a rise in sea levels and has a huge impact on people that rely on the rivers that flow off glaciers for drinking water. This is a particular issue in India, where millions rely on glacier melt from the Himalays for drinking water.

2. Impacts of sea level rise (small islands)

Sea levels rise both because of an increased volume of water in the oceans as **glaciers and ice at the Poles melt** and because of **thermal expansion** (warmer water is greater in volume).



Rising sea level has particular impacts on small islands such as Tuvalu and the Maldives. They risk being flooded and having their land damaged by saltwater.

3. Risk of flooding

The flooding of the Somerset Levels in January 2014 indicates that the UK is vulnerable to extreme weather, particularly wetter winters, as a result of climate change. The UK will need to invest in flood defences.



5. Habitat change - impact on species

Sea ice melting at the North Pole threatens the habitats of polar bears who are having to swim longer and longer distances in search of food. In Hudson Bay, Canada, the number of polar bears has fallen by a quarter in the past 20 years. Coral bleaching is when increased temperatures kill coral and the animals that survive on it as an ecosystem.



Climate Change - 1.3.5 Mitigating the effects of climate change.

Managing climate change involves both:

Mitigation - reducing causes of climate change through the reduction of green house gas emissions and the use of sustainable energy technologies.

Adaptation - Accepting that the dangers associated with climate change such as sea level rise are going to take place and taking steps to reduce the effects, such as attempting to reduce the effects of coastal flooding.

TEST YOURSELF!!! Can you:

1. From memory - Can you define the key terms above? (2 marks each).

Climate Change - 1.3.5

Method	How	Good	Bad
Alternative energy production	Renewable energy does not release CO ₂ , therefore greenhouse effect cannot happen. EG Germany - 80% renewable by 2050	No CO ₂ Creates jobs for people Renewable energy = never runs out	Expensive for LICs Wind and solar aren't always reliable (sun doesn't shine) Dams take a lot of space
Planting trees	Trees absorb CO ₂ and therefore reduce CO ₂ in the atmosphere = less greenhouse effect	Cheap Reduces CO ₂	Takes up a lot of land which could be used for farming in LICs A lot of trees needed for it to be successful
Carbon capture and storage	Carbon is captured from power plant emissions by a chemical and is then pumped underground into rocks in order to be stored for years = no CO ₂ in the atmosphere	Allows us to continue to use fossil fuels Less CO ₂ in atmosphere	Very expensive - LICs? Uses a lot of power which means there is less for human use.
International summits	Politicians meet and agree to limit CO ₂ and set goals for climate change eg Paris Summit 2015	Takes global action and agreement	Hard to enforce laws internationally Countries can pull out eg Donald Trump has exited USA from Paris Agreement.

TEST YOURSELF!!!
Can you:
 1. Explain how each method helps to prevent climate change from occurring.
 2. 7-9 = which method is best/most effective? Evaluate the use of X method.....

Climate Change - 1.3.5

TEST YOURSELF!!! Can you:
 Explain a method of coastal defence that adapts to rising sea levels? (4 marks)
 Explain how we in the UK can adapt to increased temperatures in the summer and less rainfall? (4 marks)
 Explain how Arid coastal countries can cope with drought? (4 marks)
9 MARKER = EVALUTE THESE!

Desalination

In many water scarce countries removing salts and minerals from seawater, known as desalination, is the only way to supply much needed water. This is particularly true of the Gulf states, including Saudi Arabia. Currently, 1% of the worlds population are dependent on desalinated water. This figure is set to soar as more countries are going to face water deficit.



Desalination plant in Saudi Arabia

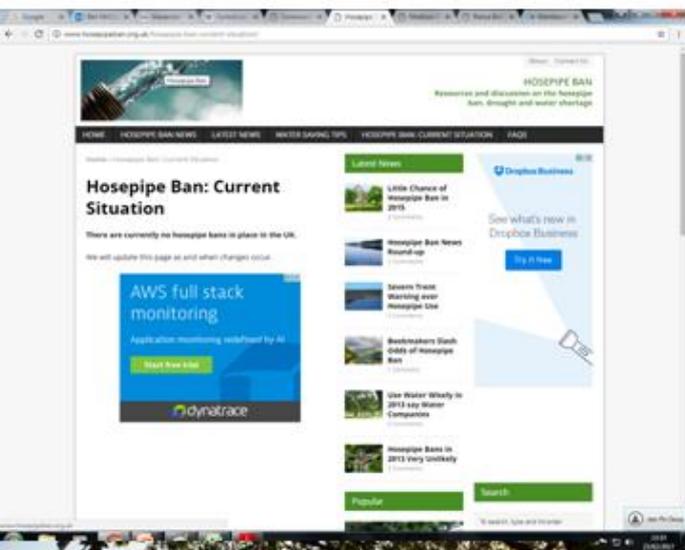
Desalination requires large amounts of energy to extract the salts from the water and is therefore a very expensive technology costing just under £2 per cubic meter. The environmental cost is also high as the Desalination plants emit high levels of Co2 by burning fossil fuels and the brine waste water damages marine ecosystems.



Hose pipe ban London 2012

Hosepipe bans affecting about 20 million customers have been introduced by seven water authorities in parts of southern and eastern England. People who flout the bans, which follow one of the driest two-year periods on record, face fines of up to £1,000. Suppliers [Thames](#), [Southern](#), [South East](#), [Anqian](#), [Sutton and East Surrey](#), [Veolia Central](#) and [Veolia South East](#) have all introduced "temporary use bans". The government has urged householders to be "smarter about how we use water".

"Two dry winters have prevented rivers, reservoirs and aquifers from refilling with the water we treat and supply the rest of the year, especially during the hotter months when demand rises."

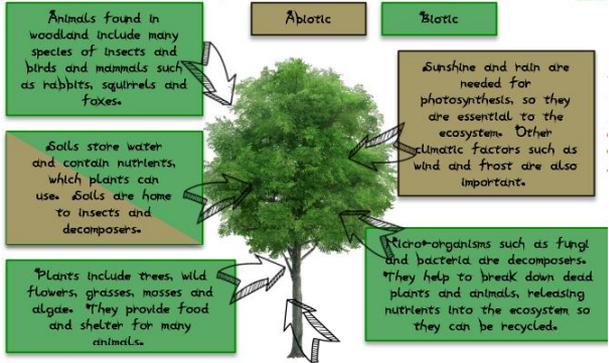


Some countries have been forced to adapt to climate change. Male, the capital of the low-lying Maldives, is constantly under threat from storms. **The government has built sea walls around the Island.**



Living World 2.1.2 Ecosystems - components and interdependence

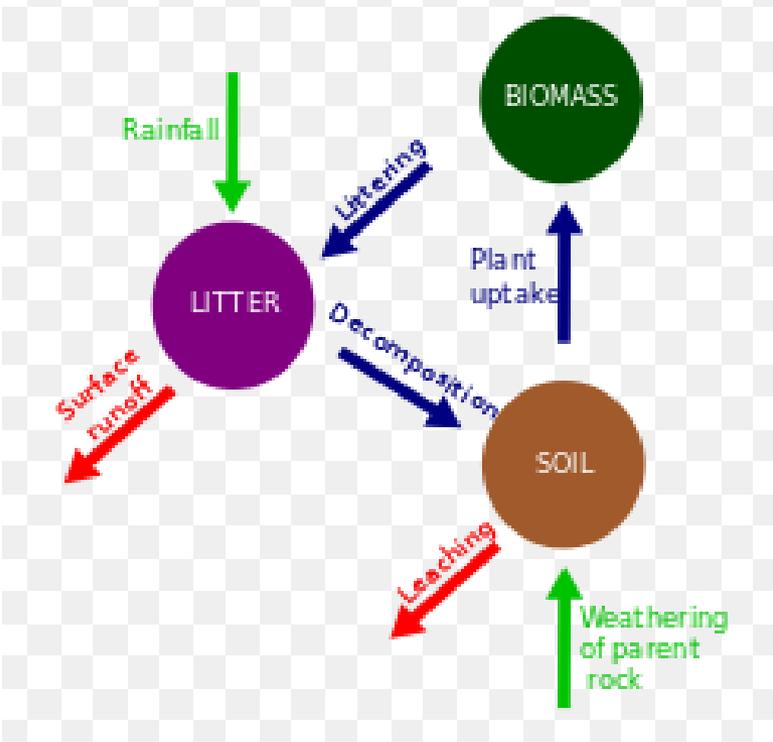
What are the parts of an ecosystem? 



Nutrient cycling: all plants and animals need nutrients. It is important that they are cycled around an ecosystem so that plants and animals can get them. They are a **good example of ecosystem interdependence**- plants rely on decomposers to break down dead animals and plants to release nutrients into the soil. Animals rely on plants to survive and eat to get nutrients. Animals then die and support decomposers.

The biomass per 40 g of soil is about...

<p>Producer - An organism that uses sunlight to produce food. Eg a plant</p>	<p>Biotic component - Part of an ecosystem that is living eg plant, animal, bacteria</p>
<p>Consumer - An organism that gets energy by eating other organisms - either producers or other consumers eg a sheep or wolf..</p>	<p>Food chain A food chain shows what eats what</p>
<p>Decomposers - An organism that gets its energy from breaking down dead organisms eg bacteria or fungi</p>	<p>Food web- A food web shows how food chains overlap.</p>
<p>Abiotic component - Part of an ecosystem that is not living eg soil</p>	



Test yourself

- 1) Define all key terms.
- 2) Explain how nutrient cycling works.
- 2) Explain how interdependence exists in ecosystems.

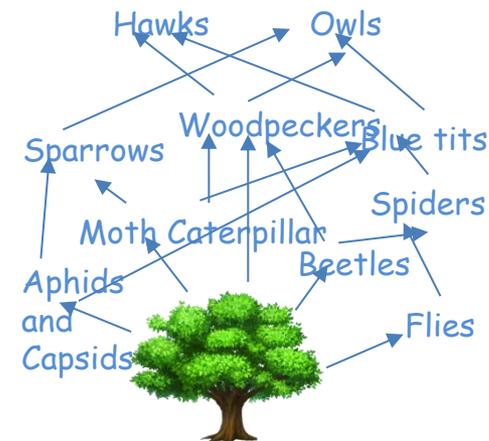
Physical - Periods of **extreme weather** of climate change can disturb the balance of ecosystems. In the years 1976-77, southern England experienced an 18 month drought that killed many trees. A further 15 million English trees were felled by a great storm in 1987. As a result, population numbers declined for many consumer species in the food chain. Secondary forest growth has since taken place, however, and consumer species have migrated back. The recent recovery of English woodland is an example of ecosystem resilience.

Human - ecosystems are sometimes damaged in permanent ways, especially when human forces are involved, for instance **by deforestation**. The removal of forest exposes the soil beneath to rainfall, and so it can be washed away making it impossible for the ecosystem to recover. In the long term **human induced climate change** could threaten the ecosystem balance of many places. Changes in temperature and precipitation patterns for southern England might make it harder for Ecosystems like Epping Forest to survive in their current form.

How does a change in a food chain impact other species? Oak woodlands support many species. Suppose that the population of beetles is reduced by disease, this would directly impact on the numbers of woodpeckers. With fewer beetles, comes fewer meals and their numbers may decline. However, we may see an increase in oak tree growth if fewer beetles were feeding on them.

The indirect result of a reduction in beetles.

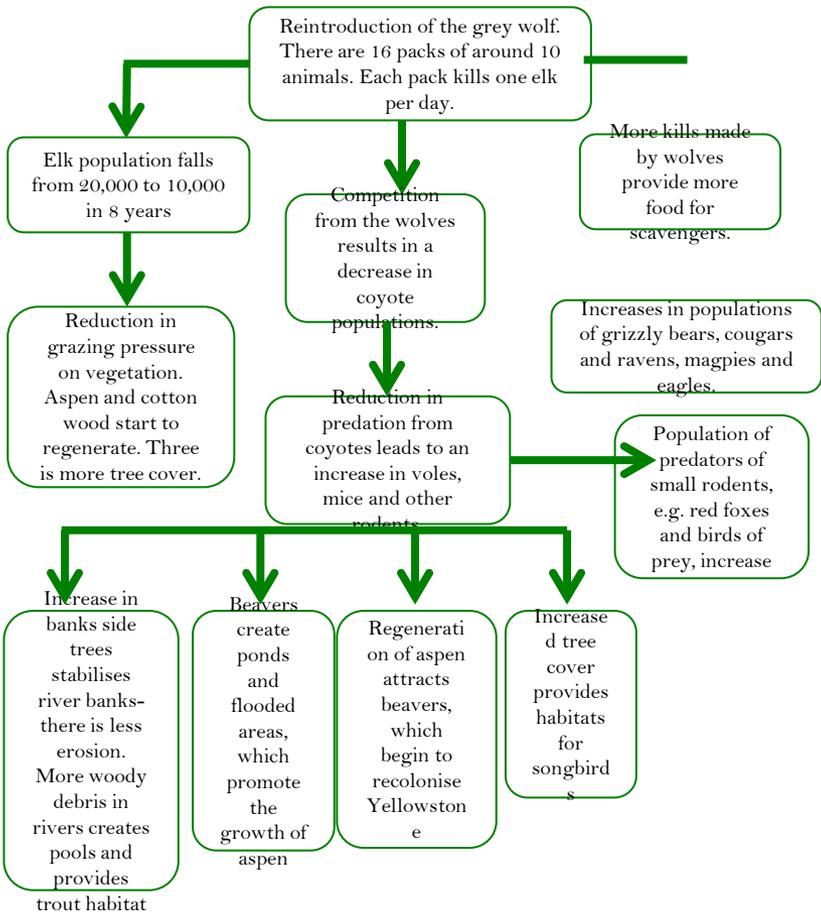
- Owl and hawk numbers may also fall because they feed on woodpeckers.
- Woodpeckers are carnivorous and have multiple food sources, they may just eat more caterpillars (but this would have problems for blue tit numbers).



Test yourself

- 1) Explain the physical reasons change can happen in an ecosystem.
- 2) Explain the human reasons change can happen.
- 3) Explain how change in a food chain/web impacts other parts of the food chain/web.

Living World - 2.1.3 Ecosystems - restoring the balance of ecosystems - wolves in Yellowstone.



Test yourself

- 1) Describe/explain how the reintroduction of wolves in Yellowstone caused **short** term changes to the ecosystem.
- 2) Describe/explain how the reintroduction of wolves in Yellowstone caused **long** term changes to the ecosystem.

Living World: 2.1.4 Ecosystems - distribution and characteristics of large scale natural ecosystems.

Biome	Location	Description of nature	Description of temperature	Link to Hadley Cell (if applicable)
Tropical rainforests	Found in bands around the world on or near the equator. In Asia (Indonesia), Africa (Congo) and South America (Brazil).	Tall, exotics trees, plants and loads of animals and insects. Most biodiversity on land in the planet.	Hot, humid and lots of rain.	Lies at the equator, so the sun's rays are strongest, creating evaporation (low pressure) and therefore lots of rain. The sun and rain mean many plants and trees can grow.
Deserts	Found in bands around the world at roughly 30° N and S.	Very little vegetation, landscapes made of just sand or rock.	Very dry (the main thing, technically Antarctica is a desert) and usually very warm.	Found at 30° N and S, also known as the sub-tropical high where dry descends in the Hadley Cell.
Deciduous/temperate forest	Found in higher latitudes around 50° N in Europe, USA and Russia.	What the UK would look like if it was all natural woodland. Large trees such as oak with animals like deer. Loose leaves during winter.	Generally mild - not too cold or hot throughout the year with enough rain to support tree growth.	Found near 60° where low pressure occurs as warm and cold air meet.
Tundra	Very northern latitudes around 60° N. Canada and Russia.	No trees only small plants and animals like hares and foxes. It is too cold for trees to grow.	Very cold, especially for 9 months of the year, well below freezing. Temperatures slightly warmer in summer	OTHER NOTABLE ECOSYSTEMS: MEDITERRANEAN AND CONIFEROUS WOODLAND (CHRISTMAS TREES)

Latitude - how far north or south from the equator generally dictates the ecosystem as this controls how warm/cold somewhere is

Altitude/height also has an influence as it gets colder the further with height you get.

Oceans also have an impact as it is likely to be drier and cooler near oceans.

Test yourself

- 1) For each ecosystem, describe:
 - location
 - what they look like
 - climate
- 2) **7-9** for each ecosystem can you explain why they are located where they are in relation to the
- 3) Explain why latitude is so important in explaining why ecosystems are located where they are.
- 4) **7-9**: explain one other control of where ecosystems are located.

Living World: 2.2.1 Tropical rainforests – physical characteristics

Climate

Tropical rainforests thrive in warm and wet conditions. The equatorial zone where they are found is characterised by high rainfall (over 2000 mm a year) and high temperatures (averaging about 27°C) throughout the year.

The climate graph below is for Manaus, in the Amazon rainforest in Brazil.

- ✓ The temperature is high and constant throughout the year. This is because the powerful Sun is overhead for most of the time.
- ✓ The rainfall is high. This is because the global atmospheric circulation causes an area of low pressure to form at the Equator. The rising air creates clouds and triggers heavy rain.
- ✓ Rainfall varies throughout the year, with a distinct wet season lasting about six months. This is due to a period of intense rainfall when the equatorial low pressure area is directly overhead. (7-9)

Biodiversity

Tropical rainforests are really biodiverse because they have huge amounts of sun and rain so there are many producers and the different layers allow plants and animals to survive from the forest floor all the way to the tops of trees. However the biodiversity is threatened by human activity such as deforestation.

Soil

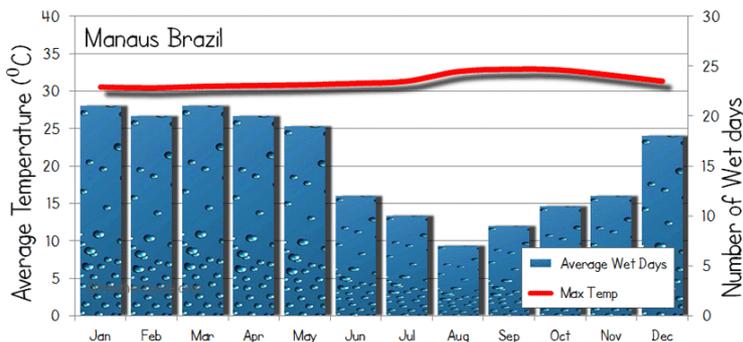
Tropical rainforest soils are surprisingly infertile. Most nutrients are found at the surface, where dead leaves decompose in the hot a humid conditions. Many trees and plants have shallow roots to absorb these nutrients. Fungi growing on the roots transfer nutrients straight from the air.

Heavy rainfall can quickly dissolve and carry away nutrients. This is called leaching. It leaves behind an infertile red, iron-rich soil called **latosol**.

- Much of the nutrients are locked up in plants and animals already
- Much of the nutrients are absorbed straight away.

Vegetation

There are huge amounts of plant life in tropical rainforests - they have the most biodiversity of anything anywhere. Trees grow as high as 40m and have leaves all year round. More than 2/3s of the world's plant life are found here.



Test yourself

1) Describe tropical rainforest climate. Use evidence if you can.

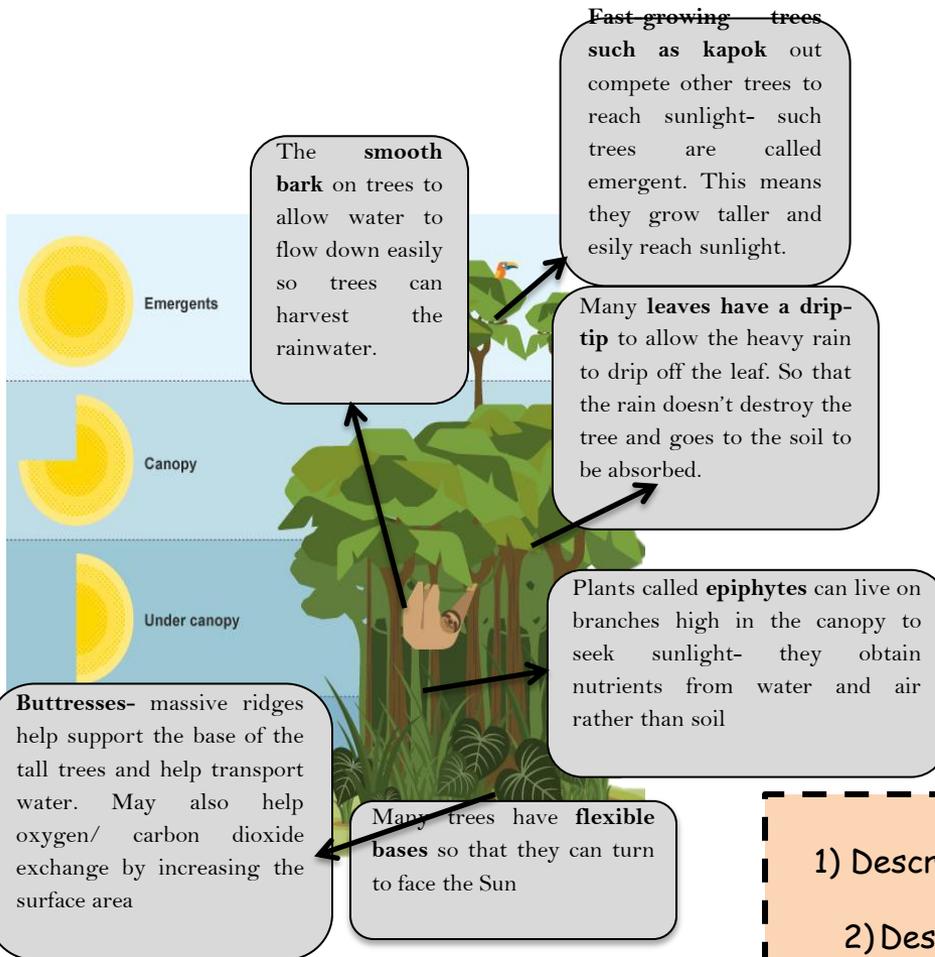
2) Describe rainforest soils and why there are infertile.

3) Describe rainforest vegetation.

4) Explain why rainforests are so biodiverse.

5) SKILLS STRETCH: identify the highest rainfall and temperature and their months from the graph.

Living World 2.2.2 Tropical rainforests - plant and animal adaptations



Animal adaptations

Monkeys - have large tails and strong claws to allow them to maintain balance high up in the trees.

Sloths - move really slowly to conserve energy because their diet doesn't give them much energy.

Jaguars - have eyes that can hunt really well in the dark canopy floor and are especially camouflaged so they can hunt well in the rainforest.

Toucans have a large beak in order to stay cool in the hot temperatures - the beak is massive so acts as a large surface area from which to lose heat.

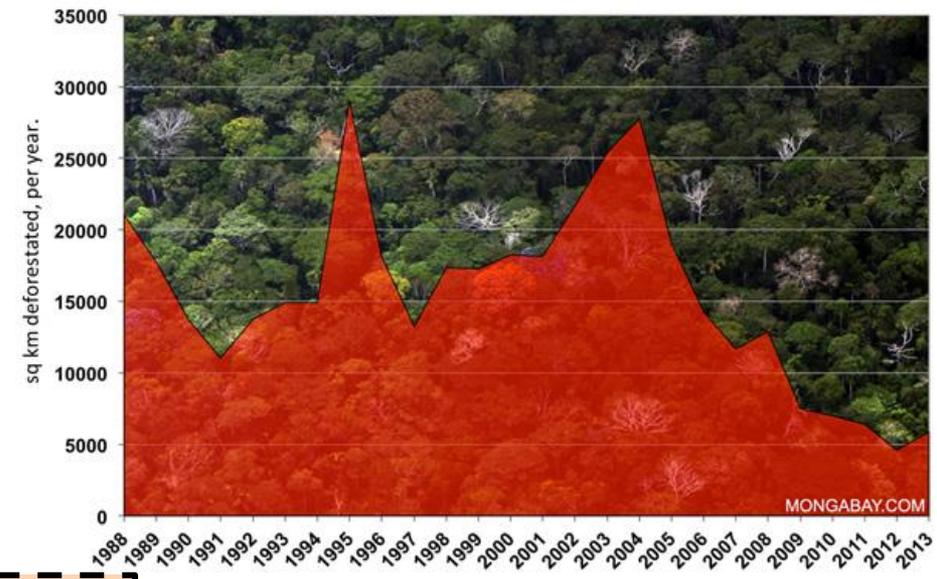
Test yourself

- 1) Describe and explain at least 2 plants adaptations to living in the rainforest.
- 2) Describe and explain at least 2 animal adaptations to living in rainforests.

Rate of deforestation

There are 62 countries with a tropical rainforest within their borders. It UN estimates that 50% of the world's tropical rainforest has been cleared - the scale and accelerating rate of deforestation are extremely worrying. From 2000-2010 the rate of deforestation increased in all three continents where there are tropical rainforests - Asia/Africa and S America. However since 2010 there are signs that the rate of deforestation is slowing, most promisingly in Brazil and Mexico which have had 21 and 37% reductions in deforestation rates. It is believed that the rate of deforestation is slowing because much of the rainforest that is left is now protected and illegal to clear. Indonesia is currently the country with the quickest and most worrying deforestation rates.

Deforestation in the Brazilian Amazon, 1988-2013



Test yourself

- 1) Describe rates what' shappened to rates of rainforest deforestation, use evidence.
- 2) 2) Explain why deforestation has slowed down.
- 3) Describe and explain each cause of rainforest deforestation.

Cause of deforestation	Resources or land?	Why does it happen/explanation.	How serious/important is it?
Logging	Resources	Timber (wood) companies like hardwood such as mahogany and sell them to other countries for furniture - this is selective logging. Small trees are used for fuel, pulp or charcoal and are cleared on larger scales - clear felling.	Very small - 3% in Brazil - although clear felling destroys large areas of land.
Mineral extraction	Resources	Many minerals that are used are found in the rainforest. In the Amazon in Brazil, gold is the main resources. Today over 50,000 hectares of land are used for gold mining. It is really bad because the whole land is clear felled - trees completely cut away.	
Energy development	Resource	Building dams for hydro electric power floods large areas of land and destroys the forest.	Small, but could increase

Living World: 2.2.3 Tropical rainforest deforestation - rates and causes

Illegal wildlife trading	Resource	This is not a cause of deforestation but hunting for wild animals to sell for zoos, medicine or meat is a big business and impacts large animals in particular.	Small
Commercial farming: cattle	Land	Clearing rainforest to grow grass for cows to eat - it can't even be used for long because the poor soil means that good grass doesn't move for long.	Huge - over 80% of deforestation
Commercial farming: crops	Land	Crops such as bananas, palm oil, pineapple, sugar cane. The amount of land cleared for this doubled between 1990-2010.	2 nd most important - 10% of deforestation
Road building	Land	Roads are made to bring equipment to industries mentioned above and move food and supplies around. It also means more of the rainforest is accessible so even more can be deforested	
Settlement and population growth	Land	As more people move to live and work in the above industries more land is required for housing so land even more land is deforested.	Less important.

Test yourself

- 1) Describe and explain each cause of rainforest deforestation.
9 MARK QUESTION - Evaluate the causes of rainforest deforestation....which cause is most important and why?

Living World: 2.2.4 Tropical rainforest deforestation - impacts of deforestation - AMAZON

Impact of deforestation	Global or local impact?	Explanation of the impact	Is the impact severe? Why/why not?
Global warming	G	Cutting trees down means there are no trees to absorb CO ₂ . If it is burnt this then adds even more CO ₂ to the atmosphere. Globally rainforests are the most important ecosystem in absorbing and storing carbon.	Very severe (global) Most severe?
Soil erosion and fertility	L	When trees are cut down the soil is exposed to rain and there are no longer any roots to bind the soil together. This means the rain washes the soil into the river. This has 2 effects - soil is eroded and plants are therefore less able to grow and recover. Also rivers become full of soil, this means they can carry less water and flood more often causing problems for people.	Locally yes
Economic development	L	<p>If deforestation occurs and soil erosion happens - this means any plantations are abandoned.</p> <p>Rivers polluted by mining means that fish die and fisheries lose out on money.</p> <p>Reduction in medicines means less people are able to benefit from improved health and medicine industry loses money.</p> <p>If the forest is damaged less tourists will come and locals will lose income.</p>	For the country yes

Test yourself

1) Describe and explain the impacts of rainforest deforestation.

2) 9 MARK QUESTION - Assess the impacts of rainforest destruction - which impact is most important and why?

Why is the rainforest important?

Resources
Tropical rainforest trees provide valuable hardwoods as well as nuts, fruit and rubber.

Water
Rainforests are important sources for clean water- 20 per cent of the world's fresh water comes from the Amazon basin.

People
Indigenous tribes live in harmony in the world's rainforests making use of the forest's resources without causing any long term harm.



Climate
Known as the lungs of the world, 28 per cent of the world oxygen comes from the rainforests. They prevent the climate from becoming too hot and dry

Biodiversity
Tropical rainforests contain half of the plants and animals around the world. They are home to thousands of different species. Some plants may become extinct before they have even been discovered.

Medicine
Around 25% of all medicines come from rainforest plants. More than 2000 tropical forest plants have anti-cancer properties.

Climate change
Rainforests absorb and store carbon dioxide, a gas that is partly responsible for climate change.

Test yourself

- 1) Describe and explain 2 ways the rainforest is important for people and the environment.
- 2) Explain how each sustainable management strategy works.
- 3) Evaluate each management strategy - what are the pros and cons of each.
- 4) 9 MARKER - Evaluate rainforest management strategies and explain which one you think is most effective and why.

Remember sustainable management involves making money and protecting the environment.

	Selective logging and replanting
Description and explanation of method	This means only cutting trees down when they are fully developed. This allows younger trees to continue to grow and protect the forest floor.
Advantages	Money still made for locals from forestry
Disadvantages	Takes 30-40 years for one cycle and is hard to police

Living World: 2.2.5 Tropical rainforest deforestation - sustainable strategies to manage deforestation - AMAZON

	Selective logging and replanting	Education and conservation	Education and conservation
Description and explanation of method	This means only cutting trees down when they are fully developed. This allows younger trees to continue to grow and protect the forest floor.	International charities educate local people about the importance of the rainforest and conservation. They also train people in conservation, pay locals to do so and buy threatened areas of the rainforest to protect them and make nature reserves. Eg WWF, Flora and Fauna International.	International charities educate local people about the importance of the rainforest and conservation. They also train people in conservation, pay locals to do so and buy threatened areas of the rainforest to protect them and make nature reserves. Eg WWF, Flora and Fauna International.
			Local people are educated and receive a job and income Rainforest is protected
			Hard to do on a large scale and needs money from HICs
Advantages	Money still made for locals from forestry	Local people are educated and receive a job and income Rainforest is protected	
Disadvantages	Takes 30-40 years for one cycle and is hard to police	Hard to do on a large scale and needs money from HICs	

Test yourself

- 1) Describe and explain 2 ways the rainforest is important for people and the environment.
- 2) Explain how each sustainable management strategy works.
- 3) Evaluate each management strategy - what are the pros and cons of each.
- 4) 9 MARKER - Evaluate rainforest management strategies and explain which one you think is most effective and why.

Remember sustainable management involves making money and protecting the environment.

Living World: 2.3.1 Cold environments - physical characteristics of cold environments and interdependence

Tundra

Where?

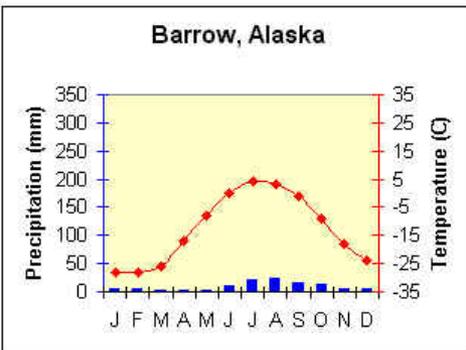
Just south of polar environments in the northern hemisphere. Occupy HUGE areas of land in particular in Russia and Canada.

Appearance

There are no trees. From October to April it is completely covered in snow and ice. From May - August snow melts and small grass/shrubs are exposed.

Climate

Below freezing for all winter months, 5-10°C on average during 3 summer months. Generally little rain.



Polar

Where?

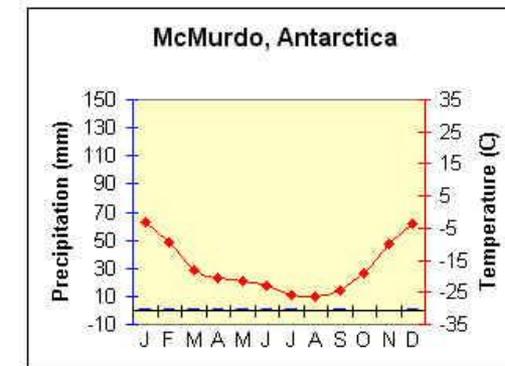
At the north and south pole and are far from the sea. Greenland, Arctic and Antarctica are the main areas.

Appearance

Completely covered in snow and ice all year round with some rocky outcrops.

Climate

The average monthly temperature is ALWAYS below freezing. There is very little rain because cold air cannot evaporate and hold water vapour.



Permafrost - both tundra and polar areas are covered in permafrost. This is ground that is currently frozen. However in the tundra, during summer months, the upper layer of the soil melts and this is called the **active layer**.

Interdependence in cold environments - tundra birds rely on plants - moss - to warm their nests during the summer. Inuit people in cold environments rely on animals for their skin and furs to use as clothing to keep them warm. Inuit people in coastal areas of cold environments have relied in sea species for food eg whales and sharks.

Test yourself

- 1) For both tundra and polar describe their location, including countries, and what they look like.
- 2) Describe their climate including figures.
- 3) Explain what permafrost means.
- 4) Give examples of how there is interdependence in cold environments.

Living World: 2.3.2 Cold environments - plant and animal adaptations

Animals

Polar bears

- White fur - means they are camouflaged and can easily hunt for prey.
- Thick fur - means they are insulated against the cold weather.
- Small ears - means they have less surface area to lose heat
- Large paws - which means they can swim easily

Snowshoe rabbits - have white fur which means they cannot be seen easily. They also have large feet which means they can spread their weight so they can run on snow.

Caribou - deer - the two layers of fur to survive the cold. Have large hoofs so they can go over soggy ground and ice.

Biodiversity is very low because of the cold and dark conditions which means not many plants can grow and therefore large animal life cannot be supported.

Plants

Mosses and lichens - have shallow roots so that they can access water in the summer and do not go into ice in the winter.

Cotton grass and Arctic willow - these are plants which are close to the ground so that they don't get destroyed by the strong and cold winds.

Arctic poppy - grows very quickly in the short summer by producing flowers very quickly so that they can absorb as much sun as possible.

Test yourself

- 1) For plants, describe and explain at least 3 adaptations.
- 2) For animals, explain at least 3 adaptations.
- 3) Explain why biodiversity is so low in cold environments.

Mineral extraction

Also known as mining, Alaska has lots of **gold, silver, zinc and lead**.

- ☺ Brings jobs and money to locals
- ☹ Harms the environment - chemicals such as mercury used in mining area highly poisonous. Also people think mines are ugly.

Fishing

Alaska has a HUGE coast - over 10,000km, 3000 rivers and 3million lakes - therefore fishing is a big business.

- ☺ 10% of Alaskans are employed in fishing, provides over 78,000 jobs and generates \$6bn dollars a year.
- ☺ Inuit communities rely on fishing for food, oil and skin to support their daily lives.
- ☹ Over fishing can harm the environment (however most fishing here is very sustainable) AND some jobs are seasonal - this means they can only be done in the summer because of the ice and people don't get money all year round.

Tourism

Alaska is beautiful and vast therefore many people come for walking, sailing and wildlife seeing holidays. Moreover there are many inuit cultural attractions.

- ☺ **6 million** visitors come a year which provides jobs for people
- ☹ Jobs are **seasonal** only in the summer so people don't get money all year round
- ☹ Walking and driving can damage the environment, especially plant life
- ☹ Many visitors come by airplane = climate change

Energy production

3000 rivers means many dams can be built, there are over **50 hydro electric power plants**.

- **Geothermal energy** is also harnessed near the Pacific Ring of Fire.

Oil is the main energy industry. Pros and cons of this are:

- ☺ Over 90% of taxes in Alaska come from the oil industry - this means vital services can be provided for the people.
- ☺ It provides 100,00 jobs and provides earnings of \$40bn for people.
- ☺ IN some places the oil pipelines pass underground so that they don't interrupt animal migrations
- ☹ Many workers are not locals and so the money does not always stay in the local economy.
 - ☹ Oil spills occur and damage the environment - Exxon Valdez oil in 1989 and a broken pipeline in 2006 spilled a total of 2.2million litres of oil. This kills rare animals, birds and plants and melts the ice.
- ☹ Some people say that oil pipelines get in the way of migrating deer, although they are often raised off the ground to avoid this.

Test yourself

- 1) For each opportunity for development can you:
 - Describe and explain what it is
 - Say why it happens in Alaska
 - Give pros and cons using evidence.
- 2) 9 MARKER - Assess the opportunities for development in Alaska - which opportunity is the best/makes most money?

Value of cold environments

- 1) There is a planet wide need to protect species of plants and animals and their gene pool so that their diversity is maintained. If there are too few of particular animals then their genes are too similar and the diversity is lost.
- 2) Scientists need access to rare plants and animals for research.
- 3) There should always be some places that are left unchanged by humans, this is so that we can study the impact we are having on the natural world.
- 4) Many people argue these areas have an intrinsic natural beauty and deserve to be protected.
- 5) Native and indigenous people live in wilderness areas and if they are not protected their values and customs will be lost.

Test yourself

- 1) Explain at least 2 reasons why cold environments are so important.
- 2) Describe and explain 3 ways in which cold environments are under threat.
- 3) 9 MARKER - Assess the threats cold environments face.....which threat is most severe and why? Are humans doing anything to stop it?

How are cold environments under threat?

Tourism - more settlements are built in order to accommodate tourists and they use more resources and produce more waste.

- Also tyre tracks and walking routes kill off plant species that can take as long as 50 years to grow back.

Energy production - oil spills (see 2 pages ago) cause huge problems for local plants and animals as it can kill them and turn the white ice black causing them to melt.

Climate change - causes snow and ice to melt which leads to habitat loss for animals such as polar bears - perhaps the biggest threat?

Mining causes local area to be destroyed and releases poisons such as mercury into local environments such as rivers.

Cold regions are very fragile and any change to their nature can take decades to repair because of how cold they are.

Living World: 2.3.5 Cold environments - Strategies used to balance the needs of economic development and conservation in cold environments

Use of technology - internet and computers

Mobile phone and internet means people can send emails, texts and calls in areas where post only arrives once a week.

This means business can take place more easily.

Video conferencing - in remote villages has meant school children have received a good education.

Online university courses - means people can take degree courses online, far away from hard to access universities which gives them qualifications.

Databases - collect and preserve Inuit knowledge and culture.

All of the above examples have limited impacts on the environment.

Role of governments

National and local governments can make laws and rules which limit certain economic activities. For instance Barack Obama created the Arctic National Wildlife Refuge which is 12million acres in size. In this place no economic activities such as oil exploration can take place. However activities such as tourism can occur.

Non governmental organisations - charities

Many charities will campaign to protect the environment. For instance Greenpeace have interrupted a lot of oil exploration in the Arctic and now campaign that all Arctic resources should be off limits. However indigenous population will argue that this limits their rights. Some charities have been set up by Inuit communities to protect them and the local environment.

Global technology companies - Facebook and Google

These companies have relocated their data centres to cold environments. The computers in data centres need cold temperatures to stop them from over heating. The cold tundra environment provides the perfect place for this.

This is great because:

- local people get jobs - 2,000 jobs provided in Lulea, Sweden.
- no electricity is required to cool the servers
- Flat land means it is easy to build and the data centres have a low environmental impact

International agreements

This is when countries get together and agree on how particular areas are going to be used. Examples of this in cold environments are:

- International Whaling Convention 1986: global ban on whale hunting meant Bowhead Whales in the Arctic have increased.
- Arctic council: Russia, Canada, USA, Norway and Denmark aim to deliver sustainable development through protecting the environment and indigenous populations.
- **The Antarctic Treaty** is perhaps one of the most successful in protecting the environment. No countries are allowed to conduct economic activities in the Antarctic, only scientific research is allowed.

Test yourself

- 1) Describe and explain each strategy outlined.
- 2) Give an example of each strategy.
- 3) 9 MARKER - Evaluate the use of X to manage cold environments - what is good and bad about each strategy? What is the best strategy and why?

UK Physical Environments

<p>The coast is shaped by a number of physical processes.</p>	<p>Wave types and characteristics.</p> <p>Coastal processes:</p> <ul style="list-style-type: none"> • weathering processes – mechanical, chemical • mass movement – sliding, slumping and rock falls • erosion – hydraulic power, abrasion and attrition • transportation – longshore drift • deposition – why sediment is deposited in coastal areas. 	<p>The shape of river valleys changes as rivers flow downstream.</p>	<p>The long profile and changing cross profile of a river and its valley.</p> <p>Fluvial processes:</p> <ul style="list-style-type: none"> • erosion – hydraulic action, abrasion, attrition, solution, vertical and lateral erosion • transportation – traction, saltation, suspension and solution • deposition – why rivers deposit sediment.
<p>Distinctive coastal landforms are the result of rock type, structure and physical processes.</p>	<p>How geological structure and rock type influence coastal forms.</p> <p>Characteristics and formation of landforms resulting from erosion – headlands and bays, cliffs and wave cut platforms, caves, arches and stacks.</p> <p>Characteristics and formation of landforms resulting from deposition – beaches, sand dunes, spits and bars.</p> <p>An example of a section of coastline in the UK to identify its major landforms of erosion and deposition.</p>	<p>Distinctive fluvial landforms result from different physical processes.</p>	<p>Characteristics and formation of landforms resulting from erosion – interlocking spurs, waterfalls and gorges.</p> <p>Characteristics and formation of landforms resulting from erosion and deposition – meanders and oxbow lakes.</p> <p>Characteristics and formation of landforms resulting from deposition – levees, flood plains and estuaries.</p> <p>An example of a river valley in the UK to identify its major landforms of erosion and deposition.</p>
<p>Different management strategies can be used to protect coastlines from the effects of physical processes.</p>	<p>The costs and benefits of the following management strategies:</p> <ul style="list-style-type: none"> • hard engineering – sea walls, rock armour, gabions and groynes • soft engineering – beach nourishment and reprofiling, dune regeneration • managed retreat – coastal realignment. <p>An example of a coastal</p>	<p>Different management strategies can be used to protect river landscapes from the effects of flooding.</p>	<p>How physical and human factors affect the flood risk – precipitation, geology, relief and land use.</p> <p>The use of hydrographs to show the relationship between precipitation and discharge.</p> <p>The costs and benefits of the following management strategies:</p> <ul style="list-style-type: none"> • hard engineering – dams and reservoirs, straightening, embankments, flood relief channels • soft engineering – flood warnings and renaturation

Coasts 1.3.1 Weathering, erosion and mass movement.

Erosion - the wearing away of rock and soil on the river bed and banks and the breaking down of rock particles being carried downstream.

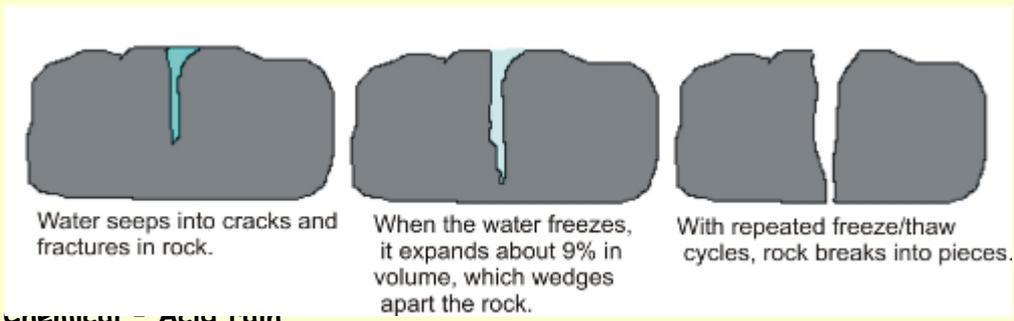
There are four main types:

- 1) **Hydraulic action** - the force of waves hitting the cliff. Air gets trapped in cracks and the pressure forces the cliffs to wear away.
- 2) **Abrasion** - particles carried in the waves scrape against the bed and banks.
- 3) **Attrition** - particles carried in the waves crash into each other and break into smaller ones.
- 4) **Solution** - soluble particles are dissolved in the river.

Weathering - the break down of rocks in situ.

There are 3 main types:

1) **Physical (Freeze thaw)** -



2) **Chemical - Acid Rain.**

- Carbon dioxide and water in the air mix to form carbonic acid.
- When this forms as rain it dissolves soluble rock such as limestone as it passes through cracks in the rock.

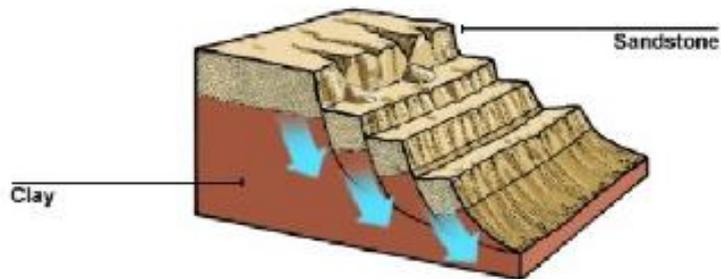
3) **Biological** - plant roots and animal burrowing can cause force cracks to get larger in rocks and soil.

Transportation Process	Description
Solution	Minerals are dissolved in sea water and carried in solution. The load is not visible. Load can come from cliffs made from chalk or limestone, and calcium carbonate is carried along in solution.
Suspension	Small particles are carried in water, eg silts and clays, which can make the water look cloudy.
Saltation	Load is bounced along the sea bed, eg small pieces of shingle or large sand grains.
Traction	Pebbles and larger sediment are rolled along the sea bed.

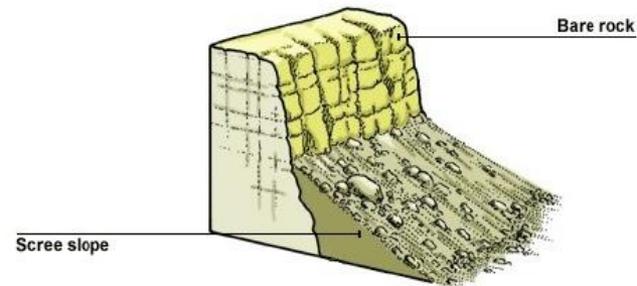
TEST YOURSELF!!! Can you:

- Define erosion/mass movement/ weathering/transportation
- Explain the 4 types of erosion.
- Explain the 4 types of transportation.
- Explain the 2 types of weathering.
- Explain the 2 types of mass movement.

Coasts 1.3.2 Systems and processes - geomorphological process: mass movement.



Landslips: also known as rotational slumps, are occasional rapid movements of a mass of earth or rock dropping down along a concave plane. Water percolating through sandstone gets into the clay beneath, saturating it. With the weight of the rock above forcing down on it the clay moves seawards as a mud flow. With the clay moving sideways the sandstone above slumps down. Undercutting of a steep slope by the sea weakens the rock above, making a slump more likely.



Rockfall: rapid, free-fall of rock from a steep cliff face due to gravity. This is made worse by freeze-thaw action loosening the rock - water enters the joint (vertical crack), freezes and expands, breaking up the rock. A scree slope of fallen rock is formed at the bottom of the cliff. It is also possible for free falls to occur in very dry conditions - for example clay cracks as it dries out and then crumbles easily

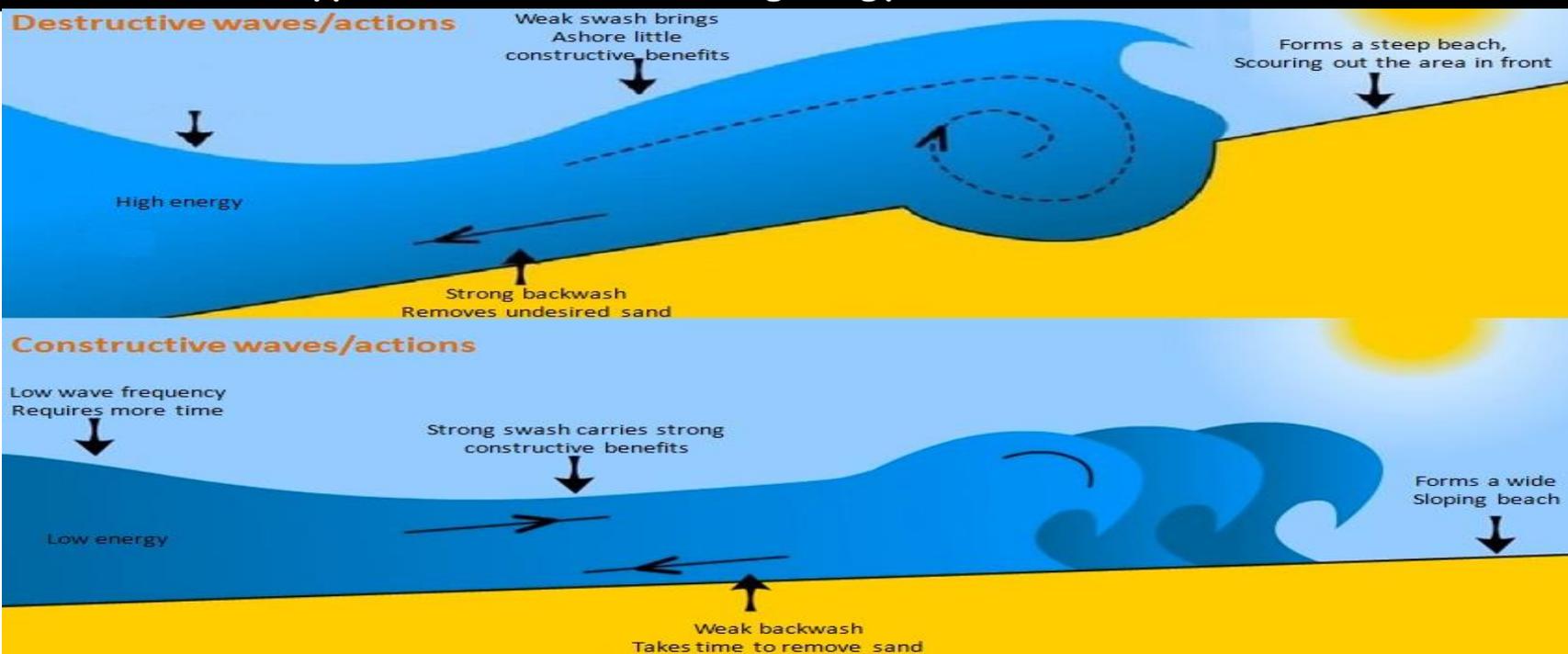
Earthflows/mudflows

Fast movements of 5-15km a year on steeper slopes which are saturated. Bulging lobes of soil are produced. Mudflows are generally faster and occur after heavy rainfall.

TEST YOURSELF!!! Can you:

1) Explain how each method of mass movement occurs

Coasts 1.3.3 Types of waves and how geology influences landforms



Rates of erosion vary from place to place depending on many factors. An important factor to consider is the **type of wave** and the distance a wave has travelled. Fetch describes the length of time and space that a wave has travelled. The larger the fetch the more time wind has had to act on waves, hence the larger the wave. Large oceans with large fetch produce large waves, called destructive waves. These waves have large wave height and short wave length and are characterised by tall breakers that have high downward force and a strong backwash. They have high frequency, between 13 and 15 waves per minute. This downward energy helps erode cliffs. In addition, due to a dominant backwash they erode the beach making for narrow steep beach profiles. Localised storms with high wind speed also form destructive waves as well as steep depth gradients around headlands.

Constructive waves have low wave height and long wave length with low frequency, between 6 and 8 waves per minute. Constructive waves are associated with weak backwash and strong swash, which builds up wide flat beaches and so are more associated with coasts of deposition. Size of fetch and type of wave are really important factors influencing rates of erosion

TEST YOURSELF!!! Can you:

- List 3 characteristics of destructive and constructive waves
- Compare their differences

Coasts 1.3.4 How geological structure and rock type influence coastal forms

Rock Type: This tends to link to how hard/resistant a rock is and how resistant it is to weathering/erosion.



Very hard: Granite

Hard: Limestone and chalk (but both vulnerable to chemical weathering as made of calcium carbonate which is an alkali)

Soft: Clays, sands and gravels

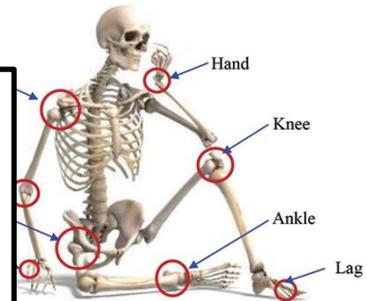
Geological structure: This tends to refer to cracks in the rock. This is important because these cracks expose the rock to hydraulic pressure and freeze thaw weathering.



A crack in a rock which is often called a 'joint' or a 'fault'.

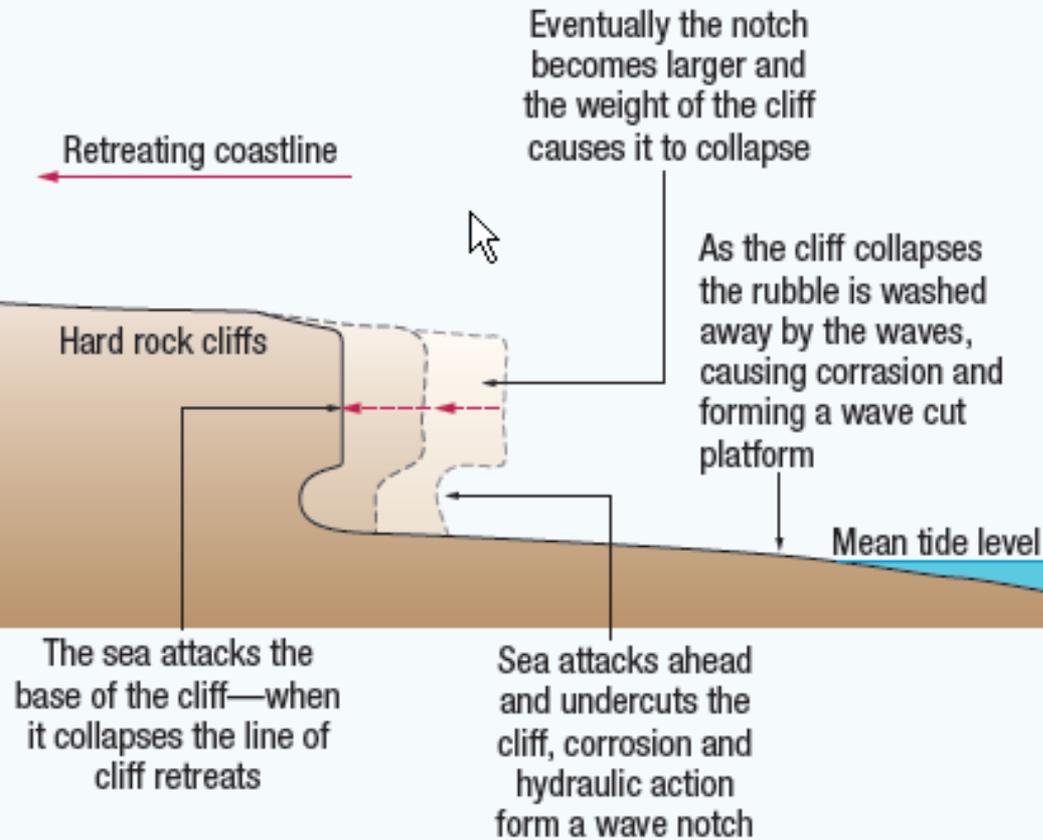
TEST YOURSELF!!! Can you:

- Explain how rock types influences the rate of erosion
- Explain why some rocks are weathered more quickly.,
- Explain how joints and faults in rocks can lead to more erosion/weathering.



Coasts 1.3.5 Coastal landscape development - erosion: cliffs and wave cut platforms.

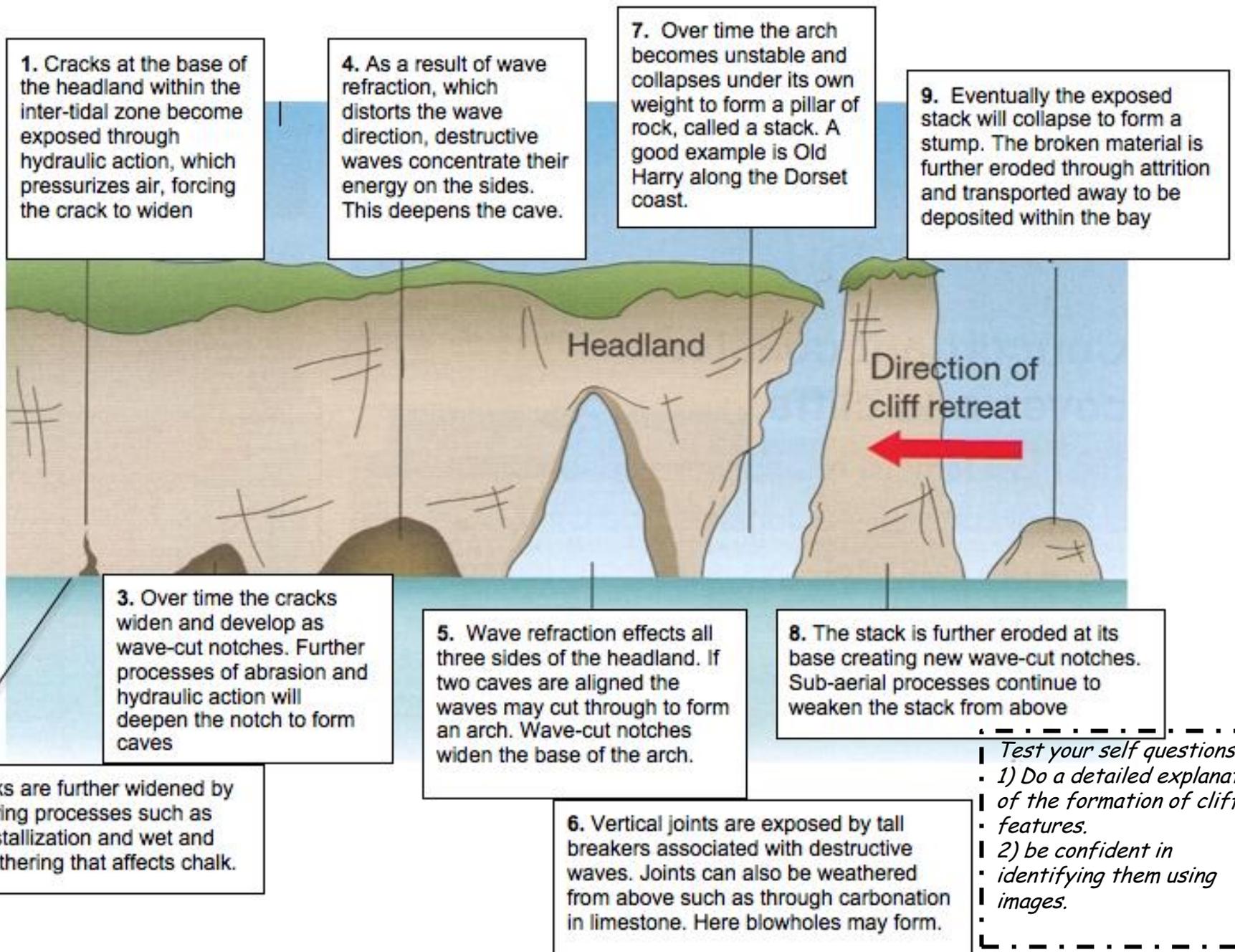
7.8 Headland and wave-cut platform



TEST YOURSELF!!! Can you:

- Explain the processes that create wave cut platforms and cliffs
- BE able to identify and label the sections of wave cut platforms from photographs

Coasts 1.3.5 Coastal landscape development - erosion: cliff profile features = caves >



Test your self questions:

- 1) Do a detailed explanation of the formation of cliff features.
- 2) be confident in identifying them using images.

Coasts 1.3.5 Coastal landscape development - erosion: cliff profile features = headland and bays.

Test your self questions:

- 1) Do a detailed explanation of the formation of headlands and bays.
- 2) be confident in identifying them using images.
- 3) Be able to explain wave refraction and it's impacts on headlands and beach formation.

The formation of headlands and bays (Example 1)

①



Headlands and bays form along coastlines where there are alternating bands of hard (resistant) rock and softer (non-resistant rock).

②

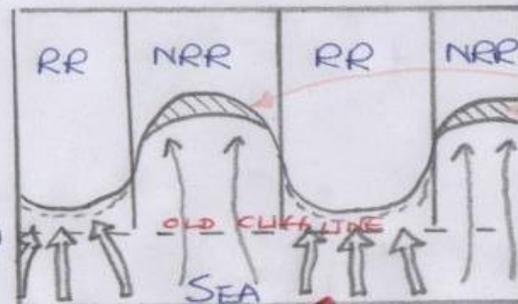


Overtime the non-resistant rock eg clay or shale are eroded by abrasion, attrition, corrosion, and hydraulic action at a faster rate than the resistant rocks eg granite or limestone.

The areas of land that stick out into the Sea are called headlands.

The areas that have receded more quickly are called bays.

③



Once formed headlands and bays interfere with the incoming waves. They make them bend or refract.

Wave energy is spread out and reduces in the bays. This results in the waves moving more slowly and so deposition happens forming a sand or shingle beach. This then slows erosion of the cliffs as waves cannot reach the cliffs and break it down.

Wave refraction makes the energy focus on the headland creating the formation of other erosion features as caves and arches.

Coasts 1.3.6 Coastal landscape development - deposition: beaches

Remember, a **swash aligned beach** brings in waves parallel to the shore and as result, they build up beaches. Swash aligned beaches are more influenced by constructive wave patterns, which are also important for building up large beaches. Swash & backwash movements move material up and down the beach producing the aforementioned beach profile features In contrast, **drift aligned coasts** bring in waves at an angle to the shoreline and so therefore, the waves tend to transport sediment down the coast, keeping beaches relatively narrow.

Drift aligned beaches that are mainly associated with spits, bars and tombolos

Swash beaches are more associated with large beach profiles, with dunes, a variety of berms and beach drainage features.

Sand beaches tend to be flatter and wider because sand particles are so close together so water cannot infiltrate into them meaning there is more swash and backwash so sediment is always moved, a bit like a rake over a lawn.

Pebble beaches tend to be narrower and steeper with because swash infiltrates into the rocks meaning sediment is dumped and there is little backwash. They also have levels called berms.



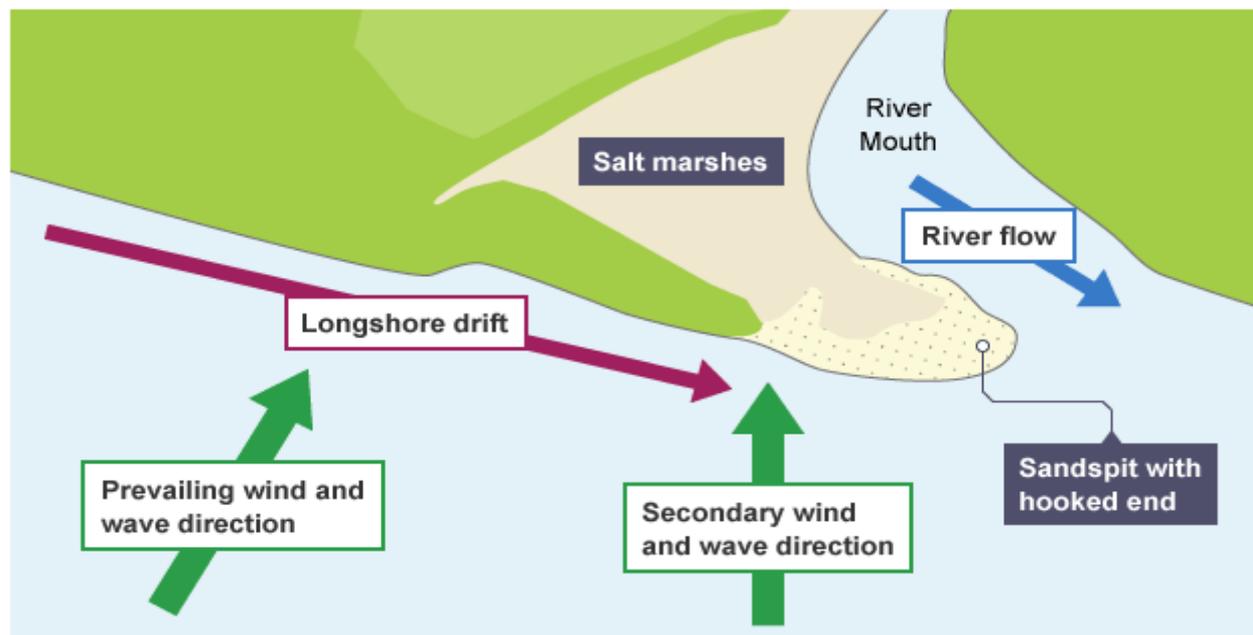
Test your self questions:

- 1) Know all these key terms.*
- 2) Explain the difference between drift and swash aligned beaches.*
- 3) Explain why sand beaches tend to be flat and pebble beaches tend to be steep.*

Coasts 1.3.6 Coastal landscape development - deposition: spits and tombolos.

Features of coastal deposition

Depositional features produced by longshore drift include **spits**, bars and tombolos. The main features of coastal deposition are shown on the diagram below.



The diagram shows the building of a spit by longshore drift across the mouth of a river.

Sandspits often have a curved or hooked end as a secondary wind and wave direction curves the end of the spit as waves strike from this second and different direction. A series of such hooks can develop over time.

The spit creates an area of calmer water, sheltered by the spit. A lagoon, salt marsh and finally dry land can develop in this sheltered area.

Bar

A bar is created when there is a gap in the coastland with water in it. This could be a bay or a natural hollow in the coastland. The process of longshore drift occurs and this carries material across the front of the bay. Material is pushed up onto beaches at an 45 degree angle when the swash brings it onto the coastline. The backwash takes it back out towards the sea at a right angle to the coast. Through this process material is constantly moved along the coastline. The deposited material eventually joins up with the other side of the bay and a strip of deposited material blocks off the water in the bay. The area behind the newly formed bar is known as a lagoon.

Tombolo

A tombolo is formed when a spit connects the mainland coast to an island. A spit is a feature that is formed through deposition of material at coastlines. The process of longshore drift occurs and this moves material along the coastline.

Material is pushed up onto beaches at an angle when the swash brings it onto the coastline at a 45 degree angle. The backwash takes it back out towards the sea at a right angle to the coast. Through this process material is constantly moved along the coastline. When the coastline changes direction or there is a river estuary the process of longshore drift continues. This causes material to be deposited in a long thin strip that is not attached to the coast and is known as a spit. If this feature moves in the direction of island and connects it to the mainland then it becomes a tombolo.

Test your self questions:

- 1) Explain the processes that form spits, bars and tombolos.*
- 2) Be able to identify the landforms in photos and sketches.*

Coasts 1.3.6 Coastal landscape development - deposition: sand dunes.



<p>Description (what does it look like, plant names)</p>	<p>Small deposits of sand that have joined together. Very little vegetation, except pioneer species such as sea rocket.</p>	<p>2) As the sand becomes more stable larger foredunes will be formed. Plants such as marram grass (Figure 2) start to colonise these dunes. Height: taller. pH: more acidic Humus content: increases.</p>	<p>The darker, richer soils with a higher organic content account for the name grey dunes. Almost completely covered by vegetation, these dunes are more stable and are sometimes called fixed dunes.</p>	<p>A waterlogged area, called a dune slack, will form here with a completely different range of plants and animals, such as orchids and creeping willow. Semi-aquatic animals such as frogs may be found here.</p>	<p>5) After a few hundred years, shrubs and trees will become established on the sand dunes. At this point, the vegetation succession is said to have reached its climatic climax. In the UK typical trees would be oaks or pines.</p>
<p>Explanation (what is happening /how has it formed?)</p>	<p>Sand builds up on the sheltered side of an obstacle such as a rock or drift wood. Very harsh conditions so plants can't grow easily.</p>	<p>Marram grass is extremely well suited to sand dunes. Its long roots seek fresh water deep below the surface and its tough stems help to bind the sand together. Marram grass is folded to reduce transpiration in windy areas.</p> <p>-----</p> <p><i>Test your self questions:</i></p> <ul style="list-style-type: none"> 1) Describe how the appearance and characteristics of sand dunes change as they progress. 2) Explain the role of plants in trapping sand and adding nutrients at each stage. <p>-----</p>	<p>Dead plants add nutrients to the soil and the environmental conditions become less extreme. New species of vegetation, such as gorse and brambles start to grow forming a range of habitats for butterflies and insects, birds (e.g. the ringed plover) and small animals (e.g. rabbits and stoats).</p>	<p>Strong winds and trampling by humans can cause hollows or depressions to form in places. These are called 'blowouts'. Occasionally the base of the hollow may reach the water table.</p>	<p>-----</p> <p><i>Test your self questions:</i></p> <ul style="list-style-type: none"> 1) Explain the 3 requirements for sand dune formation. (in your folders) 2) Describe what a sand dune looks like at each stage. Can you include height, vegetation cover and types of vegetation. 3) Explain how and why the sand dune develops the way it does in each stage.

Coasts 1.3.7 Coastal management: traditional approaches to coastal flood and erosion - hard engineering.

Groynes

Wooden or concrete fences built at right angles to the shore. They trap the sand and shingle moved by longshore drift, which forms beaches and protects against erosion. If a wide and deep beach can be retained, there is less chance of waves reaching and eroding the cliffs behind.

Building groynes

A wooden barrier built at right angles to the beach.



Hopton Sea Wall, Norfolk

Advantages

Prevents the movement of beach material along the coast by longshore drift.

Allows the build up of a beach. Beaches are a natural defence against erosion and an attraction for tourists.

Disadvantages

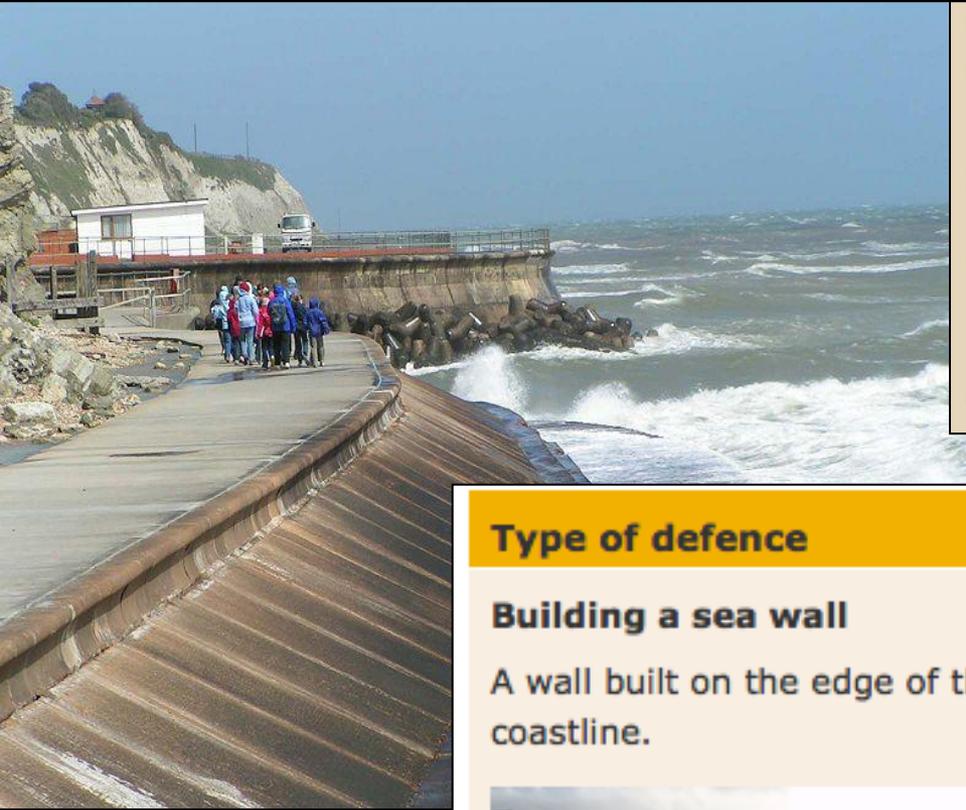
Can be seen as unattractive.

Costly to build and maintain.



Groynes interfere with the movement of coastal sediments. By trapping sand and shingle, groynes may starve beaches further down the coast of sediment and accelerate erosion there. They are intrusive and look unsightly.

Coasts 1.3.7 Coastal mangement: traditional approaches to coastal flood and erosion - hard engineering.



Concrete walls or rock structures built along a stretch of coastline and designed to stop erosion and floods. Sea walls reflect waves, and give complete protection against erosion.

Sea walls are expensive to build (£1 million per km). Reflecting waves leads to scouring at the foot of the wall; without constant maintenance, sea walls can be undermined and collapse. By stopping erosion, sea walls reduce inputs of beach-building sediments (sand and shingle) to the coast.

Type of defence

Building a sea wall

A wall built on the edge of the coastline.



Waves in Porthleven during a storm

Pros and cons

Advantages

Protects the base of cliffs, land and buildings against erosion. Can prevent coastal flooding in some areas.

Disadvantages

Expensive to build. Curved sea walls reflect the energy of the waves back to the sea. This means that the waves remain powerful. Over time the wall may begin to erode. The cost of maintenance is high.

Coasts 1.3.7 Coastal management: traditional approaches to coastal flood and erosion - hard engineering.

Armour blocks
Boulders or concrete blocks placed at the foot of cliffs or at the base of sea walls. These absorb wave energy and have less impact on the environment than most other hard engineering structures.

Rock armour or boulder barriers
Large boulders are piled up on the beach.



A boulder barrier in Nice, France

Advantages
Absorb the energy of waves.
Allows the build up of a beach.

Disadvantages
Can be expensive to obtain and transport the boulders.

- *Test your self questions:*
- ▮ *For each type of hard engineering sea defence you need to be able to:*
- *-describe it and explain how it works.*
- ▮ *- give 2 advantages and 2 disadvantages.*
- *Higher: which are the best things about them, which are the worst things about them?*
- ▮ *Higher: link to future sea level rise.*

Offshore Reefs
offshore concrete walls that break incoming waves out at sea so that their erosive power is reduced to next to none when they reach the coast. Breakwaters are effective but they can be easily destroyed during a storm and they don't look particularly nice.

Nourishes the beach, protects the coast from further erosion.
Waves break further offshore and therefore reduces their erosive power

- May be removed by heavy storms and difficult to install
- Expensive to install.
- Prevents the process of longshore drift, starving beach further along coast.

Coasts 1.3.7 Coastal management: traditional approaches to coastal flood and erosion – hard engineering.

<u>Types of management</u>	<u>Advantages</u>	<u>Disadvantages</u>
Gabions Gabions are quite simply bundles of rocks in a metal mesh. They're placed at the base of a cliff in an attempt to reduce the impact of waves on the cliff and prevent the cliff from being undercut. They're not particularly effective and they're quite unsightly but they're sure as hell cheap.	Cost effective as the wire mesh is relatively cheap in comparison to many other sea defences. Rocks can be locally transported from quarries and builder merchants, reducing cost.	– Low habitat value as it restricts and prevents plant growth and doesn't function as a good habitat for animals. – Many people find them unsightly. – Don't offer long term protection and poses safety risk to those trying to access the beach.

Test your self questions:
For each type of hard and soft engineering sea defence you need to be able to:
- describe it and explain how it works.
- give 2 advantages and 2 disadvantages.

What are the overall advantages and disadvantages of soft engineering?

Coasts 1.3.8 Coastal management: traditional approaches to coastal flood and erosion – soft engineering.

Beach replenishment/renewal

Beaches absorb wave energy (energy is spent moving sand and shingle up, down and along beaches). A wide beach is the best defence against coastal erosion. Sand and shingle can be added artificially to beaches to protect the coastline against erosion and/or flooding. Beach replenishment also maintains beaches for tourism.



1. Beach management

- ✚ This **replaces** beach or cliff material that has been removed by erosion or longshore drift.
- ✚ The main advantage is that beaches are a **natural defence** against erosion and coastal flooding. Beaches also attract **tourists**.
- ✚ It is a relatively inexpensive option but requires constant **maintenance** to replace the beach material as it is washed away.

Coasts 1.3.8 Coastal management: traditional approaches to coastal flood and erosion –

'Do nothing' and managed realignment

It is too costly to build and maintain hard structures to defend the UK's entire coastline. Moreover, the costs of coastal defence will increase in future due to climate change and rising sea levels. This means that maintaining the UK's hard coastal defences is unsustainable. Where the value of threatened property is relatively low, erosion may be allowed to continue.

'Do nothing' is a controversial policy. It allows natural processes, such as the movement of sand and shingle, to operate, and it is sustainable. But people may lose their property without compensation.

Managed realignment allows some stretches of coastline to be flooded, either by letting the sea breach flood embankments or by dismantling sea defences. This has already happened in parts of Essex and Lincolnshire. A new, sustainable coastline is established further inland. Managed realignment may result in loss of farmland, but flooded land becomes new salt marsh and mudflat – important habitats for wildlife.

2. Managed retreat

- ☛ Areas of the coast are allowed to **erode and flood** naturally. Usually this will be areas considered to be of **low value** - eg places not being used for housing or farmland.
- ☛ The advantages are that it encourages the development of **beaches** (a natural defence) and **salt marshes** (important for the environment) and cost is low.
- ☛ Managed retreat is a cheap option, but people will need to be **compensated** for loss of buildings and farmland.

Impact of 'do nothing' and managed realignment

We have seen that the lack of hard defences at Happisburgh has led to dramatic increases in erosion since 1990 (see Photograph 2.7). In response to this situation a local pressure group – Coastal Concern Action Group (CCAG) – was formed to lobby North Norfolk District Council and the government to repair the sea defences. However, there is no legal obligation on the government to compensate people who lose their land, businesses and homes through coastal erosion.



Coasts 1.3.8 Coastal management: traditional approaches to coastal flood and erosion – soft engineering.

<u>Types of management</u>	<u>Advantages</u>	<u>Disadvantages</u>
<p>Sand dune regeneration is often used to help protect and rebuild dunes. Sand dunes act as a good barrier against coastal flooding and erosion and they can be exploited as a natural defence against the sea. In order to do so though, the dunes must be left relatively undisturbed so boardwalks are constructed and sections of sand dune systems are marked as out of bounds to the general public in order to reduce the erosion of the dunes by humans.</p>	<p>Cheap to maintain Erosion and absorption prevented through absorption of wave energy.</p> <p>Cheap to create</p> <p>Provides a good natural habitat</p>	<p>Sand dunes are no longer accessible for humans</p>
<p>Land use management/zoning Involves identifying land that is likely to be flooded/eroded and where possible allowing it to do so at little economic cost. Eg. Caravan parks that can be moved parks, farmland in area that will occasionally be flooded and then return to farmland.</p> <p>Banning new settlements on some areas of the coastline.</p>	<p>Cheap Sustainable Allows people to make a living of the land</p>	<p>-Have to educate people - People have to agree to it. - Does not prevent erosion/flooding, only reduces the cost of it.</p>

Test your self questions:

For each type of hard and soft engineering sea defence you need to be able to:

-describe it and explain how it works.

- give 2 advantages and 2 disadvantages.

What are the overall advantages and disadvantages of soft engineering?

Coasts 1.3.9 Coastal management Example - Holderness Coast, East Coast England

Why is management needed?

Land is being eroded quicker than anywhere else in the UK.

Physical Reasons

Soft rock - the cliffs are made from boulder clay which is VERY easily eroded.

Narrow beaches - the beaches are very narrow meaning the waves lose little energy and therefore erode the cliffs powerfully.

Large fetch - the North sea generates violent storms with big waves.

Human reasons

Towns - there are many towns and settlements which could be eroded there would be massive social and economic impacts if these were eroded.

Tourism - the area has many campervan parks and is a holiday attraction so this business needs to be protected.

Infrastructure - there are important roads which link towns which are under threat.

Gas terminal - there is a gas terminal at which provides 25% of the UK's gas.

TEST YOURSELF!!! Can you:

- Describe and explain the physical and human reasons it needs protecting.
- Describe and explain the methods used to protect it.
- Evaluate - explain the good and bad outcomes of the coastal management. Was it good/bad overall?

How has it been managed?

Mableton

Rock armour - 61,000 tonnes of rock placed at base of cliffs to absorb wave power.

Rock groyne - stopped LSD, built up beach and reduced wave power.

Hornsea

Sea wall - absorbs and reflects power of waves

Withernsea

Sea wall/rock armour/groynes (see above)

Has the management been successful?

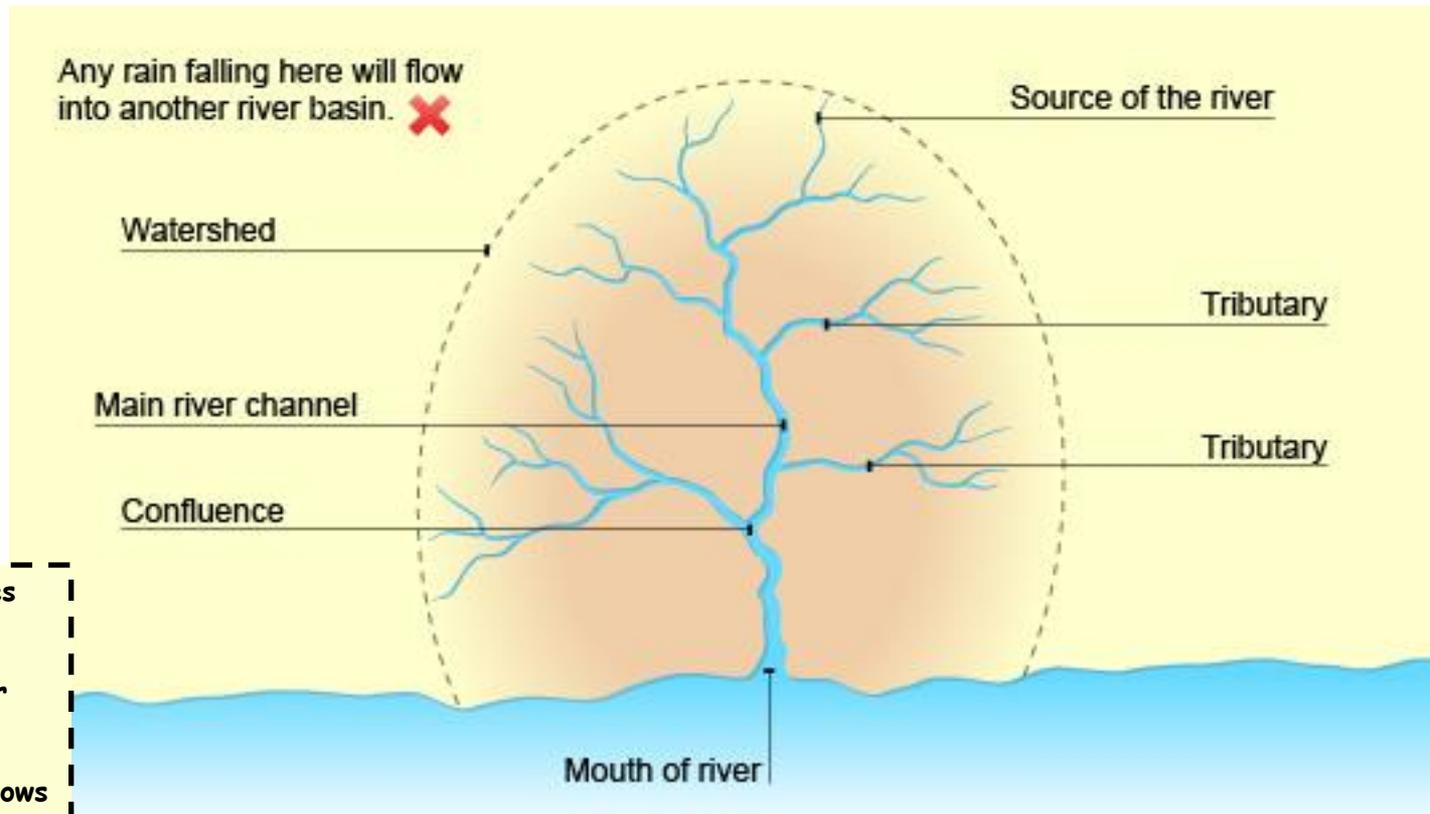
☺	☹
Major towns have been protected saving homes, businesses and infrastructure from destruction	Mableton defences cost £2m alone
	Groynes have caused more erosion further down the coast because they have trapped sand and made the beaches narrower
	Spurn Head, a nature reserve spit downstream is being eroded.
	Bays are being created in between towns

River Environments



Rivers - 1.4.1 River processes produce distinctive landforms a Drainage basin

terms: watershed, confluence, tributary, source and mouth. D



- Watershed - highland which divides two drainage basins .
- Source - the point where the river begins.
- Tributary - a small stream that flows into the main river channel.
- Confluence - the point where two rivers meet.
- Mouth - the end of the river where it flows into the sea.
- Main river channel - the landform which the river flows through.

TEST YOURSELF!!! Can you:

- Draw and label the drainage basin features from memory.
- Define all the drainage basin features.

Rivers - 1.4.2 The impact of weathering, erosion and mass movement on river landscapes.

Erosion - the wearing away of rock and soil on the river bed and banks and the breaking down of rock particles being carried downstream. There are four main types:

- 1) **Hydraulic action** - the force of the river hitting the bed and banks. Air gets trapped in cracks and the pressure forces the banks to wear away.
- 2) **Abrasion** - particles carried in the river scrape against the bed and banks.
- 3) **Attrition** - particles carried in the river crash into each other and break into smaller ones.
- 4) **Solution** - soluble particles are dissolved in the river.

Mass movement - the movement of rock/soil under the influence of gravity.

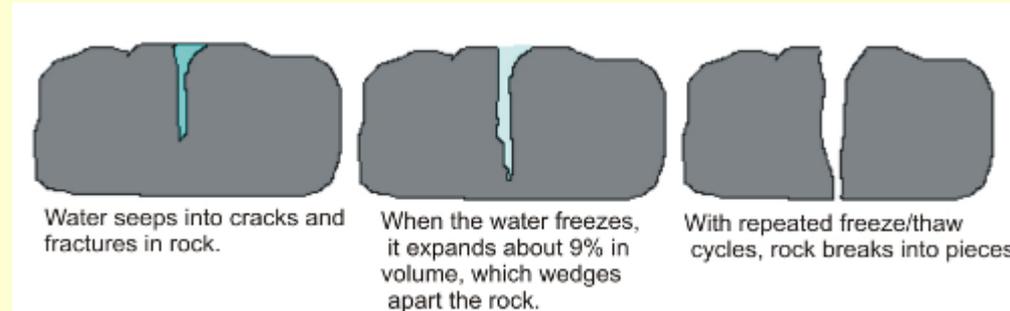
There are 2 main types that occur in river landscapes:

- 1) **Slumping** - river banks slump due to undercutting at their base by the river. Heavy rainfall acts as a lubricant meaning they move downhill in a rotational manner.
- 2) **Soil creep** - the slow downhill movement of soil due to gravity and normally caused by wetting/drying or freezing/thawing.

Weathering - the break down of rocks in situ.

There are 3 main types:

1) **Physical (Freeze thaw)** -



2) **Chemical - Acid rain.**

- Carbon dioxide and water in the air mix to form carbonic acid.
- When this forms as rain it dissolves soluble rock such as limestone as it passes through cracks in the rock.

3) **Biological** - plant roots and animal burrowing can cause cracks to get larger in rocks and soil.

TRANSPORT = see the 4 types of coastal transport – suspension, solution, saltation, traction.

TEST YOURSELF!!! Can you:

- Define erosion/mass movement/ weathering.
- Explain the 4 types of erosion.
- Explain the 2 types of weathering.
- Explain the 2 types of mass movement.

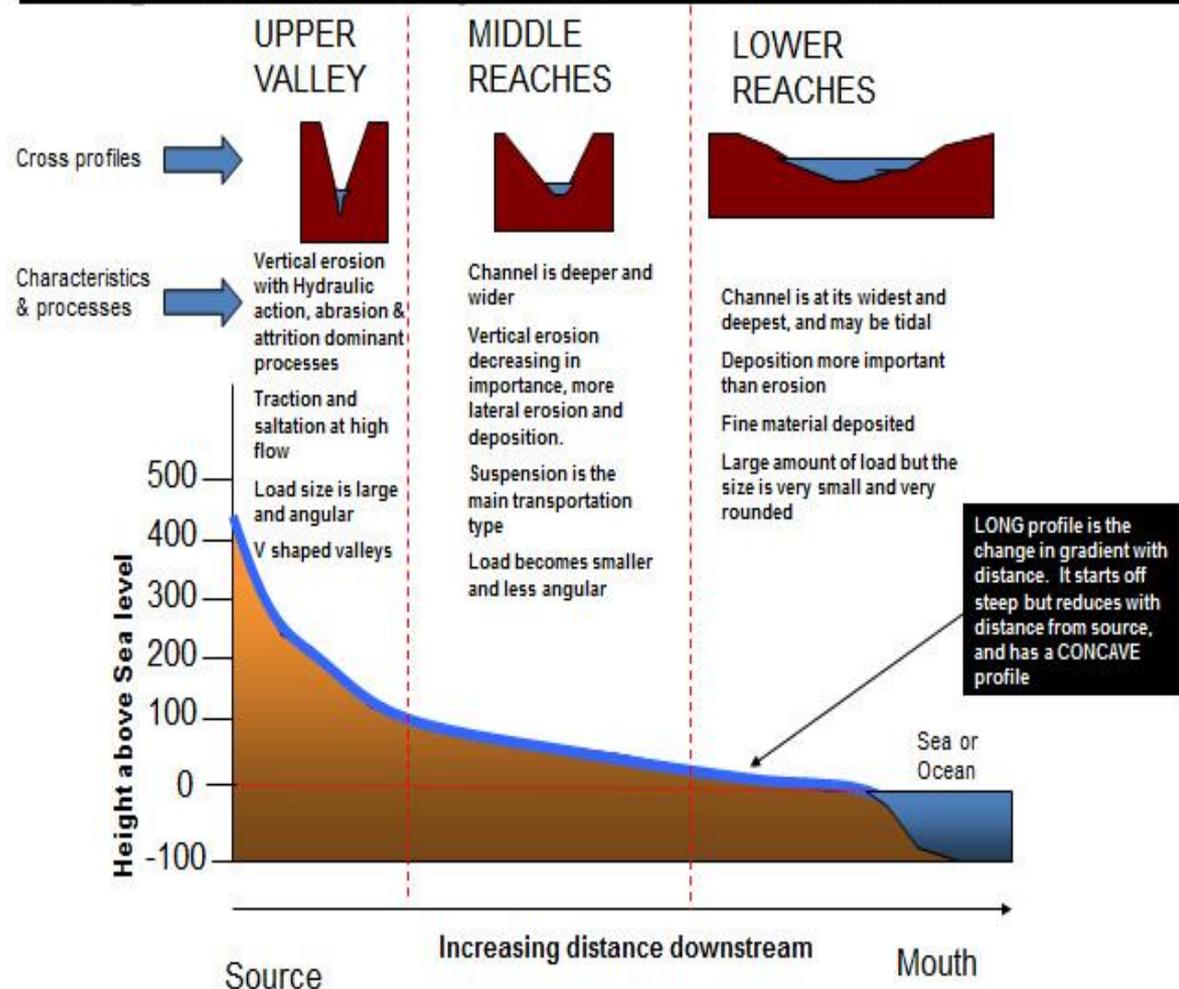
Rivers - 1.4.3 Change in river cross and long profiles.

Characteristic	Definition	Change downstream	Explanation
Velocity	Speed of the river	Increase	The river channel becomes smoother downstream therefore there is less friction.
Discharge	Amount of water in the river	Increase	The drainage basin becomes bigger as a river flows downstream and there are more tributaries.
Gradient	The steepness of the land	Decreases	The land becomes flatter as the river flows towards the sea.
Width	Distance between the two river banks	Increases	Lateral erosion makes the river wider as you move downstream
Depth	Distance between river surface and bed.	Increases	Vertical erosion makes the river deeper as you move downstream.

TEST YOURSELF!!! Can you:

- Describe/explain how the long profile (gradient and load size) changes down stream
- Describe and explain how the cross profile - width, depth, CSA, discharge - change downstream
- Define vertical and lateral erosion

Long and cross profiles on a TYPICAL river

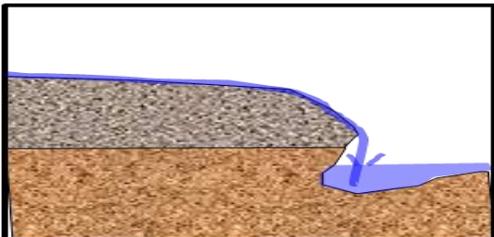


Rivers - 1.4.4 Landforms of erosion - waterfalls and gorges.



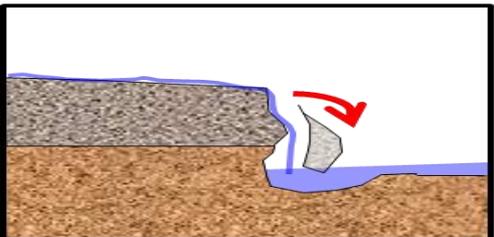
Stage 1

They occur where hard rock overlies softer rock.



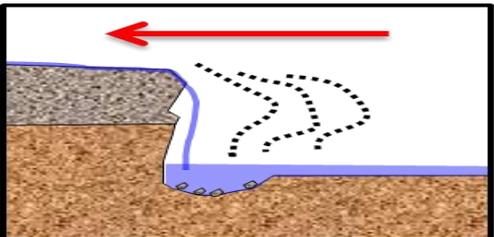
Stage 2

Erosion such as hydraulic action and abrasion erode the softer rock more quickly than the hard rock. This creates a plunge pool beneath.



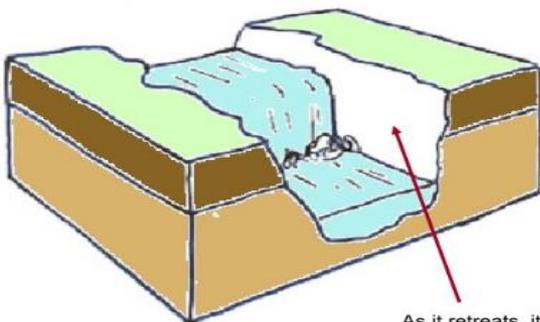
Stage 3

As the soft rock is eroded quicker an overhang is formed. The overhang made of hard rock then collapses under gravity. This collapsed rock helps to erode the soft rock further by abrasion.



Stage 4

This process repeats and the waterfall repeats upstream overtime forming a long, narrow, steep sided gorge..

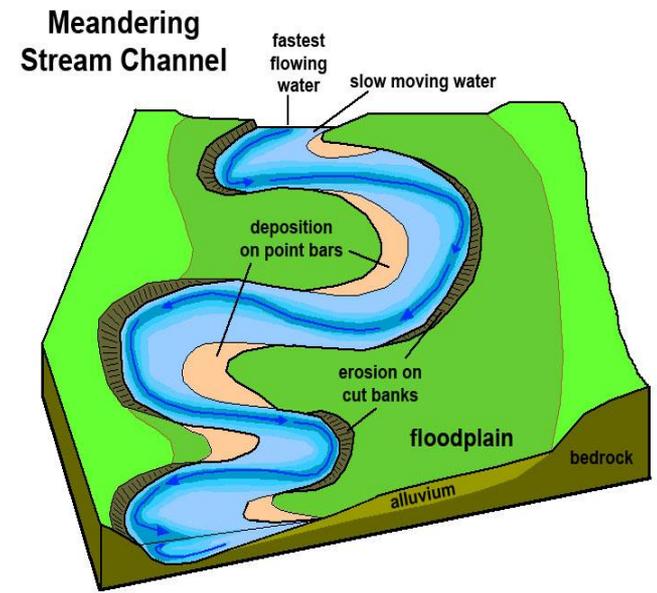
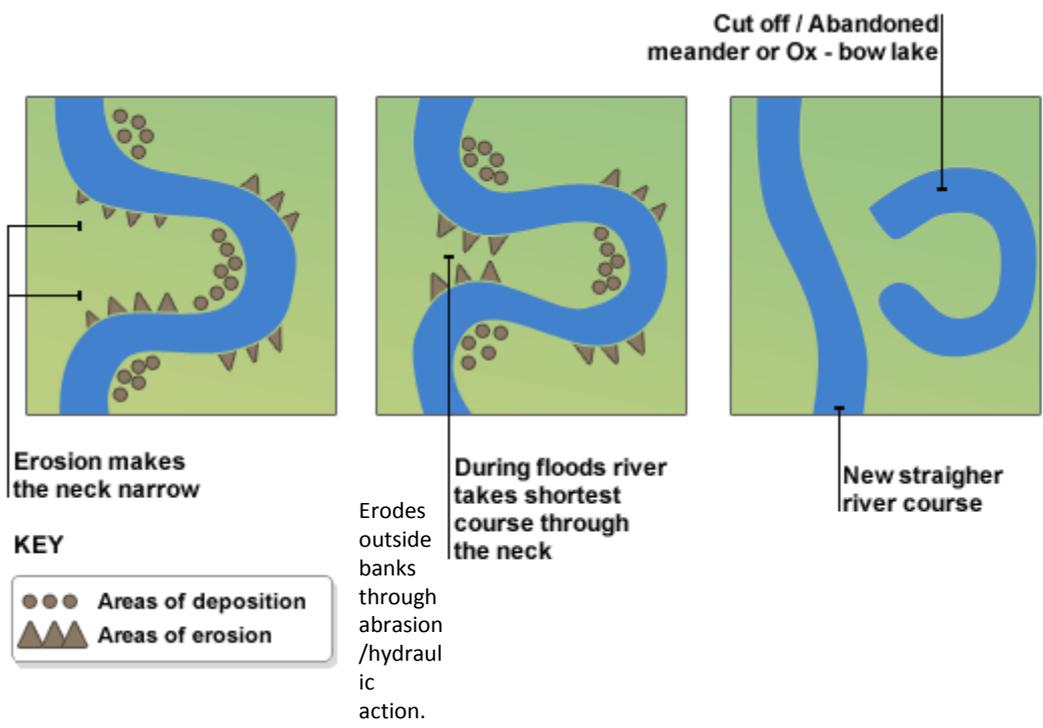


As it retreats, it leaves behind a steep sided **gorge**.

TEST YOURSELF!!! Can you:

- Explain how waterfalls are formed including processes (eg types of erosion) and landforms (eg. Plunge pool).
- including processes and landforms produce a sequence of 3 annotated diagrams to show how waterfalls are formed.

Rivers - 1.4.4 Landforms of erosion/deposition - meanders and oxbow lakes.

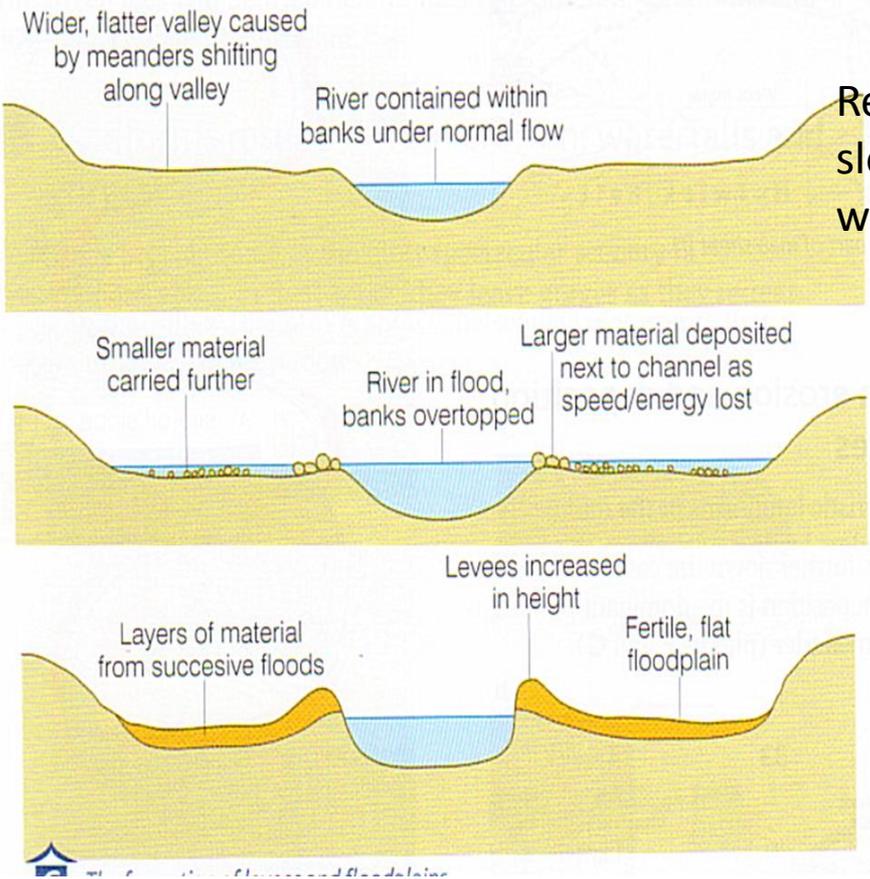


TEST YOURSELF!!! Can you:

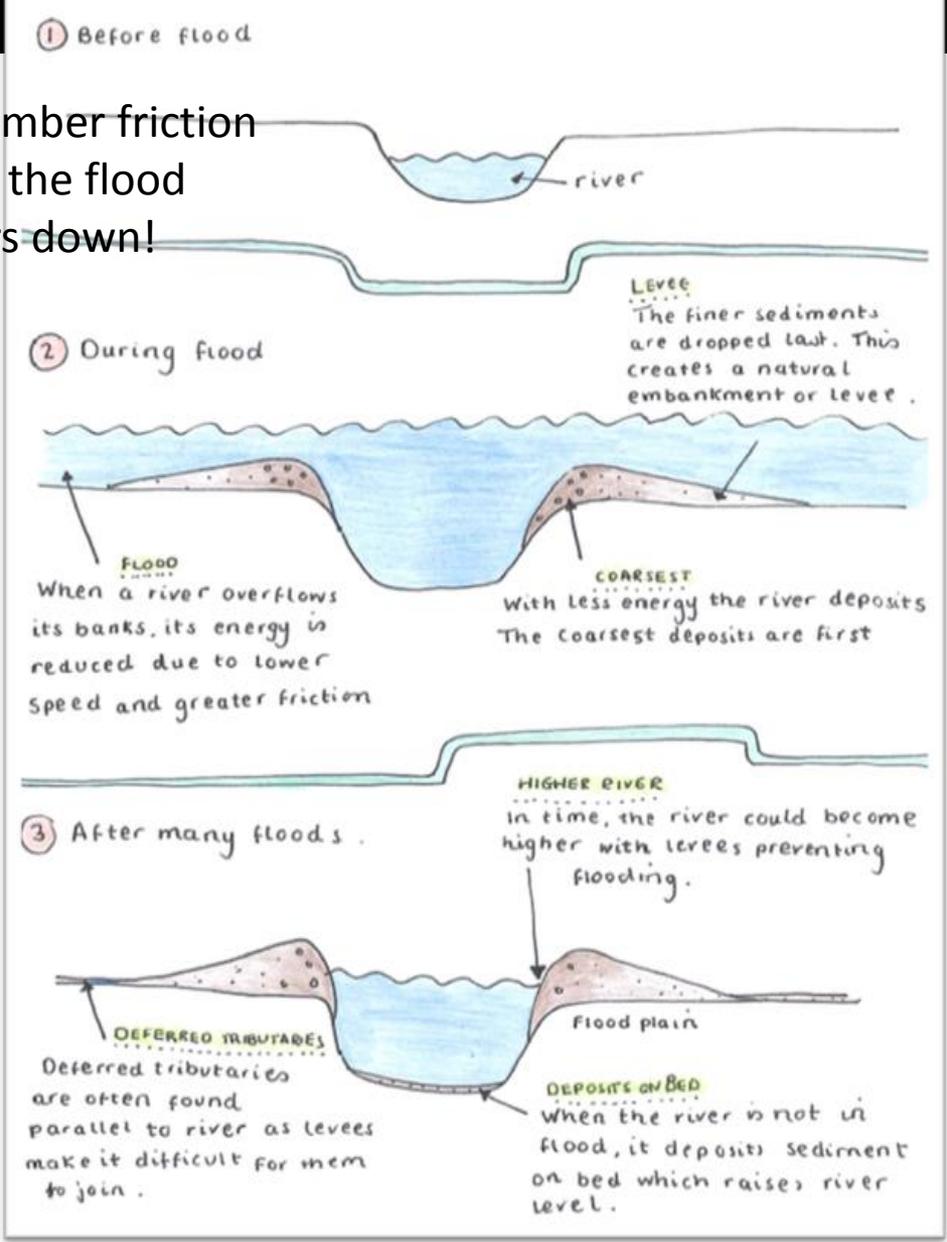
- Explain how meanders are formed including processes (eg types of erosion) and landforms (eg Slip off slope).
- Explain how ox-bow lakes are formed including processes and landforms.
- produce a sequence of 3 annotated diagrams to show how meanders and ox-bow lakes are formed.

Water flows faster on outside of meander bend because it has further to travel and erodes the river through hydraulic action and abrasion. This creates a river cliff as the outside bend is undercut, which collapses and the meander migrates across the floodplain. Water moves slower on the inside bend and therefore deposition occurs. This forms a slip off slope. Helicoidal flow moves material from one outside bend to a slip off slope at the next meander. Over time the meander migrates across the floodplain as erosion occurs on the outside bend and deposition on the inside.

Rivers - 1.4.5 Landforms of deposition - levees and floodplains. and human



Remember friction slows the flood waters down!



TEST YOURSELF!!! Can you:

- Explain how floodplains are formed including processes and landforms.
- Explain how levees are formed including processes and landforms.
- produce a sequence of 3 annotated diagrams to show how levees and floodplains are formed.

Rivers - 1.4.6 Physical causes of flooding

Cause of river flooding	Description/definition (if applicable)	Explanation
Prolonged rainfall		Long periods of rainfall saturate the soil so water reaches the river more quickly.
Impermeable rock	Rock which water cannot infiltrate/be absorbed into.	Water is not absorbed or stored in rock so moves into the river more quickly.
Steep slopes	V-shaped valleys	Steep slopes means less water is absorbed into the soil and runs over the land to the river quickly.
Snowmelt		Snowmelt in mountainous areas in spring/summer means a lot of water reaches the river very quickly. Also frozen land is impermeable (See above).
Cloudburst/thunders torm	Heavy, intense rainfall.	So much water falls in a short period of time meaning not all of it is absorbed and flows to the river quickly.



TEST YOURSELF!!! Can you:
 Explain how 4 of the above cause flooding, use key terms such as saturated, absorbed etc

Rivers - 1.4.7 The human causes of river flooding.

Cause of river flooding	Description/definition (if applicable)	Explanation
Land use - Deforestation	Removal of trees.	Removing vegetation means less water is intercepted or absorbed by trees. Water therefore flows over the land to the river more quickly.
Land use - Urbanisation	Building urban areas.	Concrete surfaces are impermeable and so water flows into drainage systems and makes it way to the river more quickly.
Land use - Ploughing up slope	Farming methods	Ploughing upslope as opposed to across the slope creates furrows (Channels) which water can flow through and reach the river more quickly.



TEST YOURSELF!!! Can you:

- Explain how 4 of the above cause flooding, use key terms such as saturated, absorbed etc remember to say it reaches the river more quickly.

7 Impacts of flooding on humans and the environment using various examples.

Impacts of flooding on **humans**:

- Floods in **China** in September 2011 killed over 250 people.
- Flooding in **Mozambique** (SE, Africa) in 2007 made 150,000 people homeless
- 16 bridges and 25 bridges were included in the **damage to infrastructure** during the 2009 Cumbria, UK floods.
- Damages to **wheat crops** in Pakistan 2010 floods was over US\$500 million.

Impacts of flooding on the **environment**:

- 455 landslides were reported in Japan during the 2011 floods.
- The unprecedented Pakistan floods of 2010 left 20% of Pakistan's land underwater. 10 million people were forced to drink unsafe water causing widespread disease.



TEST YOURSELF!!! Can you:

- Describe and explain the social, environmental and economic impacts of flooding
- DON'T worry about evidence. .

Rivers - 1.4.8 The types of hard and soft engineering used to control rivers in the UK and the advantages and disadvantages of these techniques

Hard engineering = Methods which involve physical structures being introduced to prevent flooding e.g. a dam or embankments

Soft engineering = Methods which try to fit in with natural river processes and protect habitats. They involve altering the environment to reduce flooding they but are less intrusive and do not effect the environment so much e.g. Land use zoning or afforestation.

Hard Engineering

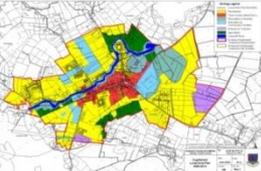
Photo	Method Hard	Description	Explanation Increase capacity or reduce water.	Advantages	Disadvantages
	Embankments	Raising river banks along river.	Increases amount of water the river can hold.	<ul style="list-style-type: none"> • Used as path. • Stops bank erosion. • Earth embankments provide habitat. 	<ul style="list-style-type: none"> • Concrete is ugly and unnatural.
	Flood walls	Barriers made from concrete at the side of the river.	Increase capacity.	<ul style="list-style-type: none"> • Used where there is limited space. • Easy and quick to construct. 	<ul style="list-style-type: none"> • Have to be assembled well so water doesn't come through.

Photo	Method Hard	Description	Explanation	Advantages	Disadvantages
	Channelisation	1) Widening or deepening river channel. 2) Straightening river channel.	1) Increases how much water the river can hold. 2) Increases velocity so water moves further down the river.	<ul style="list-style-type: none"> Protects immediate area. Long lasting. 	<ul style="list-style-type: none"> Greater risk of flooding downstream. Unnatural - destroys river ecosystem. Visually ugly.
	Flood relief channels	Adding another channel to the river so flood water avoids settlements.	Increases the amount of water the river can hold.	<ul style="list-style-type: none"> Provides safety for people in immediate area. Can be used for sport. 	<ul style="list-style-type: none"> Large amount of land needed. Extremely expensive.
	Dams	Large walls built across rivers which hold back the water.	Control the discharge of the river during flood times.	<ul style="list-style-type: none"> Generate hydroelectric power and used for recreation. Very effective. 	<ul style="list-style-type: none"> Expensive Large areas of land flooded behind including settlements and farmland. Sediment is trapped in the dam.

TEST YOURSELF!!! Can you:

- Define hard and soft engineering.
- List some general positives and negatives of both hard and soft engineering.
- explain how 2 methods of hard and soft engineering work and their strengths and weaknesses.
- explain how 4 methods of both and soft engineering work and their strengths and weaknesses.
- explain how all methods of hard and soft engineering work and their strengths and weaknesses.

Rivers - 1.4.9 The types of hard and soft engineering used to control rivers in the UK and the advantages and disadvantages of these techniques

Photo	Method Soft	Description	Explanation Increase capacity or reduce water.	Advantages	Disadvantages
	Afforestation Soft	Planting trees in the river drainage basin.	Reduce water reaching the river. Planting trees reduces the amount of water reaching the river because they intercept and absorb rainfall. Moreover trees reduce precipitation.	<ul style="list-style-type: none"> • Low cost • Improves environment • Less soil erosion • Sustainable 	<ul style="list-style-type: none"> • Dense tree planting can reduce natural look. • Increases fire risk during dry spells..
	Flood plain zoning	Government produce policies to control urban development close to or on the floodplain.	Controls land use around rivers. Less valuable land is placed close to the river (eg. Parks/football pitches) More valuable land ~(homes and businesses) are further away from rivers to reduce costs of flooding should it occur.	<ul style="list-style-type: none"> • Cheap • Sustainable - reduces damage • Less surface run off 	<ul style="list-style-type: none"> • Housing shortages require building on floodplains. • Harder to do in LICs.
	Warning system	Sirens can give people early warnings (LICs). Env Agency uses TV/radio/internet to keep people informed.	People can prepare their homes/businesses for flooding should it happen and reduce costs.	<ul style="list-style-type: none"> • Cheap • Effective way of informing people. • Valuables can be made safe. 	<ul style="list-style-type: none"> • Not enough time to prepare sometimes.
	Washlands	River floods naturally in vegetated areas to prevent flooding elsewhere.	Reduces water reaching the river/ allows less valuable land to flood.	<ul style="list-style-type: none"> • Cost effective • Provides habitats for birds • Sediment enriches soil. 	<ul style="list-style-type: none"> • Land cannot be built on. • Farmland can be wasted.

Rivers - 1.4.10 River management Example - River Valency, Boscastle, Cornwall,

Why is management needed?

In 2004 the small village was destroyed by a flood which then negatively impacted its tourism trade.

Physical reasons it floods easily are:

- 1) **Steep V-shaped valleys** = water has less time to infiltrate and be absorbed into the soil, therefore it flows to the river over the surface, causing the river to fill up more quickly.
- 2) **Impermeable rock** - the surrounding rock is impermeable so water cannot be absorbed into it. Therefore water flows quickly over the surface, causing the river to fill up more quickly.
- 3) **Location** - Boscastle is located in Cornwall which receives large amounts of rainfall and many storms, meaning soil can be easily saturated.

Human reasons it flooded are:

- 1) **Buildings** - concrete in the village meant water is not absorbed into the soil.
- 2) **Small bridges** - acted like dams meaning material (trees and cars) were trapped behind it, building up the water, which then overflowed sending lots of water into the village.

The village has many shops so if they were destroyed there would be social impacts. Moreover the village relies on tourism for its income. If it were destroyed it would mean people would lose a lot of money.

How has it been managed?

- | **River widened** - this means the river can hold more water, increasing its capacity.
- | **River deepened by 0.75m** - this means the river can hold more water, increasing its capacity.
- | **Lands owners encouraged to plant trees** - to absorb and intercept rain in the catchment area meaning less water reaches the river.
- | **Trees removed from the bank** - means trees are not washed into the river and reduce the capacity of the river.

Has the management been successful?

☺	☹
It has not flooded since	It cost £5m
Provides 1 in 75 year flood protection	It would not prevent flooding from the same storm as 2004
Tourists have returned in high numbers	People lost trade while works were occurring
	The new bridge does not fit in with the Elizabethan feel of the village

TEST YOURSELF!!! Can you:

- Describe and explain the human and physical reasons it needs management
- Describe and explain how it has been protected
- Evaluate the management - explain the good and bad outcomes - overall is it a success?