Interactive disaster education for Australian students

Dingo Creek is an engaging, easy-to-use multimedia learning tool, with associated classroom activities and resources.

The players travel back in time to save the small community of Dingo Creek from a disaster that has struck the town. Aimed at school students from years 5-9, the game introduces the concepts of disaster risk management and minimisation.

Dingo Creek provides interactive and engaging content for students and teachers and is based on real life issues and problems that affect a community during a disaster.

Unlike other disaster education activities online, 'Dingo Creek' is the first to explore the all-hazards approach and explains the to students broader emergency management concepts and issues.

By raising awareness of the risk of disasters and preparedness measures we hope to help build the skills of individuals, families and communities to cope in these situations.

Dingo Creek has been developed by the Attorney General's Department for primary and secondary age (middle years 10-15 year old) students as part of the Emergency Management for Schools education program.

Australian teachers and students have been involved in the design of this cross-curricula, cross year level learning object and teaching resource.

Dingo Creek will help to equip your students with the knowledge and skills that will allow them to make informed decisions to minimise the risks to their communities and to develop further understanding of how the emergency services across Australia work to protect communities and minimise risk.

www.ema.gov.au/schools

DINGO CREEK II

Coming soon . . . . Dingo Creek 2 ~ " The Recovery "

Help rebuild the Dingo Creek community after disaster hits. Students can explore the difficulties and issues involved in the recovery, not only the physical aspect but the economic, enviromental and social aspects as well.

Curriculum links
Geography, Personal Development, Health and Physical Education, Science, Technology, English/Literacy, Studies of Society and Environment, Personal learning.

Swine flu: Australia's preparations and response

HEALTH

How will climate change affect our volunteer sector?

Does experience alter fire fighters' attitudes to safety?

Preparing for Tsunami evacuations in New Zealand.

GREY18166

historical snapshot

The Influenza Pandemic of 1918

The influenza pandemic of 1918-1919 killed more people than World War I, at somewhere between 20 and 40 million people. It has been cited as the most devastating epidemic in recorded world history. More people died of influenza in a single year than in four-years of the Black Death Bubonic Plague from 1347 to 1351. Known as "Spanish Flu" or "La Grippe" the influenza of 1918-1919 was a global disaster.

The gauze mask was a prevention method using ideas of contagion and germ theory. In the United States it was widely accepted for use in hospitals among health care workers. The face masks consisted of a half yard of gauze, folded like a triangular bandage covering the mouth, nose and chin (BMJ, 11/2/19118). These gauze masks acted to prevent the infectious droplets from being expelled by the mouth and from the hands, contaminated with microbe from being put to the mouth. The barrier from the hands was thought to be more important than the barrier from the air. The mask was also worn in some regions by the general population. In San Francisco the gauze masks were made a requirement of the entire population in a trial ordinance. This rhyme was a popular way to remind people of the ordinance.

Obey the laws
And wear the gauze
Protect your jaws
From Septic Paws

interesting websites

Australian Government Department of Health & Ageing

Preparing for pandemic influenza website

http://www.healthemergency.gov.au/
internet/healthemergency/publishing.nsf

This website provides important information about pandemic influenza, including what the Australian Government will do if it happens, and what individuals, businesses, communities and health care professionals can do to prepare for and respond to a flu pandemic. This website was developed in consultation with State and Territory and local governments.

Even though Australia is well equipped, governments alone cannot respond effectively to a flu pandemic. It is important that we are all prepared for the possibility of a pandemic and ready to respond to the threat to help slow the spread of infection and lessen the impact.

Contents

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Please note that contributions to the *Australian Journal of Emergency Management* are reviewed. Academic papers (denoted by ⓡ) are peer reviewed to appropriate academic standards by independent, qualified experts.

Foreword

Unusual Business or Business as Usual? Workshop June 30 – July 1
By Martin Studdert, AM, Attorney-General's Department

On 30 June and the 1 July, this year I hosted the National Security Capability Development Division sponsored workshop titled, *Unusual Business or Business as Usual?* The gathering brought to the Australian Emergency Management Institute at Mt Macedon in Victoria, a wide representation of the Australian emergency management industry to consider whether the natural disaster events of 2008/2009 were Unusual Business or Business as Usual?

Australia is certainly no stranger to disaster, but even by Australian standards, the 2008/2009 heatwaves, bushfires and floods affected unusually large tracts of our nation. They left behind an unprecedented death toll, the destruction of homes, environments, businesses and local economies; widespread disruption to critical infrastructure and an extraordinary financial impact both regionally and nationally. Additionally, there was an immeasurable impact on the lives of Australians, both those directly affected and those touched by the wave of destruction. In the wake of these events which over-ran our communities we have been forced to question our resilience, our resources and our understanding of disaster. Clearly, as a country and a region, our national security is inextricably entwined with our ability to plan and prepare for, respond to and recover from all hazards, including natural disaster.

The intention of the workshop was to provide an opportunity for serious and sustained conversation between emergency management thinkers and practitioners about the strategic issues that will impact on Australia's emergency management policies, organisations and communities over the next ten years. Participants came from all over Australia and from across the spectrum of emergency management, including all levels of government, non-government organisations, private industry, and academia.

Participants were encouraged to leave aside jurisdictional and organisational perspectives and to consider the national context of changes to our financial, demographic, political and social environment; "if we knew that in 2010/11 Australia would experience disaster events similar in scope to those of 2008/9, what issues would the emergency management sector need to address in the next two years in order to save life and mitigate damage?"

Participants acknowledged the number and complexity of the issues the industry needed to address; from animal welfare to volunteers, but there was broad agreement that four issues needed to be addressed at a national level in the short-term.

These were:

- Leadership: new models of leadership moving beyond the traditional command and control to more flexible, innovative, networked models.

- Community engagement: beyond simple notions of community information to a trusted and deeply engaged relationship with all of our diverse and over-lapping communities.

- Partnerships: between the public and the private; governments, NGOs, emergency services, industry, critical infrastructure, organisations and communities working together to develop resilience and co-ordination.

- Risk: better understandings of risk and how communities, individuals and organisations understand and mediate risk in order to develop effective public information which can change behaviour and develop resilience.

These four priorities, along with the other longer-term concerns raised at the workshop will now be taken forward into a set of recommendations for action to inform the development of an Emergency Management Capability Framework and as a set of recommendations for action by the Australian Emergency Management Committee.

In answer to the question we asked at the beginning of the workshop, "is this unusual business or business as usual?"; as one participant concluded, "I think the fires and water, that's more of the same if bigger and hotter. The unusual business is all of the things in the background that are not specific to the fires and the floods, the changes to our society which mean that as emergency managers we can't fall back on familiar paradigms, we have to make a quantum leap to new and different business."

I am very grateful to all participants in the workshop for giving so generously of their time which is indicative of the deep commitment the emergency management sector has to its work. For those interested, a full report from the workshop will be available in the November 2009 issue of this journal.

Martin Studdert, AM is the First Assistant Secretary of the Attorney-General's Department's National Security Capability Development Division.

An extract from COAG Communiqué

Council of Australian Governments' Meeting – 30 April 2009

The Council of Australian Governments (COAG) held its 26th meeting in Hobart. ThePrime Minister, Premiers, Chief Ministers and the President of the Australian Local Government Association were joined for the meeting by Commonwealth, State and the Australian Capital Territory Treasurers and the Commonwealth Parliamentary Secretary for Government Service Delivery.

In light of the recent Victorian bushfires and Queensland floods, COAG resolved to re-examine Australia's arrangements for managing natural disasters and has agreed to take immediate steps to enhance these arrangements through the development of a telephone-based emergency warning system.

Natural Disaster Arrangements

COAG agreed on the urgent need for governments to re-examine Australia's arrangements for managing natural disasters and identify any further strategies aimed at building greater resilience. COAG noted such efforts would be critical to Australia's ability to deal with the expected increase in the frequency and severity of natural disasters arising from extreme weather events linked to climate change.

©Alan Porritt AAP.

Prime Minister Kevin Rudd with the Premiers and Chief Ministers of the states and territories.

COAG also agreed to take immediate steps to enhance Australia's natural disaster arrangements through the development of a telephone-based emergency warning system that will enable the States and Territories (the States) to deliver warnings to landline and mobile telephones based on the billing address of the subscriber to be operational by October 2009 and to undertake further research into a capability to deliver warnings based on the location of a mobile telephone. COAG further agreed to arrangements for a Commonwealth-provided emergency call centre surge capability that may be called upon by States should their local capacity be overwhelmed following a disaster.

COAG also agreed to the establishment of a working group to consider additional ways to build Australia's resilience to natural disasters in response to an examination of: national governance structures for the oversight and coordination of natural disaster policies and arrangements; the coordination of natural disaster mitigation, preparedness, response and recovery activities between governments; and, the efficiency and effectiveness of funding arrangements for natural disaster mitigation, relief and recovery. The working group will report to COAG by September 2009.

COAG further agreed to invite jurisdictional police services to consider the appropriateness of South Australia's *Operation Nomad* arrangements to counter bushfire arson.

International Workshop on Disaster Management, Hanoi, Vietnam

© Department of the Attorney-General.

Mr Martin Studdert AM, First Assistant Secretary, National Security Capability Development Division, Attorney-General's Department was a keynote speaker on "Australia's Emergency Management Arrangements" at the International Disaster Management Workshop held in Hanoi on Wednesday 10 June 2009. Mr Studdert attended the workshop at the invitation of Mr Tran Quang Hoai, Director, Vietnam Disaster Mitigation Partnership (www.ccfsc.org.vn/ndm-p).

Participants were highly appreciative of Mr Studdert's presentation and found both the presentation and Australia's disaster management arrangements to be extremely relevant. In particular the importance and benefits of having common arrangements that could be applied to any hazard was noted.

Vietnamese Government officials and other stakeholders took the opportunity to ask more detailed questions about the Australian system. The role of the central (or federal) Government was repeatedly raised with a large amount of interest shown in the way the Australian Government supports provinces (or States) and communities to develop their capacity.

This strategic 'whole of country' approach means that all levels of Government and community share responsibilities in disaster management.

The roles and responsibilities of the committees involved in disaster management in Australia were also discussed. Questions focused on the ability of those committees to control and assign resources and the essential work carried out by those committees in preparedness. This includes financial and technical support to provinces and communities for training, simulation exercises and planning.

The use of volunteers was also discussed, along with the Government support provided to volunteers. The need for a standardised approach across provinces and even regions was highlighted. It was also emphasized that even developed countries like Australia sometimes need and use international support. Requests for support are triggered whenever the Government is unable to deal with an event, be it for size, scope, technical or financial reasons.

For more information or to access a copy of the outcomes report of the International Disaster Management Workshop please contact **ajem@ema.gov.au**

Managing Pandemic (H1N1) 2009 influenza: A national health response

By Professor Jim Bishop AO, Australia's Chief Medical Officer

On 11 June, the World Health Organisation (WHO) raised its global pandemic alert level to Phase 6 which recognised the continuing spread of the influenza virus now called Pandemic (H1N1)2009 around the world.

WHO's Phase 6 is characterised by community level outbreaks in at least one other country in a different WHO region (from the source country). It indicates there is sustained human-to-human, community level transmission and that a global pandemic is underway and that it is no longer possible to contain the virus in a particular geographical area.

Simultaneously, after consultation with State and Territory governments, Commonwealth Minister for Health and Ageing, Nicola Roxon, announced that Australia had developed a new response phase to manage the outbreak of Pandemic (H1N1) 2009 called PROTECT. The new phase was created because this infection had turned out not to be as severe as originally envisaged when the Australian Health Management Plan for Pandemic Influenza (AHMPPI) was written in 2008 and that this new disease is mild in most cases but was severe in some and moderate overall.

PROTECT followed the CONTAIN National Pandemic phase with a greater focus on treating and caring for people in whom the disease may be severe. PROTECT is a measured, reasonable and proportionate health response to the risk that the infection poses to the Australian community. Under this phase the emphasis has now moved away from widespread testing, use of antivirals and school exclusions to concentrating on treating the most vulnerable people at risk of poor outcomes, such as those with underlying medical conditions, pregnant women and our Indigenous community.

In recent weeks there has been a marked increase in the number of cases, hospitalisations and deaths as the disease spreads as the dominant influenza this flu season. There is concern about a new category emerging who are at risk - young, fit people who deteriorate quickly. All of these cases are putting a considerable burden on our public health system, but we are coping well.

©iStock.

International travellers 'mask up' as a protection measure against the swine flu virus.

The Department of Health and Ageing has developed resources sent to GPs and others to assist in identifying a deteriorating patient early.

Our surveillance figures are showing that the number of confirmed pandemic (H1N1) 2009 influenza cases overtook the seasonal influenza cases from week 26 (20 June 2009), which could indicate that pandemic (H1N1) 2009 influenza is replacing seasonal flu activity this winter.

As at noon on 22 July 2009 Australia had 14703 confirmed cases of Pandemic (H1N1) 2009. The total number of Australian deaths associated with Pandemic (H1N1) 2009 influenza at this date was 41 with 17 deaths in NSW, 3 in the NT, 1 in Qld, 3 in SA, 1 in Tas, 15 in Victoria and 1 in WA.

Also at this date there were 226 people in hospital around Australia with Pandemic (H1N1) 2009 and 93 of these were in Intensive Care Units. The total number of hospitalisations in Australia as at 22 July 2009 since Pandemic (H1N1) 2009 was identified was 1662. The median age of confirmed pandemic (H1N1) 2009 is 19 years. This may rise as the focus changes to testing the severely affected or hospitalised individuals. Males are overrepresented among pandemic (H1N1) 2009 notifications in the younger age groups, while the number of females is slightly higher from age 20 years. Males are also overrepresented in the deaths associated with pandemic (H1N1) 2009.

Several jurisdictions have reported cases of pregnant women being admitted to hospital and ICU, reinforcing the fact that pregnant women, particularly in the second and third trimesters, are identified as a particular vulnerable group for poor outcomes with pandemic (H1N1) 2009 infection.

On the vaccine front, the Government has already placed an order for a vaccine being developed by CSL. The government has ordered 21 million doses of the vaccine which is enough to vaccinate half our population if two doses are required and the entire population if one dose is required. CSL began human trials of their vaccine on 22 July 2009 to ensure its safety and efficacy in both adults and children.

Results from the clinical trials would start to be available from September and would be carefully examined by the Therapeutic Goods Administration before the vaccine was authorised for distribution. Subject to these checks, the vaccine is likely to be available by October 2009 although if there is a need to move quicker in providing the vaccine to the public then this process can be re-evaluated. This means Australians would be among the first populations in the world to be vaccinated for this disease.

Dealing with this new infection, to which no one has immunity, has been a major challenge and has been guided by the Australian Health Protection Committee (AHPC), chaired by the Commonwealth and comprising Australia's Chief Medical Officer and the Chief Health Officers of all jurisdictions together with a range of experts. The management of this disease has been a great example of interjurisdictional cooperation and the lessons learned from this nationally coordinated effort will set us in good stead if there is a second wave of Pandemic (H1N1) 2009 influenza or any future communicable disease outbreak.

About the author

Professor Jim Bishop AO is Chief Medical Officer for the Australian Government and is the principal medical adviser to the Minister and the Department of Health and Ageing. He plays a key, strategic role in developing and administering major health reforms for all Australians. In particular his close association with Australia's medical fraternities and researchers will be crucial in the development of evidence based public health policy.

1   Australian Catholic University, University of Canberra, ACT Government Mental Health

If you build it, they will come: an influenza assessment clinic

Matt Luther and Shane Lenson share some lessons from their involvement in setting up Calvary Health Care ACT's Influenza Assessment Clinic in response to the recent Swine Flu epidemic

Human swine influenza (HSI), now known as H1N1 09, is a new strain of the subtype H1N1 Influenza A and was first detected in Mexico during late April 2009. Xeno-transfer occurred through the mutation of a common swine influenza virus (SIV) into a zoonotic swine influenza virus that was not only stable within the human upper respiratory tract, it was capable of sustained human-to-human transmission on a community level. The intensity and speed of international travel rapidly saw the spread of the H1N1 09 virus initially to the United States then internationally within a matter of months.

Australia reported its first case when an Australian citizen returned from Los Angeles to Brisbane on 7 May, 2009 and tested positive to H1N1 09. Whilst this man returned a weak positive swab he was not infectious at that stage. On 22 May the Australian Government's Department of Health and Aging (DoHA) raised the pandemic alert level to CONTAIN. This phase naming suggests the actions conducted by varying authorities to contain the spread of influenza among the community. By the end of April there were 257 confirmed cases of H1N1 09 in 11 countries and by the end of May there were 15,510 confirmed cases affecting 53 countries.

With the rapid spread of H1N1 09, the World Health Organisation (WHO) declared a phase 6 global pandemic on 11 June. As of that date there were 28,774 confirmed cases of H1N1 09 in 74 countries and an international mortality total of 144 deaths directly associated with the human swine influenza strain.

Whilst the H1N1 09 strain of influenza spread rapidly around the globe it displayed a mild morbidity and mortality profile.

Even though the symptomology experienced by suffers of H1N1 09 was mild to moderate, the situation that Australia was to experience was both unique and unpredictable compared to that of the northern hemisphere as the country moved into winter. Not only would Australia need to manage the normal impact of seasonal influenza it would now also need to prepare its health care sector for a possible proliferation of H1N1 09 cases and the associated complications of influenza such as pneumonia.

Much of this work had been done through prior preparations in response to the Severe Acute Respiratory Syndrome (SARS) and H5N1 Avian Influenza (AI) outbreaks. The AI outbreak in South East Asia during 2003 and the threat of a H5N1 pandemic mobilised the Department of Health and Aging to publish specific guideline documents such as the Australian Health Management for Pandemic Influenza (AHMPI) to help guide local State and Territory health sectors through the setup, operation and recovery responses required in the event of an influenza pandemic.

With early reports of H1N1 09 outbreaks occurring in countries outside of Mexico and the continental United Sates, especially Japan and New Zealand, the need for pandemic-scale planning was becoming more evident. The proliferation of confirmed H1N1 09 cases noted in Victoria on 28 June indicated the requirement to conduct a local needs analysis. Initially this process was reactive to experiences of Emergency Departments in the Melbourne metro area. Canberra's Calvary Hospital Emergency Department (ED), in consultation with the hospital Executive and hospital emergency plan (HEPLAN), developed trigger points for escalation within the ED which expanded over time to occupy other isolatable areas.

As a result of extensive media coverage of the H1N1 09 escalation in Victoria, Calvary realised that the demand for influenza assessment would have a greater impact on the ED's business continuity than the actual treatment of positive influenza-like illness (ILI) cases. A close relationship between the ED and ACT Public Health Unit meant that when contact tracing was required for the first confirmed H1N1 09 case in Canberra on 26 May 2009, the ED was well placed to assist with the clinical aspects of that tracing.

The first influenza assessment clinic was run for one day, 26 May, using the foyer of the Older Persons Mental Health Unit (OPHU) of the hospital. This site was chosen as it provided a separate entry with a waiting room, clerical position and 4 assessment-sized rooms all in close proximity. While the location and system worked, there were many lessons learnt from that first contact trace clinic. The most important of which was the staggering of presentations where possible. ACT Public Health had contacted all persons in direct contact with

Figure 1: Presentations per day
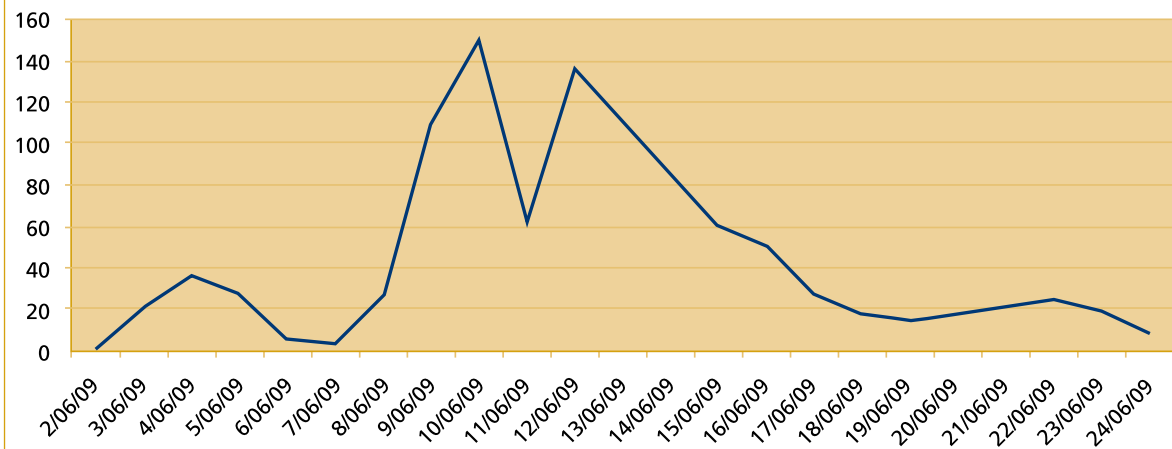
the positive HSI case, according to the CONTAIN phase guidelines, approximately 60 persons, and refereed them to the contact tracing clinic. These patients then arrived when convenient to their day plan, e.g. in the morning before work, and found an extensive wait before them. Signage was another salient issue. As the site was an adaptation of a pre-existing area, many people visiting the OPHU found it difficult to find the alternate entry and cross-contamination of these visitors was narrowly avoided through the use of security staff directing people prior to entry into the modified assessment area. Along with signage, feedback indicated that information was required for clinical staff regarding infection control issues and influenza. While it wasn't initially considered, staff are also affected by media hype and had formed, while misguided, valid personal health concerns.

Referencing the above lessons, the AHMPI and the local Australian Capital Territory Health Management Plan for Pandemic Influenza (ACT HMPPI) an Influenza Assessment Clinic (IAC) was established.

Surge presentation to the contact trace clinic identified the need for the IAC design to directly support efficient patient flow through the clinic. The IAC team envisaged and later experienced that the IAC would treat large volumes of the worried well—persons with an upper respiratory tract infection (URTI) and/or ILI of mild symptomology or not of the H1N1 09 strain. Thus consultation time within the IAC would be minimal.

Flow-modelling and trialling of the IAC concept, was achieved through the use of a modified Emergo Train System (ETS) where virtual patients of the IAC were mobilised from front door-to-discharge while taking into account real time constraints. Choke points were identified and minimised or eliminated where possible. Through this modelling it was found that a continuous linear approach would be the most efficient, with each room being allocated a number along a patient's journey.

Another issue that directly affects the operation of an IAC is the case definition applied to the H1N1 09 virus by DoHA. While the virus remains the same, the case definition, a risk-satisfying descriptor for the likelihood of a person contracting the virus, varies with the spread of the disease and the response phase associated at the time. This case definition will directly affect the workload of an IAC through the requirement for: contact tracing, viral swabbing, antiviral medication issuing and finally the number of persons that fall into the case definition. As the spread of a disease is hard to predict, all aspects of an IAC structure and design must remain flexible to accommodate changes in the case definition in a timely manner. Information fed down from the lead Commonwealth bodies needs to be inserted into local policy and paperwork for implementation.

With each dependant requirement taken into account:

Step 1: is an initial waiting room to accommodate a surge in presentations that the clerical staff are not able to attend to immediately.

Step 2: consists of registration and generation of medical record paperwork and patient labels.

Step 3: includes the collection of clinical observations with referral back to the ED if required.

Step 4: is the IAC waiting room. Whilst waiting, each patient is asked to complete a questionnaire including demographic information that may be required in contact tracing and symptomology of their ILI.

Step 5: is where the patient is assessed against the H1N1 09 case definition. If the patient meets the case definition then they are referred to Step 6 for swabbing and or antiviral medications. If the patient doesn't meet case definition they are assessed against URTI criteria and given the appropriate health advice before being discharged directly from the clinic.

It may be noted that there are two room 5s, this is due to an identified choke point in patient assessment.

Step 6: is the final stage prior to discharge where viral swabbing and or dispensing of antiviral medications.

The selection of room 6 needs consideration regard the infection control and risk of aerosolising of upper airway secretions during swabbing techniques. In this case we selected a room without curtains and all washable surfaces. While some staff in other areas of the building required reassurance, air-conditioning was not of concern due to the virus's droplet mode of transmission and the positive (verses recycled) nature of most hospital air-conditioning systems.

Due to the reactive nature of the establishment of an IAC, staffing will always be complex. While the operation of an IAC sits comfortably in the realms of community health the establishment of such a clinic at short notice to receive high numbers of initial presentations, is best suited to ED staff due to their comfort and familiarity with surge response. In the interest of business continuity and sustainability a finite timeframe should be placed on this staffing model. In the Calvary plan we factored that the community health team take over staffing of the IAC after a seven-day period. This time buffer should be sufficient for the community health model to be established, adjusted and staffed for what could be a sustained intervention.

At the time of writing, the ED have operated the IAC for 3 weeks thankfully the severity of the disease was mild-to-moderate and the ALERT phase was changed early in the epidemiological curve, leading to a lower, more sustainable workload. The severity of the morbidity and or mortality associated with the disease may affect the preference for and availability of ED staff due to concurrent loading of the ED with acutely unwell persons.

Another advantage identified with the initial use of ED staff is the minimal training and orientation requirement. The work conducted by an IAC was very similar to that of an ED, patients present requiring a rapid workup and definitive disposition, many of whom have minor ILI complaints. A combination of eLearning and competency assessment was used to ensure a best practice and consistent approach from all staff working within the IAC regarding the use of personal protective equipment (PPE), infection control and viral swabbing. IAC staff were required to attend to eLearning units on: hand hygiene (specifically the use of antimicrobial hand rubs) influenza pandemic PPE, donning and doffing, and the collection of nasopharyngeal 'flocked' and oropharyngeal viral swabs. On completion of these units staff were observed using competency assessments of the physical application of these skills.

Equipment availability was another issue that had to be overcome to ensure efficient throughput of persons in the IAC. Three main areas were identified—information

Figure 2: Floor Plan.
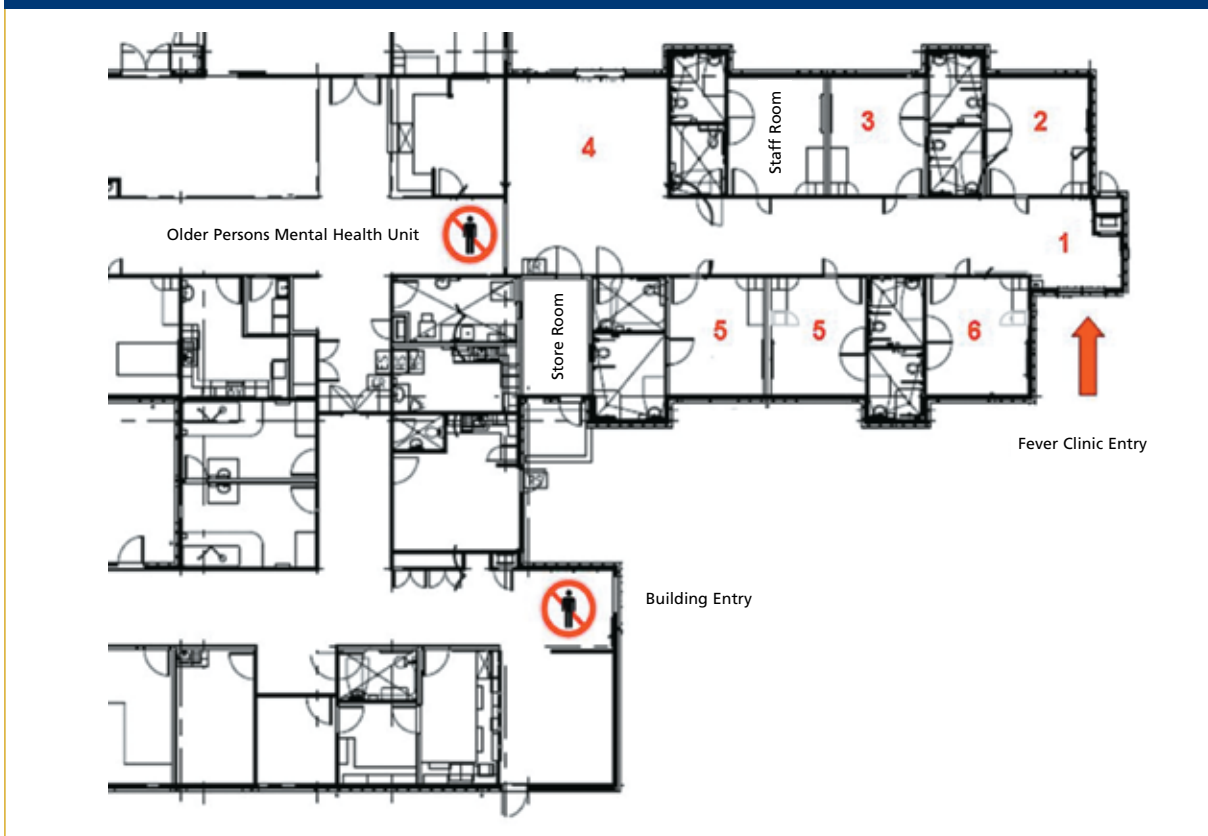
technology, clinical and environmental. While all the equipment required by the IAC was available in the hospital setting, it was all being used for day-to-day business, thus alternatives were sort. Computers, printer/fax and phones are all readily available from suppliers though have to be costed in at short notice as with the clinical examination equipment. While there were many requests for the weird and wonderful, for the purposes of an IAC there were few clinical examination pieces of equipment that were actually required. These included a multifunction observation tower such as the Welch Allyn LXi and an otoscope. Obviously, it is important to acquire thermometers that don't involve oral access as this is difficult with patients wearing surgical masks.

Environmentally there is also a demand for chairs, desks and signage. While chairs and desks are a little harder to acquire, temporary signage is a little easier with access to a large printer and lamination equipment. To aid in directing patients to the IAC, and avoid patients walking through the main hospital, we employed sandwich board signage on the roadways around the campus.

An IAC needs a lot of Consumables—predominantly PPE supplies. Accordingly, with large quantities of consumables comes a corresponding quantity of infectious waste. Many health care institutions found after the declaration of the H1N1 09 pandemic, access to PPE stock was difficult and, in many cases, controlled. As PPE is essential to the operation of an IAC it is important that IACs hold a stock of PPE above that of the normal hospital supply. Calvary found that at least one month's supply calculated on hand run and surgical masks for 50 patients a day and gowns, hand rub, gloves (S/M/L), surgical and N95(P2) masks with 3 changes per shift, should provide adequate stores of PPE. Goggles and or face masks are also suggested when conducting close examinations of the patient or when acquiring naso/oropharyngeal viral swabs. Other consumables used were: batteries and disposable plastic tips for the otoscopes; tongue depressors, paper, pens, plastic sleeves, patient labels, tissues, infectious waste and normal rubbish bags, cups and water.

Communication within the healthcare sector, pre-hospital providers and the community has been an on-going issue for all involved. The greatest factor surrounding communication is the ability of the greater pandemic healthcare governance system to provide timely clinical information such as the current case definitions. Centrally held digital forms and advice sheets are an essential tool to alleviate some of these issues, while a local or national digital pandemic influenza assessment form would be the ultimate tool, providing consistency and timely information to all healthcare providers. It was also found that while email is a powerful and readily used communication tool when the digital communication load increases dramatically as seen during a pandemic, even of mild symptomology,

a timely response may not be achieved and email communication may need to be supported with direct voice communications to ensure compliance.

From the opening of the influenza assessment clinic at the Calvary facility on 2 June until the change over from ALERT level from CONTAIN to PROTECT on the 17 June 2009, twenty-one people presented to the Emergency Department with flu like symptoms while 711 people presented to the Influenza Assessment Clinic. During this period the influenza assessment clinic and the ACT Public Health Unit identified 71 new confirmed cases of H1N1 09. These numbers are indicative of the need for an IAC to protect ED business continuity during the initial stage of an influenza pandemic response, though it should be noted that this ED driven response should be limited and a definitive staffing model such as that offered by Community Health put in place as soon as possible to enable an sustained response.

References

ACT Health, (2007). Australian Capital Territory Health Management Plan for Pandemic Influenza. ACT Health.

Australian Government, Department of Health and Aging, (2008). Australian Health Management for Pandemic Influenza: Important Information for all Australians. Commonwealth of Australia.

Australian Government, Department of Health and Aging, (2009). Health Emergency. http://www.healthemergency.gov.au/internet/healthemergency/publishing.nsf/Content/home-1. Accessed 18JUN09.

World Health Organisation, (2009). Epidemic and Pandemic Alert and Response. http://www.who.int/csr/disease/swineflu/en/index.html. Accessed 18JUN09.

About the authors

Matt Luther, MNS (Nurse Prac), GDipMid, BN, CertEmergN, is a nurse practitioner and midwife currently working in the emergency department of Calvary Health Care ACT. Matt has extensive experience in advanced life support education and is developing an eLearning platform to support the wider distribution of ALS knowledge. Matt is also a critical care aeromedical retrieval specialist Officer with the Royal Australian Air Force. Matt is currently completing a MPH Biosecurity and Disaster Preparedness to back his hospital emergency management position at Calvary.

Shane Lenson, BN, MPH, MNS (Nurse Prac), MRCNA, is the Manager of the Emergency Department of Calvary Health Care ACT. Shane holds interests in health workforce issues. These include the attraction and retention of health care professionals; the omnipresent challenge of traditions versus technologies; and the formulation of accessible training pathways and programs for clinical staff. Shane is also the Royal College of Nursing, Australia representative on the Australian Resuscitation Council & an associate editor for the Australasian Journal of Emergency Nursing.

Climate change and the volunteer emergency management sector

*Major General Hori Howard, Chair of the Australian Emergency Management Volunteers'
Forum, discusses the potential impact of climate change on the capabilities of the volunteer sector.*

Introduction

Climate change scientists tell us that we can expect more severe weather, with higher rainfall in coastal regions, more severe storms, cyclones forming further south and elevated sea levels. Inland, higher temperatures are expected, along with more severe and sustained droughts and heatwaves, which will increase the number, intensity and duration of bush fires, and heat casualties.

It is of concern that the fact that the lead agencies for all of these expected effects (except drought), are volunteer agencies, doesn't seem to be getting the attention that other aspects of climate change are attracting. Even with drought, the volunteer recovery agencies have day-to-day welfare roles as well as their emergency roles, so they can expect to experience considerable additional pressure for their services as well. I am not convinced that there has been any wide acknowledgement as yet that the sector will need to be strengthened considerably if it is to handle the expected increase in natural disasters.

As some would have us believe, the volunteer emergency management sector is not in crisis but it is showing some strains and with an expected increase in operational commitments, it is now necessary for governments, the community and sector leaders to take firm steps to strengthen it.

This paper examines some of the above pressures and suggests solutions hopefully prompting those in authority to look more comprehensively at what can be done to ensure that the volunteer emergency management sector can handle what is increasingly seen as a much harsher natural environment.

It is important to appreciate that there is already considerable action within the sector to improve our capability, as operational demands have been increasing steadily over recent years, so the sector is, at least in part, already dealing with the problem.

The volunteer emergency management sector

The organisations that constitute the volunteer emergency management sector are also the main members of the Australian Emergency Management Volunteer Forum (AEMVF) that was established by Emergency Management Australia following the 2001 Volunteer Summit. They are:

- ADRA Australia
- ANGLICARE
- Australasian Assembly of Volunteer Fire Brigade Associations
- Australasian Fire and Emergency Service Authorities Council
- Australian Council of State Emergency Services
- Australian Government's Department of Attorney General (EMA) (ex officio)
- Australian Institute of Emergency Services
- Australian Red Cross
- Australian Volunteer Coast Guard Association
- Council of Ambulance Authorities
- Department of Families, Housing, Community Services and Indigenous Affairs (ex officio)
- NSW Volunteer Rescue Association
- Royal Volunteer Coastal Patrol
- St John Ambulance Australia
- St Vincent de Paul
- Surf Lifesaving Australia
- The Salvation Army
- The State Emergency Services Volunteer Associations
- Volunteer Ambulance Officers Association
- Volunteering Australia

There are also numerous other organisations that assist during emergencies at State and local levels, particularly in the recovery area. While they may not be members of the AEMVF, their important contributions are acknowledged, as is the need to attend to their viability as well as the member agencies.

Many senior people, even from within the emergency management industry do not see beyond response agencies. The volunteer recovery agencies particularly are the unsung heroes of our emergency management system, but they often do not rate a mention during the coverage of emergencies, even though without them there would be no recovery system in Australia. Indeed, in some States some recovery agencies are not properly integrated into the recovery systems. Integrating recovery agencies into existing infrastructure should be a priority for system leaders.

The AEMVF, consider that the six main pressures faced by the sector are:

- Ageing Population, Sea Change, Tree Change, Rural Restructure.
- Community and Political Expectations.
- Increasing Time Commitment.
- The Costs of Volunteering.
- Legal Action.
- Lack of Recognition.

Ageing population, sea change, tree change, rural restructure.

As our population ages, the number of younger, fit people available to join the emergency management agencies, particularly the front line agencies, which need a high percentage of volunteers fit enough for field work is falling, and our existing members are ageing. There are also many areas particularly along the coast, which are becoming giant retirement villages, where the problem is particularly severe. Sea and tree changers, even the younger ones, are less likely to join local volunteer organisations than the original residents, who grew up with the local hazards and generally relate better to their community.

The rural restructure has seen the creation of corporate farms made up of up to 10 original family farms, with fewer workers. Many small communities have also lost much of their infrastructure such as shops, banks etc, along with their employees, who are often forced to move away. There is already pressure on the local emergency volunteer organisations in many smaller communities due to declining numbers.

These phenomena are already occurring, and the sector is coming to grips with the new environment. Most States have a good capacity for out of area operations, where volunteers are able to move to assist in areas remote from their home bases. However, there are still a couple which need to improve this capability. At national level, recent events have shown a similar capability for one State to help another, but the arrangements need to be reviewed regularly to ensure that the capability is maximised. A sleeper here is that

employers are generally less happy to release their volunteers for operations in someone else's patch, than they are for those which occur close to home.

The sector is regularly encouraged to recruit more females, as though this is something new. Most organisations have been actively recruiting female volunteers for some years. The AEMVF position is that any organisation which doesn't encourage females to join is denying itself access to 50% of the population and this is simply the height of foolishness.

Dramatic options such as combining organisations will need to be examined. This is already occurring in some of the more remote areas of Western Australia, and it is working well. There is of course likely to be a cultural problem with this proposal, but it must be considered. The main practical problem would seem to be the need for volunteers to undertake additional training if they are to take on additional roles in an environment where time is the greatest enemy of volunteering. At the very least, organisations will need to create strategic alliances to maximise their capacity to help each other, or they may be forced into combinations which don't suit.

Community and political expectations

There is no doubt that community expectations have grown tremendously over the last few years, putting pressure on for quicker responses, and calls for tasks to be undertaken which should be carried out via insurers or the householder. It is likely that we have been partly at fault here by assuring people that we will take care of them.

All organisations have recognised this situation and have begun to emphasise in their public education programs that people have a basic responsibility to look after themselves, because the emergency agencies can't be everywhere. We need to keep hammering the self-help message home, along with the need for preparedness, as there is ample evidence that we haven't yet succeeded in changing behaviour. Public education needs more human and financial resources in the volunteer emergency management sector, as it is an area of significant weakness.

Along with increased community expectations has come increased political pressure to complete operations more and more quickly. Politicians today seem to be more sensitive to criticism than in the past, and of course with the ever present media looking for mistakes, the volunteers ultimately suffer the criticism.

Our political leaders will sometimes need to run interference for us, not add to the pressure, so both political leaders and the media need to be re-educated about the nature and difficulties of launching emergency operations quickly, and the sector needs to review its public information and media capability.

Again, we believe that this is a general weakness across the whole sector in terms of people and money devoted to it. Additionally, media presence is inevitable and all agencies need to learn to work more effectively with it.

Time

In the several surveys run since the first Volunteer Summit in 2001, the biggest barrier to volunteering within the volunteer emergency management sector has been shown to be the increasing time commitment in an environment where work and family pressures are also on the rise. The 2006 survey showed that the average commitment is weekly and that the basic volunteer devotes over 200 hours annually. The commitment of those in leadership positions is much higher. It also showed that 75% of the volunteers are employed, so the need to balance volunteering against work and family commitments is a major issue.

Emergency sector organisations need to be very flexible in the attendance requirements they place on their volunteers, which need to be minimised, other than for operations and essential training. They have tended to be quite rigid in the past, but the more progressive are already introducing new volunteering options which require less time commitment than has been the standard. Community Fire Units, where local residents receive very basic bush fire training and equipment, and agree to protect their home patch is one excellent example of the type of imaginative solutions which we will need.

Training needs to be streamlined and minimised without compromising standards. This can be done, and is being addressed in the review of the Public Safety Training Package by introducing Skills Sets as alternatives to full Certificates of Competence. There is also likely to be a need for the employment of more paid trainers so that training can be delivered quickly and efficiently, and mainly in the volunteers' home bases. Time spent travelling to and from training is wasted time, and volunteer trainers, while quite competent, are not coping with the increased workload, which has resulted from the adoption of competency based training.

Equipment is becoming more sophisticated, and with it has come the need for more time to be spent on maintenance. At the same time there are more management and administrative tasks to be carried out at local level, which many volunteers really object to. This keeps surfacing as a major issue, so it should be taken very seriously. Targeted recruiting for headquarters type positions assists to reduce the administrative load on the operational volunteers, and there could well be the need for paid administrative staff at local level.

This is already being tried in the South Australian Country Fire Service, and will no doubt need to be examined elsewhere as well.

While fundraising brings volunteers together between operations, fosters teamwork and keeps them before the attention of the community, it must be controlled or it may become just another source of time pressure.

In considering time, the employers who allow their employees to take time off work to respond to emergencies, should not be forgotten. There is employment protection legislation for the volunteers in most States and Territories, and in the new National Employment Standards Legislation, but while incentive schemes for employers have been spoken about for years, there is still nothing significant in place.

Such a scheme needs to be national in nature, and something needs to be done about it soon. Experience so far is that employers have been really good, but we can't afford to lose their support, and the prospect of their volunteers needing to spend more time away from work could stretch the friendship too far in an increasingly tough economic environment.

The cost of volunteering

Volunteers don't want to be paid for their services, and they accept that there will be a personal cost to being an emergency sector volunteer. However, they expect that the costs will be kept to a reasonable level, and this is not necessarily the case these days. The AEMVF; has a position which is that emergency sector volunteers should be provided with protective clothing, safety equipment, training and professional development, free of charge, and be able to claim reasonable out of pocket expenses. .

We also believe that volunteers who suffer severe financial hardship due to extended operational commitments, such as occurred in the 1994 and 2001 bush fires, should be able to receive financial assistance. The precedent has been set, and while the take-up was low, the gesture was appreciated. Unfortunately the assistance was not extended beyond the volunteer fire fighters in 2001, and this caused great dissatisfaction. If such assistance is to be provided, it must extend to all responders, not just some of them.

Legal action

While the protection offered to emergency sector volunteers against litigation has improved considerably over recent years, there is still a deal of uncertainty about whether it will be effective, as it has never been tested in court. There have also been examples of volunteers being subjected to intense cross examination during extended coronial enquiries following bush fires, which has caused extreme personal distress. It has been suggested that national Good Samaritan legislation is needed as a means of additional protection.

Recognition

At the Volunteer Summits held in 2001 and 2005, and since, the most recurring theme from the volunteers has been that they feel they are taken for granted. We believe that one of the main underlying causes for this theme is the fact that a number of the organisations are not adequately resourced for their roles, and the volunteers translate this problem into a lack of recognition by governments of the importance of what they do. This is a difficult problem because there is no real consistency of funding of organisations between the States and Territories, even within like organisations

There is no doubt that a number of the organisations within the sector will need to be better resourced if they are to withstand the pressures of climate change, and that this will require joint approach by all levels of government. If the volunteers are provided with appropriate resources for their roles, it is highly likely that their problem with a lack of recognition will largely disappear.

A recent statement by Dr Judy Esmond sums up the need for recognition very well. She said and I quote: "There has never been a volunteer who has left because they were appreciated too much. However, there have been hundreds across all sectors who have done so because they felt unappreciated."

Recent developments

Last year the Ministerial Council on Police and Emergency Management tasked the Australian Emergency Management Committee to investigate the Attraction, Support and Retention of Emergency Management Volunteers. While this project was not generated specifically due to climate change, it should help highlight the main issues within the sector. The AEMVF has been consulted and members have provided individual input.

We await the outcome of this project with interest as there has been a great deal of talk over a number of years, about providing tangible support to the sector, but there has been very little action.

There is provision for the granting of community service leave for emergency sector volunteers in the draft national employment standard, which will go before the Parliament in 2009.

Most of the States have introduced payroll tax exemption for employers whose employees are involved in responding to emergencies as volunteers. This is a nice gesture, but we are told that unless the period is extended or the numbers large, it is not really worth the paperwork.

Conclusion

In conclusion, there is a serious need for governments, the community and organisations to understand that the lead agencies for all of the likely effects of climate change are volunteer agencies, some of which are not well-resourced.

While changes in the way volunteers are managed are needed to strengthen the sector, the most consistent complaint from the volunteers is that they are taken for granted. The AEMVF believes that if agencies are properly resourced, most of the issues associated with recognition will solve themselves.

AEMVF's message is that all emergency management sector volunteers should be provided with protective clothing, safety equipment, training and professional development, free of charge and be able to claim reasonable out-of-pocket expenses. If they suffer financial hardship due to extended emergency operations, they should be able to access financial assistance.

For further information on the AEMVF please visit their website at www.aemvf.org.au.

About the author

Major General Hori Howard served in the Australian Regular Army. His last military appointment was as Director General of the Natural Disasters Organisation. He was a Director General of the New South Wales State Emergency Service. For two terms, he Chaired the New South Wales State Emergency Management Committee.

In 2001 and 2005, he was a member of the management committee for the National Emergency Management Volunteer Summits, and produced the reports for both. In 2005 he was also appointed as chair of the National Flood Risk Advisory Group, a sub-committee of the Australian Emergency Management Committee.

He currently holds the position of Chair of the Australian Council of State Emergency Services, and Chair of the Australian Emergency Management Volunteer Forum.

Portal experiences: the impact of fire fighters' experiences of threat on risk perception and attitudes to personal safety

Holgate and Clancy examine the impact of threat experiences on the risk perception and attitudes to safety of volunteer fire fighters.

Abstract

Portal experiences are said to be those potentially life threatening experiences that enhance emergency workers' appreciation of risk and transform their attitudes to safety. This research examines the frequency and impact of threat experiences on the risk perception and attitudes to safety of volunteer fire fighters. Results show that life threatening experiences are common among volunteer fire fighters with over half the sample reporting such incidents. Those fire fighters who had had a threat experience reported a significant change in their approach to safety on the fire ground and identified significantly more risks in response to fire ground scenarios and were significantly more likely to identify human error and instability in a situation as risks, than those who had not had a risk experience. Results support the notion that portal experiences do enhance fire fighters perception of risk. It is suggested that the mechanism for this change is via an "affect heuristic" rather than rational cognitive analysis. It is recommended that fire agencies improve their incident reporting systems in order to gain training advantage from fire fighters' portal experiences.

The notion that fire fighters may have a life changing "portal experience" at some time during their career and that this is related to safer practice on the fire ground has gained currency among U.S. fire services (Mutch, 2005). Chamberlin (2005) describes the portal experience thus:

"Career fire fighters usually pass through a 'Portal' of sorts, a Safety Awareness Portal, achieving new perspectives, their reality altered. Transiting the Portal can be painful, maybe physically, always emotionally. They are often related to traumatic events such as South Canyon, Mann Gulch, Thirty Mile, Cramer, or a less legendary incident; perhaps a near miss, or a personal Waterloo. It may have happened to us, or involve a co-worker, or we have strong empathy for a situation we read about. Some think there is no significant emotional growth without a link to a traumatic experience." (p.1)

Chamberlin refers to examples of incidents in the U.S. where multiple fire fighter fatalities have occurred, e.g. the South Canyon fire where 13 fire fighters died (McLean, 1999), the Thirty Mile fire where 4 fire fighters were killed (United States Department of Agriculture Forest Service, 2001) and the Cramer fire where 2 fire fighters died (United States Department of Agriculture Forest Service, 2003). Corresponding Australian examples would include the Linton burn over (near Ballarat, Victoria) in which five CFA volunteers perished (Johnstone, 2002), and the Kuring-gai National Park burn in which 4 fire fighters died (Stevenson, 2001) .

Previous research and theory (Gold, 1993; Slovic, Finucane, Peters & MacGregor, 2004; Slovic & Peters, 2006; Gold, 2007) suggests that risks are more keenly perceived when they engage the affective system (gut feel) than the more rational cognitive system. In the South Canyon fire, fire fighters decided to pursue the fire fight despite the fact that they had explicitly identified that they had broken 13 of 18 watchout situations (McLean). Although these fire fighters had

cognitively identified that they were at risk their affective systems were apparently not engaged and they felt little fear in the situation, to such an extent that some of these fire fighters were taking photographs of the fire minutes before they were over run (McLean).

Dual-process theories of thinking hold that affective and cognitive systems operate independently and research (Slovic & Peters, 2006) suggests that affective systems exercise a greater influence on our perceptions of risk and our tendency towards "unrealistic optimism" (Gold, 2007) than do cognitive systems. Gold (1993), for example, distinguishes between "hot" cognitions (those thoughts based on affect, intuition or gut feel) and "cold" cognitions (those thoughts based on rational analysis). Gold's research shows that hot cognitions are the primary determinant of a decision to engage in risk taking behaviour. Slovic & Peters (2006) refer to this phenomenon as "the affect heuristic". The implications of these research findings are that people are less likely to respond to risks that are perceived on the basis of rational cognitive analysis and more likely to respond to risks that evoke an affective response. It is likely that the portal experiences that Chamberlin (2007) refers to have such an impact precisely because these experiences evoke a powerful affective response in the fire fighters who have experienced them.

The deaths in 1998 of five CFA volunteer fire fighters in a tanker burn over at Linton, noted previously, was a kind of organisational portal experience for fire and land management agencies. In response to recommendations by the Coroner following the inquest into the Linton tragedy (Johnstone, 2002) the Victorian Country Fire Authority (CFA) instituted a "Safety First" campaign and required all volunteer fire fighters to complete a Minimum Skills training package before being eligible to be deployed to the fire-ground. Previous research (Clancy & Holgate, 2005; Sadler, Holgate & Clancy, 2007; Holgate & Clancy, 2007) has established that fire fighter risk perception varies considerably depending on individual differences in experience, education and the way in which a fire is framed (e.g. as either "going" or "contained"). The question remains however as to what impact portal experiences may have on risk perception and attitudes to safety on the fire ground. Fire fighting agencies necessarily grapple with the question of how can fire fighters' appreciation of the threat of fire line operations be transformed from an intellectual knowledge (cold cognition) into a gut feel for danger which may better translate to safer decision making on the fire line. An aim of this research was to gather data on the frequency of threat experiences or near-misses among Australian fire fighters and to determine whether these experiences were related to risk perception and attitudes towards safety.

Method

Participants

Participants were 110 volunteer fire fighters (105 male and 5 female) ranging in age from 18 to 77 years (M=38.75, SD = 14.25). Participants varied in the number of years they had been a CFA volunteer, varying from less than one year (12%), one to two years (7%), two to five years (26%), six to ten years (24%), ten to twenty years (14%) and more than 21 years (17%). Participants were sampled from 5 of the 20 CFA regions throughout Victoria with members of 11 fire brigades represented. The majority of the sample (44%) had 1-5 years experience as a firefighter, 37% had 5-20 years experience and 19% had more than 21 years experience.

Materials

Participants were shown five photographs, which depicted a variety of fire ground scenarios (a motor vehicle accident; a house fire; a hazardous chemical spill, a grassfire and a bushfire). They also responded in writing to a questionnaire which, apart from the usual demographic information, asked: "Have you ever had an experience on the fire ground that caused you to behave more cautiously than before? (tick yes/no). If so, please give brief details." Participants were also asked to respond in writing to the question: "Has the increased emphasis on safety issues within the CFA changed the way that you approach fires/incidents? (tick yes/no). If so, please give details."

Procedure

Data were gathered as part of a larger study. Ethics approval for the research was granted by the University of Newcastle. Participants were asked to attend data-gathering nights at their local station held independently of other training or activities, which the brigade might hold. Data-gathering was administered by the first author. Participants were seated and each fire ground scenario photograph was projected onto a screen. Participants were asked to write down as many hazards/risks that they could see or anticipate in the scenario. Risks identified in response to the five fire ground scenarios were content analysed independently by the authors and five risk categories were identified: potential fire/explosion; potential for human error; failure to follow safe procedure; environment hazards and instability of the situation. Two separate scores for risk perception were calculated for each participant: 1. the total number of risks/hazards identified across all five fire ground scenarios; and 2. the total number of times each risk category was mentioned across all five fire ground scenarios.

Independent samples t-tests were calculated to compare mean total scores between groups of number of risks identified across scenarios and number of categories identified across scenarios. Qualitative responses were content analysed and categorised by the authors. Inter-rater reliability was 100%.

Results

Experience of risk

In response to the question as to whether they had had an experience on the fire ground that caused them to behave more cautiously 54% (n=60) said yes and 46% (n=50) said no. Figure 1 shows the categories of risk incidents that the sample had experienced.

In the wildfire category participants reported such experiences as unexpected wind changes; unexpected changes or flare-ups in wildfire behaviour; being burnt over or entrapped and falling tree limbs/rocks. One participant (male, 50, 10-20 years experience) had the following experience: "Got off appliance to open gate. Wind whipped up flame in long grass. Crew panicked and told driver GO, GO, GO and left me at gate on foot in long grass". Another (male, 48, 2-5 years experience) reported: "I was Crew Leader at night, at head of gully in open paddock. Fire jumped over us and lit up paddock beyond. Speed at which situation changed was beyond training." Another (male, 59, 21+ years experience) reported: "Caught in bush flashover (flames right over the top)." Another (male, 40, 6-10 years experience) reported: "I became briefly entrapped by a fence during a back burn. I now make sure I have a safe

exit." Another (male, 20, 2-5 years experience) reported: "One incident where we were pulled out just before the fire came through, makes you take a bit more notice."

In the structure category participants reported such experiences as floor or roof collapses; flashovers; visibility hazards due to smoke or darkness and sparking powerlines. One male (18, 2-5 years experience) reported: "Falling through floors at structure fires, [now] I'm more careful of assessing possible situations". Another male (40, 21+ years experience) reported: "Once during a structure fire a partial ceiling/roof collapse heightened awareness of overhead dangers [for me]."

In the poor judgement category participants reported experiences such as being asked to do unsafe things; seeing others behave in an unsafe manner; experiencing a fuel flare up during training and almost being hit by a front end loader. As one male (36, 6-10 years experience) reported: "I've seen unsafe actions and attitudes of other people on the fire ground in regards to safety and thinking." Another (male, 40, 2-5 years experience) said: "People panic – settle them down and think about what you have learned."

In the motor vehicle category participants reported experiences such as LPG tanks "blevieing" or leaking and tyres exploding. One participant (male, 39, 10-20 years experience) reported: "A gas leak in the boot of a car. It was surrounded by houses during winter and the gas was like a fog around the building." Another (male, 18, 1-2 years experience) reported: "I ran to a car fire with no water and a tyre went bang and I took a few steps backwards."

Figure 1. Categories and frequency of threat experiences among 60 firefighters (3 cases unclassified).
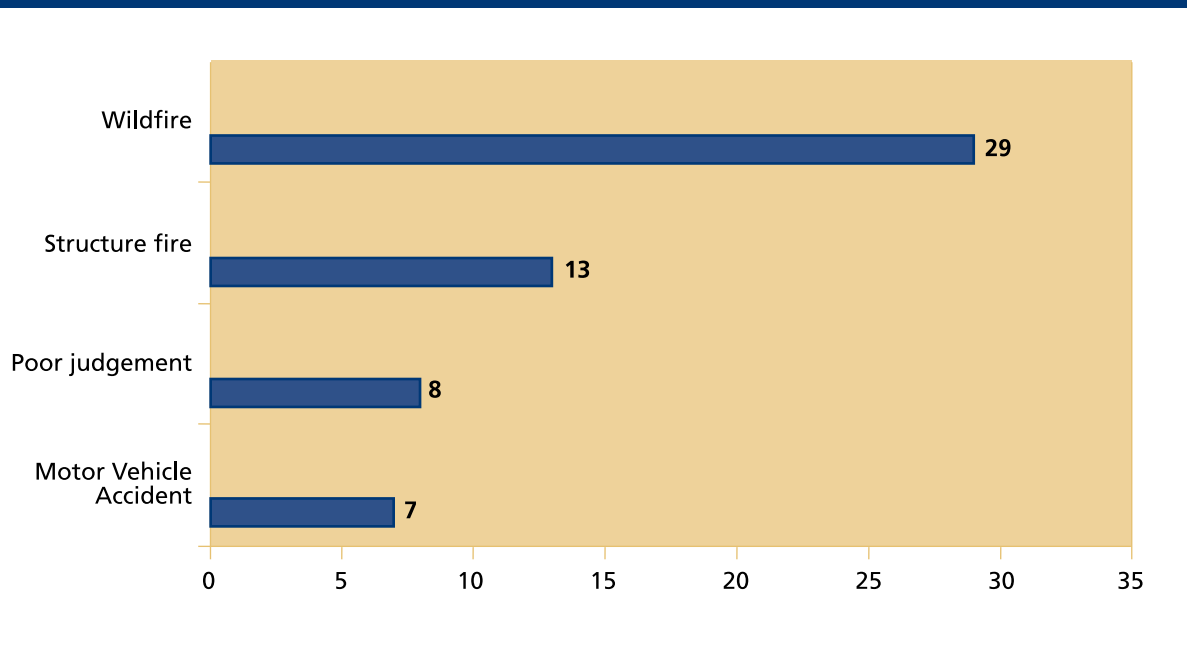
Approach to safety

In response to the question as to whether the increased emphasis on safety issues had changed the way that they approached fires and incidents 65% of the sample (n = 72) said "yes" and 15% (n = 17) said "no". No response was given to this question by 12% of the sample (n = 13) and 7% (n = 8) wrote that they had not changed their approach because they had always been safety conscious.

Table 2 shows the categories of change in approach identified by participants. Only percentages have been shown because categories identified are not independent, e.g. if a participant identified more than one way in which their approach had changed this was counted within the category, therefore percentages total greater than 100.

One participant (male, 47, 21+ years experience) commented: "I think a little more before "rushing in" – no more Harry Hollywood." Another (male, 47, 6-10 years experience) commented: "Minimum Skills [training] has had a marked effect on my assessment of risks in respect of personal safety." Another (male, 52, 21+ years experience) reported: "After serious burns – now try to get full details of fire and causes and effects before starting jobs – not always easy to do." Another (male, 37, 2-5 years experience) commented: "When I am requested or asked to do something it would be a good idea to ask as many questions as possible to ascertain the level of risk and the objectives."

Association between a risk experience and approach to safety

In order to determine whether experience of risk was associated with reporting a change in approach to safety on the fire ground a chi-square analysis was performed. Chi-squared compares the observed frequency of a category against the expected frequency of that category if category membership were randomly distributed. Chi-squared (df = 4) was found to be 58.47 (p < .001). Those who had had a risk experience were significantly more likely to report that they had changed their approach to safety on the fire ground compared to those who had not had a risk experience.

Risk experience and risk perception

Independent samples t-test results showed that those participants who had had a risk experience identified a significantly greater total number of risks across all scenarios (M=32.43, SD=11.59) compared to those who had not had a risk experience (M=28.25, SD=7.7) (t(108) = 2.24, p < .05). Participants who had had a risk experience were also significantly more likely to identify failure to follow procedure (M=2.77, SD=1.20) as a risk compared to those who had not had a risk experience (M=2.25, SD=1.18) (t(108) = 2.4, p < .05) and were significantly more likely to identify instability of the situation as a risk (M=4.24, SD =.97) compared to those who had not had a risk experience (M=3.86, SD=1.02; t(108) = 1.06, p < .05).

Table 2. Categories and frequency of threat experiences among 60 firefighters (3 cases unclassified).	
In what way has approach to fires and incidents changed?	**%**
I "stand back" more on scene	43
I prioritise safety before any other decision	37
I emphasise and participate in training of myself and others more	25
I am more careful with wildfires (e.g. I consider the risks of low water, falling trees, wind change)	14
I am more careful when entering structure fires (e.g. I consider the risks of flashover/collapse and the use of breathing apparatus)	11
I am more careful in using appropriate Personal Protective Equipment (e.g. I double glove at motor vehicle incidents, ensure everyone helmeted)	5

Discussion

It is clear that threat experiences are common on the fire ground. More than half of the fire fighters sampled had had a threat experience. Consistent with worldwide statistics on fatalities among fire fighters wildfire operations presented the greatest potential threat to life with almost half of threat experiences reported involving wildfire behaviour.

Consistent with Chamberlin's (2005) arguments it would appear that these experiences did constitute portal experiences for those sampled. Those who had had a threat experience were significantly more likely to report that they had changed their approach to safety and also identified a greater number of risks and specific risks related to human error (failure to follow procedure) and potential instability of the situation compared to those who had not had such an experience. Not only were threat experiences associated with an enhanced ability to "see" risk in scenarios they also arguably lead to a more sophisticated appreciation of the nature of likely risks. The mechanism whereby this change occurred is likely to be that experience of a potentially life threatening near-miss evoked a powerful affective response which meant that fire fighters now perceived fire ground risk in terms of a "hot" affect heuristic (Slovic & Peters, 2006) rather than in terms of a "colder" cognitive analysis (Gold, 1993).

Fire fighters reported that they were now more conscious of safety. In general the sample claimed to think more, assess risks more, "stand back" more and train more. While this is heartening it is arguable that any change is more likely to be the result of a portal experience than of safety campaigns themselves. The implications of these findings for fire agencies is the unfortunate conclusion that fire fighters are likely to learn best to take risks seriously only following exposure to actual risk. Obviously fire agencies cannot intentionally expose fire fighters to danger, however the above findings suggests that any fire fighter training should be as in-vivo as possible.

Chamberlin (2005) asks the question "can we transit the Portal without personal trauma?" (p.1) and encourages fire fighters to share their "portal stories" of how risk experiences have altered their perspective for the benefit of other fire fighters. Although most fire agencies have formal requirements and mechanisms for incident reporting these systems are notoriously underutilised by fire fighters. For example, the Linton Coroner's inquest (Johnstone, 2002) found that there had been a number of burn overs on the Linton fire ground, other than the one which killed five fire fighters, which had not resulted in injuries and had not been reported. Often what constitutes an "incident" is undefined (leaving fire fighters confused as to whether an incident they have experienced warrants reporting), reporting of incidents is not monitored or deemed to be any one person's responsibility and there are often no follow-up procedures once an incident is reported.

Fire agencies could arguably make better use of the educational value of their own people's risk experiences in training novices to the fire ground. Threat experiences and near-misses that do not result in injury are unlikely to be formally reported as incidents. In the U.S. Facilitated Learning Analyses are increasingly being conducted of near-miss incidents in order to identify lessons that may be learned from these experiences. The U.S. Wildland Fire Lessons Learned Center has set up a website where fire fighters can post their own portal stories. Local fire agencies could emulate this on their own intranets to encourage the reporting of portal experiences that taught fire fighters important lessons but did not warrant formal incident reporting. Fire agencies could also broaden their definition of an "incident" to include any experience where fire fighters felt that their life was potentially at risk.

Education campaigns are needed to promote the reporting of incidents and incident reporting should be made a responsibility of those in the chain of command. Importantly, once incidents are reported, formal follow-up procedures should be put in place to identify lessons learned and this information should be fed back by fire agencies to those on the ground.

These data present a conundrum to fire fighting agencies who must grapple with the question of how they best train fire fighters to take seriously the reality of threat on the fire ground, short of actually exposing fire fighters to real life-threatening experiences. Human beings are prone to numerous cognitive biases when assessing risk (Holgate and Clancy, 2007), most notably, illusions of personal invulnerability and optimistic biases (Metcalfe, 1998; Gold, 2007). Fire agencies need to develop training programs that go beyond dry after-action reviews and impact on the "gut feelings" of fire fighters. Klein (2004) points out the value of personally engaging "war-stories" in the learning of rules and lessons in organisations. Fire agencies could make better use of the collective wisdom of their members in communicating the lessons to be learned from near-misses.

Note: This paper is based on data presented in the conference paper Clancy, D. and Holgate, A. (2004). Rural firefighters' experiences of risk on the fireground. 39th Annual Australian Psychological Society Conference, Sydney, Australia, October.

References:

Chamberlin, P. (2005). Portals. Eighth International Wildland Fire Safety Summit: Human factors – 10 years later, April, Missoula, MT. U.S.A. Retrieved September, 11, 2007, from: http://www.wildfirelessons.net/Portal.aspx

Clancy, D. & Holgate, A. (2005). Fire fighter's assessments of fireground risk. (pp.68-72). *Proceedings of the 40th Annual Conference of the Australian Psychological Society, Melbourne.*

Holgate, A. & Clancy, D. (2007). Risky business: Can organisations define "acceptable risk" in an emergency. (pp.145-148). *Proceedings of the 7th Industrial and Organisational Psychology Conference/1st Asia Pacific Congress on Work and Organisational Psychology*, Adelaide.

Gold, R. (1993). On the need to mind the gap: On-line versus off-line cognitions underlying sexual risk-taking. In D. Terry (Ed); C. Gallois (Ed); M. McCamish (Ed). *The theory of reasoned action: Its application to AIDS-preventive behaviour.* Elmsford, NY, US: Pergamon Press.

Gold, R. (2007). The link between judgments of comparative risk and own risk: Further evidence. *Psychology, Health & Medicine*, 12(2), 238-247.

Johnstone, G. (2002). *Report into the investigation and inquests into a wildfire and the deaths of five firefighters at Linton on 2 December 2002.* State Coroners Office, Victoria

Klein, G. (2004). *The power of intuition: How to use your guts feelings to make better decisions at work.* New York, NY: Currency

McLean, J. (1999). *Fire on the mountain: The true story of the South Canyon fire.* New York: William Morrow.

Metcalfe, J. (1998). Cognitive optimism: Self-deception or memory-based processing heuristics? Personality and Social Psychology Review, 2(2), 100-110.

Mutch, R.W. (2005). *A dream, a team, a theme: Your portal to zero defect wildland fire safety.* Eighth International Wildland Fire Safety Summit: Human factors – 10 years later. April. Missoula, MT: USA.

Sadler, P., Holgate, A. and Clancy, D. (2007). Is a contained fire less risky than a going fire? Career and volunteer firefighters' perception of risk. *Australian Journal of Emergency Management*, 22(2), 44-48.

Slovic, P., Finucane, M.L., Peters, E., & MacGregor, D.G. (2004). Risk as analysis and risk as feelings: Some thoughts about affect, reason, risk, and rationality. *Risk Analysis*, 24, 311-322.

Slovic, P. & Peters. E. (2006). Risk perception and affect. *Current directions in psychological science*, 15(6), 322-325.

Stevenson, J. (2001). Inquest into the Deaths of Mark Douglas Cupit, Claire Wynne Dean, George Allan Fitzsimmons and Eric Furlan and inquiry into fire at Mt. Kuring-gai National Park. Westmead: Coroner's Court.

United States Department of Agriculture Forest Service (2001) *Thirty Mile Fire Investigation: Accident investigation factual report and management evaluation report.* Chewuch River Canyon: Washington.

United States Department of Agriculture Forest Service (2003). *Accident investigation factual report: Cramer Fire fatalities North Fork Ranger District Salmon-Challis National forest Region 4.* MT: Missoula.

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Paramedics' perceptions of risk and willingness to work during disasters

Smith, Morgans, Qureshi, Archer, and Burkle Jr argue that ambulance services may not have an adequate supply of paramedics during disasters.

Abstract

Paramedics, as emergency healthcare workers and 'frontline' responders, are expected to be both willing and able to respond when disaster strikes. In reality, paramedics may be reluctant to work when the situation poses a possible threat to their own safety, their co-workers, or that of their families. Consequently, can ambulance services expect to have an adequate supply of paramedics that will be willing to work during disasters? Through the use of paramedic focus groups, this study demonstrates that ambulance services should not assume that all paramedics will be willing to report to work during disasters. This willingness to work is directly influenced by paramedics' perceptions of risk, as well as the type, duration, location, and visibility of the disaster. The impact of this should be considered in emergency preparedness and planning.

Introduction

When major emergencies and disasters occur, employers, emergency planners, and even the public may assume that paramedics will be willing to work. In reality however, paramedics may be reluctant to work when the situation poses a possible threat to their own health and safety, or that of their co-workers and families. Such reluctance could be detrimental to the ability of the health care system to cope with the surge of demand on resources that is synonymous with major emergencies and disasters (Chua 2004, Verma 2004, Koh 2005), placing further stress on an already overcrowded and stretched emergency health care system. This issue is of particular concern in highly populated urban areas, particularly during health-related and non-conventional disasters, as the density of the population may encourage the rapid spread of infection or contamination in the event of health disasters and chemical, biological, radiological, and nuclear (CBRN) events . A ready and willing prehospital workforce will be a vital component of any strategy designed to protect the health and well-being, and ultimate survivability, of the community following a disaster. Given the importance of having a willing prehospital workforce during disasters, coupled with our current lack of understanding regarding this willingness to work, this study was designed to investigate how paramedic's perceive the risks involved with working during a disaster, and ultimately, whether this risk perception impacts on their subsequent willingness to work during these events. The findings of this research will provide emergency planners with a key insight into what concerns paramedics have in regards to responding to disasters, and how these concerns can be addressed prior to a disaster occurring on our soil.

Background

Reports from the US, Canada, Asia, Israel, Germany, and Australia highlight that during conventional and non-conventional disasters (such as hurricanes, outbreaks of infectious disease, warfare and terrorism) emergency health care workers will not always be willing to report to work. A study of Israeli health care workers reported that 58% of respondents were not willing to report to work during a non-conventional missile attack (Shapira 1991). A Hawaiian study which examined the willingness of doctors and nurses to work in field hospitals during mass casualty events identified that respondents were more likely to be willing to work during natural disasters, with willingness influenced by perception of risk, perceived knowledge, and self-perceived ability to provide the type of care required (Lanzilotti 2002).

A number of studies have been conducted in New York following the September 11th terrorist attacks and the subsequent anthrax outbreak. These studies investigated the ability and willingness of emergency health care workers to respond to work during catastrophic disasters and terrorist related events. Barriers to being willing and able to work during these events included childcare, eldercare, transportation, personal and family health concerns, and compensation (Qureshi 2002, Qureshi 2005), fears for personal and family

safety (DiMaggio 2005), perception of inadequate or too little training and education, and the lack of necessary equipment to respond to large scale events (Reilly 2007). Furthermore, emergency health care providers report a decreased willingness to work during a prolonged disaster situation, and at no time will 100% of all personnel rostered to work actually report for duty (Syrett 2007).

During the Severe Acute Respiratory Syndrome (SARS) outbreak in 2003, infectiousness of SARS was substantially higher among health care workers than the general population, especially those working in hospitals and prehospital care (Maunder 2004). Indeed, during the outbreak, Toronto suffered significant personnel and logistical problems in providing prehospital services to patients during the outbreak (Maguire 2007). Approximately half of Toronto's prehospital personnel were exposed to the disease, and many workers needed to be quarantined (Silverman 2004). Emergency health care workers believed that they were at high risk of becoming infected, with some refusing to care for the ill, and imposing self-quarantine on themselves to protect family members from potential exposure (Chua 2003, Koh 2005, Stein 2004).

A German study (Ehrenstein 2006) investigated ethical issues involved with the management of patients during an influenza pandemic. Of the 644 respondents in this study, 182 (28%) reported that it would be professionally acceptable for health care workers to abandon their workplace during a pandemic in order to protect themselves and their families. However, 52% did not find this ideology acceptable. Of interest, only a minority (32%) of hospital administration staff reported a willingness to work during an influenza pandemic while a greater number of health care providers (65% of doctors and 54% of nurses) reported an self perceived obligation to treat patients during a health disaster.

Most recently, two studies presented at the 2007 Society for Academic Emergency Medicine Annual Meeting in the United States examined the psychological barriers that may keep emergency health care workers from reporting to work during a disaster (Irvin 2007, Kruss 2007). These studies identified that healthcare workers would be more likely to report to work if they felt their role was important and that they could be effective in doing their job. 'Workers want to know that the role they play will be meaningful, and, if they put themselves out there for the benefit of others, their institution will in turn be taking care of them and their families' (Kruss 2007). Other factors that were found to impact on willingness to work included; a belief that the workplace was safe, that travelling to work will be safe, the perceived likelihood of contracting illness and exposing family members would be low, and confidence in the protective personal equipment (PPE) provided (Irvin 2007, Kruss 2007).

Nationally, a 2007 study investigated Australian paramedic's perception of risk in relation to pandemic influenza (Watt 2007, Tippett 2007). The findings of this study indicate that higher levels of perceived risk were directly associated with decreased confidence in both PPE, and strategies for protection from exposure. Of interest, 94% of the 725 respondents reported that they would want to know if a work colleague had been exposed to a known case of pandemic influenza illness, with 70% reporting that they would be concerned about working with them, and 40% reporting that the would refuse to work with them (Watt 2007, Tippett 2007). When discussing issues surrounding voluntary and enforced quarantine during a pandemic, 74% of respondents reported that their family would not be happy with the concept of 'home quarantine'. Study respondents reported that suitable support systems during a pandemic would include; subsidised vaccinations, frequent communications, financial support, quarantine away from the home, and counselling support for family members (Watt 2007, Tippett 2007).

With risk of injury, infection, illness, and contamination being inherent in the provision of emergency health care, paramedics need to find a balance between concerns for their own safety and the safety of their colleagues and family, and their duty to respond to work during a disaster situation (Singer 2003). Finding this 'balance' will depend largely on the way that paramedics perceive the risks involved with responding during disasters, and how these perceptions shape the subsequent risk assessments they make when deciding if they are willing to work or not. This research moves towards identifying how paramedics find this balance, by way of investigating how they perceive the risks involved with disaster response, and their willingness to work during such events.

Methods

A total of 58 Victorian paramedics participated in this study (55 attended focus groups and 3 were interviewed individually). A total of twelve focus groups were conducted throughout the state of Victoria during 2006 and 2007. Ethics and Research Approval were sought and obtained from the relevant committees, and no identifying information was recorded for any participant. A plain language statement explaining the project was made available and informed consent was given by each study participant. Two facilitators were present at each focus group. One facilitator conducted the interviews. Each focus group was attended by 3-8 paramedics and was 90 minutes in duration. The format, use of semi-structured questions, and the use of scenarios, were developed according to qualitative research guidelines (Bender 1994).

The focus groups and interviews were facilitated by the use of three scenarios:

Scenario One

A high speed passenger train had derailed in a major urban region. The derailment had associated traffic, structural, fuel, and fire hazards. An estimated 20-100 people will need treatment and transport.

Scenario Two

An explosion, with suspected chemical, biological, and radiological (CBR) involvement, and fire hazards, at the second largest building in the Central Business District (CBD). Initial reports indicate that this may be a series of bombings, and is potentially a terrorist attack. An estimated 15,000-20,000 people were in the building at the time of the explosion.

Scenario Three

A two part, escalating scenario that required participants to indicate their perceived risks and willingness to work at critical time points. This scenario involved cases of human-human transmitted Avian Influenza in Victoria, Australia, and escalated through suspected cased to confirmed cases.

The focus groups and interviews were audio-taped and transcribed, with each transcription reviewed by the principal investigator and members of the research team for accuracy. Each focus group and interview transcript was examined for emergent themes. Thematic analysis was conducted manually by members of the research team. Individual themes were identified by reviewing the text of each transcript. The individual themes highlighted were then compared to identify recurring and salient issues across the focus groups and interviews.

Results and discussion

Analysis of the transcripts of these focus groups and interviews identified two primary streams of discussion, one exploring the key **risks** perceived with disaster response, and the second exploring the primary **concerns** paramedics have in being asked to respond to disaster situations.

Perceived risk

Analysis of the discussions relevant to each disaster scenario highlighted a number of key perceived risks associated with the **type** of disaster situation involved. Essentially, the way that paramedics perceived risk was directly influenced by the type of disaster, and the potential for that disaster to impact on their family.

Figure 1. Hierarchy of concerns.

Health and Safety

'Will I be safe?' 'Will my colleagues be safe?'
'Could I get sick?' 'Could I take something home to my family?'

Health and Safety

'Will I be safe?' 'Will my colleagues be safe?'
'Could I get sick?' 'Could I take something home to my family?'

Training, Education

'Am I ABLE to do my job?'

Communication, Information

'Will I be able to make an accurate risk assessment?'

Mistrust of Employer

'Can I trust that my employer will give me the most accurate information to make my risk assessment?'

Threats to the health, wellbeing, and safety of self, colleagues, and family were often expressed as risk of **injury, death, exposure, infection**, and **illness**. Risk of injury was primarily related to conventional disaster scenarios (that did not involve health related or CBRN issues) **'I could get hurt'**, **'My partner could get hurt'**, **'This scene may not be safe'**. In contrast, discussion of non-conventional disasters identified perceived risk of exposure, infection, illness, and death **'I could get sick'**, **'I could take this home with me'**, **'My family could get sick'**. Of note, none of the study participants reported death as a risk associated with responding to conventional disasters . However, death was a risk associated with responding to non-conventional disasters (health related disasters or disasters involving some aspect of CBRN) **'We do not know what we are dealing with… I could die'**.

Primary concerns

Throughout the discussions of paramedics' risk perception during disasters, a 'hierarchy of concerns' emerged, highlighting a recurring set of themes (Figure 1.)

The first theme or 'concern' raised in all scenarios was the issue of personal health and safety. Threats to health and wellbeing of self, colleagues, and family (in terms of potential injury, exposure, infection, illness, and death) were the most frequently reported perceived risks of disaster response.

'…I mean, you have to look after number one, so yeah, I am definitely going to be worried about how safe the scene is…'

'Paramedic safety is constantly threatened by inadequate training for these kinds of events, and inadequate equipment to deal with them…makes you wonder what the point is when you think about the futility of the task …'

Discussion of health and safety concerns was often followed with a discussion of 'responsibility' and 'duty of care'. While many paramedic's perceived their health and safety to be primary concerns when responding to a disaster or mass casualty event, these concerns were often reported to be negated by their desire to fulfil their professional responsibilities.

'It's my job…'

'Yeah I would go, I mean, that's why I wear this uniform…'

'This uniform and this job comes with a responsibility to turn up…'

'That is what we are trained for, why put on the uniform if you are not prepared to take the good jobs with the bad..'

Paramedic's often reported the need for improved disaster-focused education and training. A reoccurring theme was the reported feeling of inadequate and infrequent training in Personal Protective Equipment (PPE) in mass casualty response, specifically, for potential Chemical, Biological, Radiological, and Nuclear (CBRN) events.

'If we had better, and more frequent training for the CBRN and unknown stuff, then I would be happier to turn up to work if something happened…'

'I just don't think we have enough training, or PPE, for this stuff, I would definitely feel better about going in if we were better resourced…'

'What's the point of only training a small core group of paramedics to deal with this stuff, I mean, if something like that actually happened, we would all be expected to turn up, not just the boys with the proper suits and training…'

Improved communication strategies were of paramount concern to paramedics.

'Without decent communications and information, we are flying blind…'

'I would feel more willing to work during a disaster if the service was up front about what they know and what they don't know…'

'Let's face it, most of your risk assessment is going to happen before you get to the job, and that is where you need sufficient communication… to help us make decisions…'

'Communication during a disaster will be vital, we will need the most accurate information available, and we will need it as soon as it comes to hand…'

Another common theme expressed across all disaster scenarios was the need for current and reliable information.

'I want enough information, and it needs to come from the services quickly, so that I can look after number one…'

'I would expect information coming from the services to be wrong, I would expect it to be slow coming…but in the end, I will rely on that information until I get to the scene and can see for myself…'

'I think it's always safe to assume that nearly everything that you're told is likely to be wrong…and let's face it, in the early stages of something like this, no one will have a clear picture of what is going on…'

'There will be a lot of speculation, and the more that information is transmitted, and re-transmitted, the more incorrect it becomes…the services need to provide us with reliable information so we know what we are getting ourselves into…'

Paramedics also reported several other 'barriers' to being willing to work during disasters. These included access to childcare and eldercare, and the ability to communicate with family members whilst responding to the disasters.

'I would want to be there and I would want to help, but my wife is a nurse, and we have two little kids at home, so which one of us has to stay home and not turn up to work? If the service has pre-set childcare structures in place, it would make it easier for my wife and I to say, ok, we will drop the kids off at such and such a place, and we will know they will be safe, and we can both go to work. I don't think the services have thought about that'

'It's not only childcare that is the problem, I have my mother living at home with us, I would need to know that she was safe and cared for before I could respond to a disaster scene, especially one that could potentially be ongoing, like 9/11'

The need to be able to communicate with family members during a disaster was a strong theme. Paramedics consistently reported the need for pre-designated communication channels and strategies for them to be able to contact their loved ones, and also for their loved ones to be able to get current information as the disaster or event unfolds.

'I need to know that I can contact my family if I need to, and that they can find out what is going on...'

'Look at 9/11 and London, the families were watching everything on tv and knew how bad things were, but when they rang the stations, no one was answering, and comms couldn't tell them anything, and with the phone systems down, you didn't know what was going on…'

Paramedics frequently reported that they would not trust the ambulance services to provide them with current and accurate information during a disaster, and that the information provided to them when responding to large-scale events would be incorrect or misleading. The issue of mistrust was particularly dominant in the discussions of avian influenza and potential emerging infectious diseases, with paramedics reporting they would seek information from outside of the ambulance services before making their personal risk assessments.

'How can we do our jobs safely when we cant even rely on the services giving us correct, up to date information… you basically get no information, in fact, it is more likely to be misleading…'

'I think most ambo's are quite cynical about the services, we don't feel like they will be looking after our welfare, there will definitely be a lack of information… I mean, we know they have information now on bird flu, but it isn't filtering through to the troops on the ground…'

There were differences in perception of risk and willingness to work for conventional and non-conventional disasters. Perception of risk for conventional disasters focused largely on safety, whereas threats to health and wellbeing of self and family (exposure, infection, and illness) were the most frequently reported perceived risks of responding to non-conventional disasters. Paramedics were more willing to work during conventional disasters (**'It's my job'**, **'It's my responsibility'**) than during non-conventional disasters (**'I could get sick'**, **'My family could get sick'**, **'I could take something home with me'**).

Paramedics reported that conventional disasters tend to be more localised (in time and place) and visible (being able to see what is happening), making it easier for paramedics to conduct a personal risk assessment about responding to the disaster. When a disaster is not visible or localised the perception of risk increases, due in part to the difficulty in accurately assessing the risks involved with responding to the event. This increased perception of risk then corresponds with paramedics reporting a decreased willingness to work.

The duration of a disaster also impacted on perception of risk and willingness to work. Perception of risk increased the longer that a disaster situation lasted for, resulting in fewer paramedics reporting willingness to work as disasters develop. This theme was particularly evident during discussions of non-conventional disasters, where paramedics reported that they would become less willing to work as the disaster developed, especially if the agent or illness had not been identified, along with appropriate treatment and vaccination options being made available.

While the majority of study participants indicated that they would be willing to work during conventional disasters, this willingness decreased when the situation became non-conventional and less visible. The primary reason reported for this decreased willingness to work was the "unknown" aspect of non-conventional disasters. You can **see** a derailed train. You can **see** a building on fire. You can't **see** a biological agent. You cannot **see** infection. Non-conventional disasters were also perceived to be less localised (in both time and space). The longer an event lasts for, the fewer staff that will be willing to work.

Non-conventional disasters also have a larger impact on the family of the paramedic, with some paramedics reporting they would self-impose quarantine if they were required to work during a health related or non-conventional disaster. Once the issues of exposure, illness, and infection enter into the personal risk assessment paramedics make each time they enter a scene, the more difficult that risk assessment will be. In addition, paramedics with families have to expand their personal risk assessment to think of the impact on their families, and the possibility that they may **'bring something home with them'**.

These issues need to be addressed at the training and education level, and also at the emergency service management level. Many of the barriers to being willing to work raised by study participants are amenable to intervention. Specifically, issues such as childcare, eldercare, transport, risk communication strategies, and communication with family members are issues that emergency services can address today.

Conclusion

This study demonstrates that ambulance services should not assume that all paramedics will be willing to report to work during disasters. The primary risks highlighted were **injury, exposure, infection, illness, and death**. The key concerns paramedics had related to **health and safety, communication issues**, the need for **accurate and timely information**, and the need for suitable **training and education**. Paramedic's often reported a difficulty in finding a balance between **safety** and **duty of care**, and a **mistrust** of ambulance services management. Study participants were more willing to work during conventional disasters **'It's my job'**, **'It's my responsibility'** than during non-conventional disasters **'I could get sick'**, **'My family could get sick'**, **'I could take something home with me'**, with factors such as **visibility, localisation** and **duration** influencing willingness to work.

Of importance to emergency planners, a large majority of study participants reported that their willingness to work during bio-events and non-conventional disasters would increase if they were provided with adequate **'safety measures'**, and **'protective equipment'** and **'training'**. Emergency planners should also take note of another recurring theme in the results from these studies – the impact of **childcare**, and **eldercare** obligations. The need for emergency health care workers to provide care and reassurance to family members needs to be recognised and addressed in emergency preparedness plans.

The inability to fulfil these obligations may have a profound influence on willingness to report to work. These findings are important as they provide emergency planners with an insight into the key risks and concerns that need to be targeted in future disaster preparedness plans, and specifically, for targeted education and training programs in the future.

References

Bender DE, Ewbank D. The Focus Group as a Tool for Health Research: Issues in Design and Analysis. *Health Transition Review* 1994;4:63-79

Chua S, Cheung V, Cheung C. Stress and psychological impact on SARS patients and high-risk health care workers during SARS outbreak. Hong Kong: Department of Psychiatry, University of Hong Kong, 2004. Available at: http://www,web.hku.hk:8400/facmed/press/-07-20/presentation.pdf. Accessed 3 May, 2006

DiMaggio C, Markeson D, Loo GT, Redlener I. The Willingess of U.S. Emergency Medical Technicians to Respond to Terrorist Incidents. *Biosecurity and Bioterrorism: Biodefense Strategy, Practice and Science*. 2005;3(4):331-337

Ehrenstein BP, Hanses F, Salzberger B. Influenza pandemic and professional duty: family or patients first? A survey of hospital employees. BMC *Public Health* 2006;6:311

Irvin C, Cindrich L, Patterson W et al. Survey of Hospital Health Care Professionals' Response during a Potential Avian Influenza Pandemic. Presented at the Society for Academic Emergency Medicine (SAEM) Conference, Chicago, USA 2007. Abstract available in *Academic Emergency Medicine* 2007;14(5S)

Koh, D, Lim MK, Chia SE et al. Risk perception and impact of SARS on work and personal lives of healthcare workers in Singapore – what care we learn? *Medical Care* 2005;43:676-682

Kruss L, Karras DJ, Seals B et al. Healthcare Worker Response to Disaster Conditions. Presented at the Society for Academic Emergency Medicine (SAEM) Conference, Chicago, USA 2007. Abstract available in *Academic Emergency Medicine* 2007;14(5S)

Lanzilotti S, Galanais D, Leoni N, et al. Hawaii Medical Professionals Assessment. *Hawaii Medical Journal*. 2002;61:162-173

Maguire BJ, Dean S, Bissell RA et al. Epidemic and bioterrorism preparation among emergency medical services systems. *Prehospital and Disaster Medicine* 2007;22(3);237-242

Maunder R. The Experience of the 2003 SARS Outbreak as a Traumatic Stress among Frontline Healthcare Workers in Toronto: Lessons Learned. *Phil Trans R. Soc London* 2004;359:1117-1125

Qureshi K, Merrill J, Calero-Breckheimer A. Emergency Preparedness Training for Public Health Nurses: A Pilot Study. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*. 2002;79:413-416

Qureshi K, Gershon RRM, Sherman MF, et al. Health Care Workers' Ability and Willingness to Report to Duty During Catastrophic Disasters. *Journal of Urban Health: Bulletin of the New York Academy of Medicine*. 2005;82(3):378-388

Reilly MJ, Markenson D, DiMaggio C. Comfort level of emergency medical service providers in responding to weapons of mass destruction events: Impact of training and equipment. *Prehospital and Disaster Medicine* 2007;22(4):297-303

Shapira Y, Marganitt B, Roxiner I et al. Willingness of staff to report to their hospital duties following an unconventional missile attack: A state-wide survey. *Israel Medical Science Journal* 1991;27:704-711

Silverman A, Simor A, Loufty MR. Toronto emergency medical services and SARS. *Emerging Infectious Diseases* 2004:10(9);1688-1689

Singer P, Benatar S, Bernstein M et al. Ethics and SARS: Lessons from Toronto. *BMJ* 2003;327:1342-1344

Smith E. Emergency Health Care Workers' Willingness to Work during Major Emergencies and Disasters. *Australian Journal of Emergency Management* 2007;22(2)

Stein BD, Tanielian TL, Eisenman DP et al. Emotional and Behavioural Consequences of Bioterrorism: Planning a Public Health Response. *Milbank Q.* 2004;82(3):413-455

Syrett JL, Benitez JG, Livingston WH and Davis EA. Will Emergency Health Care Providers Respond to Mass Casualty Incidents? *Prehospital Emergency Care* 2007;11(1):49-54

Tippett V, Archer F, Kelly H, Coory M, Burkle F, Jamrozik K, Watt K, Raven S, Beleijs I Morgans A, Smith E, Murdoch J, Plug L. The Australian prehospital pandemic risk perception study and an examination of new public health roles for Ambulance Services in pandemic response. Australian Centre for Prehospital Research, Queensland Ambulance Service, Brisbane 2007

Verma S, Chan YH, Deslypere JP et al. Post-SARS Psychological Morbidity Among General Practitioners and Traditional Chinese Medicine Practitioners in Singapore. *Ann Acad Med Singapore* 2004;33:743-748

Watt K, Tippett V, Raven S et al. Pandemic influenza: Australian paramedic risk perception study (Abstract). *Journal of Emergency Primary Health Care* (JEPHC) 2007:5(3)

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Planning for tsunami evacuations: the case of the Marine Education Centre, Wellington, New Zealand

Ruth Garside, David Johnston, Wendy Saunders and Graham Leonard outline and explore the legal implications of a 2007 Environment Court of New Zealand ruling on the proposed Marine Education Centre, Wellington, with respect to tsunami evacuation planning.

Abstract

In 2007, the New Zealand Environment Court (W 082/2007) decided to uphold appeals relating to the effects of a Marine Education Centre proposed to be built on an exposed coastal site, susceptible to tsunami risk, south of Wellington city. This resulted in a significant ruling that applicants seeking resource consents for the establishment and operation of public facilities in areas susceptible to natural hazards should not overlook evacuation planning in their application.

Introduction

Recent research on tsunami warnings emphasises the need for development of an effective tsunami warning system for both residents and transient populations, including visitors and tourists (Johnston et al, 2007). The difficulty in preparing visitors to effectively respond to warning messages has been highlighted by social science research exploring a range of hazard contexts, such as hurricanes, tsunamis, and volcanic eruptions (Drabek 1994, 1996, 2000; Johnston et al., 2005; Gregg et al., 2007; Leonard et al., 2008; Sorensen, 2000).

The need to understand and improve tsunami warnings and response capacity was identified in many countries in the Pacific region including Australia and New Zealand following the 2004 Indian Ocean tragedy (Webb, 2005) and subsequent research has explored a range of issues around warnings (Leonard, Johnston, & Saunders, 2007), evacuation planning (MCDEM, 2008) and their links to land-use planning (Saunders, Forsyth, Johnston, & Becker, 2007).

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In theory, all tsunami risk can be mitigated through land-use planning and Eisner (2005) proposes a range of land use planning tools. However, regulations and land-use planning have rarely been used in New Zealand for tsunami risk mitigation, due to a strong public desire for coastal development and the long return period of damaging tsunami events. An effective integrated warning system is therefore required to address the residual risk created by human activity in the coastal margin and this requires considerations for evacuating at-risk populations following warnings.

A recent example of the consideration of tsunami evacuation requirements can be seen in the plans for the Tora coastal development in the Wairarapa district. In the proposed subdivision, a public path will be built up the hillside behind the development with educational material and evacuation signage to help mitigate the risk (Saunders, 2008).

This paper outlines and explores the legal implications of a 2007 Environment Court of New Zealand ruling on the proposed Marine Education Centre, Wellington, with respect to tsunami evacuation planning.

The case of the proposed Wellington Marine Education Centre

Resource consents and permits had been granted (26 October, 2006) for a Marine Education Centre (MEC) to be built on undeveloped land owned by the Wellington City Council at Te Raekaihau Point on the western side of Lyall Bay, which, due to its location on the South coast is exposed to extremes of weather and sea conditions (Figure 1 and 2). The proposed development, comprising of a three-level building, fenced open area and car park was estimated to modify approximately 1.3ha of the site.

Figure 1. Location map of the proposed Marine Education Centre.
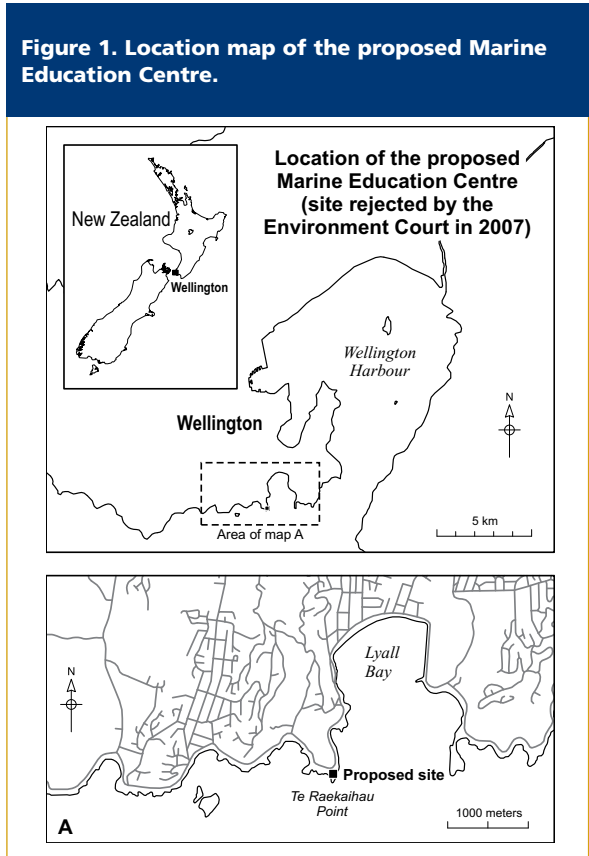
The subsequent appeals under s120 of the Resource Management Act 1991 (RMA) in Save The Point Inc & Chris Webster v The Wellington City Council & The Wellington Regional Council, 20 September 2007, related primarily to s104 of the Act which has regard to the actual and potential effects of a proposed activity on the environment. The appellants were supportive of the concept of a Marine Centre but opposed the building of the Centre on this Open Space B zone site.

In the course of a number of views brought before the Court concerning the suitability of the site, the consideration of hazards and risks arising from storm surges, wave run-up, sea level rise and tsunami waves were discussed at length to establish whether precautions could be set in place "which mitigate the risk of a high potential impact actually occurring to such a level of danger that is acceptable" (at para123).

It was understood that the RMA does not require the elimination of risk but that precautions should be in place to minimise the risk to an acceptable level, and that it was the duty of the Court (on appeal) to assess the evidence placed before it in this regard.

The decision of the Environment Court (W 082/2007) that upheld the appeals, raised a significant ruling that applicants seeking resource consents for the establishment and operation of public facilities in areas susceptible to natural hazards should not overlook evacuation planning in their application.

Natural hazard issues

Expert evidence was presented on the risk, impact and mitigation of the rising sea level and inundation of the site, and it was concluded that if the facility could be closed when an extreme storm-related event occurs, the level of risk is acceptable. However, in the event of a tsunami, the timeframe of warning will vary depending on the tsunami source, with the worst case scenario of a local source from a strongly-felt earthquake giving only minutes of warning.

The Court heard that a tsunami is a long period wave caused by the displacement of the sea floor that may be triggered by an earthquake, or an undersea or coastal landslide. The proposed site is at risk from tsunami generated from distal, regional and local sources (Berryman, 2005). For example, Te Raekaihau Point would have been inundated by the 1855 Wairarapa earthquake, magnitude 8.2, that produced a tsunami wave around 4-5 m high in nearby Lyall Bay.

Discussion ensued about the size of such an event, its probability, consequences and possible avoidance measures. It was projected that there would be considerable loss of life dependent on assumptions about the number of people at the Centre, the degree of warning and the effectiveness of evacuation to high ground. Although the Court held that the level of risk from a tsunami in itself was not enough to decline a consent, the risk needs to be reduced either by protection of the site and structure, or by adequate

Figure 2. Ta Raekaihau Point, western side of Lyall Bay, on the exposed Wellington South coast. Photo by Lloyd Homer, GNS Science.

warning and evacuation. A detailed evaluation of the tsunami risk was centred on the likely mean wave height and inundation onshore. It concluded that the protection afforded by the 3m high coastal berm would be inadequate for a tsunami wave greater than 1.5m when allowing for wave run-up, and that risk of fatalities in the Wellington region can be expected for wave heights above about 2.2m (Berryman, 2005).

Hazard warning and evacuation

Adequate warning of a tsunami event in the region is considered problematic since only tsunamis generated from a distant source (> 3hours travel time from the source) will currently receive an official warning. Tsunamis from regional sources (1-3 hours travel time from the source) may in the next few years have warnings from official channels, while those generated from local sources (< 1 hour travel time from the source) will not receive any official warning in the foreseeable future and rely on natural warnings such as strong ground shaking, observation of ocean disturbance, noises and/or a receding level (Webb, 2005). Warning time is a critical factor in the available time to reach a suitable emergency assembly point.

It was agreed by the experts that given the estimated wave height at this location, evacuation would be needed to a site at least 20m above sea level to reduce the risk to acceptable levels. Although there are possible assembly sites high enough in the vicinity, there was no consideration for their development in the resource consent application.

Conclusion

When coming to its conclusion, the Court found that (at para147) "the inundation risk from a tsunami is significant for events with a return period of 50 years and greater, and that measures are required to reduce the risk to an acceptable level". The Court criticised the fact that it was unknown whether safe evacuation sites could be developed, nor if such sites would allow timely and practical evacuation. The Court concluded that such matters were "a prerequisite for an evacuation plan and possibly even for the granting of a consent" (at para147, emphasis added). It acknowledged that some tsunami risks had been considered but "without any firm measures to deal with an emergency situation" (at para182). The Court accepted the expert opinion that "if it is not possible to have an effective tsunami warning system and evacuation plan then the risk should be avoided" (at para135).

The implication of this conclusion that contributed to the appeals being upheld by a majority decision of the Court is significant for future applicants seeking resource consents for the establishment and operation of public facilities in areas susceptible to natural hazards, in that an evacuation plan is a necessary consideration of public safety. Indeed, it is also a statutory obligation under s6(e) of the New Zealand Health and Safety in Employment Act 1992 and part of the risk mitigation requirements of the Wellington Regional Policy Statement (Policy 2).

In the light of this judgement, **what is an effective evacuation plan?** All at-risk facilities should have appropriate emergency response planning which would include:

- Warning notification protocols and systems;

- Evaluation and mapping of evacuation routes, with signage to designated assembly points (*Figure 3*);

- Consideration of evacuation timing; and

- Staff training and evacuation plan exercising.

Not only should the availability of suitable evacuation sites be identified, it is recommended that consideration be made of the practicality of reaching them in a short timeframe under difficult conditions such as darkness and adverse weather by evacuees with different ability and fitness levels (MCDEM, 2008).

Figure 3. Tsunami evacuation sign from the standards developed by the Tsunami Working Group Signage Subcommittee in 2007.

References

Berryman, K. (compiler), (2005). *Review of tsunami hazard and risk in New Zealand*, Institute of Geological & Nuclear Sciences client report, cr2005-104, Lower Hutt. (Available online at http://www.civildefence.govt.nz/memwebsite.nsf/wpg_URL/For-the-CDEM-Sector-Publications-Index?OpenDocument)

Drabek, T.E. (1994). *Disaster Evacuation and the Tourist Industry*. Boulder, BO: University of Colorado, Institute of Behavioral Science, Program on Environment and Behavior. USA.

Drabek, T.E. (1996). *Disaster Evacuation Behavior: Tourists and other Transients*. Boulder, BO: University of Colorado, institute of Behavioral Science, Program on Environment and Behavior. USA.

Drabek, T.E. (2000). *Disaster Evacuations: tourist-business managers rarely act as customers expect*. Cornell Hotel and Restaurant Administration Quarterly, 41(1): 48-57.

Eisner, R.K. (2005). *Planning for tsunami: Reducing future losses through mitigation*. Natural Hazards, 35(1): 155-162.

Gregg, C.E.; Houghton, B.F.; Paton, D; Johnston, D.M., Swanson, D., Yanagi, B. A. (2007). Tsunami Warnings: Understanding in Hawaii. *Natural Hazards*, 40:71-87.

Johnston, D., Paton, D., Crawford, G. L., Ronan, K., Houghton, B., Bürgelt, P. (2005). *Measuring tsunami preparedness in Coastal Washington*, United States. Natural Hazards, 35(1): 173 – 184.

Johnston, D., Becker, J., Gregg, C., Houghton, B., Paton, D., Leonard, G., Garside, R. (2007). *Developing warning and disaster response capacity in the tourism sector in coastal Washington*, USA. Disaster Prevention and Management, 16: 210-216.

Leonard, G.S., Johnston, D.M., Paton, D., Christianson, A., Becker, J. & Keys, H. (2008). Developing effective warning systems: Ongoing research at Ruapehu volcano, New Zealand. *Journal of Volcanology and Geothermal Research*, 172: 199-215.

Leonard, G. S.; Johnston, D. M.; Saunders W. S. A. (2007). *Hazard warning systems for the Gisborne district: assessment of options*, GNS Science Report, 2007/04 72p.

MCDEM. (2008). *Mass Evacuation Planning: Director's Guidelines for Civil Defence Emergency Management (CDEM) Groups [DGL 07/08]* Ministry of Civil Defence & Emergency Management, June 2008, 87p.

Saunders, W. (2008). *Urban design and natural hazard mitigation. Proceedings of the 4th International i-Rec: Building resilience achieving effective post-disaster reconstruction*, 30 April – 1 May 2008, Christchurch, New Zealand. (Available online at http://www.resorgs.org.nz/irec2008/i-rec2008_papers.shtml)

Saunders, W., Forsyth, J., Johnston, D., & J. Becker. (2007). Strengthening linkages between land-use planning and emergency management in New Zealand. *Australian Journal of Emergency Management*, 22:36-43.

Sorensen, J., (2000). Hazard warning systems: review of 20 years of progress. Natural Hazards Review, (May): 119-125.

Tsunami Working Group Signage Subcommittee, (2007). *New Zealand national tsunami signage recommendations for CDEM Groups*, GNS Science Report, 2007/40, 39p.

Webb, T. (compiler), (2005). *Review of New Zealand's preparedness for tsunami hazard, comparison to risk and recommendations for treatment*. Institute of Geological & Nuclear Sciences client report, cr2005-104, Lower Hutt. (Available online at http://www.civildefence.govt.nz/memwebsite.nsf/wpg_URL/For-the-CDEM-Sector-Publications-Index?OpenDocument)

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The Launceston flood policies: Levees and beyond

Atkins and Vince of the University of Tasmania examine the development of Launceston's flood levee and flood mitigation policies.

Abstract

Launceston, Tasmania's second largest municipality, has been recognised as a flood-prone area since the first major inundation was recorded in 1828. Following a one in forty year flood event in 1969, the areas susceptible to flooding were protected by a levee system which has been maintained and funded by the Launceston City Council (LCC) and the Tasmanian Government. In May 2007, the latest funding from all tiers of government was committed to levee maintenance. This article examines the development of Launceston's flood levee and flood mitigation policies. It argues that while levee maintenance is an important part of flood management, the additional social, emergency management and planning and development policies that are currently being implemented will strengthen the policy makers' responses in the event of a flood.

Launceston has been known to be susceptible to flooding since the first major flood was recorded in September 1828. This flood risk is primarily due to the location and topography of Launceston's lower suburbs, Inveresk and Invermay. These suburbs are located at the confluence of the North Esk, South Esk and Tamar Rivers which are fed by a catchment system that covers 14 per cent of Tasmania (GHD 2006: 1; Launceston City Council 2009). In addition, Inveresk and Invermay were built on reclaimed swamp, which is part of a natural floodplain on the Tamar River Estuary. As this area developed from a work site for wharf workers to a settlement in the early 1900s, flood inundation was mitigated by the construction of small tidal levees. In 1960, a decision was made to build ten kilometres of earthen levees around the flood prone suburbs. However, many of these levees failed during construction as they were too heavy for the swamp land. These construction failures were augmented during the 1960s and 1970s by use of

rigid piled concrete levees and temporary mud box levees, the latter which were to provide height without excessive weight in order to avoid sinking. However, the performance of these repairs is uncertain; the rigid concrete levees have since developed cavities underneath, allowing a degree of underflow; the temporary mud boxes have failed; and the remaining earthen levees have sunk and need to be lifted so as to prevent overflow. Recent engineering reports have concluded that the levee system is in dire need of repair as it would not protect the two suburbs in the event of a one in fifty year flood event.

The minor flooding which frequently occurs in the Esk Rivers does not pose a significant danger for the community. However, history illustrates that Launceston has encountered several major floods which have caused substantial infrastructural damage and loss of life. Among these, the flood event which occurred from 4-6 April, 1929 was the most significant experienced during the century in North-East Tasmania (State Emergency Service 1990: 21). The LCC flood classification system identifies the 1929 flood as a one in one hundred year flood event – that is, there is a one per cent chance that a flood of or greater than the magnitude of the 1929 event will occur in a given year. In comparison, the levees protecting Inveresk and Invermay at the time of the 1929 flood were merely capable of withstanding a one in twenty year flood event. The impact of the 1929 flood was intensified by the growth of Invermay, which had evolved from a swampland with one road in the late 1800s to a thriving community. The 1929 flooding caused 22 deaths, left approximately 4,500 people homeless, and 1000 homes rendered in need of repair or rebuilding (Terry and Servant 2002: 30). The flood event created immense long term ramifications for Launceston. Industries outside the inundation area were crippled due to a week of absenteeism following the flood. Flood damage, including huge losses of stock, the destruction of railways, bridges, roads and the Duck Reach Power Station, had a huge impact upon Launceston's economy. Two months afterward, ten per cent of the homes that had been inundated were still awaiting health certificates to be approved for usage

once more. It was some weeks after the flooding until the industrial and commercial workings of Launceston regained momentum and before the remaining refugees were permanently housed. Given these events, in conjunction with the subsequent development throughout Invermay since 1929, current policies have focused on reducing the consequences of such a dire flood event.

The summary of policies and decisions on local, state and federal levels that are briefly examined in this paper demonstrate the extensive policy making in this issue area. This paper is based on the research that was prepared for the Launceston Flood Research Initiative in which both authors were involved (Willis, Vogt, Natalier and Vince 2008). This Initiative had two elements. The first drew upon the perceptions of risk among flood-affected Launceston residents and preliminary findings were summarised in a recent article by Vogt, Willis and Vince (2008). This article comprises the second part of the Launceston Flood Research Initiative, focusing on the flood mitigation policies implemented as a response to this issue.

The levee issue and policy decisions

In the wake of Launceston's 1929 flood, the LCC and the Tasmanian government considered a range of flood mitigation measures. In December 1960, the Tasmanian government approved the construction of levees to replace existing earthen barriers to protect Inveresk and Invermay from future flood events. However, a number of failures apparent in the design, construction and the settlement of the foundations of the levees during the 1960s and 1970s led members of the LCC to see the levee system as fundamentally flawed (Launceston Flood Protection Board 1975; Parliament of Tasmania 2006). Temporary fixtures erected in the 1970s remain yet to be replaced. A report from engineering consultancy firm GHD in 2006 stated that the LCC Flood Protection Scheme, including the levees surrounding Invermay, posed a significant risk of failure in the event of a one in fifty year flood (GHD 2006: iv). It is estimated that if the levees were to fail, 40 per cent of Invermay could be inundated with as much as one metre of water during high tide each day. In addition, the consequences of a flood event occurring today would be considerably worse than in 1929 due to further infrastructural, business and housing development. If a one in one hundred year flood were to occur today, it would have a devastating effect on Inveresk and Invermay, potentially causing damage to 78 commercial, 649 residential and 194 industrial properties (Williams 2007: 4). Further, it is likely that some of Launceston's most prominent infrastructure, including Aurora

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Despite the flood risk, Invernay and Ineresk are considered by many to be areas offering suitable lifestyle choices.

Stadium, the Queen Victoria Museum and Art Gallery, and the University of Tasmania's Inveresk Campus would incur flood related damage (Vogt, Willis and Vince 2008: 49). The need for evacuation and the closure of major roads would render a significant part of the city inaccessible with service interruptions preventing home occupation and commercial activity. The degeneration of the levee system over time, in conjunction with further development in flood-prone areas has left Launceston highly susceptible to flood events. Although this issue has been addressed in the past, it has only been since 1999 that a comprehensive policy solution has been initiated.

The need to act upon Launceston's flood risk sparked debate between the LCC, Tasmanian government and Tasmanian representatives in the Federal government as to who should fund the reconstruction of the levees. Although the Tasmanian government was financially responsible for levee maintenance, the cost of addressing these fundamental deficiencies was far greater than could be dealt with in the annual budget (Tasmanian Department of Premier and Cabinet 2007). This predicament led to the Tasmanian government and LCC signing a Partnership Agreement and forming a Flood Steering Committee in 1999 to reassess the cost of levee maintenance. The Committee was also responsible for developing long term land use planning strategies for the suburbs and investigating sustainable dredging of the Tamar River (Tasmanian Department of Premier and Cabinet 2007).

Despite these good intentions, very little action occurred until 2003 when the Steering Committee released an expression of interest for a consultancy study to attain an educated judgment as to what actions should be undertaken. The chosen consultant was GHD, an engineering consultancy firm which was commissioned to undertake a social, economic, infrastructure and flooding risk assessment of Launceston's low-lying suburbs (GHD 2006: 1). The GHD report confirmed the poor condition of

Launceston's levee system, stating that there was a 40 per cent chance of a flood causing more than $110 million damage in the next 50 years (GHD 2006: iv). Consequently, GHD recommended a number of strategies which did not rely completely on levee focussed outcomes as had the previous State government's solution. The recommendations included parts of the current levee system being either rebuilt or repaired, the revision of land use planning and development control policies in flood prone areas, and a major review of LCC flood response and management plans (GHD 2006: v).

In order to identify a flood mitigation strategy from the options suggested by GHD and an appropriate funding model, the Flood Steering Committee hired consultant Frontier Economics (Frontier Economics 2006: iv). The consultant supported GHD's findings to redevelop levees, planning controls and flood warning and evacuation procedures. Frontier suggested that the $30 million initial cost of the recommendations should be borne equally between the LCC, State and Federal government (Frontier Economics 2006: vi). Given that the project was entirely reliant on the acquisition of the Federal government's portion of the funding, it played a pivotal role in bringing the flood issue to the fore (Tasmanian Government 2007a). Similarly, the State government's contribution to the funding was conditional on the LCC and Federal Government committing similar costs. The Agreed Measures also stated that LCC and the State government were to prepare a submission to the Federal government seeking a commitment to their $10 million share of the funding (Tasmanian Government 2007a). Despite a minor readjustment in which the overall figure had to be expanded to $39 million to compensate for an increase in property values and the need to relocate Lindsay Street properties to build a levee wall, all three tiers of government had agreed to provide $13 million each in early 2007 (Williams 2007b; Aird 2007; Australia Parliament 2007).

Policy responses

After a period of negotiation between the members of the Steering Committee, a range of flood mitigation measures was agreed upon and released in April 2007 (Launceston City Council 2007a). These Agreed Measures were designed to address relevant social issues, planning and development, emergency management coordination and levee reconstruction and maintenance. The LCC and the Tasmanian State government have since formulated a number of policy responses in order to reflect these measures.

Social issues

A distinct lack of flood risk awareness and emergency response strategies within the Invermay community necessitated the execution of social policies. The Agreed Measures stipulated that the LCC was to establish a public education strategy to increase public awareness of the flood risk in Invermay and Inveresk (Tasmanian Government 2007a). This led to the formation of the Council-enacted Launceston Flood Research Initiative in May 2007 which produced a report in February 2008 analysing community perspectives of flood risk. This report has served as a basis for the LCC's public education strategy (Vogt and Brayford 2007). A pilot flood education strategy commenced in June 2007 where flood emergency plans designed by Invermay Primary School and Meander Primary School students were showcased in an exhibition held at the Queen Victoria Museum and Art Gallery (Midgley 2007; Launceston City Council 2008a). The public education strategy also included the distribution of Flood Preparation Kits to potentially affected households to inform residents of what they should do before, during and after a flood (Scott, 2009a).The analysis of other pertinent social issues, such as the dissemination of flood emergency information to key demographic groups such as elderly people and immigrants, have been addressed in the Launceston Flood Research Initiative's report.

Building and planning

In order to attend to the Agreed Measures that related to building and planning, a Planning Steering Committee was formed within the LCC in 2006. The aim of the building and planning measures was to prevent further development which would increase the consequences of a flood, with the long-term intention of converting land use to facilitate activities that incur a low level of flood damage (Tasmanian Government 2007a). In order to execute building restrictions in Invermay, the Committee amended the Tasmanian Government's Building Act 2000 in July 2006, which involved the adoption of a floor flood level of 3.4 metres above sea level for the Inveresk and Invermay area (Launceston City Council 2007b). This flood floor level applied to the construction of all new residential buildings and the modification to any habitable floor area in the flood zone. In conjunction with the building restrictions, the Planning Steering Committee undertook a review of the LCC Planning Scheme in order to guide future land use and development and the management of natural environments up until 2020 (Launceston City Council 2007c). The review led to the development of land classifications for flood-liable land and the prohibition of construction

between the levee system and the river (Community Development Initiatives Australia 2007). Further extensive revision to the Planning Scheme included the prohibition of new residential developments, new schools and aged care homes as well as the prohibition of any other development which would magnify the damage caused by a flood.

In August 2008, LCC Aldermen voted to breach the Agreed Measures by easing these planning restrictions in order to permit the construction of housing units, education facilities and a cinema and bowling complex in Invermay (Williams 2008a). This demonstrates a frequently encountered challenge in developing flood mitigation measures for existing flood-prone communities, whereby investment in flood control works (such as levees) elicits a perceived reduction in risk and consequently stimulates floodplain development (Smith 1998: 232-3). Smith describes this as the 'levee paradox', whereby the intensification of development behind levees generates higher potential losses than that experienced before the construction of levees. Due to this inherent over-reliance in the structural control of floodwaters, the levee paradox poses a continual challenge for effective flood mitigation. Fortunately in the case of Launceston, threats from the Federal and State government to withdraw their collective $26 million funding prevented the LCC from acting upon these planning scheme changes (Williams 2008b). The LCC has since rescinded its decision to ease planning restrictions within the area.

Emergency management

A revision of all relevant emergency management procedures and documents was also undertaken. This included the LCC Flood Evacuation Plan which outlines flood evacuation procedures and lists the organisations that are to be involved in an evacuation and their responsibilities (Willis et al 2008). The Tasmania Police have developed a section within the Flood Evacuation Plan which specifically addresses flooding in Invermay. The revision also incorporated a review of the Launceston Planning Scheme (1996) to accommodate flood-related building and planning restrictions within Launceston. The LCC has formulated a Flood Warning Plan, a Flood Response Plan and a Flood Levee Patrol Plan, all of which are to be used when it is likely that a flood event will occur. A General Management Plan and a Flood Recovery Plan were also revised in order to provide support during and in the aftermath of a flood event.

Levee reconstruction

The final section of the Agreed Measures outlined the agreement to rebuild more than 70 per cent of the existing levee system. This also involved the purchase and subsequent relocation of businesses along Lindsay Street in Invermay which was to take place over six years. The Agreed Measures included an annual $150,000 for levee maintenance and $250,000 from the State government for the dredging of silt from the Tamar River (Launceston City Council 2007a). The LCC has largely completed the acquisition of the Lindsay Street properties and is set to commence demolition work on Lindsay Street buildings in August 2009. However, in June 2009 the cost of the flood mitigation project was reported to have blown out by $20 million due to the price of land acquisitions and escalating construction costs. Despite this setback and amidst surrounding uncertainty as to how this funding will be obtained, levee reconstruction project currently remains scheduled to be completed by December 2012 (Scott 2009b).

Policy responses, levees and beyond

Once the funding from all tiers of government had been secured for levee reconstruction, the LCC began to implement the measures as agreed by the Flood Steering Committee. However, there has been a distinct focus on the reconstruction of the levees as the primary policy response to mitigate Launceston's flood risk. This levee focus has been reflected through the media's reporting, the way in which some members of the government have dealt with the issue and the way in which the issue has been interpreted by the community. The media has attached salience to the levee aspect of the flood issue as the most tangible feature of the Agreed Measures, with local papers broadcasting titles such as 'Flood Levee Inaction Riles', '$10m Levee Boost', 'Action on Flood Levee Funding Needed Now' and 'Levee Action' (Williams 2007c; Price 2007; Williams 2006; Lowe 2006, Australian Broadcasting Corporation 2007). Recent difficulties surrounding land acquisition to make way for the Lindsay Street levees and a $20m funding blowout have further intensified the perceived notion held by the media and community that the levees are the most important policy response to flood risk (Williams 2008c; Scott 2009b). Members from all three tiers of government have also focused upon the levee system in order to attract political attention to the issue of flood risk and the need for funding. The LCC summarised the purpose of its quest for flood mitigation funding as a means to "repair the ageing flood levees" (Launceston City Council 2008b), while the belief that the funding should be "best spent on fixing the levee problem"

has been raised by members of Federal and State governments (Tasmanian Legislative Council 2007; Williams 2007d). These perceptions detract from the reality that effective flood mitigation must incorporate a multi-faceted approach.

Fortunately, a multi-faceted approach has indeed been adopted in the Launceston context. Despite an overt focus on levee reconstruction by the media, community and some members of government, all policy measures outlined in the Agreed Measures continue to be implemented. It is important to note that the focus on levees in Launceston should by no means reflect the importance of the other Agreed Measures. It was this perception that led to the momentary push for the easing of planning restrictions, the endangerment of the flood mitigation funding and the potential for intensified flood risk as per Smith's levee paradox. Alternatively, it should be emphasised that all policy measures are as important as one another. An effective levee system is of no use without an emergency evacuation plan. Similarly, there is no point in implementing short term strategies such as public education programs and revisions of emergency management documents without the adoption of long term planning and development restriction policies. Without the complete and unrestrained implementation of all the policies outlined in the Agreed Measures, the flood risk will not be adequately addressed. Further, a complete implementation of policies is necessary for policy makers and emergency management personnel to know what to do in the event of a flood.

Conclusion

The tri-partisan agreement between the Federal and State governments and the LCC has so far exhibited a potentially effective policy response to Launceston's flood risk. However, it is vital that continuous support is offered from all levels of government where necessary. This is particularly relevant in light of the uncertainty as to who will supply the additional $20 million necessary to complete the project. A broad range of agreed measures has been adopted, although this has not been reflected given the way in which political leadership and the media have allowed the levee issue to overwhelm the debate. Consequently, it is important to emphasise that a multi-faceted approach is critical in the effective mitigation of flood risk, as opposed to single strategy solutions or the emphasis on one measure at the expense of others. In the Launceston context, a heightened importance should be placed upon the maintenance of an effective community education strategy as highlighted by the Launceston Flood Research Initiative.

Also, a genuine constraint on development in flood-prone areas is essential so as to avoid the intensification of flood risk. Aside from these recommendations, this flood mitigation project can only be seen as a major step forward in natural disaster management for the area, reducing the risk of what could be a catastrophic scenario.

References

Aird, M, Tasmania Parliament Legislative Council *Hansard*. Hobart: Tasmanian Parliament. June 6, 2007.

Australian Broadcasting Corporation. 'Launceston Levees.' http://www.abc.net.au/stateline/tas/content/2006/s1588953.htm (accessed August 16, 2007).

Community Development Initiatives Australia, 'Community Consultations for the Launceston City Council Planning Scheme Review 2007', http://www.launceston.tas.gov.au/upload/3515/conssummary.pdf (accessed October 6, 2007).

Frontier Economics, *Flood Risk Mitigation in the Invermay Floodplain*, 2006.

GHD, *Invermay Floodplain: A Social, Economic, Infrastructure and Risk Evaluation Study*, 2006.

Launceston City Council, Floods and You: A Community Awareness Project, 'Launch and Exhibition', http://www.floodsandyou.org/?p=18 (accessed August 26, 2008a).

Launceston City Council, 'Council highlights a year of achievements at its Annual General Meeting', http://www.launceston.tas.gov.au/whatsnewitem.php?id=3795 (accessed September 9, 2008b).

Launceston City Council, 'Flood protection' http://www.launceston.tas.gov.au/index.php/environment-a-waste-mainmenu-200/flood-protection-mainmenu-536 (accessed July 19, 2009).

Launceston City Council, 'Impact of new flood level on building and planning applications in Invermay/Inveresk' http://www.launceston.tas.gov.au/subsector.php?id=2131 (accessed August 29, 2007b).

Launceston City Council, 'Launceston City Council and State Government agree on strategy for flood protection', http://www.launceston.tas.gov.au/whatsnewitem.php?id=3501 (accessed October 4, 2007a).

Launceston City Council 2007c, 'Planning Scheme Review: Progress Report number 1'.

Launceston Flood Protection Board, 'Launceston Flood Protection Scheme Agreement 1975'.

Lowe M, 'Levee action', *Examiner*, November 15, 2006.

Midgley, E, 'Invermay pupils share their emergency kit checklist', *Examiner*, August 22, 2007.

Parliament of Tasmania, Legislative Council Hansard, October 19, 2006.

Price, N, '$10m levee boost: State Government puts in its share', *Examiner*, April 16, 2007.

Scott, L, 'Invermay siren set to warn of floods', *Examiner*, July 7, 2009a.

Scott, L, '$20m blow-out in Launceston flood levee costs', *Examiner*, June 23, 2009b.

Smith, D.I., (1998), *Water in Australia: Resources and Management* (Melbourne: Oxford University Press).

State Emergency Service Tasmania, 'History of Emergency Events, Issue 1', July 1990

Tasmanian Department of Premier and Cabinet. 'Partnership Agreement: Government of Tasmania and the Launceston City Council' http://www.dpac.tas.gov.au/divisions/lgo/partnerships/agreements/Launceston/agreement.html (accessed October 24, 2007).

Tasmanian Government, 'Measures agreed by the State Government and Launceston City Council to provide a long term solution to manage the flood risks at Invermay' 2007a.

Tasmanian Legislative Council *Hansard*, 17 April 2007.

Terry, M & Servant, N, 'Launceston Heritage Study', Launceston City Council, 2002.

Vogt, M, & Brayford, G, Item for Launceston City Council Meeting, 'Launceston Flood Research Initiative', May 7, 2007, File Number SF2227.

Vogt, M, Willis, K, & Vince, J, 'Weighing up the risks: The decision to purchase housing on a flood plain' *Australian Journal of Emergency Management* 23, 1, Feb 2008: 49-53.

Williams, R, '$9m blowout in levee costs', *Examiner*, April 25, 2007b.

Williams, R, 'Action on flood levee funding needed now', *Examiner*, December 6, 2006.

Williams, R, 'Business owners keeping fingers crossed', *Examiner*, April 13, 2007a.

Williams, R, 'Compulsory acquisition on the cards', *Examiner*, April 9, 2008c.

Williams, R, 'Federal levee funds threat', *Examiner*, August 23, 2008b.

Williams, R, 'Flood levee inaction riles', *Examiner*, April 11, 2007c.

Williams, R, 'Invermay $13m jeopardised', *Examiner*, August 22, 2008a.

Williams, R, 'Invermay flood levee project: Wing on attack over authority', *Examiner*, April 28, 2007d.

Willis, K, Vogt, M, Natalier, K, & Vince, J, *Flood Risk in Launceston: Understanding Community Perceptions and Policy Responses* A report commissioned by the Launceston City Council for the Launceston Flood Research Initiative, February 2008.

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Survival confidence of New Zealanders in outdoor and post-earthquake situations

Smith and Walton argue that New Zealanders may be overconfident in their abilities in an emergency scenario they have not experienced.

Abstract

Three hundred and sixty three participants (233 from New Zealand, 130 from overseas) were surveyed on their preparedness for, and confidence at performing tasks in two hypothetical scenarios; being lost in the bush and losing their home after an earthquake. Participants compared their abilities to those of the average person from their own country. In the bush scenario, 67% of New Zealanders and 69% of those from overseas showed an optimism bias by rating themselves better than average. However, in the earthquake scenario 72% of New Zealanders and only 33% of those from overseas showed this bias. The difference in confidence between scenarios can be explained by the likelihood of having experienced the scenario examined, and it is suggested that New Zealanders may be overconfident in their abilities in a scenario they have not experienced.

Introduction

New Zealand is a country with a history of significant risks of natural disaster, representing a range of different disaster types (including tsunami, earthquake, storms, and volcanic activity). Due to its geographical position on a number of major fault lines, residents of the city of Wellington are particularly aware of the threat of a damage-causing earthquake. Extensive education campaigns in the community, schools and workplaces emphasise the need to plan for such events and include the message that individuals will likely need to be self-sufficient for at least three days (Get Thru website, 2008). A recent survey prepared for the Greater Wellington Regional Council suggests that over three quarters of households could remain self-sufficient for more than 3 days (van Schalkwyk & Hare, 2007), and further research suggests Wellingtonians are better prepared than the New Zealand average (Colmar Brunton, 2008). The majority of preparation measures

taken have been found to be "survival facilitation" (e.g. storing food and water), rather than "damage limitation" (e.g. fastening heavy objects; Spittal, McClure, Siegert & Walkey, 2008) suggesting that it is survival preparation that is most salient in people's minds.

The majority of Wellington survey respondents also said they would expect to be responsible for themselves, both in the early stages of (83%), and immediately following (71%; van Schalkwyk & Hare, 2007) a disaster. This finding is further supported by the result that 98% of respondents in the Colmar Brunton (2008) survey agree it is their responsibility to look after themselves; although if looking for help from outside sources, the majority of respondents would expect to go to neighbours or the fire service (both 80%), followed by Civil Defence (77%) and the police (70%). These findings fit with the patterns shown by actual disaster survivors, but are contrary to the results of a study by Wenger, Dykes, Sebok and Neff (1975) examining the expectations of participants who have not experienced a disaster. In this case almost half of respondents believed survivors would go to aid agencies such as the Red Cross first.

New Zealand is also known as a country that has large national parks and resources for camping in bush areas. There are around 1000 managed camping areas in New Zealand, half of which are privately owned (Department of Conservation, 2006). New Zealanders are perceived by many overseas as having extensive experience in the outdoors, and this is an opinion also shared by many residents. A report of focus group research conducted for Auckland Regional Council showed camping was regarded as being part of the "New Zealand way of life" (Mobius, 2006). Outdoor education is a key part of the curriculum in New Zealand schools, and data suggests over one third of New Zealanders are regular campers (Department of Conservation, 2006). Based on this research, we are interested in whether New Zealanders are more confident in both camping and earthquake survival tasks than those from overseas.

As well as comparing the confidence of New Zealanders to that of overseas participants, it is of interest whether participants believe they are more competent than the average person from their own country. Previous

studies in a New Zealand context have examined the relationship between earthquake preparedness and social psychological constructs including attributions, locus of control and risk taking (see McClure, Allen & Walkey, 2001; Spittal et al., 2008; McClure, Walkey & Allen, 1999; Spittal, Siegert, McClure & Walkey, 2002), and various scales of preparedness have been created (e.g. Spittal, Walkey, McClure, Siegert & Ballantyne, 2006). In this study, we examine "better than average" effects or optimism biases; studies in other areas of research (e.g. De Joy, 1989) have found that most participants rate themselves higher than the average on a range of tasks, despite this being statistically unlikely for many (Moore, 2007). For example, in the area of driver confidence, the majority (usually ranging between 70 and 80%) of people believe their driving ability to be greater than that of the average driver (e.g. Svenson, 1981; McCormick, Walkey & Green, 1986; Walton & Bathurst, 1998), with similar effects seen in areas such as financial investment (e.g. Bhandari & Deaves, 2006) and the assessment of personality traits (e.g. Kanten & Teigen, 2008). It has been noted by researchers that this "better than average" effect tends to be limited to common abilities, while rare behaviours show opposite "worse than average" effects (Moore, 2007). In this case, one of our scenarios could be seen as common, with one uncommon; however the tasks required to be performed are consistent across scenarios. It is therefore of interest how participants will rate their abilities at similar tasks in two quite different situations compared to the average person.

As earthquakes have been found to be the highest recalled natural hazard, and that rated as having the largest effect on the area by Wellington residents (van Schalkwyk & Hare, 2007) this event was chosen as the natural hazard situation for this study. We suggest that there are a number of skills and attributes that people with experience in the outdoors may be able to apply to survival after an earthquake. For example, being able to cook a meal in the open should translate between the two situations. This study tests this theory by comparing a group that is typically regarded as having good outdoor knowledge (New Zealanders) to those from different countries that perhaps have less experience (tourists or recent immigrants to New Zealand), and determining how well these skills transfer. This research will also test New Zealanders' perceptions of their own disaster preparedness, and whether they themselves a) believe they do possess these skills, and b) make the connection between the two scenarios. However, most importantly, comparisons with the "average" person from the participants' country will allow for the identification of any "better than average" effect or optimism bias. Finally, any differences between groups in who they would rely on if needing assistance in either situation will be examined. Actual disaster survivors have been shown to go to family and friends first, but this is contrary to the expectations of participants who had

not experienced a disaster in a study by Wenger, Dykes, Sebok and Neff (1975). In this case almost half of respondents believed survivors would go to aid agencies such as the Red Cross first.

Within this context a number of hypotheses can be generated. First, we expect that New Zealanders will be relatively well-equipped for a disaster, with many having camping equipment that could be used in a disaster scenario. Second, we expect that the majority of participants will be confident of surviving around 2-3 nights in both the bush and after an earthquake, but that New Zealanders may think they can last longer than others. Third, in line with previous research, it is expected that participants will judge themselves as more confident in all survival tasks than the average person; however, this may vary across cultures, or due to the rare nature of disasters, may not be seen in this case. Finally, we expect there to be cultural differences found in what groups participants would rely on for emergency assistance; overseas participants are expected to rely more on agencies such as the Red Cross, while those from New Zealand are expected to rely more on looking after themselves.

Method

Participants

Three hundred and sixty three participants were recruited for the study during a public holiday weekend earthquake exhibition at Te Papa, New Zealand's national museum. When asked where they were from, 233 were from New Zealand, with 130 from overseas (organised by geographical region in Table 1). Of those that were from New Zealand, 62% had lived in New Zealand all their lives, with 24% living in New Zealand for most of their lives. Males formed 52% of the sample, while 48% were female, with an average age of 36 years overall.

Table 1. Home regions of overseas participants.		
Region	**Number**	**%**
United Kingdom	40	31
United States/Canada	28	22
Europe	21	16
Australia	19	15
Other (predominantly Asia)	22	17

Materials

A Computer Assisted Personal Interviewing (CAPI) survey was used that consisted of two sections. The first two sections were based on either an outdoor survival, or a natural disaster situation, and included questions about experience, future likelihood, equipment and skills participants felt they possessed. Participants were asked to evaluate their skills at three tasks (building a shelter, disposing of their waste and cooking a meal), as well as the skills of the average person from their country.

Surveys were counter-balanced so that half of the participants were presented with the camping-related questions first and the other half with the natural disaster questions first. Questions were mirrored as much as possible for each situation to allow direct comparison. For example, the items "If you were lost in the bush, how long do you believe you could survive on your own?" and "After a major earthquake, how long do you believe you could survive on your own?" both had the answer options of "I could not survive overnight", "1 night", "2-3 nights", "1 week or more". The survey also included general demographic questions on age, gender and household living situation.

Results

Kit contents

A high number of New Zealanders have some camping equipment (72%), slightly more than those from overseas (66%). Overall, New Zealanders are quite well-equipped for a disaster, with 65% suggesting they had some level of survival kit. This compares to 57% of those from overseas. However, many of the participants did not make the link between the uses of supplies across situations. Of those that said they had a gas cooker for camping, 26% suggested that they did not have a bbq or gas cooker for an emergency. Of those that said they had a tent for camping, 41% said they did not have an emergency shelter, and 28% of those that owned a sleeping bag said they did not have blankets or bedding for an emergency.

Survival ability

New Zealand and overseas participants were not significantly different in their estimates of how long they could survive in the bush alone, with both having a median estimate of 2 to 3 nights. However chi-square analyses revealed that overseas participants were more likely than New Zealand participants to estimate that the average person from their country could survive for a week or more, $\chi^2(2, N = 347) = 9.258$, $p < .05$ (19% compared to 8%). There were no significant differences found in estimates of how long participants could survive after an earthquake with both groups estimating a median of 1 week or more. Median estimates of the amount of time for the average person from the participant's country were lower, at 2 to 3 nights for both groups.

Confidence

Participants' ratings of their confidence at performing the 3 survival tasks in each scenario were compared to their ratings of the average person from their country's confidence. From these comparisons, 3 groups were formed; those that believed they were less confident (worse), those that believed they were the same (average), and those that believed they were more confident (better) than the average person from their country. The results for the bush survival task are included in Table 2 below.

Table 2. Chi-square analysis of participants' self-other comparisons for the three bush survival tasks		
	Country of origin	
Self-other comparison	New Zealand	Overseas
Worse than average	24% ASR = 1.0	19% ASR = -1.0
Average	9% ASR = -.8	12% ASR = .8
Better than average	67% ASR = -.4	69% ASR = .4

ASR = Adjusted standardised residual

The majority of participants from both groups believed they would be better than the average person at performing these tasks. This result did not differ significantly between the New Zealand and overseas groups, $\chi^2(2, N = 363) = 1.30$, $p > .05$. Results for the same tasks in the earthquake scenario are included in Table 3 below.

Table 3. Chi-square analysis of participants' self-other comparisons for the three earthquake survival tasks		
	Country of origin	
Self-other comparison	New Zealand	Overseas
Worse than average	17% ASR = -8.1*	58% ASR = 8.1*
Average	12% ASR = .7	9% ASR = -.7
Better than average	72% ASR = 7.1*	33% ASR = -7.1*

ASR = Adjusted standardised residual;
* = significant effect

Those in the New Zealand group were significantly more likely to believe they would be better than average, and less likely to believe they would be worse than average, compared to those from overseas, $\chi^2(2, N = 363) = 66.48$, $p < .001$. In this case, the majority of New Zealanders

believed they would be better than average, while the majority of those from overseas believed they would be worse than average.

Further chi-square analyses were also performed to determine any effect of gender. There was no significant difference between males and females as to how likely they were to be above or below average in either scenario (bush, $x2(2, N = 347) = 4.21$, $p > .05$; earthquake, $x2(2, N = 347) = 2.05$, $p > .05$).

Finally, the effect of experience on confidence was also examined. In this case, those who rated themselves as average were excluded from the chi square analyses to maintain adequate cell counts. As shown in Table 4 below, experience in the bush made it more likely participants would rate themselves better than average at the most experienced level on the bush tasks, with those with little experience rating themselves worse, $x2(4, N = 318) = 32.23$, $p < .001$. However, experience with disasters showed no significant effect, $x2(3, N = 258) = 7.08$, $p > .05$.

Table 4. Chi-square analysis of the effect of experience on participants' self-other comparisons for the three bush survival tasks

Outdoor experience	Self-other comparison	
	Worse than average	Better than average
I regularly spend nights in the bush	1% ASR = -2.4*	10% ASR = 2.4*
I have spent a night in the bush before	24% ASR = -3.2*	44% ASR = 3.2*
I regularly make day trips in the bush	8% ASR = -.5	10% ASR = .5
I have spent the day in the bush before	33% ASR = 1.4	25% ASR = -1.4
I have never spent any time in the bush before	33% ASR = 4.8*	10% ASR = -4.8*

ASR = Adjusted standardised residual;
* = significant effect

Table 5. Chi-square analyses of participants' own and estimates of others' expectations for assistance in each situation.

Agency responsible in each situation	Country of origin	
	New Zealand	Overseas
Responsible for getting you out of the bush (self)		
Yourself	51% ASR = -2.5*	65% ASR = 2.5*
Police and/or other emergency services	6% ASR = -.7	8% ASR = .7
Search and Rescue	43% ASR = 2.9*	27% ASR = -2.9*
Responsible for getting you out of the bush (average)		
Themselves	15% ASR = -1.7	23% ASR = 1.7
Police and/or other emergency services	25% ASR = -1.9*	34% ASR = 1.9*
Search and Rescue	60% ASR = 3.0*	43% ASR = -3.0*
Responsible for your welfare after a disaster (self)		
Yourself, family, friends and neighbours	66% ASR = .8	61% ASR = -.8
Police and/or other emergency services	7% ASR = -3.3*	21% ASR = 3.3*
Local council/Civil Defence	27% ASR = 1.4	18% ASR = -1.4
Responsible for your welfare after a disaster (average)		
Themselves, family, friends and neighbours	19% ASR = .2	18% ASR = -.2
Police and/or other emergency services	32% ASR = -3.7*	57% ASR = 3.7*
Local council/Civil Defence	43% ASR = 4.9*	10% ASR = -4.9*
Other organisations e.g. Red Cross, Armed Forces	6% ASR = -2.4*	15% ASR = 2.4*

ASR = Adjusted standardised residual;
* = significant effect

Emergency assistance

A series of chi-square analyses were conducted to compare rescue expectations across groups in the two situations (see Table 5). Some categories from the survey were collapsed or excluded to maintain adequate cell counts for these analyses.

If lost in the bush, the majority of participants named themselves or Search and Rescue as being responsible; however overseas participants were more likely to believe they were responsible for getting themselves out than New Zealand participants, and less likely to rely on Search and Rescue, $x2(2, N = 347) = 8.40$, $p < .05$. Both groups nominated Search and Rescue as being the most likely choice for the average person, however overseas participants are also more likely to believe that the average person from their country would rely on police and emergency services and less likely to rely on Search and Rescue $x2(2, N = 347) = 9.24$, $p < .05$ than New Zealand participants.

After an earthquake, all participants were most likely to rely on themselves and their family, although participants from overseas were more likely to rely on police and emergency services than those from New Zealand, 2(2, N = 277) = 11.42, p < .05. Emergency services and civil defence were the most commonly named choice for the average person from both groups, however, overseas participants were also more likely to believe that the average person from their country would rely on police and emergency services, as well as other organisations such as the Red Cross or armed forces, and less likely to rely on local council or civil defence assistance, 2(3, N = 288) = 29.54, p < .001 than New Zealand participants.

Discussion

As predicted, New Zealanders were reasonably well-equipped for a disaster, although so were participants from overseas. Slightly more New Zealanders did have camping equipment, however, this did not always translate across situations in the minds of participants; many did not make the link that having camping supplies therefore means they have resources for disaster survival. Despite counterbalancing the survey to remove any effect of being exposed to one scenario influencing the other, over 40% of respondents did not realise that the tent they have for camping could act as an emergency shelter in a disaster. This result has possible impacts on disaster preparedness education, suggesting it could be emphasised that many items already in households such as tents and portable cookers could be used in a disaster if stored correctly when not in use. This type of approach could be useful in increasing preparedness as research has shown that more people know what they need to do, they just lack the urgency to actually put it in place (Dew, 1999) so recognising what they already have available would be a good start to increasing preparedness. Our prediction of how long participants believe they could survive unaided proved to be slightly conservative. Participants from both groups believed they could last 2 to 3 days in the bush scenario, but appear to be more confident in the earthquake scenario with most estimating a week or more. However participants rated the average person from their country lower, with estimates of 2 to 3 days in most cases. This point ties in to the examination of self-other comparisons, with an optimism bias being seen. In this case, it appears that the majority of participants do rate themselves as better than average in their survival skill. This effect can also be described as overconfidence, or an example of an optimism bias. This result is in line with previous research that found an optimism bias in a New Zealand context where participants rated their preparedness better than average (Spittal, McClure, Siegert & Walkey, 2005).

This optimism bias was further shown in the self-other comparisons on the task confidence scales. As predicted, the majority of participants rated themselves better than

the average person for the bush survival tasks. According to Moore's (2007) argument, this can be expected, as this scenario can be considered relatively commonplace. However, being a less common situation, the results for the earthquake scenario are mixed; the optimism bias holds for New Zealand participants, but not for the overseas participants, who in fact show a "worse than average" effect. As Moore (2007) states, these "worse than average" effects are most often found for tasks that are not common. However, in this case, the scenario in which the tasks are set is uncommon, but the tasks themselves remain the same across the scenarios.

To some extent, this confidence shown by participants may in fact be justified, as experience was related to confidence in the bush survival task. In making judgements about how they would perform in hypothetical scenarios, past experience would be the easiest starting point for most participants. However, for the earthquake scenario, few (9% of New Zealanders, 6% of those from overseas) of the participants had experienced a serious natural disaster. This could explain the lack of an effect of experience on confidence in this scenario. Without a reference point for performance, it could be expected that participants would tend towards worse than or average performance ratings, which was the case for the overseas sample. For the New Zealand sample however, the optimism bias was still seen. With little past experience to base this on, it is suggested that New Zealand participants may be overconfident in their abilities. The scenario affects the confidence of overseas participants (most likely due to most not having experienced it before), but New Zealanders maintain an overconfidence as the tasks themselves are familiar, even if in a different setting.

Lastly, against our predictions, it was overseas participants who were more likely to rely on themselves in the bush scenario, while both groups suggested this was the case in a disaster. However, both groups suggested the average person from their country would rely on various authorities in both scenarios, and as expected, it was the overseas participants that were more likely to suggest that at least the average person would rely on the Red Cross in a disaster. The result for the average person is in line with the results of Wenger et al. (1975). However again overconfidence may have reduced participants suggesting they themselves would need assistance from agencies. This research sets a useful starting point for cross-cultural research in the area of emergency preparedness and other relevant survival skills, as well as another application for self-other comparisons in different cultures. However, while cross-cultural comparisons are made, there were no set controls on the samples, with the overseas sample encompassing a range of countries that in themselves could show differences if studied more systematically. It is suggested that future research could extend the research questions to more make direct comparisons between participants of different nationalities, rather than comparing New Zealanders to a group of others with a range of

nationalities. Despite its limitations, the results of this study have implications for both emergency management and social psychology in general. For emergency management, it suggests overconfidence could be an issue in the New Zealand population, and gives some insight into who New Zealanders will rely on, as well as how prepared they are for a disaster. From a wider perspective, these results present a further example of an optimism bias in one scenario, while also producing surprising results in another. It appears that for some people (those from overseas) the context of the tasks required affects confidence, while for others (those from New Zealand) it does not. Our interpretation of this finding is that New Zealanders are overconfident in their abilities in a scenario most have never experienced, but that may appear similar to a scenario many are accustomed to.

References

Bhandari, G., & Deaves, R. (2006). The demographics of overconfidence. *Journal of Behavioural Finance*, 7(1), 5-11.

Colmar Brunton (2008). Ministry of Civil Defence and Emergency Management campaign monitoring research June 2008. www.civildefence.govt.nz. Accessed 27 May, 2009.

De Joy, D.M. (1989). The optimism bias and traffic accident risk perception. *Accident Analysis and Prevention*, 21(4), 333-340.

Department of Conservation (2006). Review of camping opportunities in New Zealand: Report to the Minister of Conservation

Dew, K. (1999). The perception of earthquake risk and the preparation for earthquakes in New Zealand. EQC Project Report 99/335.

Get Thru website (2008). www.getthru.govt.nz. Accessed 27 November, 2008

Kanten, A.B., & Teigen, K.H. (2008). Better than average and better with time: Relative evaluations of self and other in the past, present, and future. *European Journal of Social Psychology*, 38(2), 343-353.

McClure, J., Allen, M.W., & Walkey, F. (2001). Countering fatalism: Causal information in news reports affects judgments about earthquake damage. *Basic and Applied Social Psychology*, 23(2), 109-121.

McClure, J., Walkey, F., & Allen, M. (1999). When earthquake damage is seen as preventable: Attributions, locus of control and attitudes to risk. *Applied Psychology: An International Review*, 42(2), 239-256.

McCormick, I.A., Walkey, F.H., & Green, D.E. (1986). Comparative perceptions of driver ability – a confirmation and expansion. *Accident Analysis and Prevention*, 18(3), 205-208.

Mobius Research and Strategy Ltd. (2006). Camping demand and supply in New Zealand. Unpublished research report.

Moore, D.A. (2007). Not so above average after all: When people believe they are worse than average and its implications for theories of bias in social comparison. *Organisational Behaviour and Human Decision Processes*, 102, 42-58.

Spittal, M.J., McClure, J., Siegert, R.J., & Walkey, F.H. (2005). Optimistic bias in relation to preparedness for earthquakes. *Australasian Journal of Disaster and Trauma Studies*, 1.

Spittal, M.J., McClure, J., Siegert, R.J., & Walkey, F.H. (2008). Predictors of two types of earthquake preparation: Survival activities and mitigation activities. *Environment and Behaviour*, 40(6), 798-817.

Spittal, M.J., Walkey, F.H., McClure, J., Siegert, R.J., & Ballantyne, K.E. (2006). The Earthquake Readiness Scale: The development of a valid and reliable unifactorial measure. *Natural Hazards,* 39, 15-29.

Spittal, M.J., Siegert, R.J., McClure, J.L., & Walkey, F.H. (2002). The Spheres of Control scale: the identification of a clear replicable three-factor structure. *Personality and Individual Differences*, 32, 121-131.

Svenson, O. (1981). Are we all less risky and more skilful than our fellow drivers? *Acta Psychologica*, 47, 143-148.

Van Schalkwyk, R., & Hare, J. (2007). Community survey into emergency preparedness 2007. Research report prepared for the Greater Wellington Regional Council.

Walton, D., & Bathurst, J. (1998). An exploration of the perceptions of the average driver's speed compared to perceived driver safety and driving skill. *Accident Analysis and Prevention*, 30(6), 821-830.

Wenger, D.E., Dykes, J.D., Sebok, T.D., & Neff, J.L. (1975). It's a matter of myths: An empirical examination of individual insight into disaster response. *Mass Emergencies*, 1, 33-46.

Acknowledgements

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(Mal)adapting to tropical cyclone risk: the case of 'Tempestuous Tracy'

Geraldine Li explores human social adaptations to tropical cyclone risk in Darwin Australia leading up to Cyclone Tracy in 1974.

Abstract

This paper explores the process of human social adaptation in response to tropical cyclone risk in Darwin, Australia. Its particular focus is on the period leading up to Cyclone Tracy, which made landfall in Darwin on 24 December 1974, and the thirty years of learning, adapting and maladapting since. The paper focuses on social level responses to wind damage risk and storm surge risk, with particular emphasis on building codes and land use planning as adaptive responses to those risks. A separate paper from the same study tackles the problem of individual level perception and adaptation; see Li (2008). This paper concludes with a discussion of the implications of these findings for Darwin specifically and for the policy making process more generally.

Introduction

The city of Darwin in Australia's Top-End has had long history of destructive tropical cyclone impacts. The best known impacts include the Great Hurricane of 1897, the 1937 cyclone, and the Christmas Eve cyclone of 1974: 'Tempestuous[1] Tracy', that destroyed Darwin. In Cyclone Tracy more than sixty of its residents lost their lives, fifty to sixty percent of its houses and flats were damaged beyond repair, and the damage bill was of the order of hundreds of millions of dollars (DRC, 1975). While the previous cyclones provided the opportunity for social learning about tropical cyclone risk, and some learning and adaptation did occur, it was not until Tracy that radical learning took place. Residents, practitioners, such as engineers and architects, and policy makers alike responded to the tempest in ways unprecedented

in Australian history. In particular, in the thirty years following Tracy, fundamental changes in the building code as a response to wind damage risk, and land use planning as a response to storm surge risk have occurred. It is possible that these changes have made Darwin one of the most cyclone resistant cities in the world (Walker et al., 1975; Walker, 2004).

The responses or practices, however, were not always adaptive. In some instances, the unintended consequences of policy making have resulted in maladaptation or the uptake of maladaptive practices that by no means reduce the risk to individuals or society as a whole. Social level responses to wind damage and storm surge risk include building code policy and practice, and land use planning policy and practice. The adaptive and maladaptive components of these responses can be investigated through applying an understanding of human adaptation or social learning and maladaptation to tropical cyclone risk. The theory of human adaptation and social learning combined with a systems thinking methodological approach and associated methods were employed to tackle this problem. These are discussed next.

Understanding human (mal)adaptation and social learning

Human adaptation refers to the human learning process, a feedback process that occurs when learning has taken place. It is evident in changed and improved mental models of reality and associated changes in individual behaviour or practice as well as in societal laws, policies, regulations and codes (Sterman, 2000); see sketch of this process in Figure 1a. For example, long term learning and memory of tsunamis in Simeulue provide islanders appropriate knowledge and required actions to respond to earthquakes, which worked to their advantage in the 2004 Boxing Day Indian Ocean

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1. The term 'tempestuous' encompasses many of the adjectives used by the study's participants to describe and personify Cyclone Tracy. It is a term that portrays Tracy's turbulent violence felt by residents in Darwin at the time, and is used in this article as a reminder of the human side of the disaster.

Tsunami (UNESCO-IOC, 2005). Hence, effective adaptation takes into account direct or prior experience or history (Proust, 2004).

Human adaptation at the social level involves social learning. Social learning is 'a process of iterative reflection that occurs when we share our experiences, ideas and environments with others' (Keen et al., 2005). It involves a process of reflecting on what has been learnt, which then leads to new learning. If this argument is accepted then, in the context of social level policy making and practice, human adaptation and social learning of wind damage and storm surge risk would be a necessary process for those policies and practices to be effective.

Figure 1(a): Learning.
(Sterman, 2000, Figure 1-8)

Figure 1(b): Not learning.
(Sterman, 2000, Figure 1-11)

Human maladaptation in contrast refers to those situations when belief in faulty mental models continues to the person's (group's or society's) detriment and the person (group or society) has failed to learn from experience. Maladaptation is commonly associated with two main learning barriers: societal blind spots and the counterintuitive nature of complex adaptive systems within which people are embedded (Forrester, 1971; Senge, 1990; Ison, 2005). For example, despite warnings and multiple prior impacts (opportunities for learning), New Orleans city officials and engineers continued to rely on levee and seawall protection to their detriment during Hurricane Katrina (Travis, 2005). This means that if prior learning has not been taken into account and/or society turns a blind eye to certain parts of a system, maladaptation is likely to ensue. This is depicted as 'not learning' in Figure 1b due to a missing link between information feedback and mental models of the real world.

These basic concepts of human adaptation and social learning, and maladaptation have been applied in this study to learning about and adapting or maladpating to tropical cyclone risk, in particular to wind damage risk and storm surge risk in the city of Darwin. Systems thinking methodology provides an avenue for presenting the results and demonstrating the interlinked and counterintuitive nature of complex adaptive systems.

Systems thinking and complex adaptive systems

Systems thinking is a methodological approach that provides theoretical and practical tools for understanding and analysing complex real world situations. It is a powerful approach because it enables the researcher to think about, describe and understand complex behaviour in simple yet rigorous terms. The human social and natural physical systems referred to in this study are considered complex and adaptive because they involve adaptive agents, such as humans who learn (Gell-Mann, 1994; Comfort, 1999). Numerous tools are available in a systems thinking approach to enable the researcher to better understand and model system processes and feedback dynamics. In this paper two main systems thinking tools are utilised: causal loop diagrams (CLDs) and reference modes (after Sterman, 2000).

Causal Loop Diagrams

CLDs (see e.g., Figure 1) are used to represent causal links and feedback in systems. With polarity signs, they are used to represent positive or negative feedback (e.g. see Figure 3). If feedback occurs in a complex adaptive system then 'the effect of any one decision, action or intervention is not proportional to the cause' (Sterman, 2000, p.22), which makes the system counterintuitive. Commonly feedback in social systems often goes
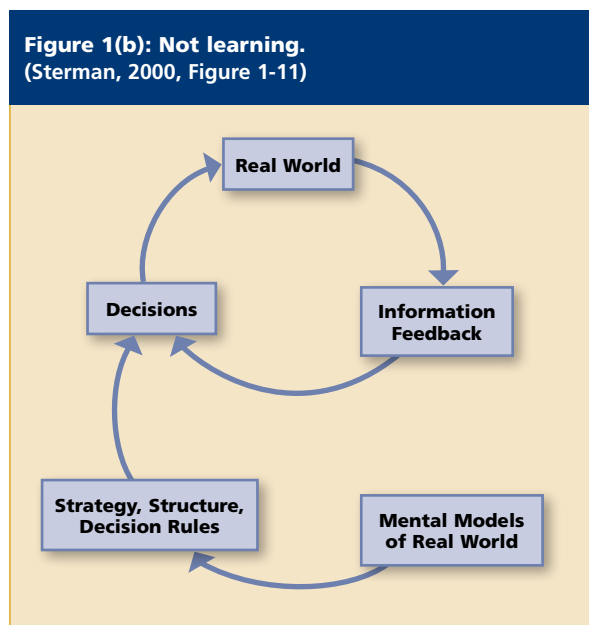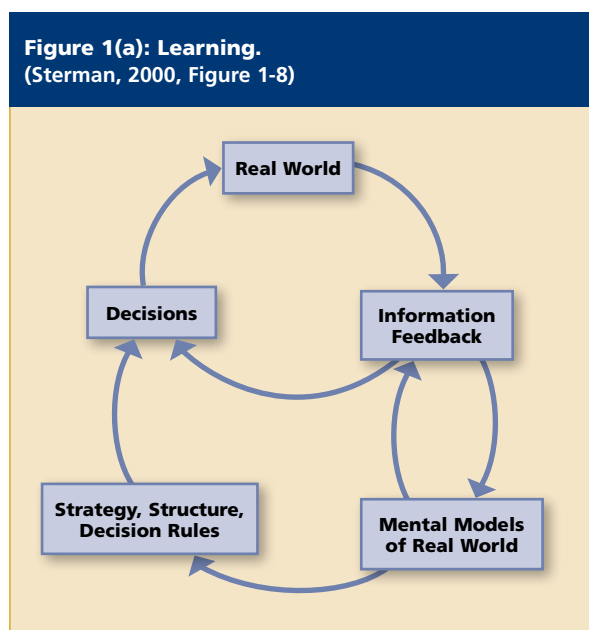
unnoticed and so contributes to maladaptive responses and societal blind spots. The latter occurs when society becomes trapped into familiar ways of thinking and acting and complacency sets in (The Open University, 2005). This can manifest itself in the implementation of outdated policies or the formulation of new policies and processes that do not take into account new learning and the complex adaptive nature of systems.

Reference modes

Reference modes are illustrations of the pattern of behaviour 'unfolding over time…[that] shows how the problem arose and how it might evolve in the future' (Sterman, 2000, p.90). They can also be used as a tool to represent dynamic time series analysis of concrete and abstract concepts and to represent historical analyses of qualitative and quantitative data (e.g. see Figure 2). Historians use the terms diachronic and synchronic historical analysis for this. A diachronic study looks at the development of phenomena through time, while a synchronic study is concerned with events at a particular period. These historical analyses include searching for patterns of success and failure in the policy-making process; identifying sources of policy failures (according to the goal of a policy or broader societal goals); identifying and analysing key events in history; looking for causal links between key variables; and developing a dynamic hypothesis and/or assembling causal loop diagrams. This approach was adopted to analyse secondary and observation data.

Data

Two main data were collected in this study from 2004 to 2005: primary qualitative in-depth interview data and field observation and secondary data. Primary data comprised in-depth semi-structured interviews with 63 participants, including male and female, residing in Darwin and representing a broad range of risk profiles or mental models such as living in or out of the storm surge zone; having long term experience with cyclones in the region such as Cyclone Tracy; having recently arrived in the city with little experience with tropical cyclones; and working in, and having expert knowledge of, the field of tropical cyclone risk management. The sample of participants was not random as the recruitment of participants, using targeted and snow ball sampling approaches, was aimed at targeting a range of risk experiences so as to investigate a broad range of risk adaptation issues in-depth. While some of the findings presented in this paper utilise analyses of the primary data, the majority reported here arise from the analysis of secondary and observation data. Further details of the participant sample and interview themes can be found in Li (2007; 2008).

Secondary data was obtained from a number of sources that dealt with tropical cyclone risk. These include: newspapers and media reporting, government archives and current government reports and policy documents, oral histories and other historical documents, technical documents and reports, electronic media and various audio media, including television and radio reports of risk incidents. Observation data was collected over one year of living in the study region, and include memos of people's cyclone risk mitigation and preparedness activities, especially in the wet season; memos of cyclone risk attitudes in general; audio recordings from radio and television of cyclone risk warnings and educational material; and participation in cyclone risk commemorative events and celebrations. The experience gained by living in the field and accumulating passive observation data provided valuable insight into community behaviour associated with cyclone risk.

Findings

Through analysis of primary, secondary and observation data, and by applying an understanding of human adaptation and social learning together with systems thinking, the findings of this study can be presented in terms of key historical events that occurred at specific times in the past, and adaptive or maladaptive change over time (system dynamics). Both natural and social system aspects are relevant to the complex, adaptive real world problem that characterises this study. In particular actual tropical cyclone impacts on Darwin and elsewhere in Australia and overseas contributed to social learning about tropical cyclone risk. The nature of colonial and subsequent settlement periods also impacted on the level of learning and the policies implemented and the dynamics of the system. Dovers defines policies to be 'positions taken and communicated by government – "avowals of intent" that recognise a problem and in general terms state what will be done about it' (Dovers, 2005, p.12). The term social policy is used here more loosely to include any formal or informal government, private sector, group 'avowal of intent' to recognise a problem and state what will be done about it (i.e. an activity or a practice, which can be either adaptive or maladaptive). In particular, building codes that respond to wind damage risk and land use planning that responds to storm surge risk are investigated. The analysed data is presented as reference modes in Figures 2 and 4 and the feedback dynamics is presented in the causal loop diagrams in Figures 3 and 5. The raw data for this analysis can be found in Li (2007, Ch 9, Ch 10 and Appendix 16).

Policy responses to wind damage risk

Policy responses to wind damage risk had to reconcile the tension between a number of factors including liveability (making houses more comfortable for the tropical climate), wind damage safety in case of

cyclones, and the cost of building. The tension was first met by colonists in the late 1800s when it was recommended that modifications to houses should be made to take into account the tropical climate and improve ventilation (Holland, 2000). During these early development years numerous severe cyclones had impacted Darwin damaging trees and buildings. Although regulators were concerned about housing standards no specific cyclone risk response was reported. For example, the Great Hurricane of 1897 did not result in any reported changes in building regimes in Darwin (Marsden, 2000), nor did the 1937 cyclone (IEA, 1974; BOM, 1977). Although Darwin was rebuilt after the 1937 cyclone, it wasn't until after WWII that wind speeds were considered in the construction of buildings. These two cyclones represent significant learning about wind damage risk, which is represented in Figure 2a, but not necessarily building codes to respond to such learning (Figure 2b).

In the post-WWII to pre-Tracy period a number of building ordinances, regulations and manuals were produced by the Department of Housing and Construction (DHC, 1975b). In 1972 a new wind code was adopted, however, since application of the code was not required by law its use was not widespread. From July 1972 to December 1974 houses built in Darwin could be called 'houses with cyclone provisions' (DHC, 1975a). These aspects have been represented in Figure 2a as an increased level of learning about wind damage risk and Figure 2b as implementation of building codes with wind provisions.

The Government and engineers' response to wind damage caused by Cyclone Tracy was immediate. It included increasing the engineering wind load requirements in the building code applied to houses being built or renovated (Figure 2b). Initially the new code was accepted, but the issue of cost, especially as it related to the internal shelter and wind load requirements, soon became apparent (DRC, 1975; Walker, 1975). These were then abandoned, demonstrating the first phase of policy resistance by Darwin residents and the building industry. In Figure 2a this has been depicted by 'forgetting' or a decrease in learning as the engineered designs (wind loading) are decreased (Figure 2c and 2d) to compensate for this tension.

The system behaviour has acted to erode the original policy goals set up post Cyclone Tracy. From an engineering perspective this is perceived as maladaptive. In Figure 3 this is demonstrated in a fixes-that-fail systems archetype, which means that policies implemented to reduce risk in the long run actually fail due to policy resistant behaviour. In response to the pressure to reduce wind damage risk after a major cyclone (Cyclone Tracy) the Government adapted to the risk by implementing a strict building code. The 'fix' then is an increase in the number of houses thought to be built to the new building code regime (Figure 3).

This, however, resulted in a number of unintended consequences in the ensuing decades, including privatisation of the building inspection process, corrupt building practices, and problems with debris minimisation (Li, 2007). These unintended consequences resulted in decreasing the actual building wind strength, which in turn feeds back to increase the risk of wind damage; see Figure 3.

Figure 2: Policy history reference modes: wind damage risk.
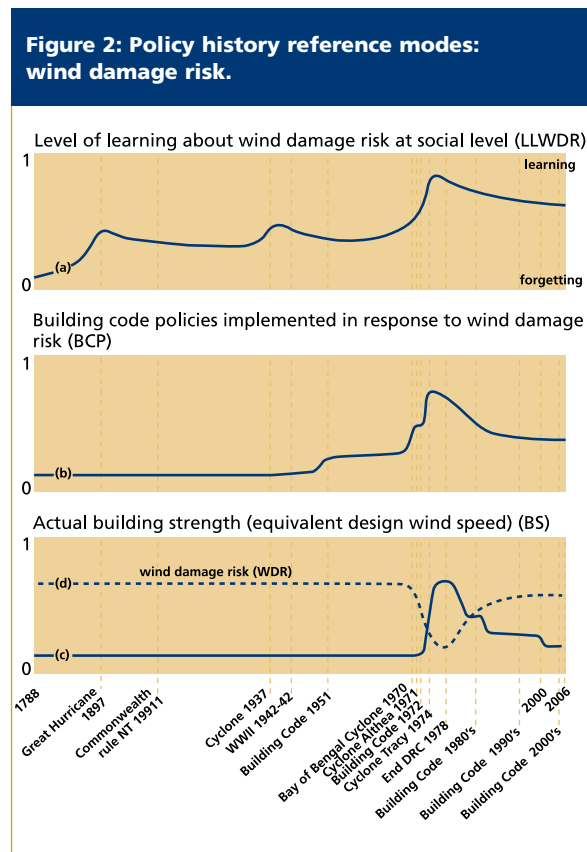
Policy responses to storm surge risk

Policy responses to storm surge risk had to take into account experience and learning from interstate and overseas (Cyclone Althea in Townsville, Bay of Bengal cyclone and storm surge) and reconcile residential planning practices and residents' desire to live near the sea.

As demonstrated in Figure 4e the level of social learning about storm surge risk really only began to rise in the late 1960s and early 1970s. In 1967 the Commonwealth Bureau of Meteorology (BOM) conducted a study of storm surge and wave action in Darwin. The specific reason was to study the 'meteorological influence on the sea in the vicinity of Darwin for the purpose of planning in the environs of the city' (BOM, 1967, p.1). The report noted that phenomena such as storm surge 'may be severe, in which case unplanned development may prove disastrous' (BOM, 1967, p.1). Although the report made no specific recommendation for planning options in Darwin it was clear that the possibility of

Figure 3: Wind damage Risk Building Code Policy: A fixes-that-fail systems archetype.

extreme events was cause for concern. The catastrophic Bay of Bengal cyclone (1970) and cyclone Althea (1971) provided an opportunity for further learning about storm surge risk in Darwin. Actual policy change, however, was not considered in the context of planning in Darwin until after Cyclone Tracy.

Although storm surge damage was minimal during Cyclone Tracy, the destruction of Darwin sparked a controversial policy reaction to planning and storm surge risk that was met with severe policy resistance by Darwin's residents. In particular it began with a radical proposal to replan the city, which included propositions from planners and others to 'the complete re-siting of the settlement, the abandonment of the northern suburbs for settlement in the short term and the concentration of the population in the southern half of the city, and the relocation of the airport' (D'Rozario, 1978, p.5). The re-siting of Darwin was abandoned immediately when the Commonwealth Government 'categorically assured the citizens of Darwin that Darwin would be rebuilt on its present site' (D'Rozario, 1978, p.5). This dynamic is depicted as a spike centred around 1974 in Figure 4f. The spike represents an attempt to implement land use planning policies that reduce storm surge risk by restricting development in the storm surges zone, followed almost immediately by the

abandonment of such policy. These dynamics are also illustrated in the CLD in Figure 5. In this instance the social maladaptation was on the part of the community at large rather than the engineering community or the government.

In the ensuing years to present numerous studies about storm surge risk in Darwin have been conducted and the storm surge zone (SSZ) has been calculated and recalculated on a number of occasions (Li, 2007, Chapter 10). During this time the level of learning about storm surge risk has gradually increased. Unlike building code responses to wind damage risk, land use planning responses to storm surge risk seem to have reached a renewed adaptive policy response over the past few years (Figure 4f). The Planning Scheme Amendment 2006, which is the land planning instrument under the NT Planning Amendment Act 2005, clearly identifies land use planning as an adaptive approach to mitigate and manage storm surge risk (see DPI, 2006, p.97). It did, however, permit some residential uses in specific developments such as the Darwin City Waterfront to go ahead in high storm surge risk areas, albeit with consideration of storm surge levels; see (DPI, 2006, p.140).

Discussion

The Government has yet to tackle the proposition that the wind code provisions might have been eroded since the post-Tracy building code and that the use of lighter, climate friendly, more comfortable material may have increased the risk of damage from flying debris. None of the consequences of policy making discussed above have yet been 'tested' by the impact of a major cyclone, nor have the consequences of a potential increase in the frequency of Category 5 cyclones as the globe warms[1], been included in the policy making process. Prior to Cyclone Tracy no Category 5 cyclone had been recorded in the NT nor included in the BOM's database of historical cyclone events (see BOM, 2006). In their early stages Cyclone Thelma (1998), Ingrid (2005) and Monica (2006), which passed within 200 kilometres of Darwin, may have been a threat to Darwin. If these events had impacted Darwin the policy responses and social-level adaptive processes may have been quite different.

Although the social policy that addresses storm surge risk has changed recently, the number of people living and assets and developments located in the storm surge zone has increased considerably in the years since cyclone Tracy.

Figure 4. Policy history reference modes: storm surge risk.
The reference modes in this figure are interpretive illustrations of the system dynamics gained through analyses of both qualitative and quantitative sources of storm surge risk information.

Figure 5. Mal(adapting) to storm surge risk: a fixes-that-fail system archetype.
B refers to a balancing (negative) feedback loop, and R refers to a runaway (positive) feedback loop.
CR refers to calculable risk; see detailed explanation in Li (submitted). SSZ refers to storm surge zone.
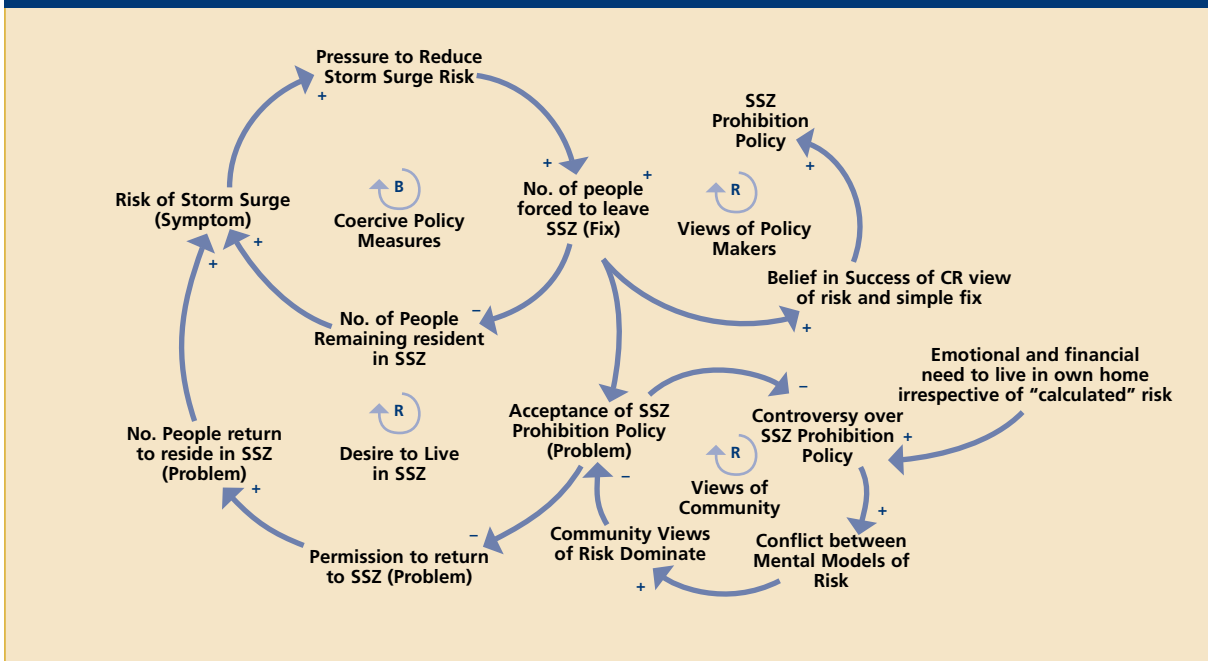
1. For more information on Climate Change in Australia see CSIRO and BOM (2007).

The exact exposed population is difficult to determine but a Northern Territory Emergency Services (NTES) estimate of the total population in the storm surge zone in 2007 was 9,914 for the NTES 1999 storm surge zone (Pers. Comm. Peter Davies, NTES, 20/11/2007). Although it may have reached a plateau in the last few years, this number is likely to increase due to some ongoing residential development in the SSZ, such as the Darwin City Waterfront. This increase in population since cyclone Tracy has been illustrated in Figure 4g and an associated increase in risk in Figure 4h.

The first attempt to learn about storm surge risk in the period immediately after Cyclone Tracy, and use land use planning as an adaptive practice, lasted less than a year. This was followed by a thirty-year period of maladaptation, with continued development in the SSZ, typical of a path dependent system. Despite recent social policy adaptations, the current and future population at risk of the effects of storm surge is likely to continue to pose an adaptive challenge for Darwin emergency services and planners well into the future.

Conclusion

This paper has discussed the processes of social learning and (mal)adaptation to wind damage risk and storm surge risk in the city of Darwin in the period leading up to, and the thirty years since, 'Tempestuous Tracy'. Using an understanding of the theory of social learning and adaptation together with systems thinking approaches and tools, this paper has demonstrated that social level responses to risk are not always adaptive. Societal blind spots in the form of policy resistance to the effective implementation of both land use planning polices to adapt to storm surge risk as well as building code policies to adapt to wind damage risk have clearly dominated the dynamics of the complex adaptive system under investigation.

Maladaptation in terms of structural safety in the case of wind damage risk, and in terms of exposed populations in the case of storm surge risk, ensues. To adapt better, we need to consider the long time frames for human adaptation, and the potential for maladapation as well as for changing future risk. In the policy making process, a proactive approach to social learning, such as through participatory community learning programs and adaptive governance, that allows for these dynamic and adaptive systems responses may be a way to achieve this.

References

BOM, 1967. A Study of Storm Surge and Wave Action - Darwin. N.T., Commonwealth Bureau of Meteorology, Darwin.

BOM, 1977. *Report on Cyclone Tracy December 1974*, Department of Science Bureau of Meteorology, Australian Government Publishing Service, Canberra.

BOM, 2006. Climate Data and Further Information: Cyclone Data. *Bureau of Meteorology* [online]. Available from: http://www.bom.gov.au/climate/how/. (Accessed 26 September 2006).

Comfort, L. K., 1999. *Shared Risk: Complex Systems in Seismic Response*, Pergamon, Amsterdam.

CSIRO and BOM, 2007. Climate Change in Australia. Technical Report. *CSIRO and Bureau of Meteorology (BOM)* [online]. Available from: http://www.climatechangeinaustralia.gov.au. (Accessed 25 June 2008).

D'Rozario, J., 1978. *Land Use Management as a Disaster Mitigation Measure: The Successes and Failures in the Case of Post-Tracy Reconstruction in Darwin*, A Paper presented at the Second Annual Seminar on Natural Hazards Management in Northern Australia, convened by the North Australia Research Unit of the Australian National University, Darwin.

DHC, 1975a. Appendix 5: Preliminary Report on Structural Damage Due to Cyclone Tracy by the Fact-Finding Committee, January 4th 1975, Amended at January 17th 1975, in *Report on Cyclone Tracy: Effect on Buildings, December 1974, Volume 2*, Department of Housing and Construction (DHC), Darwin.

DHC, 1975b. Darwin Reconstruction Study, in Report on Cyclone *Tracy: Effect on Buildings, December 1974, Volume 3*, ed G. R. Walker, Department of Housing and Construction (DHC), Darwin.

Dovers, S., 2005. *Environment and Sustainability Policy: Creation, Implementation, Evaluation*, Federation Press, Annandale, N.S.W.

DPI, 2006. *Northern Territory Planning Scheme: Proposed Planning Scheme Amendment 06/0001*, NT Department of Planning and Infrastructure, Darwin.

DRC, 1975. *First Annual Report to 30 June 1975*, Darwin Reconstruction Commission (DRC), Darwin.

Forrester, J. W., 1971. Counterintuitive Behavior of Social Systems, in *Systems Thinking, Volume II: Systems Theory and Modelling*, ed G. Midgley, SAGE, London.

Gell-Mann, M., 1994. *The Quark and the Jaguar: Adventures in the Simple and the Complex*, W.H. Freeman, New York.

Holland, G., 2000. *The Comfortable House: Responding to the Australian Environment*, in A History of European Housing in Australia, ed P. Troy, Cambridge University Press, Cambridge.

IEA, 1974. Appendix 8: Is Darwin Prepared for a Cyclone?, in *Report on Cyclone Tracy: Effect on Buildings, December 1974, Volume 3*, ed G. R. Walker, The Institution of Engineers Australia: Darwin Group, Department of Housing and Construction, Darwin.

Ison, R., 2005. Traditions of Understanding: Language, Dialogue and Experience, in *Social Learning in Environmental Management: Towards a Sustainable Future*, eds M. Keen, V. A. Brown and R. Dybal, Earthscan, London.

Keen, M., Brown, V. A. and Dyball, R., 2005. Social Learning: A New Approach to Environmental Management, in *Social Learning in Environmental Management: Towards a Sustainable Future*, eds M. Keen, V. Brown and R. Dyball, Earthscan, Sterling, VA.

Li, G. M., 2007. Investigating Individual and Social Level Risk Adaptation in Human-Natural Systems. PhD Thesis. Fenner School of Environment and Society, Australian National University, Canberra.

Li, G. M., 2008. Tropical Cyclone Risk Perceptions in Darwin, Australia: A Comparison of Different Residential Groups, *Natural Hazards*, DOI 10.1007/s11069-008-9269-8.

Li, G. M., submitted. Rendering Risk Calculable: *A Transdisciplinary Inquiry into Contemporary Understandings of Risk, in The Transdisciplinary Imagination*: Integrative Inquiry Towards a Sustainable Future, eds V. Brown, J. Russell, P. Deane and J. Harris, Publisher currently under negotiation, Nov 2008.

Marsden, S., 2000. The Introduction of Order, in *A History of European Housing in Australia*, ed P. Troy, Cambridge University Press, Cambridge.

Proust, K. M., 2004. Learning from the Past for Sustainability: Towards an Integrated Approach, PhD Thesis. Australian National University [online]. Available from: http://thesis.anu.edu.au/public/adt-ANU20050706.140605/index.html. (Accessed 7 October 2006).

Senge, P. M., 1990. *The Fifth Discipline: The Art and Practice of the Learning Organisation*, Random House, Sydney.

Sterman, J. D., 2000. *Business Dynamics: Systems Thinking and Modeling for a Complex World*, Irwin/McGraw-Hill, Boston.

The Open University, 2005. Systems Practice, Managing Complexity: Glossary. *The Open University [online]*. Available from: http://www.open2.net/systems/glossary/index.html. (Accessed 6 December 2005).

Travis, J., 2005. Hurricane Katrina - Scientists' Fears Come True as Hurricane Floods New Orleans, *Science*, 309(5741): 1656-1659.

UNESCO-IOC, 2005. *December 26, 2004 Indian Ocean Tsunami Field Survey (Jan. 21-31, 2005) at North of Sumatra Island*. Intergovernmental Oceanographic Commission of United Nations Educational, Scientific and Cultural Organisation (UNESCO-IOC) [online]. Available from: http://ioc.unesco.org/iosurveys/Indonesia/yalciner/yalciner.htm. (Accessed 23 November 2005).

Walker, G. R., 1975. *Report on Cyclone Tracy: Effect on Buildings, December 1974, Volume 1, 2 & 3*, Department of Housing and Construction, Darwin.

Walker, G. R., 2004. The Impact of Cyclone Tracy on Building Design in Australia, AWES Workshop, Darwin, 28-29 June 2004, Darwin.

Walker, G. R., Minor, J. E. and Marshall, R. D., 1975. The Darwin Cyclone, Valuable Lesson in Structural Design, *ASCE Civil Engineering Magazine*, 45(12): 82-86.

About the author

Geraldine Li's current research interests and activities include developing integrated systems approaches to risk, risk assessment, management and human adaptation. This involves introducing the dynamical systems thinking or 'integrative' paradigm into complex, interlinked human social and environmental problems, such as climate change vulnerability and adaptation. She is currently a research fellow at the Fenner School of Environment and Society, Australian National University, Canberra.

NOTES FROM THE FIELD

Case Study: New South Wales Fire Brigades' Community Fire Safety Volunteer program

The New South Wales Fire Brigades' (NSWFB) Community Fire Safety Volunteer (CFSV) program is an example of a culturally and linguistically diverse (CALD) community engagement initiative developed in recognition of Australia's increasing diversity.

Nearly one quarter of Australia's 20 million residents are born overseas making it one of the most culturally and linguistically diverse countries in the world. More than 20% of Australians speak a language other than English at home.1 In New South Wales, 35% of the growing population of the Greater Sydney Area (GSA) has been identified as coming from a CALD background, and 26% of the population of New South Wales speak a language other than English in the home2.

Guided by NSW's Principles of Multiculturalism and NSWFB's Ethnic Affairs Priority Statement Forward Plan, the Community Education Development Unit (CEDU) developed the program in 2007. It aims to enhance the relationships between the NSWFB and culturally and linguistically diverse groups by establishing a network of volunteers from these communities. The volunteers use their language skills, networks and cultural knowledge to assist the NSWFB in raising awareness of fire safety among new migrants and people with limited English skills.

Utilising established links with the Department of Immigration's

Community Fire Safety Volunteers

(DIAC) partner agencies across the GSA and regional areas, the first CFSVs were recruited from Arabic, Chinese, Sudanese and Vietnamese communities. They undertook an induction session outlining their role and providing them with a compendium of fire safety materials. In addition, the volunteer's local NSWFB Zone Commander visited them at their workplace to introduce themselves and present them with their NSWFB shirt. Burqas and hijabs carrying the NSWFB logo were made available in early 2009.

As part of the official program launch, the CFSVs participated in the "Fire fighter for a Day" four-hour training session3 held at the NSWFB Alexandria Training College on 10 December 2007. The volunteers took part in basic breathing apparatus training, rescuing a fire fighter from the tower and learning how to use a fire extinguisher.

The NSWFB have been able to reach vast numbers of people from CALD backgrounds via translated fact sheets distributed through the CFSV's community networks. The CSFVs

have also attended community events, acted as translators for NSWFB fire fighters at fire safety talks and provided fire safety tips on ethnic language radio programs.

Three of the CFSVs have secured local grants to assist them in their community work. These have included:

- a $2000 grant from Canterbury City Council to fund the development of a fire safety brochure for Arabic-speaking people and also the installation of smoke alarms for the hearing impaired in three homes in Lakemba.

- a $7700 grant from the City of Sydney Council to be used to increase fire safety awareness in Chinatown in partnership with Chinese Australian Social Services (CASS). 4

The CFSV program now has 22 trained volunteers and another 30 people identified as wishing to train for the role. The program has expanded from the GSA to include regional areas state-wide.

Related link – Please visit www.ema.gov.au/publications to download a copy of the Australian Emergency Manual series – Guidelines for Emergency Management in Culturally and Linguistically Diverse Communities. Or contact the CALD Project Officer for the Attorney-General's Department on 03 54 21 5295 for more information.

1   Australian Bureau of Statistics, Census 2006, http://www.censusdata.abs.gov.au/
2   Briefing paper: 'NSWFB launches Community Fire Safety Volunteer program'.
3   NSW Fire Brigades Community Safety Volunteers 'Firefighter for a Day' DVD.
4   'NSWFB launches the Community Fire Safety Volunteer program' NSWFB Fire News, available at www.fire.nsw.gov.au/firenews, August 08.

National Bushfire Arson Forum Report

Experts assembled from AFAC, AIC, Bushfire Collaborative Research Centre, state and territory governments, police and fire agencies.

On 25 March 2009, the Commonwealth Attorney-General for Australia called together a group of experts to discuss greater national collaboration in bushfire arson prevention. Participants came from Australasian Fire Authorities Council, Australian Institute of Criminology, Bushfire Collaborative Research Centre, state and territory government police and fire agencies.

The forum drew together examples of bushfire arson prevention and education initiatives and identified national priorities for action for the prevention of bushfire arson. Strategies were developed in five areas: environmental and situational strategies: criminal justice responses; community education; evidence base; and enabling strategies.

Aim

The aim of the forum was to discuss observations and recommendations from the Australian Institute of Criminology (AIC) report 'Using crime prevention to reduce deliberate bushfires in Australia'.

The forum provided opportunities to discuss greater national collaboration to reduce bushfires caused by arson.

Outcomes

Outcomes of the forum included:

- drawing together promising examples of successful bushfire arson prevention and education initiatives;

- identifying national priorities for action for the prevention of bushfire arson; and,

- considering outcomes that can be implemented immediately, and those that may be more long term.

Queens Birthday Honours – June 8th 2009

Australian Police Medal

Australian Federal Police

CONNELLY, Cmdr Shane Patrick

WYNCH, Federal Agent Gary Edward

GALLETTA, Det Insp Mark

BERESFORD, Det-Supt Geoffrey William

JACOBSON, Sen-Cons Phillip Keith

LYNCH, Det- Supt Ian Winston

MEURANT, Supt David John

STEWART, Supt Kyle

WILLIAMS, Sgt Michael

Victoria

BLENCOWE, Insp David

GIBBONS Sen-Sgt Peter Henry

NOLAN Supt Lucinda

O'NEILL Supt Peter Anthony

SINCLAIR Sen-Sgt Ronald Albert

STEPHENSON Supt Darrell

Queensland

COOPER Supt Ronald

HARTWELL, Det-Insp John

HAY, Det-Supt Brian

JAMES, Sen-Sgt Paul

O'MARA, Sen-Sgt Monica

Western Australia

FLACK, Insp Anthony

LEONARD, Insp William

PROPERJOHN, Supt Kellie

THOMAS, Det-Sen-Sgt Timothy

South Australia

BRAMFORD, Supt Noel

HOADLEY, Supt Peter

SCHULZ, Det Sen-Sgt John

Tasmania

BIRD, Insp John OAM

Northern Territory

MURPHY, Cmdr Anne-Marie

Australian Fire Services Medal

New South Wales

BARRON, Christopher

BOWDEN, Brett

BUTT, Keith

CHIVAS, James

MCDONOUGH, John

MURRAY, Robert

PICKERSGILL, Gregory

RAISTRICK, Alfred

REILLY, Mark

ROBINSON, Cecil

SMITH, James

Victoria

AUDSLEY, Geoffrey

BRINKMAN, Robert

FOGARTY, Liam

GIBBS, David

PICKETT, Bruce

READ, James

TAYLOR, Robert (see opposite page)

Queensland

CLEM, Rowen

GRESTY, John

RAFFEL, Shan

REID, Neil

RYAN, Gordon

Western Australia

COX, Robert

POLLOCK, Kevin

South Australia

FRICK, Gregory

SMITH, Christopher

TAYLOR, Keith

TURNER, Neil

ACT

KENT, Gregory

In Profile:

Rob Taylor

Melbourne Metropolitan Fire Brigade, Victoria

Rob joined MFB in 1976 and has served as an operational firefighter and in Research and Development, Special Projects, and Community Safety. Management roles include MFB's commercial activity Fire Equipment Services (4 years), Western Zone Command (3 years) and Emergency Response Management (2 years). During this period he was the inaugural chair of the State CBR Emergency Management Committee.

Rob has a Business degree in Management (HR), Graduate Executive Fire Officer Program - National Fire Academy USA, Emergency Management Australia courses, and Membership Diploma of the Institute of Fire Engineers. Significant operational papers include the Strategic Location of Fire Suppression Resources (1987) leading to the relocation/redevelopment of the majority of MFB stations, High Rise Fires and Firefighting in Hong Kong (1989), and Incident Investigation System as a Health and Safety Policy Component for Firefighting or Similar Organisations (1997).

Over the last eight years Rob has managed Community Education, focusing on human behaviour, diversity and community engagement issues. Private and government partnerships at a local, state and national level have also been strongly pursued for a safer community. Rob has delivered papers on human behaviour in residential fires to symposiums in Daegu, South Korea and Belfast, Northern Ireland in 2004.

Also responsible for the Workplace Emergency Management Department, Rob has overseen the updating of training programs to industry and commerce.

Rob was nominated for his dedicated leadership and endeavours in the implementation of public safety education by combining the skills and knowledge of firefighters with the expertise of educators and community workers in order to develop and deliver high quality programs that are relevant and responsive to the ever-changing needs of Melbourne's many diverse communities.

Ambulance Service Medal

Queensland

MEDLIN, Robert

TREMBATH, Gavin

South Australia

GRIGGS, Assoc Prof William Middleton, AM

ACT

MOORE, Therese

Emergency Services Medal

New South Wales

SCANES, Debra

Victoria

CROXFORD, Colin

ELLIS, Brett

MONTALTO, Dianne

Queensland

FRASER, Kingsley

HARTLEY, Robert

JACOBSEN, John

Western Australia

JONES, Arthur

South Australia

GEYER, Grant

ACT

FOOTE, Tracey

National Security Update

The following are extracts / summaries of news items and media releases that may be of interest to the emergency management sector.

10 -11 June 2009

AUSTRALIAN EMERGENCY MANAGEMENT VOLUNTEERS FORUM

The Attorney-General, Robert McClelland, welcomed members of the Australian Emergency Management Volunteers Forum (AEMVF) to Mount Macedon, Victoria.

The Attorney-General explained to the Forum how volunteering fits into the Government's broader emergency management agenda and suggested ways in which volunteers can be of assistance in this vital area of public policy.

"It is estimated that if Australia's 500,000 emergency management volunteers did not exist, Governments would have to find an extra $18 billion on wages alone to provide a comparable service. Volunteers are also a vital bridge with the general community and are a key mechanism for enhancing individual resilience."

The AEMVF is the peak voluntary body for response and recovery volunteer organisations in Australia. The Forum meets on a quarterly basis, with one outcome of this meeting intended developing the strategic and policy direction of the AEMVF for 2010 – 2015.

For more information, please visit www.attorneygeneral.gov.au

15 June 2009

ATTORNEY-GENERAL ROBERT McCLELLAND MP AND MINISTER FOR AGRICULTURE, FISHERIES & FORESTRY TONY BURKE MP

FURTHER ASSISTANCE FOR QUEENSLAND FLOOD VICTIMS

Attorney General, Robert McClelland, and Minister for Agriculture, Fisheries and Forestry, Tony Burke, announced further assistance for small businesses and primary producers affected by the February floods in Queensland.

Recovery grants of up to $15,000 will be provided to eligible small businesses and primary producers to assist in clean-up and restoration activities.

The move follows a recent request from the Queensland Government for further assistance.

The grants will be jointly funded by the Commonwealth and Queensland Governments.

In addition to the small business and primary producer grants, the Commonwealth is already providing significant assistance to affected communities, including:

• personal hardship and distress grants to low-income earners whose principal place of residence has been damaged;

• concessional loans to small businesses and primary producers;

• concessional loans for the restoration of essential facilities; and

• road and rail freight subsidies to assist primary producers for the carriage of livestock and fodder.

Inquiries in relation to the recovery grants should be made through the Queensland Rural Adjustment Authority on 1800 623 946 or at their website www.qraa.qld.gov.au

For more information, please visit www.attorneygeneral.gov.au

19 June 2009

TSUNAMI EXERCISE TESTS AUSTRALIA'S WARNING SYSTEM

Attorney-General, Robert McClelland delivered the findings of 'Exercise Ausnami', a comprehensive test of the Australian Tsunami Warning System (ATWS).

The aim of the national exercise was to allow the Government to test the effectiveness of the Australian Tsunami Warning System's communications for delivering and managing tsunami warnings for Australia.

'Exercise Ausnami' was conducted on 15 and 16 June 2009 and simulated a magnitude 9.0 earthquake in the Pacific affecting the east coast of Australia and a magnitude 9.0 earthquake off Indonesia, affecting Western Australia, South Australia and relevant off-shore islands.

The test reaffirmed that in the event of a tsunami, the Australian Government is ready to protect the Australian community.

The test confirmed:

• the capability of the system to detect and verify tsunami threats from earthquakes;

• that warnings could be issued within thirty minutes of an undersea earthquake; and

• the timely provision of information to affected jurisdictions and relevant Government agencies.

'Exercise Ausnami' involved Geoscience Australia, the Bureau of Meteorology, the Attorney-Generals Department and State and Territory emergency management agencies from Western Australia, South Australia, Queensland, Victoria and New South Wales.

For more information, please visit www.attorneygeneral.gov.au

16 July 2009

AUSTRALIAN TSUNAMI WARNING SYSTEM

Attorney-General, Robert McClelland, acknowledged the effectiveness of the Australian Tsunami Warning System (ATWS) following the undersea earthquake that took place last night off the coast of New Zealand.

"The nature of tsunamis means it is important to warn the community of a possible threat, and to use all possible time to prepare," Mr McClelland said.

"For this reason, Australia has robust arrangements for coordinating responses to tsunami warnings."

"Last month, I was pleased to visit the ATWS and deliver the results of 'Exercise Ausnami', a comprehensive test of the system." The events of last night confirm the ability of the system to detect a tsunami threat and provide quick warnings to relevant authorities, emergency agencies and the Australian public.

"I would like to thank the staff of the Bureau of Meteorology, Geoscience Australia,

Emergency Management Australia and relevant agencies in New South Wales, Victoria, Tasmania and Norfolk Island for their excellent work and quick cooperation."

For more information, please visit www.attorneygeneral.gov.au

4 August 2009

RUDD GOVERNMENT INVESTS IN OUR EMERGENCY VOLUNTEERS

Attorney-General, Robert McClelland, announced additional funding of over $3.3 million for 179 projects as part of the National Emergency Volunteer Support Fund (NEVSF).

The NEVSF provides practical support for volunteers by building and improving our national preparedness to manage emergencies. The Fund has been particularly successful in building and training volunteers to be ready to respond to a range of possible emergencies.

Speaking at St John Ambulance Australia national headquarters, Mr McClelland said it is important to appreciate just how vital volunteers are to Australia's emergency management framework.

"Every year some 500,000 Australians volunteer their services, with 350,000 of them directly involved in emergency first response through State Emergency Services and rural fire services."

"It is estimated that these emergency volunteers save taxpayers more than $12 billion on wages alone – an amount that would be impossible to provide in their absence."

Funding will be provided to a range of projects that will, for example:

• enhance the quality of training for volunteers;

• improve volunteer recruitment campaigns;

• construct and fit-out dedicated training facilities; and

• purchase key infrastructure and equipment.

Each project aims to boost the recruitment, retention and training of volunteer organisations at the frontline of emergency management.

Collectively, they represent a significant addition to the capability of volunteer agencies to prepare for, respond to and recover from, emergencies.

The Rudd Government is committed to ensure that this remarkable voluntary work continues, that training is provided, and that new recruits are encouraged to come forward.

Details of projects funded through the NEVSF can be found on the Emergency Management Australia website at www.ema.gov.au

7 August 2009

AUSTRALIAN EMERGENCY MANAGEMENT ARRANGEMENTS

Attorney-General, Robert McClelland, released the Australian Emergency Management Arrangements (AEMA).

The Arrangements provide an overview of how Federal, State, Territory and Local Governments collectively approach the management of emergencies, including catastrophic disaster events.

"Australia has adopted a comprehensive and integrated approach to the management of emergencies and disasters," Mr McClelland said.

Under Australia's constitutional arrangements, State and Territory Governments have responsibility for emergency management within their jurisdictions.

Australia's Emergency Management Arrangements, however, are based on collaborative partnerships between all levels of Government as well as business, industry and the community.

These partnerships aim to minimise our vulnerability to disasters and emergencies by protecting lives and facilitating recovery, rehabilitation and reconstruction.

The Arrangements, endorsed by the Ministerial Council for Police and Emergency Management (MCPEM), outline:

• the principles, structures and procedures that support the coordination of emergency management in Australia and its offshore territories; and

• the collaboration necessary to match the response and assistance required to the nature of the event.

"This will assist in creating more informed and safer communities that are better able to withstand natural disasters."

The Arrangements are reviewed and reissued regularly by the Australian Emergency Management Committee in consultation with relevant agencies and organisations.

The AEMA will be discussed next month as part of a workshop to examine Australia's arrangements for preparing and responding to catastrophic disasters.

A copy of the Arrangements can be found on the Emergency Management Australia website at http://www.ema.gov.au/.

AJEM BOOK REVIEW

Global assessment report on disaster risk reduction (2009)

Book Review: Filling the Ark, Animal Welfare in Disasters by Leslie Irvine (2009) Temple University Press

Reviewed by George Seymour

A damaging cyclone, rising flood waters or raging and unpredictable bushfires; all terrifying events for their victims, all the more so when they are trapped in cages. In times of disaster, animals whether caged in a farm or research laboratory, domesticated and reliant upon humans or in the wild, often find themselves helpless to events.

Many of them play a significant role in society, a role that all too often places them in danger from natural disasters. However, in times of disaster they can find their welfare and interests unaccounted for, unplanned for and unprotected.

It is this gap in disaster readiness and response that Leslie Irvine, an Associate Professor at the University of Colorado, seeks to address in her new book Filling the Ark: Animal Welfare in Disasters.

Disaster planning must have at its core a concern for the vulnerable. Leaving behind caged animals in the path of fire or floodwaters represents a massive failure in disaster planning and response.
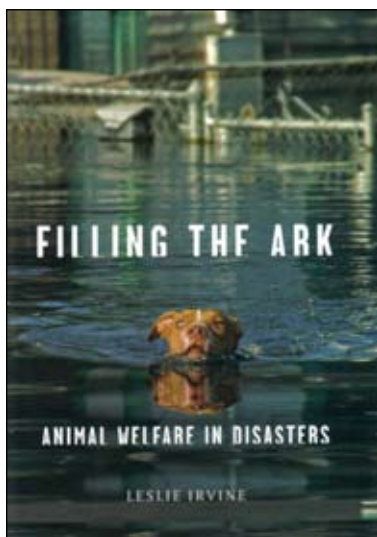
It is often not the natural disaster itself that causes the most harm but the human factor – the factory farms, the research labs or the policies on the acceptance of domestic animals in evacuation plans. Irvine brings to light many examples of where disaster planning and emergency response have been wholly inadequate in protecting the welfare of animals.

The book is a personal one for Irvine who brings her experiences in helping animals in the wake of Hurricane Katrina and other disasters. On the basis of her first hand experience and extensive research she makes recommendations for disaster planning and policy, but her ambitions are larger than this; she makes the case for a larger re-appraisal of our use of animals.

In writing Filling the Ark, Irvine poses important questions. She covers the need to ensure that animals are not placed in the path of danger and that when disaster strikes there are comprehensive response plans ready to be actioned. What emerges is a sobering account covering public policy, the practicalities of handling animals in emergencies and animal advocacy.

A central, but unanswerable, question that Irvine seeks to tease out is how societies can treat different animals in starkly differing fashions dependent upon species and/or the use to which they are put by humans. What type of institutional thinking, she questions, could possibly find consistency or logic in trapping and rehabilitating sea otters in the wake of the Exxon Valdez oil spill at a cost of $80,000 per animal with the bulldozing of live chickens in battery cages following a tornado? Such decision making suggests a mindset towards animals that is not always consistent, rational or compassionate. Irvine's mission is to rectify this.

Filling the Ark provides a consistent and compelling argument on how we could, and should, be doing more through our emergency management practices to ensure the welfare of animals.

AJEM BOOK REVIEW

Global assessment report on disaster risk reduction (2009)
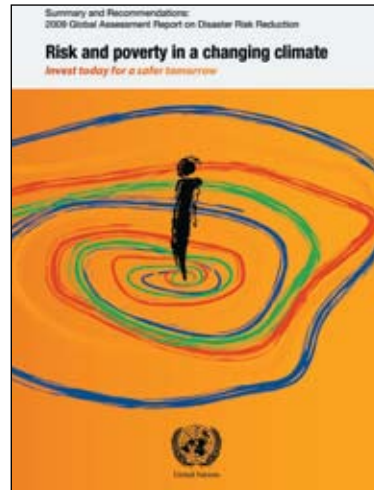
"Risk and poverty in a changing climate"

Source(s): United Nations International Strategy for Disaster Reduction Secretariat (UNISDR)

Publication date: 2009

ISBN/ISSN: 9789211320282

Number of pages: 207 p.

The Report is the first biennial global assessment of disaster risk reduction prepared in the context of the International Strategy for Disaster Reduction (ISDR). The ISDR, launched in 2000, provides a framework to coordinate actions to address disaster risks at the local, national, regional and international levels. The Hyogo Framework for Action for Action 2005-2015 (HFA), endorsed by 168 UN member states at the World Conference on Disaster Reduction in Kobe, Japan in 2005, urges all countries to make major efforts to reduce their disaster risk by 2015.

The Report was coordinated by the United Nations International Strategy for Disaster Reduction (UNISDR)

Secretariat, in collaboration with the United Nations Development Programme (UNDP), the World Bank, the United Nations Environment Programme (UNEP), the World Meteorological Organisation (WMO), the United Nations Educational, Scientific and Cultural Organisation (UNESCO), the ProVention Consortium, the Norwegian Geotechnical Institute and a wide range of other ISDR partners.

The Kingdom of Bahrain, the World Bank's Global Facility for Disaster Reduction and Recovery (GFDRR), UNDP, UNEP, the Government of Norway, the Government of Switzerland, the ProVention Consortium and the German Technical Cooperation (GTZ) contributed financial resources that enabled the successful development of the Report.

USEFUL INFORMATION

Australian Journal of Emergency Management

The Journal is published quarterly and disseminated throughout the emergency management community and related disciplines, in Australia and overseas. Articles identifying and discussing issues, policies, planning or procedural concerns, research reports and any other information relevant to the emergency/ disaster management community are welcome.

Refer to the EMA website (www.ema.gov.au/ajem) for current and past issues and information on how to subscribe and contribute.

Letters to the editor

The Journal welcomes Letters to the Editor. Please note that letters should be no more than 300 words.

Letters exceeding this limit may be edited or refused. Letters must be in good taste and focus on issues of emergency management or past AJEM content.

Letters must contain a name, address and daytime phone number of the author. Unsigned letters or those submitted without a phone number will not be considered.

Regular contributors should submit letters on varied subjects. Letters by the same author that reiterate opinions previously expressed may not be published. The editor reserves the right to reject or edit any Letter to the Editor.

Conference diary

Full details of local and international conferences relating to emergency management are available from the EMA website. For information, please visit **www.ema.gov.au**.