2022 National Seismic Hazard Model: Otago 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.

Knowing how strong future earthquake shaking might be can help us to understand the potential risks. Various tools including computer modeling, the latest knowledge of how earthquakes occur, and understanding our turbulent past can help us prepare, make good decisions, and increase our resilience to earthquakes.

On average, around 250 earthquakes are felt in Aotearoa New Zealand each year and thousands more are measured outside of the region. Damaging shaking can occur from earthquakes that might occur from local or known faults. Don’t just think about your local area, think about your region, go to: www.gns.cri.nz/nshm.

We prepare as we can be. Essential to help us be as safe and resilient to earthquakes.

The NSHM calculates multiple levels of potential shaking forecast to occur across the region. In Otago, earthquake shaking is forecast to be severe towards the west coast.

Otago regional information

The NSHM calculates multiple levels of potential shaking forecast to occur across the region. In Otago, earthquake shaking is forecast to be more severe towards the west coast. 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. Hazard curves are one way of showing the results for one location. Below is an example for Dunedin. Hazard curves are one way of showing the results for one location. Below is an example for Dunedin. For detailed results: www.gns.cri.nz/nshm.

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.

Be prepared


Significant past earthquakes which have affected the Otago region

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

Magnitude 6.2 - 1947
Magnitude 5.8 - 1876

Source: Rollins et al (2022)

Don’t just think about your local or known faults. Damaging shaking can occur from earthquakes outside of the region.

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.

Earthquakes Ngā Rū Whenua

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.

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.

There are around 1000 faults that we know of in Aotearoa New Zealand, and these are found both on and offshore.

How can earthquakes affect structures?

If an earthquake causes strong ground shaking our built infrastructure (like buildings and dams) and lifelines (like our power and water networks) can be affected.

Ground shaking will vary due to:
- the ground conditions
- the land deep beneath our feet
- earthquake location and magnitude
- the direction the earthquake fault ruptures

These all affect the way the seismic waves travel through the ground and how the ground will shake. So, for the same earthquake affecting one region, an area of reclaimed land will shake very differently to an area of more solid rock.

It is common to see a range of hazard results, even within one region.

Be prepared

1. Keep your whānau safe: Practice Drop, Cover and Hold at least twice a year.
2. There's a lot we can do to make our homes safer for earthquakes. The Toka Tū Ake EQC website has key steps that will help you prepare your home and protect your whānau.
3. Long or Strong? Get Gone. If you live near the coast, as soon as earthquake shaking stops, move immediately to high ground or as far inland as possible, in case of tsunami.

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.