Hazards Revision: Where are hazards found globally?

LO: To understand why different hazards are found in different locations globally.
Learning Outcomes:

• You are able to explain the location of earthquakes and volcanoes globally (E)
• You are able to explain the distribution of tectonic hazards globally, giving reference to key words and processes (C)
• You are able to explain the distribution of tectonic hazards globally, making reference to key words, processes and specific examples (A/A*).
Volcanoes and earthquakes occur at **plate boundaries** (where the tectonic plates meet).

- **Earthquakes** occur at all plate boundaries irrespective of which direction the plates are moving in.
- **Volcanoes** tend to occur where oceanic and continental plates are moving towards each other or where two oceanic plates are moving apart (where they form mid-ocean ridges).
Think:
What is each layer of the earth like?

Think:
How do the tectonic plates move?

Think:
Why are there so many tectonic hazards around the Pacific Ring of Fire?
Types of tectonic Plate Margins:

- Match the following images with their labels:

  - Divergent/Constructive
  - Transform/conservative
  - Convergent/destructive
Types of tectonic Plate Margins:

• **Answers:**

- Convergent/destructive
  - Examples: Japan.

- Divergent/Constructive
  - Mid Atlantic Ridge

- Transform/conservative
  - San Andreas Fault
The distribution of tectonic hazards:

- Earthquakes happen at all 3 types of margins.

- Volcanoes happen at convergent/destructive margins and divergent/constructive margins.

- Your task: Can you explain why?
Plate boundaries

Constructive margin

- Oceanic plates move apart
- Lava erupts
- New crust is formed on the sea bed
- Underwater volcanoes (e.g. mid-Atlantic ridge)
- Gentle earthquakes

Destructive margin

- Oceanic and continental plates move together
- Heavier/denser oceanic crust is pushed down into the mantle
- Ocean crust is melted and destroyed
- Explosive volcanoes (e.g. St. Helens)
- Violent earthquakes
- Most hazardous boundaries
• Tectonic plates move in **different directions**, or at **different speeds**.
• Plates are locked together by friction
• Pressure builds up until a plate breaks along a fault line
• No volcanoes
• Violent earthquakes

• Continental plates **move together**
• Plates are too ‘light’ to sink into the mantle
• Plates buckle and fold to form mountains (e.g. Himalayas and the Alps)
• Volcanic activity is rare
• Violent earthquakes
To finish:

• Why are there varying impacts of tectonic hazards, depending on where they are located?
Learning Outcomes:

• You are able to explain the location of earthquakes and volcanoes globally (E)
• You are able to explain the distribution of tectonic hazards globally, giving reference to key words and processes (C)
• You are able to explain the distribution of tectonic hazards globally, making reference to key words, processes and specific examples (A/A*).
Hazards revision 2: The impacts of tectonic hazards.

LO: To understand the impacts that tectonic hazards may have on people and places; and how these may be reduced.
Learning Outcomes:

• You are able to identify different impacts of earthquakes and volcanoes (E)
• You are able to identify different primary and secondary impacts of earthquakes and volcanoes (C)
• You are able to identify different primary and secondary impacts of earthquakes and volcanoes, and relate these to sustainable options (A/A*)
The impacts of earthquakes:

• Impacts can be primary or secondary.
  – Create a table like the one below and fill in the columns.

<table>
<thead>
<tr>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings and bridges collapse</td>
<td>Landslides/tsunamis triggered</td>
</tr>
<tr>
<td>Roads, buildings, bridges collapse</td>
<td>Leaking gas may lead to fires</td>
</tr>
<tr>
<td>People injured or killed by buildings/bridges collapsing</td>
<td>Electricity damaged/cut off</td>
</tr>
<tr>
<td>People may be left homeless</td>
<td>Roads blocked/destroyed making aid hard to distribute</td>
</tr>
<tr>
<td>Shortage of clean water/proper sanitation</td>
<td>Telephone poles destroyed</td>
</tr>
</tbody>
</table>
Reducing the impacts of earthquakes:

• Prediction
• Building techniques
• Planning
• Education
• Aid

Your task:
In each group – take a method of reducing the impacts of earthquakes and explain how you may do so with this method.

Think:
How do you make these sustainable?
The impacts of volcanoes:

- Impacts can be primary or secondary.
  
  - Create a table like the one below and fill in the columns.

<table>
<thead>
<tr>
<th>Primary</th>
<th>Secondary</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buildings and roads destroyed by lava flows/pyroclastic flows</td>
<td>Businesses damaged</td>
</tr>
<tr>
<td>Mud flows (lahars) form when material from eruption mixes with water</td>
<td></td>
</tr>
<tr>
<td>People injured or killed by pyroclastic flows (or lava/ash)</td>
<td>Crops destroyed/damaged</td>
</tr>
<tr>
<td>People may be left homeless</td>
<td>Roads blocked/destroyed making aid hard to distribute</td>
</tr>
<tr>
<td>Shortage of clean water/proper sanitation</td>
<td>Fires started by lava/pyroclastic flows</td>
</tr>
</tbody>
</table>
Reducing the impacts of volcanoes:

• Prediction
• Planning
• Building techniques
• Education
• Aid

Your task:
In each group – take a method of reducing the impacts of earthquakes and explain how you may do so with this method.

Think:
How do you make these sustainable?
LEDC vs MEDC

- **Think:**
  
- Why are impacts more severe in LEDCs?
- How can reducing impacts be more difficult in LEDCs?
To finish:

• Why do people continue to live in areas impacted by tectonic hazards?
Learning Outcomes:

• You are able to identify different impacts of earthquakes and volcanoes (E)
• You are able to identify different primary and secondary impacts of earthquakes and volcanoes (C)
• You are able to identify different primary and secondary impacts of earthquakes and volcanoes, and relate these to sustainable options (A/A*)
Hazard Revision 3: Case study examples of tectonic hazards.

LO: To understand how case study examples can be applied to key theories.
Learning Outcomes:

• You are able to identify impacts of generalised earthquake examples (E)
• You are able to identify the causes and impacts of specific case study examples (C)
• You are able to identify causes and primary/secondary impacts of specific case study examples in differing levels of development (A/A*)
One tectonic hazard in an LEDC: Haiti Earthquake

When did it happen?

What was the magnitude?

What were the causes?

What were the impacts (primary/secondary)?

What were the responses?
Mount St. Helens 1980
MEDC

Mount St Helens is a mountain in the Cascades range in North West USA. The Cascades have formed because the area is a destructive plate margin. The Juan de Fuca plate (oceanic) is being subducted under the North American plate (continental).

Mount St Helens erupted on **May 18th 1980**. This followed a period of activity which began in March 1980 with an earthquake measuring 4.0 on the Richter scale. There was 3 months of activity as magma rose inside the mountain, creating a large bulge on the north side of the mountain. This was due to a blockage in the main vent which prevented the magma rising through the vent in the normal way. The technical name for the bulge is a cryptodome.

On May 18th, an earthquake measuring 5.1 on the Richter scale caused a landslide on the northern flank of the volcano. This exposed the cryptodome and resulted in a sudden release of pressure and a huge eruption in the form of a lateral (sideways) blast.

The plume of ash erupted for more than 9 hours. It spread north-eastwards, eventually reaching 30 kilometres into the sky. **540 million tonnes of ash** were pushed into the atmosphere and noticeable ash fell on 11 American states. Just three days after the eruption, air pollution monitoring systems detected ash in east coast cities such as New York (over 4000 kilometres away). **The ash circled the globe in 17 days.**

The blast zone covered over 700 square kilometres and left a lunar landscape. Trees were flattened and ash covered the area.
Primary effects of the Mount St Helens eruption
Ash column of over 80,000 feet in height.
Pyroclastic flows moving at up to 670 miles per hour flattened over 600 square kilometres of forest.
Poisonous gases released.

Secondary effects of the Mount St Helens eruption
Glaciers melted on the volcano, mixing with ash and mud to form lahars.
200 homes, 27 bridges, 15 miles of railway and 185 miles of roads were destroyed.
7000 big game animals perished (deer, elk and bear).
People across north-western America were told to stay indoors and wear gauze masks.
The ash made roads slippery and reduced visibility. Many roads were closed, trains halted and aircraft grounded.
Fish, in some hatcheries, perished as ash fell into lakes and streams, clogging their gills and raising the temperature of the water.
Crops were destroyed, or subsequently produced low yields, because ash settled on leaves, impeding photosynthesis.
Electricity supplies were interrupted and sewers were blocked, and the ash damaged car engines.
The town of Yakima, as an example, some 150km away, was blanketed in 1.5cm of ash.
Skies were turned grey as far away as as Spokane, Washington State, 400km away.
57 people lost their lives in the blast, including 84-year-old Harry Truman who had refused to evacuate his lodge near Spirit Lake.