



# 3<sup>rd</sup> Societal Planning for Natural Hazards Research Forum

20<sup>th</sup> February 9.30am - 4pm

University of Canterbury  
Christchurch

Sponsored by EQC





## **Introduction to the 3<sup>rd</sup> Societal Planning Research Forum**

Welcome to the 3<sup>rd</sup> Societal Planning for Natural Hazards Forum at the University of Canterbury on the 20th of February 2007.

These forums are intended to bring researchers together from across New Zealand to learn more about the diverse research programmes going on that look at how society plans and prepares for natural hazard events. The overall aim of the forum is to promote greater collaboration and co-ordination across these research programmes.

As you will see from the attached programme, there is a great deal of multi-disciplinary research going on in this area. We have reserved time at the end of the day for a final discussion. Here we hope to:

- identify inter-relationships, and where practical, potential collaborative efforts between research teams
- highlight any areas of overlap and dependencies between research programmes
- promote the transfer of information between research teams and encourage joint publications

At the end of the day we will also have drinks and nibbles; you are all very welcome to stay on and enjoy!

## Programme

**Erica Seville** Welcome and introductions

### **Session 1 - Modelling and Measuring Societal Resilience (Chair: Julia Becker)**

---

**Erica Seville** Resilient Organisations Programme  
University of Canterbury

**John McClure** Business Resilience  
Victoria University of Wellington

**Douglas Paton** Modelling Resilience: Community, Family and Institutional Perspectives  
University of Tasmania

*Coffee Break (11am)*

**Michele Daly** Measuring Community Resilience  
Kestrel Group

**Bruce Glavovic** Case Study Research: Lessons for Building Sustainable, Hazard-Resilient Coastal Communities based on experiences in the USA Gulf Coast, Indonesia, The Maldives and New Zealand  
Massey University

*Lunch Break (12:10pm)*

### **Session 2 - Society and Natural Hazard: Reduction, Readiness, Response and Recovery (Chair: Andre Dantas)**

---

**David Johnston** Joint Centre for Disaster Research – Massey University and GNS Science  
GNS Science

**Julia Becker** GNS Hazards Programme- Society's readiness and response to hazards  
GNS Science

**Wendy Saunders** Geological Hazards & Society Programme – Obj 1: Policy and land use planning for natural hazard reduction  
GNS Science

**John Campbell** Pacific Island Disaster Reduction  
University of Waikato

**Greg MacRae** WSSI Methods to Mitigate Loss in the Third World  
SEATTLE FAULT SCENARIO – A Decision-Making Tool for Earthquake Risk  
University of Canterbury

**Steve Lamb** Social and Economic Recovery from Natural Disasters through Community Resilience  
OPUS

*Coffee Break (3pm)*

---

### **Final Discussion (Chair: Erica Seville)**

---

*Social refreshments (4pm onwards)*

# Resilient Organisations Programme

Erica Seville

Department of Civil Engineering, University of Canterbury

The Resilient Organisations research programme ([www.resorgs.org.nz](http://www.resorgs.org.nz)) is designed to understand and improve the resilience of New Zealand organisations to major disruption. The ability of organisations to respond effectively following a hazard event will have a large influence on the length of time that essential services are unavailable, and therefore New Zealand's ability to retain economic competitiveness in the aftermath of a hazard event.

The research programme is divided into three inter-related objectives:

1. Organisational planning for hazard events
2. Prioritisation and deployment of physical and human resources for recovery
3. Legal and contractual frameworks for post-disaster reconstruction

Key outputs expected from each of these objectives over the six years include:

## Objective 1 (Key Contact: Erica Seville)

- *Development of a resilience management framework.* Development of a framework for evaluating and improving the resilience of organisations. Application of this framework to ten case study organisations.
- *Metrics for benchmarking resilience across different organisations.* Metrics are needed so that organisations can demonstrate and value their resilience strategies, and create a business case for improving resilience.
- *Best practice principles for improving resilience.* Best practice principles and 'real-world' examples to be identified and promoted throughout the research programme.

## Objective 2 (Key Contact: Andre Dantas)

- *Analysis of Information Flows and Requirements during Response and Recovery Activities for the Road Network.* Significant challenges exist for collecting, collating, and communicating information about the real-time status of the road network in times of major disruption. Initial focus is to understand current information flows during response and recovery. Focus will then shift towards how these information flows could be improved.
- *Generalising the methodology.* Taking the techniques and principles developed for the road network and looking at how they might be applied more generally to other types of networked infrastructure and industry sectors.
- *An Optimisation Procedure for Prioritising Works on Networked Infrastructure.* Networked infrastructure provides unique challenges in optimising in real time response and recovery activities as the importance of any one particular link will be dependent on the availability of alternative links across the network.

## Objective 3 (Key Contact: Suzanne Wilkinson)

- *Suggested Clauses for Contracts.* Our objective is to provide immediate solutions for asset owners and operators, for example through draft standard clauses or specifications relevant to response and recovery activities that can be added to conventional procurement contracts.
- *Best Practice Construction Procurement Strategies for Response and Recovery Activities.* Best practice principles to be written up and published as a set of construction industry guidelines, and promoted to the construction industry through targeted workshops and conferences.
- *Strategic Review and Recommendations where appropriate for Industry Wide Action.* Where significant industry wide issues are identified, the researchers will prepare discussion documents and facilitate workshops with industry players to promote discussion and change.

# **Business Resilience**

John McClure

Victoria University of Wellington

The research extends a research programme focusing on reducing people's fatalism about hazards, particularly earthquakes; fatalism is the belief that there is little point in taking actions to prepare for the hazard or to take actions that would mitigate damage. The research has focused on clarifying the messages that enhance people's belief that damage from natural hazards is preventable. Initial studies clarified which type of messages lead people to attribute damage in earthquakes to building design as well as hazard magnitude.

This talk presents three current projects. The first project examines whether controlling for and equalizing the annual insurance cost of high frequency and low frequency hazards overcomes the common tendency for people to give greater importance to high frequency hazards than low frequency hazards. The second project examines ways in which the framing of the risk messages in terms of gains or losses shapes citizens' intentions to take action about the hazards. The project varies two aspects of framing: first, in terms of gains or losses resulting from an action and second, varying whether the relevant action is described in terms of the consequences of taking a preventive action as opposed to the consequences of not taking such an action. The third project focuses on business resilience in Central Wellington, and examines whether incorporating action plans into hazard communications increases the rate of businesses adopting two specified preparedness actions within a 6 month time frame. This paper presents the expected outcomes from each of these 3 projects.

The project was initially supported by Victoria University from 1992-2003 and since 2003 been supported by a FRST subcontract to GNS Science and a Grant from the EQC. John McClure is PI and the Associate Researchers are Ron Fischer, Maree Hunt, Chris Sibley, Frank Walkey, Matt Spittal, (Psychology), Michael Crozier (Geography), and Andrew Charleson (Architecture). Consultants are Douglas Paton and David Johnston.

# **Modelling Resilience: Community, family and institutional perspectives**

Douglas Paton

School of Psychology, University of Tasmania

To proactively promote resilience, emergency planners need to be able to identify the individual and community characteristics that predict resilience. Given the potentially large number of factors that could be implicated, a parsimonious and cost-effective approach to modeling resilience is required. Several projects are underway to identify these factors and their inter-relationships to develop a cohesive model of community resilience. This paper discusses work being undertaken to model resilience in communities, families and in high risk organizations. Given that an accurate assessment of resilience can only be made after disaster strikes, model development focused on identifying the predictors of the resources (e.g., preparedness, community networks etc) that would be required if people and communities were to confront the consequences of disaster.

For modeling community resilience, a generic model that comprising personal, community and institutional indicators was developed and tested using volcanic and pandemic scenarios in Auckland. The structural equation modeling analysis produced a model that that comprised three person-level (action coping, positive and negative outcome expectancy), two community-level (community participation, community problem solving), and two institution-level factors (empowerment, trust). The statistical characteristics of the model indicated that it represented a very good fit for the data in both cases. Testing on two different hazards provided an opportunity to test the validity of the model. The development of a reliable model means that a model is available that can: a) guide the development of community resilience, b) assist the formulation of practical intervention strategies, c) inform planning initiatives by supporting resource allocation strategies (e.g., to direct resources to areas/groups within the community according to need), and d) provide key performance indicators for the assessment, monitoring and evaluation of resilience at different levels (e.g., district, regional) and demographic groups.

This work also includes examining the cross-cultural implications of the resilience concept.

Work on hazard preparedness identified family dynamics as a significant influence on household resilience. This work expands existing research on household preparedness to examine the family dynamics that influence resilience to adverse events. As with the community work, the development of resilience models is hampered by the lack of significant demands that can be used to test the validity of the mechanisms identified. The family resilience project is being undertaken with the Australian Antarctic Division and is examining the predictors of resilience in families when expeditioners are working for prolonged periods (12-15months) in hazardous conditions. This work is also being used to identify the characteristics of personnel and organizations that contribute to resilience. The latter work will complement another organization-related project.

Because they create demands that exceed resource availability, disasters create significant demands on emergency management groups. Another project is underway that is developing adaptive capacity at the tactical EOC level of emergency management. This work, which is being undertaken with Auckland District Health Board and the South Australian Metropolitan Fire Service, is developing resilience programs for response staff. This work focuses on putting the lessons learnt from previous analyses of disaster response into practice and is providing training in core competences such as, for example, multi-disciplinary team work and crisis information and decision management.

# Measuring Community Resilience

Michele Daly

Kestrel Group

Many of the natural hazards that characterize the New Zealand hazardscape have the potential to destroy infrastructure and create prolonged disruption to peoples' lives and societal functions. The Auckland Region Civil Defence Emergency Management Group (CDEM Group) is responsible for emergency management in the Auckland region. It has a vision of *A Resilient Auckland Region*. The CDEM Group has defined community or social resilience as the capacity of people, communities and organisations to adapt to, manage and learn from the demands, challenges and changes encountered during emergencies.

To better understand resilience and to measure progress in achieving the vision, the CDEM Group, has developed a generic model of social resilience by identifying factors at the individual, community and societal levels that have been implicated in promoting a capacity to adapt to adverse circumstances. A generic approach was used to accommodate the social and hazard diversity that underpins Auckland's complex natural hazard risk context. The model has been tested in the context of both a volcanic and pandemic scenario in Auckland. The distribution of risk associated with these hazards fulfils the criteria necessary for testing a model with regional applicability.

While it was originally intended to use direct measures of personal and community capability, hazard and mitigation knowledge, and levels of community hazard planning, low prevailing levels of these factors precluded their use in the analysis. Instead, a measure of intention (to develop the generic capabilities to confront demands associated with different stages of disaster response and recovery) was used. Where levels of adoption of specific actions are low, intentions represent a valid predictor of future actions. Data were collected from telephone surveys of 297 and 400 residents (volcanic and pandemic surveys respectively) and analysed using structural equation analysis. The first analysis produced a model comprising two person-level (positive outcome expectancy, negative outcome expectancy), two community-level (community participation, ability to articulate community problems), and two institution-level factors (empowerment, trust). The second analysis confirmed the validity of the model, although there were differences in some of the pathways. A role for one variable that was marginal in the volcanic model, action coping, was confirmed in the second survey.

The analysis has produced a reliable, evidence-based model that represents a cost-effective device that can be used by emergency planners and other civic agencies to assess prevailing levels of resilience, guide its future development, facilitate planning decisions regarding the allocation of limited resources, and provide an empirically validated set of key performance indicators for the assessment, monitoring and evaluation of resilience. This format provides a comprehensive basis for modeling community resilience and for integrating this model with subsequent work on societal-level (e.g., economic, business continuity) resilience.

The major limitation of this approach, and one common to all work in resilience, is that the utility of the model can only be guaranteed following analysis of responses to an actual disaster. It thus represents a model of resilience potential.

The presentation will discuss the model, look at how the model is already been used to assess current levels of resilience in Auckland and discuss the implications of the model for planning, risk communication, public education, and community development. Next steps for the research programme will be to expand the model to include other aspects of resilience (e.g. economic, business continuity) and to use the community resilience model to design specific intervention strategies. The model is also being considered as a common measurement framework that can be used to compile local, regional and national assessments and facilitate their comparison.

## Key researchers

Douglas Paton, School of Psychology, University of Tasmania, Tasmania, Australia

Michele Daly, Kestrel Group, Auckland, New Zealand

Bruce Parkes, St John, Auckland, New Zealand

David Johnston, GNS Science, Wellington, New Zealand

# Case Study Research: Lessons for Building Sustainable, Hazard-Resilient Coastal Communities based on Experiences in the USA Gulf Coast, Indonesia, the Maldives and New Zealand

Dr Bruce C. Glavovic

EQC Fellow in Natural Hazards Planning Resource & Environmental Planning Programme  
School of People, Environment & Planning, Massey University

This research addresses two questions: Firstly, what can we learn from international experience about building sustainable, hazard-resilient coastal communities? Secondly, what are the challenges and opportunities for building such communities in New Zealand?

Coastlines provide resources of incredible value, sustain the livelihoods of and are home to the majority of the world's population. The New Zealand coast, like coastlines around the world, is a place of enormous value. But this narrow land-sea interface is subject to intense and growing development pressure. If prevailing patterns of development intensification continue, essential coastal goods and services will be jeopardised. Furthermore, given global climate change and sea-level rise, many coastal communities will become increasingly vulnerable to hazards. It is therefore urgent and imperative that we learn to build more sustainable and hazard-resilient coastal communities.

Integrated coastal management (ICM) has been developed over the last four decades to resolve coastal conflicts and achieve the elusive ideal of sustainable coastal development. ICM efforts are now carried out in more than 120 countries. But insufficient attention has been focused on the role of ICM in dealing with coastal hazards. Recent coastal disasters, from the devastating Indian Ocean Tsunami to the 2005 hurricane season in the USA Gulf Coast, highlight the imperative to 'mainstream' natural hazards planning into coastal management endeavours.

This research analyses recovery experiences in Indonesia and the Maldives in the aftermath of the 2004 Indian Ocean tsunami, and recovery experiences related to Hurricane Katrina with a particular focus on New Orleans. Personal observations and interviews with planners, academics and others involved in recovery efforts inform this analysis. Notwithstanding significant contextual differences between these three case studies, they provide lessons that can help to inform future coastal policy, planning and decision-making processes. New Zealand case studies will also be analysed to derive locally relevant lessons and provide a basis for comparative analysis. These lessons from real-world experience, together with insights from diverse literatures, including coastal management, natural hazards planning, collaborative planning, sustainable communities, sustainable livelihoods, ecological economics, environmental governance, adaptive management and co-management, will be synthesised to develop a conceptual framework and outline substantive and process principles to guide action. The following principles provide a preliminary point of departure for building sustainable, hazard-resilient communities:

- **Put people first:** Prioritize people's concerns, especially vulnerable people, by striving for social equity, respecting cultural diversity and securing sustainable livelihoods.
- **Develop responsive and participatory processes:** Ensure authentic participation and collaboration through responsive, accountable and transparent governance institutions and processes.
- **Prioritise empowerment:** Foster social learning and build social institutions that enable and strengthen resilience and adaptive capacity.
- **Prioritise ecological sustainability:** Respect and restore coastal ecosystems and the powerful and often unpredictable processes that structure these ecosystems to sustain coastal communities.
- **Adopt a proactive but precautionary approach:** A visionary outlook must be implemented in a risk averse manner in face of uncertainty:
  - Avoid exposing coastal communities to coastal hazards;
  - Place the 'burden of proof' on those engaged in unsustainable practices; and
  - Ensure that public services and infrastructure are examples of 'best practice'.

Key opportunities and challenges for translating these principles into practical reality will be explored. This analysis demonstrates that building sustainable, hazard-resilient communities will remain elusive unless 'business as usual' is confronted by a transformational process of developmental planning: Sustainable, hazard-resilient coastal communities are founded upon robust 'critical infrastructure' (including ecological, political, social, livelihood and physical dimensions) that is secured by planning and decision-making processes that enable coastal communities to build 'layers of resilience' to overcome 'waves of adversity'.

# Joint Centre for Disaster Research – Massey University and GNS Science

David Johnston

Joint Centre for Disaster Research, GNS Science/Massey University

The new centre is a joint venture between Massey University and GNS Science within the School of Psychology, based at the Massey University campus in Wellington.

The centre undertakes multi-disciplinary applied teaching and research aimed at:

- gaining a better understanding of the impacts of natural, man-made and environmental disasters on communities
- improving the way society manages natural, man-made and environmental risk
- enhancing community preparedness, response and recovery from the consequences of natural, man-made and environmental hazard events

Key initial areas for research will be:

- Emergency management planning
- Community resilience and long-term welfare issues in recovery
- Role of public education in disaster preparedness, response and recovery
- Warning systems and evacuation planning
- Health sector emergency management
- Community involvement in emergency management

**New Graduate Students** – linked to the Centre

**Debra Ellis** (PhD student, School of Psychology)

“Health sector emergency management roles in New Zealand”

**Julia Becker** (PhD student, School of Psychology)

“Increasing Community Resilience: Understanding how individuals make meaning of hazard information and how this relates to preparing for hazards”

**Wendy Saunders** (PhD student with School of People, Environment & Planning)

“Effective land-use planning for natural hazard management”

**Ian de Terte** (PhD student, School of Psychology)

“Resilience and the prevention of work related traumatic stress: testing an ecological model”

**James Hudson** (PhD student, School of Psychology and Te mata o te Tau)

“A tri-partite governance framework for iwi development and resilience”

**Rosalind Houghton** (Victoria University PhD student – Department of Sociology and Social Policy)

“Domestic Violence following natural hazard events in New Zealand”

**David McIvor** (University of Tasmania PhD student – School of Psychology)

“Means-end Chain Modelling of Natural Hazard Preparedness”

**Kate Pishief** (University of Waikato MSc student – Department of Earth Sciences)

“Spatial and temporal variations in tsunami risk in the North Island”

**Jen Du Bois** (University of Canterbury MSc student – Department of Geological Sciences)

“Spatial and temporal variations in tsunami risk in the South Island”

**Contact Details**

David Johnston - david.johnston@gns.cri.nz

# **GNS Hazards Programme- Society's readiness and response to hazards**

Julia Becker

GNS Science

This objective aims to assist the emergency management sector by developing appropriately targeted strategies to improve emergency management procedures, and crisis management methodologies that have considered societal perceptions to hazards. Research projects are developed around four main themes; 1) improving community resilience; 2) emergency management planning; 3) hazard education; and 4) public response to warning systems.

## **Improving Community Resilience**

This research involves developing a model to assess the factors that make a community withstand the consequences of natural hazards. Some of these factors are psychological, behavioural, and community aspects that positively influence community resilience. We also analyse the role of hazard mitigation in community fulfilment, growth and development.

## **Emergency management planning**

We research the impact of specific natural hazard events and the effectiveness of planning, communicating and training within and between responding organisations. Our research in this area includes: 1) developing and reviewing natural hazard management plans (e.g. floodplain management); 2) developing and reviewing Civil Defence Emergency Management Plans; 3) integrating emergency management structures and procedures; 4) coordinating response agencies; 5) developing appropriate response warning systems; 6) evacuation planning; and 7) planning for gathering of crisis information and crisis decision-making.

## **Hazard education**

Research is focussed on community understanding of, and preparedness for, natural hazard events. Results are used to design education strategies to meet the specific needs of communities (through local authorities), businesses, schools and others. Recent studies are directed towards community understanding of natural hazards in New Zealand, Australia and the United States.

## **Public Response to Warning Systems**

Research is aimed at improving public response to warning systems for tsunamis, eruptions, lahars and dam-break floods, which involves: 1) assessing warning systems and needs against examples of effective end-to-end warning systems internationally; 2) researching the effectiveness of warning systems in emergencies to understand what makes them work or fail and what makes people respond correctly 3) studying existing training approaches among emergency response agencies and ways to improve these developing and implementing new training methods; 4) on-site analyses of operating and environmental conditions and how these impact on warning system effectiveness; 5) conducting hazard event simulations and evacuation exercises involving the community to evaluate the effectiveness of warning systems and 6) surveying communities to understand how they respond to warning systems, and their attitudes to natural hazard risk.

## **Key researchers**

GNS Science: Julia Becker, Dr Graham Leonard, Gaye Downes, Wendy Saunders, Jane Forsyth, Maureen Coomer. Massey/GNS Science: Dr David Johnston. Victoria University: Dr John McClure. University of Tasmania: Dr Douglas Paton. University of Central Queensland: Dr Kevin Ronan. University of Hawaii: Dr Bruce Houghton. East Tennessee State University: Dr Chris Gregg. Dominican University of California: Dr Matt Davis. University of Canterbury: Dr Jim Cole.

**Contact:** [david.johnston@gns.cri.nz](mailto:david.johnston@gns.cri.nz) and [j.becker@gns.cri.nz](mailto:j.becker@gns.cri.nz)

# Geological Hazards & Society Programme – Objective 1: Policy and land use planning for natural hazard reduction

Wendy Saunders

GNS Science

This objective draws on the evolving body of international knowledge about the role of land-use planning as a hazard risk mitigation (reduction) and recovery tool. We conduct research to enable the application of hazard information by practitioners, with a focus on land use planners.

A Natural Hazards Planning Advisory Group has been established to provide a strategic overview to the research but in a practical sense, this group also have the role of encouraging “buy-in” to our research and assist with dissemination and uptake of the research. By collaborating with a broad range of disciplines including geologists, engineers, planners and community groups, we develop best practice guidance for land use planning in hazard areas (e.g. Active Fault Guidelines, Landslide Guidelines).

We address the ever-increasing focus on recovery from hazard events by developing an approach to integrate recovery issues into the land use planning process so that local authorities have given thought to how a city, town or community could be rebuilt in the aftermath of a significant hazard event before the event occurs.

Recognising the role that strong community groups can play in reducing hazard risk by influencing local authorities as well as initiating and undertaking practical measures, we determine what makes these groups “tick” so other communities can employ techniques that enhance risk reduction.

Again, at a community level, we make links with a range of Pacific cultures with a history of significant hazard events in order to build knowledge of cultural understanding of hazards and traditional methods of mitigation and look at the integration of these into current hazard management practice.

Specific outputs for 2007-08 include:

- Finalise and disseminate the landslide guidelines for consent and policy planners
- Undertake short courses to engage with practitioners on hazard issues
- Hold a meeting of the Natural Hazards Planning Advisory Group to provide strategic overview to our research, and identify how barriers to land use planning can be overcome.
- Workshop and test the applicability of the pre-event recovery plan methodology, and review as required.
- Research effective and innovative land use planning initiatives
- Continue research into the role of community participation in coastal hazard management.

## **Primary Researchers:**

*GNS Science:* Wendy Saunders, Julia Becker, Maureen Coomer

*NIWA:* Terry Hume (with Paula Blackett, AgResearch), Darren King, Taoho Patuawa

*University of Waikato:* John Campbell

## **Recent outputs include:**

Becker, J., Saunders, W., & J. Kerr, 2006: *Pre-event recovery planning for land-use in New Zealand*. GNS Science Report 2006/23.

Becker, J., Saunders, W., & R. Van Dissen, 2005. *A study of the adoption and use of the Active Fault Guidelines*. Institute of Geological & Nuclear Sciences Science Report 2005/16.

Becker, J., Saunders, W., & R. Van Dissen, 2005: *Planning for fault rupture hazard in New Zealand*. *Planning Quarterly*, 158:14-16.

Blackett, P.E. & Hume, T.M., 2006. *Community involvement in coastal hazard mitigation: an initial scoping of process and pitfalls*. NIWA Client Report HAM5006-083.

Campbell, J.R., 2006. *Traditional disaster reduction in Pacific Island communities*. *GNS Science Report*. SR 2006-038.

Forysth, P.J., 2006: *Natural hazards in Canterbury – planning for reduction*. GNS Science Report 2006/31.

King, D., and Gough J., 2006. *Maori Environmental Knowledge in Natural Hazards management and mitigation*. NIWA Client Report, AKL 2006/055.

# Pacific Island Disaster Reduction

John Campbell

Department of Geography, Tourism and Environmental Planning  
University of Waikato

This research is a subcontract to GNS and is part of a larger project:

Objective 1 “Planning and Policy for Reduction and Recovery” of the Hazardscape Programme, Task 4 “Cultural Understandings and Traditional Mitigation”

*Topic 1.* Investigate the procedures by which international relief is made available in Pacific Island countries and then delivered to disaster communities. The key research question will be: does disaster relief serve to strengthen local capacities or to weaken them and increase vulnerability? The research will seek to identify the following issues in relation relief as a disaster response a) The importance of disaster relief, b) who supplies relief?, c) the magnitude of relief in Pacific Island Countries, d) the nature of relief (e.g. what items are provided by donor countries and what conditions are imposed on the provision of relief?), e) the measures taken by donors to reduce vulnerability to disasters rather than focusing on relief and recovery, and f) the extent to which disaster relief has played a role in modifying traditional disaster response mechanisms. The research will focus on New Zealand disaster relief activities and will include official disaster assistance and that provided through non-governmental organisations.

*Topic 2.* A major demographic transformation in the Pacific Islands region has been the growth of the urban centres in many of the countries. However, most research on disaster reduction has focused on rural communities. Urban areas present new sets of problems, and possibilities for, disaster reduction including the maintenance of infrastructure (or building infrastructural resilience), the vulnerability of residents in informal housing areas, rising urban poverty levels and the possibility of using planning tools for land-use management. The research will seek to identify the key concerns in urban hazard risk management, in particular those traditional disaster reduction measures that might be applicable in the contemporary urban setting and an appropriate set of tools which might be considered to increase the resilience of urban communities in Pacific Island Countries.

The research is being conducted in collaboration with GNS and Maureen Coomer from GNS is contributing to the research activities.

The main groups that the project will interact with are:

- Aid agencies in New Zealand
- National Disaster managers in Pacific Island Countries and agencies involved in regional disaster reduction activities (e.g. SOPAC)
- Planners in Pacific Island Countries

This project is at the beginning stages and will be completed in mid-2008.

# **WSSI Methods to Mitigate Loss in the Third World**

G. A. MacRae

University of Canterbury, Christchurch, NZ

The World Seismic Safety Initiative (WSSI) was established in 1992 as an undertaking of the International Association for Earthquake Engineering and WSSI was approved by Scientific and Technical Committees of the International Decade for Disaster Reduction (IDNDR) as an International and Regional IDNDR Project in January 1993.

The Board of WSSI, and advisors to the board conduct most of the work. The group contains 14 people from universities and industry in Canada, China, India, Japan, New Zealand, Portugal, Singapore, Taiwan and USA. It is a small group with low overheads which can do a lot.

The aims of WSSI are to:

- Raise awareness
- Disseminate state-of-the-art engineering information
- Incorporate experience and research findings into practice
- Be a catalyst for action
- Create alliances for synergistic efforts
- Lobby governments to be pro-active
- Assist nations in establishing policies to understand and prepare for future earthquakes

WSSI has been responsible for the following:

- High Level Meetings (HLM) (10)
- Workshops (24 to date around the world)
- Courses (4)
- Interdisciplinary "learning" teams to Disaster Regions (2)
- Creation of National Earthquake Societies (6)
- Review and Advisory Rolls (5)

Since its establishment, WSSI has worked with many countries around the world and in the Asia Pacific Region in particular. Feedback provided at workshops indicates that WSSI and its programs have had remarkable successes in some countries while in others the impact has been less.

Current WSSI projects are being carried out in Myanmar, Aceh (Indonesia) and Mongolia.

# SEATTLE FAULT SCENARIO

## A Decision-Making Tool for Earthquake Risk

G. A. MacRae

University of Canterbury, Christchurch, NZ

An Earthquake Engineering Research Institute (EERI) report entitled "Scenario for a magnitude 6.7 earthquake on the Seattle Fault" was released in late 2005. This report represents more than three years of effort by professionals in the Seattle region in conjunction with EERI. It was initiated to assist engineers, architects, building owners, emergency managers, government agencies, and elected officials to plan for response to such an event, and to serve as a basis for reducing earthquake risks. The scenario document describes the scenario earthquake, ground failure, possible effects on lifeline structures, transportation facilities, buildings and critical facilities as well as the economic impact. Response and recovery issues are also described. The key object of the scenario is a "call to action" for regional preparation and mitigation. The tool "HAZUS" was used to quantify some of the expected losses. This presentation describes the background to the document, methods which have been used to communicate technical details to non-technical people, and the impact of the document since its recent release. The impact of the scenario is described below in terms of the awareness raised regarding earthquake risk, or from any activities initiated to better consider or manage earthquake risk which can be attributed in some part to the scenario effort.

- There have been more than a dozen television and radio interviews and newspaper stories regarding the scenario. This includes a big multi-page feature story starting on the front page of the Sunday Seattle Times in February 2004.

- Several presentations were made to interested groups (of up to 100 people including city organisations such as planners, engineers, fire, police, emergency responders, insurance underwriters) both during the development of the scenario, as well as after the scenario. At the rollout meeting in February 2004, 450 people from different professions attended. The local mayor spoke and the state governor's office was represented.

- The Seattle Fault Scenario document was produced in 2005. A total of 4,100 books were printed and distributed. The scenario has its own web site where the book can be downloaded <http://seattlescenario.eeri.org>. The number of copies downloaded to date is not known.

- Significant presentations were made to the Washington State Senate Transportation Committee and to the Puget Sound Region Freight Mobility Roundtable in Autumn 2004 regarding the impacts of the scenario earthquake on the transportation infrastructure.

- Funding for renovation of the University of Washington Seismic Laboratory, the major laboratory which collects seismic data in the Washington State, has been given high priority for the supplemental budget and it is currently under consideration by the state legislature. This renovation was one of the call-to-action items.

- The State Seismic Safety Committee, which was relatively ineffective, has been reconstituted. This change is a result of the recommendation for an independent Washington State Seismic Safety Commission directly accountable to the state governor. Dave Swanson, a structural consulting engineer and one of the team members, has agreed to serve as a co-chair of the reconstituted State Seismic Safety Committee.

- The City of Seattle Department of Planning and Development was inspired by the scenario study and is currently putting together a proposal with the city to analyze the cost effectiveness of retrofit investments on city infrastructure with the goal of lining up people and money behind targeted retrofit investments.

There are also less quantifiable effects impacts of the study. For example, planners were initially noticeably uninterested in the scenario. However this changed after the Hurricane Katrina. Statements from a New Orleans resident who stated "They (the authorities) knew there was a problem, they knew that it was only a matter of time, and they did nothing!" have echoed around the world media. Planners around the US have meet together to evaluate the vulnerability and risks in their own regions to any type of natural hazard. Hurricane Katrina has caused a significant increase in understanding why it is important to plan for recovery. A task force is currently being launched through the local American Planners Association using this window of awareness. Representatives of many communities including smaller ones without large planning staffs are participating

# **Social and Economic Recovery from Natural Disasters through Community Resilience**

Steve Lamb

Opus Central Laboratories

The Behavioural Sciences team at Opus Central Laboratories is currently undertaking a four-year project for the Foundation for Research, Science and Technology (FRST) into Social and Economic Recovery from Natural Disasters through Community Resilience. There are two major components; The Emergency Event Information Needs Analysis Survey (EEINA) and The Emergency Event Travel Analysis Survey (EETA).

The EEINA is a computer-aided survey designed to examine post-earthquake information needs. Four earthquake simulation videos were created using a shaking table at Opus Central Laboratories. These modelled a moderate and severe event (6.8 and 7.5 respectively on the Richter Scale) in an office and home setting. A 67-mixed-item computer assisted survey was administered to 562 members of the general public recruited from city and suburban malls. Changes in perceptions of severity were examined over three independent variables (Simulated Setting, Simulated Intensity and Media Order) using a 2x2x6 mixed design. Participants selected the viewing order of three media sources, internet, TV and radio which were developed for the survey. Changes in perception of severity were measured by a 5-item scale (alpha = .87) following each media source. While radio was the most preferred media source prior to viewing, television was found to cause the largest increase in perceptions of severity. Viewing all media sources significantly increased perceptions of severity compared with only viewing the initial earthquake simulation video. Participants' believed that their home would suffer more damage than the CBD or their neighbourhood, but they also believed that the CBD would be more damaged than their neighbourhood, indicating a belief that they suffered the worst damage despite their general area not being the worst affected. The EEINA paper has recently been sent for review.

The EETA is the sister survey to the EEINA and employs a similar methodology to examine travel movements of people immediately following a simulated, large scale earthquake event across the independent variables (Simulated Setting and Simulated Intensity). The survey integrates the QuickMap Geographic Information System allowing us to examine travel movements over a simulated 48-hour period following the simulated earthquake. The start and end locations, roads travelled, distances, and other important information for trips were recorded. The survey is designed to also reveal key social psychological information about behaviour immediately following an Emergency Event, particularly return-to-work behaviour. Eight-hundred and fifty members of the general public have been administered the survey. We are in the process of weighting the data to account for sampling bias and more accurately represent travel estimates for the region. Next we will conduct the data analysis and write a paper on the findings. In the longer term we anticipate exploring the possibility creating a stand alone version of the EETA as a commercial application that businesses could use to survey their staff for business continuity planning.

## **Key researchers**

Dr. Darren Walton, Opus Central Laboratories, & University of Canterbury, New Zealand

Vince Dravitzki, Opus Central Laboratories, New Zealand

Steve Lamb, Opus Central Laboratories, New Zealand

## **Key contact**

Dr. Darren Walton

Research Manager

Opus Central Laboratories

138 Hutt Park Road

PO Box 30 845, Gracefield

Lower Hutt

New Zealand

Tel +64 4 587 0600, Direct +64 4 587 0663,

e-mail: Darren.Walton@opus.co.nz

## List of Participants

Name		Organisation
Julia	BECKER	GNS Science
John	CAMPBELL	University of Waikato
Maureen	COOMER	GNS Science
Michele	DALY	Kestrel
Andre	DANTAS	University of Canterbury
Tim	DAVIES	University of Canterbury
Bruce	GLAVOVIC	Massey University
Monica	GOWAN	University of Canterbury*
Helen	GRANT	Ecan
Deirdre	HART	University of Canterbury
James	HEWITT	University of Auckland*
Brandon	HUTCHINSON	University of Canterbury
Rijal	IDRUS	University of Canterbury*
Ahmed	JAMEEL	University of Canterbury*
David	JOHNSTON	GNS Science
Peter	KINGSBURY	MCDEM
Ray	KIRK	University of Canterbury
Steve	LAMB	OPUS
Greg	MACRAE	University of Canterbury
John	McCLURE	Victoria University of Wellington
Sonia	McMANUS	University of Canterbury
Keith	MORRISON	Lincoln University
Alan	NICHOLSON	University of Canterbury
Marie-		
Therese	PAHUD	University of Canterbury*
Douglas	PATON	University of Tasmania
Wendy	SAUNDERS	GNS Science
Erica	SEVILLE	University of Canterbury
Richard	SMITH	MCDEM
Graham	STRICKERT	Lincoln University*
Andrew	WIEBE	University of Canterbury*
Susan	WILKINSON	University of Auckland
Tom	WILSON	University of Canterbury*
Kelvin	ZUO	University of Auckland *

\* Postgraduate Student