

Relief of the UK

Relief of the UK can be divided into uplands and lowlands. Each have their own characteristics.

Key

- Lowlands
- Uplands

Areas +600m: Peaks and ridges cold, misty and snow common. i.e. Scotland

Areas -200m: Flat or rolling hills. Warmer weather. i.e. Fens

Types of Erosion

The break down and transport of rocks – smooth, round and sorted.

Attrition	Rocks that bash together to become smooth/smaller.
Solution	A chemical reaction that dissolves rocks.
Abrasion	Rocks hurled at the base of a cliff to break pieces apart or scraped against the banks and bed of a river.
Hydraulic Action	Water enters cracks in the cliff, or river bank, air compresses, causing the crack to expand.

Types of Transportation

A natural process by which eroded material is carried/transported.

Solution	Minerals dissolve in water and are carried along.
Suspension	Sediment is carried along in the flow of the water.
Saltation	Pebbles that bounce along the sea/river bed.
Traction	Boulders that roll along a river/sea bed by the force of the flowing water.

Mass Movement

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

Rock slides occur when there is a failure along the bedding plane.

Slumping occurs when there is a downward rotation of sections of cliff. Often occur after heavy rain.

Rockfall is the rapid free fall of rock from a steep cliff face because of gravity.

Formation of Coastal Spits - Deposition

Example: Spurn Head, Holderness Coast.

Material moved along beach in zig-zag way. Coastline changes direction. Material deposited in shallow, calm water, to form a spit. Prevailing winds bring waves in at an angle. Spit curved with change of wind direction.

Types of Weathering

Weathering is the breakdown of rocks where they are.

Biological	Breakdown of rock by plants and animals e.g. roots pushing rocks apart.
Mechanical	Breakdown of rock without changing its chemical composition e.g. freeze thaw

What is Deposition?

When the sea or river loses energy, it drops the sand, rock particles and pebbles it has been carrying. This is called deposition. Heaviest material is deposited first.

Formation of Bays and Headlands

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

- Swash moves up the beach at the angle of the prevailing wind.
- Backwash moves down the beach at 90° to coastline, due to gravity.
- Zigzag movement (Longshore Drift) transports material along beach.
- Deposition causes beach to extend, until reaching a river estuary.
- Change in prevailing wind direction forms a hook.
- Sheltered area behind spit encourages deposition, salt marsh forms.

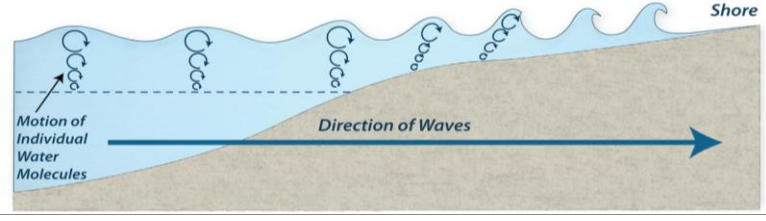
Physical Landscapes in the UK

How do waves form?

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

Why do waves break?

- Waves start out at sea.
- As waves approaches the shore, friction slows the base.
- This causes the orbit to become elliptical.
- Until the top of the wave breaks over.



Mechanical Weathering Example: Freeze-thaw weathering

Stage One	Water seeps into cracks and fractures in the rock.		Stage Two	When the water freezes, it expands about 9%. This wedges apart the rock.		Stage Three	With repeated freeze-thaw cycles, the rock breaks off.	
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Types of Waves

Size of waves	Constructive Waves	Destructive Waves
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Affected by:

- Fetch how far the wave has travelled
- Strength of the wind.
- How long the wind has been blowing for.

<p>This wave has a swash that is stronger than the backwash. This therefore builds up the coast.</p>	<p>This wave has a backwash that is stronger than the swash. This therefore erodes the coast.</p>
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Formation of Coastal Stack

Example: Old Harry Rocks, Dorset

- Hydraulic action widens cracks in the cliff face over time.
- Abrasion forms a wave cut notch between high tide and low tide.
- Further abrasion widens the wave cut notch to form a cave.
- Caves from both sides of the headland break through to form an arch.
- Weather above/erosion below –arch collapses leaving stack.
- Further weathering and erosion eaves a stump.

Coastal Defences

Hard Engineering Defences

Groynes Wood barriers prevent longshore drift, so the beach can build up.

- ✓ Beach still accessible.
- ✗ No deposition further down coast = erodes faster.

Sea Walls Concrete walls break up the energy of the wave. Has a lip to stop waves going over.

- ✓ Long life span
- ✓ Protects from flooding
- ✗ Curved shape encourages erosion of beach deposits.

Gabions or Rip Rap Cages of rocks/boulders absorb the waves energy, protecting the cliff behind.

- ✓ Cheap
- ✓ Local material can be used to look less strange.
- ✗ Will need replacing.

Soft Engineering Defences

Beach Nourishment Beaches built up with sand, so waves have to travel further before eroding cliffs.

- ✓ Cheap
- ✓ Beach for tourists.
- ✗ Storms = need replacing.
- ✗ Offshore dredging damages seabed.

Managed Retreat Low value areas of the coast are left to flood & erode.

- ✓ Reduce flood risk
- ✓ Creates wildlife habitats.
- ✗ Compensation for land.

Case Study: Holderness Coastline

Location and Background
The Holderness Coastline is in the North of England and runs between the Humber Estuary in the south and a headland at Flamborough head. It has the reputation as the fastest eroding coastline in Europe, average of 2m a year due to the soft glacial till that is easy for the destructive waves to erode. In a stormy year waves from the North sea can remove between 7 and 10m of coastline.



Management
-The village of Mableton, perched on a cliff top on the Holderness coast, has approximately 50 properties. Due to the erosion of the cliffs, the village is under threat. In 1991, the decision was taken to **protect** Mableton. A coastal management scheme costing £2 million was introduced involving two types of hard engineering - placing rock armour along the base of the cliff and building two rock groynes. Mableton and the cliffs are no longer at great risk from erosion. The rock groynes have **stopped** beach material being moved south from Mableton along the coast. However, this has **increased** erosion **south** of Mableton. **Benefits** in one area might have a **negative** effect on another. The increased threat of **sea level rise** due to **climate change**, means that other places will need to consider the sustainability of coastal defence strategies for the future.

Water Cycle Key Terms

Precipitation	Moisture falling from clouds as rain, snow or hail.
Interception	Vegetation prevents water reaching the ground.
Surface Runoff	Water flowing over the surface of the land into rivers
Infiltration	Water absorbed into the soil from the ground.
Transpiration	Water lost through leaves of plants.

Physical and Human Causes of Flooding.

Physical: Prolonged & heavy rainfall
Long periods of rain causes soil to become saturated leading runoff.

Physical: Geology
Impermeable rocks causes surface runoff to increase river discharge.

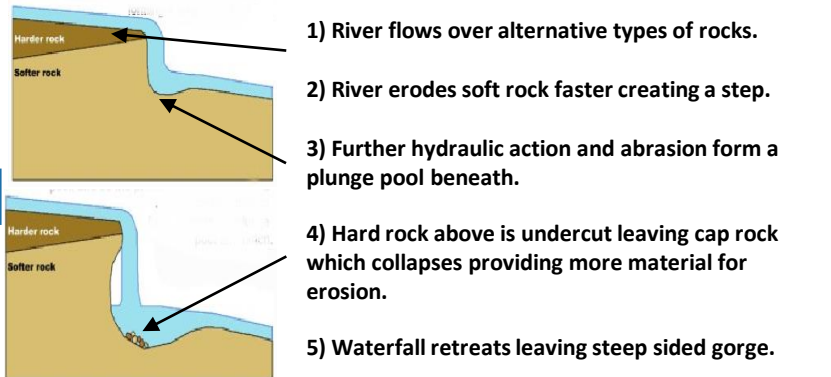
Physical: Relief
Steep-sided valleys channels water to flow quickly into rivers causing greater discharge.

Human: Land Use
Tarmac and concrete are impermeable. This prevents infiltration & causes surface runoff.

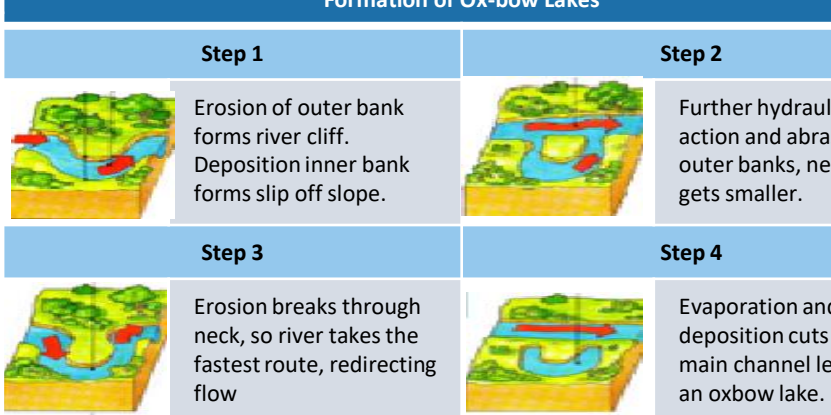
Upper Course of a River

Near the source, the river flows over steep gradient from the hill/mountains. This gives the river a lot of energy, so it will erode the riverbed vertically to form narrow valleys.

Formation of a Waterfall



Formation of Ox-bow Lakes



Middle Course of a River

Here the gradient get gentler, so the water has less energy and moves more slowly. The river will begin to erode laterally making the river wider.

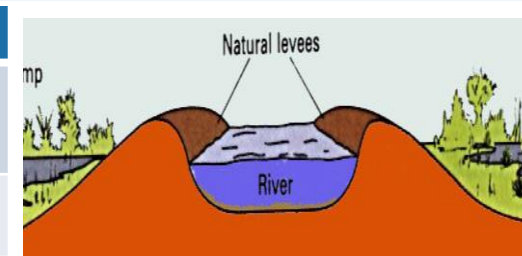
Lower Course of a River

Near the river's mouth, the river widens further and becomes flatter. Material transported is deposited.

Formation of Floodplains and levees

When a river floods, fine silt/alluvium is deposited on the valley floor. Closer to the river's banks, the heavier materials build up to form natural levees.

- ✓ Nutrient rich soil makes it ideal for farming.
- ✓ Flat land for building houses.



River Management Schemes

Soft Engineering

Afforestation – plant trees to soak up rainwater, reduces flood risk.
Demountable Flood Barriers put in place when warning raised.
Managed Flooding – naturally let areas flood, protect settlements.

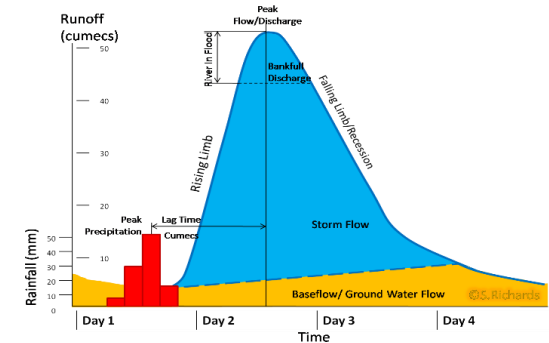
Hard Engineering

Straightening Channel – increases velocity to remove flood water.
Artificial Levees – heightens river so flood water is contained.
Deepening or widening river to increase capacity for a flood.

Hydrographs and River Discharge

River discharge is the volume of water that flows in a river. Hydrographs who discharge at a certain point in a river changes over time in relation to rainfall

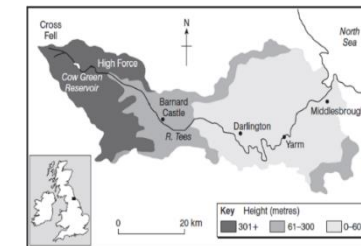
- Peak discharge** is the discharge in a period of time.
- Lag time** is the delay between peak rainfall and peak discharge.
- Rising limb** is the increase in river discharge.
- Falling limb** is the decrease in river discharge to normal level.



Case Study: The River Tees

Location and Background
Located in the North of England and flows 137km from the Pennines to the North Sea at Red Car.

Geomorphic Processes
Upper – Features include V-Shaped valley, rapids and waterfalls. High force Waterfall drops 21m and is made from harder Whinstone and softer limestone rocks. Gradually a gorge has been formed.
Middle – Features include meanders and ox-bow lakes. The meander near Yarm encloses the town.
Lower – Greater lateral erosion creates features such as floodplains & levees. Mudflats at the river's estuary.



Causes of flood – Prolonged Rainfall (183mm, 200% higher than average) / Saturated Ground / High Tide and storm surges / lack of dredging / changing in farming practices.

Effects of flood – 0 deaths / 600 homes flooded / 6880 hectares of farmland flooded and crops ruined Villages such as Muchelney were completely cut off / 900 litres of fuel were stolen from a water pumping station / Local businesses lost over £1 million in trade / There was a £200 million loss to the tourist industry

Case Study – Somerset Levels Flood 2013-14

The Somerset levels are an area of low lying land which were subject to flooding because of the extreme winter weather conditions.