Earthquakes

Earthquakes are caused by the release of built-up pressure inside the Earth's crust. An earthquake's power is measured on the **Richter Scale** using an instrument called a **seismometer**. The effects of an earthquake can be devastating - they can destroy settlements, change landscapes, and cause many deaths.

Causes

An **earthquake** is the shaking and vibration of the Earth's crust due to movement of the Earth's plates (plate tectonics). Earthquakes can happen along any type of plate boundary.

Earthquakes occur when tension is released from inside the crust. Plates do not always move smoothly alongside each other and sometimes get stuck. When this happens pressure builds up. When this pressure is eventually released, an earthquake tends to occur.

The point inside the crust where the pressure is released is called the focus. The point on the Earth's surface above the **focus** is called the epicentre.

Earthquake energy is released in seismic waves. These waves spread out from the focus. The waves are felt most strongly at the epicentre, becoming less strong as they travel further away. The most severe damage caused by an earthquake will happen close to the **epicentre**.

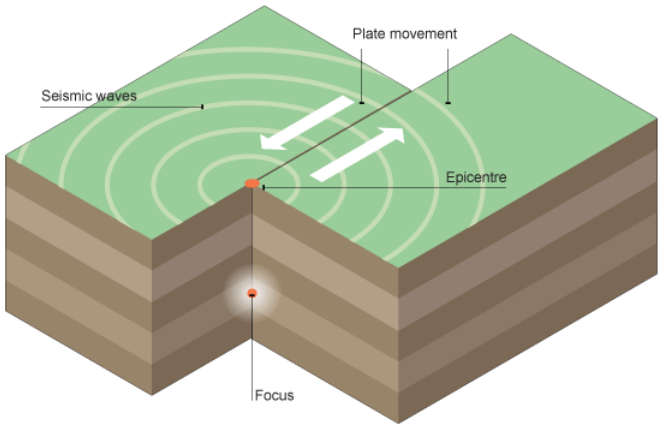

Diagram of an earthquake

Measurement of earthquakes

The aftermath of an earthquake, Golcuk, Western Turkey

The power of an earthquake is measured using a seismometer. A seismometer detects the vibrations caused by an earthquake. It plots these vibrations on a seismograph.

The strength, or **magnitude**, of an earthquake is measured using the Richter scale. The Richter scale is numbered 0-10:

Earthquakes measuring just one or two on the scale are very common and can happen everyday in places like San Francisco. These earthquakes are so small that people cannot feel them, they can only be picked up by a seismometer.

Earthquakes measuring around seven or eight on the Richter scale can be devastating. The earthquake in China's south-western Sichuan province in May 2008 measured 7.8 on the Richter scale.

Effects of an earthquake

Clearing rubble after an earthquake, Bhuj, India

Earthquakes can destroy settlements and kill many people. Aftershocks can cause even more damage to an area. It is possible to classify the impacts of an earthquake, by taking the following factors into account:

short-term (immediate) impacts
long-term impacts
social impacts (the impact on people)
economic impacts (the impact on the wealth of an area)
environmental impacts (the impact on the landscape)

	Social impacts	Economic impacts	Environmental impacts
Short-term (immediate) impacts	People may be killed or injured. Homes may be destroyed. Transport and communication links may be disrupted. Water pipes may burst and water supplies may be contaminated.	Shops and business may be destroyed. Looting may take place. The damage to transport and communication links can make trade difficult.	The built landscape may be destroyed. Fires can spread due to gas pipe explosions. Fires can damage areas of woodland. Landslides may occur. Tsunamis may cause flooding in coastal areas.
Long-term impacts	Disease may spread. People may have to be re-housed sometimes in refugee camps.	The cost of rebuilding a settlement is high. Investment in the area may be focused only on repairing the damage caused by the earthquake. Income could be lost.	Important natural and human landmarks may be lost.

Effects are often classified as primary and secondary impacts. Primary effects occur as a direct result of the ground shaking, eg buildings collapsing. Secondary effects occur as a result of the primary effects, eg tsunamis or fires due to ruptured gas mains.

Factors affecting the impact of an earthquake

Distance from the epicentre – the effects of an earthquake are more severe at its centre.

The higher on the Richter scale, the more severe the earthquake is.

Level of development – MEDCs are more likely to have the resources and technology for monitoring, prediction and response.

Population density (rural or urban area). The more densely populated an area, the more likely there are to be deaths and casualties.

Communication - accessibility for rescue teams.

Time of day influenceS whether people are in their homes, at work or travelling. A severe earthquake at rush hour in a densely populated urban area could have devastating effects.

The time of year and climate will influence survival rates and the rate at which disease can spread.

Earthquakes and volcanoes in LEDCs

LEDCs often suffer more from the effects of volcanoes and earthquakes than MEDCs

The effects of an earthquake or a volcano in LEDCs

Communication systems may be underdeveloped, so the population may not be well educated about what to do in the event of a volcanic eruption or an earthquake.

Construction standards tend to be poor in LEDCs. Homes and other buildings may suffer serious damage when a disaster occurs.

Buildings collapsing can cause high death tolls.

Evacuation and other emergency plans can be difficult to put into action due to limited funds and resources.

Clearing up can be difficult. There may not be enough money to rebuild homes quickly and safely.

Many people could be forced to live in emergency housing or refugee camps.

Case studies

Kobe, Japan, 1995 – MEDC

On 17th January 1995, an earthquake struck Kobe, a heavily populated urban area in Japan. It measured 7.4 on the Richter scale and occurred as a result of plate movement along the boundary between the Philippines Plate, Pacific Plate and Eurasian Plate.

Effects: Key Fact - primary effects happen immediately. Secondary effects usually occur as a result of the primary effects.

Primary effects	Secondary effects
35000 people injured. Buildings and bridges collapsed despite their earthquake proof design.	Buildings destroyed by fire when the gas mains fractured. 316000 people left homeless and refugees moved into temporary housing.

Responses

These can be divided into short and long term.

Short term	Long term
People were evacuated and emergency rations provided. Rescue teams searched for survivors for 10 days.	Many people moved away from the area permanently. Jobs were created in the construction industry as part of a rebuilding programme.

Kashmir earthquake – LEDC

On 8th October 2005, an earthquake measuring 7.6 on the Richter scale hit the Kashmir region of Pakistan. The earthquake was the result of collision between the Indian and Eurasian plates.

Effects

Primary effects	Secondary effects
Buildings collapsed. 79000 people were killed. Landslides, and large cracks appeared in the ground.	Broken sewerage pipes contaminated water supplies and spread disease. People died of cold during the harsh winter.

Responses

Short term	Long term
The army and emergency services arrived to join the rescue effort. Tents were given out by charities. Aid workers arrived from abroad to find survivors and treat the injured.	Schools and hospitals were rebuilt. Building regulations were improved to reduce damage and the death rate in future earthquakes.

Kashmir earthquake – LEDC