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# 5A3 – ISSUES IN AUSTRALIAN ENVIRONMENTS

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## GEOGRAPHICAL ISSUES – COASTAL MANAGEMENT

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*Explain the interaction of the physical and human elements of the environment*

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- **Atmospheric interactions** (the air)
  - o **Wind** generates waves, currents and storm surges
  - o **Temperature** affects weathering, glaciation (ice – sea level changes)
  - o **Precipitation (rain)** affects flow of water and groundwater
- **Lithospheric interactions** (the crust and rocks)
  - o Tectonic plates can cause shifting of sediments and tsunamis
  - o Rock types differ in weathering and erosion rates
  - o Soil degradation, erosion, salinization
- **Hydrospheric interactions** (the water)
  - o Hydrosphere creates currents, tides, storms, rivers and sedimentation with atmospheric interactions
- **Biospheric interactions** (living organisms)
  - o **Dune vegetation** affects stability of dunes
  - o **Diversity of flora and fauna** is sustained by dune systems
- **Human interaction** has caused various changes to the elements of the environment, such as:
  - o **Climate change**, causing sea level changes
  - o Building **structures**, such as groynes and sea walls, affect coasts
  - o Humans **affect dune systems** through fires, deforestation and introduced species

*The geographical processes relevant to coastal management*

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- The coast is the meeting point between the land and the sea.
- There are **three processes** relevant to coastal management – **erosion, transportation and deposition.**

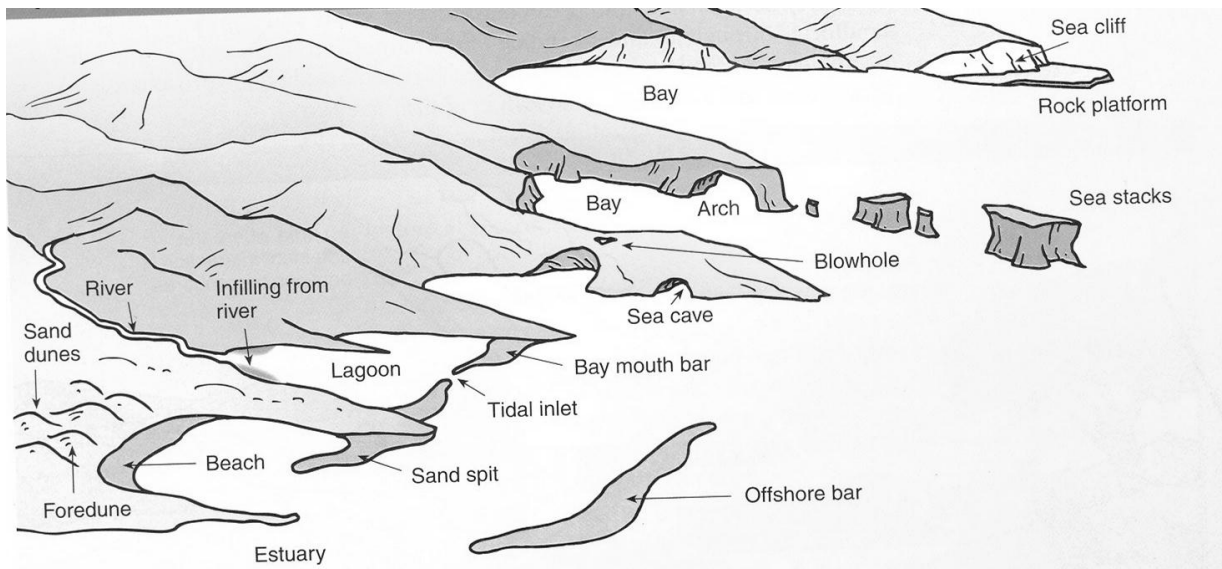
### WAVES

- Waves are the most significant in shaping the coastal zone.
  - o **Backwash** – the return flow of water **back down a beach** after a wave has broken
  - o **Swash** – the rush of water that **moves up a beach** after a wave breaks
- Two different waves allow the **three processes** (erosion, transportation and deposition) to occur.
  - o Destructive waves cause erosion, while constructive waves transport and deposit material.

	<b>Constructive Wave</b>	<b>Destructive Wave</b>
<b>Wave height</b>	Low	High
<b>Wave Length</b>	Long	Short
<b>Wave period</b>	6 to 9 per minute	10 to 15 per minute
<b>High or Low energy</b>	Low	High
<b>Beach gradient</b>	Flat	Sharp
<b>Stronger</b>	Stronger Swash	Stronger Backwash

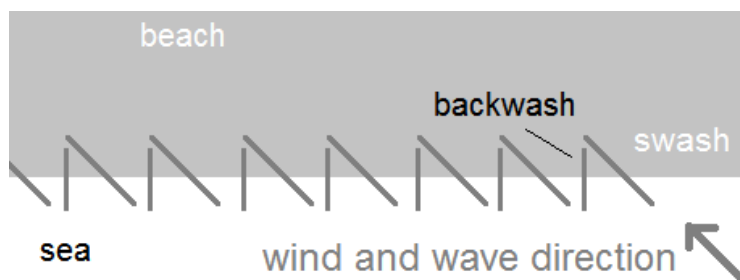
## EROSION

- There are six main types of **erosion by waves**.
  - **Abrasion** – **rock fragments are hurled** at cliffs by waves, scraping away the cliff face
  - **Corrosion** – **salt water** is able to **dissolve some chemicals** in rocks
  - **Hydraulic Action** – air trapped in joints and cracks on a cliff face is **compressed** by a wave, which **weakens the cliff**
  - **Scouring** – at the base of the cliff, waves break and swirl around, removing loose rock
  - **Attrition** – **rock fragments** carried by the wave **hit against each other** to form sand and silt
  - **Wave pounding** – force of wave hitting cliff face
- Erosion doesn't always occur from waves – **weathering** sometimes causes the coast to break down.
  - **Salt-spray weathering** – **salt particles expanding and contracting** as they dry from the sun
  - **Plant weathering** – breaks rock as **plants send roots** into joints of the rock
- Erosion and weathering cause structures to be created.
  - Headlands and bays, rock outcrops, waves eroding a notch into cliff, causing it to collapse, arches, caves and sea stacks



## TRANSPORTATION

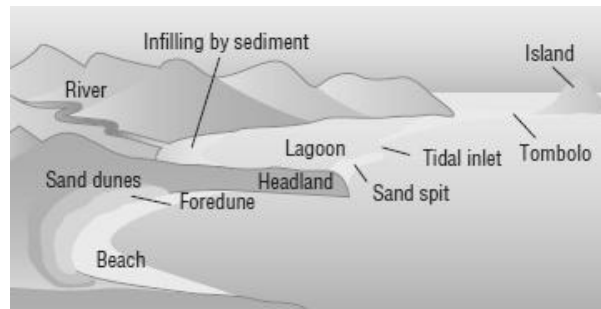
- Longshore drift is **the transportation of material** along the shore by wave action.



- There are four ways that waves and currents can **transport** sediment.
  - **Traction** – large material is rolled along the sea floor
  - **Saltation** – material is bounced along the sea floor
  - **Suspension** – material is suspended and carried by the waves
  - **Solution** – material is dissolved and carried by the water

## DEPOSITION

- Deposition occurs when eroded material is dropped off by **constructive waves**.
- Various **structures** can be formed by deposited material.



- A **sand dune** is formed when wind blows loose sand inland, and is stabilised by plantation.
- A **spit** is formed when sand is transported (by longshore drift) towards a river.



## *The perceptions of different groups about coastal management*

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- **Residents** near the coast may be affected by the coast through **destructive waves** removing parts of the coast, **salt spray** (corrosion of steel), tourists who walk past and **reduce privacy** and **increased noise pollution**
- **Developers and real estate** want to **build near the coast**, but must be wary of erosion and weathering
- **NGOs and interest groups**, such as Dunecare and Coastcare, protect the coastline and replenish dunes

## *Individual, group and government responses to coastal management*

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### AUSTRALIAN GOVERNMENT

- Sign treaties/international agreements for protecting coastlines

### STATE GOVERNMENT

- Funding of significant coastal projects such as sea walls

### LOCAL GOVERNMENT

- Fences and walkways, vegetation to protect dunes
- Provide public facilities, such as bins, public toilets, parking areas
- Zoning and approving development applications
- Responsible for construction of groynes, beach replenishment (longshore drift)

*Some title which was misplaced during note-making*

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- **Coastal defence systems** have been devised, and are categorised as **hard and soft engineering**.
  - o **Hard engineering** is where **manmade** defence structures protect coastline
  - o **Soft engineering** is where beaches or **naturally formed** material protect coastline

**HARD ENGINEERING**

<b>Defence System</b>	<b>Purpose</b>	<b>Effectiveness</b>
<b>Wave reflection wall</b>	Curved to reflect wave's energy (instead of absorbing), but waves can scour base of wall	Effective, expensive
<b>Seabees Seawall</b>	Dissipates energy, collects sand and made of tyres so water can swirl around instead	Very effective, very expensive
<b>Rip Rap (Rock Armour)</b>	Large boulders that absorb energy, but waves can wash away sand beneath the rocks	Movement of boulders expensive
<b>Groynes</b>	Wooden or steel structures that stop longshore drift, reducing erosion	Effective, but starve + increase erosion in areas
<b>Gabions</b>	Rock-filled cages built into cliff face, to protect cliff from force of waves	Cheaper, but visually degrading, effective
<b>Revetments</b>	Wooden slope that breaks the force of wave and beach material collects behind it	Cheap and effective, more replacing required
<b>Footpath and fences</b>	Paved to prevent tourists and people destroying vegetation	May be damaged by waves

**SOFT ENGINEERING**

<b>Defence System</b>	<b>Purpose</b>	<b>Effectiveness</b>
<b>Beach Nourishment</b>	Beach material fed back in after destructive waves or longshore drift move sand	Expensive, more natural, no visual degradation, very expensive, more replacement required
<b>Sand Dunes (with vegetation)</b>	Sand is held together by vegetation, and protects against waves	Very effective, natural