

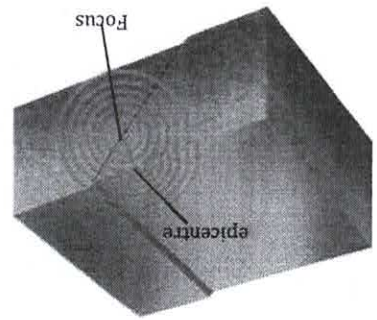
Unit 4 Earthquakes

4.1 Formation of earthquakes

- An earthquake is the sudden, violent shaking of the Earth, caused by the movement of faults.
- When two slabs of crust move against each other or one dives beneath the other, movement on the fault between them produces earthquakes.
- Collapses in mines can also produce.

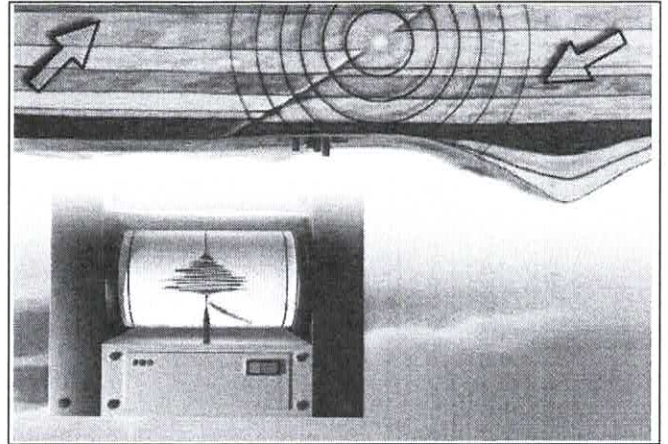
4.2 Measurement and recording earthquakes

- The focus – the point below the surface where the earthquake starts.
- The epicentre – the point on the Earth's surface immediately above the focus.



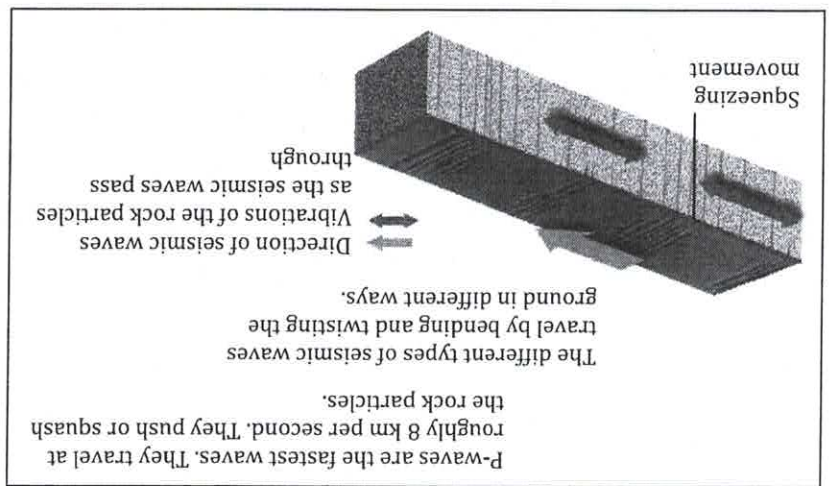
*The focus and epicenter of an earthquake*

- Seismic or earthquake waves – shock waves which move out from the focus in all directions.
- Seismograph – the instrument which measures seismic waves.
- Seismogram – the graph showing the strength of the seismic waves.

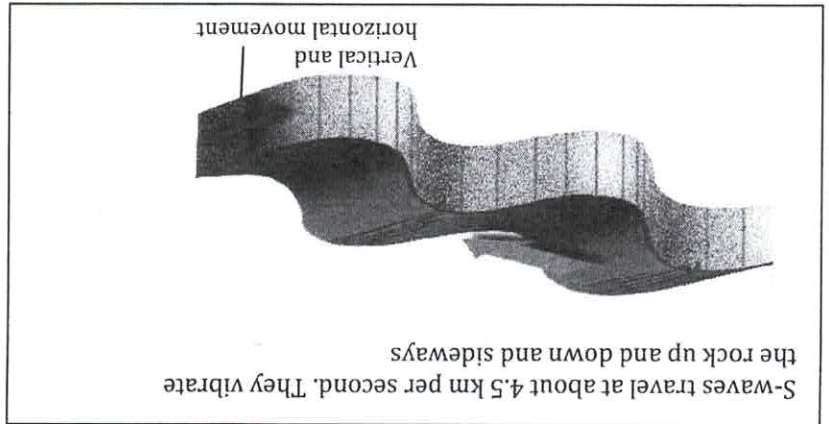


## 4.3 Earthquake waves

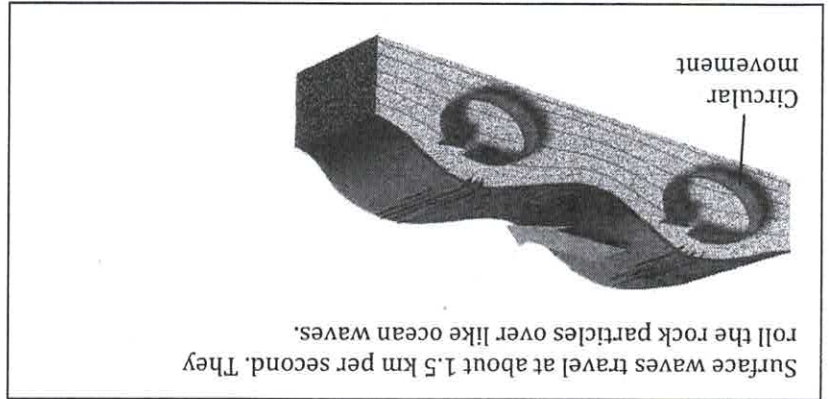
- Primary waves (P-waves) – fastest waves – squeeze and stretch the ground.



- Secondary waves (S-waves) – move the rock up and down and sideways at the same time.

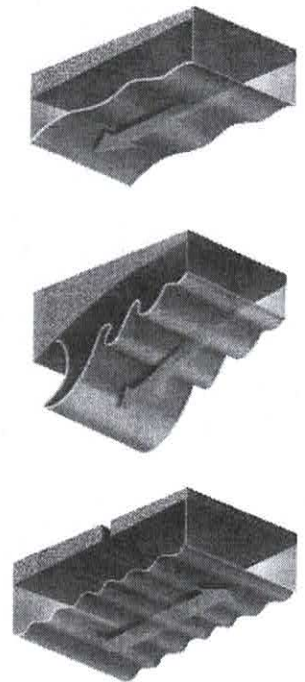


- Surface waves – similar to ocean waves, they roll the rock particles over in circles – in the crust of the Earth.



## 4.3.1 Tsunami

A tsunami is a big ocean wave that is created by a strong earthquake, a volcano, undersea slump or a large meteorite that hits the sea or nearby land.



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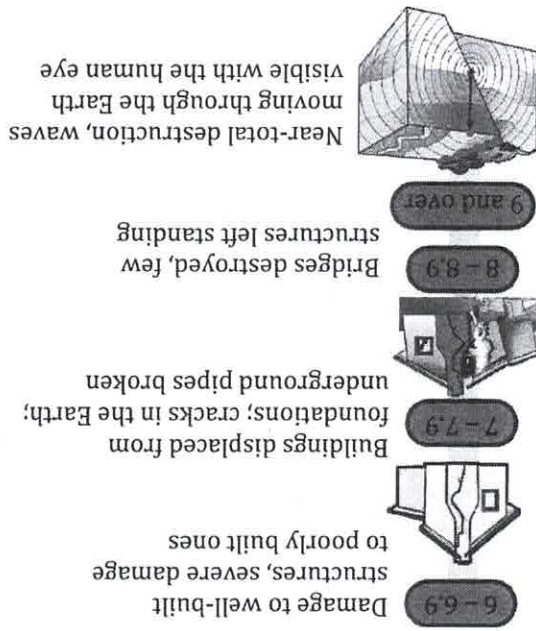
- 1 Under-sea earthquake – rise and fall in ocean floor.
- 2 Wave causes sea level to rise.
- 3 Near land, tsunami wave slows down and builds in height. Sea draws back and creates a big wave that speeds onto land.

## 4.4 Strength of earthquakes

Earthquakes are measured using the Richter scale. It is a logarithmic scale used to measure the energy emitted by earthquakes and to compare the strength of different earthquakes.

Measures energy waves emitted by earthquake

- 0-1.9 Can be detected by a seismograph only
- 2-2.9 Hanging objects may swing
- 3-3.9 Similar to the vibration of a passing truck
- 4-4.9 May break windows, cause small or unstable objects to fall
- 5-5.9 Furniture moves, chunks of plaster may fall from walls



## 4.5 Effects of earthquakes

- Electricity, gas and water supplies are disrupted.
- Dam walls may break and cause landslides and mudslides.
- A shortage of fresh drinking water, food and medical supplies result.
- Industries may be forced to close.
- Diseases may break out.
- Near the coast, tsunamis (very large ocean waves) may occur.
- High fatalities in densely populated areas, instant loss.

### 4.5.1 Why earthquakes have a greater impact on developing countries

Developed countries	Developing countries
Researchers and geologists provide vital information to predict earthquakes.	Under spend on research or complete lack of research.
Construct earthquake-resistant buildings, causing less destruction.	Higher population density, more informal settlements – more deaths.
Better emergency services and medical facilities.	Lack infrastructure and facilities to care for larger population.
Better communication networks – keep people informed and provide early warning signals.	Lack communication infrastructure.
More educated about how to protect themselves when earthquakes strike.	Generally unprepared. People live in high risk disaster zones, because of limited space.

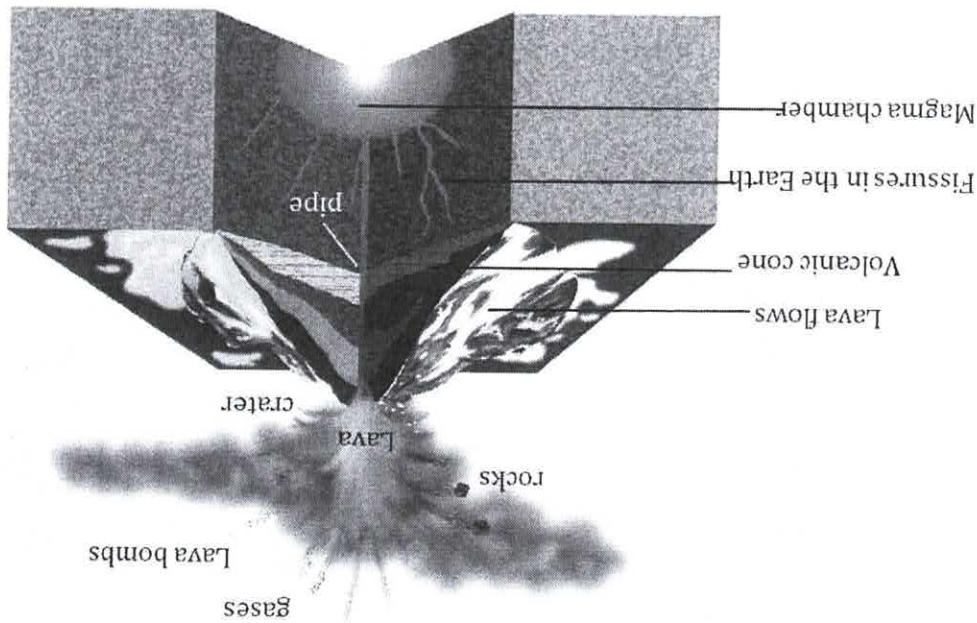
### 4.5.2 Initiatives in developed countries to prepare for earthquakes

- Search and rescue teams supported by block captains (California).
- Establish a trailer morgue (California).
- Specialists using concrete-cutting chain saws to open holes to save trapped victims.
- Establishment of first aid stations with volunteer doctors and nurses.
- Setting up earthquake warning systems (Japan, Mexico).
- A nation-wide alert system (Japan). California doesn't have one yet.
- Quakeproof utility ducts deep below Tokyo to minimise damage to water, electricity, telephone, and sewage lines.

Unit 5 Volcanoes

5.1 Formation of volcanoes

Material ejected by volcano

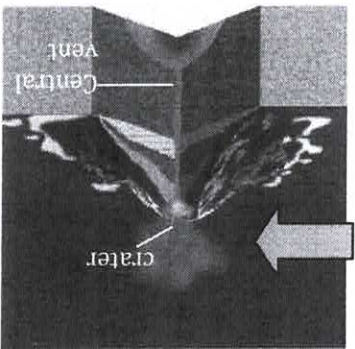
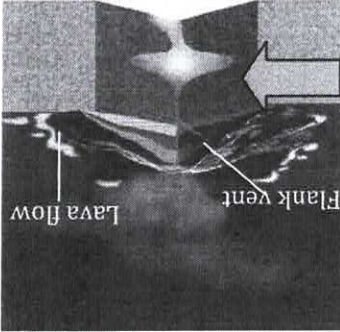



- Volcanoes are formed when molten material (magma), below the Earth's surface, rises through cracks/pipes and forms a magma reservoir/chamber.
- Magma moves through a pipe onto the Earth's surface through a vent.
- Molten rock at the Earth's surface is called lava.
- A volcano can have several pipes. Some don't reach the surface.

5.2 Classification of volcanoes

- Active – erupt regularly. Example: Anak Krakatau, erupted 2007.
- Dormant – have erupted in recorded history and could do so again. Example: Fujiyama
- Extinct – have never erupted in recorded history and probably will not do so. Example: Mt Kenya

## 5.3 Types of volcanoes

 <p>Labels: crater, Central vent</p>	<ul style="list-style-type: none"> <li>• Cinder cones (simplest volcanoes): Form when eruptions shoot great quantities of ash and particles of glassy lava into the air. The particles solidify in the air and rain down around the vent. Conical peaks are steepest. Consist of ash and solid material.</li> <li>• The eruption is explosive. Lava is limited. Example: Italy's Monte Nuovo</li> </ul>
 <p>Labels: Flank vent, Lava flow</p>	<ul style="list-style-type: none"> <li>• Shield volcanoes: Form when lava flows out of a central vent. The result is gentle slopes of enormous breadth. Bases are dozens of kilometres wide.</li> <li>• The eruption is not explosive. Example: Hawaii's Mauna Loa</li> </ul>
 <p>Labels: Layers of lava and ash</p>	<ul style="list-style-type: none"> <li>• Composite volcanoes: Form when alternating layers of ash, lava and rocks are created by multiple and often explosive eruptions. Characterised by a steep-sided conical peak.</li> <li>• Example: Vesuvius in Italy and Fuji-yama in Japan</li> </ul>

## 5.4 Impacts of volcanoes on people

Positive impacts		Negative impacts	
Tourist attractions: Caldera, hot springs, geysers.	Volcanic ash is a good fertilizer.	Can emit dangerous fumes/particles.	Ash can pollute water supplies.
Volcanic material forms fertile soil.	Ash can reduce visibility, interfere with aircraft flights.	Diamonds can be found in some old volcanic pipes.	Mud flows can cover settlements.