

## **Conference proceedings**

# **1st Australasian Natural Hazards Management Conference: from warnings to response and recovery**

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## DISASTER DENIAL: SOLUTIONS FOR SURVIVAL

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This project involves the development of new product designs and product visions designed to mitigate the effects of a natural disaster. It was inspired by a two-day workshop 'Natural Disaster Solutions' held in November 2005 in Christchurch. Participants at the workshop affirmed the relevance of the subject, that the subject was broad, and that it was outside the usual bounds of individual company consideration. The very dramatic scenarios arising from a natural disaster inspired products that crossed contemporary company boundaries and product ranges.

The three stages of the planned project are outlined below. We are currently at the end of Stage Two.

### *1) Research and concept generation*

Research and development of a body of knowledge about the field, followed by idea and concept generation that addressed particular disaster scenarios.

### *2) Development and resolution*

This involved grouping initial concepts by subject matter, and reviewing and selecting from these clustered concepts areas of interest for development. Eleven areas have been selected: a human registration system; a rescue backpack; a stretcher; domestic water conservation; a personal communication device; an electronic positioning emergency radio beacon (EPERB); a water collection device; reusable flares; an ablution/toilet device; rescue tools; a nebulizer.

### *3) Promulgation of the concepts*

The outcomes will be presented by making models and prototypes of product concepts and preparing presentation panels explaining and providing context for the concepts. These will be exhibited throughout New Zealand.

It is hoped that the product concepts presented will promote discussion and dialogue about disaster preparedness between the public, civil authorities, industry and the university. Providing a contemporary reference helps us to assess whether the existing provisions for natural disaster are still satisfactory.

## **CREATING HAZARD-RESILIENT COMMUNITIES: UNDERSTANDING HOW PEOPLE MAKE MEANING OF HAZARD INFORMATION AND HOW THIS INFLUENCES PREPAREDNESS**

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Research has shown that a number of community and individual attributes can be used as indicators of resilience. These indicators include outcome expectancy, action coping, articulation of problems, community participation, empowerment, social trust and self-efficacy (McClure et al., 1999; Paton et al. 2000; Paton et al., 2005; Paton et al., 2006; Ronan et al., 1999). A model of community resilience which incorporates these attributes is currently under development; (Paton et al., 2006). This model seeks to outline the relationships between the different influences, and to make suggestions for increasing community preparedness.

To date, as part of the modeling process, research has focused on identifying predictors and defining the linkages between them to construct a model. However, there has been very little in depth study on the processes that influence specifically how individual, community and societal factors interact to determine how people render hazard information meaningful, and how this interactive process translates into preparedness actions. Research over the following three years will investigate this issue.

Following a literature review, and the selection of a conceptual methodology to work within, three community case studies will be chosen. The case studies will be carefully selected to ensure that the context of the environment (including key parameters) is broadly comparable. For example, one criterion of the selection of geographic locations will be the degree to the hazardscape affords comparable levels of risk for citizens. Locations will also be selected to ensure that risk management is undertaken within the context of similar legislative/regulatory frameworks and implemented through similar civic institutions.

Approximately 20 unstructured interviews will be undertaken with individuals in each community to explore how people make meaning of hazard information, and the factors behind why these people do, or do not, prepare. Communities will also be monitored over time to explore the effects of any subsequent education programmes and engagement strategies.

The ultimate aim of this research is to enhance community resilience to natural hazards. With a better comprehension of the influences and mechanisms that enhance sustained household and community preparation, we hope to contribute to the creation of effective policies for hazard management at central government and civil defence emergency management group level.

## PRE-EVENT RECOVERY PLANNING FOR LAND USE IN NEW ZEALAND

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This research addresses the issue of recovery after a disaster, and presents a methodology for pre-event recovery planning for land-use in New Zealand. A full report detailing the research is available from the GNS Science website at <http://www.gns.cri.nz/services/hazardsplanning/>.

The research particularly focuses on how land, or a particular land-use, may be affected by a hazard event, and provides a methodology for how it may be 'recovered' or used afterwards. The pre-event land-use recovery methodology is based on the process followed for the Australia/New Zealand Risk Management Standard (4360:2004), and focuses on using existing legislative frameworks and processes already available in New Zealand.

The methodology is aimed primarily at local authority land-use planners who deal with land-use issues on a daily basis. However, the methodology will also be useful for a range of people in professions who may be involved with recovery, including civil defence emergency management (e.g. recovery managers); resource, insurance and risk managers; land owners; and developers.

The methodology is presented in the form of a flow chart allowing users to follow a comprehensive set of steps in completing the process of planning for land-use recovery. These steps include:

- establishing the context for land-use recovery and identifying risks;
- identifying gaps;
- analysing risks and developing options for land-use recovery;
- evaluating risks and prioritising options for land-use recovery; and
- treating risks (implementation).

Once risk treatment options have been prioritized, there needs to be some method of delivering these. There are a number of existing frameworks and processes available in New Zealand that could be adapted to accommodate pre-event recovery planning, making it part of everyday routine. These include regional and district plans, civil defence emergency management group plans, long term community council plans, asset management plans, structure plans, growth strategies and other non-regulatory documents such as business continuity plans and risk management plans. The research report suggests various planning measures that would assist with pre-event land-use recovery planning, and the frameworks that could incorporate these measures.

## COASTAL HAZARD RISK MANAGEMENT CONUNDRUMS

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The foreshore is where a natural battle rages, episodically, between a highly dynamic ocean and pliable coastal land margins. Such a battle typically only becomes an issue when 'permanent' human settlement and assets on this pliable margin become exposed and therefore vulnerable to damage. Projected climate change effects on coastal dynamics, including sea-level rise, will further exacerbate the risk in every coastal locality. There has also been a growing awareness of the possible consequences of tsunami events: yet another coastal hazard to contend with.

New Zealand has now benefited from coastal hazards research over 45 years, beginning with some university coastal groups, and more latterly, agencies like NIWA. New Zealand's ground-breaking Resource Management Act, which focuses on achieving sustainability and environmental outcomes, was enacted 15 years ago. However, there are a number of questions that need to be addressed by researchers from various disciplines and policy/planner practitioners about the quality of the outcomes that are being achieved in managing coastal-hazard risks. Is coastal research making a sufficient contribution to informing the debate and decision-making processes, given societal constructs on coastal living and individual property rights? How will we cope with a compounding risk arising from global warming effects? What are the planning/policy barriers to coping with a rising residual risk and ultimately adaptation to climate change? How well integrated is emergency-management planning with land-use planning and building codes in dealing specifically with residual risk?

Recent coastal research and climate change projections have highlighted both the capricious and insidious nature of threats to coastal margins, which pose increasing challenges in planning and managing developed coastal areas. These research findings predominantly show the need to temporally and spatially upscale coastal research, resource management and planning to span interannual and interdecadal climate variability, source-to-sea interconnectedness, downstream effects of coastal development, long-term climate change and coping with mega-events like tsunami or tropical cyclones. As a society, we live very much in the 'now', as exemplified by burgeoning coastal developments. However, both our strong attraction to the coastal lifestyle and our tendency to resort to a 'hold the sea back' paradigm when assets are threatened will need to be modified as we enter an era of unprecedented change towards ongoing and greater hazard exposure. A switch to a more sustainable coastal management paradigm is required to gradually restrain the couplet of rising risk and deterioration in environmental values, services and amenities (including public access). This calls for a concerted effort by all disciplines and agencies in raising awareness, backed by a determined commitment to engage and assist coastal communities to think and plan at intergenerational timescales.

## **CAPACITY BUILDING IN EARTHQUAKE AFFECTED AREAS OF PAKISTAN**

**Jitendra Bothara**

A M7.6 earthquake struck Northern Pakistan in October 2005, causing the death of more than 73,000 people and damaging or destroying more than 350,000 buildings. The poor performance of the building structures was the main cause of the human and property loss. The buildings performed poorly because they lacked earthquake-resistant features, the quality of construction was low, and their builders had not understood the strength limitations of the materials. There was a lack of awareness of earthquake hazard in the region, a lack of capacity in earthquake-resistant construction, and a shortage of construction materials. As well, there were socio-cultural and economic reasons for the type of construction. In response to the massive destruction, UNDP-Pakistan invited the National Society for Earthquake Technology-Nepal (NSET) build the capacity of local building stakeholders in the earthquake-resistant construction of buildings. This paper shares the experiences of the NSET team in investigating what happened in the earthquake-affected area and why. It then describes the approach adopted by the team for capacity building in the area.

# **AN ASSESSMENT OF THE PUBLIC PERCEPTION OF THE AUSTRALIAN BUREAU OF METEOROLOGY'S SEVERE THUNDERSTORM WARNING SERVICE**

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In 2003, the Commonwealth Government allocated funding to the Australian Bureau of Meteorology to allow the Bureau to modernise its radar network and supplement its severe weather warning capabilities. One of the key deliverables of the Radar Network and Doppler Services Upgrade Project (RNDSUP) is improvements in severe thunderstorm warnings. This is being achieved through improvements to radar data and information systems such as the Thunderstorm Interactive Forecasting System (TIFS), which produces graphical severe thunderstorm warnings for specialised clients as well as the general public.

In order to assess the Bureau's performance in meeting the severe thunderstorm warning requirements of the Australian public, considering aspects such as the accuracy, timeliness and usefulness of the severe thunderstorm warning service, an online survey was conducted during the 2006/2007 summer. The survey resulted in over 37,000 responses over a four-week period.

Based on the survey responses, this presentation discusses how members of the Australian public use and understand severe thunderstorm warnings, including graphical severe thunderstorm warnings, when making weather-dependent decisions, and assesses their understanding and perception of the severe thunderstorm warnings. The survey revealed that 92% of respondents found the severe thunderstorm warnings easy to understand, with 93% of respondents who use graphical severe thunderstorm warnings indicating that the graphical section of the graphical severe thunderstorm warnings improves the warning. These responses indicate that the improvements to the severe thunderstorm warning service have been well received by the Australian public.

## **INTRODUCING THE EAARS *EMERGENCY, ALERT, ACTION and RESPONSE* SYSTEM**

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The EAARS *Emergency, Alert, Action and Response System* is a new communication technology that integrates online two-way bulk SMS text messaging and offsite online database systems analysis for activation, individual message receipt confirmation and individual action response reporting. The foundation of the patented technology is the ability to store individual SMS messages in an online database and provide real time reporting of individual responses. The system has the potential to solve several problems for the emergency manager who needs to know that targeted groups have received bulk-warning messages and have acted or not acted using the desired responses. The poster will graphically describe an example of how the EAAR system will work in two emergency situations.

In the first example a rural fire emergency team is notified using the EAAR system. A bulk SMS message is activated using a single online prompt by the rural fire emergency manager. Each individual rural fire emergency team member receives a SMS text message on their mobile phone. In the hypothetical example 22 out of the team of 25 respond with a SMS text message indicating that they can meet at the pre-assigned meeting location within 15 minutes. Three team members respond with different action responses indicating that they cannot report for duty on this occasion within this time frame for some reason.

In the second example a rural school in a known fire risk area decides to evacuate students to the school oval due to an emergency following the schools emergency evacuation plan. As part of the school's evacuation plan the school's emergency manager activates the SMSbulkalert message to every parent and or care-giver, emergency service and staff member using an online computer in a near-by business outside of the evacuation zone, which became the control centre. In this hypothetical example, 250 parents respond that they can pick up their children at the time specified in the EAARS message. Fifty parents did not respond, and front office team focused on resolving these issues. Twenty-five parents responded that they could pick up their child at a later time. Forty-nine of 55 staff responded that they would meet at pre-assigned locations in school evacuation plan. Two teachers were not attending school that day. Four remaining teachers reported problems that were acted on.

The EAAR system appears to provide a new tool for emergency communication by providing bulk messaging using any online computer and frees up emergency management time to manage individual situations. Comments are requested.

## THE HYDRANT MAINS-CONNECTED EMERGENCY WATER TANK SYSTEM

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In preparation for an emergency or disaster, New Zealand Civil Defence recommends the storage of water. Potable water supplies may be in jeopardy from broken or damaged water lines or rendered unusable through cross contamination with damaged infrastructure, such as sewage pipes and fuel storage. The recommended quantity of water storage is six litres per person per day for three days, providing three litres for drinking and a litre each for cooking, washing up and personal hygiene. This equates to 54 litres for a family of four. The hot water cylinder has been the traditional emergency water supply system, but these have become less common with the advent of continuous hot water systems.

At present individuals must source suitable storage containers, provide a place to fill and store them, and refresh them once a year. A brief was developed to improve the rate and success of emergency water storage by developing a dedicated water storage product.

Early concept investigation identified a strong potential for an in-house system. Development and screening of this concept helped us understand more about:

- How the product components could work together.
- The storage location within the home.
- The physical characteristics such as size and volume.
- How people would use it.
- How to make it more useful.

New objectives and criteria were developed to focus and further direct design effort. Ergonomic evaluation of the product concept has developed the usability and manual handling of the product. The result is a product that features:

- Easy installation.
- Minimal maintenance.
- A self-refreshing feature that eliminates the need for manual refilling.
- Slide out tanks that can be easily carried to a safer location or to a communal refilling station.
- Modular product architecture that permits easy expansion of storage capability for individual needs.
- Low maintenance fit and forget functionality.
- A sturdy, stable racking system.
- Integration with mains supply, plus easy isolation after an emergency event.
- Utility of installation either inside or outdoors.

Hydrant is a simple, easily integrated product that can be retrofitted into existing homes or specified in new construction. It can be connected to any reticulated water system, inside or outside, or installed as a stand-alone external unit anywhere on a property. Hydrant provides an elegant single solution to the problem of emergency water storage.

## **EMERGENCY MANAGEMENT IN SCHOOLS**

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Children and their families have been identified as particularly vulnerable to the effects of hazard events. Research aimed at assisting children, youth, and families more effectively cope with the effects of disasters is being undertaken in the Wellington region. In collaboration with local emergency management organisations, we are assessing the level of emergency management education and preparedness in Wellington, Hutt Valley, Porirua, and Kapiti Coast schools. The study aims to look at current emergency management teaching and exercises within schools, to assess the information and resources available, and how they are used for emergency management education and preparedness. We anticipate the findings of this survey will lead to more uptake of hazard information within school curriculum teaching. Increasing our children's knowledge of New Zealand hazards and improving their preparedness if a hazard event should occur can only benefit their future.

## **SOCIAL IMPACT ASSESSMENT FOR DISASTERS**

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Studying experiences that are the result of previous disasters, hazards or crises provides information to reduce vulnerability and enhance resilience of individuals, families, and communities. What is learnt and understood becomes incorporated into emergency management, organisational practice and community awareness and preparedness activities. These types of studies which are often referred to as 'post-disaster' studies can vary in terms of the type of event; the time elapsed since the event; the scale of the event; and the size of the community affected. Many post-disaster studies focus on negative aspects, forgetting that there may be some positive outcomes and ignoring the resilience that resides in communities. It is important to address all kinds of impacts so that we do not underestimate latent community resources. Post-disaster studies are a form of social assessment.

Post-disaster studies, social assessments and social impact assessments are all closely related activities. However, post-disaster studies are obviously after the event whereas social assessments and social impact assessments should preferably be carried out before an event. Social impact assessments also tend to be a legal requirement of many environmental impact statements and development activities. This paper reviews the linkages between social impact assessments as pre-event activities, post-disaster impact assessments as post event activities, the types of variables that need to be considered, and the different types of methodologies that might be used. The linkage to pre-event assessments and the role of planning in disaster mitigation is also made. A classification of disaster impacts is presented that identifies different timescales and methodologies of impact studies. From this, a model of social impact assessment of disasters is developed as a structure that may guide both the methodology and the assessments within the context of pre existing vulnerability and mitigation strategies.

## TOWARDS MORE EFFECTIVE TROPICAL CYCLONE WARNINGS

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The tropical cyclone warning process consists firstly of the cyclone analysis and forecast information and secondly, of the transfer of this information to the user. For this process to be effective the analysis and forecast have to be accurate *and* this information has to be delivered in a timely fashion using a range of technologies and formats enabling the user to make appropriate decisions. If decision makers don't fully understand the range of possibilities, the official warnings lose their effectiveness, no matter how accurate they may be.

The Bureau strives to be at the forefront of international efforts to improve the meteorology of cyclone forecasting in terms of location, direction, intensity and impacts (wind, rain, waves and storm surges) of cyclones. Improvements in computer modelling are a key driver in this process, although the interpretation of satellite information remains fundamental in the analytical process particularly in the areas of sparse data offshore. These scientific advances can be described as incremental, and much work remains to improve intensity forecasts, cyclones under extra-tropical transition, forecasts for unusual track behaviour and quantifying rainfall and storm surge impacts.

A software package facilitating the warning process has been developed in Australia, and is now being exported. This has allowed a greater range of products to be quickly delivered via different media and in different formats to a range of users with different needs. For example, the graphical forecast track map on the internet allows the public to see the past track, the current location with the range of damaging (category 1), destructive (category 2) and very destructive winds (category 3 or higher) winds, the watch and warning zones and, of particular importance, the forecast track and accompanying uncertainty area. This uncertainty area represents the range of likely track in the next 48 hours and is a first step in conveying a level of confidence in the spread of possibilities. It is a major improvement on forecast lines depicted as single thin black lines, which conveyed unrealistic expectations.

Community alerts have been added to the warning process in Western Australia. These are determined by FESA and are added to the tropical cyclone advice issued by the Bureau of Meteorology. There are four levels:

1. Blue alert
2. Yellow alert
3. Red alert
4. All clear with caution

Each alert level has a specific recommended action for the community. These stages are decided following a teleconference between emergency services personnel at which the cyclone forecaster briefs key users on the most recent information.

The final component of the warning system is that the public need to be aware of potential risks, and be both motivated and able to take appropriate action. This relies on a comprehensive community preparedness strategy. Post-event surveys can highlight reasons why people may not take appropriate actions, and can be used to shape subsequent education approaches.

## **COMMUNICATING THE TROPICAL CYCLONE RISK IN WESTERN AUSTRALIA: WHAT WORKS AND THE CHALLENGES AHEAD**

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As the northwest coast of Australia between Exmouth and Broome experiences more cyclones than the rest of Australia's coastline combined, it is vital that communities understand the risk and potential impacts, and know what to do when a cyclone threatens in order to prevent loss of life and minimise damage. It is also important that this awareness process begins well before the cyclone event. People's understanding is strongly shaped by their experiences and, despite the relatively high frequency of events, only a minority of people have endured the very destructive winds of a severe cyclone. Even fewer people will have experienced a significant storm surge. This builds complacency particularly in communities that have had many 'near misses' in recent years. The many new residents in the Northwest have little cyclone experience and may be anxious at the prospect of a cyclone.

To meet these challenges, the Bureau of Meteorology and FESA work in partnership to communicate the cyclone risk using a number of strategies. A key component of this are pre-season tropical cyclone awareness tours that address a diverse range of groups, particularly emergency services, but also community and industry groups. These meetings are valuable in establishing relationships with people in emergency services, media and industry. Presentations include video footage of cyclone events to give people a better idea of what it is like to experience a cyclone, and are updated with material from recent tropical cyclone events.

Apart from the pre-season tour, cyclone information is communicated through the internet: ([www.bom.gov.au/weather/wa/cyclone/about/](http://www.bom.gov.au/weather/wa/cyclone/about/) and [www.fesa.wa.gov.au](http://www.fesa.wa.gov.au)), through the media, a cyclone DVD and through the local SES and Bureau staff. People are most attentive when a cyclone is imminent, so having information readily available on the internet and via well-informed media is vital.

Despite these efforts, considerable challenges remain. Storm surges are a difficult concept for people to understand. If a severe cyclone threatens a community, emergency services have no choice but to evacuate people in low-lying areas. However, people have to understand that nine times out of ten people will be evacuated without anything happening because of the nature of a storm surge.

While tropical cyclones have a high profile in the north of WA, it is much harder to keep the public informed along the west coast, and particularly in Perth and the southwest where the cyclone incidence is lower. The absence of recent events and the complex range of potential cyclone impacts ranging from hot and windy conditions (leading to an extreme fire hazard) to flooding rains add to this challenge.

## **EXPLORING THE IMPACTS OF EMERGENCY SERVICE VOLUNTEERING ON VOLUNTEER FAMILIES**

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Despite the widely-acknowledged importance of families in supporting the endeavours of emergency service volunteers, little is known about the impacts of emergency service volunteering on family life. As the first stage of a program of research addressing this issue, interviews were conducted with 20 Victorian Country Fire Authority (CFA) staff who were managers of volunteer firefighters. Several themes were identified from transcriptions of the interviews, providing an agency staff perspective of how volunteering could impact on families. Negative impacts included some volunteers consistently prioritising brigade needs ahead of family responsibilities, with consequent resentment by family members. Positive impacts included enhanced social networks. The next stage of the research will involve obtaining information from emergency service volunteers and family members. The aim of the research is to provide volunteer-based emergency service agencies with information to better inform family support policies and procedures.

## ASSESSING AUCKLAND'S CAPACITY AND CAPABILITY TO PREPARE FOR AND RESPOND TO A DISASTER

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Auckland is New Zealand's most populous region (1.3 million) and is the country's economic and commercial centre. It is at risk from numerous hazards, including volcanic eruptions, tsunami, ex-tropical cyclones, and pandemic. To date, no significant hazard event requiring a regionally coordinated civil defence response has occurred. In the absence of actual events against which performance in responding to an event can be measured, other methods are required to assess the region's state of readiness.

The Auckland Region Civil Defence Emergency Management Group (CDEM Group), which is responsible for emergency management in the Auckland region, has recently assessed its capacity and capability to respond to a disaster. In the first of its kind in the country, the CDEM Group has undertaken a structured semi-quantitative assessment across a range of emergency management functions. The resulting score-card has established a benchmark against which future improvements can be measured.

The assessment is derived from an independently developed rating methodology which examines the *collective* operational readiness for the CDEM Group partners (emergency services, local authorities and lifeline utilities) to prepare for and respond to emergencies and disasters. The methodology comprises a self assessment survey supported by workshops, interviews and an independent review of CDEM Group reports and exercise evaluations. The methodology is largely semi-quantitative, although for this first assessment and to reflect the still developing maturity of the emergency management sector, qualitative inputs were required to inform the assessment. Although confined in this project to an assessment of operational readiness and response, the methodology is flexible enough to be extended to reduction and recovery.

The results of the assessment have been used to re-evaluate priorities and review the CDEM Group's work programme. The assessment has also resulted in political support for a threefold increase in budget.

The presentation will discuss the assessment methodology and its scope, look at possible future applications of the methodology and discuss the importance of evaluation and performance monitoring in an emergency management context.

## **CREATING RESILIENT COMMUNITIES IN THE PACIFIC – INNOVATIVE WAYS TO IMPLEMENT DISASTER RISK REDUCTION**

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The integration of risk assessment, environmental management and land use planning with emergency management is feasible and desirable, particularly in Pacific Island nations where there are high risks from natural hazards but low funding to address and respond to these hazards. By directly involving communities in determining their level of risk and mitigation and response options, the resilience of communities can be greatly enhanced.

This poster presentation examines the principles of creating resilient communities, through a 'partnership' approach with communities and private sector organisations, community participatory processes and by respecting local values, traditions and customs.

A range of innovative methods and tools will be presented which have been used to develop national level policy documents, local (district and village) level infrastructure management plans, and community and agency response plans. In particular, there is a strong focus on reduction by hazard avoidance, through community focussed initiatives and approaches that enable better integration of environmental management, land use planning and emergency management. For example, the use of community-driven planning projects, advocacy and education and support services (such as training courses and manuals) are examined.

In the Pacific context, the focus is on how developing Agency Response Plans and Village Response Plans has provided opportunities to improve basic disaster risk reduction components, such as integration with national disaster management structures, warning systems and internal village communications, identifying 'safe' places, and provision of disaster supplies and signage.

In the New Zealand context, the focus is on how wider community planning processes (e.g. local Structure Planning and land use development planning) can incorporate emergency management planning to better enable integrated approaches.

Finally the poster presentation sets out what we can learn from the approaches taken in New Zealand and Samoa, including:

- varied community based solutions, which leads to increased community resilience;
- greater ownership of risks;
- greater level of fiscal (or other) incentives for communities actively reducing their risk, e.g. access to mitigation funds;
- more emphasis on public/private partnerships in resourcing and developing mitigation solutions;
- more emphasis on integrating emergency management in land use and future land use planning exercises.

## FLOOD RISK MANAGEMENT: A PROTOCOL FRAMEWORK

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After a spate of large damaging floods, local and central government in New Zealand undertook a reassessment of flood management practice. A key outcome of this process was the development of a decision making framework or protocol [1] that encourages a comprehensive approach to flood risk management whereby hazards, community needs (societal, economic and environmental) and vulnerabilities are considered. The protocol is based on a suite of key elements, supported by a series of principles to guide implementation. The elements include recognition of the need to respect natural processes on a catchment scale, finding solutions appropriate for the local community while recognising implications on regional and national levels, addressing residual risks, and employing adaptive management techniques.

The protocol approach is anchored on: risk management to encourage a wider assessment of options, anticipation of change and awareness of residual risks; sustainability to bring natural and social systems together over the long term; and catchment based management to provide a natural framework within which to manage for sustainable outcomes. These perspectives bring a broader, longer term, integrated and dynamic approach to managing flood risks. Understanding these perspectives offers an improved framework through which better risk management decisions can be made. The Protocol also emphasises the importance of addressing inter-organisational risk and ensuring that appropriate management support systems are in place to support effective implementation.

The Protocol framework does much to encourage the integration of existing river management activities with environmental management objectives for river, water resources and catchments through sharing flood risk management experiences across local government and providing a broader view within which to assess flood risk management options. Other benefits from adoption of the Protocol include, for central government, knowledge that local government is approaching flood risk in a comprehensive manner and a better clarity of where the critical issues lie for targeted interventions. For local government, the benefits include shared knowledge and methodologies, consistent professional practice, common risk strategies, and defensible decisions. Finally, communities benefit from having more security from a common approach and longer-term solutions, plus more efficient service delivery and, ultimately, reduced personal and business risk.

Most aspects of public risk management in New Zealand require a cooperative, coordinated approach between and within all levels of government. The Protocol framework respects this allowing each level of government to act comfortably within its own mandate while offering an approach to seamless joint inter-governmental management of public risk. Currently the Protocol is being developed into a NZ Standard.

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[1] *Managing Flood Risk: Draft New Zealand Protocol*, T.J. Day (editor), New Zealand Centre for Advanced Engineering, 2005

## **PSYCHOLOGICAL MANAGEMENT OF THE NEW ZEALAND DISASTER VICTIM IDENTIFICATION TEAM IN RELATION TO THE ASIAN TSUNAMI**

**Ian de Terte**  
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**Geoff Ruthe**  
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As a result of the Asian tsunami on 26 December 2004, Disaster Victim Identification (DVI) teams from various international police agencies went to Phuket, Thailand to assist in the identification and subsequent repatriation of the victims of this tragedy. The New Zealand DVI teams working in Thailand were deployed for approximately 21 days. The New Zealand DVI teams included police personnel, forensic pathologists, forensic dentists, fingerprint experts, photographers, and mortuary technicians. The New Zealand DVI teams are specifically trained for their role and in the past have primarily dealt with aviation disasters. The New Zealand Police Department employed the services of clinical psychologists to screen, support, and monitor the psychological well being of the personnel working in the New Zealand DVI teams. There are two bodies of literature regarding debriefing after the involvement of personnel in a traumatic incident. On the one hand, some theorists suggest that debriefing is a useful strategy, whilst on the other hand, some theorists suggest that debriefing can do more harm than good. This paper will review the strategies that were implemented to assess the suitability of staff being deployed on this operation, the monitoring of staff in Thailand, and the ongoing support of personnel involved in this operation.

## **TORT LIABILITY FOR FAILURE TO WARN: A THREAT TO COMMUNITY RESILIENCE**

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It has been argued that imposing liability on authorities for failure to adequately prepare or warn a community of impending disaster will encourage authorities to ensure that relevant, adequate and timely warnings are given to communities, and to hold them accountable if they are not.<sup>1</sup> On the other hand, fear of legal liability may well encourage authorities to 'over warn' or practice 'defensive warning' (ie give too many warnings to ensure that they can not be criticized for failing to predict an adverse event) or fail to issue warnings at all.

This paper will consider, in the Australian context, the potential liability of those involved in communicating risk information and warnings to the community. The paper will examine the potential liability for failure to warn of natural hazards as well as arguments for and against imposing liability in tort for any alleged failure. It will be argued that although accountability mechanisms are important, reliance on tort (or fault based litigation) is not the most appropriate means to achieve that end.

1. Kumar, C. Raj and Srivastava, D.K. (eds), *Tsunami and Disaster Management: Law and Governance* (Sweet & Maxwell Asia, Hong Kong, 2006).

## **GENDERING THE HYOGO FRAMEWORK FOR ACTION**

### **Elaine Enarson**

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The presentation analyzes the 'state of the art' with respect to gender-sensitive disaster policy, practice, and scholarship internationally and offers a set of action steps geared to the Hyogo Framework for Action: 2005-2015. First, significant advances in research, policy, and practice in the last decade are briefly reviewed, followed by an assessment of gender and disaster scholarship in both developing and developed nations. This is the context for the challenge of fully engaging both women and men in disaster risk reduction and integrating gender equity holistically in all dimensions of disaster risk reduction. The presentation then focuses on the new gender mainstreaming initiative of the International Strategy for Disaster Reduction. Specific and concrete action steps and guidelines are proposed to help governments and other actors be gender inclusive in each of the five priority areas of the Hyogo Framework for Action: 2005-2015: 1) making disaster risk reduction a priority; 2) identifying, assessing and monitoring risk and enhancing early warning; 3) building a culture of resilience to disasters through awareness, education and training; 4) reducing risk in key sectors; and 5) strengthening disaster preparedness for effective response. Particular emphasis will be placed on women's community groups as potential partners and leaders.

## **INCREASING THE EARTHQUAKE AWARENESS OF CHILDREN IN EARTHQUAKE-AFFECTED COMMUNITIES IN TURKEY**

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In 1999, a devastating earthquake in Turkey caused major loss of life, and this year marked a turning point in efforts to improve disaster preparedness and mitigate effects on vulnerable communities. Children, as one of the most vulnerable groups, are an important target group to increase the awareness of the community and create an earthquake preparedness culture. Taking into consideration this reality, an awareness-increasing program has been implemented in some earthquake-prone cities in Turkey. From 2004 to 2007, 350,000 children and their families were trained in six cities, namely Istanbul, Eskisehir, Izmir, Tekirdag, Bursa and Iskenderun. Three hundred and fifty thousand books were published and distributed to the children. The program was implemented by Disaster Preparedness and Earthquake Training Association in cooperation with the Ministry of National Education. This paper explains the details of the program and how it became a good practice for earthquake awareness building of vulnerable communities. It also reports the major challenges, the key success factors, lessons learned and points to improve for similar programs in the future. A discussion is made about how to replicate such a practice elsewhere in the world and how this practice can be replicated in a different context.

## **LIAISON OFFICER TRAINING SYSTEM FOR INTERNATIONAL URBAN SEARCH AND RESCUE TEAMS: TURKISH MODEL**

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The United Nations International Search and Rescue Advisory Group (INSARAG) is the network for international urban search and rescue teams. All INSARAG teams should follow the necessary standards indicated at INSARAG Guidelines. One of these requirements is to have a liaison officer in the team. The teams can send their liaison officers to various international trainings or may train them through their own trainings. Istanbul University Natural Disasters Search and Rescue Team (ISUDAK) trains its liaison officer candidates through a Liaison Officer Training System which is composed of two courses and an exercise. This paper explains how an INSARAG member team achieved training its liaisons. It gives details regarding the tools used, the topics taught, points to improve and the lessons learned via this training. The paper also gives a good example for the other teams who want to create their own training programs. At the end of the paper, it discusses the points about how to shape an internal liaison officer training system for all INSARAG member teams.

## **UNITED NATIONS EARTHQUAKE FIELD COORDINATION SYSTEM THROUGH THE PERSPECTIVE OF THE CONTINGENCY APPROACH**

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Strong earthquakes often hit populated, poorly-constructed and unprepared areas of the world. These factors cause earthquakes to turn into devastating events. As their negative impacts are very broad, the capacity of the affected country may not be adequate for response activities. Huge numbers and variety of humanitarian relief assistance may come to the country. Additional to the national response resources, this international relief may be a problem itself. Because when there are numerous national and international relief actors in the field, it may create chaos. To prevent this chaotic situation, it is important to have a good coordination system for both national and international actors. Also, as it is difficult for a government to take the responsibility of the entire coordination of all international assistance, the United Nations takes an important role at these coordination efforts as it has a special office for the coordination of humanitarian affairs and a special section for the coordination of field activities. This study gives an overview of United Nations' field coordination system through the perspective of the contingency approach. It explains the characteristics of earthquake disasters, coordination systems relevant with the relation between organization and environment dynamics and United Nations' coordination tools for field. The study ends with the evaluation of field coordination tools of United Nations through the coordination and environment theories.

## **FROM SCIENCE TO PRACTICE: COMMUNITY-BASED PUBLIC EDUCATION INITIATIVES**

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Recommendations given in a Ministry of Civil Defence and Emergency Management report on creating resilient New Zealand communities suggest that to increase community preparedness a combination of communication/public education and community development/education is required. Traditional public education is a necessary tool to initially motivate people to prepare. It helps to create an awareness of the hazardscape, initiate discussion and thinking about hazards and their repercussions and form an understanding of how certain actions will be of benefit. However, public education alone does not lead to an uptake of preparedness activities.

For this reason, New Zealand's Earthquake Commission commissioned a study into community-based public education initiatives. The aim of the study was to collate a set of concepts and considerations to assist the design of successful community-based public education initiatives for delivery in New Zealand communities. Community-based initiatives have been found to effectively increase preparedness through assisting with mitigation projects and fostering the qualities in people that motivate them to undertake preparedness activities (i.e. problem-focused coping, self-efficacy, sense of community, etc).

This study contained three elements; a review of local and international community-based education initiatives, a summary of issues around volunteering, and a guide to elements of programme evaluation. The programmes reviewed range from conventional community-based public education project to projects that involve physical modifications, community action projects and action research.

Overall, the study identified numerous keys to programme success, and motivating and sustaining volunteers, and considerations for programme evaluations. Successful programmes were found to be consistently attributed to factors such as community consultation, collaboration with many partners, working with already established groups and initially implementing simple and achievable projects. Volunteers are attracted and maintained by promoting opportunities that correspond with their motivations, having specified tasks and matching their skills and interests with those tasks, and giving them recognition for their achievements. Evaluation requirements need to be contemplated at the same time as conceptualisation of the initiative to ensure the goals of the evaluation are met. To undertake a meaningful evaluation, the purpose, intended audience, information requirements and sources, and timing and budget for the evaluation need to be established.

## **THE INEVITABLE RIPPLE: NEW SOUTH WALES EMERGENCY MANAGEMENT OF THE SOLOMON ISLANDS TSUNAMI OF 2 APRIL 2007**

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New South Wales has a well-developed tsunami emergency plan, which details the arrangements for the preparation for, response to and the initiation of recovery coordination arrangements following the impact of a tsunami. The NSW State Emergency Service (SES) is recognised as the combat agency (lead agency) for the emergency management of tsunami in NSW, responsible for planning for and controlling tsunami response operations when they occur. The arrangements within the State Tsunami Emergency Sub-Plan have been exercised, however the recent 2 April 2007 Solomon Islands tsunami provided the first real-life test for the plan.

In close consultation with the SES, the Bureau of Meteorology provided real time warnings to the community during this event. The liaison between the SES and the Bureau on the day highlighted the benefits of detailed pre-event planning and scenario-based exercises. Both agencies were aware of the capabilities of the system and the messages to be provided.

This paper will provide an insight into the emergency management of tsunami in NSW including the current activities being undertaken to prepare for tsunami and provide an overview of the NSW response to the recent Solomon Islands tsunami.

## **INTEGRATING THE THREATENED INTO EFFECTIVE WARNING SYSTEMS**

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Disaster managers will work closely with a more activated community in a natural hazard zone, with information from enhanced web and regional media sources to provide clear preparation motivation and timely, detailed warnings. Internalising the reality of a threat, preparations and effective warning are inseparable. Hazard warning and preparation should start months before an impact threat.

The era of a passive community awaiting emergency instructions is past. The new mitigation model for effective warnings includes active and self-help communities, web and media interplay to produce an aware, informed community who know the risks, and will act in advance to maximise their own safety.

Web designers will further refine information delivery of natural hazards threatening areas; describing preparations needed, and include fine detail near-term and 'nowcasting' as the threat approaches. Examples of authoritative web sources include the Bureau of Meteorology or fire agencies. Local media will work directly from these sources.

Using bushfire preparedness as an example, the community safety (hazard warning) triangle is introduced as the conceptual framework to maximise the effectiveness of existing and emergent warning systems. This model helps residents, web, media and hazard managers to understand the complexity of providing active rather than passive motivation to prepare for knowable threats, and to activate final preparations in a timely manner. A local email tree, used in the January Bega Valley fire, augmented the local phone trees, and was praised by residents threatened by fire.

Research into warnings after Cyclone Larry, current bushfire zone research and work at Woodgate Beach, a motivated Queensland community subject to earthquake, flood, cyclone and bushfire; shows many hazard zone residents rely on friends and neighbours for warnings. There is also some strong community demand for local sirens when a hazard threatens, simply telling people to 'find out more'.

Current research indicates adopting the Communications Safety Triangle may produce the most effective warning system, encouraging hazard managers, media editors and web hazard managers to work more interactively with communities. They will ensure warnings come from multiple reliable sources, with 'how to' information providing maximum awareness and preparation and resulting in minimum loss. As the final hours of a threat approach, an effective, community-oriented preparation and warning system means all residents will be safe where they live, or have moved to somewhere clearly safer, well before impact.

## **DISASTER MANAGEMENT AND SCHOOLS**

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Experts predict that climate change will lead to more frequent intense cyclones. Schools need to be prepared for such disasters. Presenter Richard Graham is Deputy Principal at Innisfail SHS and has been working in Queensland schools for close to 25 years. He was present during Cyclone Larry in March 2006, and the subsequent recovery process. He has had extensive involvement with other critical incidents that have occurred in schools, such as the death of a student. These experiences have led him to believe that school management plans are totally inadequate for disasters of the magnitude of Level 5 cyclones. He argues that generic Disaster Management Plans in Schools are akin to a doctor having the same treatment for a patient regardless of the illness.

To support this notion he has commenced significant research in the form of interviews with educational leaders and surveys of educational leadership and teachers to ascertain the effectiveness of school planning and subsequent management of these plans during a disaster. Quantitative research in this area is minimal and hence this project may go some way to helping schools be better prepared for natural disasters.

The project aims to ease the impact of disasters on students and teachers and for the results to be easily adapted by other community organizations. The research is supported by the Queensland Secondary Principals' Association and endorsed by Education Queensland.

## WHY DON'T WE TAKE HEATWAVES SERIOUSLY?

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Heatwaves are the most lethal of all natural hazards, yet their impacts are not formally recognised in Australia as being natural disasters. Frequently in these tragic events, the community, and those charged with providing for community safety, have been caught unaware of the potential magnitude of the threat, the ways of dealing effectively with the threat and the consequences of the disaster.

Heatwaves are prolonged episodes of a combination of excessive heat and humidity. They are a summer phenomenon, most commonly occurring in Australia between December and February, but they can occur as early as September and as late as April. The southern states of NSW, Victoria, Tasmania and South Australia are more frequently associated with fatal heatwave events such as those of 1893 and 1939 in each of which at least 430 people died. In addition to the deaths, each event generates a very large upsurge in people requiring hospitalisation with a resultant strain being placed on the medical and ambulance services.

In a recent emergency risk management study of the Newcastle and Lake Macquarie communities in NSW, undertaken by the author, heatwaves were assessed as posing the greatest risk out of a total of the 26 natural and anthropogenic hazards analysed, including floods, bushfires, storms, earthquakes, human pandemic, hazardous materials and terrorism.

Added to what we know has occurred in the past is what is being forecast for the future heatwave regime under changed climatic conditions. An increasing number of days with maximum temperatures over 35°C across most of Australia and more consecutive days of excess heat, combined with an aging population, will inevitably lead to an increase in heatwave-associated fatalities and hospital admissions. The national heatwave death toll is already approaching that of road accidents, yet it receives little publicity or government action.

This paper examines the heatwave phenomenon, the impact on southeast Queensland of a single four day long episode in January 2004, and looks at the likely future impact of heatwaves across Australia. It also explores ways in which governments could reduce the risks - if they eventually recognise heatwaves as being a natural disaster.

## **LAND USE, PLANNING AND RISK: THREE AUSTRALIAN RIVER PORTS – BRISBANE, NEWCASTLE AND ADELAIDE**

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Australia's three oldest and most active river ports are Brisbane, Newcastle and Adelaide. They were each established over 150 years ago and evolved to meet the needs of colonial trade and 19<sup>th</sup> century technology. They were central to the export of wool and wheat from their hinterlands and for the import of manufactured goods, primarily from Europe. They also share a similar range of exposure to the impact of natural hazards including floods, storms and earthquakes.

Land use in and around these ports in earlier days combined, in close proximity, the warehouses and storage sheds of the export/import businesses with the low cost housing for the large number of labourers needed to manually handle the cargo. Development, especially over the past 50 years, however, has seen many changes. The construction of new port facilities closer to the mouths of the Brisbane and Port Rivers (Adelaide) has been driven by the need to service larger vessels and take advantage of the economies of containerisation and bulk handling of goods such as wheat and coal. The decline in some industries, such as iron and steel in Newcastle and the closure of the Port Stanvac refinery near Adelaide, and the growth of other industries, especially chemical manufacture, has also driven changes in land use.

This paper examines the present land use patterns and planning regimes in place in each of these major ports, with particular emphasis on the risks posed to these assets of major National importance from flood, storm and earthquake together with the various secondary threats that those natural hazards can generate. In particular, it examines the ways in which potentially incompatible land uses created by changing needs have been managed, and the ways in which residential communities adjacent to the ports could be affected should a major disaster strike.

## **HAPPY AFTER LARRY? A COMPARISON OF MODELED LOSSES AND INSURANCE PAYOUTS**

**Paul Grasso**

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Cyclone Larry devastated the Innisfail region in March 2006 and produced one of the most significant losses to the insurance industry in some time. Over the last decade the insurance industry has increasingly utilised third party catastrophe models to estimate potential losses from catastrophes. Claims information allowed for testing of these models and provided interesting insights into the disparity between modeled outcomes following an event and the physical losses suffered.

## **DESIGN OF EOC AT DISTRICT LEVEL IN RAJASTHAN, INDIA**

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Rajasthan is the largest state in India in terms of geographical area, at 342,239 km<sup>2</sup>. Administratively, Rajasthan state is divided in 32 districts. Seventy-seven percent of the population (57 million in 2001) lives in rural areas. Historically socioeconomically backward scheduled cast and scheduled tribes constitute 30% of the population. Rajasthan has one of the lowest literacy rates in India (76 % for male and 44% for female - 2001 census). Rajasthan is vulnerable to floods, droughts, and earthquakes. During last 60 years there have been only six years when some part of the state did not suffer from drought.

The District Emergency Operations Center (EOC) is to be established for centralized direction and coordination to the overall response and support to district administration. Responding organizations converge at EOC during an emergency to coordinate response, recovery, information, and resources. The District EOC is to serve number of uses, including operation, training, and meetings. It is suggested to use EOC for law and order, accidents, riots, fire and related activities, apart from disasters.

There are no permanent EOCs in districts. An exercise is underway to design EOCs at district level. The exercise primarily concerned with EOC designing in terms of equipment, staffing, and training. This presentation is to share with the IDRC participants our experiences in designing EOC.

A concept note on EOC was prepared and sent to the district collectors (administrators). To get the involvement of Collectors, a questionnaire was sent asking for their suggestions in terms of equipment, staffing, and training. The EOC designer visited selected district collectorate offices and had interviews. It was suggested to have a District Emergency Operations Manager, with a technical emergency communications and IT trained person, and a support staff. Different types of training for different staff were suggested. A list of equipment with priorities was suggested for procurement.

In any disaster it is the poorest of the poor who die. Women, children and elderly are the worst sufferers. The overriding principal for designs of EOC is to benefit the people who are likely to be worst sufferers in any disaster. It should be possible even for the illiterate citizen to communicate with the EOC. Therefore, the design of EOC has to be extremely user friendly from the perspective of the citizens.

## HANDLING THE TSUNAMI DEAD

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The 2004 Indian Ocean tsunami is the biggest peacetime mass fatality incident in recent history. The tsunami traveled across the Indian Ocean causing death in 12 countries of an unknown number of persons from 55 nationalities. The exact number of persons died due to tsunami will never be known. However, estimates are 300,000+. The majority of the dead and missing were female and children. The handling of the tsunami dead raises many social, political, forensic, economic, cultural, religious, and other issues. The way dead bodies are handled also leaves a lasting psychological impact on the next-of-kin.

This paper presenter is a member of the fourteen international interdisciplinary disaster researchers' team who studied cross-cultural analysis of responses to mass fatalities under a US National Science Foundation grant. I did field work in the severely affected countries. This was the most involved unprecedented international co-operative research on the subject. The research is ongoing.

I will report on how the dead bodies were recovered, moved, stored, preserved, identified, communicated to next of kin, and disposed. Most of the immediate response after the tsunami was by the local civic community. There was coordination and cooperation between private and public responders. The experience is compared with the western thinking and practice of command and control. Findings reveal consistency in human treatment of the dead. Mechanisms of response were consistent with regulations and the idiosyncrasies and cultural characteristics of the locality and the specific countries, except Hindus were mass buried, instead cremation. We did not find any negative differential treatment in the response due to cast, religion, or socioeconomic status of the victims. There was definite differential treatment of the foreign bodies. While many local bodies were buried unidentified, foreign bodies were generally preserved for identification. Unidentified buried foreign bodies were exhumed on foreign governments' pressures. Professional police and forensic experts of many countries worked in coordination to identify bodies. Ante mortem and post mortem data of dental, finger prints, and DNA were used wherever it was possible. Norwegian firm Normeca flew a state-of-the-art morgue to Phuket. Danish firm Plass data developed electronic, System International was used for Interpol Disaster Victim Identification (DVI) protocol. Handling of the tsunami dead raises the issues of why bodies of individuals of some countries are identified, while others are buried in mass graves? Would wealthy countries commit sufficient resources to identify all the dead if thousands died in an incident within their boundaries?

## HIGHER EDUCATION OPPORTUNITIES IN DISASTER REDUCTION

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Emergency management or disaster reduction is among the top 20 growing professions in USA according to the Department of Labor, Bureau of Labor Statistics. Collegiate emergency management programs in USA have grown from four in 1994, when Federal Emergency Management Agency (FEMA) started Higher Education Project, to 125 in 2006. Internationally, education is the fastest growing industry in general and disaster reduction in particular. This spurt has resulted in international shortage of faculty. This presentation is from the perspective of a student seeking full time higher education or a practitioner looking for part-time or distant education opportunities. However, academicians, researchers, administrators, NGOs, marketers and citizens may also benefit from the paper.

International Association of Emergency Managers (IAEM) is professional organization offering Certified Emergency Manager (CEM) qualification after a through peer review process. CEM is well recognized in North America. There is a list of fifty most recommended books for graduate students of emergency management by the graduate faculty of emergency management in USA on the FEMA web site. This list was prepared after a FEMA funded research by Kailash Gupta. Ph.D. in Emergency Management is offered by only North Dakota State University, USA although six other U.S. universities offer related Ph.D. programs. Seven European Universities in cooperation provide Joint European Master's in International Humanitarian Action. Many universities in the United Kingdom provide higher education opportunities in disaster management. University of British Columbia, Canada offers degrees up to Ph.D. levels that allow for a specialization in emergency management and disaster preparedness planning. University of New South Wales, Australia offers Ph.D. in the area of emergency and disaster management. Canterbury University, New Zealand recently started offering Hazard and Disaster Management degrees up to Ph.D. level. In India, Guru Govind Singh Indraprastha University, Delhi started MBA in Disaster Management; Indian Red Cross Society started PG Diploma in Disaster Preparedness and Rehabilitation; and Indira Gandhi National Open University started Post-Graduate Diploma in Disaster Management. Tata Institute of Social Sciences, Mumbai established Disaster Management Center and plans to start a master's program in disaster management.

## EARLY WARNING SYSTEMS: REFRAMING THE DISCUSSION

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For decades, the international community has discussed and debated how coordinated, collaborative international action can reduce the loss of life, property damage, and social and economic disruption caused by natural disasters. The initial emphasis on the development of disaster response capabilities has shifted to the need to strengthen risk reduction and control mechanisms and policies, and most recently, to the design and implementation of better early warning systems. The emphasis on early warning systems has turned attention and funding to the current capabilities and developments in science and technology, and unfortunately, distracted us from the central issue of addressing the real needs of the communities and people at risk. The word 'early' in Early Warning emphasises the need to improve and optimise not only the science and technology, but also the human capability throughout the entire range of interactions that support emergency management.

This paper argues from a background in mission critical systems, project management and business performance, that we cannot achieve the risk reduction and mitigation we seek until the emphasis is placed on the leadership role of emergency management in providing an effective early warning capability through the integration of the improvements in science and technology with traditional methods and an expanded commitment and involvement by all those at risk. Emergency managers must actively lead, engaging both the community and the strategic service providers (such as scientists, engineers, infrastructure providers, public officials, community emergency services, and the media) in the development of the early warning capability, and strengthen and sustain that capability through a continuous cycle of review, assessment and improvement activities with the community and the strategic service providers.

The international emphasis on early warning systems has shifted the focus from emergency management to science and technology, creating the impression that scientists and technologists should be leading the development of a global early warning capability. While there are important benefits to be gained from improving our detection and interpretation systems for natural hazards, these benefits cannot be fully realised unless these systems are integrated into the all-hazards emergency management capability. Adopting an all-hazards approach, in which local needs are clearly identified and provided for in national and regional policies, generates synergies and efficiencies that can, and must, be leveraged in international strategic planning for early warning capabilities.

**Note:** This paper has been accepted for publication in the February 2007 issue of the Australian Journal of Emergency Management.

## WHAT SEA LEVEL AND CLIMATE MONITORING IN THE SOUTH PACIFIC IS TELLING US

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The South Pacific Sea Level and Climate Monitoring Project (SPSLCMP) has been active for over 15 years and is now in its fourth phase. The Project was developed in 1991 as an Australian response to concerns raised by the member countries of the South Pacific Forum over the potential impacts of global warming on climate and sea levels in the Pacific. Its primary goal is *'to generate an accurate record of variance in long-term sea level for the South Pacific and to establish methods to make [these] data readily available and usable by Pacific Island countries'*.

The project has installed a sea level and climate monitoring network of 12 Seaframe stations, supported by 10 CGPS stations, involving 12 participating forum countries and providing a wide coverage across the Southwest Pacific basin. With one exception, the Seaframe stations have been operational since October 1994.

The SPSLCMP is first and foremost a data gathering network that enables us to “monitor” what the sea level in the region is doing today, and to provide data to support the work of meteorologists and climatologists to predict with a moderate-to-high degree of confidence climate variability over the next three to six months. The data are also used by international scientific agencies and organisations in their long range modeling of climate change and its potential impacts, both regionally and internationally.

The network also plays a role in contributing to a regional and international early warning capability for climate change detection. For example, there is a lag from when the melting of the Greenland and Antarctic ice expanses starts to have a significant impact on global sea levels, and the Seaframe network will enable us to detect the early stages and monitor the ongoing trends of those impacts on sea level change in the South Pacific region.

Historical sea level trends, and even to an extent the current Seaframe sea level trends, would suggest that we could expect sea level rises of less than 0.5m over the next 50 years, which is at considerable variance to current scientific commentary. It is possible, therefore, that the effects of recent accelerations in climate change have not yet started to have a significant contribution to or impact on current sea levels; but based on the body of international scientific opinion, it is more a case of when, rather than if.

## **GROWING THE IAEM IN OCEANIA**

### **Kristin Hoskin**

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In April 2007 the Oceania Region formed. At that time there were over 90 Australian members and nearly 30 New Zealand ones. The IAEM's total membership exceeds 3000. IAEM Oceania has become the newest region of the International Association of Emergency Managers. With almost 150 members across the Pacific, the IAEM is an excellent way for professionals who work in emergency management to network and advance their professional development through a globally recognised association.

The main tool that the IAEM offers for advancing professional development is its credentialing programme. The credentialing programme that is administered by the IAEM is two-tier. The two credentials offered are Accredited Emergency Manager (AEM) and Certified Emergency Manager (CEM). These credentials were developed as a result of a need in the US for a consistent way to approach professional development of emergency managers. The credentials are internationally recognised and are administered through a peer review process. The credentials must be maintained through a five-year review cycle to remain valid. The Oceania Region is committed to building these credentials into a recognised credential for our members and the emergency management community of Oceania.

IAEM Members represent emergency management across a wide range of industries including but not limited to:

- Health
- Military
- Government
- Infrastructure
- Emergency Services.

A number of special interest committees have been established for members with a focus in practicing emergency management in some of these areas. This is provided to meet members networking needs as well as advancing emergency management thinking in these industries.

The main communication source for the region's members is the website [www.oceania-iaem.com](http://www.oceania-iaem.com). This site acts as a repository for information about the region and as a place for members to share information such as job vacancies, upcoming events, resources, presentations they have given and to recommend links. There is also a regional email list that can be used to make enquiries to fellow members. In addition to the regional site, the global site [www.iaem.com](http://www.iaem.com) has a range of information for members including access to the IAEM Bulletin, a monthly newsletter, and the IAEM's credentialing programme.

## **CRISIS INFORMATION MANAGEMENT SYSTEMS (CIMS) FOR HAZARD INFORMATION SHARING**

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After a number of recent major natural disasters such as the Boxing Day Tsunami, Hurricane Katrina, and Cyclone Larry, the sector stakeholders are moving towards efforts to define and exploit greater ICT utilisation during the response and recovery phases of major incidents. The focus has moved from just improving voice-data-network-level technologies for communication into harnessing new information-level technologies to cover all phases of crisis management. This includes information infrastructure for incident message routing and standard languages for conveying the semantics of emergency warnings and resource and task management. In this presentation we review some of the emerging requirements for Crisis Information Management Systems (CIMS) and look at the current and future technologies that will need to address these requirements, in particular, for sharing all-hazards information with emerging standards.

A CIMS needs to also address the sharing of information across emergency agencies and any stakeholders involved in the response and recovery. A CIMS will also be required to follow any number of emergency response models and provide technologies to match and support the policies and rules that govern these human-oriented models (such as AIIMS). Also, based on our own CIMS demonstrator, we propose a starting framework to support CIMS functionality and identify the key interoperability opportunities. In particular, we focus on two key functions; information exchange across emergency operations centres and for public warnings; and the process and protocols for resource management, including discovering, requesting, confirming, tracking, and returning resources during a crisis.

We believe that the emerging CIMS-based approach – distributed interoperable sharing of information and tasks – will provide significant improvements to response and recovery from major hazards.

## **MODELLING THE ROLE OF MEDIA AT FOUR PHASES OF NATURAL DISASTER MANAGEMENT IN TURKEY**

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Media management is a vital part of integrated natural disaster management. At the previous experiences in Turkey, it has been observed that bad media management has been a factor at the increase of the chaotic situation whereas good media relations became a vital tool for the success of the mechanism. Taking into consideration these experiences, this paper models the role of media as a part of the integrated natural disaster management system in Turkey. The model covers the increasing and decreasing media focus on natural disasters at all four phases of a disaster management cycle and the effects of similar small-scale emergencies at the media's focus on natural disaster management. The study highlights various lessons learned from Turkish disaster experiences, achievements, strengths and weaknesses for each phase. It also explains key success and failure factors together with the links of media relations with incident command system in Turkey. The study discusses concrete suggestions about how to improve media management in similar disaster-prone countries by benefiting from the lessons learned in Turkey.

## **TEPHRA HAZARD ANALYSES INCORPORATING POTENTIAL MULTI-STAGE VOLCANIC EVENTS**

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While volcanic events are commonly characterised by multiple eruptive stages, most previous probabilistic tephra hazard analyses have only considered the major (paroxysmal) stage for each simulated event. To test the validity of this approach, we simulate events in the traditional manner (single-stage analysis) and then also incorporate probable smaller-magnitude explosive stages (multi-stage analysis). This builds upon the results of a global statistical study of multi-stage explosive events and uses the Okataina Volcanic Centre in New Zealand as a case study. The two sets of resultant hazard - in the form of spatial tephra thickness, the associated cumulative duration of explosive behaviour and the duration of the entire eruptive sequence - are compared to assess the difference in approaches. The multi-stage analysis shows an increased hazard when compared with the single-stage analysis and we found the greatest difference in duration and tephra thickness to lie at middling distances from the vent. In some places, tephra thickness increased by one order of magnitude and up to 25% more of New Zealand's North Island was impacted, while the probability of an event lasting longer than one month increased sevenfold. The more traditional single-stage approach is recommended where little previous eruptive history has been established, so that the modeling does not become too dependant upon global analogies. Given an eruptive history as in-depth as that at Okataina Volcanic Centre we recommend the second multi-stage approach, which leads to more realistic event simulation and thus a better understanding of the probable hazard.

## **A HAZARDSCAPE OF WELLINGTON REGION: INFLUENCES ON INTRA-REGIONAL RESPONSE**

**Shabana Khan**

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The poster is based on the PhD research, which aims to draw the hazardscape of Wellington Region, and to infer its influences on the response to natural hazards in the area. It displays the concept, parameters and significance of hazardscape, besides the aim, objectives and methodology of the research.

The lexicon of hazard and disaster studies contains numerous terms with their multiple interpretations and loose definitions. Hazardscape is one such term, which has been used randomly by scholars to introduce the hazards of a place. The research conceptualizes the term in the backdrop of various definitions, which have been forwarded in the recent past. It argues the significance of the term in the phase of shifting paradigm in dual context of matter and method of hazard analysis. In the situation where research on hazard and disaster has passed through different phases of its subject matter from hazards to vulnerability and now to resilience, hazardscape provides a common ground to study all of them together at one place. By having a holistic approach it also attempts to bridge the chasm of hazard research divided in natural and social sciences.

Wellington region, the New Zealand's capital territory is exposed to range of natural hazards from earthquakes to liquefaction, landslide, flood, bushfire, tsunami etc. Hazardscape mirrors their ecological perspective at the place, which have built through a constant, implicit and intricate relationship between human beings and the environment in the particular spatio-temporal context. It also displays its dynamic character, which it inherits through uncertainties associated with natural processes along with changing physical susceptibility, human vulnerability and response. The research uses both qualitative and quantitative data base, and involves scheduled structured interviews with local communities and administrative bodies across all the eight Local Territorial Authorities in the region.

## **SEQ FLOODWAY STANDARDISATION PROJECT: MINIMISING THE RISK TO ROAD USERS**

### **Lou Kamenos**

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Managing the risks associated with our transport network is a key issue in today's society. Along with the risks associated with speeding, drink driving, fatigue and other unsafe road use characteristics, a set of inherently treatable road risks exist. One such treatable risk is that of a roadway intermittently inundated by water from a river, creek, stream, drain or other waterway. This scenario is referred to as a floodway and forms the focus of the information presented.

The study report was commissioned by Brisbane City Council (BCC) on behalf of the South East Queensland Disaster Management Advisory Group (SEQDMAG). This study has been successful in developing, through consultation with key stakeholders of best practice and detailed site investigation, a set of measures suitable for the treatment of floodway risks.

These measures and options have then been utilised to formulate a draft guideline that sets out a methodology for assessing a problematic site as well as a pragmatic approach to the selection of treatment measures. This draft guideline provides a necessary first step towards assisting practitioners to apply a standard set of measures when safeguarding floodways across the South East Queensland (SEQ) region.

This presentation outlines the key components of the investigation undertaken and the methods available in order to treat the elements of floodway risk including:

- A review of best practices available;
- Investigation and review of warning systems currently in use in SEQ;
- Field inspections of problematic sites in the region;
- Key elements of risk;
- The development of a guideline for practitioners utilising a scenario treatment based assessment methodology.
- An assessment of a range of risk communication strategies;
- Recommendations for further work to be undertaken in order to implement the guideline by road authorities to provide consistency in treatments.

## **RISKSCAPE: AN INNOVATIVE MULTI-HAZARD LOSS MODELLING TOOL**

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New Zealanders are exposed to a wide variety of natural hazards having experienced community damage from nearly every type of natural hazard. Recent events have seen damaging floods, mudslides and earthquakes that have acutely affected communities. A recent national overview of the tsunami risk has estimated that the potential for casualties is higher than the equivalent earthquake risk. Increasingly emergency managers and planners are demanding more quantitative information of the risks associated with different hazards and to be in a position to compare the impacts across the different hazards before making risk-reduction decisions for their region. Once the zone of influence of a particular hazard has been ascertained and its recurrence interval established, then the impact of events of various intensity can be calculated by overlaying the hazard exposure for each event over built-environment inventories and demographic profiles of the people exposed to such event. Then, by reference to the fragility of each inventory or people class to that exposure, the losses and casualties resulting from these events can be quantified. Conceptually, this process is relatively straight forward, but application to real-world situations is problematic, with inherent difficulties in obtaining and linking good-quality inventory and demographic datasets and comparing hazards with vastly different recurrence intervals and source mechanisms.

These challenges are being met by the development of the Regional RiskScape system. The main goal of this joint-venture project between GNS Science and NIWA is to produce a fast and user-friendly decision-support tool that converts existing hazard exposure information into likely consequences for a region, such as damage and replacement costs, casualties, disruption and number of people affected. Consequences for each region presented in a common platform across all natural hazards can then form the basis of prudent planning and prioritized risk-mitigation measures that link directly to the severity of the risks. A working prototype of the RiskScape system has been completed, along with field techniques for sampling building and infrastructure characteristics and deriving relevant fragility functions. The prototype is now being trialled in three distinct regions of New Zealand comparing regional losses across five hazards (earthquakes, floods, wind storms, tsunamis, and volcanic ash fall). For the first time, a quantitative assessment can be made of the risk profile ('riskscape') of these regions, given a particular planning horizon, and therefore where risk-reduction measures will be most effective. There is also considerable interest in using the tool during a disaster to quickly evaluate the extent and likely losses and casualties to assist emergency managers and inform government agencies of the potential scale of the impacts.

## **POST-EARTHQUAKE TRAVEL BEHAVIOURS: AN EXPERIMENTAL SIMULATION**

**Steven Lamb, Darren K Walton, Vince Dravitzki and Stephen Murray**

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A CAPI (Computer-Aided Personal Interviewing) survey examining post-earthquake travel behaviours was administered to 803 members of the general public recruited from city and suburban malls. Earthquake simulation videos were created on a full-scale shaking table, modelling a moderate and severe event (6.8 and 7.5 respectively on the Richter Scale) in an office and home setting. The survey contained 63-mixed-items. Travel movements were recorded over a simulated 48-hour period following the earthquake. QuickMap GIS (Geographic Information System) software was used to obtain trip start and end locations, predicted route taken using a shortest path algorithm, and trip distances. Other factors, such as information seeking, were included to examine their relationship to travel behaviours. The sample data was weighted by age and location to account for sampling bias.

Analyses investigated the following research questions: 1) Where do people travel and how does this change across earthquake severity and initial location?; 2) How does information, or lack of information, affect peoples' decision to travel?; 3) How do travel patterns change over the 48 hours following an earthquake event, and across severity and initial location?; 4) What travel modes do people expect to be able to use following the event?; 5) What effect does gender, ownership of property, and presence of dependants have on travel behaviours?; 6) How do people fit into an emergency response hierarchy where people have differing "investment" in the region, e.g. family and property?; 7) What are peoples' post-disaster priorities, in what order are they addressed, and how are they affected by demographic differences, earthquake severity and initial location?.

Differences in travel destinations and travel modes were observed across severity, and across initial location the earthquake was experienced. Information received had a differential effect on people's likelihood to travel depending on severity and initial location.

This study is part of a four-year project for the Foundation for Research, Science and Technology (FRST) project into Social and Economic Recovery from Natural Disasters through Community Resilience.

## **SEASONAL BUSHFIRE OUTLOOKS FOR AUSTRALIA**

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Bushfires are a serious environmental concern in Australia requiring a large amount of planning and logistics to effectively manage. As part of the Bushfire Co-operative Research Centre, we are developing the Seasonal Bushfire Assessment Workshop, a product giving a seasonal outlook of bushfire potential to assist with strategic planning by fire management officials.

The inaugural workshop was held last June. The event brought together fire managers, severe weather meteorologists and climatologists to discuss the outlook for the upcoming season. After discussion, a national map of 'fire potential' for the upcoming season was created. This map was based on the contemporaneous state of the climate and the fuels, the seasonal climate outlooks and fire-fighting resource availability. The map and discussion of the outlooks was updated in September. It was distributed by the Bushfire CRC.

This year, two workshops are planned; one for northern Australia and one for the southern Australia. The northern workshop is to be held on May 8; the southern in late-August. The workshops were split in deference to the different fire seasons across Australia.

The presentation will cover the methodology of the workshops and a verification of the previous forecast. The map of fire potential from the northern workshop will also be presented and discussed.

## **DEMOCRATIC COMMAND: THE POLITICAL LIMITS OF COMMAND AND CONTROL IN MAJOR EMERGENCIES**

**Douglas Magendanz**

Queensland Department of Emergency Services

Post-Katrina and 9/11, there has been a call for greater cooperation between operations and political leaders. One report by the US Government Accountability Office calls for a unified command and control structure that integrates political leaders for responses to major emergencies. While desirable, the integration of political leaders within command and control arrangements poses considerable problems. This paper argues that problems of integration have their roots in the very structures which underpin Westminster democratic systems. Democracy may, in the end, preclude the possibility of a vertically integrated command and control arrangement.

## **WIDER BENEFITS FROM AN INDUSTRY APPROACH TO CATASTROPHE RISK CALCULATION**

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Catastrophe loss models, as commonly utilised by the insurance industry, incorporate much scientific research while providing a user-friendly method for calculating risk. In addition to estimating the economic impacts of disasters, these models can provide much wider benefits for emergency planning and management.

Using stochastic techniques, loss modelling considers event frequency, simulations of physical hazardous processes, spatial distributions of exposure and vulnerability functions. Additional exposure and vulnerability modules may be added to investigate issues such as likely evacuation, required resources and lifeline interruption.

Using models developed to calculate volcanic risk in New Zealand and Japan, we discuss the key features of catastrophe loss modelling as well as the advantages and disadvantages of the approach when applied to assist in emergency planning.

Volcanic events are unique in that there is usually some prior warning and that activity may occur over an extended period of time with hazard intensity varying throughout. We show how models may be adjusted easily to update risk assessments leading up to and during an event.

## **EMERGENCY WARNINGS AND ABC LOCAL RADIO**

**Ian Mannix**

ABC Local Radio

ABC Local Radio has a radio network which covers the entire Australian community. It is putting in place systems to enable the community to receive emergency messages quickly and accurately. Best practice suggests 'incident controllers' should be centrally involved in the first instance to deliver all emergency messages. This is in line with research conducted by ABC Local Radio which shows listeners want local voices, timely contact, human understanding, and information emanating from people they trust. These processes are enhanced if emergency agencies work on a regular basis with ABC Local Radio.

## **MONITORING LANDSLIDE MOVEMENT AND TRIGGERING FACTORS IN NEAR REAL-TIME, EXAMPLES FROM TRANSLATIONAL LANDSLIDES IN NEW ZEALAND**

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The monitoring of landslides is typically done for two reasons: to investigate and assess landslide movement patterns for mitigation purposes; and to provide some form of warning system. The investigation and interpretation of translational landslide movement patterns have been undertaken using a range of techniques, including the use of fixed survey marks; extensometers; inclinometers; analogue and digital photogrammetry, both terrestrial and aerial; synthetic aperture radar interferometry (InSAR) and more recently LiDAR surveys, both terrestrial and aerial. Rainfall intensity-duration thresholds, in combination with rainfall forecasts and real-time rainfall measurements have been the basis for operational landslide warning systems in several areas of the world including Hong Kong, America and the UK. These systems are operated over broad regions or in specific areas where people and infrastructure are at risk from landslides.

Although new movement monitoring techniques have improved the understanding of landslide movement patterns in recent years, these techniques suffer from shortcomings in terms of spatial or temporal resolution. As a result many monitoring programmes are not able to link specific periods of landslide movement to the factor that triggered the movement. Other shortcomings in landslide monitoring, especially for landslide warning systems, are the ways in which the monitoring data are collected, transferred, processed, and ultimately displayed. Solutions using robotic total stations, fixed continuous GPS receivers, rain gauges, strong motion accelerographs and piezometers, set up in near-real time monitoring frameworks, have been implemented at several translational landslides situated in New Zealand. This paper discusses key aspects of the installed monitoring equipment; transfer, processing and display of the monitoring data; as well as presenting results from the monitoring.

## **VALUING INVESTMENTS IN MITIGATION: AN INSURANCE MODEL**

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Political decision-making in relation to hazard mitigation often takes place in a soup of uncertainty. This arises naturally because of the inherent complexity of such decisions. In the insurance industry, negotiations about catastrophe risk now routinely use stochastic modeling to provide a technical price. But whereas the insurance sector represents an educated consumer of risk information, most others would find risk expressed as exceedence loss statistics unhelpful in making difficult but important decisions. Even for specialists, it is not obvious how one might use such information for cost-benefit analyses or for prioritizing investments mitigating against hazards likely to impact at wildly different return intervals; for example, what represents the best investment for a community, protection against frequent flooding or infrequent earthquakes? The skewed nature of the likely loss outcomes means that the average annual loss is a misleading metric despite its wide usage. This paper introduces an alternative way of pricing such investments based on a hypothetical insurance premium that is the market cost of transferring this risk. Even though government assets, for example, are rarely insured, this hypothetical premium represents the real cost of self-insuring. The methodology will be demonstrated in the context of an idealized case study concerning flooding and the risk of levee failure.

## HOW COGNITIVE BIASES INFLUENCE PREPAREDNESS

**John McClure and Chris Sibley**

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Preparedness reflects community factors and individual factors, and voluntary as well as involuntary factors (such as legislation). This paper reports research on the cognitive biases that shape preparedness. These biases mostly fall into two groups: those concerned with the efficacy of actions and those relating to judgments of risk. With regard to efficacy judgments, people who are less fatalistic judge that their actions are likely to influence outcomes and are better prepared. Fatalism is affected in turn by whether people attribute outcomes in natural disasters solely to uncontrollable factors or partially to controllable factors such as preparation actions. These judgments about actions combine with assessments of risk. People show the optimistic bias when they think they are less likely to be affected by hazards than other people. A series of studies show that people also take fewer precautions for low frequency events than high frequency events, even when all other factors such as annual insurance cost are controlled for. In addition, studies on the effects of message framing show that people's judgments about preparedness are affected in different ways depending on whether the positive and negative framing applies to the preparation action or the outcome of that action. Suggestions are made as to which strategies are likely to be affective for countering each of these biases.

## LANDSLIDE VELOCITY AND ITS IMPACTS ON NEW ZEALAND HOUSING AND COMMUNITIES

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The velocity of a landslide plays a major role in determining the nature and extent of its impacts on the landscape, infrastructure and people. This poster describes three different landslides that caused damage or disruption to communities in the southern North Island of New Zealand during 2006. All three landslides were triggered by rain but they had different impacts on their affected communities. The primary difference between these landslides is their respective velocities. The Taihape landslide is a complex translational block slide with an extremely slow (0.000002m/sec) movement rate. The Hunterville landslide began as a rotational slide and transformed into an earthflow with a very rapid (0.04m/sec) movement rate. The Eastbourne landslide was a debris flow with an extremely rapid (14m/sec) movement rate.

The Taihape landslide is the largest of the three landslides and has caused the most damage (over a period of at least 40 years). This landslide is not life-threatening and it moves slowly enough to allow detailed investigation of the landslide as it moves. The landslide investigations have the potential to allow landslide movement to be mitigated once the processes controlling the movement are better understood. The Hunterville earthflow caused the least damage. The slow velocity of this landslide necessitated only temporary evacuations, although extensive clean up activities were required. The potential for future failures at this site still exists and further mitigation measures are currently under construction. The extremely rapid Eastbourne debris flow badly damaged one house, caused injury, and was life-threatening, because of its velocity. The risk of further debris flows at this site (an old debris flow fan) has resulted in abandonment of the affected house.

Damage and disruption could have been avoided at all of these sites if there had been: earlier recognition of the potential of these landslides; better understanding of the landslide processes; and appropriate management strategies in place. Examples of appropriate management strategies include preventing housing developments on the debris flow fan or alternatively, the construction of physical works.

Landslide velocity is a critical factor in controlling the impacts of the landslide and management of the hazard. Large extremely slow moving landslides can cause damage to infrastructure and disrupt communities over time. Extremely rapid landslides are more likely to be life threatening and destroy housing before preventative measures can be put in place. Effective management of the hazards presented by landslides requires an ability to predict the impact of different landslide velocities because these will necessitate different response and mitigation options.

## **AIRAID: EMERGENCY MANUAL NEBULIZATION**

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*Saturday October 21<sup>st</sup> 2006: wild weather hits the lower North Island causing equipment failure at the Pauatahanui substation north of Wellington. Electrical supply to around 6000 homes in the Whitby and Mana area is cut.*

Within the two-hour period that the substation was down, the Wellington Free Ambulance Service Emergency Call Centre received more than 100 emergency calls related to the application of nebulized (air-administered) medication. The Free Ambulance Service has eight ambulances to service the greater Wellington area. Each ambulance is equipped with three oxygen outputs that can be used for nebulization.

Nebulizers are commonly used to treat severe attacks of asthma at a doctor's surgery or in an accident and emergency department. Nebulizers are designed for those who can't use an inhaler, such as young children or the seriously ill. Some suffers of asthma also need to use a nebulizer to take their regular preventer medication.

A nebulizer works by passing compressed gas through liquid medication and turning it into a mist, which is forced through a baffle to further reduce the particle size. Nebulization requires 5-7 litres of air per minute at 1.2-1.5 bar, producing particles in the range of 0.1-0.7 microns. These particles are delivered through a mask that the patient wears over the nose and mouth. Nebulizers are powered by mains electrical supply, which runs a compressor within the unit, or through regulated gas bottles that supply compressed air or oxygen. When the power supply is cut, mains powered nebulization is not available and a medical emergency can ensue.

Airaid is a fully manual nebulization unit requiring no electrical or bottled gas power supply. Airaid's neat suitcase design is easily stored until needed. A manual foot pump, facemask, nebulizing device, and tubing are housed within a storage case attached to a compression chamber. Airaid works like a set of bagpipes. The foot pump is connected to the compression chamber and pumped to fill the chamber. A regulator attached to the chamber transfers compressed air to the nebulizing device where medication is then transferred through to the facemask of the patient. Pumping maintains a steady stream of compressed air for nebulization of the medication.

Initial proof-of-concept testing has delivered positive results for the Airaid design. Airaid provides a low-tech solution that delivers the medication when the lights have gone out.

## **SPECULATIVE DESIGN PROJECTS EXPLORING DISASTER RELIEF THROUGH SPATIAL DESIGN**

### **Sven Mehzoud**

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*Safety is an instinctive need that has guided human choices throughout history. The protection, reassurance, and comfort that we crave - for ourselves and our homes, families, cities, nations, and for the whole world - shape much of our daily activities and indeed the system on which our society operates.*

Paola Antonelli, Curator, 'Safe, Design takes on Risk' Exhibition, MOMA New York.

The design of space considers human inhabitation and the needs and behaviour of individuals as well as of people in communal and social contexts. While spatial design often considers how one might create more functional spaces for people and to provide safe and well working environments it is also about the understanding of how people act in space, individually and socially.

For a design project, Year 2 Interior Design students from the Bachelor of Design Programme at Massey University's Institute of Design for Industry and Environment were given a 20 foot mobile container with which to develop a spatial design / product to support the management (readiness, response, recovery) of a particular hazard that could occur in the Wellington region.

The resulting projects displayed in this presentation deal with extreme situations of spatial environments, where stress occurs, mentally and physically. However these set of projects offer solutions of a more didactic nature as opposed to a pragmatic one. They address problems that can occur simply by a lack of education of how we as individuals or as a community can or should respond. The illustrated projects are: 1) a tsunami education and warning system unit, and 2) a media monitoring station that educates people about hazards around the globe and their relationship to paranoia.

Scenarios and their environmental conditions are investigated, and peoples' behaviour anticipated. This understanding is the basis for many of these projects. It allows, to a degree, for the manipulation of people through the design of spatial conditions, thereby effecting helpful behaviour. Most designs presented are of a speculative nature, and pragmatics aside, offer creative and original responses. They demonstrate spatial design approaches to solutions where a good understanding of a community's culture, coupled with science and technology can potentially provide new ways of making our environments safer.

## **GATHER: GPS DIGITAL REGISTER**

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One of the first steps in dealing with the aftermath of a disaster is to register the survivors, whether able-bodied, injured or sick, and the missing and dead. The registration process documents the person's name, address, age, gender, contact details, next of kin, missing family members, registration location, and urgent concerns such as medical matters.

This information is used to address survivors' immediate needs, to reunite families, inform government relief efforts and welfare and insurance agencies, and to provide official figures and geospatial intelligence. In New Zealand, traditional paper systems used in disaster registration have recently been updated, but to make the information accessible, secondary processing to collate and input data is still required.

GATHER is a portable digital registration device designed to efficiently facilitate the registration of disaster victims. It combines GPS, digital camera, touch screen interface, on board storage capacity, and state of the art wireless technology. GATHER provides full registration of disaster victims in three basic steps:

1. One-click identification photo and capture of GPS coordinates.
2. Personal information input using the touch screen.
3. The file containing all information about the person is transmitted to a centralized database, or stored for later transmission or uploading to computer via a USB2.0 port.

Each personal data-file is automatically added to a searchable digital database, accessible online by aid and relief organizations.

### **GATHER**

- Eliminates double handling as data is automatically entered into a digital database
- Creates a database that can be instantly searched for missing persons
- Provides current, quality information through real time updates.
- Permits faster more focused and appropriate disaster response
- Affords comfort and reassurance to disaster victims
- Creates a live, constantly updated database from the field, accessible from within and outside the disaster zone.

Efficient information management is integral to coordinating disaster relief efforts, allowing people to request adequate aid supplies, prioritise the needs of victims, and aid the restoration of normality. GATHER delivers critical information to relief agencies about the location and condition of disaster victims and, in doing so, informs and accelerates the planned response from relief and rescue agencies.

## **MARKETING RECOVERY: OUTREACH AND COMMUNICATION STRATEGIES FOR RECOVERING COMMUNITIES**

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New research into how disaster-affected communities responded to, or rejected, communication and outreach services designed to help with their recovery has shown that it is no easy task to reach all of the people all of the time with helpful, timely, effective and appropriate communication and personal support initiatives (Camilleri et al., forthcoming). This paper draws on research conducted after the 2003 Canberra bushfires, touches on experiences of other recent disasters, and uses a body of theoretical principles more commonly applied to marketing communication, to evaluate outreach strategies and communication techniques utilised in recovery programs, and to propose some best practice models for future programs. Topics to be explored in the paper include:

- rebuilding resilient communities through timely and effective communication/outreach strategies
- what marketing communication and public relations theories can tell us about effectively connecting with recovering communities
  - theories of learning and motivation; attitudes and behaviour; involvement theories; public opinion formation; constructing persuasive messages; campaigns; media influence
- ACT bushfire recovery research findings from a communication point of view
- how recovery newsletters can be used (ACT, Eyre Peninsula and Cyclone Larry)
- the how and why of outreach programs:
  - the need for outreach
  - the use of media in outreach
  - partnering with community
  - outreach to vulnerable communities
  - a variety of outreach methods
- models for best practice recovery programs.

## **RESQMAX: A MULTITOOLO FOR FIRE BRIGADES AND URBAN SEARCH AND RESCUE**

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Fire brigades and urban search and rescue are equipped with a variety of tools and devices to assist with the location and extraction of injured victims during and after disaster events. Problem analysis of these tools, their storage and method of use, identified a range of issues including:

- The broad range of tools required.
- The space required for storage and transportation.
- Confusion over the selection and distribution of tools between rescue crews.
- Crews numbering less than six have difficulty carrying bulky and heavy tools and equipment.
- Equipment needs to be rugged in order to function under difficult conditions.
- Tools must have great utility and be low maintenance.
- Losing tools within a disaster environment.

We also analysed the strengths, weaknesses, opportunities and deficiencies of an existing product, FireMaxx, and a previously developed design concept, Multi Head Tool. These analyses resulted in the development of new design criteria and product objectives for a multifunctional emergency response tool. Objectives for the tool included:

- Reducing storage space.
- Improving portability.
- Fitness for purpose.
- Eliminating redundant features.
- Enhancing reliability.
- Producing a product that the end users want.

Ergonomic investigation developed and refined the end user interaction with the product. This provided clear and meaningful representations of the way the product is to be used, for example grip areas are contoured to accommodate the hand.

The final product, ResQmax, combines the functions of a sledge and slide hammer, an axe and forcible entry device, a pry and crowbar. The extendable handle increases the range and leverage available for lifting and shifting objects.

Its combined functionality makes ResQmax a more useful tool that requires less storage space than other tool offerings. Rescuers' access into disaster zones is accelerated because there is less confusion over tool selection, and at the scene Fire Brigades and Urban Search and Rescue have fewer tools to carry.

## **VERTEBRACE: A MULTISCENARIO FIRST AID STRETCHER**

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First aid is an essential part of disaster response. The patient stretcher is a standard component of any emergency response team. Currently domestic first aid responders carry up to four different stretchers in order to deal with the range of different scenarios they may face in attending a disaster. Due to cost and storage considerations, a general-purpose stretcher is often pressed into use for a range of these scenarios, with varying degrees of success.

Vertebrace is a versatile response stretcher designed to eliminate the need for additional stretcher types by providing a flexible design that can be easily customized for any given scenario. For water rescue flotation aids can be attached, for spinal injury cervical collars and spinal restraints may be added, for restricted or difficult access shortened back braces and a rope attachment may be used, and for low transport risk a foam mattress may be added.

The design objectives for Vertebrace include:

- Reducing spinal movement for back injuries.
- Safe handling of difficult (unconscious, seizure, dangerous) patients.
- Provide patients with a comfortable transfer platform.
- Ability to be used in confined spaces.
- Adjustable for different size patients.
- Being comfortable and easy to use for stretcher-bearers.
- Efficient to store when not in use.
- Easily cleaned and maintained.

The final product concept has undergone basic ergonomic testing, which has established the dimensions and the range of adjustment of Vertebrace. Usability factors involving lifting and ground clearance of handholds, and enclosing the head position to improve comfort and safety have also been established.

An innovative multi point strapping system has been developed. This provides easy isolation of the patient within the stretcher regardless of their type of injury. Adjustable support blades allow custom fit to the patient. Lifting and sliding these blades provides support where it is needed for the patient. Push-button lock mechanisms provide ready adjustment of the stretcher length.

Vertebrace provides a single solution for patient transfer that eliminates the need for additional stretcher devices and reduces the amount of equipment carried by first aid responders. The superior versatility of Vertebrace enables faster and more successful response by first aid personnel, ensuring better care and safer transfer of the patient.

# **FACILITATING READINESS FOR NATURAL HAZARDS: THE ROLE OF SOCIAL TRUST**

**Douglas Paton**

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In areas susceptible to natural hazards, a key goal of risk management is mitigating risk by encouraging people to adopt protective measures. Despite efforts of civic emergency management agencies to do so, the goal of ensuring sustained adoption has proved elusive. This poster argues that this problem reflects a failure to accommodate two factors.

The first is concerns the relationship between the complexity of hazards and peoples' lack of experience of them, and the consequent need to rely on others to acquire pertinent information. The second concerns the fact that it is not information per se that determines whether people act to manage their risk. Rather, decisions to act are determined by how people interpret information (i.e., render it meaningful to them) in the context of experiences, beliefs and expectations that are forged, changed and sustained through their social relationships with other members of their community and/or representatives of civic and scientific agencies.

The infrequent nature of natural hazard activity makes it difficult for people to acquire the knowledge or experience required to guide their preparedness decisions. Consequently, they tend to rely more on expert sources for this information. Given its prominence as a predictor of how people manage uncertainty, it is argued that social trust plays a pivotal role in this process. This poster draws upon research conducted on preparing for bushfire, earthquake and volcanic preparedness to test the predictions of a model (Kee & Knox, Mayer et al., 1995) of the role of social trust in predicting how people manage risk. First, the poster discusses how familiarity with a hazard and the availability of information about it affects the relationship between trust and preparing. Secondly, the poster discussed how trust mediates the relationship between community (e.g., participation, problem solving) and societal (e.g. empowerment) characteristics and natural hazard preparedness.

The analysis supports the prediction that the quality of the relationships between people, communities and civic agencies exercises an influence on the effectiveness of public education that transcends the quality of the information made available. The implications of the findings for conceptualizing and delivering public education programs in ways that accommodate these relationships is discussed. In particular, this work introduces how effective risk communication requires communities and civic agencies to play complementary roles in the risk management process.

## MEASURING COMMUNITY RESILIENCE IN AUCKLAND, NEW ZEALAND

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The Auckland Region Civil Defence Emergency Management Group (CDEM Group), which is responsible for emergency management in the Auckland region, has as a vision *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 this vision, the CDEM Group 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. The model has been tested in the context of both a volcanic and pandemic scenario in Auckland using a generic approach to accommodate the social and hazard diversity that underpins Auckland's complex natural hazard risk context. The distribution of risk associated with these hazards fulfils the criteria necessary for testing a model with regional applicability.

Data were collected from telephone surveys of 297 and 400 residents (volcanic and pandemic surveys respectively) and analysed using structural equation modelling. The first analysis produced a model comprising: two person-level factors (positive outcome expectancy, negative outcome expectancy); two community-level factors (community participation, ability to articulate community problems); and two institution-level factors (empowerment, trust). Although there were differences in some of the pathways the second analysis confirmed the validity of the model. A role for one variable (action coping) that was marginal in the volcanic model, 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 poster presentation will discuss the model and its limitations, look at how the model is already being used to assess current levels of resilience in Auckland and how it is being considered as a common measurement framework that can be used to compile local, regional and national societal resilience assessments and facilitate their comparison.

## **PROMOTING COMMUNITY BUSHFIRE PREPAREDNESS: AUSTRALIAN AND PORTUGUESE PERSPECTIVES**

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In societies vulnerable to experiencing adverse impacts of bushfire hazards, a key component of any risk management strategy is encouraging people to adopt prevention measures. In Portugal, where the annual rate of forest burned area stands today at 2.7% per year, little attention has been paid to bushfire education and awareness. Public inquiries in Australia following recent major bushfire events identified improving public education as a major social policy objective. It is thus important to determine why levels of preparation remain low and identify alternative approaches to facilitating sustained levels of preparedness.

Currently, public education relies heavily on making information available to people. However, people do not necessarily accept this information at face value. Rather, it is how people interpret their risk and the information available that determines whether they prepare for bushfires. This paper reports on recent work that illustrates that while some people appear predisposed to prepare, but need to be guided in this endeavour, others decide not to prepare. This means that, when planning public education, it is not enough to know that levels of preparedness are low. It becomes necessary to find out if levels are low because people have decided not to prepare, or if levels are low because people need guidance to know what to do. Different strategies are required to deal with each contingency.

Drawing on the findings from survey and interview research conducted in Portugal and Australia, this paper identifies factors that result in people interpreting their relationship with their environment and the bushfire risk in ways that result in deciding to prepare (e.g., acceptance of risk and responsibility, relative salience of bushfire as a community concern, outcome expectancy beliefs, sense of social responsibility) or electing not to prepare (e.g., negative attitudes, anxiety, environmental attitudes). This information is used to identify guidelines for public education.

The adoption of a cross-cultural comparison can play an important role in allowing us to determine whether we are tapping into universal processes that affect people's risk perception and how their risk management strategies develop.

## **CHILDREN AND DISASTERS: UNDERSTANDING VULNERABILITY, DEVELOPING CAPACITIES, AND PROMOTING RESILIENCE**

**Lori Peek**

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Natural, technological, and intentional human-caused disasters impact the lives of millions of children around the world each year. Indeed, disasters harm the physical spaces in which children live (their homes, neighborhoods, schools, and playgrounds) and may lead to long-term displacement, disrupt their daily routines and educational progress, threaten their sense of safety and security in the world, cause stress within families and communities, and may result in personal injury or the death of loved ones. Infants and young children, in particular, are physically vulnerable to both sudden onset as well as more chronic disaster events due to their partial or total reliance on adults for protection. Older children and adolescents may suffer from various behavioral, psychological, and emotional issues in the aftermath of disaster, as they often express elevated levels of frustration, depression, fear, and worry. Youth may also show decreased school performance, engage in hazardous or reckless behavior, or be at increased risk for alcohol or drug misuse after disaster. These problems are often exacerbated for children who are impoverished, living in unstable environments, or lacking strong familial and social support systems.

In the aftermath of disaster, adults – including parents, disaster responders, counselors, childcare providers, and teachers – all may play vital roles in helping children recover. Immediately following a disaster, it is important that children's basic physical needs are met, including providing food, water, shelter, clothing, and emergency medical assistance. Once these immediate needs are taken care of, then adults can assist by reestablishing routines and helping children regain some sense of security and normalcy in their lives.

Although children are vulnerable in disasters, and they are often dependent on adults for physical, material, and emotional security, children are not passive victims. Rather, children have special capacities that could serve as a significant resource for families and communities attempting to prepare for, respond to, and recover from disasters. Children's knowledge, creativity, enthusiasm, and social networks are all largely underutilized assets. As disaster events increase in frequency and intensity around the globe, it is all the more important that disaster researchers and practitioners develop new ways to learn from and work with children to make their lives safer and their communities more resilient to disasters.

## **TOWARDS TSUNAMI-RESILIENT COMMUNITIES IN AUSTRALIA AND NEW ZEALAND**

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Coastal communities worldwide are susceptible to tsunamis, and Australia and New Zealand are no exception. Both countries are at risk from distant and locally generated tsunami, and an increase in the number of people choosing to live in the coastal zone over the past few decades has greatly exacerbated the risk to society from tsunamis. Therefore, it is necessary for hazard managers to adopt a range of activities that engage, empower and motivate at-risk communities to respond effectively and appropriately to tsunami warnings.

This study aims to assist emergency management planning and assess the effectiveness of outreach programmes in preparing at-risk communities to adopt appropriate tsunami adjustments and to respond effectively to tsunami warnings. This can be achieved by developing an understanding of the factors that shape community resilience to tsunami. Successful response to future tsunamis in Australia and New Zealand will be greatly enhanced if an understanding into the complex processes that lead to the adoption of measures for tsunami preparedness and understanding of warning systems is gained. Research will also explore local arrangements for disseminating tsunami warnings, and the role of both formal and informal social networks and issues around community engagement and empowerment. It will also look into different strategies for motivating and sustaining community participation.

Data will be collected using a mix of quantitative and qualitative methods. It is proposed that survey data will be collected from adult residents of two Australian and two New Zealand communities that have either (i) experienced damage in the 20<sup>th</sup> or 21<sup>st</sup> century from tsunamis or have not, or (ii) have participated in extensive campaigns aimed at tsunami mitigation or have not.

## **THE ROLE OF EXERCISES AND SIMULATIONS IN DISASTER MANAGEMENT**

**Tony Ralph**

RFM Consulting Services

Most local authorities have well developed disaster plans and procedures. The regular testing of these plans through innovative and realistic exercises or simulations is an important step in the development of any disaster management capability. While many local authorities are developing their ability to exercise plans, increasingly, this requirement is being mandated through legislation.

A well-planned exercise or simulation can be used to train individuals, develop teams, validate plans and procedures while building organisational capacity and working relationships with other stakeholders.

The RFM approach to simulations and exercises has been developed and proven over many years. It is based on a systematic process which begins with the engagement of senior management and key staff in the selection of the aim and objectives for the activity and unfolds to cover the preparation, conduct and analysis of the results of the activity.

Using a series of recent case studies to illustrate the presentation, RFM will outline their highly successful approach. Their presentation will demonstrate how well developed exercises can test specified objectives while assisting to validate plans and procedures in a realistic and controlled setting. It will also show how this process educates key staff on their role and duties, and will highlight the key steps in planning for, conducting and drawing learnings from the exercise and simulations.

This promises to be a timely, practical and interesting presentation delivered by Queensland's leading consortium specialising in all aspects of emergency and disaster management.

## **A COMPLETE ALERT SYSTEM SOLUTION**

### **Wilfried Roding and Wernher Roding**

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### **Meerkat Guardian™ Indoor Siren**

Designed exclusively for indoor use, this portable siren plugs into any standard domestic power outlet. When activated, a piezo-electric sounder emits a specific high-pitched pulsed tone. The siren is AC-powered and triggered by ripple control command which is transmitted over the electrical grid from the local power company's control centre.

The siren will only operate on electrical networks equipped with a ripple control facility and does not function during power outages.

### **Meerkat Sentinel™ Outdoor Sirens**

Designed predominantly for outdoor applications, Sentinel™ sirens deliver cost-effective and targeted alert dissemination. Modular construction facilitates tailor-made applications without having to pay for unwanted functionality. Siren assemblies consist of a weather-proof control panel and remote projection horn array. Power output is configurable from 100W-400W, which translates into a nominal directional range of 250-750m. Siren options include light beacon and PA capability. Activation options include: Ripple control, voice (DTMF) or data radio, GSM and manual control.

### **Meerkat Messenger™ Control Centre**

The control centre is an optional PC-based SCADA package which integrates with base-station radio/GSM communications equipment for system activation and diagnostics. Secure system access is possible via GUI at the base station or remotely via radio, cellular phone or internet.

### **Meerkat Poseidon™ Mass Alert Sirens**

For certain applications where a mass-alert siren system may be preferred (eg: military- or industrial bases), these high-powered projection horn sirens are configurable up to a power output of 3200W, providing long-range alert and PA capability.

### **Communications**

Sirens, excluding the Meerkat Guardian™, can be configured to be activated by virtually any means. To ensure high system integrity and comprehensive diagnostic capability, however, data radio is the preferred communication medium.

## **A NEW APPROACH IN ALERT SYSTEM DESIGN**

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Meerkat Alert Systems has adopted a new approach in alert system design, by using a short-range electronic siren network, which can either form part of a wider, integrated emergency alert system, or function independently as an evacuation alarm. System design and siren deployment differ from conventional siren systems, in that siren type and configuration are specifically tailored to the situation of the target audience, to achieve greater alert penetration.

### **Modular Design**

By using a simple modular design, siren assemblies can be configured to suit availability of mountings, audible range, sound direction, means of activation and communication.

### **Cost Savings**

The use of indoor sirens and modular, short-range outdoor sirens, allows for cost efficiencies in siren manufacture and placement. Existing infrastructure, such as power poles and buildings are generally used as siren mountings. 'Decibel Dollars' are saved by efficiently directing sound energy to the target audience.

### **The Meerkat Guardian™**

People located in buildings may not hear outdoor sirens, particularly when there is background noise or while they are asleep. The Meerkat Guardian™ indoor siren, which plugs into any mains outlet and is triggered by ripple control over the electrical grid - alerts people effectively with a specific high-pitched tone signal.

### **The Meerkat Sentinel™**

Designed for outdoor use, the Sentinel™ series of sirens uses electronic projection horns for sound generation. Sirens are configurable as to power output level and functionality, such as multiple means of activation, diagnostics and PA capability.

### **The Meerkat ZULU™ Alert Signal**

The Morse code for 'Z' (dash-dash-dot-dot) has been chosen specifically for its unique application as an emergency alert signal and to distinguish itself clearly from the multitude of other alarm signals used by emergency services. The alert either directs recipients to access other media (TV, radio, etc) to determine the nature of the emergency, or may be specific to a particular emergency.

## TOOLS FOR MANAGING FLOOD EVENTS IN SWITZERLAND

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Flood and debris flow hazards are frequently causing fatalities and big economic losses in Switzerland. To reduce damage due to natural hazards, first, hazard prone areas should be avoided by land use planning. Second, technical measures are widely implemented to reduce the impact or the frequency of hazardous processes. However, not all risks can be eliminated. Due to historical reasons settlements are not always where they should be. Technical protection is not feasible against all processes in all dimensions. Furthermore, not all possible technical measures are economically, ecologically and socially reasonable. Therefore not only preventive measures but also interventive measures such as temporary deflection dikes are required to limit the damage. To be fully effective, emergency measures have to be installed before an event really happens. To decide when the moment has come to do such installations and where to position them but also to minimise false alarms, emergency managers need best possible information. The crucial point in this respect is time. In small catchments with short reaction times emergency management pose a particular challenge.

This challenge may considerably be facilitated on the one hand by a site-specific early warning systems giving information about the evolution of possibly risky situations, and on the other hand by instructions for intervention giving advice to relief units. In our proposed talk we report on two appropriate tools developed within the last three years.

The first tool is an information and warning system for hydrological hazards in small and medium scale catchments (in the range of 1 to 1000 km<sup>2</sup>). The system referred back to the good experience with avalanche warning (system IFKIS) in Switzerland and was therefore named IFKIS-Hydro. This system combines different information such as weather forecast, precipitation gauging, discharge simulation, and local observations of event-specific phenomena, and presents them on a web-based platform, called InfoManager. This data, integrated in a clearly defined procedure, then supports decision making on interventions.

The second tool is an intervention plan, which provides relief unit officers and safety managers with the information needed to plan and organize missions and to give priority to particularly vulnerable objects at risk. Of course, the intervention should be supported by an early warning system like IFKIS-Hydro. Last but not least, the simple form of the plan, a double side printed sheet of paper A4 for each object and each event phase, facilitates a quick and concentrated transfer of information.

Warning and intervention are important pillars of a successful emergency management. The decision-support tools described above may substantially contribute to a more effective emergency management. There is a particular interest among the involved stakeholders in Switzerland to further advance these and akin tools as well as to employ and institutionalise them in regions prone to floods and debris flows.

## **THE POTENTIAL OF RAZAKSAT™ FOR DISASTER MANAGEMENT IN MALAYSIA**

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Malaysia relies on existing satellite remote sensing data provided by commercial organizations in which these data are not readily available for disaster management due to limitations in revisit time and high cloud cover in the equatorial regions especially by the use of passive systems. The chance of imaging could be increased by increasing the number of revisits. To allow for higher revisits, Malaysia will launch a remote sensing satellite, the Razaksat™ that will be placed in a 9 degree inclination orbit to provide 14 passes day and night with a maximum of four imaging capabilities during the daytime over Malaysia. The paper will discuss about the roles of Razaksat™ in Malaysian national disaster management system in delivering the best information to be put into practice and how it will affect or complement the existing early warning systems. It is expected that with the operationalisation of the Razaksat™ satellite system, the current national disaster management system can be improved at much lesser cost due to reduced reliance on data from foreign commercial organizations.

## LANDSLIDE HAZARD MAPPING AND STATE PLANNING POLICY

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The potential landslide hazard in two adjacent South East Queensland local government areas was assessed using different hazard mapping schemes, under the DOTARS Natural Disaster Mitigation Programme. Caloundra City and adjacent Caboolture Shire to its south share common elements of geology and physiography, and have a comparable climate and history of development. As such, these LGAs provide an ideal site to examine the effectiveness of differing approaches to landslide hazard assessment.

Queensland State Planning Policy SPP1/03 calls for an assessment of landslide susceptibility to be based on the assumption that slopes above a nominal 15% should be considered suspect unless shown otherwise through dedicated hazard mapping for a local government planning scheme; the corollary being that slopes less than 15% are nominally considered stable. A proviso in SPP1/03 also allows that instability is possible in lesser slopes.

Both the Caboolture and Caloundra landslide hazard assessment approach recognise that slope angle alone is not enough to define hazard and that a consideration of rock type is also critical. A common geological mapping base is adopted in both schemes. The two approaches agree that previous signs of landslide activity are critical indicators of continuing and future instability, and both approaches, in common, recognise the vital importance of land clearing as a contributor to instability.

The two methods differ in the slope stability angles ascribed to each of the various lithologies. To a large extent, the Caboolture approach is influenced by an attempt to align divisions in its scheme with the nominal 15% slope limit, even though SPP1/03 does not require this. The landslide hazard mapping method adopted for Caloundra assumes limiting stability (ie. once the slope stability limit for a particular rock type is reached, failure is considered likely to occur), whereas the Caboolture method envisages various degrees of risk of slope failure (low, medium, and high).

Significant differences arise between the two schemes in their prediction of potential landslide hazard. In general, the adoption in Caboolture of a nominal 15% slope as one limit on stability, and the use of an intermediate hazard category, only serve to force the assessment of stability in the majority of rock types towards excessive conservatism. In contrast, where additional conservatism can be shown in practice to be fully warranted (e.g. in colluvial aprons surrounding Tertiary basalts), the same assumptions actually lead to a non-conservative outcome.

We apply both schemes to both LGAs, and highlight the differences in assessed landslide potential and the impacts that arise as a consequence. The results have implications for the legislated use of 15% slope as a criterion for stability and for attempts to incorporate this nominal limit in hazard assessment schemes, as well as for the uniformity of landslide hazard assessment that is capable of being achieved state-wide.

## **UNIT<sup>®</sup>: MODULAR SHELTER SOLUTION FOR IMMEDIATE DISASTER RESPONSE**

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When disaster strikes, buildings and homes can be destroyed or rendered uninhabitable or unsafe. Victims may need temporary accommodation, or to move into community shelters outside the disaster zone. In major disasters or in difficult terrain, accommodation intended to be temporary, can become semi permanent.

Unit<sup>®</sup>, is a human-centred shelter solution designed to provide a safe refuge for individuals and families. Protection from the elements, comfort, security, the ability to navigate a sea of tents to their own tent community, can help reduce the anxiety and sense of displacement of disaster victims.

Unit<sup>®</sup> is a modular shelter designed for efficient distribution and fast erection as semi-permanent community accommodation. Unit<sup>®</sup> is packed on a transportation pallet in colour coded hard-cases in clusters of sixteen, providing accommodation for approximately 40-50 people of mixed ages. A coloured community flag (viewable from a distance) and village layout plan are included.

Unit<sup>®</sup> offers a range of features and benefits to the shelter dweller:

- Easily constructed by one person, using simple twist and lock mechanisms, on solid or soft ground.
- Colour coded components with easily read pictogram instructions sheets.
- 12 sq m (3m x 4m) footprint, 1.8-2.2m height, 40kg weight.
- Withstands high winds, rain and snow.
- Roof design provides water catchment, airflow and roof clearing of snow or ash.
- No protruding guy ropes to trip over.
- A lockable storage compartment within the tent when erected.
- Replaceable ground sheets are so each deployment receives a fresh unused floor.
- An identity pack for each tent uses numbering and graphics in a weatherproof sleeve attached to the shelter to make it easier to identify and locate people from a group within the shelter community.
- Modular design allows two shelters to be zipped together to accommodate families.

The Unit<sup>®</sup> design takes into account the storage, transportation, deployment and refreshment of the product before, during and after use. Unit<sup>®</sup> provides shelter for the essential well being of victims of disaster, so that communities can quickly regroup and rebuild.

## **ENGAGING AND PREPARING COMMUNITIES FOR RECOVERY PRE-EMERGENCY**

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Typically, the concept of recovery is one which is only given consideration at or towards the conclusion of an emergency event. While agencies are well versed in preparing for emergencies in terms of their roles and responsibilities, often the community is overlooked as a key partner and driver in this process particularly in relation to having input into the planning of their own recovery.

The recovery engagement model was developed by Department of Human Services in partnership with the Cardinia Shire Council to enhance recovery planning and community participation pre event in the bushfire prone areas of Gembrook, Upper Beaconsfield and Cockatoo.

The model seeks to facilitate stakeholders and organisations from recreational, social, environmental and economic interest areas within a community to be engaged and provided with the opportunity to consider the potential effects of bushfire on their community. Though a facilitated workshop participants were asked to consider and identify the sectors within their community which would be vulnerable to bushfire; identify opportunities to strengthen community links to connect with and build resilience within vulnerable groups and identify potential needs which may emerge post incident in consideration of the social, built, natural and economic functional areas.

This process has provided an opportunity for Cardinia Shire Council to obtain information and gauge levels of resilience and susceptibility within each of the respective townships and ascertain areas of potential need. This has also further enabled Council to identify networks to connect in with and utilise in the dissemination of information to the vulnerable sectors of the community, and provided an opportunity to validate, review and enhance existing recovery plans with community input.

The benefits of the recovery engagement model are that it is transferable and can be applied to any hazard or community type. It presents a holistic approach to emergency management planning and recovery by providing an opportunity for Councils to actively engage with at risk communities prior to an emergency occurring and obtain clearer understanding of potential community needs which may arise during the recovery phase. Through engaging in dialogue with communities in planning for recovery, the model also facilitates the opportunity to enhance resilience within both the vulnerable and wider community sectors as well as promoting the importance of recovery being driven by those in an affected area.

## **CREATING RESILIENT ORGANISATIONS AND COMMUNITIES.**

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Developing the concept of resilience may be a very effective approach to managing Australia's exposure to an increasing number of system failures and extreme weather events. The complexity and the tightly coupled nature of the systems that support our society and economy means it is very difficult for organisations to even know that they might be affected, much less be in a situation to reduce losses and recover from disasters.

Organisations and communities are faced with a bewildering array of approaches to managing exposure to disasters such as BCM, BC Planning, Emergency Management, Emergency Risk Management security risk management and crisis management. We must rethink and develop new approaches and institutions. Anticipation while a useful strategy for familiar hazards may fail to cope with high levels of uncertainty, ambiguity and complexity.

This paper will scan the current environment, review current approaches and suggest ways to progress the field.

## **R-PLB: A PERSONAL RESPONSE LOCATOR BEACON**

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During a disaster communications can fail and power may be cut off. Rescuers are tasked with the location and rescue of survivors. These survivors could be stranded on rooftops or buried beneath meters of rubble. Survival for some of victims can rely on the knowledge and skill of the search and rescue team.

For survivors the first few hours after the disaster can be crucial. In severe conditions and where victims may be suffering from injury or exposure, time is a critical factor. In these circumstances having a ready to hand product that lets the rescuers know where you are and your condition could mean the difference between life and death.

Getting people to prepare for disasters is difficult enough; getting them to purchase specific transmitter products for the eventuality of a disaster is even harder. The problem is how to get people to purchase the disaster product in the first place?

One strategy is to make it useful across a range of applications. By developing a product that can be used in outdoor recreation we can provide an emergency product that presents a more direct application and use for:

- 4WD excursions
- Tramping and hunting
- Boating
- Rock fishing
- Climbing

This will more successfully distribute a disaster transmitter product throughout the community.

R-PLB is a rescue, personal locator beacon designed to fill this product gap, ensuring recreational safety in the outdoors and being ready at hand in a disaster situation. R-PLB fits into the existing COSPAS-SARSAT rescue system. It uses 406 MHz frequencies to transmit an individually encoded message to search and rescue base. This message contains information on the owner of the R-PLB and its location. The user can select from three settings describing the severity of the situation. Used by rescuers, it can transmit the location and situation without jamming up the emergency radio channels.

The device is powered by a battery and has a dormant life of five years. It is lightweight, compact and waterproof. It can be easily slipped into a pack, jacket or glove box. An easy-to-navigate interface and logical button controls simplify activation and use.

## **BUSHFIRE RISK PERCEPTION: A DEVELOPMENTAL PERSPECTIVE**

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One outcome of inquiries in the 2003 Canberra bushfires was recognition of a need for greater community preparedness, with schools being identified as a resource for pursuing this objective. However, the effective use of this resource requires understanding how children construct bushfire risk. There are two significant issues in this context. The first relates to the fact that risk perception is socially constructed (Joffe, 2003). The second concerns the fact that children's understanding of constructs that underpin taking preventive actions (e.g., causality, prevention) change with age (Paton & Brown, 1991). This poster describes a model of bushfire risk perception that integrates these perspectives.

Traditionally, research on risk perception has been conducted within the cognitive paradigm and focused on explaining risk perception in terms of individual characteristics (e.g., deficits in information processing ((Kahneman, Slovic & Tversky, 1982). The limited explanatory power of this approach has been recognized (Sjoberg, 2000). Consistent with the cultural approach, Joffe's (2003) Social Representation Theory (SRT) proposes that risk perceptions evolve through social interaction. Joffe's approach complements socio-cultural theories of development that argue that the skills and knowledge of the culture are internalized through social interaction (Rogoff, 1990; Vygotsky, 1978). Taken together, the SRT of Risk and socio-cultural theories of development provide a framework within which to examine children's construction of bushfire risk. This poster discusses this through the integration of three perspectives (school, family, peer group), selected because they are implicated in children's conceptual development in diverse knowledge domains (Case, 1992).

Because the relative influence of each element of social context changes as children move from early childhood through to adolescence (e.g., in early adolescence, an increase in the influence of the peer group is accompanied by a decrease in family influence), risk perception will change as children develop as they get older. A need for a developmental framework is also necessitated by developmental changes in the way in the quality of children's understanding of the causation of events and preventability (Case, 1998; Paton & Brown, 1991). The utility of this approach has been consistently demonstrated in research on health-related risk communication (Paton & Brown, 1991; Shute & Paton, 1990) and road safety education (Tolmie et.al, 2005), with research in both areas providing evidence that when risk communication is designed to accommodate cognitive capability and social context, children can develop more sophisticated understanding of risk, how risk can be managed, and are more likely to convert these beliefs into protective actions and attitudes.

Drawing upon data collected from interviews in several at-risk communities in Tasmania, this poster discusses the role of the social context in the construction of bushfire risk at each developmental stage and identify the cognitive constraints on the construction of bushfire risk each developmental stage. The contribution of these data to the development of a comprehensive, theoretically robust, model explaining the construction of bushfire risk over the lifespan is discussed. This will provide agencies responsible for educating communities about

bushfire risk and mitigation with an evidence-based framework that they can use to design more effective risk communication programs that accommodate and capitalise on existing social resources and cognitive capabilities.

## **SAHANA: A SUSTAINABLE ICT SOLUTION FOR DISASTER MANAGEMENT**

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Sahana is Sinhalese for 'relief', and is the name given to a web-based information management system initially built by a group of volunteers from the Sri Lankan IT industry following the impact of the tsunami from the Sumatra-Andaman earthquake on December 26, 2004. The original version of Sahana was primarily designed to meet the immense humanitarian needs in the weeks and months following the tsunami. The development of a disaster management solution during recovery is not ideal, but there were no other options available at the time. Three weeks after development started, Sahana was authorised as part of the Sri Lankan Government's website for the Center of National Operations. Nine months later, Sahana entered Phase Two of its development, during which it was redesigned from the ground up so as to support more modular application and a wider range of deployment scenarios.

Perhaps the defining feature of Sahana is that it is Free and Open Source Software (FOSS). Commercial disaster management systems are often unsustainable for all but the wealthiest of countries. Sahana was created as a system that can be deployed in a sustainable fashion in any country on the bare minimum of computer hardware and communications. Sahana is designed and developed by a truly international community that brings together practitioners from the humanitarian and emergency management sectors, as well as computer programmers.

The key benefit that a FOSS solution like Sahana provides is that all improvements to the system are returned to the global community free – this results in a continually improving system based on deployment feedback from recent deployments. Many others benefits provided by FOSS contribute directly to sustainability of Sahana as a disaster management solution – increased flexibility, ease of customisation, deployment is not restricted by licence agreements or finance, and skills required to support Sahana are increasingly available in local communities.

The long-term vision for Sahana is to not only act as a response and recovery tool, but to enhance community resilience as a portal of hazard information and planning advice, in addition to providing distributed tools that can be used by professionals and also directly by communities. To date, Sahana has received over USD\$150,000 in development funding from organisations such as the Swedish International Development Cooperation Agency, the US National Science Foundation, IBM and Google to support and grow this project, recognising its benefits to the global community.

## **COMMUNITY EMERGENCY RISK MANAGEMENT: D.I.Y. RESILIENCE**

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Effective community preparedness arrangements are inextricably linked to awareness levels and risk perception by members of the community. Community Emergency Risk Management (CERM) programmes facilitated by practitioners from Victoria State Emergency Service (VICSES) have proved particularly successful in identifying specific hazards within local communities and enabling effective planning to be undertaken at the local level. This process encourages community ownership and, consequently, community resilience.

This presentation will provide a practical example of the CERM process using a case study of a Gippsland community recently affected by 06/07 Great Divide Fire. It will explore:

- community risk perceptions versus objective risk assessment;
- “lights ‘n bells” to the rescue versus building community self help capacity;
- utilising existing local infrastructure such as the Tourist Railway in both the response and recovery stages of an event;
- integration into the broader municipal emergency management plan; and
- assessment of the CERM process in light of the 06/07 Great Divide Fire event.

While the CERM process has been implemented in all municipalities within Victoria, Gippsland has a number of remote communities, some of which have unique geographic or political issues which don't necessarily fit with the general municipal profile. The presentation will show how small local communities can contribute to the overall emergency management planning within a large municipal context.

## **BUILDING COMMUNITY CAPACITY FOR FLOOD SAFETY IN MAITLAND AND THE HUNTER VALLEY**

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The 1955 Hunter Valley flood devastated the city of Maitland and other areas of the Hunter Valley. Fourteen lives were lost, 58 homes washed away, and over 5000 homes flooded. We now know that a better understanding of flood risks and evacuation procedures could have prevented many of these losses.

The recent influx of new residents with little or no flood experience, combined with a lack of recent large flood events has led to misconceptions about the real risks of flooding in the Hunter Valley. In addition to this, flood mitigation structures built over the past 40 years have fostered a false sense of security among residents who believe they will be protected by all future flood events.

The reality is that while current flood mitigation structures including levee banks and spillways will alleviate the risks of moderate flooding, another flood of the intensity of the 1955 flood will present a similar threat to the community today.

These factors have highlighted the need for an integrated and sustained approach to flood education in flood-prone communities. The Hunter-Central Rivers Catchment Management Authority, the State Emergency Service and the local community have been working closely together on the development of a flood education strategy for Maitland and the Hunter Valley. The project aims to build resilient local communities through effective community engagement. Input from an advisory committee has ensured the strategy developed meets the needs of the local residents and businesses.

An extensive survey of Maitland residents was conducted at the beginning of the project to gain an understanding of community attitudes, awareness and behaviour towards flooding. The results of the survey indicated the knowledge gaps regarding local flooding issues, and the community's preferred methods of addressing these. In response, a flood safety toolkit has been developed including an educational DVD with a computer model depicting the extent of inundation associated with a major flood in the Maitland area. The model has been developed using the latest technology to simulate a 100 year flood event and effectively depict complex engineering issues. The model visually conveys the limitations of the flood mitigation scheme and the level of protection it affords the Maitland community. The educational DVD

communicates the risks of a major flood and informs the community on how to prepare for such an event, where to get more information, and how to respond in an emergency.

Following distribution of the flood safety toolkit throughout the project area, the project will be evaluated using a repeat of the initial survey to evaluate the uptake of flood safety messages in the community. The comparative analysis of the surveys will be an important tool in measuring the overall effectiveness of the flood education strategy.

## **PEOPLE POWER: ALTERNATIVE COMMUNICATION CHANNELS FOR HAZARD INFORMATION**

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Everybody agrees natural disasters have negative impacts on our societies and need to be avoided or mitigated. However, at planning and property level matters are getting complicated as people often have conflicting interests: for example, property sellers versus buyers. Local government agencies often find themselves between a 'rock and a hard place' as they control the hazard information and communication channels.

The rise of internet and other new media, such as satellite TV, is also causing a shift in peoples' behaviour. People are now actively pursuing different sources of information for decision-making. This trend potentially erodes the position of the 'professional'. Although this trend may worry some people, it also creates new opportunities.

Moreover, despite all efforts going into hazard management during the last decade, research indicates that resilience of communities has not increased and the effectiveness of current communication strategies is debatable.

So, is it possible to use new communication channels to develop a self-service portal for hazard information that contributes to more resilient communities and makes life easier for local government agencies?

In 2003, GNS Science, a New Zealand crown research Institute, and Quotable Value, a New Zealand State-Owned Enterprise, took up the challenge and started the PropertyInsight initiative. The purpose of PropertyInsight is to make hazard information available online to support decision-making at property level – from anywhere at anytime by anyone.

The Manukau City Council, New Zealand's third largest local government agency, has adopted this approach and uses PropertyInsight to deliver customised hazard reports (real-time using internet applications) for its building consents, LIM reports, emergency management and customer service processes.

This presentation will examine some of the drivers behind the PropertyInsight initiative: its scaling at national level, independent, multi-hazard, uniformity and standardisation.

It will also discuss the differences between a customer-focused approach versus a legislation-driven approach, integration with other information channels, mitigation of legal risks and how the financial risks for the development, operation and maintenance of the system are covered.

## NOW IS THE TIME TO BE FLOODWISE

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Brisbane, with a population of over one million people, is located in Australia's fastest growing region, South East Queensland, which is experiencing a population growth of over a thousand people per week. Many pressures face our city, such as an increasing population, shortage of housing, the worst drought in 100 years and a huge demand on industry and residents to conserve water through level 5 restrictions. How then do we inspire our residents to prepare their homes and family for a flood?

Brisbane has a substantial number of properties liable to flooding, due to its location on a major river, an extensive network of suburban creeks and its subtropical climate. It is estimated that up to 11,000 residences across Brisbane may be prone to flooding by a 100 year ARI flood from creek and river flooding. Of these, 6,900 can be attributed to creek flooding and up to 400 properties regularly flood during a 2-year ARI flood event.

Whilst older residents of Brisbane remember the famous 1974 Brisbane River flood, which caused over \$200 million in damage, many Brisbane residents would be surprised to hear that a worse flood event for some parts of the city actually occurred in 2001. With so many creeks across the city, the river doesn't need to rise for it to flood in Brisbane.

In 2005, Brisbane City Council embarked on a task to increase flood awareness throughout Brisbane during a period of unprecedented drought. Council launched the *Be FloodWise*<sup>®</sup> Flood Awareness campaign last September in readiness for the summer storm season. The campaign consists of four stages:

- Stage One: a detailed four step approach for residents and businesses to be aware of their risk, prepare for an event, respond when the water comes, and recover once the water recedes.
- Stage Two: a summer storm season campaign of four key messages transmitted through radio, print and online material: don't drive through flooded roads, prepare your home and yard for flooding, obtain a free *FloodWise* Property Report from Council if you are buying or renting, building or renovating and listen out for forecasts and be prepared.
- Stage Three: engagement of industry and peak bodies to practice and promote *FloodWise* conduct within the real estate, building and conveyance industries and the insurance industry.
- Stage Four: community capacity building program based on survey results on the awareness level of residents in flood prone areas. Council will be working with flood prone communities to: increase their flood awareness, build capacity to assist themselves and each other, and assist in the development of their own flood emergency plans via workshops.

Council encourages Brisbane residents to prepare for flood events and reduce the impact on life and property. Future weather patterns are unpredictable, so now is the time to *Be FloodWise*.

# VULNERABILITY OF RURAL WATER SUPPLIES TO VOLCANIC ASH

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Volcanic ash is the most widely-distributed product of explosive volcanic eruptions, with even relatively small explosive eruptions distributing ashfall hundreds of kilometres distant from the volcano. It is well established that even small quantities of volcanic ash fall can disrupt water supplies. However, most studies in this area have focused on the urban environment, often on comparatively large-scale water supply, sewerage and storm water systems. In general, little attention has been paid to the impact of volcanic ash on rural water supplies. Much of New Zealand's farming occurs within the central North Island, including the highly productive areas of Waikato, Bay of Plenty, Taranaki, Hawkes Bay and Manawatu. Due to the distribution of volcanoes in New Zealand and the variable climatic conditions, these regions are all vulnerable to volcanic hazards, and in particular ashfall hazards. Water demands of modern farms are wide-ranging, and include stock watering, irrigation and cleaning, as well as the household supply.

This poster presents the findings from our recent study of the vulnerability of New Zealand's rural water supplies to volcanic ashfall. The study was based on the use of case studies (dairy farms, sheep and beef farms, vineyards and orchards) in Hawkes Bay, Taupo, the Waikato and Taranaki. Specific areas of interest were:

- An assessment of water sources in different regions (relative proportions of surface water and groundwater) and critical demand periods;
- Identifying vulnerable points in water supply, storage and distribution systems (such as intake structures, open ponds and stock watering troughs);
- Identifying critical water demand periods for different farm types and regions (seasonal vulnerability);
- Using New Zealand and international water quality guidelines for primary production to identify the water quality characteristics (eg pH and turbidity) at risk from ashfall contamination;
- Applying a simple model to predict impacts of ashfall on water quality;
- Investigating the vulnerability of farm equipment such as effluent pumps to ash contamination using artificial mixtures of water and ash.

Our findings will be used to develop mitigation measures for before, during and after an ashfall.

## **TARGETED FLOOD AWARENESS AND PREPAREDNESS: A SOUTH AUSTRALIAN CASE STUDY**

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**Robert Stevenson**

SA State Emergency Service

**John McArthur**

City of Unley

During the past decade, the South Australian Flood Warning Consultative Committee has overseen a program of updating floodplain mapping for catchments in and around Adelaide. It has been estimated that some 7,500 properties would be affected by the 1% flood within the vicinity of Adelaide alone.

Despite this program to define and map the extent of flood risk, the success of authorities in communicating risk to property owners in flood prone areas has been limited to date. It is likely that few residents within high risk areas are aware of the risk and of those, even less would be suitably prepared to take appropriate action in the event of flooding.

Recent flooding in Brownhill/Keswick Creek and the Upper Sturt River (2001, 2005) resulted in significant property damage to residences and businesses. Subsequent contact with flood affected residents confirmed that many were indeed unaware that their properties were flood prone, and hence were unprepared. Significantly, several residents acknowledged during the cleanup that even a relatively low level of preparedness could have prevented most of the damage, given the generally shallow flooding which characterises much of these urban catchments.

These anecdotal reports prompted local government and the SES in 2006 to pursue funding for a project to address the level of flood awareness and preparedness amongst residents. A pilot project was established, funded through the Australian Government's 'Working Together to Manage Emergencies Local Grants Scheme', and jointly managed by representatives from the Cities of Unley and Mitcham, SA State Emergency Service and the Bureau of Meteorology. The project aims were to promote self-reliance amongst residents and businesses to minimise risk to personal safety and property damage during a flood event. The costs of the program have been kept low by utilising existing hazard information from recent floodplain mapping combined with local knowledge. The aim is to target those most at risk, focusing on one-on-one interviews, on site at floodprone properties. The nine-month program will be completed by August 2007.

This paper will review the pilot program outcomes to date, and discuss approaches to extend similar programs to a wider area. It will explore the value of self help measures in producing resilient communities and some of the costs involved in maintaining effective flood response.

# **SUPPLY CHAIN AND MATERIAL PROCUREMENT FOR POST DISASTER CONSTRUCTION: THE BOXING DAY TSUNAMI RECONSTRUCTION EXPERIENCE IN ACEH**

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In order to accommodate the growing complexity of construction processes, various management systems and methods have been developed in academic research and well-applied in industry practices. Among those, supply chain management (SCM), as a significant component in construction material procurement, becomes increasingly popular within the context of broader cooperation, vertical disintegration and the viewpoint of a networked supply chain in construction industry. Following the Boxing Day Tsunami in 2004, the procurement and supply of sustainable and legal construction material for the massive reconstruction become the first priority of almost every organisation involved in this process in Indonesia. As a result, the competition for limited resources and the lack of effective coordination between reconstruction agencies has nearly tripled the cost of a standard house and leaving thousands of people in transit living conditions two years after the disaster. Based on the reconstruction experience in worst affected area Banda Aceh, this paper will examine the modern literature on supply chain management (SCM) and analyse this process in practice associated with construction material procurement, review the problems inherited in Indonesian context and analyse the proposed procedures of local and international procurement of timber to streamline the supply. Conclusion will then be made based on above-mentioned analysis for future development and adoption of an integrated SCM concept in post disaster reconstruction.

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