Topic 2: Volcanoes, earthquakes and floods

Structure of Earth

The earth's structure is made up of three layers:

- The crust
- The mantle
- The core

The crust is the outer part and is solid, but the mantle that lies beneath it is mostly made up of hot molten rock. The core at the centre is divided into the inner core and the outer core.

The crust is divided into the oceanic crust, which consists mostly of the ocean beds, and the continental crust which makes up the continents. The oceanic crust is usually less than 10 km thick and consists of heavy rocks rich in magnesium and iron. The continental crust is about 30 km thick and is made up of silica-rich minerals like granite. About 40% of the earth's surface is continental crust.

The crust consists of large slabs that "float" on the molten rock of the mantle beneath. These are called tectonic plates, and their edges are known as plate margins or plate boundaries. The plates move around at the rate of about 3 cm a year, probably due to convection currents caused by the heat of the molten rock in the mantle below.

New crust is made when magma from the mantle bursts through the earth's crust in volcanoes, and the volcanic lava cools and hardens to form rock. Surface rocks can also be melted by this heat, and disappear back into the mantle below, destroying some of the crust.

Volcanoes

Most volcanoes are to be found on the edges of tectonic plates.

The edges of the Pacific Plate are known as "The Ring of Fire", due to the large number of active volcanoes on the plate margins.

When tectonic plates rub against each other the mantle beneath is disturbed, resulting in earthquakes and volcanoes.

There are about 1500 volcanoes in the world that are considered "active".

Many volcanoes are caused by tectonic plates moving apart, or by one plate sliding under another.

Earthquakes

Like volcanoes, earthquakes are most common along plate boundaries. Several million earthquakes occur each year, but almost all of these are too weak to cause any damage. Tectonic plates slowly grinding against each other cause shock waves that vibrate through the crust and cause the ground to shake.

The earth's crust is weakest at the plate boundaries, so the underlying convection currents in the magma can cause pressure to build up that pushes the plates apart or together. This tension on the crust causes the rocks to shudder and then to slip suddenly, causing movement along lines of weakness in the crust. These lines are called faults, and are where most earthquakes occur. Earthquakes on the seabed can cause tsunamis.

People living along plate margins are at risk of being affected by earthquakes. The destructive effects of such quakes depend on the following:

- how many people live in the area
- the quality of the buildings they live in
- how well the area is prepared for an earthquake
- the availability of people to rescue and treat earthquake survivors

In countries like New Zealand and Japan where earthquakes are common, people have emergency plans and buildings are made to withstand quakes.

More damage and death occur in places where earthquakes are rare and people are unprepared.

There are several ways that people can prepare for earthquakes, and respond to them when they happen:

- helicopters, diggers and cranes can be kept for earthquake emergencies
- rescue teams are equipped and trained for emergencies
- medical teams are available to help, and there are emergency supplies of food and water
- emergency plans are made to cut gas and electricity when an earthquake strikes
- warning systems are in place to warn of approaching tsunamis and to give other information

On 12 January 2010, the most powerful earthquake ever to hit the country struck Haiti in the Caribbean Sea.

- 3,5 million people were affected by the quake
- 230 000 were killed
- More than 300 000 were injured
- 105 000 houses were destroyed, and 190 000 badly damaged
- 1,5 million people became homeless, and many had to live in tents
- 4000 schools were damaged or destroyed
- Over 600 000 people left the capital, Port-au-Prince, to live with relatives elsewhere
- Most of Haiti's communication lines were destroyed, delaying the arrival of aid
- In October 2010 an outbreak of cholera infected 216 000 people, and killed 900

One year after earthquake, 1,8 million people had received help

- Nearly 500 000 got improved temporary homes
- 720 000 were given clean water
- 890 000 got access to safe toilets
- 187 000 medical consultations were made
- 236 building teams were trained
- 39 schools were functioning again in less than six months
- 13 000 teachers were trained
- Nearly a million books were given to schools

Floods

Floods happen when there is too much water on the land, causing rivers, lakes and dams to overflow.

Certain things in the **environment** help to cause floods

- Heavy rain can quickly fill rivers and dams
- Steep slopes cause rainwater to run off the land very quickly
- Water flows fast over land that has lost its vegetation due to fires or too many animals grazing
- Tsunamis and big storms can flood coasts

People also help to cause floods by

- Building dams that can fill and overflow
- Removing natural vegetation to make fields for farming
- Covering the ground in cities with streets and buildings, causing water to flow fast
- Filling in wetlands and lakes that would normally store water from heavy rain

People and land can be affected by floods in many ways

- People drown or are injured
- Crops and animals are destroyed, resulting in food shortages
- Fertile soil can be washed away by soil erosion, leaving land infertile
- Buildings, property and transport systems can be destroyed
- Sewage can be washed out of sewerage works, polluting food and water
- Diseases spread easily after a flood
- Coastal flooding can cover the land with salt water, poisoning the soil and plants

Millions of people across the world live with the danger of floods because their homes are close to rivers. Why do people live next to rivers?

- They use river water for drinking, cooking and washing
- They need water for watering their crops
- Land next to the river is flat and easy to build on
- There is not enough suitable land elsewhere, or it is too expensive
- They have ways to protect themselves against floods

Floods are natural and can't be stopped from happening, but people can reduce the damage by:

- Building walls and barriers along river banks and coasts
- Improving drainage to get rid of water from heavy rain
- Building settlements away from river banks
- Making laws to prevent people living in high-risk flood areas
- Teaching people about the dangers of flooding
- Using lakes, wetlands and natural vegetation to slow down water flow