

# Geography Department

Year 7

Week 13, 14  
Coasts and Rivers

## 1 Weathering, rivers and coasts

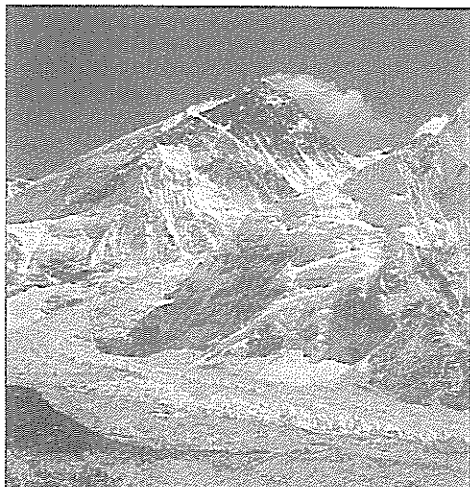
### What is weathering?

There is a great variety of different scenery in the world. Some places are mountainous, some are flat, some can be described as spectacular and others simply as interesting. Geographers call the scenery of a place the **landscape**. Some examples of the world's landscapes are shown in photos A, B and C.

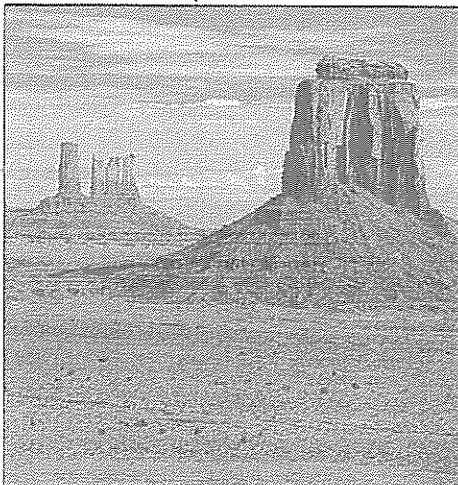
The surface of the earth and the landscapes we see around us not only differ from place to place, but they are

changing all the time. Rain, sun, wind and frost constantly break down the rocks. Great mountain ranges get worn down, valleys are made wider and deeper, and coastlines are changed. The breaking up of the earth's surface in this way is due to **weathering** and **erosion**. Weathering takes place when the rocks are attacked by the weather. Erosion is the wearing away of the land. These two pages show some examples of weathering. Erosion is explained more fully on pages 6 and 7.

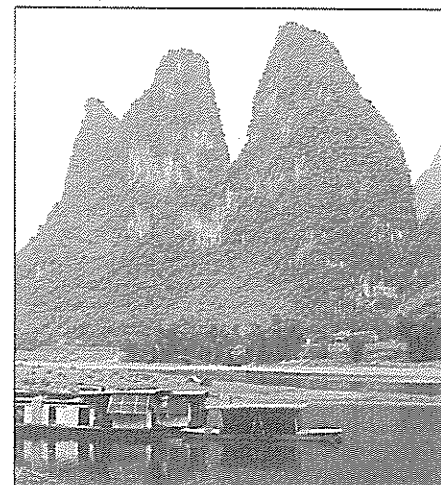
A Mount Everest



B Monument Valley, USA

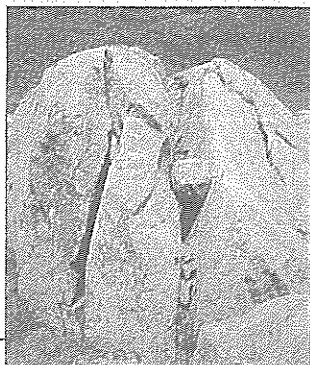


C Guilin, China



#### Freeze-thaw weathering

This can also be called frost shattering. Water may get into a crack in a rock and freeze. As the water turns to ice it expands and causes the crack to open a little. When it thaws the ice melts and changes back to water. Repeated freezing and thawing weakens the rock and splits it into jagged pieces. This type of weathering is common in mountainous areas where temperatures are often around freezing point.



Water fills a crack in a rock



The water freezes and the crack is made wider



The rock breaks into several pieces



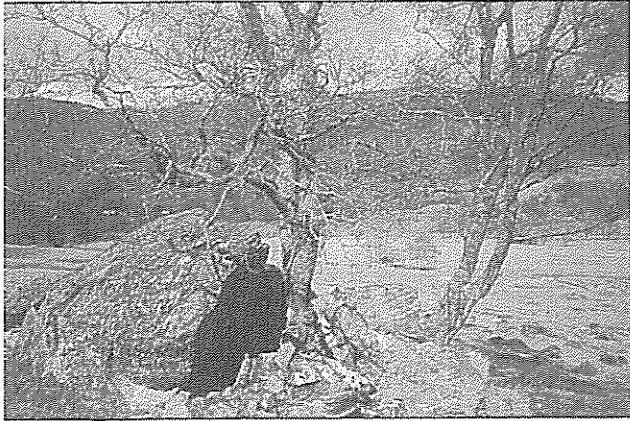
#### Onion-skin weathering

This happens when a rock is repeatedly heated and cooled. As it is heated, the outer layer of the rock expands slightly and as it cools the rock contracts. Continual expansion and contraction causes small pieces of the rock surface to peel off like the skin of an onion. This type of weathering is common in desert areas where it is very hot during the day but cool at night.



## Biological weathering

This is due to the action of plants and animals. Seeds may fall into cracks in the rocks where shelter and moisture help them grow into small plants or trees. As the roots develop they gradually force the cracks to widen and the rock to fall apart. Eventually whole rocks can be broken into small pieces. Burrowing animals such as rabbits, moles and even earthworms can also help break down rock.



## Chemical weathering

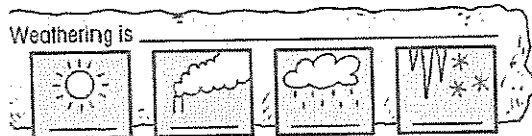
This is caused by the action of water. Ordinary rainwater contains small amounts of acid. When it comes into contact with rock the acid attacks it and causes the rock to rot and crumble away. The results of this can be seen on buildings and in churchyards where the stone has been worn away or pitted. Water and heat make chemical weathering happen faster, so it is greatest in places that are warm and wet.



## Activities

Make a larger copy of diagram D.

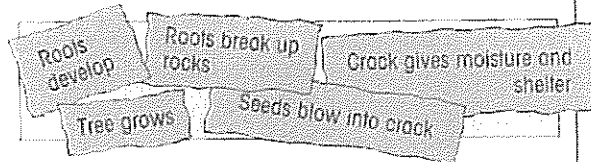
- Write in the meaning of weathering.
- Add labels to the weathering features.



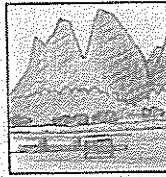
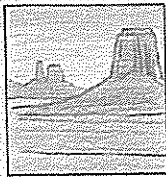
Copy and complete these sentences.

- Freeze-thaw weathering is . . .
- Onion-skin weathering is . . .
- Chemical weathering is . . .

- With the help of a labelled diagram show how freeze-thaw weathering can break up rocks.
- Make a larger copy of diagram E.
- Show how root action can break up rocks by adding the following labels to the correct boxes. Give your diagram a title.



## Extras



Draw these simple sketches of photos A, B and C. Give each sketch a title and underneath say what type of weathering is likely to be most important there. Give reasons for your answers.

## Summary

Weathering is the breakdown of rocks by water, frost and temperature change. Rocks can also be broken down by the effects of plants and animals.



## 1 Weathering, rivers and coasts

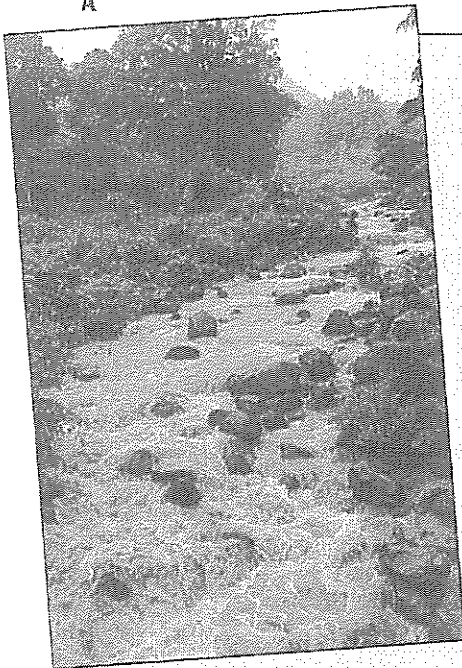
### What is erosion...

Weathering and erosion work together. Weathering breaks up and weakens the surface of rocks while erosion wears away and removes the loosened material. The action of rivers, the sea, ice and wind are the chief types of erosion. Human erosion is also important. Bulldozers and lorries can dig out and move large amounts of soil

and loose rock, so changing the landscape. People also remove trees and vegetation which can allow water, wind and ice to erode land more easily.

The work of rivers, the sea, ice and wind are explained in A below.

A

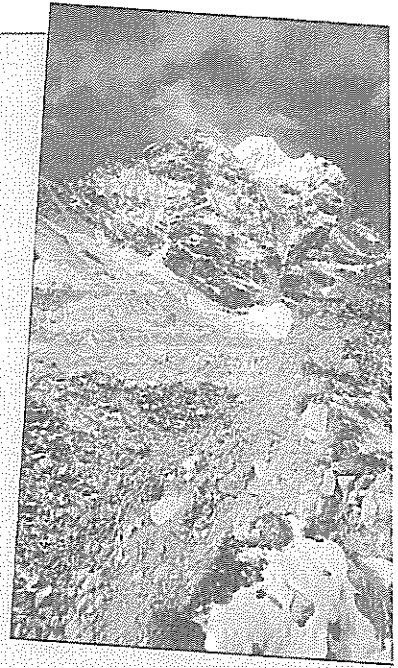


#### Rivers

Every day rivers wear away tiny bits of rock from their bed, and eat into the banks on either side of the channel. This material is carried downstream and deposited when the water slows down. In times of flood large boulders may be loosened and rolled down the river bed.

#### Ice

A glacier is a tongue of ice moving down a valley. Stones and boulders that fall on to it freeze into the ice and act like sandpaper on the rocks beneath. As the glacier moves, it carries the material downwards and at the same time wears away the valley bottom and sides.



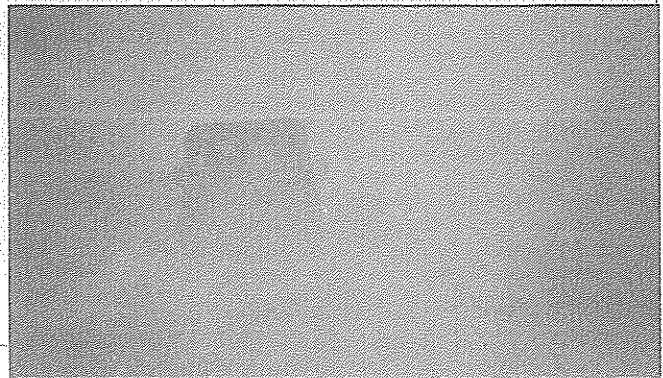
#### Sea

Coastlines are under constant attack by waves. During storms each wave hits the rock with a weight of several tonnes. When this is repeated many times, the rock is weakened and pieces break off. **Currents** carry loose material away and deposit it elsewhere.



#### Wind

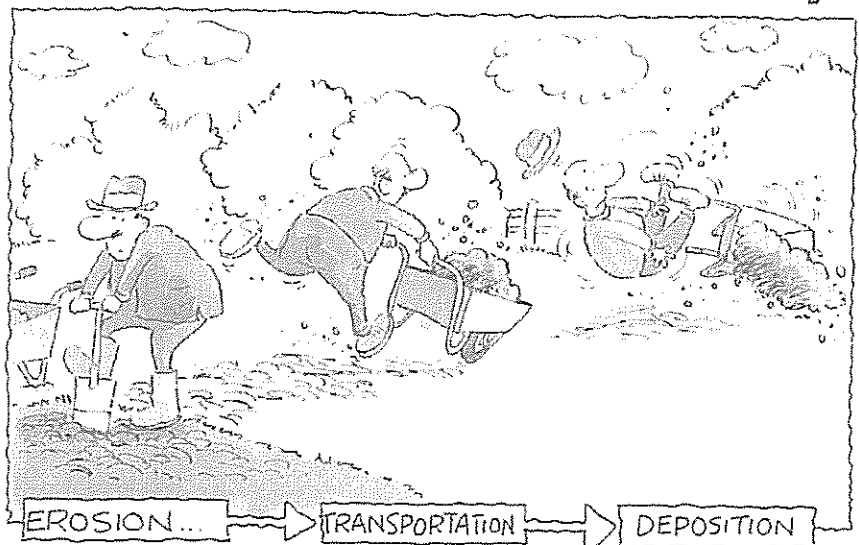
Explorers who cross deserts in cars often find their paintwork worn away and their windscreens scratched. This is because the wind picks up tiny particles of sand and blasts them against anything that is in the way. Rocks in desert areas are often eroded into strange shapes by this sand-blasting effect.



## ... and how can it help shape the land?

Look at cartoon B on the right. It shows some gardeners who are trying to alter a garden by digging out soil (erosion), moving it in a wheelbarrow (transportation), and dumping it somewhere else (deposition). The more energy they have, the more soil they can dig or transport. When they are tired the digging slows down and they lack the strength to push the barrow, resulting in it toppling over and dumping its load.

On a larger scale, mountains, valleys, plains and coasts are shaped and changed by water, ice and wind. **Erosion** wears away the land, **transportation** moves the material from one place to another and **deposition** builds up new landforms.



## Activities

- a) List the following in order of how hard they are. Give the hardest first and the softest last.

Steel Chalk Soap Wood  
Rubber Diamond Plastic

- b) Put a line under the two you think would be most difficult to wear down.  
c) Choose any three from your list and say how they might be worn down.

Of the five statements below three are correct. Write out the correct ones.

- Weathering is the breakdown of rock by nature.
- Erosion is the wearing away of rock.
- Weathering and erosion are the same.
- Weathering moves material from one place to another.
- Erosion includes the removal of loose material.

- a) Make a large copy of table C.  
b) Add labels to each drawing.  
c) Write a short description for each type of erosion.

C Types of erosion

Type	Description

## Extra

Cartoon B shows erosion, transportation and deposition in a garden. How else could this be shown? What about a bulldozer, washing dishes or sandpapering wood? For one of these ideas, or for one of your own, draw a simple labelled cartoon to show how it works.

## Summary

Erosion is the wearing away of rock and its removal by streams, ice, waves and wind. Erosion, transportation and deposition help shape the land.

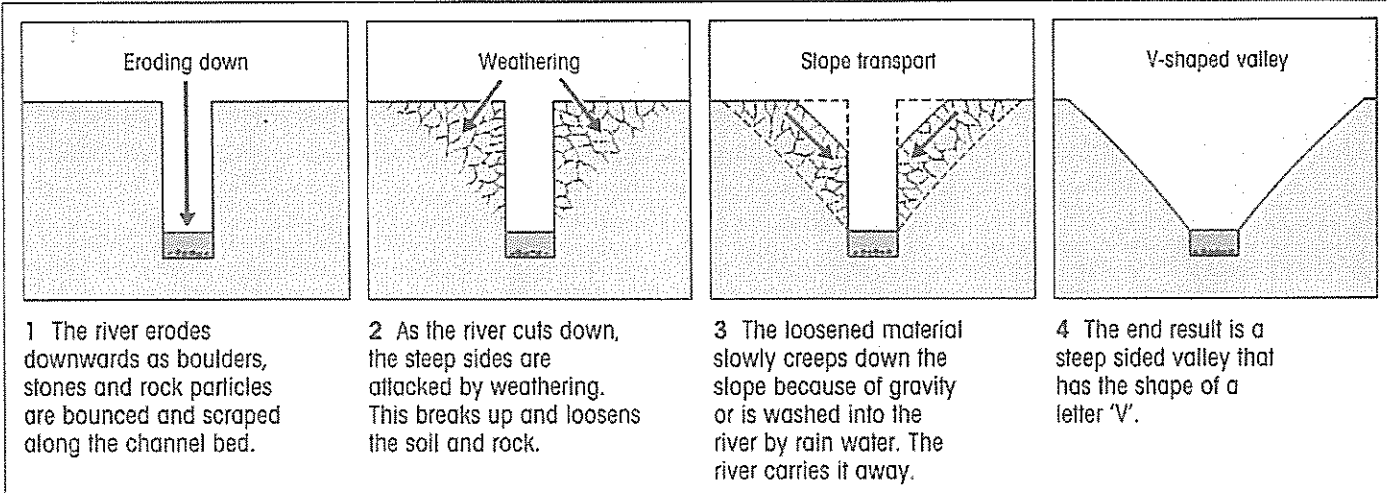
## How do rivers shape the land?

Rivers work hard. They hardly stop and they continually erode and move material downstream. They are a major force in shaping and altering the land. Running water by itself actually has little power to wear away rocks. What happens is that the water pushes boulders, stones and rock particles along the river's course. As it does so, the loose material scrapes the river bed and banks and loosens other material. Much of what is worn away is then transported by the river and put down

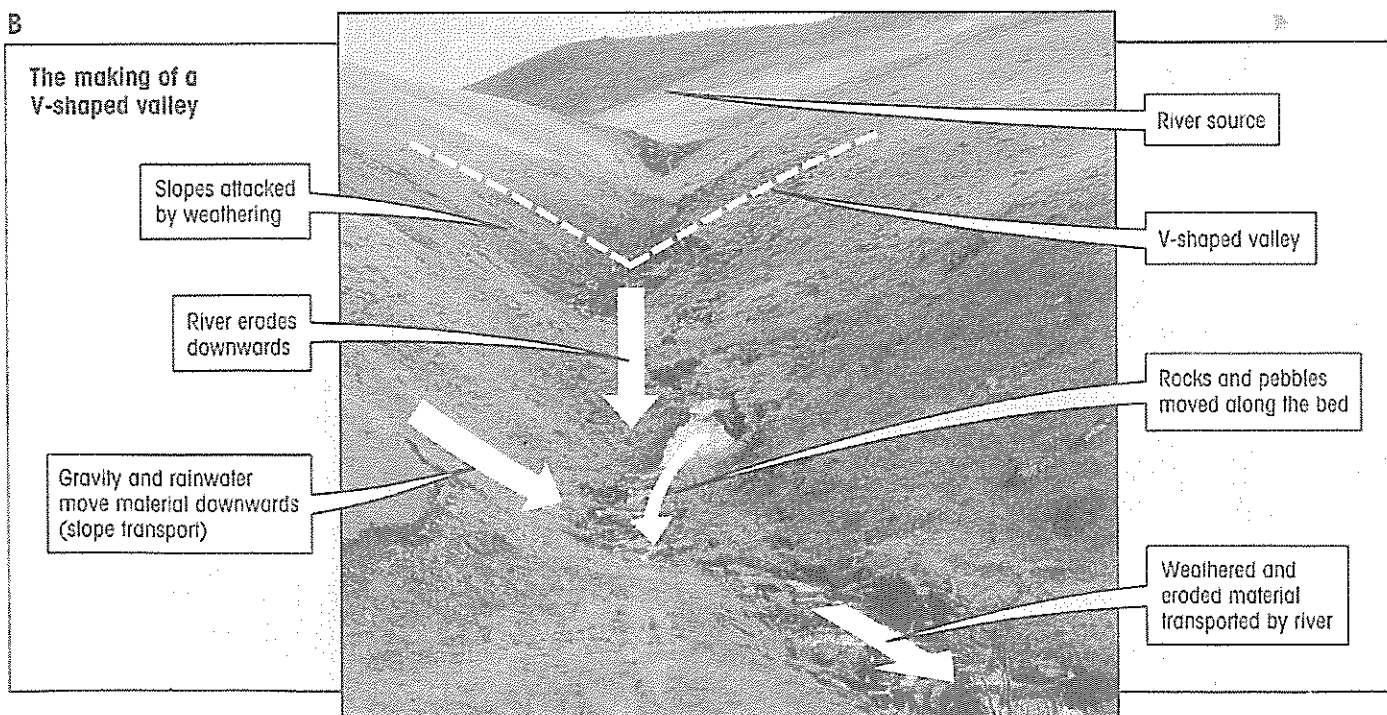
somewhere else. In this way rivers can wear out and deepen valleys. They can also change their shape by depositing material.

The landforms to be seen along a river change as it flows from source to mouth. These two pages explain the features of a river in its upper course which is usually in the hills or mountains. Diagram A and photo B show how a river cuts out a steep sided valley that is V-shaped.

A



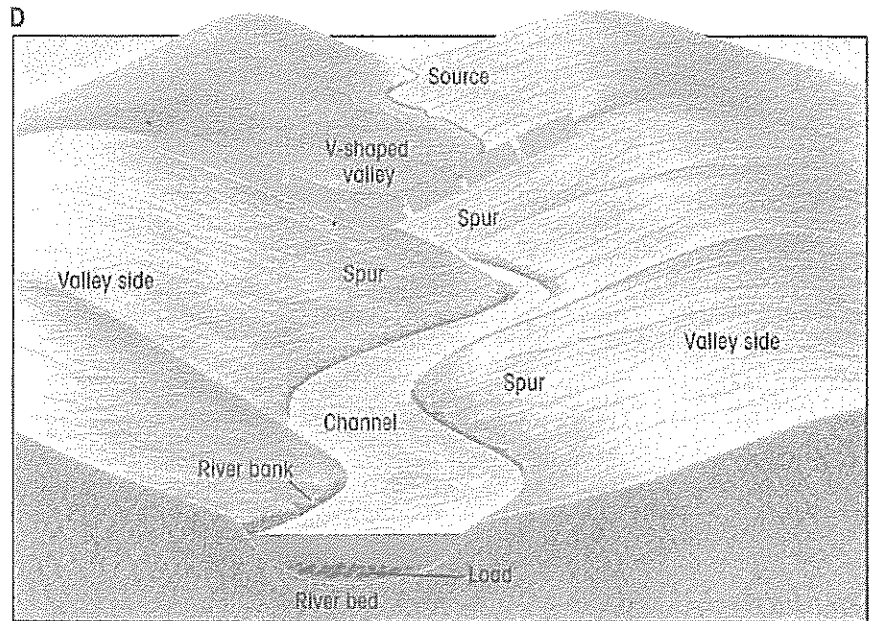
B





able C below and sketch D give some features of a river and its valley.

Source	Where a river starts
Spurs	Ridges of land around which a river winds
Valley sides	The slopes on either side of a river
V-shaped valley	The shape of a valley in its upper course
Channel	The course of a river
River banks	The sides of a river channel
River bed	The bottom of a river channel
Load	Material that is carried or moved by the river

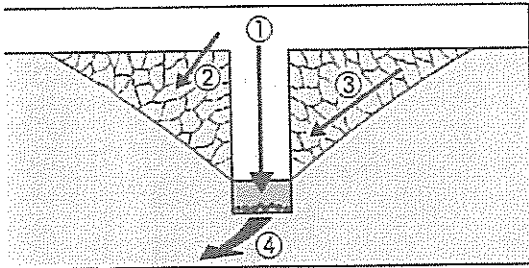


## Activities

Describe how rivers erode their channels. Include these words in your description.

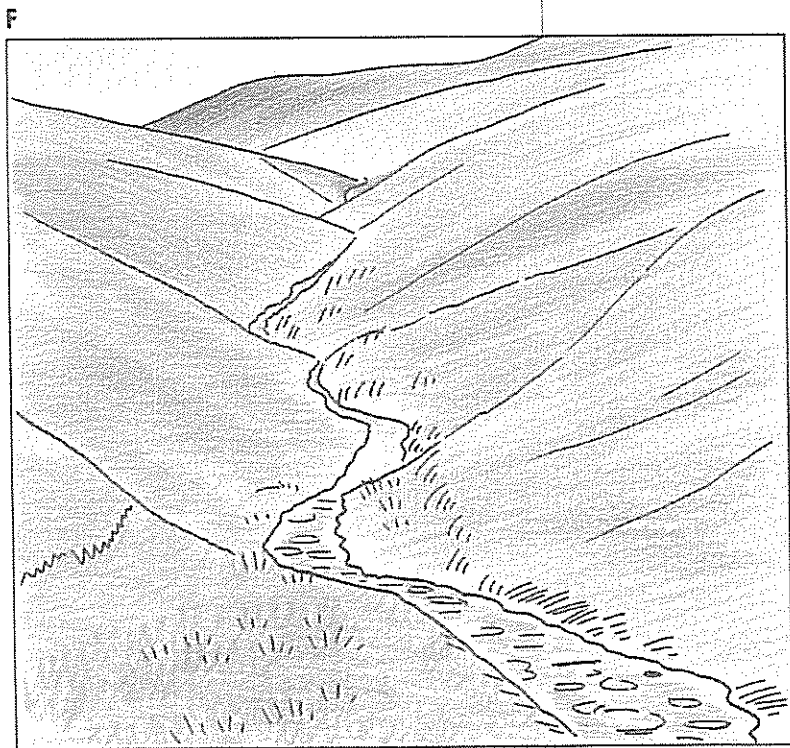
*pushes scrapes loosens moves drops*

- Make a large copy of diagram E.
- Show how a valley gets to be V-shaped by describing what happens at ①, ②, ③ and ④.
- Give your diagram a suitable title.



- Sketch F is a simplified drawing of the river valley shown in photo B. Make a copy of the sketch.
- Add the terms below to your sketch in the correct places. The information at the top of this page will help you.

*River channel River bank Load  
Valley side Spur V-shaped valley*

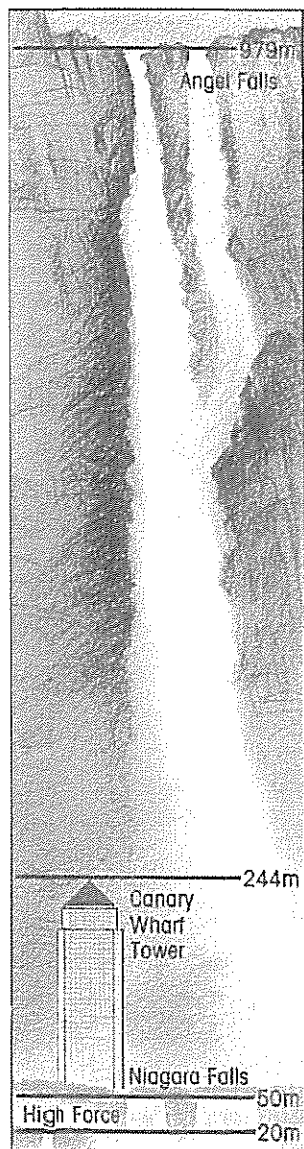


## Summary

Rivers erode, transport and deposit material. This helps shape the land. V-shaped valleys are a common feature of a river in its upper course.

## 1 Weathering, rivers and coasts

A



## What causes waterfalls?

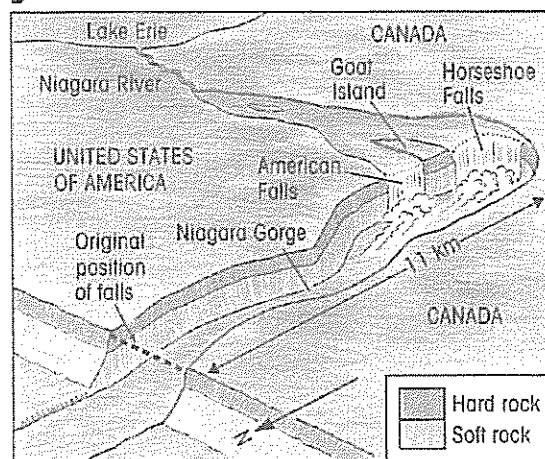
Waterfalls are an attractive and often spectacular feature of a river. The highest waterfall in the world is the Angel Falls in South America. Its total height is 979 metres. That is about four times the height of Britain's tallest building, the Canary Wharf Tower in London's Docklands. Waterfalls in Britain are much smaller than this (diagram A). One of the finest is High Force in the north of England. It has a height of just 20 metres. It is most impressive in times of flood.

Probably the best known waterfall in the world is Niagara Falls. It lies on the Niagara River which forms part of the border

between Canada and the United States. In this area, a band of hard limestone rock lies on top of softer shales and sandstone. The river flows over the top of the hard rock then plunges down a 50 metre cliff. At the bottom of the cliff the water has worn away the softer rocks to form a pool over 50 metres deep. This is called a **plunge pool**. Down from the falls is the Niagara Gorge. A **gorge** is a valley with almost vertical sides that has been carved out by the river and the waterfall. Photo D shows the gorge and waterfall at Niagara.

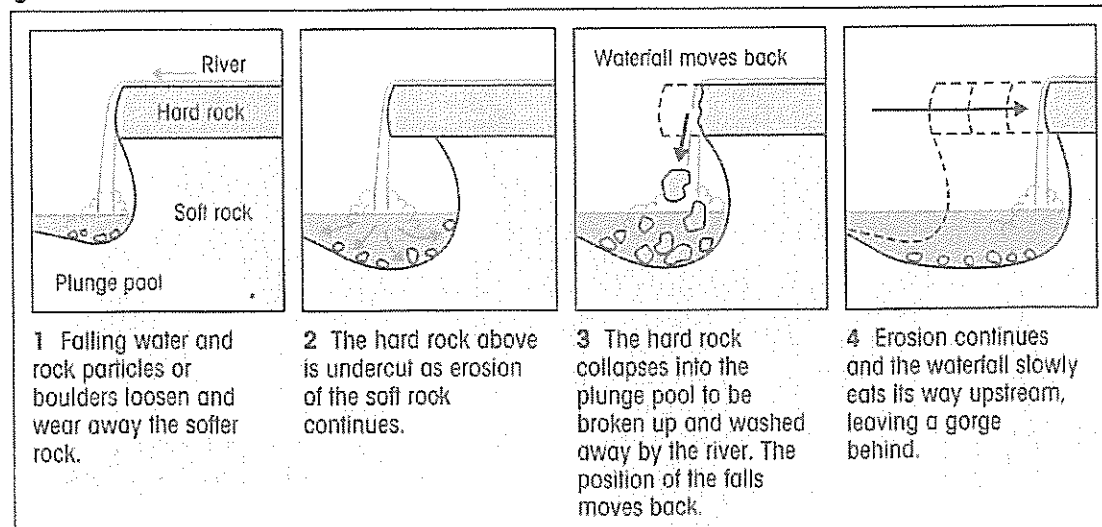
Sketch B shows the Niagara Falls area. The falls here are eating into the cliffs behind the waterfall at nearly one metre a year. The gorge that has been left behind is now 11 kilometres long.

B

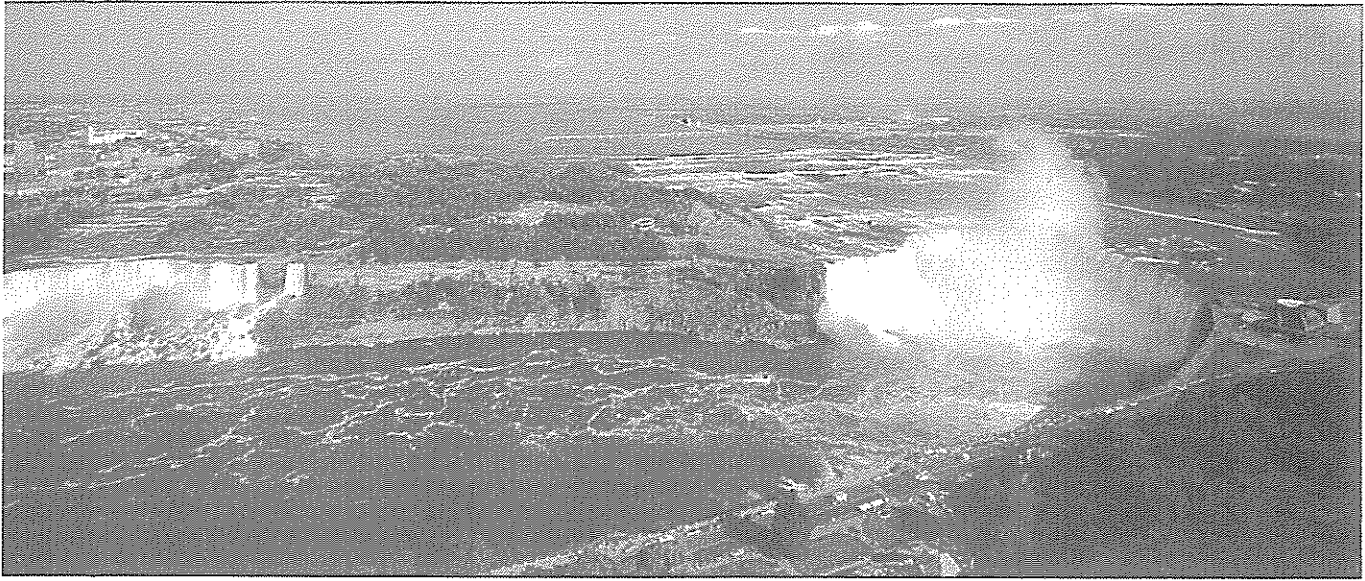


Many waterfalls are formed in the same way as Niagara. They occur when rivers flow over different types of rock. The soft rock wears away faster than the hard rock. In time a step develops over which the river plunges as a waterfall. Water also cuts away rock behind the waterfall. This causes the falls to move back and leave a gorge as it goes. Diagram C shows how a waterfall may be worn away by a river.

C



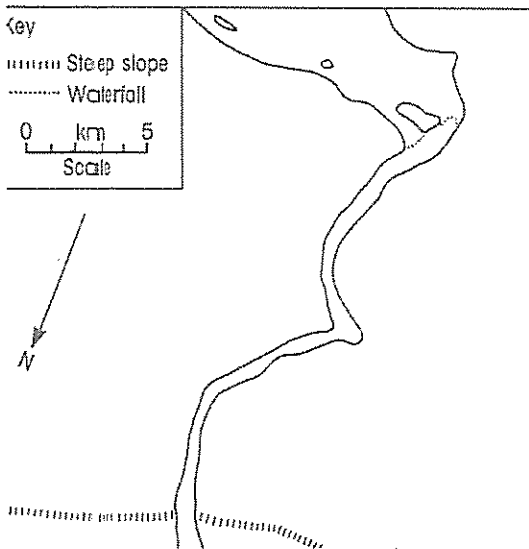




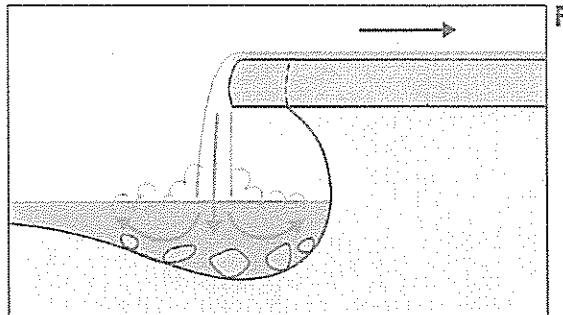
## Activities

Map E shows the Niagara Falls area.

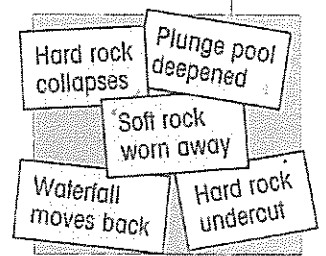
- Make an accurate copy of the map.
- Colour the water blue and the land area green.
- Label the following:  
USA   Canada   American Falls  
Horseshoe Falls   Niagara Gorge  
Niagara River   Goat Island
- Draw on and label the original position of the falls.
- The falls have taken 30 000 years to wear back 11km. Draw on and label where the falls might be 10 000 years from now.



- Make a larger copy of diagram F.
  - Put these labels in the correct places.  
Hard rock   Soft rock   Plunge pool  
Hard rock breaks off   Eroded material  
Undercutting   Waterfall moves back



- Sort the phrases on the right into the correct order and link them with arrows to show how a waterfall may be worn away by a river.



## Summary

Many waterfalls are a result of water wearing away soft rock more quickly than hard rock. As a waterfall erodes back, a gorge may be produced.

## 1 Weathering, rivers and coasts

### What happens on a river bend?

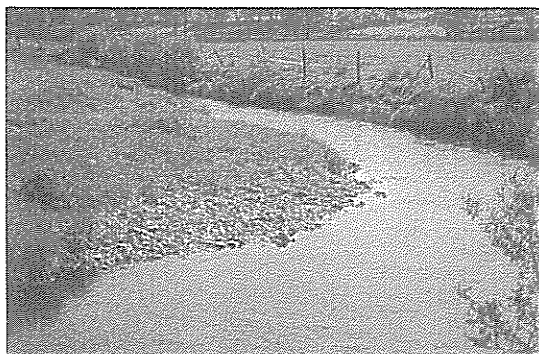
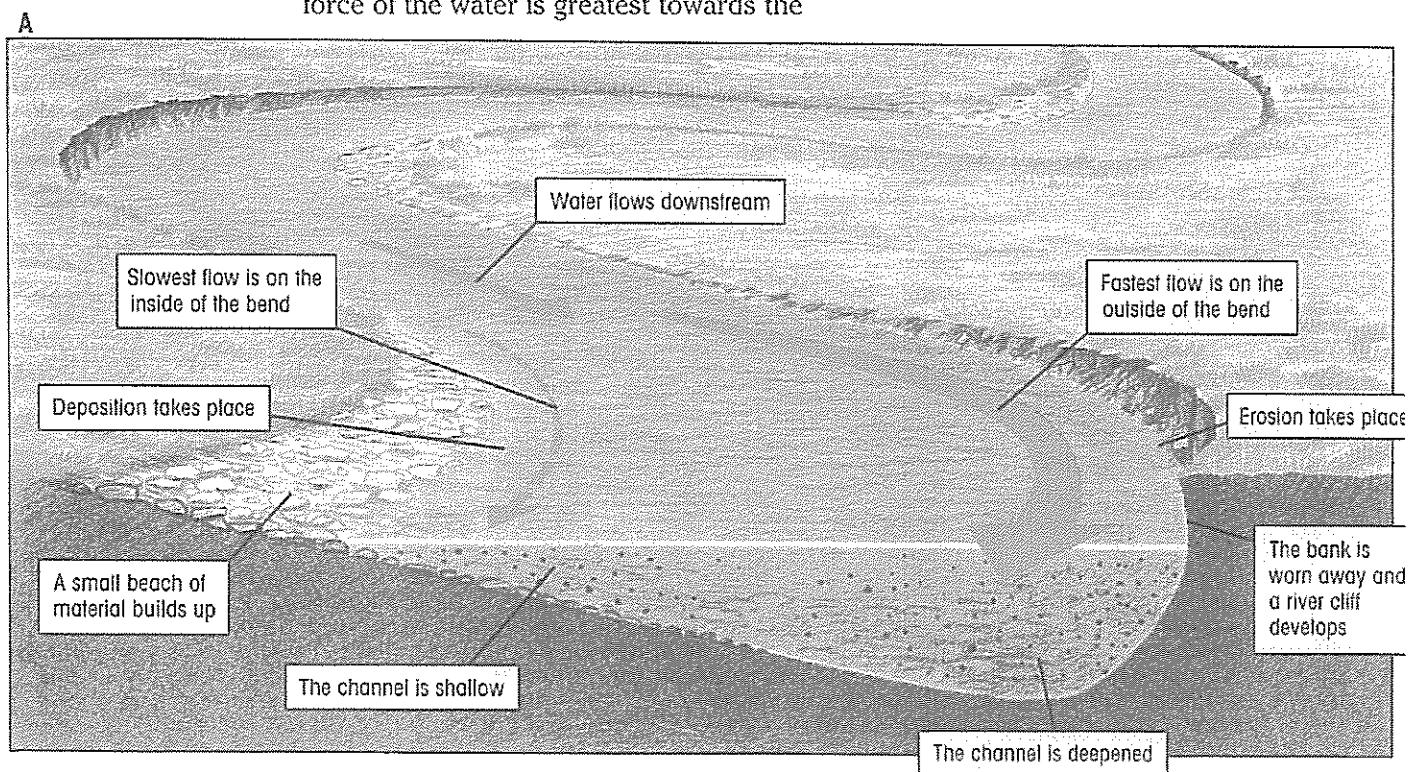


Have you noticed that rivers rarely flow in a straight line? Usually they twist and turn as they make their way down to the sea. The only time they are straight seems to be when people interfere with them by building banks or diverting their course.

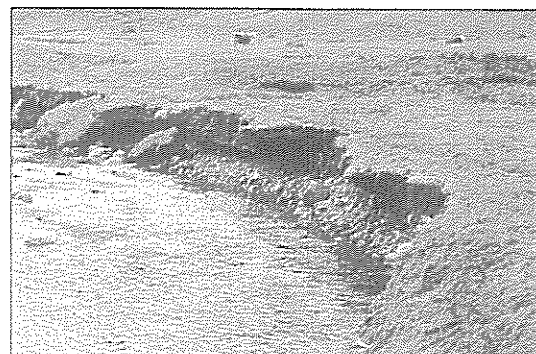
Bends develop on a river mainly because of the water's eroding power. Think about when you are a passenger in a car and it goes around a corner. You are thrown towards the outside of the curve, often with quite a lot of force. The same happens when a river goes around a bend. The force of the water is greatest towards the

outside of the bend. When it hits the bank it causes erosion. This erosion deepens the channel at that point and wears away the bank to make a small river cliff. On the inside of the bend, water movement is slower. Material builds up here due to deposition. This makes the bank gently sloping and the river channel shallow.

Diagram A shows what happens on a river bend. At the bottom of the diagram is a **cross-section**. This shows what the river would look like if a slice was cut across it from one side to the other.



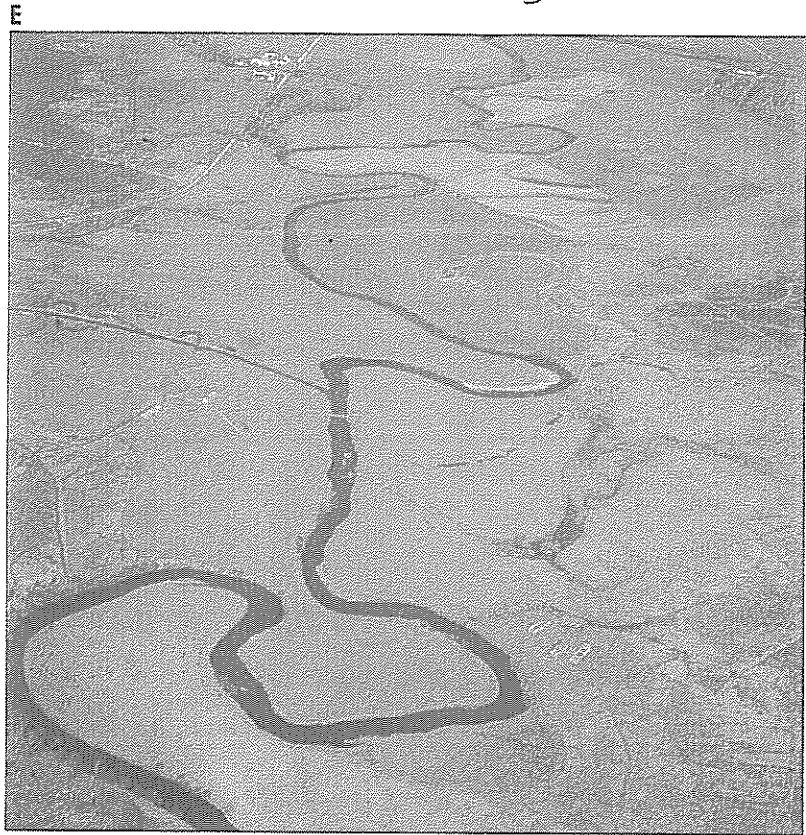
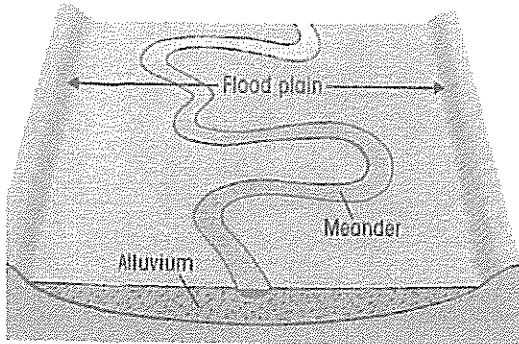
**B** Deposition on the inside of a river bend



**C** Erosion on the outside of a river bend

Look at sketch D and photo E. The river has many bends. These are called **meanders** and are a common feature of most rivers. On either side of the river channel there is an area of flat land called the **flood plain**. This area gets covered in water when the river overflows its banks. Flood plains are made up of **alluvium**, a fine muddy material that is left behind after floods. Alluvium is sometimes called **silt**.

Flood plains are useful to people because they are areas of flat land and have rich fertile soil. This makes them good for building on and for farming.

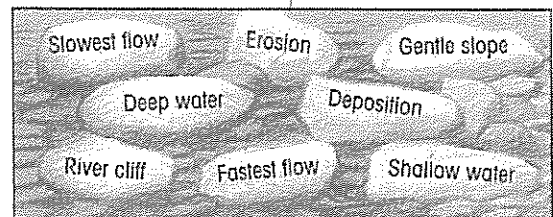
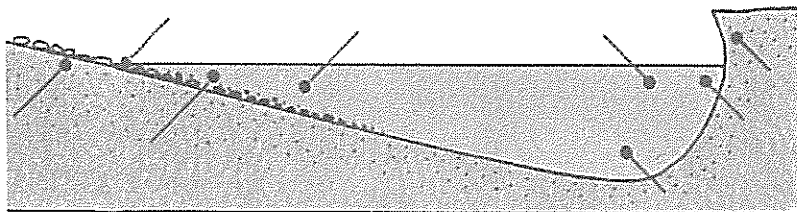


## Activities

Look at diagram F, which is a simple cross-section of a river bend.

- Draw the cross-section.
- Write the labels from G in the correct places.
- Give your drawing a title.
- Describe why one side of the river bend is different from the other.

- Make simple sketches of photos B and C.
  - For each sketch describe the river feature that it shows.
  - Explain how each feature was made.
- Give the meaning of the terms shown in sketch D.



## Extras

- Write down two reasons why the flood plain of a valley is good for farming.
  - Give one problem of farming the flood plain. Suggest what could be done to reduce the problem.

## Summary

A river's course is seldom straight. It usually has many bends which cause it to meander down its valley. The outside of a river bend is worn away by erosion while the inside is built up by deposition.



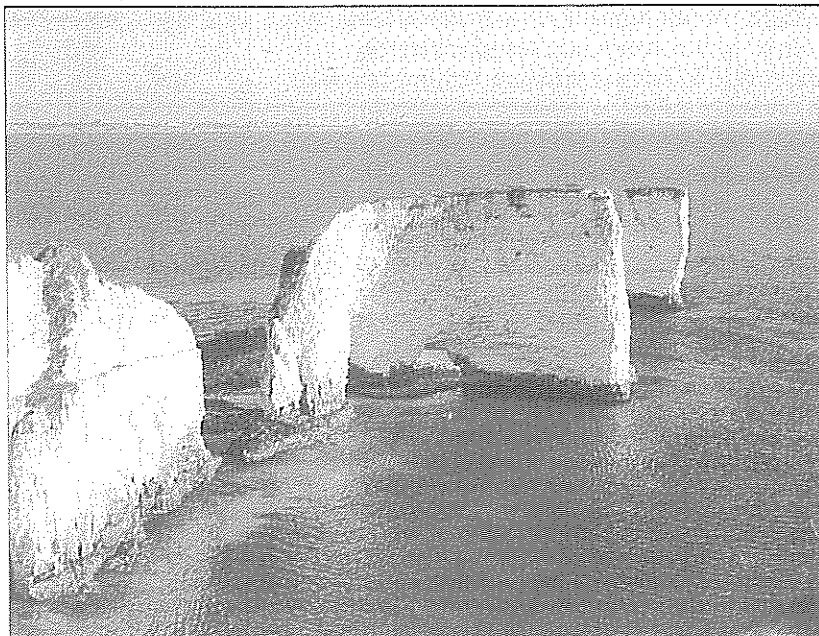
## 1 Weathering, rivers and coasts

### How does the sea shape the coast?

The sea is never still. On quiet days the movement is slow and gentle, and the sea is flat and almost calm. On stormy days large waves crash against the shore. These large waves have such force that they can drive a ship against the rocks or smash up sea defences and piers. The sea can also wear away the coast and move bits of rock and sand from one place to another. This ability to erode, transport and deposit material produces many interesting coastal landforms.

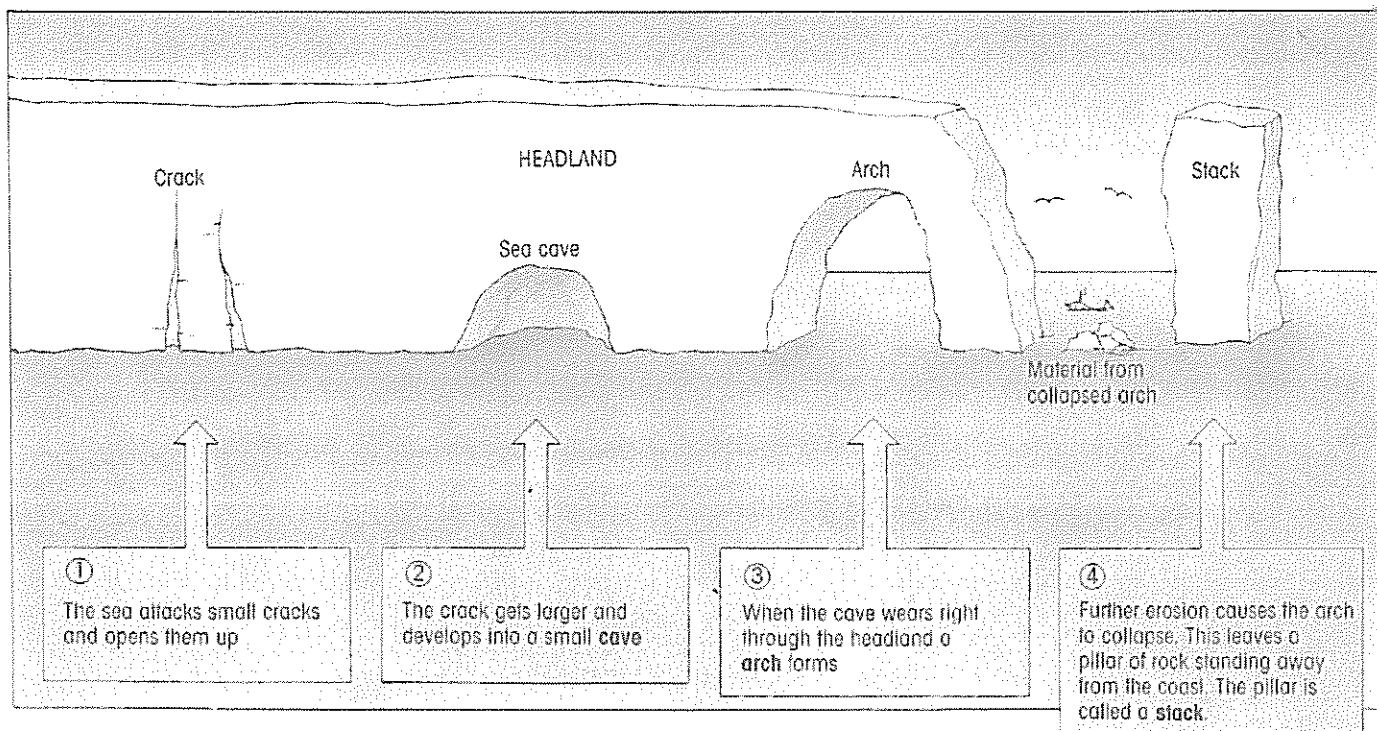
**Erosion landforms** are made by the wearing away of the coast (photo A). In stormy conditions the sea picks up loose rocks and throws them at the shore. This bombardment undercuts cliffs, opens up cracks and breaks up loose rocks into smaller and smaller pieces. Areas which have soft rocks are worn away more easily than those with hard rocks. The soft rock areas become **bays** and the hard rock areas become **headlands**. A bay is an opening in the coastline. A headland is a stretch of land jutting out into the sea.

A Old Harry Rocks, the Foreland, Dorset



Sketch B shows how a headland is eroded by the sea and how other landforms develop.

B



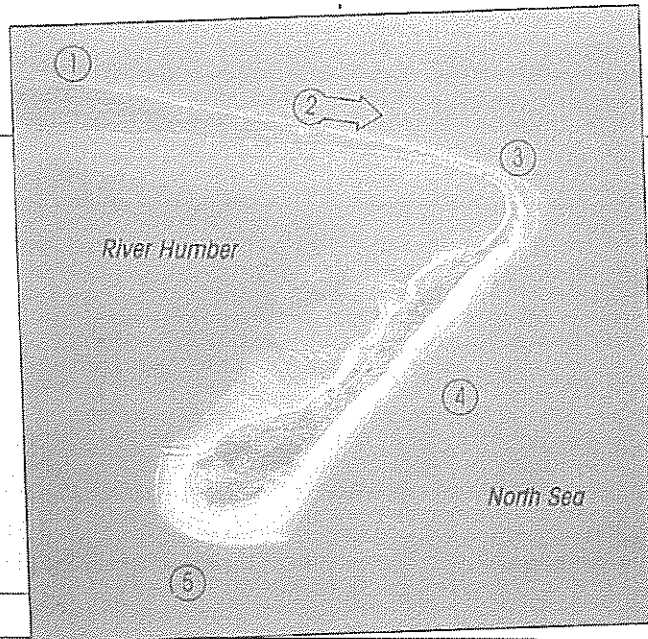


**Beaches** are one of the most common features of our shoreline. They are formed when material worn away from one part of a coast is carried along and dropped somewhere else. A beach is an example of **deposition landform**. A **spit** is a special type of beach extending out into the sea. It is a long finger of sand and shingle that often grows out across a bay or the mouth of a river.

Photo C and map D show Spurn Head spit. It is 6 kilometres long and forms a sweeping curve that stretches half way across the mouth of the River Humber. It is continually changing its shape as new material is deposited and old material is worn away or moved elsewhere.

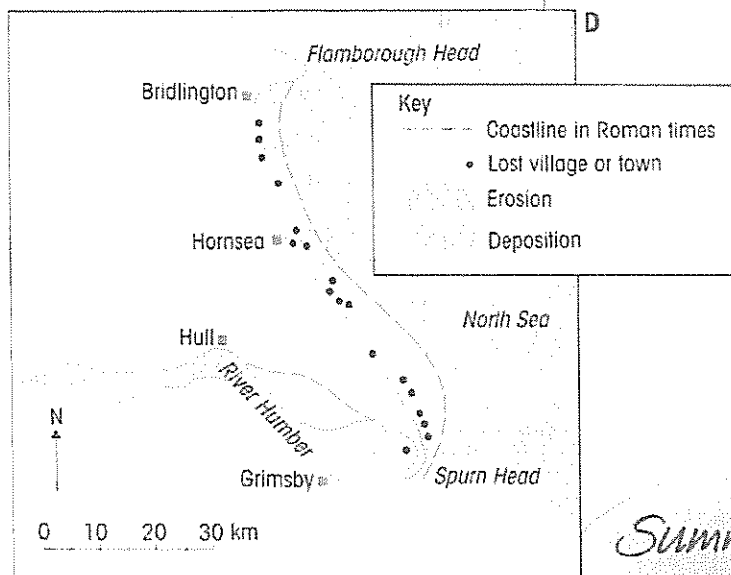
## The making of Spurn Head spit

- 1 Erosion of coastline north of Spurn Head
- 2 Eroded material transported down the coast by sea currents
- 3 Material dropped where coastline changes direction
- 4 Spit grows out from coast as more material builds up
- 5 End of spit curved by action of the waves



## Activities

- a) Make a sketch of photo A.
- b) Mark and label on your sketch the following terms:  
*crack cave arch stack material from a collapsed arch*
- c) Give your sketch a title.
- d) Draw map D showing the Spurn Head area.
- e) Shade **orange** the area of coastal erosion from Flamborough Head to the northern end of Spurn Head.
- f) Shade **purple** the areas of deposition on Spurn Head and in the mouth of the Humber.
- g) Draw an arrow to show the movement of eroded material along the coast.
- h) Explain why some of the villages on map D have been 'lost'.
- i) How has the shape of the mouth of the Humber changed since Roman times?



- 4 Explain how the spit at Spurn Head has been made. Include these terms in your writing:  
*erosion Flamborough Head transportation currents deposition Spurn Head grows 6 km*

## Summary

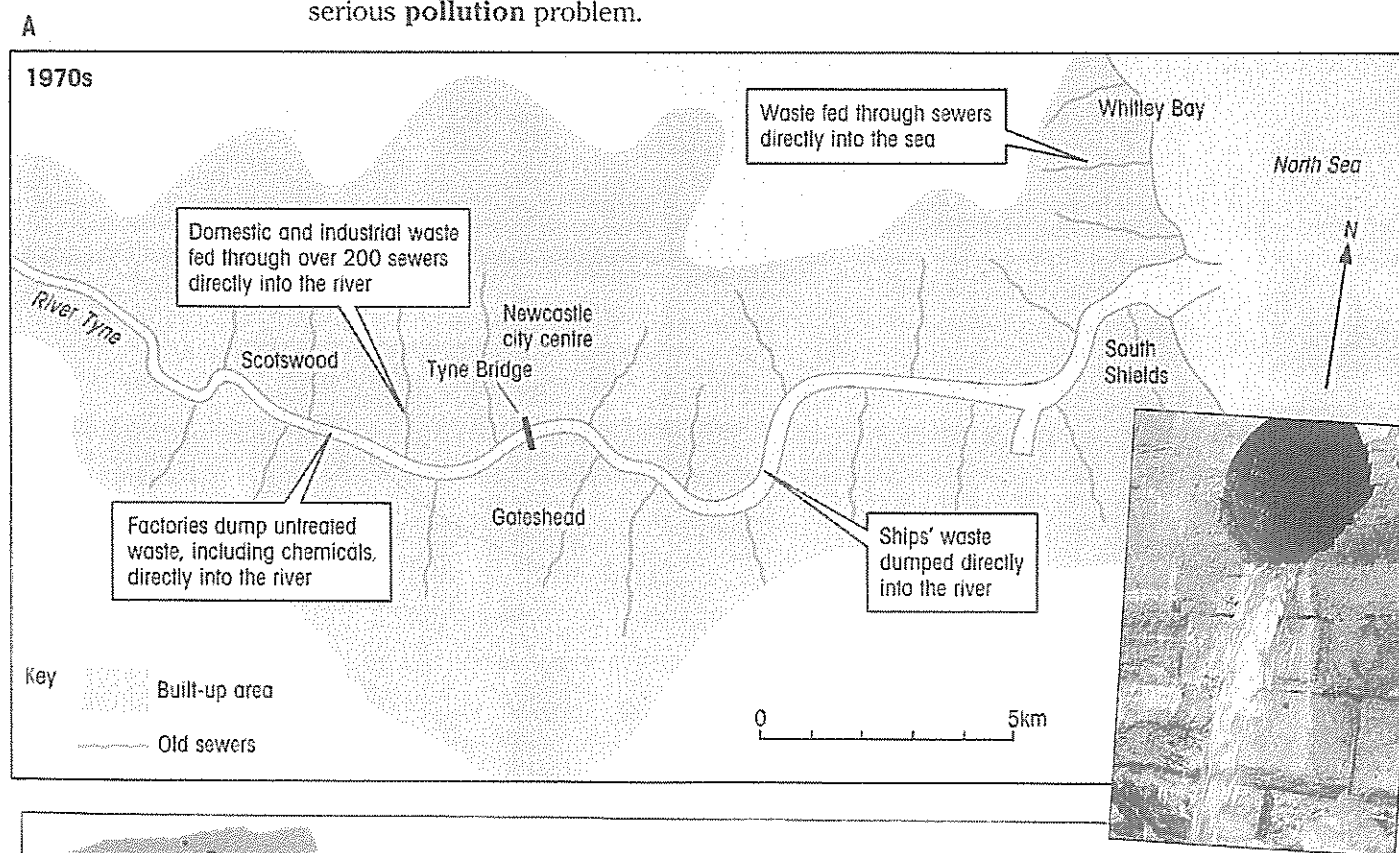
The coastline is always changing its shape. Some parts are being worn away by erosion while other parts are being built up by deposition.

## 1 Weathering, rivers and coasts

### How are rivers polluted?

Water is one of the basic needs of human life and for this reason rivers have long been good places to locate towns and cities. Rivers can provide water for domestic use and supply the needs of industry and agriculture. They may also be used for communications, the generation of power and, more recently, for recreational purposes. Sadly, they are also used for the disposal of unwanted waste. Waste that is put into rivers from farmland or from cities is continually carried away but there is a limit to how much a river can get rid of. When that limit is reached there becomes a serious **pollution** problem.

The River Tyne is an example of a polluted river. Most of its pollution comes from the large industrial towns of Newcastle upon Tyne and Gateshead. As map A shows, raw sewage from nearly a million people as well as waste from scores of factories was dumped directly into the river. The result was unpleasant sights and smells, danger to public health from poisons in the water, and a biologically dead river that was unable to support fish or any other sort of life.



### Activities



- 1 Give six reasons why many towns and cities are located beside rivers.
- 2 Draw a warning poster to be placed along the banks of the Tyne showing the dangers of pollution in the 1970s. Your poster should show the facts, be colourful and attract attention.
- 3 Imagine that you work for a pollution research unit. Write a short report to the

National Rivers Authority giving the main causes of pollution on the River Tyne. Use the headings *Domestic*, *Industrial* and *Shipping* for your report. Make your report about a page long.

- 4 Describe the River Tyne clean-up scheme by writing out the following in the correct order. Start with 'Domestic waste . . .' and end with '. . . and fish

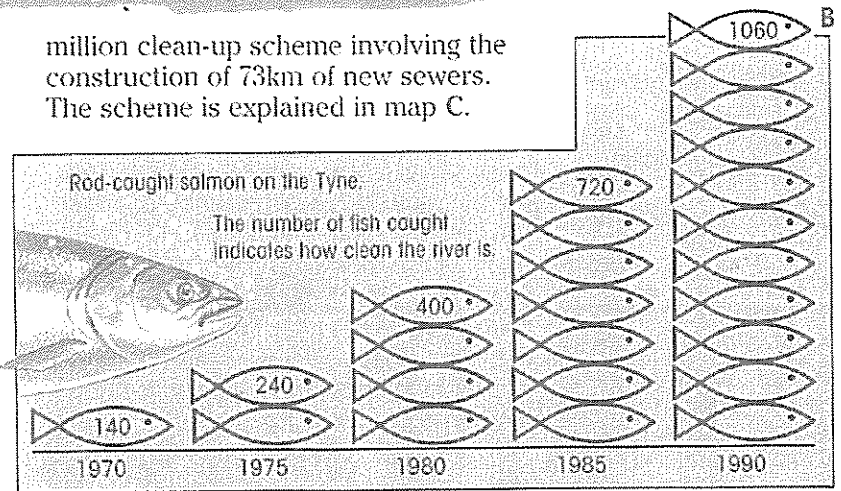
## And how can they be cleaned up?

On a hot day in the summer of 1969 a Council meeting held near the River Tyne had to be stopped because the smell from the river was so bad. The river today is very different. It is clean, attractive and an ideal place for water sports like sailing, rowing, powerboat racing and windsurfing. It is also reckoned to be one of the best salmon fishing rivers in England.

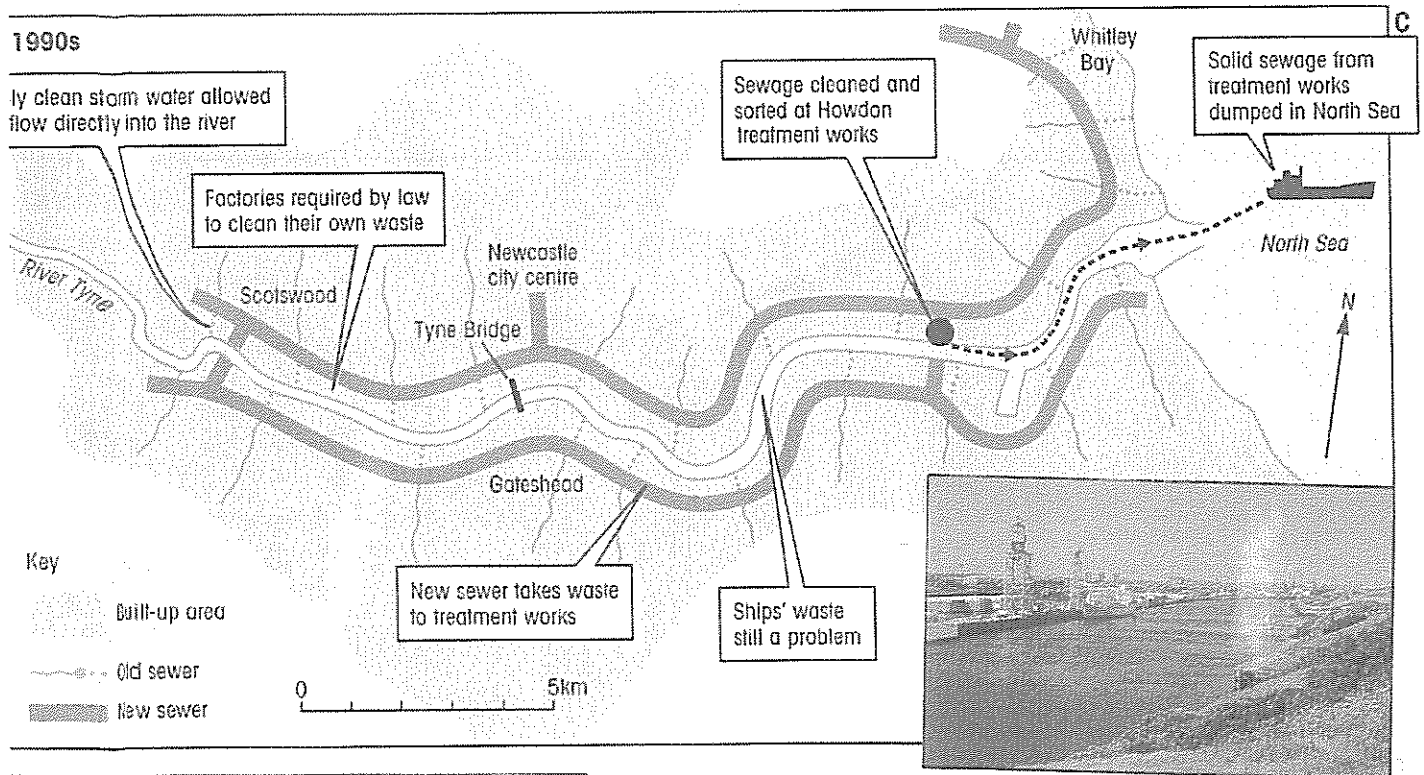
This dramatic improvement has been brought about in two main ways:

- first, by stopping industry from dumping waste directly into the river;
- second, by setting up a huge £150

million clean-up scheme involving the construction of 73km of new sewers. The scheme is explained in map C.



1990s



return. Add a title to your completed description.

- Domestic waste from houses
- Clean water is returned to the river
- flows down the new sewer to
- so the river quality improves
- goes into the sewers then
- the treatment works.
- and fish return.

### Extra

For a polluted stream, river or lake that you know:

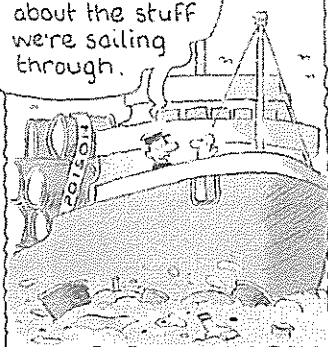
- Say what the pollution problem is.
- Describe the causes of pollution.
- Suggest how the pollution problem may be reduced.

### Summary

Rivers can be very useful to people but their misuse may lead to pollution. Clean-up schemes and regulations to control waste disposal are needed to reduce river pollution.

## The North Sea - Europe's dustbin

Forget the cargo we're carrying. I'm more worried about the stuff we're sailing through.

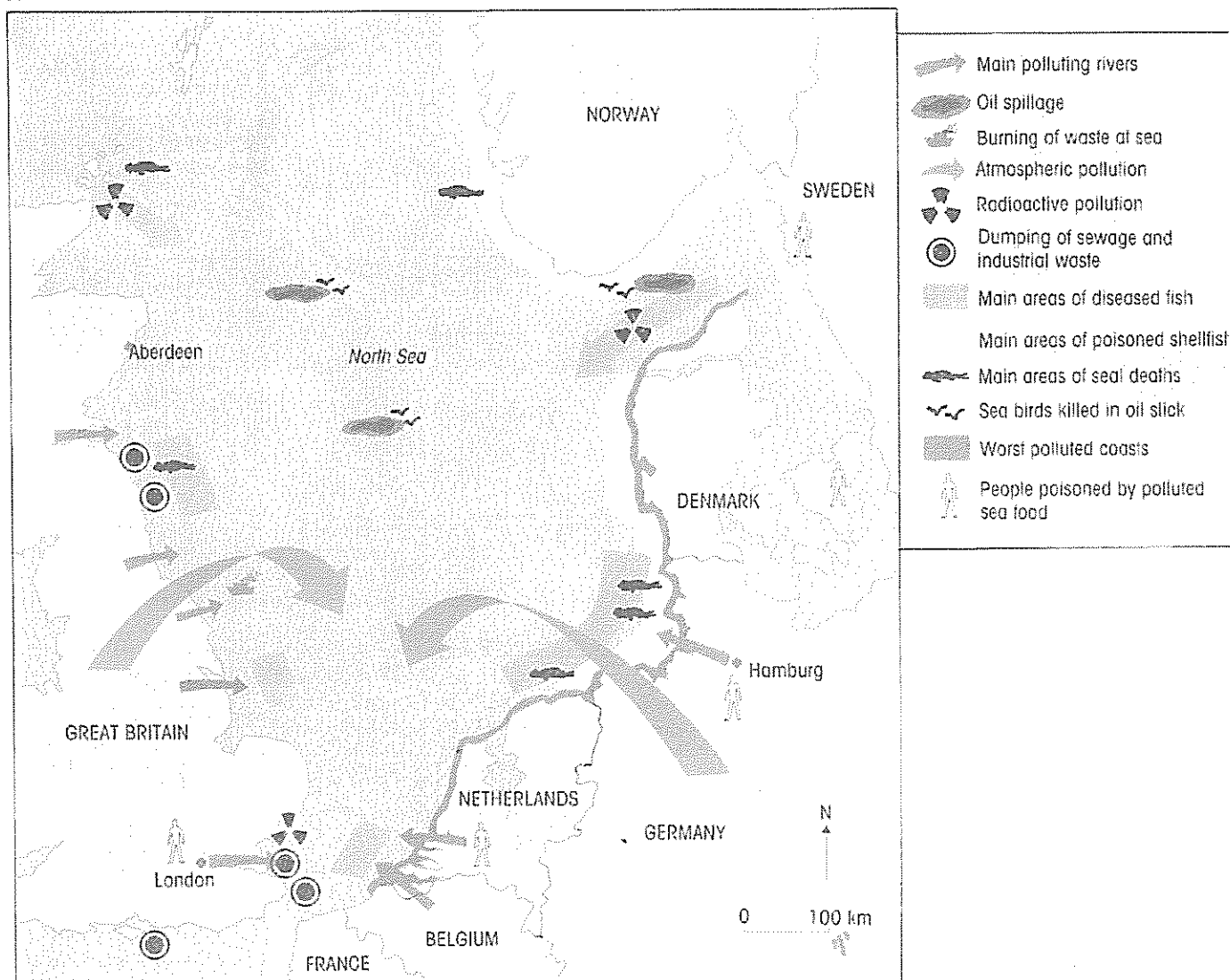


The North Sea is very important. Over 50 million people live close to its shores and no other sea in the world has so much industry operating around it. The sea is a great provider. It gives us sand and gravel for the building industry, cooling water for power stations and fish for food. Coal, oil and gas are extracted from below its shallow, stormy waters and busy shipping routes criss-cross the sea from one side to the other. The sea is also important for recreation – a place to sail on, swim in, or simply a place to relax beside.

Unfortunately the North Sea is also filthy. In fact, it is one of the dirtiest and most polluted of all the seas in the world. It has been called 'Europe's dustbin' because everyone dumps their unwanted rubbish into it. It is estimated that over one billion tonnes of pollution enter the sea every year. Poisonous chemicals, domestic sewage, oil, litter and even radioactive waste all get dumped into the sea.

Some of the causes and effects of this pollution are shown in map A below.

A





Cleaning up the North Sea is very difficult. We do not know exactly what is dumped in the sea or what actual damage it does. Nor do we know how to clean up the sea or stop people dirtying it. Eight different countries border the North Sea and each blames the other for being the worst polluter. How can laws be made which will

be accepted by all? Cleaning up a mess is never easy but unless something is done soon, the damage to the sea will be so great that it may never recover.

Look at diagram B, it shows some of the solutions and problems of cleaning up the North Sea.



## Activities

- Name the countries that have coastlines on the North Sea.
  - Which countries suffer the worst coastal pollution?
- Draw table C below, and complete it by writing in six causes and six effects of North Sea pollution.  
Note -there is no need to link each cause with an effect.

C

North Sea Pollution	
Causes	Effects

- A ship has to take some cargo from Aberdeen down the east coast of Britain to London. From there it has to sail across to Hamburg in Germany. Follow the ship's route on map A and list

the types of pollution it will pass through.

- Give six reasons why it is difficult to clean up the North Sea.

## Extras

- Imagine that you are taking part in a march against North Sea pollution.
  - Design a banner to take with you.
  - On the banner give suggestions as to how the sea might be cleaned up.
  - Add drawings and colour to make it interesting and attractive.
- Draw the flags from diagram B and match each one to a North Sea country.

## Summary

The North Sea is badly polluted. Pollution comes from rivers, coastal discharges, the air and dumping at sea. Solving the problem of pollution is difficult and needs the joint efforts of many countries.