

Insurer pricing for natural hazards

Are you using all of the available data?

November 2017

There is a wealth of data on natural hazards in New Zealand – if you know how to find it. In this Topix we've picked a small region – in this case Hawke's Bay – to illustrate how earthquake, flood, tsunami and coastal erosion risks vary across the region. In most cases the granularity of risk data is much finer than postcode level. We then go on to look at some market premiums to see which insurers are actually accounting for the diversity of risk.

Catastrophe risk data

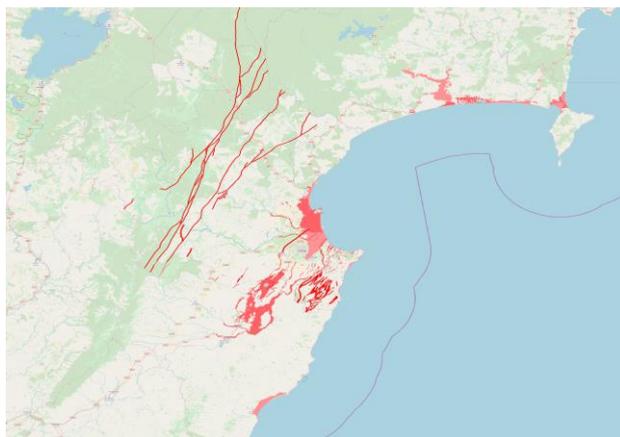
We utilised a number of datasets for this analysis:

- **Earthquake risk:** recurrence interval of various faults, shaking amplification factor according to ground conditions, liquefaction susceptibility.
- **Flood risk:** flood plain data, river bank stability, detention dams.
- **Tsunami and coastal erosion:** areas susceptible to sea level rise or storm surge, coastal erosion, slope stability.

We've used some geospatial mapping tools to overlay this data and produce the pictures you see below.

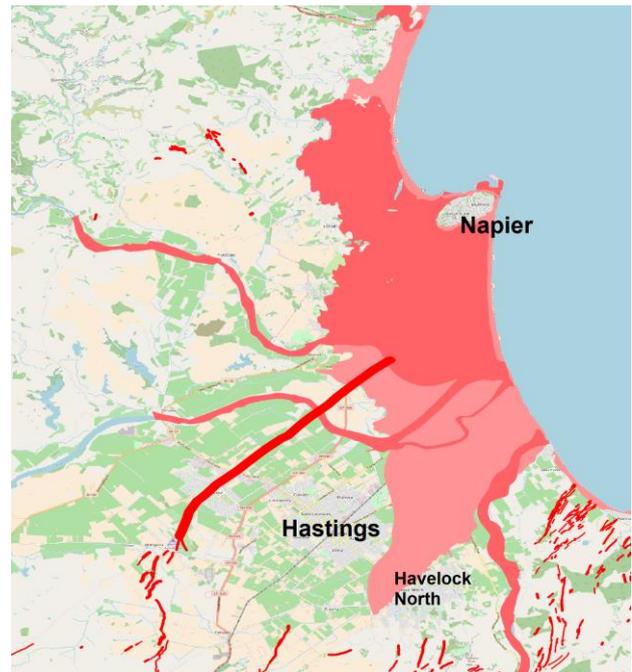
Earthquake

Fault lines in the North Island generally run up the east coast – which makes Hawke's Bay an ideal region to analyse. The picture below illustrates the major fault lines and liquefaction zones across the region. We've only illustrated the high and very high liquefaction susceptibility zones.



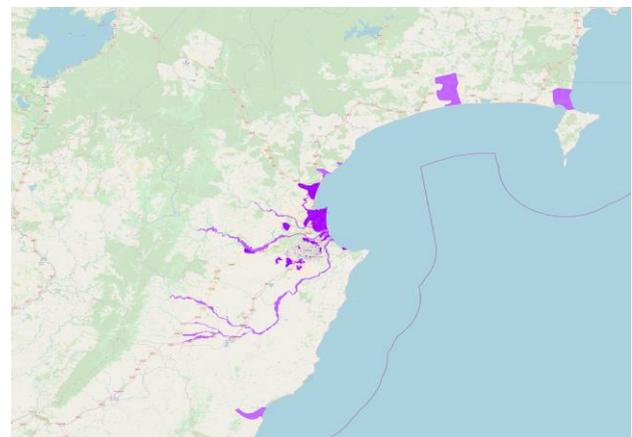
- Fault avoidance zone
- Liquefaction - very high
- Liquefaction - high

Zooming in a bit we take a closer look at Napier and Hastings. Most of Napier sits on land very highly susceptible to liquefaction, whilst the majority of Hastings and Havelock North are lower risk, although with some notable pockets of higher risk land. The Awanui fault runs south west out of Napier towards Hastings airport, resulting in ground rupture risk for existing properties in the fault avoidance zone i.e. where the council now deems it unsafe to build.



Flood

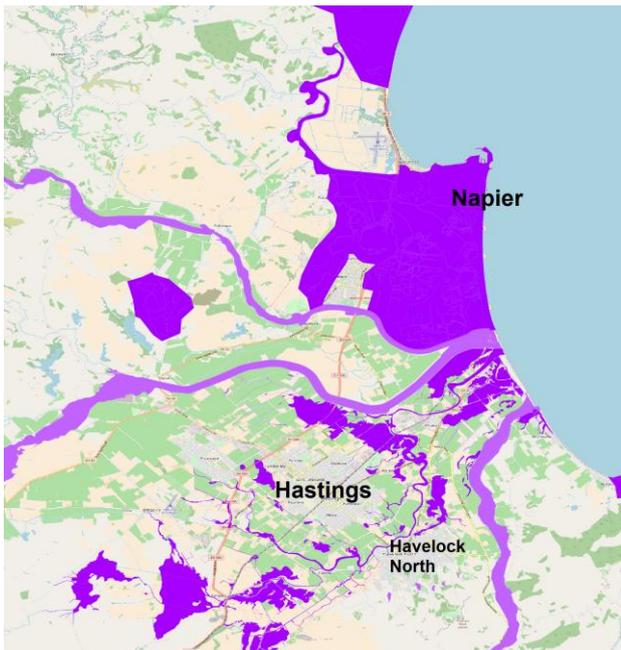
The chart below looks at flood risk at the 1/50 and 1/100 year level, so we're dealing with higher frequency lower severity risks here relative to earthquakes in the previous section.



- 1/50 yr downpour flood
- 1/100 yr river flood

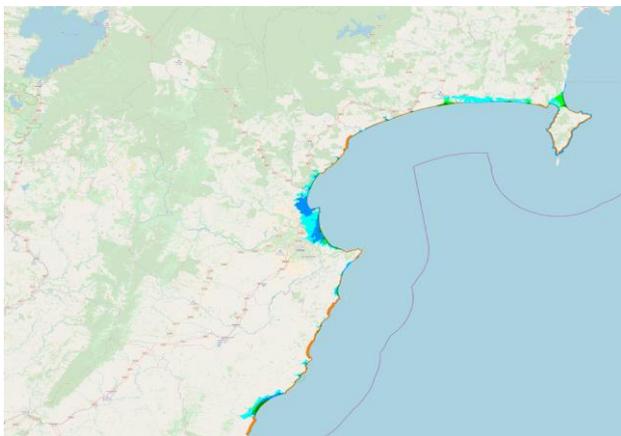
Zooming in again we see that the whole of Napier is susceptible to flooding in a 1/50 year downpour. What we're looking at here are areas where local drainage systems are likely to be overwhelmed with a 1/50 probability. Hastings avoids the worst of the flood risk (with the exception of certain pockets of land, as was the case with earthquakes).

As one might expect, land near to the region's riverbanks is more susceptible to flooding. We've illustrated the areas here which would likely be affected by riverbanks being overwhelmed by a 1/100 year rainfall event.



Tsunami and coastal erosion

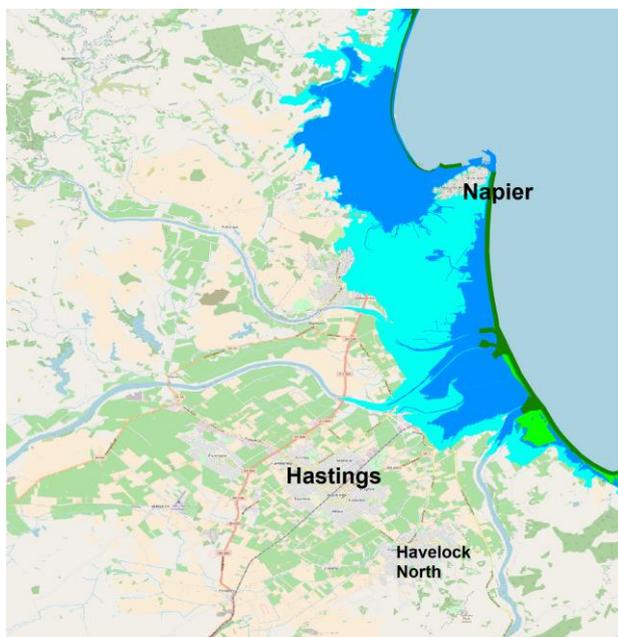
When it comes to tsunamis and coastal/cliff erosion, unsurprisingly the risky areas all lie along the coastline, which again leaves Hastings in a better position than Napier.



- Orange Cliff Hazard Zone
- Brown Cliff-Coast Transition Zone
- Dark Green Coastal Hazard Zone 1
- Light Green Coastal Hazard Zone 2
- Bright Green Coastal Hazard Zone 3
- Cyan Tsunami - Near
- Blue Tsunami - Distant

The orange and brown areas (though difficult to see on this scale) are cliffs with a high risk combination of ground slope and shoreline movement or soft shore land. The green areas are at risk of coastal inundation and erosion due to severe storms, dune instability or sea level rise. The darker green areas exhibit higher risk than the lighter green areas. The blue areas are tsunami risk areas due to either near or distant Pacific earthquakes.

Looking closely again at Napier and Hastings we see that, aside from the elevated areas of Bluff Hill and Hospital Hill, much of Napier could be affected in a significant tsunami.



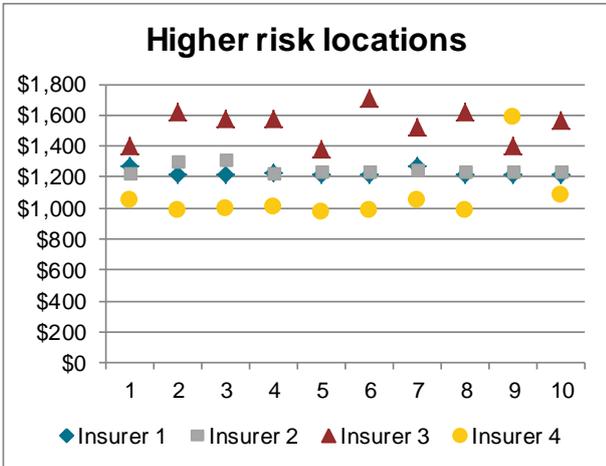
The picture emerging here is that Napier is generally a higher risk area than Hastings in terms of natural hazards. Although the nature of that risk varies at a very granular level.

Market premiums

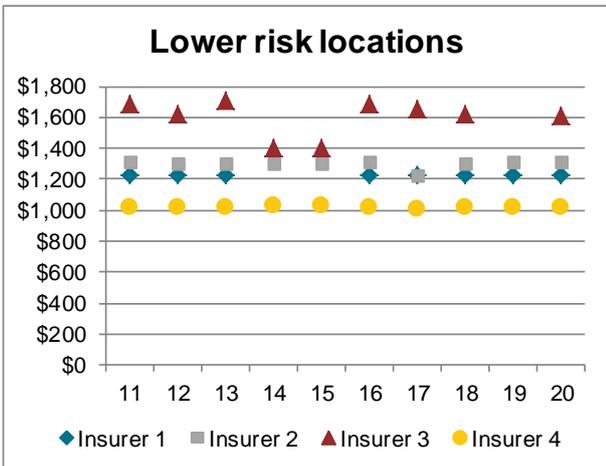
We took a sample of premiums from some of New Zealand's large insurers. We defined a typical residential property and compared premiums for that property at a few different locations around Hawke's Bay.

The enlarged map on the last page shows 10 locations with varying degrees of earthquake, flood and tsunami/coastal risk labelled 1-10. We've also included 10 lower risk locations (labelled 11-20) with less significant natural hazard susceptibility based on the factors above.

The chart below compares the premiums charged for the same residential house at each of locations 1-10. One insurer differentiated strongly between locations, while some insurers barely differentiated at all. And for those that did differentiate, there is little correlation between insurers in how that differentiation applied.



This second chart shows how insurers differentiated between locations 11-20. Ironically, the average premium for our standard property in the low risk areas was slightly higher than the average for that same property in the high risk areas. That could be the result of other risk factors unrelated to the hazards above, for example fire or theft. Although the inconsistent variation in market pricing suggests it may simply be random anomalies.



Earthquake Commission

What about EQC charging a flat rate for catastrophe cover across the country – doesn't this negate the need for insurers to price for cat risk?

With the limit for EQC cover set at \$100,000, and being restricted to residential properties only, private insurers still bear the lion's share of the risk. The EQC Act review will likely see the limit increase to \$150,000, but this still leaves plenty of scope for insurers to pick up the bill.

Conclusion

Competition is heating up in the personal lines market, with a number of new entrants looking to cherry-pick the best risks. The brief analysis we've done here suggests that the larger insurers are leaving room for more granular pricing.

Incorporating all of this information into your rating structure isn't simple, but it may eventually be necessary if another insurer heads down this path. Perhaps in the same way that the Australian insurers scrambled to establish their flood risk maps a few years ago, no one wanted to be the last man standing with a pool of high risk properties on their books.

Further information

A larger, more detailed map showing all the hazard data for the region is given on the following page. Similar datasets are available for the rest of the country.

If you want to find out more about how you can use this data to better price for risk then feel free to contact any of the authors below.

ABOUT MELVILLE JESSUP WEAVER

Melville Jessup Weaver is a New Zealand firm of consulting actuaries providing advice on superannuation, insurance and investment consulting. The firm, established in 1992, has offices in Auckland and Wellington and is an alliance partner of Willis Towers Watson, a leading global services company and is located on the web at willistowerswatson.com.

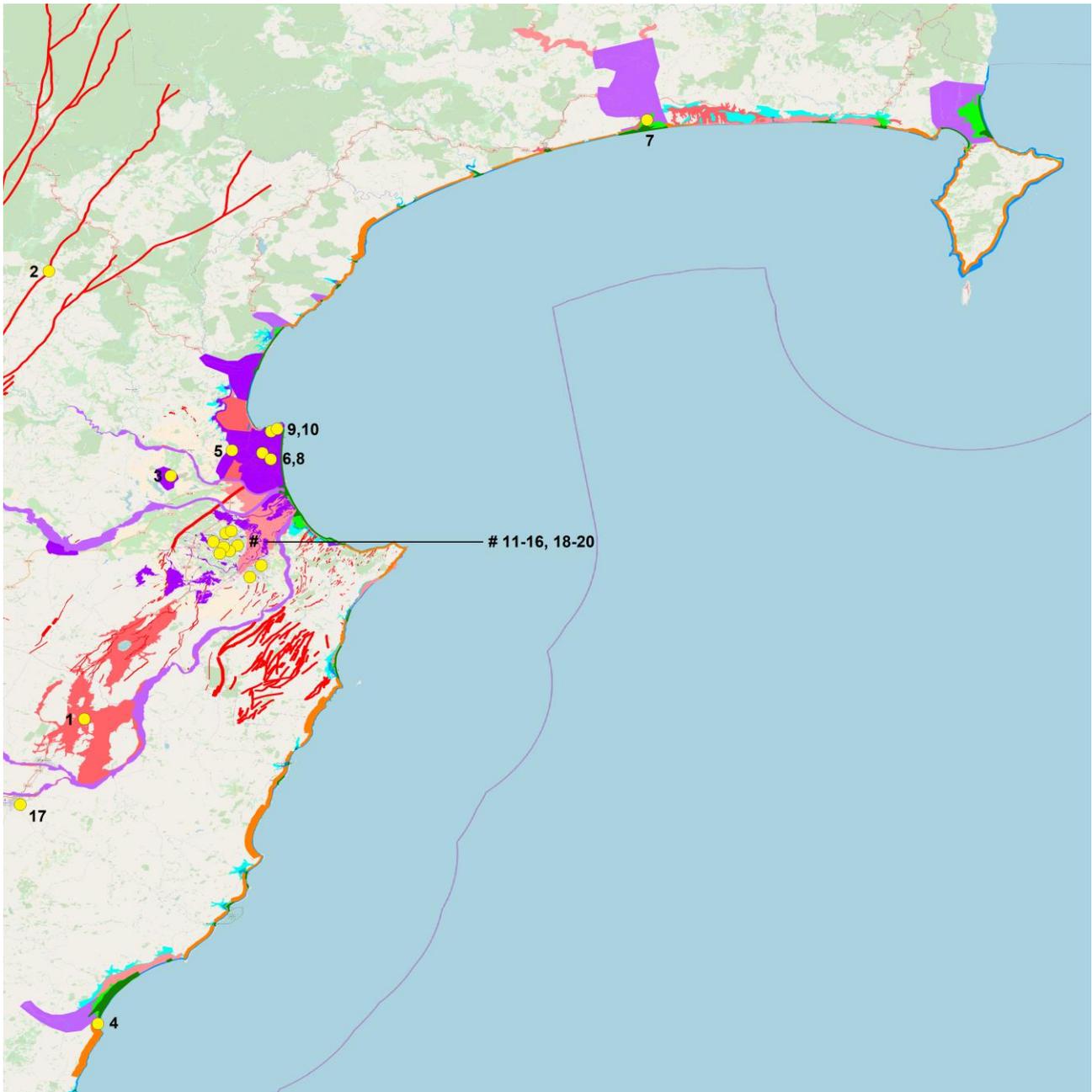
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Hawke's Bay natural hazards



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