

Volcanic Hazard Case Study: Eyjafjallajökull eruption, Iceland 2010

1 Describe the location of the case study.

Eyjafjallajökull is a small ice-cap in southern Iceland. The name means 'island mountain glacier'. Below the ice is a volcano. Iceland is in the Atlantic Ocean.

2 Identify two primary impacts of the eruption.

e.g. ash clouds, ash fall, lava flow, fire fountains (lava fountains), toxic gas emissions, etc.

3 State one secondary economic impact of the eruption.

e.g. Airlines lost \$2 billion in cancelled flights; London lost £102 million in lost tourism; supermarkets ran low on imported food, etc.

4 Explain how plate movement created the eruption.

Iceland sits on the Mid-Atlantic Ridge, where the Eurasian and North American plates are separating. This divergence allows magma to the surface.

5 Suggest why the eruption had such a large impact on Europe.

Winds in the upper atmosphere spread volcanic ash across northern Europe, causing chaos to air travel with over 92'000 flights cancelled.

14 Explain why nobody died as a result of this large eruption.

This area is very rural with low populations. The eruption was predicted and warnings given in time to evacuate. Roads were closed and policed to ensure minimal exposure.

Farm in Þorvaldseyri, at the foot of Eyjafjallajökull



6 Identify one way that the eruption brought benefit to Iceland.

Tourism increased to the area following the eruption (and during the eruption for many Icelandic people), bringing economic investment.

13 What is the Mid-Atlantic Ridge?

The spreading ridge along the seabed of the Atlantic Ocean, where plates diverge to allow magma to reach the surface. Constant effusive eruptions underwater lead to 'seafloor spreading' that creates new land on oceanic crust.

7 Name the tectonic plates that Iceland sits on.

North American and Eurasian plates.

12 Theorise why some people called the area a 'volcanic Disneyland'.

Following the eruption, there was an increase in volcano tours, glacier hikes, helicopter flights, etc. that led to a boom in investment. Even the farm in the photo became a museum.

11 Suggest how technology was used to mitigate the eruption.

Computer simulation predicted the second more explosive eruption that led to evacuation and reduced loss of life. Text messages warned local people to evacuate.

10 Outline why Iceland is part of two continents.

Iceland formed at a hotspot over a spreading ridge, the Mid-Atlantic Ridge, which is the division between the North American and Eurasian plate. So Iceland is geologically part of North America & Europe.

9 From the photograph, describe local impacts of the eruption.

20 farms such as this in the photograph were damaged or destroyed. Crops and grazing land was destroyed. Animals suffered respiratory illness for years after due to ash in soil.

8 Describe how authorities responded to the eruption.

e.g. Residents were warned via social media, mainstream media, and text message; roads were closed; local populations & animals were evacuated; temporary roads replaced those washed away.



For more information on the Eyjafjallajökull case study,

Visit the website for a useful video and resources.

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Volcanic Landscapes & Volcanic Features: suggested answers

1 Define 'volcanic landscape' and name an example.

A volcanic landscape is an area which is dominated by volcanoes, created by volcanic activity, and shaped by volcanic activity over time. For example, in Iceland.

2 Identify what a vent is.

A vent is an opening in Earth's crust that allows magma, gas, and pyroclastic flows to escape to the surface. A vent may be a central cone vent or a side fissure vent opening. They may be on land or under the sea.

3 State one type of volcanic feature.

For example: fumarole, vent, fissure, caldera, cone, crater, lava plug, lava dome, cinder cone, magma chamber, lava tube, etc.

4 Explain how divergent plate movement creates a volcano.

Divergent plate movement is when two plates move away from each other. This allows magma from the mantle to reach Earth's surface and create volcanoes.

5 Suggest one reason why people live near volcanoes.

e.g. Volcanic activity may be infrequent and so people feel less afraid; volcanic soils are fertile and suitable for agriculture; the landscape is distinctive & attractive, etc.

14 Describe what fumaroles are.

Fumaroles are vents that give out volcanic gases (mostly sulphur dioxide, carbon dioxide, hydrogen chloride). They lead to brightly coloured landscapes where the gases react with water and rock.

13 True or False most volcanoes on Earth are submarine?

True. There are an estimated 1 million volcanoes under the oceans on the sea bed. These produce 75% of all lava on Earth.

12 Suggest why shield volcanoes are so large.

Shield volcanoes are formed of layers of cooled solid lava and ash flows, which form with each successive eruption to build up wide, shallow-angle slopes that become very large over time.

11 Explain why magma/lava type influences the shape of volcanoes.

e.g. Magma that is more viscous (thick and sticky) and gassy leads to more explosive eruptions, which can create pyroclastic flows and lead to volcanic cone collapse.

10 Outline one way that volcanic landscapes provide economic opportunities.

e.g. Volcanic ash once eroded creates fertile soil which is beneficial for agriculture, and leads to better productivity / crop yields and an income for farmers.

9 State one form of lava.

Pahoehoe or a'ā or block.

8 Describe how a lahar changes volcanic landscapes.

A lahar is a volcanic flow, a mix of water, soil, rock and pyroclastic material. It can flow very fast (up to 50mph), and changes landscapes by eroding slopes, destroying trees, knocking down buildings, etc.



Volcanic eruption of Bárðarbunga in Iceland

6 Identify two challenges of living in volcanic landscapes.

e.g. If the area is active there may be relatively frequent earthquakes or gas emissions; there may be difficulties for infrastructure & transport; if an eruption does occur, there is potential devastation, etc.

7 Name one category of volcano.

e.g. Shield volcano, cone volcano, calderas, cinder cone volcano, fissure volcano, stratovolcano (also called composite).



Would you like to 'speak volcano'?

Try our matching exercise here to boost your knowledge of volcanic keywords.

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Volcanic Hazards



1 Define 'hazard' and 'risk'.

A hazard is a threat of something that can cause harm, e.g. volcanic eruption, earthquake, electricity, water, etc. A risk is the chance or probability of that hazard happening.

2 Identify two primary volcanic hazards.

e.g. Lava flow, pyroclastic flow, ash column, ash cloud, ash fall, pumice fall, volcanic gas emissions, earthquakes, etc.

3 State one method for reducing the impact of a volcanic hazard.

e.g. Evacuation from a risk area; covering windows and doors to prevent ash or gases coming in; building homes away from high risk zones, etc.

4 Explain how volcanic activity is monitored / predicted.

e.g. Seismometers to detect ground movement, tiltmeters to detect magma chamber changes, gas measurements, etc. These can be used for computer model predictions.

5 Suggest one reason why death tolls are often higher in lower income countries.

Lower income countries may not have a reliable monitoring network to detect changes in advance in order to prepare or evacuate, and so more deaths.

14 Explain why volcanic gases might be a more serious threat than lava flows.

Volcanic gases can travel far, and can poison soil, water, and air leading potentially to much greater death tolls, e.g. through toxic water, suffocation, etc.

13 Outline the difference between an oceanic and continental tectonic plate.

Oceanic plate is newer, having been recently generated at submarine spreading ridges. It is therefore heavier, more dense, and thicker. Continental plate is lighter, thinner, and so floats higher on the mantle.

12 Select the correct term for a tectonic plate that collides with another tectonic plate causing subduction.

- ✗ Divergent
- ✓ **Convergent**
- ✗ Continental
- ✗ Transform

11 Name the scale used to measure volcanic eruptions.

Volcanic Explosivity Index, VEI. The scale is from 1-8 with 8 being the most explosive eruption. Each stage is ten times stronger than the one before.

10 Outline what is meant by 'subduction zone'.

The subduction zone is where a heavier oceanic plate sinks below a lighter continental plate at a convergent boundary, causing the plates to rub and create friction and melting.

9 From the photograph, describe one benefit of volcanic hazards.

Volcanic hazards can lead to an increase of tourism in an area, particularly for dramatic distinctive landscapes, which leads to an income for local businesses.

6 Identify two threats caused by volcanic eruptions.

e.g. Ash fall can collapse roofs; ash in the atmosphere can cause aircraft engines to fail; volcanic gases poison soil and water sources; lava flows can destroy property and ecosystems, etc.

7 Name one secondary volcanic hazard.

e.g. Mudflow/lahar/jökulhlaup can be caused by heat from volcanic activity melting glaciers and mixing with volcanic emissions; electrical fire from collapsed lines; flash floods from melting ice; roads blocked causing accidents, etc.

8 Describe one way to attempt to mitigate a volcanic hazard.

You cannot stop an eruption, but you can prepare and predict. Prediction means a chance to evacuate in advance, and to protect possessions where possible and reduce loss of life.



Tourists visit volcanic eruption in Iceland



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