Ko te tūāpapa e tū pakari ai tātau, kia ngātahi

The foundation from which we stand strong, together

Resilient Homes and Buildings Action Plan

2022–2027

Te Kāwanatanga o Aotearoa
New Zealand Government

Toka Tū Ake EQC

Contents

Acronyms and abbreviations

%NBS	% New Building Standard
AF8	Alpine Fault Magnitude 8
BCA	Building Consent Authority
DEVORA	Determining Volcanic Risk in Auckland
DIA	Department of Internal Affairs
HUD	(Ministry of) Housing and Urban Development
ICNZ	Insurance Council of New Zealand
LGA	Local Government Act 2002
LGNZ	Local Government New Zealand
LINZ	Toitū Te Whenua Land Information New Zealand
MBIE	Ministry of Business, Innovation and Employment
MfE	Ministry for the Environment
NDF	Natural Disaster Fund
NEMA	National Emergency Management Agency
NSHM	National Seismic Hazard Model
NZGS	New Zealand Geotechnical Society
NZIA	New Zealand Institute of Architects
NZLC	New Zealand Lifelines Council
NZSEE	New Zealand Society for Earthquake Engineering
RBP	Resilient Buildings Project
RMA	Resource Management Act 1991
RNC	Resilience to Nature's Challenges
SESOC	Structural Engineering Society
SNZ	Standards New Zealand
URM	Unreinforced Masonry

Key terminology

Adaptation
The process of adjustment to actual or expected climate and its effects. In human systems, adaptation seeks to moderate or avoid harm or exploit beneficial opportunities. In some natural systems, human intervention may facilitate adjustment to expected climate and its effects.[1]

Built environment
The designed and constructed spaces that human activity takes place in, including buildings, housing, critical infrastructure, urban design, and planning.

Climate change
A change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods.[2]

Functional recovery
A post-natural hazard event performance state in which a building or lifeline infrastructure system is maintained, or restored, to safely and adequately support the basic intended functions associated with the pre-event use of occupancy of a building, or the pre-event service level of a lifeline infrastructure system.[3]

Infrastructure services
A system of inter-connected physical structures that employ capital to provide shared services to enhance wellbeing.[4]

Natural hazard
Any atmospheric, earth, or water related occurrence—including earthquake, hydrothermal activity, landslide, tsunami, volcanic activity, flood, storm, or natural hazard fire—the action of which adversely affects or may adversely affect human life, property, or other aspects of the environment.[2]

Resilience
The ability to anticipate and resist the effects of a disruptive event, minimise adverse impacts, respond effectively post-event, maintain or recover functionality, and adapt in a way that allows for learning and thriving.[5]

Risk
The potential loss of life, injury, or destroyed or damaged assets which could occur to a system, society, or a community in a specific period of time, determined as a function of hazard, exposure, vulnerability and capacity.[3]

Risk reduction
Preventing new and reducing existing natural hazard risk, including managing residual risk.[5]

1 https://www.ipcc.ch/site/assets/uploads/2018/02/WGIIAR5-AnnexII_FINAL.pdf
2 New Zealand Natural Hazards Insurance Bill
3 https://www.fema.gov/sites/default/files/documents/fema_p-2090_nist_sp-1254_functional-recovery_01-01-2021.pdf
4 https://www.tewaihanga.govt.nz/assets/Uploads/Te-Waihanga-Infrastructure-Under-One-Roof-2020.pdf
5 https://www.civildefence.govt.nz/assets/Uploads/publications/National-Disaster-Resilience-Strategy/National-Disaster-Resilience-Strategy-10-April-2019.pdf

Executive summary

Toka Tū Ake EQC wants resilient homes and buildings, but we can't do this alone.

Strong building regulation and governance is one of the most effective ways to manage natural hazard risks. Along with land-use planning, insurance, and resilient infrastructure, it determines how communities and the built environment come through natural hazard events.

Toka Tū Ake EQC insures Aotearoa New Zealand homes, buildings, and the land they stand on against natural hazard damage. This includes buildings of poor design or construction. Historically, we have held to our role in response and recovery. Now we are increasingly working to reduce natural hazard risks and to make sure individuals understand these risks.

The primary purpose of this action plan is to highlight opportunities to increase the resilience of homes and buildings, for the safety and wellbeing of all those living in Aotearoa New Zealand.

This document addresses challenges that span professions, sectors, institutions, building uses, and people. It describes how to increase resilience, including opportunities for decision-makers, practitioners, and individuals. This action plan complements our *Smarter Land Use Action Plan*. Together, their actions will enhance the resilience of Aotearoa New Zealand communities to natural hazards.

Building sector representatives have reviewed the content and direction of this plan. This document includes actions that Toka Tū Ake EQC can only undertake with the cooperation of built environment stakeholders and other like-minded organisations.

This action plan is based on three objectives, each with associated activities, milestones, and outcomes. We have provided a snapshot of these on the next page.

Objective 1: New homes and buildings are designed and built for resilience

ACTIVITIES		MILESTONES	OUTCOMES
Support improved functional recovery by implementing low-damage design	**Year 1**	Support MBIE in promoting the low-damage design guidelines Support building consent authorities in reviewing and consenting new low-damage design projects Support the Resilient Buildings Project Use Toka Tū Ake EQC experience to guide standards and practice Work closely with professional and technical societies	Low-damage design guidance is published Wider conversations on the intent and purpose of the *building code* are held Toka Tū Ake EQC makes use of its valuable data and experience
Build for resilience and climate change	**Year 2**	Deliver professional development and public education seminars to promote low-damage design Investigate guidance on low-carbon design for engineers Encourage designers to consider natural hazards and climate change as part of overall building function when designing infrastructure Develop and promote additional design solutions that make buildings perform 'above code' Encourage regular review and update of building regulations and standards	Design practitioners are confident and capable in producing more resilient, sustainable solutions Natural hazard resilience becomes a driving factor in designing the built environment
Help drive best practice	**Year 3**	Monitor to identify gaps in implementation of low-damage design Undertake cost-benefit analyses to demonstrate value and return of low-damage design	Ensure the built environment can sustain low-damage projects, from design to consenting to delivery Ensure low-damage projects are fit for purpose, and demonstrate a realistic and desirable option

RISKS	EXISTING LINKAGES
The system does not change Tāngata whenua, and Māori in general, are not empowered The reputation of Toka Tū Ake EQC prevents widescale acceptance and participation A significant event (e.g., natural hazard event) shifts organisational, public, and political will COVID-19 safeguards delay the effective collaboration and delivery of this action plan A change in government pauses delivery during the changeover or stops the action plan	**Central Government:** Update to the National Seismic Hazard Model (NSHM), MfE climate adaptation porta, HRB Risk Tolerance Sub-Group, Stats NZ IDI and LBD, New Zealand Infrastructure Strategy **Research:** New Zealand Landslide Database, New Zealand Tsunami Database **Technical Societies:** NZSEE, SESOC, NZGS, New Zealand Geotechnical Database

Objective 2: Existing buildings are assessed and managed so they are safe and resilient

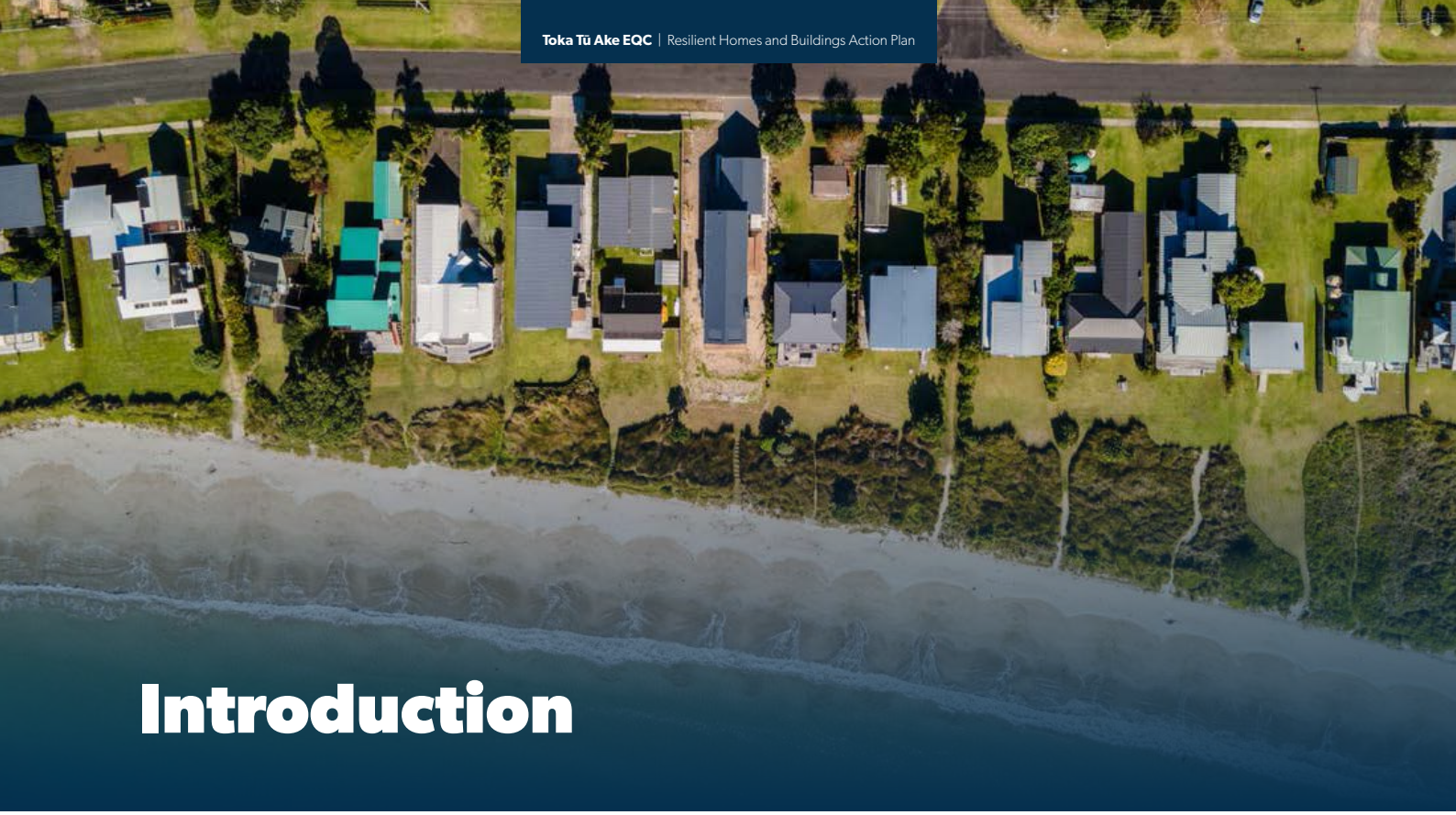
ACTIVITIES		MILESTONES	OUTCOMES
Promote effective strategies to retrofit and strengthen existing buildings	**Year 1**	Produce a think piece on incentivising resilience Build the evidence base for a residential risk reduction scheme Develop accessible guides on retrofitting and strengthening for builders and homeowners, rather than just for engineers Continue directed research investment Build a proposal, business case, and funding model	Scope is clarified for residential risk reduction incentive scheme Non-technical building stakeholders are empowered to take risk reduction actions New or better ways to manage risk from existing vulnerable buildings types are investigated
Build the evidence base for a residential risk reduction incentive scheme	**Year 2**	Support new research into retrofitting and strengthening solutions Determine cost-effective risk reducing actions for incentive scheme Develop vulnerability-based building assessment metrics Investigate the 'point of diminishing returns' for risk reduction investment Encourage more, stricter strengthening 'trigger laws' Develop a monitoring and evaluation framework for a possible incentive scheme	Investment in risk reduction is targeted, thoughtful, and efficient Currently unrecognised vulnerabilities in our building stock are investigated, and solutions to address them are considered Existing buildings are more frequently strengthened or retrofitted
Scope the implementation of a residential risk reduction incentive scheme	**Years 3-5**	Demonstrate value and return on investment of retrofitting and strengthening Enable 'build back better initiatives' for damaged properties Monitor delivery of risk reduction incentive scheme for perverse outcomes Complete full assessment of policy implications	Retrofitting and strengthening is seen as adding value and benefit, not cost No more vulnerable buildings are added to the building stock The risk reduction incentive scheme does not make existing inequities worse or create new ones
Support investigation and research into 'unknown unknowns'			

RISKS	EXISTING LINKAGES
The system does not change Tāngata whenua, and Māori in general, are not empowered The reputation of Toka Tū Ake EQC prevents widescale acceptance and participation A significant event (e.g., natural hazard event) shifts organisational, public, and political will COVID-19 safeguards delay the effective collaboration and delivery of this action plan A change in government pauses delivery during the changeover or stops the action plan	**Central Government:** Update to the National Seismic Hazard Model (NSHM), MfE climate adaptation porta, HRB Risk Tolerance Sub-Group, Stats NZ IDI and LBD, New Zealand Infrastructure Strategy **Research:** New Zealand Landslide Database, New Zealand Tsunami Database **Technical Societies:** NZSEE, SESOC, NZGS, New Zealand Geotechnical Database

Objective 3: Aotearoa New Zealand's built environment system is enduring and fit for purpose

ACTIVITIES		MILESTONES	OUTCOMES
Actively collate and share lessons learnt Support the ongoing development and integration of national hazard models Support engineering science	**Year 1**	Support the updated National Seismic Hazard Model (NSHM) Investigate trends from Toka Tū Ake EQC's data and experience Continued directed research investment Engage closely with professional technical societies Create role at Toka Tū Ake EQC to lead development of the National Risk and Resilience Portal Make historic Toka Tū Ake EQC claims information open to the public Investigate risk tolerance and thresholds to develop a comprehensive framework Actively submit on plans, policy, etc Determine datasets critical to the performance of the built environment and ensure their longevity	Scientific evidence bases are up to date and fit for purpose Toka Tū Ake EQC information and experience is useful and used Valuable scientific research continues to inform our decisions Parallel initiatives are coordinated Historic Toka Tū Ake EQC claims information drives homeowner decision-making Natural hazard resilience is prioritised Resilience data is publicly available to ensure wide use in the building system
Lead the development of a national *Risk and Resilience portal* Collect and curate building information	**Year 2**	Create a central resource of past lessons and experience Create and maintain a National Building Register Engage with local governments to capture and incorporate building information as it is 'created' Provide a robust evidence base to drive building policy	Sharing of knowledge and experience is commonplace, and benefits all A *National Building Register* allows for clearer and better informed consideration of buildings
Actively contribute to national policy development Support improvements to the building regulatory system	**Years 3-5**	Publish a series of lessons lear nt and evolving understanding Support the incorporation of the new NSHM into standards and regulation Ongoing curation of a *National Building Register* Establish ongoing, regular updates of the NSHM Promote frequent review of standards and regulation	The review and update of underlying evidence bases is regular, frequent, and ongoing National Building Register is sustainable and increases resilience of the built environment

RISKS	EXISTING LINKAGES
The system does not change Tāngata whenua, and Māori in general, are not empowered The reputation of Toka Tū Ake EQC prevents widescale acceptance and participation A significant event (e.g., natural hazard event) shifts organisational, public, and political will COVID-19 safeguards delay the effective collaboration and delivery of this action plan A change in government pauses delivery during the changeover or stops the action plan	**Central Government**: Update to the National Seismic Hazard Model (NSHM), MfE climate adaptation porta, HRB Risk Tolerance Sub-Group, Stats NZ IDI and LBD, New Zealand Infrastructure Strategy **Research:** New Zealand Landslide Database; New Zealand Tsunami Database **Technical Societies**: NZSEE, SESOC, NZGS, New Zealand Geotechnical Database



Introduction

Aotearoa New Zealand's built environment is facing urgent challenges. In the past decade especially, natural hazards like earthquakes and storms have repeatedly demonstrated inadequacies in our building stock.

The global climate emergency will significantly amplify the impacts and frequency of natural hazard events, which in turn will affect our people and property. In addition, Aotearoa New Zealand has a national housing crisis, with too little space to house people, made worse by rapidly increasing house prices. Further, the COVID-19 pandemic has dramatically changed what people expect and need from their homes and buildings. It has demonstrated that a resilient housing stock contributes to wellbeing and allows people to shelter in place while keeping a significant portion of the nation's economy moving amidst a crisis. The resilience of our built environment has never been more important.

Many stakeholders and interest groups contribute to Aotearoa New Zealand's built environment. These include builders, tradespeople, engineers, researchers, architects, planners, developers, and local, regional, and central government. All have a role to play in increasing the resilience of our homes and buildings.

This action plan outlines objectives, activities, and milestones to make homes and buildings resilient for all communities. Strong building regulation is one of the most effective strategies for reducing natural hazard risk and increasing resilience of our built environment. This plan calls for collaboration and coordination across the building sector to make sure our homes and buildings are fit for purpose, and that they remain resilient in an uncertain future.

The role of the built environment in natural hazard risk management

Hazard risk in Aotearoa New Zealand is currently managed across three key pieces of legislation: the Resource Management Act 1991 (RMA), the Local Government Act 2002 (LGA), and the Building Act 2004.

From these three frameworks, governance decisions are made to reduce natural hazard risks for communities, businesses, and individuals. Regulation of the built environment is a significant tool to reduce risks in Aotearoa New Zealand.

The built environment is made up of our homes, the buildings we spend time in each day, the infrastructure and services supplying them, and the designed space connecting them such as roads, transportation networks, and public areas. It is the setting where most human activity takes place. Many of societies' functions rely on suitably designed and reliable spaces. This is why the built environment plays such a significant role in natural hazard risk management.

Robust building codes and their governance are one of the most effective drivers of natural hazard risk reduction alongside land-use planning regulation. In hazard-prone communities around the world, there are consistently striking differences between the outcomes of those with robust building regulatory systems and those with weak building governance structures. Building standards set the minimum performance objectives our homes and buildings must meet to adequately serve communities. Alongside supporting infrastructure, they play a significant role in determining the outcomes of natural hazard events.

Where we build our homes and buildings is as important as how we build them.

While building design and regulation is effective in managing the consequences of natural hazards, land-use planning can be a primary tool in natural hazard risk management. Smarter land-use planning can avoid, if not entirely eliminate, exposure to some natural hazards. This means the structure may not need to be designed and constructed to withstand them.

Why is Toka Tū Ake EQC interested in the resilience of homes and buildings?

Toka Tū Ake EQC is responsible for providing natural hazard insurance to residential property owners in Aotearoa New Zealand.

The potential loss associated with natural hazard risk in Aotearoa New Zealand is high and is carried by Toka Tū Ake EQC on behalf of the Crown. Money paid out by Toka Tū Ake EQC comes from the Natural Disaster Fund (NDF) and is currently capped at $150,000 + GST per claim. However, from October 2022, the payout cap doubles to $300,000 + GST. This means that our financial liability will double. As the NDF comes from publicly funded levies, it ultimately means the liability of the public doubles. Additionally, climate change is making some natural hazards worse, and population growth is pushing building development into higher risk areas. Together, these factors are increasing natural hazard risk. As a result, Toka Tū Ake EQC has a strong interest in reducing risk from, and increasing resilience to, natural hazards for the good of those in Aotearoa New Zealand.

To help communities to reduce their risks, Toka Tū Ake EQC is focused on improving Aotearoa New Zealand's resilience.

We use the best data and knowledge available to consider and quantify potential consequences of social and economic disruption by natural hazards, and factor them into everyday development decisions.

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

To support our resilience goal, Toka Tū Ake EQC is developing two complementary action plans: the *Smarter Land Use Action Plan*, and the *Resilient Homes and Buildings Action Plan*.

The goal of the *Smarter Land Use Action Plan* is to proactively reduce our current and future risks through smarter, risk-informed land use planning. Land use planning is one of the most effective options for reducing natural hazard risk. But it is also a challenging policy area that must balance a range of often competing priorities. Our society's risk tolerance is shaped by social norms, planned and existing building development, information availability, the availability of risk treatment measures, and sustainability. Land use planning and resilient construction of the built environment must be used together to ensure Aotearoa New Zealand's resilience and prosperity.

This *Resilient Homes and Buildings Action Plan (ReHAB)* outlines our commitment to proactively improve the lives of people living in Aotearoa New Zealand by making their homes and the built environment around them more resilient. Our mandate is primarily directed at residential property, but the actions and ideas in this plan reach further. Homes are increasingly located in building types other than standalone, single-family houses on individual lots.

Toka Tū Ake EQC deals with multi-family residential apartment blocks, mixed-use developments with residential over commercial, and redeveloped and repurposed older buildings not originally designed as housing. Additionally, the importance of supporting infrastructure and services in making a space usable and comfortable cannot be ignored. As housing pressures push development into urban centres and denser areas, Toka Tū Ake EQC must look beyond the commonplace timber-framed, standalone house prevalent throughout the last century.

Guiding principles of this action plan

As we pursue our vision of a resilient Aotearoa New Zealand, seven principles guide our actions, including the development and implementation of this action plan.

Each of these principles is underpinned by te ao Māori values, including whakawhanaungatanga (sharing trusting and enduring relationships), rangatiratanga (sharing and gathering information to support informed decisions), tika (doing what is right, just, and fair), pono (being authentic, genuine, and sincere), and aroha (being considerate, caring, and compassionate):

- partner for greater impact
- be open and transparent
- steward national capabilities
- foster innovation
- enable targeted, high-quality research
- focus on greatest national benefit
- enable system integration and adaptation.

These guiding principles are graphically presented in Figure 1 (over).

Figure 1: Principles that guided the development and implementation of this action plan (based on EQC Resilience Strategy for Natural Hazard Risk Reduction 2019-2029, p13).

Vision Mātauranga and Mātauranga Māori

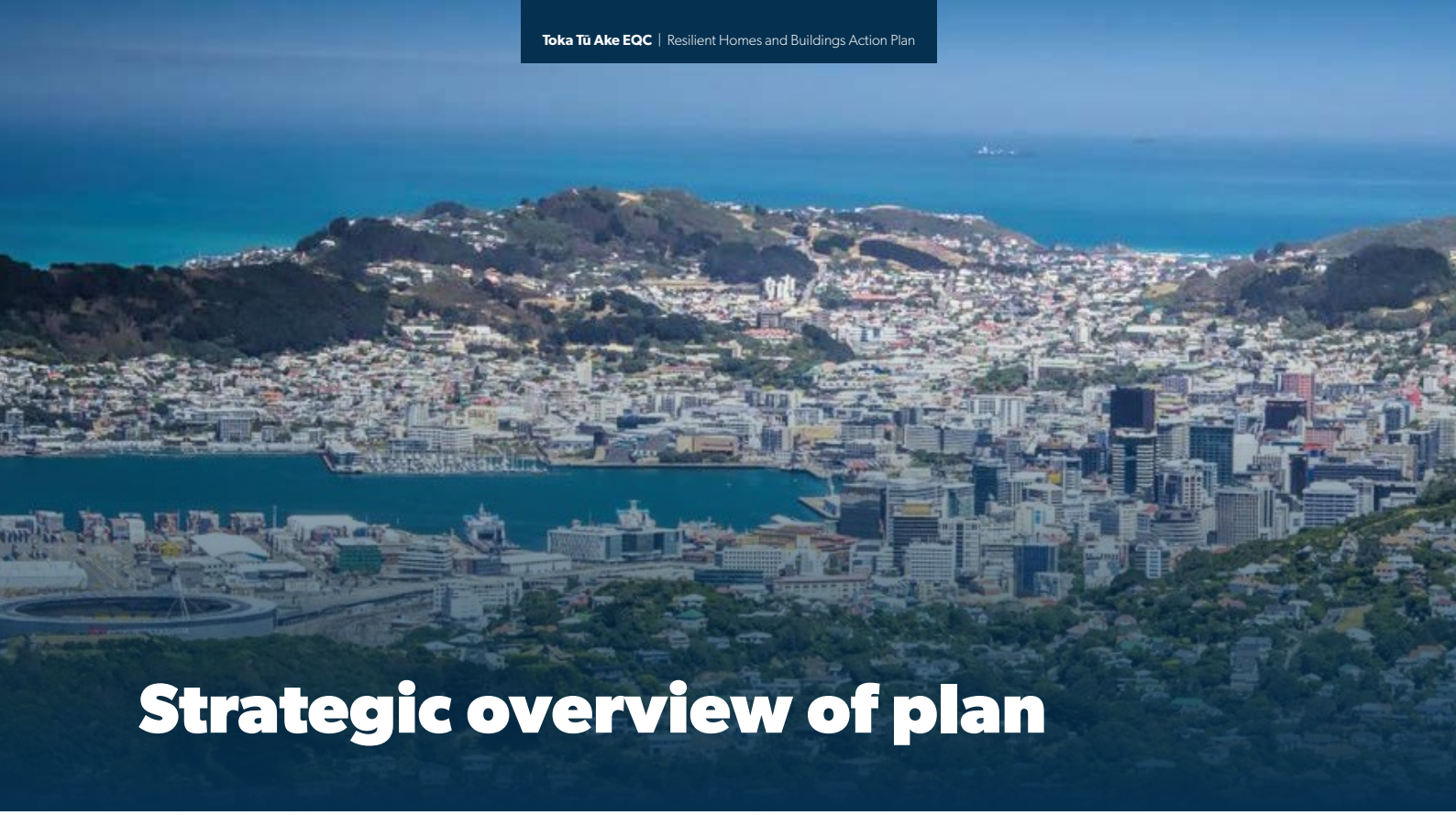
As outlined in the *EQC Resilience Strategy*,[6] Toka Tū Ake EQC is committed to the policy themes and outcomes of Vision Mātauranga.

This is the Aotearoa New Zealand government science policy framework that seeks to unlock the innovation potential of Māori knowledge, people, and resources. Vision Mātauranga themes relevant to risk reduction and resilience are:

- indigenous innovation: Contributing to natural hazard risk reduction and resilience through distinctive research and development;
- taiao/environment: Improving natural hazard risk reduction and resilience through iwi and hapū relationships with the land and sea
- hauora/health: Improving health and social wellbeing by increasing natural hazard resilience
- mātauranga: Exploring indigenous knowledge, science, and innovation for natural hazard risk management.

It is widely acknowledged that Māori are underrepresented in built environment professions. We will support and encourage Māori in the built environment whenever the opportunity arises, either through existing or new initiatives with different organisations.

6 EQC 2019, Resilience Strategy for Natural Hazard Risk Reduction 2019-2029, Wellington (NZ). https://www.eqc.govt.nz/assets/Publications-Resources/Resilience-and-Research-Publications-/EQC-Resilience-Strategy-2019-2029.pdf



Strategic overview of plan

Goal

We want everyone living in Aotearoa New Zealand to live in a home that meets their expectations of being resilient to natural hazard risks.

Built environment stakeholders will support this by collaborating to reduce natural hazard risks through risk-based, community-informed design and construction. Our goal is **to increase the resilience of homes and buildings for the safety and wellbeing of all those in Aotearoa New Zealand.**

Intended outcome

The overarching intended outcome of this action plan is:

Homes and buildings are more resilient to natural hazards

Supporting outcomes include:

- **Councils** actively consider and plan for natural hazards and risks in the short, medium, and long term.
- Councils make risk-based decisions and understand the trade-offs that need to be made between:
  - investment in natural hazard risk reduction (such as avoiding the worst land, retrofitting buildings, and upgrading buried pipes); and
  - other opportunities to improve the resilience and wellbeing of their communities.
- **Built environment** stakeholders (including engineers, architects, builders, developers, real estate professionals, and technical societies) increase the resilience of homes and buildings over time by:
  - understanding the need for, and value of, incorporating risk-based decisions; and
  - adopting resilient design principles.
- **Central government** includes reducing risk and managing natural hazards in built environment policy, frameworks, standards, funding, guidance, and position statements, including the:
  - *Building for Climate Change Programme*
  - *National Disaster Resilience Strategy*

- *Rautaki Hanganga o Aotearoa – New Zealand Infrastructure Strategy 2022-2052*
- *Wellbeing Budget 2022*
- *Living Standards Framework*
- *Government Policy Statement on Housing and Urban Development*
- *National Policy Statement on Urban Development 2020*
- *Resource Management (Enabling Housing Supply and Other Matters) Amendment Act 2021*
- *Natural Hazards Insurance Bill*
- *[Future] Natural and Built Environment Act*
- *[Future] Strategic Planning Act*
- *[Future] Climate Adaptation Act.*

Objectives

The action plan has three objectives, each with their own activities, milestones and intended outcomes:

1. New homes and buildings are designed and built for resilience.
2. Existing buildings are assessed and managed so they are safe and resilient.
3. Aotearoa New Zealand's built environment 'system' is enduring and fit for purpose.

The goal and objectives of this plan contribute to the *EQC Resilience Strategy for Natural Hazard Risk Reduction 2019-2029* objective: 'More resilient buildings and infrastructure reduces damage and impacts', with the aim of 'Reducing New Zealand's vulnerability and exposure to natural hazard events'.[7]

7 EQC 2019, Resilience Strategy for Natural Hazard Risk Reduction 2019-2029, Wellington (NZ). https://www.eqc.govt.nz/assets/Publications-Resources/Resilience-and-Research-Publications-/EQC-Resilience-Strategy-2019-2029.pdf

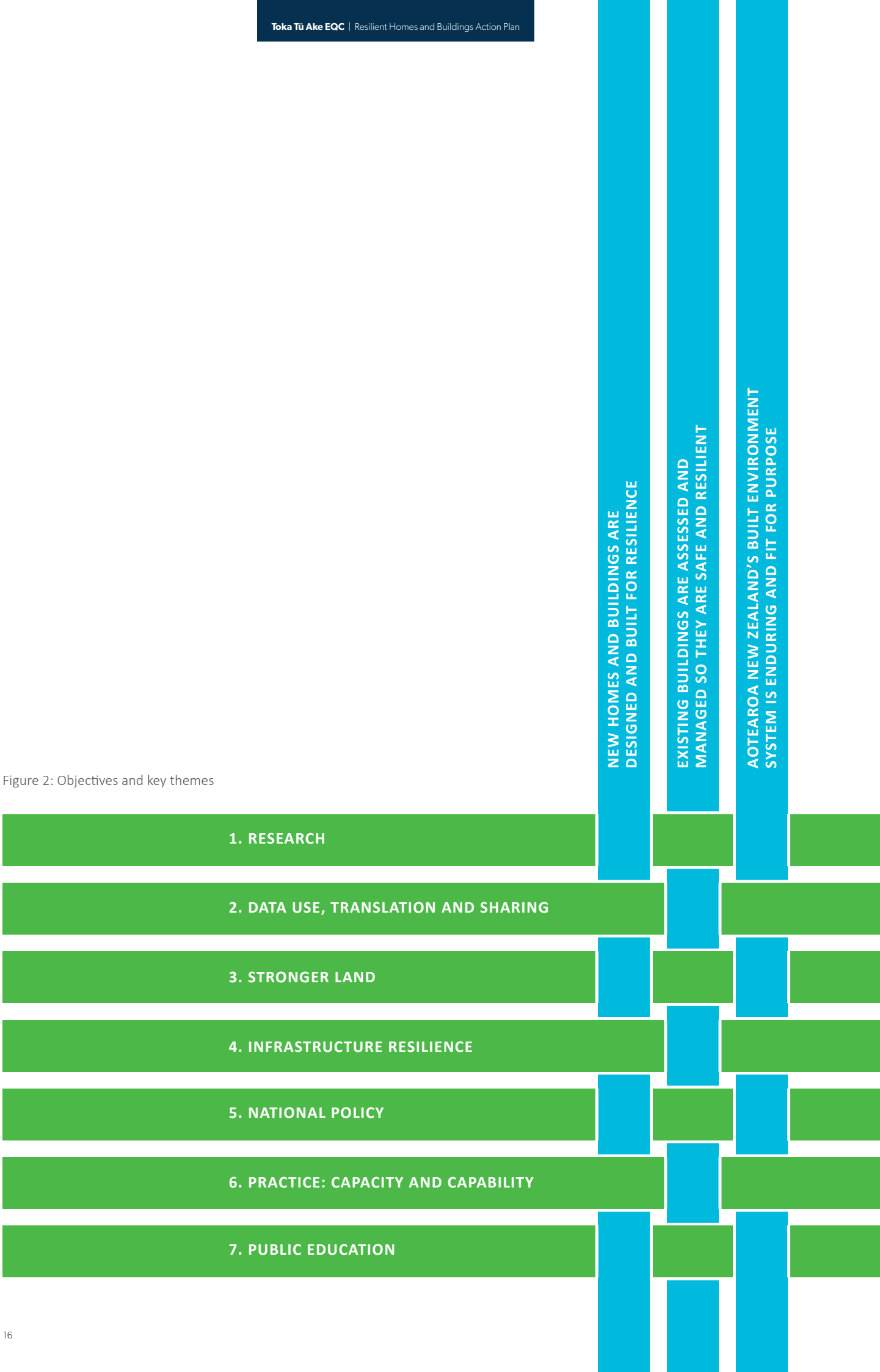


Figure 2: Objectives and key themes

Themes

The objectives are supported by seven themes (summarised here in Figure 2).

These themes are key areas of focus which will contribute substantially to achieving the objectives. We identified that the themes were critical to implementing the action plan by consulting with stakeholders. The scope of the action plan is not limited to these themes. The themes underpin the objectives, but not every theme is necessarily relevant to every objective or activity.

1. Research

Research is a major focus area for Toka Tū Ake EQC as we look to increase our understanding of natural hazards and risk reduction. We maintain an active relationship with researchers around the country, and they will play a vital part of informing the work of this action plan.

2. Data use, translation, and sharing

Strategic use and translation of data is a key priority for Toka Tū Ake EQC, and this action plan also aims to enable data-informed decisions. Collecting, maintaining, sharing, translating, and using data and information will all be vital parts of this action plan.

3. Stronger land

A building's performance cannot be considered separately from the ground below it. This is reflected in our resilience goal ('smarter land use that avoids the worst risks'). But some buildings are already built on vulnerable land, and other factors push development into hazardous areas. In these cases, we need strategies and options for strengthening or improving the land under our homes and buildings.

4. Infrastructure resilience

Infrastructure disruptions can make an otherwise functional building unfit for use. A building's resilience is ultimately about how well it serves its occupants, and infrastructure and services are a key aspect of this. This is represented in our resilience goal that homes and buildings are served by resilient infrastructure.

5. National policy

Strong building regulation and governance structures are the most effective methods of reducing natural hazard risk in the built environment. Toka Tū Ake EQC sits in a unique position between government agencies and academic and scientific practitioners. This means we can help to develop effective evidence-based policy that builds resilience at a systemic level across Aotearoa New Zealand.

6. Practice – capability and capacity

Resilience must be built into daily decisions and choices for those involved in the built environment, whether as building owners or as technical designers. Resilience must be prioritised in construction and design, and practitioners must be capable of delivering a resilient outcome.

7. Public education

We will support this plan with a robust public education programme to make sure stakeholders in the building sector use it. Communicating with the public will be a key part of implementing this plan. This will involve telling people about the risks affecting them and, more importantly, what they can do to address them.

Scope

This action plan will drive resilience decisions in the built environment for existing buildings and future developments.

It will span central, regional, and local government, and the private sector. It aims to increase resilience for geological and weather-related natural hazards. These include earthquakes (active faults, shaking, and liquefaction), hydrothermal activity, landslide, tsunami, volcanic activity, flooding, and storms. Climate change is increasing the extent, frequency, and magnitude of natural hazards (e.g., increased intense precipitation is increasing landslides). We have included this worsening effect of climate change in the natural hazard risks within this plan.

In this action plan, 'risk reduction' is defined as it is in the *National Disaster Resilience Strategy*[8] : 'preventing new and reducing existing natural hazard risk, including managing residual risk.'

The performance of a building cannot realistically be separated from the ground below it. This means the consideration of resilient homes and buildings goes beyond structural engineering and building to geotechnical engineering and land improvement. However, it stops short of land use or land use planning, which is instead considered in the *Smarter Land Use Action Plan*.

This plan should be read in conjunction with:

- *National Disaster Resilience Strategy (2019)*
- *Toka Tū Ake EQC Resilience Strategy for Natural Hazard Risk Reduction 2019-2029*
- *Report of the Public Inquiry into EQC (2020)*
- *Toka Tū Ake EQC Statement of Intent*
- *Toka Tū Ake EQC Research Investment Priorities Statement*
- *Toka Tū Ake EQC EQC Statement of Performance Expectations*
- Toka Tū Ake EQC *Smarter Land Use Action Plan.*

Specific alignment between this action plan and the *EQC Resilience Strategy for Natural Hazard Risk Reduction* and *Report of the Public Inquiry into Toka Tū Ake EQC* can be found in Appendices 1 and 2, respectively.

Development of this action plan

This plan has been developed to support the first objective of the *EQC Resilience Strategy for Natural Hazard Risk Reduction 2019-2029: 'More resilient buildings and infrastructure reduces damage and impacts'*.

The plan also actions recommendations of the *2020 Report of the Public Inquiry into the Earthquake Commission*.

To make sure the action plan is useful, usable, and used, Toka Tū Ake EQC held workshops with internal and external stakeholders and refined the action plan through targeted reviews and feedback. This consultation substantially shaped the action plan, and we thank everyone involved for their time, enthusiasm, and detailed and insightful contributions.

Target audience and pathways

The built environment is a complex ecosystem with many contributors, users, and stakeholders.

This action plan relies on our strong relationships with these various groups. Below are some of the partners we expect to work with to make sure the actions and objectives in this plan are accepted and implemented.

8 MCDEM. (2019). National Disaster Resilience Strategy. Wellington (NZ). https://www.civildefence.govt.nz/assets/Uploads/publications/National-Disaster-Resilience-Strategy/National-Disaster-Resilience-Strategy-10-April-2019.pdf

Table 1. Expected Audience and Partners (adapted from EQC Resilience Strategy for Natural Hazard Risk Reduction 2019-2029).

Partners		Outcomes	How
Local government	Councils Building consent authorities	Integrated accessible hazard information Economic and social impact analysis Realistic scenarios Risk communication guidance Technical guidance for resilient design and land use planning Training and professional development	New formal partnerships Toka Tū Ake EQC Loss Modelling Capability Project Leverage existing partnerships (e.g., AF8, DEVORA, East Coast LAB, and It's Our Fault resilience programmes) Integrated hazard information project Mission-driven research *GeoNet* and other data sources
Central government and crown entities	MBIE NEMA Treasury HUD Kāinga Ora Te Waihanga Infrastructure Commission DIA LINZ Waka Kotahi Stats NZ	Hazard risk management policy advice Resilient building regulatory framework Central resilience resource Integrated accessible hazard information Economic and social impact analysis Realistic scenarios Technical guidance for resilient design and land-use planning Using and linking multiple large databases	New formal partnerships Toka Tū Ake EQC Loss Modelling Capability Project Integrated hazard information project Mission-driven research Mapping and sharing of open data sources
Professional and trade organisations	Engineering New Zealand Structural Engineering Society of New Zealand New Zealand Institute of Architects New Zealand Society of Earthquake Engineering New Zealand Geotechnical Society Master Builders	Technical guidance for resilient design Feedback and commentary on performance and direction of the built environment Training and professional development	Industry partnerships for guidance development Sector training and education
Research community	Te Hiranga Rū QuakeCoRE Resilience to Nature's Challenges BRANZ GNS Science NIWA	Ongoing research work	Forwarding the research investment of Toka Tū Ake EQC
Public and building owners		Public education Risk communication Incentivising resilience	Become empowered to make risk-informed decisions
Insurers and reinsurers		Incentivising resilience Better loss modelling Provide claim data sharing	

Objective 1: New homes and buildings are designed and built for resilience

Aotearoa New Zealand must change its approach to designing and constructing homes and buildings.

Natural hazard resilience has not historically been a driving factor in making decisions about the built environment. We have recently seen the consequences of this long-term under-investment. Codes, standards, and practice shaping the built environment have not led to appropriate outcomes. They also do not support a sustainable, resilient building stock that is fit for purpose.

This objective will lead to a built environment where those responsible for new development always acknowledge, consider, and address natural hazard risks. As a result, buildings will be designed to meet the expectations and needs of owners and occupiers, including during and immediately after natural hazard events, and as those needs change in the future. Construction practices make sure buildings function as they were designed to and involve stringent oversight to make sure buildings meet the required standard.

Activities

The following activities support this objective:

- Support improved functional recovery by implementing low-damage design.
- Build for resilience and climate change.
- Help drive best practice.

Support improved functional recovery by implementing low-damage design

Functional recovery describes a state of operation of the built environment following a natural hazard event in which the building or infrastructure system retains some basic amount of its intended function or operation after a natural hazard event. It is a 'higher' performance objective than what is commonly known as 'life safety', where buildings do not fatally collapse, but have significant levels of damage that are often unacceptable to society.

Low-damage design is an innovative building design approach that aims to raise building performance towards improved functional recovery. It has been developed to offer guidance on design methodologies that minimise both building damage and adverse effects on communities. The low-damage design guidance project (led by MBIE and Engineering New Zealand and expected to be published in the near future) will provide guidance for designers—as well as building owners, tenants, and users—to achieve low-damage outcomes in their structures.

Toka Tū Ake EQC will help to make sure the guidance documents and associated framework are implemented and maintained. Continuing professional development initiatives will be organised and offered for designers to help them understand and implement the low-damage design guidance. This will make designers fluent and competent in the guidance principles so they can use them in their daily work. It will also empower them to deliver technically appropriate solutions.

They will be able to have the right conversations with clients and building owners to achieve the outcomes they want. Additionally, public education must be offered to building owners, tenants, and users so they understand the value of low-damage, resilient structures, and market demand for these grows.

Build for resilience and climate change

There are opportunities to reduce the greenhouse gas emissions from the built environment which contribute to global climate change. The building sector is a significant contributor to carbon emissions worldwide, and it must do its part so national and global reduction targets can be reached. However, reducing what goes into a building cannot be prioritised over a building's performance and functions, especially in natural hazards. MBIE's Building for Climate Change Programme addresses this concern in its *Whole-of-Life Embodied Carbon Emissions Reduction Framework*[9], calling for '…as much material as required to meet performance requirements—and not more…'. This programme supports reducing carbon emissions while maintaining the importance of structural performance and allowing flexibility about the intended performance level or objective. Work such as the Resilient Buildings Project[10] also point to the co-benefits between increasing natural hazard resilience and decreased lifetime carbon emissions.

Resilient solutions are also sustainable. The combined benefits of resilience and sustainability should be recognised as important factors in construction and design. Buildings that are resilient to natural hazards are less likely to suffer avoidable damage and subsequently be demolished. That results in lower carbon emissions and makes our buildings last longer. Our homes and buildings become adaptable to environmental stresses, including through structural retrofit and strengthening, or upgrading of services and infrastructure.

Help drive best practice

Significant improvements have been made in design, construction, and ongoing maintenance of the built environment over the past two decades, and this trend must continue. Importantly, improvements in practice must keep up with the significant development and urban intensification in Aotearoa New Zealand. They must also go far enough to address past shortcomings in the built environment. Standards for building performance (especially during natural hazard events) must incorporate both technical expertise and public expectations.

9 MBIE. (2020). Whole-of-Life Embodied Carbon Emissions Reduction Framework. Wellington (NZ). https://www.mbie.govt.nz/dmsdocument/11794-whole-of-life-embodied-carbon-emissions-reduction-framework

10 The Resilient Buildings Project. (2022). Societal expectations for seismic performance of buildings. https://www.resorgs.org.nz/our-projects/risk-and-resilience-decision-making/nzsee-resilient-buildings-project/

Engineering and technical design standards need to be invested in and maintained to incorporate new information as it becomes available. Practitioners need to be able to provide feedback on whether standards or guidance are being implemented as intended. When new information shows that an accepted practice is not fit for purpose, there needs to be a clear way to correct this.

Milestones and intended outcomes

Annual milestones to achieve Objective 1 of the action plan are provided in Table 2 below.

Table 2. Milestones and intended outcomes for Objective 1: New homes and buildings are designed and built for resilience.

Year	Milestone	Intended outcomes
Year 1	Support MBIE in promoting the low-damage design guidelines Support building consent authorities in reviewing and consenting new low-damage design projects Support the Resilient Buildings Project Use Toka Tū Ake EQC experience to guide standards and practice Work closely with professional technical societies*	Low-damage design guidance is published Wider conversations on the intent and purpose of the building code are held Toka Tū Ake EQC makes use of its valuable data and experience
Year 2	Deliver professional development and public education seminars to help make sure low-damage design is used Investigate guidance on low carbon design for engineers Promote increased natural hazards resilience of infrastructure services as part of climate change adaptation* Develop and promote additional design solutions 'above code' Promote regular review and update of building regulations and standards	Design practitioners are confident and capable of producing more resilient, sustainable solutions Natural hazard resilience becomes a driving factor in design of the built environment
Years 3-5	Identify gaps in implementation of low-damage design through monitoring* Undertake cost-benefit analyses to demonstrate value and return of low-damage design	Make sure the built environment system can sustain low-damage design projects, from design to consenting to delivery Make sure low-damage design projects are fit for purpose and demonstrate a realistic and desirable option

* Indicates ongoing action

Objective 2: Existing buildings are assessed and managed so they are safe and resilient

Even if Aotearoa New Zealand can improve its new homes and buildings, it still must consider the variety of buildings we currently use.

It is not economical, practicable, nor environmentally responsible to demolish everything at once to start new with better practices. Instead, the existing building stock must be managed over time. There is a massive opportunity to reduce risk by improving Aotearoa New Zealand's existing building stock, and retrofitting would significantly improve the resilience of the built environment.

Effective retrofitting and strengthening strategies must be developed and implemented. Mandatory requirements and voluntary incentives should be used to make sure these strategies are made available, and that people use them. And importantly, building practice shortcomings—like misuse of hollowcore floors or the 'leaky homes' crisis—need to be found and mitigated before a natural hazard event reveals them.

Activities

The following activities support this objective:

- Promote effective strategies to retrofit and strengthen existing buildings.
- Build the evidence base for a residential risk reduction incentive scheme.
- Implement a residential risk reduction incentive scheme.
- Support investigation and research into 'unknown unknowns'.

Promote effective strategies to retrofit and strengthen existing buildings

Eighty percent of the buildings we will use in 2050 have already been built[11] . Because a high proportion of our building stock is built to older codes, there is a massive opportunity to address building risk by improving existing buildings alongside new building standards. Targeted policy and legislation are needed to encourage retrofitting or strengthening of vulnerable buildings. Structural vulnerabilities in buildings generally do not have to be fixed unless they fit within the earthquake-prone buildings legislation, which has a narrow and static scope. Broader policy that appropriately identifies and addresses risks in a timely manner must be implemented.

Strengthening and retrofits also need to focus on addressing the right aspects of a building. Reducing structural performance to a single number (% New Building Standard, %NBS) implies a more certain outcome than is appropriate. It also does not describe the nature of the potential failure. Different metrics should guide retrofitting strategies. Reducing existing building risks should

11 IET. (2020). Scaling up retrofit 2050. Nottingham (UK). https://www.theiet.org/media/8758/retrofit.pdf

be taken up at all 'levels' of the built environment system, not only by capable engineers and interested legislators. Engineering designers need technical guidance, but builders and homeowners also need similar resources with 'non-engineered,' accessible solutions that directly address known vulnerabilities.

Toka Tū Ake EQC will scope how it can directly subsidise risk reduction initiatives, especially for homeowners. Over time, as we gather building information and identify trends, Toka Tū Ake EQC will assess ways to support the mitigation of existing building risks. These will likely include simple solutions that strengthen buildings or make them safer, such as removing brick chimneys from timber framed homes, or ensuring homes are sufficiently secured to their foundations. In some cases, the cost to reduce the risk of an existing building may outweigh the benefits of those mitigation measures. Buyout or 'cap' settlement agreements may be more suitable in these situations. Our data and information capabilities at Toka Tū Ake EQC will play a significant role in this work. We will need to show evidence of specific improvements in resilience, on a large enough scale to justify a risk reduction incentive scheme. This will also likely be connected with our research initiatives. We will need to identify trends to determine which actions improve resilience, and especially which are the most cost-effective. This may also extend to policy, as Toka Tū Ake EQC determines how this work fits within its mandate and how to deliver (and fund) such a scheme.

Scope the implementation of a residential risk reduction incentive scheme

After completing an evidence basis for a residential risk reduction incentive scheme, Toka Tū Ake EQC will scope suitable ways to implement it. This will include working across the built environment, central and local government, insurers, and most importantly homeowners and residents. It will involve Toka Tū Ake EQC understanding any unintended consequences or perverse outcomes and developing a robust risk assessment.

Support investigation and research into 'unknown unknowns'

Unfortunately, it often takes a natural hazard event like an earthquake to truly test our built environment. After the 1855 Wairarapa earthquake caused significantly more damage to stone masonry buildings than to wooden structures, people around the Wellington region started building with timber instead. The 1931 Hawke's Bay earthquake caused so many deaths that Aotearoa New Zealand's first seismic design code was introduced. And throughout history, and the world, various events have revealed inadequacies in our material choices, construction methodologies, and site selection.

Toka Tū Ake EQC does, and will continue to, support researchers working to understand unknown fragilities in our built environment before natural hazard events reveal them. We can also commission targeted research to support the focus of this plan more directly.

Our work programme is already well established across structural and geotechnical engineering, as is our relationship with organisations like MBIE on core projects of national relevance (e.g., ongoing development of the NSHM Model). This valuable research must then be taken up in practice. Toka Tū Ake EQC can support this via continuing education with design practitioners.

Milestones and intended outcomes

Annual milestones to achieve Objective 2 of the action plan are provided in Table 3 below.

Table 3. Milestones and intended outcomes for Objective 2: Existing buildings are assessed and managed so they are safe an resilient.

Year	Milestone	Intended outcomes
Year 1	Produce a think piece on incentivising resilience Continue, directed research investment* Build a proposal, business case, and funding model	Clarify the scope for a residential risk reduction incentive scheme New or better ways to manage risk from existing vulnerable building types are investigated
Year 2	Develop accessible guides on retrofitting and strengthening for builders and homeowners, rather than just for engineers Support new research into retrofitting and strengthening solutions Determine most cost-effective risk reducing actions for scheme Investigate 'point of diminishing returns' for risk reduction Develop a monitoring and evaluation framework for a possible incentive scheme	Non-technical building stakeholders are empowered to take risk reduction actions Investment in risk reduction is targeted, thoughtful, and efficient Currently unrecognised vulnerabilities in our building stock are investigated, and solutions to address them are considered
Years 3-5	Demonstrate value and return on investment of retrofitting and strengthening Complete full assessment of policy implications	People view retrofitting and strengthening as adding value and benefit, rather than cost Implementing a residential risk reduction incentive scheme does not aggravate existing inequities or create new ones

* Indicates ongoing action

Objective 3: Aotearoa New Zealand's built environment system is enduring and fit for purpose

The previous two objectives directly address the resilience of Aotearoa New Zealand's homes and buildings.

But the 'ecosystem' of Aotearoa New Zealand's built environment has enabled the systemic stresses and challenges that must now be addressed. The current combination of building regulation, resources, systems, and underlying scientific bases can hold back positive change, and even encourage unsustainable development. The building sector also faces pressure from new challenges such as the climate emergency, an affordable housing crisis, unclear regulation, and retaining skilled staff.

A healthy, thriving building system—encompassing regulation, administration, design, practice and implementation, and use—will naturally lead to better outcomes for all involved. In an industry that evolves very slowly, several policy areas and the underlying scientific evidence bases need updates and revisions. Resources and tools that standardise approach and information across sectors and stakeholders are needed. And importantly, the system must be supported to change and improve continuously. Otherwise, it remains stagnant until systemic pressures build up, causing sudden and disruptive changes.

Activities

The following activities support this objective:

- Actively collate and share lessons learnt.
- Support the ongoing development and integration of national hazard models.
- Support engineering science.
- Lead the development of a national Risk and Resilience Portal.
- Collect and curate building information.
- Actively contribute to national policy development.
- Support improvements to the building regulatory system.

Actively collate and share lessons learnt

To lead innovation, it is important to recognise when the status quo is no longer acceptable. Many of the lessons learnt in the built environment have come from natural hazard events highlighting past shortcomings. These must be recognised and acknowledged, and then changes must be made to make sure the same mistake is not repeated.

Toka Tū Ake EQC actively supports research on vulnerabilities of existing building systems and potential hazards not currently considered in design. We will continue to invest in broadening our collective understanding of building performance and behaviour. However, to bring

about change, we must also use new knowledge coming from these valuable research efforts. Toka Tū Ake EQC will use its unique relationships with researchers, government agencies, insurers, and policymakers to put new lessons into practice and policy. Practitioners and researchers must normalise sharing lessons learnt as part of working together.

Support the ongoing development and integration of national hazard models

Many areas of Aotearoa New Zealand are exposed to significant natural hazards. Quantifying these hazards allows society to consider their impacts and begin to address them. The best developed such model is the NSHM Model , which provides the scientific basis for earthquake engineering and seismic loading provisions in Aotearoa New Zealand's building code system. It was first developed in 1998, then updated in 2002 and again marginally in 2010. As of 2021, it is being updated again for release in 2022. There is already widespread speculation about its expected implications for structural engineering design, building assessments, and construction costs. This is despite none of the revised model being released yet.

The NSHM, and other national hazard models currently under development, such as for tsunami and volcanic hazards, require ongoing investment and regular revision and implementation. Legislative mandates on time frames for such broadly significant pieces of work to be regularly revised, updated, and implemented by would be significant in maintaining fit-for-purpose systems. A regular cycle of revision and update would improve quality in the design and construction sector. Practitioners could feel confident that their work consistently represented the best scientific evidence basis available. This would also avoid significant differences between the resilience of buildings from different eras, built to different codes or standards.

Support engineering science

Aotearoa New Zealand has a decorated history of innovation in response to its significant seismic hazard. Lead rubber bearings allow over USD$100 billion worth of buildings around the world (including Te Papa Tongarewa in Wellington) to float above the shifting ground below. They were first developed in Aotearoa New Zealand in 1974 by Dr Bill Robinson. In the 1990s, prolific Aotearoa New Zealand structural engineer Nigel Priestley pioneered Precast Seismic Structural Systems (PRESSS), which involve precast concrete components pulled back to their original positions by high-strength steel cables. PRESSS also prompted the development of Pres-Lam at the University of Canterbury in the 2000s, which combines PRESSS's realigning concepts with the environmental advantages of timber over concrete. Even Aotearoa New Zealand's current building code, first set out in 1992, was one of the first in the world to adopt a performance-based approach, rather than a prescriptive one.

This rich history must be respected by leading future innovation. Buildings, land, infrastructure, as well as their interactions, must continue to be explored and understood. That understanding must then be carried through to use and implementation in building codes, regulation, consenting systems, and technical design guidance. Investment and support should be targeted in ways that will build Aotearoa New Zealand's natural hazard resilience.

Lead the development of a national Risk and Resilience Portal

One of our medium- and long-term resilience goals is developing a Risk and Resilience Portal. The Portal's primary function is a public information and education tool. It will be public-facing, self-service source of natural hazard risk and risk management information. It will offer a comprehensive view of Aotearoa New Zealand's risk, at an individual, community, local, regional, and national level. We will complete this work by using the data, information, and risk modelling capability Toka Tū Ake EQC owns or funds.

Over time, it will be a cornerstone for addressing some of the issues Aotearoa New Zealand faces when translating, sharing, promoting, and using hazard risk information. We know clear and transparent sharing of risk information leads to better understanding of risks and more risk-based decision-making, including early risk reduction interventions.

Collect and curate building information

Significant thought and effort go into how new buildings should be designed and built. But once it is built, a building is often ignored based on the assumption it is 'safe'. This misrepresents the ongoing risk it can pose to society. There is currently no centralised source of information on Aotearoa New Zealand's vast existing building stock that represents the current state of buildings and their structural condition. Incomplete collections of this information exist in varying states and locations around the country, some with public and others with private entities.

There are many opportunities to begin capturing this information as building work takes place and consent applications come through building consent authorities (BCAs). But in its current splintered state, any existing information on buildings is not being used effectively. It must be consolidated into a central resource for consistent use and maintenance. Existing information must first be included, and then systems and processes for incorporating future information as it comes in must be established. These sources will tell us more about Aotearoa New Zealand's building stock over time. Trends and lessons will emerge that can improve risk reduction efforts in the built environment. This work will feed into the national Risk and Resilience Portal resource mentioned previously. Building information, and how it changes over time, is a key factor in assessing natural hazard risk. The concept and precedent for this work draws from the success of the *New Zealand Geotechnical Database*, which has provided significant benefit to Aotearoa New Zealand through sharing of information and resources.

Actively contribute to national policy development

Toka Tū Ake EQC recognises that risk extends beyond natural hazards affecting residential homes or buildings and is one of many entities working to improve Aotearoa New Zealand for all. It may seem that we can directly and quickly improve the resilience of the built environment in some ways. However, Toka Tū Ake EQC acknowledges the importance of balancing needs between central government agencies, varying public and private interests, and cultural sensitivity.

Toka Tū Ake EQC will champion for our resilience vision in national policy to move Aotearoa New Zealand towards a safer future. There are significant opportunities to improve how Aotearoa New Zealand's legislation addresses natural hazard risk. This is especially true as the *Resource Management Act 1991* is revised and replaced, and a national conversation continues about the nature of the *Building Code* and *Building Act 2004.* Efforts to reduce Aotearoa New Zealand's impacts from global climate change will undoubtedly target the built environment, a sector frequently blamed for high contributions to emissions. However, Toka Tū Ake EQC will make sure that lowering immediate emissions does not come at the expense of lasting resilience.

Support improvements to the building regulatory system

In the decade since the Canterbury Earthquake Sequence, there has been significant debate about whether Aotearoa New Zealand's building regulatory system is fit for purpose. Design practitioners, central government agencies, and the public have asked for varying changes. There has also been resistance to change, or at least to the extent and focus of the change, at various levels.

Toka Tū Ake EQC agrees that the past decade of natural hazard events, and the response across the built environment, has demonstrated that change is necessary. We will support the development of a better regulatory system through:

- supporting research into building performance;
- consultations on stakeholder opinions and expectations;
- regular hazard modelling updates; and
- facilitating agreement on the intent and implementation of the *Building Code* and supporting policy.

Supporting legislation should be clarified where possible to help streamline processes, but in a thoughtful and resilient manner. This includes around building performance and assessment of existing buildings. Additionally, legislation should be written in a way that anticipates and actively accommodates regular updates of underlying building standards and hazard modelling.

Milestones and intended outcomes

Annual milestones to achieve objective 3 of the action plan are provided in Table 4 below.

Table 4. Milestones and intended outcomes for objective 3: Aotearoa New Zealand's built environment system is enduring and fit for purpose.

Year	Milestone	Intended outcomes
Year 1	Support update of the NSHM Investigate trends and lessons from Toka Tū Ake EQC's past data and experience Continue directed investment in research* Engage closely with professional technical societies* Create role at Toka Tū Ake EQC to lead development of the national *Risk and Resilience Portal* Make historic EQCover claims information open to the public Investigate risk tolerance and thresholds to develop a comprehensive framework Actively submit on plans, policy, etc Determine datasets critical to the performance of the built environment (such as the *NZ Geotechnical Database* and *NZ Landslides Database*) and ensure their longevity Support the establishment of a built environment governance leadership panel	The professional use and understanding of seismicity are up to date and fit for purpose Toka Tū Ake EQC information and experience is useful, and people use it Valuable scientific research continues to guide our decisions Parallel initiatives are coordinated Historical EQCover claims information empowers homeowners to make informed decisions Natural hazard resilience is prioritised Resilience data is publicly available and used across the building system Roles and responsibilities in the 'built environment system' are clarified and agreed upon
Year 2	Create a central resource of past lessons and experience Create and maintain a *National Building Register** Engage with local governments to capture and incorporate building information as it is 'created'* Provide a robust evidence base to guide built environment regulation	Sharing of knowledge and experience is commonplace, and benefits all A National Building Register allows for clearer and better-informed consideration of buildings Sustainable systems are established for the ongoing addition to and maintenance of the National Building Register
Years 3-5	Publish a series of collective lessons learnt and evolving understanding* Support the incorporation of the new NSHM into standards and regulation Invest in ongoing curation of a *National Building Register** Establish ongoing, regular updates of the NSHM Promote more frequent and regular reviews and updates of standards and regulations	Underlying evidence bases are reviewed and updated regularly, frequently, and continually

* Indicates ongoing action

Delivery of action plan activities

Delivery of the action plan is summarised in Table 5.

Some actions will be achieved in partnership, or through collaboration, with organisations external to Toka Tū Ake EQC. We will monitor the progress of the action plan against achieving these actions. We may evaluate progress both externally and internally. The results of any evaluation will directly guide next actions, to make sure the plan remains useful and useable, and that people use it.

Table 5. Milestones for the Resilient Homes and Buildings Action Plan objectives.

Actions		Key Partners
Objective 1: New homes and buildings are designed and built for resilience.		
1	**Support improved functional recovery by implementing low-damage design**	
	Support MBIE in promoting the guidelines	MBIE
	Deliver seminars encourage technical professionals to use the guidelines	ENZ, Technical Societies
	Support local government in reviewing and consenting new low-damage design projects	ENZ, LGNZ
	Monitor to identify gaps in approach and implementation	Research community
	Carry out cost benefit analyses to 'prove' worth of concept	Research community
2	**Build for resilience and climate change**	
	Produce low-carbon design guidance for engineers	ENZ, MfE, Technical Societies

Table 5. Milestones for the Resilient Homes and Buildings Action Plan objectives (cont)

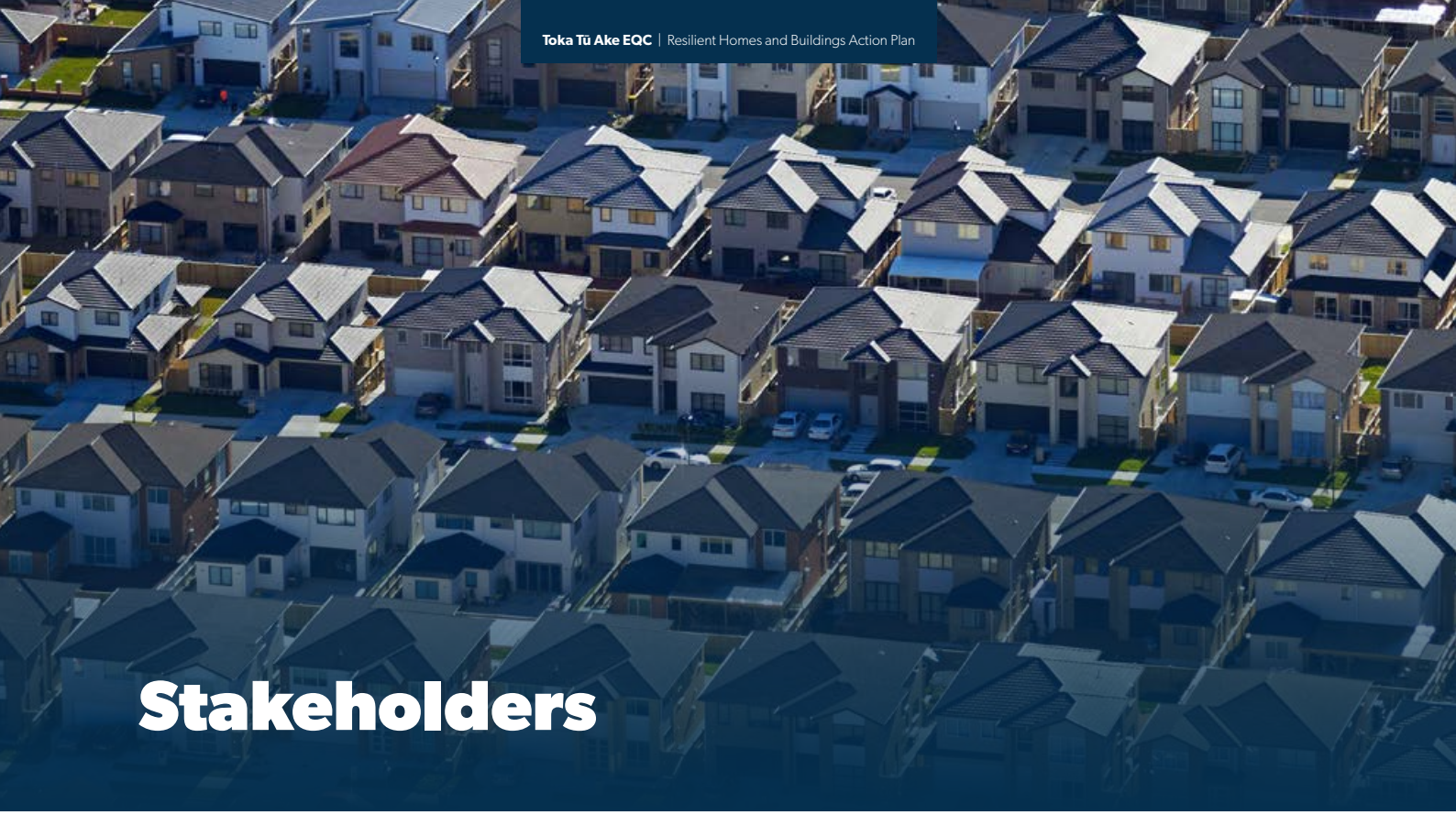
	Actions	Key Partners
2	Demonstrate carbon benefit of natural hazard resilience through life cycle assessments	Research community
	Promote increased natural hazards resilience of infrastructure services as part of climate change adaptation	
3	**Help drive best practice**	
	Support the Resilient Buildings Project	Resilient Buildings Project
	Produce guidelines for building 'above code'	ENZ, Technical Societies, MBIE
	Develop and promote alternative design strategies	ENZ, Technical Societies, MBIE
	Promote regular review and update of building regulation/standards	
	Use Toka Tū Ake EQC experience to inform standards and practice	
	Engage closely with professional technical societies	
	Objective 2: Existing buildings are assessed and managed, so they are safe and resilient	
1	**Promote effective strategies to retrofit and strengthen existing buildings**	
	Develop basic guides to retrofitting or strengthening without building consents or an engineer	ENZ, Technical Societies, MBIE
	Promote opportunities for tradespeople or homeowners (not just engineers) to retrofit and strengthen buildings	
	Develop engineering assessment guidelines for vulnerability-driven assessment, rather than %NBS	ENZ, Technical Societies, MBIE
	Support new research into retrofitting and strengthening solutions	Research community
	Demonstrate the value/return on investment of strengthening	Research community
2	**Build the evidence base for a residential risk reduction incentive scheme**	
	Produce a think piece on incentivising resilience	
	Determine cost-effective actions for risk reduction (that the incentive funds may be put towards)	
	Investigate the 'point of diminishing returns' after which more funding does not increase risk reduction	Research community
	Develop a monitoring and evaluation framework for a possible incentive scheme	

Table 5. Milestones for the Resilient Homes and Buildings Action Plan objectives (cont)

Actions		Key Partners
3	**Scope the implementation of a residential risk reduction incentive scheme**	
	Build evidence base	
	Develop a roadmap for possible delivery and implementation	
	Build a proposal, business case and funding model	
	Complete full assessment of policy implications	
4	**Support investigation and research into 'unknown unknowns'**	
	Continue directed investment into research	Research community
Objective 3: Aotearoa New Zealand's built environment system is enduring and fit for purpose		
1	**Actively collate and share lessons learnt**	
	Create a central library or resource of lessons	
	Publish a series on lessons learnt	ENZ, Technical societies
	Investigate residential building seismic fragility	Tonkin + Taylor
2	**Support the ongoing development and integration of national hazard models**	
	Support and fund the NSHM update	GNS Science, MBIE
	Support new standards to incorporate new model(s)	
	Look ahead to establish ongoing, regular updates	MBIE
3	**Support engineering science**	
	Continue directed investment into research	Research community
	Engage closely with professional technical societies	
4	**Lead the development of a national Risk and Resilience Portal**	
	Toka Tū Ake EQC to lead development	
	Refine and further develop existing datasets to create a *National Building Register*	LGNZ, MBIE, LINZ, Stats NZ
	Investigate a framework for risk thresholds and tolerances	MfE
	Make historical EQCover claims data available to the public	

Table 5. Milestones for the Resilient Homes and Buildings Action Plan objectives (cont)

Actions		Key Partners
5	**Collect and curate building information**	
	Refine and further develop existing datasets to create a *National Building Register*	LGNZ, MBIE, LINZ, Stats NZ
	Engage with local government (BCAs) to capture building information as it comes in for consenting	LGNZ, MBIE, LINZ, Stats NZ
6	**Actively contribute to national policy development**	
	Provide robust evidence base to guide built environment regulation	
	Actively submit on plans, policy, etc	
	Support more explicit consideration of existing buildings, up to/including a national Existing Building Code	
7	**Support improvements to the building regulatory system**	
	Promote more regular and frequent review and update of policy, regulation, and standards	
	Support the establishment of a built environment governance leadership panel	
	Support more explicit consideration of different buildings, situations, and compliance pathways	
	Consider feedback and be able to reflect (and improve) as a sector	



Stakeholders

Achieving the goal of this action plan will rely on the commitment, collaboration, and coordination of built environment stakeholders.

Toka Tū Ake EQC will work with the following stakeholders to make sure this plan is implemented.

Stakeholders have been classified as primary and secondary. Primary stakeholders will be directly involved in activities. Secondary stakeholders can support activities and will be kept informed of ongoing progress.

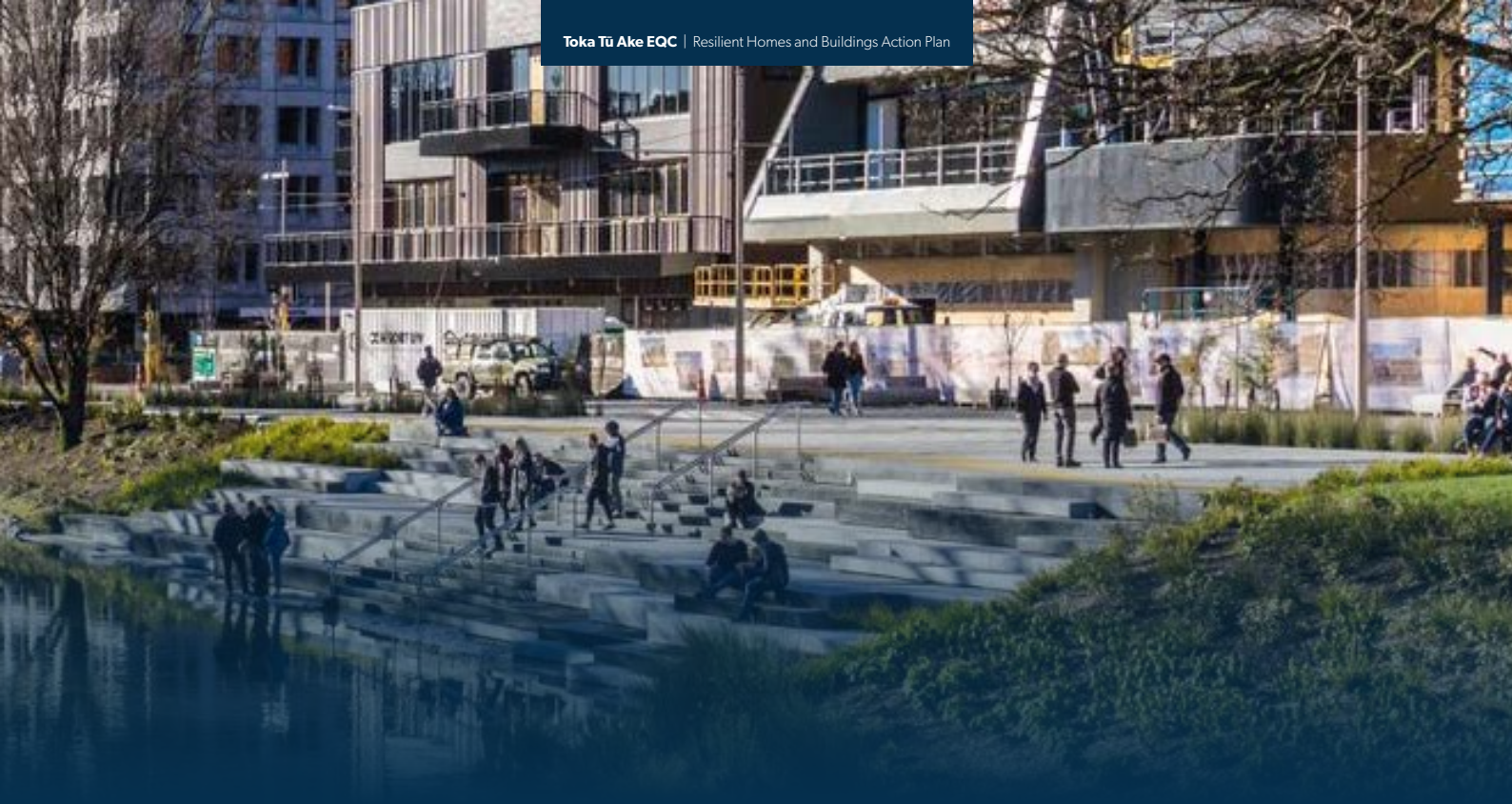
Table 6. Primary and secondary stakeholders for this action plan.

Category		Primary Stakeholders	Secondary Stakeholders
Māori interests are considered and enabled at every opportunity	Local government	Building consent authorities	
	Central government	MBIE Te Waihanga	DIA HUD Kāinga Ora LINZ NEMA Waka Kotahi
	Professional organisations	Engineering New Zealand Master Builders NZGS NZIA NZSEE SESOC	BRANZ GNS Science NIWA Research community

Risks to successful Action Plan implementation

Table 7. Barriers and risks to implementation.

Risk	Mitigation
The system does not change despite concerted efforts by Toka Tū Ake EQC to deliver this action plan	Be targeted and deliberate in promoting the actions outlined in this plan. Work with organisations and stakeholders to create acceptance and co-ownership
Tāngata whenua, and Māori in general, are not empowered in the development and implementation of this action plan	Deliberately and explicitly ask for collaboration and involvement from Māori, early and often
The reputation of Toka Tū Ake EQC, either among the public or between other organisations, prevents widescale acceptance and participation	Be strategic when dealing directly with the public. Partner with other organisations where possible. Nurture and leverage professional networks to involve other organisations
A significant event (e.g., natural hazard event) shifts organisational, public, and political will and priorities away from the delivery of this action plan, towards response and recovery	Shift priorities as possible, noting that building resilience is a long-term activity, as important as responding to individual events. Natural hazard events may actually increase public and political openness to the principles in this action plan and so speed up implementation
COVID-19 safeguards hinder the effective collaboration and delivery of this action plan	Work around obstacles as appropriate. Plan for delays or contingencies in delivering and implementing this plan. Make sure work can be delivered virtually or remotely
A change of government, either in majority party or new ministers, at best pauses delivery during the changeover, and at worst stops it completely	As this plan starts to be implemented, track work completed and benefits to demonstrate positive effects and outcomes



Appendix 1: Alignment of Action Plan with EQC Resilience Strategy 2019-2029

EQC Resilience Strategy for Natural Hazard Risk Reduction 2019-2029	Action Plan Contribution
Toka Tū Ake EQC's resilience vision for New Zealand Homeowners are risk-aware and understand the choices they can make about the types of buildings and locations that are more resilient to natural hazards Engineers, architects, developers and builders understand the value of incorporating damage-limiting design in buildings and other infrastructure, which means the building stock becomes more resilient with time Councils actively consider natural hazards in their short-term and long-term planning and understand the trade-offs that need to be made between investment in disaster risk reduction (such as avoiding the worst land, retrofitting buildings and upgrading buried pipes) and other opportunities for community wellbeing investments	**Objective 1:** Deliver seminars to encourage technical professionals to use low-damage design. Support local governments in reviewing and consenting new low-damage design projects. Support the Resilient Buildings Project **Objective 2:** Develop basic guides for retrofitting and strengthening done without building consents or an engineer. Scope the implementation of a residential risk reduction incentive scheme **Objective 3:** Lead the development of a national *Risk and Resilience Portal*. Collect and curate building information
Resilience goal More resilient buildings and infrastructure reduces damage and impacts	The entire action plan supports this goal
What we will do Toka Tū Ake EQC's role is to facilitate the translation and integration of information and knowledge, create the tools to understand and estimate natural hazard impacts, and to quantify the return on investment from enhanced resilience	**Objective 1:** Carry out cost-benefit analyses to prove the worth of low-damage design concept. Help drive best practice **Objective 2:** Demonstrate the return of investment of strengthening buildings. Support investigation and research into 'unknown unknowns' **Objective 3:** Actively collate and share lessons learnt. Lead the development of a national *Risk and Resilience Portal*. Actively contribute to national policy development

EQC Resilience Strategy for Natural Hazard Risk Reduction 2019-2029	Action Plan Contribution
Priorities over the next three years A renewed focus on the strategic value of data and information Accelerating the synthesis and translation of research outputs Developing reciprocal partnerships	**Objective 1:** Help drive best practice. Use Toka Tū Ake EQC's experience to inform standards and practice. Work closely with technical societies **Objective 2:** Support investigation and research into 'unknown unknowns' **Objective 3:** Support the ongoing development and integration of national hazard models. Lead the development of a national *Risk and Resilience Portal*
Vision Mātauranga Toka Tū Ake EQC is committed to the policy themes and outcomes of Vision Mātauranga, the New Zealand government science policy framework that seeks to unlock the innovation potential of Māori knowledge, people, and resources	Māori interests are considered and enabled at every opportunity

Appendix 2: Alignment of Action Plan with EQC Public Inquiry Recommendations

Public Inquiry		Action Plan Contribution
1.6.1	**The Government should:** Identify changes to provisions in relevant legislation that will require…future resilience of housing following repairs after a natural hazard event	**Key Theme** of National Policy supports this **Objective 3:** Actively contribute to national policy development
1.6.2	**The Government should:** Consider a provision in legislation that allows EQC to work with the homeowner to enable necessary structural but non-natural hazard repairs to be dealt with at the same time as natural hazard repairs (at the homeowner's cost)	**Objective 2:** Build the evidence base for a residential risk reduction incentive scheme. The implementation of a residential risk reduction incentive scheme
3.1.8	**EQC should:** Work with relevant agencies and experts on engineering solutions for housing and land (both area-wide and for individual properties), including determining the need to retire land from residential use and provide monitoring to ensure that these solutions are applied appropriately	**Objective 1:** Support improved functional recovery through the implementation of low-damage design. Help drive best practice **Objective 2:** Promote effective strategies to retrofit and strengthen existing buildings; support investigation and research into 'unknown unknowns' **Objective 3:** Support engineering science
6.1.3	**EQC should:** Develop and roll out a nationwide online register that provides EQC information on claims specific to individual residential properties. This should be free and simple to access for users such as prospective home buyers and should provide basic information about a claim and its status	**Objective 3:** Lead the development of a national *Risk and Resilience Portal*. Collect and curate building information

Public Inquiry		Action Plan Contribution
6.4.1	**The Government should:** Consider changes to relevant legislation to enable greater availability and use of information about land and its stability to inform land-use decision making and current and prospective property owners through appropriate public information sources	**Key Theme** of Stronger Land supports this **Objective 3:** Lead the development of a national *Risk and Resilience Portal*. Collect and curate building information
6.4.3	**EQC should:** Proactively share up-to-date local area information about land and hazards with relevant authorities	**Objective 3:** Lead the development of a national *Risk and Resilience Portal.* Collect and curate building information
7.2.1	**EQC should:** Ensure that the range of research it sponsors encompasses new opportunities in relevant fields and includes natural hazard events other than earthquakes	**Objective 2:** Support investigation and research into 'unknown unknowns' **Objective 3:** Support the ongoing development and integration of national hazard models
7.2.2	**EQC should:** Support social science research that will help it build a greater understanding of the impacts on communities following a major natural hazard event	**Objective 1:** Help drive best practice **Objective 2:** Build the evidence base for a residential risk reduction incentive scheme
7.2.3	**EQC should:** Cooperate with the research community in New Zealand and internationally to disseminate as widely as possible the research findings in all fields it supports	**Objective 1:** Help drive best practice **Objective 2:** Support investigation and research into 'unknown unknowns' **Objective 3:** Actively collate and share lessons learnt. Support engineering science

Te Kāwanatanga o Aotearoa
New Zealand Government

Toka Tū Ake EQC

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