

QuakeNZ

Earthquake Loss Model

Intelligently Designed, Location and Portfolio Level Intelligence

QuakeNZ is Risk Frontiers' earthquake loss model for New Zealand. Covering residential, commercial and industrial exposures, QuakeNZ incorporates the latest seismological and engineering research. Major improvements include:

- Updated earthquake recurrence intervals consistent with the GNS intermediate term hazard forecast for central New Zealand (which includes Wellington)
- Coverage of residential, commercial and industrial property and business interruption lines of business
- Improved vulnerability functions and demand surge calculations
- Incorporation of a new exposure dataset and market portfolio composition

Full Spectral Response

To determine damage to buildings, QuakeNZ 4.0 calculates the full seismic demand spectrum of each simulated earthquake (462,000 events) at each building location. This enables more accurate modeling of progressive changes in building stiffness during shaking, enhancing the estimation of building damage.

Liquefaction probability is also calculated at each location for each event and is mapped at 16 m resolution to represent its highly localized sensitivity to soil type, distance to water, and slope.

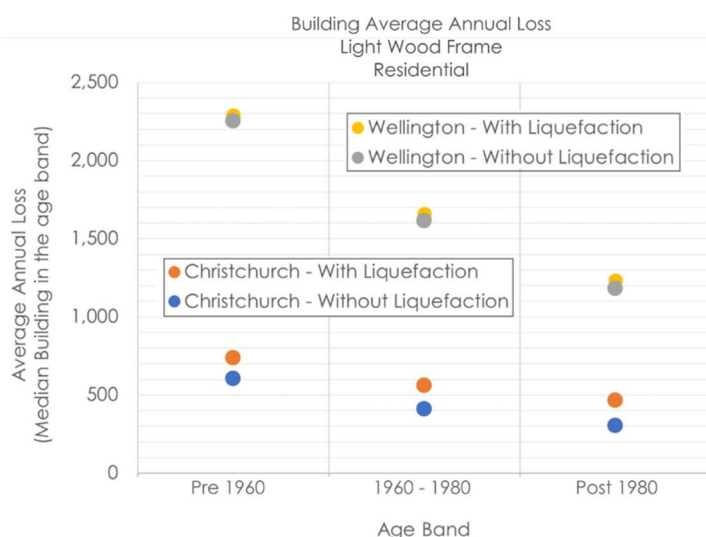


Figure 1: Calculated contributions of ground-shaking and liquefaction damage for a location in Christchurch and Wellington

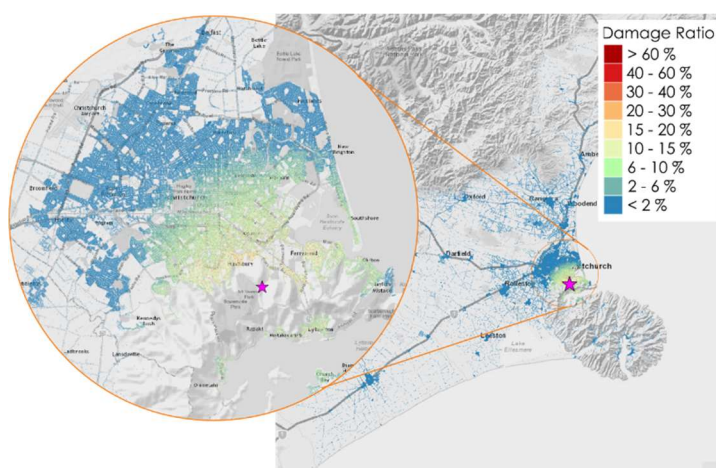


Figure 2: High resolution damage calculations that take in to account depth, distance to source, and soil type on a variable resolution grid.



Model Overview

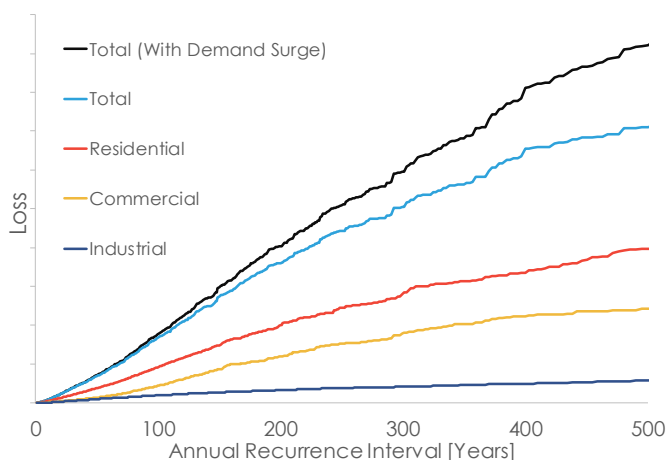
Hazard Resolution: Ground Shaking	Variable resolution, down to 500 m
Hazard Resolution: Liquefaction	16 m
Exposure Resolution	Location Address Level
Event Catalogue	50,000 years of stochastic earthquakes
Ground Shaking, Liquefaction and Exposure Parameters	Location, full acceleration demand spectrum, soil type, liquefaction potential, building construction type, building age, building height
Line of Business	Residential / Commercial / Industrial
Business Interruption	Commercial / Industrial
Coverage	All Properties on mainland New Zealand

An up-to-date view of the hazard

Risk Frontiers has developed an earthquake source model for NZ from a complete catalogue of events including the Canterbury sequence. For central New Zealand, the model uses time-dependent earthquake probabilities consistent with GNS Science's revised earthquake forecast. This was developed after the 2016 Mw 7.8 Kaikoura earthquake, when GNS convened a panel of world leading scientists from Japan, Taiwan, and the United States to estimate the probabilities of large earthquakes occurring in central New Zealand. Risk Frontiers updated our active fault model in central New Zealand to reflect the resulting intermediate term increased likelihood of large events.

QuakeNZ also implements the Bradley ground motion prediction model, which is based on an extensive global data set, is calibrated to optimally fit New Zealand data, and provides an excellent fit to the Canterbury earthquake data.

One Click Portfolio Roll-up



Location Level Intelligence

Location	Oak St, Upper Hutt, Wellington
Latitude	-41.11
Longitude	175.07
Property Replacement Value	NZD 350,000
Annual Probability of Loss	1.7% (AAL: 1,320 NZD)
Liquefaction Potential	Very low
Soil Type	Firm to hard rock
Selected Vulnerability Parameters	
Building Year Built	1978
Building Construction Type	Reinforced Masonry
Number of Storeys	2



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