YEAR 7 GEOGRAPHY NOTES

These notes are to be seen as a back up to your lesson work. They contain the major areas we have studied – your own lesson notes have the finer details and the specific case studies, such as Dartmoor National Park....etc.

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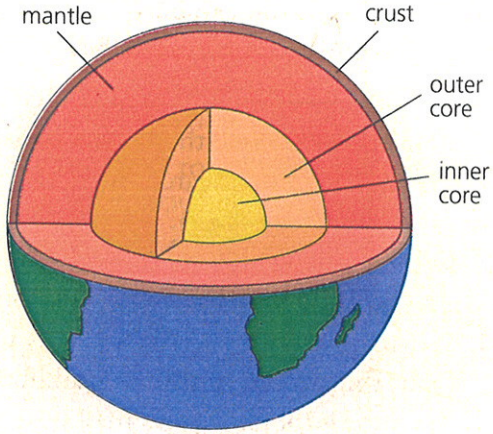
2 The Earth

In this section of the book you will investigate the following things:

- What is the Earth?
- How was the Earth formed?
- What is the Earth made of?
- How has the Earth changed?

Structure of the Earth

The Earth is one of nine planets orbiting the Sun. The Earth was formed around 4600 million years ago. Dust and gas produced in the **'Big Bang'** came together to form planets. One of these planets is the Earth. In the beginning the Earth was not solid, but over time the outside has cooled to form a hard rock **crust**.



▲ ***Fig 1*** *The structure of the Earth.*

The Earth's crust varies in thickness. Under the oceans it is only between 5 km and 10 km thick. On the land it is between 25 km and 90 km thick. Beneath the crust there are a number of layers of rock (Fig 1). The thickest layer is the **mantle**. The mantle is hot enough to melt but is kept solid by huge pressure. Although the mantle is solid, it is able to flow very slowly like plasticine.

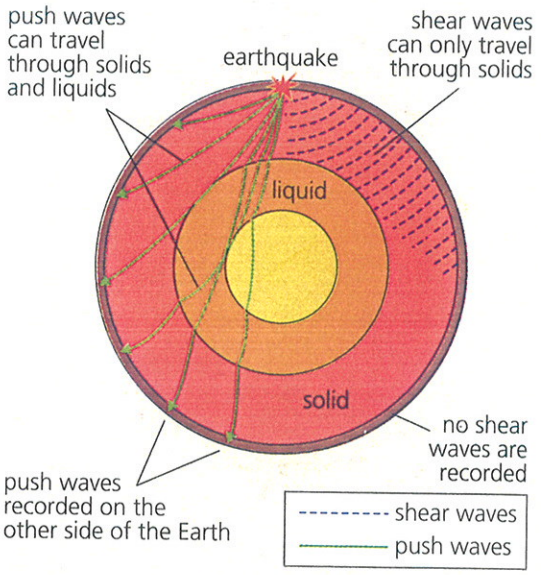
Q1 When was the Earth formed?

Q2 How was the Earth formed?

At the centre of the Earth is the **core**. The core is very dense and probably made of nickel and iron. The inner core is thought to be solid, whereas the outer core is liquid and able to flow. The core reaches about 5500 °C.

Seismic waves

How do we know what is beneath the Earth's crust? Although we cannot see inside the Earth, earthquakes give us a big clue. Earthquakes cause two types of **seismic wave**: push waves and shear waves. Push waves can travel through solids and liquids. This means they can travel all the way through the Earth to the other side. However, shear waves cannot travel through liquids. As shear waves only reach half way round the world this suggests that there is liquid rock at the Earth's core (Fig 2).



▲ ***Fig 2*** *Seismic waves.*

Q3 What is the difference between push waves and shear waves?

USGS home page http://www.usgs.gov/

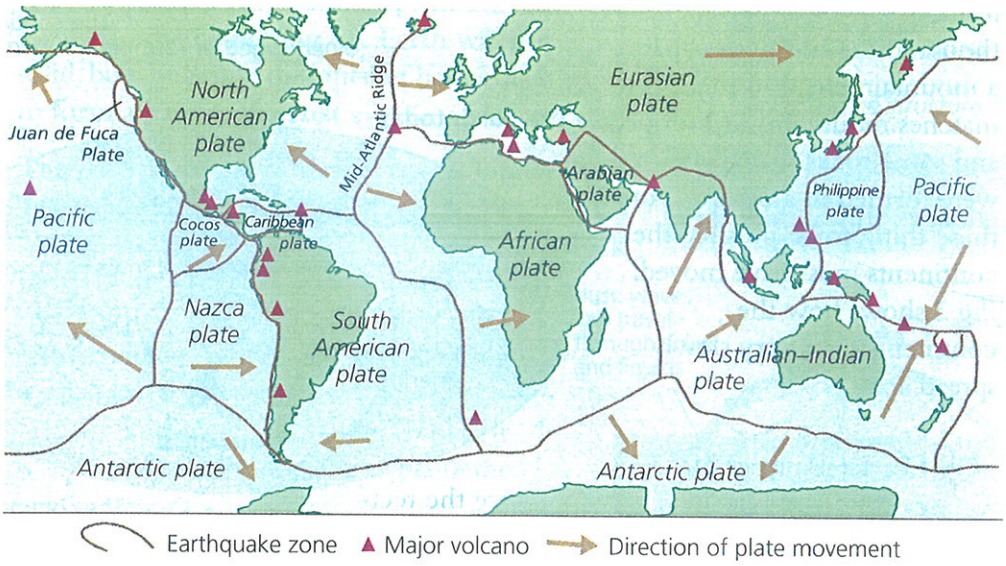
3 Plate tectonics

In this section of the book you will investigate the following things:

- How is the Earth's crust divided into plates?
- How do tectonic plates move?
- Where do earthquakes and volcanoes occur?

Tectonic plates

The Earth's crust is not one solid piece. It is broken into huge slabs of rock called **tectonic plates**. There are seven major plates and twelve smaller ones (Fig 1). Tectonic plates are lighter than the rock in the mantle. This means that the plates are able to 'float' on top of the mantle. The major tectonic plates are larger than continents.



▲ ***Fig 1*** *The Earth's major tectonic plates.*

There are two different types of tectonic plate. The lightest and thickest plates are called continental crust. Continental crust forms the land but can also extend under the sea. Because continental crust is light it cannot sink into the mantle and be destroyed. This means that continental crust can be very old.

The second type of tectonic plate is called oceanic crust. Oceanic crust is thinner but made from heavier rock. Because it is heavy, oceanic crust can be pushed down into the mantle. Oceanic crust is then melted and destroyed in the mantle. Oceanic crust is continually being destroyed in one place, and renewed in another.

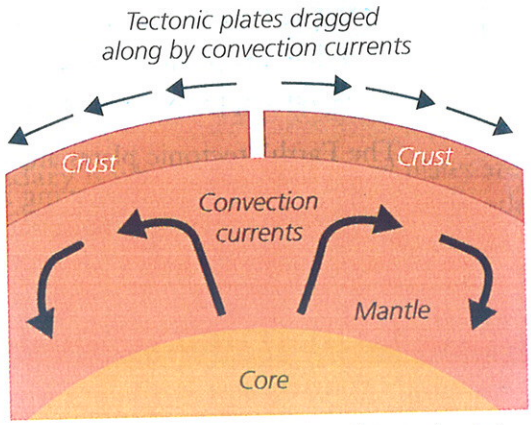
Q1 What is a tectonic plate?

Q2 What is the difference between continental and oceanic crust?

NASA – plate tectonics http://observe.ivv.nasa.gov/nasa/earth/tectonics/Tectonics1.html

Plate movement

The Earth's core is extremely hot. Heat escapes from the core and rises up into the mantle. This heat causes **convection currents** in the semi-solid rocks of the mantle. The convection currents cause the mantle rock to move very slowly in a circular motion. The movement of the rock in the mantle drags the tectonic plates along (Fig 2). In this way, the tectonic plates move by a few centimetres every year. In our lifetimes the plates will only move a few metres. But over millions of years, plates can move the whole way around the Earth! This process is called **plate tectonics**. It explains how the continents, which used to be joined together, have spread apart.



▲ ***Fig 2*** *Movement of tectonic plates.*

Q3 What causes convection currents?

Earthquakes and volcanoes

Fig 1 shows the location of the world's major volcanoes and earthquake zones. It shows that earthquakes and volcanoes are found together in long narrow bands. For example, there is a large band of volcanoes and earthquake sites around the Pacific Ocean. This band is known as the 'Ring of Fire'. Notice how close the bands of earthquakes and volcanoes are to where the tectonic plates meet. This map shows us that most earthquakes and volcanoes occur at **plate boundaries** (Fig 3). Earthquakes and volcanoes can be very useful for learning about the movements of the Earth's crust.

▶ ***Fig 3*** *San Andreas Fault – an example of a plate boundary.*

Key words

convection current – a transfer of energy as heat causing movement in a circular direction

plate boundary – the point where two tectonic plates meet

plate tectonics – theory explaining how the Earth's crust is able to move

tectonic plate – a large, rigid section of the Earth's crust

SUMMARY

- The Earth's crust is broken into several large pieces called tectonic plates.
- There are two types of crust: oceanic and continental crust.
- Tectonic plates move because of convection currents in the mantle.
- Earthquakes and volcanoes are located at tectonic plate boundaries.

SUMMARY activity

Describe the distribution of earthquakes and volcanoes around the world. Use an atlas to name some countries which have volcanoes, and which have experienced earthquakes.

4 Plate boundaries

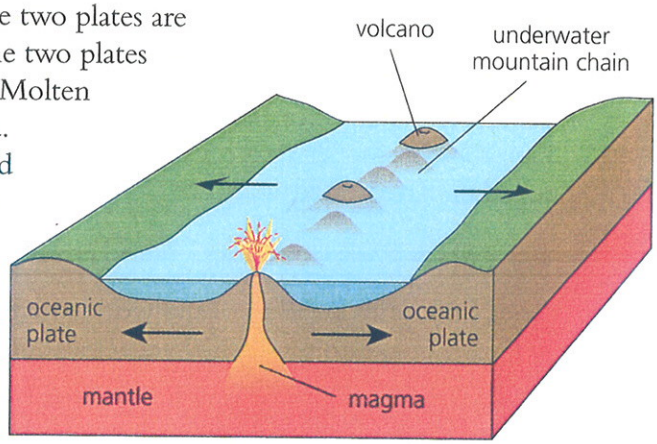
In this section of the book you will investigate the following things:

- What happens when tectonic plates move apart?
- What happens when tectonic plates collide?
- What happens when tectonic plates slide past each other?

The Earth's tectonic plates are moving very slowly around the surface of the planet. In some places, plates are moving apart from each other. In other places they are pushing together. Some plates are sliding sideways past each other. The places where tectonic plates meet are called plate boundaries. There are four different types of plate boundary.

Constructive boundaries

A **constructive boundary** is where two plates are moving apart from each other. As the two plates pull apart, rock in the mantle melts. Molten rock in the mantle is called **magma**. Magma erupts at the surface as liquid rock called **lava**. As the lava escapes it builds up mountains called volcanoes. Volcanic eruptions at constructive boundaries are quite gentle, but may continue for many years (Fig 1).



▲ ***Fig 1*** *Constructive plate boundary.*

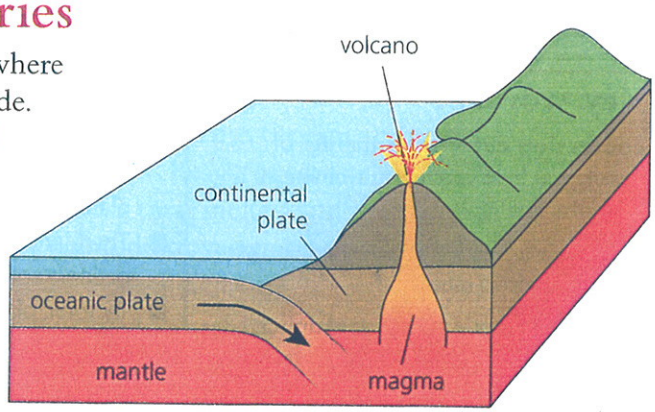
Most constructive boundaries are under the sea. Millions of years of eruptions have formed underwater mountain chains. The most famous is the Mid-Atlantic Ridge. Sometimes a volcano grows so high that it can make an island, for example, Tristan da Cunha or Surtsey.

Q1 What is the difference between magma and lava?

Q2 How was Tristan da Cunha formed?

Destructive boundaries

A **destructive boundary** occurs where oceanic and continental plates collide. The heavier oceanic plate is forced underneath the continental plate. As the plate is pushed down into the mantle it melts. The melted crust forms magma. The magma slowly rises up towards the surface. If it reaches the surface it forms dangerous explosive volcanoes (Fig 2).



▲ ***Fig 2*** *Destructive plate boundary.*

PBS mountain maker http://www.pbs.org/wgbh/aso/tryit/tectonics/

Effects

Primary effects are hazards which happen immediately an earthquake strikes:

Building collapse – buildings which have not been built to withstand earthquakes may collapse, trapping and killing the people inside (Fig 4). In some cases the land becomes liquefied and buildings actually sink.

Falling objects – objects, such as signs, may fall from buildings. Glass falling from broken windows is a major hazard. Glass falling from a ten-storey building is able to cut through a car roof.

Secondary effects are problems faced in the hours and days after an earthquake:

Fire – gas pipes ripped open in an earthquake may catch fire. If enough buildings are on fire, a firestorm can develop.

Tsunami – huge waves, up to 30 metres high and travelling at 500km hour, can occur after an earthquake which happens out at sea.

Disease – cholera and typhoid may spread through the population of an area if the water supply has been cut off.

Communications – buckled roads and railways, and fallen telephone cables, make travelling and communicating difficult.

Economy – factories may have to close, and people lose their jobs. The country will have to spend millions of pounds on repairs.

No	Effects
1	Detected only by instruments
2	Slight vibrations, hardly noticed
3	Slight vibrations, noticed by people not moving
4	Moderate, felt by people moving about
5	Quite strong, loose objects fall over
6	Strong, slight damage to buildings
7	Very strong, walls crack
8	Destructive, chimneys fall
9	Ruinous, buildings collapse
10	Disastrous, many buildings destroyed
11	Very disastrous, few buildings left standing
12	Catastrophic, total destruction

▲ ***Fig 3*** *The Mercalli scale.*

▲ ***Fig 4*** *Earthquake in Turkey, 1999.*

Key words

epicentre – the point on the Earth's surface directly above the focus of an earthquake
fault – a line of weakness in rock
focus – the point underground where the energy of an earthquake is released
seismic wave – shock waves or vibrations caused by an earthquake
seismometer – sensitive instrument used to measure earthquakes

SUMMARY

- Earthquakes are caused by sudden movements of the Earth's crust.
- Earthquakes are measured using either the Richter or Mercalli scales.
- The effects of earthquakes can be divided into primary and secondary effects.

SUMMARY *activity*

Describe how the effects of an earthquake might vary under the following conditions:

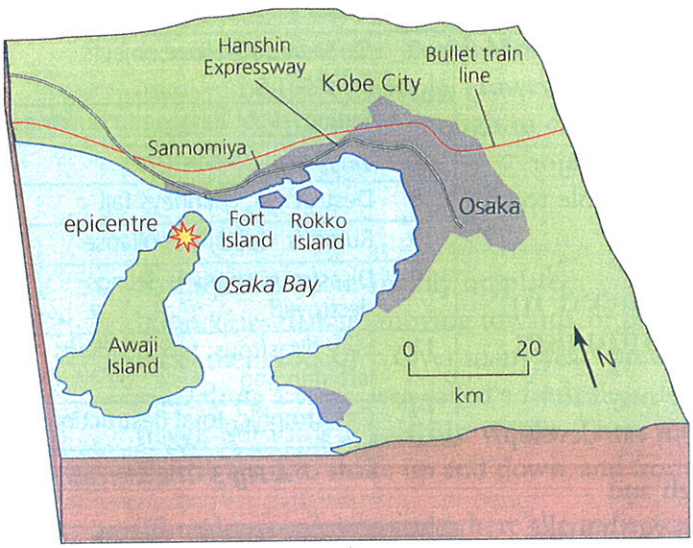
- *in a richer country or a poorer country*
- *in a rural area or an urban area*
- *during the daytime or at night*
- *in an inland area or coastal area.*

USGS earthquake information centre http://www.neic.cr.usgs.gov/

9 Kobe earthquake

In this section of the book you will investigate the following things:

- What caused the Kobe earthquake?
- What were the effects of the earthquake?
- How did people respond to the disaster?



▲ ***Fig 1*** *Kobe and Osaka.*

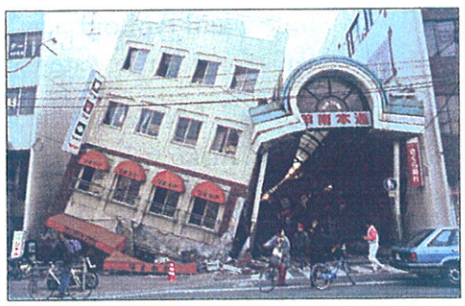
Each year Japan has around 2000 earthquakes. Luckily, most of these are not powerful enough to do much damage. The Japanese have spent a lot of time and money studying earthquakes. They are trying to predict where the next 'big one' might strike. However, nobody was expecting the earthquake which struck Kobe in 1995. Kobe is a coastal city on the main island of Honshu (Fig 1). At 5.46 a.m. on 17 January 1995, an earthquake measuring 7.2 on the Richter scale struck the city. The earthquake lasted only 20 seconds, but caused terrible human suffering and damage estimated at £80 billion (Fig 2).

Cause of the earthquake

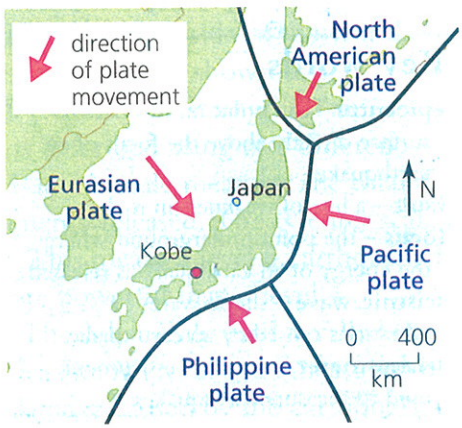
Japan lies in the middle of four **tectonic plates**. The huge Pacific plate is moving west at 10 cm every year. As it moves, it is forced underneath the North American and Philippine plate. The Philippine plate is also sliding underneath the Eurasian plate (Fig 3). The immense pressure of these movements has created **faults** (cracks) in the crust in Japan. There is a fault running through the Kobe area, but it had not moved for 50 years. Because it had not moved for such a long time, an enormous amount of pressure had built up. When the fault suddenly did move, shock waves spread out causing the earthquake. The **epicentre** of the earthquake was on Awaji Island in the Akashi Straits.

Q1 Where is Kobe?

Q2 Draw a labelled diagram to explain the cause of the earthquake.



▲ ***Fig 2*** *Collapsed building in Kobe.*



▲ ***Fig 3*** *Plate boundaries around Japan.*

EQE Kobe disaster report http://www.eqe.com/publications/kobe/kobe.htm

Effects of the earthquake

The primary effect of the earthquake was damage to buildings. Many older buildings collapsed completely. Wooden buildings in the poorer area of Kobe, Nagata, were flattened. Although wood is more flexible than concrete, the walls could not support the heavy tile roofs. A number of tall concrete buildings 'pancaked'. This means the walls gave way and each floor piled up on top of the one below. In the bay area, the soil liquefied during the earthquake. Buildings sank down into the ground and settled at dangerous angles (Fig 2).

The most devastating secondary effect was fire. Paraffin heaters and gas cookers set fire to buildings. The fire was made worse by gas escaping from broken gas pipes. The fire services could do little to help. Water mains had burst in the earthquake and the roads were blocked. In total 190 000 buildings were either destroyed or damaged and 300 000 people lost their homes and had to live in temporary shelters (Fig 4).

Q3 Draw a table to show the primary and secondary effects of the earthquake.

Human response

A few days after the earthquake, people became angry with the government. They said that the government had not done enough to help them. They claimed that:

- the emergency services took too long to arrive;
- the emergency services gave up looking for survivors after only 24 hours;
- there was a lack of rescue equipment, such as thermal image cameras;
- the government turned down assistance from other countries;
- the poorer part of the city received less help.

Q4 Why did the emergency services take a long time to reach earthquake victims?

Deaths	4 569
Injuries	14 679
Fires	175
Aftershocks	1 320
Schools	85% damaged
Industry	12% destroyed
Ports	90% destroyed
Bullet train	130 km of track closed

▲ ***Fig 4*** *Data on the Kobe earthquake.*

Key words

epicentre – the point on the Earth's surface directly above the focus of an earthquake

fault – a line of weakness in rock

tectonic plate – a large, rigid section of the Earth's crust

SUMMARY

- The earthquake was caused by the movement of tectonic plates.
- The major primary effect of the earthquake was building collapse.
- The major secondary effect of the earthquake was fire.
- The Japanese government was accused of not doing enough to help.

SUMMARY activity

Carry out a geographical enquiry into the Kobe earthquake. Use a variety of resources to find information.

Kobe City homepage http://www.city.kobe.jp/index-e.html

7 Living with volcanoes

In this section of the book you will investigate the following thing:

- **What are the benefits of living close to volcanoes?**

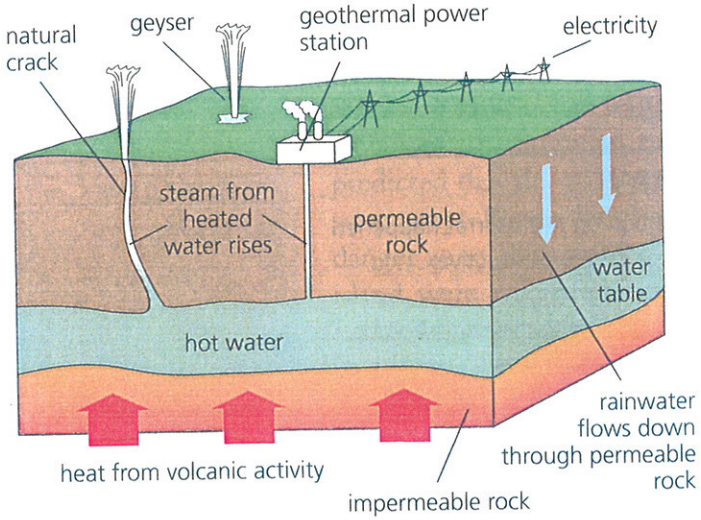
Volcanoes are one of the most powerful and destructive forces on Earth. In a single eruption they are able to destroy everything for miles around. Yet 360 million people around the world live and work next to volcanoes. Despite the dangers, volcanoes offer people many benefits.

Fertile soils

Mt Etna is an active volcano on the Italian island of Sicily. On average, Mt Etna erupts every ten years. Each time it erupts, it threatens the homes and farmland of the one million people who live on its slopes (Fig 1). People choose to live close to the volcano because of the high quality farmland. Ash erupted from the volcano weathers quickly to form very fertile soil. The rich soil is excellent for growing vines and fruit trees. Farmers can produce very high yields of crops. The money earned from selling the crops is thought to be worth the risks of a possible volcanic eruption.

▲ ***Fig 1*** *Mount Etna overlooking the town of Randazzo.*

Q1 Why are volcanic areas good for farming?



Geothermal energy

People living in volcanic areas can have access to cheap electricity and hot water. Underground water is heated by hot and molten rock deep in the crust. When the water is brought to the surface it turns to steam. The steam is used to drive turbines to produce electricity (Fig 2). Hot water brought to the surface can be used directly for central heating. Electricity and hot water produced in this way is called **geothermal energy**.

▲ ***Fig 2*** *Geothermal energy.*

USGS – living with volcanoes http://vulcan.wr.usgs.gov/Living With/Framework.html

New Zealand has a large geothermal energy plant at Wairakei. Fifty boreholes bring steam to the surface. The steam drives nine turbines to produce 150 megawatts of electricity. Unfortunately, the Wairakei plant has caused environmental problems. Too much water has been taken out of the rocks. As a result **geysers** and **mudpools** have dried up.

Q2 Draw a flow diagram to show how geothermal energy is produced.

Q3 How might geothermal energy benefit, and harm, the environment?

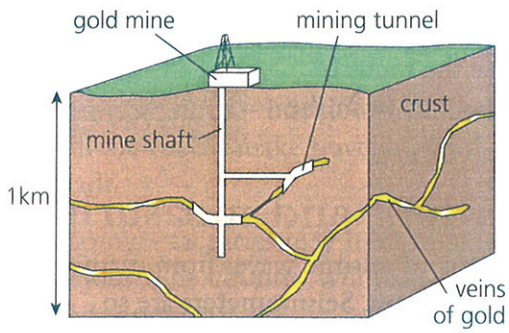
Tourism

Volcanic landscapes can be spectacular. Tourists visit volcanic areas to see unusual features such as craters, lava flows, hot bubbling mud pools and geysers. A very popular volcanic tourist destination in New Zealand is Rotorua (Fig 3). Rotorua is a crater lake, formed when a volcano exploded thousands of years ago. Close to Rotorua is an area with brightly coloured mud pools and geysers. One geyser gushes up to 18 metres into the air!

Hotels, restaurants and shops have been built in the area to cater for tourists. Many local people are employed in the tourist industry. This means the people of Rotorua benefit economically from living in a volcanic area.

▲ ***Fig 3*** *Rotorua, New Zealand.*

Q4 What makes volcanic areas attractive to tourists?



▲ ***Fig 4*** *Mining for gold in South Africa.*

Minerals

Several valuable minerals are found in volcanic areas. Hot liquids and gases move through cracks in the crustal rocks. The gases and liquids deposit minerals, such as copper, lead and gold in long 'veins' (Fig 4). Precious gem stones such as diamonds and sapphires are also found in volcanic areas. South Africa is a country with gold and diamond mines. Thousands of people are employed in mining them.

Key words

geothermal energy – heat and electricity produced from hot underground water

geyser – a jet of hot water and steam which erupts from a hole in the ground

mudpool – a pool of hot mud which bubbles with volcanic gases

SUMMARY

- Millions of people around the world live near to volcanoes.
- Volcanic ash and lava weather to make fertile soil.
- Geothermal energy can be produced in volcanic areas.
- Tourism in volcanic areas brings economic benefits.
- Valuable minerals, such as gold and copper, are mined in volcanic areas.

SUMMARY activity

Imagine you are an estate agent selling a house in Rotorua. Design an advert to persuade people that it is a good idea to live in a volcanic area.

Italy's Volcanoes http://www.geo.mtu.edu/~boris/STROMBOLI.html

6 Montserrat

In this section of the book you will investigate the following things:

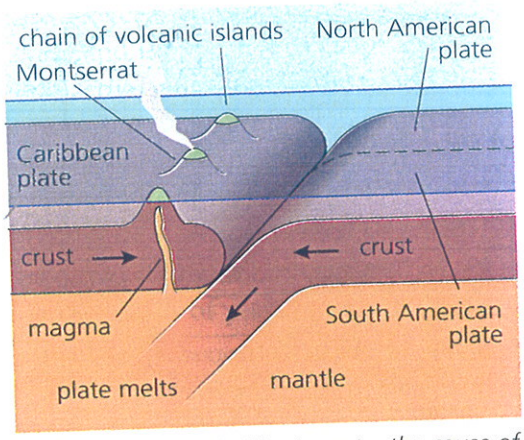
- What caused the volcanic eruption on Montserrat?
- What type of eruption occurred?
- What were the effects of the eruption on people, the economy and the enviroment?
- How have people responded to the eruption?

In 1995, a volcano began to erupt on the Caribbean island of Montserrat (Fig 1). The volcano, which had been dormant for 350 years, has shattered the lives of the 12000 people who lived on the island.

▲ **Fig 1** *The location of Montserrat.*

Cause of the eruption

Montserrat is close to a destructive plate boundary. The North and South American plates are sinking underneath the Caribbean plate. As the American plates sink into the mantle they are melted and destroyed (Fig 2). The melted plates become magma, which rises to the surface to form a chain of volcanic islands. The volcano which erupted on Montserrat is a composite volcano. Composite volcanoes are made from ash and thick lava, and erupt extremely violently.



▲ **Fig 2** *Montserrat – the cause of the eruptions.*

The eruption

In July 1995 a volcano called Soufrière Hills began to give off clouds of ash and steam. Scientists predicted that the volcano would soon erupt. People living in the danger zone, the south of the island, were evacuated to the north. In 1996 the volcano erupted. Fiery volcanic bombs were hurled out at 200 km per hour. **Pyroclastic flows** flattened and burned buildings and trees. Ash was blasted high into the air. When the ash settled it covered over two-thirds of the island, burying buildings and farmland. The volcano has continued to erupt regularly, and the southern part of the island is still off limits (Fig 3).

▲ **Fig 3** *Montserrat after the eruptions.*

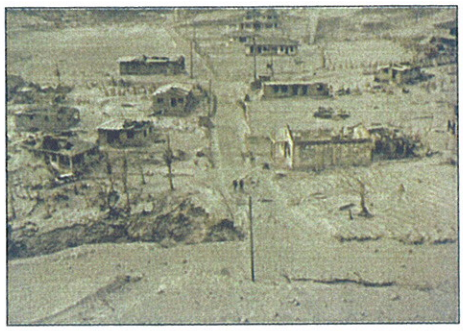
Q1 Why was the eruption on Montserrat so violent?

Q2 Use Fig 3 to calculate how far ash erupted from the volcano has travelled.

Volcano World – Soufrière Hills, Montserrat
http://volcano.und.nodak.edu/vwdocs/current_volcs/montserrat/montserrat.html

Effects

Many people have left Montserrat as **refugees**. The original population of 12000 is now less than 4000. Most refugees have either moved to Antigua or Britain. The people who have stayed on Montserrat have a difficult life. Over 60% of the housing was destroyed. Today, people have to live in crowded conditions in the north of the island. There is a lack of clean water and sewage facilities. There is no proper hospital, and few schools are open (Fig 4).



▲ ***Fig 4*** *Effects of the eruptions on Montserrat.*

Q3 Draw a sketch map of Montserrat. Label it to show how the people, the economy and the environment have been affected by the eruption.

Q4 Why do you think some people have chosen to stay on Montserrat?

Before the eruption most people worked either as farmers or in the tourist industry. There is little left of either industry. Most fields are buried under several metres of ash, and any goods that are grown are difficult to export because the main port is closed. The island is now considered too dangerous for tourists and the airport has closed. The loss of income has further reduced people's quality of life.

Montserrat used to have many trees and plants. Many of these are now dead. They have been burned by pyroclastic flows, buried by ash, or poisoned by acid rain. Much of the wildlife has also disappeared. Off the coast, coral reefs and sea creatures are dying. They have been buried by ash washed into the sea by rain.

Aid

Aid has been sent to the people of Montserrat from different areas. Other Caribbean countries sent food, shelters and medical help. **Non-government organisations**, such as the Red Cross, have also provided medicines and doctors. The British government offered £2600 to every adult in compensation. They also promised £42 million to rebuild houses, the hospital and the airport. The people of Montserrat did not think this was enough, and they rioted in protest.

Key words

aid – help given in the form of food, medical supplies, skilled people or financial loans

non-government organisation – an organisation which provides aid, but is not tied to any government

pyroclastic flow - a cloud of gas and ash ejected from a volcano

refugee – a person forced to leave their home by war or natural disaster

SUMMARY

- The eruption on Montserrat happened because it is on a destructive plate boundary.
- The volcano erupted volcanic bombs, pyroclastic flows and ash.
- The economy, based on farming and tourism, has been very badly affected.
- Over half the population have left Montserrat. Many people are angry that there was not more help from Britain.

SUMMARY *activity*

Write a letter from a person in Montserrat to the British Prime Minister. In the letter say what you need, and why the British government should help you.

Government of Montserrat – volcano site http://www.geo.mtu.edu/volcanoes/west.indies/soufriere/govt/

51 Urban challenges

In this section of the book you will investigate the following things:

- Why are cities growing rapidly in poorer countries?
- What problems have been caused by this growth?
- What have people done to try to solve the problems?

In 1950 there were only 80 cities in the world with over a million people. By the year 2000, this had risen to over 300 cities. Most of this growth has happened in poorer countries. People have **migrated** from the countryside to cities in search of better jobs, higher wages and better living conditions. This rapid growth of cities has caused a number of problems, to which governments are trying to find solutions.

City	Pop
Tokyo	29 m
Mexico	22 m
Jakarta	20 m
Sao Paulo	19 m
Seoul	18 m.

▲ ***Fig 1*** *The world's largest cities.*

Q1 What has caused the rapid growth of cities?

Q2 Where is the largest growth in cities taking place?

Jakarta, Indonesia

Indonesia is a country in South-east Asia (Fig 2). It is made up of 17 000 islands. The capital city of Indonesia is Jakarta. Since the 1950s Jakarta has grown rapidly. It has become the largest city in South-east Asia, with a population of 14 million. This growth has been caused mainly by **rural-urban** migration. A shortage of land in the countryside, and the possibility of a paid job in the city, has encouraged millions of people to move to Jakarta.

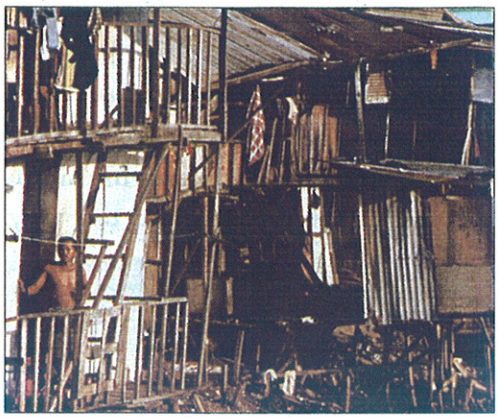
◀ ***Fig 2*** *Indonesia.*

Jakarta is a city of great contrasts. It has gleaming new office buildings, and luxurious apartment blocks for the better-off. However, it also has a lot of poor-quality housing and even **shanty towns**. Shanty towns have poor-quality buildings made from scrap wood, plastic and metal by the migrants.

Q3 Draw a map of Indonesia.

Encarta – Jakarta http://encarta.msn.com/find/Concise.asp?2=1&pg=2&ti=050D600

Problems



▲ **Fig 3** *A shanty town in Jakarta.*

A large number of migrants are not able to find a job in Jakarta. They may end up living in poverty on the streets. Those lucky enough to find a job in a factory may find that the pay is very low, and the work hard and dangerous. A shortage of cheap housing means that many migrants are forced to live in appalling conditions in shanty towns (Fig 3). The city authorities are struggling to supply the growing population with basic services. Piped water is unusual. Most people have to pump water up from underground by hand. This has caused the water table to fall and become polluted with sea water. Jakarta does not have a mains sewerage system. Human waste is collected in cess pits, which are emptied by special lorries. Traffic congestion is becoming worse as the number of cars, lorries and autotaxis increase. Vehicle exhaust fumes result in smog over the city. The smog can damage peoples' health.

Solutions

▲ **Fig 4** *High-quality housing in Jakarta.*

The local government of Jakarta is trying to solve some of the city's problems. Road congestion is being tackled by building large flyovers throughout the city, and by improving the railway. New towns have been built on the outskirts, but these have merged with Jakarta to form a **mega-city**. High-rise apartments have been built, but most people cannot afford the rent. Shanty towns have been destroyed, but this leaves people with nowhere to live. A successful solution has been 'self-help schemes'. People are given land and materials, and are allowed to build their own homes.

Q4 Describe the different types of housing shown in Figs 3 and 4.

Key words

mega-city – city with over ten million people.
migration – movement from one place to another
rural – countryside
shanty town – area of very low-quality housing
urban – town or city

SUMMARY

- The number and size of cities is increasing.
- The largest growth of cities is in poorer countries.
- The growth of cities is placing huge pressure on resources.

SUMMARY activity

Describe two problems caused by the growth of Jakarta. Explain what you think should be done to solve them.

Lonely Planet – Indonesia http://www.lonelyplanet.com/dest/sea/indo.htm

13 Limestone landscapes

In this section of the book you will investigate the following things:

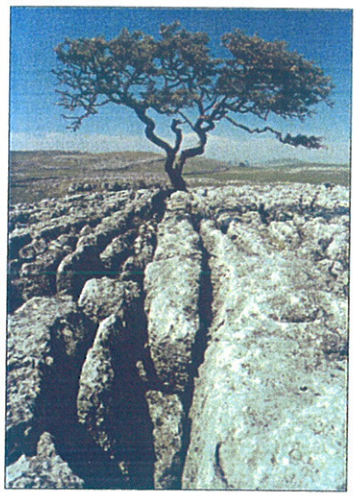
- How is limestone formed?
- What landforms occur in limestone areas?

Limestone

Limestone is a sedimentary rock. It was formed hundreds of millions of years ago, when warm tropical oceans were full of tiny sea creatures. As the creatures died, their shells and skeletons fell to the sea floor. Over many years they built up in thick layers and were stuck together to form new rock. Later, movements of the Earth's crust lifted the limestone high above sea level (unit 3). Today, we can still see the layers in limestone. These layers are called **bedding planes**. Limestone also has many cracks, caused when it was lifted out of the sea. The cracks are called **joints**. Water is able to flow through the bedding planes and joints in limestone. This means the rock is **permeable**.

Q1 Why does limestone contain fossils?

Q2 Why is limestone permeable?



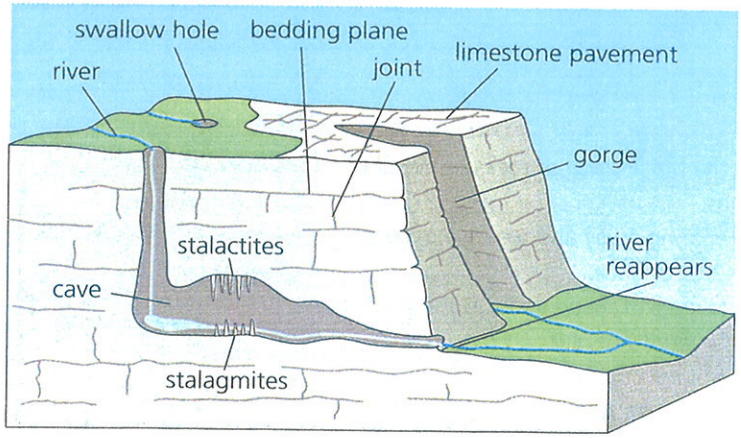
▲ ***Fig 1*** *Limestone pavement.*

Surface landforms

Limestone is a very hard rock, but it can be dissolved by rain water. Limestone is made of calcium carbonate, which is alkaline. Rainwater is acidic, so it reacts with the limestone and dissolves it. This is a very slow process. Only around 1 cm of limestone is dissolved every 100 years!

Rainwater attacks the limestone at its weakest points, the joints and bedding planes. This results in a unique landform at the surface. As the joints are worn away, blocks of stone are left behind. The enlarged joints are called **grykes**, and the blocks are called **clints**. This landscape is called a limestone pavement. There is a good example of a limestone pavement in the Yorkshire Dales (Fig 1).

Q3 What is a limestone pavement?



Underground landforms

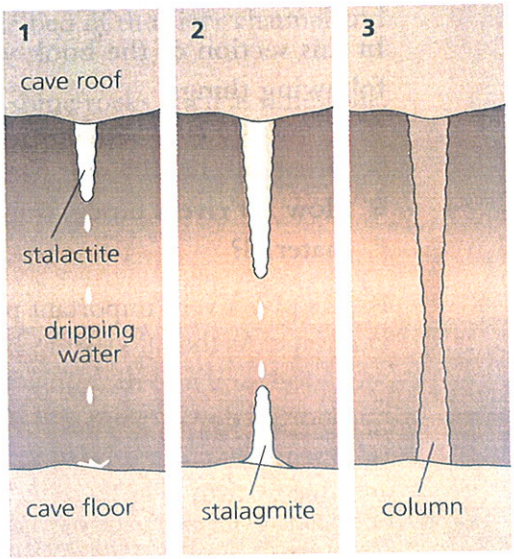
Very few rivers flow over the surface in limestone areas. Rivers disappear down holes called swallow holes. A swallow hole forms where a joint has been completely dissolved. Once underground, the river continues to dissolve the limestone. At first it

◀ ***Fig 2*** *Limestone features.*

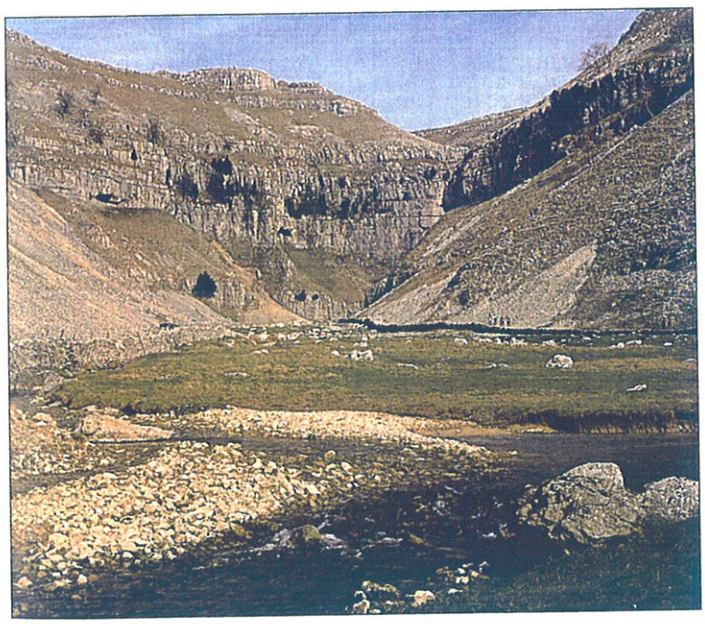
www National Park Service – Mammoth Caves http://www.pbs.org/wgbh/aso/tryit/tectonics/

forms tunnels, then caves and then huge caverns (Fig 2). The largest limestone cave system in the world is the Mammoth Caves in the USA. The Mammoth Caves are 560km long.

Limestone caves contain beautiful features called stalactites and stalagmites (Fig 3). These form when water drips from the roofs of caves. Each drip deposits a tiny amount of dissolved calcium carbonate. Over hundreds and thousands of years the calcium carbonate builds up to form icicle-shaped columns. Columns hanging from the roof are called stalactites. Those rising from the floor are called stalagmites. If stalactites and stalagmites meet, they will form a pillar.



▲ **Fig 3** *Formation of stalactites, stalagmites and pillars.*



In some places, the roof of a large cavern collapses. This forms a spectacular steep-sided valley, often with a river flowing through it. A valley formed in this way is called a **gorge**. Gordale, in the Yorkshire Dales, is an example of a limestone gorge (Fig 4).

Q4 What is the difference between stalactites and stalagmites?

Q5 How is a gorge formed?

◀ **Fig 4** *Gordale Gorge, Yorkshire Dales.*

Key words

bedding plane – a horizontal crack between layers of rock
clint – block of stone on a limestone pavement
gorge – a deep steep-sided valley
gryke – weathered joint on a limestone pavement
joint – a crack in the rock
permeable – allows water to flow through joints in the rock

SUMMARY

- Limestone is a sedimentary rock formed from the remains of ancient sea creatures.
- Limestone is weathered at the surface to form limestone pavements.
- Limestone is dissolved underground to form caves and caverns.

SUMMARY activity

Some people explore new limestone caves as a hobby. Imagine you have just discovered a new cave system. Draw a map of your caves and label the features you found.

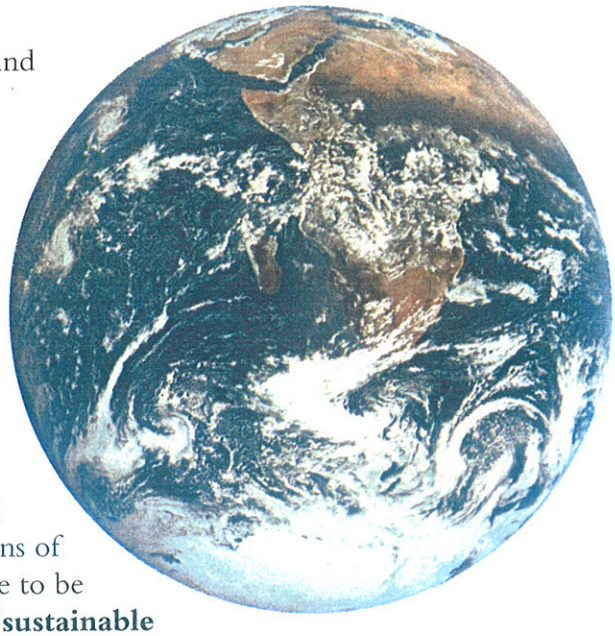
www The stupid page of rocks http://www.geocities.com/RainForest/Canopy/1080/

78 Sustainable development

In this section of the book you will investigate the following things:

- What is sustainable development?
- What is the environment?
- What are resources?
- What is Agenda 21?

We rely on the Earth's **environment**, and the **resources** it provides, for our survival. It is only in recent years that people have begun to think about the effects people are having on the Earth. In our rush to become rich, we are using up the Earth's precious resources, and at the same time we are polluting the environment. If we are not careful, we will run out of resources such as oil and gas within our lifetime, and the consequences of environmental pollution, such as global warming, could be disastrous for millions of people worldwide. If these problems are to be avoided, we need to adopt a policy of '**sustainable development**'. Sustainable development means 'meeting our needs today without compromising the ability of future generations to meet their needs'. In other words, we need to use fewer resources and take more care of the planet.

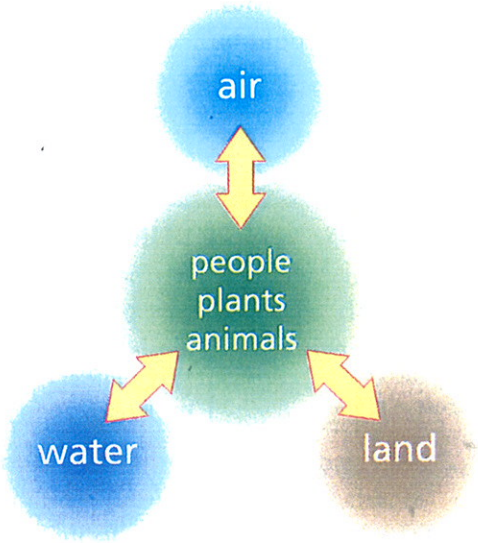


▲ ***Fig 1*** *The Earth, a limited resource.*

Q1 What is meant by the term 'sustainable development'?

The environment

The environment is the land, the air, the water and the living organisms of the Earth (Fig 2). All four areas of the environment are at risk from misuse by people. Twenty per cent of the land is at risk from **desertification** and **salinisation**. The air is being polluted, causing global warming, acid rain and ozone layer damage. The seas, rivers and lakes are being polluted with chemicals. A quarter of all species of plants and animals are at risk of extinction.



▶ ***Fig 2*** *The environment.*

Q2 What is the environment?

Planet.com http://planet.channel4.com/

79 National Parks

In this section of the book you will investigate the following things:

- What are National Parks?
- What are the demands on the environment in National Parks?
- How do these demands conflict?
- How can these demands be managed?

National Parks

National Parks are large areas of attractive countryside. There are eleven National Parks in England and Wales (Fig 1). National Parks were set up in 1949, to protect our most beautiful areas from uncontrolled development. Each National Park is managed by a **National Park Authority (NPA)**. National Park Authorities have two main jobs:

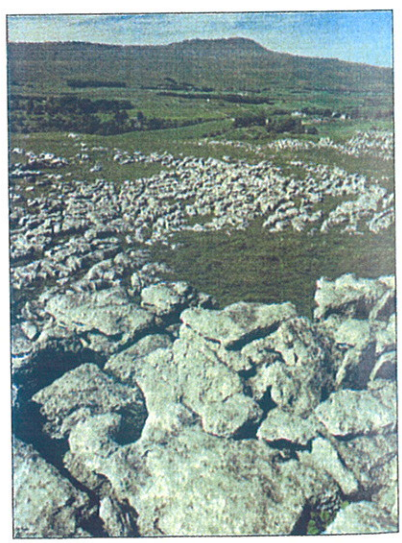
- To preserve the beauty of the landscape, and the traditional way of life of people living there.
- To encourage the public to visit the National Parks for recreation.

The job of the NPAs is difficult because they do not actually own the National Parks. Most of the land is owned by farmers and organisations such as the National Trust and Department of Defence.

◀ ***Fig 1*** *National parks.*

Q1 What is a National Park?

Q2 Name the eleven National Parks in England and Wales.



▶ ***Fig 2*** *Yorkshire Dales.*

The Yorkshire Dales

The Yorkshire Dales are a National Park in north-east England. The Park is an area of outstanding upland scenery. It contains areas of limestone which form spectacular features such as caves and gorges. As a result over one million people visit the Yorkshire Dales every year. These visitors put pressure on the environment. They also come into conflict with the people who live and work in the National Park.

Association of National Park Authorities http://www.anpa.gov.uk/

Classification of Industry

There are Four Types of Industry

1) Primary Industry involves Raw Materials

Raw materials are anything naturally present in or on the earth before processing. They are collected in three ways:

i) They can be quarried, mined or drilled for below the earth's surface — for example coal mining, oil drilling, gold mining.

ii) They can be grown — farming and forestry are both primary industries.

iii) They can be collected from the sea — fishing is also a primary industry.

2) Secondary Industry is manufacturing a Product

A product from Primary Industry is turned into another product. But the finished product of one Secondary Industry may be raw material for another.

For example, one factory may make tyres which are then sent on to be used in a car plant.

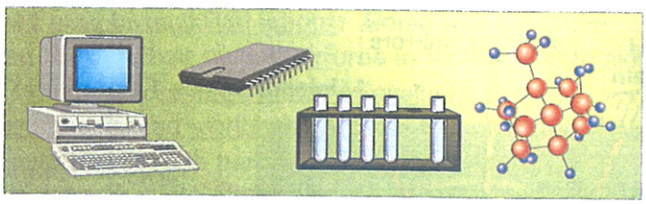
3) Tertiary Industry provides a Service

This involves a wide range of services instead of making anything, and is the largest group of industries in MEDCs.

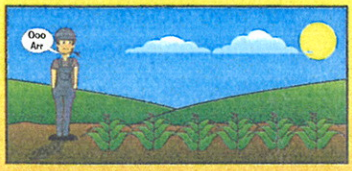
Examples are anything from teaching, nursing and retailing to the police force or the civil service and transport.

4) Quaternary Industry involves a small group of Research and Development industries

It's the newest industrial sector and is growing rapidly due to developments in information technology and communication.



PRIMARY INDUSTRY

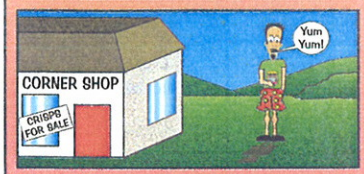


The farmer grows potatoes.

SECONDARY INDUSTRY

The factory processes the potatoes into crisps.

TERTIARY INDUSTRY



The crisps are sold in the corner shop.

QUARTERNARY INDUSTRY

Scientists are employed to research new production methods.

Industry is not the same as Employment

Industry is part of a chain — from raw materials to finished product, finished product to service sector and service sector to research and development. Employment is the job of work you do. So you could have a tertiary job as a secretary in a secondary industry like a toy factory. It isn't as daft as it sounds...

A day in the life of a crisp — and that's before lunch...

There you go — the four types of industry just ready for you to learn. But remember that quaternary industry is less common than the others — it doesn't have to be part of the process unless the company needs new research. Scribble a list of examples of all four industrial types.

Location of Industry

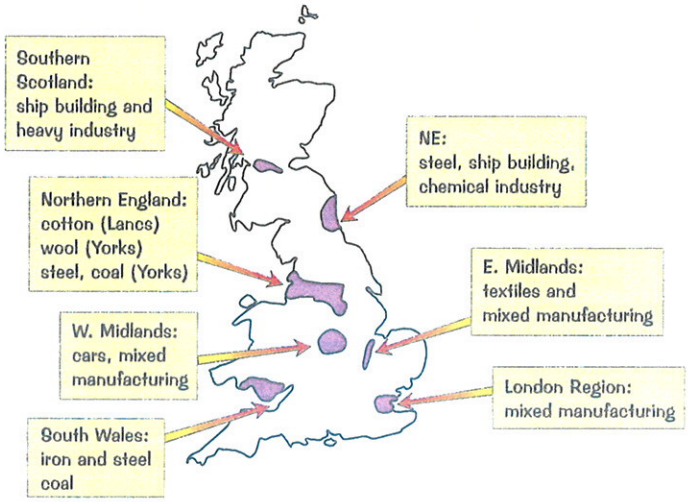
The growth of cities, population distribution and social and employment changes have all been affected by the location of industry. This page and the next page describe the four big influences on the location of industry — raw materials, labour supply, transport and the market. Learn on or get t'mill...

Raw Materials Influence Industrial Location

1) During the Industrial Revolution, new industries needed power supplies (originally fast flowing streams) and raw materials such as coal or iron ore. Industry grew up where these were easily available. A pattern of industrial location developed where different areas specialised in industries using local resources. For example South Wales developed a major coal industry, Sheffield was known for steel products (particularly cutlery) and Newcastle for ship building. As most of our natural resources are in the North of England, this became our Industrial Heartland.

2) Location near raw materials reduces transport costs, particularly if they are bulky or lose weight during the manufacturing process.

Traditional Manufacturing Regions of the UK



3) Ports became important too, as they were the source of any imported raw materials. Good examples are Liverpool and Bristol.

Labour Supply has influenced Industrial Location

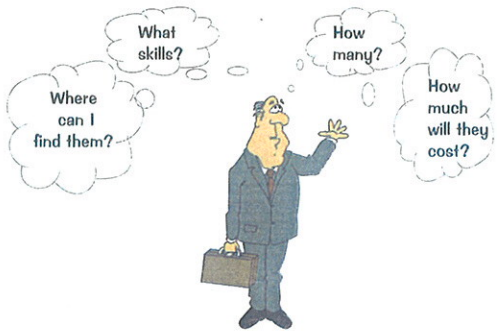
1) The availability of labour supply is important to industry. A new factory is likely to locate where there are enough people looking for work to fill their needs. Unemployment levels vary enormously by region, so this can be an important factor.

2) The labour supply must be suitable. There are three main types of labour requirement:

a) A large pool of unskilled labour: Some industries are happy to train their own workforce in the necessary skills, and simply need a large group of available people.

b) A large specialised workforce: Some industries need a large workforce with particular skills, and they will often locate near similar industries, as the workforce will meet this requirement.

c) A small highly skilled workforce: Some industries need highly skilled or qualified staff, and will need to locate where these people are available.



3) Labour costs also vary around the country, so industries try to locate in an area where they can keep these costs down. Industries requiring highly skilled workers are less likely to be able to do this.

Ship building is on the coast — unless you're Noah...

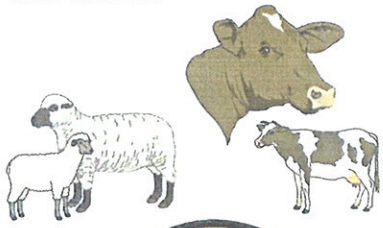
This page gives you the first two of four major influences on the location of industry. Raw materials and labour supply are extremely important in determining where you set up business if you're a heavy industry (eg. steel making). They're not as important in the UK nowadays as you'll find out on page 87...

Distribution of Farming Types

Farming depends on the physical characteristics of an area — the climate, soils and relief. Different farming types are associated with different areas, on a global and regional scale.

The Farming Type depends on the Climate

1) On a global scale, patterns of farming are associated with climatic belts — with distinct differences between the temperate and tropical climatic zones.



2) The temperate latitudes have mainly commercial farming — most of the countries involved are MEDCs — and their produce includes cereals, livestock and mixed farming. Intensive and extensive farming are found here, for example intensive horticulture in N.W. Europe, and extensive sheep farming in Australia.

3) The tropical latitudes have both commercial and subsistence farming, and mostly include LEDCs. Plantations are important, for example coffee and sugar plantations are found in Brazil — and both intensive and extensive farming are found.

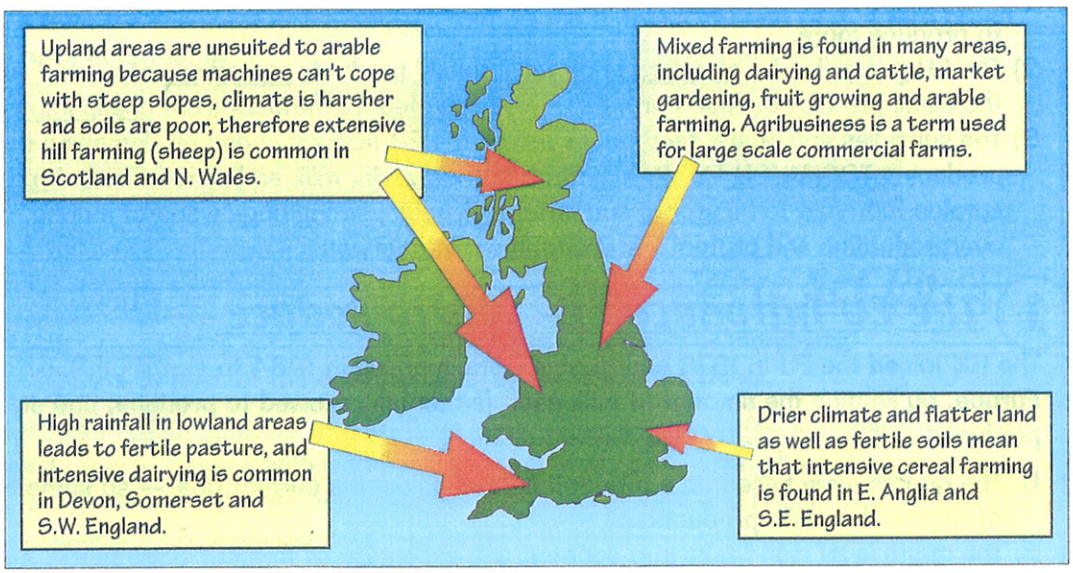
4) Areas of extreme climate (either hot or cold) have little sedentary (fixed) farming, but nomadic hunters or herders are found — e.g. the Tuareg herders of Sub-Saharan Africa, or the Inuit of North Canada.

Remember — physical characteristics are not the only influence on farming types, but they do dictate what type of farming is possible. Economic and Political influences are also important.

Rainfall and Relief Affects Farming on a Regional Scale

1) Patterns of farming can be identified within countries due to variations in rainfall and relief — the causes are demonstrated by the patterns evident in the UK.

2) The Western UK receives more relief rainfall due to its upland areas and prevailing westerly winds — the East has less rainfall, is flatter, and has a longer growing season. Farms in the South and East are more intensive, have larger fields and use more machinery than those in the North and West. This results in the distribution shown here. Remember that there are more types of farming in the UK than this, but there is a clear general pattern by region.



This page is about where it's at — farming, that is...

An easy page I reckon — but you've still got to learn the thing. Remember that farm location depends on several factors on a global or regional scale — and you need to have them all really clear. Scribble a list of the physical factors that influence what can be grown where, and how they influence the type of farming in that place.

Multinationals

Multinationals or MNCs (multi-national companies) are large corporations with branches in several countries. They've grown huge in trade and manufacturing over the last thirty years. They can also be called Transnational companies or TNCs to make things harder. Learn them both...

Multinationals are vital for World Manufacturing

1) Multinationals place different parts of their company in locations with the greatest benefits. Research and Development (R and D) are usually located in MEDCs where research facilities and staff expertise are better, and the manufacturing process is often completed in LEDCs or NICs where wages are lower, so production costs are cheaper.

2) Multinationals are extremely powerful. The largest — oil companies and car makers — have an annual turnover greater than the Gross National Product (GNP) of most LEDCs. It's estimated that in 1990 the hundred top multinationals controlled around 50% of all world manufacturing.

3) Many LEDCs try to attract multinationals by offering few restrictions on them, because they bring important capital investment into the country. This lack of restriction makes the multinationals even more powerful.

4) In the past, European and American companies controlled the global economy, now the Asian companies are becoming dominant. In 1972 there was one Japanese firm in the UK — by 1991 there were 220. The UK motorcycle industry was put out of business altogether at one stage due to competition from Japan. Competition from NICs is also growing – companies like Proton are increasing their share of the European car market.

Advantages and Disadvantages for the Host Country

Advantages

Multinationals.....

1) provide jobs and training for local people.
2) bring investment to the country.
3) provide expensive machinery and equipment which the host country cannot afford.
4) increase international trade and bring foreign currency.
5) provide health care and education for their workers and families.
6) increase wealth, providing a domestic market for consumer goods - which then creates more industry.

Disadvantages

Multinationals.....

1) provide largely low paid jobs often with long hours.
2) bring in foreign nationals for management and higher paid positions.
3) take much of the profit out of the host country.
4) make products for export rather than for the domestic market.
5) can pull out of the host country at any time — the host may become dependent on their employment.
6) may pay little regard to the protection of the host country's environment.

What a wonderful world — if you're a multinational...

There you have it, a clear list of the advantages and disadvantages of MNCs for a host country — just ready for you to learn. The best way to do it is to learn each numbered point one at a time, and then scribble down what you can remember without looking at the page. So get to it.