

Glacier town at risk in next great New Zealand earthquake

August 21 2020, by Radhika Goyal



Franz Josef Glacier in New Zealand. Credit: [Vaido Otsar](#)

Running through the heart of New Zealand's glacier country is the infamous [Alpine](#) Fault. The 600 kilometer-long (370 mile) faultline on the boundary of the Eurasian and Pacific tectonic plates beneath the

country's South Island produces infrequent but significant earthquakes. In the line of fire is the small town of Franz Josef, just 5 kilometers (3 miles) from the often-visited Franz Josef glacier in the Southern Alps or Kā Tiritiri o te Moana (the Maori name), a popular destination for visitors. [New research](#) affirms that the next magnitude 8.0 (M8) Alpine Fault rupture, which has a 30 percent chance of occurring in the next 50 years, would devastate Franz Josef.

The New Zealand government is supporting projects like AF8, a collaboration between scientists and the National Civil Defense, to prepare for an M8 Alpine Fault [earthquake](#). By mapping possible rupture scenarios, AF8 develops effective emergency response plans. However, because development occurred along the [fault](#) for decades before the [earthquake risk](#) was fully known, the anticipated damage would be extensive.

An Alpine Fault rupture could produce one of the most destructive earthquakes since European settlement of New Zealand because of its geologic characteristics. The fault is a strike-slip boundary in which the Australian Plate and the Pacific plate are moving horizontally past each other. However, the plates are locked and when they overcome these barriers, they produce large but infrequent earthquakes. The fault has ruptured 27 times in the last 8,000 years, every 300 years on average. With the last rupture in 1717, another major earthquake is expected soon.

New Zealand is no stranger to earthquakes as it is located in the seismically active [Pacific Ring of Fire](#). A [2011 earthquake](#), part of a series of earthquakes from 2010-2012 known as the Canterbury earthquakes, ravaged Christchurch, the country's second-most populous city at the time. The M6.3 earthquake claimed 180 lives—130 lost in the collapse of two newly built large buildings alone—and caused extensive physical damage. Compared to other [natural disasters](#), "earthquakes

cause the most fatalities and that's because we can't predict them," John Mutter, a geophysicist at Columbia University, told GlacierHub.



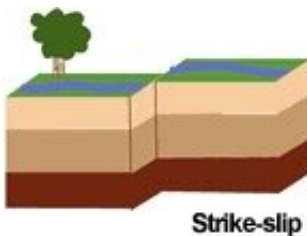
The Alpine Fault is visible as the boundary between the snow-covered Southern Alps and the green plains on the West Coast of New Zealand's South Island.
Credit: Jeff Schmaltz, MODIS Rapid Response Team, NASA/GSFC

The Southern Alps, which include the Franz Josef and Fox glaciers, are a stunning attraction for tourists. Though the town of Franz Josef has only [441 residents](#) (according to the 2013 census), because of its proximity to these glaciers, it receives over 1 million visitors every year and up to [6,000 visitors a night](#) in the peak season. As Stephen Espiner, an expert on conservation and tourism at Lincoln University, explained to GlacierHub, "the two glaciers have supported those communities [of the West Coast] economically for over 100 years."

Franz Josef's city center, including its petrol station, police station,

motels and many businesses, are situated on the faultline. As Caroline Orchiston, a researcher from the University of Otago and lead scientist for the AF8 project, told [GlacierHub](#), "Franz Josef is almost ground zero when it comes to a future Alpine Fault earthquake." [Horizontal ground displacement](#)—movement—of at least 8m (26 feet) and vertical displacement of at least 1.5m (5 feet), combined with significant shaking during an earthquake, could decimate any infrastructure on the fault. Additionally, because of the mountainous terrain, vibrations would dislodge material from the mountains resulting in landslides that could disrupt rivers and roads, explained Mutter. If the rupture happens during peak tourist season, a significant number of people could be at risk.

As the Westland District Council, the local governing body in Franz Josef, told GlacierHub, after an earthquake, "of primary importance is assuring that the access to the region and the glacier country is available at all times for any enterprise or visitor." The loss of access to the West Coast after an earthquake could be particularly damaging for the region which depends on its tourism economy. According to Espiner, road access is expected to be lost for weeks or months and some places might never reopen to tourists.



Credit: [U.S. Geological Survey](#)

A 2016 [report](#) from GNS Science, New Zealand's leading geoscience

research organization, recommends that either establishments move away from the fault line—out of a 200-meter avoidance zone which would face maximum impact—or the town relocates 5-10 kilometers (3-6 miles) northwest of the fault to reduce the impacts of an earthquake on infrastructure and people. While the Westland District Council is contributing to AF8 and working with agencies like the National Emergency Management Agency to respond to a disaster, no relocation or adaptation plans have been implemented yet.

Relocation, however far, brings significant costs. After the Christchurch earthquake, the New Zealand government acquired neighborhoods, buying out properties so the people could move. However, the Westland District Council wrote, "councils do not possess enough funding to buy out at-risk properties [and] the property owners do not wish to walk away from their livelihoods." Additionally, the cost of infrastructure in a new location is more than residents or the local government can afford. Relocation could also hurt tourism because "a town that's located 20 km [12 miles] down the road from the attraction [the glacier] may not have the same draw power as one that's right on the doorstep," said Espiner.

Many community members have also resisted efforts to relocate the town. Although the Canterbury earthquake sequence increased public awareness about earthquake risk, "the problem is converting that into action," said Orchiston, because "people have a very strong tie to place." After the Canterbury earthquakes, many people did not move even when temporary housing was provided. In Franz Josef, residents don't want to relocate despite awareness of the risk, as their livelihood depends on the glacier. Through road shows in the Southern Alps and teaching modules on physical geography for middle and high school students, AF8 aims to increase public awareness of natural hazard risk so that communities might develop a resilience and adaptation plan down the road.



CTV Building in Christchurch 24 minutes after the earthquake. Credit: Michael Lucas

Franz Josef is also accustomed to natural hazard risk as it is located in a multi-hazard area. The retreat of the Franz Josef glacier has increased the risk of rock falls, with tourist access [limited](#) as a result. Moreover, the accumulation of material like stone and sediment in valleys due to glacial retreat has raised the river bed of the Waiho River—which runs between the Fox and Franz Josef glaciers—and increased the risk of floods. With heavy rainfall in the region, the [flood of the Waiho River](#) in July 2019 destroyed a bridge connecting the two glaciers.

Building resilience strategies to effectively respond to the next Alpine Fault earthquake might be the only option for communities that have

lived along the fault line for decades. Furthermore, as Orchiston explained, because of New Zealand's location, no part of the country is free from natural hazard risks ranging from earthquakes to volcanoes to tsunamis. "We have to live with them, and we have to learn to live with them [natural hazard risks] better than we have in the past," she added.

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