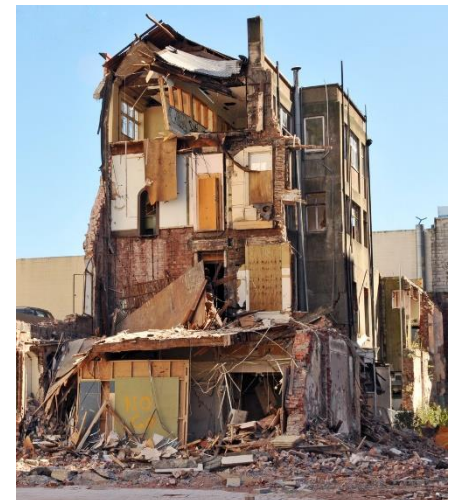


Natural Hazards Research Platform



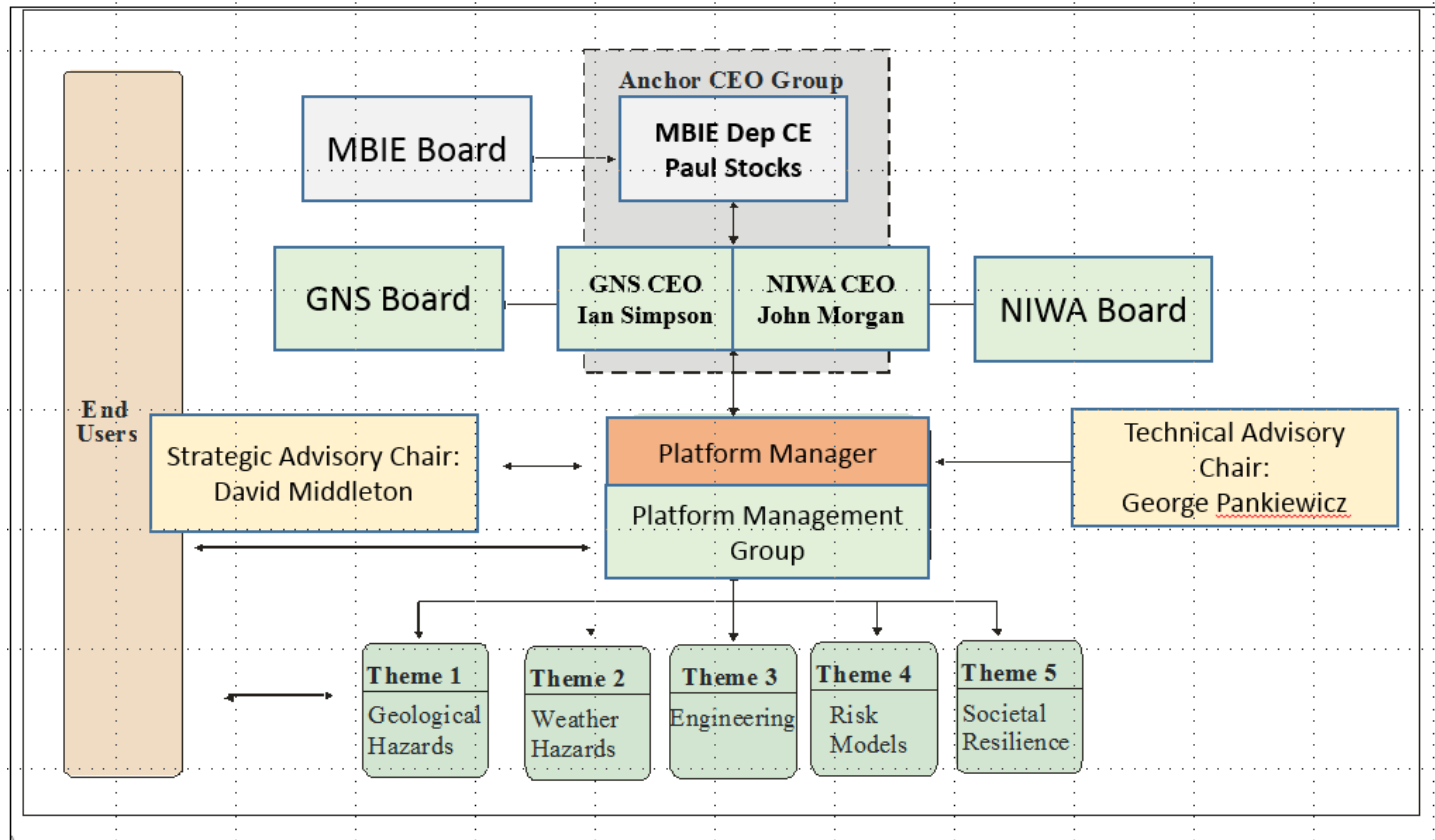
- Established by Government in 2009 (FRST).
- Developed to increase NZ's resilience to natural hazards via high quality collaborative research.
- Funded longer term; Partner-led research; Contestable funding round every two years
- **6 Partners** – GNS Science, NIWA, UoA, UoC, Massey, Opus Research
- **5 Natural Hazard Themes:**
 - **GEOLOGICAL** - earthquake, volcanic, landslide & rockfall, tsunami
 - **WEATHER** - weather, flood & coastal hazards
 - **RISK** - regional & national risk evaluation models
 - **ENGINEERING** - resilient buildings & infrastructure
 - **SOCIETAL** - societal resilience

Forerunner to the current National Science Challenges
www.naturalhazards.org.nz



Structure

Governance, Advisory, Management



- **Platform Management Group (PMG)** – Senior managers not directly involved in the research; all parties to the Platform represented.
- **Theme Leaders** – Active researchers within the theme; provide advice, coordination and key linkages.
- **Strategic Advisory Group (SAG)** – NZ representatives from end-user sectors; provide advice and support.
- **Technical Advisory Group (TAG)** – international scientists who provide external advice on the research programme.

Partners

- Natural Hazards Research Platform (NHRP)
- Resilience to Natures Challenges (RNC)



	NHRP	RNC
Partners	6	11
	GNS	GNS
	NIWA	NIWA
	UOA	UOA
	UOC	UOC
	Massey	Massey
	OPUS	OPUS
		Otago
		Lincoln
		Scion
		BRANZ
		VUW



Dislodged boulders at Red Cliffs following Christchurch EQ 2011 Photo: GNS Science



Highlights of the past 10 years

- Initiatives



- **Port Hills, Christchurch (slope stability risk assessments)**
 - People & communities are safer because of the Port Hills red zone – example of science helping to inform policy.
- **Tsunami blue lines**
 - Adopted in Oregon; tsunami vertical evacuation structures built in Washington State – developments directly influenced by NZ research collaboration.
- **2012/13 release of National Tsunami Hazard Model**
 - Included for the first time all coasts of NZ.
- **Low damage bridge design**
 - Implementation of first low damage bridge in Christchurch.
- **Unreinforced Masonry (URM)**
 - Increased knowledge helped inform earthquake prone building policy.
- **RiskScape**
 - Contributed to the NIWA report to the PCE: “Preparing NZ for Rising Seas” - includes advice to councils and advice on fiscal risks of sea level rise.
- **Risk included in the Resource Management Act**
 - *Section 6(h) - The management of significant risks from natural hazards.* This principle was added to the Resource Management Act in 2017.

Major events of the past 10 years



2009	Fiordland earthquake Storms & tornadoes
2010	Darfield earthquake Floods & storms
2011	Christchurch earthquake & aftershocks Port Hills rockfall Floods & tornadoes
2012	Mt Tongariro volcanic eruption Auckland tornado
2013	Cook Strait – Lake Grassmere earthquake White Island volcanic unrest Floods & storms
2014	Dart River Landslide Christchurch flooding Floods & storms, ex tropical cyclone Lusi
2015	Floods & storms: ex tropical cyclone Pam
2016	Kaikoura earthquake Floods, wind damage
2017	Port Hills fire Edgecumbe floods Severe weather ex tropical cyclones Cook & Debbie
2018	Severe weather ex tropical cyclones Gita & Fehi Tornadoes, flood
2019	Nelson fires



Tongariro eruption. Photo: GNS Science



Canterbury Earthquakes

- Short-term research response informed by stakeholder needs
- Longer-term programme of research

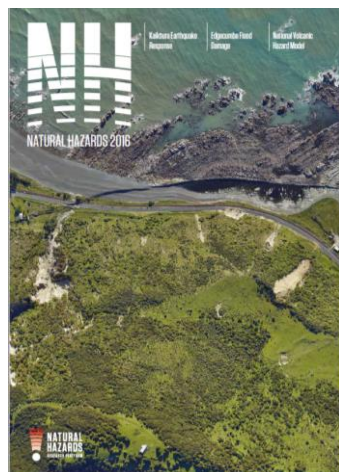


Kelvin Berryman and Hannah Brackley in the Emergency Operations Centre Christchurch Art Gallery



Christchurch flooding post 2011 EQ. Photo: Univ of Canterbury

KAIKŌURA EARTHQUAKE RESPONSE



Geotechnical characterization of CentrePort reclamations

Misko Cubrinovski, University of Canterbury, University of Auckland, Tonkin & Taylor, USA universities

- CentrePort is a key Import/Export hub; performance of ports vital to an economy.
- The research team is contributing to assessment of liquefaction of reclaimed land and performance of land, wharves and buildings.
- Findings will be relevant to other areas of reclaimed land.

Improving economic model estimates of central government productivity losses

Erica Seville, Resilient Organisations, Market Economics, GNS Science

- Evaluate economic impact of business relocation due to building damage
- The MERIT software tool will be utilised in the data analysis and recalibration of the productivity functions.

Updated NZS 1170.5 subsoil site class and site period maps for the Wellington CBD

Anna Kaiser, GNS Science & University of Auckland

- Sub-surface geology influences how a building responds to earthquake ground shaking, and determines the subsoil site class.
- Five site classes have been defined in NZ standard 1170.5, these range from 'strong rock' to 'very soft soils'.
- The team will create updated, open-access maps for subsoil site class and site period for Wellington CBD, including areas where there is scant data.
- These outputs will be vital for engineering design, re-building, and new buildings, and important for the long-term economic outlooks for Wellington.

Post-seismic deformation following the Kāikōura Earthquake

Sigrun Hreinsdóttir, GNS Science

- Land deformation continues after seismic events and is an important dataset to capture
- Data from GPS stations – both permanent and temporary following the Kāikōura earthquake – will contribute to understanding of:
 - how stress is transferred in the Earth's crust
 - the likelihood of another earthquake and
 - future of seismic risk in the affected region.

Assessment and repair of existing concrete buildings in Wellington with precast floors

Ken Ehuod, University of Auckland, University of Canterbury, CompuSoft Engineering

- The Kāikōura earthquake resulted in extensive damage to concrete multi-storey buildings with precast floor systems, and was a key factor that led to widespread building inspections in the Wellington CBD and elsewhere
- Research engineers are working with practitioners to access damage data and provide advice across the sector
- Working closely with MBIE Building & Housing System Performance group and informs National Recovery.

Inventories of onshore surface ruptures and coastal uplift

Nicola Litchfield, GNS Science, University of Canterbury, University of Auckland, Victoria University, University of Otago

- The Kāikōura earthquake was unprecedented in having multiple onshore surface fault ruptures (at least 21) and extensive coastal uplift affecting more than 110 kilometres of coastline
- The research will document permanent ground deformation, inform future seismic hazard and risk scenarios, and land-use planning.

Landslide inventory and landslide dam assessments

Chris Massey, GNS Science, University of Canterbury, Massey University and NIWA

- More than 10,000 landslides with an area greater than 100m²
- Four high risk dams continue to be monitored
- The data will provide a key landslide inventory showing location, size and type of landslide
- Undertake landslide dam surveys and assessments, modelling and monitoring
- Providing advice to National Recovery authorities on ongoing hazards.

Phil Barnes diverted NIWA's RV Tangaroa to survey the seabed. Barnes and team identified turbidity currents suggestive of undersea landslides triggered by the earthquake. RV Tangaroa is suited for deeper water surveys; the RV Ikarewa was deployed to obtain data closer to shore (See Mountjoy).

Including Kāikōura-triggered slow slip earthquakes (SSE) into earthquake forecasts and seismic hazard estimates

Matt Gerstenberger, GNS Science

- Three SSE were triggered by the Kāikōura earthquake
- SSE events increase the potential for large earthquakes in central New Zealand
- This research will provide improved probabilistic estimates for the occurrence of large earthquakes, and will be immediately included in aftershock forecasts provided by GNS Science & GeoNet
- Research contributes to improved national hazard and risk assessments.

Understanding land damage at Mt Lyford to inform Hurunui District Council recovery

Robert Langridge, GNS Science, ECAN, Hurunui DC, EQC

- Evaluate extensive damage to land and properties
- Provide updated advice on seismic hazard for the region
- The research is contributing to National Recovery aims.

Aerial reconnaissance of Kāikōura landslides

Thanks



- NHRP Managers
 - Kelvin Berryman
 - Hannah Brackley
 - Catherine Pinal
- Strategic Advisory Group
 - David Middleton, Chair
- Technical Advisory Group
- Researchers
- End-Users
- Funders
- Resilience to Nature's Challenges

