Resilience and Research Highlights Report

2024

Natural Hazards Commission
Toka Tū Ake

Te Kāwanatanga o Aotearoa
New Zealand Government

This report is dedicated to our dear friend and team member, Fleur Templeton.

At Natural Hazards Commission Toka Tū Ake, our vision is that natural hazards resilience becomes embedded in all aspects of decision-making for our homes, towns and cities.

We inform, enable, and influence the choices and decisions that reduce the exposure and vulnerability of New Zealand's built environment to natural hazards.

We do this through:

- building knowledge, data and insights on natural hazards impacts and ways to reduce them
- enabling, influencing and advocating for natural hazards resilience.

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Welcome to our 2024 Resilience and Research Highlights Report

Tēnā koutou

Other countries look at New Zealand as a leader in natural hazards insurance and research. When the first version of our scheme was set up in 1945, we were the only country in the world to provide affordable insurance through a risk pool scheme, to help communities recover from natural disasters.

Fast forward to 1993 when we became the Earthquake Commission, and with that earned a greater remit for research into preparedness and mitigation – now a core pillar of our work and the focus of this Resilience and Research Highlights Report.

We fund research, modelling and education that helps reduce the impact of natural hazards on people, properties and communities in New Zealand. This focus on risk mitigation linked to the natural hazards we cover helps us build resilience as well as secure reinsurance.

It's the first time this Report is being published under our new name, Natural Hazards Commission Toka Tū Ake. We adopted this new name on 1 July 2024 to better reflect our role supporting New Zealand through a wide range of hazards, not just earthquakes. The name change is underpinned by new governing legislation, which further strengthens the importance of our resilience and research work.

I hope you enjoy reading this report, and feel proud of the unique and proactive approach we take in New Zealand to understand and prepare for our natural hazard risks.

Ngā mihi

Tina Mitchell
Chief Executive | Te Tumu Whakarae
Natural Hazards Commission Toka Tū Ake

Kia ora

It's my pleasure to share some of the important work my team has been involved in over the past year to improve New Zealand's resilience to natural hazards.

One thing that always strikes me when we put together this annual Highlights Report is the breadth and depth of the work we dive into – ranging from creating quake safety tips for new parents to guidance for designing more resilient buildings.

To list just a few figures from this year, we supported 74 science and research projects, advocated for risk-based decision-making through nine government submissions, and delivered hundreds of Quake Safety for Young Children brochures nationwide.

We embraced our new name, Natural Hazards Commission Toka Tū Ake, and took that opportunity to refresh the strategies governing our research, risk reduction and public education work programmes, which provide a clear roadmap for how we'll work towards our resilience goal over the next five years.

On a personal note, in 2024 we lost our beloved friend and team member, Fleur Templeton. Fleur had an infectious love for science and shared that with many New Zealanders throughout her remarkable career as a science communicator. This report is dedicated to her.

Ngā mihi

Dr Jo Horrocks
Chief Resilience & Research Officer | Pouārahi Manawaroa me te Rangahau
Natural Hazards Commission Toka Tū Ake

Supporting people and decisions

We help New Zealanders make evidence-based decisions about their natural hazard risks, based on the best available science.

Protecting precious assets from flooding

A new project looking at impacts of flooding on Māori communities in the Wairau Bar is a stellar example of how our funded research is supporting communities to plan for natural hazards[1].

The Wairau Bar in Blenheim is home to some of the first Māori settlements in New Zealand. Its kaitiaki (guardians), Rangitāne o Wairau, wanted to know when the wāhi tapu (sacred land) would be compromised by sea level rise and extreme weather events – and what these hazards mean for its taonga (treasured assets).

To answer these questions, Rangitāne o Wairau partnered with Dr Shaun Williams' team from NIWA under an NHC-funded biennial grant.

Using interviews to collect local knowledge of how taonga have responded to hazards in the past, coupled with science-based flood modelling and mapping, scientists will build quantitative models of how future events may impact taonga. The project also uses ongoing work led by the Marlborough District Council into mapping of sea level changes and compounding flood inundation.

The team hopes to create a scalable methodology that can be rolled out throughout New Zealand and the Pacific. This project, focusing on Marlborough region, will wrap up in April 2026.

1. Our research investment is linked to the hazards that we cover. In a flood event, we cover some components of residential land (but not houses)

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> Our role as kaitiaki is to ensure that the legacy of our ancestors endures. This collaboration brings together mātauranga Māori and western science, and allows us to proactively address the risks of flooding and sea level rise to safeguard our wāhi tapu and taonga.
>
> **Corey Hebberd**
> General Manager at Rangitāne o Wairau Kaiwhakahaere Matua

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> Risk is all about value. If there's nothing of value, there's no risk. This project is about creating a methodology to better understand what we value and take that into account when calculating risk.
>
> **Dr Shaun Williams**
> NIWA scientist

The research team at Wairau Bar (suppled by NIWA)

Natural Hazards Portal celebrates one year

We celebrated the Natural Hazards Portal's first birthday in 2024. Since it's launch, over 80,000 people have visited the Portal for NHC claims information showing how natural hazards may have impacted their current or potential new homes, and how to strengthen their homes against future hazards. Nearly 30,000 reports were downloaded, representing about 37% of all individual users who accessed claims information for properties they viewed.

We are expanding the Portal to include natural hazard maps, which will improve awareness of natural hazard risks, enhance understanding of how natural hazards may impact their homes, and provide guidance on managing those risks.

> We know that more New Zealanders are considering natural hazards when buying a home, and we hope they are turning that interest into action when they become homeowners.
>
> **Sarah-Jayne McCurrach**
> NHC's Head of Risk Reduction

Resources for students

Dr Marion Tan, a lecturer at Massey University's Joint Centre for Disaster Research, has been working with Bay of Plenty communities to create fit-for-purpose educational resources on natural hazards. One output of the NHC-funded work is a teachers' portal offering a range of activities for students in primary through to secondary school: crisislab.org.nz/teachingresource

> School programmes can be great for engaging kids and whānau with natural hazard risks, but often they are one-off activities that may not be suitable for each community's unique situation and resources.
>
> **Dr Marion Tan**
> Lead researcher

Fast track – responsibly

Continuing to build in high-risk locations is a recipe for disaster. It means individuals and communities are exposed to avoidable risks, and governments at all levels take on more financial risk. Insurance in risky places is becoming unaffordable, and in the future it may become unavailable.

That's why we're champions of responsible development that considers what science, research, data and modelling tells us about risks.

In April 2024, we submitted on the government's Fast Track Bill, advocating for natural hazards resilience to be an integral part of the Bill – and in the resource management system reform more generally. Specifically, we called for avoiding development in known high-risk areas and ensuring new developments can withstand the hazards they are exposed to. In other words, "stronger homes on better land."

Science guides community decisions

Takapūwāhia is home to 1500 people, many of whom are tangata whenua from Ngāti Toa Rangatira. Takapūwāhia hugs Porirua harbour and is exposed to many natural hazards, from earthquakes to tsunami.

Knowing it's a matter of when – not if – an event will strike, Ngāti Toa Rangatira wanted to get better prepared.

Bespoke hazard maps of Takapūwāhia

They connected with scientists from It's Our Fault – a GNS Science-led research programme studying Wellington's natural forces – to create bespoke hazard maps of their region.

Takapūwāhia is now using these maps to guide important land-use planning decisions, such as where to place emergency supplies and other critical infrastructure. As a result, Takapūwāhia is in a better position to respond to future events.

We're proud to fund It's Our Fault, alongside Wellington City Council and WREMO.

The right information

With funding from NHC, Associate Professor Julia Becker from the Joint Centre for Disaster Research investigated what information people need to make decisions about their preparation, response and recovery from volcanic activity.

Focusing on a Ruapehu unrest scenario, the research showed that people are always interested in what the volcano is doing, what actions they should be taking and where to go for more information. As activity moves to unrest, information related to forecasts, precursors and locations at risk became more important. During an eruption and recovery, people wanted to know about impacts and how to address these.

This research also highlighted the importance of information consistency, trusted relationships and multiple channels to share messages. Dr Becker's team recommends responsible agencies work together to review and develop shared resources to ensure the right information is provided at the right time, and in the most effective ways.

In conversation with... Dr Natalie Balfour and Dr Charlotte Brown

Our Head of Research, Dr Natalie Balfour, and Dr Charlotte Brown, Joint Managing Director at Resilient Organisations, spoke to us about how science and research can help empower communities.

Why is it important for NHC to invest in research?

Dr Natalie Balfour: We invest in research to improve our understanding of the natural hazards we live with in New Zealand and to understand ways that we can reduce the impact of these hazards on people, property and the community. We hope the research we fund will build the evidence base for more informed decision-making.

Dr Charlotte Brown: In a hazard-prone and resource-constrained country, we have to make some tough decisions about how and where we invest to best mitigate natural hazard risk. Research is essential to ensure investment decisions are based on evidence.

How does natural hazards research lead to better outcomes for New Zealanders when it comes to preparing for future events?

NB: Natural hazards research can improve our understanding of the likelihood, scale and impact of future events. It can be used to inform land-use planning, improve the resilience of our buildings, and understand how people perceive and manage risk.

Having a robust evidence base about New Zealand's risks also helps us secure access to reinsurance, which is important to financing some of our lower probability but higher impact events like big earthquakes.

CB: NHC also does great work in supporting social science research. This research helps us better understand how people perceive and make decisions about how they manage natural hazards. We cannot design effective policies, education programmes, or plans without understanding what people do in the face of a natural hazard risk and what motivates action to reduce that risk.

What type of research do we need to see more of in this space?

NB: In research, the work is never done. There are always questions out there that need investigating.

We need research that is driven by community and end-user needs, and that will support people to take action to reduce their risks.

CB: I agree with Natalie. In New Zealand we are great at understanding hazards and likely impacts on people and property. But the impacts to our communities are much wider than these direct impacts and there are multiple hazards to manage. We need to start with community needs and work backwards to identify the best ways to mitigate risks for those communities across all the hazards they face.

How do we communicate this uncertainty while at the same time encouraging resilience-building actions?

NB: Communicating uncertainty is always a challenge as there are often multiple sources and it becomes quite technical to explain to a lot of audiences. I think it is good to keep in mind what is going to help the audience you are speaking to. In most cases we don't need to wait for some magic level of precision before we can take action.

CB: I think part of the answer to this sits with understanding the regulatory and organisational environments natural hazard risk decisions are made in.

Perceptions of liability and political fallout lead to inertia in the face of uncertainty. But in the rapidly changing world we live in, certainty is a misnomer. Our decision-makers, institutions and legal frameworks need to shift to embrace uncertainty.

How is NHC contributing to a shift in mindset towards risk-based, evidence-based decision-making on natural hazards?

NB: We are doing this by connecting the research and researchers with those who need to use it in policy, practice and with the community. This is done through the activities in our Risk Reduction and Public Education teams, as well as through our communication and engagement activities

CB: NHC do a fabulous job of bridging research and practice. The deep relationships that NHC has with the research community as well as their connections across government puts them in a strong position to connect, share knowledge and influence policy and practice.

Credit: Sam Tyler GNS Science

Honourable mentions

NHC-funded research from Dr Lauren Vinnell (Joint Centre for Disaster Research) found that, despite living in a relatively low seismic region, Aucklanders ranked earthquakes as the geohazard risk they think most about. Yet, fewer than 50% said they have taken earthquake preparedness action, suggesting further work is needed to help these communities plan for future shakes.

We commissioned research by Victoria University of Wellington's Law Faculty into legal barriers to Māori access to insurance for natural hazards. The research will help inform our approach to supporting Māori to have equitable access to the benefits of our scheme.

An NHC biennial project led by University of Canterbury PhD student Kristie-Lee Thomas has produced a Māori-centred educational tool with – and for – communities to empower iwi, hapū and hapori to get prepared.

Smarter land-use

Stable land is the foundation of a resilient built environment. We help to build an understanding of hazard-prone land and champion responsible development that doesn't put people, property and communities in harm's way unnecessarily.

Mitigating landslide risk

Annually on average, landslides are New Zealand's costliest and most deadly natural hazard. Earlier this year, Principal Advisor Risk Reduction Dr Wendy Saunders travelled to Nelson, home to the country's largest urban landslide – the Tāhunanui slump.

Since its development in the early 1890s, the Tāhunanui slump has led to several damaging slips, and more are likely to come as it continues to develop. Planning restrictions have been in place since 1985, but there are at-risk homes built on the slump before that time that need to be managed.

The situation raises difficult questions about future housing on the slump. Our work to support the decision-making process shows the breadth of how we contribute to better land-use planning.

- We are funding research by GNS Science to create a 3D model of the landslide, to better understand similar slow-moving landslides around the country.
- In 2023, we made a submission on Nelson's Plan Change 29 in support of limiting future development on areas known to be at high risk for future slips.
- Our Risk Tolerance Framework is a resource to guide community conversations about levels of acceptable risk.
- Through the Natural Hazards Portal, we provide information about past claims to inform prospective and current homeowners about potential future risks.
- We put information on our website on how to identify damage from landslips and undertake basic repairs: naturalhazards.govt.nz/slopes-and-retaining-walls
- Our Resilient Homes & Building Action Plan aims to provide technical advice on how to retrofit and strengthen existing buildings against hazards like slips.
- We funded new guidance by the Geotechnical Society to help geotechnical practitioners identify landslide hazards and find suitable mitigation strategies.

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> We are investing in building a solid evidence base through which we can empower decision-makers, like councils and homeowners, to move towards an uncertain future with more confidence about their risks and what they can do to avoid, mitigate or minimise them.
>
> **Dr Wendy Saunders**
> NHC's Principal Advisor Risk Reduction

Measuring landslide risk to homes

Landslides are one of New Zealand's most pressing natural hazards, accounting for the most confirmed deaths and insurance claims on average.

Dr Tom Robinson from the University of Canterbury is using NHC funding to create a nationally consistent way to identify landslide risk to homes across the motu.

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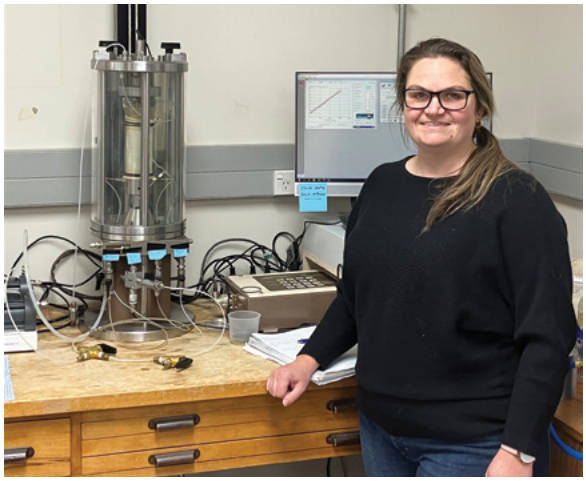
> It's important to understand just how much of a risk landslides present to our homes and livelihoods, particularly in the context of a changing climate. This work will allow us to model that risk and to compare the risk from landslides triggered by earthquakes or rainfall so we can better prepare and hopefully reduce the risk we face
>
> **Dr Tom Robinson**
> Lead researcher

Finding slope hazard hotspots

We can expect to see more extreme rainfall in the coming years, which may prove dangerous for houses and infrastructure built on slopes. However, not all slopes are equal and some soil types are more vulnerable to weakening when wet than others.

To help better predict which areas will be vulnerable to instability from rainfall, Dr Katherine Yates from the University of Canterbury is using NHC funding to test how different samples of soils from across New Zealand respond to repeated wetting from rainfall.



Dr Katherine Yates

The work will produce a catalogue of slope hazard 'hot spots' across the country that can inform risk modelling and land-use decisions. Yates will publish her findings in early 2027.

Groundbreaking research

Water that sits right below the earth's surface can make soils more prone to liquefaction and flooding. A better understanding of shallow groundwater systems beneath New Zealand could help inform decisions about which soils make good foundations, and how buildings in risky areas can be made more resilient. We're helping fund a project by Aqualinc Research Limited to develop a state-of-the-art technique for mapping groundwater systems.

National Liquefaction Model

We know from experiences like the 2011 Christchurch earthquakes that liquefaction is a major hazard in New Zealand that can cause significant property damage.

While various models exist for some regions, a clear and consistent picture of liquefaction risk across New Zealand would help us better predict impacts of future earthquakes.

That's why we're funding New Zealand's first National Liquefaction Model, which will make use of the latest advances in liquefaction research and provide a nationally consistent way to describe and measure liquefaction risk. The model and its outputs will be openly accessible.

We are leading this work with Tonkin + Taylor and input from an active end user group, peer reviewers, and steering group. We hope to share an early version of the model in the first half of 2025.

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> It is exciting to be working on such a novel approach to liquefaction modelling. The model is designed to be readily repeatable and updatable as new data and methodologies become available. Recognising that there are many different potential uses of hazard data, it has also been designed to provide different outputs for different users. This framework and philosophy set an example that could be applied across many hazards.
>
> **James Russell**
> Project Director at Tonkin + Taylor

In conversation with... Dr Wendy Saunders and David Curtis

We asked our Principal Advisor Risk Reduction and Champion of Land-use Planning, Dr Wendy Saunders, and New Zealand Planning Institute CEO, David Curtis, about the current and future trends in the intersection of land-use planning and natural hazards.

Do you think enough is being done to consider natural hazard risks in land-use planning decisions?

Dr Wendy Saunders: While some councils have success incorporating natural hazards data and information in their decision-making about land use, unfortunately we're also seeing a lot of decisions that create new risks or exacerbate existing risks. There are definitely opportunities to better manage New Zealand's risks through resilient land-use planning.

David Curtis: When we look at the damage caused by weather events in New Zealand over the last few years, it is hard to say we are doing enough. There is always room for improvement, but the answers aren't simple.

What can be done to incentivise taking natural hazards into account in land-use planning, and who should enact and enforce it?

WS: Councils should be empowered to make and enforce decisions around land use, including preventing or restricting development in high-risk areas, as the risk is transferred from developers onto property owners – and then often insurers.

We've seen the devastating impact of poor planning on communities and we need leadership from all levels to do this.

DC: Strong national direction on how to collect information on natural hazard risk and how to assess levels of risk, and a clear mandate for councils to say 'no', would be very helpful. There is a strong presumption in favour of development under our planning system, and strong tools are needed to overcome this so we can keep people safe.

If you could introduce or change one piece of legislation to support more resilient land-use planning, what would it be and why?

DC: I'd bring back the Spatial Planning Act and make sure it requires the identification of areas that need to be avoided due to natural hazard risk, as well as areas that are safe where development should be encouraged. It would also be very helpful if we had a clearly stated outcome at the national level that we are all required to work towards, along the lines of "a community where people's homes, places of work and their livelihoods are out of harm's way".

WS: I would require councils and developers to take a risk-based approach to natural hazards, where land use becomes more restrictive as risk increases.

This could be done through comprehensive direction under the Resource Management Act, or through the proposed Adaptation Framework.

However, taking a risk-based approach requires good hazard and risk information which can be expensive, so I'd also provide a sustainable funding mechanism to enable this type of approach.

How has NHC supported sector collaboration this year?

WS: We have continued to submit on central government policy changes and local and regional plan changes to advocate for natural hazard risk reduction policies and actions. We also support the NZPI with training for practising planners and are regular guest lecturers for university courses. We're working with the Ministry for the Environment on aspects of the draft national direction for natural hazards and continue to seek opportunities to support the planning profession.

DC: NZPI has a good working relationship with NHC. We have collaborated on submissions to central government. The NZPI Conference includes a natural hazards and climate change stream, which is supported by NHC, and allows practitioners to share experiences and learnings.

NZPI also collaborates with the local government sector on submissions.

What is the biggest challenge you see for natural hazard planning?

WS: We need to be planning for current and future natural hazards. As well as dealing with legacy planning issues on areas where we weren't aware of the risk, we are continuing to build in places of known risk that need managing almost immediately. We need to be planning for a changing climate, environment, and development needs and priorities. Each of these requires a different approach and options to ensure our communities are resilient and sustainable into the future.

DC: Community understanding of risk is essential, given the significant role the community has in the development of plans. Education of individuals, community groups, developers, financers, environmental advocates, infrastructure providers, etc. is needed to shift our culture of "she'll be right" when it comes to hazards.

Honourable mentions

We are investing in a state-of-the-art model built by Professor Iain White that will predict how various groups involved in urban development – from builders to real estate agents – behave and interact with each other, to better predict how planning decisions impact natural hazard risk.

We are funding updated tsunami modelling and evacuation mapping for Northland Region – one of the regions most vulnerable to tsunami – to support their land-use planning.

As part of our long-standing partnership with the New Zealand Planning Institute, in 2024 we funded two fees-free courses for professionals focusing on natural hazards in the planning sector.

Resilient buildings

Homes that can withstand natural hazards are the backbone of a resilient New Zealand. We invest in research to better understand how building design can support resilience, and guidance to put the latest research into practice.

Prof Santiago Pujol (supplied by University of Canterbury)

Design.Resilience.NZ

New Zealanders expect more than life safety from their buildings, so we're investing in creating and sharing guidance that makes it easier to build homes that are more resilient to natural hazards.

To give a home to the guidance we fund as well as other useful documents, in 2024 we launched Design.Resilience.NZ.

Design.Resilience.NZ is an open-access platform for non-regulatory building documents, curated by a panel of experts. The website is a joint effort between us, MBIE, BRANZ and three technical societies.

An example of guidance currently underway is Professor Santiago Pujol (University of Canterbury)'s project. With support from researchers at the University of Auckland and Tonkin + Taylor, Pujol is creating New Zealand's first guidelines on retrofit techniques to mitigate future earthquake damage. The guidelines will focus on multi-storey reinforced concrete buildings, as many of these popular structures were constructed to outdated design standards.

For buildings that have already been earthquake damaged, we funded Dr Nicholas Brook (Compusoft) to ensure US guidance into repairing buildings is relevant to New Zealand. The guidance FEMA P-2335 will be published on the Federal Emergency Management Agency website in early 2025. The report on New Zealand applications of P-2335 will be available on Design.Resilience.NZ after that.

For new builds, we're working with MBIE to produce a series of Low Seismic Damage Design guidelines that will spell out the benefits of designing above-code earthquake resilience and how to do it. The first phase of the guidance was released in December 2024 and is available through MBIE's website and Design.Resilience.NZ.

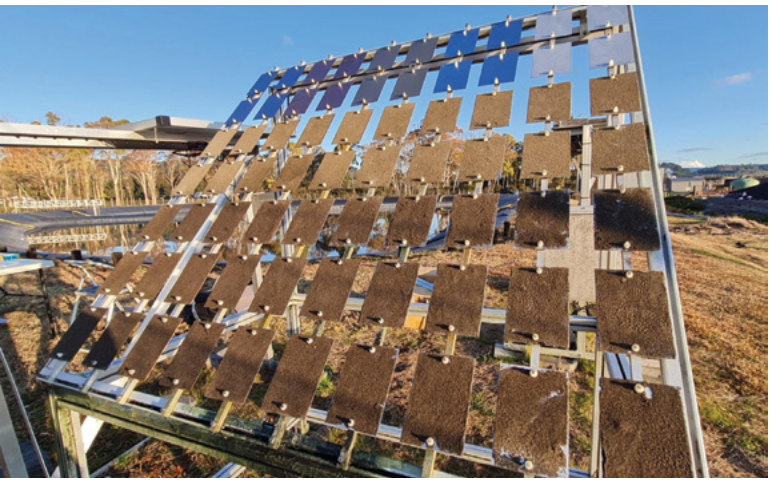
Volcanic impacts on built environment

New Zealand's high volcanic activity means our infrastructure is vulnerable to corrosion from volcanic gas and ash following an eruption.

Associate Professor Carol Stewart (Massey) and Dr Zhengwei Li (BRANZ), along with their team, are using NHC funding to study the impacts of volcanic ash and, in a world first, gas on the built environment.

Experiments are taking place near Sulphur Bay in Rotorua, because of its high level of geothermal activity, and a control site near Rotorua airport.

The team coated samples of steel, copper and other common construction metals with two types of volcanic ash gathered from recent eruptions and are observing the impact of sulphur gas on the materials over time.



Volcanic ash-coated samples at Rotorua wastewater treatment plant near Sulphur Bay

The findings will help us understand the vulnerability of the built environment to volcanic activity.

Dr Stewart hopes the research, which will be released in early 2026, will also be useful to other volcanically active places, like Iceland and Hawai'i.

The true cost of base-isolated buildings

Dr Alex Shegay

Base isolation is a technique that's been proven to minimise earthquake damage to buildings. It involves resting a building on flexible bearings or pads (base isolators), rather than directly on the ground.

Base isolators absorb shaking, meaning the building moves very little or not at all in an earthquake.

Although use is increasing in New Zealand, the technique isn't widely adopted here due to its perceived high cost. But some experts say that the cost of base isolation is worth it, especially when considering the economic and social impacts of downtime associated with reconstructing damaged buildings.

University of Auckland's Dr Alex Shegay has embarked on an NHC-funded project to prove this point and ultimately promote base isolation technology in New Zealand.

Using building models and cost impact assessments, Dr Shegay's project will provide quantitative data on the lifetime costs of base-isolated versus conventional buildings. He hopes the findings will give building owners more confidence to opt for this resilience-boosting design. Dr Shegay expects to release his findings in April 2026.

Bringing home lessons in resilience

New Zealand can learn from other countries' experiences with natural hazards. In 2024, we funded two research trips that brought home lessons for improving New Zealand's resilience.

The 2021 volcanic eruption in La Palma, Canary Islands, saw lava as thick as 70 metres devastate communities. A similar eruption could happen in Auckland, so GNS researchers travelled to La Palma to understand the impact of lava flows on infrastructure, helping inform the risk associated with eruptions closer to home.

The 7.8 magnitude earthquake in Hualien city, Taiwan, in April 2024 injured over 1000 people and damaged many buildings. Hualien is similar in geography and demography to Wellington, making insights from this event particularly relevant. A team of experts from the New Zealand Society for Earthquake Engineers led a reconnaissance trip to Hualien to talk to affected homeowners, officials and engineers.

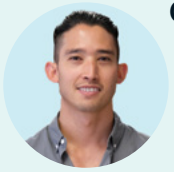
They shared their findings through a series of seminars held around New Zealand.

Lava flow cover in La Palma, Canary Islands

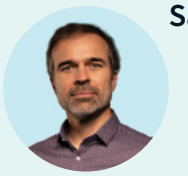
In conversation with... Caleb Dunne and Professor Santiago Pujol

We asked two experts in resilient buildings, our Principal Advisor Caleb Dunne and University of Canterbury's Professor Santiago Pujol, how to strengthen New Zealand's homes against natural hazards.

What are the biggest opportunities to increase resilience in the built environment?



Caleb Dunne: Existing buildings, by definition, represent the majority of our building stock compared to new builds. Strategies to reliably and cost-effectively retrofit, adapt, and reuse our existing buildings will be a vital part of increasing the resilience of the built environment moving forward.



Santiago Pujol: Caleb is quite right that the most pressing need we have is to strengthen our existing buildings. I would add, nevertheless, that to minimise future problems we should also tighten our building codes to produce better new structures. In this regard, we need to be more proactive. Earthquakes have not stopped surprising us. If we build more robust structures, we are likely to run into fewer surprises in the future.

There is a lot of impressive research into boosting building resilience being done in New Zealand and abroad. How can this research be better incorporated into policy and practice?

CD: It is important to encourage researchers to plan their work with a 'line of sight' to its ultimate impact and outcomes. This includes connecting with intended end users and bringing them on as advisors to shape the research, but also to set them up as champions of the work once the outputs are available.

SP: Turkey is implementing a drastic code update. Colombia and Peru went through similar processes nearly a decade ago. Chile and Japan preceded those countries by many decades. In all these cases, building standards were modified to produce more robust structures. We should learn from those experiences. The case of Turkey shows that waiting can prove too expensive.

Where are the biggest gaps in our understanding of resilient building design that can be addressed through research?

CD: Research to quantify the 'resilience dividend' or return on investing in better building performance would help dispel misperceptions that it is cost prohibitive.

Downstream benefits like avoided damage or disruption costs need to be better captured and valued to help with resilience decision-making.

SP: The biggest misconception is that more robust buildings are too expensive. Research and international experience have shown the cost increases are not prohibitive. Another common misconception is that robustness results in too much non-structural damage. Field data has surfaced from Chile suggesting that hospitals with abundant structural walls have been more likely to remain functional after earthquakes than less robust hospitals without structural walls. That observation refutes the second misconception.

How does NHC support sector-wide collaboration?

CD: NHC benefits from sitting between a wide range of stakeholders and partners. This enables it to identify gaps, prompt work to fill them, and generally support connections between different groups to facilitate better outcomes across the system.

SP: In my opinion, NHC is in a very good position to ask the earthquake-engineering sector for more stringent design standards and tangible incentives to help owners retrofit. Given the pressures affecting insurers already, the overlapping of the effects

of climate change and an earthquake disaster affecting a key urban area such as Wellington, can prove quite difficult to cope with.

What's one piece of advice you would give to New Zealanders to make their homes more resilient?

CD: Ask for more. Many people assume that a typical 'code' building will meet their needs in natural hazard events like earthquakes. That may not be the case, but that doesn't mean better solutions aren't available. Designers and builders are capable of constructing more resilient homes, so ask for it.

SP: At least for new construction, ask the builders and their engineers whether you will be able to remain in your home should an earthquake occur. Ask them to try to put things in the context of the Canterbury earthquakes. As unlikely or likely as similar events may be to occur, most people in New Zealand can use the Canterbury earthquakes as a frame of reference.

Honourable mentions

Our funded research from the University of Canterbury found that walls with staggered lap splices – a building technique common in New Zealand but banned in some parts of the world – are vulnerable to earthquakes. Researchers call for the technique to be immediately removed from building practice.

With NHC funding, Dr Charlotte Toma from the University of Auckland is exploring how to improve the link between two of the greatest challenges facing New Zealand's construction industry: improving seismic resilience and achieving net-zero carbon builds.

Better together

We want all New Zealanders to live in homes and communities that are safer and more resilient to the impact of natural hazards. Public education and partnerships are an important way we help ensure Kiwis understand their risks, possible impacts, and what they can do about them.

Helping communities get prepared for AF8

One of the ways we're helping communities build resilience is through funding the award-winning Alpine Fault 8 (AF8) programme.

While we can't predict when the next earthquake will happen, research tells us there is a 75% chance of an Alpine Fault earthquake occurring in the next 50 years, and it's likely to be a magnitude 8+ event.

Among the amazing work AF8 delivered this year is a new NCEA Level 1 Geography resource for students and teachers to learn about the Alpine and other active faults. In just two school terms, it received 1381 unique visitors – the equivalent of 60 classrooms full!

AF8's partnership with Ngāi Tahu on the "Kauraka e Mataku, kia Takatū! Don't be scared, be prepared!" video campaign reached over a quarter of a million people. Its goal was to use storytelling to raise awareness among whānau about the critical need for preparedness.

AF8 Ngāi Tahu video

> "
>
> I prepared emergency kits years ago. Unfortunately, lots of items expired. Good reminder to recheck and update again especially as we are semi-rural.
>
> **Facebook comment in response to the campaign**

Protecting babies from earthquakes

In April 2024, we extended our partnership with Whānau Āwhina Plunket to see our Quake Safety for Young Children brochure delivered to all new parents nationwide. A survey sent to new parents to judge the brochure's impact found 94% overall satisfaction.

Many parents said they'd taken action to make baby's space safer after receiving the brochure, with the most common actions being ensuring nothing could fall on the baby while sleeping, hanging pictures and mirrors on correct hooks, and moving baby's bassinet or cot away from windows.

> "What a great resource, it made me have a proper think about what I need to do in a natural disaster with a baby. Thank you for giving this out to prompt new parents to plan ahead.
>
> **Parent in Auckland**

New touring exhibition

There's an exciting new exhibition coming to a town near you, as the latest offering to come out of our 25-year partnership with Te Papa.

Rūaumoko: Restless Land is a new touring exhibition designed to spark conversation about our relationship with Papatūānuku (the land), promote understanding of mātauranga in relation to nature and connect with whānau/families, Māori audiences and rural communities.

The modular design can be packed into a van and brought to museums, marae, libraries and community centres around the motu. The exhibition launches in December 2024 at Pātaka Art + Museum in Porirua.

Rūaumoko: Restless Land exhibition

Museum metrics

We've continued our strong partnerships with New Zealand's museums to deliver information about natural hazard risk and preparedness in fun and interactive ways.

2100

people visited the NHC-funded QuakeCity exhibit during Canterbury Museum's free weekend in August.

5396

students across 47 schools attended Auckland Museum's volcanoes education programme, sponsored by NHC.

207

attendees (online and in-person) at NHC x Te Papa 'Active Land Talks' showcasing the science behind natural hazard preparedness.

1

interactive game about how to get ready for a volcanic event has been created and is now being played in Auckland Museum's Volcanoes! exhibit.

Virtual trip to volcano city

We've sponsored a LEARNZ virtual field trip each year since 2009. The field trips inspire students aged 9-11 to learn about geohazards, their risks and how we can live safely with them. Thousands of Kiwi children have taken part in the trips – all from the comfort of their own classrooms.

The latest virtual field trip 'takes' students to Auckland, New Zealand's 'volcano city'. The field trip teaches students how large parts of the city could be affected by the likely next eruption, and how to be prepared for the impacts of volcanic activity.

Tips for communicating science

We released '12 Tips for Effective Science Communication' on our website to help scientists share their work with wider audiences, enabling more Kiwis to make evidence-based decisions about natural hazard risk. The tips are based on our popular webinar series focused on science communication.

Celebrating 10 years of Resilience to Nature's Challenges

This year we bid farewell to Resilience to Nature's Challenges (RNC), one of 11 National Science Challenges funded by MBIE to help tackle some of the biggest science-based issues and opportunities facing New Zealand.

RNC was tasked with accelerating the country's resilience to natural hazards through collaborative, innovative research – a mission close to our own hearts.

Over RNC's decade of existence, we've worked together on many projects and initiatives. Some of our most impactful collaborations include:

- updated engineering guidance to help with the design of new buildings
- improved approaches to public education for natural hazard risk and preparedness
- the development of New Zealand's first nationwide probabilistic tsunami hazard model.

We've also helped boost New Zealand's capability and expertise in natural hazards, risk reduction and resilience planning. Together, we've funded dozens of post-graduate students and supported the annual 'Disastrous Doctorates' symposium and CRiSISLab Challenge.

The new Natural Hazards and Resilience Platform is a research programme funded by MBIE and hosted by GNS Science, which will build on RNC's work. We look forward to many more years of collaboration!

Attendees at the final RNC symposium 'Te Tai Whanake', May 2024. Credit: Dave Allen Photography

In conversation with... Hamish Armstrong and Alice Lake-Hammond

When it comes to understanding and preparing for natural hazards, how are New Zealanders tracking? We asked our Public Education Manager, Hamish Armstrong, and AF8's Programme Manager, Alice Lake-Hammond, about challenges and opportunities in this space.

What's the biggest natural hazard risk most New Zealanders face?

Hamish Armstrong: Tricky one! We live in a country that has risks from many different types of natural hazards – and that risk can differ greatly depending on where you live, the type of home you live in, and many other factors. But when I think about hazards that could seriously impact many New Zealanders I automatically go to the big plate boundary earthquake scenarios – the Alpine Fault and Hikurangi Subduction Zone – and the secondary hazards that are likely to follow those events.

Alice Lake-Hammond: Yes, it is hard to narrow it down to one! Our beautiful landscape is largely thanks to the dynamic forces that have shaped it, so we are not short of natural hazard risks to choose from here in Aotearoa New Zealand. I suspect the biggest challenge to us as a country is likely to be multi-hazard events, with compounding consequences over time.

If you could give only one piece of resilience-boosting advice to New Zealanders, what would it be?

HA: Just as we've got lots of hazard risks there are loads of actions we can take to make our homes safer and stronger. Past events have shown that falling hazards in our homes pose a real risk of causing casualties in larger earthquake events, so I'd advocate for actions that remove or mitigate those hazards: remove or replace your old brick or concrete masonry chimney; secure tall and heavy furniture and appliances; and secure or remove header tanks and hot water cylinders. If pressed for just one of those I'd love to see zero New Zealand homes with hazardous chimneys!

ALH: Talk about natural hazard risk and what you can do to prepare for their potential impacts with your family, friends, community. Share your knowledge, because the more we talk about natural hazards, the better prepared we can be for them together. Talking about it is a great place to start and possibly the most economical way to improve your preparedness.

Whose responsibility is it to prevent or minimise the impact of natural hazard events?

HA: This really is a job for every single one of us. For us at NHC Toka Tū Ake, it's making sure New Zealanders understand the risks they face and know about what actions they can take in their homes and why they'll make a difference. But while intentions are great, it's actually taking action that makes the difference. We can all do something and every step, big or small, will make a difference in a disaster.

ALH: Yes, we all have a part to play in preparing for the impacts of natural hazard events – preparedness is a team sport. It can be overwhelming and many of the natural hazard risks we face here in Aotearoa New Zealand are confronting. However, everything we do now will make a difference for future events.

We are seeing an increase in awareness of natural hazards among New Zealanders, but are we also seeing an increase in preparedness actions?

HA: Despite many New Zealanders facing cost-of-living challenges, we are seeing record levels of people taking action to make their homes safer and stronger for natural hazards. Around 60% of all people say they have taken some kind of action, which is the highest we've seen. When looking at specific preparedness and risk-reduction actions, we have also seen increases across the board over the past four years. This is great to see, but we also know that many of us could be doing even more. As to why, we consistently see that protecting loved ones from injury is the main motivator for people to act.

ALH: The more we talk about the 'AF8' the more people want to know about it, and we're really grateful for that because big island-shaking earthquakes aren't in everyone's comfort zone. We acknowledge that preparing for this event is going to look different for everyone, and while we are not able to measure the individual actions people take to prepare in detail, we do know actions are being taken across the South Island – from community plans and meetings to agency workshops and planning exercises. Big thanks to everyone who was taken steps to be better prepared!

How does NHC work with programmes, like AF8, to help New Zealanders better understand and prepare for their natural hazards?

HA: We've been proud to support the excellent work of the AF8 programme for a number of years. We really value the 'boots on the ground' approach that AF8 takes to connecting with communities directly to help them understand the risks posed by an Alpine Fault earthquake event and then connecting them with preparedness information that will help reduce the impact and get them and their whānau through. They also bring some first-rate storytelling aspects to all elements of their work, which really brings the science to life for many different audiences.

ALH: Most people don't realise that the AF8 Programme is very small. The work we do and the action it generates is testament to our wide partner network of funders, collaborators and communities. The support we receive from NHC Toka Tū Ake enables most of our public education activities (e.g. AF8 Roadshow, AF8 NCEA Curriculum Resource). We are incredibly grateful for their support!

Honourable mentions

NHC-sponsored ShakeOut included more than 670,000 participants in 2024.

We rolled out a new 'Make Your Place Quake Safe' video series in the lead-up to ShakeOut, twelve of which are now available in New Zealand sign language and captions in 10 languages

We've released updates to our Quake Safe Your Home collateral, including updated guidance on securing hot water cylinders and insurance-focused content.

We're seeing a return on our efforts to support homebuyers, with a recent NielsenIQ survey showing over 85% of Kiwis consider natural hazard risk when buying a new home.

Meet our team

Our Resilience and Research team members share why they're passionate about working at NHC

Dr Jo Horrocks
Chief Resilience Officer

There is so much we can do to live with our sometimes-volatile natural environment, the challenge is getting that information to people who can make a difference, in encouraging action, in persuading people that it's worthwhile. That's what we do at NHC, and why I'm eager to get to work every day.

Sarah-Jayne McCurrach
Head of Risk Reduction

I feel privileged to lead a team that is driven by building strong, knowledge aware communities regarding hazard risk. Together we ensure science and research makes a tangible difference in how we manage and live with risk across the country.

Dr Wendy Saunders
Principal Advisor Risk Reduction and Land Use Planning Champion

We've got a strong team and, together, I *do* think we can make a real difference – in fact, we're already seeing our influence in changes to legislation, policy and district plans.

Caleb Dunne
Principal Advisor Risk Reduction

Society takes buildings for granted. My role lets me advocate for buildings to constantly improve so that people can continue their lives without worrying about the buildings around them.

Dr Chris McDowall
Natural Hazards Portal Lead

I love maps. This role is an opportunity to create and share maps that might save people's lives and homes. That's a rare privilege for a cartographer!

Dr Alistair Davies
Manager, Risk Reduction

Natural hazard events don't have to be disastrous, so I work to empower the public and professionals to take risk reduction actions that help us to "weather the storms"

Ghada Elashi
Senior Advisor Risk Reduction

Resilient homes and buildings can be tricky but possible! My work at NHC is to support the implementation of practical improvements in our built environment that help mitigate natural hazards impacts and 'build back better'.

Dr Tabitha Bushell
Senior Advisor Risk Reduction

My role is in translating natural hazard science into a format that can be used by everyone, and working to encourage the use of science based natural hazard policies in local and central government.

Livvy Harris
Advisor Risk Reduction

I'm passionate about reducing the impacts from natural hazard events, which is why I work to promote the uptake of effective risk reduction measures.

Louisa Clark
Advisor Risk Reduction

Natural hazards are fascinating, and I'm always inspired to learn more about them. I want to help others understand them better so they too can be both educated and intrigued.

Dr Natalie Balfour
Head of Research

I love seeing research, data and information being used to improve people's lives. At NHC I get to work at the boundary between research and impact.

Delia Tamsen
Senior Research Advisor

Our hazard and risk resilience is strongly shaped by the policies that are developed and implemented by central and local governments, so what role can research play in ensuring good outcomes?

Sally Owen
Senior Research Advisor

I love the breadth of research we are involved in, from quantifying hazards for loss modelling purposes to understanding risk perception. I'm passionate about improving our collective natural hazard resilience through research and data.

Joseph Gannon
Senior Research Advisor (Acting)

Knowing the work we do helps people during some of the most difficult days of their lives along with the infectiously upbeat and positive attitudes of our colleagues makes NHC one of the best places I have worked.

Hema Wihongi
Senior Research Advisor – Māori

By integrating traditional Māori knowledge with contemporary science, we can better assist vulnerable hapori Māori to protect and preserve their cultural heritage, and mitigate natural hazard threats to their community assets.

Nina Vidovic
Senior Science Communications Advisor

I love working with researchers to share how science is helping New Zealand understand and prepare for natural hazards.

Hamish Armstrong
Public Education Manager

What gets me out of bed in the morning is knowing that there is so much we can do to reduce the impacts of our natural hazards, and the amazing people – my colleagues and partners – who are so passionate about our mahi.

Associate Professor Emma Hudson-Doyle
Principal Advisor Resilience & Research

My career passion is to bring research knowledge into practice, so at NHC I love finding links and solutions from across different disciplines to help us communicate our knowledge about science and risk in more accessible and compelling ways!

Professor Kenneth Elwood
Chief Engineer, Resilient Buildings (NHC and MBIE)

I love working at the nexus between research, policy and practice – this is the unique space filled by NHC!

Shyra Alladeen
Team Coordinator

I'm passionate about helping our team stay organized and connected while supporting public education initiatives, ensuring we work together to make New Zealand more resilient to natural hazards.

Our vision is that natural hazards resilience becomes embedded in all aspects of decision-making for our homes, towns and cities.

Natural Hazards Commission
Toka Tū Ake

Te Kāwanatanga o Aotearoa
New Zealand Government