Relief of the UK

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

Key

Lowlands

Uplands

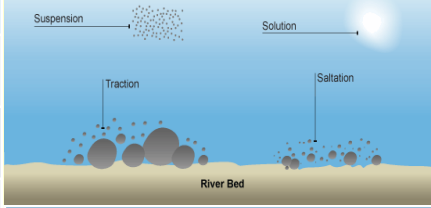
Areas +600m: Peaks and ridges cold, misty and snow common. i.e. Scotland

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

RIVER PROCESSES

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

2 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.



Deposition

When the river loses energy, it drops the sand, rock particles and pebbles it has been carrying. This is called deposition.

Types of Weathering

Weathering is the breakdown of rocks where they are.

Chemical	Breakdown of rock by changing its chemical composition.
Physical	Breakdown of rock without changing its chemical composition.

WEATHERING is the breakdown of rocks *in situ* (where they are) . MECHANICAL WEATHERING e.g. freeze-thaw

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.

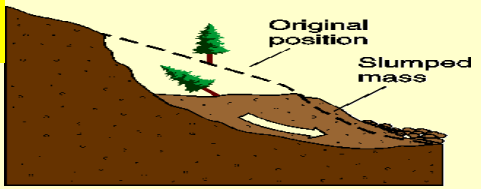
Stage Three

With repeated freeze-thaw cycles, the rock breaks off.

River Landscapes of the UK

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.



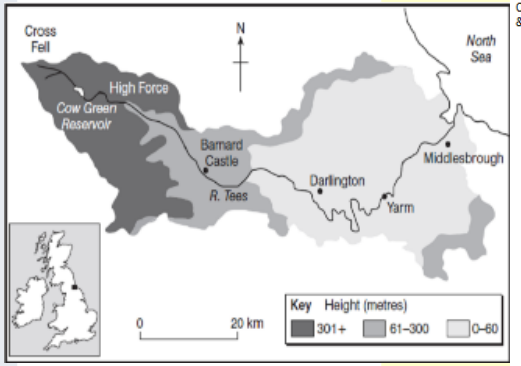
1	Rain saturates the permeable rock above the impermeable rock making it heavy.
2	Waves or a river will erode the base of the slope making it unstable.
3	Eventually the weight of the permeable rock above the impermeable rock weakens and collapses.
4	The debris at the base of the slope is then removed and transported by a river.

River Tees case study

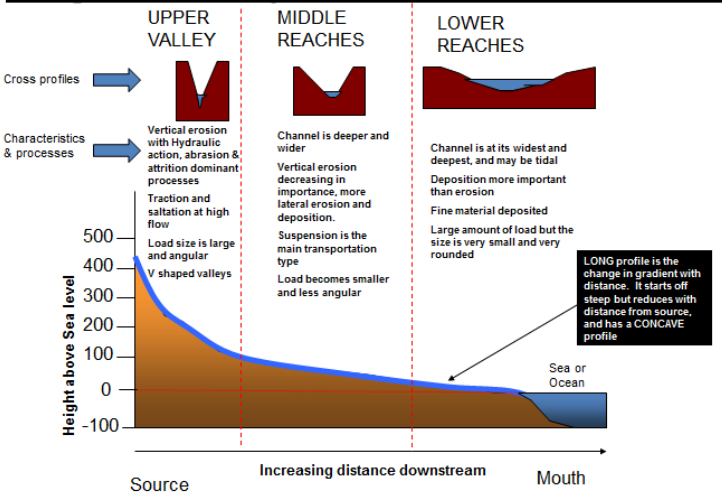
Management – Cow Green reservoir in the upper course. Gates on the dam are opened and closed to control the amount of water in the river and stop flooding. In the middle course the river was straightened at Yarm to make it easier for transportation. Here the river has been lined with concrete to stop erosion and it has raised banks to stop flooding. In the lower course, the Tees Barrage has been built to stop flooding. Soft engineering includes land-use zoning in Yarm and planting trees.

UPPER COURSE: Processes - Mostly vertical erosion. **Landforms** -V-Shaped valley, rapids and High Force waterfall which has made a gorge. **Land-use –** agriculture (sheep farming)
MIDDLE COURSE: Processes – Erosion and deposition. **Landform**s - meanders and ox-bow lakes. The meander near Yarm encloses the town. **Land-use–** arable farming, settlements,
LOWER COURSE – Mostly deposition lateral erosion creates features such as floodplains & levees. Mudflats at the river's estuary. **Land-use –** heavy industry, oil terminal, iron and steel works, chemicals manufacturing.

The course of the River Tees



Long and cross profiles on a TYPICAL river



Processes – Actions that lead to changes in a place.
Landforms – natural features made by nature e.g. waterfalls

Water Cycle Key Terms

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

Physical and Human Causes of Flooding.

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

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

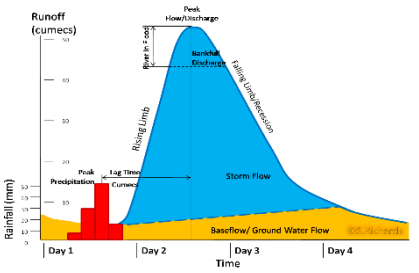
***Physical:* Relief**
Steep-sided valleys channels water to flow quickly into rivers causing greater discharge.

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

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

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

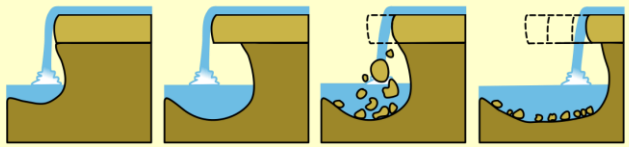


Physical features – Natural things like mountains, rivers, waterfalls, deserts.
Human features – Things made by people like roads, buildings, farms.
Sustainable development – Using rivers in a way that they will still be there for future generations to enjoy, whilst at the same time meeting the needs of local people. Soft engineering is sustainable.

Impermeable rocks – do not allow water to soak into them e.g. clay.

River Landscapes of the UK 2

The formation of a waterfall



1. Waterfalls typically form in the upper stages of a river. They occur where a band of hard rock overlies a softer rock. Falling water and rock particles erode the soft rock below the waterfall, creating a plunge pool.
2. The soft rock is undercut by erosional processes such as hydraulic action and abrasion creating a plunge pool where water and debris swirl around eroding the rock through corraision further deepening it and
3. Hard rock overhang above the plunge pool collapses as its weight is no longer supported.
4. Erosion continues and the waterfall retreats upstream leaving behind a gorge.

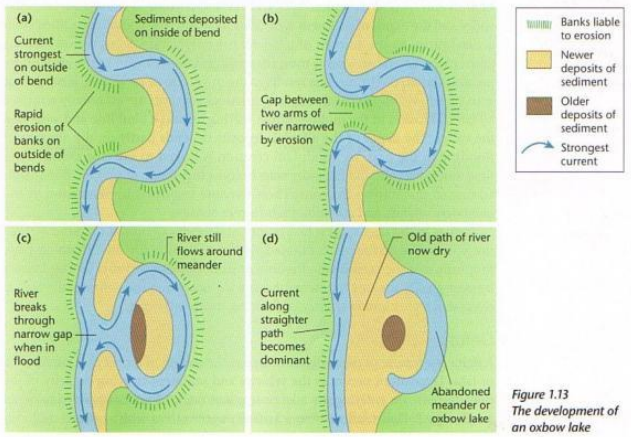


Figure 1.13 The development of an oxbow lake

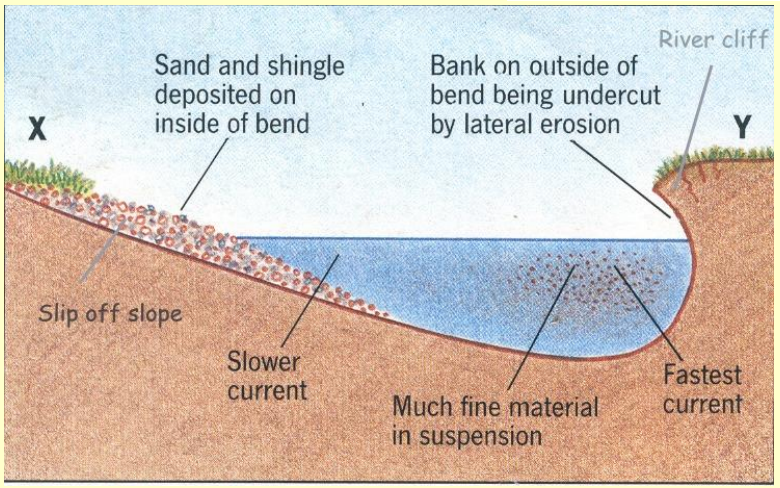
River Management Schemes

Soft Engineering

Afforestation – plant trees to soak up rainwater, reduces flood risk.
Land-use zoning – planning what the land next to rivers is used for e.g. parks not housing
Ecological Flooding – naturally let areas flood, protect settlements.

Hard Engineering

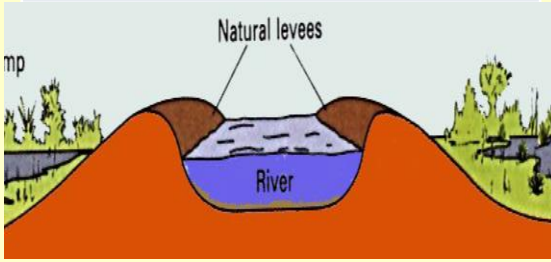
Straightening Channel – increases velocity to remove flood water.
Artificial Levees – heightens river so flood water is contained.
Deepening or widening river to increase capacity for a flood.



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.



Coastal processes

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

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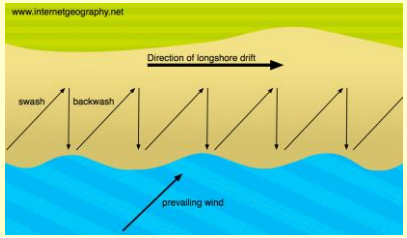
2 Transportation: longshore drift

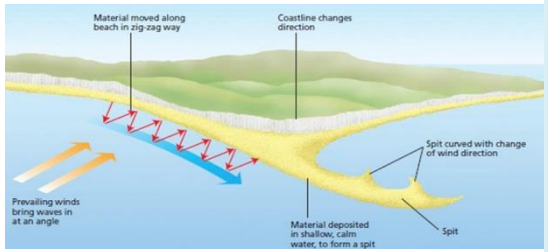


3 Deposition

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

Formation of Coastal Spits – Longshore drift and deposition

Example: Spurn Head, Holderness Coast.



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

Factors affecting the rate of erosion:

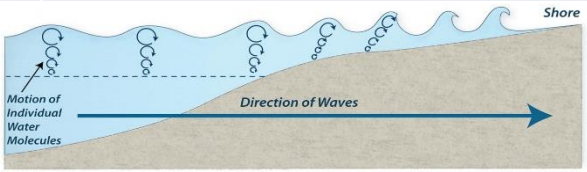
- Geology
- Fetch
- Weather
- Climate
- Management
- Type of waves

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?

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



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: South Dorset Coast

Location and Background
Located on the South coast of Dorset. The area is a popular sea resort for tourists to visit all year round.
The area is famed for a wide array of attractive coastal landscape features.

Geomorphic Processes
- Studland is a spit which is dominated by dunes that are formed when sand is trapped and built up behind objects.
-Swanage Bay is formed when soft clay is eroded between two headlands.
-At Old Harry Rocks the cliffs are retreating. The sight is an example of a stack and arch formed in chalk near Swanage.
- There are examples of wave cut platforms at Kimmeridge Bay.

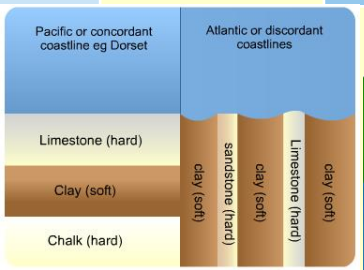
Management **Hard engineering** **Soft engineering**
-West Bay is now protected by a number of rock groynes. These trap sand to build up the beach for better protection.
-West Bay is also protected by large sea walls to prevent flooding and deflect the waves' energy. The cliff is drained to stop water building up and causing landslides.
-£ million has been spent on beach nourishment to add sediment to beach for increased protection against flooding.

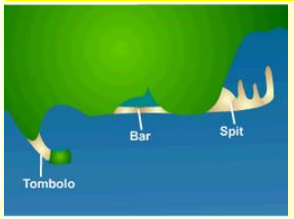
https://www.youtube.com/watch?v=1YQPW41LWTU

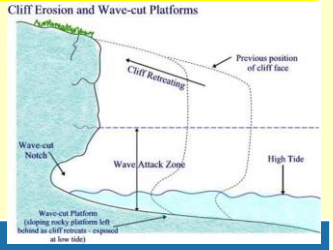
Formation of Bays and Headlands

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

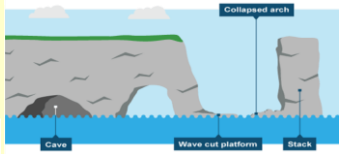
Coastal Landscapes of the U.K







Formation of Coastal Stack



Example: Old Harry Rocks, Dorset

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

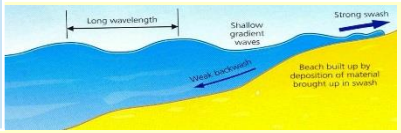
Size of waves

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

Types of Waves

Constructive Waves

This wave has a **swash that is stronger** than the backwash. This therefore builds up the coast.



Destructive Waves

This wave has a **backwash that is stronger** than the swash. This therefore erodes the coast.