|  |  |  |
| --- | --- | --- |
| |  | | --- | |  | | **Situation 1: New High School in Orting**  Business and community leaders in the city of Orting in Pierce County, Washington state, wish to build a new high school to accommodate and encourage the local population explosion. (Orting is only 30-40 minutes commuting time from the rapidly growing Tacoma and Seattle metropolitan areas.) However, Pierce County officials have refused permission to build the high school on county lands because they feel the location is hazardous. Geological surveys show that both Orting and the proposed high school site are on top of solidified mudflows that originated on the slopes of nearby [Mount Rainier](https://web.archive.org/web/20150506151835/http:/www.cotf.edu/ete/modules/volcanoes/mountrainier.html). Based on the location of older flows around Mount Rainier and on experience gained from observing mudflows during the 1980 eruption of **Mount St. Helens**, county officials argue that any new mudflow coming down the valley could easily destroy the high school and anybody who happened to be in it. County officials have also passed an ordinance forbidding high-density housing (like tract-home developments) on county lands, claiming that there are not sufficient roads out of the city to allow for emergency evacuation. The ordinance has upset local developers. City leaders counter that warning from a system of acoustic sensors (which have not yet been built) would give students enough time to evacuate the school, if necessary. The city has tried three separate times to pass a bond issue enabling the high school to be built on city lands but has not been successful. Photo: USGS EROS Data Center  Representatives from both the city and the county have appealed to your company to provide them with the facts and potential risks of the situation and to recommend whether to build the high school. |

**Situation 2: Volcanic Unrest in Paradise**

  
Scientists at the Hawaii Volcano Observatory have notified newly elected county officials on the "Big Island" of Hawaii that they expect a new eruption of Kilauea. Attendants at the Hawaii Volcanoes National Park have closed the park and escorted all visitors beyond its boundaries. However, companies running tours, restaurants, and concession stands in the park and other interested individuals are pressuring the county officials to open the park in order to take advantage of what they think is a great tourist opportunity. On the other hand, homeowners around Hilo and the Puna Coast want to know whether they should evacuate. The county officials have asked you to evaluate available [seismic](https://web.archive.org/web/20150506151957/http:/www.cotf.edu/ete/modules/volcanoes/vmonitor.html) and [tilt meter](https://web.archive.org/web/20150506151957/http:/www.cotf.edu/ete/modules/volcanoes/vmonitor.html) data to predict the size and approximate location of the expected eruption and to recommend a plan of action that would ensure public safety. Photo: USGS EROS Data Center

**Situation 3: A New Eruption in the Cascades**

A new eruptive cycle of Mount Hood in Northern Oregon has been in progress for several months. It began with a series of earthquake swarms that were centered in a volume of rock under the mountain roughly 15 miles across and at least 20 miles deep. Geologists immediately placed tilt meters around the mountain and began an intensive watch on both seismic and eruptive activity. During the next few weeks several small outbursts of steam and ash occurred at different locations around the volcano. In the last two months the mountain and its surroundings bulged upward several hundred meters over a large area and seismic activity intensified. Numerous large, new fractures have also formed around the mountain, but no further explosive activity has occurred. Local forestry officials have set up a safety zone of restricted access around the mountain and issued warnings to city officials in nearby Portland and shipping companies that operate on the Columbia River. Government officials have complied by restricting traffic on the river and by alerting residents of Portland and other cities in the area.

The extended period of relative quiet (no eruptions) has prompted numerous requests of government officials to lift restrictions: Private individuals want access to their summer homes and recreational areas, owners of small tourist-dependent businesses in the area want the tourists back, industry officials want to resume logging and mining operations, and town and city officials want shipping restrictions along the Columbia River lifted. Continuing restrictions will cause great hardships for many, including the probable failure of many small businesses. On the other hand, local geologists think that the seismic and tilt meter data indicate an imminent major eruption and want to keep the restrictions in place. Your company has been hired by the governors of both Oregon and Washington to analyze the data, predict the magnitude of the eruption, and make safety recommendations.

**Situation 4: The "Big One" in Yellowstone National Park**

The volcanic nature of the area around Yellowstone National Park is well known. Much of the park is within the boundary of a giant caldera that formed in a huge explosion about 600,000 years ago. The magma chamber underneath the caldera still contains liquid rock and provides the heat for all of the geysers and hot springs that make the park famous. However, the Yellowstone Caldera is only the latest in a long string of calderas that formed along the Snake River Valley over the last 15 million years. These calderas apparently formed over a plume of hot material rising through the mantle. As the North American plate moves southwest over the hot spot at about 2.2 cm/year, the hot material periodically "burns through" in a giant eruption. Since the hot spot remains active, another giant eruption will almost certainly occur. The question is, when?

In the last year a new cycle of volcanic activity has begun. The number and strength of earthquakes have increased; new hot springs have appeared, and existing ones have grown. A large area to the northeast of Yellowstone Lake has uplifted again. Park officials have hired your company to analyze the data and history of the Yellowstone area with three objectives: (1) Estimate the significance of the new activity. Determine whether it is evidence of a new cycle of major volcanic activity. (2) Estimate regional and global effects of a new Yellowstone-scale eruption. (3) Make recommendations concerning possible protective measures.