EQC

EARTHQUAKE COMMISSION

*Kōmihana Rūwhenua*

A Guide to EQC's Targeted Research Investment

# RESEARCH INVESTMENT PRIORITIES STATEMENT 2021 – 2023

# The Earthquake Commission (EQC) has a role in research and education as a part of one of its functions under the Earthquake Commission Act 1993:

**"To facilitate research and education about matters relevant to natural disaster damage, methods of reducing or preventing natural disaster damage, and insurance provided under this Act."**

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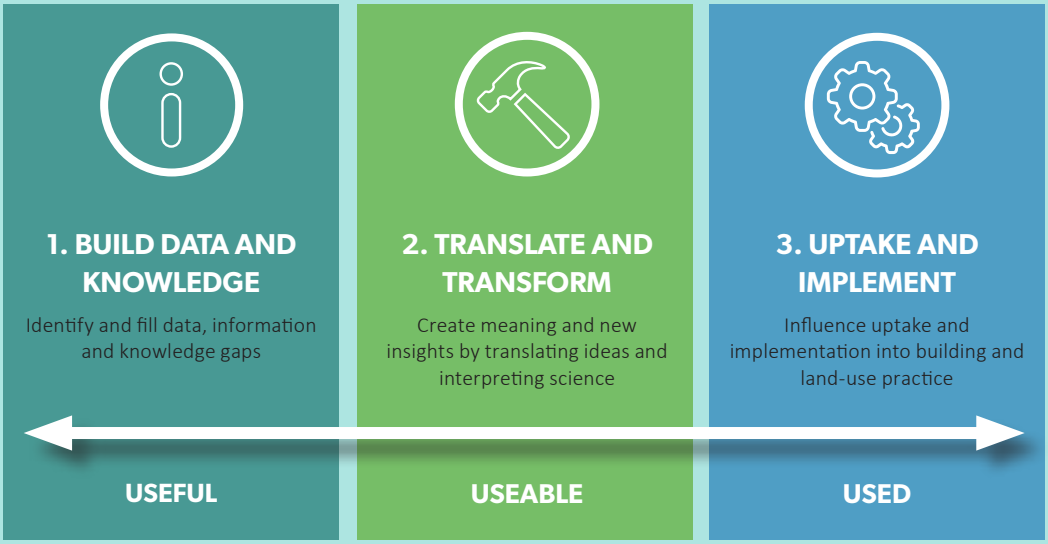
# STATEMENT INTENTIONS

This Research Investment Priorities Statement outlines the research opportunities and gaps we see in the New Zealand natural hazard risk landscape. The statement is organised around EQC's strategic goals, and describes in detail the areas we want to target with our research investment in order to progress those goals. The aim of this Statement is to assist applicants to align their proposals with our strategic areas of interest.

# RESILIENCE GOAL

Our resilience goal is to inform, enable and influence the choices and decisions that reduce vulnerability and the exposure of New Zealand's built environment to natural hazard events. In simple terms the result will be stronger homes, built on better land, served by resilient infrastructure, supported by affordable risk capital.

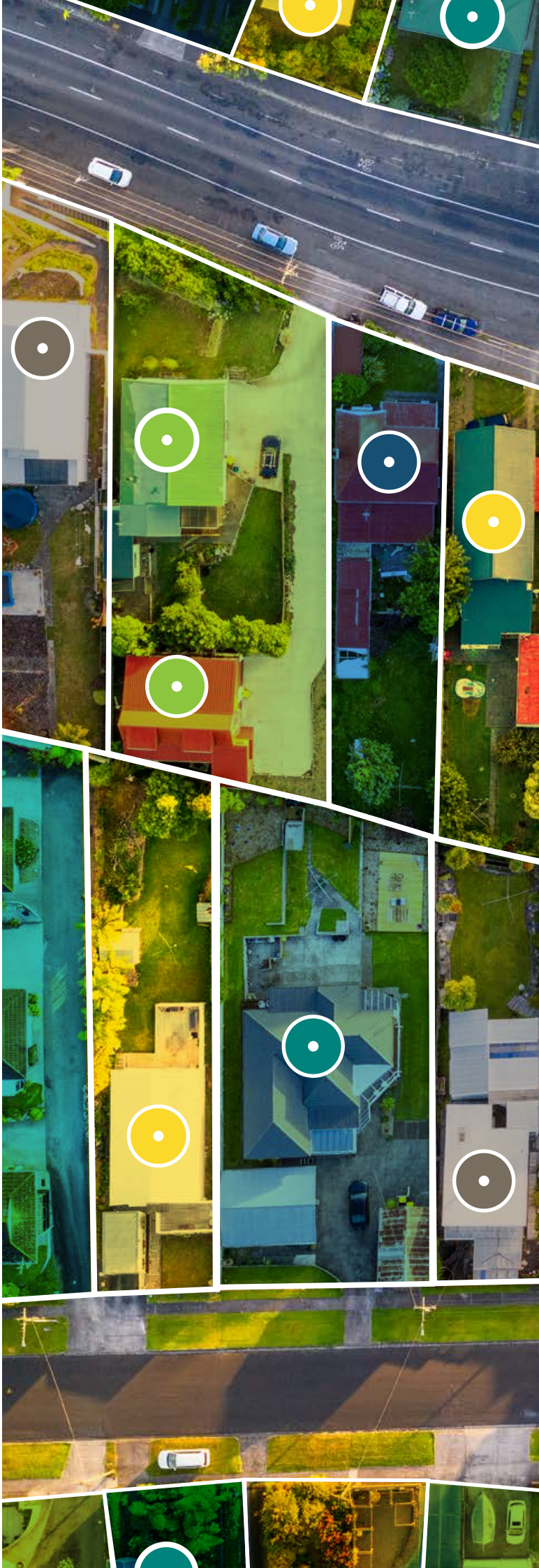
In pursuing this goal, we will invest in creating, integrating and translating information and knowledge to drive risk reduction actions and build readiness to improve resilience.



# A DATA-CENTRIC FUTURE

EQC is transforming itself from a data-informed to a data-centric organisation. This means that data is at the centre of our business and forms the foundation of our decision making. For this transformation to be successful, EQC is focusing on improving the completeness, quality, interoperability and accessibility of its own data. EQC is not doing this on its own; we are doing this with our partners as well and it is vital that it extends to the research programmes we fund that collect and manage data.

A key priority of the EQC Resilience Strategy for Natural Hazard Risk Reduction is a renewed focus on the strategic value of data and information for natural hazard risk management. One of our most important uses of data and models is to inform EQC's loss modelling and the loss modelling of our reinsurers. EQC's investment in this ensures New Zealanders continue to have access to insurance for damage to residential buildings and land from an earthquake, natural landslip, volcanic eruption, hydrothermal activity and tsunami - and for land damage from storms and flooding. In future, we are keen to explore more ways to utilise New Zealand's extensive data to reduce the impacts of natural hazards on people and property.



# RESEARCH INVESTMENTS

## Future Research Investment

This Statement will serve as a guide for applicants to align their proposals with our strategic areas of interest.

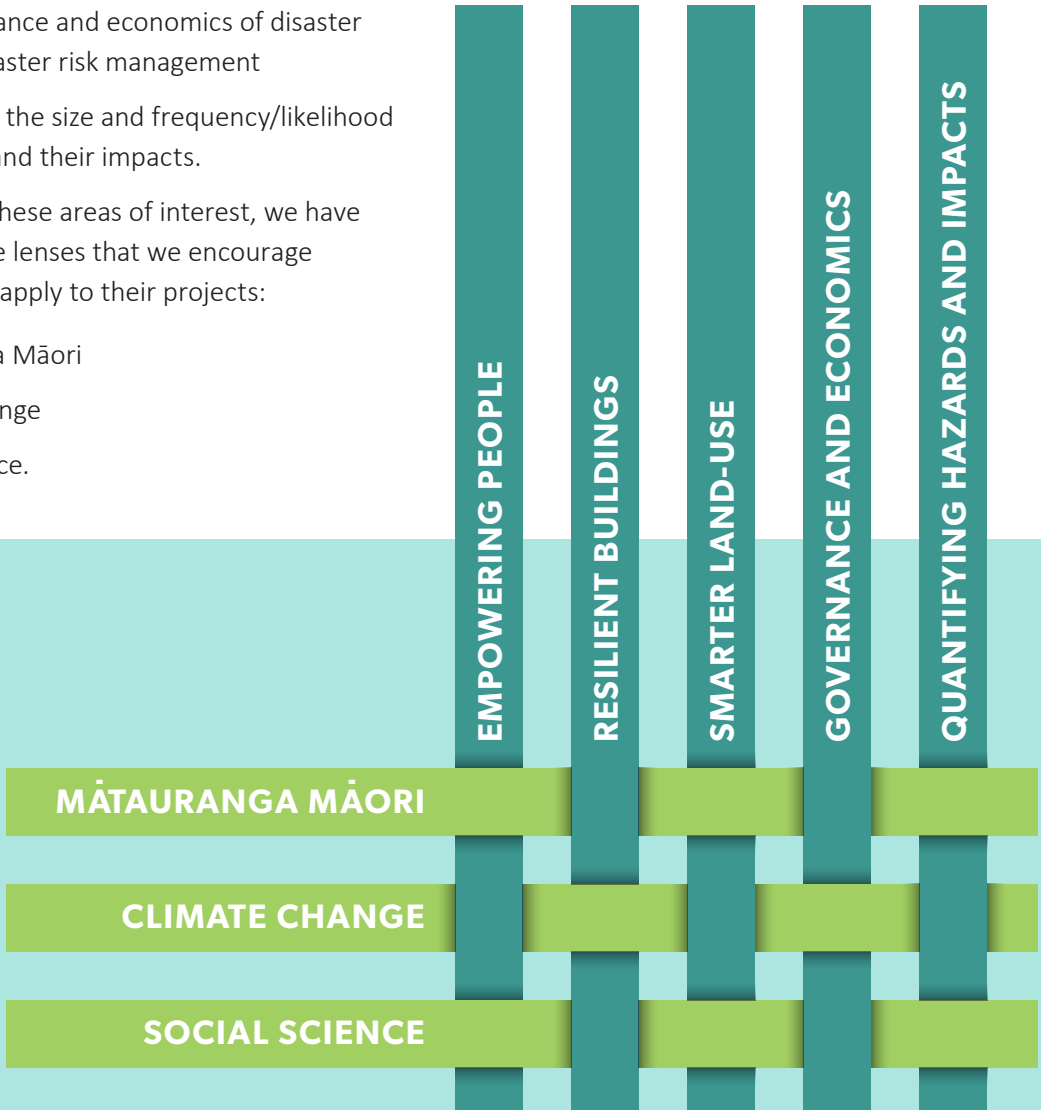
The areas that will guide our investment are targeted at improving the understanding of:

- How people perceive and manage risk (empowering people)
- Building and infrastructure performance (resilient buildings)
- Land-use management (smarter land-use)
- The governance and economics of disaster risk and disaster risk management
- Quantifying the size and frequency/likelihood of hazards and their impacts.

In addition to these areas of interest, we have identified three lenses that we encourage researchers to apply to their projects:

- Mātauranga Māori
- Climate change
- Social science.

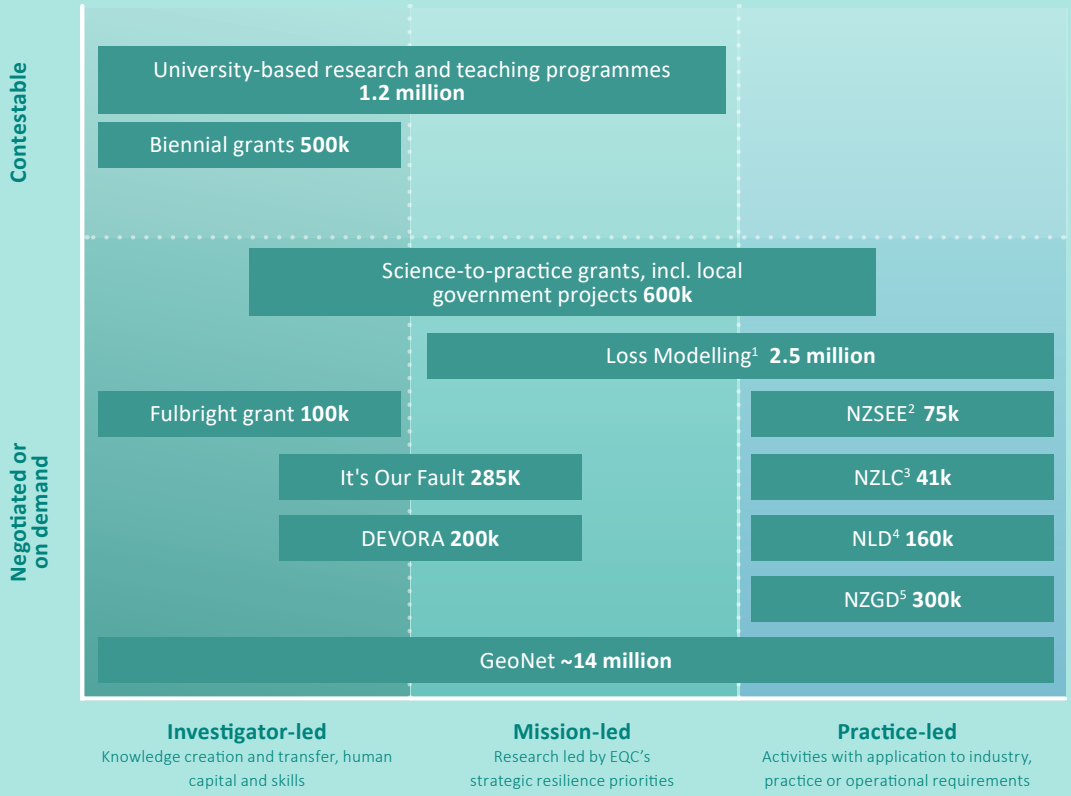
It is not an EQC priority to fund core climate change research, such as modelling or forecasting, but we are interested in how climate change may influence the frequency and severity of natural hazards covered by EQC. And any subsequent impacts on EQC achieving its resilience goals.



# CURRENT FUNDING

Our annual research investment is around $20 million, of which ~$14 million is allocated to our principal science investment GeoNet. $6 million is invested in resilience and hazard science through university-based research and teaching programmes, regional consortia (e.g. DEVORA and It's Our Fault) and funding of individual science projects (e.g. through Biennial grants and science-to-practice grants).

## How our funding is allocated




1 Loss modelling includes National Seismic Hazard Model, 2 NZSEE: New Zealand Society for Earthquake Engineering, 3 NZLC: New Zealand Lifelines Council, 4 NLD: National Landslide Database, 5 NZGD: New Zealand Geotechnical Database.

Adapted from MBIE, National Statement of Science Intent, 2018.

## Working with Other Initiatives

EQC is supportive of research proposals that leverage and align with existing research investments, whether they be from EQC or other organisations. A successful proposal will clearly articulate connections with existing initiatives and highlight the components and deliverables that are distinct to EQC and the specific funding request.

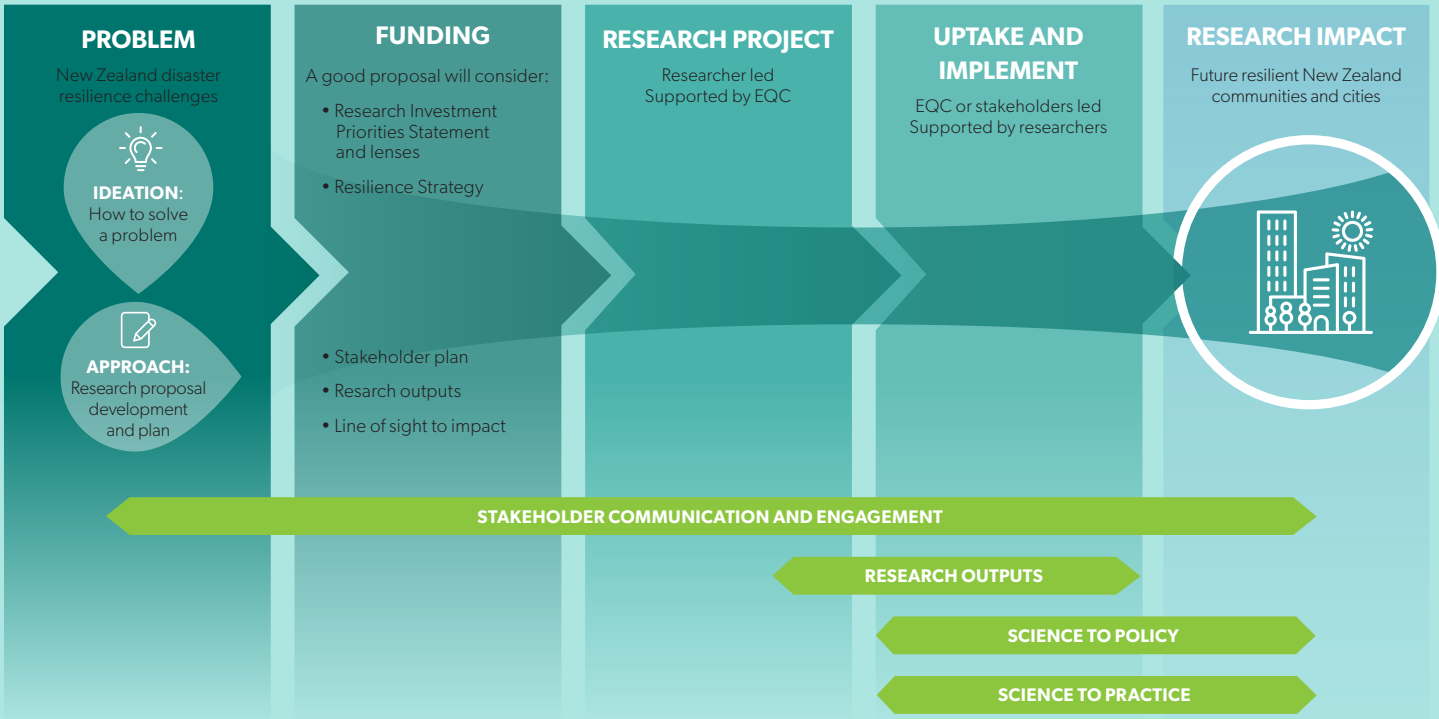
EQC is also interested in assisting researchers who wish to generate larger programmes of work with funding from other sources. EQC is happy to accept proposals for seed funding and projects designed to build capabilities.

EQC discourages any attempt to boost funding through duplication of funding or 'double-dipping'. If a project needs co-funding or partnering to reach its full potential and cover costs, EQC is happy to consider the proposal if the benefits to EQC are clear and aligned with EQC priorities. EQC appreciates clear and open communication.

## What Does a Successful EQC-Funded Project Look Like?

A successful proposal will have a clear path to uptake of the research and how it will be or could be used. EQC is not interested in purely theoretical research that has a very loose line to application, uptake and impact. We appreciate that the outcomes of some research may be aspirational, but proposals nevertheless provide a clear line of sight as to how any significant findings would be used to improve New Zealand's resilience to natural hazards.

## A successful EQC funded project



# AREAS OF RESEARCH INTEREST

Many of the focus areas listed on the following pages could fit in multiple categories.
We recommend that you read all sections to get a complete picture of EQC's priorities.

# 1. EMPOWERING PEOPLE

## Understanding how people perceive and manage risk

- Supporting the development of a National Risk Tolerance Framework by further understanding what drives people to accept, avoid or take action regarding risk exposure.
- Contributing to disaster risk reduction and resilience through distinctive indigenous research and development, including on:
  - Taiao/environment – achieving disaster resilience through iwi and hapū relationships with land and sea
  - Hauora/health – improving health and social wellbeing aspects of disaster resilience
  - Mātauranga/knowledge – exploring indigenous knowledge and science and innovation regarding hazard risk management
- Understanding the resilience opportunities and learnings from papakāinga developments, and how these learnings can contribute to building resilience in our wider communities.
- Increasing the participation of Māori in disaster risk management.
- Increasing the participation in disaster risk management of Pasifika and people who are new to New Zealand.
- Improving socio-cultural and vulnerability inputs to risk modelling generally.
- Understanding and/or developing Mātauranga Māori approaches to the assessment of risk, hazard risk management and risk communication.
- Understanding mechanisms and success factors for the translation and communication of complex science to decision-makers, policy-makers, practitioners and the public.
- Understanding and developing novel methods for communicating risk and uncertainty.
- Exploring lessons from recent disaster events in New Zealand, including COVID-19, the 2019 Whakaari White Island eruption and the 2019 Christchurch terror attack, that can be applied to future natural hazard risk management, such as:
  - How to combat misinformation, especially with young people and children,
  - Engaging and communicating with vulnerable communities, especially non-English-speaking, elderly and disabled people.
- Understanding how to engage New Zealanders in the process of being better prepared (as participants) rather than just measuring how many things they have done to prepare.
- Understanding of Matauranga Māori views the home – and hence the preparedness of the home.
- Understanding culturally appropriate ways of working with Māori and other groups in post-disaster situations.
- Understanding the drivers of, and solutions to, under-insurance.
- Understanding the socio-economic profile and geographic distribution of under-insurance.
- Understanding potential challenges of insurance retreat as a result of the increasing risk of hazards including climate change exacerbation.


## Currently funded initiatives:

- Biennial Grants (2020-2021 round):
  - Understanding organisations' perceptions of obligations under the Health and Safety at Work Act 2015 in relation to seismic hazards
  - Community-led, low-cost micro-seismic sensor network applications for Earthquake Early Warning
- University Research Programme:
  - Te Toi Whakaruruhau o Aotearoa – Mātauranga Māori Disaster Risk Reduction Research Centre

# 2. RESILIENT BUILDINGS

## Understanding and improving building performance

- Exploring retrofit and resilient design approaches that can reduce damage before, and improve building reparability after, natural hazard events.
- Understanding the barriers (social, financial etc) to the uptake and implementation of building resilient buildings and the implementation of specific practices, such as low damage design.
- Understanding the barriers (social, financial etc) in uptake to retrofitting and strengthening existing buildings.
- Understanding the expectations of communities around the resilience of the built environment (and what they are prepared to pay for).
- Understanding the building and infrastructure response to low-frequency and high-magnitude events.
- Modelling how hazards of different types and intensities affect and/or damage our built environment.
- Understanding how architectural design can improve resilience.
- Understanding the characteristics of New Zealand's building stock, focusing on where and what buildings and infrastructure are most vulnerable.
- Understanding the trade-offs in and possible risks to the resilience of the built environment to natural hazards, when considering carbon-neutral or climate-conscious developments.
- Understanding how the changing requirements around carbon-neutral building practices will affect building for resilience against natural hazards.
- Understanding and defining what 'functional recovery' of building means in the New Zealand context.
- Understanding the cost of building to different design standards.
- Understanding of potentially hazardous non-structural building elements, covering for each element: proliferation, primary risk factors and best pathways to improve performance.
- Exploring novel ways to incorporate broader resilience measures into buildings, including measures that are non-structural.

Photo ©Tectonus

## Currently funded initiatives:

- Resilient Buildings project
- Residential fragility projects
- Structural resilience and lifecycle cost implications of designing to various international standards
- Biennial Grants (2020-2021 round):
  - Understanding the seismic performance of structural insulated panels for use in New Zealand
  - Application of AI to advance structural performance and resilience quantification
  - Seismic strengthening of reinforced concrete walls in existing buildings with fibre-reinforced polymer materials
  - Seismic performance of multi-storey, cross-laminated timber shear wall structures with high-capacity anchoring systems
  - Physics-based ground motion modelling for the urban Wellington region: Basin-edge effects and implications for seismic design
  - Determining ability of ground improvement to improve seismic foundation performance through full-scale field testing
- University Research Programme:
  - Engineering for stronger homes and better land in Aotearoa New Zealand

# 3. SMARTER LAND-USE

## Understanding, improving and managing land-use

- Understanding how new and emerging governance and development control mechanisms (such as national direction, spatial plans and district and regional planning policies and rules) could better control the location, density and design of development to reduce vulnerability and exposure to natural hazards.
- Understanding the challenges and opportunities for local and central government to better avoid or reduce exposure to natural hazards through land-use planning.
- Supporting local authorities' understanding and use of new and emerging planning instruments to reduce natural hazard risks.
- Developing tools or nationally consistent approaches to multi-hazard or cascading-hazard risk assessment and scenario development.
- Understanding the barriers to implementing existing guidance and frameworks related to natural hazard risk management, especially around what level of risk is 'significant' for land-use planning.
- Understanding best-practice long-term spatial planning approaches.
- Developing risk-based adaptive planning instruments and determining how they would incorporate changing hazards and risks over time because of a warming climate.
- Exploring the potential for incorporating risk modelling into land-use planning.
- Investigating the costs (e.g. financial, social, cultural, environmental) of poor land-use outcomes, and what led to them.
- Exploring innovative natural hazard risk reduction methods that contribute to reducing climate change and related impacts, such as the use of native flora to mitigate the impacts of flooding.

### Currently funded initiatives:

- Population exposure model (PEM) and Land-use planning for resilience and sustainability
- It's Our Fault
- DEVORA
- University Research Programme:
  - Assessment and mitigation of liquefaction hazards

# 4. GOVERNANCE AND ECONOMICS

## Understanding the governance and economics of disasters and disaster risk management

- Investigating financial mechanisms and incentives for reducing risk and building resilience.
- Modelling the direct, indirect and/or intangible costs of disasters, including projected costs for a warmer climate.
- Measuring and modelling the economic costs of social impact, including establishing a 'standardised' methodology for doing so.
- Investigating trends in insurance markets and insurance uptake, nationally and internationally, particularly in relation to insurance retreat under climate change.
- Understanding the consequences and cascading effects of risk-based insurance pricing.
- Understanding EQC's financial exposure to a range of hazard scenarios, under a range of market conditions.
- Investigating how government (central, regional and local) policy affects the country's risk profile, including to understand which policy instruments can have the biggest impacts on risk profiles.
- Better understanding barriers to and opportunities for implementing policies that reduce risk and build resilience.
- Understanding optimal governance structures for natural hazard risk management.
- Understanding the true costs of rebuilding following a disaster, including disruption, legal, carbon and social costs.
- Understanding the consequences of taxation on carbon as applied to building resilience.
- Investigating the relative effectiveness of alternative mechanisms for delivering post-disaster insurance for large-scale events (e.g. cash settlement, managed repair, Project Management Offices, insurer-led, government-led).
- Understanding the use of cash settlement as an insurance solution, including effects on the resilience of the building stock.
- Exploring how New Zealand's response to disaster events compares with other countries' responses in terms of settling claims and recovery strategies (timing, cost and social impacts).
- Understanding the range of challenges for building owners and local authorities in the later stages of implementing the Earthquake Prone Building Policy.

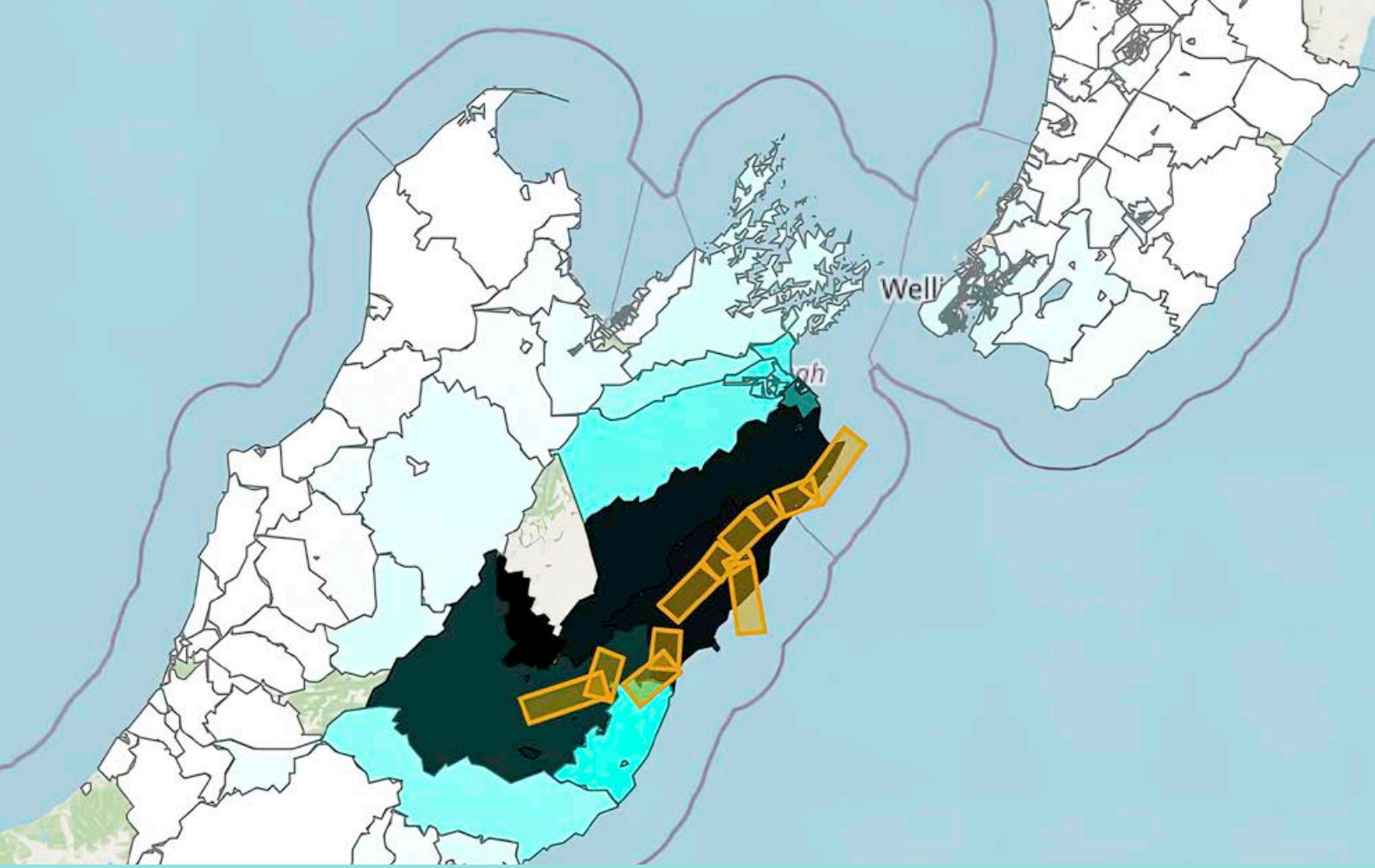

### Currently funded initiative:

- University Research Programme:
  - The economics of financial natural hazards risks and changing insurance markets

# 5. QUANTIFYING HAZARDS AND IMPACTS

## Understanding the size, severity, and likelihood of hazards and their impacts for loss modelling

- Developing consistent national approaches to mapping and modelling natural hazard risks, such as liquefaction and tsunami inundation, with a focus on consistent and interoperable data and information.
- Developing hazard and/or hazard scenarios and impact forecasts for use with RiskScape.
- Improving hazard models, especially for 'underdeveloped' hazards (such as slope stability, flooding, storm surge, tsunami and fire following earthquake), which contribute to improved risk modelling, such as RiskScape.
- Understanding how climate change will affect the frequency, severity and geographic extent of natural hazards that EQC covers.
- Updating models of hazards and their impacts to incorporate changes expected based on climate models.
- Interrogating and assessing existing data to better understand current and future vulnerable communities exposed to hazards, including those exacerbated by climate change.
- Better understanding New Zealand's building stock, especially how vulnerable buildings are to natural hazards.
- Developing infrastructure or platforms to collate data and information to enable data-driven decision making or access to data for natural hazard risk reduction research.
- Developing initiatives that maximise the value of data and models related to understanding, or used to understand, natural hazard risks. These initiatives should focus on consistency, access, and interoperability of data and models on a national scale.




## Currently funded initiatives:

- GeoNet
- National Seismic Hazard Model
- New Zealand Geotechnical Database
- National Landslide Database
- Loss modelling projects related to volcanoes and tsunami
- Biennial Grants (2020-2021 round):
  - Towards real-time probabilistic ash deposition forecasting for Aotearoa New Zealand
  - Improved constraint on past Hikurangi subduction earthquake rupture dimensions using a locally derived marine reservoir correction
  - Paleoseismology of the newly discovered Te Puninga Fault, Hauraki Plains
  - Frictional strength and stability of greywacke fault zones
  - A fuzzy approach to understanding multi-fault earthquakes
  - High-resolution gravity methods to improve our knowledge of basement depths and the shape for the edge of the basins that Wellington city is built on
- University Research Programme:
  - Earthquake seismology and tectonic geodesy
  - Next-generation seismic hazard analysis for New Zealand
  - Building resilience through earthquake and landslide multi-hazard research in New Zealand
  - Understanding and managing risk in low seismic hazard zones

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