



# *Stewards Academy*

## **Geography Year 9**

### **Blended Learning Booklet**

### **Y9-4 Coasts**

**Name:**

**Form:**

Aim to complete one lesson each week. Write down the **title and LI** for each lesson and then complete the tasks which are **highlighted**.

The Knowledge Organiser on page 3 has all the key information and vocabulary to help you with this unit.

Upload all work onto ClassCharts for feedback.



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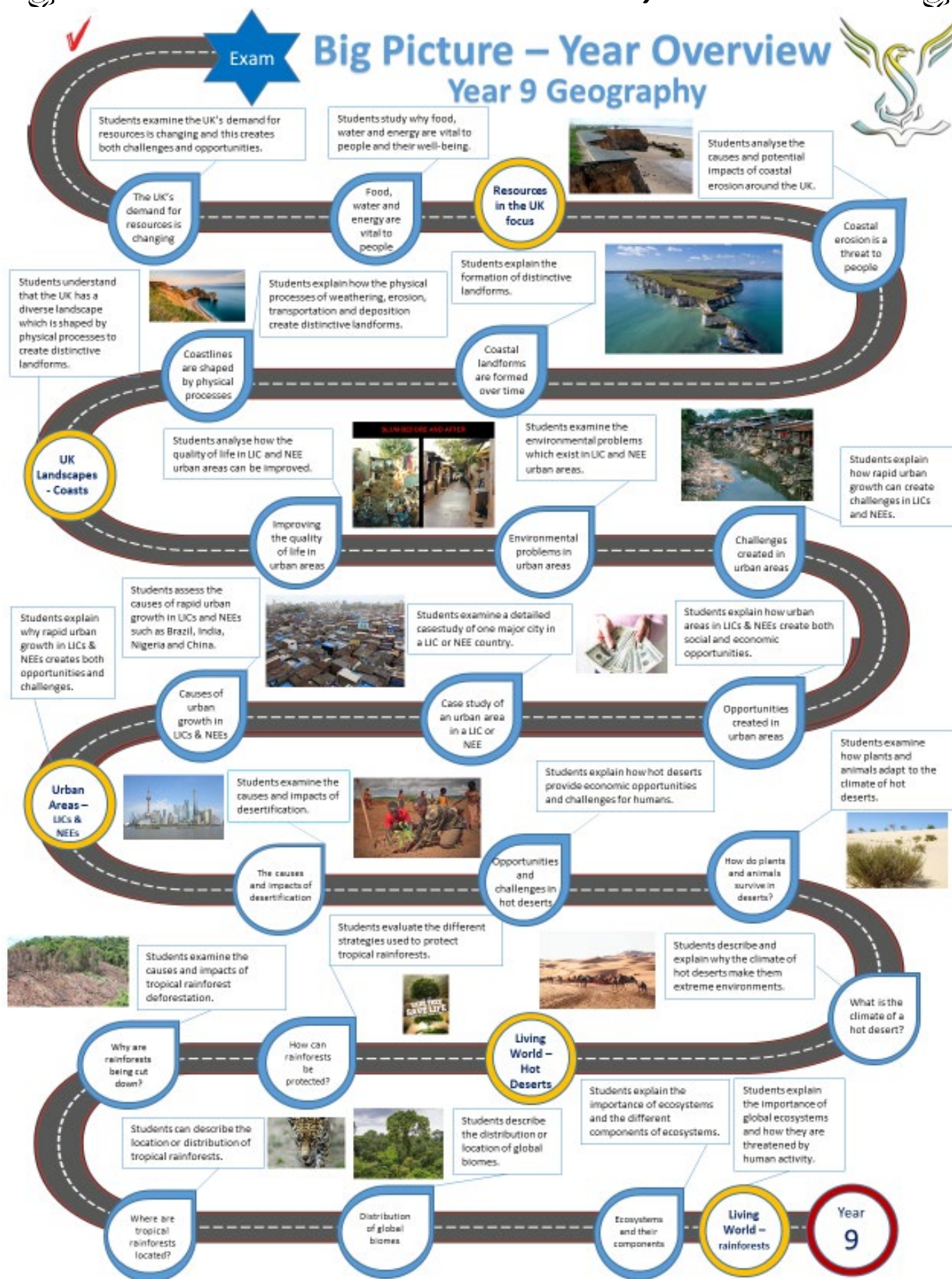
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## Lesson One: UK Landscapes

LI: To identify that the UK has a range of diverse landscapes.

Lake District (Northern England):



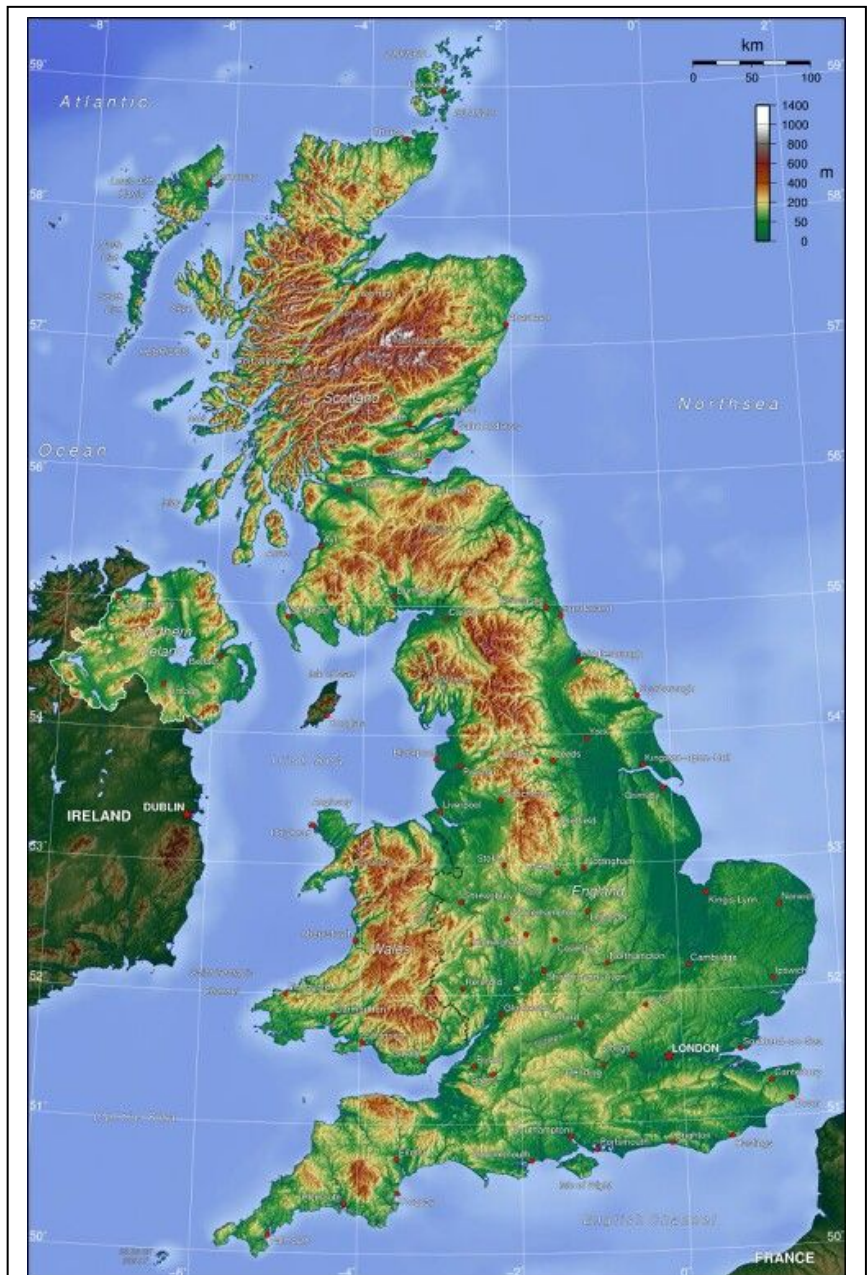
Dorset Coast (Southern England):



Scottish Highlands:



Essex countryside:



### TASKS to complete:

- 1) Describe each landscape – notable features, height and shape of the land.
- 2) Draw a line from each photo and locate the landscape on the map above. Use online maps or an atlas to help you.
- 3) Use the map to identify highland and mountain areas and areas which are low lands

**TASK:** Watch the video on UK landscapes <https://www.youtube.com/watch?v=H8uy86v6Kaw>



## TASK: Complete the following gap fill

The UK has a ..... range of landscapes. Much of Scotland, northern England and Wales is dominated by .....such as the Grampians, the Pennines and the ..... Mountains in Wales. The southern part of England is largely ....., with some hilly areas and large areas of countryside. The UK also has an extensive range of coastal landscapes from high ....., bays to mudflats and river estuaries.

*Cliffs   low-lying   Cambrian   mountain ranges   diverse*

## Lesson Two: Coastal processes

LI: To define and describe the physical processes which shape coastlines – weathering, erosion and mass movement.

## TASK: Read through the following weathering processes

### Types of weathering

Exposed rocks along the coastline can be broken down by the processes of weathering.

#### Freeze-thaw weathering

Freeze-thaw weathering occurs when rocks are **porous** (contain holes) or **permeable** (allow water to pass through).

1. Water enters cracks in the rock.
2. When temperatures drop, the water freezes and expands causing the crack to widen.
3. The ice melts and water makes its way deeper into the cracks.
4. The process repeats itself until the rock splits entirely.

#### Biological weathering

Plants and animals can also have an effect on rocks. Roots burrow down, weakening the structure of the rock until it breaks away.

1. Plant roots can get into small cracks in the rock.
2. As the roots grow, the cracks become larger.
3. This causes small pieces of rock to break away.

#### Chemical weathering

Rainwater and seawater can be a weak acid. If a coastline is made up of rocks such as limestone or chalk, over time they can become dissolved by the acid in the water.

TASK: Watch the video on the different types of weathering <https://www.youtube.com/watch?v=2yJZES3bDOY>



## Methods of erosion

Erosion is the wearing away of rock along the coastline. Destructive waves are responsible for erosion on the coastline. There are four types of erosion:

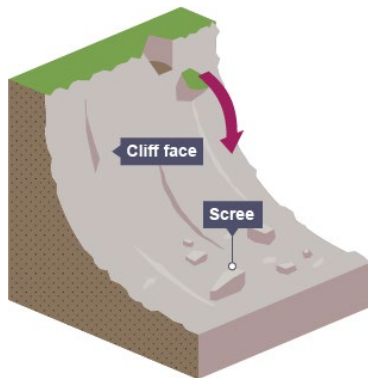
- **Hydraulic action** - this is the sheer power of the waves as they smash against the cliff. Air becomes trapped in the cracks in the rock and causes the rock to break apart.
- **Abrasion** - this is when pebbles grind along a rock, much like sandpaper. Over time the rock becomes smooth.
- **Attrition** - this is when rocks that the sea is carrying knock against each other. They break apart to become smaller and more rounded.
- **Solution** - this is when sea water dissolves certain types of rocks. In the UK, chalk and limestone cliffs are prone to this type of erosion.

**TASK: Create your own revision cards or a poster which describes and defines the processes of weathering and erosion**

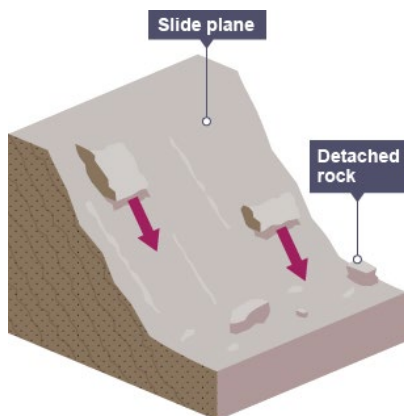
**TASK: Create your own revision notes for each of the processes of mass movement detailed below:**

## Mass movements

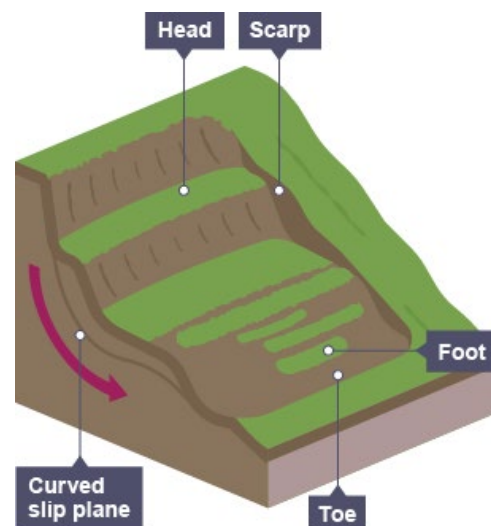
**Rockfall:** Bits of rock fall off the cliff face, usually due to freeze-thaw weathering.



**Landslide:** Large blocks of rock slide downhill.



**Rotational slip:** Saturated soil slumps down a curved surface.







**TASK: Complete the following gap fill to describe the methods of erosion**

**Hydraulic action** is caused by the ..... force of water compressing ..... in rocks, which then shatter as the pressure is released. **Abrasion** is caused by pebbles act like..... and ..... against a rock, eroding it over time. .... occurs when rocks crash into each other and break apart. **Solution** occurs when ..... in sea water chemically dissolve rocks.

*acids    rub    sheer    attrition    sandpaper    air*

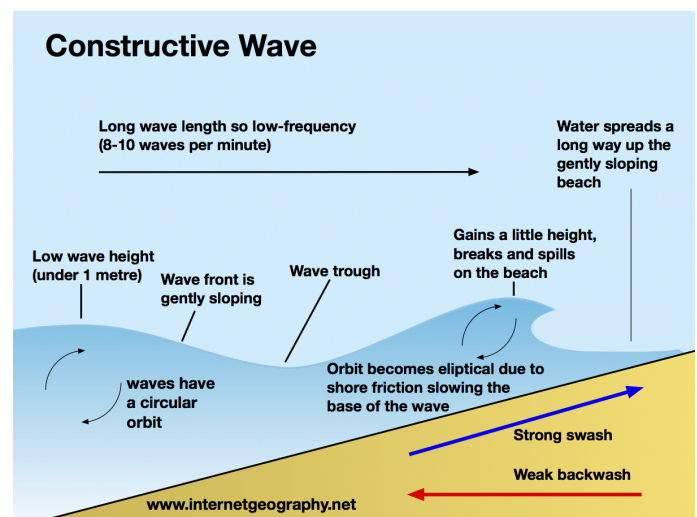
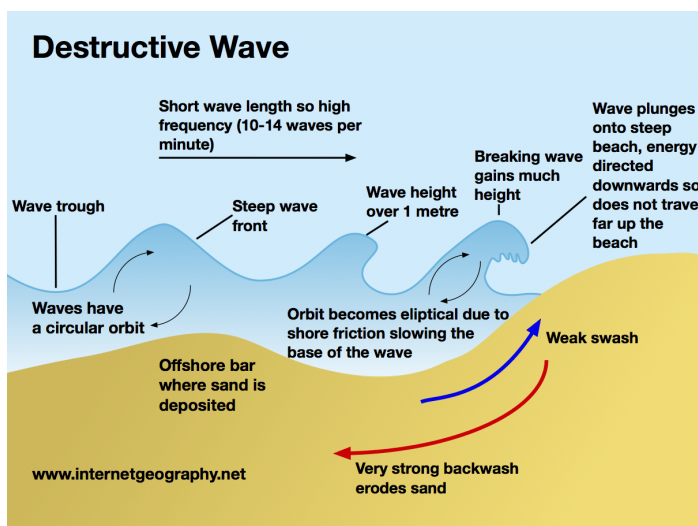
## Lesson Three: Coastal processes

**LI: To define and describe the physical processes which shape coastlines – waves, transportation and deposition.**

**TASK: Read through the following information on constructive and destructive waves**

### Wave types

There are two different types of wave - **constructive** and **destructive**. They can affect the coastline in different ways. When a wave reaches the shore, the water that rushes up the beach is known as the swash. The water that flows back towards the sea is known as the backwash. The energy of the swash and backwash determine the type of wave.



**TASK – watch the video on waves:** <https://www.youtube.com/watch?v=YtEAXPIfUK8>

### **TASK: 7 questions about waves**

Q1) Which type of wave occurs mostly in calm weather conditions?

Q2) What is 'swash'?



Q3) What is 'backwash'?

Q4) Which type of wave has strong 'swash'?

Q5) Which type of wave has weak 'backwash'?

Q6) Which type of wave helps to build beaches?

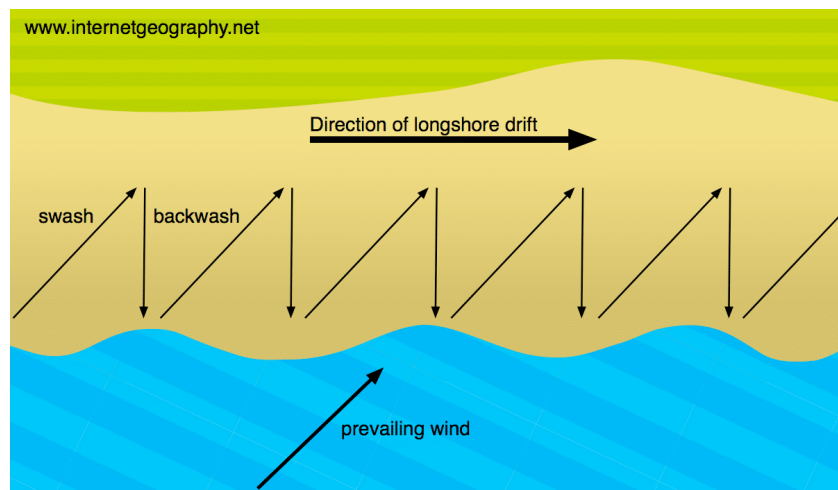
Q7) Which type of wave often occurs during stormy winter weather?

## Processes of transportation

Beach material can be moved in four different ways. These are:

- **Solution** - when minerals in rocks like chalk and limestone are dissolved in sea water and then carried in solution. The load is not visible.
- **Suspension** - small particles such as silts and clays are suspended in the flow of the water.
- **Saltation** – where small pieces of shingle or large sand grains are bounced along the sea bed.
- **Traction** – where pebbles and larger material are rolled along the sea bed.

## Longshore drift



### **TASK: Complete the gap fill activity**

Sediment is carried by the ..... along the coastline. The movement of the material is known as longshore drift. Waves approach the coast at an ..... because of the direction of the ..... wind. The swash will carry the material towards the beach at an angle. The ..... then flows back to the sea, down the slope of the beach. The process repeats itself along the coast in the zigzag movement.

*Angle    along    backwash    prevailing*

**TASK – watch the video on longshore drift** <https://www.youtube.com/watch?v=3bENNfLUldw>



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## Deposition

When the sea loses energy, it **drops the material it has been carrying**. This is known as **deposition**. Deposition can occur on coastlines that have constructive waves.

Factors leading to deposition include:

- waves starting to slow down and lose energy
- shallow water
- sheltered areas, e.g. bays
- little or no wind

**TASK: Describe when and where deposition is most likely to occur.**

**TASK: Explain why a beach has formed in the bay shown in the photograph below**



## **Lesson Four: Coastal landforms - erosion landforms**

**LI: To explain the formation of distinctive coastal landforms created by erosion – headlands and bays.**

**Task - watch the video on the formation of headlands & bays** <https://www.youtube.com/watch?v=F1PtFRs23EA>

### Headlands and bays

Cliffs along the coastline do not erode at the same pace. When a stretch of coastline is formed from different types of rock, headlands and bays can form.

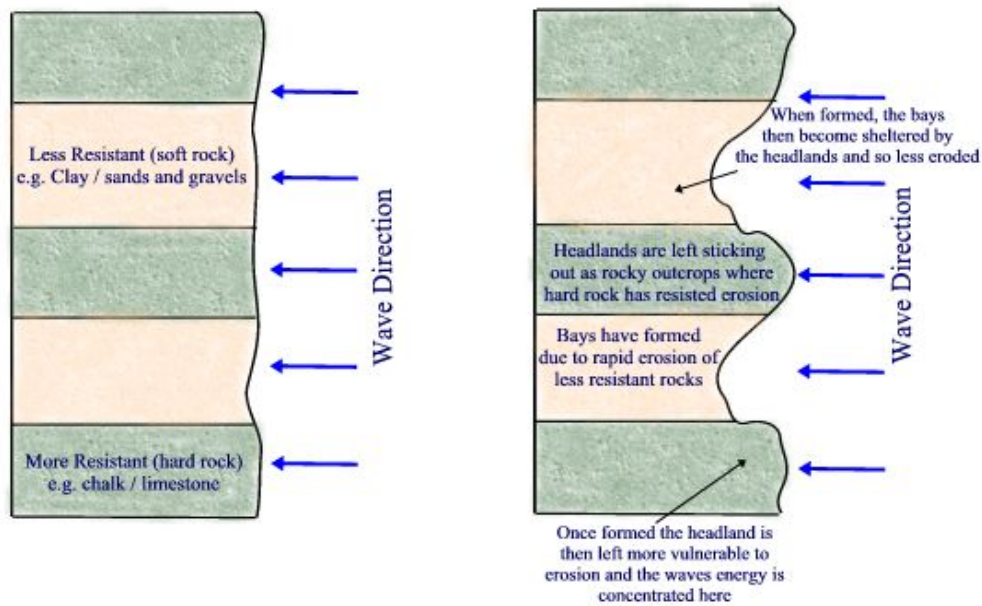
Bands of **soft rock** such as **clay and sand** are weaker therefore, they can be eroded quickly. This process forms **bays**. A bay is an inlet of the sea where the land curves inwards, usually with a **beach**. **Hard rock** such as **chalk** is more resistant to the processes of erosion. When the softer rock is eroded inland, the hard rock sticks out into the sea, forming a **headland**.

Erosional features such as **wave-cut platforms and cliffs** can be found on headlands, since they are more open to the waves. **Bays** are more sheltered with constructive waves which deposit sediment to form a beach.





## The Formation of Headlands and Bays



**TASK:** Using the diagram and notes above, describe the formation of 'headlands and bays' and include the key terms – **headland**, **bay**, **soft rock**, **hard rock**, **beach**. Draw your own diagram to help you.

### Lesson Five: Coastal landforms - erosion landforms

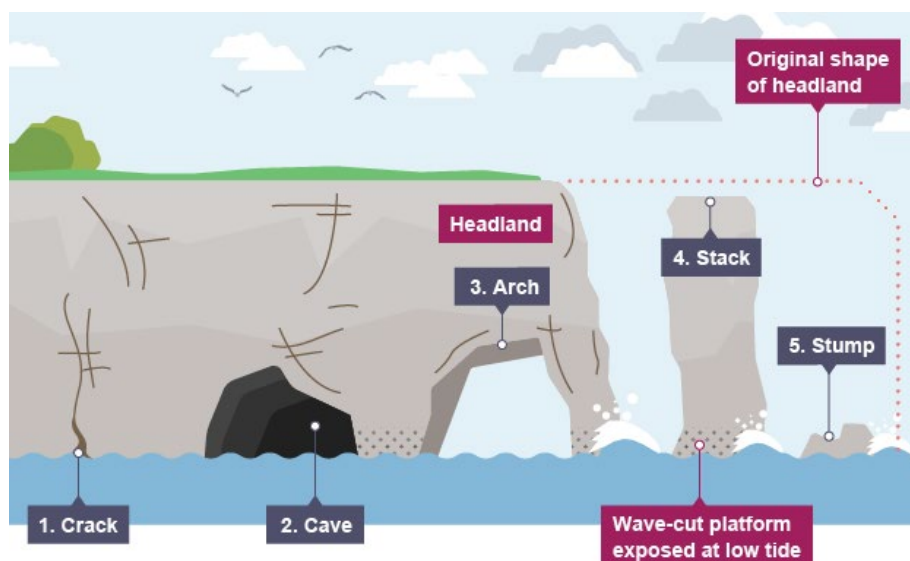
**LI:** To explain the formation of distinctive coastal landforms – caves, arches & stacks and cliffs.

**TASK:** Watch the video on the formation of caves, arches and stacks:

<https://www.youtube.com/watch?v=00Khn0RSpYA>

### Caves, arches and stacks

Caves, arches, stacks and stumps are erosional features that are commonly found on a **headland**.





## Formation of caves, arches and stacks

1. .... are widened in the headland through the erosional processes of hydraulic action and abrasion.
2. As the waves continue to grind away at the crack, it begins to open to form a .....
3. The cave becomes larger and eventually breaks through the headland to form an .....
4. The base of the arch continually becomes wider through further erosion, until its roof becomes too heavy and collapses into the sea. This leaves a ..... (an isolated column of rock).
5. The stack is undercut at the base until it collapses to form a .....

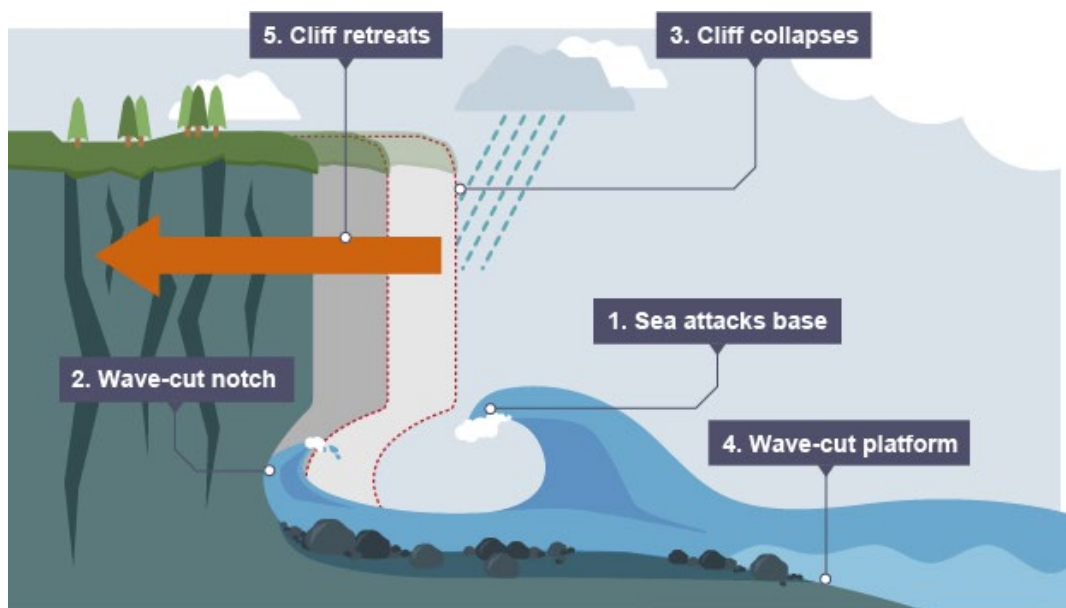
*Stack   cracks   arch   cave   stack*

**TASK: Fill in the missing words into the description above**

**TASK: Describe the formation of caves, arches and stacks in your own words.**

## Cliffs and wave-cut platforms

Cliffs are shaped through **erosion** and weathering. Soft rock erodes quickly and forms gentle sloping cliffs, whereas hard rock is more resistant and forms steep cliffs. A wave-cut platform is a wide gently-sloping surface found at the foot of a cliff.



A wave-cut platform is formed when the following occurs:

1. The sea attacks the base of the cliff between the high and low water mark.
2. A wave-cut notch is formed by erosional processes such as abrasion and hydraulic action - this is a dent in the cliff usually at the level of high tide.
3. As the notch increases in size, the cliff becomes unstable and collapses, leading to the retreat of the cliff face.
4. The backwash carries away the eroded material, leaving a wave-cut platform.
5. The process repeats. The cliff continues to retreat.



**TASK: Describe the formation of cliffs and wave-cut platforms in your own words.**

**TASK: complete the following 6 questions**

- Q1) The sea attacks which part of the cliff – the top or the bottom?
- Q2) What 'notch' is found at the base of the cliff?
- Q3) Name two processes of erosion which could erode a cliff.
- Q4) What happens to the top of the cliff when the base is eroded?
- Q5) Does the cliff retreat inland or out towards the sea?
- Q6) What platform is left behind as the cliff retreats inland?

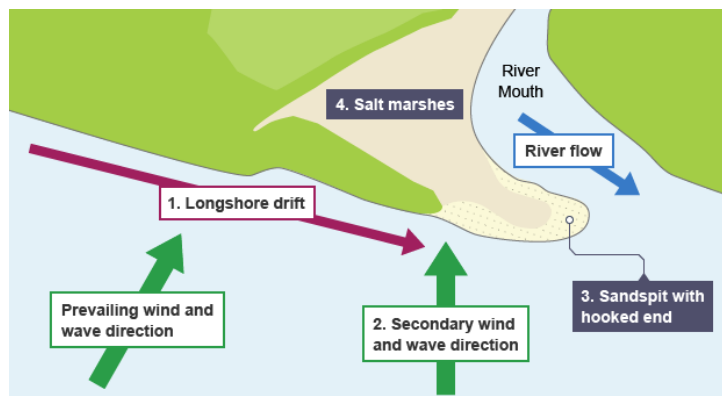
## Lesson Six: Coastal landforms - deposition landforms

**LI: To explain the formation of distinctive coastal landforms created by deposition – beaches, bars and sand dunes.**

**TASK: Read through the following information**

### Spits

A spit is an extended stretch of sand or shingle jutting out into the sea from the land. Spits occur when there is a change in the shape of the landscape or there is a river mouth.



This is how spits are formed:

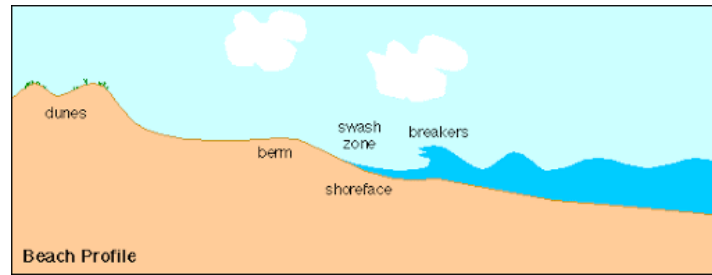
1. Sediment is carried by **longshore drift**.
2. When there is a change in the shape of the coastline, deposition occurs. A long thin ridge of material is deposited. This is the spit.
3. A hooked end can form if there is a change in wind direction.
4. Waves cannot get past a spit, therefore the water behind a spit is very sheltered. Silts are deposited here to form salt marshes or mud flats.

### Beaches

Beaches are made up from eroded material that has been transported from elsewhere and then deposited by the sea. For this to occur, waves must have limited energy, so beaches often form in sheltered areas like bays. Constructive waves build up beaches as they have a strong swash and a weak backwash.

Sandy beaches are usually found in bays where the water is shallow and the waves have less energy. Pebble beaches often form where cliffs are being eroded, and where there are higher energy waves.





A cross-profile of a beach is called the beach profile. The beach profile has lots of ridges called **berms**. They show the lines of the high tide and the storm tides. A sandy beach typically has a gentle sloping profile, whereas a shingle beach can be much steeper. The size of the material is larger at the top of the beach, due to the high-energy storm waves carrying large sediment. The smallest material is found nearest the water as the waves break here and break down the rock through attrition.

**TASK: Describe the formation of a spit.**

**TASK: Explain why beaches usually form in sheltered areas.**

**Lesson Seven: Protecting coastlines - hard engineering.**

- **LI: To explain how hard engineering management strategies can be used to protect coastlines.**

**TASK: Read through the following information about hard engineering:**

Type	Definition	Advantages	Disadvantages
Sea Wall	Large walls constructed from concrete, steel, or stone located along the shoreline of a beach	Protects cliffs from upland erosion and is a barrier to flooding	Waves can erode the wall defeating its purpose, and is expensive to implement and maintain
Groyne	Wooden fence-like barriers built at right angles at the beach	Prevents longshore drift, flooding, and erosion, and allows beaches to build up	Can create erosion further down the coast. Is unattractive and expensive.
Gabion	Bundles of rocks in metal mesh located at cliff bases	Reduces the impact of waves	Inexpensive hard engineering structure, but not very effective or attractive
Revetment	Slanted structures made from concrete, wood or rocks along a cliff	Prevents cliff erosion as it absorbs the waves energy	Expensive to implement. Can create a strong wave backwash
Coastal Barrage	Partly submerged dam-like structures that control tidal flow	Create a more consistent water level, can be used to create hydroelectricity	Has a strong impact on the environment and expensive to implement and maintain
Rock Armour (rip rap)	Large boulders or rocks piled up on a beach in front of a cliff or sea wall	Absorbs energy of waves and helps build up beaches	Expensive to implement and maintain
Cliff Fixing	Metal bars inserted in cliffs to reinforce them	Improves strength of cliff and prevents rocks from falling	Can create a metal mess



**TASK: Which methods of hard engineering have been used in the image above? Are they effective?**

**TASK: Explain the advantages and disadvantages of using hard engineering to protect coastlines – use 4 examples in your answer.**

**Lesson Eight: Protecting coastlines - Soft engineering.**

- **LI: To explain how soft engineering management strategies can be used to protect coastlines.**

**TASK: Read through the following information about hard engineering**



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Type	Definition	Advantages	Disadvantages
Beach Nourishment	The beach is made wider by using sand and shingle.	Increases the distance a wave has to travel, thus slowing it down and preventing erosion.	Sand and shingle need to be sourced from somewhere else - usually by dredging. Requires a lot of maintenance and can be costly.
Managed Retreat	Certain areas of the coast are allowed to erode and flood naturally due to their low value	Natural eroded material encourages the development of beaches and salt marshes. Is low cost.	Required to compensate people who lose buildings and farmland
Beach Stabilization	Planting dead trees in the sand to stabilize the beach	Widens the beach therefore slowing down waves and preventing erosion	Similarly to beach nourishment trees need to be sourced and requires maintenance.
Dune Regeneration	Creating new sand dunes or restoring existing dunes	Dunes act as a barrier and absorb wave energy reducing erosion and protecting against flooding	Dunes are a barrier to beach access and creating new dunes results in land loss
Afforestation of Coastal Dunes	A way to stabilize dunes by planting trees	By stabilizing the dunes this minimizes sand drift and erosion	If non-native trees are planted this impacts the nutrient deposition of the soil
Mangrove Preservation & Planting	Planting mangrove trees along the shore	Their roots keep soil in place preventing erosion and help dissipate wave energy	Non-native mangroves can become invasive to an area's natural plants
Coral Reef Preservation & Enhancement	Protecting existing coral reefs from harm and creating artificial reefs by placing environmentally friendly man made materials on the seafloor	Coral reefs reduce wave energy and height and protect against coastal erosion	Constructing artificial reefs can create pollution. The materials can result in unforeseen contamination and artificial reefs are not as stable as natural reefs



*Studland Bay in Dorset*

**TASK: Which method of soft engineering has been used in the image above? Why is it highly effective?**

**TASK: What are the advantages and disadvantages of using soft engineering to protect coastlines?**

**Lesson Nine: Protecting coastlines – Holderness case study.**

- LI: To explain how management strategies have been used to protect a specific UK coastline.

**TASK: Read through the following information about a coastal management case study**





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## The Holderness coastline – UK

The Holderness coastline in East Yorkshire is **eroding very quickly**. It is made from soft mud called **Boulder Clay**.

The coastline is retreating almost **2 metres** every year – a European record! In the last 2000 years, the coast line has retreated by almost 2 miles.

The material from Holderness travels south towards the **Essex coast** and protects **London** from erosion.

There are many arguments for and against trying to save Holderness from erosion through building **coastal defences** along the coastline.

### Arguments for saving Holderness:

- Local people want to save their own homes.
- Holderness is an area of good farmland and is useful for food production.
- People do not want to move to another area as they will lose their sense of community.
- Major North Sea gas terminals are located to the north of the village of Easington along the Holderness coast. This gas terminal supplies the UK with 25% of our gas for heating and cooking.



*A map of the Holderness area and an example of coastal erosion along the Holderness coast*

### Arguments for NOT saving Holderness:

- Erosion is a **natural process** and the sand from Holderness helps protect more valuable places like **London** which has a population of nearly 9 million.
- Very few people live along this coastline (about 70,000).
- Building coastal defences will cost **hundreds of millions of pounds** – it could be spent elsewhere.
- **Taxes** would have to rise to pay for any coastal defences at Holderness. This would make people in other parts of the UK angry as they will see it as a **waste of money**.

### TASK: 6 questions on Holderness

Q1) Describe the location of the Holderness coast.

Q2) How quickly is the Holderness coastline eroding?

Q3) What is the link between erosion at Holderness and London?

Q4) What are the arguments for protecting the Holderness coastline?

Q5) What are the argument for letting the Holderness coastline erode?

Q6) Do you think the Holderness coastline should be protected or should it be allowed to erode to help protect more important places like London?