Te Tauira Matapae Pūmate Rū i Aotearoa
NSHM The New Zealand National Seismic Hazard Model
A GNS Science Led Research Programme

A bit about earthquakes

On average, around 250 earthquakes are felt in Aotearoa New Zealand each year and thousands more are measured.

Faults

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. Faults can be as short as a few metres or up to 1000kms long and they can cause a variety of different land movements.

Repeated earthquakes and their associated fault movements have formed the major mountain ranges of New Zealand.

There are around 1000 faults that we know of in Aotearoa New Zealand, and these are found both on and offshore. There will be others that we don't know about yet.

If a fault shows evidence of having moved at least once in the past 125,000 years, it is classified as being 'active' which means that geologists see it as a potential source of future earthquakes.

Magnitude

We describe an earthquake as happening at a place (the epicentre), at a distance below the Earth's surface (depth), and having a size (magnitude).

Magnitude is an estimate, and there are different ways of calculating magnitude, so it is quite common to see slightly different magnitude values attributed to the same earthquake.

Ground Shaking

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 as well as the location and orientation of the earthquake fault rupture. These all affect the way the seismic waves travel through the ground.

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.) Frequency of shaking (how many times it moves up or down, or back or forth during a set time) is also important. Typically, we expect that high frequency (rapid) ground shaking might mostly affect shorter buildings, and low frequency (slow) ground shaking might mostly affect tall buildings.

Earthquake monitoring

Seismic waves are caused by energy released when two sides of a fault become unstuck and rapidly move past each other. Measuring these waves help us determine the type of earthquake, its origin, and its strength/intensity.

We monitor earthquakes by measuring these seismic waves they generate, using a seismometer.

GNS Science, through the GeoNet programme, owns and operates the national seismograph network and there are hundreds of broadband seismometers located across New Zealand to help rapidly identify and measure our earthquakes.

Probability

We cannot predict earthquakes, but we can forecast them, and then forecast the ground shaking that might occur from those earthquakes.

The hazard forecast estimates the level of ground motion that might happen at any one location with a specified *probability of exceedance.* For example, we might determine a level of ground shaking that has a 10% chance of being exceeded within the next 50 years. In other words, it is 10% likely we will experience this level of shaking, or greater, within 50 years.

The NSHM calculates multiple probabilities of exceedance (Such as 2% and 10%) so we can explore the range of potential hazard scenarios.

For more information: www.gns.cri.nz