

# COASTAL GEOMORPHOLOGY

# DEFINITION

- Coastal geomorphology is the scientific study of land forms at the coast.
- A coast is a part of the land bordering the sea, lake or an ocean.

Taunton

0 Kilometres 20

Seaton

Bridport

Poole

Weymouth

Lulworth Cove

Old Harry  
Rocks

Swanage

Portland Bill

**Jurassic Coast**

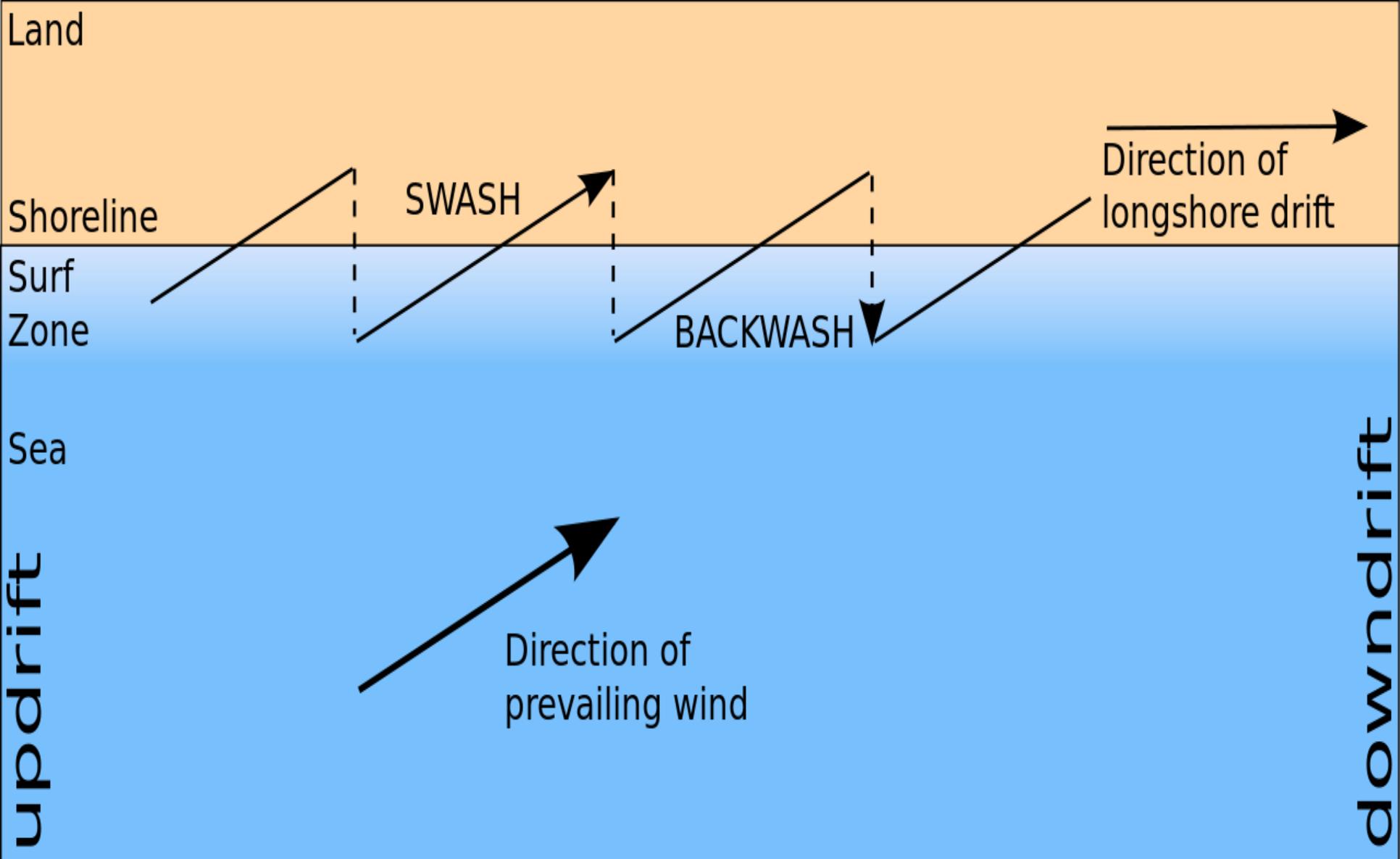
by <sup>CyberLink</sup>PowerDirector

- The coast is affected by water as it moves to and fro the coast in form of waves
- **Waves** are ripples or oscillation of water on a water body.
- Oscillation of water involves up and down ward movement of water.
- Waves are caused by catastrophic events like moving wind, volcanicity, earth quakes, moving objects like ships, whales etc.

- Waves are either constructive or destructive.
- Wave erosion/ marine erosion/ wave destruction involves the washing away of the coast.
- Destructive waves are called steep/spilling/ swash because they are very strong.
- They break at a sharp angle and are characterized by a strong back wash leading to erosion of the coast.

# Waves wash the coast in three major ways;

- **Swash** – movement of water in a wave form towards land.
- **Back wash-** movement of water backwards into the sea in a wave form.
- **Longshore drift-**





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# WAVE EROSIONAL PROCESSES

1. Abrasion / corrasion
2. Corrosion (solvent action)/solution
3. Hydraulic action
4. Attrition

# 1. **Abrasion / Corrasion**

- - Wearing away or removal of the shore line by materials carried by the water wave such as pebbles and boulders.

## 2. Corrosion/ Solution

- Involves dissolving of the rocks that are soluble at the sides and beds of the river valley, ocean or lake into solution form

### 3. Hydraulic action

- Process by which the coast is widened or eroded by the action of water alone.
- Waves send powerful swash that pounds the cliff face compressing air in the cliff cracks
- As water withdraws from the cliff face, compressed air suddenly expands causing shock waves that break coastal rocks.



## 4. Attrition

- where the eroded rock particles collide with each other while in motion to form smaller particles that can easily be carried.

# COASTAL LAND FORMS

# LAND FORMS DUE TO WAVE EROSIONAL

1. Cliff
2. Wave cut platform
3. Caves
4. Blow hole
5. Arch
6. Stack
7. Geo
8. Stamp
9. Headland and bay

***Caves***- cylindrical tunnel which extends into the cliff face following line of weakness.



# Formation of a cave

- Caves occur when water waves force their way into cracks or lines of weakness in the cliff face.
- The water contains sand and other materials that grind and erode the rock until the cracks expand and become a cave.
- Hydraulic action is the predominant process.
- *Examples at Lutembe, kaliti in kenya, Entebbe palm resort beach.*

# Cave formation



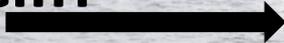
# Cave formation



***Cliff***- high steep sided rock facing the sea.



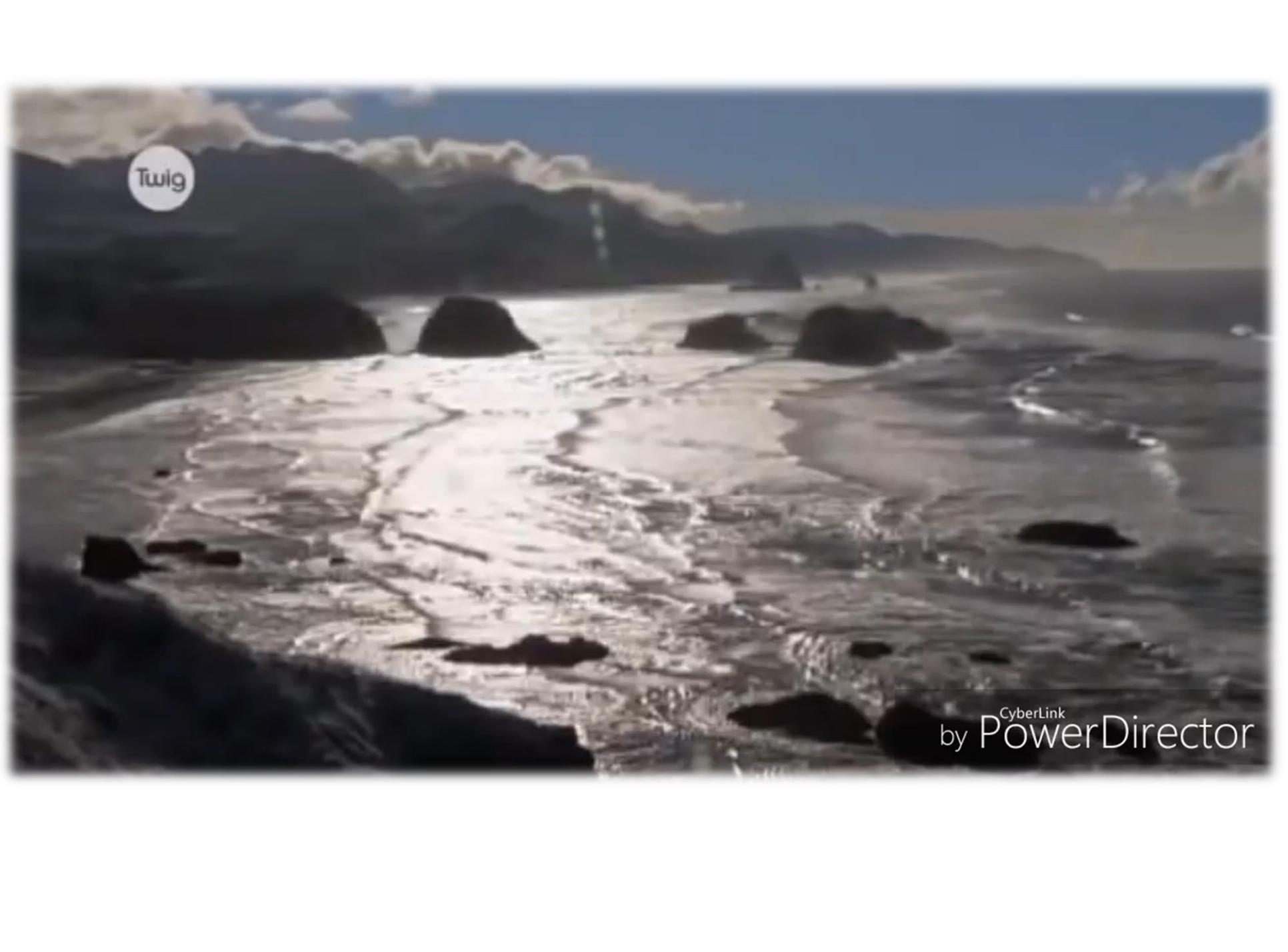
cliff



lake

# Formation of a cliff

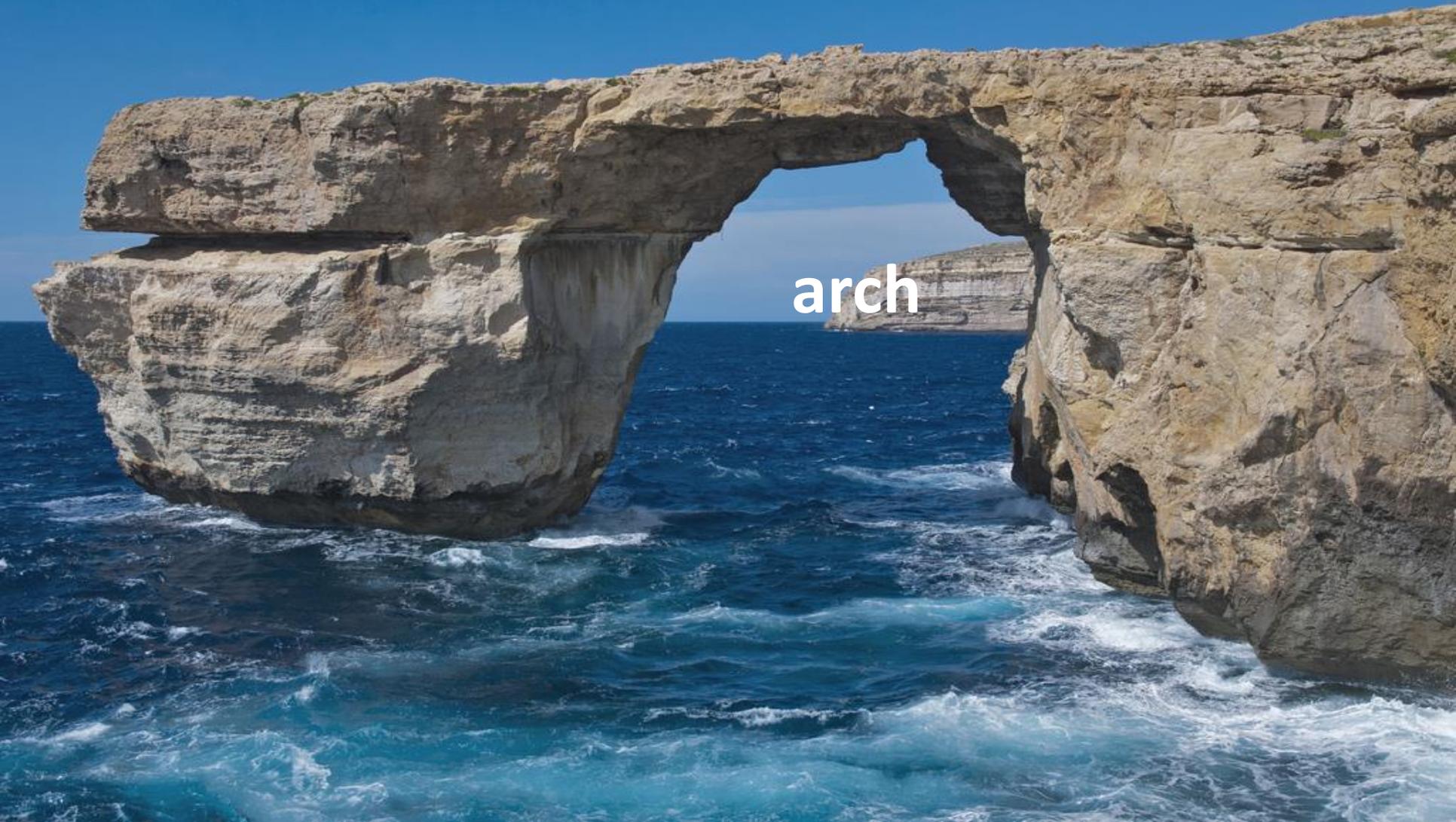
- Cliffs start to form when waves begin crashing into the bottom of what will become the cliff.
- Water waves begin cutting away a hole or notch.  
Through hydraulic action and corrosion, waves enlarge the notch.
- Repeated wave action causes the notch to enlarge.
- The upper rock becomes weaker and eventually collapses, forming a cliff.
- *Examples include; the one at port Jesus, Kasenyi landing site, Botanical beach Entebbe, fort Gaza near Kilwa etc.*



Twig

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***An arch-*** formed when two caves join together.



# Formation of arches

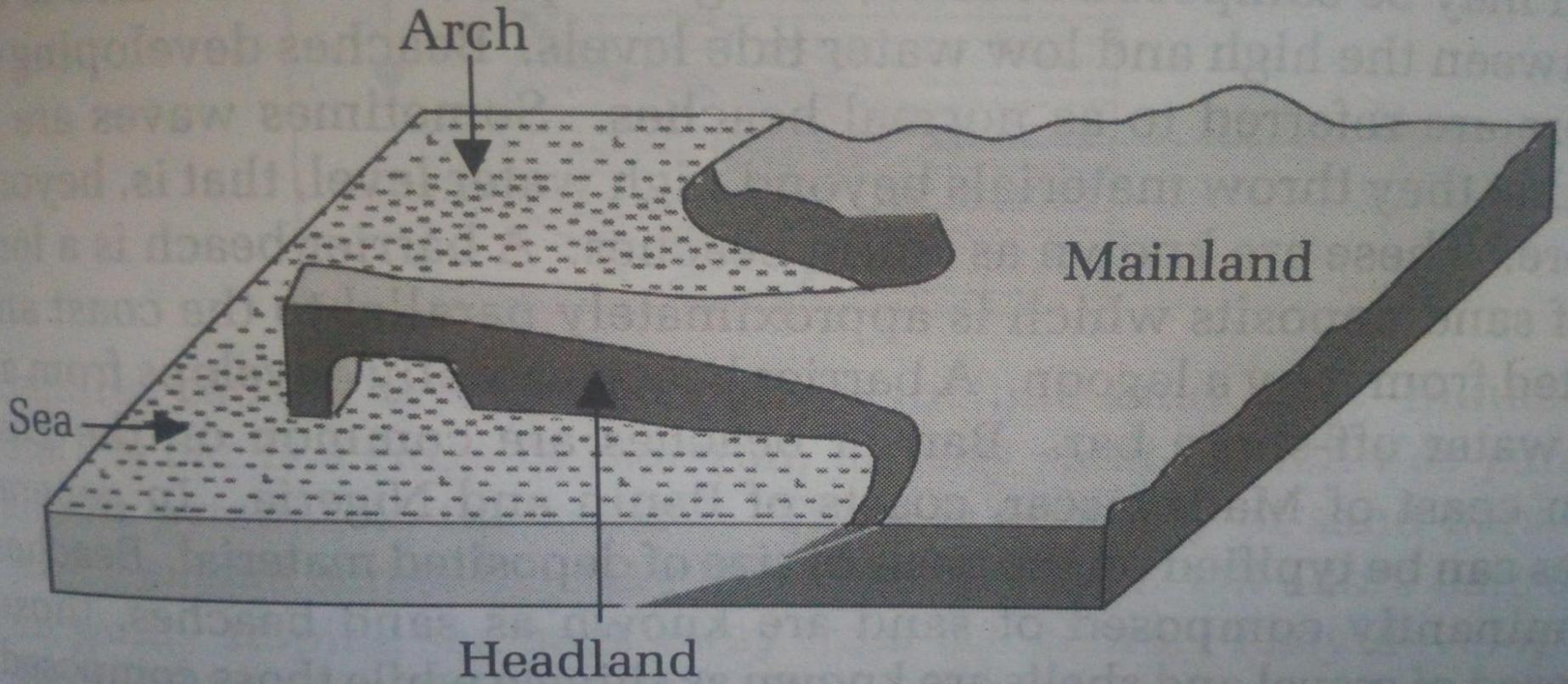
- Arches are formed when water waves attack the headland from either side.
- The common erosional processes are hydraulic action and abrasion.
- Waves start by attacking the soft rocks and forming caves.
- Continuous erosion and drilling of the sides of a headland causes the two caves to meet.
- A tunnel is formed below leaving a bridge like feature on top called an **arch**
- *Examples are seen at Kasenyi, Vasco da Gama*

# Arch formation



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# Diagram of an arch



***Stack***- an off shore island which develops after the collapse of an arch.



stack

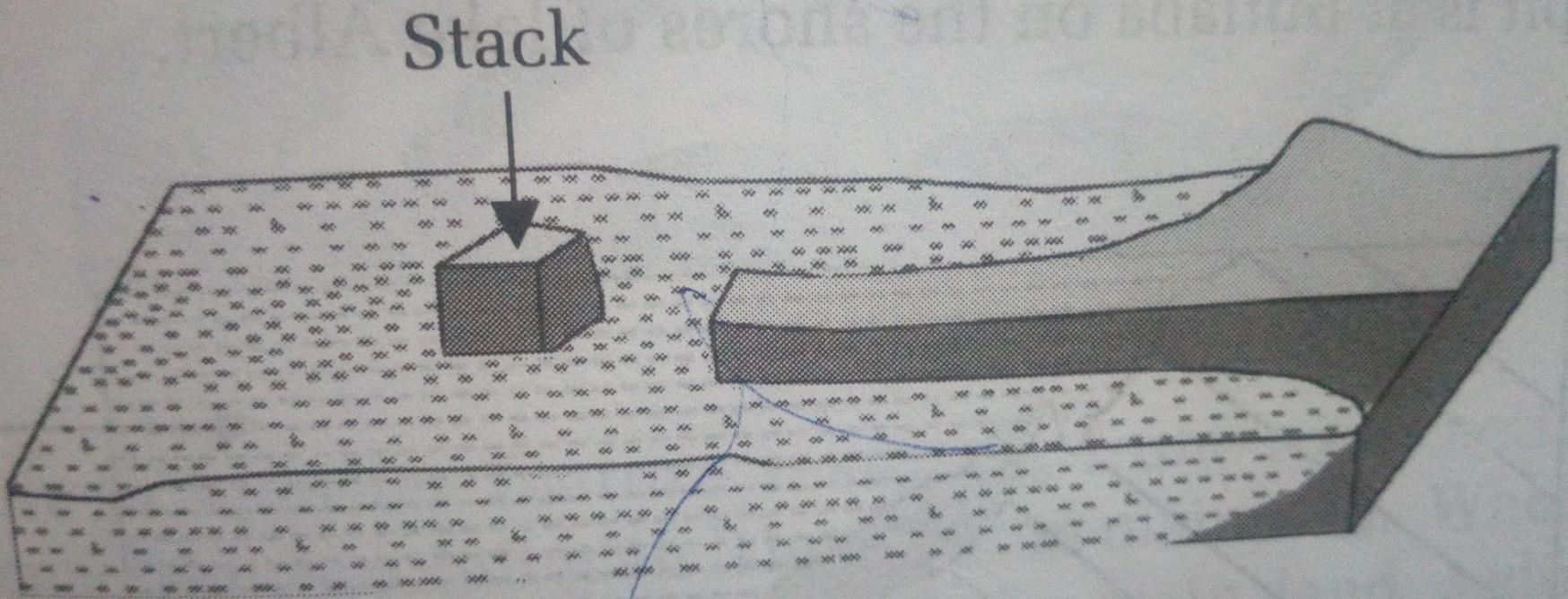
# Formation of a stack

- A stack is an isolated rock feature found in a water body completely detached from the main land.
- Its formed when the roof of an arch is gradually eroded until it collapses resulting into a detachment of the rock from the headland or main land.
- *Examples are seen at Kasenye land site on lake Victoria*



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# Diagram



# Stamp

# Formation of a stamp

- Stamp is an isolated piece of land found below the water level in a water body.
- It can be exposed during low tide.
- Its formed when a stack is eroded down by wave action leaving a residue rock know as a stamp.
- *Examples can been seen at Kasenyi landing site on lake victoria*

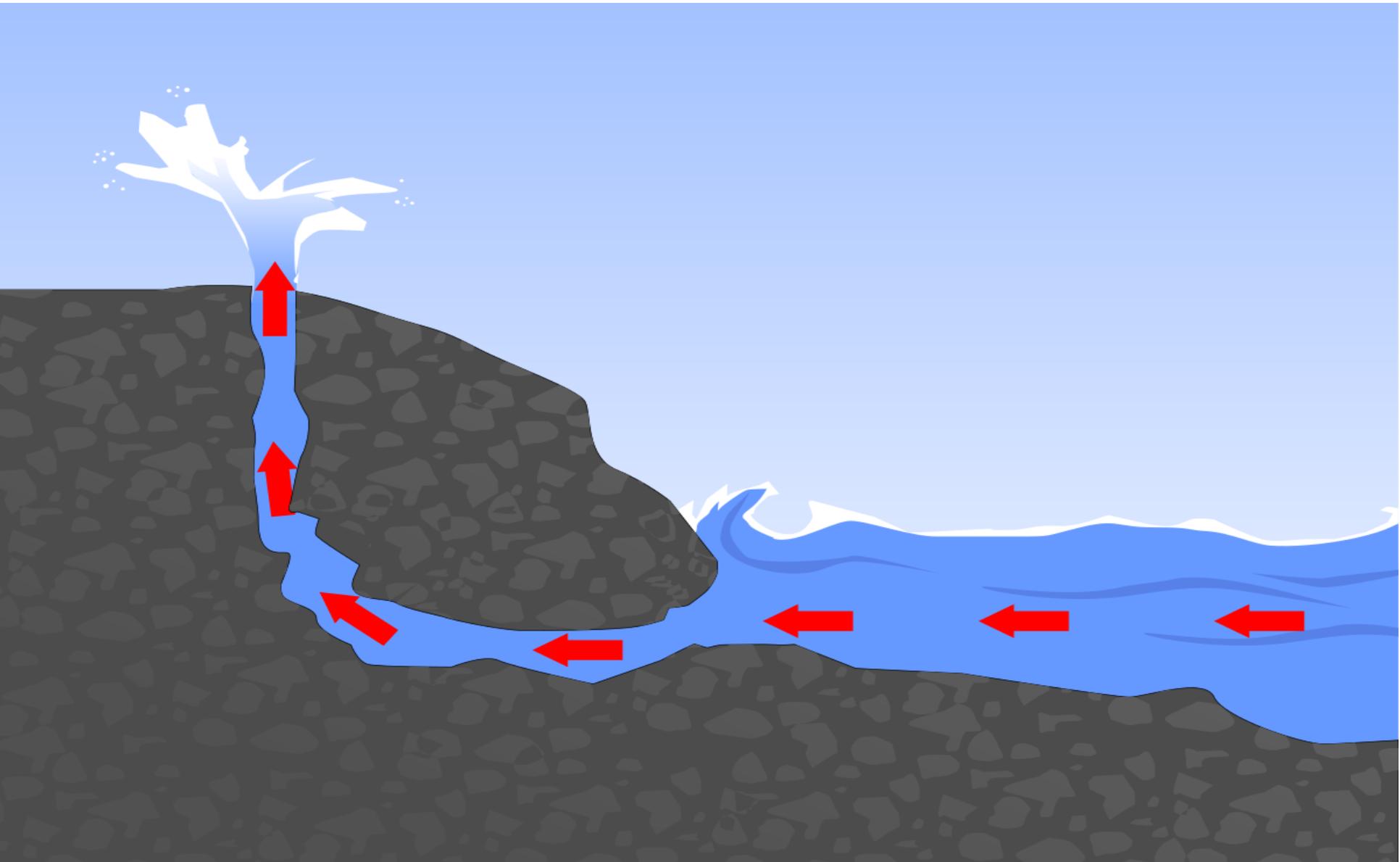


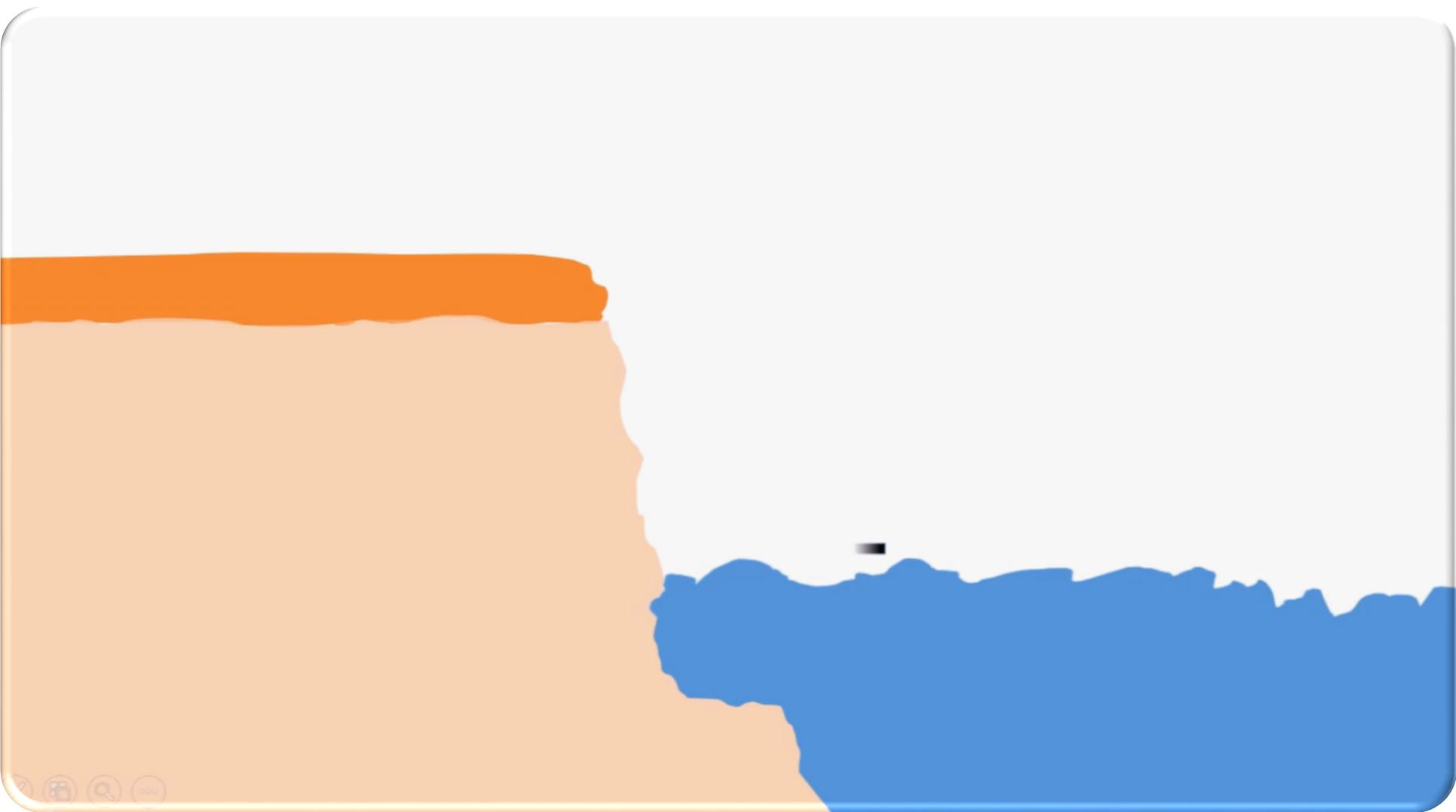
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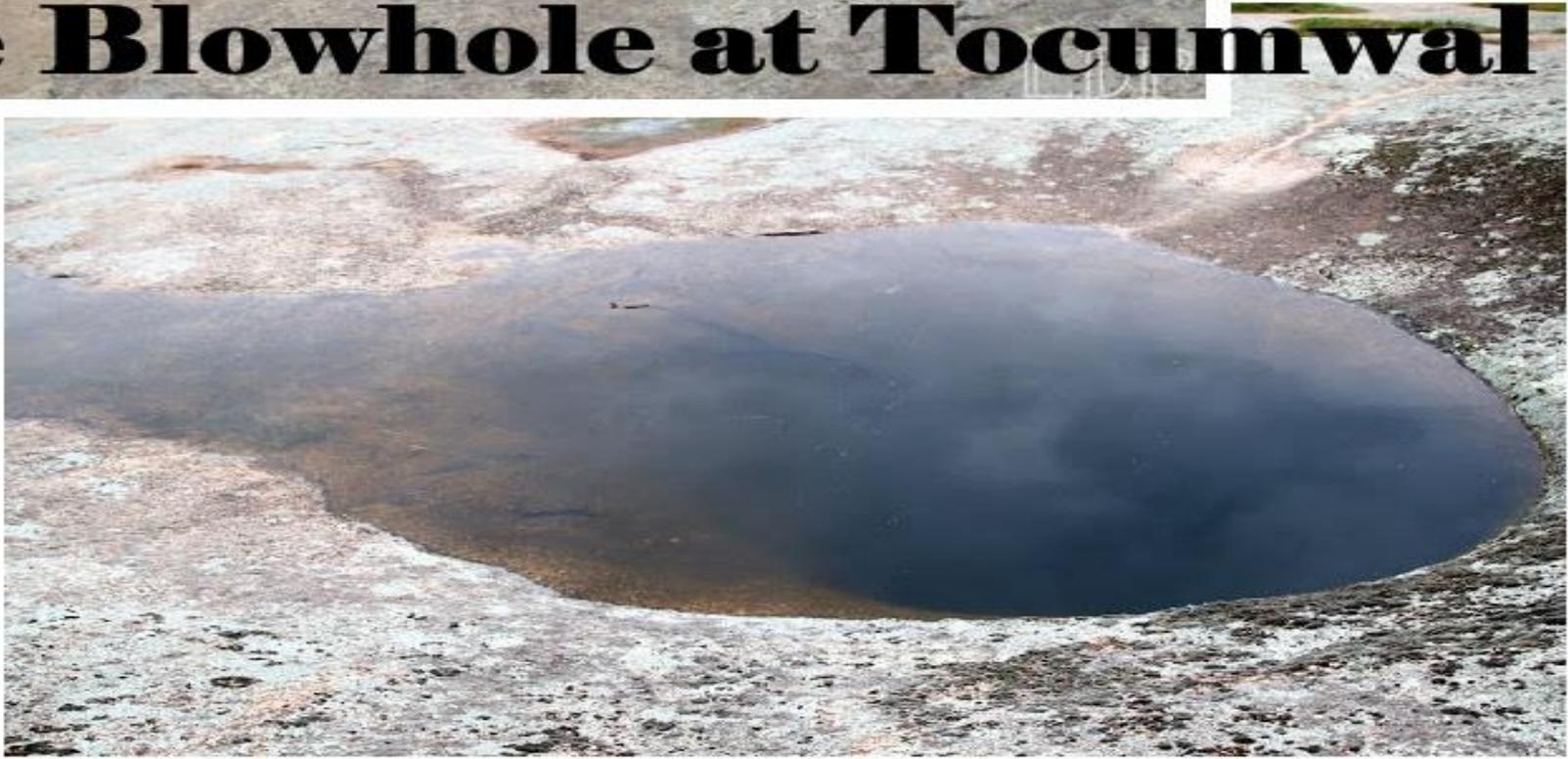
**Wave cut platform- gently sloping landscape towards the sea.**



***Blow hole*** – vertical sharp hole joining the cliff top and the cave below.







***Geo*** – narrow inlet along the coast



Headland- an extension of land into the sea



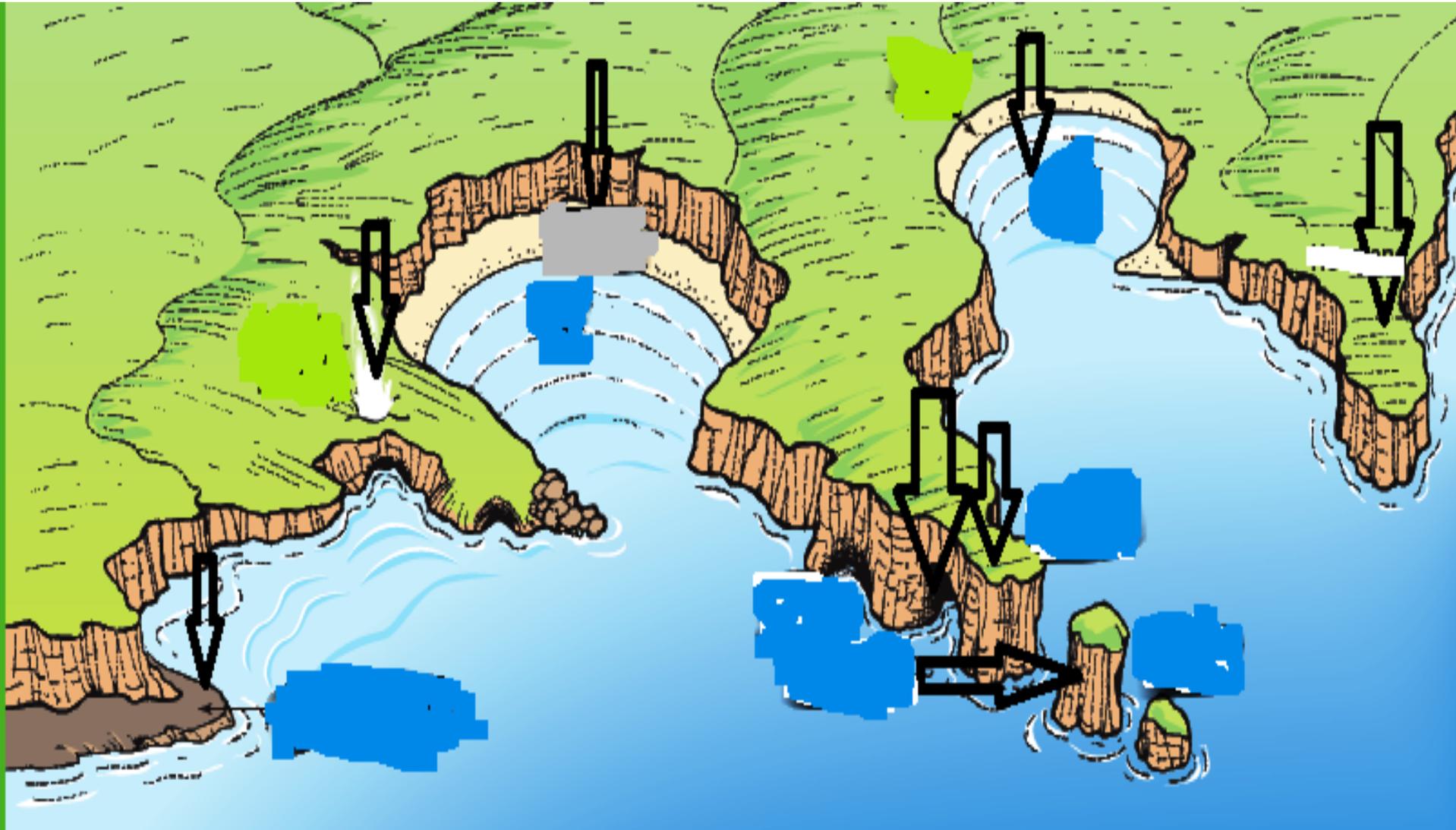
# Peninsula



**Bay-** extension of the water body into the land.



Name the features shown below



# LAND FORMS DUE TO WAVE DEPOSITION

- a. Beaches
- b. Berms
- c. Tombolo
- d. Bar
- e. Fore shore bar
- f. Spit
- g. Cuspate foreland
- h. Mud flats and silt marshes

# Beaches

- *Storm beach- formed when strong waves deposit materials beyond the high tide water level.*



***Berm***- accumulated heavier stones and boulders at the upper beach



***Tombolo***- depositional feature connecting a headland to a stack or an island



***Bar-*** embankment built off shore but is parallel to the coast.



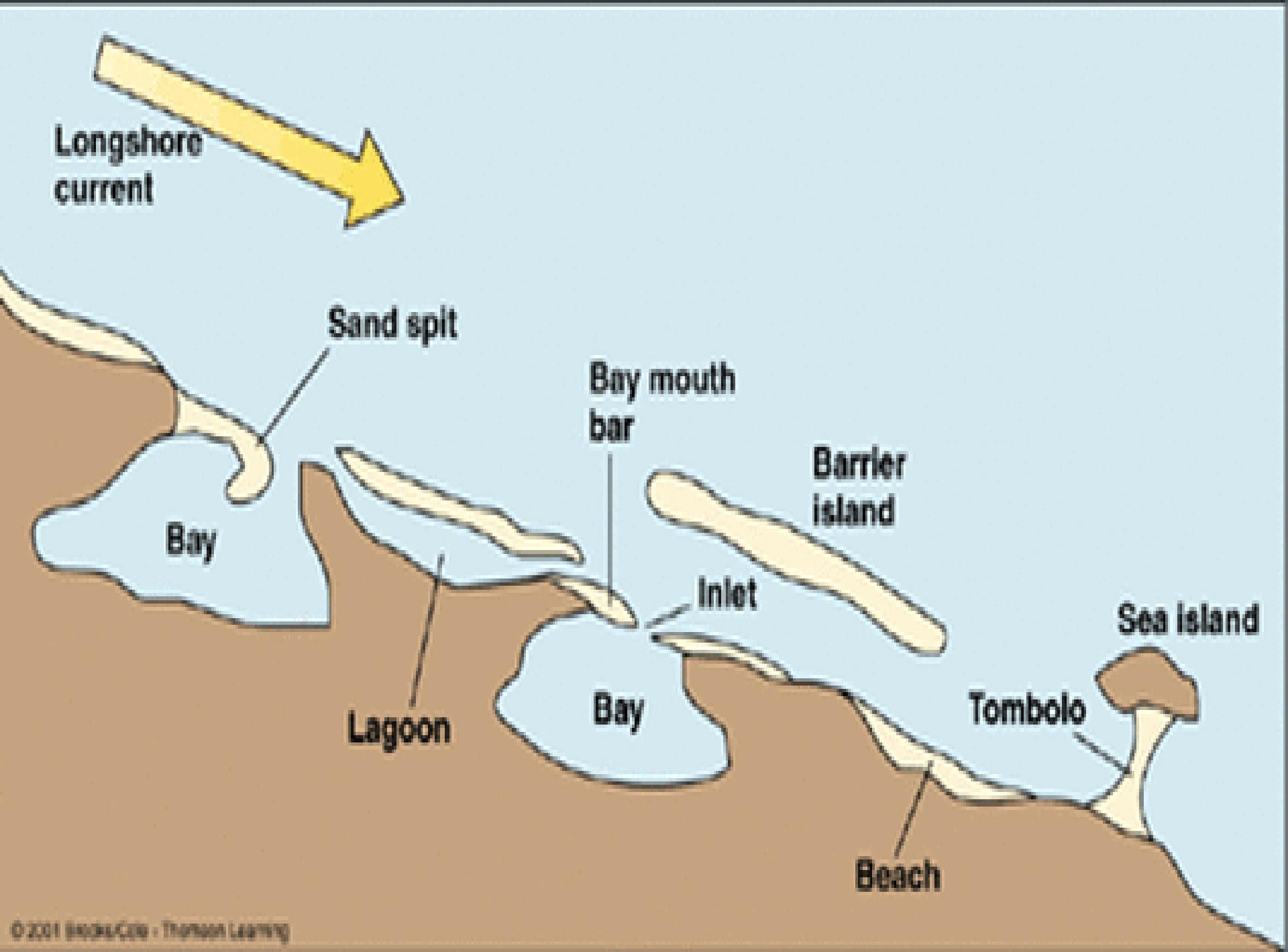
***Spit***- low lying ridges of sand, pebbles joined to the coast and the other end into the deep water



# Lagoon-







Longshore  
current

Sand spit

Bay

Lagoon

Bay mouth  
bar

Bay

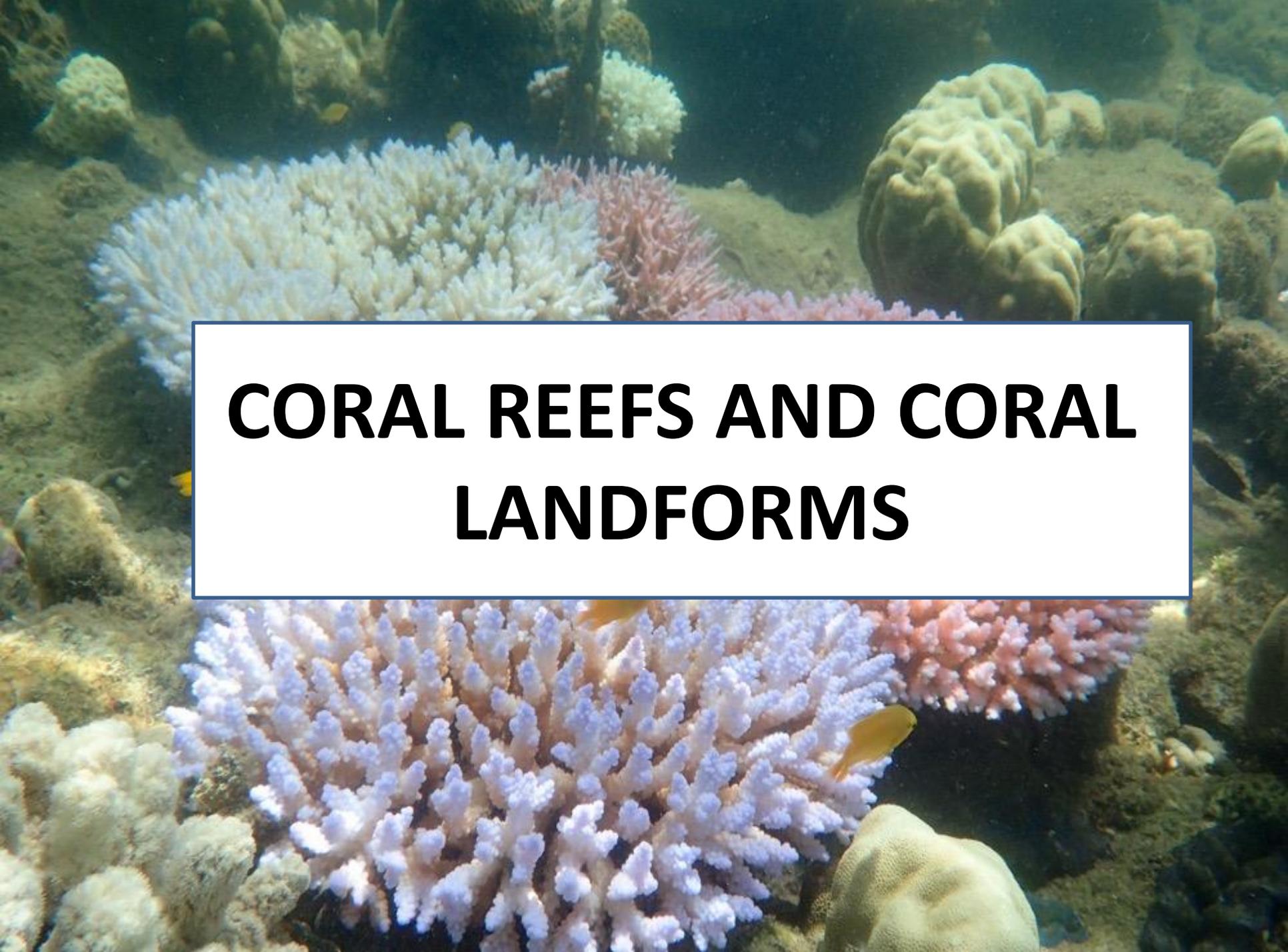
Inlet

Barrier  
island

Beach

Tombolo

Sea Island

An underwater photograph of a coral reef. The scene is filled with various types of coral, including large, rounded, yellowish-green corals and smaller, branching corals in shades of white and pink. Several small, yellowish-orange fish are visible swimming around the coral. The water is clear, and the lighting is bright, highlighting the textures and colors of the marine life.

# **CORAL REEFS AND CORAL LANDFORMS**

# Types of Coral Reefs:

- **Fringing Reefs:** These are coral platforms that are joined to the coast or separated from the coast by a narrow and shallow lagoon.
- The platform surface is usually flat and slightly concave.
- A shadow and a narrow lagoon occur between the coast and the edge of the reef.
- They form when the coral polyps start building near the sea shore and sea wards.

## FRINGING REEF



This type of reef can only be exposed during periods of low tide. They are found around Mombasa, Malindi, Dar-Es-salaam, Tanga and Zanzibar.

**Barrier Reef:** This is a coral platform which is separated from the sea by a deep lagoon. This is similar to the fringing reef except that it extends some kilometers from the shore and separated from the coast by a deep wider lagoon.

- Examples can be found between Madagascar and Mozambique.



# **Atolls.**

These are circular reefs enclosing a circular lagoon without any land in the same center.

The enclosing ring is usually broken in a few kilometers to allow free flow of water.

Atolls usually form in the middle of the ocean where they normally enclose a submerged island to form reef which is circular and horse shoe shaped surrounding a shallow lagoon.



Examples include the Aidabra atoll of the East Africa coast which lies between Madagascar and lies about 700km away from the coast.

# **Economic Importance of Coral Reefs in East Africa.**

- Coral reefs produce beautiful scenery which attracts tourists hence bringing foreign exchange to the people of East Africa.
- Coral reefs provide raw materials for building and construction i.e. they are sources of limestone which is used to make cement e.g. Bamburi cement works in Mombasa.
- Coral reefs shelter ports from strong winds and waves from the sea e.g. Mombasa port is sheltered by reefs.

- The lagoons are ideal sites for fishing and fish breeding.
- Weathered soil from coral reefs forms suitable soils for coconut growth and growing of cloves especially in Pemba and Zanzibar.
- Coral reefs are used for decoration purposes
- Coral reefs promote education and research / are used for study purposes
- The lagoons are also used for recreation activities like swimming
- Coral reefs provide a firm/ strong foundation for building port facilities.

# Problems Resulting from Presence of Coral Reefs in East Africa.

- Coral limestone is porous and sandy hence produces soil that is infertile and not ideal for agriculture
- Coral reefs hinder marine navigation; ship sailing towards the coast can collide against the coral rocks resulting into extensive damage.
- Coral growth on the continent shelf interferes with marine activities, they interfere with movement of shipping vessels and at the same time the fishing nets are torn by coral reefs
- Lagoons enclosed by coral reefs are sometimes colonized by swamp vegetation and become habitats for disease carrying vectors.
- Coral reefs cause accidents on water where boats hit the coral rocks