2022 National Seismic Hazard Model: Bay of Plenty region

The National Seismic Hazard Model (NSHM) combines the best available scientific knowledge to estimate future earthquake shaking in Aotearoa New Zealand.

The NSHM considers possible earthquakes that could affect a location and then estimates the severity of the related shaking that might occur.

Knowing the likely impact of future earthquakes on New Zealand's land, structures, and people is essential to help us be as safe and prepared as we can be.

Bay of Plenty regional information

The NSHM calculates multiple levels of potential shaking forecast to occur across the region.

In the Bay of Plenty, earthquake shaking is forecast to be more severe in the East, as well as south of Rotorua.

These two example maps display the level of ground shaking (PGA) that has either a 10% chance or a 2% chance of being exceeded within the next 50 years.

Areas on the maps that show warmer colours are more likely to experience severe shaking.

All of the information on the website must be considered together – no one map on its own can illustrate the hazard.

Significant past earthquakes which have affected the Bay of Plenty region

Earthquakes shown: Mw ≥ 5.8 and since 1840 in upper 250 km

Magnitude 7.3 - 1914
Magnitude 6.5 - 1987
Magnitude 6.6 - 1914

Source: Rollins et al (2022)

Shaking shown in the upper left is smaller, but more frequent
Shaking shown in the lower right is larger but much less frequent

A hazard curve shows the shaking for a single location, but for all probabilities of exceedance.

It is normal to feel anxious or overwhelmed when thinking about future earthquakes and looking at shaking maps.

Our scientific knowledge is constantly improving as we gain more understanding of earthquakes and their impacts.

Developing and sharing this knowledge is part of our safety tool-kit, as it helps New Zealanders to be prepared.

For detailed results for your region, go to: www.gns.cri.nz/nshm
Earthquakes generate waves in the earth which cause the ground beneath our feet to shake. These waves can be short and fast (like shaking a rattle) or long and slow (like fly fishing), depending on many factors.

Peak ground acceleration (PGA) is a measure of earthquake shaking. It measures the maximum acceleration of the ground that occurred during shaking at a particular location. Acceleration describes how the ground moves from slower to faster shaking speeds, much like accelerating in your car.

This is why we have seen some buildings affected more than others in previous earthquakes. Buildings move as a result of the unique combination of earthquake source, ground shaking, soil type, and building design.

The National Seismic Hazard Model (NSHM) provides a scientific estimate of the likelihood and strength of potential earthquake shaking which might occur in different parts of the country. It is detailed science, produced over several years, and the end product is a model that helps decision makers manage risks to safety and the economy from earthquakes.

On the NSHM website you can see multiple maps, hazard curves and reports. All of this information must be considered together to understand hazard and its likely impacts. There is not one map which tells us what the hazard from earthquakes is.

Earthquakes mostly occur on faults. A fault is a rupture in the Earth’s crust that enables the land to move independently on either side. When pressure builds up in a fault, it can cause an earthquake and ground shaking.

Faults can be as short as a few metres or up to 1000 kms long and they can cause a variety of different land movements. Many faults can rupture together affecting multiple regions.

There are around 1000 faults that we know of in Aotearoa New Zealand, and these are found both on and offshore. That’s 1000 faults we know about – there will be others that we haven’t discovered yet. The potential for unknown faults is accounted for in the model.

If you would like more support or advice, have feelings of heightened or prolonged anxiety, stress, fear, hopelessness, or anger, or if you just need to talk with someone, please text or free phone 1737 to speak to a trained counsellor in the National Telehealth Service.

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