

Study Notes: Coasts

Remember: use these notes with the Powerpoint, so that you can understand the notes better.

1. Waves

a. Formation of waves *(see animation in Powerpoint to understand better)*

- Created by wind blowing across ocean surface.
- Wind creates friction.
- Friction produces a swell.
- Energy of the wind causes water to rotate in swell.
- Wave moves forward.

b. Size and energy of waves

- How long has the wind been blowing.
- Strength of the wind.
- How far the wave has travelled (fetch).
 - Fetch: The distance over which a wind blows continuously to move waves.
 - Prevailing wind: The most common wind or wind direction experienced in a place

c. Swash and backwash

- Swash: Wave breaks, water washes up on beach.
- Backwash: Water runs back to the ocean.
- Constructive: (deposition) Stronger swash.
- Destructive: (Erosion) Stronger backwash.

d. Tides

- Tides: Rise and fall of water in the ocean due to the moon's gravitational pull.
- Low Tide: When the water is at it's lowest level.
- High Tide: When the water is at it's highest level.
- Tidal Range: The drop in sea level from high to low tide.
- Tidal Wave: Bigger waves due to the stronger gravitational pull of the moon when it is closest to the earth.

2. Coastal Processes

- Erosion – eating away of coast
- Transport – moving of eroded matter
- Deposition – dumping of eroded matter

a. Processes of Erosion

Hydraulic action, abrasion, attrition, solution

i. Hydraulic Action

- Strong waves break against cliffs.
- Trap air in cracks.
- Air is compressed by waves.
- Rocks break apart.

ii. Abrasion

- Waves pick up sand and pebbles.
- Particles crash against cliffs.
- Scrape against cliff: erosion.

iii. Attrition

- Particles are carried by waves.
- Particles crash against each other.
- Broken up into smaller pieces.
- Become smooth.

iv. Solution

- Acid in seawater.
- Dissolve chalk and limestone cliffs.
- Dissolved material carried away.

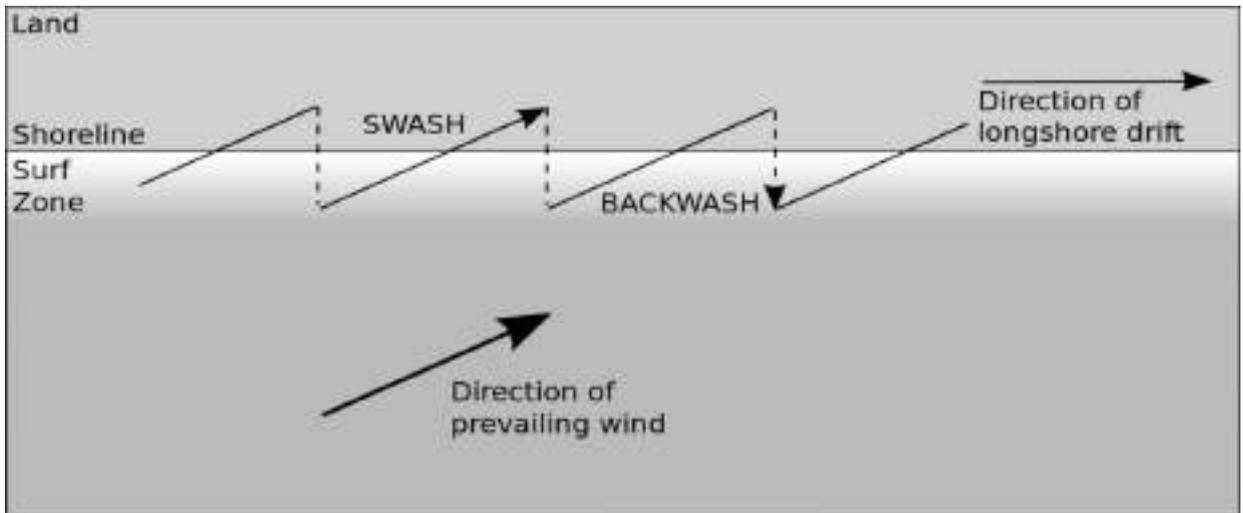
b. Transport

This is the action of the waves to move eroded matter from one place to another. The most important way of doing this is longshore drift.

Longshore drift *(see Powerpoint animation to understand better)*

- Waves move in the direction of the wind.
- Swash carry pebbles on to the beach at an angle.
- Backwash carries pebbles back in a straight 90° line.
- Pebbles move along the coast in zig-zag pattern.

ii. Sketch *(must be able label or explain sketch)*



c. Deposition

- Sometimes the sea loses energy.
- Drops rocks, pebbles, sand and particles.
- Swash must be stronger than backwash.
- Waves are constructive.

3. Landforms

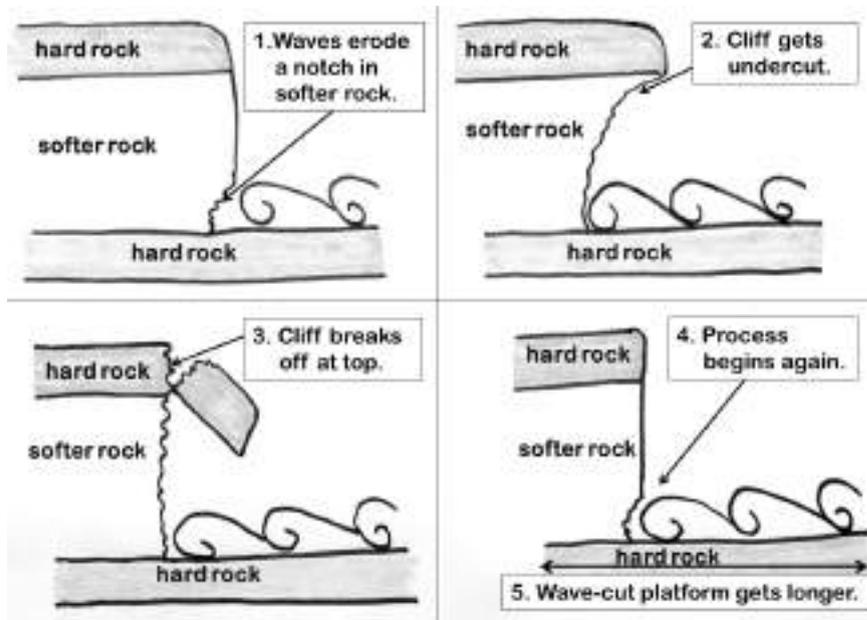
a. Erosion Landforms

- Cliffs and wave-cut platforms
- Headlands and bays
- Caves, arches, stacks, stumps

i. Wave-cut Platform

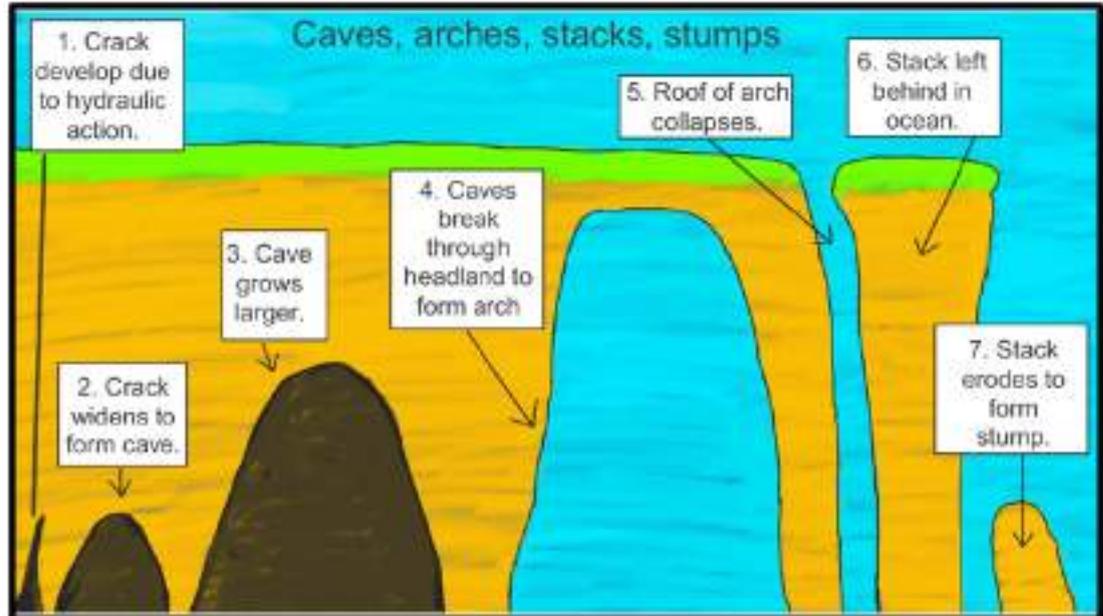
- Harder rock on the cliff floor
- Hard rock at the top of the cliff
- Softer rock in the middle
- Soft rock gets eroded (cliff undercut)
- Top part hangs over, too heavy, breaks off
- Process repeats over and over
- Wave-cut platform becomes longer
- Cliff retreats (goes backwards)

Sketch:



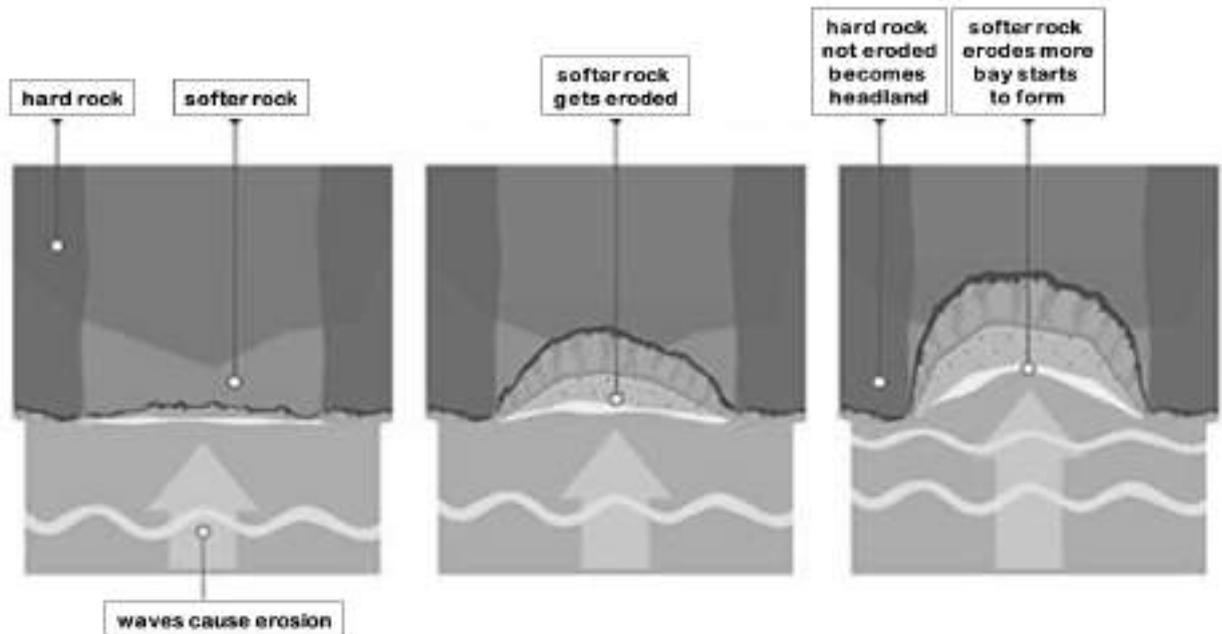
ii. Caves, arches, stacks, stumps

- Headland erodes on both sides.
- A cave forms in headland.
- Roof of cave falls in to form an arch.
- Arch erodes more to become shorter stack.
- Stack gets shorter to form stump.



iii. Headlands and Bays

- Coast has bands of hard rock and softer rock.
- Waves cause erosion in the softer parts.
- Hard rock does not erode.
- Soft rock areas form bays.
- Hard rock areas are headlands.

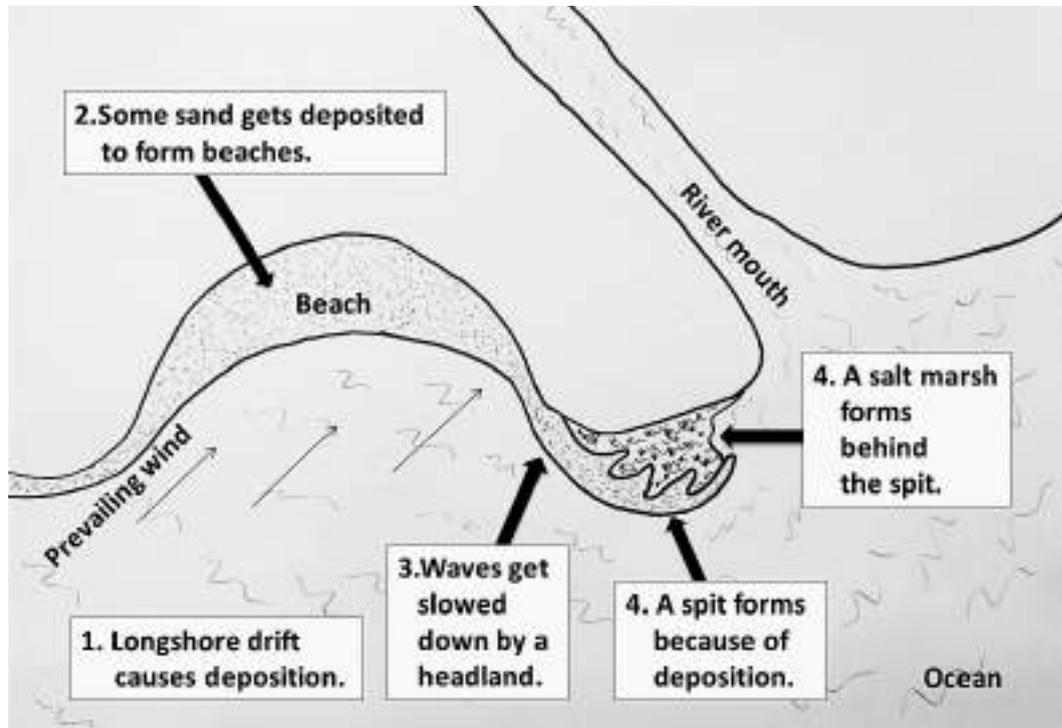


b. Deposition Landforms

- Beaches
- Spits
- Salt Marshes

Formation of a spit:

- Waves are driven by a prevailing wind (The most common wind or wind direction experienced in a place). This causes Longshore drift.
 - Longshore drift carries material along coast.
 - Some sand is deposited to form beaches.
 - Longshore drift can be slowed down by a headland.
 - Sand gets deposited to form a spit.
 - Later a salt marsh can develop behind the spit.
 - This can often happen where a river mouths out into the sea.
- Lagoon: A stretch of salt water separated from the sea by a low sandbank or coral reef. This can later become a salt marsh.
- Marsh or salt marsh: An area of low-lying land which is flooded at high tide
- Shingle: small pebbles that are deposited on the beach



4. Coastal defences: protecting coasts and beaches

- Hard engineering: manmade, concrete or wood, expensive, invasive.
- Soft engineering: using anything already in the landscape to manage risk.
- Both hard and soft engineering is designed to reduce erosion at the coast.
- Hard engineering methods: Rip rap, gabion, groyne, seawall, breakwater, revetment
- Soft engineering methods: Dune stabilisation, cliff regrading, beach profiling, beach nourishment, beach drainage

Hard Engineering Methods

- Rip-rap or rock armour: Giant boulders placed at foot of cliffs. Designed to absorb wave energy and protect cliffs behind
- Gabions: Large boulders placed in cages which means can be installed quickly
- Groynes: Designed to stop longshore drift transporting beach material away.
- Sea wall: Made out of concrete & aims to absorb wave energy, often curved to direct waves energy back to sea. Protects the base of the cliff
- Breakwater: Built out into the sea. Waves break on breakwater first before going onto the beach
- Revetments: Similar to sea walls, but often built out of wood & designed to absorb wave energy



Rip-Rap



Gabions



Groynes



Sea wall



Breakwater



Revetment

Soft Engineering Methods

- i. **Dune stabilisation:** Marram grass planted on sand dunes stabilises the dunes and helps to trap sand to build them up
- ii. **Cliff regrading:** This is making the cliff less steep with bulldozers. Cliffs can be unstable while being eroded so reducing the angle means you should reduce the levels of erosion
- iii. **Beach reprofiling:** Sand is redistributed from the lower part of the beach to the upper part of the beach.
- iv. **Beach nourishment:** Sand is pumped onto an existing beach to build it up. Sand is often collected by scraping the seabed. This process is called dredging.
- v. **Beach drainage:** Removing some of the excess water from the sand. Sand dries faster and beach can be built up more quickly.



Beach stabilization (Marram Grass)



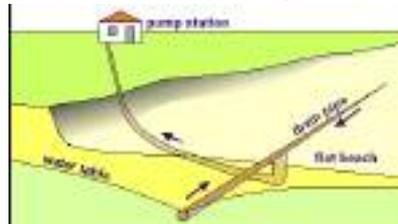
Beach reprofiling



Beach nourishment



Cliff regrading



Beach drainage

5. Storm surges

Storm surges can be caused by low-pressure systems.

When a low-pressure system develops, it can cause stormy conditions.

When the wind blows very hard, and there is a heavy rainfall, the waves can become very high. These waves can flood the areas next to the coast.

This is called a storm surge.