

# Natural hazards

## Risk is all about facing consequences

What if a major stopbank failed at night during a 1-in-50 year flood? What if we had a magnitude 7.5 quake on a local fault at 2 p.m. on a weekday? What if that quake generated a tsunami?

Where are the likely injury hotspots, depending on day and time? How many people could be affected? What vital infrastructure is at risk and where? What might be the costs of repair or replacement?

RiskScape is a new tool, being developed jointly by NIWA and GNS Science, to answer such questions.

RiskScape can be applied in the aftermath of an event to help prioritise the response. But even more importantly, it's vital to ask those 'what if?' questions beforehand. Quantifying the consequences of credible scenarios helps long-term land-use planning (e.g., siting new subdivisions) and provides a realistic picture for emergency arrangements and exercises (e.g., evacuation maps). Consequently, RiskScape will be useful to land-use planners, design engineers, emergency managers, and the insurance sector.

NIWA and GNS Science are running a working prototype with councils covering Westport, central Hawke's Bay (Napier, Hastings, Havelock North), and Christchurch. RiskScape will be set up for five hazards in these three areas by mid 2008.

RiskScape is funded by the Foundation for Research, Science & Technology.



*A screenshot from RiskScape showing estimated cost of damage to cars if the stopbank along the Ngaruroro River were to breach during a 1-in-50 year flood. The simulation was supplied by Hawkes Bay Regional Council. The lime green colour shows the extent of the area modelled; cars in these areas would not be damaged. The heaviest damage to cars would be in the red areas. In reality, for this scenario, there would be at least 12 hours' warning, allowing time to shift vehicles.*

## New Plymouth landslide hazard assessed

This year, NIWA assessed the landslide hazard for the New Plymouth district. The project required statistical and geotechnical modelling, analysis of soil moisture and rainfall data, field-work, and laboratory-based soil geotechnical work.

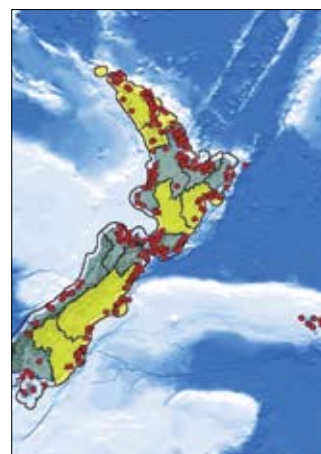
Reassuringly, the study concludes that only 9% of the district – mudstone country in the east and northeast – is likely to be affected by landslides. The estimated average return periods for heavy rainfall events which could trigger landslides in this area range from 1-in-70 years towards the end of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

The landslide hazard assessment is part of a suite of reports commissioned by the New Plymouth District Council. The council has asked NIWA to take a comprehensive look at the climate hazards and extremes facing the district now and as a result of climate change. Using a mid-range projected climate change scenario, the landslide probability is likely to at least double during the 21st century, with more areas affected, though most of the district will still have stable soils.



Jochen Schmidt, NIWA

*Shallow landslides under pasture near Tarata, southeast of New Plymouth.*



## Tsunami hazard

NIWA's tsunami specialists have had a busy year, conducting tsunami hazard assessments in the regions coloured yellow. The red circles show a representative sample of locations in NIWA's palaeotsunami database where physical evidence or oral tradition suggests past tsunamis.

## All-hazards forecasting capability established

After several years of research, NIWA has the key elements of an integrated 'all natural hazards' forecasting capability.

This challenging project has already produced for the New Zealand region:

- the first high resolution weather forecast model that can incorporate satellite and conventional weather observations – the New Zealand Limited Area Model (NZLAM). NZLAM uses the UK Met Office Unified Model™;
- the first data-assimilating, spatially-distributed flood forecasting model;
- the first regional-scale high resolution wave forecasting models;
- the first regional-scale sea-level forecasting model.

The research is part-funded by the Foundation for Research, Science & Technology.



Alan Blacklock, NIWA

## Towards a national flood forecasting service

Currently, some councils rely only on heavy rainfall warnings to forecast floods. Others predict downstream flows using river gauge data (0–6 hours warning for typical catchments), or rain gauge data (0–12 hours warning). In the past, NIWA has also produced experimental longer-range flood forecasts from a weather model on a best endeavours basis.

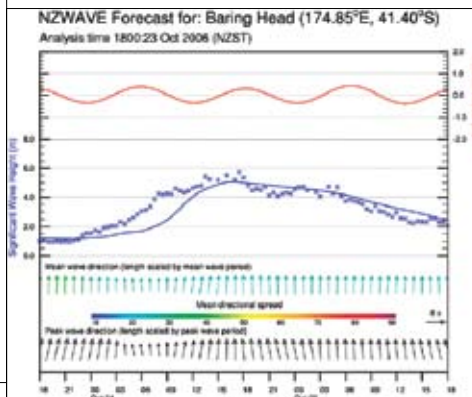
EcoConnect, NIWA's environmental forecasting and information service, can now provide up to 48 hours warning of flooding in five catchments: Rangitaiki, Manawatu, Wairau, Buller, and Clutha. EcoConnect runs operationally 24/7 and uses better models than past systems. We use NZLAM to produce our rainfall forecasts, and are one of only a few organisations worldwide to incorporate real-time measurements into our hydrological model, which improves accuracy.

Our next steps are to apply this science across every river basin in the country. We hope to produce a genuinely national flood forecasting service by mid 2008.

## Bumpy crossing

On 24 October 2006, the Interislander ferry *Kaitaki* took 10 hours to travel from Picton to Wellington, encountering 9 m swells en route. The vessel had to shelter in Cloudy Bay for several hours because of poor conditions at the entrance to Wellington Harbour.

NIWA's new wave forecasting system comprises a set of models, each providing more detail but shorter notice. Up to 123 hours (five days) beforehand, our global wave forecast model was signalling sizeable waves in Cook Strait for the 24th. By 6 p.m. on the 23rd, our regional wave forecast model was predicting significant wave heights greater than 5 m, meaning individual waves would be expected to reach up to 9 m when the ship was due to enter Wellington Harbour. Our system was running in test mode, not operationally, at the time.



NZWAVE forecast as at 6 p.m. on 23 October 2006, predicting the severe storm in Cook Strait the following day.

## Natural Hazards Centre

setting the foundation for a safer future

bringing together the expertise of NIWA & GNS Science:

- providing information for policy managers, planners, emergency managers
- helping people improve their resilience & better manage the risks
- covering the full range of natural hazards, including floods & droughts, extreme weather, coastal erosion, landslides, earthquakes, volcanoes, tsunamis

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