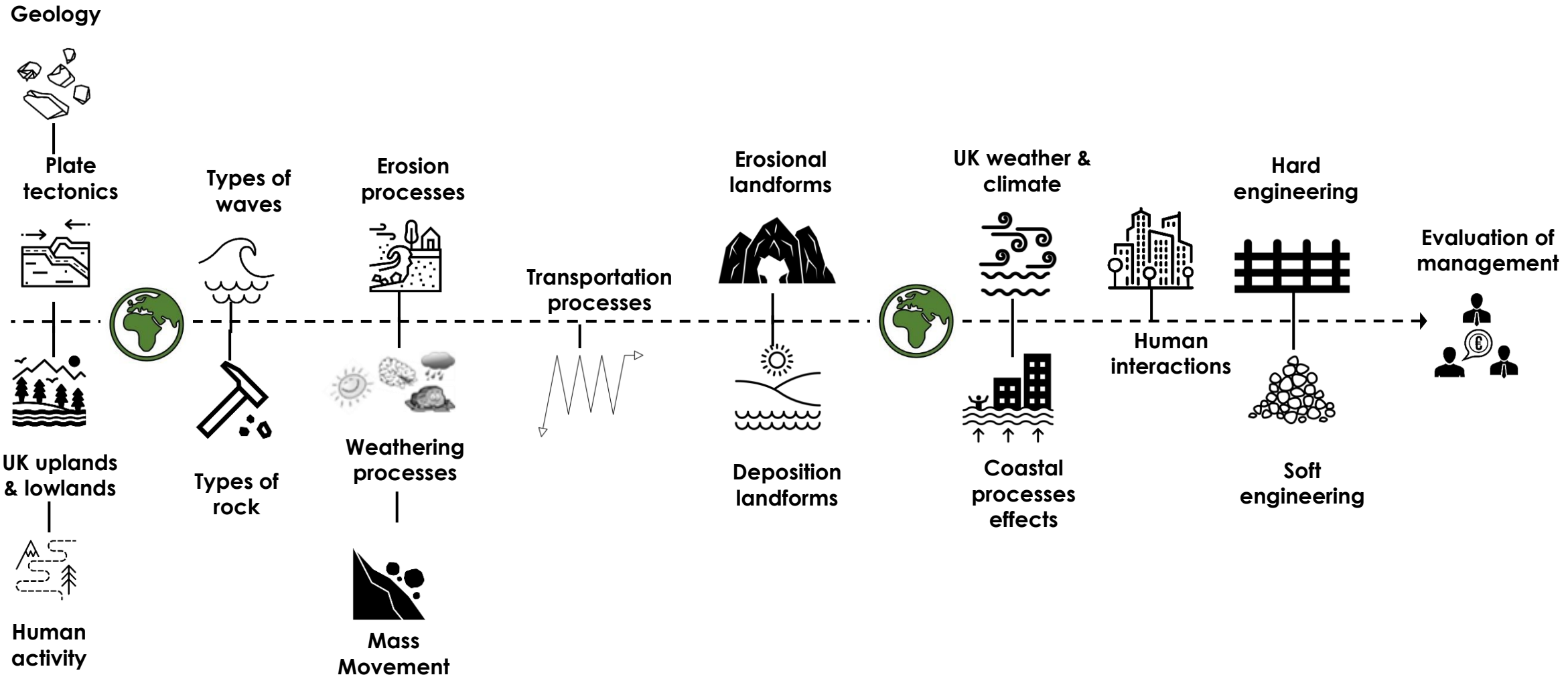
Paper 1 Topic 1 The changing landscape of the UK – Geology and Coasts

UK landscapes overview

Coasts overview



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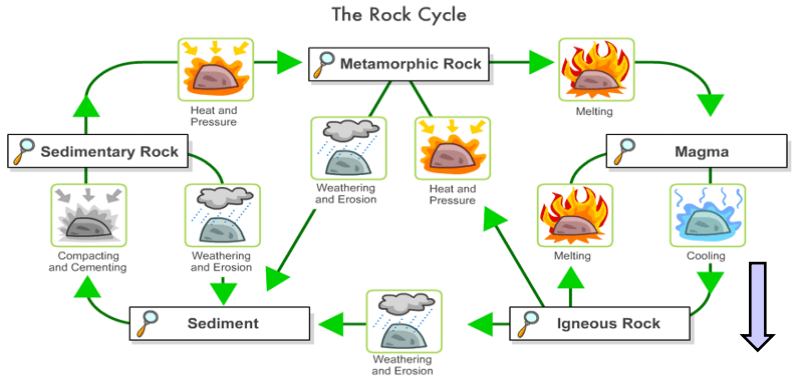
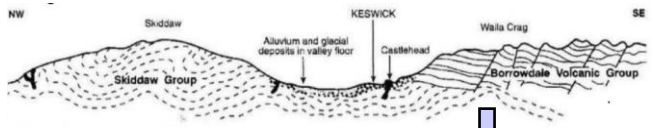
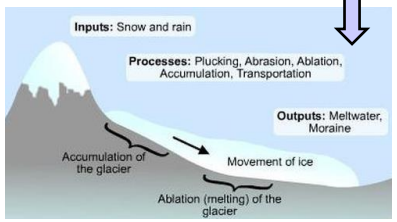
Paper 1 Topic 1 The changing landscape of the UK - Geology



- **Geology = type of underlying rock – igneous, metamorphic, sedimentary**
- **Tectonic processes = movement of the Earth's tectonic plates**
- **Glaciation = process of land or water being covered by glaciers or ice sheets**



Tectonic processes



Glacial processes

Weathering – the breaking down of rock by heat, wind & water

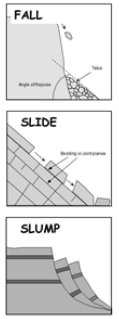
Freeze-thaw

Onion skin

Chemical

Biological

Mass Movement

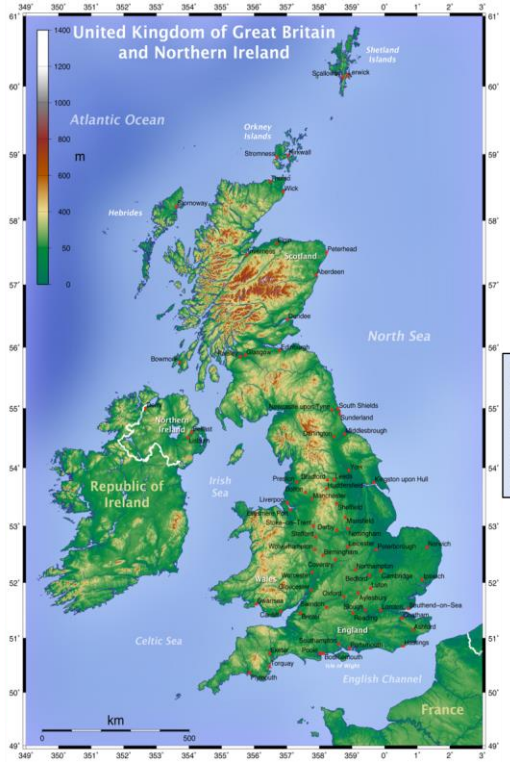


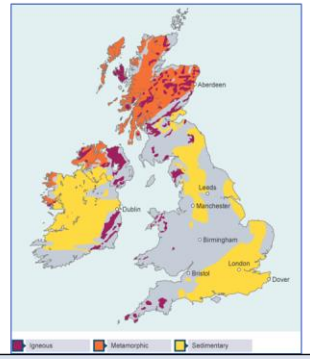
Uplands
Scotland - The Northwest Highlands, the Cairngorm Mountains, the Grampian Mountains and the Southern Uplands. **Ben Nevis** is the UK's highest peak and is found in the Grampian Mountains.

Uplands
England - The Pennines, Lake District, Dartmoor and Exmoor. **Scafell Pike** is the highest mountain in England and is found in the Lake District.

Uplands
Wales - Snowdonia and the Brecon Beacons. **Snowdon** is the highest mountain in Wales and is found in Snowdonia.

Lowland areas
England - around The Wash (East Anglia and Lincolnshire), The Midlands, The London Basin, The Vale of York, **The Fens** in East Anglia - the lowest place in the UK





The UK's main rock types
Rocks can be classified in to three main groups - **igneous**, **metamorphic** and **sedimentary**. These three different rock types can be found in distinct areas of the UK.

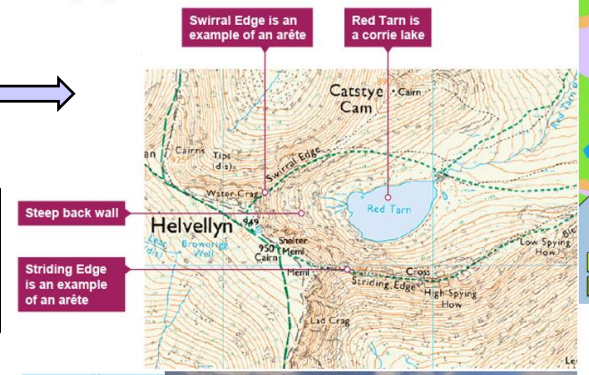
Igneous rocks - these rocks are a result of **tectonic processes** in the past, when Britain was close to a plate boundary.

Metamorphic rocks - these are rocks that have been changed in shape and form by **intense heat and pressure** at a plate boundary or along a fault line.

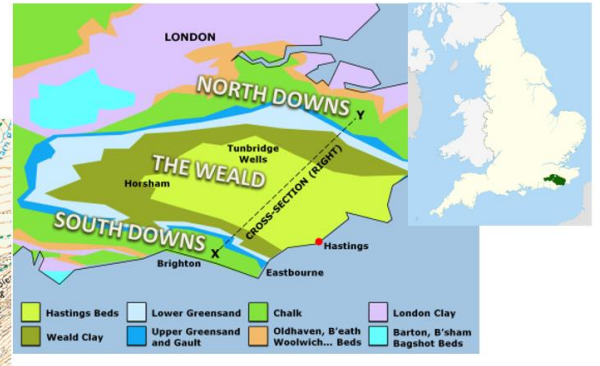
Sedimentary rocks – these are made up of small particles of sand and rock, which have been transported by the **wind, rivers and ice** and are usually deposited on lake or seabed

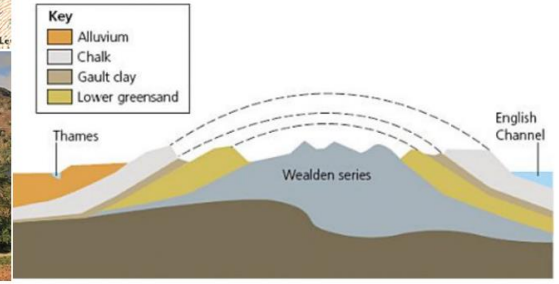
Case Studies: The Lake District & The Weald

Helvellyn stands as one of England's highest mountain, standing at 949 metres above sea level in the Lake District in north-west England. It is made up of **igneous** rocks which were formed 450 million years ago. Many of the landscape features visible around Helvellyn today were formed during the last ice age over 20,000 years ago. Large **glaciers** dominated the landscape and through their erosive power, carved out classic glaciated landforms such as **arêtes**, **corries** and **glacial troughs**. Helvellyn is a mountain, which contains several glacial landforms. Two arêtes ascend to the summit of Helvellyn, Striding edge and Swirral edge. Striding Edge forms the back wall of the Red Tarn corrie.

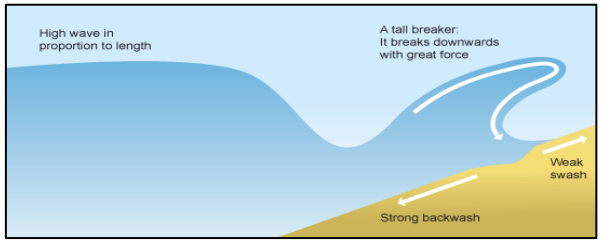


The Weald is an area of upland landscape in lowland southern Britain, in Kent and Sussex. It is about 250m above sea level and was originally an anticline of folded rocks that has been ben exposed to much **weathering**. This weathering has resulted in different layers of strata being exposed, with more resistant rocks such as chalk being exposed as escarpments. This gives a scarp and vale landscape between the North and South Downs.





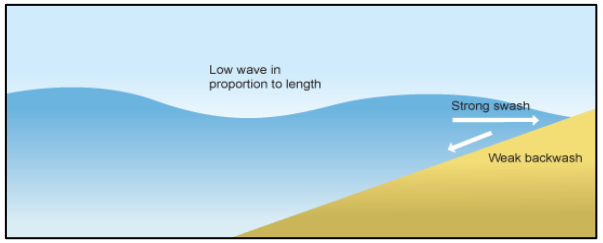
Paper 1 Topic 1The changing landscape of the UK – Coastal processes



Destructive waves

Waves are created by **wind** blowing over the surface of the sea. As the wind blows over the sea, friction is created - producing a **swell** in the water. The energy of the wind causes water particles to rotate inside the swell and this moves the wave forward.
The size and energy of a wave is influenced by:

- how long the wind has been blowing
- the strength of the wind
- how far the wave has travelled (the **fetch**)



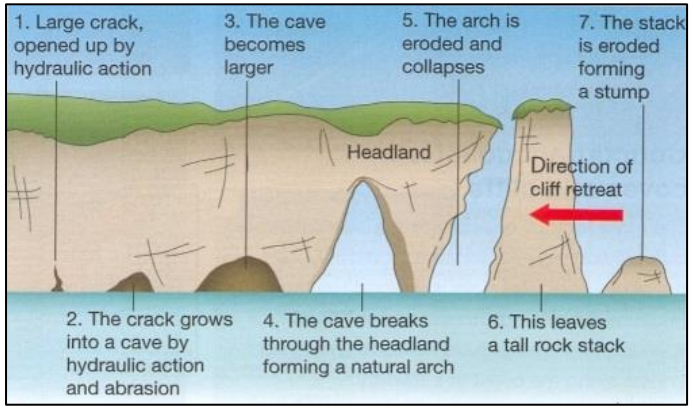
Constructive waves

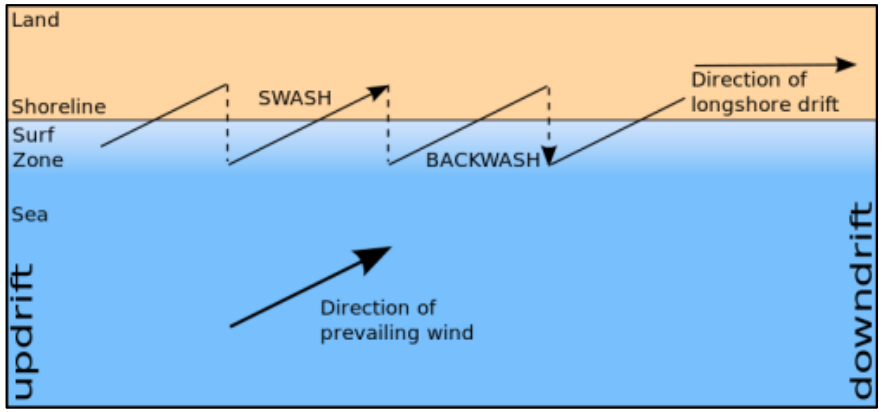
When a wave breaks, water is washed up the beach - this is called the **swash**. Then the water runs back down the beach - this is called the **backwash**. With a constructive wave, the **swash is stronger** than the backwash. With a destructive wave, the **backwash is stronger** than the swash.

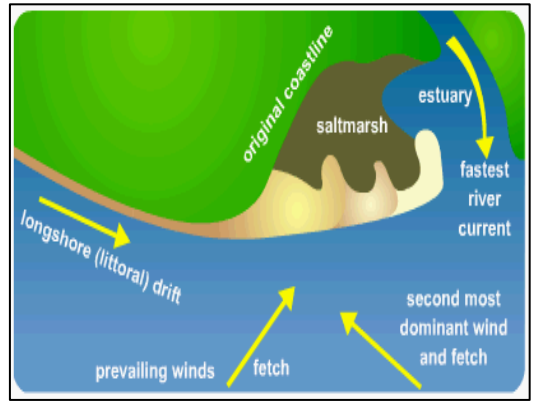
Coastal Processes
Erosion
Hydraulic action
Abrasion
Attrition
Corrosion

Coastal Processes
Transportation – longshore drift
Traction
Saltation
Suspension
Solution

Coastal Processes
Deposition
Heaviest material 1st
Change in coastline

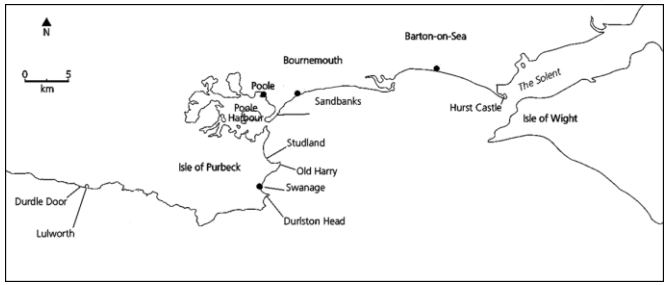




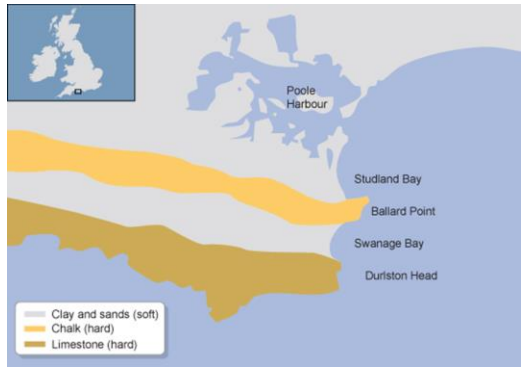


Paper 1 Topic 1 The changing landscape of the UK – Coastal Management

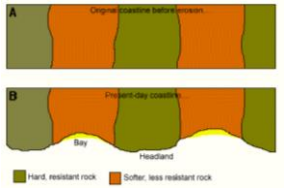
Case Study: Coastal landforms Dorset Coast



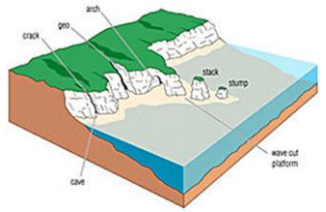
Where: Dorset coast (Jurassic Coast)
Why: Lines of hard and soft rock, **concordant and discordant coastline**, prevailing SW winds
Who: Main urban areas Swanage, Poole, Bournemouth



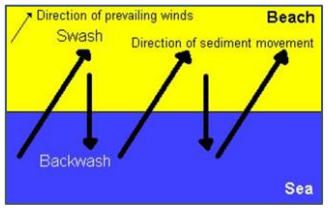
How: **Swanage Bay = discordant coastline -** formed through erosion of soft clay and sands, **headlands** remain of harder limestone and chalk



How: **Old Harrys Rocks** formed through hydraulic action, abrasion and attrition.
Crack → Cave → Arch → Stack → Stump



How: **Sandbanks spit** formed by longshore drift and deposition at estuary at **Poole Harbour**



Main industries: Tourism (Swanage and Jurassic Coast), transportation (Poole Harbour), Oil refinery (Bournemouth)

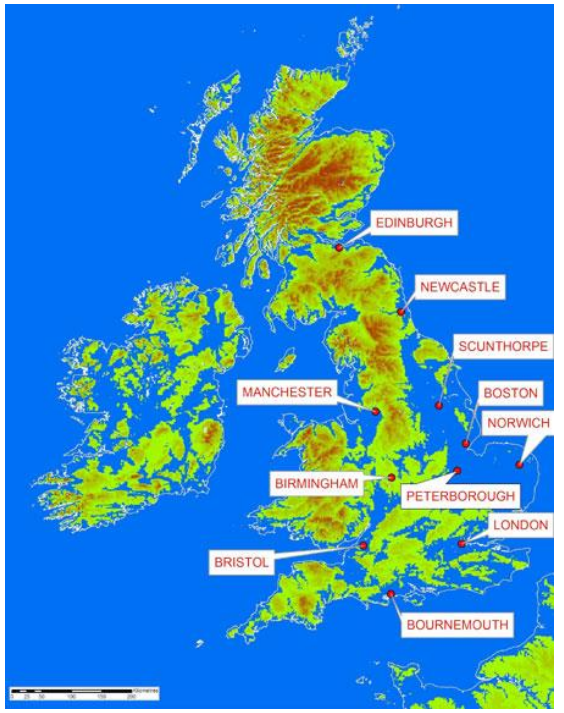
Paper 1 Topic 1 The changing landscape of the UK – Coastal Management

Erosion processes remove land from some parts of the coastline, whereas deposition processes create new land in other places. In addition, the fact that the sea level is rising locally and globally could add to these erosion and deposition problems whilst also removing land from use at the coastline. It is for these reasons that human beings have long sought to control and MANAGE the coastline. However, there is a huge debate as to how to do this - either by using HARD ENGINEERING or SOFT engineering.

Hard engineering

- Sea Wall
- Rip-rap
- Gabions
- Off-shore breakwater
- Groynes

Sea level rise around the UK



Soft engineering

- Beach nourishment
- Dune regeneration
- Salt marsh
- Coastal zoning
- Mangrove swamps (tropical climates)

Shoreline Management Plans (SMP's) use one of 4 options to manage the coast:

- **Advance the line**: move the coastline seaward – expensive
- **Hold the Line**: use of hard or soft engineering methods – expensive but preferred by locals
- **Managed retr**eat: allows coastline to move inland – cheap but causes conflict
- **Do nothing**: allow natural erosion and flooding – cheap but causes great conflict

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Paper 1 Topic 1 The changing landscape of the UK – Rivers

UK landscapes overview

Rivers overview

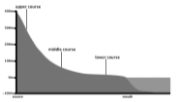
Geology

Erosion processes

Transportation processes

Deposition

Long profile



UK weather & climate

Human interactions

Hard engineering

Evaluation of management

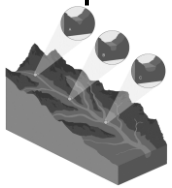
Soft engineering

Upper course landforms

Middle course landforms

Lower course landforms

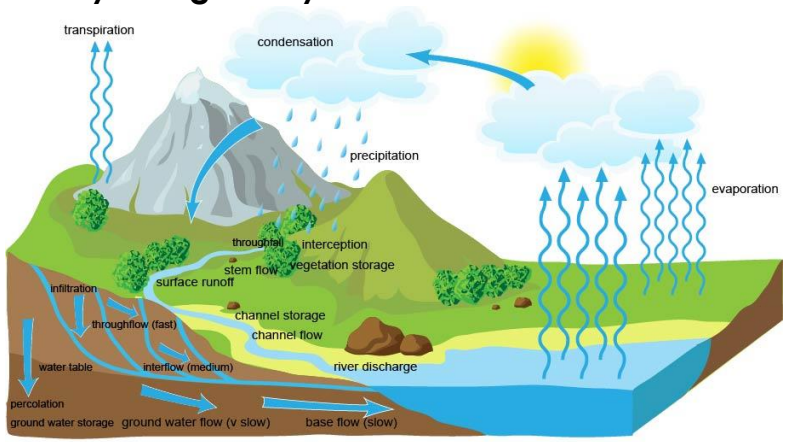
Cross profile

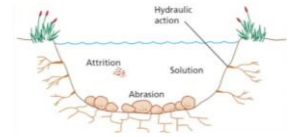


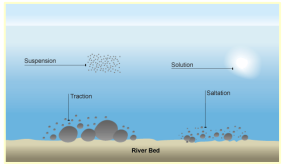
Flood hydrographs

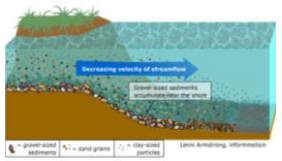
Paper 1 Topic 1 The changing landscape of the UK – River processes

The Hydrological Cycle









Hydrological Processes

Erosion
- Hydraulic action
- Abrasion
- Attrition
- Corrosion

Transportation
- Traction
- Saltation
- Suspension
- Solution

Deposition
- Heaviest pebbles 1st

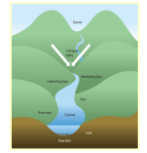
River Landforms

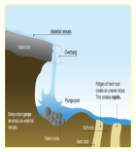
Upper Course
- V-shaped Valleys
- Interlocking spurs
- Rapids
- Waterfalls and Gorges

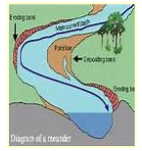
Middle Course
- Meanders
- Ox-bow lakes
- Floodplains
- Levees

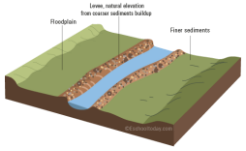
Lower Course
- Estuaries and deltas

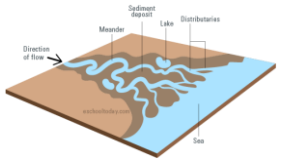
Source → Mouth



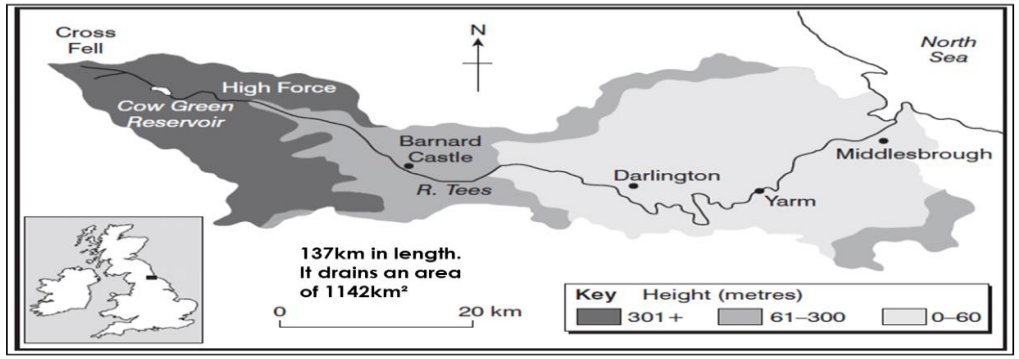








Case Study: River Landforms - River Tees

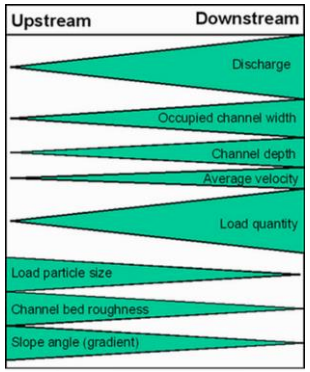


Upper Course
-**Source** high in the Pennines (893m above sea level)
-High run off as steep **V shaped valleys** of impermeable rock
-High **rainfall** – good water supply
-Many **tributaries**
-Famous high fall **waterfall** – tallest in England 21m high – **High Force**
-**Gorges**, **rapids** and **potholes**

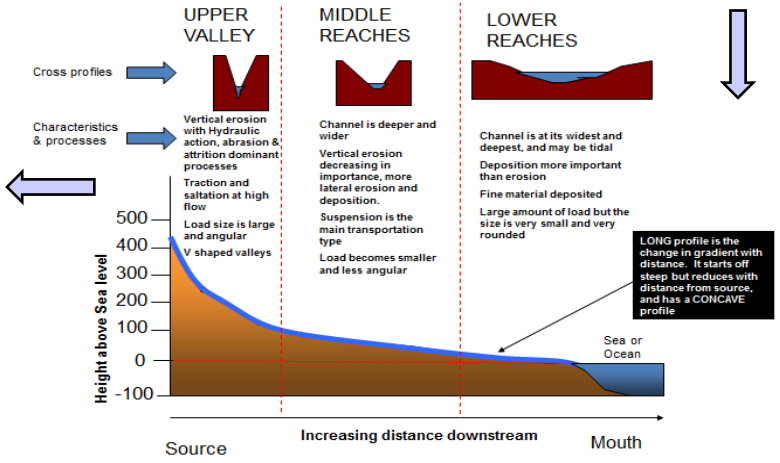
Middle Course
-Clear widening and **meandering**
-**Meanders** cut off in the 19th century
-Sides become **less steep**
-**Lateral erosion**
-**Fertile soil**

Lower Course
-Very **urbanised** and large populations. Eg **Yarm**
-Important **wildlife** seals & migratory birds also **SSSI**
-**Ox bow lakes**
-Large oil, gas and petrochemical industries (as **flat land**)
-Natural **levees** formed due to silt build up
-**Mouth** is in the North sea
-Wide mudflat **estuary** (tidal)
-Huge water sports complex **Tees Barrage**

River Management
-Long history of **flash flooding**
-**Cow Green reservoir**, controls water supply for industries along the river
-**Straighten** the river for easier navigation during the industrial revolution
-**Flood protection** schemes in Yarm



The Bradshaw Model



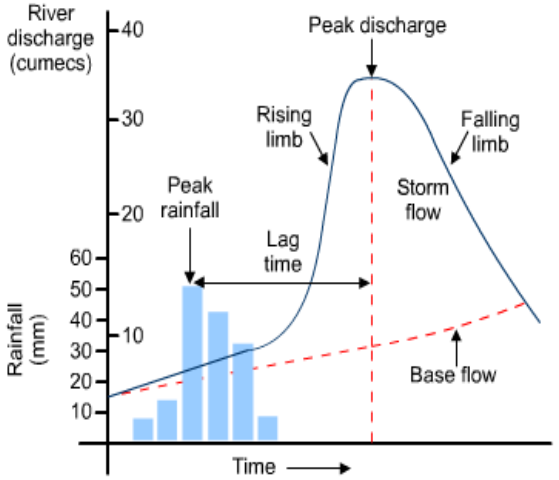
The **long profile** of a river shows the changes of the **relief** of a typical river as it moves from its upstream source to its downstream mouth.
The **Bradshaw Model** shows why these changes occur. **Discharge increases because there is a larger drainage basin/catchment.**

Paper 1 Topic 1 The changing landscape of the UK – River Management

Rivers are managed in a huge variety ways and for a variety of different reasons. We use rivers for collecting water for drinking, industry and farming, and we manage then to prevent damage caused by deposition, erosion and flooding. Management can be split into 2 areas - HARD and SOFT ENGINEERING.

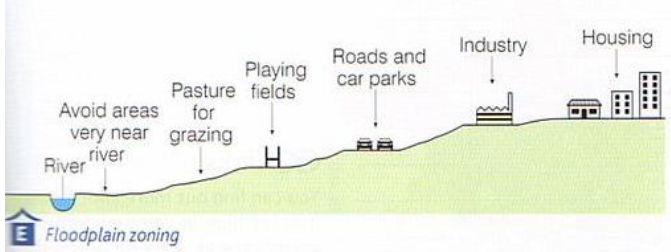
Hard engineering

- Dams and reservoirs
- Channelization
- Culverts
- Sluice gates
- Flood walls or levees
- River groynes (deflectors)
- Weir
- Gabions
- Flood relief channels
- Dredging



Soft engineering

- Afforestation
- Managed flooding, washlands, floodplain restoration or preservation
- Floodplain zoning



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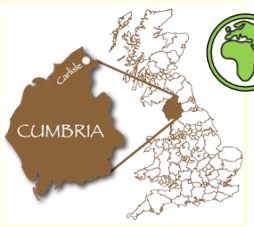
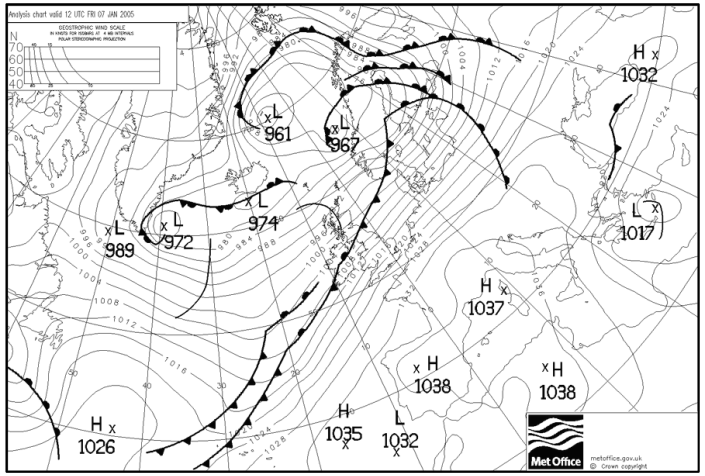
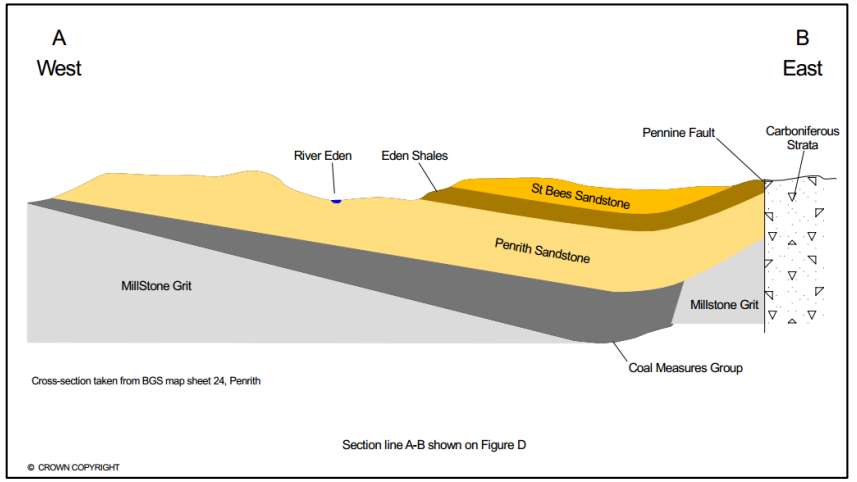
Paper 1 Topic 1 The changing landscape of the UK – River Management

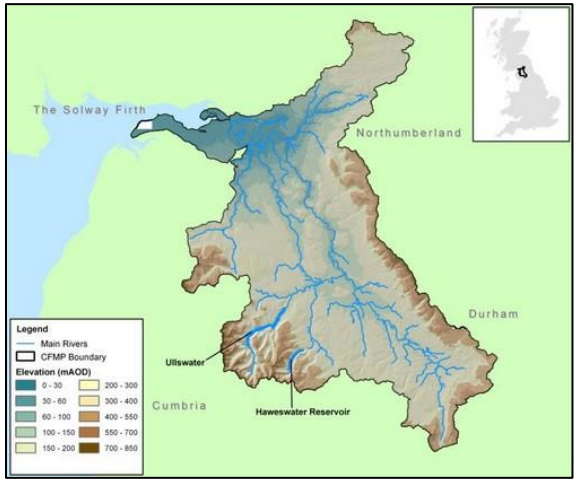


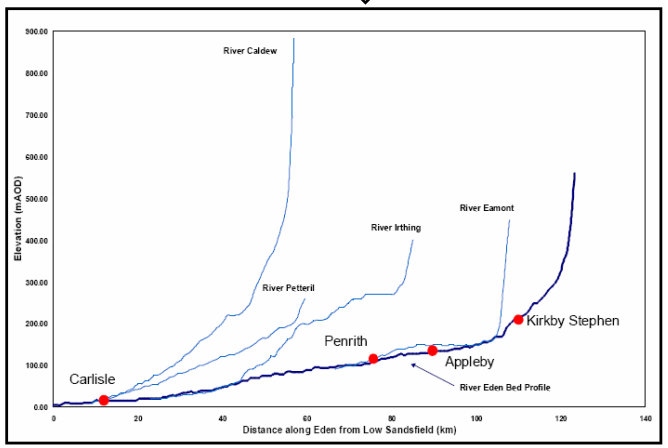
Case Study: River Eden floods, Carlisle, UK

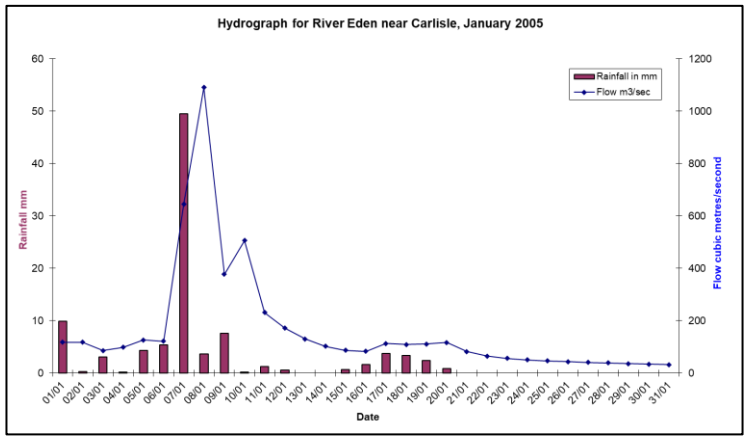
What: UK Floods **When**: 6th to 8th January 2005 **Where**: River Eden, Carlisle, Cumbria, Lake District, England **Who**: Population 105,562

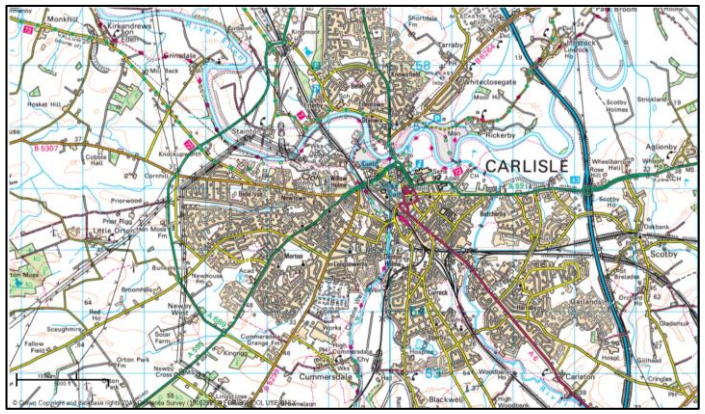












Paper 1 Topic 1 The changing landscape of the UK – River Management

Case Study: River Eden floods, Carlisle, UK

What: UK Floods **When**: 6th to 8th January 2005 **Where**: River Eden, Carlisle, Cumbria, Lake District, England **Who**: Population 105,562

Causes:

Social: Carlisle is built on the floodplain of the River Eden and lies at the confluence of the River Eden, River Caldew and River Petterill

Technological: Limited flood management schemes

Economic: Sheep farming compacted soil upstream leading to greater surface run-off

Environmental: Intense low pressure system (depression 980mb) stayed over NW England, precipitation fell constantly for several days, 180mm with some areas experiencing 100mm in 24 hours (7.12.2004), saturated ground on top of impermeable underlying bedrock.

Political: Government was unprepared for one in 200 year weather experience. Lack of funding from local and central government for flood protection schemes

Impacts:

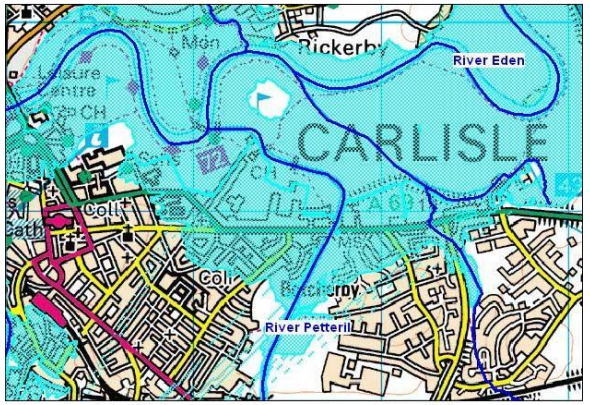
Social: 3 people died, 2,700 homes affected, 50% of residents had not signed up to received flood warning messages, several schools temporarily closed

Technological: Transport systems damaged as impassable, no electricity for several days

Economic: Cost estimated at over £400 million, many local businesses affected including McVities biscuit factory, where several people lost their jobs, many homes were not insured or under insured

Environmental: Up to 2.5m of water in some places, increased bank erosion, drains and sewerage system could not cope

Political: Fire station and police station flooded, people rescued by the coastguard



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Management:
Rivers Eden and Peterill Flood Alleviation Scheme

- Raised embankments
- Flood gates
- Diversion of river course
- Flood warning system
- Flood storage areas allocated
- River wall at Carlisle United FC ground
- New sewers
- £36 million project

Floods since 2005:

2009 150 flooded homes
2015 Storm Desmond 7,500 flooded properties