

# NHRP

## Natural Hazards Research Platform

*A multi-party research platform funded by MSI that is dedicated to increasing New Zealand's resilience to Natural Hazards via high quality collaborative research*



Infrastructure Theme Leader  
November 2012

Facilitate cooperation, collaboration and co-ordination between researchers  
Increased linkage of research with practitioners

# NHRP Recovery Project

NHRP Recovery Project	Project Team	End-Users
<b>Earthquake and Land Stability</b>		
CHCH subsurface structure (RC)	GNS, UOC, University of Calgary	MCDEM, CERA, ECAN, EQC, CCC,
Offshore faults (RC)	NIWA, University of Otago	CERA, EQC, GNS, ECAN, CCC
Earthquake likelihood & seismic coefficients (RC)	GNS, VUW	MCDEM, CERA, CCC, Tonkin & Taylor, EQC, DBH
Port Hills Rehab & Landuse Planning	GNS, UOC, UOA, Consultants	CCC, ECAN, CERA
Liquefaction impacts on pipe networks (RC)	UOC, UOA, GNS, Geotech Consulting	CCC, CERA, CELG
Greenfields Landuse (RC)	GNS	ECAN
<b>Built Environment &amp; Infrastructure</b>		
CBD foundation damage (RC)	UOC, UOA, Consultants	CCC, EQC
Engineering issues for rebuilding (RC)	GNS, UOC, BRANZ, UOA	CCC, CERA, EQC, Insurers
Performance of fire protection systems	UOC, GNS, Fire Protection Assoc., DBH	NZ Fire Service, Fire Protection Assoc, DBH
Bridge Performance	UOC, UOA	NZ Transport Agency, CCC
Pallet racking systems	GNS, UOC, UOA, Branz, Compusoft Eng	DBH, Branz, Industrial Manufacturers (Dexion)
Lifelines, hospital services, and housing	UOC, GNS, Massey, CCC, Univ Illinois,	ECAN, CELG, Lifelines Utilities, Canterbury DHB, CCC, CERA
<b>Risk &amp; Societal Resilience</b>		
Business impact survey program	UOC, Opus, NZ Centre of SME Res.	CDC, Canterbury Employers' Chamber of Commerce, CERA
Risk communications and advice	UOC, GNS, VUW, ESR, Massey, Risk Strategies	MSI, MCDEM, DBH, CCC, CERA, Engineers, DBH, EAG, Property Council
Internal Migration	GNS, Opus, UOC	MSD, MCDEM, Statistics NZ, MSI
Psychosocial intervention and support for schools	Massey, Central Queensland University	Ministry of Health, Ministry of Education, MCDEM, MSD
Role of public education	John Lindsay, GNS, Massey, VUW, UOC	MSI, Civil Defense sector
Shift in student numbers within the Tertiary sector	UOC, Massey	TEC
Impacts on the tourism sector & other int'l visitors	University of Otago, UOC, Massey	Ministry of Tourism, MFAT, MED

**RC**, Royal Commission Technical Reports; **CCC**, Christchurch City Council; **CELG**, Canterbury Engineering Lifelines Group; **CDC**, Canterbury Development Corp.; **EAG**, Engineering Advisory Group; **ECAN**, Environment Canterbury

# Short Term Recovery Programme

Theme	Title	Leader	Organisation	Status
Eng	<b>Bridge Performance</b>	A. Palermo	UOC	Publication available
Geotech	<b>Liquefaction impacts on pipe networks</b>	Misko Cubrinovski	UOC	See brief description; Report available
Eng	<b>Pallet Racking Systems</b>	SR Uma	GNS	
Eng	<b>Fire</b>	Tony Abu	UOC	See brief description
Eng	<b>Hospital Function &amp; Services</b>	Sonia Giovinazzi	UOC	Report available
Societal	<b>Internal Migration</b>	Kim Wright / David Johnston	GNS	
Societal	<b>Risk Communications</b>	David Johnston	GNS	
Societal	<b>Role of Public Education</b>	David Johnston	GNS	
Societal	<b>Shift in Student Nos. Within the Tertiary Sector</b>	David Johnston	GNS	confidential to the TEC
Societal	<b>Impacts on Tourism Sector and other International Visitors</b>	Caroline Orchiston / David Johnston	U Otago / GNS	Report available
Eng	<b>Temporary Housing Issues</b>	Sonia Giovinazzi	UOC	Report available
Societal / Res Orgs	<b>Business Impact Survey Program</b>	Erica Seville / John Vargo	UOC	Report available
Eng	<b>Recovery of Lifelines</b>	Sonia Giovinazzi	UOC	Report available
Societal / Res Orgs	<b>Risk Advice for Commercial Bldgs</b>	Erica Seville	Indep consultant	Report available

# MSI - Hazards & Infrastructure

Title	Detail	Organisation
<b>Grid Energy Storage</b>	FIR-capable energy storage for enhanced grid stability management	IRL
<b>Renewable Energy &amp; the Smart Grid</b>	Renewable Energy & the Smart Grid Future Proofing New Zealand's Electricity Supply	UOC
<b>Energy Cultures 2</b>	Energy Cultures 2: realising the potential of energy efficiency for New Zealand in households, businesses and transport.	UOO
<b>New Zealand climate changes, impacts &amp; implications</b>	Climatic conditions to 2100 and assessed Impacts & Implications for New Zealand's Environment, Economy and Society	NIWA
<b>Resilient Urban Futures</b>	Resilient Urban Futures	UOO
<b>Seismic Response of Underground Services</b>	Seismic Response of Underground Utilities Following the Canterbury Earthquakes: National Implications for Networks and Structural	OPUS
<b>Resilient infrastructure through effective organisations</b>	Building resilient infrastructure through effective leadership and management of infrastructure organisations	UOC
<b>Economics of Resilient Infrastructure</b>	At the heart of this research is the development of a Spatially Explicit Dynamic Economic Model (SEDEM). SEDEM will be used to simulate the economic consequences of infrastructure failures based on real (Christchurch) and hypothetical (Auckland) events and will be readily transferable to other hazards and regions.	GNS
<b>Future Streets</b>	Future Streets for Auckland and New Zealand	TERNZ
<b>Network Infrastructure</b>	Comprehensive Monitoring of New Zealand's Digital Infrastructure	UOW
<b>Networked Infrastructure - Connecting Christchurch and NZ to the World</b>	Positioning Christchurch as the world's demonstration site for infrastructure sensor deployment, validation and analysis.	IRL

# Contestable 2012

## (NZ Natural Hazards/Lessons Learned From Christchurch)

Theme	Title	Leader	Organisation	Detail
Geol Haz / Eng	<b>Tsunami impacts on Ports &amp; Harbours</b> / Tsunami resilience of NZ Ports	William Power / Bruce Melville	GNS / UOA	Improved tsunami warning / numerical modelling of tsunami load on ports
Social / Eng	<b>Acceptable Seismic Risk of Older Buildings</b>	Vince Dravitzki	Opus	Acceptable risk of older commercial buildings for earthquake-prone NZ
Social	<b>Faster Rebuilds with MRCGE</b>	Shane Cronin	Massey	Simulating socio-economic rebuild following volcanic event
Engineering	<b>Wind Speed Hill Shape Multiplier</b>	Michael Revell	NIWA	Aims to modify provisions of Wind Loading standards; To estimate reliable and accurate code methods that enable engineers to estimate wind speed-up variations in complex terrain

# Baseline Funding (Core Funding & Novated Hazards Contracts)

Theme	Title	Leader	Organisation	Detail
Weather	<b>Coastal processes and forecasting;</b> minimise vulnerability to coastal communities & coastal / maritime infrastructure & industries. Improve best practice guide for coastal inundation (incl tsunami)		NIWA	Improve models of wave and storm surge and their impacts, by incorporating the ability to assimilate wave and storm surge data into forecast models, developing adaptive modelling techniques and validating forecast models against in-situ and satellite data, in order to reduce vulnerability to coastal hazards.
Risk	<b>RiskScape</b>		NIWA/GNS	Various - includes asset repository populated with default National Building dataset and infrastructural network
Risk	<b>Hazards Exposure, Impacts and Vulnerability</b>	Pondard	GNS	Development or adaption of hazard models as they evolve from core hazard programmes to determine the regional exposure to multiple hazards and prepare modules or methodologies that quantify this exposure and its uncertainty for different modes of application; creation or adaption of impact and vulnerability models of communities, their assets and supporting infrastructure and economic development that are appropriate for the NZ context, relating hazard exposure to potential impacts (direct and in-direct) and including the inherent uncertainties
Risk	<b>Immediate Surveillance and Damage Assessment</b>	Glasse		Real-time reliable and robust delivery of intelligence during and following natural disasters, via acquisition, geo-referencing and interrogation of remotely sensed data, and conversion into an intelligence product which is delivered to emergency management as quickly as possible.
Eng	Alternative design approaches to achieve tolerable impacts in buildings	SR Uma	GNS	Improving current design philosophies to achieve tolerable impact levels with respect to building functionality and safety at different intensities of earthquake hazard including examination of current design philosophies and identification of required areas of improvement, developing framework for design and construction for different building performance group categories

# Baseline Funding (Core Funding & Novated Hazards Contracts)

Theme	Title	Leader	Organisation	Detail
Eng	<b>Interdependencies</b> of Critical Lifelines and Infrastructure	Buxton	GNS	Developing models to minimise post-earthquake trauma and economic impact for people in urban areas by minimising damage to buildings, contents, and infrastructure, and enhancing economic performance of the built environment through recommending improvements to regulations, construction methods, protective technologies, and infrastructure management
Eng	<b>Impacts of infrastructural damage</b>	Cousins	GNS	Modelling the damage to underground pipelines, restoration times, damage costs, and impacts of mitigation measures, and assessing the impacts on people of the loss of infrastructure, and the success of mitigation measures
Eng	<b>Resilience of NZ Coastal Infrastructure</b> to Natural Hazards - tsunami effects on coastal infrastructure	Melville	UOA	The specific focus of the Task is laboratory experiments to determine the impact of tsunami on coastal structures, including bridges, residential buildings and commercial buildings, as follows: The forces induced on coastal structures by tsunami waves, including effects of vegetation and other roughness components on such forces The effects of wave-borne debris on coastal structures Localised scour about coastal structures due to tsunami Numerical modelling of tsunami-building interaction

# Baseline Funding (Core Funding & Novated Hazards Contracts)

Theme	Title	Leader	Organisation	Detail
Eng	<b>Seismic response of New Zealand Bridges -</b> (1) Relative movement effect on bridges in NZ earthquakes; (2) Bridge Seismic Assessment; (3) Post-earthquake assessment of bridge condition and damage using monitoring data; (4) The impact of vertical motion on bridges and infrastructure damage in the Canterbury earthquakes of 2010 and 2011	Chouw	UOA	The goal of this project is to investigate the seismic performance of bridge structures incorporating the effect of the soil by considering the soil-structure interaction. The work entails assessing the actual bridge performance numerically and experimentally, including consideration of exceptionally high vertical ground accelerations, and by field monitoring of the actual bridge response to strong ground motion. The outcomes of this research will provide recommendations to practicing professional bridge designers by updating the current bridge design manual.
Eng	<b>Advanced Bridge Construction and Design -</b> (1) Bridge system: typologies and construction methods adopted in NZ; (2) Materials / long term resilience; (3) Structural / Loss modelling - life cycle analysis	Palermo	UOC	The aim of the project is to implement into New Zealand bridges advanced technical solutions sustained by appropriate design strategies, innovative/accelerated construction methods and enhancing/durable material properties which assure long term resilience.
Societal	<b>Planning &amp; Policy</b>	Saunders	GNS	Exploring how to improve the preparation and implementation of plans and policies addressing natural hazards within district, regional and central Government
Societal	<b>Community Resilience</b>	Becker	GNS	Identifying practical strategies, in consultation with emergency management practitioners and community stakeholders, for developing resilience to disasters in NZ communities



# Baseline Funding (Core Funding & Novated Hazards Contracts)

Theme	Title	Leader	Organisation	Detail
Societal	<b>Emergency Management</b>	Leonard	GNS	Considering societal perceptions of hazards and warning messages, and development of strategies that motivate and maintain appropriate social responses to warnings; and develop practical strategies for the effective response to emergencies
Societal	<b>Disaster Recovery</b>	Johnston	GNS	Determination of physical, economic, social and psychological impacts on communities using longitudinal evaluation methodologies, to understand the recovery process over time
Societal	<b>Volcanic Impacts</b>	Wilson	UOC	"...Although ash falls rarely endanger human life directly, threats to public health and disruption to critical infrastructure services, aviation and primary production can lead to significant societal impacts. Even relatively small eruptions can cause widespread disruption, damage and economic loss. Identifying and quantifying these impacts is an essential step in building resilience within these critical systems...."
Societal / Res Orgs	<b>Organisational Resilience</b>	Seville & Vargo	UOC	"...Research within this task will focus on understanding the impact of hazard events on organisations and organisational arrangements, identifying ways to encourage organisations to proactively strive for greater resilience, and mechanisms for supporting recovery of the organisational community following a hazard event...."
Societal	<b>Behavioural response and social recovery indicators</b>	Dravitzki	OPS	This strand of research will address the social response to a hazard event, examining the transition from immediate behaviour (e.g. evacuation), through to recovery back to normal functioning (return to work, normal home-life and leisure). We will identify characteristics and processes that enhance and facilitate a faster recovery back to the level of day-to-day household and community stability required before economic recovery can fully proceed.
Societal	<b>Dynamics of urban &amp; regional economic recovery</b>	Dravitzki	OPS	"...unique opportunity to understand the impact of disasters on the urban dynamics of our larger centres and the region in which they are located. This includes understanding how business agglomerations and their associated workforces and population markets are at first disrupted and displaced, then re-form temporarily, and then as the rebuild progresses either entrench in their new locations or return...."