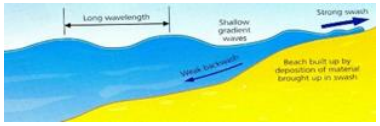
YEAR 11 UNIT 1: Coasts

Waves

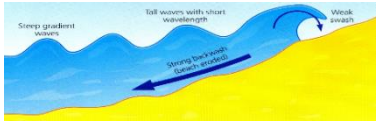
Formation - Waves are created by wind blowing over the surface of the sea. As the wind blows over the sea, friction is created - producing a swell in the water.

Size – Determined by the fetch which is how far the wave has travelled, the strength of the wind and how long the wind has been blowing for.

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

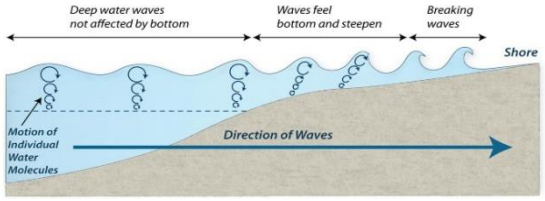


Destructive wave - This wave has a **backwash that is stronger** than the swash. This therefore erodes the coast.



Why do waves break?

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



Deposition

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

Erosion

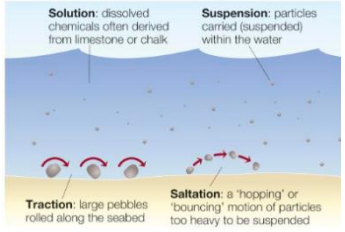
Erosion -The break down and transport of rocks – smooth, round and sorted.

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 Power - Water enters cracks in the cliff, air compresses, causing the crack to expand.

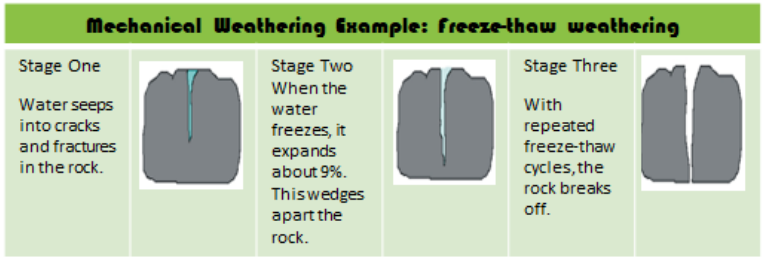


Weathering

Weathering is the breakdown of rocks where they are.

Carbonation - Breakdown of rock by changing its chemical composition.

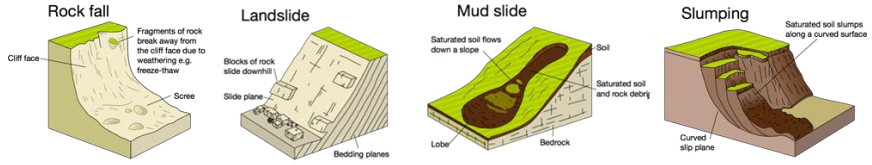
Mechanical - Breakdown of rock without changing its chemical composition.



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.



Transportation

Solution - Minerals dissolve in water and are carried along.

Suspension - Sediment is carried along in the flow of the water.

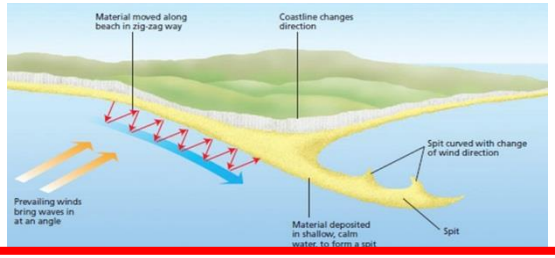
Saltation - Pebbles that bounce along the sea bed.

Traction - Boulders that roll along a river/sea bed by the force of the flowing water.

Formation of Coastal Spits

A spit is a long, narrow finger of sand or shingle jutting out into the sea from the land.

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.



Case Study – Hunstanton

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.

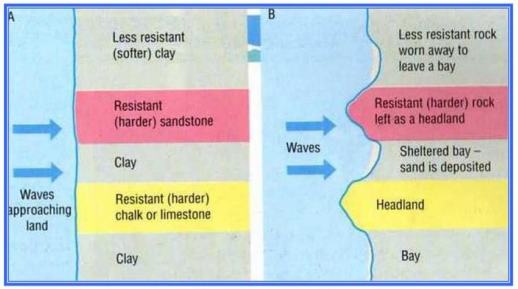
In 2013, the town suffered damage from a storm surge. The Sea Life Centre was flooded and closed for a number of months.

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.

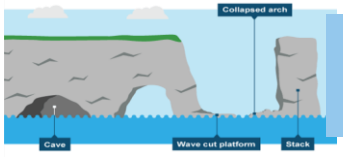
Management - Hunstanton is protected by a number of groynes. These trap sand to build up the beach for better protection. The town is also protected by large sea walls to prevent flooding and deflect the waves energy. £15 million has been spent on beach nourishment to add sediment to beach for increased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

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.



Caves, arches and stacks



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.