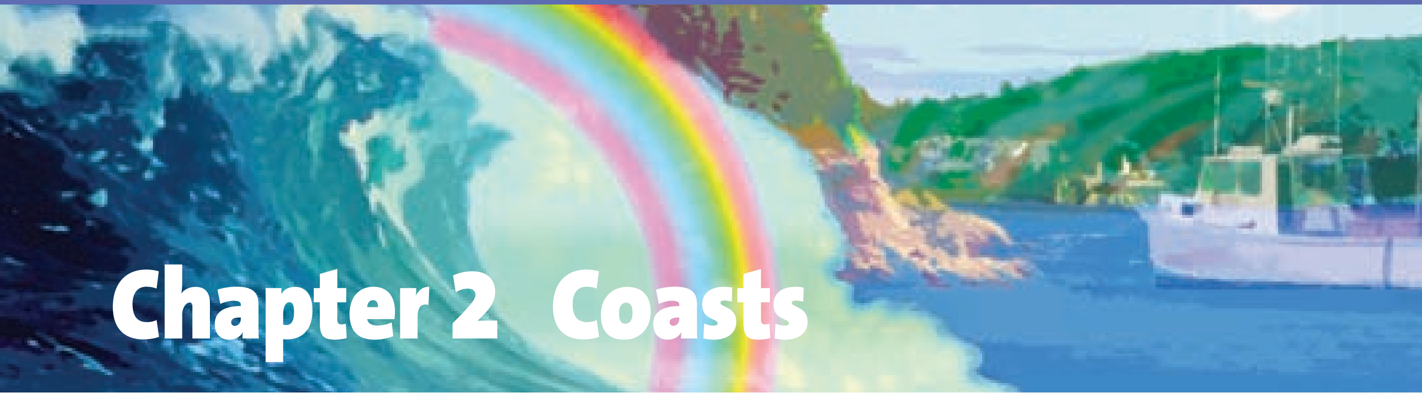
Theme 1 Rivers and coasts



Chapter 2 Coasts

Part 1 Coastal processes and landforms

The coastline is the place where land meets sea. Weathering helps to break up the rocks exposed along the coast while **waves**, generated far out at sea, erode the rocks to create familiar landforms such as cliffs and caves. Eroded rock particles, reduced to sand and mud, are transported along the coast by waves and currents. Eventually these particles are deposited elsewhere to form new features such as beaches, sand **dunes** and **salt marshes**.

Weathering

Rocks exposed on the coast are broken down and weakened by moisture and temperature. This is the process of weathering. Frost weathering and chemical weathering operate on the coast as well in river environments (see Chapter 1). However, there are two other weathering processes which are unique to coastal environments: **salt weathering** and **biological weathering**.

Unlike fresh water, sea water is salty. When rocks wetted by waves and sea spray dry out, salt crystals form in cracks and tiny air spaces in the rocks. As these crystals grow the surface layers of rocks weaken and crumble. This is salt weathering.

Rocks on the shoreline are also destroyed by the action of organisms such as algae, shellfish and sea urchins. Some marine organisms secret organic acids which cause chemical weathering. Meanwhile, softer rocks are attacked by rock-boring shellfish. Both processes are examples of biological weathering.

Key ideas

- The geomorphic processes responsible for distinctive coastal landforms are weathering, erosion, transport and deposition.
- Some coastlines are dominated by erosional (destructive) processes; others by depositional (constructive) processes.
- Geology influences the formation of coastal landforms.
- Coastal landforms include cliffs, headlands, caves, arches, stacks, **beaches** and **spits**.

Table 2.1 Processes of coastal erosion

Process	Description
Abrasion	Waves erode the coastline by hurling pebbles against cliff faces. This happens most during storms, when high and powerful waves batter the coast. Abrasion is concentrated at the high-tide mark, where it forms a notch, causing overlying rocks to collapse.
Attrition	This is the wearing down and rounding of rock particles by wave transport as they collide with each other and abrade the coastal rocks.
Hydraulic action	Water and air at high pressure are forced into cracks and joints in rocks. This process weakens rocks and is a major cause of cliff collapse. The pounding of storm waves has a similar effect.

Table 2.2 Describing upland coastlines from OS maps

(1)	In which direction does the coastline run?
(2)	What is the average height of the coastline?
(3)	Is the coastline straight, or indented with bays, coves and headlands?
(4)	Are there any erosional landforms, such as cliffs, arches, stacks and shore (wave-cut) platforms?
(5)	Are there any coastal protection structures against erosion, such as **groynes**?
(6)	What are the main human activities along the stretch of coastline?

Factfile

2.1 Waves, coastal processes and landforms

- Waves erode the coast. They also transport eroded and weathered rock particles and deposit them elsewhere.
- The coastal processes of erosion are abrasion, attrition and hydraulic action.
- Wave erosion and the deposition of sand and **shingle** create distinctive coastal landforms.
- Erosion dominates upland coasts (destructive coastlines); deposition dominates lowland coasts (constructive coastlines).
- Erosion produces a sequence of distinctive landforms which includes cliffs, caves, arches and stacks (see Figure 2.1)

Erosion

Erosion is the wearing away of the coastline by wave action. There are three main processes of coastal erosion. They are described in Table 2.1.

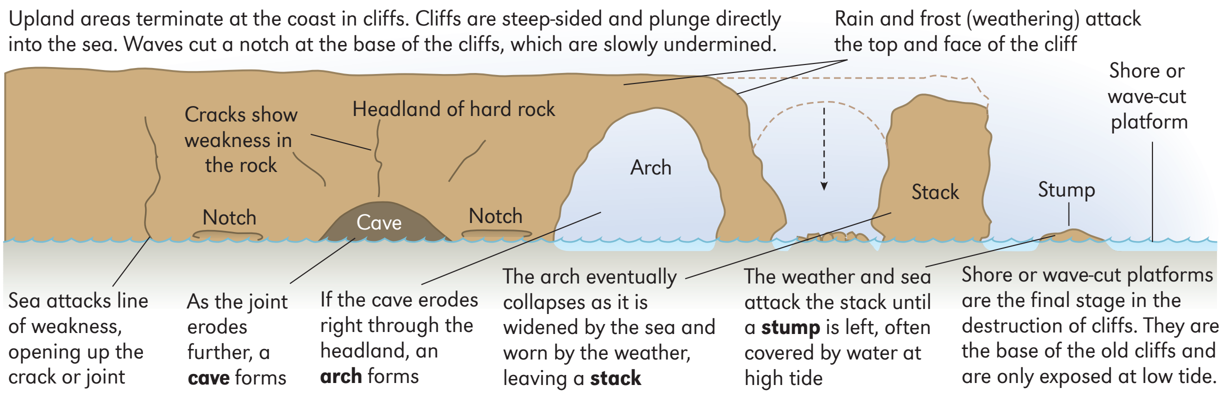
Sediment transport and deposition

Waves and currents transport shingle, sand and mud, which are then deposited to form features such as **beaches**, sand dunes and **mudflats**. These landforms often dominate lowland coastlines.

Waves and currents

Waves are movements of energy through water. Imagine a wave approaching parallel to the shore. As it gets close to the shore it enters shallow water and starts to change. First, it begins to 'feel' the sea bed and slows down. Then, as it

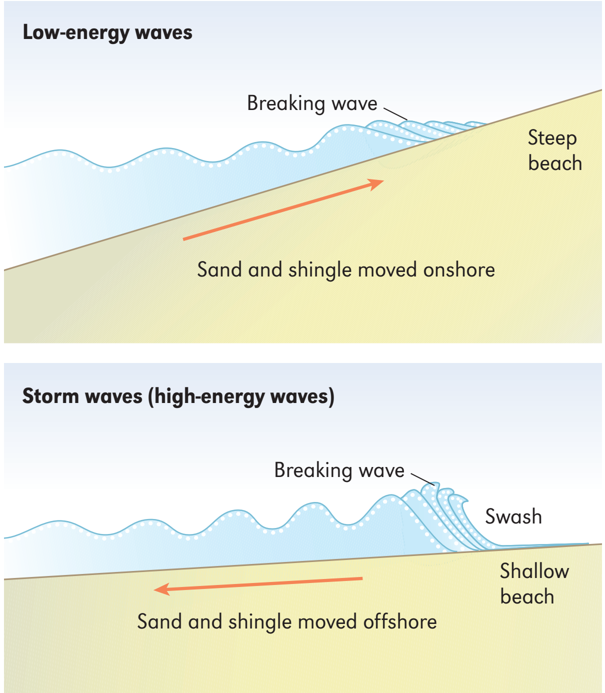
Figure 2.1 Erosion of a headland



slows its height increases. Finally, the wave becomes unstable, breaks, and water surges up the beach as **swash**. Some of this water then returns down the beach as **backwash**. Swash and backwash can move sand and shingle in three directions: up and down beaches; along beaches; and between beaches and the sea bed immediately offshore.

Onshore and offshore transport

The amount and direction of sand and shingle transported by waves depends on their energy. Low-energy waves are usually less than 50 cm high and have long distances between each **wave crest**. When they break, these waves collapse at a shallow angle, and their swash pushes sand and shingle up the beach (see Figure 2.2). The weaker backwash carries a smaller amount of sand and shingle back to the sea. As a result, low-energy waves tend to form beaches with steep gradients.



▲ *Figure 2.2 Low-energy waves and storm waves (high energy waves)*

Storm waves (or high-energy waves) have the opposite effect (see Photograph 2.1 and Figure 2.2) These waves have lots of energy. When they

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◀ *Photograph 2.1 Powerful storm waves on the coast of Maine, New England* break, the force of the water is directed down onto the beach. In this way they erode sand and shingle and flatten beaches. The eroded sediments are then transported offshore and are stored in bars.

Longshore transport

When waves arrive at the coast obliquely, they move sand and shingle along beaches, rather than up and down them. This process is called **longshore drift** (see Figure 2.3). Because waves strike the coast at an oblique angle, the swash follows the same angle up the beach, carrying sand and shingle with it. However, the backwash returns down the beach on a straight path, at right angles to the shore. This means that each wave produces a saw-tooth movement of swash and backwash. As a result, sediments are shifted in a particular direction along the beach. While this beach drift is going on, the oblique angle of the waves produces a **longshore current**. This flows parallel to the shore, and transports large amounts of sand along the coast.

Deposition of sand and shingle by waves and currents is responsible for distinctive landforms on constructive, lowland coasts, especially beaches and spits.

Figure 2.3 Longshore drift

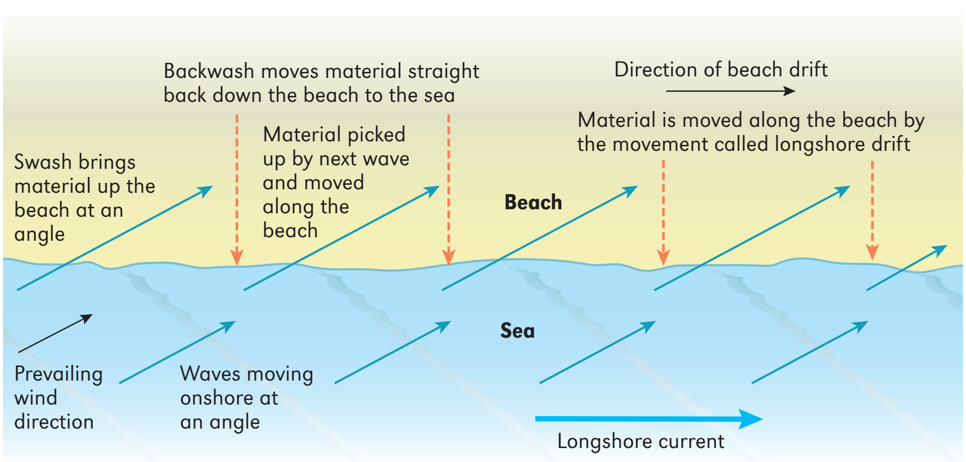

Table 2.3 Describing lowland coastlines from OS maps

(1) In which direction does the coastline run?
(2) What is the average height of the coastline?
(3) Is the coastline straight, or interrupted by river mouths and estuaries?
(4) Are there any depositional landforms, such as beaches, bars, spits, tombolos, sand dunes, salt marshes and mudflats?
(5) Are there any coastal protection structures against erosion (e.g. groynes) and/or flooding (e.g. flood embankments)?
(6) What are the main human activities along the stretch of coastline?

Activity 2.1

Study the coastline on the 1:50,000 OS map extract of the Lleyn Peninsula in north-west Wales (Figure 2.4).

1 **Using the questions in Table 2.3 as a guide, describe the main features of this stretch of coastline.**

Figure 2.4 OS map extract showing the coastline of the Lleyn Peninsula

Case study The Yorkshire Coast — Flamborough Head to the Humber Estuary

Flamborough Head

Flamborough Head in east Yorkshire, is a 15 km stretch of coastline formed where the Yorkshire Wolds meet the North Sea. It is an upland coast (50 to 60 m above sea level) dominated by erosional landforms (see Photograph 2.2).

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Photograph 2.2 Headlands and bays at Flamborough Head

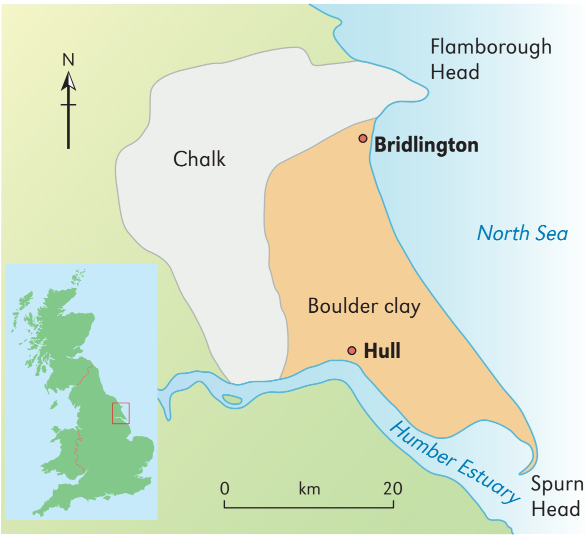


Figure 2.5 Geology of the Yorkshire coast between Flamborough and the Humber

Flamborough owes much of its character to geology, relief and wave energy (see Figures 2.5 and 2.9). The main rock type is chalk, which crops out in horizontal layers. It is fairly resistant to wave erosion and produces impressive vertical cliffs. Resting above the chalk is a thick layer of soft boulder clay. Powerful waves from the north-eastly direction crash against the cliffs and have carved a classic sequence of erosional landforms including caves, arches and stacks.

Erosional landforms

The principal erosional landforms at Flamborough are headlands, cliffs, caves, arches, stacks and shore (wave-cut) platforms.

Headlands

Headlands are small peninsulas on upland coasts that project seawards. They are flanked on either side by

Activity 2.2

1 (a) Photograph 2.2 is the view from 257707 (see Figure 2.6 — OS map). In which direction was the camera pointing when this photograph was taken?
(b) Name the bay shown in Photograph 2.3a.

2 Describe the main features of the coastline between Flamborough Head (2570) and Thornwick Bay (2372) by answering the questions in Table 2.2.

Figure 2.6 OS map extract: Flamborough

bays or coves. Often headlands consist of resistant rocks that erode more slowly than the softer rocks in adjacent bays. Although Flamborough Head is carved from a single rock — chalk — in several places the cliffs jut out from the coast to form headlands (see Figure 2.6). This is probably due to differences in the density of jointing and faulting in the chalk. Bays such as Selwicks and Thornwick have developed where major joints and **faults** have been exploited by wave erosion. In contrast, the headlands, with fewer lines of weakness, have been eroded more slowly.

Cliffs

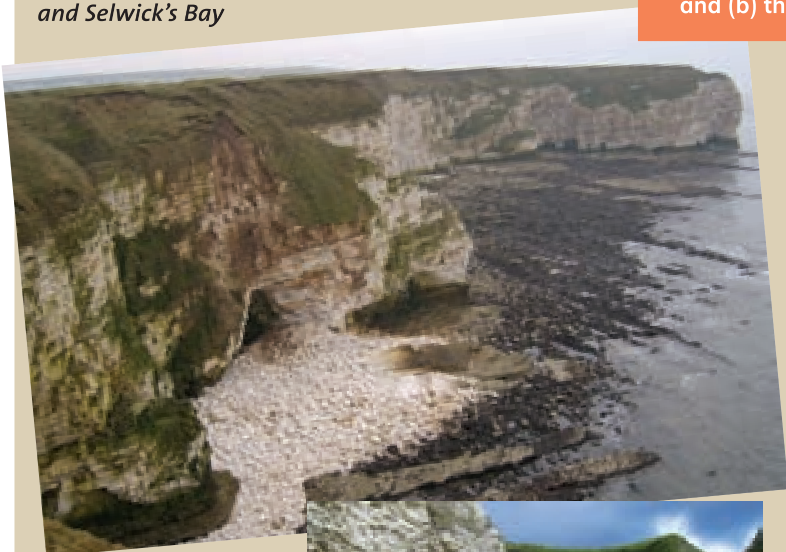
The cliffs at Flamborough are made of chalk and boulder clay. Standing 50–60 m high, they are the tallest cliffs on the east coast of England, between Kent and Yorkshire. The cross-section or profile of the cliffs is clearly seen in the photographs in Figure 2.7. The lower part of the cliffs is almost vertical, and consists of horizontally bedded chalk. The upper part, formed from weak boulder clay, has a much lower angle, between 40 and 45 degrees. Because chalk is a hard rock, rates of erosion are fairly low, averaging just 0.3 mm a year. However, sudden rockfalls are not unusual (see Photograph 2.3a). These occur where wave erosion undermines the cliff base and forms a deep notch. Eventually the cliff becomes unstable and collapses.

Activity 2.3

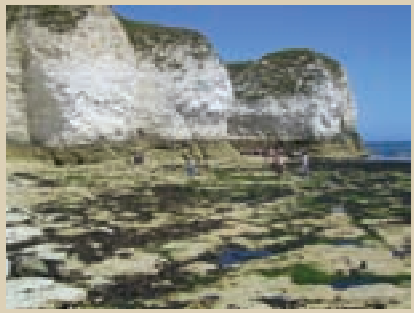
1 **Study the photographs in Figure 2.7 and draw a labelled sketch diagram to show the profile of the cliffs at Flamborough. Add a scale to your diagram.**

2 **Draw sketch diagrams to show how (a) the cave and (b) the arch in Photograph 2.3c have formed.**

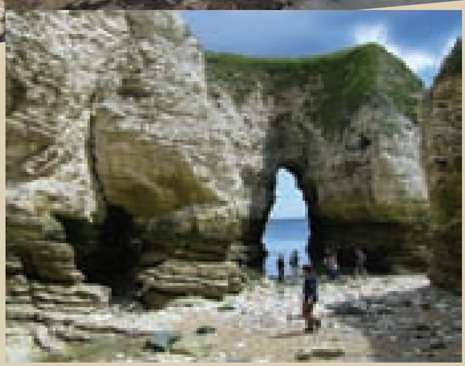
Figure 2.7 Cliffs, caves and arches: Flamborough and Selwick's Bay



▲ *Photograph 2.3(a) Caves, cliffs and recent rockfall at Flamborough*

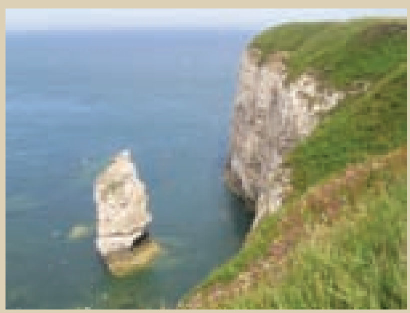


▲ *Photograph 2.3(b) Cliffs and shore platform at Selwick's Bay*



► *Photograph 2.3(c) Arch and cave at Selwick's Bay*

▼ *Photograph 2.3(d) Cliff profile and stack at Flamborough*



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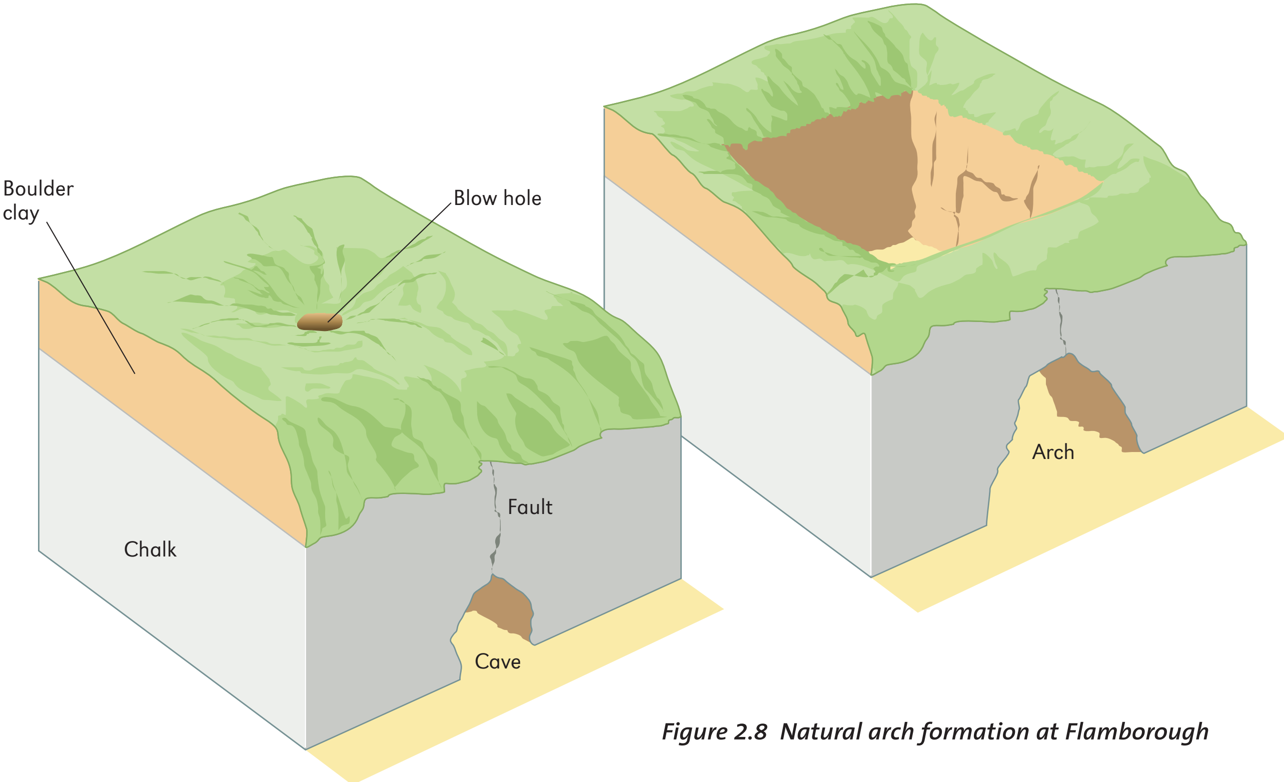


Figure 2.8 Natural arch formation at Flamborough

Caves

Caves form in the chalk at the base of the cliffs (see Photograph 2.3a). The processes of wave erosion, especially hydraulic action and abrasion, are concentrated on lines of weakness such as faults, vertical cracks (or joints) and horizontal cracks or **bedding planes**. Gradually the cracks and joints are widened leading to rock collapse and the formation of caves. At high tide the caves are completely flooded. In Photograph 2.3c you can see how a cave has formed between the high and low water mark along a vertical fault line.

Arches

If a cave roof partly collapses, the surviving roof section may form an arch. Some arches develop where a narrow fin of rock on an exposed headland is attacked on both sides by wave erosion. In this situation caves on opposite sides of the headland eventually meet, forming a tunnel. Further erosion and rockfalls increase the roof height to leave an arch.

At Flamborough, most arches lie parallel to the coastline (see Figure 2.8 and Photograph 2.3c). They seem to have formed by the partial collapse of caves that developed along major fault lines running at right angles to the cliffs. The collapse of the cave roof begins some distance from the shoreline where a master joint or fault reaches the surface as a **blow hole**.

Stacks, stumps and shore platforms

Further wave erosion leads to the collapse of arches leaving an isolated rock pillar known as a stack (see Photograph 2.3d). In time, stacks, undercut by wave erosion, also collapse to form stumps that are submerged at high tide. The final landform in the sequence of erosion (see Figure 2.1) is the shore or wave-cut platform (see Photograph 2.3b), This is a flat expanse of solid rock than slopes gently seawards and is exposed at low tide. Shore patforms owe their formation not only to abrasion, but also to weathering processes such as wetting and drying, and the biological action of marine organisms like algae and molluscs.

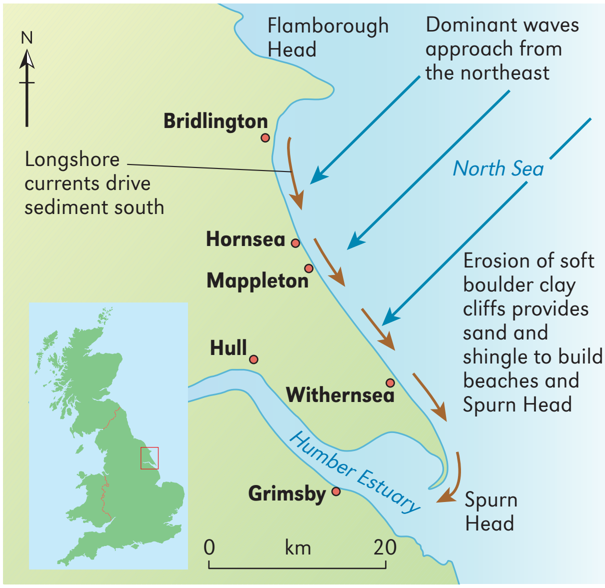
Holderness and Spurn Head

Depositional landforms

South of Flamborough, the Yorkshire coast has a very different character. This is a straight coastline of low boulder clay cliffs, and long, narrow beaches. Unlike Flamborough, beaches are prominent landforms, and deposition is an important process. Holderness is best known as one of Europe's most rapidly eroding coastlines.

Beaches

Along the Holderness coastline the beaches consist of sand and shingle eroded from the local boulder clay cliffs (see Photograph 2.4). Holderness's beaches are narrow for two reasons. First the clay cliffs contain only small amounts of sand and gravel; and second there are no major rivers along this stretch of coast to bring new sediments into the coastal zone. The beaches extend for over 50 km and run parallel to



▲ ***Figure 2.9 Sediment movement along the east Yorkshire coast***

Photograph 2.4 Holderness coastline: crumbling boulder clay cliffs and narrow beaches

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the straight coastline. Longshore drift operates along the entire length of the Holderness coast, transporting sand and shingle from north to south (see Figure 2.9).

Spurn Head

Spurn Head is a type of beach joined to the mainland at one end, known as a **spit** (see Figure 2.10). Made of sand and shingle, it forms a narrow, hooked peninsula, 6 km long, at the mouth of the River Humber (see Photograph 2.5). Several factors have contributed to the formation of Spurn Head:

- A supply of sand and shingle from the rapidly eroding cliffs of Holderness to the north.
- Longshore drift – the north to south movement of sand and shingle along the coast due to the dominant north-easterly waves striking the Holderness coast obliquely.
- The abrupt change in the direction of the coastline caused by the Humber Estuary.

As sediments are transported by longshore drift along the Holderness coast, Spurn Head spit has grown south across the inlet formed by the Humber Estuary. The hooked shape of Spurn Head is due to the movement of waves around the end of the spit.

Figure 2.10 OS map extract: Spurn Head

Activity 2.4

Study the the 1:50,000 OS map extract of Spurn Head (see Figure 2.10).

1. **What is the approximate length and width of Spurn Head between 420150 and its southermost tip?**
2. **What evidence is there on the OS map of: (a) the direction of longshore drift (b) the value of Spurn to people (c) protection measures to reduce the risk of erosion?**
3. **With reference to the OS map and Photograph 2.5 draw a sketch map of Spurn Head. Add notes to your map to describe and explain its main features.**

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◀ *Photograph 2.5 Spurn Head looking north*

Part 2 Coastal management

There is a need to protect some stretches of coastline from erosion and flooding. For example, towns and cities, with massive investments in housing, businesses, public buildings and infrastructure, will be protected by 'hard' defences such as seawalls and flood barriers — regardless of cost. In this situation, whatever the costs of protection they are dwarfed by the value of the property and investments they defend. Coastlines with vital economic installations like nuclear power stations, gas terminals and oil refineries will also be given priority for defence.

Coastal protection may also be jusitified for environmental reasons. Sand dunes, which often support habitats for rare plants and animals, may be protected from erosion with **rock armour** blocks and brushwood fences. Similar protection may be given to sand spits such as Spurn Head, and Blakeney Point in Norfolk, which are important refuges for birds and marine mammals like common seals.

Key ideas

- There is a need to protect some stretches of coast-line from erosion and flooding.
- Coastlines can be protected from erosion and flooding in different ways.
- Some strategies for coastal management are more sustainable than others.

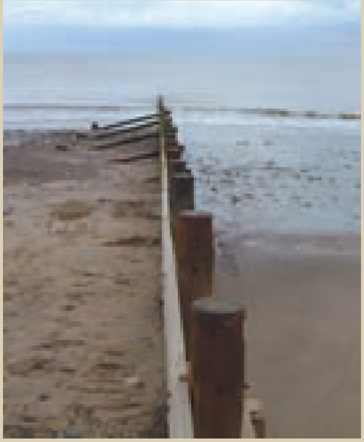
Case study: Coastal erosion at Happisburgh

Background

Happisburgh is a small village (population 850) on the northeast coast of Norfolk. Following the disastrous floods of 1953, hard sea defences were built to protect the villages. These comprised **revetments** and groynes (see Figure 2.11). Then in 1990 a violent storm destroyed a 300 m length of the revetments southeast of the village. These were not repaired. This decision was in line with the government's policy of 'do nothing' and **managed realignment** for this stretch of coastline (see Table 2.4). As a result, erosion since 1990 has been spectacular. In 15 years, 26 seafront homes were lost, and today several others are under immediate threat.

Figure 2.11 Coastal defences: hard engineering structures

Groynes



Wooden or concrete fences built at right angles to the shore. They trap the sand and shingle moved by longshore drift, which forms beaches and protects against erosion. If a wide and deep beach can be retained, there is less chance of waves reaching and eroding the cliffs behind.

Groynes interfere with the movement of coastal sediments. By trapping sand and shingle, groynes may starve beaches further down the coast of sediment and accelerate erosion there. They are intrusive and look unsightly.

Sea walls

Concrete walls or rock structures built along a stretch of coastline and designed to stop erosion and floods. Sea walls reflect waves, and give complete protection against erosion.

Sea walls are expensive to build (£1 million per km). Reflecting waves leads to scouring at the foot of the wall; without constant maintenance, sea walls can be undermined and collapse. By stopping erosion, sea walls reduce inputs of beach-building sediments (sand and shingle) to the coast.

Gabions

Wire cages filled with cobbles and stones placed where there is coastal erosion. The gaps between the cobbles and stones make them effective in absorbing wave energy and reducing erosion.

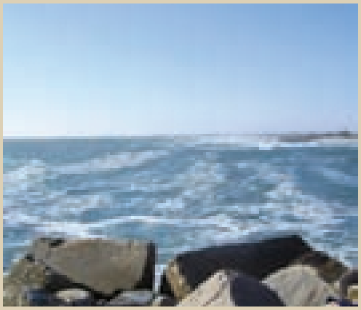
Gabions are cheaper than armour blocks but look unsightly.

Revetments

Latticed wooden fences built parallel to the shore. These allow shingle to build up behind them, creating beaches that give additional coastal protection. Unlike sea walls, they absorb wave energy.

Revetments reduce access to beaches and are unsightly.

Armour blocks



Boulders or concrete blocks placed at the foot of cliffs or at the base of sea walls. These absorb wave energy and have less impact on the environment than most other hard engineering structures.

Blocks (especially concrete ones) are ugly and reduce access to beaches.

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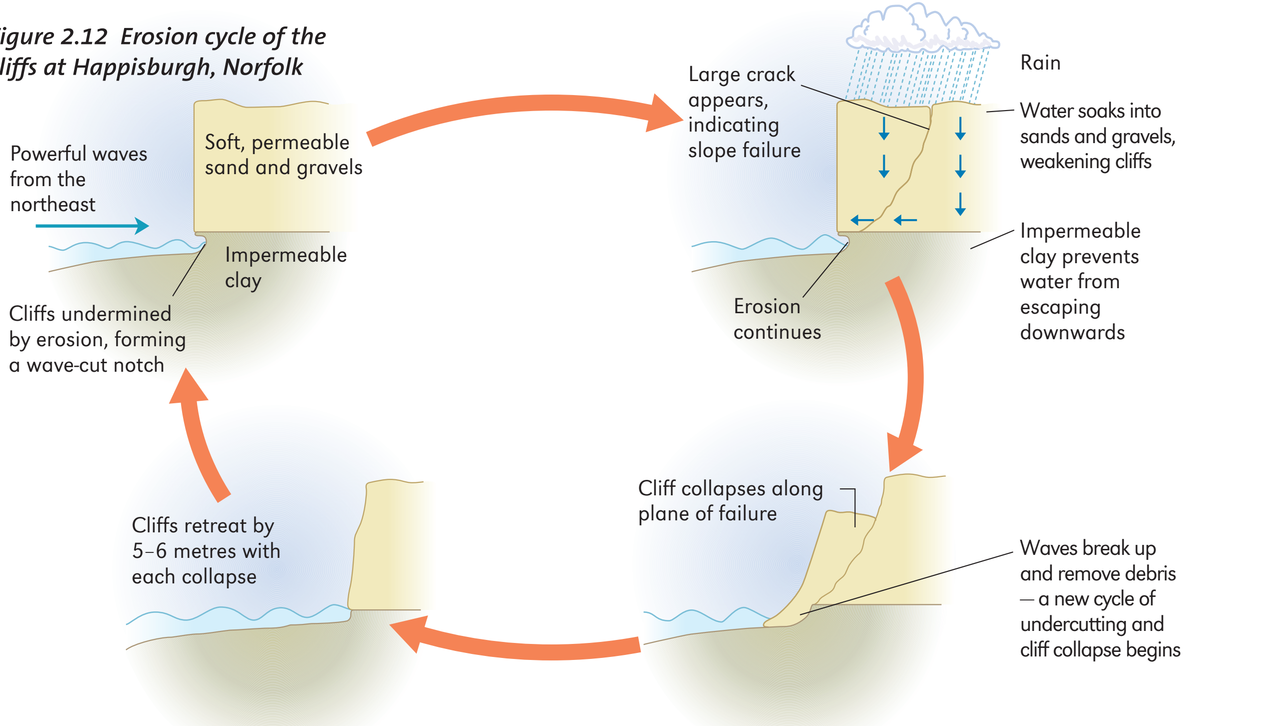
Figure 2.12 Erosion cycle of the cliffs at Happisburgh, Norfolk



Since the destruction of the revetments, rates of erosion at Happisburgh have averaged 5–8 metres a year. Already erosion has carved a shallow bay to the south of the village (see Photograph 2.6). Rapid erosion is explained by three factors:

▼ ***Photograph 2.6 Happisburgh looking south, showing the shallow bay eroded since 1990***

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- Cliffs formed from soft glacial sands, gravels and clay (see Figure 2.12).
- The long fetch (i.e. expanse of open sea) to the northeast (see Figure 2.13) that generates powerful storm waves.
- Narrow beaches that give little protection from storms.

Figure 2.13 Sediment movement in eastern England

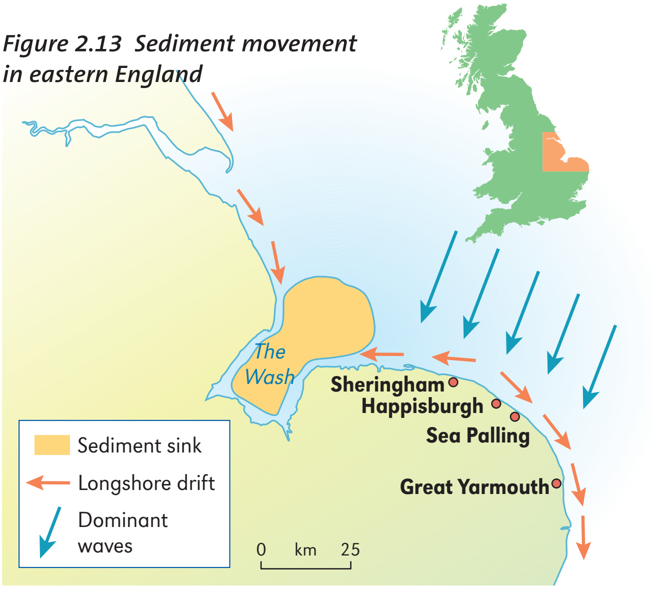

Table 2.4 Coastal defences: soft engineering approaches

Beach replenishment/ renewal	Beaches absorb wave energy (energy is spent moving sand and shingle up, down and along beaches). A wide beach is the best defence against coastal erosion. Sand and shingle can be added artificially to beaches to protect the coastline against erosion and/or flooding. Beach replenishment also maintains beaches for tourism.
'Do nothing' and managed realignment	It is too costly to build and maintain hard structures to defend the UK's entire coastline. Moreover, the costs of coastal defence will increase in future due to climate change and rising sea levels. This means that maintaining the UK's hard coastal defences is unsustainable. Where the value of threatened property is relatively low, erosion may be allowed to continue. 'Do nothing' is a controversial policy. It allows natural processes, such as the movement of sand and shingle, to operate, and it is sustainable. But people may lose their property without compensation. Managed realignment allows some stretches of coastline to be flooded, either by letting the sea breach flood embankments or by dismantling sea defences.This has already happened in parts of Essex and Lincolnshire. A new, sustainable coastline is established further inland. Managed realignment may result in loss of farmland, but flooded land becomes new salt marsh and mudflat — important habitats for wildlife.

Impact of 'do nothing' and managed realignment

We have seen that the lack of hard defences at Happisburgh has led to dramatic increases in erosion since 1990 (see Photograph 2.7). In response to this situation a local pressure group — Coastal Concern Action Group (CCAG) — was formed to lobby North Norfolk District Council and the government to repair the sea defences. However, there is no legal obligation on the government to compensate people who lose their land, businesses and homes through coastal erosion.

Protection against the sea

Grants for protection against coastal erosion are available from the government. They cover 40–50% of costs; the rest comes from the local authority. Applications for grants are considered against three criteria:

(1) Whether the cost of sea defences is greater than the value of the property being protected.

(2) The number of properties at risk and the vulnerability of the population (as measured by economic deprivation).

(3) Environmental benefits (e.g. creation of salt marshes, protection of heritage sites or Sites of Special Scientific Interest).

So far Happisburgh has not been awarded a government grant. The value of the property and land at risk is less than the cost of sea defences (revetments cost £1,500 per metre, and **sea walls** £5,000 per metre). At the moment only a few outlying houses and other properties at Happisburgh are threatened. The main part of the village is not in immediate danger.

The current situation

CCAG's case for repairing the sea defences at Happisburgh is based on several arguments:

- Many local people bought their homes before 1990, when secure defences were in place and rates of erosion were only a fraction of those that have occurred since then.
- Erosion of the coast is not only due to natural processes. It has been accelerated by the following:
  - **Sea walls** to the north, which stop erosion and reduce the amount of sediment available to build beaches at Happisburgh.
  - Dredging sand and shingle from the sea bed off Great Yarmouth (from 1989 to 2002, 163 million tonnes were dredged), which starves beaches at Happisburgh of sediment.
  - Granite reefs built offshore near Sea Palling, which restrict the movement of sand and shingle from the sea bed to the coast.

However, in 2006, Happisburgh won a temporary reprieve when Norfolk County Council provided £200,000 to place nearly 5,000 tonnes of boulders

Photograph 2.7 Cliff-top houses at Happisburgh

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Activity 2.5

Study the information in Table 2.5 and in the case study of coastal erosion at Happisburgh.

1 State and explain your view on the issue.

2 As a resident of Happisburgh whose home is threatened by erosion, write a letter to your local newspaper expressing your views on:
(a) the policy that designates Happisburgh as a coastline of 'do nothing'/managed realignment
(b) the government's rejection of Happisburgh's application for a grant to put towards the cost of repairing the coastal defences

3 As a representative of North Norfolk District Council's planning department, give a presentation to the residents of Happisburgh, explaining the council's 'do nothing'/managed realignment policy.

4 Write a short scene (with dialogue) dramatising the meeting between Happisburgh's residents and representatives of the council and government in the village hall. The principal actors are: village residents, the chief planning officer for North Norfolk District Council, a junior minister from the government, and the MP for North Norfolk.

at the foot of the most vulnerable cliffs. Remarkably, the villagers also managed to raise a further £50,000 for an additional 950 tonnes of rock. While the erosion problem has not gone away, these new defences will 'buy' Happisburgh and its residents another 10 years. It is hoped that by then the government will have found ways to help communities adapt to coastal change.

Table 2.5 Arguments for and against defending Happisburgh from coastal erosion and/or compensating residents

Arguments for defending Happisburgh and/or compensating residents	Arguments against defending Happisburgh
There is a huge debate about the effects of coastal erosion on tourism. The negative side is that cliff-top properties like B&Bs and hotels will be lost. *Gary Watson, coastal manager, North Norfolk District Council*	Spending money on coastal defences is a waste of resources; the money would be better spent on hospitals and schools. *Professor Keith Clayton, environmentalist*
My mother and father's bungalow is now the second to go in the sea. I grew up in Happisburgh and am extremely upset, not only because I wanted to bring up my children there, but because it has caused so many people like my parents so much pain. *Former Happisburgh resident*	It would be wholly unrealistic to defend every part of Britain's coastline. *Gillian Shepherd, Minister for Agriculture, 1993*
Having worked all our lives to buy this property, it will mean we have nothing to leave our children. It seems to us that if the government can't get our assets the sea will. *George Dixon, Happisburgh resident*	Controlled retreat is the only affordable and sustainable way to manage the coastline. *Spokesperson for DEFRA*
I would like to say how monstrous it is that people should lose their homes and businesses, for which they have worked and saved hard for so many years. *C. E. Lilley, Happisburgh resident*	Sea defences interrupt natural coastal processes, such as longshore drift and sediment movement, leading to a shortage of sand to feed beaches. *Gary Watson, coastal manager, North Norfolk District Council*
It makes you question whether those who make decisions actually care about people. No one seems to mention the people who could lose their homes. *Thomas and Gillian Beeby, Happisburgh residents*	The trouble with management of coasts is that changing one bit of coast means changing someone else's. Defending north east Norfolk would remove material that is being washed down the coast and protects the Broads. *Professor Philip Stott, geographer*
The rate of erosion at Happisburgh is ten times the historic rate. No coastal authority would consider putting in a sea defence scheme in isolation without considering the effects on adjacent coastlines. So why do we tolerate this exact situation at Happisburgh? *CCAG member*	Hard coastal defences are a waste of time and money. Defences save only cliff-top properties, and they destroy coastlines. We must make a mobile and unstable coast. *Professor Tim O'Riordan, environmental scientist*
We are not starting with a natural coastline and this means that the abandonment of sea defences is highly irresponsible. *Dr Clive Stockton, deputy leader, Norfolk District Council*	Managed realignment is the best answer for a sustainable coast. *Tim Collins, English Nature*
Money should be spent by the government on sea defences...our coastline should be protected...we don't want to lose it. *Andy Smith, Beach Holiday Village*	We want the coastline to do its own thing, not to be defended by man-made means. It needs to be dynamic and able to move around. *Lisa Bray, Wildlife Trust*
The 'do nothing' policy has wiped thousands off the value of properties. The north Norfolk villages are now like prison camps — no one can buy in or out of them. *Malcolm Kerby, coordinator of CCAG*	We should try to work with nature where we can. The coastline isn't fixed and as sea levels rise it will cost us more to defend. *Peter Midgeley, Environment Agency*
People who bought properties on the understanding that it was a defended coastline have now had the goal posts shifted. Compensation is completely lacking and the issue has to be considered. *Norman Lamb, MP for North Norfolk*	