Unit 1c
Physical Landscapes in the UK

The Orme Academy AQA

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.
Hydraulic Action	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.

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.

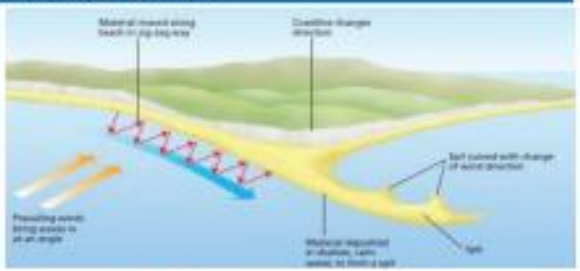
Mass Movement

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

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.



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.

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.

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.

Formation of Bays and Headlands

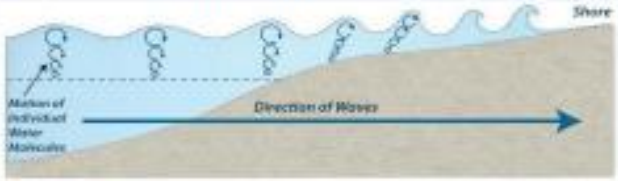
1) Waves attack the coastline.
2) Softer rock is eroded by the sea quicker forming a bay, calm area cases deposition.
3) More resistant rock is left jutting out into the sea. This is a headland and is now more vulnerable to erosion.

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.

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.



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.

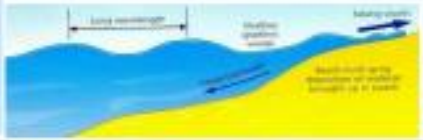
Size of waves

- 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.

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 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.

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: Lyme Regis, Dorset

Location and Background
Located in on the southern coast of England, Lyme Regis is a town in west Dorset. It is 25 miles west of Dorchester and east of Exeter. It lies on the Jurassic Coast, a World Heritage Site famous for its fossils and coastal landforms.

Erosion and Mass Movement
-The geology of Lyme Regis is a mixture of limestone, resistant to erosion, and clay, vulnerable to erosion. The clay lies on limestone, so as the clay erodes, the cliffs are vulnerable to landslides. Therefore, houses, roads and farmland are at risk of cliff landslides.
- The coast at Lyme Regis experiences erosion. Much of the town has been constructed on unstable cliffs, which experience some of the highest erosion rates in Europe.

Management Strategies
The local government developed a plan to manage the coastline at Lyme Regis called the Lyme Regis Environmental Improvement Scheme.
- £22 million has been spent on large sea walls to prevent flooding and deflect the waves energy, a sand & shingle beach, and rock armour.
- Nails, up to 19 metres long, have been installed into the cliffs to prevent landslides. Once installed, the nails were covered with a 60 to 120-year design life mesh.

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.

***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.

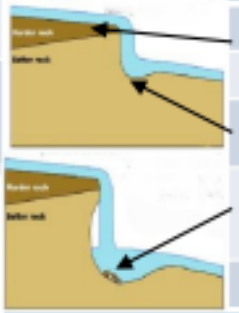
***Physical*: Relief**
Steep-sided valleys channels water to flow quickly into rivers causing greater discharge.

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

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



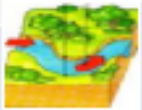
1) River flows over alternative types of rocks.
2) River erodes soft rock faster creating a step.
3) Further hydraulic action and abrasion form a plunge pool beneath.
4) Hard rock above is undercut leaving cap rock which collapses providing more material for erosion.
5) Waterfall retreats leaving steep sided gorge.

Middle Course of a River

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

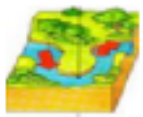
Formation of Ox-bow Lakes

Step 1



Erosion of outer bank forms river cliff. Deposition inner bank forms slip off slope.

Step 2



Further hydraulic action and abrasion of outer banks, neck gets smaller.

Step 3

Erosion breaks through neck, so river takes the fastest route, redirecting flow

Step 4

Evaporation and deposition cuts off main channel leaving an oxbow lake.

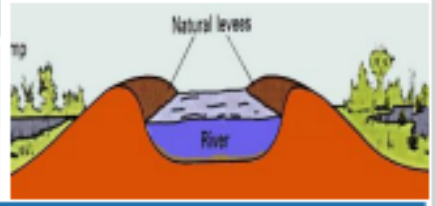
Lower Course of a River

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.

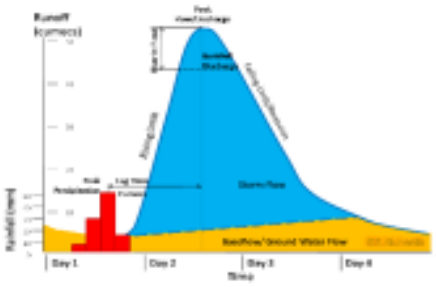
Hard Engineering

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

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: Banbury Floods, Oxfordshire

Location and Background
Banbury is in Oxfordshire, 50km north of Oxford. The town has a population of 45,000. Much of the town is on the floodplain of the River Cherwell (tributary of River Thames).

Flooding
The town was destroyed during major flooding in 1998. Further flooding has happened again in 2007 and in 2012!
River that flooded = River Cherwell
Date of Flooding = Easter 1998
Cost of Damages = £12.5 million
People forced to evacuate = 350

Social	Environmental	Economic
😞 House owners are no longer worried about damage to their property. Uninsured houses are especially at risk during flooding, because homeowners lose everything and must pay for repairs themselves. 😞 New footpaths and parks surrounding the flood water storage. Dog walkers and families can take advantage of the pathways, which will improve their quality of life.	👍 The new biodiversity plan will increase vegetation - trees, hedges, ponds - to reduce the risk of flooding. This will improve the environment. 👍 During construction of the flood water storage, heavy machinery damaged the nearby vegetation. 👍 Soil was removed from areas surrounding Banbury to make embankments. This will disrupt habitats and wildlife.	👍 The construction work cost £18.5 million. 👍 Construction jobs were created in the process, as well as some jobs to maintain the biodiversity plan. 👍 It is estimated that the storage scheme has saved £180 million in avoiding damages.

Management Strategies
The schemes above have benefited the economy and allowed the town to develop. However, this has come at a cost to the environment.