FROM WARNINGS TO EFFECTIVE RESPONSE AND RECOVERY

3RD AUSTRALASIAN HAZARDS MANAGEMENT WORKSHOP SERIES 2009

GNS Science Miscellaneous Series 25

MELBOURNE, AUSTRALIA

5-7 AUGUST 2009

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INTRODUCTION AND WORKSHOP PROGRAMME

The Australasian Hazards Management Conference is run annually, alternating between locations in New Zealand and Australia. The conference provides a forum to discuss the integration of hazard information into effective risk management, including:

- Applying hazard information to best practice planning;
- Developing effective warning systems
- Improved response and recovery from events
- Creating resilient communities through integrating science into practice

Our target audience is: emergency managers, planners, risk assessors, asset and utility managers, natural hazards researchers and scientists.

Workshop titles

Day 1, 5th August 2009, Morning
Workshop 1: Building tsunami resilient communities
Workshop 2: Climate change adaptation, fire & emergency management
Workshop 3: International Disaster Response Law in Australia

Day 1, 5th August 2009, Afternoon
Workshop 4: Weather and Society
Workshop 5: The role of NGOs in disaster risk reduction
Workshop 6: Probabilistic hazard and risk modelling as a tool in planning for natural disasters

Day 2, 6th August 2009, Morning
Workshop 7: Working with children, families and school in disasters
Workshop 8: Remote & rural communities in a changing environment.
Workshop 9: Impact Modelling in Australia and New Zealand

Day 2, 6th August 2009, Afternoon
Workshop 10: Gender and Disasters (one and a half days)
Workshop 11: Developing effective emergency management within local government
Workshop 12: Land tenure, GIS and disasters

Day 2, 6th August 2009, Evening, 5 – 8 pm
Student Research Forum

Day 3, 7th August 2009, All day
Workshop 10: Gender and Disasters (continues)

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PREDICTING THE LOCATION AND SIZE OF COSEISMIC LANDSLIDES

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The significance of earthquake-induced mass movements to erosion and hazards in mountain lands has been recognised for some time. The effect of large earthquakes in causing failures of mountain rock slopes, which transform into catastrophic rock avalanches, is now well recognized, and the dynamics of large rock avalanches are beginning to be understood. However, delineation of areas likely to be affected by such events has until now been prevented by lack of ability to predict, with any confidence at all, which rock slopes are most likely to fail in an earthquake of given magnitude and source location, and what volume of rock will be involved. This problem is extremely complex, mainly because the effect of specified shaking on specific rock slopes is a three-dimensional dynamic slope stability problem beyond current analytical capability.

The application of discrete element methods in the form of the Itasca code PFC-3D is a recent development in discontinuum modeling. The successful simulations of small-scale rock failure using PFC-3D show that it is possible in principle to simulate initiation of a large-scale rock failure by this method. The discrete element method overcomes the following two difficulties with continuum methods: First, a well-behaved stress-strain law may not exist for some materials. Second, the natural development of cracks and rupture surfaces is not well handled by continuum methods.

The internal stress, and development of failure surfaces, can be simulated and tracked very realistically with PFC-3D, allowing the locations and volumes of potential coseismic failures to be identified. The geometric and structural characteristics that lead to large-scale, deep-seated failure of edifices caused by seismic shaking from known sources will be identified and coded into a GIS to search for such characteristics in the mountains of the Southern Alps.

DISASTER DEBRIS MANAGEMENT

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Natural disasters can generate large volumes of debris. In some cases, many years worth of waste can be generated in a single event – often overwhelming local solid waste management facilities and personnel. The need to plan for disaster debris has only been recognised, internationally, in the last 15 years or so. However, the role of debris in disaster management is still largely underestimated and misunderstood – presenting as more of a logistical technical exercise and road-block to recovery than an action integrated into both the emergency response/recovery and solid waste management system, with social, environmental and economic effects.

Disaster debris impacts almost every aspect of an emergency response and recovery effort. Disaster debris can impede rescuers and emergency services reaching survivors; inhibit provision of lifeline support; pose a public and environmental health hazard; and hinder the social and economic recovery of the affected area. Poor management of a clean-up effort can exacerbate these problems, and can result in a slow and costly recovery which is potentially risky to public and environmental health in both the short and long term.

Drawing on international experience and case studies the aim of the research is to develop a decision making framework designed for collaborative use by relevant regional disaster debris management decision-makers. The framework will be tested through the development of two disaster debris management plans in New Zealand.

LINKING DISASTER RISK REDUCTION AND CLIMATE CHANGE ADAPTATION: THE EXPERIENCE FROM INDONESIA

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The need to link climate change adaptation and disaster risk reduction (DRR) has recently been gaining momentum. The Bali Action Plan of the UNFCCC Parties recognises that existing knowledge, experience and capacities for reducing vulnerabilities and increasing preparedness to extreme weather events must be harnessed in adapting to climate change. DRR must be a key component of the post-2012 climate change policy framework if an effective, sustainable approach to adaptation is to be achieved. The 2009 Global Platform on DRR also reiterates the importance of the synergies between the two approaches.

The need for convergence is strong because there is significant overlap between the theory, policy and practice of DRR and climate change adaptation. The adaptation and DRR communities have many similar aims and could benefit by collaborating more closely. However, research shows that these two communities are still working largely independently (Schipper, 2009). This situation must change in order to bring about an integrated approach that reduces vulnerabilities to climate-related hazards and builds adaptive capacity to climate change. DRR takes into consideration current climate variability and is perceived as the 'first line of defence against climate change' (Mitchell and Aalst, 2008). On the other hand, to ensure successful implementation of DRR in the future, more severe and frequent impacts as a result of a changing climate need to be taken into account and mal-adaptation that increases vulnerability must be avoided.

There are various methodologies proposed for the convergence. The underlying idea of the proposed method is the importance of communication and information sharing between researchers, policymakers and practitioners of the two communities. Sperling and Szekely (2005) proposed several approaches ranging from integrative approach, convergence of approach, significant benefits, pragmatic approach, non-regret policy approach, existing experience, addressing barriers and challenges, as well as strengthening leadership. Thomalla et al (2006) proposed three experiments of a resilience/vulnerability dialogue: identifying regions of large-scale vulnerability as well as meta-analysis of vulnerability. Some of these recommendations apply to both communities, others are specific to each community. However, while the need to link the two approaches has been highlighted by many researchers, the operationalisation and implementation has so far been limited. Mitchell and Aalast (2008) outlined several obstacles for the convergence relating to international policy processes, multi-lateral and bi-lateral institutions, financing mechanisms, and implementation at the national level.

In this research project, I will explore the lessons of current efforts aimed at linking climate change adaptation and DRR in Indonesia in order to develop a framework for mainstreaming these two approaches into development planning at the local government level. The questions guiding the research will include: 1) which government agencies are currently tasked with climate change adaptation and DRR?; 2) what are the opportunities and obstacles to increase collaboration between these agencies or to establish new institutions?; 3) how can synergies be created in existing strategies and policies and what new policies are emerging?; and 4) how do sub-national government institutions engage with these issues and implement new strategies and policies?

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A KAIKOURA TSUNAMI? THE PLAUSIBILITY OF A SUBMARINE LANDSLIDE-GENERATED TSUNAMI AT KAIKOURA CANYON

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The head of the Kaikoura Canyon is located in close proximity to shore at Goose Bay in the Kaikoura district. Sediments are deposited regularly into the canyon from rivers to the south via longshore sediment motion. These sediment deposits, which already exhibit tensional fracturing, continue to build up in a tectonically active area. Rupture of the nearby Hope Fault or the more distant Alpine Fault, which is expected to occur every few hundred years, could induce failure on the deposits. The subsequent submarine landslide is expected to produce a tsunami of significant magnitude in the nearby Kaikoura township. There should presently be sufficient amounts of sediment to cause such a tsunami.

The failure of the Kaikoura Canyon sediments potentially could occur approximately every 100-200 years, in which case there should be sedimentological evidence in the Kaikoura region and prehistoric accounts in the form of oral histories and legends referring to extremely large waves or taniwha, sea monsters. If there is evidence that the Kaikoura Canyon will produce an appreciable tsunami then it will be necessary to determine how the people will react and what emergency measures need to be put in place.

LANDSLIDE-GENERATED TSUNAMI HAZARDS IN FIORDLAND (NEW ZEALAND) AND NORWAY

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Sub-aerial or submarine landslides can generate large displacement waves, sometimes with devastating consequences. Catastrophic rockslides fall into the fiords of western Norway about every 100 years: during the last century, 174 people have been killed by landslide-generated tsunami, including the 1934 Tafjord rockslide which generated a 62 m high wave, killing 41 people. Hazard evaluation for the Norwegian fiords is based on high-resolution sonar imagery of landslide deposits, seismic reflection data, and event chronology developed from radiocarbon and surface exposure dating. The ongoing hazard is managed by identifying and monitoring potential failure areas, calculating slide paths and estimating slide properties at the points of impact. High-risk locations are monitored intensively, and include the 50 x 10^6 m^3 Aknes slide area on Geirangerjord which could generate a tsunami of up to 30 m in height, and the 10^6 m^3 Akernes landslide above Storfjorden. The current system of hazard evaluation and mitigation in western Norway is effective because large landslides are normally preceded by smaller rockfalls and by accelerating motion of the rock bodies.

By contrast, large landslides in the very similar but highly seismic terrain of Fiordland, southwestern New Zealand are most likely earthquake-initiated, and therefore precursory minor rockfalls are unlikely. Co-seismic landslides are common in New Zealand; seismic shaking serves as the primary trigger for failures that are preconditioned by progressive degradation of rock mass strength since deglaciation. The seismicity of Fiordland is dominated by the plate-boundary Alpine Fault, which runs immediately offshore of the popular tourist destination of Milford Sound; it has ruptured at least four times in the past 1000 years (the last time around 1717 A.D.) producing earthquakes of about magnitude 8. The probability of an earthquake of similar magnitude occurring along the Alpine Fault within the next 50 years is estimated at $65\pm15\%$.

New seismic reflection and high-resolution sonar data from the fiords of New Zealand clearly show the presence of large rock avalanche deposits. I compare the distribution of landslide deposits in Milford Sound to that in Tafjord in Norway, and compare the means available to manage the hazard risk in both locations.

A COMMUNITY RECOVERY COMMUNICATION MODEL

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This poster is designed to show graphically how organisational structures set in place after a disaster could be designed to have a major, beneficial effect on community recovery.

Most organisational structures are predicated on a hierarchical, top-down concept with the CEO, Premier or Chief Minister at the top, and branching substructures beneath in a military-style line of command. This is part of a command-and-control mentality that has been shown to provide less than optimal benefits for surviving communities in their recovery efforts.

One of the key aspects missing from traditional organizational structures is the place of communication – not the giving of orders or instructions, but communication as dialogue facilitating feedback and aimed at mutually acceptable and beneficial outcomes.

The model illustrated in this poster puts the recovering community at the top of the diagram, since their need for assistance, support, advice and material aid is paramount in disaster recovery. Moreover, the community itself is in the best position to know what is required, when it is required, and by what means it should be delivered. The only way authorities can meet these needs is to listen to the community and act on that information. This model enables such a response.

Recovering communities require facilitation and support in their efforts to achieve 'a new normal' after disaster, rather than a plethora of prescriptive, one-sided information. The organisational structure proposed supports a dialogic model, showing how each segment of the structure has communicative connections to others, with a specialized communications unit facilitating, monitoring and managing the overall communications picture.

In brief:

- All structures are put in place with a focus on who it is all for – the affected community, not the organisation charged with recovery operations.
- Communication is the lynchpin between all functional areas.
- Communication as a management function sits close to the dominant coalition (Mayor, Premier, CEO etc).

All functional areas respond to the need for responsive, two-way communication to ensure that messages and information are understood, and that unmet needs or oppositional responses are heard and methods, assistance or facilities are changed accordingly.

PLANNING FOR RESILIENT COMMUNITIES IN ACEH POST-TSUNAMI: LESSONS FROM VILLAGE SPATIAL PLANNING

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To understand the planning process in Aceh reconstruction post-tsunami is really a challenge. The process is complex, compressing all aspects of urban development into a short time period. It is like building a ship while floating in the middle of the sea. This paper discuss about planning issues in Aceh post disaster recovery. Which planning theories are more appropriate in Aceh situation? Should government led in the planning process or community led? it will look at the application of theories in planning of reconstruction and the implementation at the level of government and of community. We draw lesson from the case study of villages in Banda Aceh City (urban villages) and in Aceh Besar Sub district (rural villages). We focus to examine the process of the village spatial planning during the reconstruction process in three communities in Aceh. Evaluation on village planning performance conducted based on three essential aspect of post disaster recovery planning, namely: reconstruction, mitigation, and community participation aspects. One of village spatial plan project in Aceh supported by Australia Government under LOGICA project, other by USAID, GTZ, BRR, etc. From the case studies we can learn how the concept of build back better to be implemented, factor that promote or hindered the achievement. A document review on village plan, interview and field observation was conducted to get insight to the village planning process.

RESIDENTIAL BUILDING DAMAGE FROM VOLCANIC ASHFALL IN FUTALEUFÚ, CHILE

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From 2-6 May 2008, following a Plinian eruption of Chaitén volcano, rhyolitic ash fell over 20,000 km^2 of southern Chile and Argentina. An estimated volume up to ~4 km^3 (non-dense rock equivalent) of rhyolitic magma was erupted, mostly during the explosive phase during which both urban and rural communities were affected. The town of Futaleufú, Chile (~70 km away) received a total thickness of 300 mm of ashfall and suffered disruption to water supply, electricity supply, transportation, and telecommunication services. Both residential and commercial buildings suffered gutter damage, corrosion of roof cladding, limited structural damage to several roofs, and internal contamination by ash. Research is underway to itemize the damage observed in Futaleufú, assess the impact to the local building stock, and then by using the damage intensities observed, present a comparison of the damage that would be sustained in a similar community in New Zealand.

THE IMPACT OF THE 2004 BOXING DAY TSUNAMI ON PEOPLE'S LIVELIHOODS AND THE EFFECTIVENESS OF AID

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Most disaster studies have been carried out in Western (and often urban) settings, and studies of tsunamis are an emerging area of research. This research is to extend the existing literature to understand the impact of natural disasters on small island communities and also to examine the effectiveness of aid that was given in the aftermath. It will also attempt to find possibilities for reducing the vulnerabilities to ecological disasters of small communities of people. The study will also explore, from the recipients' viewpoint, the politics of relief aid received (both local and foreign) in terms of its timeliness, management, and effectiveness to the tsunami-affected communities. Provision of aid to the relief sector in the literature is debated in the areas of civil society, its organisations and their contribution to the enterprise. Reports published by World Bank and International Financial Institutions have raised concerns about the delivery and the effectiveness of aid to fight global poverty, suffering and destitution. It is also important to evaluate whether the aid given has been destructive or constructive for these communities.

MULTI-HAZARD LOSS MODELING: RISKSCAPE NEW ZEALAND

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New Zealand is exposed to a wide variety of natural hazards, including volcanoes, earthquakes, floods and tsunamis. To identify community vulnerability and prioritize resources for hazard management, it is important to understand the relative impacts natural hazards have on communities. The National Institute of Water and Atmospheric Research (NIWA) and GNS Science are jointly developing RiskScape, a multi-hazard tool that models potential losses and supports decision-making for the management of natural hazard events. RiskScape improves the information and understanding of natural-hazard risks for a range of end-users, including land-use planners, emergency managers, and the insurance industry.

RiskScape combines current scientific and engineering knowledge about community hazards, built environment, land uses, and social characteristics into a powerful geo-information framework, the loss-modeling software package 'RiskScape'. This tool can be used for analysing and comparing the potential impacts of natural hazard events, within different regions. The RiskScape System is built on a modular modeling framework. New hazard, asset, or loss modules can be seamlessly integrated into the running system. The geospatial zone of influence of a particular hazard event is ascertained and its local intensity established. Then the impact is calculated using vulnerability or fragility functions by geospatially intersecting the hazard exposure with built-environment inventories and demographic profiles of the at-risk population. Analysis of a events with a range of recurrence intervals will provide probabilistic risk estimates.

A critical factor in modeling losses is information about all assets that may be impacted. A comprehensive inventory of assets and people is the backbone of a loss-modeling tool. Dealing with different types of hazards and numerous assets and land uses requires a huge amount of information, particularly the characteristics of the assets at risk e.g., construction characteristics of buildings, routes for utilities such as water supply, demographic details and business information. A comprehensive national database of building and infrastructure attributes does not exist in New Zealand. Whilst existing building valuation databases are a useful starting point, providing a few basic attributes, different methods are being tested (e.g. remote sensing analysis) to find the most efficient approach to estimating some of these attributes where the data does not exist.

Consequences for each region are presented in a common platform across all hazards. Each model uses a similar framework however; multi-risk modeling poses different challenges than classical risk assessment and has several features and implications to be considered – both in the modeling process and in using the results. The technical framework is independent of the specific nature of the individual hazard and the vulnerability of individual assets. The RiskScape System was implemented as a stand-alone Java application, including a set of basic functionalities, embedded into an application programmer interface (API), and a graphical user interface (GUI). This framework ensures that all the requirements for RiskScape are being met by an easy-to-use, transparent interface, and basic GIS functionality is included without being restricted in a proprietary GIS environment.

INCREASING RISKSCAPE'S VALUE TO USERS: HORIZON SCANNING (2009-2016) CONNECTS PAST LESSONS TO FUTURE DELIVERABLES

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The purpose of this poster is twofold. Firstly, to establish that the RiskScape development team has refined methodological approaches that qualify and quantify societal vulnerability and infrastructure vulnerability to natural hazards, using a multihazard loss estimation framework to model potential loss from environmental hazards. In addition, to scan relevant software development literature with the view that RiskScape will benefit as the research team considers current discussions in the technical interoperability standards literature, inclusive of the role users' input can play in ensuring that users' needs and software capability are better aligned. By technical interoperability standards literature it is meant the literature that focuses on user interface management and workflow issues as well as users' priorities, data requirements and feedback on current software development.

The poster has four sections. First, we set the broader information integration platform context (2004-2016). We list envisioned future benefits and value RiskScape may bring to a) formal sciences, b) the natural sciences, and c) the social sciences. In addition, we provide a preliminary overview of some challenges likely to be encountered: challenges specific to providing natural hazard and socio-economic data analysis services and outputs as RiskScape takes active steps in negotiating with users to manage an analysis portal accessed by all users, with different output requirements, and with different levels of technical expertise.

Second, we set the historical context, with an analysis of the historical communication management frameworks used by the RiskScape development team. Primary evidence reveals that the RiskScape development team focused on the development of the multihazard loss estimation model as a means to communicate with users. This is how the RiskScape development team collected, analysed and reported on users' priorities, data requirements, and users' feedback in the 2004-2008 software development phase. The analysis of the RiskScape development team's past difficulties in managing users' communication offers two important lessons for the future. Yes, the loss estimation model allowed the research team to improve its ability to encode climate change and natural hazard data in RiskScape Model; and standardize outputs. However, the RiskScape development team's focus on the loss estimation model has meant that the research team lacked a software development strategy to manage numerous difficulties encountered meeting wide spectrum of users' interests and needs.

The third section will focus on the present – a time when the RiskScape development team is following a six prong communication management framework with users (2009-2012) as part of its software development strategy. We now know: a) users' input is required to develop a better analysis portal for a wide spectrum of users; and b) we need to build communication bridges among different disciplines, professions and individual researchers. The present software development strategy will allow the RiskScape development team to better manage likely challenges: e.g. providing data analysis services and outputs as we collect and analyse users' feedback on the current software development (2009-2016).

The concluding section focuses on the future, when the RiskScape development team can better manage users' input. In sum, we envision that the technical interoperability standards literature will provide the foundational base for RiskScape to participate in an institutional structure such as a nationwide information interoperability organisation.

See www.riskscape.org.nz

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