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A satellite image captures continuing volcanic emissions from White Island in New Zealand on 13 December 2019.

SCIENCE AGENCY ON TRIAL FOLLOWING DEADLY VOLCANO ERUPTION

The rare example of a government research agency facing criminal charges after a natural disaster underlines the perils of communicating and managing risk.

By Dyani Lewis

New Zealand's Earth-science research agency, GNS Science, has pleaded not guilty to criminal charges laid in the wake of a devastating volcanic eruption at White Island in 2019 that left 22 people dead and 25 injured.

The cone-shaped volcano, 48 kilometres off the coast of the country's North Island, was the site of an explosive eruption of steam, rock and other debris on 9 December that year.

The case is unusual because government

science agencies have rarely faced criminal charges following natural disasters. Some experts fear that pressing charges against a science agency in relation to the information it releases could have a chilling effect on the ability of scientific organizations to provide advice that is used to manage natural hazards.

But others say that the trial's outcome might clarify the roles and responsibilities of GNS Science and its co-defendants in keeping people on the island safe and informed of dangers.

"One of the questions this case raises is how far a scientific organization has to go in terms

of presenting information in a manner that is accessible to the public, and how you would assess if they have done so," says Simon Connell, a lawyer specializing in accident law at the University of Otago in Dunedin, New Zealand.

White Island, also known by the Māori name Whakaari, is one of New Zealand's most active volcanoes, and was a popular tourist destination, where visitors regularly walked on the crater floor. Raymond Cas, a volcanologist at Monash University in Clayton, Australia, believes the 2019 tragedy was "a disaster waiting to happen". He points to a 2016 eruption

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that was comparable in size, but happened at night, when no one was present (G. Kilgour *et al. Earth Planets Space* 71, 36; 2019).

Last November, the country's workplace health and safety regulator, WorkSafe New Zealand, laid two charges against GNS Science, which is based in Lower Hutt, New Zealand. The charges cover a period from April 2016 to December 2019, spanning both recent eruptions. Each carries a penalty of a fine of up to NZ\$1.5 million (US\$1 million).

'Unexpected but not unforeseeable'

This is the first time a scientific agency has been charged under New Zealand's Health and Safety at Work Act of 2015, which is usually applied in workplaces such as factories, says Len Andersen, a workplace health and safety lawyer in Dunedin.

WorkSafe New Zealand is not commenting on the case, but in a statement posted on 30 November 2020, chief executive Phil Parkes said that although the eruption was unexpected, it was not unforeseeable, and any organization or individual involved in getting people to the island had a duty to protect those under their care.

Co-defendants in the case – which does not cover rescue and recovery efforts – include seven tour operators and the National Emergency Management Agency (NEMA).

The first charge alleges that GNS Science – formerly known as the Institute of Geological and Nuclear Sciences Limited – failed to ensure the health and safety of helicopter pilots it hired to take its employees to the island. The second alleges that GNS Science should have consulted and coordinated with other agencies and tour operators, and reviewed “the structure, content and delivery of its volcanic alert bulletins” to ensure that they “effectively communicated the implications of volcanic activity”.

Nature approached GNS Science for comment, but the agency declined to respond while the matter is before the courts.

GNS Science issues volcanic alert bulletins for New Zealand's 11 active volcanoes and the volcanic field that sits beneath its most populous city, Auckland, through a service called GeoNet, which disseminates the bulletins to registered media and emergency-response agencies and to the public. The bulletins contain observations about volcanic activity and include the volcanic alert level – a measure that distils the observed phenomena into a number on a scale from 0 to 5.

One common misconception is that volcanic alert level systems – used worldwide – provide a forecast, but that's not the case in New Zealand. “It's simply a measure of what's going on with a volcano at the time,” says Tom Wilson, a volcanic-risk scientist at the University of Canterbury in Christchurch.

Predicting when an eruption might occur



NEW ZEALAND DEFENCE FORCE VIA GETTY

New Zealand Defence Force personnel at White Island in the wake of the 2019 tragedy.

“is one of the most difficult things to do in a volcanic system”, says volcanologist Roberto Sulpizio at the University of Bari in Italy.

New Zealand's volcanic alert level system does not indicate future risk, Wilson explains. And it is currently unclear where the responsibility lies for assessing risks associated with visiting or working on White Island, he says. “Ultimately, this is going to get tested in court.”

In the weeks before the 2019 tragedy – the first fatal eruption at the site since 1914, when several sulfur miners were killed – the volcanic alert bulletins contained information about seismic activity, mud and gas emissions, and changes to water levels in the crater lake.

Charges being brought against other parties explicitly mention failures to conduct risk assessments or communicate risk. NEMA is charged with failing to communicate risk to the public. Charges against tour companies and another defendant also allege failures to conduct risk assessments.

But Wilson says that requiring tour companies to conduct volcanic risk assessments is a tall order. “Assessing volcanic risk robustly is bloody difficult,” he says. “You're asking these relatively small companies to undertake quite sophisticated risk assessments” that very few people globally are qualified to do.

A guilty verdict for GNS Science could leave other scientific agencies that provide information about natural hazards, such as earthquakes, floods and wildfires, questioning what information they can provide without incurring liability, and how to communicate it, especially if the advice is used to make decisions about how to manage risk.

Organizations that have previously provided information “might decide not to make it available publicly any more” for fear of prosecution, says Connell.

“Everybody's waiting to see what will happen here,” says Wilson.

L'Aquila earthquake

The unusual case calls to mind another case, brought against scientists after the 2009 L'Aquila earthquake in central Italy, which killed 309 people. Six scientists and one government official were initially convicted of manslaughter. The scientists' convictions were overturned on appeal, but the case led to a reckoning in the geoscience community over how best to communicate risk to the public.

Charlotte Rowe, a seismologist at the Los Alamos National Laboratory in New Mexico, says the geological community is working towards communicating volcanic risks more consistently. The International Civil Aviation Organization, based in Montreal, Canada, has recognized aviation alerts for volcanoes, but ground-based alert levels are not standardized. “It's an evolving system,” she says.

In Japan – unlike the United States, New Zealand or Italy – the national meteorological agency issues volcanic warnings that explicitly link the alert to specified danger levels. The warnings also include measures, such as evacuation, that residents and others must take.

In Italy, the upshot of the L'Aquila case was that the roles and responsibilities of scientists and the Department of Civil Protection in regards to managing and communicating risk are now clearly defined, says Sulpizio.

Tours of White Island have been suspended since the 2019 eruption, and there is debate about whether they should resume. NEMA formally pleaded not guilty in court on 3 June, followed on 26 August by all the other co-defendants. The next hearing is scheduled for the Whakatane District Court, near White Island, on 21 October.