

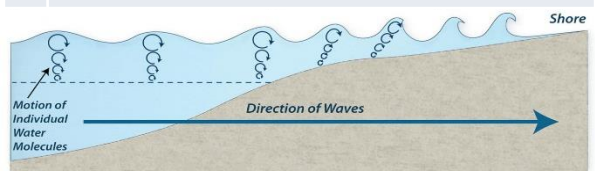
- 1) Swash moves up the beach at the angle of the prevailing wind.
- 2) Backwash moves down the beach at 90° to coastline, due to gravity.
- 3) Zigzag movement (Longshore Drift) transports material along beach.
- 4) Deposition causes beach to extend, until reaching a river estuary.
- 5) Change in prevailing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

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?

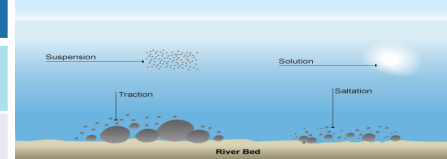
- 1) Waves start out at sea.
- 2) As waves approaches the shore, friction slows the base.
- 3) This causes the orbit to become elliptical.
- 4) Until the top of the wave breaks over.



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.
Hydraulic Action	Water enters cracks in the cliff, air compresses, causing the crack to expand.

Types of Weathering	
Weathering is the breakdown of rocks where they are.	
Carbonation	Breakdown of rock by changing its chemical composition.
Mechanical	Breakdown of rock without changing its chemical composition.

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.



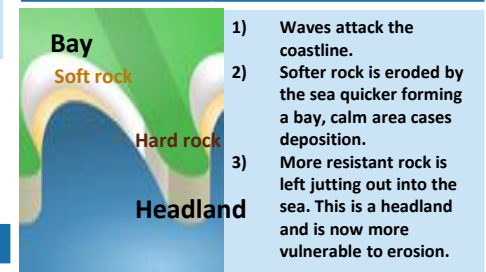
What is Deposition?

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

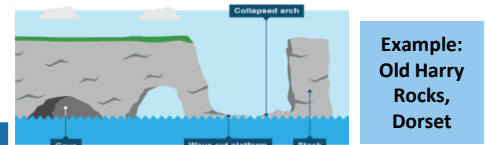
Mass Movement	
A large movement of soil and rock debris that moves down slopes in response to the pull of gravity in a vertical direction.	
1	Rain saturates the permeable rock above the impermeable rock making it heavy.
2	Waves or a river will erode the base of the slope making it unstable.
3	Eventually the weight of the permeable rock above the impermeable rock weakens and collapses.
4	The debris at the base of the cliff is then removed and transported by waves or river.



Formation of Bays and Headlands



Formation of Coastal Stack

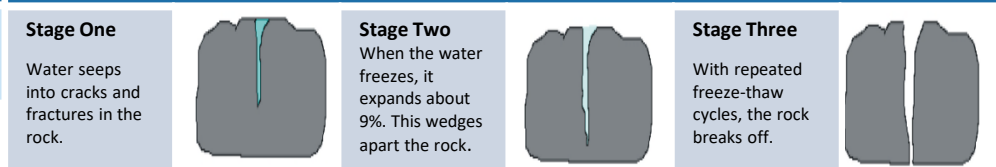


- 1) Hydraulic action widens cracks in the cliff face over time.
- 2) Abrasion forms a wave cut notch between HT and LT.
- 3) Further abrasion widens the wave cut notch to form a cave.
- 4) Caves from both sides of the headland break through to form an arch.
- 5) Weather above/erosion below –arch collapses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

Unit 1c Physical Landscapes in the UK



Mechanical Weathering Example: Freeze-thaw weathering



Size of waves

Types of Waves	
Constructive Waves	Destructive Waves
This wave has a swash that is stronger than the backwash. This therefore builds up the coast.	This wave has a backwash that is stronger than the swash. This therefore erodes the coast.
<p>Long wavelength</p> <p>Shallow gradient waves</p> <p>Strong swash</p> <p>Weak backwash</p> <p>Beach built up by deposition of material brought up in swash</p>	<p>Steep gradient waves</p> <p>Tall waves with short wavelength</p> <p>Strong backwash</p> <p>Weak swash</p>

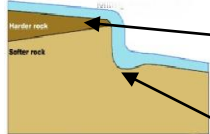
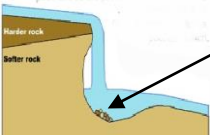
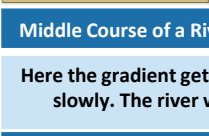
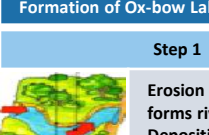

Coastal Defences			
Hard Engineering Defences			
Groynes	Wood barriers prevent longshore drift, so the beach can build up.	<div>✓</div> <div>✗</div>	Beach still accessible. No deposition further down coast = erodes faster.
Sea Walls	Concrete walls break up the energy of the wave . Has a lip to stop waves going over.	<div>✓</div> <div>✓</div> <div>✗</div>	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.	<div>✓</div> <div>✓</div> <div>✗</div>	Cheap Local material can be used to look less strange. Will need replacing.

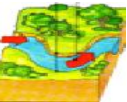
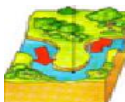


Soft Engineering Defences			
Beach Nourishment	Beaches built up with sand, so waves have to travel further before eroding cliffs.	<div>✓</div> <div>✓</div> <div>✗</div> <div>✗</div>	Cheap Beach for tourists. Storms = need replacing. Offshore dredging damages seabed.
Managed Retreat	Low value areas of the coast are left to flood & erode.	<div>✓</div> <div>✓</div> <div>✗</div>	Reduce flood risk Creates wildlife habitats. Compensation for land.

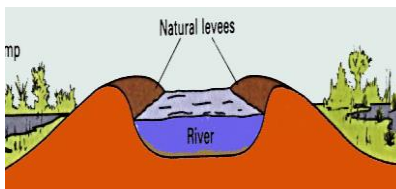
Case Study: Holderness coast	
Location and Background Located in East Yorkshire. Flamborough Head to north and spurn point to south.	

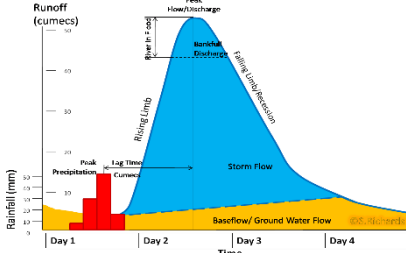
Geomorphic Processes /Landforms Flamborough Head – Chalk, resistant rock headland with caves, arches, stacks and wave cut platforms. Steep vertical cliffs.
Mappleton – Boulder clay, soft rock. Easily eroded and retreating quickly. More gentle sloping cliffs. Wide beach. Erosion up to 2m a year.
Spurn Point – Spit formed across Humber Estuary due to longshore drift and deposition. Current of Humber prevents the spit extending across estuary.
Management Spurn Point – Managed retreat as cost of defences to high to maintain.
Mappleton – Rock Groyne and Rock armour – cost £2m – to protect cliffs – stop them collapsing and retreating and ensure a wide build up of beach by trapping sediment – causes issues further down coast as beaches become smaller.

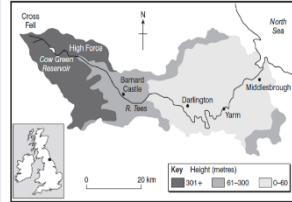
Water Cycle Key Terms	
Precipitation	Moisture falling from clouds as rain, snow or hail.
Interception	Vegetation prevent water reaching the ground.
Surface Runoff	Water flowing over surface of the land into rivers
Infiltration	Water absorbed into the soil from the ground.
Transpiration	Water lost through leaves of plants.
Physical and Human Causes of Flooding.	
<i>Physical:</i> Prolong & heavy rainfall Long periods of rain causes soil to become saturated leading runoff.	<i>Physical:</i> Geology Impermeable rocks causes surface runoff to increase river discharge.
<i>Physical:</i> Relief Steep-sided valleys channels water to flow quickly into rivers causing greater discharge.	<i>Human:</i> 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	
	1) River flows over alternative types of rocks.
	2) River erodes soft rock faster creating a step.
	3) Further hydraulic action and abrasion form a plunge pool beneath.
	4) Hard rock above is undercut leaving cap rock which collapses providing more material for erosion.
	5) Waterfall retreats leaving steep sided gorge.

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.	
Formation of Ox-bow Lakes	
Step 1	Step 2
	
Step 3	Step 4
	

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.	
<div>✓</div> <div>✓</div>	Nutrient rich soil makes it ideal for farming. Flat land for building houses.
	
River Management Schemes	
Soft Engineering	Hard 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.	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	
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.	

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. Highforce 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.	
	
Management -Towns such as Yarm and Middlesbrough are economically and socially important due to houses and jobs that are located there. -Dams and reservoirs in the upper course, controls river's flow during high & low rainfall. - Better flood warning systems, more flood zoning and river dredging reduces flooding.	