# Physical Landscapes in the UK

## 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

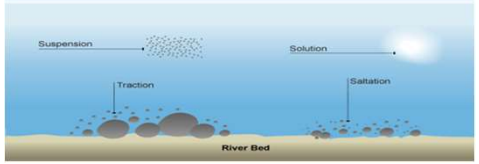
**The break down and transport of rocks – smooth, round and sorted.**

| | |
|---|---|
| **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. |



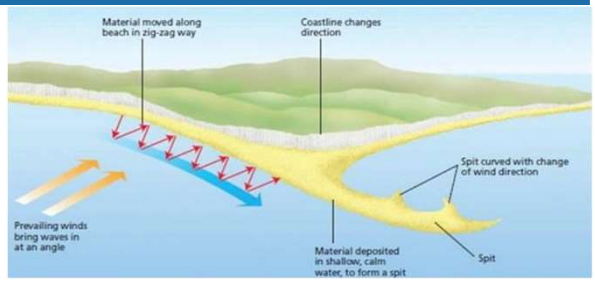

## Mass Movement

**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: Dawlish Warren.**




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.

## Mechanical Weathering Example: Freeze-thaw weathering

**Stage One**

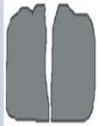
Water seeps into cracks and fractures in the rock.

**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.



## 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. |

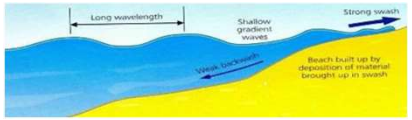

## Size of waves

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

## Types of Waves

### Constructive Waves

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

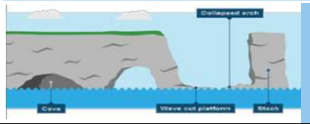



### Destructive Waves

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


## Formation of Coastal Stack

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.




**Example: Old Harry Rocks, Dorset**

## Coastal Defences

### Hard Engineering Defences

| | | |
|---|---|---|
| **Groynes** | **Wood barriers prevent longshore drift, so the beach can build up.** | ✓ **Beach still accessible.**<br>✗ **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**<br>✓ **from flooding Curved**<br>✗ **shape encourages erosion of beach deposits.** |
| **Gabions or Rip Rap** | **Cages of rocks/boulders absorb the waves energy, protecting the cliff behind.** | ✓ **Cheap**<br>✓ **Local material can be used to look less strange.**<br>✗ **Will need replacing.** |

### Soft Engineering Defences

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

## Coastal Case Studies

**Swanage: Features of Erosion & Deposition Geology:** composed of resistant Limestone / chalk and less resistant clay and sands (soft rock)
**Landforms of erosion:** Headland - a protruding area of resistant rock. Bay - an enclosed area of less resistant rock. Cliffs and wave cut platforms. Caves. Arch Stack e.g. Old Harry Rocks

**Landforms of deposition:** Beaches / Bar / Spit e.g. Dawlish Warren. Tombolo / Sand dunes

**Lyme Regis: Management**
**Reasons**: Layer cake geology, susceptibility to landslides, powerful destructive waves in autumn/winter
**Method**: coastal management at Lyme Regis has involved two focus areas: 1. **Beach front** - to combat wave attack hard engineering has used (groynes, the Cobb extended, sea wall, rock armour). Beach nourishment has also been used. 2. **Slopes** – to prevent landslides soil nailing/piling has been used. **Effects** (benefits): 140 properties protected, secures tourism (worth £994 million); safeguards beach, improves access. Financially benefits outweigh costs 6:1.
**Conflicts** (costs): £21 million, environmental impact e.g. Langmore Gardens, terminal groyne syndrome

## 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.

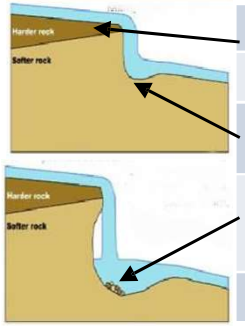
***Physical:* Relief**
Steep-sided valleys channels water to flow quickly into rivers causing greater discharge.

***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

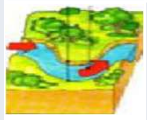


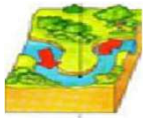

1) River flows over alternative types of rocks.
2) River erodes soft rock faster creating a step.
3) Further hydraulic action and abrasion form a plunge pool beneath.
4) Hard rock above is undercut leaving cap rock which collapses providing more material for erosion.
5) Waterfall retreats leaving steep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

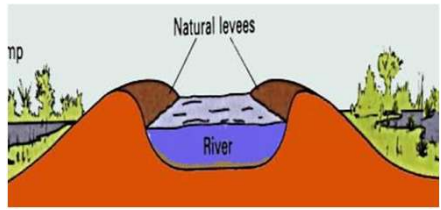
Evaporation and deposition cuts off main channel leaving an oxbow lake.

## 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.

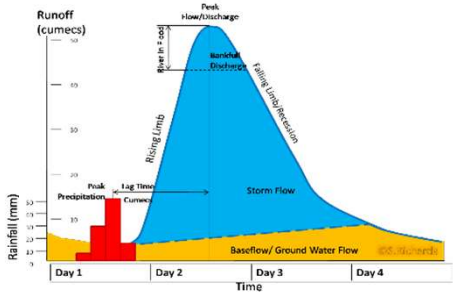
### Hard Engineering

**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

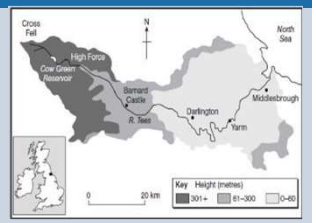
**River discharge is the volume of water that flows in a river. Hydrographs who discharge at a certain point in a river changes over time in relation to rainfall**

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: The River Tees

**River Tees: Features of Erosion & Deposition**
Located in the North of England and flows 137km from the Pennines to the North Sea at Red Car.
**Landforms of erosion:** V shaped valleys interlocking spurs e.g. North Pennines. Waterfalls and gorges e.g. High Force
**Landforms of deposition:** Meanders and oxbow lakes e.g. Dalton on Tees. Levees and floodplains e.g. Croft on Tees. Estuary e.g. Tees Estuary




**Banbury, Cotswold Hills: Flood Management**
**Reasons**: Near River Cherwell, a tributary of the River Thames, has a history of flooding in 1998 and 2007 flooding houses and costing over £12.5 million. **Strategy**: Built embankment parallel to M40 to create flood storage area – area where rainwater is stored. Flow control structures backing up water behind gate in reservoir rather then continuing towards the town. Raise A361 main road plus improved drainage, new pumping station, creation of Biodiversity action plan (BAP) wetland habitat to store more water. **Effects (S):** Raised road can remain open during floods, quality of life improved from new habitats, reduced anxiety **(Ec) COST £18.5 MILLION,** protects 441 houses and 73 commercial properties. **(En)** New habitats created, new area able to be flooded