ACTIVITY: Volcanoes as Natural Hazards

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Objective: Learners will explain how volcanoes pose a threat to humans, infrastructure, and ecosystems, and will describe how monitoring of volcanic activity can be used to minimize the negative effects of volcanic activity.

Introduction: Volcanoes pose significant natural hazards, threatening lives, property, and infrastructure in their vicinity. The primary hazards associated with volcanic activity include:

- Eruptions, explosions, and blasts. Explosive eruptions may include explosions and blasts that can devastate large regions surrounding a volcanic vent.
- Earthquakes may be caused by moving magma within and underneath a volcano and create seismic hazards.
- Lava flows may travel many miles from a vent and bury anything in their path.
- Pyroclastic flows are fast-moving currents of hot gas, ash, and rock fragments that destroy everything in their path and are almost always deadly to humans and animals.
- Volcanic ash and tephra may be ejected high into the atmosphere where it may form clouds and travel great distances before falling to the Earth. Ash clouds can disrupt air travel. Volcanic ash may damage crops and cause respiratory issues.
- Lahars are volcanic mudflows that may be triggered by volcanic activity or by precipitation or melting snow. Lahars can travel many miles from volcanoes and are one of the most destructive of all volcanic hazards.
- Volcanic gases including carbon dioxide (CO_2) sulfur dioxide (SO_2), hydrogen sulfide (H_2S), and others are emitted during eruptions, and sometimes continuously from fumaroles. With the exception of water vapor, these gases present geohazards because they can be toxic or even lethal.

Additionally, volcanic eruptions can induce other hazards such as landslides, tsunamis, and wildfires. Understanding and monitoring volcanic activity is essential for creating evacuation plans, informing emergency response efforts, and safeguarding vulnerable populations living in volcanic regions.

Have learners:

1. Brainstorm factors that they would want to monitor around volcanoes to help predict when they might erupt. Study **this USGS graphic** to give ideas about how volcanoes are monitored.
2. Mark on the map of Hawai'i where they might place monitoring stations.

Read about the weather in Hawai'i, as well as when these volcanoes last erupted, in addition to other information that could inform them where to best place monitoring stations.

3. Read the **new NPS site on Monitoring Volcanoes**, then view the **U.S. Geological Survey's Volcano Monitoring site**.

   a. In the menu on the right of the screen, choose Regions, then in the dropdown menu, select Hawai'i.

   b. Zoom in on the largest island.

   c. In the menu on the right, choose Instruments, then go through each one to see where different monitoring stations are located.

   d. Compare the locations of stations to the sites they chose.

   e. Discuss:

      - *Are any of the volcanoes currently active? How can you tell? Choose Volcanoes in the right menu to see the key for which volcanoes are being actively monitored. If there are none currently in Hawaii, choose another region where a volcano is marked yellow or orange.*

      - *What might each instrument be measuring? Click on some of the stations to see the data that they output. Research each instrument and its functions in monitoring volcanic activity. View videos that summarize how USGS monitors volcanoes:* ***Deformation***, ***Gas Monitoring***, ***Earthquakes*** *(alternatively,* ***volcano seismicity****).*

      - *Why do volcanic gases have to be monitored? Investigate more about* **volcanic gases** *by completing this activity.*

4. Mark on the map which areas are most likely to be affected by the secondary hazards related to volcanic activity:
   - Landslides
   - Tsunamis
   - Wildfires
   - Ashfall

5. Discuss the image of ashfall after the eruption of Katmai. What hazards does this pose to humans?

6. Research a recent volcanic eruption and how it affected the area nearby. Prepare a news broadcast to inform residents of the hazards near them and actions to take to protect themselves.

HANDOUT: Volcanoes as Natural Hazards

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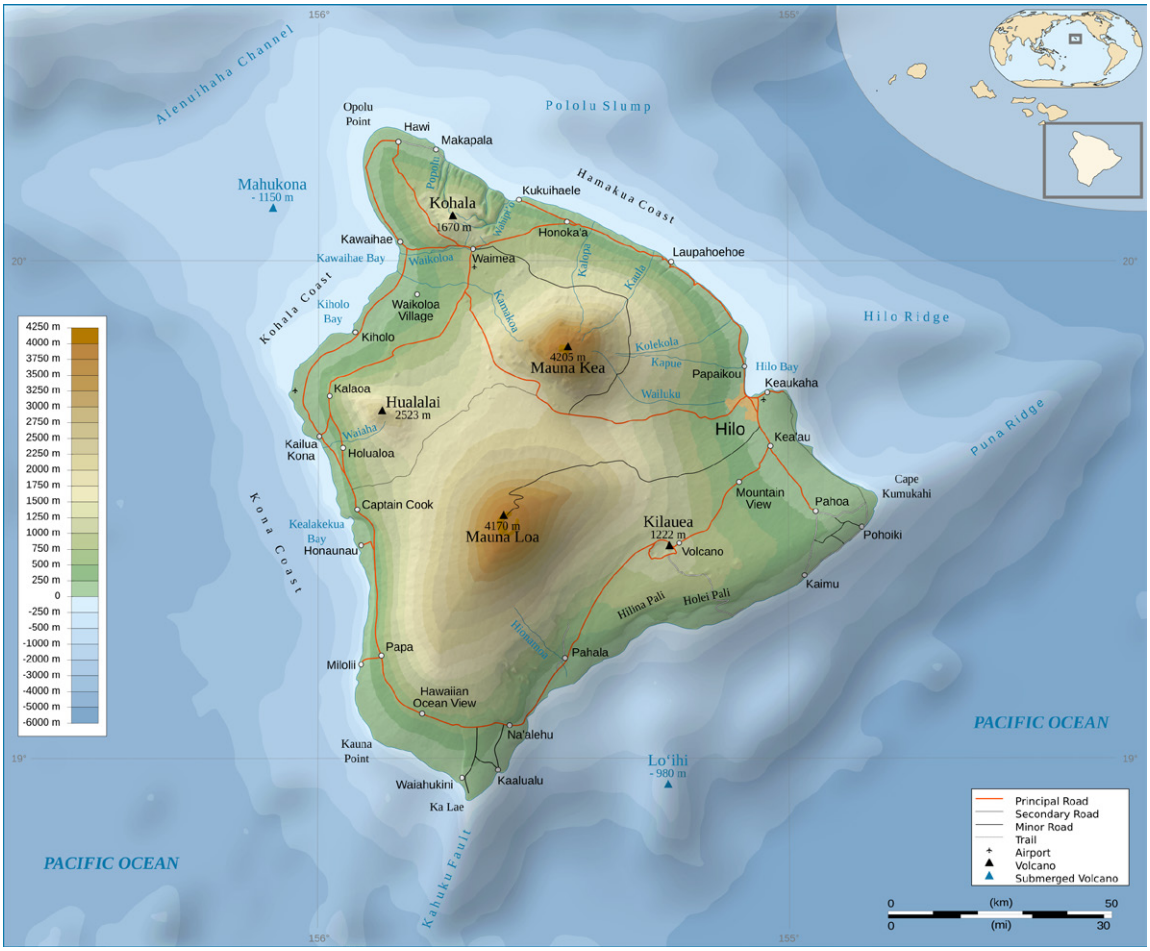
- Brainstorm factors that could be monitored around a volcano to help predict when it might erupt:

THE ISLAND OF HAWAI'I'



The map above shows the height of the land compared to sea level on Hawai'i's largest island. Green areas are the lowest parts of the island, while brown areas are the highest.

- Mark on the map where you would place monitoring stations.
- What else would you want to know about the island and the volcanoes so that monitoring stations are in the right place?

ASHFALL AFTER THE ERUPTION OF KATMAI

Credit: **NPS**

- Make observations of the image, showing ashfall after an eruption.

- What threat might this pose to humans?