Restless Earth

What are volcanos?

An opening in the Earth's crust through which lava, ash, steam, rock particles and gas are erupted from the mantle.

Active – recently erupted and could do again at any time.
Dormant – has not erupted for a long time but still could.
Extinct – can no longer erupt.

How do you measure how severe volcanos are?

VEI = **volcanic explosivity index**. This scale runs from **0-8** and looks at:

- how far the ash has travelled
- the volume of material ejected
- how often that type of eruption occurs

It is a **logarithmic scale** where each step of the scale means a 10-fold increase in severity.

Facts:

There hasn't been a VEI-8 eruption in the last 10,000 years. The largest in human record was **Mount Tambora in Indonesia in 1815** which registered 7 on the VEI. The eruption was so loud it could be heard 12,000 miles away.

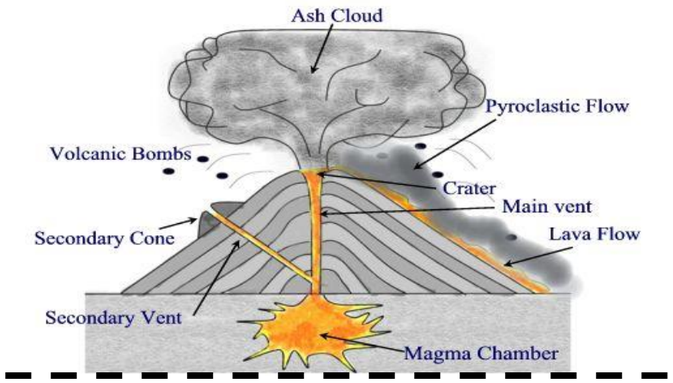
Why do people live near volcanoes?	
Push factors	Pull factors
Danger to life	Fertile soils
Lava bombs/lava flows etc	Beautiful scenery
Sulphur damages crops	Tourism
Mudslides	Valuable resources e.g. crystals

What happened in Iceland in 2010?

Iceland is located on the North-American and Eurasian plate. The plates move apart on a constructive boundary. This causes magma to rise to the surface and form volcanos. The latest eruption happened under a glacier, cooling the magma quickly resulting in glass particles entering the plume.
It resulted in local and global consequences.

Consequences
Social
Economic
Environmental

The impacts of E-15	
Local impacts	Global impacts
• Areas located under the glacier were flooded.	• Travel was severely disrupted around the world as flights were grounded.
• Farming land was damaged by the ash.	• It happened during the Easter holidays so many people were travelling.
• E-15 has become a new tourist attraction	• Sporting events were cancelled.
• Local water sources were contaminated by fluoride	• Perishable food was wasted as could not be transported.
• Businesses lost money and trade.	



The 3P's

Protection: Design and build structures that are safe and provide protection rather than cause danger in an earthquake.
Prediction: This is difficult to do but there are some ways of forecasting when an event may occur.
Preparation: Involves people taking action to minimise the potential damage. Countries invest in well trained emergency services, they prepare hospitals and educate the population on how to respond

How do different countries respond to natural hazards?

	Japan:	Nepal:
- Population:	127.3million	27.8million
- Yearly income:	$38,600	$694
- Life expectancy:	84 years	69 years
- Literacy rate:	99%	57%
- People per doctor:	500	4800

Prediction – Due to Japan being an AC, it had greater access to technology and money that allows them to do a lot of research into previous earthquakes, therefore patterns can be identified allowing future prediction.

Preparation – Japanese school children are taught how to prepare for earthquakes at school. They complete drills, have helmets available in school and have chutes to escape school quickly. Japan also use earthquake simulators for Japanese school children, so they know what an earthquake feels like. They do not have this technology in Nepal.

Protection – due to having more money, ACs can build earthquake proof buildings, designed to withstand strong quakes. These have steel frames and counter-weights allowing the building to flex, but not fall. Infrastructure in Nepal is much less advanced, and buildings do not have the same technology.

What are earthquakes?

A violent shaking of the Earth's crust. Earthquakes can cause vast damage and loss of life and are very difficult to predict. They are unevenly distributed globally.

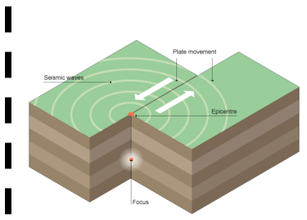
Unlike climatic hazards, there is **no season or time of year** when earthquakes are most common.
They are geological hazards created by plate movements and **can occur at any time**, **often with very little warning**.

How do earthquakes form?

1. Tectonic plates are not smooth; they are jagged and rocky. Their edges grind together and stick.
2. This snagging creates stress and friction between the plates.
3. This friction builds up until it can no longer cope with the stress the rocks carry.
4. At this point, the rocks will suddenly jolt and move forward.
5. This sudden movement is the earthquake and it releases energy through seismic waves.

The structure of an earthquake

Epicentre - the point on the Earth's surface directly above the focus, where the earthquake is felt at its strongest.
Focus - the location in the Earth's crust where the earthquake starts.
Seismic waves - a wave of energy emitted from the focus which passes through the Earth.



An earthquake's shaking power is measured on the **Richter scale** using an instrument called a **seismometer**. A seismometer detects the vibrations caused by an earthquake and plots the vibrations on a seismograph. It is numbered from 1-10. It is a logarithmic scale which means that an earthquake which measures '6' on the Richter Scale is 10 times more powerful than a '5' and 100 times more powerful than a '4'.

Impacts of the Nepal Earthquake – 25th April 2015		
Social	Economic	Environmental
- 8000 people killed - Displaced over 450,000 people. - Schools and hospitals collapsed - Temples destroyed.	- Roads and other infrastructure destroyed. - Damage added up to half of Nepal's wealth.	- People forced to sleep on parks caused damage to land.

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What are natural hazards?

A natural hazard is a naturally occurring event that is likely to have a negative effect on people, property and the environment.

Examples: Volcanic eruption, tsunami, earthquake, flood, storm

What are human hazards?

Human hazards result because of human actions including those which are deliberate and those which are accidental. They can present danger or risk to people, property and the environment.

Examples: arson, terrorism, nuclear disaster, war, crime

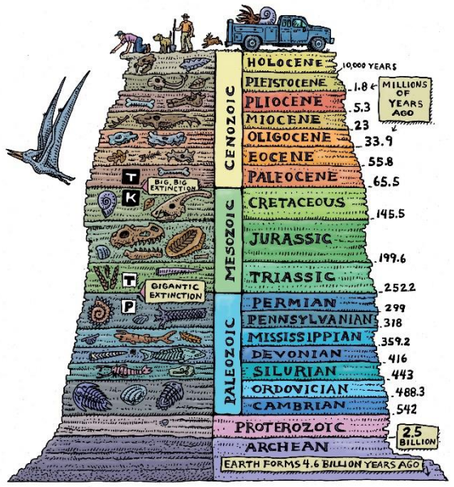
The danger of hazards

The factors affecting how dangerous a hazard can be include:

- The location of the hazard – if it happens in a rural area it will cause less damage than urban.
- The population in the area.
- The wealth of the area.

Geological timescales

- Split into 4 main eras
- Each era is split into geological periods.
- Time is measured in millions of years.
- Life was very different in each era, AND within each period.



The Earth is 4.6 million years old. It looked very different back then.

Continental drift

- To begin, all the continents formed one super-continent called Pangea.
- Slowly, they drifted apart into 2 continents; Laurasia in the north and Gondwanaland in the south.
- Eventually, they drifted to the positions they are in now today (7 continents).

Continental drift

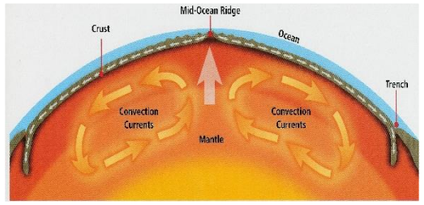
The continents are slowly and continuously shifting their position.

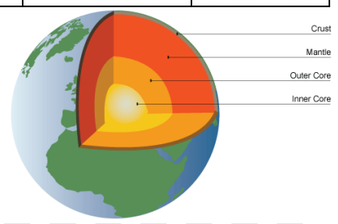
- Alfred Wegener
- German scientist
- Proposed the theory of 'Continental Drift'

The evidence for continental drift.

1. **Continental jigsaw** – The continents appear to fit into each-other like a jigsaw puzzle.
2. **Fossil records** – There are fossils evident on opposite sides of the oceans from animals that could not fly or swim (migrate).
3. **Rock record** – There are rocks of matching type and age on opposite sides of the oceans.

Name of layer	What is it made of?	Liquid or solid?	Temperature	Thickness
Crust	Rock	Solid	200ºC	2-20 miles
Inner core	Iron and nickel	Solid	5,500 ºC	750 miles
Mantle	Magma	Semi-molten	4500ºC	1,800 miles
Outer core	Iron and nickel	Liquid	400-5000ºC	1400 miles





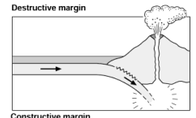
Convection currents

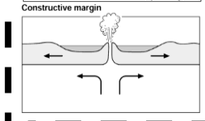
The **core** is the hottest part of the Earth. Heat is radiated out towards the surface (crust), with heat energy spreading through the mantle, where it creates molten magma. The hot magma churns around in the mantle due to a process called **convection**. Heated magma rises towards the crust where it begins to cool, become more dense and sink again. Once it reaches the core, it is reheated, and the process continues. These convection currents are responsible for forcing the floating tectonic plates to move.

Distribution of hazards

Most volcanic eruptions and earthquakes are located around the edges of plate Boundaries, especially around the Pacific Ring of Fire.

Volcanoes can also occur on **hotspots**, weaknesses in the Earth's crust where the magma breaks through to the surface.

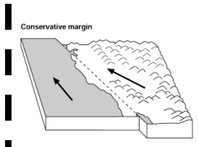




At this plate boundary, oceanic and continental plates **move towards** each other. The oceanic plate is forced under the lighter continental plate. Friction causes melting of the oceanic plate and may trigger earthquakes. Magma rises through cracks and erupts onto the surface forming a volcano.

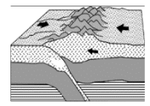
At this plate boundary plates **move apart**. Volcanoes are formed as magma wells up to fill the gap, and eventually new crust is formed.

At this plate boundary plates **slide past each other** in opposite directions, or in the same direction, but at different speeds. Friction is eventually overcome, and the plates slip past in a sudden movement. The shockwaves created produce an earthquake.



At this plate boundary, two continental **plates collide**. Neither plate is forced under the other and so both are forced up and form fold mountains. This is how the Himalayas were created.

Collision margin



Which plate boundaries do hazards occur at?