

# How does volcano risk differ from other natural disasters?

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The United States has seen no shortage of large-scale geological hazards lately, from Hurricanes Harvey, Irma, and Maria to the recent volcanic activity of Hawaii's Kilauea eruption. And while the Kilauea eruption has produced award-winning photography and spectacular TV, it is also a reminder that other perils besides hurricanes can produce catastrophic damage and with potentially global effects.

On the island of Hawaii, the Hawaii County Civil Defense estimates that approximately 700 homes so far have been destroyed by the Kilauea eruption, and just recently 23 people were injured after an airborne ball of lava hit their tour boat as they were on a sightseeing tour. While insurance claims from the volcanic activity are likely still coming in, to date only a few dozen homeowners claims have been filed. Residents are still displaced, and a state of emergency is still active.

Homeowners coverage on the Big Island of Hawaii is provided by both a private insurance market and the Hawaii Property Insurance Association (HPIA), the state's not-for-profit high-risk property insurer. Consumers and insurers are tabulating damage, determining coverage, and assessing the ongoing risk from this natural disaster. As they do, let us look at some of the differences in insurance among volcanoes and other catastrophic events, such as hurricanes and floods.

## How insurers think of catastrophic events

Insurance companies manage catastrophic risk using the concepts of probability and magnitude of loss—that is, the likelihood of an event producing certain levels of financial losses occurring in a given period of time. For example, auto accidents occur every day and are managed as a group when

assessing financial impacts. At the other extreme, the impact of a large asteroid would be so catastrophic that insurers do not actively apply risk management or mitigation techniques to this type of event. The most interesting cases are those in the middle, the events that are infrequent, difficult to predict, and severe enough to present a risk of ruin, but can be modeled with enough accuracy to build a risk management strategy.

Insurers often refer to these risks with a shorthand description of their frequency and financial loss: “the 20-year storm with a loss of \$5 billion” or “the 250-year flood with a loss of \$50 billion.” It is vitally important to recognize that the return period (that is, the estimated likelihood of an event, stated as an average number of years between similar events) reflects the probability that a given level of loss could occur *in any given year* and is not necessarily cyclical. The 250-year loss has a 0.4% *annual* probability, and the 20-year loss has a 5% *annual* probability. Further, many types of events can produce the same level of loss, and the same type of event can produce different levels of loss depending on where it occurs. It is important not to interchange the scientific definition of an *event* return period (such as “a 50-year storm with winds as strong as Katrina”) with the insurance definition of a *level of loss* and its return period (such as “a 50-year hurricane would cause \$40 billion in losses”). Understanding this can prevent confusion when interpreting frequency statements made publicly by various parties. Finally, return periods depend on geographic scope. An extremely rare event for a small community, such as the Baton Rouge flood of 2016, would not be as rare when considering the entire U.S. in the same time period. It is misleading, for example, to say “The U.S. has had many 100-year events in a short time” if these return periods were measured locally.

## Is volcanic risk manageable as an insurable disaster?

As with hurricanes and floods, the frequency of volcanic eruptions appears to be in line with other insurable perils. Records of volcanic eruptions date back centuries, and historical data, coupled with modern geographic information systems (GIS) and catastrophe simulation models, allow insurers to assess the localized risk. Examples of recent large-scale eruptions that have affected local communities include

the recent Fuego volcanic eruption in Guatemala—which has killed at least 62 to date—Indonesia’s Mount Merapi, the Eyjafjallajökull eruption in Iceland in 2010, and Mount St. Helens’ eruption in 1980. Last year, reinsurance company Swiss Re announced that it had developed a catastrophe model that assesses risk for over 500 volcanoes. The reinsurer noted that “one in seven of the world’s largest urban areas, encompassing over 1 billion people, are located within a 150-kilometer, or 93-mile, radius of an active volcano, and some of the largest cities are at risk of total economic losses of up to \$30 billion.”<sup>1</sup> According to Swiss Re, some of the cities most exposed include Tokyo, Naples, Manila, Managua, and Jakarta.

## The complications of local and global impacts

Insurers can model the direct impact of lava flow and other immediate volcanic perils, such as explosions and fires, with enough accuracy to balance risk and profitability. After all, we know where volcanoes are, we know enough about geology to anticipate the effects and patterns of potential volcanic blasts and lava flow, and we can even model ash fallout and other follow-on perils.

But unlike hurricanes or earthquakes, volcano risk is also global in nature, with the potential for worldwide economic and social disruption, problems that are not a good fit for traditional insurance. The geological record shows that past eruptions have produced long-lasting devastating effects on climate and human activity. The 1815 eruption of Mount Tambora led to the “Year Without a Summer” in 1816 when average global temperatures fell by one degree Fahrenheit, causing widespread crop failures on multiple continents, followed by starvation and social unrest. Looking to ancient history, some researchers believe the Mt. Toba eruption 74,000 years ago caused a decade-long volcanic winter and large-scale climate shifts that altered the course of human population.

Most researchers agree that volcano risk figures prominently in the scope of extinction-level events that could result in geological shifts or population die-off. Volcanoes thus represent a conundrum for insurers because the direct impacts, such as damage from lava and ash, can be readily modeled—but unlike hurricanes and earthquakes, eruptions can mushroom into worldwide events. The global ramifications of a massive eruption would fall into the window of “too extreme to insure.”

The embedded potential for global impacts means insurers should proceed with caution in defining coverage in order to uphold the financial resilience their stakeholders expect. Extreme events are insurable only when insurers diversify risk

exposure, making sure too much risk is not concentrated in one region or combined into one policy type. Hurricanes are reasonably diversifiable because a storm footprint is generally localized in time and space. While the direct effects of volcanoes may be localized, a massive and long-lasting regional or global contagion would not be. In such a disaster, it’s simply not clear which populations or elements of the worldwide economy are most vulnerable to the eruption’s effects, making it hard to evaluate the maximum risk exposure of a diversified portfolio that includes volcano risk.

## Insurance coverage can be confusing

A standard homeowners policy is typically the first line of defense for insuring against property loss, but there are exceptions to this rule in natural disasters. The direct impact of volcanic activity—lava flow, ash, pyroclastic flows, even fire caused by lava—is covered by most homeowners policies in most regions. But damage to a home or property from floods and earthquakes associated with volcanic activity—even when coverage for direct damage from volcanoes is in place—may not be covered unless the homeowner has purchased an earthquake endorsement or flood insurance policy. Damage caused over time by volcanic ash is also not typically covered nor is volcanic effusion (volcanic water and mud).

Further, there is notable inconsistency of policy language among states and insurers. Some types of homeowners policies, such as HO-5 policies, do cover volcano risk, while others, such as some “named perils” policies, do not explicitly include it. Ambiguities in coverage can be exacerbated when “loss of use” or “additional living expense” coverages are triggered by standard policy language that cites civil authorities and their power to force evacuations. The bottom line is that among affected homeowners, it can be unclear whether the risk is covered. On the Big Island of Hawaii, for instance, homes in the high-risk Lava Zones 1 and 2 are only able to obtain insurance through HPIA, which offers coverage up to a value of \$350,000. Most of the recent Kilauea destruction has taken place in these two high-risk lava zones.

In reality, what often determines insurance coverage after a large-scale disaster is the case-specific stance of regulators and the judiciary. State insurance departments familiar with the local hazards, such as Hawaii volcanoes, will review the circumstances and prevailing policy language, and often compel insurers to cover events to some degree.

Volcanoes are routinely excluded from most business interruption (BI) or contingent business interruption (CBI) insurance unless specific coverage is purchased by endorsement. This type of insurance varies in definition from policy to policy. To trigger BI coverage in a volcanic eruption, a business must demonstrate direct physical damage that prevents operations; physical damage that prevents customers

1 “Sitting in the shadow of volcanic risk.” By Rob Lenihan. Business Insurance. April 18, 2017. Retrieved on August 6, 2018, from <https://www.businessinsurance.com/article/20170418/NEWS06/912312944/Sitting-in-the-shadow-of-volcanic-risk>.

or employees from accessing the business; or government closure of the area, preventing customers from accessing the business. In 2010, the Eyjafjallajökull volcano eruption in Iceland caused 100,000 flights to be canceled across the Atlantic, greatly disrupting air travel during peak summer travel season. It is almost certain that BI and CBI claims were filed as a result, but we are not aware of any study that has attempted to assess the actual insured loss.

Health effects of volcano events would likely be covered by health insurance, workers' compensation, or some combination. If a person is at work when an eruption happens or is required to stay there during the aftermath, workers' compensation should cover any resulting health problems, such as those related to ash. Workers' compensation policies in all 50 states must cover statutory benefits and may not have exclusions, so ultimately the decision belongs to the states.

## Conclusion

As GIS and related technology advance, it is becoming easier to model—and therefore insure—the risk of natural disasters. Scientists can now monitor volcanoes and improve warning times for a looming eruption, improving the insurability of locations surrounding the volcano. While insurers are familiar with the risk management tools and approach for the local and immediate physical impacts of volcanic activity, the global impact of a large volcanic eruption remains ominous and difficult to predict. For the near future, insurers will continue to play an important role in recovery despite having an incomplete understanding of this unique catastrophic peril.



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