

# Sleeping giants underneath

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With the exception of extremely rare major meteorite impacts, no other natural events can devastate such large areas with the intensity and suddenness of volcanic eruptions. Their direct effects: lava, mudflows and pyroclastic flows, ash clouds and ash deposits. The indirect effect: climate impact. The losses: besides the direct losses, disruption of air traffic and shipping, and crop losses.



Twenty-eight Holocene volcanoes are located in New Zealand. They are called “Holocene” because they were active in the Holocene epoch, starting some 11,700 years ago. A total of 326 Holocene eruptions have been documented in New Zealand, 228 of them occurring after 1500 AD. The largest Holocene eruption in New Zealand happened some 1,800 years ago – with dramatic impact: the Taupo eruption generated a pyroclastic flow that devastated an area of about 20,000 km<sup>2</sup> and produced pumice and ash falls over a wide expanse of the central North Island. It was the most violent volcanic eruption the world has seen in the last 5,000 years.

Taupo also produced the world’s most recent VEI 8 (Volcanic Explosivity Index) eruption, about 26,500 years ago. VEI 8 is defined by an eruption volume of more than 1,000 km<sup>3</sup>. This eruption created a caldera that is partly filled by lake Taupo today. The thickness of the tephra (volcanic material) reached up to 200 m in the central North Island. Heavy ash falls went far beyond New Zealand’s coasts: on the Chatman Islands, some 1,000 km away, 18 cm of ash was deposited.



#Volcanoes close to people and infrastructure, limited historical data, risks nobody dares to think of. #New Zealand, #Auckland, #Volcanic fields.

Much of the North Island of New Zealand lies within 100 km of one or more Holocene volcanoes, this includes seven airports and eight ports. Also, some 5,600 km of roads and 770 km of railroads are located within 100 km of a volcano. While the proximal population of most of New Zealand’s volcanoes is relatively small, a particular exception to this is the Auckland Volcanic Field beneath the city of Auckland, the economic hub of the country. This volcanic field extends over 360 km<sup>2</sup> and comprises 50 separate volcanic vents which are located beneath and next to a heavily populated area. Even a small eruption could have a huge impact.

In the course of 250,000 years, the Auckland volcanoes have transformed the local landscape. The field includes small cones as well as explosive craters. The volcanoes are fed by a single hotspot at a depth of 100 km. Each eruption occurred in a new location, and it is rather unlikely that a forthcoming event will reactivate one of the existing vents. The last eruption took place 600 years ago and created Rangitoto Island.

### The global perspective

Worldwide, around 550 volcanoes are classed as being active. Each year, between 50 and 65 of them erupt. The 1980 eruption of Mount St. Helens in the US state of Washington demonstrated quite dramatically the disaster potential of volcanoes. Since then, the eruptions of Mount Pinatubo (Philippines, 1991), La Soufrière (Montserrat, 1995–97) and Mount Tavurvur (Papua New Guinea, 2006) also caused substantial losses. During the eruption of Mount Eyjafjallajökull on Iceland in 2010, an ash cloud rose several kilometres high into the atmosphere and was carried towards northern and central Europe by the prevailing winds. European airspace was closed to air traffic for safety reasons, and more than 100,000 flights were cancelled, with consequent knock-on effects for airline profits. A local eruption might thus have tremendous global impacts.

Eruptions can also lead to devastating agricultural losses. Some crops do not survive a layer of ash just 1 cm deep. In addition, major volcanic eruptions can have an impact on the global climate. During a major event, ash clouds and volcanic gases are often ejected into the higher atmosphere, where they are distributed around the globe over time. Blocking portions of the sunlight, they can cause global temperatures to drop for a couple of years. Such a temperature drop would trigger weather extremes and cause crop losses over vast regions.

### Frequency of volcanic eruptions

The effects of large volcanic eruptions are so severe that the occurrence probability needs to be considered not only on a local basis but also globally. Unfortunately, major eruptions have not been fully documented – either in historical or in geological terms. In order to be able to arrive at more precise values of the occurrence probability in future, Munich Re is currently supporting a research project under the overall control of the Department of Earth Sciences at the University of Bristol (UK). The aim is to extend the database for major eruptions from the current 2,000 years to 10,000 years. This work increasingly allows us to get a more dependable idea of the overall occurrence rate of major volcanic eruptions.

Despite the availability of better data on overall volcano statistics and our ability to warn people more reliably of imminent eruptions, we still have no means of predicting when or where the next VEI 8 eruption will strike.

**Volcanic eruption – An insurable risk?**

In principle, volcanic eruption is an insurable risk. Apart from a few exceptions, however, the infrequency of loss occurrences means that the technical rate is low. Any action taken in response to an advance warning – in other words, an evacuation – would constitute an immense logistical challenge. In the case of the Auckland Volcanic Field, more than 1.3 million people would be affected.

However, volcanic eruptions can also become global catastrophes. An event on the scale of the Yellowstone volcano eruption 630,000 years ago

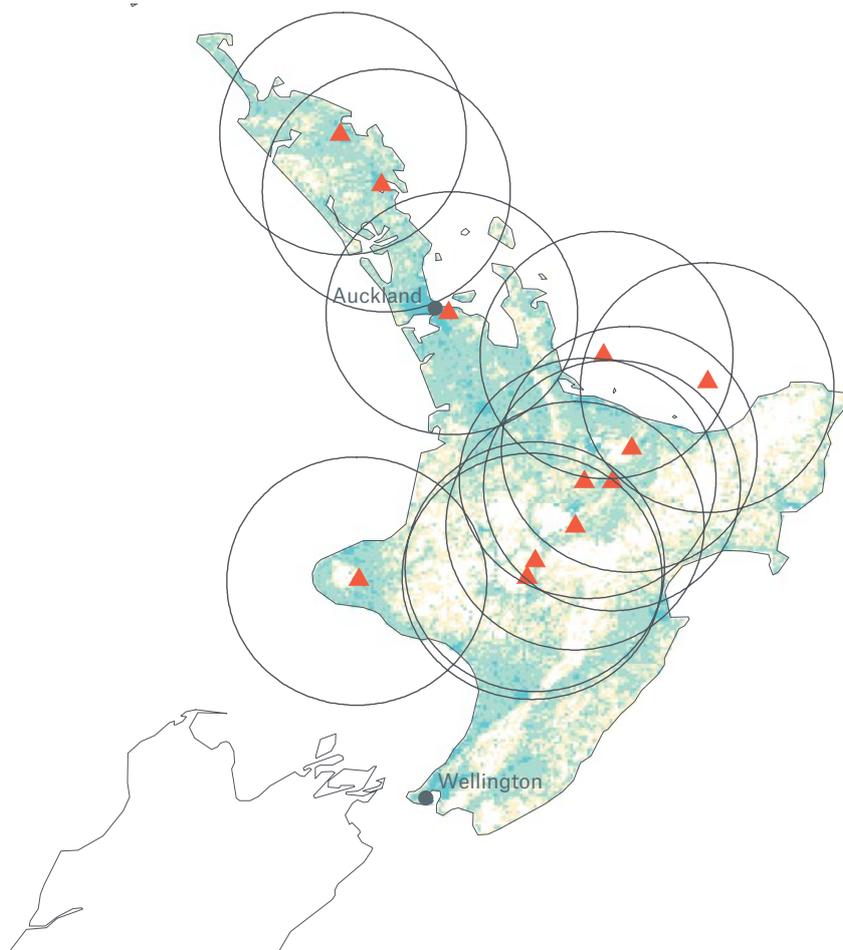
would exceed the limits of insurability. At that time, huge areas of North America were covered in ash. The scale of the damage is unimaginable.

So far, the insurance industry has not dealt systematically with such extreme events, including those involving other natural hazards. Munich Re will therefore continue to support projects like the Global Volcano Model that will make it possible to assess such risks more effectively in the future.

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**Volcanoes in New Zealand**



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Much of the North Island of New Zealand lies within 100 km of one or more Holocene volcanoes, this includes seven airports and eight ports.

- ▲ Volcanoes
- 100 km buffer zone

Source: Munich Re

