

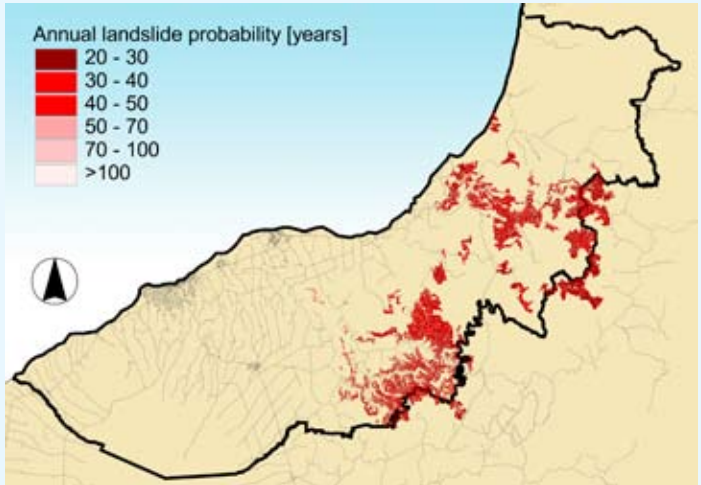
NIWA Natural Hazards

setting the foundation for a safer future

New Plymouth landslide hazard assessed

NIWA recently assessed the landslide hazard for the New Plymouth district.

Reassuringly, the study concludes that only 9% of the New Plymouth district (about 183 km²) is likely to be affected by landslides. The affected area is in the mudstone country in the east and northeast of the district. We calculate that average return periods for heavy rainfall events which could trigger landslides in this area range from 1-in-70 years towards the end of summer (February) to 1-in-25 years in winter when soils are very wet, especially in July and August.



Annual landslide probability for the New Plymouth district – calculated as the minimum monthly (winter) landslide probability for shallow, rainfall-induced landslides. The probability is expressed as the average return interval in years. The map shows that only areas in the eastern mudstone country are affected, with return intervals of about 20-50 years.

Climate change could double landslide probability

Human-induced climate change is likely to increase the extreme rainfalls in the district. Using a mid-range projected climate change scenario for the 2030s and 2080s, the return period for widespread landslide-inducing rainfall reduces from 70 to 50 and 30 years respectively, and 20 years for a high-range scenario. This suggests that the landslide probability is likely to at least double during the 21st century, with more areas affected. Despite this, however, most of the district will still have stable soils.

How did we work this out?

The project required a combination of statistical and geotechnical modelling, analysis of soil moisture and rainfall data, field-work and laboratory-based soil geotechnical work. The key is to establish when high intensity rainfall will trigger a landslide in an area. This depends on: how much moisture the soil is already holding; the point at which the land gets too saturated and starts to slide; and the maximum probability (or minimum recurrence interval) of a rainfall event that can saturate soils to the triggering threshold. Clearly, the antecedent soil moisture content and the probability of heavy rainfall vary depending on the season, so we developed landslide hazard models for each month of the year.

Why do hazard assessments?

The landslide hazard assessment is part of a suite of reports commissioned by the New Plymouth District Council. The council asked NIWA to take a comprehensive look at the climate hazards and extremes facing the district now and as a result of climate change. While it's not possible to reduce the incidence of natural hazards, it is possible to reduce the vulnerability of communities to these events. The assessments will help the district make well-informed decisions about how to lessen the impact of natural hazards, thus saving lives, reducing damage and disruption, and enabling faster recovery when disaster strikes.



Shallow landslides under pasture near Tarata, southeast of New Plymouth. [Photo: Jochen Schmidt, NIWA]

Forecasting rip currents: how can it be done?

Even the strongest swimmers can get caught in rips, pulled rapidly into deep water – and deep trouble. Some rip currents have been measured at velocities of over 2 metres per second. The benefits of accurately forewarning beachgoers and lifeguards about where rip currents will form are obvious.

Over 75% success but challenges remain

NIWA scientists Scott Stephens, Richard Gorman and Giovanni Coco, in collaboration with Karin Bryan and Darcel Rickard of the University of Waikato, recently developed a method of forecasting rip occurrence at Tairua Beach, Coromandel, using offshore wave forecasts. The rip forecast was based on a probabilistic relationship constructed from five years of rip observations and hindcast waves at the beach. The team identified the rips from NIWA's 'Cam-Era' webcam video images collected from 2001–2005, and used NIWA's wave model to produce wave hindcast data for correlation with the rips. The rip current forecasting method correctly predicted rip occurrence 76% of the time.

To improve on this, the team believes future advances in rip forecasting will require models that can predict the way the shape (morphology) of the beach continually changes and show feedback between morphology and hydrodynamics. Improving operational forecasting of rips remains a challenge, although breakthroughs in modelling concepts are being made.

Beach hazard indices: a practical step now

In the meantime, beach 'hazard indices' may be the most practical form of forecasting, using forecast indices customised for local shorelines. These don't predict the specific beach state or presence of rip currents for a given time, but rate the hazard on the beach using local information about beach rescues/drowning or by coupling forecasts of wave heights with general knowledge of beach types and variability.

More information:

Cam-Era shoreline video monitoring:

www.niwascience.co.nz/services/cam-era

Wave climate around New Zealand:

www.niwascience.co.nz/rc/prog/chaz/news/waves

Wave forecast for the New Zealand region:

www.niwascience.co.nz/ncco/forecast

Time-averaged image of Tairua Beach, from 940 images collected at 1 second intervals on 24 Feb 2001. Rip currents are seen as patches of dark 'unbroken' water extending offshore from the beach, inside the surf-zone.



Coastal Hazards & Climate Change

Are you involved in coastal planning for local government? We'd like to hear your views on how to make guidance material on climate change most useful!

The Ministry of Environment funded *Coastal Hazards and Climate Change: A guidance manual for local government in New Zealand* was prepared in 2003 and published in 2004. The Ministry now wishes to update the manual to include the latest findings of the Intergovernmental Panel on Climate Change, being released by May this year.

We are seeking opinions on the existing guidance manual:

- Which sections have proved useful?
- Do some sections need to be expanded or shortened?
- Are there new topics that need to be included?
- How accessible and user-friendly is the manual?

We would also welcome case studies of good or innovative practice where climate change considerations have been incorporated within local government functions or decision-making relating to coastal margins.

We would like to collate any contributions by the end of April 2007.

A questionnaire is available at:

www.naturalhazards.net.nz/manual.

Alternatively, contact Doug Ramsay at

d.ramsay@niwa.co.nz.

The guidance manual is available at:

www.climatechange.govt.nz/resources/local-govt/coastal-hazards-may04/index.html



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