Unit 1c CGP pages 37-57

Physical Landscapes in the UK

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. Erosion Eddie is Moving Steady!

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.

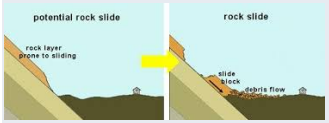
Types of Transportation

A natural process by which eroded material is carried/transported. Transportation Trish TSSS!

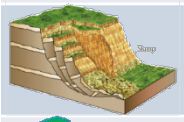
Solution	Minerals dissolve in water and are carried along.
Suspension	Sediment is carried along in the flow of the water.
Saltation	Pebbles that bounce along the sea/river bed.
Traction	Boulders that roll along a river/sea bed by the force of the flowing water.

Mass Movement

Large movement of soil &rock debris that moves down slopes in response to the pull of gravity in a vertical direction. Max Movement: Gravity Takes Him Down!



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

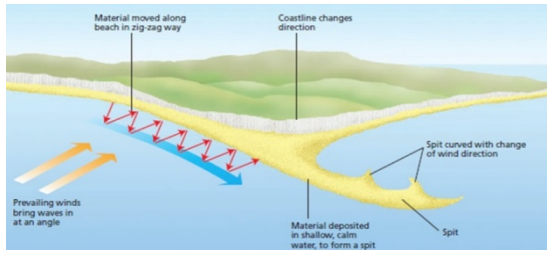


Slumping occurs when there is a downward rotation of sections of cliff. Often occur after heavy rain.

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.



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

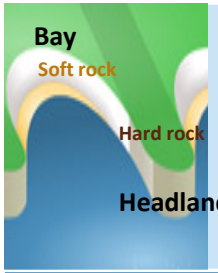
Weathering is the breakdown of rocks where they are: Weathering Will is Standing Still!

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?

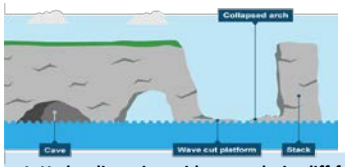
When the sea or river loses energy, it drops the sand, rock particles and pebbles it has been carrying. This is called deposition. Heaviest material is deposited first.

Formation of Headlands and Bays



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.

Formation of Coastal Stack



Example: Old Harry Rocks, Dorset

1. **Hydraulic action widens cracks in cliff face over time.**
2. **Abrasion forms a wave cut notch between high tide and low tide.**
3. **Further abrasion widens wave cut notch forming 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 leaves a stump.**

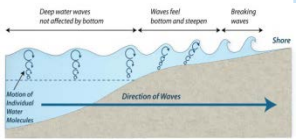
Case Study: The Dorset Coast

Location and Background
The Dorset coast is made from bands of hard rock (like limestone and chalk) and soft rock (like clay). The rocks have been eroded at different rates giving headlands and bays and lots of other exciting features.

Geomorphic Processes
Durdle Door is a great example of an arch.
Lulworth Cove is a small bay formed after a gap was eroded in a band of limestone. Behind the limestone is a band of softer clay rock.
Chesil Beach is a tombolo (a type of bar joined by longshore drift. Behind Chesil beach is a shallow lagoon called the **Fleet Lagoon**.
The foreland is a band of harder chalk rock. The headland has eroded to become a stack called **Old Harry.**

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

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.

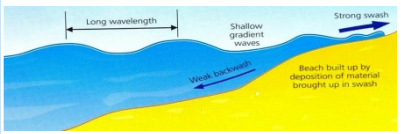
Size of waves

Affected by:
- **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.

Why do waves break?

1	Waves start out at sea.
2	As waves approaches shore, friction slows 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** ✗ **Some people think they can look ugly & do not blend in with the natural beach.**
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.**

Coastal Management Case Study: Holderness, E. Yorkshire

Reasons for erosion
Cliffs are made of soft bolder clay, prevailing wind from NE causes longshore drift to move material south. 1.8m of land is lost every year & up to 10m at **Great Cowden**.

Hold on to Holderness! Management Strategies
In 1991 450m of coastline around **Mappleton** was protected at a cost of £2m, using 61,000+ tonnes of rocks.
- Granite boulders (rock armour), 2 rock groynes to trap sand
- Sea wall & groynes at **Hornsea**, sea wall, groynes and rock armour at **Withernsea**

Issues with management strategies:
1. Groynes have trapped sand & prevented sediment moving south - increasing rates of erosion south of Mappleton
2. Farm & caravan park at Great Cowden have lost land
3. Coastguard/lifeboat service at **Spurn Head** threatened by erosion
4. Loss of habitat at Spurn Head as erosion of the spit speeds up
5. In 1999 a 1km stretch of coast near **Easington gas terminal** had to be protected by rock armour at a cost of £6.6m.

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.

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:* 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.

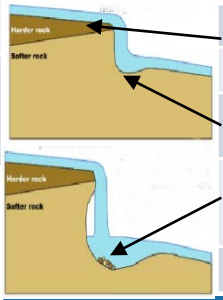
***Physical:* Relief**
Steep-sided valleys channels water to flow quickly into rivers causing greater discharge.

***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.

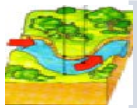
Formation of a Waterfall



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.

Formation of Ox-bow Lakes

Step 1

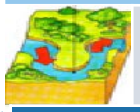


Erosion of outer bank forms river cliff. Deposition inner bank forms slip off slope.

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.

Case Study - Boscastle flood, August 2004

Boscastle is a small village in Cornwall. It has a permanent population of under 1000. 90% of jobs in the village are linked to tourism.

Causes of flood - 5 hours of heavy rain (3 inches in 1 hour), Impermeable rock, steep valley sides, thin soils limit vegetation. Buildings narrowing river channel. Narrow bridges trapped debris.
Effects of flood - 100 homes and 25 businesses damaged. 75 cars and 8 boats washed away. 150 people had to be rescued. Damage cost £15 million.
Responses to flood - Scheme cost £4.6 million. Beds of rivers lowered and channels widened. Bridges widened. Car park raised. Trees removed from near river.

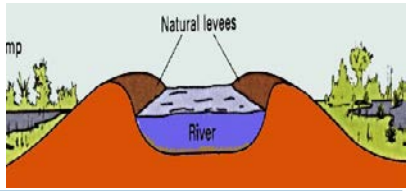
Lower Course of a River

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.

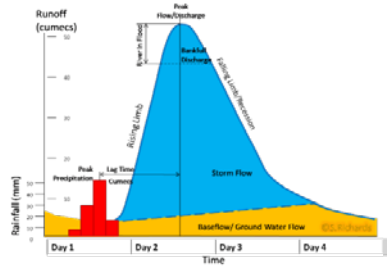
Hard Engineering

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 show how discharge at a certain point in a river changes over time in relation to rainfall. A flashy hydrograph like the one below has a short lag time, which means the river more likely to experience flash floods.

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 Clyde

Location and Background
The River Clyde flows through Scotland and is about 160km long.

Geomorphic Processes
Upper – Features include interlocking spurs at **Crawford**. The **Falls of Clyde** are four waterfalls, the highest is 27m. There is also a gorge along this part of the river.
Middle – Features include meanders and ox-bow lakes at **Lanark** and between **Motherwell** and **Glasgow**
Lower – Glasgow is built on the floodplain of the River Clyde. The land is about 5m above sea level. River's estuary is about 34km west of Glasgow. Mudflats are exposed at low tide.