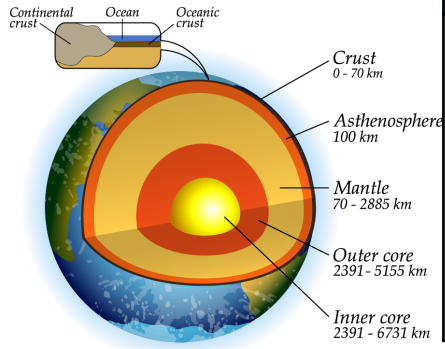




A natural hazard is a naturally occurring event that poses risk to humans and property.

EARTH IN CROSS SECTION



Convection currents	Ridge Push	Slab Pull
The mantle has convection currents circulating because the core heats up the mantle.	New hotter, less dense crust is formed at constructive plate boundaries, as this cools it sinks. This process continues to push the plates apart.	The process of subduction drags the rest of the plate behind it.

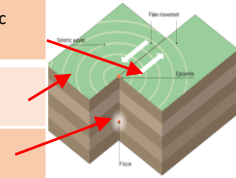
Causes of Earthquakes

Earthquakes are caused when two plates become **locked** causing **friction** to build up. From this **stress**, the **pressure** will eventually be released, triggering the plates to move into a new position. This movement causes energy in the form of **seismic waves**, to travel from the **focus** towards the **epicentre**. As a result, the crust vibrates triggering an earthquake.

The point directly above the focus, where the seismic waves reach first, is called the **EPICENTRE**.

SEISMIC WAVES (energy waves) travel out from the focus.

The point at which pressure is released is called the **FOCUS**.

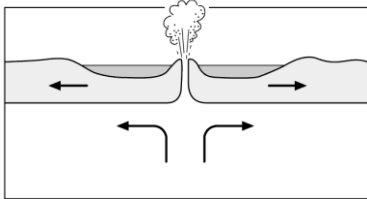


Measuring earthquakes:

- Richter Scale
- Mercalli Scale
- Moment Magnitude

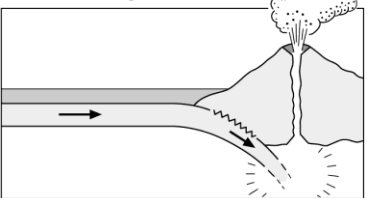
The earth's crust is split into tectonic plates. Where this border each other different processes occur which create different hazards.

Constructive margin



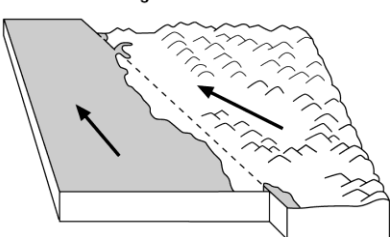
The plates are moving apart, new hot and less dense oceanic crust is forming. Earthquakes occur as the plates move. Shield volcanoes supply an almost constant flow of lava which creates new crust.

Destructive margin



The denser oceanic crust subducts under the continental crust. The friction between the plates builds up pressure which is released suddenly into violent earthquakes. The subducting plate enters the hot mantle and melts. This melt rises as a gas rich magma. This means pressure builds as it reaches the surface creating explosive and highly dangerous composite cone volcanoes.

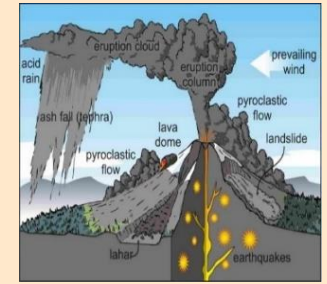
Conservative margin



The crust isn't created or destroyed at conservative plate boundaries. The plates slide past each other. Friction builds up creating violent earthquakes.

Volcanic Hazards

Ash cloud	Small pieces of pulverised rock and glass which are thrown into the atmosphere.
Gas	Sulphur dioxide, water vapour and carbon dioxide come out of the volcano.
Lahar	A volcanic mudflow which usually runs down a valley side on the volcano.
Pyroclastic flow	A fast moving current of super-heated gas and ash (1000°C). They travel at 450mph.
Volcanic bomb	A thick (viscous) lava fragment that is ejected from the volcano.



Prediction

Prediction involves using **seismometers** to monitor earth tremors. We can use this to understand **where** earthquakes will happen but it is difficult to know when. **Animal behaviour has also been linked to predicting earthquakes.**

Planning

Hospitals, emergency services and residents practise for an **earthquake**. They have drills so that people know what to do in the event of an earthquake. This helps to **reduce the impact** and increases their chance of survival. Residents are also encouraged to create emergency **earthquake kits** with things such as: **hardhats, torches, first aid**

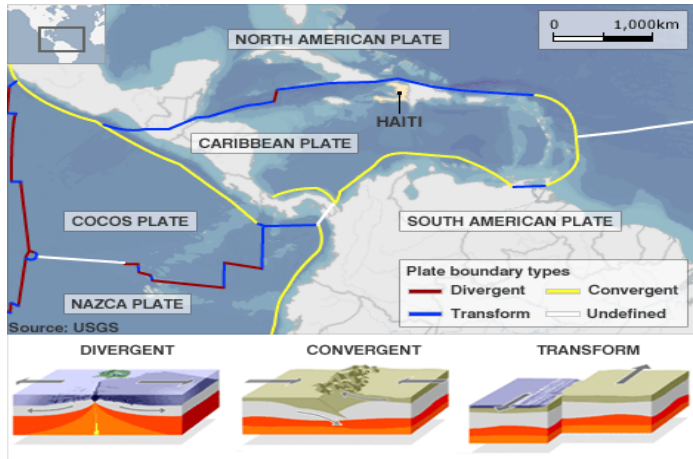
Protection

Protection involves constructing **earthquake resistant buildings** so that they are safe to live in and will not collapse. Some examples of building improvements are:

- rubber shock absorbers** in the foundations to absorb the Earth tremors
- steel frames** that can sway during Earth movements
- open areas** outside of the buildings where people can assemble during an evacuation

Case studies

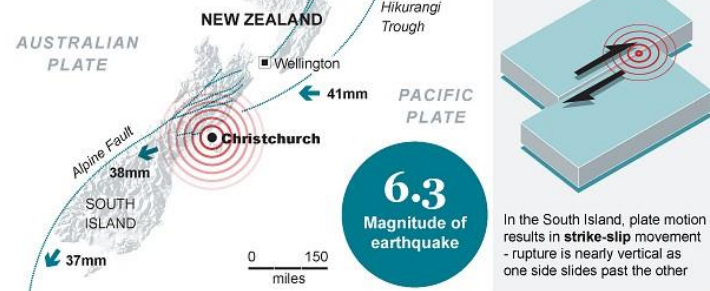
	Christchurch, New Zealand (HIC)	Haiti Earthquake, Caribbean (LIC)
GDP	\$41,000 per person, 27 th in the world	\$1,200 per person, 168 th in the world
HDI (Human Development Index)	0.913, 9 th in the world	0.483, 163 rd in the world
Population	4.5 million	9.7 Million
When?	22 nd February 2011	12 th January 2010
Background	A 6.3 magnitude . The epicentre was 10km South East of Christchurch and the focus was very shallow at 5km.	7.0 richter scale Focus 13km underground. The epicentre was 25km from the capital Port-au-Prince.
Effects	185 people were killed 3, 129 injured 50% of the Central City buildings were damaged 3.5m tsunami on Lake Tasman Water pipes, bridges, power lines and cell phone towers were taken down Damage to roads due to liquefaction	220 000 people were killed 300 000 people were injured 1.3 million people were displaced 1000000 homes were destroyed The damage to the port meant that critical aid and supplies were prevented from arriving. Over 2 million Haitians were left without food and water. Looting became a serious problem The tourist industry declined. By November 2010 there were outbreaks of cholera.
Responses	<ul style="list-style-type: none"> Water supplies were restored to 70% of households within 1 week The New Zealand Defence Force provided equipment, transport, evacuation, food and water aid to 1000 homeless people as a result of the earthquake A full emergency response plan was in place within 2 hours of the earthquake happening Satellite imagery was used to co-ordinate the recovery of New Zealand The Australian police joined forces with New Zealand police to enforce cordons, organise evacuations, help with search and rescue, traffic control and prevention of looting 	<p><u>\$100 million in aid given by the USA and \$330 million by the European Union</u></p> <p>Lack of immediate aid through poor planning, management and access meant that people had to try and rescue each other</p> <p><u>4.3 million people provided with food rations in the weeks following the earthquake</u></p> <p>1 million people were still without houses after 1 year so still have to live in aid camps</p>



PLATES AND FAULT LINES

New Zealand straddles the boundary of two slowly moving tectonic plates

— Fault line
← Relative movement per year



Questions from previous exams

1. Explain how the risks of a tectonic hazard can be reduced. (4 marks)
2. Choose either an earthquake or a volcanic eruption. Assess the extent to which primary effects are more significant than secondary effects. (9marks)
3. 'Long-term responses to a tectonic hazard are more important than immediate responses'. Do you agree? (9 marks)
4. To what extent do the effects of a tectonic hazard vary between areas of contrasting wealth? Use one or more named examples in your answer. (9 marks)