

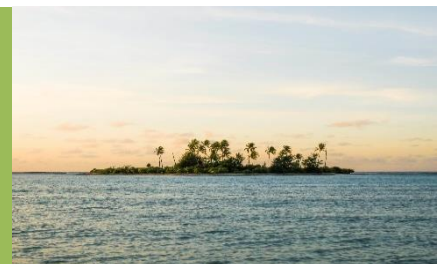


# RiskScape

NIWA  
Taihoro Nukurangi



## Newsletter December 2016



What a year 2016 has been! The team has been super busy in the last few months, so we've brought together a bumper edition for you to browse while sipping a wine or downing a cold "lemonade" during the holiday period....

This edition includes:

- Kaikoura Earthquake surveys and rockfall products
- Updates from activities in the Pacific and Chile
- Information on defining new building state damage levels
- Oh, and Version 1.0.... it's coming soon!

### Coming soon: Version 1.0!

We are continuing to work toward the release of version 1.0 of RiskScape. Our developers have been working hard throughout 2016 to bring together a better product for our users.

Further work will continue in early 2017 and we hope to have a launch announcement in the first few months. We'll also be in touch with what this means for support of existing versions and modules.

Expect to hear from us in the New Year and keep up to date with the latest RiskScape news on our website:

[www.riskscape.co.nz](http://www.riskscape.co.nz)

Probability of Localised Rock Fall  
24 Hours From 12:00 28/11/16



48 Hours From 12:00 28/11/16



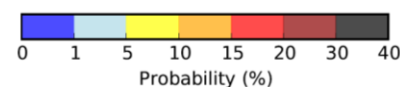
Probability of Widespread Rock Fall  
24 Hours From 12:00 28/11/16



48 Hours From 12:00 28/11/16



Examples of rockfall probability products produced by the RiskScape team for the Kaikoura Emergency Access Road Project team.



### *RiskScape product informs the reinstatement of Kaikoura Inland Road*

The M7.8 Kaikoura earthquake caused extensive damage to road networks in the Marlborough and Canterbury districts. On the coast, SH1 was extensively damaged by large rockfalls, multiple fault ruptures and coastal uplift. As of mid-December, SH1 access to Kaikoura is still not possible from either the north or south and the focus has been on the reinstatement of the inland road between Kaikoura and Waiau.

To reinstate road access as soon as possible, the KEA (Kaikoura Emergency Access) Road team needed to understand the broad risk of potential rockfall to inform contractor activities. To help this decision-making, the RiskScape team developed a product to provide both widespread and localised rockfall probabilities for the next 24, 48 and 72 hours. RiskScape used aftershock

forecast information and a seismic hazard model linked to risk thresholds to provide probabilities for sections of the road. Probabilities were mapped and updated every 3 to 5 days.

For more information about the rockfall probability product: Dr Nick Horspool, [N.Horspool@gns.cri.nz](mailto:N.Horspool@gns.cri.nz) OR Dr Matt Gerstenberger, [M.Gerstenberger@gns.cri.nz](mailto:M.Gerstenberger@gns.cri.nz)

[www.riskscape.co.nz](http://www.riskscape.co.nz)

### *Marlborough Region three waters assets damage survey*

Opus International Consultants Limited (Opus) and GNS Science (GNS) conducted a joint visit to Blenheim, Seddon and Ward on 7th and 8th December 2016 to survey how three waters systems had performed in the M7.8 Kaikoura earthquake. The team gathered survey data to better understand the response of the three waters services and to discuss how Marlborough District Council (MDC) had managed the restoration and recovery process.

The survey found that modern systems (pipelines and tanks and other structures) generally performed better than older ones. The majority of failures seen were either in older systems known to have higher vulnerability or were due to severe relative displacements between connecting components or the land, which affected both old and new systems. While there were several failures in AC water pipelines and relatively few in more modern systems (PE or PVC), some older AC pipelines that were previously believed to be vulnerable due to deterioration had survived without apparent damage. Temporary repairs had been effective in



Mostafa and Brabha surveying the Taimate pump house and its equipment near Ward. The pump house building slid on its base, causing the borehole pipework to fail.



The thin ferro-cement walls of water tanks in Ward failed and the segmented roof collapsed.

restoring at least partial service within a week by engaging one to two repair crews.

Good asset management practice for operational purposes (including updating of GIS information, renewals for operational purposes, appreciation of criticality, good knowledge of the system and a practical contingency plan) had helped improve overall system resilience. For example, exposure to soft aggressive water meant that galvanized steel and copper water pipes had been replaced relatively early with PE, which has good tolerance to earthquake loading, so service line damage was low.

For more information about the survey results please contact Mostafa, [m.nayyerloo@gns.cri.nz](mailto:m.nayyerloo@gns.cri.nz) OR Jonathan [jonathan.morris@opus.co.nz](mailto:jonathan.morris@opus.co.nz)

### *RiskScape Damage State Working Group*

The RiskScape Damage State Working Group (DSWG) was an interim group setup between July to October 2016. The group was established following the Joint GNS-NIWA Biannual RiskScape meeting held in May 2016, and was comprised of RiskScape personnel from GNS and NIWA. The aim of the DSWG was to establish an agreed set of high-level multi-hazard consistent terms for building damage state levels to be implemented in RiskScape. If you are interested in the findings or progress of work being undertaken by the DSWG please contact Shaun Williams, [Shaun.Williams@niwa.co.nz](mailto:Shaun.Williams@niwa.co.nz)



### *Kaikoura Earthquake Building and Infrastructure Damage Survey*

On the 14th November 2016, a Mw 7.8 earthquake occurred in the Kaikoura area in the South Island, causing widespread building and infrastructure damage. The most extensive damage occurred in Seddon, Ward, Kaikoura, Hanmer, Waiau, Culverden and Cheviot, and Wellington in the North Island. While the earthquake had significant impact to the environment and community, it also provides an opportunity to collect information on damage to building and infrastructure from extreme earthquake shaking.

Two teams consisting of scientists and engineers from NIWA and GNS used the Real-time Asset Capture Tool (RiACT), developed through the RiskScape project, to conduct damage surveys. The



RiACT tool is an application that runs on tablets that can be used in the field to rapidly collect data and photos of damage to infrastructure. RiACT records GPS coordinates of survey sites and links this to electronic damage survey forms and photos to allow efficient and fast damage data collection. Each night the data is transferred to a web-server database so the surveyed data can be reviewed and the next day's survey activities can be planned.

The survey teams collected earthquake damage information for building and infrastructure assets over a three-day period between Tuesday November 29th and

Thursday December 1st 2016. The recorded damage from these earthquakes to buildings and infrastructure, along with instrumented shaking intensity will be important for the development of vulnerability models. These models can then be applied in risk modelling tools to estimate asset damage and economic losses caused in future earthquake events. For more information on the damage survey: Sheng-Lin Lin, [s.lin@gns.cri.nz](mailto:s.lin@gns.cri.nz)

### *Pacific Island partners outline their RiskScape needs*

In September 2016 the RiskScape team met with partners in Samoa and Vanuatu to identify risk assessment needs and RiskScape case studies. These case studies will form the back bone of the new PARTneR project (Pacific Risk Tools for Resilience) where we will be tailoring RiskScape for use in the Pacific Islands. Samoa and Vanuatu disaster management office staff together with key stakeholder from across the countries' government identified six priority case studies. These case studies will be jointly implemented over the next 2 years. PARTneR is 3 year NZ Aid partnership funded project.



#### **Samoa:**

- Tsunami and Tropical Cyclone response planning
- Landslide Risk for land use planning
- Water outage and restoration times (multiple hazards)



#### **Vanuatu:**

- Tropical Cyclone response planning
- Drought impacts on agricultural production
- Volcanic ashfall impacts

For more information about PARTneR please contact Kate Crowley, [Kate.Crowley@niwa.co.nz](mailto:Kate.Crowley@niwa.co.nz)

### *New Zealand Coastal Society 2016 Conference*

A RiskScape related talk was presented at the New Zealand Coastal Society 2016 Conference in Dunedin between 15 and 18 November 2016. The talk was titled “*Application of tsunami fragility functions for buildings into the RiskScape loss modelling tool*” and focused on discussing the tailoring of global tsunami fragility functions for buildings to the New Zealand building stock in RiskScape. This is important, as we have very limited tsunami damage data relating to the New Zealand building stock. The work will contribute to providing more reliable tsunami-related building and contents loss estimates using the RiskScape tool in the future. You can browse the New Zealand Coastal Society 2016 Conference website here: [http://www.coastalsociety.org.nz/NZCS\\_Conference\\_2016](http://www.coastalsociety.org.nz/NZCS_Conference_2016)

For more information, please contact Shaun Williams, [Shaun.Williams@niwa.co.nz](mailto:Shaun.Williams@niwa.co.nz)

### *RiskScape contributes to international volcanic eruption impact assessment investigation in Chile and Argentina*

In November and December 2016, members of the wider RiskScape team contributed to an international volcanic eruption impact assessment investigation in Chile and Argentina. The investigation focused on the consequences of the April 2015 eruption of Calbuco (Chile), which had damaging lahars on the flanks of volcano and ash deposition in Chile and Argentina. Over our 2-week impact assessment trip, we interviewed emergency managers, infrastructure providers and regulators, government agencies (infrastructure, agriculture, and public health), community organisers, business owners, and farmers on both sides of the border.

It is too early to provide definitive results, but here are some initial impressions. We were very impressed by how well managed the Calbuco eruption was in Chile – as a number of the people we interviewed pointed out, this was the third eruption in a decade, and the experience they had gained in that time showed. In Chile, lahars

caused most of the damage, although remarkably coarse tephra fall did collapse some roofs on the northern side of the volcano. Clean-up is still ongoing, although most of it was completed within 6 months – the summer tourist season was a major motivating factor for a speedy clean up. In Argentina, ash remobilisation continues to be a major issue – from ash from the 2008 Chaiten eruption onwards. We were humbled to see that numerous recommendations we had made for Argentina following our 2012 impact assessment trip had been implemented, and seem to have reduced the impact of the most recent eruption.

How will the information gathered feed into RiskScape? We will use the data to improve, calibrate, and develop fragility functions used by RiskScape, in particular for tephra fall and potentially lahar. The data is particularly relevant for clean-up, roads, buildings, agriculture, and electricity. We will also look into incorporating some of the mitigation measures adopted in Chile and Argentina into our functions.

For more information, please contact Natalia Deligne, [N.Deligne@gns.cri.nz](mailto:N.Deligne@gns.cri.nz) OR Graham Leonard, [G.Leonard@gns.cri.nz](mailto:G.Leonard@gns.cri.nz) OR Tom Wilson [thomas.wilson@canterbury.ac.nz](mailto:thomas.wilson@canterbury.ac.nz)



Property damaged by tephra fall (loading) of the 2015 Calbuco eruption in the rural community of Ensenada, Chile. The roof of the building left standing hasn't yet been cleaned ~18 months after the eruption. Photo credit: Natalia Deligne



---

### *Conference Report: Cities on Volcanoes 9, Puerto Varas, Chile, 20 – 25 November 2016*

This November, members of the extended RiskScape research team attended the 9th edition of the Cities on Volcanoes conference, held in Puerto Varas, Chile. This conference, facilitated by the International Association for Volcanology and Chemistry of the Earth's Interior (IAVCEI)'s Cities and Volcanoes Commission, was started in 1998 in Naples, Italy, and since another 8 cities on or in close proximity to a volcano has hosted the conference. About 700 people attended COV9, including scientists, government officials, and engineers.

Cities on Volcanoes 9 was divided into three symposia: volcanic risk reduction, volcanic hazard and risk assessment, and volcano processes and monitoring. Nearly 70% of the presentations were in volcanology applied to society – a conference record. The remaining 30% concerned key topics in volcano physical science, including advances in monitoring. New Zealand had a very strong showing, with over 15 attendees (University of Canterbury, University of Auckland, GNS Science, Massey University, and Auckland CDEM) and over 30 presentations, including a plenary session and two keynotes.

At the conference, Natalia Deligne presented a poster on RiskScape entitled RiskScape: a software programme for multi-hazard risk assessment. RiskScape was also mentioned in Deligne's keynote presentation, and a number of New Zealand's presentations were linked to the greater RiskScape research programme. In particular, New Zealand researchers presented recent advances in volcanic impact and vulnerability work concerning agriculture, buildings, surface transportation, and clean-up following volcanic eruptions.

Cities on Volcanoes 9 was stimulating and provided a wonderful opportunity to learn from others involved in volcanic hazard, impact, and risk assessment. There are numerous exciting studies from around the world focused on better understanding the consequences of volcanic eruptions, studies which will serve the volcanic module of RiskScape well in the coming years.

For more information, please contact Natalia Deligne, [N.Deligne@gns.cri.nz](mailto:N.Deligne@gns.cri.nz)

---



View of Osorno volcano from Petrohué, taken on the Cities on Volcanoes 9 intra-conference field trip. Photo credit: Natalia Deligne

*From all of the RiskScape team:*

