

ELQ Geography

Entry Level Geography

Unit 4: Coasts



Unit 4: Coasts



Learning Outcome 1:

Demonstrate knowledge of coastal landforms created by erosion.

Learning Outcome 2:

Demonstrate knowledge of coastal landforms created by transportation and deposition.

Learning Outcome 3:

Know how coasts can be managed to reduce the impact of and prevent erosion.

Guidance notes

This resource includes information and suggested tasks relating to Entry Level Geography. The resource focuses on:

Unit 4 Coasts

- **Learning Outcome 1: Demonstrate knowledge of coastal landforms created by erosion.**
- **Learning Outcome 2: Demonstrate knowledge of coastal landforms created by transportation and deposition.**
- **Know how coasts can be managed to reduce the impact of and prevent erosion.**

There is no requirement to use this resource material. Teachers may choose to use this material or to amend it to suit the needs of their learners.

Resources

The list of resources is neither prescriptive nor exhaustive.

GCSE Geography AQA A Ch. 7 ISBN978-0-19-913549-3

Geography Matters 2 Higher Ch. 2 ISBN 978-0-435355-17-3

Geography 360 Core Book 1 Ch. 6 ISBN 978-0-435356-43-9

New Key Geography – Connections Ch. 1 ISBN 978-0-7487-9702-8

Home Ground – a Geography of N.I. pp26-28 ISBN 1-898392-97-8

Useful websites:

Recommended websites were correct at time of publication.

http://www.geography.learnontheinternet.co.uk/video_coastal_management.html

http://www.bbc.co.uk/schools/gcsebitesize/geography/coasts/coastal_management_video.shtml

<http://www.bbc.co.uk/education/clips/zccd2hv>

<http://www.bbc.co.uk/education/guides/zxj6fg8/revision/2>

http://www.bbc.co.uk/schools/gcsebitesize/geography/coasts/coastal_processes_rev4.shtml

<http://www.bbc.co.uk/education/clips/zpcwmp3> (Note: this is aimed at Key Stage 1)

<http://www.bbc.co.uk/education/clips/z4mn34j> (Note: this is aimed at Key Stage 2)

http://www.bbc.co.uk/schools/gcsebitesize/geography/coasts/depositional_landforms_video.shtml

<http://www.bbc.co.uk/learningzone/clips/coasts-longshore-drift-and-spits/3086.html>

http://www.bbc.co.uk/schools/riversandcoasts/coasts/change_coast/pg_18_flash.shtml

http://www.geography.learnontheinternet.co.uk/activities/coasts_erosion.html

https://www.youtube.com/watch?feature=player_detailpage&v=ZWEJq03NBao&list=PL3zRSp0cNbnlXrKVD2vvEsmrWbAvjLACE

https://www.youtube.com/watch?feature=player_detailpage&v=An0EQyeFKs

https://www.youtube.com/watch?v=0xBW20oQ9KE&feature=player_detailpage

https://www.youtube.com/watch?v=AG9eOC-Er00&feature=player_detailpage

Erosion at the Coast

The sea shapes the coastal landscape. Coastal erosion is the wearing away of rock along the coast. There are four main processes of coastal erosion. They are:

- abrasion;
- solution;
- hydraulic action; and
- attrition.

1. **Abrasion** – when waves break at the coast they throw sand and pebbles against the face of the cliff. This wears away the cliff face. Abrasion happens at the base of the cliff causing undercutting. The undercutting leaves part of the cliff unsupported. This is called an overhang. The **overhang** will eventually collapse into the sea. Fig. 1 shows a cliff being undercut by waves.



Fig. 1 Undercutting on a cliff

Source: <http://coastal.er.usgs.gov/navassa/sail/nw1.html>

2. **Attrition** - rocks and pebbles that are being carried in a wave bang into each other breaking small pieces off each other. This causes the rocks and pebbles to become smaller, more rounded and smoother.
3. **Solution** - over time, seawater dissolves rocks. This is an important type of erosion where the rock is chalk or limestone. The dissolved rock is carried away in solution by the seawater.
4. **Hydraulic action** – air becomes trapped in joints and cracks on a cliff face. When a wave breaks, the trapped air in the joints and cracks is compressed. The great weight and force

of water breaking against the cliff face weakens it and causes pieces of rock to break off. Hydraulic action is greatest under storm conditions when hundreds of tonnes of water hits the rock face.

LANDFORMS CREATED BY COASTAL EROSION

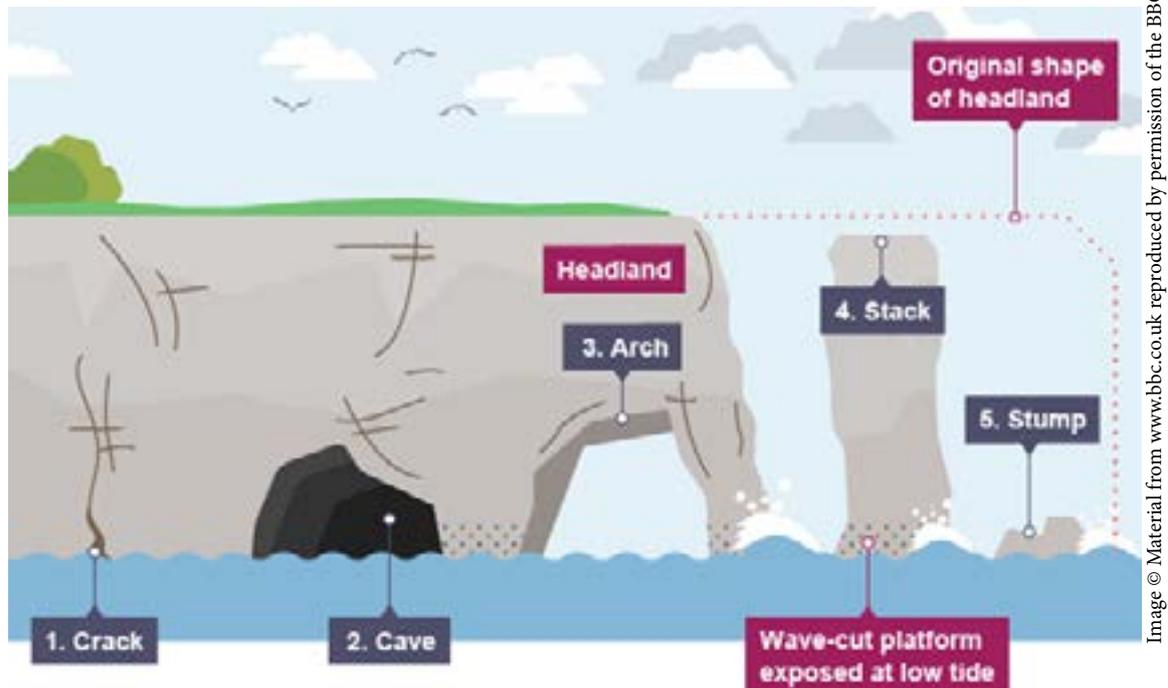


Fig 2 Landforms created by coastal erosion

Source: <https://www.bbc.com/bitesize/guides/z8tstv4/revision/4>

Fig. 2 shows the landforms created by erosion at a headland. A headland is a piece of the coast that sticks out to the sea. The formation of these landforms follows a sequence:

1. As waves break they cause erosion along any lines of weakness on the cliff face opening up **cracks**.
2. These lines of weakness get enlarged and develop into small openings called **caves**. As erosion continues the caves become bigger.
3. The caves will form on **both sides** of the headland. Eventually the sea cuts through the headland, forming an **arch**.
4. The rock at the top of the arch eventually collapses to form a **stack**.
5. Over time the stack will be worn away to leave a **stump**.

Activity 1

There are four erosion processes that occur at the coast. Complete each box by describing each erosion process.

Erosion process: Attrition

Erosion process: Solution

Erosion process: Abrasion

Erosion process: Hydraulic action

Activity 2

Study Resource A which shows coastal landforms at Flamborough Head in Yorkshire, England. Use the words in the box below to complete the following sentences about landforms at the coast.

RESOURCE A



stack	caves	arch	weakness
cracks	stump	headland	

1. As waves break at the coast they cause erosion along any lines of _____.
2. Lines of weakness get enlarged and develop into small _____.
3. The caves become bigger until eventually the sea cuts through the headland forming an _____.
4. The rock at the top of the arch eventually collapses forming a pillar of rock which is called a _____.

Activity 3: Landforms of Coastal Erosion

Study the photographs in **Resource B, C, D** and **E** which show coastal landforms created by erosion.

Name each landform shown. For each landform, explain how erosion creates the landform.

RESOURCE B



Name of landform:

Explain how erosion creates this landform: _____

RESOURCE C



Name of landform:

Explain how erosion creates this landform:

RESOURCE D



Name of landform:

Explain how erosion creates this landform:

RESOURCE E



Name of landform:

Explain how erosion creates this landform:

Transportation and Deposition

The coast is constantly being eroded by waves. Eroded material is transported (moved) by the waves up, down and along the coast until it is eventually dropped (deposited). The movement of material along the coast is called **LONGSHORE DRIFT**, see Fig 3.

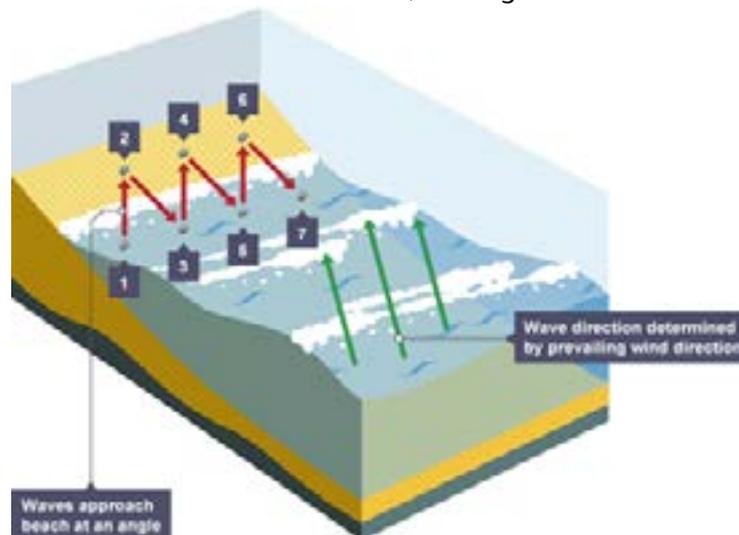


Fig. 3 Longshore Drift

Source: <https://www.bbc.com/bitesize/guides/zq9t7p3/revision/3>

Longshore Drift happens when waves approach the coast at an angle. As the wave breaks it moves up and across the beach. This is known as the **SWASH**. The swash carries material (sand particles and pebbles) up and across the beach. When the wave has no energy left it stops moving up and across the beach.

BACKWASH refers to that part of the wave that then goes straight back down the beach under the force of gravity. Material carried by the backwash is now dragged down the beach. This process is repeated over and over so that the combined effect is to move material along the beach in a zig-zag pattern. This is called **LONGSHORE DRIFT**.

Formation of a beach

When the sea erodes the cliffs, large rocks fall into the sea. These rocks are tossed about by the action of the waves. Over time they are eroded into smaller and smaller pebbles. The pebbles are eventually ground down into the tiny grains of sand that form a beach.

Sand and shingle will be transported along the coast by longshore drift until it reaches an area where the water is sheltered and the waves lack energy, e.g. a bay. The materials will then be deposited to form a beach.



Image © SUNIVERSITY OF CAMBRIDGE COLLECTION OF AIR PHOTOGRAPHS / SCIENCE PHOTO LIBRARY

Fig.4 A Beach in Dorset

Beaches are usually found in sheltered bays between two headlands. We usually think of beaches as being sandy. Some beaches are made up of shingle (pebbles). Shingle beaches are steeper than sandy beaches. People love sandy beaches; they are a valuable resource for the tourist industry.



Fig 5: A Shingle Beach

Formation of a spit

A spit is a coastal landform that projects out to sea and is joined to the mainland at one end. Spits are formed where the wind blows at an angle to the coastline. This produces a process called longshore drift. Longshore drift continues until there is a change of direction of the coastline. The material being carried by longshore drift is deposited forming a spit. The area behind a spit becomes sheltered. Salt marshes often form behind a spit. Fig. 6 shows how a spit is formed.



Fig.6 The formation of a spit: Spurn Head, Humberside



© CNES, 1998 DISTRIBUTION SPOT IMAGE / SCIENCE PHOTO LIBRARY

Fig 7: A Satellite Image showing the Humber Estuary and Spurn Head

Activity 4

Complete the following sentences to describe how material is transported and deposited at the coast. Use the words in the box below to help you. The number of dashes will show you how many letters are in the word.

transportation	swash	angle
backwash	longshore	deposited
erosion	wind	wave

_____ is the movement of material along the coast by waves.

The movement of material along the coast by wave action is called _____ drift.

Longshore drift happens when waves moves towards the coast at an _____.

The _____ carries material up and along the beach.

The _____ carries material back down the beach at right angles. This is the result of gravity. This process slowly moves material along the beach.

Longshore drift provides a link between erosion and deposition. Material in one place is eroded, transported then _____ further along the coast.

Activity 5

Study Resource F which shows a coastal landform. Use the photograph to help you answer the questions that follow.

Resource F



1. Name the landform shown in the photograph.

2. Name the process that has created this landform.

3. Explain how this landform was formed.

Activity 6

Study **Resource G** which shows part of Spurn Head. Use both **Resource F** and **Resource G** to answer the questions that follow.

Resource G



Use labels to show the following:

- The direction of the waves
- The direction of the swash on the beach
- The direction of the backwash
- The direction of longshore drift

Types of human activity at the coast

Many people like to live at the coast. However, this is not the only human activity that can be found at the coast. Coasts are important for many different reasons and for different groups of people:

- **Residential** - some people choose to live by the sea.
- **Industrial** - coasts provide places for people to work, for example fishing, port activities and power stations. Some industry must locate at the coast such as port activities.
- **Tourism** - Coasts also provide places for people to relax, for example recreation, leisure and tourism industries. Some tourism related businesses such as hotels develop at the coast.

Conflicting human activity at coasts

When so many users want to use the same place this can lead to disagreements between users. The disagreement can lead to conflict.

Examples of conflict include:

- People going to a seaside resort for the day need somewhere to park their cars. This can cause traffic congestion, making it difficult for local people to move around the resort and to park.
- Tourists often leave lots of litter behind. This makes the area unsightly for people who live there.



Fig 8: Litter on a beach

- Dog owners often like to walk their dogs on the beach. Sometimes the dogs scare young children and this can lead to conflict with locals and tourists.



Fig 9: A Man Playing with his Dog on a Beach

- Industry located at the coast can spoil the sea view for residents and visitors.



Fig 10: A Oil Refinery Located at the Coast

Coastal Management

Houses and industry will be affected by coastal processes. The most important process affecting home and businesses at the coast is **erosion**. About 3008 km, or 17%, of Britain's mainland coastline is under threat from coastal erosion.

Erosion of the coastline affects the way we use and manage the coast.

Keeping the sea out

Building a **sea wall** using concrete and brick such as the one shown in the Fig 11 is one of the most common ways to keep the sea out. Sea walls work by providing a strong barrier between the land and the sea, and reflecting the power of the waves back out to sea. This prevents coastal resorts from being flooded and also prevents erosion of the promenade and road at the back of the beach.



Fig 11: Waves breaking against a Sea Wall

Protecting Cliffs and Beaches

Sometimes a different approach is needed. Maintaining a beach is important for tourism, if the beach is lost, the tourist trade could decline. In some places a cliff is under attack by the waves. This means that any building on top of the cliff may be in danger.

1. Groynes

Groynes are used to prevent the loss of beach material. Groynes are barriers stretching out to sea at regular intervals along the beach. Groynes are often made of wood and look like wooden fences that are built down the beach, at right angles to the coastline. Fig 12 shows a groyne on Waikiki Beach in Hawaii.



Fig 12: A Groyne on Waikiki Beach

Groynes are designed to stop material being moved along the beach by longshore drift. They work by trapping sand as it is transported along the coast by longshore drift, building up the amount of sand to form a wide beach. There will usually be several groynes protecting a beach such as shown in Fig 13.



Fig 13: Groynes Protecting the beach

The wide beach absorbs the wave energy. This means that the cliffs shown in the photograph are also protected.

Gabions

Gabions are another strategy that is used to protect cliffs from erosion and possible collapse. Gabions are wire baskets filled with inexpensive and locally sourced boulders such as the ones shown in Fig 14. Gabions work by providing a hard surface for the waves to break against before they reach the cliffs. The air spaces between the rocks contained in the basket absorb the force of the waves. This reduces the impact of the breaking waves against the coast. This helps prevent erosion at the base of a cliff.



Fig 14: Gabions at base of cliff

Activity 7

Coasts are important for many different reasons and for different groups of people. Look at **Resources H - O** on the next page showing how we use coastal areas.

Insert the letters A-H into Table 1 under the appropriate title to identify how we use the coast for Residential, Industrial and Tourism purposes.

Table 1

Residential	Industrial	Tourism

Resource H



Resource I



Resource J



Resource K



Resource L



Resource M



Resource N



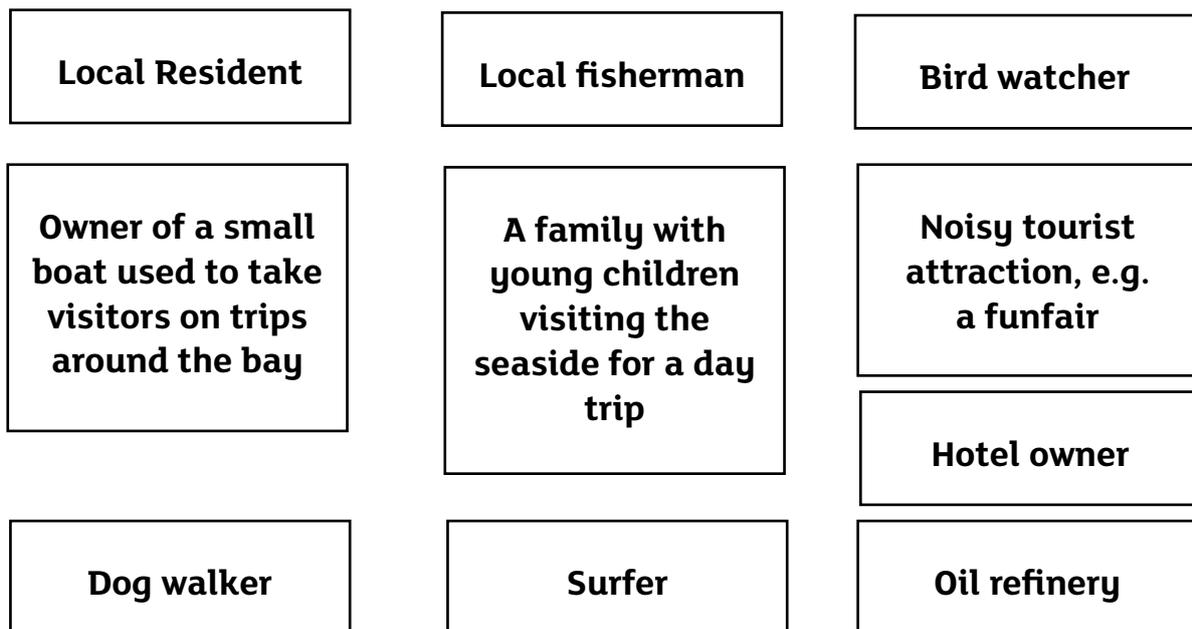
Resource O



Activity 8

Study **Resource P** which shows some people and activities that can be found at the coast. Choose two groups of people or activities. Decide if the people or activity is residential, industrial or tourism. Describe the activity and how conflict might happen. Complete this activity using a second example.

RESOURCE P



Explain how different groups of people and different activities can lead to conflict at the coast.

Use examples from the diagram above in your answer.

Activity 9:

A Coastal Management Strategy to Keep the Sea Out

Study **Resource Q** which shows the sea wall at Dawlish in England.

RESOURCE Q



Explain how the sea wall operates to keep out the sea.

Hint: think about the materials used to build the sea wall, the size of the sea wall and how it operates to keep the sea out.

Activity 10:

Coastal management strategies to protect cliffs or beaches.

Study **Resource R** which shows groynes protecting a sandy beach.

Describe the groyne.

RESOURCE R



Explain how the groyne operates to protect the beach.

Hint: think about the process operating on this coast.

Activity 11: Coastal management strategies to protect cliffs or beaches.

Study **Resource S** which shows gabions protecting a cliff.

Describe what gabions look like.

RESOURCE S



© Ian West and Tonya West

Source: www.southampton.ac.uk/~imw/Hill-Head.htm

Explain how the gabions in the photograph operate to protect the cliff.

Hint: think about the materials used to build the gabions, the size of the gabions and how they work to protect the cliff.
