

### 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.	
<b>Attrition</b>	Rocks that bash together to become smooth/smaller.
<b>Solution</b>	A chemical reaction that dissolves rocks.
<b>Abrasion</b>	Rocks hurled at the base of a cliff to break pieces apart.
<b>Hydraulic Action</b>	Water enters cracks in the cliff, air compresses, causing the crack to expand.

### Types of Transportation

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

<b>Solution</b>	Minerals dissolve in water and are carried along.
<b>Suspension</b>	Sediment is carried along in the flow of the water.
<b>Saltation</b>	Pebbles that bounce along the sea/river bed.
<b>Traction</b>	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.

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 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. Spit curved with change of wind direction. Prevailing winds bring waves in at an angle. Spit.

### Types of Weathering

Weathering is the breakdown of rocks where they are.

<b>Carbonation</b>	Breakdown of rock by changing its chemical composition.
<b>Mechanical</b>	Breakdown of rock without changing its chemical composition.

### 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.



- 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.

# Unit 1c Physical Landscapes in the UK

AQA

### Formation of Bays and Headlands

**Bay**  
Soft rock

**Headland**  
Hard rock

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

### How do waves form?

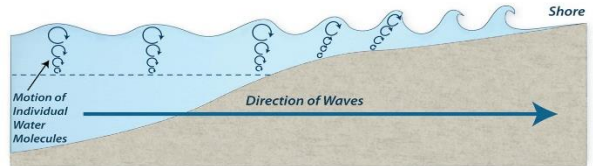
Waves are created by wind blowing over the surface of the sea. As the wind blows over the sea, friction is created - producing a swell in the water.

### Mechanical Weathering Example: Freeze-thaw weathering

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

- ### 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.

Size of waves	Types of Waves
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Constructive Waves	Destructive Waves
This wave has a <b>swash that is stronger</b> than the backwash. This therefore builds up the coast.	This wave has a <b>backwash that is stronger</b> than the swash. This therefore erodes the coast.

### 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 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.

## Coastal Defences

Hard Engineering Defences		
<b>Groynes</b>	Wood barriers prevent longshore drift, so the beach can build up.	<ul style="list-style-type: none"> <li>✓ Beach still accessible.</li> <li>✗ No deposition further down coast = erodes faster.</li> </ul>
<b>Sea Walls</b>	Concrete walls break up the energy of the wave. Has a lip to stop waves going over.	<ul style="list-style-type: none"> <li>✓ Long life span</li> <li>✓ Protects from flooding</li> <li>✗ Curved shape encourages erosion of beach deposits.</li> </ul>
<b>Gabions or Rip Rap</b>	Cages of rocks/boulders absorb the waves energy, protecting the cliff behind.	<ul style="list-style-type: none"> <li>✓ Cheap</li> <li>✓ Local material can be used to look less strange.</li> <li>✗ Will need replacing.</li> </ul>

## Soft Engineering Defences

<b>Beach Nourishment</b>	Beaches built up with sand, so waves have to travel further before eroding cliffs.	<ul style="list-style-type: none"> <li>✓ Cheap</li> <li>✓ Beach for tourists.</li> <li>✗ Storms = need replacing.</li> <li>✗ Offshore dredging damages seabed.</li> </ul>
<b>Managed Retreat</b>	Low value areas of the coast are left to flood & erode.	<ul style="list-style-type: none"> <li>✓ Reduce flood risk</li> <li>✓ Creates wildlife habitats.</li> <li>✗ Compensation for land.</li> </ul>

## Case Study: Hunstanton Coast

**Location and Background**  
 Located on the North-West coast of Norfolk. The town is a popular sea resort for tourists to visit all year round. In 2013, the town suffered damage from a storm surge. The Sea Life Centre was flooded and closed for a number of months.

## Geomorphic Processes

- Old Hunstanton is dominated by dunes that are formed when sand is trapped and built up behind objects.
- Hunstanton Cliffs are made from three different bands of rock (sandstone, red chalk and white chalk).
- Hunstanton Cliff are exposed to cliff retreat. This is when a wave-cut notch develops enough for the cliff face to become unstable and eventually collapses.
- Longshore drift travels from Sheringham in the north to the Wash in the south.

## Management

- Hunstanton is protected by a number of groynes. These trap sand to build up the beach for better protection.
- The town is also protected by large sea walls to prevent flooding and deflect the waves energy.
- \$15 million has been spent on beach nourishment to add sediment to beach for increased protection against flooding.

## Water Cycle Key Terms

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

## Physical and Human Causes of Flooding.

<b>Physical:</b> Prolong & heavy rainfall Long periods of rain causes soil to become saturated leading runoff.	<b>Physical:</b> Geology Impermeable rocks causes surface runoff to increase river discharge.
<b>Physical:</b> Relief Steep-sided valleys channels water to flow quickly into rivers causing greater discharge.	<b>Human:</b> 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
<p><b>Step 1</b> Erosion of outer bank forms river cliff. Deposition inner bank forms slip off slope.</p>	<p><b>Step 2</b> Further hydraulic action and abrasion of outer banks, neck gets smaller.</p>
Step 3	Step 4
<p><b>Step 3</b> Erosion breaks through neck, so river takes the fastest route, redirecting flow</p>	<p><b>Step 4</b> Evaporation and deposition cuts off main channel leaving an oxbow lake.</p>

## 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	Hard Engineering
<p><b>Afforestation</b> – plant trees to soak up rainwater, reduces flood risk.</p> <p><b>Demountable Flood Barriers</b> put in place when warning raised.</p> <p><b>Managed Flooding</b> – naturally let areas flood, protect settlements.</p>	<p><b>Straightening Channel</b> – increases velocity to remove flood water.</p> <p><b>Artificial Levees</b> – heightens river so flood water is contained.</p> <p><b>Deepening or widening river</b> to increase capacity for a flood.</p>

## 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.