

ELQ Geography

Entry Level Geography

Unit 2 Earthquakes and Volcanoes



Rewarding Learning

Unit 2 Earthquakes and Volcanoes



Learning Outcome 2:

Know how earthquakes and volcanic eruptions impact people and the environment

This resource includes information and suggested tasks relating to Entry Level Geography. The resource focuses on:

Unit 2 Earthquakes and Volcanoes

- **Learning Outcome 2: Know how earthquakes and volcanic eruptions impact people and the environment.**

Teachers may choose to use this material or to amend it to suit the needs of their learners.

The list of resources is neither prescriptive nor exhaustive.

Geography Matters Book 3 (Higher) Ch. 6
ISBN978-0-435355-26-5

Geography 360 Foundation Book 3 Ch. 1
ISBN 978-0-435356-70-5

New Key Geography – Interactions Ch. 2
ISBN 978-0-7487-9703-5

Revision sites and video clips:

<http://www.bbc.co.uk/education/guides/zcv7hyc/revision/5>

<http://www.bbc.co.uk/education/guides/zcv7hyc/revision/6>

<http://www.bbc.co.uk/education/guides/zcv7hyc/revision/7>

Case Study earthquake, Haiti 2010:

<http://www.bbc.co.uk/education/guides/z3sg87h/revision/2>

BBC news reports on Haiti showing maps (2010)

<http://news.bbc.co.uk/1/hi/world/americas/8458690.stm>

https://www.youtube.com/watch?feature=player_detailpage&v=B5dG6vyFWFo

Animated guide – volcanoes:

<http://news.bbc.co.uk/1/hi/sci/tech/7533964.stm>

USGS footage of eruption of Mt St Helens (1980)

https://www.youtube.com/watch?feature=player_detailpage&v=xP2dreOI8gI

Montserrat Case Study

https://www.youtube.com/watch?feature=player_detailpage&v=jBQk2dzo9yM

[Montserrat Volcano Observatory](http://www.montserratvolcanoobservatory.com/)

https://www.youtube.com/watch?feature=player_detailpage&v=qRGyFfV9WF

BBC news reports on Japan earthquake (2011)

https://www.youtube.com/watch?feature=player_detailpage&v=V96r_0_cjQM

http://www.bbc.co.uk/science/earth/natural_disasters/earthquake#p00gmvmz

Case Study volcanic eruption, Nyiragongo, the Democratic Republic of Congo 2002:

<http://www.bbc.co.uk/education/guides/zvnbkqt/revision/3>

http://www.bbc.co.uk/science/earth/natural_disasters/volcano#p00gtrzw

The Impacts of Earthquakes

Earthquakes are one of the most dangerous types of natural disasters. An earthquake causes the ground to shake. Earthquakes strike with little or no warning.



Fig 1: Damage to a road caused by an earthquake



Fig 2: Damage to a building caused by an earthquake

The most severe earthquakes are those that:

- have a **shallow focus** – the nearer the focus is to the surface, the more devastating the effects of the earthquake.
- have a **greater magnitude (strength)** – measured from 1 (barely noticeable and frequent) to 10 (devastating and extremely rare) on the **RICHTER SCALE** using a **SEISMOGRAPH** which uses a needle to record tremors as lines on paper.

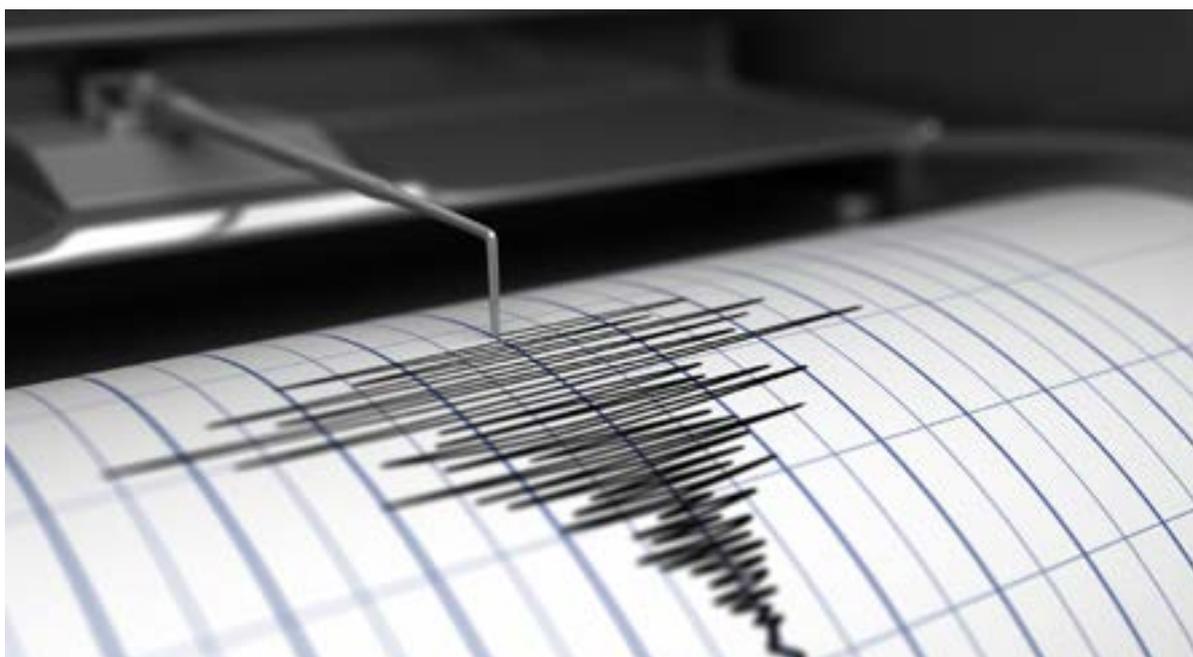


Fig 3: A seismograph

Impacts on People

When an earthquake happens it can cause a lot of damage that has an impact on people. Buildings and homes shake and may collapse (“pancake”). This traps people in the rubble who may be injured or killed. It also leaves people without a home.

Roads buckle and wide cracks appear. This makes it difficult for emergency services to reach the injured.

Power lines collapse cutting off electricity supplies. This means that homes and businesses have no electricity for things like lighting, cooking and heating.

Bridges and flyovers collapse trapping people in their vehicles causing death and injury. This also means that the fire and rescue services cannot reach areas quickly.



Fig 4: Collapsed section of Highway

Fires can be caused by broken gas pipes. The fires often rage out of control because fire fighters may be unable to reach the affected areas due to collapsed buildings and damaged roads. These fires cause deaths and destroy property.

It can take a long time and cost a lot of money to clear up the debris. If the earthquake happens in a LEDC, richer countries may send specially trained teams to help search for missing people and help with the clear up - this costs a lot of money. Rebuilding damaged buildings and roads is also expensive and takes a long time.



Fig 5: Damage to homes in Japan following an earthquake

The huge loss of life and disruption to people's lives causes trauma, which takes a very long time for people to come to terms with and recover from. Some children may be left as orphans and must be cared for.

Impacts on the Environment

When ground made of clay, or ground which has been reclaimed from the sea, is shaken during an earthquake, the water it contains comes to the surface. This is known as liquefaction.

Liquefaction causes the foundations of buildings to sink into the wet clay causing them to topple and collapse.

When earthquakes occur in areas with steep slopes the soil may slip downhill causing a **landslide**. The landslide can block roads and bury buildings. If an earthquake occurs in a mountainous area where the mountains are covered in snow it can trigger an **avalanche** which may cause death, injury and destruction of property.

If a large earthquake occurs on the seabed it can cause a **tsunami**. This is a powerful wave that gets higher as it approaches the coast. The wave floods inland destroying everything in its path.

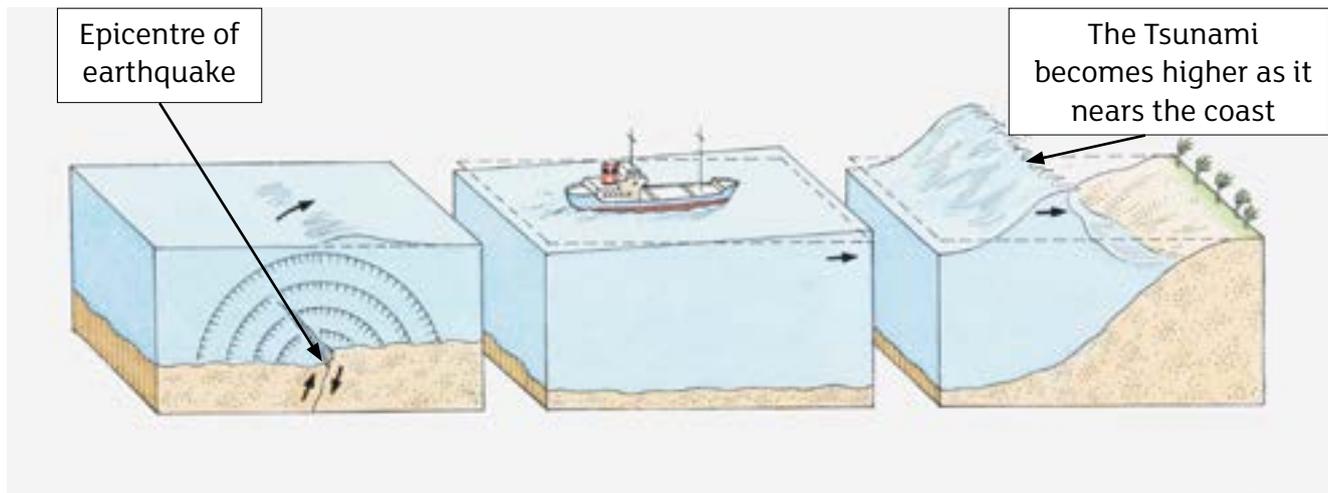


Fig 6: Diagram Showing How a Tsunami Forms



Fig 7: An Illustration of Damage Caused by a Tsunami Hitting the Coastline

Case study: The Haiti Earthquake

Fact File:

- Date: 12 January 2010
- Time: 4.53 pm (local time)
- Magnitude (size): 7.0 on the Richter Scale
- Epicentre: 25 km west of Port-au-Prince, the capital city of Haiti, which is home to over one million people.



Fig 8 : Map showing the location of Port Au Prince, Haiti

Impacts:

- 3 million people were affected
- Over 220,000 people died
- 300,000 people were injured
- 1.3 million people were made homeless
- Several hospitals collapsed
- Thousands of jobs were lost as businesses such as clothing factories were destroyed
- 30,000 buildings collapsed
- The airport and port were badly damaged

Some of the impacts were **primary**, this means that they happened **immediately**. Deaths and injuries caused by collapsing buildings are examples of primary impacts. Other impacts were **secondary** and did not occur until many months later. Earthquakes are often followed by outbreaks of disease such as cholera. This is a disease that occurs when people do not have access to safe, clean drinking water.

The impact of this earthquake was particularly bad because:

- many buildings were poorly built and very few were earthquake-resistant. This meant that many buildings collapsed easily;

- the epicentre was near to the capital; and
- there were few resources to rescue or treat injured people as this is a very poor, less economically developed country (LEDC).

The Impacts of Volcanic Eruptions



Fig 9 : Kilauea Volcano in Hawaii

Volcanic eruptions can have both negative and positive impacts on people and the environment.

Negative impacts on people and the environment

People may have to be evacuated when a volcano threatens to erupt. Tremors are often the first sign that a volcano is likely to erupt. The eruption may include ash and lava.



Fig 10: Ash Cloud



Fig 11: Lava Flows

Hot molten lava flowing down the side of a volcano will engulf everything in its path. This destroys property and causes loss of life. Lava from recent volcanic activity in Hawai'i not only damaged property, it also led to over 2000 people being evacuated from their homes. The volcanic activity was widely reported in news bulletins and led to fewer tourists visiting the area.

There may be an ash cloud and/or a very heavy fall of ash during an eruption. This can cause major disruption to people's lives. The ash may cause travel restrictions, for example, aeroplanes may not be allowed to fly. The ash will cause poor visibility and breathing difficulties. The 2010 eruption of Eyjafjallajökull in Iceland was a relatively small eruption that caused huge disruption to air travel across western and northern Europe over a period of six days.

Positive impacts on people and the environment

When lava and ash have been weathered (worn down and combined with the soil) they add nutrients to the soil, making it fertile and good for growing crops. The crops produce higher yields and this gives the farmer more income from selling his crops. It also gives local people an abundant food supply.

Many visitors may come to the area on holiday to admire the scenery or to even climb to the see the crater at the top of the volcano. Hawai'i, Iceland and Sicily are all popular tourist areas. The tourists need hotels, restaurants and entertainment. This creates jobs for local people and improves their quality of life.



Fig 12: Mount Fuji in Japan is a popular area for tourists

Minerals such as diamonds, pumice and sulphur may be mined from the base of some volcanoes. This also creates jobs for local people. These minerals can then be sold, creating an income for local businesses.

When lava flows occur close to the coast, for example on an island such as Hawai'i, the lava flows into the sea it cools and hardens. This builds up over time to create new land which increases the size of the island. Sometimes an eruption happens on the sea bed and this leads to a new island such as Surtsey off the coast of Iceland that rose out of the sea in 1963.



Fig 13: Lava Flowing Into the Sea

When there are underground water supplies near a volcano, the water is heated naturally by the hot molten magma under the ground in the magma chamber. This hot water can then be piped to heat the homes of local people such as in the Rotarua region of New Zealand. This provides them with a renewable, cheap source of heat and energy known as **geothermal** energy. This energy can also be used in factories (industry).

The heated underground water may also come naturally to the surface as geysers, which spout the hot water above the surface of the ground at regular intervals, such as 'Old Faithful' geyser in Yellowstone National Park, USA. These draw tourists to the area to see them. Geysers are also good for wildlife during the very cold winters, the ice and snow near the geysers is melted by the heat allowing the wildlife to graze.



Fig 14: Old Faithful Geyser in Yellowstone National Park

Summary table of impacts of volcanoes

<i>Impacts on people</i>	<i>Impacts on the environment</i>
<p>Negative:</p> <p>Risk of death and injury.</p> <p>Damage or destruction of property such as homes and businesses.</p> <p>Disruption to people's lives, for example restrictions on travel.</p>	<p>Negative:</p> <p>Destruction of natural habitats such as forests.</p> <p>Roads, bridges, railway lines and airports may be damaged or destroyed.</p>
<p>Positive:</p> <p>Fertile soils causing higher crop yields, better income for farmers and better food supply for locals.</p> <p>Jobs in tourism at sites of volcanoes, geysers and hot springs.</p> <p>Jobs in mining for minerals and precious stones such as diamonds, sulphur and pumice.</p> <p>Renewable geothermal energy for local people.</p>	<p>Positive:</p> <p>Minerals and precious stones may form in the base of a volcano.</p> <p>New land or new islands may form due to lava flows and undersea eruptions.</p> <p>Geysers heat the ground in winter creating areas for wildlife to graze which are free of ice and snow.</p>

Case study: Mount St Helens - the impacts of a volcanic eruption

Fact File:

- Date – 18th May 1980
- Location – Cascade Mountains, Washington State, USA
- Warning signs before the eruption – earthquakes, steam from the crater and a bulge in the side of the volcano.



Fig 15: Mount St Helens Volcano, USA

Impacts on people:

- 57 people were killed
- 200 homes were destroyed
- 27 bridges, 15 miles of railway lines and 185 miles of roads were destroyed
- Jobs were lost in forestry
- Lack of tourists in the years immediately after the eruption

Impacts on the environment:

- Landslides – filled a river valley with soil and ash
- 17 pyroclastic flows – destroyed a forest 19 miles long
- Ash cloud – 10 miles high
- Ash fall – over a large area
- Mountain 390 m lower after the eruption

Activity 1

Volcanic eruptions and earthquakes are examples of natural disasters which have impacts on people and the environment.

Study the photographs in **Resource A**. They show the impact that earthquakes and volcanic eruptions can have on people and property.

Identify **ONE** impact that an earthquake can have on people. Write the word PEOPLE under the photograph.

Identify **ONE** impact that a volcanic eruption can have on the environment. Write the word ENVIRONMENT under the photograph.

RESOURCE A



Photo A



Photo B



Photo C



Photo D



Photo E



Photo F

Activity 2

Complete the following table by colouring the impact of an earthquake on people in red and the impacts of an earthquake on the environment in green. Are there some impacts that affect both people and the environment?

Impact	Effect on people or the environment
Collapsing buildings and bridges	A large earthquake on the seabed can cause a big wave which destroys everything in its path
Power lines collapse	Buildings may sink into wet ground
Gas mains ruptured	People may be trapped as their houses 'pan-cake' and be injured or killed
Searching for missing people and clearing the debris	Earthquakes in snowy mountains may lead to lots of snow falling down the mountain
Liquefaction	Earthquakes may cut off electricity supplies
Avalanche	Underground pipes may crack and gas leaks can cause fires

Activity 3

Study **Resource A**. Choose one photograph that shows the impact an earthquake can have on people.

Describe the impact an earthquake can have on people.
For example: were people likely to be injured?

Study **Resource A**. Choose one photograph that shows the impact an earthquake can have on the environment.

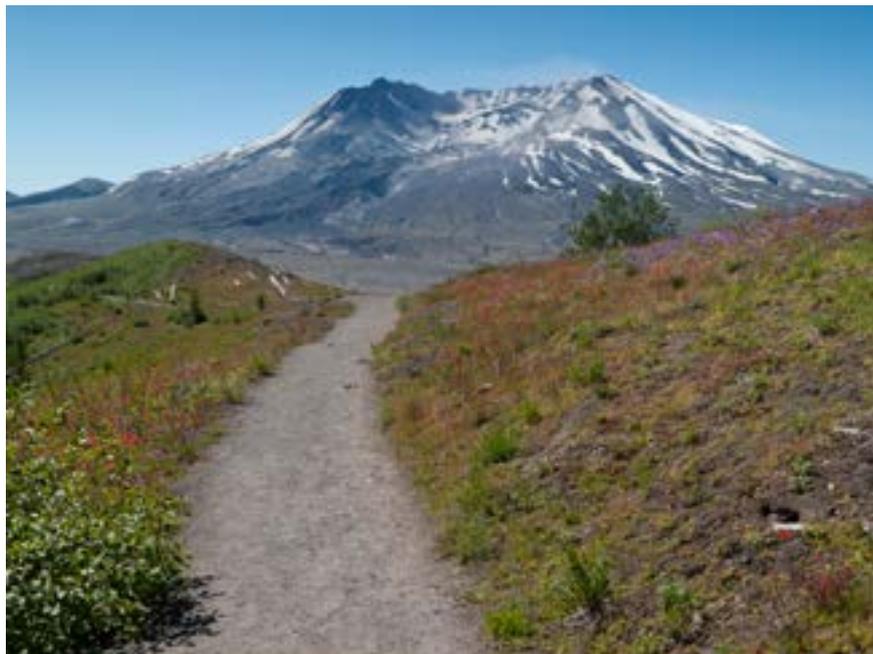
Describe the impact an earthquake can have on the environment.
For example: what might happen on a steep hillside?

Activity 4

Case Study: The Eruption of Mount St Helens, USA (1980) St Helens, USA.

Students could be given some background information such as **Resource B** or a list of the main impacts such as **Resource C**.

Resource B



Pathways for public access on Mount St Helens

Resource C:

The impact of the Mount St Helens Eruption on People and the Environment

57 deaths forests destroyed 200 houses destroyed
roads and railways destroyed
jobs lost in forestry and tourism
ash cloud and ash fall landslides filled a river valley

Describe two impacts this volcanic eruption had on people.

1. _____

2. _____

Describe two impacts this volcanic eruption had on the environment.

1. _____

2. _____

