Expect a Big One

Alexander Allmann
Munich Re expert on earthquakes

Earthquakes in Australia are infrequent and mostly moderate in size. At first glance, this appears to be a much more comfortable situation than in New Zealand, Japan or the United States. However, on closer examination the picture looks different: earthquakes in Australia could cause insured losses in the same order of magnitude as in the highest-exposed regions worldwide.

#Earthquakes in Australia? It could happen close to every major city: low probability, high consequences #seismic activity, #lessons learned, #Christchurch

Australia is not known as an earthquake hotspot – but neither was Christchurch in New Zealand. As it turned out, in Christchurch in 2010/2011 an unexpected series of severe earthquakes with a magnitude of up to 7.1 surprised even the experts and destroyed large parts of the city – it was one of the most expensive insured natural catastrophes in history. Since Australia is not located at the margins of tectonic plates, where 90% of the world's seismicity occurs, many Australians are not aware that this is a peril we need to worry about – but maybe we should.

The Australian continent experiences small earthquakes all the time because the Indo-Australian tectonic plate is being pushed north and thus collides with other plates. This leads to a build-up of mainly compressive stresses that are released in shallow earthquakes. Although earthquakes can occur anywhere in Australia, this seismicity is spatially heterogeneous; some regions have significantly increased seismic activity. Statistical analyses on recorded earthquakes show that events with a magnitude similar to or higher than that in Newcastle in 1989 (magnitude 5.6) can be expected every two years, with a magnitude of 6.0 or more every five years on average. Fortunately, most of them happen in unpopulated or sparsely populated regions.

Our models show that regions of elevated seismicity are in close proximity to most of the major conurbations (Perth, Adelaide, Melbourne and Sydney). For each individual area, the seismicity is too low for a robust statistical analysis of the probability of a severe event right underneath a city or the maximum size of such an event. What we do know is that each of the cities has the potential to be hit by earthquakes bigger than a magnitude of 6. Earthquakes like those in Christchurch should not come as a surprise and are very realistic scenarios.

Many buildings will not survive strong ground motions

A few small to moderate earthquake events have provided data that have helped us to constrain our modelling of the potential ground motions that can be expected in Australia. Overall, the data set is still very limited and there are barely any data for bigger events. The uncertainty associated with these ground motion estimates is high. Fortunately, the soil conditions in cities like Sydney are much better than in Christchurch. Although ground motion amplification is expected in some regions that have soft soils, no widespread liquefaction is expected.

Given the moderate earthquake hazard in Australia, buildings are not constructed to resist very strong ground motions. The moderate Newcastle event in 1989 provided a good illustration of the very poor behaviour of structures such as unreinforced masonry buildings. Should a severe earthquake occur underneath one of the major cities, the ground motions will significantly exceed the design ground motion in the building codes. This will inevitably lead to very high loss levels close to the earthquake epicentre. In Christchurch, the design ground motion was exceeded by more than a factor of three. The Central Business District (CBD) had to be cordoned off for years, and many buildings suffered a total loss.

Exposures will be factors higher than in Christchurch

What if the unexpected were to happen? It will happen. We know an earthquake will hit one of the cities. The only questions that remain are: when and how severe? So far, we have not experienced a major earthquake catastrophe in Australia. This is consistent with our expectation of a low to moderate seismicity. For return periods of several hundred years, this is different. Loss estimates are very high, with considerable uncertainties. They increase sharply for higher return periods. This makes risk management difficult for the insurance industry.

In Japan, insurance cover is strictly limited and extreme events are expected, so that potential losses are not likely to be significantly underestimated. In Australia, a really unpleasant wake-up call from an extreme event is much more likely. This is because earthquake insurance penetration in Australia is generally very high (above 80%), and risks are covered on a full-value basis with very small deductibles. Most of the exposure in Australia is concentrated in the big cities. The value concentration is enormous. If an earthquake strikes one of the cities, the exposure affected by high ground motions will be factors higher than in Christchurch – and the major part of any earthquake loss will be borne by the insurance industry.

Challenges for claims handling

While the local insurance industry has experience with handling mass claims due to cyclones, hailstorms and floods, the earthquake engineering community is not very strong. So the handling of earthquake losses would also be a great challenge for insurers – despite the steep learning curve insurers experienced while dealing with the Christchurch earthquakes.

The experience from Christchurch demonstrates that claims handling and reconstruction would be a complex and long-lasting process. Such unexpected complexities arise after nearly every major natural catastrophe event worldwide. Many of the challenges following the Christchurch events were associated with the structure of the market – the Earthquake Commission (EQC) in particular. In addition, legal aspects slowed down claims handling.

Prepared for a Big One with Munich Re

Australia's largest earthquake, with a magnitude of 7.2, occurred in 1941 in Western Australia – far away from any of the bigger cities. The earthquakes in Christchurch have shown us that even moderate earthquakes can cause huge losses for the insurance industry. Such an earthquake – but with significantly higher losses – is a very realistic scenario for Australia.

The vulnerable, highly concentrated building stock has the potential for extreme losses. A repetition of the 1954 Adelaide earthquake (magnitude 5.7) would result today in multi-billion insured losses. A bigger event closer to Adelaide could cause a loss costing tens of billions.

aallmann@munichre.com
https://de.linkedin.com/in/alexanderallmann

Historic earthquakes in Australia

5.4
Magnitude
2012
Victoria – Moe

5.3
Magnitude
2011
Queensland – Bowen

5.6
Magnitude
1989
New South Wales – Newcastle

6.3–6.7
Magnitude
1988
Northern Territory – Tennant Creek

6.2
Magnitude
1979
Western Australia – Cadoux

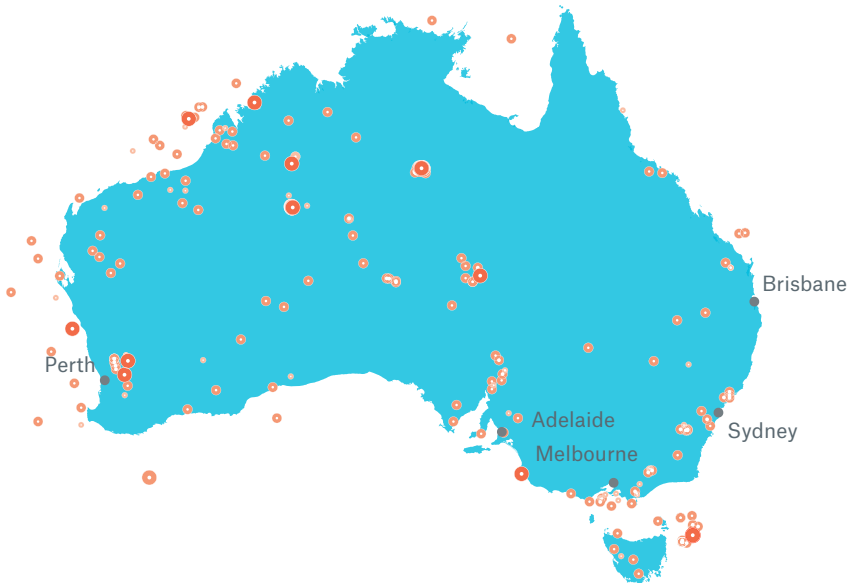
6.9
Magnitude
1968
Western Australia – Meckering

5.4
Magnitude
1954
South Australia – Adelaide

7.2
Magnitude
1941
Western Australia – Meeberrie

Maps of earthquake epicentres in Australia and New Zealand

Australia

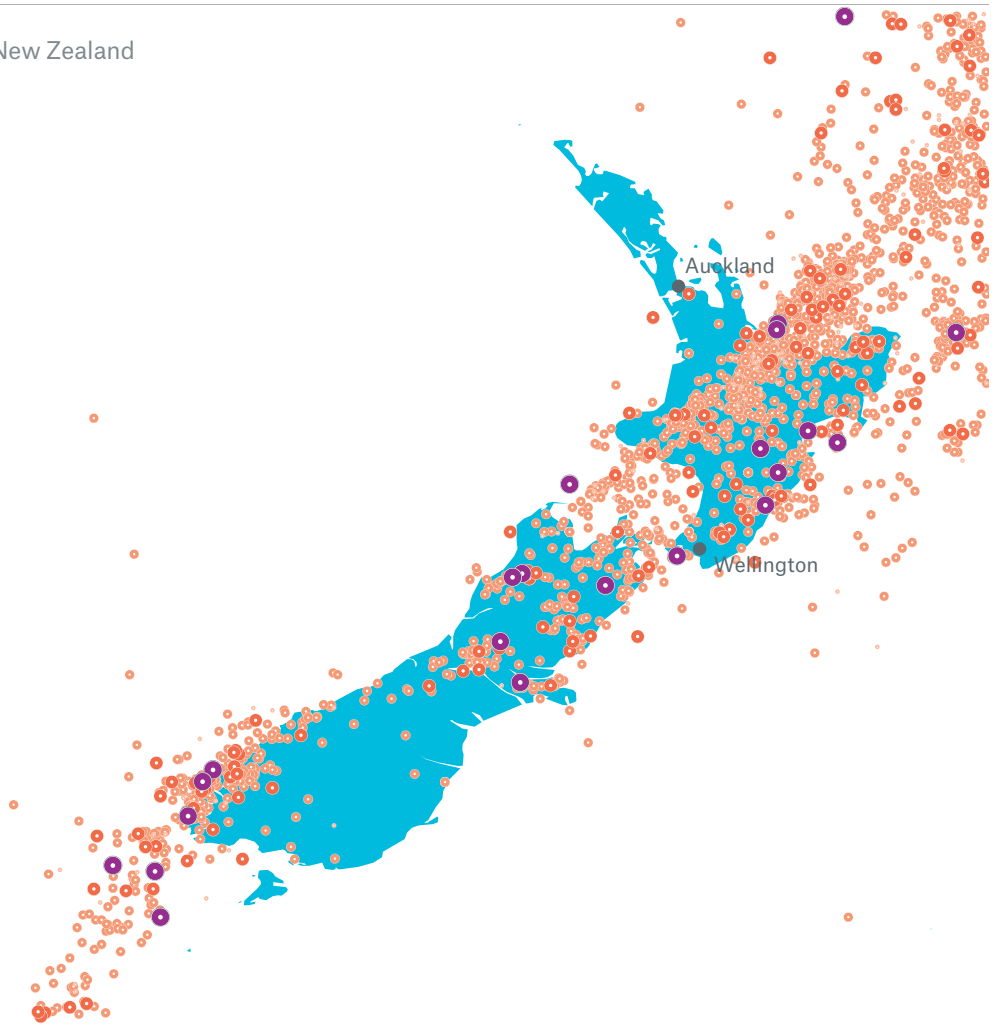


Earthquake epicentres since 1840

Source: Munich Re

Magnitude
- 5.0
- 5.1 – 6.0
- 6.1 – 7.0
- > 7.0

New Zealand



Earthquake epicentres since 1840

Source: Munich Re

Magnitude
- 5.0
- 5.1 – 6.0
- 6.1 – 7.0
- > 7.0