



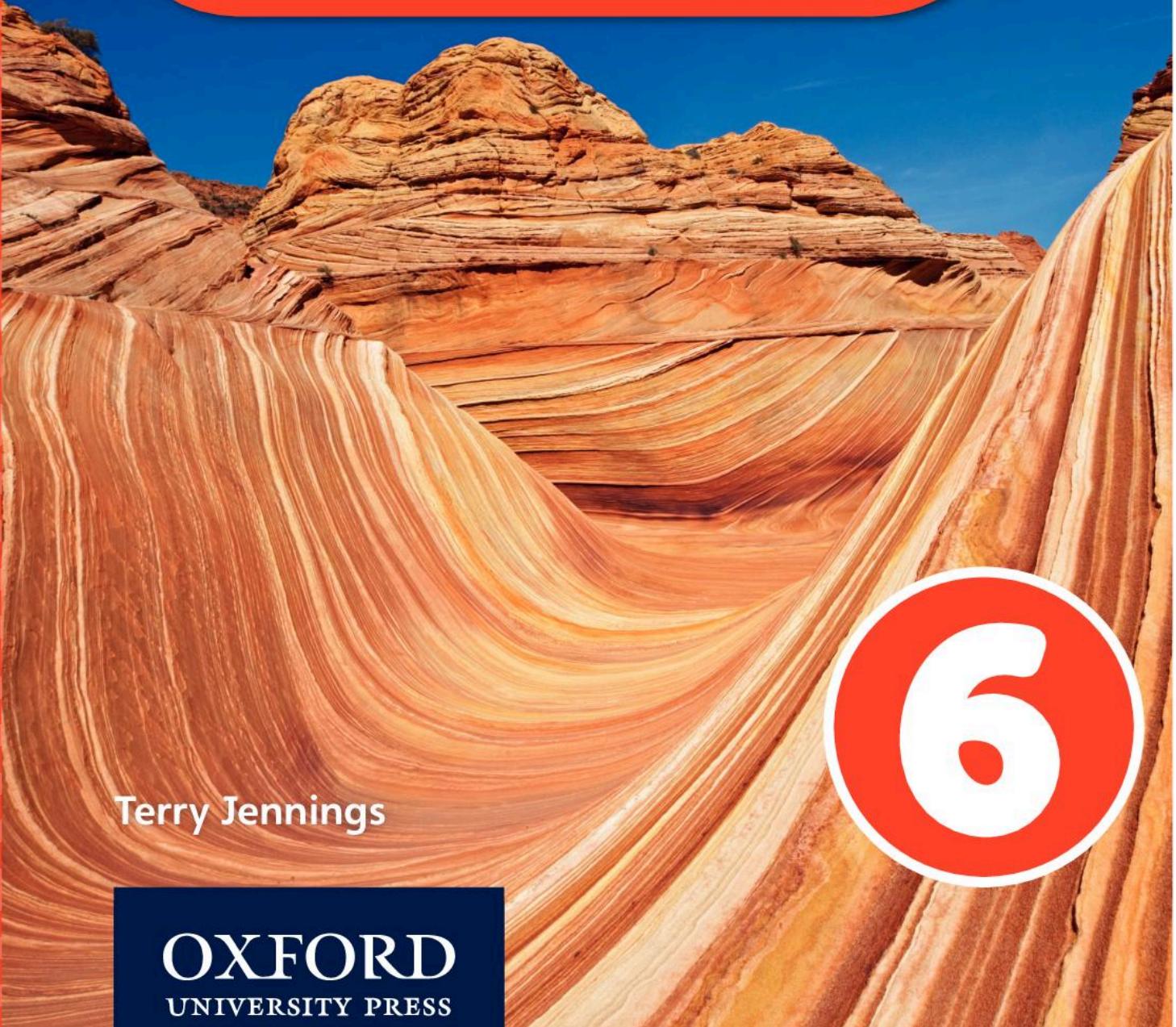
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Oxford International Primary Geography

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Terry Jennings

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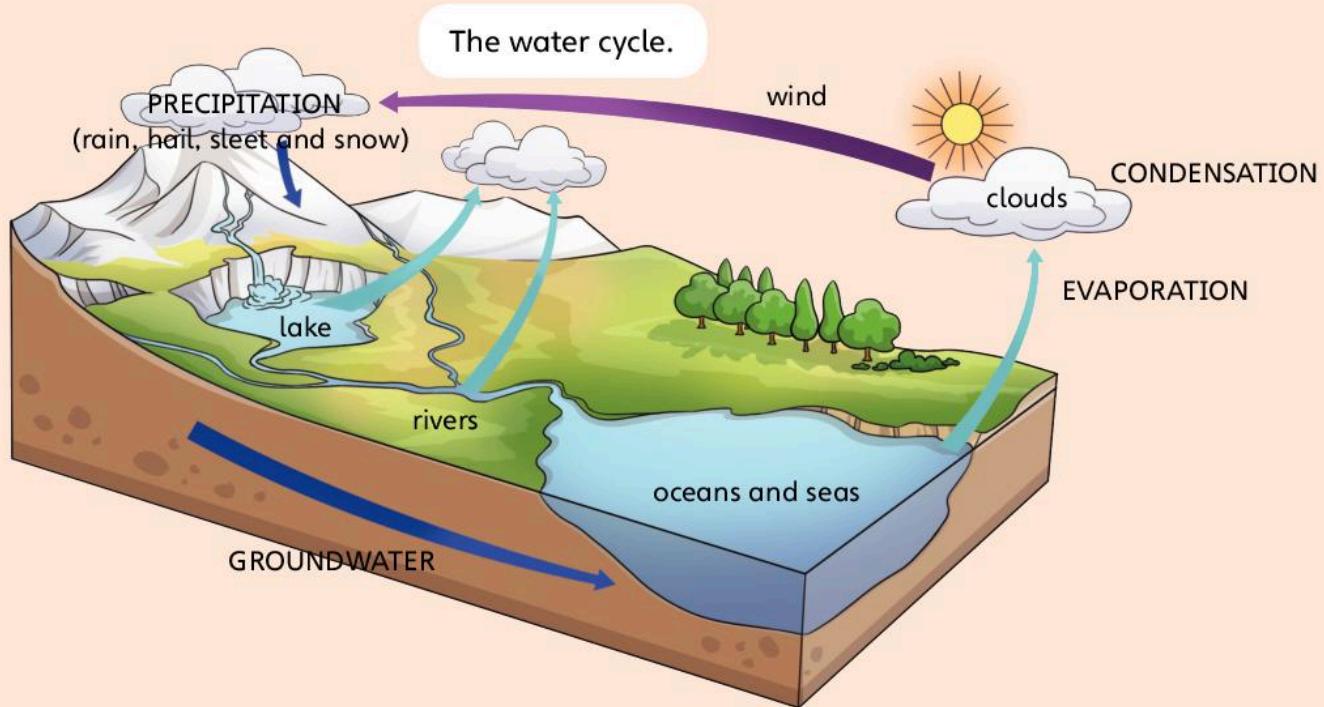
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1

Rivers

Where does water come from?



The water cycle

Water is always moving on an endless journey. The **water cycle** produces all the rain and snow on Earth and it allows us to use the same water over and over again.

Look at the diagram of the water cycle above. Now match the points on this page to the correct part of the diagram.

- I The water cycle is driven by the Sun's energy. When the Sun warms the water in the oceans, seas, rivers, lakes and the wet surfaces of the land, the water **evaporates** and turns into the invisible gas called water vapour. The Sun's warmth and the wind blowing over

the oceans and seas turn large amounts of water into water vapour all the time.

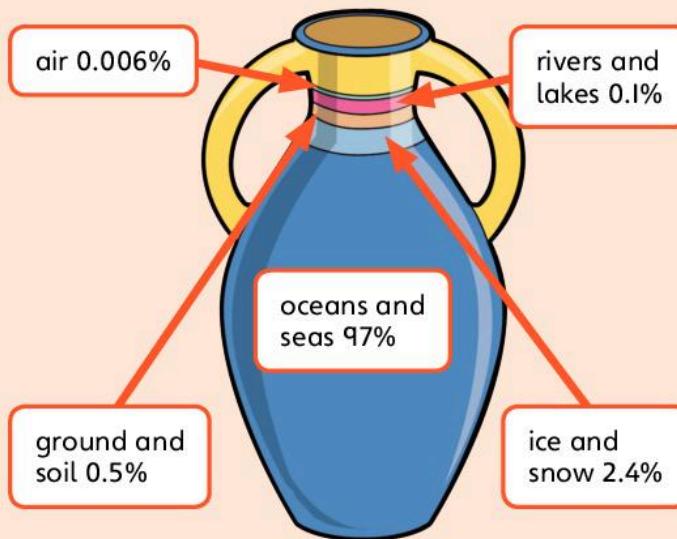
- 2 The water vapour rises up into the air.
- 3 High in the sky, where the air is cold, the water vapour cools and condenses. This means that it turns from a gas into tiny droplets of water. These are so small and light that they float in the air and form clouds.
- 4 When the water droplets get colder, such as when the clouds rise over a **mountain**, the tiny droplets of water join together to form bigger droplets that fall to the ground as rain.

- 5 When the air is very cold, the tiny droplets of water in the clouds may turn to ice crystals, which join together and fall to the ground as snowflakes.
- 6 The water in the rain and snow that falls on the land eventually flows back into the rivers, which flow downhill to the ocean or the sea.

Did you know?

Most rain or snow falls over the oceans and seas. Only 10 per cent falls on the land.

Where is the world's water?



Activities

- 1 Answer the following questions about the water cycle:
 - a Where is most water stored in the water cycle?
 - b How does water move from the oceans and seas to the air?
 - c How does water move from the air to the land?
 - d How does water move from the land to the oceans and seas?
- 2 During a heavy rainstorm, 1 centimetre of rain fell on a village. This means that the rainwater filled a straight-sided tin or jar to a depth of 1 centimetre.
 - a Work out how many litres of water would fall on 1 square metre of land during the storm. Experiment using small containers and marking out a square metre on the ground, or by simple calculation.
 - b How much does this water weigh?
 - c Approximately how much water would fall on your whole playground if 1 centimetre of rain fell over it?
- 3 a Find out how much rain falls each year where you live.
 - b Where are the wettest parts of your country?
 - c Where are the driest parts?
 - d Which months are wettest?

Where rivers begin

River sources

A river's **source** is its starting point.

The main types of river sources are:

- **Rain and melted snow:** When rain falls or snow melts, some of the water flows over the surface of the land and forms tiny streams. These streams may join up to form rivers. The rivers flow downhill until they reach an ocean or a sea.
- **Springs:** Some of the water from rain or melted snow soaks into the soil. It passes through **permeable** rocks until it reaches a layer of **impermeable** rock that will not let the water pass through it. If the layer of impermeable rock comes to the surface of the ground, the water runs out of the ground as a spring. Springs are the sources of many rivers.
- **Lakes and glaciers:** A few rivers have a lake as their source. Other rivers in high **mountain** areas start at the edges of melting glaciers.



Glaciers, like this one, are the sources of some rivers.

Near its source, a river is usually high above sea level and it flows very fast downhill. Even though it may be small, the river will get bigger and flow faster after heavy rain or when lots of snow melts.

Erosion

All rivers have sand and pieces of rock that are carried along by the water. The moving water, and the sand and rocks, bump and rub against the rocks on the bottom and sides of the river, and slowly wear them away. This is called erosion. Erosion causes the river to slowly form a V-shaped **valley**.

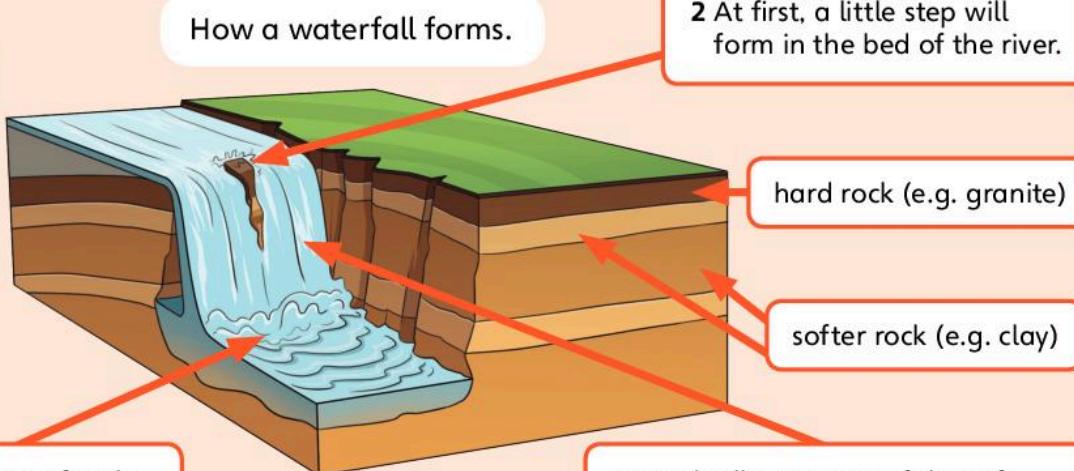


Because it flows very fast, the water in a mountain river can push large boulders along.

How are waterfalls formed?

A river often has waterfalls near its source. A waterfall is formed when there is a section of hard rock followed by a section of soft rock along the riverbed. The soft rock wears away faster than the hard rock, forming a step in the riverbed. The step forms the waterfall.

1 If a river flows over a hard rock and then a soft rock, the soft rock will be eroded more.



4 The water and pieces of rock swirling around at the bottom of the waterfall wear away a hollow called a plunge pool.

Did you know?

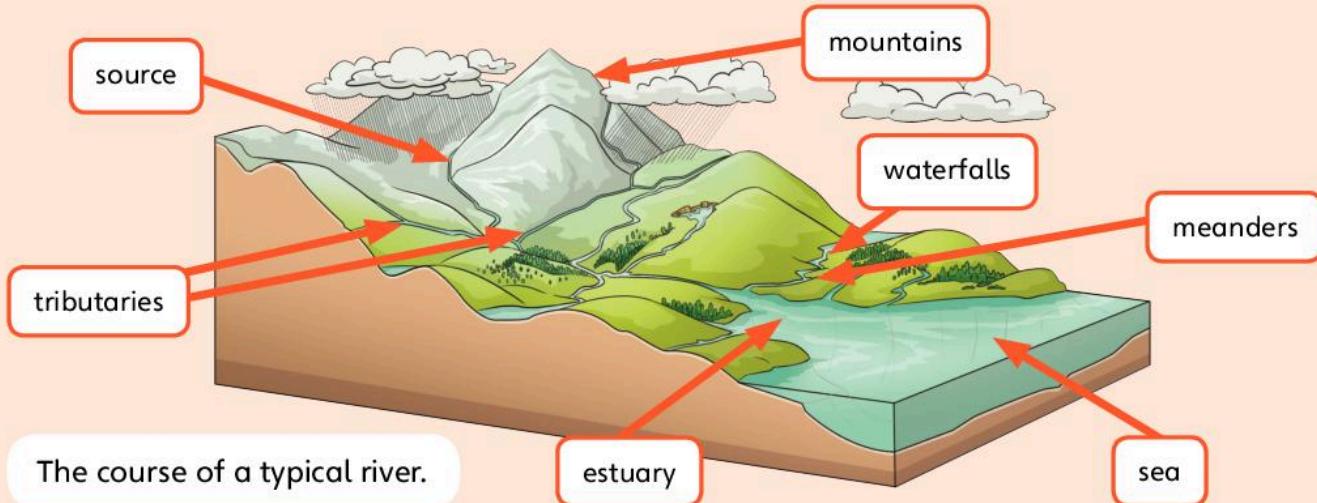
The River Amazon in South America drops 5000 metres in its first 1000 kilometres. It then runs almost level for 5500 kilometres to the sea.

Activities

- 1
 - a Where is your nearest river?
 - b Look at a map of your area and find the source of the river.
 - c Which larger river, ocean or sea does it flow into?
 - d How long is your river?
 - e Which towns and cities does it flow past?
- 2
 - a Work with a friend to write a list of all the rivers you can think of.
 - b Use an atlas to see if you can find all the rivers you listed.
 - c Write which ocean or sea each river flows into.
- 3 Write down all the ways you can think of that rivers can:
 - a help people
 - b be a nuisance to people
 - c be a danger to people.

Down to the coast

As a river flows from its **source** to the sea, it changes. Close to the source, the land is often steep and so the river is narrow and flows quickly. As the river gets nearer to the coast, the land is flatter and so the river slows down and widens.



What are meanders?

When a river reaches flatter ground, it flows more slowly. It can no longer carry boulders and large pieces of rock, only sand, mud and small stones. The river no longer erodes deeply into its bed, but it still moves fast enough to erode its banks and widen its **valley**. It makes wide S-shaped bends, called **meanders**.

Meanders are formed when the water wears away the outer bank of the river. If a car goes around a bend, the passengers may be thrown to one side. In the same way, when a river flows around a bend, the water and pieces of rock are thrown against the outside bank. The outside bank is worn away and a small cliff is formed. On the inside of the bend, the water moves more slowly. Here some of the mud, sand and gravel sink to the riverbed.

Sometimes when it floods, a river will cut off meanders from the main river. These old meanders form **oxbow lakes**, which eventually dry up.

Tributaries

A river grows bigger as it flows from its source towards the sea. It is joined by other small rivers, called tributaries. The whole area of land from which a river gets its water is called the river basin.



One of the meanders on the River Amazon has been cut off to form an oxbow lake.

What is a floodplain?

After heavy rain, or when snow has melted, a river sometimes floods the nearby land. When the floodwater has gone, the land is covered by fine mud **deposited** by the river. When this flooding and deposition is repeated thousands of times over many years, it forms a large, flat area called a **floodplain**. The mud makes the floodplain very fertile so that crops will grow well on it.

What happens when the river reaches the coast?

A few rivers flow into lakes, but most flow into the sea. When a river flows into the sea, we say it has reached its mouth. If the river has a wide mouth, this is called an estuary. When the river water meets the seawater, it deposits its load of mud and sand. Some of the mud and sand is washed away by the seawater, but often it piles up around the estuary or mouth of the river. Plants may eventually grow in the mud and sand so that it forms new land.

If the tides are not strong where the river enters the sea, the river may split up into several channels. The mud and sand deposited by the river form a triangular-shaped **delta**.

Did you know?

The delta of the River Nile spreads out across 240 kilometres along the coast of Egypt on the Mediterranean Sea.

Activities

- 1 Use the Internet or reference books to help you make a fact file about rivers.
 - a Choose at least two rivers from each continent, apart from Antarctica.
 - b Record the name of the river, the mountains where it rises, the length of the river, the ocean or sea it flows into, and the names of the towns and cities along its banks.
- 2 Write down the correct word for each of the descriptions below. Make a drawing of each of the river features described.
 - a where it reaches the sea
 - b where it flows over a cliff
 - c where it begins
 - d the flat area bordering it
 - e a smaller river that joins a larger one
 - f a large bend in a river.
- 3 Use the Internet or reference books to find out more about the largest waterfalls in the world. Draw a bar chart showing your results.

Rivers and people

Many early towns and villages were built near rivers because the rivers stopped enemies from attacking from one side. Some villages and towns gained even more protection by being built on the inside of river **meanders** or on an island in a river. Water from the river could also be used by people and animals for drinking and it could be used to water food crops. The soil near rivers is often fertile and moist so crops grew well, while fish from rivers could be used for food. Many people used rivers to travel along because the early roads were poor.

Rivers and cities

Many of the world's greatest cities are close to rivers. Some of these cities developed at fords, where the river was shallow and could be crossed on foot. Other cities grew where the first bridges were built over rivers. Many large **ports** developed at the mouths of rivers that provided sheltered harbours for ships. Some river towns grew because of industries that developed along the river. For example, ship-building on the River Clyde in Scotland and on the River Tyne in England was mainly responsible for the growth of the cities on those rivers. Newcastle, a city on the River Hunter in Australia, grew because large amounts of coal from the local area were exported through the city's port.

Rivers often form the borders or boundaries between different countries. The River Rhine in Europe, for example, forms a border between several countries. Which are they?



The city of Cork in Ireland was built on marshy islands at the lowest point where the River Lee could be crossed on foot.

Paris, the capital city of France, began on a small island, now called the Île de la Cité, in the River Seine.

New York City started out in 1612 as a Dutch trading post on Manhattan Island, at the mouth of the Hudson River.

Rivers and land use

Roads and railways often follow the course of a river because the ground is less steep. Dams are built in river **valleys** where they can catch and store rainwater or melted snow from the **mountains**. These dams can be used to generate electricity and to supply water for drinking, washing and irrigating fields.

Further down river valleys, where the land is flatter, the rich, deep soils of river **floodplains** can be used for farming.

Because they are flat, floodplains are also used for building houses, factories and water treatment and sewage works.

However, these areas are the most likely to flood after heavy rain.

The wide, flat areas around the river mouth or estuary are important habitats and feeding grounds for wildlife. They also provide cheap land for power stations and factories. The sheltered water at the river mouth is an excellent site for a port.

Rivers and leisure

Rivers and reservoirs are important for leisure activities. Many people enjoy angling, birdwatching, walking, canoeing, sailing and windsurfing, on or near rivers and reservoirs.

Did you know?

In the United States of America, more than 50 cities rely on the Mississippi River for their daily water supply.



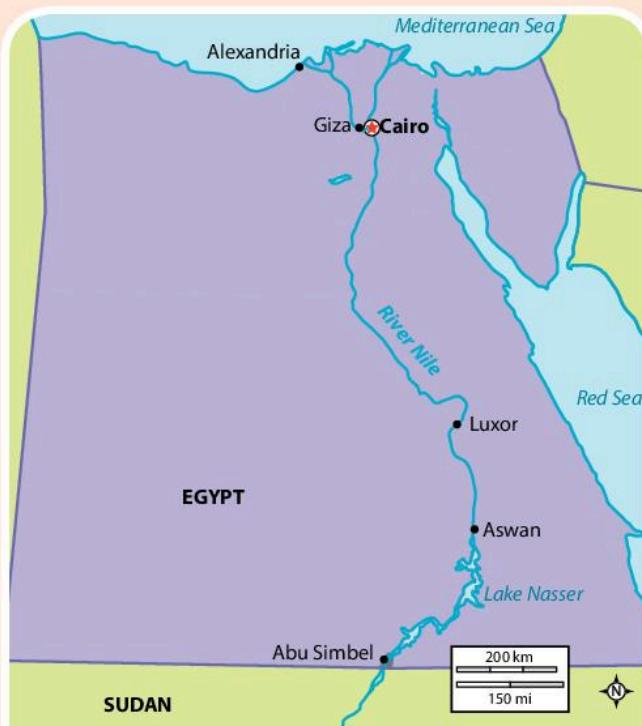
Like many large ports, Bremerhaven in Germany developed from a village near the sheltered mouth of a large river. Bremerhaven is at the mouth of the River Weser.

Activities

- 1 Write four important uses of the world's larger rivers.
- 2 Write a sentence about each of these river words: stream, dam, valley, **gorge**, waterfall, **oxbow lake**, estuary, **delta**.

The River Nile

The River Nile is the longest river in the world. It measures 6648 kilometres from its **source** to its mouth at the Mediterranean Sea. It drains about 3.4 million square kilometres, which is about one tenth of the area of Africa. Most people in Egypt live along the banks of the Nile.



A map of Egypt showing the course of the River Nile.

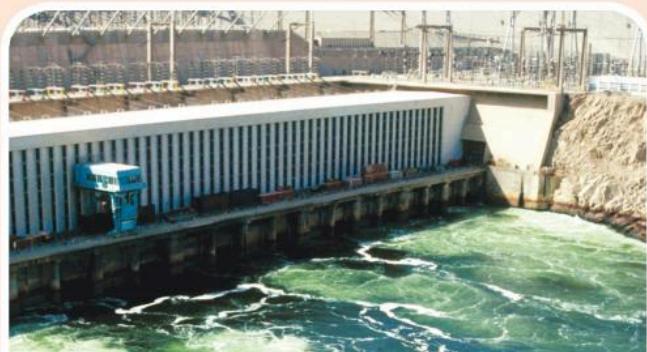
The course of the River Nile

The main source of the River Nile is the White Nile, which begins in the small country of Burundi. The water flows through Lake Victoria and on to a series of spectacular **gorges**. In Sudan, the White Nile spreads out in an enormous swamp, called the Sudd, and it is joined by the Blue Nile, which flows from Ethiopia. From this point on, the river is called the River Nile.

In Egypt, the River Nile **meanders** across its **floodplain** to Cairo, where it forms a very large **delta**. It then flows into the Mediterranean Sea. In the past, summer rains and melting snows in Ethiopia caused the River Nile to flood its banks every autumn. These floods left behind water and fertile mud that made it possible for farmers to grow crops along the banks of the River Nile, in the delta and on the floodplain south of it.

The Aswan High Dam

By building a number of dams, the Egyptians control the flow of water in the River Nile. The biggest dam is the Aswan High Dam. It holds floodwater back in a huge **reservoir** called Lake Nasser. The people who live along the River Nile no longer have to deal with the annual flooding of their homes and land. Small canals have been built to carry water to the fields and villages. Water rushing over the dam wall is also used to generate electricity.



The Aswan Dam holds back floodwater for use throughout the year. It also provides hydroelectricity.

Problems with Lake Nasser

Much of the water in Lake Nasser **evaporates** in the hot sun. A lot of the fertile mud that would have spread over the fields when the river flooded now settles to the bottom of Lake Nasser. Without the fertile mud brought by the floods, farmers in the River Nile **valley** now have to use chemical fertilisers on their crops. The soils in the delta are also becoming more salty because there is less freshwater flowing down the River Nile and more saltwater from the Mediterranean Sea can flow into the delta.

Settlements and transport

Most of the towns and cities in Egypt and Sudan are on or near the banks of the River Nile. For the people who live in these towns and cities, the river is still a vital means of transporting people and goods, particularly in the flood season when road transport is difficult. Boats and small ships can travel along most of the length of the River Nile, through Egypt and Sudan, except at times when the water level is very low.



In Egypt sailing boats, river steamers and cruise ships carrying tourists can sail south along the Nile as far as Aswan.

Did you know?

With a surface area of 68 800 square kilometres, Lake Victoria is Africa's largest lake, and the largest tropical lake in the world. The only river that flows north from the lake is the White Nile.

Activities

- 1 The River Nile and its tributaries and lakes connect eleven countries.
Can you find their names?
- 2 Work with a friend.
 - a Discuss what would happen if Ethiopia took all the water from the Blue Nile, so that it no longer flowed through Egypt.
 - b Explain to your friend why the flooding of the River Nile in the past was useful.
- 3 Use a compass and an atlas.
 - a What is the general direction in which the River Nile flows?
 - b Look for rivers that flow in the other main compass directions.
 - c Write down your results.

The River Amazon

The River Amazon and the River Nile are the two largest rivers in the world. The Nile is the longest river, but the Amazon carries more water and has the biggest river basin.



The northern part of South America, showing the course of the River Amazon and a few of its tributaries.

The course of the River Amazon

The River Amazon flows for about 6440 kilometres across South America. It begins as hundreds of tiny streams more than 5000 metres above sea level in the Andes **mountains** of Peru. Although its **source** is only about 160 kilometres from the Pacific Ocean to the west, the Amazon flows eastwards to the Atlantic Ocean. Hundreds of smaller rivers, or tributaries, flow into the main river. These tributaries and the land between them make up the Amazon River basin, which covers an area of more than 7.5 million square kilometres.

When the River Amazon reaches the Atlantic Ocean, its mouth is more than 300 kilometres wide. The river does not form a proper **delta**, because the current is so strong that it sweeps the mud carried by the river far out into the Atlantic Ocean.

The River Amazon pours 200 000 cubic metres of water into the Atlantic Ocean every single second. That is enough water to fill one hundred Olympic-size swimming pools. As much as one fifth of all the freshwater that runs off the Earth's surface is carried by the River Amazon.

The River Amazon is so deep near its mouth that large ocean-going ships can sail 1500 kilometres up the river from its mouth to the city of Manaus in Brazil.

The Amazon rainforest

Much of the Amazon River basin is hot and humid and is covered by rainforest. It is the largest area of rainforest on Earth, and covers an area more than half the size of the United States of America. It rains there more than 200 days a year. In the rainy season, the level of the River Amazon rises by more than 9 metres and floods large parts of the rainforest on either side of the river.

Settlements and transport

Many different groups of people live in villages along the River Amazon and its tributaries. They eat food from the forest and fish from the rivers.

Much more recently, oil and valuable minerals have been discovered in the Amazon River basin. In addition, the forest contains valuable trees, including teak, mahogany and rosewood. Large roads have been made through the forest and large areas of rainforest have been cut down for wood and to make room for villages, towns, mines and large fields for growing crops and raising cattle. These changes have damaged large parts of the rainforest. They have destroyed many plants and animals, and have made it very difficult for the local people to survive in the rainforest.

The loss of the trees in the rainforest has caused a lot of soil erosion, and lots of mud flows into the River Amazon. Chemicals also flow into the river from the farms, mines and towns that have been built in the rainforest.



Large ships can sail up the River Amazon all the way to Manaus.

Did you know?

There are no bridges across the River Amazon, mainly because there is no need for them. Most of the River Amazon runs through rainforests, rather than roads or cities. The largest city along the Amazon is Manaus in Brazil. It is home to about 1.8 million people.

Activities

- 1 Write a short story or draw a cartoon describing the journey of a particle of water along the River Amazon, from its source to its mouth. Make sure that you state how pollution or flooding affect the water at each stage.
- 2
 - a Write a quiz consisting of ten questions about the River Amazon.
 - b Try out your quiz with a friend.
- 3 Work with a friend. Make a model of a river and the surrounding landscape in a cardboard box by following these steps:
 - **Step 1:** Begin by cutting away the lid and front of the box to make a frame for your model.
 - **Step 2:** Build up the landscape using egg cartons, pieces of screwed-up paper or other recycled materials.
 - **Step 3:** Cover the whole surface of your model with papier mâché.
 - **Step 4:** Paint your model and label the various features.

The Murray River

The Great Dividing Range is a **mountain range** that runs along the eastern and south-eastern side of Australia. The highest peaks of this range are known as the Australian Alps. The Murray River begins in the Australian Alps. With its tributaries, the Murray is the largest river system in Australia.



The Murray River and its tributaries.
Which towns and cities are near the river?

The course of the Murray River

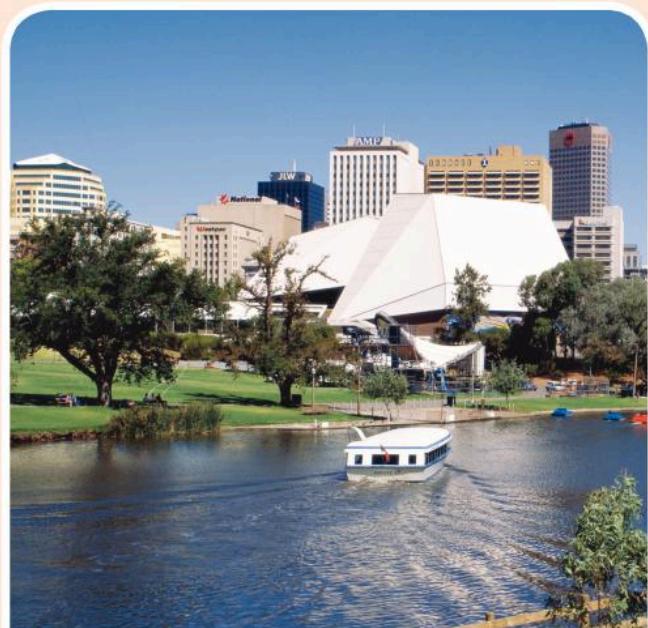
The rain that falls on the Australian Alps is the **source** of the Murray River and some of its tributaries. The Murray flows westwards over the dry plains inland.

Because it flows slowly, much of the water **evaporates** in the heat of the Sun. In very dry summers, the Murray River almost stops flowing. It dried up completely three times between 1800 and 1950. In 1981 the mouth of the Murray also dried up. The river enters the Indian Ocean at Encounter Bay.

The Murray River, with its tributary the Darling River, is 2520 kilometres long. Its river basin is more than one million square kilometres, which is nearly twice the size of France.

Settlements and transport

More than two million people live in the basin of the Murray River. Ninety per cent of the population of South Australia depends either completely or partly on water from it.



The city of Adelaide receives most of its water from the Murray River.

The Snowy River scheme

Many rivers, such as the Snowy River, flow down the eastern side of the Great Dividing Range towards the Pacific Ocean. But there are few rivers that flow westwards into the dry inland parts of Australia like the Murray River does.

Many people inland depend on the Murray and its tributaries for water to drink and to irrigate their crops. To improve the water supply to the inland parts of Australia, sixteen dams were built along the Snowy River. Water from these dams is sent through tunnels under the mountains and into the Murray and Murrumbidgee Rivers. **Hydroelectric power** stations near some of the dams also provide electricity for the area.

Irrigation

The soils of the Murray River **valley** are dry but fertile. More than 400 000 hectares of land in the valley are irrigated by water from the Snowy River dams. As a result of this irrigation, sheep and cattle can now be kept in areas that were once desert. Grapes, oranges, grapefruit, cereals and many other crops are also grown.

Because so much water is taken from the Murray River for irrigation, there is far less water flowing in it than there used to be. A lot of the water that is left behind evaporates in the heat of the Sun, which makes the water salty. Salty water is not good for drinking or irrigation. Some of the water used to irrigate crops also evaporates from the soil, leaving a hard layer of salt on the surface of the soil in which it is difficult to grow crops.



These vineyards are irrigated with water from the Murray River.

Did you know?

The Murray River is important for sports and leisure activities. The world's largest canoe race is held along it every year, and there are 37 golf courses along its banks.

Activities

- 1
 - a Find the names of five Australian rivers other than the Murray River.
 - b Create a spreadsheet to show which oceans or seas they flow into and which large towns or cities are built along them.
 - c What is the name of Australia's largest lake? Where is it? Do any rivers flow into it?
- 2 Use building blocks or other modelling equipment to design and build a model dam system.

Polluted rivers

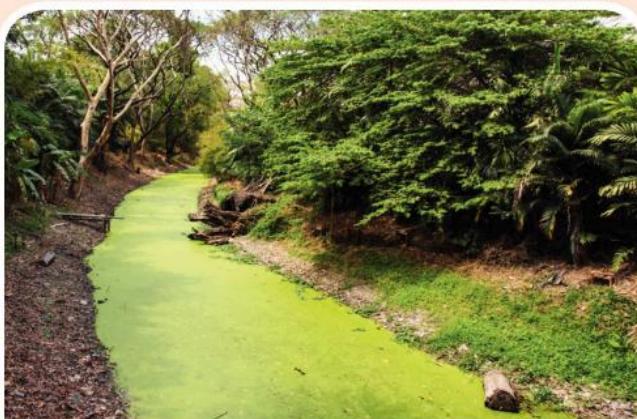
Many villages, towns and cities were built near rivers so that people could make use of the water. Unfortunately, the water that people return to the river after they have used it often contains harmful substances that pollute the river.

Causes of river pollution

Rivers are polluted by the following things:

- Untreated sewage from homes, schools and factories.
- Chemical wastes from factories and mines.
- Farm chemicals such as fertilisers and pesticides.
- Waste oil and rubbish.

All these different pollutants kill plants and animals and make the water unsafe for people to use.



The water in this river looks green because it is filled with many tiny plants called algae. The algae have grown and multiplied very fast because fertiliser from the farm on the riverbank has polluted the water. When the algae die they will sink to the river bottom and rot away, using up most of the oxygen in the water. This leaves little oxygen for other water plants and animals and they will die.

Acid rain

When fuels, such as coal, oil and petrol, are burned in factories, power stations and motor vehicles they let sulphur dioxide and other gases into the air. These gases dissolve in droplets of moisture in the atmosphere and form droplets of acid rain. The acid rain eventually falls to the ground, sometimes hundreds of kilometres from where the gases were released. Acid rain kills fish and other wildlife in rivers and lakes. It also kills trees, damages crops and erodes stone buildings.



The River Indus, which supplies most people in Pakistan with their water, is heavily polluted with chemicals from the many factories along its banks.

Preventing river pollution

Many people and governments are worried about river pollution and are trying to do something to prevent it.

Some ways to prevent river pollution are:

- Having strict laws that make it illegal to pollute rivers.
- Making factories remove harmful substances from their wastewater before they let it flow into rivers.
- Making factories and mines pay to clean up rivers if they pollute them.
- Treating sewage to make it safe before the wastewater is returned to a river.
- Having laws to reduce the amount of air pollution released by factories, power stations and motor vehicles in order to reduce acid rain.



The workers on this boat in China are collecting the litter people have dropped in the river before it can do any harm.

The River Thames

The River Thames has always supplied most of London's water. But by the late 1950s the Thames was so polluted that it was black in colour and it smelled very bad. The main causes of pollution were sewage that was allowed to flow straight into the river and oil from ships using the river. The government took action to clean up the Thames.

Today the River Thames is much cleaner for two main reasons:

- London's old docks were closed because large modern ships could not use them. A new port was built near the mouth of the river where it is deeper and wider.
- New sewage works were built and all wastewater from homes, businesses and factories has to be treated instead of being put straight into the river.

Now birds, fish and other wildlife are returning to the River Thames. Clean rivers are important because they show that the environment is healthy. There is another good reason why we should not pollute our rivers: the river water that we pollute today may be the water we have to drink tomorrow.

Activities

- You could use the Internet, or contact environment agencies and water companies, to help you with these activities.
- 1 **a** Name three places in your home where water is made dirty.
- **b** Where does the dirty water go when it leaves your home?
- 2 Design a poster telling people about the problems that face our rivers and what they can do to help.

Mountains, hills and maps

Mountains and hills are areas of high ground. If the ground rises more than 300 metres above the land around it, it is called a mountain. If it rises less than 300 metres it is called a hill.

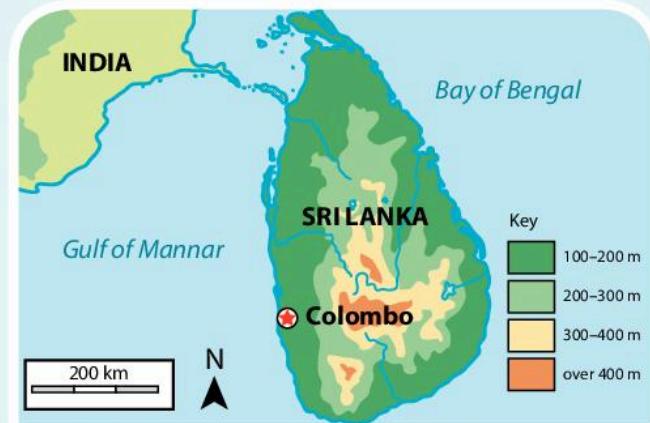
A map is almost essential if you are walking in the mountains. But a map is flat, so how does it show hills and mountains and the rise and fall of the land?

Topographic maps and relief maps

There are two main types of maps:

- **Topographic maps** show the natural features of the land, such as hills, mountains, lakes and rivers, as well as things made by people, such as roads and towns. Many atlases contain topographic maps.
- **Relief maps** show only how high the different parts of a region, country or continent are.

On both topographic and relief maps, the height of the land is shown by using different colours, usually shades of brown and green. All land areas of the same height above sea level are given the same colour. Such a map needs a key to show what the different colours mean.



A simple relief map showing the high ground and mountain **ranges** in Sri Lanka.



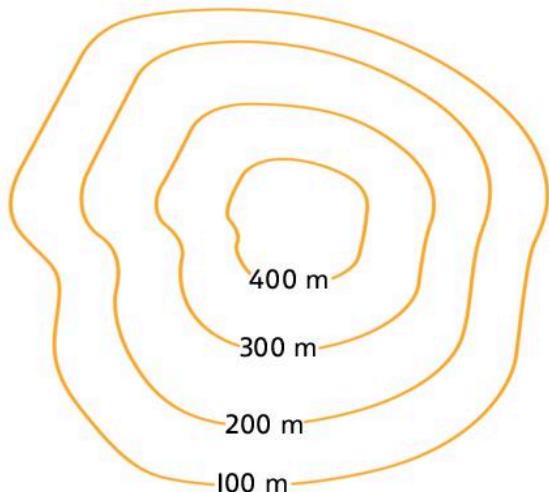
A relief map of a mountain.

Heights above sea level

It is important to remember that heights (and depths) on a map are measured above and below the average level of the sea. When we say that Mount Everest, the highest mountain in the world, is 8863 metres high, we mean that its height measures 8863 metres above sea level.

Contour lines

Another way that we can show heights on a map is using **contour lines**. Contour lines are lines joining places that are the same height above sea level. They are exactly level. They do not cross each other and if they seem to join up or stop it is because they have reached a cliff or some other vertical surface.

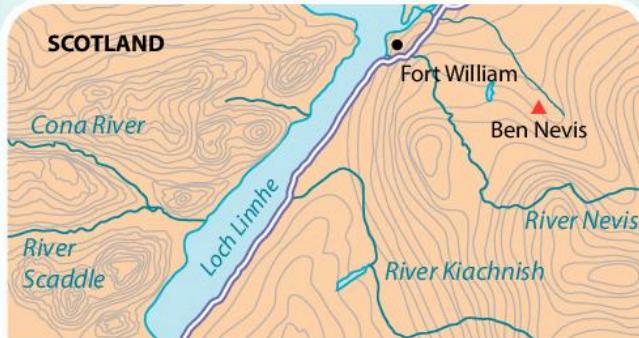


Contour lines do not cross each other.

Map scales and contour lines

The differences in height, or intervals, shown by contour lines depend on the **scale** of the map. On a small-scale map in an atlas the contour lines may be at intervals of 1000 or 2000 metres. On a large-scale map the contour lines may be shown at intervals of 10 metres or even less.

Look at the large-scale map of part of Scotland below. The contour lines tell us about the slope of the land. On a steep slope the contour lines are close together. On a gentle slope they are further apart. If there are no contour lines at all, the land is flat.



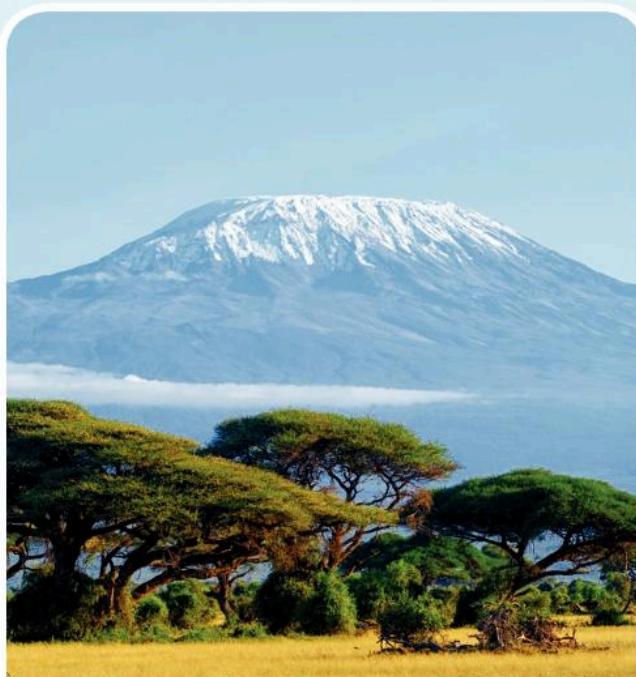
What is the land like in this area?

Activities

- 1
 - a Find out how slopes are marked on roads and railways.
 - b Make drawings of the signs used and write a sentence or two about each one.
- 2 Study a large-scale map of your local area.
 - a Approximately how high is your school above sea level?
 - b What is the highest point on the map and where is it?
 - c Which parts of your local area are almost flat?
 - d Are there any steep hills or **valleys** on the map? Where are they?

How are mountains formed?

A few **mountains** stand alone, such as Fujiyama in Japan, Mount Taranaki in New Zealand, and Mount Kenya in Africa. Most mountains are found in long chains called **mountain ranges**. The Alps, Andes, Himalayas, Sarawat and Rocky Mountains are examples of mountain ranges.

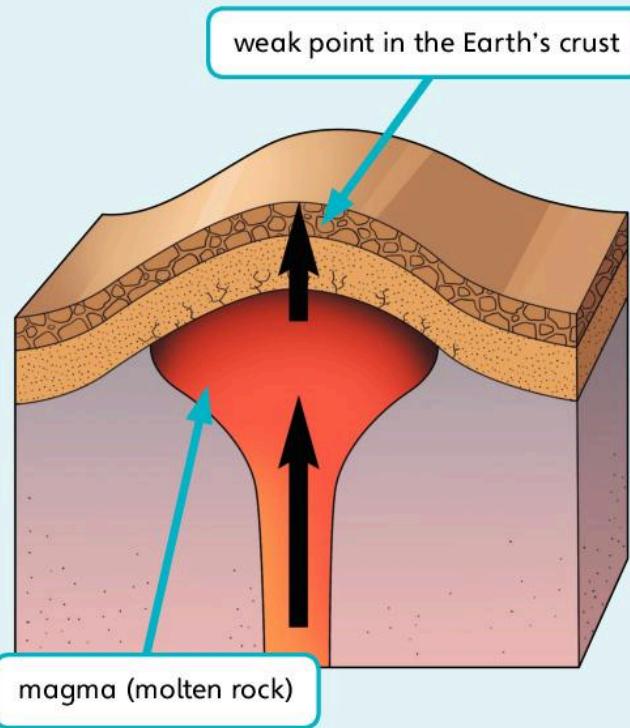


Mount Kilimanjaro in Africa is a volcanic mountain that stands alone.

Volcanic mountains

In order to understand how volcanic mountains are formed, we need to know what the inside of the Earth is like. The Earth is made up of layers of rock. The solid outside layer of rock is called the Earth's crust. Beneath the crust is a layer called the mantle. Near the top of the mantle some of the rocks are so hot that they have melted to form a thick liquid, like sticky tar. All the rocks around the mantle

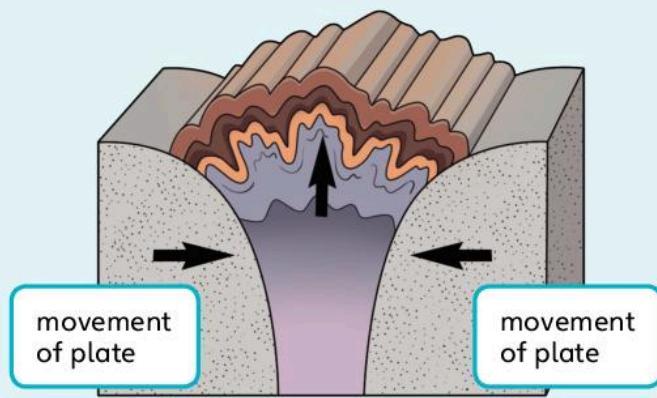
press down on it, so the molten rock is under great pressure. If there is a weak point in the Earth's crust, the molten rock bursts through it and out on to the Earth's surface, forming a volcano. Some mountains are formed by volcanoes.



How a volcanic mountain is formed.

Fold mountains

The Earth's crust is made up of large pieces, called plates, which fit together like the pieces of a jigsaw puzzle. Some of the plates have continents on them and others carry oceans. The plates move slowly, floating on the molten rock of the mantle below them. Where two plates push against each other the Earth's crust is slowly pushed up in folds or ridges, which form **fold mountains**.



How fold mountains are formed.

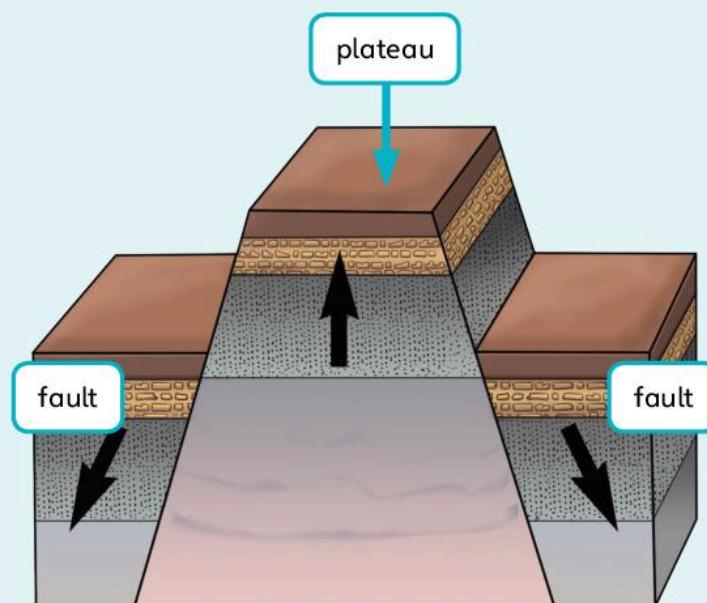
India used to be a long way from Asia, but slowly the plate with India on it moved closer to the plate with Asia on it. The rocks in the sea between India and Asia were gradually pushed up into folds that now form the Himalayan mountain range. That is why it is sometimes possible to find fossilised seashells near the tops of the Himalayas. Many other mountain ranges, including the Alps, Rockies, Andes and Urals, are fold mountains.

Faults and block mountains

While some plates are pushing together, others are moving apart. Europe and North America are slowly moving further

apart. Each year the Atlantic Ocean is a few centimetres wider.

As the rocks move apart, they often crack and create breaks called faults. Sometimes large blocks of rock are pushed up between two faults. These blocks may be so large and high that they form **block mountains**, like some of the highland areas of East Africa. Block mountains often have flat tops. A flat-topped highland is called a plateau.



How block mountains are formed.

Activities

- 1 On an outline map of the world, draw and label as many mountain ranges and solitary mountains as you can.
- 2 Research a mountain range. How was it formed? What is the scenery like? Who lives there? Write a short description of what you discover.
- 3 Collect postage stamps that show mountains or volcanoes. Display your stamps in an album or on a wall chart. Write a sentence or two about each of the stamps, the mountains or volcanoes they show, and the countries the stamps came from.

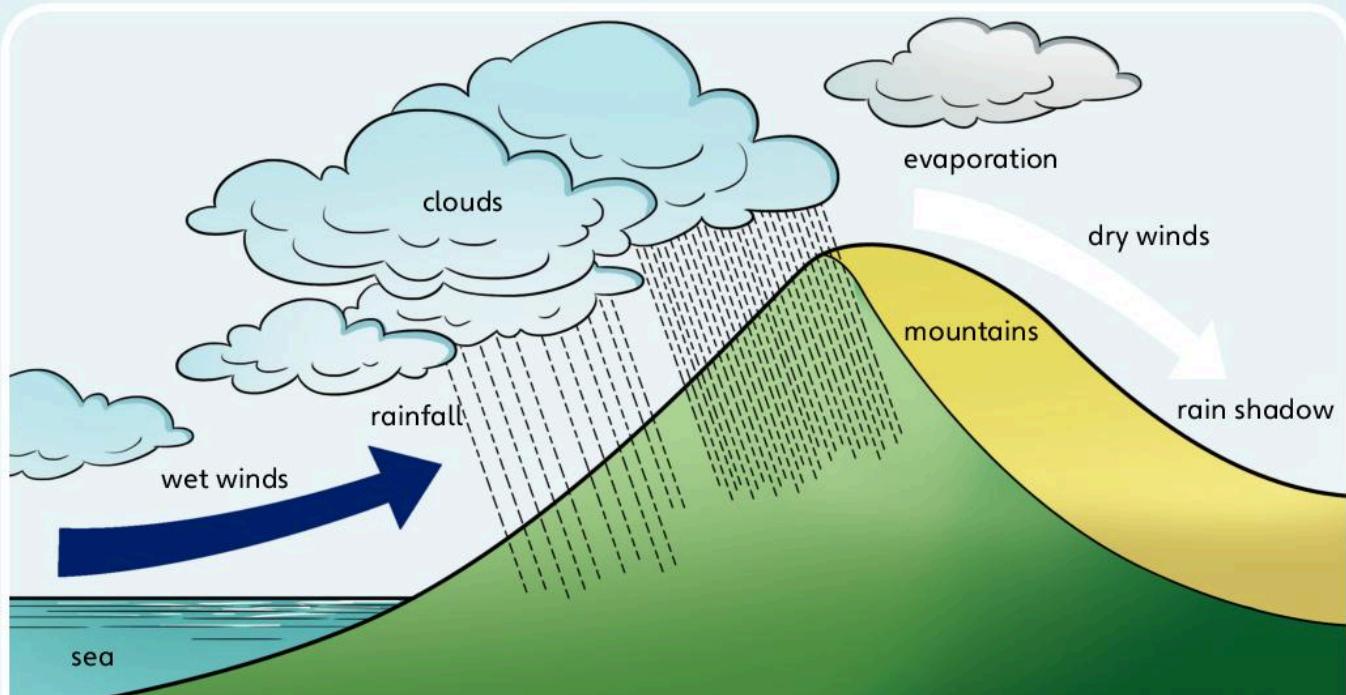
Mountains and the weather

Mountains and temperature

As you climb up a **mountain**, the weather changes. The higher you go, the colder it gets. The temperature falls by about 2 degrees Celsius for each 300 metres you climb. If you climb high enough, you will eventually reach the **snow line**. Above this height, it is so cold that snow covers the ground even in summer. This is why there is snow on the tops of very high mountains near the Equator.

What is a rain shadow?

The upper parts of mountains are often covered in clouds. Clouds are made up of tiny water droplets. Mountains cause the clouds to rise so high that the droplets join together. The bigger drops fall as rain or snow. Often the rain or snow falls on only one side of the mountain, called the **windward** side. The other side of the mountain, the **leeward** side, which receives much less rain or snow, is said to be in a **rain shadow**.



How a rain shadow is formed.

Mountain weather and land use

The Sun affects the different sides of a mountain differently. One side may be in sunshine and the other in shadow. Also, because cold air is heavier than warm air, it tends to sink into the **valleys**. That is

why orchards of fruit trees are planted on the lower slopes of a mountain and not in the bottom of a valley. Villages are often built on the lower slopes of a mountain too, rather than in the colder valley bottom.

Weathering

Even as mountains are being formed they are also being worn away or **weathered**. This happens in the following ways:

- **Ice:** Rocks have tiny cracks in them. When rain falls or dew forms, water gets in these cracks. If it gets very cold, the water freezes to form ice. When water turns to ice, it expands or gets bigger. The ice presses hard against the sides of the cracks and eventually pieces of rock break off and slide down the mountain.
- **Water:** Rainwater is also a weak acid and it gradually dissolves rocks made of chalk and limestone.
- **Changes in temperature:** In hot, dry places, such as the hot deserts, the big difference in temperature between day and night weakens the rocks. Over time rocks break up into smaller pieces that slide down the sides of the mountain.

In addition to weathering, plant roots can grow into the cracks in rocks. As the roots grow bigger, they force the cracks open and pieces of the rock break off.



The pieces of rock formed by weathering may form a loose bank of fragments, called **scree**, near the bottom of a mountain.

Glaciers

In some high, snowy mountains, there are slow-moving rivers of ice called glaciers. When a glacier moves down a river valley, it wears away the rocks, making a deep U-shaped valley.

Activities

- 1 a Approximately how much would the temperature fall if you climbed from sea level to the top of Mount Everest, which is 8863 metres high?
b If the temperature where you are today dropped by the amount you calculated, what would the temperature be?
c What would the weather be like?
- 2 Find out all you can about the kinds of clothes people should wear when they walk in the mountains.
 - a What kinds of shoes or boots should they wear?
 - b What else should they do to make certain they are safe?
- 3 Mountains are always being weathered.
 - a How does weathering affect buildings, monuments and other structures?
 - b Is the weathering of buildings in towns and cities worse than in the country?
c Why is this?

The Himalayas

The Himalayas are a series of **mountain ranges** that curve in a large arc for 25 000 kilometres across Asia, from Pakistan in the west to China in the east. They cover an area of nearly 600 000 square kilometres and include parts of Pakistan, India, Nepal, Bhutan and China.



The Himalayas include the highest mountain in the world, Mount Everest.

Formation and features

The Himalayas are relatively young **fold mountains**. They began to form about 38 million years ago. Like all young mountain ranges, the Himalayas have jagged peaks. The upper parts of the Himalayas are always covered with ice and snow. Neither people nor animals can live there because there is so little air. The higher you go above the Earth, the less air there is, and high in the Himalayas there is so little air that most climbers can only breathe with the help of bottles of oxygen.

Climate and land use

The lower slopes of the Himalayas have a milder climate than the upper slopes and the soil is fertile and well drained. Farmers cut terraces into the slopes and grow fruit trees, tea, potatoes, wheat, maize, rice and sugar cane on them. Farmers also raise sheep, goats and yaks on the slopes. Yaks are a kind of mountain cattle. The farmers take the animals up to the high pastures to feed in summer. In the autumn they bring them back down to the shelter of the **valleys**. The high mountains make it very difficult to build roads and railways and many settlements are very isolated. Yaks are used to carry people and heavy loads along rough tracks.



These terraces have been cut into the slopes of a valley in the Himalayas in Nepal.

Minerals and rivers

The mountains contain valuable minerals and gemstones, as well as iron ore and coal. However, it is difficult to mine these materials because of poor transport.

Nineteen large rivers drain the Himalayas, including the Indus and Brahmaputra. These rivers provide water for people, and water and fertile silt for crops in India, Pakistan and Bangladesh. Many of the rivers have been dammed to provide **hydroelectric power**.

Forests and flooding

About one third of the lower slopes of the Himalayas are covered with forests. But the Himalayas are changing. In Nepal, India and Bangladesh many trees on the lower slopes have been cut down to make new fields and to provide firewood. The trees are also used to make paper, matches and other products. Normally the tree roots act like a sponge, soaking up rainwater and releasing it slowly. They also hold the soil in place. Now, when it rains in the Himalayas, the rivers overflow and there is serious flooding in the valleys and plains

below. The thin soil on the steeper slopes is washed away and occasionally even the terraces and villages are swept away. To stop these things happening, more trees are being planted, but it will be many years before the damage is repaired.



The soil has been washed away on this Himalayan slope because the trees have been removed.

Did you know?

The Himalayas have the highest peaks and deepest valleys on Earth. Thirty of the mountains are higher than 7300 metres above sea level.

Activities

- 1 Imagine you have been transported to the Himalayas for the day. Write a short paragraph describing what you see, feel and hear.
- 2 a Use reference books and the Internet to find out all you can about Nepal, including its climate.
b Design and write your own guidebook to Nepal.
- 3 What are the difficulties of living in a mountainous area like the Himalayas? Write a short paragraph describing your ideas.

The Andes

The Andes form the longest **mountain range** in the world. They are more than 7000 kilometres long and up to 320 kilometres wide. They run through seven countries along the west coast of South America.



A photograph of part of the Andes.

Formation and features

The Andes mountains include the following features:

- The Atacama Desert in Chile, which is one of the driest places on Earth.
- Lake Titicaca, on the border between Peru and Bolivia, which is the largest freshwater lake in South America and the highest lake in the world on which ships can sail.
- The **source** of the River Amazon, the largest river in the world.

The Andes are **fold mountains**, formed when the Earth's plate that carries the

Pacific Ocean pushed into the plate carrying the South American continent. Many of the jagged peaks are more than 6700 metres high, and they always have a covering of snow, even those at the Equator. There are frequent earthquakes and eruptions from 183 active volcanoes, including the highest volcano on Earth, Ojos del Salado in Chile, which is 6887 metres tall.

People

It is not easy to live in the Andes. The soil is poor and the steep slopes make farming very difficult. It is also difficult to build roads and railways there. The high altitude means that there is little air and much less oxygen than at lower levels. Some of the mountain chains are separated by high plateaux. The people who live on these plateaux are able to survive in the thin air because they have extra-large lungs and so they can get more oxygen from the air they breathe in.



Potatoes are the main crop on the slopes of the Andes in Peru.

Farming

The best land for farming in the Andes is found in the **valley** bottoms. But terraces dug into the valley sides and held up by stone walls are used to grow crops on the lower slopes. The main crop is the potato and hundreds of different kinds are grown. Other crops grown are soya, maize, rice and cotton.

The most important animals kept by farmers in the Andes are llamas. Llamas are relatives of the camel. They are used to carry loads and they also provide meat, milk and wool. Alpacas, which look like small llamas, are kept for their meat and their wool.

Minerals

The Andes contain a large number of metals and minerals, including gold, silver, tin, copper and aluminium.

There are also phosphates and nitrates that are used as fertilisers. The Yanacocha gold mine in Peru is the largest gold mine in South America and the second largest gold mine in the world.



In the Yanacocha gold mine in Peru rocks containing the gold are blasted with dynamite. The rock is then sprayed with cyanide. The cyanide washes the gold out of the rock so it can be collected.



Alpaca wool is used to produce some of the world's finest cloth.

Did you know?

The Andes contain what many people believe is the highest large city in the world. El Alto in Bolivia is situated 4150 metres above sea level and has a population of about 1.2 million people.

Activities

- 1 Imagine you live in a small farm high up in the Andes. Write a list of the advantages and disadvantages of living in the mountains.
- 2 There are many mountain ranges in the world. Choose one of them and make a fact file about it. Include such headings as Length, Highest mountain, Type of mountains, Vegetation (plant life), People, Farming, Mining and Tourism.
- 3 Work with a friend. Discuss why you think there are few large cities in the Andes.

Mountains and tourism

Many thousands of tourists visit **mountain** areas every year to enjoy the fresh air and beautiful scenery. Many take part in activities such as hiking, birdwatching, skiing, snowboarding, rock climbing, potholing, hang-gliding, parascending and mountain biking.



Many people enjoy snowboarding in the mountains.

What are the advantages of tourism?

Tourism can bring many benefits to a mountain area. Tourism leads to the building of hotels, restaurants, cafes, shops and nightclubs, which provide jobs for local people. It also leads to improved public transport, which benefits local people as well as the tourists. Traditional local crafts, such as weaving, knitting, wood carving and pottery, may be encouraged to produce items to sell to tourists.

What are the disadvantages of tourism?

Tourism also brings disadvantages. The influx of wealthy tourists may encourage shops and restaurants to put up their

prices, so that local people can no longer afford to use them. Tourists bring more noise, litter and extra cars, caravans, coaches and other traffic, which can cause traffic jams on narrow mountain roads. Tourists may start campfires that get out of control, causing large areas of land to be destroyed. Sewage from caravans and campsites may pollute local rivers. It may also be necessary to dig quarries to obtain materials for making new roads and buildings for the tourists.

Mountains look strong and solid but, as we have seen, they are being worn away all the time by **weathering** and erosion. Anything that destroys the thin layer of soil or plants speeds up the process. Even people walking or cycling can cause mountains to wear away.



If too many people walk or cycle up a mountain path, they may kill the plants. When it rains, the water will run down the path and wash away the soil and rocks, forming deep **gulleys**.

What are the problems?

Many trees are removed from mountain slopes for firewood, to provide timber for buildings, or to clear space for ski runs. Once the trees have been removed, there may be **avalanches** in winter and mudslides or landslides at other times. Mountain railways, cable cars, ski lifts and ski tows can look unsightly and spoil beautiful scenery. They also allow thousands of skiers and other tourists to easily reach remote areas of the mountains where they can damage the fragile plant life, disturb animals and leave litter and other forms of pollution. Because it is so cold on high mountains, the litter left by people takes a very long time to rot away.



Ski lifts can be unsightly and spoil beautiful mountain scenery.

National parks

Many mountain areas that attract large numbers of tourists are now **national parks**. A national park is an area of land that has been set aside to protect its natural beauty and wildlife. Tourists in national parks leave their vehicles where they will not spoil the scenery and they follow set paths so that they cause less disturbance to wildlife and the landscape.



Many tourists visit the Grand Prismatic Spring in Yellowstone National Park in the United States. It is the second largest hot spring in the world.

Did you know?

More than 100 million tourists visit the European Alps each year.

Activities

- 1 a Write a list of all the ways in which tourists in a mountain area might spend their money.
b Write a list of all the jobs that tourists to a mountain area might help to create.
- 2 Design a poster to warn people of the ways in which they can damage mountains.
- 3 a Which mountain areas do people most often visit for holidays? Look at travel agents' advertisements and brochures and the Internet to find out.
b What attractions do these places offer for holidaymakers?

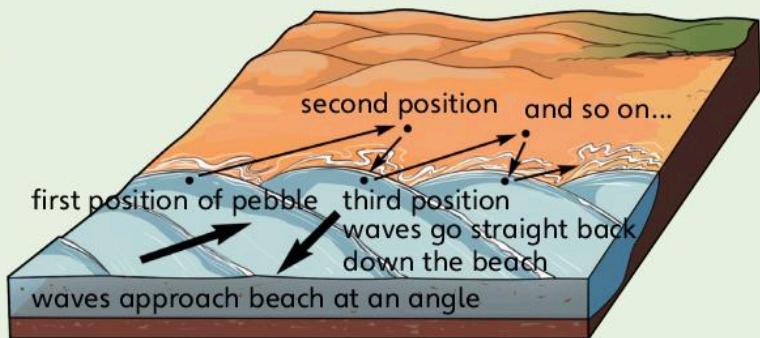
3 Coasts

Changing coastlines

Over many years, the waves on the sea change the shape of countries as they build new land in some places and wear it away in others. Even beaches are constantly changing because of waves, winds and tides.

Longshore drift

Waves can move sand and pebbles along the shore. This happens in places where the prevailing wind blows the waves towards the shore at an angle. Instead of flowing back in the direction it came from, the water from the wave goes straight back down the beach. Any sand and pebbles carried by the waves also slowly travel along the shore in this zig-zag pattern. This movement is called **longshore drift**.



How longshore drift can move pebbles along a beach.

What problems are caused by longshore drift?

Over a period of time, longshore drift can carry the whole beach away along the coast. This can happen in as short a time as one year. Some holiday resorts have to pour or pump sand on to their beaches to replace the sand that has been carried away by longshore drift. Harbours can be completely blocked by the sand and shingle that longshore drift carries to them.

Deposition

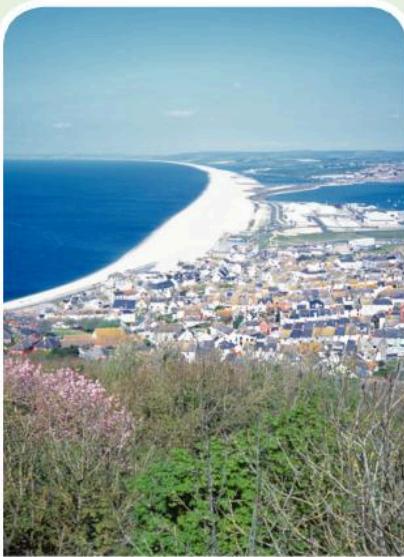
When something on the coastline, such as a bay or the mouth of a river, makes the waves move more slowly, they no longer have the energy to carry sand and shingle. The waves then slow down and **deposit** or drop the materials they were carrying.

Over time, the sand and shingle dropped may pile so high that they form a ridge across part of the bay or river mouth. This ridge is called a **spit**. Sometimes a spit

grows all the way across a bay. It is then called a **bar**. The shallow pool of water trapped behind the bar is called a **lagoon**. Lagoa dos Patos lagoon in Brazil is about 280 kilometres long and has a maximum width of about 70 kilometres.



Farewell Spit on South Island, New Zealand is 26 kilometres long with another 6 kilometres underwater.



The longest bar in Europe is Chesil Beach in Dorset, England, which is about 16 kilometres long. It encloses a lagoon, called the Fleet.



If a bar grows so that it is always above sea level, it may form an island called a barrier island. Hatteras Island is a barrier island located off the North Carolina coast of the United States of America.

Did you know?

The longest spit in the world is the Arabat Spit in the Sea of Azov in Ukraine. It is about 110 kilometres long.

Activities

- 1 Write your own explanation of the meanings of the following words:

erosion	longshore drift	spit	bar
lagoon	deposition	beach	cliff

- 2 Study a large-scale map showing the coast. Choose part of the coast and sketch what you think the coastline would look like.

- 3 For the area of coastline you studied in Activity 2, design an illustrated leaflet describing what a walker or holidaymaker would see and how these features were formed.

Sand dunes and people

What happens to dry sand on a beach when it is windy? If the wind is blowing towards the land, some of the sand will be blown along and will collect behind any kind of shelter, including stones, pieces of wood and even old shoes. Eventually, the sand piles up into small sand dunes.

New land from old

As time passes, these sand dunes may blow away or they may grow bigger. As more sand heaps up on them, a grass called marram grass may start to grow on the dunes. Later, other plants, including shrubs and trees, will grow on the dunes and eventually the sand dunes will form new land. Meanwhile new dunes will be forming on the seaward side of the older ones.



Marram grass has a dense mesh of underground stems that binds the sand together to help form a sand dune.

Over hundreds of years, if the wind mainly blows in the same direction, it can push the dunes inland, burying farmland and buildings. Once they have stopped growing and spreading, sand dunes are often used for grazing sheep or are turned into golf courses. Many of the world's most famous golf courses are built on land that was once sand dunes.



Oregon Dunes are the longest expanse of sand dunes in North America. They stretch for 72 kilometres and reach 150 metres high.

Blow-outs

Sand dunes are very fragile. If people walk through the sand dunes and make a new path, or if children play or dig in the sand, they damage the thin layer of plants that protect the sand dunes. The next time there is a strong wind, it may blow through the gap in the plant cover and produce a blow-out. This is a large hole or hollow in the dunes where sand has been blown away by the wind.

On the bare sand in the blow-out, the marram grass and other plants have to start the long, slow process of colonising the dunes all over again. Sometimes where the beach is in danger of blowing away, people plant marram grass on the bare sand to stop this happening.



This blow-out among sand dunes was caused by walkers taking a short-cut to the beach.

The importance of dunes

Sand dunes are important as homes for a number of interesting and unusual plants and animals. They are also extremely important to people because they help to stop the sea flooding inland.

Activities

- 1 a Use an atlas to find the location of the following large sand dune systems:
 - Arcachon in France
 - Las Marismas in Spain
 - Maspalomas, Gran Canaria, Spain
 - Raabjerg Mile Dunes in Denmark
 - Bodie Island on the Atlantic coast of the United States
 - Fraser Island, off Queensland, Australia
 - Oregon Dunes in the United States
 - Empty Quarter on the Arabian Peninsula.
- b Use reference books or the Internet to research one of these sand dune systems, and present your findings to the class.
- 2 Work with a friend. Discuss how it might be possible to reduce the damage people do to sand dunes by trampling over them.
- 3 Write a short story describing how a grain of sand washed up on a beach became part of a sand dune system that was eventually used as a golf course.

Buildings on the coast

In some places, waves erode cliffs and other coastal features so quickly that it can put the lives of people at risk and make buildings unsafe to use.

Coastal erosion

Cliffs made of soil or soft rocks, such as chalk and clay, can erode very quickly. The eastern coast of England is made of very soft rocks and, in places, erosion is occurring rapidly. The western coasts of the British Isles are made of hard rocks, such as granite, carboniferous limestone and hard sandstones, and they erode much more slowly.



These cliffs on the Californian coast in the United States are made of soft rock. Houses along this coast quite often fall on to the beach as the cliffs erode.

Dunwich, Suffolk

Dunwich is a small village in Suffolk on the eastern coast of England. Today Dunwich consists of a few houses and other buildings. But in the past Dunwich was a large and prosperous **port** at the mouth of the River Blyth. About a

thousand years ago, it had nine churches and about 5000 inhabitants. The local people kept erosion at bay by piling up brushwood, weighted with stones, at the foot of the cliffs. But one night in January 1326, a storm swept away three of the town's churches and 400 houses. About one million tonnes of sand and shingle piled up across the mouth of the harbour, cutting it off from the sea and forcing the River Blyth to take a new course to the north of Dunwich.

Year after year, whole streets and buildings tumbled into the sea and by 1677 the waves had reached the market place. By the middle of the eighteenth century most of the town had fallen into the sea and in 1919 the last of the original churches also fell into the sea. Sometimes, after a cliff fall, human bones from one of the old graveyards can be seen on the beach. At very low tides, flint rubble and pieces of brick can be seen among the pebbles on the shore.



Dunwich in the 13th century.

Land reclamation

People sometimes reclaim land that was once covered by the sea. In the Netherlands large areas of farmland were once under the sea. The Dutch people cut off sections of the **delta** of the River Rhine from the sea, using walls of brick and stone called dykes. They then used pumps to lift the water into canals. The fields reclaimed from the sea are called polders. They are fertile and the Dutch grow wheat, barley, sugar beet and other crops on them.

Palm Jumeirah in Dubai in the United Arab Emirates is the world's largest man-made island. It stretches into the Arabian Gulf in the shape of a palm tree. It consists of a trunk and a crown with sixteen fronds. Surrounding it is a curve of rock that forms an 11-kilometre-long **breakwater**. The island's area is equal to about 800 football pitches. It was built on sand dredged from the bottom of the Arabian Gulf and rock from local quarries. The Palm Jumeirah is the site for waterfront apartments, villas, restaurants and hotels, all with views of the sea.



Palm Jumeirah, the world's largest man-made island.

Did you know?

The soft cliffs in Yorkshire, on the east coast of England, are eroding at the rate of about 2 metres a year. Since Roman times, this coastline has been worn away by the waves for a distance of 4 kilometres, and at least 36 villages have been lost to the sea. In June 1993 erosion of the cliffs caused a landslide during which a large hotel fell into the sea.

Activities

- 1 Imagine that you were living at Dunwich during the fourteenth century. Write a newspaper report, using ICT, about the disaster.
- 2 Work with a friend. Discuss the advantages and disadvantages of building a new hotel on the cliffs in Yorkshire to replace the one that fell into the sea in 1993.
- 3 What are the advantages and disadvantages of reclaiming land from the sea, as has been done in the Netherlands and the United Arab Emirates? Write a list of advantages and disadvantages.

Using the coast

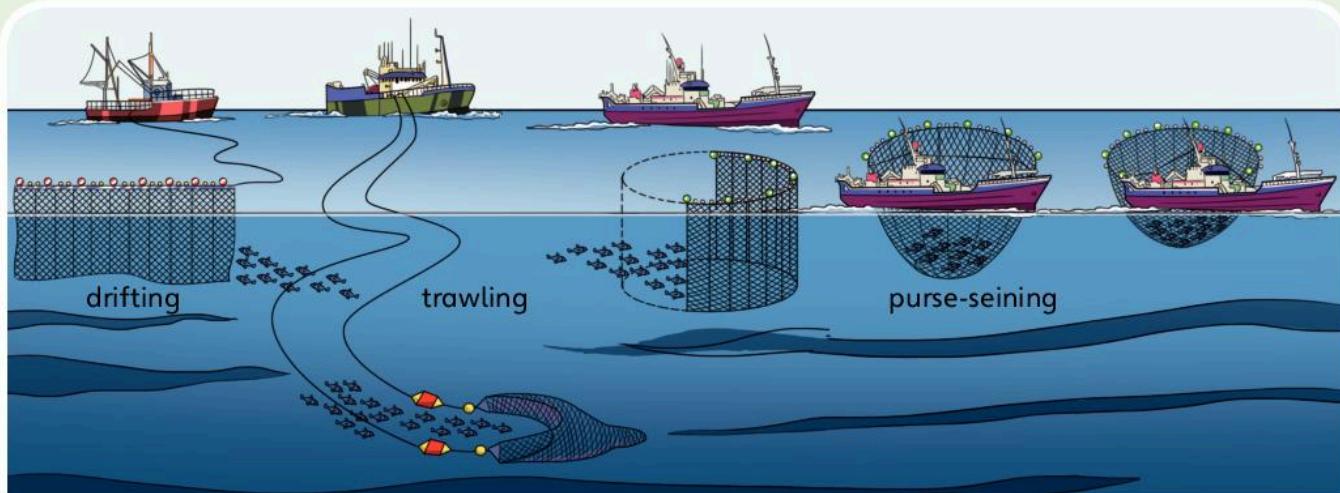
Besides being used for holidays and leisure, coasts also provide us with some of our food and electricity, and certain fuels and minerals.

Fish and shellfish

Fish and shellfish are important human foods. Many of them are caught in the shallow waters along coasts. Almost every coastal village has some fishing boats that supply local needs. Fish are caught using small nets or lines with baited hooks. Shellfish, such as crabs and lobsters, are caught in baited traps on the bottom of the sea.

Some of the fish we eat come from the deep oceans far from land. Large fishing boats, or **trawlers**, sail from **ports** on the coast to catch these fish.

Some deep-sea trawlers bring their catch back to the port to sell, but many pass their catches to factory ships out at sea. On the factory ships the fish are processed and frozen while still at sea. This allows the trawlers to stay at sea for weeks or even months at a time.



Three different ways of catching fish at sea.

Fish farming

Some fish are farmed in sheltered bays, inlets and estuaries in special fish farms. Shellfish, such as crabs, oysters, mussels and prawns, and certain fish, such as salmon, sea bass, grouper and tilapia, are farmed in different parts of the world.



A fish farm that rears salmon in an inlet along the Norwegian coast.

Oil and gas

Much of the world's oil and natural gas is pumped from the rocks of the seabed. Special platforms or rigs are used to drill wells down to the oil or gas. It is then taken ashore by pipeline or tanker ship. The oil is sent to a refinery where it is processed into petrol, diesel oil, heating oil and other valuable fuels and materials.

Electricity

The world's first power station to use tidal energy to produce electricity was built in northern France. Some countries are trying to use the energy of waves to produce electricity.

There are power stations that use coal, oil, gas or nuclear fuels to produce electricity along the coasts of many countries. These power stations use seawater to cool their machines and to make the steam that turns the generators, which produce electricity. Coasts, being windy, are good sites for the wind turbines that produce electricity.

Salt

Seawater contains valuable minerals, one of the most important of which is salt. In countries with a warm climate, seawater is pumped into large open-air ponds called salt pans. The seawater is allowed to **evaporate** in the Sun, leaving only the salt behind. The salt can then be collected and sold.



Salt pans in France.

Did you know?

Fish farming began in China about 5500 years ago. Common carp were grown in ponds on silk farms, and were fed the young silkworms.

Activities

- 1
 - a Find out what kinds of fish and shellfish are sold at your local shops.
 - b Where are these fish caught or packed?
 - c What are fish fingers and fish steaks made from?
- 2 Many kinds of sea fish are decreasing in numbers because of overfishing. Use the Internet to find out what is being done to try to reduce the effects of overfishing.

Holding back the sea

What problems are caused along coasts where the sea is rapidly wearing away the land? Farmland, houses and beaches can be destroyed. It can cost lots of money to build sea defences to protect the land from flooding and from erosion by the sea.

Sea walls and artificial reefs

Sometimes a **sea wall**, of stone or concrete, is built to protect the land. Most modern sea walls are curved so that they push the waves up, round and back out to sea again. This reduces the energy of the waves and stops them from damaging the coast. Along parts of the east coast of England, artificial reefs, consisting of long rows of boulders running parallel to the coast, are being built to protect the soft cliffs from erosion by the waves.



Curved sea walls can protect seaside towns from flooding

Groynes and breakwaters

Groynes are wooden fences that run down the beach into the sea. Groynes reduce the force of the waves and cause sand or shingle to pile up on the side of the groynes facing the prevailing wind.

The piled-up sand makes the beach bigger, which stops the waves from eroding the cliffs behind the beach. They also stop **longshore drift** from blocking small harbours.



Groynes reduce the force of the waves on the beach and help to make the beach larger.

Breakwaters are long and wide concrete walls or barriers made of rocks, which are built out in the sea. Breakwaters reduce the force of the waves before they reach the shore. They also protect boats and ships in harbours from damage during stormy weather.



Large lumps of rock have been placed in front of this breakwater in Portugal to break up the force of the waves.

Barrages

One way of preventing the sea from flooding an estuary is to build a barrage. A barrage is a barrier that can be closed so that it stops very high tides or storm surges from pushing up into the estuary and flooding the surrounding area.



The Thames Barrier was built across the River Thames to protect the city of London, in England, from flooding. It is normally open to allow shipping to pass, but is closed when very high tides or storm surges are likely.

Managed retreat

Sea walls, artificial reefs and other coastal defences are very expensive. They also affect wildlife habitats and may simply move coastal erosion and the **deposition** of sand and shingle to other unprotected parts of the coast. Sometimes, where there are no homes, factories or other buildings to protect, it is cheaper and better to let the sea flood the land next to the coast. The flooded land becomes a salt marsh,

a valuable habitat for wading birds, wildfowl and other wildlife. Just as importantly, the new salt marsh breaks the force of the waves and stops the sea flooding further inland. Allowing the sea to flood certain parts of the land is called 'managed retreat'.

Activities

- 1 Work with a group of friends. Imagine that the government or local council wants to allow the sea to flood a length of low-lying coast in order to protect a town a little way inland. Discuss how you would feel if you were:
 - a a farmer who owns some of the land that will be flooded
 - b a local wildlife expert
 - c a local fisherman
 - d the mayor of the nearby town
 - e a civil engineer who builds sea walls.
- 2 Explain the difference between a sea wall, a breakwater and a groyne.
- 3 Look for pictures of artificial and natural sea defences in magazines, travel brochures or on the Internet. Use them to make a poster or class display. Write a sentence or two describing each picture.

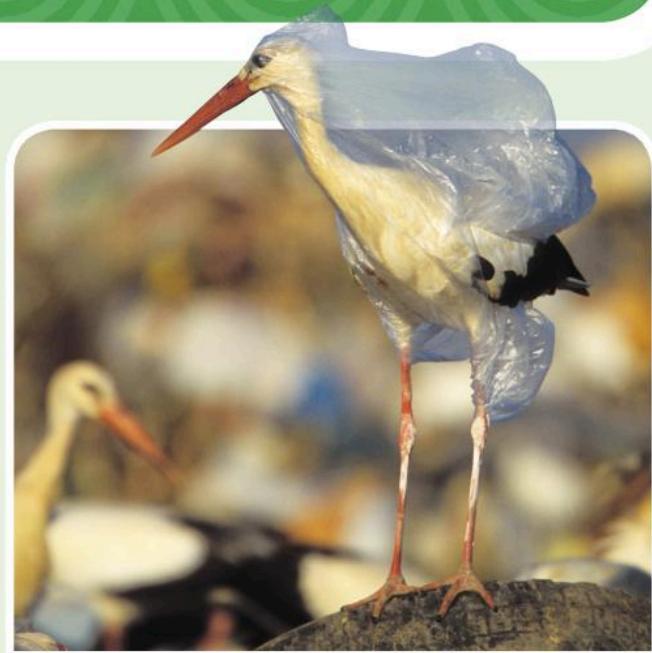
Threats to coasts

Coasts are very important for tourism and leisure. They are also where a lot of the fish and shellfish that we eat are farmed or caught. Coasts and seas are also important wildlife habitats, and for all these reasons it is essential that they are clean and unpolluted.

What causes pollution along coasts?

Today there are more than seven billion people on Earth. We make very large amounts of rubbish. Lots of this rubbish is dumped into the sea, or into rivers that flow into the sea. This rubbish may include sewage, pesticides and fertilisers from farmland, chemicals from factories, warm water from power stations and low-level nuclear waste from hospitals and research laboratories.

People visiting the coast often drop litter. Even more litter is washed on to the coast from ships at sea. Litter not only spoils the beauty of the coast, but it can also be dangerous. People and animals can be cut by broken glass. Fish, seabirds, seals and other wildlife can become tangled in some types of litter, such as plastic bags, discarded fishing line, pieces of fishing net and the plastic loops that hold drinks cans. These animals eventually die. Cleaning up litter is also difficult and expensive.



While feeding among rubbish, this white stork has become tangled in a plastic bag. Unless it can free itself, it will die.

Down the drain

In many coastal towns and cities, sewage is treated to make it safe before it is put into the sea. But in some towns and cities, untreated sewage is pumped straight into the sea. In the sea, bacteria feed on the sewage and multiply. The bacteria use up the oxygen in the seawater, leaving little for other sea life, which may die.



Litter is unsightly and dangerous.

Did you know?

Bacteria in sewage can cause fatal diseases, such as cholera. They can also poison the shellfish that are later eaten by people.

Oil pollution

Oil accidentally spilled from ships and rigs, or deliberately dumped at sea, can kill seabirds, fish and other sea life. It also washes up on beaches, making them unfit for people or wildlife to use. The oil is difficult and expensive to clean up, and the chemicals used to clean up the oil can themselves harm wildlife.



This beach is closed because of oil pollution from a wrecked ship.

Cleaner beaches

Many countries now have strict laws to ensure that waste chemicals and sewage are made safe before they are put into the sea. There are also laws to prevent people from dropping litter and ships from dumping waste oil. Where these laws are enforced the water and beaches are cleaner.

Global warming

One of the biggest threats facing coastal areas is global warming. If the world continues to become warmer, sea levels will rise because:

- the higher temperatures will make the water in the oceans expand
- the polar ice caps will melt, adding huge amounts of water to the oceans.

A rise in sea level could affect millions of people by flooding low-lying areas near the coast.

Activities

- 1
 - a Use reference books or the Internet to find out what can be done to get rid of oil floating in the sea and washed up on beaches.
 - b What can be done to help seabirds whose feathers have oil on them?
- 2 Work with a friend.
 - a Discuss the main causes of water pollution described in this unit.
 - b Can you think of a way that this pollution could be reduced?

4 Cities

The growth of cities

The first cities developed as trading centres in Asia and the Middle East about 7000 years ago. Now over one third of all the people in the world live in cities.



Some of the many grand old buildings in Mexico City, the capital city of Mexico.

Modern cities

In most modern cities land is used for homes, shops, offices, banks, factories, schools, hospitals, railway and bus stations, and civic buildings, such as city halls or town halls. Land in the city centre is very expensive. To make the most of the land people build very tall buildings called skyscrapers, which tower over the older buildings. Many cities have a mixture of

older and newer buildings because the city has developed over a long period of time.

City zones

Cities may be divided into different areas or zones with different purposes. The middle of the city is called the **central business district** and is where most offices, banks, large shops, art galleries and museums are. Around the central business district, there may be industrial zones with factories and residential areas where people live.

Better transport, such as **commuter** trains and metros, help cities to spread outwards. More people can then live further away from the city centre and still be able to travel to work. As a result, new residential areas, called **suburbs**, develop around the edges of the city.



This aerial photograph of Paris shows the different parts of the city, with buildings of different sizes and heights, parks, roads and bridges.

Conurbations

As cities grow, they spread out into the surrounding countryside. Eventually neighbouring towns and cities may merge and become one very large urban area. This is called a **conurbation**. In Pakistan the two cities of Rawalpindi and Islamabad were originally about 13 kilometres apart. Over time, as both cities grew, they joined to form one conurbation. In Japan the cities of Tokyo and Yokohama have joined into one very large conurbation. Most people agree that this is the largest conurbation, with 34 million people living there.

Capital cities

Every country has a capital city. It is where the government of the country meets. The capital city is usually the largest and most important city in a country.

Some countries have built their capital cities specially. For example, in the nineteenth century Sydney

and Melbourne were the two largest cities in Australia. The people could not decide which should be the capital city. So they built a new city, called Canberra, to be the capital city. In 1927 it became Australia's capital. Canberra is inland, about halfway between Sydney and Melbourne.

Other specially-built capital cities include Brasilia in Brazil, Islamabad in Pakistan, Abuja in Nigeria, and New Delhi in India.



The planned capital city of Canberra in Australia.

Activities

- 1
 - a Write a list of the problems that affect cities.
 - b What would you like/not like about living in a city?
- 2
 - a Label 10 or 12 of the world's largest cities on an outline map of the world.
 - b Are most of the cities in the Northern Hemisphere or the Southern Hemisphere?
 - c Do some continents have more large cities than others? Which ones?
- 3 Use an atlas to find the names of ten other conurbations in the world.

Nairobi, Kenya

Some of the world's big cities, such as London and New York, are no longer growing very quickly. But in parts of Africa, Asia and South America many cities are growing rapidly.

Look at the map of the world on pages 60–61. Where is Kenya?



An aerial view of the **central business district** of Nairobi in Kenya.

Nairobi, Kenya's capital

Kenya is a country in East Africa. Over the last 50 years, the population of Kenya has increased very quickly, from about 6 million people to about 44 million people. Although the population growth has now slowed down, it is still growing by more than 2 per cent each year.

Nairobi is the capital of Kenya. It is Kenya's largest city and one of the most modern cities in Africa. The main buildings of Nairobi include a very large conference centre, the Parliament building and city hall, the law courts, cathedral and the

headquarters of the United Nations Environment Programme. There are also high-rise offices, luxurious hotels, museums, theatres and a university and polytechnic. Like most cities, Nairobi has rush-hour crowds and traffic problems.

What are the main industries in Nairobi?

Nairobi is Kenya's main industrial centre. The railways employ many workers. There are also factories making cars, soft drinks, tobacco products and coffee. Tourism is an important industry in Nairobi. Many tourists visit the Nairobi **National Park**, which is just south of the city, before they go on to visit other national parks in Kenya, or the white-sand beaches along the coast.



In Nairobi National Park, on the outskirts of the city, tourists can see giraffes, gazelles, lions, black rhinoceroses, zebras and antelopes, as well as many different reptiles and birds.

Communications

Nairobi has good roads and railways. Jomo Kenyatta International Airport, which is 15 kilometres to the south-west of Nairobi, is one of the main international airports in Africa.

Why are people moving to the cities?

Most people in Kenya still live on farms and in villages, but the situation is changing. The number of people living in large towns and cities has increased from 10 per cent in 1969 to about 24 per cent today, and it is still rising.

There is a shortage of farmland in Kenya, and much of the existing farmland is used for very large plantations of coffee and tea grown for export. Each year thousands of people move from the country to Nairobi and other towns and cities to find work.

Shanty towns

There is a shortage of work in Kenya, and only about 40 per cent of people have jobs. Many people who move to Nairobi end up without work or a proper home. Today several thousand people

live in shanty towns on Nairobi's outskirts. The nights can be very cold in Nairobi because it is high up, about 1680 metres above sea level. Many people in Nairobi's shanty towns suffer from cold, and from a lack of good food and clean water. Nairobi's city council tries to build proper homes for all the people in the shanty towns, but it is difficult because new people come to the city all the time, so the shanty towns keep growing.



A shanty town in Nairobi, where homes are made from scrap materials.

Did you know?

About 14 million people in Kenya do not have a safe water supply, and 29 million do not have access to safe toilets.

Activities

- 1 Use reference books, travel brochures or the Internet to make a fact file about Kenya and Nairobi.
- 2 Design a travel poster to encourage people to visit Nairobi. What features would you advertise? Why?
- 3 Imagine you are trying to persuade a factory owner to build a new factory on the outskirts of a village in Kenya. Write the disadvantages and advantages of building such a factory.

Rio de Janeiro, Brazil

Look at the map of the world on pages 60–61. Where is Brazil?

Brazil is the largest country in South America and the fifth largest country in the world. It occupies almost half of the continent of South America. Brazil is one of the richest countries in the world, but not everyone enjoys its wealth.



Which are Brazil's main cities?

Although Brazil is a huge country, three quarters of its people live in cities. Brazil's largest city is Sao Paulo. The second largest city is Rio de Janeiro, called 'Rio' for short.

Rio de Janeiro was the capital of Brazil until 1960, when the smaller city of Brasilia, which was built especially, became the capital. The city of Rio is located on a narrow shelf of land around Guanabara Bay, facing the Atlantic Ocean. The land around the

bay has hills and steep **mountains** that are partly covered by tropical rainforest. There are many rocky palm-covered islands at the edges of the bay.



Rio de Janeiro and Guanabara Bay.

Rich and poor

In Rio, as in many other cities, there is a big difference between how rich people and poor people live. Rich people live in large houses, in tall blocks of apartments and in **suburbs** that face the sea. Some of the beachfront houses and apartments are second homes that belong to rich people from other Brazilian cities and other countries.

Poor people live in shanty towns, called 'favelas', on the very outskirts of the city, where the ground is too steep or too wet for proper houses. There are no sewage systems, and many of the houses are made of cardboard or plastic. The people that live there often suffer from diseases due to lack of clean water, poor diet and inadequate health care.

In Brazil, as in many other countries, most farmland is owned by a small number of rich people, while millions of poorer people have no land at all. Some people without land move to the Brazilian rainforest to clear the trees and grow food for themselves. Others move to the cities in search of work and a better life. Most of these people end up living in the favelas.



Favela houses in Rio de Janeiro.

Commerce, industry and tourism

Rio de Janeiro is a commercial, financial and industrial centre, and an important **port**. Its main industries include ship-building and the manufacture of clothing, furniture, chemicals, glass, tobacco products and processed foods.

Rio de Janeiro is also a major tourist centre. Its main tourist attractions are the beautiful white sandy beaches, its busy nightlife and the carnival. This carnival is held each year, and people dress up in colourful costumes, play music and dance in the streets.

Did you know?

In 1950 70 per cent of the people of Brazil lived in country areas. Today 84 per cent live in towns and cities.

Activities

- 1
 - a Find out six facts about Brazil from books, atlases, travel brochures, the Internet or other sources.
 - b Write a list of questions to ask your friend.
- 2 Imagine you are on holiday in Rio de Janeiro.
 - a Design a postcard with a picture on the front.
 - b Write a description of what you have been doing on your postcard.
- 3 Copy these sentences and write True or False against each:
 - a Brazil is a very large country.
 - b Favelas are places where rich people live.
 - c The cities in Brazil are growing quickly.
 - d The people who live in favelas make their own homes.
 - e There are farms in the centre of Rio de Janeiro.
 - f Many people move from the countryside to Rio de Janeiro to look for jobs.

Tokyo, Japan

Look at the map of the world on pages 60–61. Where is Japan?

Japan is made up of about 3000 islands, which form a long chain. The main islands are Honshu, Hokkaido, Shikoku and Kyushu. Most people in Japan live on these four islands, even though much of the land is taken up by hills and **mountains** covered in forest.

Japan's farmland is in the narrow coastal lowlands, where its major cities are also located. Before 1945, most Japanese people lived in rural villages. Today less than 9 per cent of the population lives in villages, with fewer than five million families left to farm the land.



Part of the centre of Tokyo.

Tokyo and its site

The capital of Japan is Tokyo, which is situated on the largest island of Honshu. Tokyo is on the west coast of the island, at the mouth of the Sumida River.

Tokyo is a very wealthy city and seaport. It is also extremely large, densely populated and overcrowded. In fact, it is one of the world's largest cities with a population of more than 13 million people.

Tokyo became the capital of Japan in 1868. It has grown very quickly since then. Tokyo's growth only stopped twice during the twentieth century. In 1923 an earthquake destroyed the city's railway network and much of the inner city, and killed about 143 000 people. Then, during the Second World War, American bombers destroyed much of the city, killing many thousands of people.

Business and industries

Today modern government offices, the headquarters of international companies and banks, as well as major universities, are found in the city centre. There are also national museums and theatres, department stores and shops. Modern buildings stand alongside the Imperial Palace and many religious shrines. Thousands of factories of different sizes produce many things, from books to computers, cameras, electrical goods and heavy machinery.

Land use and communications

Much of the land on which Tokyo stands has been reclaimed from the sea. The high cost of land and small amount of space available has also led to the steady expansion of Tokyo into the **suburbs**. The city now has 26 smaller cities.



Comparing cities

Tokyo, Nairobi and Rio de Janeiro are like all cities in the following ways:

- they all have offices, shops and public buildings in the centre
- they all have areas with good houses and areas with poorer houses
- they all get bigger by growing out from the centre
- most people live away from the city centre.

Did you know?

More than a quarter of Japan's population of more than 126 million people live within 50 kilometres of the centre of Tokyo.



Public transport in Tokyo is fast, regular and very crowded. Every day about 24 million workers **commute** into the city from the suburbs, mostly by train.

Activities

- 1 Use reference books or the Internet to find out about Japan and Tokyo.
Make a fact file to help with the following activities.
- 2 Pretend that you have been transported to Tokyo for the day.
 - a Write a description of what you see, feel, hear, smell and eat.
 - b Are you sad or happy to leave the city at the end of the day?
- 3 a Write a list of three Japanese companies and some of the goods they make.
b What do you have at home that was made in Japan?

Food and people

Never before have people had such a wide choice or such a regular supply of food as we do today. Because of refrigeration, canning, freeze-drying, worldwide trade and fast transport, people in developed countries have a large variety of food from all over the world all year round. For example, they may have bananas from Africa or the Caribbean, cheese from New Zealand, rice from India, pasta from Italy and breakfast cereals from Canada. Unfortunately, not everyone gets the food that they need in the right quantities.



For people in developed countries there is a huge range of food available.

What happens when people have too much food?

In developed countries many people eat more food than they need to be healthy. People who eat too much and do not

exercise may become **obese**. Obese people have a greater risk of tooth decay, heart attacks, strokes, diabetes, appendicitis and certain forms of cancer.

Country	Percentage of adults who are overweight or obese
Eritrea	4.4
Ethiopia	5.6
India	16
China	38
United Kingdom	62
United States	68

Today there are about one billion overweight people in the world. This is about four times as many overweight people as there were in 1980. There are about 42 million overweight children under the age of five in the world. The information above shows the percentage of people in different countries who are overweight or obese.



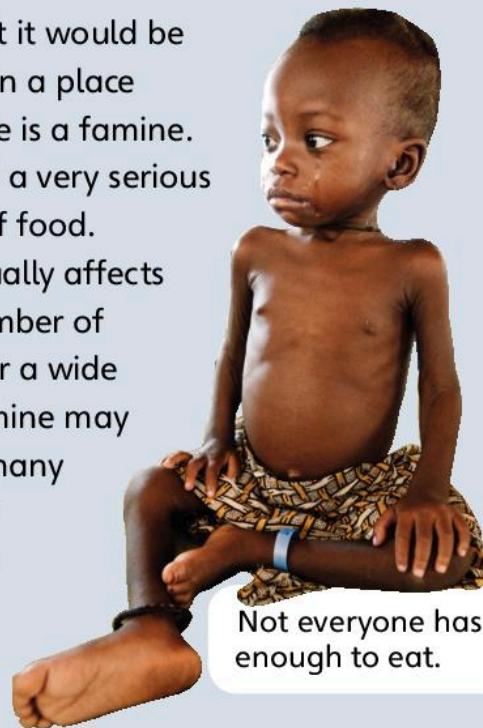
Obesity is becoming a problem in many countries.

What happens when people have too little food?

Have you ever felt hungry? Do you ever think you can't wait for the next meal? Have you ever said, 'I'm starving!'? What do you do to satisfy your hunger? You can probably get food from your family's food cupboard or refrigerator, or you can buy it from the local supermarket or food shop.

Now imagine you haven't eaten properly for days, weeks or even months. Because you are so hungry, you have been forced to eat grass, tree leaves or bark. What little food is available is so expensive you cannot afford to buy it. How would you feel? What would happen to your body? You would become weaker each day. You would lose weight and get thinner and thinner. If you were not able to get food soon, you would probably die of starvation or disease.

This is what it would be like to live in a place where there is a famine. A famine is a very serious shortage of food. Famine usually affects a large number of people over a wide area. A famine may go on for many months, or even years.



Not everyone has enough to eat.

Did you know?

During your lifetime you will probably eat 50 tonnes of food, and drink about 50 000 litres of liquid.

Activities

- 1
 - a Write a list of the food and drink you have had today.
 - b Which countries did each of the foods come from?
 - c Display this information on an outline map of the world.
- 2
 - a Choose one of the main food crops, such as wheat, rice or potatoes.
 - b Use reference books or the Internet to find out where, when and how the crop is grown and harvested.
 - c How does your chosen crop get to the shops and supermarkets?
 - d What kinds of meals is it used for?

How does hunger affect people?

While many people in developed countries have too much food, many people in poorer countries do not have enough. About 24 children under the age of five die every minute from diseases of hunger. Every night more than 500 million children and more than 300 million adults go to bed hungry around the world. And every morning they wake up to face another day without proper food.



Organisations like the International Red Cross and Red Crescent help to provide food for people affected by famine.

Malnourishment

People who do not eat enough of the right kinds of food are said to be **malnourished**. They do not have a balanced diet to keep their bodies healthy and strong. Malnourished children grow more slowly than children who eat a balanced diet. Malnourished children also fall ill more easily from illnesses such as diarrhoea, measles and tuberculosis.

Famine

During a famine, adults become too weak to work properly and they cannot farm the land. If all the stored grain is used for food, there will be no seeds to plant and so there will be no harvest. People who are strong enough may leave the area, hoping to find a place where there is food. These people may never return home, and so families and communities break down.

Younger adults usually survive and recover from a famine, but babies and old people often die. Children may have permanent mental and physical problems from a famine.



These people have left their homes in Somalia and have come to a refugee camp to seek food and medical help.

Famine myths

Many people think that we have famines because there is not enough food in the world or because there are too many people. The truth is that there is more than enough food for everyone. The problem is that the food does not always get to the people who need it and a lot of food is wasted.

For example, up to a quarter of all the food in North American supermarkets is thrown away. In order to avoid famines we do not need to produce more food, but we need to share the food more fairly and not waste it.

Famine in poorer countries

If crops fail in poor countries, their governments usually do not have the money to buy food from elsewhere. Similarly, if floods destroy homes, crops and livestock, most people cannot afford to replace the things they have lost.

International aid

Poorer countries find it very difficult to recover from famine. Many rely on help from international aid organisations, such as the Red Cross and Red Crescent, Oxfam, Save the Children Fund, ActionAid and UNICEF. Look at the photographs on this page showing how food was distributed to starving people in the Philippines after Typhoon Haiyan struck the islands in November 2013.



Food from donor countries is packed into sacks, ready to be loaded on to special trucks and aircraft.



Where roads and other communications are poor, the sacks are dropped by aircraft.



Local people collect and sort the food that has been dropped from an aircraft.

Activities

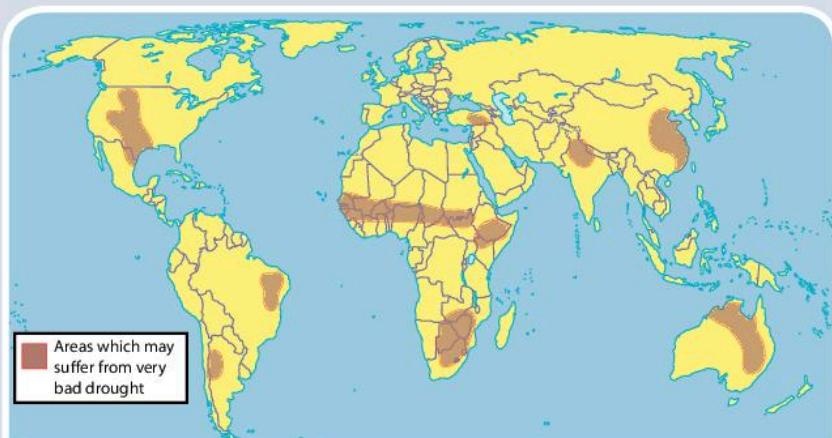
- 1 Look for news reports of famines and mark where they occur on a world map. What caused each one?
- 2 Most food we buy in packets and other containers has a date printed on it. If the food is not sold by this date, the food is thrown away. Work with a friend.
 - a Discuss whether you think these dates are a good thing or a bad thing.
 - b What do you think should be done with the food that is past its date? Why?

Famines caused by nature

Famines can be caused by natural things such as:

- long periods of dry weather, or drought
- floods
- earthquakes and volcanoes
- plagues of insect pests or plant diseases.

Of these natural causes of famine, the most common are drought and flooding.



This map shows the areas of the world that regularly suffer from drought. Can you name any countries that are in the drought areas?



In 2013 the island state of Madagascar suffered a terrible plague of locusts. The locusts and bad weather left up to four million people short of food.



Drought in China is killing this rice crop.

Drought

A drought is a period of abnormally dry weather. Plants begin to shrivel and die. Soon the wells, rivers and reservoirs dry up too. If it does not rain, crops do not grow and farm animals die. The price of

food in the shops rises and people have to pay more money for less food. They may have to sell their possessions to pay for food. When they have sold everything they can, they can no longer afford to eat.

Floods

Floods destroy crops by covering them with water or burying them in mud. Severe floods may drown farm animals.

Severe floods occur fairly regularly in the country of Bangladesh. Most of Bangladesh lies on the **delta** at the mouths of the Ganges and Brahmaputra rivers. The two rivers often flood the delta, leaving a layer of fertile mud over the fields. When the monsoon rains come, up to three crops of rice are grown here in a year. But if the monsoon rains fail to arrive, there is a drought and food is

Did you know?

A series of floods in China in 1931 is generally considered to be among the deadliest natural disasters ever recorded. It is believed that up to four million people died.

in short supply. If the rains are very heavy, the floods destroy crops and farm animals are drowned. Floods also damage buildings, power supplies and roads, making it difficult to rescue people or to get food to the people who need it.

During August and September in 2013, the African country of Niger suffered severe floods that destroyed crops and food supplies. About 230 000 people were forced from their homes, and 32 people died.



Flooding damages homes and destroys farm crops.

Activities

- 1 Use reference books and the Internet to help you draw a timeline showing major famines across the world. Show where each famine occurred and how many people are believed to have died.
- 2 Many aid organisations, such as the Red Cross and Red Crescent, Oxfam, Save the Children Fund, ActionAid, and UNICEF, work hard to try to help people affected by famines.
Choose one of these organisations. Find out where in the world it is helping famine victims and what it is doing to help them.
- 3 Imagine you are working in Africa on the edge of the Sahara Desert, helping people affected by a famine. Write a letter to a friend saying why life is so hard for these people. Give at least four reasons.

Famines caused by people

People can also cause famines. Human causes of famine include:

- wars, sieges, civil disturbances and the deliberate destruction of crops
- accidentally turning land into desert by the process known as **desertification**
- governments failing to provide a cheap and efficient means of getting food from one part of a country to another
- using large areas of the best land to grow **cash crops**, such as coffee, tea, cocoa and bananas, which are sold to richer countries, instead of growing food for local people.

How does war cause famine?

War turns farms and fields into battlegrounds. Farmers in a war zone cannot plant their seeds, harvest their crops or feed and look after their animals. Sometimes soldiers will deliberately kill farm animals and destroy crops and food stores as a way of trying to weaken their enemies. Wars also disrupt the transport of food from one part of a country to another.

War frequently forces large numbers of refugees to gather in one small area, hoping to escape the fighting. This puts a huge strain on food supplies in the area where the refugees gather. Even when war is over, people may not be able to farm their lands because of landmines.



A refugee camp in Dadaab, Kenya, for Somali people escaping the war in their own country.

How does desertification cause famine?

In many countries large areas of farmland have been turned into desert where nothing will grow. This process is called desertification, and its causes include:

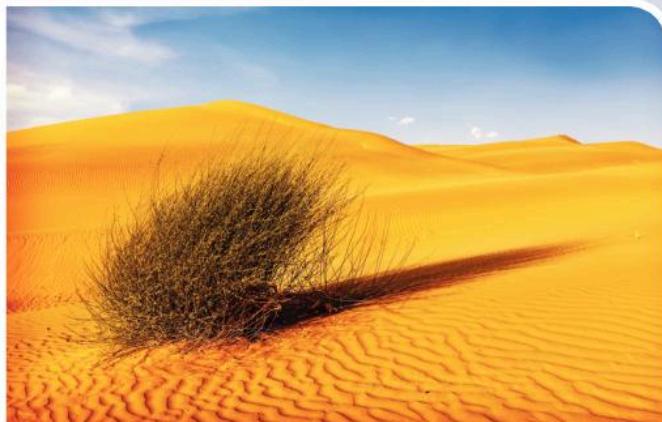
- **Overgrazing:** When farmers allow too many animals to eat the grass and trample on it, the ground is left bare and grass and other crops will not grow there.

- **Deforestation:** When people cut down all the trees for firewood or timber, the soil is no longer held together by the trees' roots and the land turns to desert.

When land becomes desert, it can't be farmed and it can't produce enough food for the people living there.

Did you know?

Up to 110 million landmines from past wars are still buried in fields around the world. As a result, crops are not grown in these fields and local people go hungry.



During the last 40 years, the Sahara Desert in Africa (left) and the Thar Desert in India (right) have become larger because of overgrazing and deforestation.

Activities

- 1 a Use the information opposite to draw a map of the world showing where the developed and less-developed parts of the world are.
- b Some people say that the countries of the world can be divided into the richer, developed countries in the north and poorer, less-developed in the south.

From your map, for which countries is this untrue?

- 2 a Collect food labels, packets and wrappings.
- b Where were the foods grown or manufactured?
- c Which of the foods came from poorer, less-developed countries?
- d Discuss with a friend whether you think this is a good thing or a bad thing.

Developed	Less-developed
Arabia	Africa
Australia	Rest of Asia
Europe	South America
Japan	
New Zealand	
North America	
Russia	

Map of the World





Glossary

Avalanche A sudden collapse of snow down the side of a mountain.

Bar A ridge of sand or shingle across a bay or river mouth.

Block mountain A flat-topped mountain formed when a large block of land has been pushed up between two faults.

Breakwater A wall built into the sea to protect the coast or a harbour against strong waves.

Cash crop A crop grown for sale to other countries.

Central business district The middle of a city where most of the offices, banks and shops are.

Commuter Someone who regularly travels to work, especially by train or bus.

Contour line A line on a map joining points that are the same height above sea level.

Conurbation A very large urban area formed when a city grows and joins with neighbouring towns and villages.

Delta An area of flat land at the mouth of a river, which is made of mud dumped there by the river. Many deltas are shaped like a triangle.

Deposit Dropping mud, sand and pebbles when moving water is slowed down.

Desertification The process in which once fertile land is turned into desert.

Evaporate When liquid water turns into the invisible gas called water vapour, it is said to evaporate.

Floodplain The flat area bordering a river formed from the mud deposited by the river when it floods.

Fold mountain A mountain that is formed by folds or ridges or the Earth's crust that are pushed up by movements of the Earth's plates.

Gorge A narrow valley with steep sides.

Groyne A fence built at right angles to the shore to stop the beach being washed away by the sea.

Gully A narrow channel that carries water.

Hydroelectric power Using the energy of running water to produce electricity.

Impermeable Any material that does not let liquids and gases pass through it.

Lagoon A shallow lake separated from the sea by a sandbank or spit.

Leeward Facing away from the wind.

Longshore drift The slow movement of pieces of rock along a beach when waves move towards the shore at an angle.

Malnourished Someone who does not have enough food or the right kinds of food to eat.

Meander A large S-shaped bend in a river.

Mountain An area of high ground that is 300 metres higher than the ground around it.

National park A large area of land set aside so that its beautiful scenery is not spoiled and so that its plants and animals can be protected.

Obese Someone who is very fat.

Oxbow lake A lake made when a river changes course and cuts off a meander.

Permeable Any material that lets liquids and gases pass through it.

Port A place where ships can be loaded and unloaded.

Rain shadow The sheltered side of a mountain where there is less rainfall than on the other, windward, side.

Range A row or line of mountains.

Relief map A map that shows how high the different parts of a region, country or continent are.

Reservoir A large artificial lake used to store water for drinking, irrigating crops, producing electricity or to prevent a river flooding.

Scale A way of showing distances on a map.

Scree The pieces of rock that collect at the bottom of a steep mountain slope.

Sea wall A wall made of concrete or stone built to protect beaches and buildings from the sea.

Snow line The line on a mountain above which it is so cold that snow covers the ground, even in summer.

Source The place where a river rises.

Spit A ridge of sand or shingle joined to the land at one end and sticking out into the sea at the other.

Suburb An area on the outskirts of a town or city where many people live.

Topographic map A map showing both natural features, such as hills, mountains, lakes and rivers, as well as human features, such as roads, railways and towns.

Trawler A fishing boat that pulls a large net behind it.

Valley An area of low land between hills or mountains.

Water cycle The movement of water from the oceans, seas and other wet surfaces to the air, then back to the ground, oceans and seas again.

Weathering The breaking up of rocks by heat, cold, ice and rainwater.

Windward The side that faces the wind.

Oxford International Primary Geography

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