The Challenge of Natural Hazards: Tectonic Hazards

**Conservative plate margin**
Tectonic plate margin where two tectonic plates slide past each other.

**Constructive Plate Margin**
Tectonic plate margin where rising magma adds new material to plates that are diverging or moving apart.

**Destructive plate margin**
Tectonic plate margin where two plates are converging or coming together and oceanic plate is subducted. It can be associated with violent earthquakes and explosive volcanoes.

**Earthquake**
A sudden or violent movement within the Earth's crust followed by a series of shocks.

**Immediate responses**
The reaction of people as the disaster happens and in the immediate aftermath.

**Long-term responses**
Later reactions that occur in the weeks, months and years after the event.

**Monitoring**
Recording physical changes, such as earthquake tremors around a volcano, to help forecast when and where a natural hazard might strike.

**Plate margin**
The margin or boundary between two tectonic plates.

**Planning**
Actions taken to enable communities to respond to, and recover from, natural disasters, through measures such as emergency evacuation plans, information management, communications and warning systems.

**Prediction**
Attempts to forecast when and where a natural hazard will strike, based on current knowledge. This can be done to some extent for volcanic eruptions (and tropical storms), but less reliably for earthquakes.

**Primary effects**
The initial impact of a natural event on people and property, caused directly by it, for instance buildings collapsing following an earthquake.

**Protection**
Actions taken before a hazard strikes to reduce its impact, such as educating people or improving building design.

**Secondary effects**
The after-effects that occur as indirect impacts of a natural event, sometimes on a longer timescale, for instance fires due to ruptured gas mains resulting from the ground shaking.

**Tectonic hazard**
A natural hazard caused by movement of tectonic plates (including volcanoes and earthquakes).

**Tectonic plate**
A rigid segment of the Earth's crust which can 'float' across the heavier, semi-molten rock below. Continental plates are less dense, but thicker than oceanic plates.

**Volcano**
An opening in the Earth's crust from which lava, ash and gases erupt.
Case Study: Volcanic Eruption

**Iceland**

- **Name:** Eyjafjallajökull
- **Date:** 20th Mar - 17th Jun 2010
- **VEI:** 3

**Effects**
- Seismologists warned of the eruption eight hours before the main eruption.
- The eruption moved quickly and communities around the volcano had very little time to flee.
- Locals living on the slopes were used to smaller eruptions and were caught by surprise.
- Almost 4,000 people were housed in temporary shelters.
- Search and rescue teams pushed through ash and debris to reach villages buried under pyroclastic flow and debris to search for missing people.
- Survivors were being treated for burns and breathing difficulties.
- Local residents had received training in emergency procedures but were not able to implement them because the initial volcanic activity happened too fast.
- Volunteers have been handing out food and other essentials to those affected, as well as to rescue workers.

**Responses**
- Face masks distributed to residents.
- Automated warning messages went to phones and alert messages displayed on TV.
- 700 people evacuated.
- Rescue workers helped 70 tourists trapped near the volcano.
- Community meetings were held to bring locals up to date information.
- Farmers advised to keep livestockindoors to avoid contaminated water and hay.
- Diggers used to remove sections of the main road in 4 places to divert flood water and relieve pressure on the road bridge.
- Face masks distributed to residents in the worst affected areas.
- Air space was closed in much of Europe. In total 107,000 flights were cancelled, impacting over 10 million passengers and air cargo delivery.
- Assistance was given to residents to clean ash from infrastructure.
- Some compensation and financial support available for damage to houses and cultivated land due to flooding and ash.
- Farms around Iceland harvested more hay than normal to form a “hay bank” for farmers in ash affected areas.
- More than 180 people killed but official figures are disputed.
- Villages on the slopes were buried in volcanic ash and mud following pyroclastic flows and lahars.
- More than 17 million people were affected.
- Ash raised down on towns and cities across a far wider area and the airport in Guwatemala City was temporarily closed by debris on the runway.
- Estimated that 13,823 people were evacuated and 3,813 people placed in shelters.
- Crops and livestock were destroyed and damaged, affecting population’s livelihoods and impacting their food security and household economic security.
- Seismologists warned of the eruption eight hours before the main eruption.
- Government faced criticism for not acting sooner to start forced evacuations.
- The eruption moved quickly and communities around the volcano had very little time to flee.
- Locals living on the slopes were used to smaller eruptions and were caught by surprise.
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**Guatemala**

- **Name:** Fuego
- **Date:** 3rd - 5th June 2018
- **VEI:** 3

**Effects**
- 185 people were killed.
- 164 people were seriously injured.
- Cost $18 billion.
- Water pipes, roads, bridges, power lines, cell phone towers and ordinary phone lines were broken or damaged.
- Liquefaction caused buildings and other structures to sink into the ground.
- Up to 103,000 buildings were damaged and about 10,000 buildings needed to be demolished.
- Many people needed to use portable or chemical toilets, and got their water from tankers.
- Contaminated with ash.
- Farms around Iceland harvested more hay than normal to form a “hay bank” for farmers in ash affected areas.
- Over 220,000 people were killed.
- At least 330,000 people were seriously injured.
- Cost $4.5 billion.
- About 15 million were homeless.
- Many of Port-au-Prince’s multi-story concrete buildings collapsed.
- 3,978 schools were damaged or destroyed.
- An outbreak of cholera in October 2010 resulted in 5,919 deaths with 218,000 people infected.

**Responses**
- Over 600,000 people left their homes in Port-au-Prince.
- People were being taken in makeshift internally displaced persons (IDP) camps.
- Neighbouring Dominican Republic provided emergency water and medical supplies as well as heavy machinery to help with search and rescue but most people were left to dig through the rubble by hand.
- Emergency rescue teams arrived from a number of countries e.g. Iceland.
- Temporary field hospitals were set up by organisations like the International Red Cross to treat the injured.
- GIS was used to provide satellite images and maps of the areas to assist aid organisations.
- United Nations troops and police were sent to help distribute aid and keep order.
- $5.34 billion of aid was allocated by international agencies to assist in rebuilding.
- Cash for work programmes paid workers to clear rubble.
- Small farmers were being supported to grow crops.
- Schools were rebuilt.

Comparing high and low income countries

**Low Income Country:** Guatemala

- The government declared a national state of emergency the day after the quake.
- Authorities quickly cordoned off Christchurch’s central business district. The cordon remained in place in some areas until June 2013.
- Power companies restored electricity to 75% of the city within three days, but re-establishing water supplies and sewage systems took much longer.
- Over a quarter of the buildings in the central business district were demolished.
- The population for the greatest Christchurch area declined by 5.210%.2.
- A number of schools found they couldn’t follow the emergency procedures they had practiced because many students were outside the classroom hearing lunch.
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Case Study: Earthquake

**New Zealand**

- **Date:** 12th Jan 2010
- **Magnitude:** 7
- **Depth:** 13km

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