

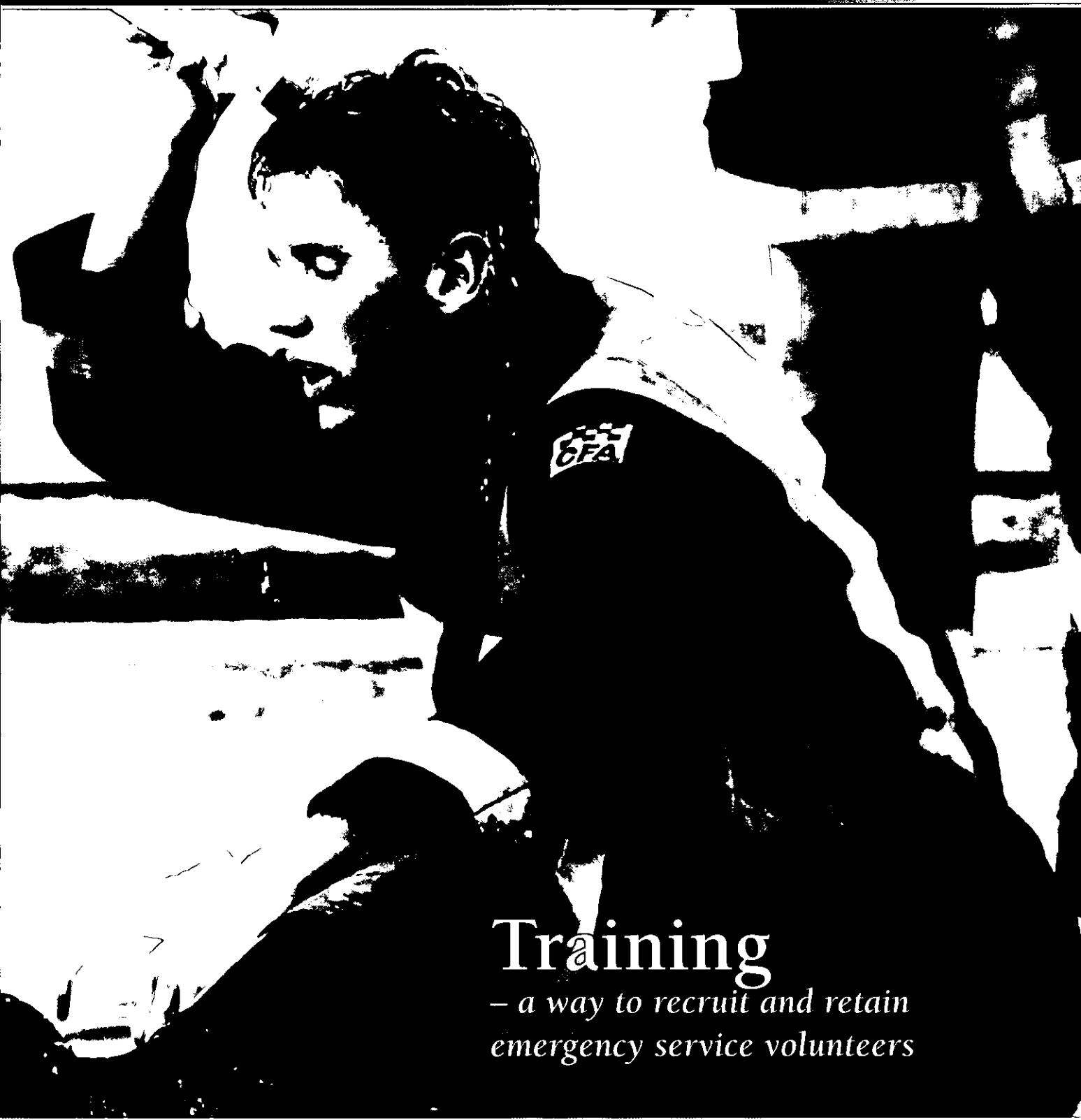


EMA

The Australian Journal of
Emergency Management

SAFER SUSTAINABLE COMMUNITIES

Vol 17 | No 3 | November 2002



Training

*– a way to recruit and retain
emergency service volunteers*

Is global warming
increasing natural
disasters?

Is there a right way to
do rapid response post
disaster research?

Reviews of flood warning
systems in North America
and Europe – the
statements and silences.

Snapshot



Maryborough Bushfires: On Monday 14 January 1985, a day of total fire ban throughout the State of Victoria, a large number of serious fires occurred in country areas, continuing in some cases into Tuesday. Army personnel were employed in fuel reduction activities (to contain the fires and limit losses). In the Maryborough Region alone the fire took one life, caused 100 other casualties, destroyed 101 homes and other inhabited dwellings, devastated hundreds of farm and holiday properties and killed approximately 40,000 sheep.



Cover: Winning entry of the 'Emergency Volunteers in Action' photographic competition, 'Devastation' by Angela Trapani, Senior Photographer with The Shepparton News. The shot features Victorian Country Fire Officer, Peter Martini, cooling-off after battling a house fire in Shepparton East in December 2001.



**The Australian
Journal of Emergency
Management**

Vol 17, No 3, November 2002 ISSN: 1324 1540

PUBLISHER

The *Australian Journal of Emergency Management* is the official journal of Emergency Management Australia and is the nation's most highly rated journal in its field. The purpose of the Journal is to build capacity in the emergency management industry in Australia. It provides access to information and knowledge for an active Emergency Management research community and practitioners of Emergency Management.

EDITOR-IN-CHIEF

David Templeman, Director General,
Emergency Management Australia.

AJEM ADVISORY COMMITTEE

Louisa Graham, Office of Emergency Services
Commissioner, Melbourne

Christine Jenkinson, Emergency
Management Australia

Roger Jones, TEM Consultants, Mt. Macedon

Chas Keys, NSW State Emergency Service

Robert Lee, Emergency Management Australia

Graeme Nicholas, Queensland Emergency
Services

David Parsons, Sydney Water Corporation,
Sydney

Michael Tarrant, Emergency
Management Australia

PUBLISHER & EDITORIAL TEAM

Grey Worldwide Canberra

Manager, Mark Godfrey

Editorial Coordinator, Anita Cleaver

Researcher, Margaret Wallis

Design and Typesetting by Whizzbang Art

CIRCULATION

Published on the last day of August, November,
February and May each year. Over 5,000 copies
are distributed quarterly without charge to
subscribers throughout Australia and overseas.

COPYRIGHT

Material in *The Australian Journal of Emergency
Management* is protected under the
Commonwealth Copyright Act 1968.

No material may be reproduced in part or in
whole without written consent from the
copyright holders. The views in this journal are
not necessarily the views of Emergency
Management Australia.

SUBMISSIONS

The *Australian Journal of Emergency Management*
welcomes submissions. Please contact us on
ajem@ema.gov.au for a copy of our
Contributors' Guidelines. Articles for
publication may be forwarded to:

The Australian Journal of
Emergency Management
Main Road

MT MACEDON VIC 3441

Tel: (02) 6295 3662

Email: ajem@ema.gov.au

Or visit us online at www.ema.gov.au/ajem

Contents

Vol 17 | No 3 | November 2002

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.



**Training can be a recruitment and retention
tool for emergency service volunteers** 4

This article profiles a research study of Tasmania's Volunteer Ambulance Officers indicating training may be a strategic recruitment and retention solution helping to stabilise Tasmania's emergency rural health workforce.



**The implementation of the incident control
system in NSW: Span of Control and
Management by Objectives** 8

Jennifer Bean examines the implementation of management by objectives (MBO) and span of control (SOC) concepts in the context of the Incident Command System in NSW.



**Flood warning reviews in North America
and Europe: Statements and Silence** 17

John Handmer examines the main themes, issues and gaps in the many recent reviews of flood warning systems in North America and Europe are presented in this paper.



**Perceptions by Counter Disaster personnel of
the risks of bulk transport of dangerous goods
along the Brisbane-Gladstone transport corridor** 25

This article presents the results of research conducted in Queensland with Counter Disaster personnel stationed along the Brisbane to Gladstone road-rail corridor.



**Perceived change in risk of natural disasters
caused by global warming** 34

Chris De Freitas examines the extent to which the expectation of the increasing frequency and severity of extreme climate events is justified.



Post Disaster Surveys: experience and methodology 39

David King questions whether there is a right or standard research methodology for rapid response post disaster studies.



**The Politics of Emergency Response and
Recovery: Preliminary Observations on
Taiwan's 921 Earthquake** 48

This paper presents preliminary results of a study on the organisational and institutional response to the 921 or Chi Chi earthquake.

FOREWORD

Lessons from violent tragedy

Rob Cameron discusses the impact of the Bali terrorist attack on Australia's emergency management arrangements



Candle lighting ceremony at the National Memorial Service held for victims of the Bali terrorist attack at the Great Hall of Parliament House, Canberra, Australia on 24 October 2002.

In the Summer 2001–2002 edition of this journal, Rod McKinnon, the Director of Planning and Operations at EMA discussed the implications for Australia's emergency management arrangements of the terrorist attacks on the World Trade Centre in New York and the Pentagon in Washington on 11 September 2001. He highlighted the opportunity for Australia's emergency managers to review our arrangements and the level of preparedness for events of a similar nature and foreshadowed a series of lessons learned seminars to be hosted by EMA with guest speakers arranged from the United States.

The violent terrorist bombings in Bali on 12 October tested Australia's capability for managing disaster events impacting on Australians travelling overseas. At the time of writing, the explosions and subsequent fire outside Paddy's Bar and the Sari Nightclub in the popular tourist destination of Kuta in Bali killed 67 Australians with the Department of Foreign Affairs and Trade holding very serious concerns for another 20 who remain unaccounted for. Indonesian authorities continue to advise that the total death toll is expected to be approximately 180. This is the first time Australian citizens in such numbers have been victims of deliberate terrorist acts outside our national borders, and the extra-territorial dimension has added a layer of complexity and uncertainty.

The observations after the 11 September attacks that prompted Rod McKinnon's argument for the greater integration of Crisis and Consequence Management have been reinforced by experience and national effort following the Bali bombings. With the overriding concern of all involved being the rapid provision of appropriate care to those injured and the welfare of the families and friends of all victims and casualties, effective coordination, cooperation and communication between all the agencies involved was a premium requirement. As noted earlier, the location of the bombings outside Australia, together with the numbers of casualties from each Australian jurisdiction meant that agencies who may not have had such a prominent role in an event that occurred inside our national borders were now very important contributors to, if not managers of, key phases of the response and recovery processes.

In each phase of the Australian response to the 12 October bombings there was and still are a significant number of public and private agencies with responsibilities to discharge and contributions to make. The agencies and companies involved accomplished some remarkable achievements. For example, by early Wednesday following the Saturday night bombing, all Australians requiring hospitalisation had been evacuated and were receiving care in Australian hospitals – a noteworthy effort. As the response continues and the recovery work gathers momentum, it is becoming increasingly clear that this event has far reaching consequences for families and communities, and that a sustained multi-agency recovery effort will be required.

So what can we learn from this tragedy?

Since the attacks in the United States on 11 September, Australia has remained on a heightened security alert. The bombings in Bali confirm the assessment that the alert is valid and is not limited to the Australian

domestic arena. Any likelihood of the need for a multi-agency, multi-jurisdictional and possibly international response indicates our arrangements must be effective and well understood by all those likely to be involved. The requirement for ongoing inter-agency contacts and partnerships entails an appreciation of the interdependencies of respective agencies' roles.

To ensure the experiences and observations of the Bali response to date are captured and made available to the crisis and consequence management communities, EMA has commenced a series of debriefs. The first was held at EMA's Mt Macedon campus on 8 November and focussed largely on opportunities for improvement in inter-agency linkages. Preliminary feedback indicates a need to develop, implement and exercise a national plan for the management of incidents involving evacuation and repatriation to Australia of large numbers of injured and deceased. The next activity in the debrief process will be in Darwin in December and will focus more closely on learning from the experiences and observations of those more closely associated with the initial response. The reports from the EMA-convened debriefs will contribute to Federal Cabinet's decision for a whole of government review of the response to the bombings to be completed by early 2003.

Learning from the Bali bombings needs to be reflected in our plans and arrangements while the experience is current and our observations fresh. We have an opportunity now to use the experiences of those involved in the response to and recovery from both the 11 September attacks and the Bali bombings to ensure that where required, our arrangements are improved. We need to learn from violent tragedy.

Rob Cameron is Acting Assistant Director, Development (Projects), Emergency Management Australia

Training can be a recruitment and retention tool for emergency service volunteers

University of Tasmania researchers argue that training may give incentives for recruitment and retention of Tasmania's emergency rural health workforce.

By Christine Fahey, Professor Judi Walker and Associate Professor Adrian Sleight – University Department of Rural Health, University of Tasmania

This paper reports the training findings of a larger study of Tasmania's Volunteer Ambulance Officers, the first-line response to medical emergencies in rural and remote areas. They are a dwindling resource in an isolated state with a great need for such services due to its large rural population and numerous tourists. The project surveyed all Tasmanian Volunteer Ambulance Officers and then conducted 10 focus groups. We found that training is important to VAO. It is not a disincentive. If done well, training will be a strategic recruitment and retention tool and will help to stabilise Tasmania's emergency rural health workforce. This research has a wider application for emergency services as they undergo similar changes and pressures related to training volunteers.

Over the past two decades Australia has dismantled its trade barriers and successfully joined a globalised economy. But over the same period rural areas have entered a period of economic decline and rising unemployment with high social costs. Thus it is not surprising that rural Australia now finds it increasingly difficult to recruit and retain volunteer ambulance officers (VAO). In both the USA and Australia there is a worrisome fall in such emergency service workers (Morisey 1993, Fitch 1994, Reinholdt and Smith 1998) and the 1994 Senate Standing Committee Report on Disaster Management in Australia (EMA 1999) stressed that volunteers need to be encouraged and supported if response capability is to be maintained.

VAO are important not only for the provision of emergency services, but also health services in most rural and remote Australian towns, where there is total reliance on VAO for first-line response to medical emergencies. Those living in rural and remote areas have poorer health indicators than those living in metropolitan areas, but of particular note is the rate of avoidable deaths (particularly from injury, asthma, and suicide), which is 40% greater than in urban areas (Bryant and Strasser 1999). VAO form an important first link for rural areas in Tasmania, Western Australia, South Australia, Northern Territory, and Queensland. Unfortunately, lack of specific information about factors that boost recruitment and retention of rural ambulance officers makes it difficult to plan strategic solutions to the looming crisis (Hudgings 1988, Swan 1991, Federal Emergency Management Agency 1995, Halpin 1998, Reinholdt and Smith 1998, Aitken 1999). Tasmanian Ambulance Services, like other emergency services, have experienced growing difficulties with VAO recruitment and retention. It is important that Tasmania, with a high proportion of rural residents (41%), develop and maintain a skilled rural ambulance workforce.

A compounding factor is that Australian emergency services have recently initiated national competency standards for training volunteers, and the Tasmanian Ambulance Services have been quick to use this approach. The aim is to increase the standards of training to ensure organisations meet 'a duty of care' (Howard 1999), but the accompanying increase in training and accreditation requirements could be a deterrent to potential volunteers (Federal Emergency Management Agency 1998, Aitken 1999).

To address this rural health workforce problem in Tasmania we gathered statewide data from volunteer ambulance officers regarding recruitment, retention, training and support. This study was the research component of a larger project (*More than a Band-Aid*) financed by Emergency Management Australia to devise strategies to improve the situation (Fahey and Walker 2001). We surveyed all Tasmanian VAO, and then conducted ten focus groups yielding both quantitative and qualitative data. Here we report our findings on the substantial potential of training as a strategic recruitment and retention tool.



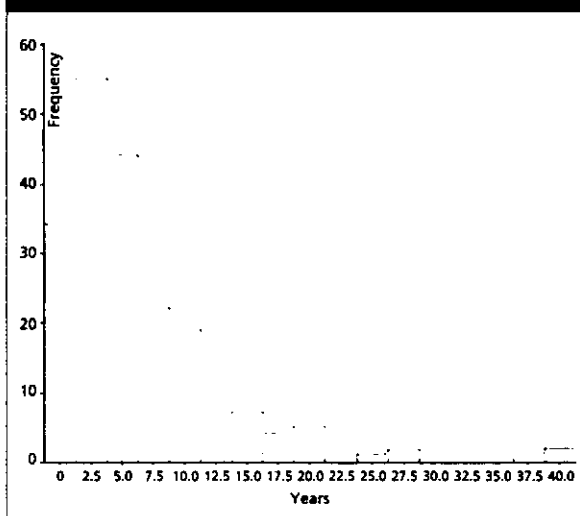
Training connects self-interested needs with altruistic urges to assist the community.

Methods

A questionnaire was developed with advice from an advisory committee of major stakeholders, and minor changes were made after piloting. We included items on VAO length of service, age groups, sex, motivations, recruitment prompts and training attitudes. The questionnaire was mailed to the entire population of VAO in Tasmania, estimated at 380 at the time of survey, with a 55% (206) response rate.

Then we chose 10 focus groups on the basis of a representative mix of VAO from different unit types (such as remote or semi-urban), including three groups formed among VAO geographic subsets with low response rates. Overall, representatives from nineteen ambulance units were consulted through the focus group component of the study and all were asked to define issues affecting VAO and to explore strategies to improve recruitment, retention, training and support.

Figure 1: Histogram of the years respondents had been VAO



After coding the open-ended items on the questionnaire we processed the data using SPSS software. Responses were analysed for frequency and compared according to age group, sex, geographical location and length of service. Ordinal categories with five levels were collapsed to three levels before testing relationships. Each focus group resulted in extensive field notes and the texts were analysed to identify common issues and themes.

Results

Tasmanian VAO closely resemble other Tasmanian and Australian volunteers (Australian Bureau of Statistics 2001) in age (most are 31–45 years old) and sex (54% female); however more Tasmanian VAO are employed (84% versus 44–58%), and fewer have completed tertiary study. Most respondents had been VAO for five years or less (Figure 1).

Assisting the community was rated as an important motivation by 94% of questionnaire respondents; 94% also acknowledged that they receive benefits by gaining new skills and over 50% reported various social benefits (Table 1). Many VAO activities were reported as enjoyable, especially training and skills maintenance, helping people and group friendships (Table 2). The major factors that made volunteering difficult were lack of time (33%) and inadequate provision of resources (29%).

Table 1: Respondents motivations for becoming Volunteer Ambulance Officers

	Important (%)
Assisting the Community	94
Learning New Skills	94
A Sense of Achievement	90
Being Part of a Group	58
Gaining Self-esteem	57
Meeting New People	55
Improving Employment Prospects	33
Other	10

Table 2: VAO activities reported as enjoyable

	Count*	%
Training & skills maintenance	206	26
Helping people, patients	175	22
Friendship & being member of a group	131	17
Call-outs, on road	68	9
Social events	50	6
Meeting members of the public as a VAO	39	5
Job satisfaction & sense of achievement	24	3
Case discussion & medical interest	23	3
Other	19	3
Adventure & challenge	18	2
Driving, work around the station	18	2
Coordinating operations & leadership 1	7	2
Getting qualifications - improving employment prospects	2	0
Total	790	100

*Count = no. of times activity was cited as enjoyable.

Most respondents (94.5%) felt that training did not take too much time and was usually run at a convenient hour (84.5%). Seventy-eight percent of respondents spent less than thirty minutes to reach the training location. Most

respondents (76.6%) wished to upgrade to the next skill level. Increasing age correlated with less interest in upgrading qualifications: 87.5% of 18–30 year olds wished to upgrade but only 46% of those over 60 years old had similar desires

The majority of respondents were satisfied with current training delivery methods. Ninety-two per cent found training sessions interesting and 83% agreed that training sessions usually have all the necessary equipment. Delivery of training by electronic methods was accepted, with 61% being aware of the benefits of video and teleconferencing and 54% having access to the Internet. But only 18% of respondents used the training information available on the Internet.

Focus group findings revealed a strong consensus about what is important to VAO. They felt a lack of adequate support, particularly those located in remote regions. Specifically, the VAO identified that one of their priority needs was training, universally complaining of inconsistent provision. This problem was described as most serious in remote groups, and irritating in units with a paramedic attached. The remote island groups had the least training over the last two years with only one professional training session delivered in the last twelve months, and many last minute cancellations due to 'staff shortages'.

Units with a paramedic attached had more consistent training, but these groups also suffered from last-minute cancellations if the paramedic was called out to an emergency. This might happen for several training sessions in a row, causing difficulties for the paramedic to cover the required training topics and sign off all the logbooks. Last-minute training cancellations were felt to lessen enthusiasm for attending training.

The irregular availability of the training modules necessary to improve qualifications was another identified problem. There were many VAO who wished to complete Level 1, 2, and 3 qualifications. The availability of these modules was felt to be very irregular in two of the regions, creating frustrations for VAO wishing to gain national accreditation. Significantly, a new recruit could only act as an observer until they had completed Level 1, and yet they had difficulty accessing the relevant modules. One recruit said "I've been waiting twelve months and I still can't do anything because I'm only an observer". Other VAO identified that some new members had left because they were tired of waiting for Level 1 training. In addition some groups admitted that they did not want to recruit new members if there was no training to offer them.

Overall, focus group participants indicated that poor training implementation made them lose confidence in their ability to respond appropriately to emergencies. Maintaining confidence emerged as a major reason for training with one respondent stating that "lack of training



Volunteer Ambulance Officers are unable to provide adequate emergency services to the community without new skills.

leads to lack of interest, lack of skills and competence, loss of a sense of belonging and personal confidence, which all reduces volunteer retention rates."

Discussion

Our use of both quantitative and qualitative data collection methods provided information that was both wide and deep, an 'enlivened' account of volunteer concerns. Other advantages include triangulation of measurements for increased internal validity, and additional flexibility in sampling (Fahey and Walker 2001). The sampling method and geo-demographic attributes of our respondents suggest the data represent well the Tasmanian Volunteer Ambulance Officers. The similarity of our results on motivation and volunteer profiles to those noted in other studies (Australian Bureau of Statistics 1995, Aitken 1999) mean that these data enrich and support that body of knowledge, with implications for other volunteer emergency services. Overall we learned that adequate training is very important to VAO. It is unfortunate that many emergency service planners do not consider training a recruitment and retention tool, but more a means for services to ensure 'duty of care'. When emergency services are looking to attract and retain volunteers training may be their greatest weapon.

Volunteer recruitment literature stresses the importance of understanding volunteer motivations and successful recruitment methods. Volunteer motivations are the focus of much debate, with the belief that volunteers operated largely from 'self-interest' being the dominant

paradigm for at least half of the 20th Century (Marwell and Oliver 1993). However, more recent opinion embraces the altruistic and civic engagement motivations for volunteering that are often cited by volunteers themselves (Bell 1999; Ko 1999). It is probable that most volunteers are motivated by both self-interest and altruism, acting to reinforce each other. This fits well with the evident desire for education: training connects self-interested 'learning new skills' with altruistic urges to 'assist the community'. The new skills have little purpose or use in ambulance service unless they are used to 'assist the community', and VAO are unable to provide adequate emergency services to the community without new skills. These two motivations reinforce each other; our focus group data strongly support this view as participants feared being inadequate in emergency situations and desired training to ensure competency.

When individuals choose to volunteer they have many opportunities within the community to provide services. Most of our respondents identified an interest in medical care and first-aid as a major reason for joining an ambulance service instead of another volunteer service. So ambulance services now know that highlighting provision of appropriate training will be a recruitment tool, offering a window into the medical world for interested community members.

Once volunteers are recruited, ambulance services must retain them. Retention of current volunteers benefits organisations by retaining expertise. Many groups in the USA are realising that retention is a major part of the solution to falling volunteer numbers (Federal Emergency Management Agency 1995, 1998, Halpin 1998). Our data reveal that retention is a problem in Tasmania as most VAO remain for less than five years. Emergency services understand that retention means ensuring volunteers are happy with their role, and use incentives, recognition and reimbursement as strategies to ensure this. (Hudgings 1988, Swan 1988, 1991, Federal Emergency Management Agency 1995). But training is not mentioned in this context.

However, we found training should be considered not only as a recruitment tool, but also as a strong retention tool. Training and related activities were by far the most frequently stated activities enjoyed by respondents. Poor provision of training also formed a strong theme from the focus group data and the final open-ended comments section of the survey. If 'keeping volunteers happy' means providing them with activities they enjoy and avoiding things that upset them, then ambulance services can deploy a powerful retention tool by providing quality training.

Appropriate training should be high quality, flexible, timely, and meet set standards. Despite time commitments being listed as the major difficulty in involvement

in VAO activities, VAO were clearly willing to volunteer their time to attend training, as many respondents identified that training did not take too much of their time. When volunteers commit time to attend training they don't deserve inconsistency and irregularity. Providing appropriate training for VAO requires a substantial financial investment, and ambulance services may be wary of overtraining volunteers who may not stay within the ambulance service. Training, however, is a key incentive to emergency service volunteers as it ensures they are competent, and assists them to feel confident. Services should acknowledge that VAO are not a free service. The cost required to sustain the VAO workforce is timely, consistent, quality training. Such training has benefits that far outweigh the actual cost of not providing it – high staff turnovers, limited skills and dwindling emergency capacity. The question now becomes 'Can ambulance services afford not to provide adequate training for volunteers?' Our study indicates that the answer is 'no' – any savings arising from cutbacks or cancellations of VAO training would be illusory.

Conclusion

The role of VAO in health and emergency services is important because of the numbers reliant on this service, and the health profile of the rural population. The utility of training to VAO is an important finding as ambulance services are experiencing difficulties with recruiting and retaining volunteers. Tasmanian Ambulance Service appears to have developed a satisfactory training formula, with national standards and training plans, but is failing to deliver it regularly.

Emergency services must not be afraid that training standards are a deterrent to potential volunteers. It is clear that appropriate training will act as a powerful recruitment and retention tool for VAO if provided in a timely and suitable manner. Poorly delivered or constantly re-scheduled training is a disincentive to VAO and the same principles are likely to apply for other emergency service volunteers. All emergency services aiming to recruit and retain volunteers should investigate the flexibility, quality and timeliness of the training they deliver to ensure it reinforces the motivations of their workforce. Barriers to provision of such training need to be identified and removed.

Acknowledgements

The More than a Band-Aid Project was undertaken with close collaboration with Tasmanian Ambulance Service and the Volunteer Ambulance Officer Association of Tasmania and sponsored by the Commonwealth Government through the Emergency Management Australia Projects Program 2000/2001.

References

- Aitken A., (1999) Identifying key issues affecting the retention of emergency service volunteers. *Australian Journal of Emergency Management*, 14: 16–24.
- Australian Bureau of Statistics, (2001) *Voluntary Work, Australia*, Australian Bureau of Statistics, Canberra.
- Australian Bureau of Statistics, (1995) *Voluntary Work: Australia*, Australian Bureau of Statistics: Canberra.
- Bryant D L and Strasser P. R., (1999), *The delivery of sustainable rural and remote health services*, Regional Australia Summit , 27–29 October 1999, Canberra.
- Emergency Management Australia., (1999), *Record of the Dennis Mileti Workshop 25–26 August 1999*, Emergency Management Australia, Mt Macedon.
- Fahey C and Walker J., (2001), *Asking Volunteers – Volunteer Ambulance Officers have their say! The More than a Band-Aid Project Report*, University of Tasmania: Hobart.
- Fahey C and Walker J., (2001), It's more than numbers! The advantages of mixed-method inquiry in volunteer organisations. *Australian Journal on Volunteering*, 6: 49–53.
- Federal Emergency Management Agency., (1995), *Emergency Medical Services Recruitment and Retention Manual*, Federal Emergency Management Agency: Virginia.
- Federal Emergency Management Agency., (1998), *Recruitment and Retention in the Volunteer Fire Service, Problems and Solutions*, Federal Emergency Management Agency: Virginia.
- Fitch J., (1994), Endangered Species: Volunteers. *Emergency Medical Services*, 23: 38–45.
- Halpin T., (1998), Recruitment and retention of volunteers: Find 'em, keep 'em. Obstacle or opportunity? *Journal of Emergency Medical Services*, 25: 58–72.
- Howard B., (1999), Managing Volunteers, *Australian Journal of Emergency Management*, 14: 37–38.
- Hudgings E., (1988), Volunteer incentives: Solving recruitment and attrition problems. *Journal of Emergency Medical Services*, 13: 58–61.
- Marwell G and Oliver P., (1993), *The Critical Mass in Collective Action: A Micro-Social Theory*, Cambridge University Press: Cambridge.
- Morisey J., (1993), 'Here to stay?': Recruiting EMS volunteers. *Journal of Emergency Medical Services*, 18: 53–58.
- Reinholdt S and Smith P., (1998), *Directions in Volunteer Development in Australian Emergency Services*, Country Fire Authority and Emergency Management Australia: Mt. Waverly, Victoria.
- Swan T., (1988), Keeping Volunteers in Service. *Journal of Emergency Medical Services*, 13: 55.
- Swan T., (1991), Great Expectations: What do EMS volunteers want from management? *Journal of Emergency Medical Services*, 16: 47.
- Swan T., (1991), No-cost benefits and incentives. *Emergency*, 12: 21.

Authors

Christine Fahey is a nurse with a Master of Public Administration and an interest in evaluation and community participation. As a researcher at the University Department of Rural Health (UDRH), Tasmania, she did this work on Volunteer Ambulance Officers, analysed and interpreted the data, and prepared the paper. Judith Walker is a psychologist-educator who is Professor and Director of UDRH. She conceived and supervised the project. Adrian Sleight is a physician-public health specialist heading research at UDRH. He helped to interpret the information and co-wrote the paper. Email: Christine.Fahey@utas.edu.au.



The Implementation of the Incident Control System in NSW: Span of Control and Management by Objectives

Jennifer Bean examines the Incident Control System in NSW to determine adoption of Management by Objectives and Span of Control principles.

By Jennifer Bean, University of New England.

Jennifer Bean conducted research using interviews and questionnaires on the implementation of 'management by objectives' and 'span of control' in the context of the Incident Control System (ICS) in NSW. The research found that objectives and strategies are being developed for every fire and communicated effectively to the Incident Management Team (IMT) but not to the field. In addition, the objectives being developed are not useful or meaningful and the process of reassessing objectives and strategies is not well understood by the IMT. The Incident Action Plan (IAP) is often not perceived as being relevant or useful to the incident, and preplans are not used extensively at incidents. Logistics are being duplicated by agencies rather than having one function for an incident, and duplication of tasks is occurring between the planning and operations sections. Span of Control is well understood and adhered to but not proactively reassessed.

Many of these issues can be resolved with interagency training/refresher exercises and standardised procedures (such as briefings, development of the IAP and planning meetings) to encourage agencies to implement ICS in the same manner.

The Incident Command (Control) System (ICS) is 'a set of personnel, policies, procedures, facilities and equipment, integrated into a common organisational structure designed to improve emergency response operations of

all types and complexities' (Irwin 1989). NSW fire agencies are currently using ICS, having adopted the system in 1987. Interwoven with ICS are the concepts of Management by Objectives (MBO) and Span of Control (SoC) in as much that they are the principles that the Australian version of ICS is based upon.

Management by Objectives is 'a process of consultative management where the management team determines the desired outcomes of the incident. These outcomes or objectives are then communicated to those' (AIIMS, 1994). MBO is important therefore, so that people know where they are, why they are there and what direction is being taken during the operation.

Span of Control is a concept that relates to the number of groups or individuals which one person can successfully supervise (AIIMS, 1994). The inference here being that if the SoC is exceeded supervision will be compromised and therefore the safety and effectiveness of subordinates is compromised as well.

Investigation of these two concepts can provide useful insights on how ICS is implemented in NSW. This paper looks at their adoption in NSW, and suggests recommendations for the future.

Methodology

Performance indicators were derived from the principles of ICS. Each performance indicator was given a 'measure' or 'measures', that were used to provide a focus or benchmark for research and analysis. Data was gathered on the measures, and conclusions were made on whether the performance indicator was achieved or not based on this information (Table 1).

Various techniques were used to collect data. The two questionnaires were used to obtain quantitative data to identify trends in implementation. They were sent to incident management team participants and crew leaders/crew members. Interviews were used to follow up the trends from IMT members and obtain more qualitative, detailed information on specific subjects. Operations Plans were analysed for inter-agency

Table 1: Performance Indicators, measures and methods used

	PERFORMANCE INDICATORS	MEASURES	METHOD
Management by Objectives	Joint planning of incident	<ul style="list-style-type: none"> • IAP is written and used • Objective is communicated • Preplanning 	IMT Questionnaire Field Questionnaire IMT Interview Operations Plans
	Unified command	<ul style="list-style-type: none"> • One organisational structure, one Incident Control Centre, one planning process, one logistics centre and one communications framework. 	Field Questionnaire
Span of Control	Unity of Command	<ul style="list-style-type: none"> • Everyone has one boss. 	IMT Questionnaire Field Questionnaire
	Duplication is avoided	<ul style="list-style-type: none"> • No duplication in tasks. 	IMT Interviews

arrangements and Rural Fires Act (1997) Section 44 reports were used to analyse the management of individual fires.

The responses were dominated by the Rural Fire Service and National Parks and Wildlife Service. NSW Fire Brigades participated in the research to a lesser extent because they are primarily an urban fire fighting organisation. State Forests declined to participate in the research.

1. Management by Objectives

Joint planning of the incident: Communication of the objective

For management by objectives to be effective, the incident objective needs to be communicated to all agencies and personnel involved in the incident. Crew leaders/crew members were asked if they knew the incident objective, 59% responded yes, 41% responded no. The results were identical when asked if they knew the strategies. It is evident from these results that the incident objective is communicated to the field only half the time. As Management by Objectives requires that all participants on an incident should know the objective, this principle is not being implemented as well as it should.

The Incident Management Team (IMT) results contrast with the field results. 100% of respondents said that an objective was set for the incident. 93% of respondents knew the objective and 7% didn't. This shows that the incident management team is given the objective and strategies. However the method of communicating the objective was not researched.

An objective should define what the Incident Controller wants to achieve in a particular timeframe. This objective should be realistic and achievable. To do this, an objective should have time and space parameters and an intent that is meaningful. An example of an objective may read, 'to contain the fire within the established

control lines by 2100 in order to protect Brown's village'. Cowardin (1984) refers to this as 'action centred Management by Objectives (MBO)', where an Incident Controller takes available information, and based on their experience, sets a single overall strategy including an objective for the emergency.

Often a person will not remember a piece of information because it is not directly relevant to them personally or their situation, or is not 'action centred'. 927 situation reports/incident action plans for the period 1997/1998 -1999/2000 were analysed. The objectives that occurred in this period can be summarised into categories, these are shown in Table 2.

Table 2 shows that not one objective was set with time and space parameters and an intent. The majority of objectives (34%) were generic statements that do not convey the incident specific goal. These generic statements can be considered as the overarching mission statements for all fire fighting, and are included in the BFMC Operations Plans as 'aims'. 27% of the objectives provided some details and guidance in that they contained what was to be done within a space parameter. 26% of the objectives however, only outlined what was to be done without any details on the parameters or intent, and 11% of the objectives weren't objectives at all, but strategies. The lack of detail and direction in these objectives makes them irrelevant and therefore difficult for subordinates to remember. Perhaps the communication of objectives to the field is occurring, but the objective is not meaningful enough for the subordinates to use or recall.

The objective and corresponding strategies should be reassessed regularly for relevance and achievability with the changing incident context. This process should be driven primarily by the Incident Controller and the planning section with consultation with the other sections. IMT members were asked whether the objectives and strategies were reassessed. 92% said

Table 2: Types of objectives occurring in 1997/98–1999/2000

OBJECTIVE	EXAMPLES	PERCENTAGE
Generic	To protect catchment values To protect biodiversity values To protect life and property To ensure the safety of crews	34%
Strategy	Patrol and mop-up the fire Inspect the fire perimeter Establish an accurate plot of the fire	11%
What	To minimise the area burnt To prevent re-ignition To contain and blackout the fire To prevent escape from the control lines To blackout the control lines To secure the control lines To mop-up the hotspots To monitor the fire	26%
What/space	To contain the fire within control lines To contain the fire to the current area	27%
What/time	To contain the fire by 1800 hours	2%

yes, 6% said no and 2% didn't know. Table 3 outlines how the objectives and strategies were reported as being reassessed.

Table 3 demonstrates that the process of reassessing objectives and strategies is not well understood. The Incident Controller is responsible for determining the objective, which sets the scene for the incident, and provides everyone on the incident with a 'direction'. Not one person responding to the questionnaire identified the Incident Controller carrying out this role or having this responsibility.

The primary forum for reassessing strategies (and the objective) is via the planning meetings. All functional officers should be present for this meeting, and should analyse the intelligence from the field and other sources to assess the success of activities and the relevance of the strategies. The responses reflect the different components and triggers of assessment, but only 12% specifically identified the importance of the planning meetings.

The objective of an incident therefore, is being communicated well to the IMT, but less so to members in the field. The process of reassessing objectives and strategies is not well understood.

Joint planning of the incident: Incident action plan development and use

An Incident Action Plan (IAP) is the primary tool used to communicate the objective of the incident to all staff involved. IMT members were asked whether there was an IAP for a nominated fire on which they had participated. 93% said yes, 7% said no. They were then

Table 3: 'How was the objective and strategies reassessed?'

31%	Said they were reassessed following liaison and briefings from the field
19%	Identified IMT meetings reassessed the objective and strategies
17%	Identified that after weather reports, aerial inspections and field inspections the strategies/objective were reassessed
12%	Identified that planning meetings reassessed the strategies/objective
9%	Said that they were reassessed as the shift progressed
7%	Said that they were assessed for the next IAP/shift change

asked if an IAP was developed for each shift. 83% said yes, 14% said no and 3% didn't know. The 93% positive response is not surprising, as an IAP is a reporting mechanism required by most agencies and the Rural Fire Service Commissioner (for s44 incidents).

IMT members were asked if they used the IAP to carry out their role. The results are shown in Table 4.

Table 4: 'Did you use the IAP to carry out your role?'

13%	Said never
4%	Said rarely
23%	Said sometimes
25%	Said frequently
34%	Said always

Table 4 shows that 40% of the respondents said that they used the IAP sometimes, rarely or never. As the IAP is the basis for Management by Objectives, this response is surprising. It shows that either the role and usefulness of the IAP is not well understood, or that the IAPs being written are not useful and are therefore not being used.

The purpose of an IAP is to communicate the objective, strategies and support mechanisms provided for a fire. If the plan is not useful and relevant then the purpose of the plan is negated. Interview participants were asked if the IAP was useful. 39% responded no, 61% responded yes. It was reported that the three main reasons for the usefulness of the plan was that it was a form of

Table 5: 'Why wasn't the incident action plan useful?'

56%	Felt the IAP didn't reflect the field operations.
33%	Felt that the field (or operations section) does what they want regardless of an IAP.
11%	Felt that the IAP was too prescriptive and outlined tactics

Table 6: 'What preplanning was evident at the incident?'

34%	Identified the Operations Plan
19%	Said that there were agency databases and management plans
17%	Said that there was rapport between agencies and interagency contact through the BFMC forum, inter-agency training or previous incidents
13%	Said that agency staff were trained and experienced
9%	Referred to internal agreements (such as professional officer awards) and standard operating procedures
6%	Identified control lines such as trail maintenance and hazard reductions
3%	Identified the DISPLAN

Table 7: 'Why was the preplanning useful?'

24%	It saved time
18%	The preplanning identified positions and people
18%	There were non-locals involved who benefited from the preplanning
12%	It summarised local information
12%	Preplanning assisted team cooperation and lessens conflict by outlining the ground rules
6%	It improved response
6%	People knew their roles

documentation, it gave clear direction and it was a measure of progress and performance. Table 5 outlines the reasons why the 39% that felt the IAP wasn't useful.

The results in Table 5 demonstrate that when the IAP is not used it is generally because the information in the plan wasn't useful (56%). If the IAP is useful, Management by Objectives (using the IAP as a tool) should be implemented by everyone. 33% of the reasons were that the field 'does what they want' because they do not participate in process to set the objectives. This can be remedied with training and use in ICS roles and responsibilities.

In summary, there are two primary problems associated with the objective setting process. These are that although the IAP is being written, the communication of the objectives to the field and IMT is not widespread or equitable, nor is monitoring of the achievement of the objectives and subsequent feedback occurring.

Joint planning of the incident: Pre-planning

Multi-agency pre-planning is an important tool in assisting the establishment of objectives and the development of the IAP (Riley, 1988). Each agency should have a good understanding of their neighbour's concerns and ideals, available qualified personnel and available resources before a major incident. Pre-planning can take many forms, IMT members were asked what pre-planning was evident at the incident they participated in. The results are shown in Table 6.

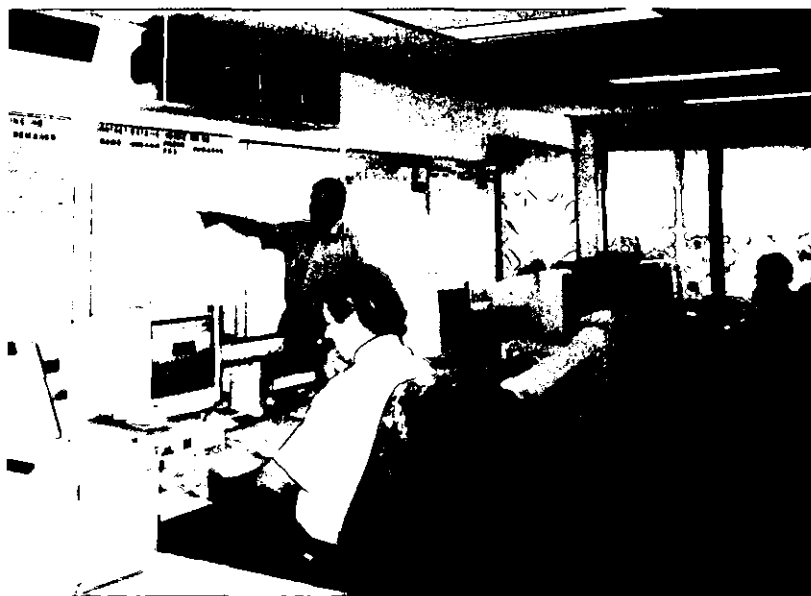
In NSW, the main sources of information should be the BFMC Operations Plan and agency management plans (e.g. NPWS Plans of Management, Reserve Fire Management Plans).

- The Operations Plan is a standard document for each bush fire district in the State, outlining procedures and protocols, and identifies resources, communications and assets at risk. It should be routine for the IMT to access the Operations Plan to identify any issues. In Table 5 only 34% referred to Operations Plans.
- Agency documents outline area specific information including assets, procedures and relevant legislation. Only 19% referred to these sources of information. These plans should be consulted during incidents in those areas to assist in the rapid identification and prioritisation of tasks.
- The BFMC is a forum that can establish rapport and understanding between agencies and performs a valuable role in facilitating pre-planning. Only 17% reported that these forums fulfilled a pre-planning role.

Compiling information into documents for an incident is only a valuable exercise if the information and format can be used and accessed rapidly. IMT members were asked if the pre-plans they used were useful and why. 65% said yes, the usefulness of pre-planning is outlined in Table 7.

The responses in Table 7 are generally referring to the Operations Plans. The Operations plans are now required to identify people and roles they can fill during an incident, and outlines the 'ground rules' for command, control and cooperation.

Of the other responses, 10% said they weren't sure if the pre-planning was useful, 10% said pre-planning was not useful and 15% said there was no pre-planning evident at the incident. 20% of the respondents therefore were ambivalent or negative about the use of pre-planning. This result could stem from the



National Emergency Management Coordination Centre, EMA.

pre-planning not being in a useful format/not containing relevant information or from the participant not understand how pre-planning can benefit incident management. All BFMCS have Operations Plans approved by the Coordinating Committee, these plans should therefore be used as the minimum form of pre-planning. There is no justifiable reason why these plans were not present at incidents (15%).

The information provided by respondents shows that the use of pre-planning is not occurring consistently. Although the value of pre-planning is recognised, the pre-planning tools identified were not varied or many in number.

Unified command

Irwin (1989) defines unified command as a method for all agencies or individuals who have jurisdictional responsibility, or in some cases who have functional responsibilities at the incident, to contribute to the:

- determination of overall objectives for the incident, and
- selection of strategies to achieve the objectives.

Irwin (1989) suggests that by all agencies using ICS during a major incident (and therefore having the same organisational structure, same terminology, same management procedures), unified command occurs. This means that instead of preparing several sets of plans (with no guarantee of coordination among them), only one set need be prepared to inform all participants. In place of several logistical and communications processes, only one system of collective and integrated procedures is used. The Australian ICS does not specifically include the concept of 'unified command', NSW addresses the components of unified command

in its pre-planning policy for coordination. For the purposes of this research, the American five ICS characteristics (one organisational structure, one Incident Control Centre, one planning process, one logistics centre and one communications framework) are used as measures of unified command.

It is evident that the ICS roles and structure are being filled. The IMT questionnaire results showed that the five characteristics of unified command were generally occurring at every fire. The particular jobs undertaken varied between responses, however the core tasks were reported as being carried out, such as 'management of the section' for IMT Officers. The survey responses were quite simplistic (often identifying one task). This may be a function of the amount of space provided for respondents (4 lines).

Generally the reporting structure was theoretically correct. All respondents who were IMT Officers knew that they reported to the Incident Controller. The positions reporting to the IMT Officers varied considerably. Some responses included:

- Division Commander reports directly to Deputy Appointee.
- Crew Leaders report to Division Commander.
- Crew Leader reports to Operations Officer.
- Planning Officer reports to Appointee.
- Planning Officer reports to Operations Officer.
- Logistics Officer reports to Planning Officer.
- Logistics Officer reports to Operations Officer.
- Operations Officer reports to Planning Officer.

21% of the respondents outlined reporting structures that did not correspond with the theoretical ICS structure. There was no agency-based trend in these results. This shows that there is either a considerable lack of understanding of the reporting structure and roles of the positions, or that the structure is being adapted to local conditions. Either response will have the disadvantage of inconsistencies and non-standardisation. Correspondingly, there could be advantages if the variations were agreed to by the agencies and were due to adaptation to local circumstances.

It is interesting to note the range of responses from the Incident Controllers. When asked who they reported to, the responses included:

- The local Council General Manager;
- RFS Regional Manager;
- NPWS (District, Region) Manager;
- The s44 Appointee;
- Rosehill/RFS State Operations;
- A 'Higher Authority';
- RFS Commissioner; and
- NPWS Park Operations.

Table 9: 'Why did you reassess the span of control as a manager?'

30%	They needed more staff
30%	They had too many staff to do the job
20%	They accept everything initially and then reassess the span of control
20%	They reassess span of control always and implicitly

Table 10: 'How did you know if the span of control was enough?'

33%	Reported that if the job was being done, the span of control was correct
26%	Said that the span of control depended on the objectives, strategies and tactics (e.g. mop up span of control could be 1:8, direct attack span of control could be 1:3)
26%	Said they used the 1:5 proportion as a basis for decision making but took into account other factors
11%	Reported that they kept strictly to the 1:5 proportion
4%	Reported that if they couldn't manage their staff properly the span of control was likely to be wrong

This shows that there is some confusion about the reporting structure above the Incident Controller. Ultimately, an Incident Controller appointed under s44 of the Rural Fires Act primarily reports to the Commissioner of the Rural Fire Service, and maintains liaison with all other concerned parties.

One incident control centre is required by Coordinating Committee policy via the Operations Plans for all Class 2 and 3 fires. The control centre is agreed on by the local Bush Fire Management Committee in the Operations Plan and is generally the Rural Fire Service Control Centre. All section 44 reports identified that one control centre was used for the major incidents. There may be some overlap and confusion of control centres for Class 1/Class 2 fires on public managed land (such as National Parks and Wildlife, State Forests) as they are escalating. This was not researched.

53% of interviewees said that logistics were organised on an agency basis. 47% said that the incident management team's logistics section organised the logistics for the incident. When asked why the agency organised their own logistics, the overwhelming response was that different agencies have different needs and therefore need to be organised separately. One issue that was raised a number of times was the issue of 'rich cousin – poor cousin'. This means that one agency was perceived

to have received good accommodation and feeding, while another agency received different arrangements that were perceived to be worse, and therefore not equitable. This is an inherent problem associated with different agencies organising their own logistics.

All changeovers were reported as being scheduled by the IMT, but organised by each agency by swapping their own resources with like resources. The IMT in every instance changed over together regardless of agency. A number of respondents (20%) raised the issue that there are often different shift times for different agencies because of the volunteer-paid firefighter concept. Volunteers work flexible and often different hours compared to a paid workforce with an award. These hours and conditions were not researched in this study. The implications of different hours and conditions of volunteer fire fighters to paid fire fighters (with an award with set working conditions) could be considerable, not only in terms of coordination and logistics of the actual incident, but for occupational health and safety requirements.

Unified command is therefore being carried out well as a result of the ICS hierarchy and the existing policy framework. Establishing one control centre and one planning process is a routine and normal practice. Areas where there is some variation are related to the ICS structure, lines of reporting, and logistics/changeovers. In addition, logistics and changeovers need to be proactively incorporated into the IMT and organised across agencies.

2. Span of Control

Assessment of Span of Control

During interviews, IMT members were asked if they reassessed the Span of Control in their section as a manager. 65% responded yes, 35% responded no. Table 9 outlines the reasons that people said that they reassessed the Span of Control.

Table 9 shows that 60% of the participants reactively managed Span of Control, that is, when the situation was too difficult or too easy, the Span of Control and structure was reassessed. 20% reported a philosophy of accepting all resources initially and assessing the required Span of Control and structure. This approach may have serious implications for cooperative fire fighting on a state-wide basis. Often when there is severe fire weather, fires will be occurring across the State, resources will be shared and allocated on an as needs basis. As resources are finite, accepting everything initially will freeze the resources from attending another fire and contribute to the potential loss of assets. Span of control should proactively assess each shift both on current and predictive basis, because reactive or opportunistic management may result in delays and confusion.

Of the people who responded in the negative to the question 'as manager, did you reassess the Span of Control in your section?', 66% said the structure and Span of Control was acceptable and didn't need reassessing. This corresponds to the results that show that the majority of people are reactive in reassessing Span of Control. 17% said the structure was standard and non-negotiable, and 17% said it was someone else's job to reassess the Span of Control.

To determine how Span of Control is interpreted and implemented in an incident, IMT members were asked 'How did you know if the Span of Control was enough?' Table 10 outlines the results.

At emergency incidents, the environment in which supervision is required can rapidly change – possibly with dangerous consequences. Five reporting groups or individuals are considered to be the optimum, as this maintains a supervisor's ability to effectively task, monitor and evaluate performance. The results in Table 10 reflect this theory, the majority of people (63% of people interviewed) look at the task and the environment and make a judgement on how well subordinates can do the job, how safe the environment is and how well they can supervise them. Managing staff based on a designated ratio is limiting and inefficient, the ratio should be used as a guide only.

To gain an understanding how Span of Control is being implemented within the ICS structure, participants were asked 'How would you have expanded/reduced the Span of Control in your section?'. The results are outlined in Table 11.

Table 11 shows that less than half of the people interviewed understand the chain of command and process to expand/reduce the Span of Control. The correct method is to discuss the resources required in an IMT forum, the IC to approve the decisions and the Logistics Officer (and Operations Officer) to carry out the required actions. The 15% who responded that they would report the proposal to the Operations Officer were all Division Commanders and therefore identified the correct chain of command.

It is of concern that 23% of the respondents would go via their agency channels rather than the IMT and logistics function. The IMT will never exhibit true cohesion and efficiency until the IMT carries out all functions. Separate agencies duplicating logistical arrangements is inherently inefficient.

Unity of Command

Unity of Command is important – if every person on the incident reports to one person, and receives one set of instructions, duplication and confusion is avoided. This concept is being implemented well at fires in NSW:

Table 11: 'How would you have expanded/reduced the span of control in your section?'

50%	Outlined that the IMT discusses it, the Incident Controller approves the decision and the logistics officer does it.
23%	Reported that they would have contacted their agency to organise it
15%	Reported that they would report the proposal to the Operations Officer
8%	Felt that the planning section organises the reduction/expansion of resources through the IAP
4%	Felt that the field carried out the reduction/expansion as required

Table 12: 'What duplication was evident in the IMT?'

50%	Responded that the operations section and planning section exhibited duplication of tasks
14%	Said that it was human nature for there to be duplication
9%	Reported that the deputy Incident Controller also acted as an operations officer for their own agency
9%	Reported that there were too many resources for the job
4%	Reported blurring of roles such as agency liaison and planning officer
4%	Reported that there were two operations officers (one for NPWS, one for RFS)
4%	Said that the field set their own strategies

- 100% of the crew leaders/crew members knew who they reported to.
- 98% of IMT members reported to one person. The 2% reported that as Divisional Commander they reported to the Operations Officer and Incident Controller.

These results demonstrate that the hierarchy of ICS, particularly in the field, is well understood and accepted. This result can be attributed in part to the level of training people have received in the last five years in lines of communication and chain of command. The Rural Fire Service and NSW Fire Brigades system reinforces this reporting structure with their brigade structures.

Duplication of effort

Duplication of effort can cause inefficiencies in the management of an incident, while a structure with designated roles and responsibilities can remove the

potential for duplication of effort. Although strongly linked with the concept of Unity of Command, duplication of effort can occur as a result of many influences. During the interview, participants were asked if duplication of effort was evident in the IMT, 80% responded yes, 20% responded no. Table 12 outlines the type of duplication that was evident.

Table 12 shows that duplication of IMT roles and tasks is widespread. Overwhelmingly, the planning and operations functions showed duplication of tasks (50%) including both sections carrying out separate mapping; the operations officer not participating in the planning process and the planning section writing the operations plan; resource tracking being done by logistics, operations and planning; and having the operations officer and planning officer both trying to fulfill the operations function.

Another strong trend (13% of respondents) alluded to operations being divided into agencies (such as the Deputy Incident Controller acting as operations officer for their agency, and having operations officers for each agency). This may be a method to ensure that command is maintained and cooperation is facilitated, although it doesn't strictly adhere to the principles of Span of Control.

14% of participants accepted duplication and inefficiency as a part of normal practice. During an incident, the Incident Controller should manage the staff to ensure that staff are carrying out their roles and that inefficiencies do not occur.

Duplication of effort is occurring on a regular basis during incidents. The interactions between the different sections should be strong and open, if the communication is not strong, duplication of effort may occur. Duplication of effort is inefficient, it can also cause confusion and ill-feeling between agencies because cooperation and trust are not being actively facilitated through the ICS process. The reasons are not well known, but may be linked to agency politics and the tussle for control of an incident.

Conclusions and Recommendations

1. Management by Objectives

Although the objective and strategies for the incident are being developed by the IMT, they are not effectively communicated to the field operations staff. An inter-agency standardised approach to briefing should be adopted to ensure that the objectives and strategies are communicated to the fireline in a consistent, timely and effective manner. The IAP should be used as the basis for this briefing. Communication of the objective and strategies within the Incident Management Team is reported as good.

The low reporting rate in the field may be due to the lack of a meaningful and useful objective. Overwhelmingly, the objectives in this study period were broad and not 'action-centred'. Refresher courses and exercises should stress the importance of Planning Meetings and exercise the process of IAP development and briefing procedures.

The process of reassessing objectives and strategies is not well understood by IMT members. In theory, the planning meeting brings together the Section Officers to discuss and agree on strategies, and the Incident Controller has the responsibility for determining the objective. The results from this research failed to identify an understanding of these key responsibilities and processes.

Although the IAP is being developed and distributed to the IMT, its usefulness or relevance is variable. The key issues are that the information is out of date, it does not reflect the situation on the ground or what the field officers believe is required. Agencies are generally adhering to the strategies outlined in the IAP. Specific training for the Planning section needs to address the timeframes and processes involved in developing an IAP and the operational staff need to be specifically briefed to provide field information to ensure the IAP is based on accurate intelligence.

Although pre-planning is occurring, the plans are not being used at incidents. A checklist of 'essential information' needs to be included in the Operations Plan for the use of the Incident Controller and planning section. Obviously these plans are not included in the Operations Plan, but the checklist would ensure that important information in pre-plans are not overlooked. The checklist could include:

- Relevant legislation.
- Local Bush Fire Management Committee Operations Plan.
- Local Bush Fire Management Committee Bush Fire Risk Management Plan.
- Contact lists for all agencies .
- Plans of Management for National Parks in the local government area.
- Fire Management Plans for National Parks in the local government area.
- State Forest Plans of Management.
- Department of Land and Water Conservation Crown Land Fire management Plans.
- Topographic maps for the local government area.
- Vegetation maps for the local government area.
- Environmental and community assets map.

Preplanning also includes other factors such as fruitful discussion in the BFM. A list of items for discussion

could include: training and experience of current key IMT staff, resource availability updates, location of areas of high fuel loads, fire trail capability, smoke sighting arrangements, first response arrangements, location of specific environmental and cultural assets. Although many of these issues are outlined in the Operations Plans, discussion prior to the fire season could be a timely and useful process to raise the members' awareness and focus.

Unified command seems to be working well (i.e. there is a common operations centre and common planning) but common logistics is not occurring. Currently, for over half of the fires studied, the logistics function is duplicated on an agency basis, consequently logistics is seen as ineffective and inequitable. A logistics team provided with adequate information on resources and needs, can satisfy most requirements. One of the most prevalent responses to not standardising logistics and changeovers was the concept of 'different agencies, different needs'. As ICS was developed and adopted as a tool to reduce duplication and encourage coordination of fire management, this attitude needs to be discussed and resolved in a pre-fire season forum at a local and Coordinating Committee level.

Reporting structures are not well understood. The purpose of a hierarchy is that all aspects of an incident are being considered and addressed. If the hierarchy or reporting structure has a weak link, the likelihood of potential failure or something being missed increases. Training and exercises are integral to ensuring that people respond and perform in an agreed and appropriate fashion to incidents. Refresher courses and exercises need to reassert what the roles and responsibilities are and why the chain of command is the way it is. These exercises need to be varied, regular and involve all agencies that may participate in fire management.

2. Span of Control

The concept of Span of Control is deceptively simple. In theory it provides a mechanism for coordinating the efforts of all areas involved through delegation of authority and responsibility. Indeed, one measure of Span of Control, Unity of Command, is being implemented well, when everyone has one boss, they know who they are, they know the lines of communications and authority and they can perform their allocated tasks. Training is required to encourage the on-going maintenance of Span of Control during an incident. This training should focus on proactive and predictive resource management, and be targeted at people who may fulfill the role of a Section Officer and Incident Controller.

As managers however, understanding how to facilitate Span of Control is a little more difficult. IMT members interviewed report on the overwhelming trend to

reactively assess Span of Control rather than assess it as part of a proactive management system. The actual assessment of Span of Control is refreshingly flexible, with people focusing on many contributing factors such as the level of safety, the task at hand and the competency level of staff to carry out the task. The 1:5 ratio is being used generally as a guide, not a rule.

Almost one quarter of people felt that they would go through their agency channels rather than a IMT/Incident Controller/Logistics Section process to reduce or expand the Span of Control. This process would generate inefficiencies and confusion, and is alien to the concept of Span of Control in that coordination would not occur.

Duplication generally has been reported to be occurring as the norm rather than the exception during fires. The main form of duplication is occurring between the planning and operations sections. The reasons are not well known, but may be linked to inter-agency politics and the issue of in-control arrangements. For this reason, agencies may need to discuss these issues on both a local and statewide basis. Further training could occur to restate the roles of each of the operations and planning sections, and their links with other sections and reduce the amount of duplication occurring during an incident.

References

- AIIMS 1994 *Incident Control System: The Operating System of AIIMS*. AFAC Limited.
- Cowardin, D.H., (1991), ICS – Think Regionally, Act Nationally. *American Fire Journal*.
- Cowardin, D.H., (1984) Action-Centred Management for ICS. *American Fire Journal*, November 1984.
- Irwin, R.L., (1989), 'The Incident Command System (ICS)' in *Disaster Response – Principles of Preparation and Coordination*, ed. E. Auf de Heide, Mosby, Missouri.
- Phelps, B., (1996), *The Incident Command System for Fire departments: History of the merger of FGC and ICS*. International Fire Service Network, Inc.
- Riley, D.J., (1988) Know they neighbour – the key to unified command. *USDA Fire Management Notes*. Vol 49 (1).
- Rural Fire Service, (1999), *Bush Fire Coordinating Committee Policy 1/99: Management of Bush Fire Operations*, NSW Coordinating Committee.
- Rural Fire Service, (1998), *New South Wales State Bush Fire Plan (An Operational Bush Fire Management Plan)* NSW Coordinating Committee.
- Rural Fire Service, (1998b), *Model District Bush Fire Management Plan Operations: pursuant to section 52 of the Rural Fires Act, 1997*. Coordinating Committee 30 April 1998. *Rural Fires Act (1997)*.

Jennifer Bean currently works for NSW National Parks and Wildlife Service as Senior Ranger (Fire). She has also held positions in the NSW Rural Fire Service in planning roles in the Northern and Central Regions. This paper is based on a chapter from her Master of Natural Resources thesis titled The Implementation of the Incident Control System in NSW. Email: bjtblunden@hotmail.com



Flood warning reviews in North America and Europe: statements and silence

John Handmer examines recent reviews of the flood warning systems in North America and Europe overviewing some of their issues, themes and gaps.

By John Handmer, Centre for Risk and Community Safety, Geospatial Science, RMIT University, Melbourne

This paper examines the many recent reviews of flood warning systems in North America and Europe. My purpose is to set out the main themes and issues contained in these reviews. It is also interesting and important to establish areas and issues not covered by the reviews, and I try to identify these areas of silence. A serious omission of the US and European material is the failure to explicitly conceptualise the warning task as being about enabling the communities, enterprises and individuals at risk to take action to reduce their risk and property losses. Processes are needed to ensure that the needs of those at risk drive warning system design.

Flood warning systems need continual improvement just to maintain current levels of service. Warnings are increasingly expected by those at risk and they are expected to be timely and accurate. There appears to be less tolerance for what are viewed as mistakes – even though we may regard errors as inevitable given the complexities and inherent uncertainties surrounding the warning task. This is in effect a steadily rising standard.

It would be difficult enough by itself, but there are more and more people potentially at risk demanding warnings. Many are at risk for what we might call traditional reasons; that is living, working and traveling in flood prone areas. But an increasing number are at risk because they use such areas for recreation. This group is probably not reached by warnings today with occasional disastrous consequences. Separately, there is an emerging consensus that the natural phenomenon of flooding is likely to worsen with global warming (Handmer, Penning-Rowse and Tapsell 1999).

This paper examines the many recent reviews of flood warning systems in North America and Europe. The purpose is not to compare these reports with the situation in Australia – although some comparisons are made – but to set out the main themes and issues contained in these reviews. It is also interesting and important to establish areas and issues not covered by the reviews, and I try to identify these areas of silence.

Are reports from other countries relevant to Australia?

Examining overseas experience raises an obvious issue which is far too often ignored – that is the question concerning the applicability of lessons and experience from elsewhere. This is quite distinct from the concerns raised when the information from elsewhere would be embarrassing or show the inadequacy of local thinking and practice. It is also

distinct from concerns about the limits of generalisability of case study research.

If the national – let alone regional or local – contexts of the research are very different to where it is being applied, then research results may not be automatically transferable. A large question mark hangs over the applicability to Australia of research results from the US in particular (where most of the English language literature originates). Yet such research is usually quoted as if it was perfectly transferable to Australia or elsewhere. A similar comment may be made about the uncritical transfer of results within countries to rather different contexts, for example, the results of research conducted in rural towns in the US and Australia have typically been applied to metropolitan areas without consideration of the differences. There has been and still is an assumption of universal applicability – with the exceptions of indigenous communities and easily identifiable neighbourhoods which appear to be distinctly different, such as the 'Chinatowns' of many major cities. Results from long ago are even more problematic. Few would disagree that in addition to all the other changes in our societies over the last few decades our approach as individuals and societies to risks and hazards has changed dramatically, most famously as set out by Ulrich Beck in *Risk society* (1992).

This is not the place to examine these problems – I simply want to

indicate the need for caution, and to suggest that the area is worth further investigation.

Reports and other sources

For North America the paper draws on recent reports from the US Federal Government's National Science and Technology Council *Effective disaster warnings* (2000); Sorensen's (2000) review of 'Hazard warning systems' completed as part of the US second assessment of natural hazard research and policy; Kendall Post's (2001) review of "Barriers to effective US alert and notification system"; *Coping with flash floods* (2001) the results of a NATO workshop on the subject (Gruntfest and Handmer 2001), and Dennis Mileti's summary volume on the reassessment of natural hazards in the US, *Disasters by design* (1999).

For Europe there are numerous national reports and some Pan European studies. The recent evolution of warnings in the UK and establishment of the National Flood Warning Centre following the 1998 English floods and subsequent enquiry (Bye and Horner, 1998) has been well covered elsewhere (Haggett 2002; Handmer et. al. 2000; Handmer 2001). The enquiry is mentioned in the text. There have since been a number of further investigations following the floods of Autumn 2000 (Environment Agency 2001). Most of my comments on Europe will come from a recent review 'Improving flood warnings in Europe' which examined many European reports (Handmer 2001), the NATO volume mentioned above (Gruntfest and Handmer 2001), the results of a major European funded study into climatic hazards (SIRCH or Social and Institutional Responses to Climate Change and Climatic Hazards: floods and droughts.) and a workshop last September in London which examined current issues in European flood policy (www.gs.rmit.edu.au/research/risk.htm). Rosenthal and t'Hart (1998)

provide a useful analysis of emergency response to the European floods during the 1990s.

In addition, there are of course many projects, reports, web sites and commentaries of relevance, for example see the Boulder site for the US (www.colorado.edu/hazards) and for Europe, www.MITCH.ec.net, or www.hrwallingford.co.uk/projects/RIBAMOD/.

Some key themes

Examining many reports and papers from many places unavoidably means that any summary will be general. Here some major themes have been selected that emerge from the material as well as some distinctive omissions.

Material on flood warnings can be divided loosely into micro and macro issues. There is much in most reports on what can be termed the micro issues of warning – message design, psychometric and demographic factors which affect warning response and so on. As micro issues are very well covered by the literature and show relatively little change over time, the emphasis here is on macro issues. These concern broader policy and system design issues and the sharing of best practice. Areas of continuing concern within the micro category include the need for: effective processes for community engagement; determining and delivering appropriate advice on what action to take on receipt of a warning; and the identification of high risk groups and ensuring that they get the warnings they need.

Warnings are very much part of flood risk management, but are no substitute for effective risk management. The emphasis should be on the development of national (or continental) approaches to risk management. Effective approaches in one area are often at present offset by ineffective or non-existent action elsewhere. This is inequitable for those at risk, probably economically inefficient, likely to be

environmentally damaging where development proceeds in floodplain areas, and unlikely to produce resilient communities.

Enforcement problems raise questions over sole reliance on a regulatory approach – an issue raised in reviews and interviews in Canada (Emergency Preparedness Canada and Environment Canada 2001), UK, USA, France and Poland. These problems suggest that approaches relying less on enforcement and more on cooperation, as employed in New South Wales, may be more workable (May et. al. 1996).

The emphasis on technology

The government warning reports reviewed for this paper generally emphasised the potential of modern technology and the need to apply it with more fervour. Most of this effort has been directed at improvements to monitoring, modelling and prediction systems (for example see www.MITCH.ec.net) – this is hardly surprising given that most warning reports are authored by technical specialists. Apart from this area much effort is going into large scale applications such as GDIN (Global Disaster Information Network) and it is not always clear how this would actually help local warnings or response – given that effective management of rapid onset flooding depends initially on local warnings and response. All the current EU funded warning related research projects are essentially about the application of information and communication technology – although they may have other dimensions as well. This is important when we appreciate that some agencies with warning responsibilities claimed to be unable to share key data between their own offices, let alone across national borders. Apart from the use of the internet, large scale fully operational examples of the successful application of modern technology in local

*The warning task has become harder
because of our expanding use of
flood-prone areas for recreation*





Early warnings enable communities to reduce risk and property loss.

warning and response are rather scarce. The NATO volume mentioned above contains one example from Oklahoma which is likely to be applied across the US (Crawford, 2001). This combines the communication and access potential of the web with traditional weather monitoring and relies on a sound hydro-meteorological network – something which is under threat in many jurisdictions (e.g. the Canadian review). I know of no other large scale examples proven to be both cost-effective and performance enhancing. There are some more local cases, such as the Denver metropolitan district which uses a range of technology for storm detection and warnings, and the Danish Hydraulic Institute's FLOODWATCH system.

How does the emphasis on modern information technology match up against the problems being faced by warning systems? I would assert that it matches poorly. The main problems and complaints relate to human and institutional failures.

They relate to the failure to properly identify and address the residual risk, they touch on issues of determining acceptable risk – a social and political process, and the difficulty in achieving improved outcomes. In his review of warnings in the US, Sorensen (2000) states that: "Better local management and decision making about the warning process are more critical than promoting more advanced technologies, although both would help."

It may be that a real pessimist would see that the concentration on information and communication technologies may make things worse by directing effort and resources away from the real problems and issues. We can see that we have better and better ability to monitor, detect and predict hazards while using similar procedures to warn those at risk as were used thirty years ago. Why do we wonder why warning response and effectiveness as measured by outcomes has improved little?

An exception to this rather negative assessment is the use of the web as part of the interface between the science of prediction and those at risk. Even here many of the web displays do not inform people of their own risk of flooding, and do not follow good practice in warning message design. In particular, they do not tell people what to do in the event of a warning. An outstanding exception to this picture is the website of the UK Environment Agency (www.environment-agency.gov.uk). Locally, the Traralgon flood warning system has been designed to maximise community access to warning information including via the Bureau of Meteorology's Victorian flood warning services web site (Kazacic at al. 2001).

An urgent policy need may be to agree on the technical specifications for warnings via various new media such as mobile phones, as suggested by the US report on *Effective disaster warnings* (NSTC 2000).

Key groups at risk

Some attention in the reports reviewed has been devoted to groups seen as particularly vulnerable in the warning context. These are usually seen as people who would have trouble responding to warnings. However, these groups are relatively visible and include the housebound, immobile, mentally ill, and those who cannot hear or read warning messages.

Far less attention is given to less visible but nevertheless at-risk groups. These include people who may not be reached easily by the normal warning communication mechanisms, such as:

- All those mobile at the critical warning time.
- Tourists.
- Business travelers (US reports).
- Seasonal workers (US reports).
- Those who are socially isolated such as the homeless and those trying to remain out of sight including undocumented people (those without permission to be in the country).

Nevertheless, these groups can usually be identified and located even if only by police patrols, with the possible exception of the last listed. In practice, during a major flood event the emergency services may not have time for this task.

Another group is more problematic. This group consists of those who occupy high risk locations on a casual basis such as bushwalkers, cross-country skiers and adventure recreationists. If we considered recent well publicised flash flood deaths in Europe we would add campers. This group can be subdivided into those using official camp grounds, commercial or other organised groups, and independent adventure recreationists.

The largest numbers at risk at any one time are campers and organised groups of recreationists. These two groups have contributed significantly to flash flood death

tolls in Europe. France in particular has tried to implement warning systems at camping grounds, although there is a conflict between raising awareness of the hazard and the economic imperative of having people stay at a flood prone camp ground. Organised groups appear to be generally aware of flood warnings although their risk related decision-making processes may be poor. Like camp-grounds, they can be regulated, targeted and warned and most would already carry communication equipment. One risk here is that a withdrawal of insurance cover or heavy-handed regulation may lead to these groups becoming more informal, less visible and further outside formal warning arrangements.

When considering warning priorities we should focus on where they are likely to have the most impact. There are two major areas here: where substantial property losses can be avoided with warnings and appropriate response; and where the risk of large death tolls is high. To concentrate on the second area – the groups most at risk appear to be organised groups of adventure recreationists, campers and vehicle occupants. About half of all flash flood related deaths in the US are people in vehicles (Gruntfest and Handmer, 2001). Failure to warn organised recreational groups leads to inquiries, lawsuits and in Europe criminal charges. At present, the main group missed altogether by warnings appears to be independent recreationists. To confirm this a gap analysis may be useful.

Handling uncertainty

Although not generally set out explicitly in reviews and reports, uncertainty plagues most aspects of flood warning. There are several interrelated dimensions to this, a few are discussed below.

Many parts of Europe and the US are subject to severe flash flooding presenting testing challenges for

warnings and response. *Uncertainty over the timing and occurrence of the flooding as well as the modelling of water spread*, makes flood prediction difficult. Although there are often complaints about the accuracy of prediction – especially if it is around critical heights for road closures or levee failure – the real issue is failure to predict flooding altogether, or to communicate warning messages to those at risk before flooding commences.

Largely inseparable from this point is *uncertainty over the precise location of the areas likely to be affected*, particularly when dealing with rare events and unexpected phenomena and pathways. Floods may affect groups and areas that are not seen as hazardous. Even the best hazard identification process will contain uncertainties and assumptions, for example about what degree and type of flooding to include. Frequently, areas thought to be low- or no-hazard may still be flooded in severe events. Warning systems need to be designed to cover such areas even when they are not identified in advance. Usually however, areas can be identified as of very low, but nevertheless real, hazard. The question then is how to ensure their inclusion in warning system coverage.

Uncertainty over the impact of the hazard. Impact is related to the timing and magnitude of the flood. A flash flood sweeping through a campground at night will likely result in a high death toll. Flooding mid afternoon on a week day will cause maximum disruption in a major city, and so on. Another aspect of this is that late at night few people will receive or respond to warnings with the result that the impact could be much greater in the absence of any damage reducing actions.

Perhaps more challenging is how people respond to warnings, once they have received and understood them, and how this can influence the flood impact. An important

issue here is *uncertainty over appropriate action*. Many warnings do not provide advice on appropriate action. For some hazards, the advice provided may increase the risk; for example, evacuations from relatively secure premises at the last minute for bushfires, or through deep or fast flowing flood waters.

Pre-event awareness and education

Almost all post flood-disaster reports advocate pre-event public awareness raising and education. However, this is no panacea. According to Sorensen's summary of the US experience (2000) "There is no conclusive evidence regarding whether or not a public education or information program actually makes a significant difference of increasing human response to warnings." His statement echoes much earlier findings published by the Illinois Department of Transportation in 1980. He goes on to say that the evidence for effectiveness is mixed, probably because many programs are poorly designed or executed. Other reasons for this statement are that many assessments are poorly designed or executed (see Rohrmann 1999); and in any case there is simply no guarantee of success in advertising, promotion, or in trying to change people's attitudes or behaviour.

This gloomy assessment is not a reason for giving up, however. The current British public awareness and preparedness program being developed by their National Flood Warning Centre suggests one novel approach to building awareness and behaviour change using a strategic campaign over a ten year period. The program is based on the social marketing approach well developed in the field of health promotion

Measuring success

This is an ongoing critical issue. Without a clear and agreed approach to assessing success, or failure, it is not easy to see how we

can be confident that warnings are improving. Recent papers by Rohrmann (1999) and Handmer (2000) examine this issue and the difficulties surrounding rigorous assessment. The NATO volume contains discussion of some alternative approaches (Gruntfest and Handmer 2001). Some reviews deal with the issue implicitly only. Here I simply want to highlight some different approaches:

- Outcomes in terms of lives saved and property loss avoided.
- The primary output of prediction timing and accuracy.
- Assessment of each stage of the warning process against targets such as proportion of audience reached and time taken to reach them.
- Satisfaction with warnings by those at risk.
- Warning system design and function including the quality and reliability of inputs.
- The principles and assumptions underlying design and operation, for example, is it based on the needs of those at risk assessed through processes of community engagement?

The focus here is quite properly on warnings and warning messages issued in advance of the flood, but much can also be done to reduce losses immediately after inundation through salvage and appropriate treatment of flooded items.

However, virtually no guidance is available to those wishing to do this. For businesses, continuity planning provides a proven approach to damage limitation.

Institutional design – task focused

The material reviewed rarely mentioned the real purpose of warnings: that is to assist those at risk. Where it was mentioned, it was in the context of micro issues such as message wording. The fundamental problem of designing warning systems so that they meet community needs was ignored. An exception may be the UK.

In Australia positive examples are provided by some of the regional offices of the Bureau of Meteorology, which have worked to ensure that warning system improvements are based on community needs (Songberg et. al. 1999; Kazazic et. al. 2001).

Warning system models discussed and proposed in the reports are essentially top-down or agency centred. This may be unavoidable, as the agencies generally have the ultimate responsibility for warnings, but may perpetuate warning dissemination and response problems. If user needs and priorities are overlooked or ignored completely, it is difficult to see how warning outcomes will improve, although system performance may show improvements judged by so far – while it is clear that there is much room for improvement in interagency coordination. There is an ever increasing amount of material put in front of the 'public', much of it more attractive (in the sense of being positive and entertaining) and of more immediate interest than flood warning education. Furthermore, if material does not address community needs it is unclear how it will achieve improvements. To address community needs, these needs have to be known by those responsible for warnings. Community engagement is also necessary to manage public expectations of the warning system.

At a more general level, engagement with the communities at risk is a fundamental part of the risk assessment and management process of which warning systems form part. Similar comments could be made concerning the commercial sector. Most warning systems also involve the mass media, at least, if not other private or autonomous groups, and these groups should be part of warning system design.

Another and very important aspect of an agency centred approach is the way the links between the informal and the official are ignored – the



Areas thought to be low risk should be included in warning system coverage.

informal in this context being people's personal networks, information sources and their priorities. No official report discussed this issue, but European research highlights its importance and potential, both for undermining and reinforcing official efforts (Tapsell et al. 1999; Gilbert and Gouy 1998: 24; Parker and Handmer 1997). It is an area where investigation seems urgently needed.

A cross-cutting institutional issue is the frequently mentioned weak legal position of warnings in common-law jurisdictions such as the UK, USA and Australia. But no solutions are advocated in the reviewed reports. The problem is that legal uncertainty may make some officials reluctant to provide information on flood preparedness and appropriate action on receipt of a warning. This appears to be less of an issue in the civil code countries of Europe.

Processes for implementation

For a long time it has not been difficult to find statements on what a sound warning system should achieve, what components it should contain, how messages should be designed and so on. In 1986 Handmer and Ord reviewed the literature to that date and found that such statements had been set out since the 1970s. The recent US and European material reviewed in this paper restates and adds to this literature, but does not set out processes or procedures for developing and implementing a warning system. (For an approach used in Australia see Handmer, Keys and Elliott 1999). Processes are also needed for sharing experience and ideas between the various jurisdictions and agencies involved. In Europe, European Commission funded projects are

attempting to meet this need on a continental wide basis.

Partial exceptions to this general lack of material on process include the US NSTC (2000) recommendation for a public-private sector partnership to leverage government and industry needs, capabilities, and resources to deliver effective warnings. But there is no recommendation on processes to achieve this beyond suggesting that it could be in the form of a not-for-profit corporation. Separately, the report suggested that working groups of stakeholders should be established to support warning system improvements. (See also www.partnershipforpublicwarning.org/). The inquiry following the British floods of Easter 1998 recommended some institutional changes including the formation of a national flood warning centre – which is now well established.

Conclusions and implications

For the US, Sorensen summarises progress with flood warning over the last 20 years with the words: "not much improvement", although he assesses that there is "some improvement" for the prediction/forecast component. This is a little harsh as the death toll appears to have fallen and modest improvements have occurred even as the warning task has become harder. It has become harder because of our expanding use of flood prone areas especially for recreation, and because of changes in society. People may be more difficult to warn as society becomes more atomised – and other features set out in Handmer (2000). This overall negative assessment of warning performance hides substantial progress in many local areas and in some countries such as the UK, as well as the steadily improving reliability of prediction and communication hardware. Sorensen also asserts that warning systems "have not been demonstrated to

have any significant impact on reducing damage to ... private property or ... economic disruption." However, Australian and UK research has long shown the property savings and economic benefits of successful warnings in specific areas. The challenge everywhere is to make such successes widespread and normal.

Making success normal requires, among other things, that the warning task be properly conceptualised as being about enabling communities, enterprises and individuals to take action to reduce their risk and property losses. The US and European material generally fails to make this clear. It has been said for decades that the finest monitoring and prediction systems possible are of no value if they do not serve this purpose – and they cannot serve it by themselves. There are many related issues in warning system success, such as harnessing the benefits of new information and communication technology, inclusion of the informal and private sector, resolving the uncertainty of legal liability, and the need to identify and engage those most at risk from flooding. In Australia, a group whose lives may be at risk from flooding are the increasing numbers occupying low quality housing in riverside caravan parks.

Processes are needed to engage with those at risk and to ensure that their needs drive warning system design and operation. Good practice and experience needs to be shared on a regular basis – and this requires leadership. Australia may need to devote more attention to state or national leadership and to processes for continuous improvement, through engagement of communities and other stakeholders critical to successful risk management.

Acknowledgements

An earlier version of this paper was presented at a joint RMIT University/

Emergency Management Australia Institute workshop "Flood warnings: status and trends", Mt Macedon, 9 April 2002. My thanks to those who provided comments at the workshop, and to Chas Keys of the NSW State Emergency Service and Jim Elliott of the Australian Bureau of Meteorology, for constructive criticism.

References

- Beck, U., (1992), *Risk society – towards a new modernity*. London: Sage.
- Bye P. and Horner M., (1998), *Easter 1998 floods: Report by the independent review team to the board of the Environment Agency. Volume 1*. Bristol: Environment Agency. 30 September
- Crawford, K., (2001), The Killer Tornado Outbreak of 3 May 1999: Applications of OK-First in Rural Communities. In Grunfest, E. and Handmer, J.W. (eds) *Coping with flash floods*. Kluwer.
- Drabek T.E., (1999), Understanding disaster warning response. *The Social Science Journal*. 36(3): 515–523.
- Emergency Preparedness Canada and Environment Canada., (2001), *Managing flood hazard and risk: report of an independent panel*. (Edited by Ashij Kumar, Ian Burton and David Elkin.) Emergency Preparedness Canada and Environment Canada.
- Environment Agency, (2001), *Lessons learned: Autumn 2000 floods*. UK Environment Agency: Bristol.
- Gilbert, C. and Gouy, C., (1998), Flood management in France. In Rosenthal, U. and t'Hart, P. (eds): *Flood response and crisis management in Western Europe: a comparative analysis*. Springer Verlag: 15–55.
- Grunfest, E. and Handmer, J.W. 2001), (eds) *Coping with flash floods*. Kluwer.
- Handmer, J.W., (2000), Are flood warnings futile? 2000–2. www.massey.ac.nz/~trauma/issues/2000-2/handmer.htm
- Handmer, J.W., (2001), Improving flood warnings in Europe. *Environmental Hazards*. 3:19–28.
- Handmer, J.W. and Ord, K., (1986), Flood warning and response. In Smith, D.I. and Handmer, J.W. (eds) *Flood warning in Australia*. Canberra: CRES, Australian National University: 235–257.
- Handmer, J.W., Keys, C. and Elliott, J., (1999), Achieving lasting change in a multi-organisational task: the case of flood warnings in Australia. *Applied Geography*. 19: 179–197.
- Handmer, J.W., Penning-Rowell, E.C. and Tapsell, S., (1999), Flooding in a warmer world: the view from Europe.

In Downing, T.E., Olsthoorn, A.J. and Tol, S.J. (eds) *Climate, change and risk*. London: Routledge: 125–161.

Illinois Department of Transportation., (1980), *Notifying floodplain residents*. Vol 1: An assessment of the literature. Vol 2: Annotated bibliography. Division of Water Resources. Chicago.

Kazazic, E., Baker, A., Zimmerman, P. and Songberg, K., (2001), Traralgon's flood warning system – community access. *Proceedings Planning for the inevitable: Victorian Floodplain Management Conference Traralgon*. October 2001.

May, P., Burby, R., Ericksen, N., Handmer, J.W., Dixon, J., Michaels, S. and D.I. Smith., (1996), *Environmental management and governance: intergovernmental approaches to hazards and sustainability*. London: Routledge.

Mileti, D.S., (1999), *Disasters by design: A reassessment of natural hazards in the United States*. Washington DC: Joseph Henry Press.

National Science and Technology Council (NSTC). (2000), *Effective Disaster Warnings*. Report by the Working Group on Natural Disaster Information Systems. Washington DC.

Parker, D.J. and Handmer, J.W., (1997), The role of unofficial warning systems. *Journal of Contingencies and Crisis Management*. 6(1): 45–60.

Post, K., (2001), Barriers to effective US alert and notification system. Presentation at the Annual Hazards Workshop, Boulder Colorado, July 2001.

Rohrmann, B., (1999), Assessing hazard information/communication programs. *Australian Psychologist*. 33(2):105–112.

Rosenthal, U. and t'Hart, P., (1998), *Flood response and crisis management in Western Europe: a comparative analysis*. Springer Verlag.

Songberg, K., Baker, A., Kazazic, E. and Zimmerman, P., (1999), Tailoring improvements to your flood warning system. *Victorian Flood Management Conference Wangaratta: Floodplains – risks and rewards*.

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

Tapsell, S., Tunstall, S., Penning-Rowell, E.C. and Handmer, J.W., (1999), *The health effects of the 1998 Easter flooding in Banbury and Kidlington*. For the Environment Agency, Thames Region. Flood Hazard Research Centre, Middlesex University, London.

John Handmer, Centre for Risk and Community Safety, Geospatial Science, RMIT University, Melbourne
Email: John.Handmer@rmit.edu.au

Perception by Counter Disaster Personnel of the risks of bulk transport of dangerous goods along the Brisbane-Gladstone transport corridor

This Southeast Queensland research team reports on the wide range of perceptions and responses of disaster personnel to a major dangerous goods road accident scenario.

By Childs, I.R.W., Hastings, P.A [School of Humanities and Human Services, QUT Carseldine, Beams Rd, Carseldine 4034] Carlisle, R.D [Chemical Hazards and Emergency Management (CHEM) Unit, Department of Emergency Services (Queensland)] and Powell, N.[F.I.Fire.E.]

Counter Disaster personnel stationed along the Brisbane to Gladstone road-rail corridor took part in focus groups aimed at eliciting their perceptions of the hazards associated with the bulk transport of dangerous goods that occurs along this route. Six groups, each representing a Disaster District, discussed their responses to a major road accident scenario on a local stretch of the Bruce Highway involving two fuel-carrying tankers and a resulting explosion (BLEVE). That is, a low probability, but high-impact and rapid-onset hazard. A wide range of perceptions and responses to the scenario was noted both within groups and between groups, reflecting differing hazard and risk perceptions, resource availability and mobility, and other geographical factors. Initial management of the hazard, establishing safe zones, effecting evacuation, managing traffic and dealing with casualties were all variously raised as challenges to the emergency services personnel and the frameworks of coordination and response under which they operate. Some settlements along this transport corridor were identified as being notably vulnerable to a dangerous goods accident because of their proximity to the highway, and the relative inaccessibility of the resources needed to cope with such an event.

Project Background

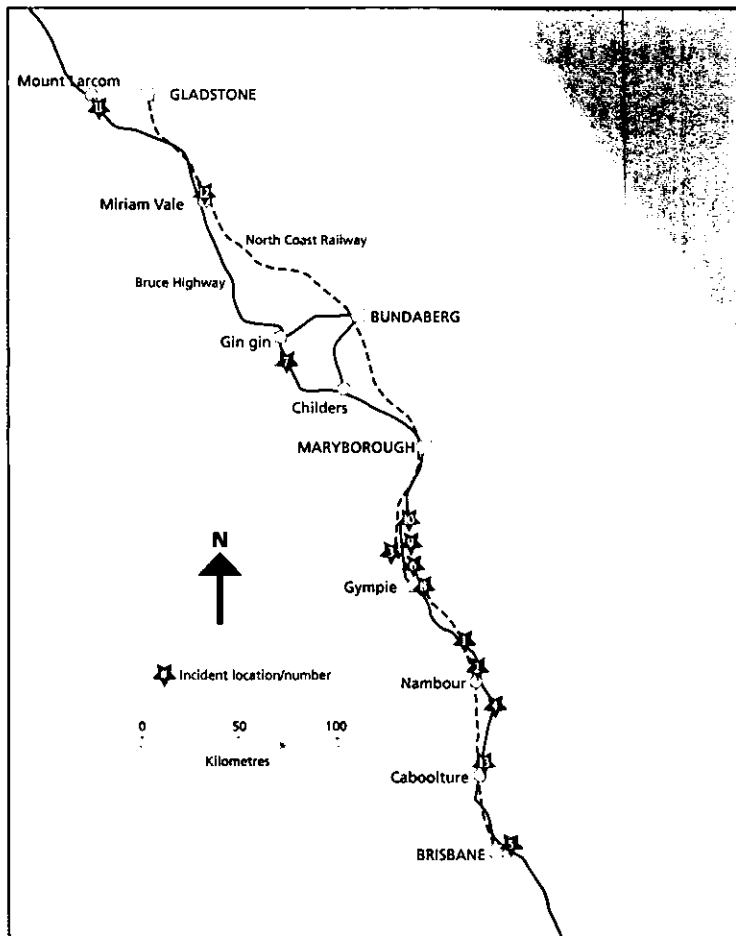
Brisbane and Gladstone, located some 600 km apart on the east coast of Queensland, are the two major heavy industrial centres of Queensland. Both have significant chemical industries, and there is considerable bulk transport of dangerous goods¹ along the Brisbane-Gladstone road-rail transport corridor. Over the past decade, several road accidents occurred involving bulk-transport vehicles carrying dangerous goods along this route, resulting in deaths, injuries and major losses of loads. Childs et. al. (2001) documented these incidents² and broadly identified some of the factors along the corridor that contribute to risk and vulnerability in relation to dangerous goods transport.

The aim of the present research was to capture perceptions held by key emergency services personnel (primarily responsible for local counter-disaster operations), government and community workers located in several centres along the Brisbane-Gladstone route regarding the risks of the bulk transport of dangerous goods. The foci of the present study are to elicit from these groups: levels of awareness of dangerous goods travelling along the Brisbane-Gladstone route, perceptions of the risks of potential emergencies involving such materials, and envisaged response and recovery strategies for an accident scenario.

The research results presented here summarise the main elements of a report submitted to the Queensland Department of Emergency Services (DES) in December 2001 following a joint initiative between DES (CHEM Unit) and the Queensland University of Technology (School of Humanities and Human Services).

1 The term 'dangerous goods' is used in relation to chemicals considered to be sufficiently hazardous to require regulation of their transportation under the Australian Dangerous Goods Code (the ADG Code).

2 In 2001, there were three additional incidents at Mt. Larcom, Miriamvale and Caboolture resulting in two deaths.



Map 1: The Brisbane-Gladstone Transport Corridor. Refer to Childs et. al. (2001) Table 1 for incident details.

The Brisbane to Gladstone Transport Corridor

A range of dangerous goods travels via bulk tankers and intermediate or smaller containers along the Brisbane to Gladstone transport corridor. These include petroleum, liquefied petroleum gas, liquefied ammonia, molten sulfur, liquefied chlorine, concentrated hydrochloric acid, compressed hydrogen, and sodium cyanide. The primary road route comprises Brisbane's Gateway Motorway, the Bruce Highway (National Route 1) and feeder roads to/from regional centres and Gladstone. The rail link (North Coast railway) closely parallels the highway, with the two routes being rarely separated by more than a few kilometers except in one section between Maryborough and Gladstone (Map 1). Both routes pass either through or near numerous settled areas, including northern Brisbane localities, the Sunshine Coast Hinterland, regional centres and

smaller towns. Although the Bruce highway now bypasses several of the larger centres (e.g. Bundaberg, Nambour and Caboolture) by several kilometers, the highway remains the 'main street' for smaller towns such as Childers.

Qualitative analysis of the combination of risk factors (impact radius of potential *dangerous goods* emergencies, population potentially exposed, local geography and highway conditions and likely level of emergency resources) suggested varying levels of potential risk and vulnerability in the present dangerous goods context for several geographical regions along the route (Childs et. al. 2001). With the expected increase in the quantity of chemicals passing along the corridor commensurate with the projected population³ and industrial growth in Southern and Central Queensland⁴, there is a need to systematically assess risks and community vulnerability along the corridor with a view to contributing to the preparation of emergency services for dealing with any hazard arising from such transport. While the probability of a catastrophic accident is very low, the consequences of such an accident, should it occur in a built-up area, could be very severe. The potential risk from the use and transport of dangerous goods throughout the region must, however, be balanced against the many economic, employment and other benefits that accrue from these activities.

Methodology

The broader context of the research was a disaster/emergency risk-management framework, based on the Australia/New Zealand Standard on Risk Management (AS/NZ 4360: *Risk Management*) and an approach to vulnerability assessment outlined by the Australian Emergency Management Institute (Hunter, 1996)⁵. This includes a description of community risk perception. While the availability of physical resources is an important factor in coping with any disaster, the effectiveness of such resources is a function of the quality of emergency preparedness and planning at the local level. Preparedness and planning, in turn, is a function of numerous factors, but is anchored by risk perception (e.g. Young 1998; Zamecka and Buchanan, 1999). Community vulnerability to the hazards associated with the bulk transport of dangerous goods, thus, depends in the first instance on awareness and risk perception of emergency response personnel along the route, and on their perceptions of possible response and recovery

3 *Population Trends and Prospects for Queensland 2001*, available from the Planning Information and Forecasting Unit, Department of Local Government and Planning, Queensland.

4 Mooted developments include a new alumina refinery at Yarwun; a magnesium production facility at Rockhampton (Stanwell), about one hour's drive north of Gladstone; an ethylene dichloride plant at Gladstone.

5 Hunter's (1996) model includes several stages of risk evaluation and assessment: (i) description of the hazard, the community, the environment and the emergency services; (ii) analysis of interaction between the hazard, the community, the environment and the emergency services; (iii) assessment of community risk perception; (iv) ranking of vulnerabilities; and (v) comparison of risk to existing risk criteria.

Table 1: Disaster Districts where research focus groups were held, with corresponding scenario locations.

DISASTER DISTRICT	SCENARIO LOCATION	DESCRIPTION
Redcliffe	Burpengary	Highway passes through built-up area with entry ramp and highway speed limits*.
Sunshine Coast	Cooroy	Highway passes near built-up area with entry ramp and highway speed limits*.
Gympie	Gympie	Highway passes through extensive built-up area with intersections and urban speed limits*.
Maryborough	Howard	Highway passes through built-up area (small town) with intersections and urban speed limits*.
Bundaberg	Gin Gin	Highway passes through built-up area (small town) with intersections and urban speed limits*.
Gladstone	Gladstone South (Kinkora)	Feeder road from highway passes through extensive built-up area with intersections and urban speed limits*.

* Highway speed limits – 90–110 km/h; urban speed limits – 60–80 km/hr

strategies in potential emergencies. The methodological challenge for the research was therefore to elicit and capture information relevant to these factors.

Data collection

Focus group discussions with appropriate emergency services personnel along the route were used to gather perception and response information concerning the risks of dangerous goods incidents. At each focus group, general questions addressing risk perception, and a local road accident scenario involving bulk dangerous-goods transport, provided the catalysts for discussion (see Map 1 and Table 1.). Given the scale of the proposed scenario (see below), it was resolved to access Disaster District Control Groups (DDCG)⁶ for the project because of their membership of senior emergency service personnel and other representatives (local government, government services, health professionals etc.). It was later noted that less senior, operational personnel and crews often attended the project's focus group meetings, providing a practical perspective. Although access to emergency services personnel was gained via the DDCG, the committee itself was not the focus of the present study, rather the attending Emergency Services representatives were.

Focus group meetings were held in the six non-metropolitan Disaster Districts along the Brisbane-Gladstone route (viz. Redcliffe, Sunshine Coast, Gympie, Maryborough, Bundaberg and Gladstone).

Perceptions of the risks posed by the scenario and possible responses to these risks were sought from focus-group participants. When necessary, the focus group facilitator (project research officer) stimulated

discussion through a series of structured questions. Areas of investigation and subsequent data-capture were summarised under the headings of: awareness of dangerous goods passing through local areas; communication; impact assessment; mobilisation of resources; and location of resources. Discussions arising from the scenario were further directed by the facilitator to consider the progression of responses from pre-incident, through to event response, post-incident and recovery phases. Generally discussions took approximately two hours and were scheduled as part of a DDCG meeting. Police, Fire, State Emergency Service (SES) and local government institutions were well-represented. The Ambulance Service and medical authorities were represented at most but not all meetings.

Several information-gathering and recording strategies were employed by the researchers. One of the project's chief investigators was present as an observer on each occasion to record discussion points. In addition, participants (identified by service-affiliation and not as individuals) were asked to write their key thoughts on formatted information-recording sheets provided (structured as described above). Usually within three days of each focus group, the research team met to identify the key issues that had emerged.

The scenario

In the case of a dangerous goods emergency or chemical disaster, the onset speed of the hazard is usually rapid and, consequently, warning time for evacuations is most likely to be minimal or non-existent. Thus, in terms of community vulnerability one is dealing basically with pre-existing risk perceptions, the capacity for rapid and

⁶ As a result of the State Counter Disaster Organisation Act, 1975, Disaster Districts, Disaster District Control Groups (DDCG) and Local Government Counter Disaster Committees (LGCDC) were established in Queensland. Membership and functions of the separate groups/committees are outlined in *Counter Disaster and Rescue Services* (2001a; 2001b)



Participants thought the threat to their communities from the transport of bulk chemicals/dangerous goods was increasing.

effective response by emergency services and the community's capacity to respond post-event. The latter is particularly related to the resources of the emergency services to evacuate post-event, and to cope with potential casualties and injuries resulting primarily from the effects of fire, blast or toxic gas release.

The written scenario presented to focus groups in the present research involved a collision between a petrol tanker (20,000 litre) and an LPG tanker at a local intersection. This resulted in a substantial fire and a BLEVE⁷ approximately 15 minutes later. Locations varied from an isolated stretch of the Bruce highway near the small settlement of Howard to the busy northern fringe of the Brisbane metropolitan area (Caboolture). Potential blast and danger zones were presented visually to the focus groups in the form of a short video of a BLEVE incident⁸, maps and air photos. Under the scenario, the immediate consequences following the BLEVE were 20 casualties, 40 severe injuries and traffic banked up on the Bruce highway. The focus groups were also asked to consider questions of community recovery in the medium and longer term.

Emergent issues from focus group meetings

This research proceeded on the understanding that individuals would not be directly identifiable in the reporting of results. Therefore, the following information is presented in a manner, and at a resolution, appropriate to that understanding. Only when

comments are general by nature, and do not directly identify individuals, are they attributed to particular focus groups or participating organisations. Some comments reported do not relate directly to the scenario used, but rather to response to dangerous goods emergencies in general. The descriptions below sometimes reflect perceptions of senior officers anticipating what crews attending incidents would do, and sometimes reflect the perceptions of those who were likely to be actually attending an incident at a given time. Attendance and participation in focus groups on the day was the determinant of sources of perception.

Awareness and risks of chemical hazards

Participants were generally aware of a wide range of hazardous materials transported along the road and rail routes in bulk containers. Fuels (petroleum, diesel LPG), farm chemicals (fertilisers and pesticides), chlorine, ammonia, acids, explosives and cyanide were the most frequently nominated. From the knowledge of the researchers, these results indicate a reasonable picture of the types of dangerous goods moving along the route. Nevertheless, it was commonly reported as a cause for concern that information regarding quantities and timing of shipments was not easily available to local emergency service personnel. Focus-group participants were overwhelmingly of the opinion that the threat to their communities from the transport of bulk chemicals/dangerous goods was increasing.

Responses to scenarios

In all focus groups there was a degree of initial skepticism by some individuals regarding the probability of the scenario eventuating in reality. In most cases this skepticism dissolved (a) after the BLEVE video (Cairns 1987) was shown, and (b) after initial discussion established a recognition of the serious consequences of such an event, albeit at a low probability of occurrence.

There was no consistency of emergency response to the scenario across the focus groups and, hence, no consistent indication that a rote response would generally be elicited from the invocation of a standard set of operational procedures and instructions. The scope of the present research does not, however, extend to evaluating the envisaged responses in terms of the formal procedures, but simply notes this inconsistency and seeks to contextualise it within overall emergency response and community vulnerability.

Initial risk perception and response

Focus groups indicated that, in the initial stages of the scenario (i.e. pre-BLEVE and during the explosive phase) indicated that Queensland Fire and Rescue

7 BLEVE. Boiling Liquid Expanding Vapour Explosion. Computer modelling carried out by the CHEM Unit, Queensland Department of Emergency Services, indicates that a BLEVE of a 14 tonne LPG tanker would have injurious thermal effects within a radius of 240 metres.

8 A video compiled by QFRS from a set of still photographs of the Cairns BLEVE in 1987.

Service (QFRS) officers, rather than Police, would take the leadership role on the ground if present.

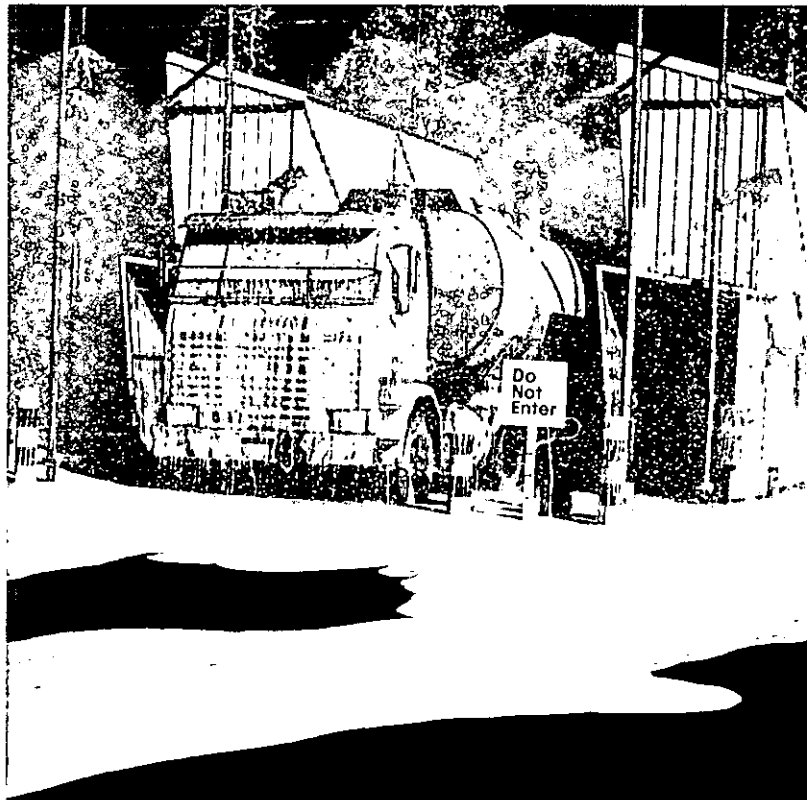
Two broad response patterns were evident in dealing with the pre-BLEVE fire, should Queensland Fire and Rescue Services (QFRS) crews arrive in time. One view was that if QFRS could get to the scene quickly enough (within minutes) and play water onto the LPG tanker to cool its temperature, a BLEVE could be avoided. Some QFRS officers considered that taking such action, would lead to a high probability of injury or death to attending personnel placed in the danger zone. Nevertheless, an emergent view was that this approach may 'buy time' for evacuating the public. Furthermore, some QFRS participants felt that pressure from public and community expectations would mean that crews would attempt to fight the fire – even if the professional judgement suggested that to do nothing, except to evacuate the area, was the best action. Other QFRS officers made a much more conservative initial risk assessment and insisted that 1500m clearance be achieved from the accident site. One group commented that after conducting an evacuation there would be little more that they could do to modify the hazard.

Evacuation and establishing 'safe' zones

A critical question explored by all focus groups was how to effect an initial evacuation of crowded areas at risk in the post-accident pre-BLEVE period; for example shopping centres adjacent to the accident scene, and motorists in vehicles 'banked up' along the highway. When the need to evacuate the public from the accident vicinity was not raised by focus groups, the question was prompted by the facilitator.

There was general acknowledgment of the potential for an initial lack of coordination among the emergency services in establishing safe zones and evacuating those deemed at risk. This was arguably driven by the unfamiliarity, speed and scale of the proposed incident. Focus group participants were unaware of specific evacuation plans under the circumstances of a rapid-onset hazard such as the one presented. Given that the available time for the required evacuation was very short (i.e. 15 minutes under the scenario), participants generally acknowledged that it would probably have to be achieved by first-arriving QFRS or police officers.

A concern of several police officers who had had experience with evacuations was the difficulty of managing the public under circumstances of danger. Given the scenario, the comment was made that it was easy enough to stop traffic, but it may be quite difficult to persuade people to leave their vehicles unattended in order to evacuate an area. Police participants reported resentment from members of the public unwilling to accept Queensland Police Service (QPS) authority when



Skepticism about the likelihood of the disaster scenario dissolved after participants were shown evidence of previous events.

being asked to interrupt their business or activities and to leave an area. State Emergency Service volunteers were noted to face similar issues. The solution was seen to be the declaration of an 'emergency situation' under the *Public Safety Preservation Act, 1976*⁹ which gives additional powers to police.

Establishing safe distances for the public (and the emergency services) and maintaining these was seen as another problematical issue. Hazard identification and risk perception on the part of emergency services personnel at the scene clearly becomes critical in this context. One focus group commented that when an evacuation zone had been established, the public would 'take the lead' from emergency service personnel as to the distances that should be maintained from an incident. The problem was that in a situation where emergency service personnel have entered the danger zone, the public may underestimate the safe distance required, and, without good crowd control members of the public may enter the danger zone.

Discussion of the practicalities of achieving a successful evacuation and controlling crowds under the scenario conditions raised some communication issues. One interesting line of inquiry questioned how emergency services personnel at the scene would rapidly and authoritatively issue evacuation orders directly to the public. Do police officers possess public address systems

⁹ This can be invoked very quickly by a commissioned Police officer, even if not present at the scene.

or hand-held loud hailers in their vehicles? Several police respondents conceded that such equipment may not be readily available, given the rapid-onset hazard.

Traffic control

One of the main topics of discussion in several groups was how to manage gridlocked traffic caused by such an accident on the highway. This problem was particularly severe for the Burpengary scenario location (Redcliffe Disaster District focus group) because of heavy traffic just north of the metropolitan area. Relaying information both among emergency service personnel and to the public (i.e. stationary gridlocked motorists), clearing congestion on the highway, diverting traffic to side-roads and evacuating casualties were seen as critical problems. The possibility was raised that some critically injured victims may actually expire before they could be evacuated because of delays caused by traffic congestion. *A suggestion was that this situation could be ameliorated by the use of helicopters.* In other less busy locations, however, the traffic control issue was regarded as much less of a problem as drivers may have more room to manoeuvre and may have local knowledge to take alternative routes.

Resource availability and mobilisation

A key concern for most focus-group participants was the availability and mobilisation of adequate resources to initially deal with the accident (and hazard), and then the chaotic aftermath of the scenario. At all meetings, emergency service representatives voiced strong concern over the accessibility of appropriate resources at the incident locations. Issues involved the availability of: emergency service personnel (particularly experienced personnel), communications, medical aid, equipment, water and foam.

Across all groups and scenarios, it was generally accepted that off-duty personnel would have to be recalled, and resources of surrounding localities requested. Given a fast-onset hazard, the time taken to contact such personnel and for them to arrive at the scene were significant issues. 'Next available' QFRS, QAS¹⁰ and QPS resources could be up to 30 to 45 minutes travel time away and it was not always clear that even local services could reach the scene 'pre-BLEVE'. Furthermore, highway traffic congestion was deemed likely to impede the arrival of emergency services, and senior officers, whose 'on site' presence would be desirable in the circumstances. State Emergency Service (SES) personnel, generally viewed as having potential roles in crowd control and traffic monitoring, could take an hour or more to mobilise, even if locally available.

The availability of adequate and experienced personnel at the scene was viewed as potentially important to

aspects including hazard and risk identification, and evacuation. In some regions and remote localities, it was suggested that the initial tasks of hazard identification (i.e. recognising the potential for a BLEVE) and the immediate response may fall to an auxiliary fire officer (e.g. Rural Fire Service). There was speculation that these operatives would not be adequately resourced, and may not recognise the risk of a BLEVE.

One focus group raised the problems of establishing a command post and effecting evacuations where incidents occurred in areas serviced by small or 'single officer' police stations. Settlements along the Brisbane-Gladstone corridor were specifically identified as being representative of these contexts. Therefore, from the perspective of resource accessibility, such small communities may be the most vulnerable to this type of hazard.

Further discussion of the experience levels of emergency services personnel likely to attend the emergency scene occurred at some meetings. This was particularly raised by police representatives in one region where there are high proportions of relatively inexperienced officers. This was seen as a potential problem if junior officers were left with the difficult task of effecting a rapid evacuation of members of the public from the high risk blast area (assuming such a zone had been defined). This situation is exacerbated where senior officers would not be able to easily access an incident location due to highway gridlock. QAS crews were also identified as likely to have inexperienced crew members in some areas. QFRS cited their policy of maintaining a crew of 'balanced experience' on fire trucks with no more than one junior (i.e. <3 years experience) officer on an operational vehicle at any one time.

In terms of communication infrastructure, some problems were noted with the mobile phone network encountering 'dead spots' along some stretches of the highway. A similar problem was also noted for dead-spots for 2-way radios in some areas. One group commented that 'truckies' with radios may provide an opportunity to gain first-hand information from the incident scene in the early stages, and where access problems existed for initial emergency service vehicles.

Given the specific nomination of casualty numbers within the scenario, access to, and mobilisation of emergency medical support was seen as critical. Discussion of the treatment of patients with severe burns turned to the allocation of hospital beds. From the advice of medical personnel participating in the focus groups, the capacity of most regional hospitals (relevant to this study north of Brisbane) to deal with emergency burns victims appears to be limited to 3-4 beds. It was suggested that the further allocation of burns victims would most likely be handled from Brisbane, and

involve patients being transported to Brisbane hospitals by air. One group speculated that this mode of patient transportation could take several days if there were multiple casualties. This group also raised the issue of 'tough decisions' having to be made in terms of allocating relatively scarce medical resources/opportunities to the injured at the time of the incident.

There was a strong opinion expressed that heavy machinery for site works should be available through the local government channels. Provision of adequate protective clothing (level 2 or 3 suits) for QFRS officers and auxiliary fire officers dealing with toxic releases in small towns was also raised.

Recovery phase

Following considerations of immediate response to the scenario, the facilitator directed discussions to the longer-term recovery phase. In recovery, there is an issue of differentiating the broader and longer-term roles of 'disaster management' and the shorter-term roles of 'incident management' that may directly involve operational emergency services and SES personnel. Depending on the perception of 'disaster' vs. 'incident', different roles and responsibilities within the disaster management framework should be activated. This relates to how well the various players in Emergency Services understand the impact that the event has on the community. The disaster management system only responds if the impact on the community cannot be adequately managed by local emergency services and existing community arrangements¹¹. Investigation of this aspect is beyond the scope of the current research, but may have implications for explaining some of the observations reported below.

Wider community dislocation

Social dislocation ensuing from the scenario presented was not generally raised as a planning issue by focus-group participants in this project. This may reflect a need to prioritise the management of the immediate, physical threat and/or result from perceptions of the scenario and committee roles as indicated below. Only in one group did an individual raise the issue of social dislocation; the comment being that the affected community would be 'in shock'. Another group was prompted to discuss longer term social recovery, but offered few specific ideas on the needs or management of such. General uncertainty surrounded the issue of organisational responsibility dealing with the wider community, particularly in the immediate and medium-term post-incident phase. In the longer term this responsibility would be that of relevant government departments and community organisations (e.g. Department of Families, Red Cross, etc.)

Further issues: roles of committees

The present research used Disaster District Control Group (DDCG) meetings to access emergency services personnel to investigate their perceptions of a dangerous goods transport incident and associated rapid-onset hazard response. The research focus was not specifically on critiquing the roles and operations of organisational structures, such as DDCGs or Local Government Counter Disaster Committees (LGDCGs), although the relevance to the current research of their separate functions is clearly recognised. Nevertheless, comments and observations made at focus group meetings suggest that a broader set of issues can be distilled in this context, and await further investigation. The following represents an attempt by the researchers to articulate these issues, based on information and observations gained from the focus group meetings and follow-up work.

One issue to emerge from the research relates to the roles of, and links between the DDCG and the LGCDC. The relative responsibilities of these committees is established within State law and disaster plans (State Counter Disaster Organisation Act and the State Counter Disaster Plan). Nevertheless, faced with the practicalities of responding to the scenario presented in the project (a rapid-onset, high impact technological hazard) relative roles and activities of the groups, as perceived by personnel involved in response activities, were sometimes blurred. Again, the researchers caution that this observation emerged from focus group discussions, and its investigation was not originally part of the research design.

Opinion varied widely on the appropriate responsibilities of the DDCG and the LGCDC in the case of the specific scenario presented. The researchers noted varying degrees of willingness to take ownership of the scenario situation across the groups. In some, it was suggested that DDCGs would be quickly activated, while not in others. It was recognised that the event would unfold too quickly for either the DDCG or LGCDC to convene, let alone play an effective role initially. The immediate response phase would most likely be dealt with exclusively by operational personnel. Later response and recovery is therefore the time for potential responsibility for these committees. The DDCG was seen as playing a role in the recovery phase of a disaster in some focus groups, while in others members saw their group as having no role at all in the longer-term recovery phase.

The distinction in determining the roles of the two committees was contingent upon the perception of the particular research scenario as being either a 'disaster' or an 'incident'; the former being a larger scale and

¹¹ Wayne Ripper, Director, Disaster Operations, Counter Disaster and Rescue Services, Queensland Department of Emergency Services.

therefore a more serious event, particularly in terms of the degree to which the community is able to cope. If an event is deemed to be a 'disaster' (i.e. beyond the normal coping capacity of the community), a key role is activated for the DDCG, whereas if it were a 'major incident', this may not be the case, and responding

emergency services, the QPS and LGCDC maintain key responsibilities. The question as to whether the scenario of the present research was a disaster or an major incident was therefore critical, yet the focus groups were not consistent in categorising the scenario as either a disaster or an incident.

Key Recommendations

Based on the project results, the researchers suggest the following recommendations

Recommendation 1: Awareness of chemical hazards

That opportunities be identified to improve the availability to local emergency services of information regarding the transport of dangerous goods along the Brisbane-Gladstone corridor.

A major cause for concern was that information regarding quantities and timing of shipments of dangerous goods through communities was not easily available, and that hazards from such sources were increasing. A record of average annual movements of bulk dangerous goods loads along transport routes could be established. An administrative system would be needed to collate and analyse the data relating to both road and rail transport.

Recommendation 2: Responses to scenario

That community vulnerability to dangerous goods transport along the Brisbane-Gladstone corridor be further investigated by extending existing hazard mapping programs to include bulk transport of dangerous goods.

The hazard mapping program within the Department of Emergency Services could be developed further to integrate vulnerability associated with the hazard. Furthermore, due to the relative rarity of major dangerous goods incidents or disasters to provide experience, training based on mapped databases could become the primary mechanism for improving emergency response.

Recommendation 3: Resource availability and mobilisation

That the causes of the wide variability found in response between the focus groups to the research scenario be investigated by considering factors such as local resources, location and training.

Availability and mobilisation of resources were identified as major issues. Limited resources may be an unavoidable reality in small centres. An integrated strategy utilising the resources of a network of larger urban nodes along transport routes could improve rapid deployment of specialised resources to smaller centres when needed. More effective communication systems would reduce mobilisation times.

Recommendation 4: Evacuation

That community safety programs along the corridor include an education component dealing with appropriate responses by members of the public to emergencies arising from the transport of dangerous goods through communities.

The need to protect public safety by prompt evacuation in the case of dangerous goods emergencies was well recognised. Public behaviour and acceptance of directives from emergency service personnel in such circumstances could be improved if public awareness of such hazards and appropriate behaviour strategies was increased.

Recommendation 5: Recovery

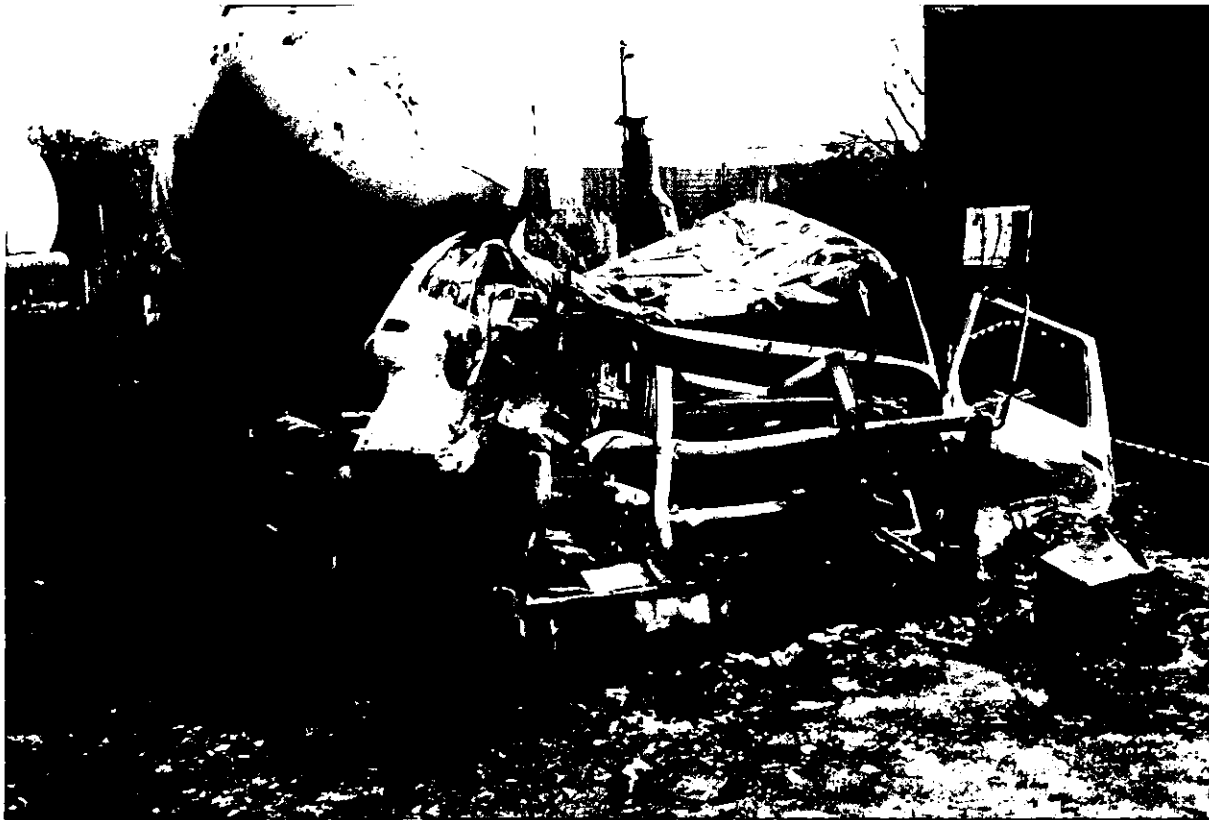
That the need to assist communities recover from dangerous goods disasters be clearly recognised in the disaster management system.

While the need to pay close attention to longer-term community recovery from natural disasters is well-recognised by the disaster management system, it is possible that this may be overlooked in the event of a major dangerous goods incident.

Recommendation 6: Roles of committees

That the interpretation of rapid-onset, dangerous goods emergencies as either incidents or disasters be further investigated. This would clarify the relative operational roles of Disaster District Control Groups and of Local Government Counter Disaster Committees in responding to this type of hazard.

While the immediate incident response phase in the case of a dangerous goods emergency would be dealt with exclusively by operational personnel, perception of the role of the two levels of disaster management committees (Disaster District Control Group and of the Local Government Counter Disaster Committee) in the recovery phase would hinge upon whether the emergency was regarded as a major incident or a disaster. Further examination of these roles is needed to clarify this issue.



At each focus group, questions addressing risk perception and a local road accident scenario involving bulk dangerous good transport provided the catalysts for discussion.

References

- Childs, I. R. W., Carlisle, R.D. and Hastings, P.A., (2001), The Brisbane-Gladstone Transport Corridor: identification of risk and vulnerability for the bulk transport of dangerous goods. *Australian Journal of Emergency Management*, 15, 4, 54-57.
- Childs, I. R.W., Hastings, P.A., Carlisle, R.D. and Powell, N., (2001). *Perception by Counter Disaster Personnel of the Risks of Bulk transport of Dangerous Goods Along the Brisbane-Gladstone Transport Corridor*, Research Report, Queensland Department of Emergency Services, 30pp.
- Counter Disaster and Rescue Services, (2001a), *The Queensland Disaster Management System* Department of Emergency Services, March, 12pp.
- Counter Disaster and Rescue Services, (2001b), *Disaster Planning for Local Government* Department of Emergency Services, March, 8pp.
- Federal Office of Road Safety, (1998), *Australian Code for the Transport of Dangerous Goods by Road and Rail*.
- Hunter, C., (1996), A New Approach to Emergency Management, Education and Training in Australia. *Australian Journal of Emergency Management*, Spring, 12-19.
- Standard Association of Australia, (1997), *HB76 Dangerous Goods: Initial Emergency Response Guide*.
- Young, E., (1998), Dealing with hazards and disasters: risk perception and community participation in management. *Australian Journal of Emergency Management*, 13, 2, pp 14-16.
- Zamecka, A. and Buchanan, G., (1999), *Disaster Risk Management*, Queensland Department of Emergency Services.

Acknowledgements

The present research has been supported by an Australian Research Council grant, 1998-1999.

The researchers gratefully acknowledge the support of the Queensland Department of Emergency Services in making resources and expertise available to the research.

The participation of Mr. Nick Powell F.I.Fire.E. in facilitating focus group meetings is gratefully acknowledged.

The research could not have proceeded without the cooperation and participation of the following groups and individuals in the administration of focus groups. Their valuable assistance is gratefully acknowledged:

- Redcliffe Disaster District Control Group, Inspector Ken Benjamin (Chair) and Sergeant Andy Besant
- Sunshine Coast Disaster District Control Group, Inspector Neil Behm (Chair) and Sergeant Ian Tinker
- Gympie Disaster District Control Group, Inspector Veronica Cane (Chair) and Sergeant Pat Armstrong
- Maryborough Disaster District Control Group, Inspector Mal Churchill (Chair) and Sergeant Chris Sidey
- Bundaberg Disaster District Control Group, Inspector Phil Wardrope (Chair) and Sergeant Erwin Hoffman
- Gladstone Disaster District Control Group, Inspector Gary Harland (Chair) and Sergeant Dave Thomas

The research team also gratefully acknowledges:

- Mr. Jeff Shelberg, Area Manager, Queensland Ambulance Service.
- Mr. Tony Bitz and Mr. Dennis Duquemin, Qld. Dept. of Main Roads, for assistance with air photo resources;
- Ms Janelle Quelch (formerly Scientific Advisor, CHEM Unit) for conducting quantitative risk modelling for the scenario; and
- Mr Michael Walker, Queensland Transport, for initial advice and discussion on transport issues.
- Mr. Wayne Ripper, Director, Disaster Operations, Counter Disaster and Rescue Services, Queensland Department of Emergency Services, for advice and discussion on the final draft of this report.
- Dr. Paul Barnes, formerly Manager, State Community Safety, Queensland Fire and Rescue Services.

For further information please contact: i.childs@qut.edu.au

Perceived change in risk of natural disasters caused by global warming

Contrary to insurance company perceptions, *Chris de Freitas* argues that although the future state of global climate is uncertain, there is little scientific evidence to suggest any change will result in an increased risk of natural disasters.

By C R de Freitas, School of Geography and Environmental Science, University of Auckland, PB 92019, Auckland, New Zealand

Natural hazards causing disasters that lead to human suffering are as much a product of the social, political and economic environment as they are of the natural environment. It follows, therefore, that the risk associated with natural hazards is in part a social construct that, as Young (1998) has pointed out, is perceived differently by all of us and must be defined with this mind. For example, risk is defined by Emergency Management Australia (1995) as the perceived likelihood of given levels of harm.

With this in mind, one major determinant of risk is the perceived trends in disasters. Given that a) weather hazards are the most significant natural hazards in Australia (Coates, 1998) and elsewhere (Downing et. al., 1996; Dlugolecki et. al., 1996; Kattenburg et. al., 1996; McCarthy et. al., 2001) and that b) in the latter part of the 20th century insured losses have been unprecedented (Dlugolecki et. al., 1996; Kattenburg et. al., 1996), the possibility of worsening trends have, understandably, attracted the attention of the insurance industry.

There are a number of possible reasons for increasing losses: a) a greater concentration of people and high value property in vulnerable areas, mainly coastal; b) business processes have become more susceptible to damage; or c) that changes have occurred in the frequency and severity of extreme climatic events. The last of these is in line with expectations of climate change resulting from an enhanced greenhouse effect and this too has attracted the attention of the insurance industry. Dlugolecki et. al. (1996, p. 541) comment "It is a common perception in the insurance industry that there is a trend toward an increasing frequency and severity of extreme climate events." The important

question arises as to the extent to which these expectations are justifiable.

Evidence versus perceptions of worsening conditions

It is not uncommon to see media reports attributing the occurrence of extreme climate events to global warming. The problem is that no matter how outrageous the tale it becomes the truth if it is told often enough, or at the very least shapes perceptions of shifting risk. According to the United Nations Intergovernmental Panel on Climate Change (Houghton et. al., 1996, p. 173), "Overall, there is no evidence that extreme weather events, or climate variability, has increased, in a global sense, through the 20th century..." The 2001 IPCC Report (Houghton et. al., 2001b, p. 5) states that "no systematic changes in the frequency of tornadoes, thunder days, or hail are evident..." The increasing dollar cost of storm and other weather related events could be accounted for by a rise in the value of development and number of properties, especially in tropical cyclone prone areas (Changnon et. al., 1997; Pielke and Lansea, 1998; Kunkel, Pielke and Changnon, 1999). In fact, there is great deal of research which, taken together, suggests that extreme climate events may become both less frequent and less severe when the planet warms. Some of this work is discussed here.

Storms

In the Atlantic region, the number of intense hurricanes declined during the 1970s and 1980s, and the period 1991–1994 experienced the smallest number of hurricanes of any four years over the last half century (Idso et. al., 1990; Landsea et. al., 1996; Bengtsson et. al., 1996; Zhang and Wang 1997; Murphy and Mitchell, 1995). There is also evidence from Europe that suggests a similar trend. For the period 1896–1995, Bielec (2001) analysed thunderstorm data obtained at Cracow, Poland, which is "one of the few continuous records in Europe with an intact single place of observation and duration of over 100 years." From 1930 onward the trend is negative, revealing a linear decrease of 1.1 storms per year from 1930 to 1996. Bielec (2001)



Future global warming may lead to fewer and less intense El Niño events. (Andrus, 2002)

also reports there has been a decrease in the annual number of thunderstorms with hail over the period of record, and there has been a decrease in the frequency of storms producing precipitation greater than 20 mm.

Pirazzoli (2000) analysed storm surges, atmospheric pressure and wind change and flooding probability on the Atlantic coast of France over the period 1951–1997. He found that climate variability is decreasing. Specifically, the work shows that the number of atmospheric depressions and strong winds that cause storm surges in this region are becoming less frequent resulting in reduced frequency and severity of coastal flooding.

Nguyen, and Walsh (2001) simulated the occurrence of hurricanes in the Australia region using a general circulation model (GCM) that assumes a tripling of the atmospheric concentration of carbon dioxide. The results showed that the numbers of hurricanes declined in a greenhouse-warmed world and that the decline is statistically significant. In a study of Atlantic hurricanes, Goldenberg et. al. (2001) show that they occur in distinct multidecadal cycles and are linked to sea-surface temperature anomalies in the Atlantic Ocean's main hurricane development region. Warm anomalies are associated with increased major hurricane activity; cold anomalies with suppressed activity. Goldenberg et. al. (2001) suggest that increases in the frequency of big Atlantic hurricanes are due to the natural variations in hurricane frequency and intensity rather than global warming.

The most important energy source for extratropical storms is the temperature difference between the tropics and the poles. Most GCMs predict that the greatest warming will occur over the high latitudes in winter with relatively little warming in the tropics and around equatorial latitudes. This implies reduced temperature variation since such variations result from air moving from one latitude to another. Thus, according to these predictions, the future contrast between the polar and equatorial latitudes will lessen, producing a weaker gradient and fewer and less intense storms. Consistent with this, the IPCC 2001 Summary for Policymakers (Houghton, 2001b) notes that no significant upward trends have been identified in tropical or extratropical storm intensity and frequency.

Floods and droughts

Lins and Slack (1999), concerned about possible increases in floods and droughts accompanying global warming, looked directly at stream flow from hundreds of rivers in the United States. They state:

“The pattern indicates that baseflows are increasing (which suggest that drought is decreasing), median or average flow stream flow is increasing, but annual maximum flows (including floods) are neither increasing nor decreasing. Hydrologically, the nation appears to be getting wetter, but less extreme.”

Lins and Slack (1999) conclude that, as the surface air temperature of the globe gradually increased through 20th century, the conterminous United States became

Table 1: Day-to-day air temperature variability for the United States, Peoples Republic of China and the former Soviet Union, shown as mean linear trend (°C per decade) in daily temperature variability values (Michaels et. al., 1998).

Air temperature	USA	China	USSR
Maximum			
January	-0.19	-1.13	0.07
July	-0.13	0.06	-0.02
Minimum			
January	-0.26	-1.32	-0.37
July	-0.19	0.06	-0.08

wetter but less variable at the extremes, where floods and droughts occur. In a similar study, Molnar and Ramirez (2001) analysed precipitation and streamflow trends for the period 1948–1997 in the Rio Puerco Basin of New Mexico found no change in high-intensity precipitation.

Working on the assumption that the best real-world analogue of future global warming is past periods of global warming, Nesje et. al. (2001) analysed a sediment core from a lake in southern Norway to determine the frequency and magnitude of prior floods in that region over the past thousand years. The results showed an extended phase characterised by very little flood activity coincided with the Medieval Warm Period (AD 1000–1400). This was followed by a period of extensive flood activity that corresponded with the period known as the Little Ice Age, which was characterised by lower air temperature, thicker and more long-lasting snow cover, and more frequent storms.

There has been other research carried out using long-term data. For example, the results of research by Andrus et. al. (2002) confirm the findings of several other studies that indicate the mid-Holocene was significantly warmer than it is currently. Andrus et. al. (2002) show a situation where a considerably warmer climate than that of the present was apparently unable to sustain significant El Niño activity. This demonstrates that future global warming may lead to fewer and less intense El Niño events.

Focussing specifically on droughts, several studies have examined the past 300 years during which global climate has been recovering cool conditions of the Little Ice Age and is bringing conditions closer those experienced earlier during Medieval Warm Period conditions. These studies have shown convincingly that not only does global warming not produce more frequent and severe droughts, it does just the opposite. For example, in the United States, Cronin et. al. (2000) using sediment cores from Chesapeake found that conditions were wetter than normal and droughts uncommon during the Medieval Warm Period. At other

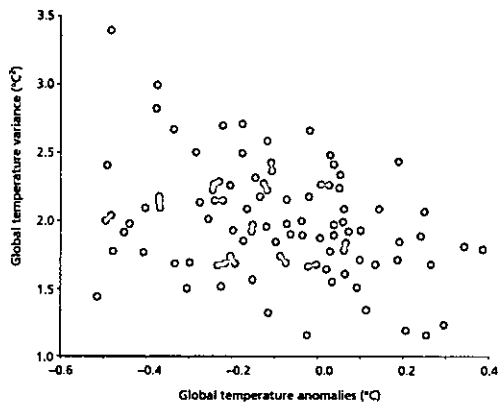
times the region had experienced several extreme droughts lasting from 60-70 years, many of which were more severe than droughts of the twentieth century. In a review of the subject, Woodhouse and Overpeck (1998) have come to a similar conclusion. Gan (1998), using data sets for the North American Midwest from the last century showed that warming is not associated with increased occurrence of drought. Benson et. al. (2002) studied sediments from Pyramid Lake, Nevada. They found that over the past 2700 years drought lasted from 20 to 100 years, while droughts of the recent historical period have generally lasted less than a decade. Similarly, Fritz et. al. (2000) used sediment cores to construct a 2000-year history of drought for a part of the Northern Great Plains of North America. Their results indicated that droughts equal or greater in severity to those of the 1930s Dust Bowl were a common occurrence during the last 2000 years. Likewise, Stahle et. al. (2000), using tree rings to develop a long-term history of drought over all of North America, found that drought during 16th century was the most extreme and prolonged in the past 2000 years, far exceeding any drought of the 20th century, including the Dust Bowl drought.

Temperature extremes

Coates (1998) has stated that heatwaves are the most significant natural hazard in Australia in terms of loss of life. There is speculation that global warming will increase climate variability and thus the frequency of heat waves. Michaels et. al. (1998) show there is little support for this, or for the popular perception that temperatures have become more variable. They examined daily maximum and minimum temperatures from the United States, China and the former Soviet Union for day-to-day variability in January and July and most of the trends indicated declining variability (Table 1).

Several other studies have found that more warmth leads to more stable climate. Karl et. al. (1995) point out that an increase in the atmospheric concentration of carbon dioxide should decrease temperature variability. Balling (1998) examined changes in the spatial variability of mean monthly and daily temperatures that

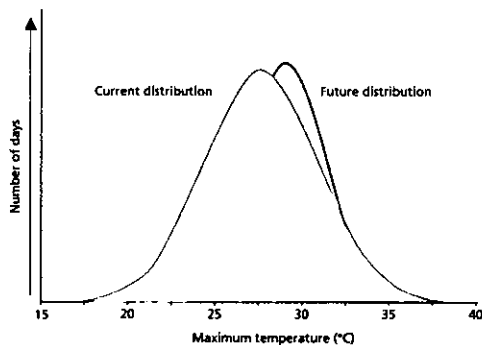
Figure 1: Inter-annual surface temperature variability vs. global temperature anomalies for the 1897–1997 time series showing the warmer the surface temperature, the less variable climate becomes



Source: Michaels et. al. (1998).

Figure 2: A realistic forecast of future maximum air temperature distribution

If forecasts by Easterling et. al. (1997) and Karl et. al. (1997) are correct, variability in the data will shrink more than the predicted mean warming and give a distribution shown schematically here



After: Michaels and Balling (2000).

have occurred during the historical climate record. His research showed that, overall, the spatial variability in temperature anomalies has declined, and that the interannual variability in temperature anomalies is negatively correlated to mean hemispheric temperatures. Balling et. al. (1998) and Michaels et. al. (1998) both show that as the atmosphere warms, the month-to-month variability also declines (Figure 1).

Karl et. al. (1997) state that GCMs predict temperatures will be confined to a tighter range. This is confirmed by Easterling et. al. (1997) who found that most of the increase in global temperatures has been occurring during the winter and at night. Summer maximum air

temperatures in the Northern Hemisphere showed no statistically significant trend. If these forecasts are correct, variability in the data will shrink more than the predicted mean warming and give a distribution shown schematically in Figure 2.

Conclusion

Global warming involves a scientifically realistic mechanism that links climate change to the concentration of greenhouse gases in the atmosphere. Although the future state of global climate is uncertain, there is little reason to believe that catastrophic change is underway. Moreover, there is little or no evidence to suggest any change will result in an increased risk of natural disasters caused by increased frequency and severity of climate extremes. Climate models suggest that increases in greenhouse gases are likely to give rise to a warmer and wetter climate in most places. Generally higher latitudes would warm more than lower (equatorial) latitudes. This means milder winters and coupled with increased atmospheric carbon dioxide, which is food for plants, it also means a more robust biosphere with more forest, crops and ground cover for more animals and people.

References

- Andrus, C. F. T., Crowe, D. E. Sandweiss, D. H., Reitz, E. J. and Romanek, C. S., (2002), 'Otolith $\delta^{18}O$ record of mid-Holocene sea surface temperatures in Peru.' *Science*, Vol. 295, pp. 1508–1511.
- Balling, R. C. Jr., (1998), 'Analysis of daily and monthly spatial variance components in historical temperature records.' *Physical Geography*, Vol. 18, p. 544–552.
- Balling, R. C. Jr., Michaels, P.J. and Knappenberger, P. C., (1998), 'Analysis of winter and summer warming rates in gridded temperature time series.' *Climate Research*, Vol. 9, p. 175–181.
- Bengtsson, L. Botzet, M. and Esch, M., (1996), 'Will Greenhouse Gas-induced Warming Over the Next 50 Years Lead to a Higher Frequency and Greater Intensity of Hurricanes?' *Tellus*, Vol. 48A, pp. 57–73.
- Benson, L., Kashgarian, M., Rye, R., Lund, S., Paillet, F., Smoot, J., Kester, C., Mensing, S., Meko, D. and Lindstrom, S., (2002), 'Holocene multidecadal and multicentennial droughts affecting Northern California and Nevada.' *Quaternary Science Reviews*, Vol 21, pp. 659–682.
- Bielec, Z., (2001), 'Long-term Variability of Thunderstorms and Thunderstorm Precipitation Occurrence in Cracow, Poland, in the Period 1896–1995.' *Atmospheric Research*, Vol. 56, pp.161–170.
- Changnon, S.A., (1999), 'A Rare Long Record of Deep Soil Temperatures Defines Temporal Temperature Changes and an Urban Heat Island.' *Climatic Change*, Vol. 42, pp. 531–538.
- Changnon, S. A., (Changnon, D., Fosse, E. R., Hoganson, D. C., Roth, R. J. and Totsch, J. M., (1997), 'Effects of recent weather extremes on the insurance industry: Major implications for the atmospheric sciences.' *Bulletin of the American Meteorological Society*, Vol. 78, 425.
- Coates, L., (1998), 'Deaths and ENSO: Fate, Chance or Change?' *Natural Hazards Quarterly*, Vol. 4, No. 4, pp. 2–3.
- Cronin, T., Willard, D., Karlsen, A., Ishman, S., Verardo, S., McGeehin, J., Kerhin, R., Holmes, C., Colman, S. and Zimmerman, A., (2000), 'Climatic variability in the eastern United States over the past millennium from Chesapeake Bay sediments.' *Geology*, Vol. 28, pp. 3–6.

- Dlugolecki, A.F., Clark, K. M., Knecht, F., McCauley, D., Palutikof, J. P., Yambi, W., (1996), 'Financial Services.' In Watson, R.T., Zinyowera, M.C., Moss, R.H. eds. 1995, *Climate Change 1995 – Impacts, Adaptations and Mitigation of Climate Change*. Contribution of Working Group II to the Second Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, New York, 539–560.
- Downing, T. E., Olsthoorn, A. A. Tol, R. S. L. eds., (1996), *Climate Change and Extreme Events*. ECU Research Report Number 12. Vrije Universiteit, Amsterdam, 309 pp.
- Easterling, D. R., Horton, B., Jones, P. D., Peterson, T. C., Karl, T. R., Parker, D. E., Salinger, M.J., Razuvayev, V., Plummer, N., Jamason, P., and Folland, C.K., (1997), 'Maximum and Minimum Temperature Trends for the Globe.' *Science*, Vol. 277, pp. 364–367.
- Emergency Management Australia, (1995), *National Emergency Management Competency Standards*, EMA, Canberra.
- Fritz, S.C., Ito, E., Yu, Z., Laird, K.R. and Engstrom, D.R., (2000). 'Hydrologic variation in the Northern Great Plains during the last two millennia.' *Quaternary Research*, Vol. 53, pp. 175–184.
- Gan, T.Y., (1998), 'Hydroclimatic trends and possible climatic warming in the Canadian Prairies.' *Water Resources Research*, Vol. 34, pp. 3009–3015.
- Goldenberg, S., Landsea, C. W., Mestas-Nuñez, A. M. and Gray, W. M., (2001), 'The Recent Increase in Atlantic Hurricane Activity: Causes and Implications, *Science*, Vol. 293, pp. 474–479.
- Houghton, J. T., Ding, Y., Griggs, D. J., Noguer, M., van der Linden, P. J. and Xiaosu, D. eds., (2001a), *Climate Change 2001: The Scientific Basis*. Contribution to Working Group I to the Third Assessment Report of the Intergovernmental Panel on Climate Change (IPCC), Cambridge University Press, New York.
- Houghton, J. T., Ding, Y., Griggs, D. J., Noguer, M., van der Linden, P. J. and Xiaosu, D. eds., (2001b), *Summary for Policymakers, Third Assessment Report. Climate Change 2001: The Scientific Basis*. Cambridge University Press, New York.
- Houghton, J. T., Meira Filho, L. G., Callander, B. A., Harris, N., Katenberg, A. and Maskell, K. eds., (1996), *Climate Change 1995: the Science of Climate Change*. Contribution to Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, New York, 572 pp.
- Idso, S. B., Balling, R. C. and Cerveny, R. S., (1990), 'Carbon Dioxide and Hurricanes: Implications of Northern Hemispheric Warming for Atlantic/Caribbean Storms.' *Meteorology and Atmospheric Physics*, Vol. 42, pp. 259–263.
- Karl, T. R., Knight, R. W. and Plummer, N., (1995), 'Trends in high frequency climate variability in the twentieth century.' *Nature*, Vol. 377, pp. 217–320.
- Karl, T. R., Nicholls, N. and Gregory, J., (1997), 'The Coming Climate.' *Scientific American*, Vol. 276, pp. 79–83.
- Kattenburg, A., Giorgi, F., Grassl, H., Meehl, G. A., Mitchell, J. F. B., Stouffer, R. J. Tokioka, T., Weaver, A. J., Wigley, T. M. L. eds., (1996), 'Climate Models – Projections of Future Climate'. In Houghton, J. T., Meira Filho, L. G., Callander, B. A., Harris, N., Katenberg, A. and Maskell, K. eds., (1996), *Climate Change 1995: the Science of Climate Change*. Contribution to Working Group I to the Second Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, New York, pp. 285–357.
- Kunkel, K. E., R. A. Pielke and S. A. Changnon., (1999), 'Temporal fluctuations in weather and climate extremes that cause economic and human health impacts: A review.' *Bulletin of the American Meteorological Society*, 80, 1077.
- Landsea, C. W., Nicholls, N., Gray, W. M. and Avila, L. A., (1996), 'Downward Trends in the Frequency of Intense Atlantic Hurricanes During the Past Five Decades.' *Geophysical Research Letters*, Vol. 23, pp. 1697–1700.
- Lins, H. F. and Slack, J. R., (1999), 'Streamflow Trends in the United States.' *Geophysical Research Letters*, Vol. 26, pp. 227–230.
- McCarthy, James J., Canziani, Osvaldo F., Leary, Neil A., Dokken, David J., White, Kasey S. eds., (2001), *Climate Change 2001: Impacts, Adaptation, and Vulnerability*. Contribution of Working Group II to the Third Assessment Report of the Intergovernmental Panel on Climate Change. Cambridge University Press, New York.
- Michaels, P. J. and Balling, R. C. Jr., (2001), *The Satanic Gases*. Cato Institute, Washington, D.C. 235 pp.
- Michaels, P. J., Balling, R. C. Jr., Vose, R. S. and Knappenburger, P. C. 1998, 'Analysis of trends in the variability of daily and monthly historical temperature measurements.' *Climate Research*, Vol. 10, 27–33.
- Molnar, P. and Ramirez, J.A., (2001), 'Recent trends in precipitation and streamflow in the Rio Puerco Basin.' *Journal of Climate*, Vol. 14, pp. 2317–2328.
- Murphy, J. M. and Mitchell, J. F. B., (1995), 'Transient Response of the Hadley Centre Coupled Ocean-atmosphere Model to Increasing Carbon Dioxide. Part II: Spatial and temporal structure of response.' *Journal of Climate*, Vol. 8, pp. 57–80.
- Nesje, A., Dahl, S. O., Matthews, J. A. and Berrisford, M. S., (2001), 'A ~ 4500-yr record of river floods obtained from a sediment core in Lake Atnsjoen, eastern Norway.' *Journal of Paleolimnology*, Vol. 25, pp. 329–342.
- Nguyen, K. C., and Walsh, K. J. E., (2001), 'Interannual, Decadal, and Transient Greenhouse Simulation of Tropical Cyclone-like Vortices in a Regional Climate Model of the South Pacific.' *Journal of Climate*. Vol. 4, pp. 3043–3054.
- Pielke, R. A. and Landsea, C. W., (1998), 'Normalized Hurricane Damages in the United States 1925–1995.' *Weather Forecasting*, Vol. 13, pp. 621–631.
- Pirazzoli, P. A., (2000), 'Surges, atmospheric pressure and wind change and flooding probability on the Atlantic coast of France.' *Oceanologica Acta*, Vol. 23, pp. 643–661.
- Stahle, D.W., Cook, E.R., Cleaveland, M.K., Therrell, M.D., Meko, D.M., Grissino-Mayer, H.D., Watson, E. and Luckman, B.H. 2000), 'Tree-ring data document 16th century megadrought over North America.' *EOS, Transactions, American Geophysical Union*, Vol.81, pp. 121, 125.
- Woodhouse, C.A. and Overpeck, J.T., (1998), '2000 years of drought variability in the central United States.' *Bulletin of the American Meteorological Society*, Vol. 79, pp. 2693–2714.
- Young, E., (1998), 'Dealing with hazards and disasters: risk perception and community participation in management.' *Australian Journal of Emergency Management*, Vol. 13, No. 2, pp. 14–16.
- Zhang Y. and Wang, W. C., (1997), 'Model Simulated Northern Winter Cyclone and Anticyclone Activity Under a Greenhouse Warming Scenario.' *Journal of Climate*, Vol. 10, pp.1616–1634.

About the author

Chris de Freitas is a climate scientist and Associate Professor in the School of Geography and Environmental Science at the University of Auckland, New Zealand. He is also an editor of the international science journal *Climate Research*. He was an expert reviewer of the 1995 and the 2001 Scientific Assessment Reports of UN's IPCC, and the UK Department of the Environment 1996 Report *Potential Effects of Climate Change in the United Kingdom*.

For further information contact: c.defreitas@auckland.ac.nz



Post Disaster Surveys: experience and methodology

David King examines and questions research methodologies used in disaster studies in Australia.

By David King, Director of the Centre for Disaster Studies, School of Tropical Environment Studies and Geography, James Cook University, Townsville.

Rapid response post disaster studies take place immediately after a disaster has occurred, so the researcher carrying out the study needs to have a clear methodology and research aim as soon as the disaster happens. The question raised by this type of research is whether or not there is a right way of doing it, or at least a standard methodology. This question has concerned researchers in the Centre for Disaster Studies at James Cook University since we initiated a fresh emphasis on the social impact of catastrophes in the mid 1990s. This paper will begin by illustrating our own experience in post disaster research to show the range of problems encountered in this kind of research, and the general findings and issues that the studies raised. Following the summary of the centre's research, the paper will go on to examine what other researchers have been doing in the field of post disaster research, and to attempt to classify these types of studies to conclude whether or not there is a standard or typical approach and method. Fleming (1998) wrote an early review of the Australian post disaster program, prompting an ongoing evaluation as studies eventuated.

Sending rapid response teams to examine the impact of a hazard immediately after the event, has been a role of the Centre for Disaster Studies since it was first established in the 1970s. The Centre was originally established in 1979 following a decade of concerted disaster research initiated after the devastating impact on Townsville of *Cyclone Althea* in 1971, and *Tracey* on Darwin. The creation of a centre following a serious natural disaster mirrors similar initiatives in emergency management and hazard research in other parts of Australia. The shock of a catastrophic event prompts a determination to 'do something' to be better prepared 'next time'. Inevitably in Australia there have been sufficient 'next times' over the succeeding years to justify the continuation of centres and institutes once established. While the Centre for Disaster Studies was initially concerned primarily with understanding the physical causes and impacts of hazards, the emphasis since the mid 1990s has been more concerned with the social and community impacts of disasters.

The Centre for Disaster Studies was able to maintain its role of carrying out immediate post disaster studies through the introduction of Emergency Management Australia's *Post Disaster Grants Scheme* in the mid 1990s (Fleming 1998). The centre had been re-established in 1994 with a completely new group of researchers who had had no previous involvement in disaster research. Involvement in post disaster studies thus provided rapid experience, and North Queensland provided no shortage of events. The first study carried out by the new centre was not actually a disaster declaration. *Cyclone Gillian* never eventuated, but it was the first time in a number of years that a major city, Townsville, had received a cyclone warning. Thus the Bureau of Meteorology was interested in learning how the community had responded to its warnings. This began a very successful relationship between the centre and the Bureau of Meteorology. Most of the succeeding post disaster studies drew on funds contributed by the three agencies of Queensland Department of Emergency Services, the Bureau of Meteorology and Emergency Management Australia. Thus between 1997 and 2001 the Centre



Examining the impact of a disaster immediately after the event has been a role for the Centre for Disaster Studies since it was first established in the 1970s.

Table 1: Post Disaster Studies Carried out by the Centre for Disaster Studies Since 1995

Place	Year	Hazard	Name	Research Method
Townsville	1997	Cyclone	Gillian	Questionnaire, warnings & behaviour
Cloncurry	1997	Flood		Questionnaire, interviews
Cairns Mareeba Innisfail	1997	Cyclone	Justin	Longitudinal Questionnaire & short survey questionnaire
Townsville	1998	Floods	(Syd)	Household Telephone, Business & Mag. Island surveys interviews
Burketown Normanton Karumba	1998	Floods		Questionnaire, interviews
Innisfail Cairns – Barron River suburbs Port Douglas & Mosman Wujal Wujal	1999	Cyclone	Rona	Flooded buildings survey Evacuation questionnaire Warnings & behaviour questionnaire Warnings & impact interviews
Broome	2000	Cyclone	Rosita	Questionnaire, interviews
Cairns	2000	Cyclone	Steve	Longitudinal Questionnaire
Mornington Island	2001	Cyclone	Abigail	Questionnaire, Interviews
Total	17/13	5	2	9

carried out 17 separate studies in 13 different towns and communities (nearly all in North Queensland) following 9 separate hazard events. These are listed in Table 1.

Partners and research needs

As the emphasis of the Centre's research changed, so also did the role of post disaster studies, although the impact on people was always paramount even when understanding the process of the hazard dominated the research. While post disaster surveys in the 1980s were funded from the Centre's own budget, university re-structuring in the 1990s has resulted in all of the Centre's post disaster studies needing to be funded directly from government agencies and departments. The Centre has thus had to work in much closer partnerships with organisations outside the university, and has had to be more responsive to their needs, rather than engaged in purely academic research. In microcosm this is an example of a national and international process, whereby government funding agencies are demanding more focussed or applied research from universities. While that shift in focus and funding has prompted a vigorous debate about academic freedom and the ongoing need for pure research, this has been less of a problem for the Centre for Disaster Studies because its research has always been applied to the practical problems of dealing with and learning from disasters.

Part of the reality of that process of applied research is the need for the researcher to work with several funding agencies at once. These can affect the independence of the research and may result in competing or even

contradictory demands being placed on the researcher such that research objectives are watered down and outcomes must be sensitive to the politics of the sponsoring organisations. Fleming (1998) illustrated these issues of agency control of research and manipulation of results to ensure a final product that satisfied the organisation. However, the greatest threat to small research centres like the Centre for Disaster Studies, is for the research initiative to be taken entirely away from universities and shared out amongst government agencies, each with a narrow area of responsibility. The very nature of disasters, in demanding a totally integrated response from all agencies, runs counter to such a trend and reinforces the need for multi-organisational collection and sharing of research data. Thus an independent post disaster study complements the specific information gathering of agencies that are responsible for mitigation, response and recovery.

Because post disaster surveys are carried out in direct liaison with funding partners, those partners, government agencies and local government, play a direct role in formulating the research question. Some of these questions remain fairly standard across a number of studies, but much of the information gathered is specific to the severity, timing and location of the event, as well as local issues. Some of these local issues are strongly political or become political controversies later. This is the nature of a disaster as a catalyst of crisis and change. Political controversies cannot be ignored in post disaster studies but in working with government agencies and

the public it is a tension that requires sensitivity in communicating those issues. While the partner agency may influence or define the research questions, inevitably the research design is primarily driven by the disciplinary background and previous experience of the researcher, as well as relating to the broader literature on research methods. If this background does not fit with the needs of the sponsoring agency the researchers may find their work ignored, or their services dispensed with (Fleming 1998).

The partner agencies have roles that directly relate to the management of the disaster event. They have clearly defined responsibilities and procedures in monitoring or warning of a hazard, or in responding to the crisis both during and immediately after the event, and/or managing the clear up and recovery. They may therefore carry out their own surveys in the form of needs assessments for disaster victims and communities, and they will very likely assess their actions at some period after the hazard in a formally structured de-briefing. Post disaster studies carried out by the Centre for Disaster Studies and similar researchers are not of this type, and will attempt to avoid being in the way during the most immediate post disaster period. Instead the purpose is to capture a bigger picture of the disaster that will contribute to the de-briefing and attempt to relate the experiences of this disaster to those of other catastrophes, most often as they have been reported and analysed in the academic literature. The rapid response post disaster study must be comparable to other studies of its kind, hence the need to use or be aware of the research methodology of previous work. It would be extremely useful if there were guidelines available to the sponsoring agencies that could mitigate against excessive or unwarranted influence over the researcher.

However, the post disaster study must still take place as soon as practicable after an event to record peoples' experiences and memories while they are still fresh, but equally without adding to the stress. The results of the study also need to be available for de-briefing sessions which may be some weeks or at most a few months after the event (depending on the severity of the disaster and the agencies involved). This means that most post disaster studies will necessarily be rapid surveys. The researchers must also be able to respond quickly, work with partner agencies and produce useable results in a short time frame. Some professional teams of rapid response researchers exist, but generally government agency funds will not support permanent employees whose only role is to study a disaster, and once an individual is involved in the management or response work, it is no longer possible to carry out an independent big picture analysis. The rapid responders have included many academic researchers and university staff who become involved in local events as part of their wider research. Many have not been primary

disaster researchers but have switched to the impact of a catastrophe when it has been close to home.

By drawing on a pool of researchers in a region that is regularly impacted by predictable natural hazards the Centre for Disaster Studies has been able to attend a large number of hazard events over a short period. All may be described as relatively low impact events in that loss of life was minimal and structural damage was either concentrated or at least did not amount to total devastation. The 9 events have all been floods or cyclones, or a combination of both, with repetition of events in the same places. Thus as well as relating North Queensland/North Australian experiences to the broader literature, the Centre has also had the opportunity to cross relate its own post disaster studies, especially within the same communities and even individuals.

Post disaster experience

From all of these studies we can summarise seven main groups of impacts or issues. These are: 1. the unequal distribution of the impact; 2. loss of services during the event; 3. a lack of expectation of the impact; 4. late or minimal preparation; 5. community or neighbourhood response; 6. confusion concerning warnings and the media; and 7. a level of resilience.

In all of the disasters we have studied, only a portion of the community experienced severe loss or impact. These were places that were especially physically vulnerable. Some such as the Black River Settlement outside Townsville, or housing along the terrace of the Cloncurry River, should never have been there in the first place. Apart from responsibility of local government, the residents of these places were clearly ignorant of the hazard on their doorsteps. Other developments, such as the trend to enclosure of spaces underneath houses (often as granny and teenage flats), equally exhibits an attitude that the flood hazard is no longer a threat (King 1998, Goudie & King 1997).

The loss of emergency services and utilities during a hazard has already been illustrated. Apart from the Townsville flood, this has occurred in all natural disasters. Generally people expect that they will lose power and water for a while, but it is a more serious oversight for emergency service operations to be located in the more vulnerable parts of the city (King 1997, 1998). This has been an historical trend, where these services have been sited in a central location, which in the case of the old city centres is most likely to be in the vicinity of the wharf and sea front. Thus apart from the sheer size of a major disaster in a city, the police, fire, ambulance etc. may not be able to get out of their buildings, let alone provide widespread assistance.

The most common response from people who have experienced major loss, was surprise and disbelief, often backed up from community and personal knowledge,



Type of impact varies enormously so survey questions must also suit various places and events.

that the river had never risen so high before, or the floodwaters had never been so extensive. This is usually quite true, for any individual, but the devastating natural hazard is a predictable process at the State level. People who experienced severe loss of property, experienced that loss precisely because they never expected it (Goudie & King 1997).

The disbelief is compounded by a universal lack of adequate preparations, whether for flood or cyclone, or at best hurried and minimal late preparations. Part of this derives from stoicism, part from a desire to be in control and not to be panicked. The result is that people end up out of doors once the strong wind has already started and debris becomes airborne, or as flood waters rise, they are out in deep water moving belongings, people and pets. This has happened in many instances in the dark. In remote communities the lack of preparation has resulted in a widespread lack of food, necessitating expensive airlifts (Berry 1997).

In all disasters people reported checking on or helping their neighbours. There were tales of genuine bravery and risk, some of which made good media stories. Most risk taking and rescue could have been avoided, though, if people had acted earlier, or had never built in such vulnerable locations (King 1998). In the remote communities people expect to rely on their neighbours, but are unlikely to request assistance until the last minute. In the cities, the numbers of people needing help runs into thousands, so that reliance has to be on

friends and neighbours. Clearly everyone in the community has to know how to deal with the hazard, because the reality is that during and immediately after an event, many thousands of people are going to be actively involved in providing assistance.

All of the post disaster studies contained questions on warnings and messages from the authorities. The media transfers messages, so that part of regular preparation is to have a working battery radio. Prior to and during an event both television and radio stations relay cyclone and bad weather warnings. The technical language of warnings has caused some confusion, but the Bureau of Meteorology has responded by simplifying its messages. There is also controversy over the use of sirens, and the location and use of emergency shelters. But after all disasters the greatest criticism has been against the media, for inconsistency in the timing of broadcasts of messages, and for either exaggerating or playing down a threat. There is an expectation gap between the public and the media, in which commercial television receives the greatest criticism. Despite advances in communication technology, remote communities in North Queensland occasionally still fail to receive any warning at all, as transmitters fail, or remote area broadcasts are made from very distant locations where there is no knowledge of local conditions. This was the experience of Wujal Wujal aboriginal community on Cape York Peninsula as Cyclone Rona passed virtually overhead (Cottrell et. al. 2001).

Finally there is a level of resilience inherent in communities, that emerges from the interviews and responses of participants. Natural disasters such as floods and cyclones in Northern Australia are seen as part of the pattern of life and seasons. A lack of physical preparedness is countered by a higher level of mental preparation, or perhaps risk acceptance. The disaster is usually primarily an economic one as damage and crop loss devastates a region, and the response to this is to clear up, rebuild, re-plant and get on with life.

Some questions were common to all surveys, especially those concerning warnings. However, with just the three floods the type of impact varied enormously because the places and events themselves were very different. The Cloncurry flood was a river inundation that severely damaged dwellings in a part of the town, while the issues in the Gulf floods were primarily the problems that related to isolation, damaged infrastructure and allied health concerns. Townsville's flood was a high rainfall event that inundated the whole town, temporarily isolating almost every household. Similarly the cyclones were different and by the time of cyclone Rona we decided to do completely different surveys in different places that had been impacted, according to the local issues. In Innisfail river flooding had been a major issue so the post disaster survey looked at the impact on houses that were in the flood zone. In Cairns the population of two riverside suburbs was evacuated at night, so the survey examined the evacuation experience. In Douglas Shire (Port Douglas and Mossman), as well as Wujal Wujal aboriginal community to the north, the issue was the rapid onset of the storm and the adequacy or inadequacy of warnings. Thus the studies in these communities concentrated on those issues.

Most post disaster surveys were necessarily short, consisting of rapid appraisal method questionnaires, either administered face-to-face or by telephone, and backed up by interviews of community leaders, key informants and experts or officers responsible for components of the response.

The most useful surveys, though, have been the longitudinal community surveys of the Cairns northern beaches suburbs carried out by Linda Anderson-Berry. These began in 1996 as a TCCIP (Tropical Cyclone Coastal Impacts Program) project to examine awareness and preparedness for cyclones and storm surge. The northern beaches were selected as a relatively new outer suburban area in a vulnerable location along the coast. The first survey was independent of any hazard event (there had not been a cyclone warning in the area for six years). The initial survey drew on earlier awareness and preparedness questions that had been used in Townsville during the 1970s following *Cyclone Althea*, but the northern beaches survey instrument was greatly expanded and generated extensive data. It was also complemented by surveys in schools of grade five and nine children.

Shortly after the main community survey had been administered to a sample of 700 households, cyclone Justin crossed directly over the northern beaches. Then in 2000 cyclone Steve crossed in the same place. Thus post disaster studies following Justin and Steve, re-administered the same awareness and preparedness questionnaire, with some modifications, to the same sample of households. While there was some change in residence, many of the same people participated in the sequence of studies enabling a measurement of change over time, and in response to subsequent experience.

The longitudinal surveys were significantly different from the much shorter rapid appraisal method surveys carried out after other disasters. While the shorter surveys generated comparative data, the repeated community surveys give depth and much greater understanding of the processes at work in the community. However, it was chance that provided the opportunity to resurvey the same community. Generally it will be the rapid appraisal type of survey that will have to suffice. Thus it has been an appropriate point at which to examine the experiences and methods of other researchers who have been involved in post disaster studies.

Review of post disaster methodology

Tables 2 and 3 summarise an analysis based on 130 post disaster reports primarily available in the libraries of the Australian Emergency Management Institute at Mount Macedon and on the web site of the Natural Hazards Research Applications and Information Center at the University of Colorado. Emergency Management Australia modelled its post disaster grants scheme on the Colorado scheme. However, a few of the reports that were examined came from outside both of these schemes. All dealt with immediate post disaster studies, although some of them very usefully made comparisons of experiences across several events.

These studies have been classified in Table 2 according to the place of study and the type of hazard. The Australian studies were carried out by Australian based researchers, but most of the other non USA and USA studies were carried out by United States based researchers under the National Science Foundation Quick Response Scheme, which unlike its Australian equivalent allows funds for researchers to travel outside the USA. Outside the Caribbean, most American researchers had an existing research link, or ethnic connection with the overseas disaster site.

Table 2 has sub categorised studies according to the type of hazard that was involved in the disaster. In fact most of the studies were primarily concerned with societal response to a catastrophe, rather than being a study of a particular type of hazard. The hazard is not the centre of the disaster, but rather the impacted community. The hazard is the framework, but it inevitably configures aspects of response, mitigation

and warnings. Besides, the disasters are powerful events that we name and construct within the framework of the character and form of the hazard itself.

Cyclones (Hurricanes), floods and earthquakes dominate, and with tornadoes and bushfires account for the vast majority of hazards. All necessarily benefit from post disaster study because of their predictability and the need for the population to be physically and mentally prepared for a hazard event. Table 3 classifies the main research methodology used in these studies

All 130 reports that were reviewed for this paper concerned experiences that were gleaned directly from actual disasters. However, 25 were reports or bibliographies that either examined a number of disasters to draw comparative conclusions or they were annotated bibliographies. Most of these have been classified as reviews in which a general analysis of previous hazards summarised findings and experiences. Three of the

reviews were of the same hazard but as it unfolded in different locations, such as El Niño for example.

Case studies

Case studies of disasters were used as examples to examine Emergency Management issues and policy analysis, as well as reports that were primarily concerned with mitigation. Physical assessments of disaster impact used methodologies that were appropriate to the discipline, such as engineering or geomorphology. These were entirely case studies of specific events, but there was little or no involvement of human participants involved in the disaster. The aim of these studies was to add to knowledge of the process of the hazard itself and in some cases the strengths and weaknesses of built structures.

The majority of the quick response studies were case studies of a specific disaster, with a broad aim of

Table 2: Hazards and Regions Covered by 130 post disaster studies and reports

Region/ Hazard	Australia	USA	Central America & Caribbean	South America	Japan	Pacific	South & South East Asia	Europe (inc. Turkey)	Total
Flood	2	16	1	2					21
Cyclone/Hurricane	3	14	7			4	1		29
Bushfire	5	3							8
Earthquake	1	5			2		1	4	13
Tornado		7					2		9
Drought							2		2
Blizzard/ Ice Storm		3							3
Volcano			2						2
Landslide								1	1
Severe Storm	1								1
Plane Crash		2							2
Massacre		4							4
Chemical Spill		2						1	3
Bus Crash		1							1
Ship Loss								2	2
General & Other	2						1	1	29
Total	14	57	10	2	2	4	7	9	130

Source: Emergency Management Australia, Natural Hazards Research and Applications Center University of Colorado, Bureau of Transport and Regional Economics

Adamson, S. 1997, Allen R.D. & Rosse, W. 1998, Benight, C.C. 1996, Benight, C.C. & Harper, M.L. 1997, Blanchard-Boehm, D. 1997, Bush, D.M. et al 1996, Butler, D.R. 1997, Caporale, R. 2000, Carley, K. & Harrold, J. 1993, Coarsey-Rader, C.V. 1995, Comfort, L.K., 1996 & 2000, Dow, K. & Cutter, S.L. 1997, Drescher, K.D. & Abueg, F.R. 1995, Dymon, U.J. & Boscoe, F.P. 1996, Edwards, B. et al. 2000, Enarson, E. 2000, Fischer, H.W. III. 1999, Gant, D.B. 1996, Hapke, H.M. 2000, Jones, R.T. 1993, Krause, G. & Dyer, C.L. 2000, Langley, A. & Jones, R.T. 2000, Legates, D.R. & Biddle, M.D. 1999, McEntire, D.A. 1998 & 1999, Mitchell, W.A. 1996, Montz, B.E. & Tobin G.A. 1997, Neal, D.M. 1995, O'Brien, P.W. & Payne, J. 1997, Paul, B.K. 1995, 1997, 1999, Peraz-Lugo, M. 1999, Perry, J.B. et al. 1996, Pine, J.C. 1999, Rao, et al. 1985, Rodrigue, C.M. & Rovai, E. 1998, Rossi, I. 1998, Rodilsky, J.L. 1999, Rubin, C.B. et al. 1985, Sattler, D.N. & Kaiser, C.F. 2000, Schmilden, T. & K. & Ono, Y. 1996, Schmidlin, T. & King, P.S. 1997, Schmidlin, T. et al. 1998, Smith, Emm & North, C.S. 1998, Sylves, R. 1996, Tiefenbacher, J.P. et al. 2000, Tobin, G.A. & Montz, B.E. 1997, Tollinger, M.L. & Dixon, D. 1999, Waelde, L.C. et al. 1998, Wilson, J. & Oyola-Yemaiel, A. 1998.

Note: 25 reports were comparative analyses or annotated bibliographies of multiple events and hazards.

Table 3: A Classification of Methodologies Used in 130 Post Disaster Studies and Reports

Type/ Method	Physical Assessment	Policy Review	Mitigation	Emergency Management	Review	Case Study
Case Study	10	2	4	2	3	na*
Questionnaire		1				48
Interviews		1				28
Secondary Sources						17
Post Trauma Methodology						23
Observations						7
General Analysis		2	4	1	21	3
Focus Groups						3
Economic Analysis						2

Source: Emergency Management Australia, Natural Hazards Research and Applications Center University of Colorado, Bureau of Transport and Regional Economics

Adamson, S. 1997, Allen, R.D. & Rosse, W. 1998, Benight, C.C. 1996, Benight, C.C. & Harper, M.L. 1997, Blanchard-Boehm, D. 1997, Bush, D.M. et. al. 1996 & 1999, Butler, D.R. 1997, Caporale, R. 2000, Comfort, L.K. 1996 & 2000, Coursey-Rader, C.V. 1995, Dow, K. & Cutter, S.L. 1997, Drescher, K.D. & Auberg, F.R. 1995, Dymon, U.J. & Boscoe, F.P. 1996, Edwards, B. et. al. 2000, Enarson, E. 2001, Fischer, H.W. III. 1999, Gamble, D.W. 2000, Gant, D.B. 1996, Hapke, H.M. et. al. 2000, Krause, G. & Dyer, C.L. 2000, Langley, A. & Jones, R.T. 2000, Legates, D.R. & Biddle, M.D. 1998, McEntire, D.A. 1998 & 1999, Mitchell, W. A. 1996, Montz, B.E. & Tobin, G.A. 1997, Morrow, B.H. & Ragsdale, A.K. 1996, Neal, D.M. 1995, O'Brien, P.W. 1997, Paul, B.K. 1995, 1997, 1999, Perez-Lugo M. 1999, Perry, J.B. et. al. 1996, Pine, J.C. 1997, Rodrigue, C.M. et. al. 1998, Rossi, I. 1998, Rozdilsky, J.L. 1999, Sattler, D.N. & Kaiser, C.F. 2000, Schmidlin, T. & Ono, Y. 1996, Schmidlin, T. & King, P.S. 1997, Schmidlin, T.W. et. al. 1998, Sylves, R. 1996, Tiefenbacher, J.P. et. al. 2000, Tobin, G.A. and Montz, B.E. 1997, Tollinger, M.L. & Dixon, D. 1999, Waelde, L.C. et. al. 1998, Werner, L.S. et. al., 1998, Wilson, J. & Oyola-Yemaiel, A. 1998.

* Note. There were case studies in each of the separate methods and case studies also constituted a method themselves.

assessing the impact, response and behaviours of participants. The studies carried out by the Centre for Disaster Studies fall into this same broad category, and altogether they form the bulk of post disaster studies.

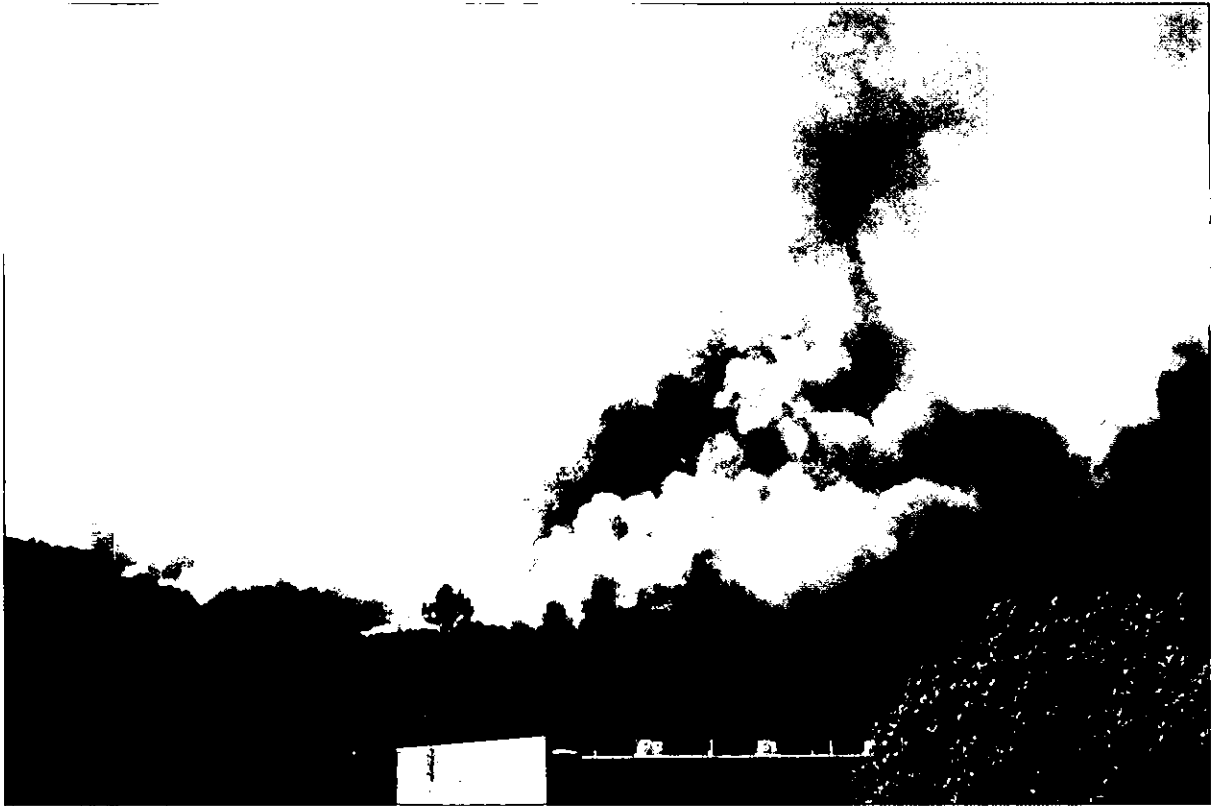
It is in this kind of post disaster study, where the researcher is approaching the disaster to find out what happened and to search for lessons that may contribute to mitigation and Emergency Management, that a variety of approaches may be employed. The most commonly used research tool is a rapid appraisal questionnaire administered face-to-face or by telephone in the majority of studies, or by drop off and pick up where the researcher has a longer time in the field. Face to face or telephone surveys are necessarily short and thus can only cover a brief set of issues. However, after a disaster many people are still excited or shaken by the experience and are frequently willing to talk to the interviewer for an extended period. These extra anecdotes can contribute to key informant type interviews and provide valuable insights.

Drop-off and pick-up surveys require a face-to-face introduction and thereby achieve a much higher return rate than a mail out. They also allow for many more, and much more complex, questions. Their shortcoming is the need to prepare much more substantially before entering the field, which requires a sound knowledge of the community and the likely impact of the disaster before designing the survey instrument.

The questionnaire is often supplemented by some other source of data and information. The most common sources are interviews and secondary data. In some cases these have been the entire survey method, especially where the impact is small or remote. Key informant interviews may include those whose role is to respond or manage, as well as members of the public. Several reports used the term 'snowballing', a technique whereby the interviewee refers the researcher on to other informants. Where the population is not known and a proper sample cannot be drawn, this technique is highly effective as links will usually go in diverse directions. Some researchers used tape recorded interviews, but these can seem intrusive and the majority (like newspaper reporters) still rely on field notes and log book.

Secondary sources are records made by management agencies, databases such as the census, local government records and databases etc. A number of researchers made extensive use of textual analysis from newspapers and reports at the time of a disaster. News reporters invariably exaggerate and sensationalise stories, but they will often capture the main issues even if numbers and names are not always accurate.

Observations were generally used as a backup to a main survey method such as interviews and questionnaires. For very experienced researcher's observation techniques are valid, especially if categorised from a checklist of



The devastating natural hazard is a predictable process at the State level.

issues, impacts and questions. In particular, observations are used to contribute examples and to underscore statements made by participants. Researchers may also be participant observers. This has been the experience of staff of the Centre for Disaster Studies and clearly was the case for several of the researchers involved in the quick response studies. The researcher loses some objectivity (which is not necessarily an essential characteristic) but participant observation fills in the linkages between issues and gives powerful insights into vulnerability and resilience.

Only three studies used focus groups as a method of data collection and analysis. This research method can be extremely powerful, but may be inappropriate immediately after a disaster and can be extremely difficult to organise. Only two studies carried out an economic analysis, and both were done by skilled specialists using economic analytical techniques designed for disasters. Clearly this area is one where more research needs to be done to contribute to mitigation.

Post trauma studies

Entirely separate from the bulk of the rapid response surveys were specialist studies that employed post trauma methods. These were concerned with all groups of participants, emergency managers, response and rescue personnel and those who had suffered loss or trauma in the disaster, although not usually all

participants in any one study. For example some studies looked at police post trauma experience, some at teenagers, some at the elderly, women, medical staff etc. The researchers were mainly psychologists, with some (probably) psychiatrists who engaged in more direct medical analysis. Generally these studies were either more longitudinal, with surveys close to and then repeated at some distance from the event, or they were entirely distant from the event, in some instances by a number of years. As the aim of these post disaster studies was to understand the longer term impact on peoples' mental health or state of mind, the greater distance from the event was an important component of some of the studies. Most used highly technical standardised post trauma tests and questionnaires. From the methodology statements these standardised survey instruments did not appear to have been significantly modified for the type of location or hazard.

Very few of the case study post disaster surveys used both the general approach of questionnaires and interviews etc., as well as post trauma specialist surveys. They were either one or the other – quite distinct groups of researchers and surveys. Furthermore the post trauma methodologies were oriented to specific psycho-social models or theories. The general case study quick response surveys approached a broad range of models and concepts as a structure to the methodology, depending upon the disciplinary background of the researcher.

The difference between these two types of post disaster studies, the post trauma studies and the general quick response case studies, significantly separates the methods employed. The post trauma studies are less likely to have to take place immediately after the event and thus may not contribute to the de-briefing. Research into understanding how people deal with and recover from trauma may contribute to Emergency Management, mitigation and our understanding of vulnerability and resilience. While these studies are primarily individual responses, they may also aid our understanding of community and the individual in the community. The methodology is also standardised and frequently takes place in a controlled or clinical environment.

By contrast, the quick response case studies are primarily fieldwork based and are much more hazard and location specific. A variety of methodologies are used to gather information, but questionnaires and interviews are the dominant methods. Results and lessons learned contribute directly to an understanding of individual and community behaviour in response to a disaster, and provide insights into ways in which Emergency Management and mitigation may be enhanced. They generally do not extend beyond the immediate post disaster period because that is the way in which most post disaster studies are funded.

Researchers who have been involved in a number of post disaster studies are able to discern common trends and patterns, but this has also been achieved by third party researchers who have analysed experiences from multiple events and reports.

Conclusion

However, a limitation to a number of studies is that they are too isolated, too location and hazard specific, or even too discipline or model specific. Some researchers, possibly coming to an inter disciplinary disaster study for the first time, explain their models and methodologies as though they have never been tried or examined before, or who regard the event they are studying as unique. Generally though, post disaster studies employ common methods, drawing most significantly on either standardised post trauma methodology, or on rapid appraisal methodology.

A significant contrast between Australian and USA studies is the ability of the United States to fund research in other countries. A strong case could be made for Australian researchers to carry out studies within the immediate Asia Pacific region, especially where a significant Australian aid response is involved. The United States quick response studies have been running for a much longer period and have developed as time has passed. A tradition of such studies in Australia will also very likely develop over time. An important role has been played by research students in the US, who have worked with more senior researchers and gone on to lead educational and research programs of their own.

This opportunity is more limited in Australia, although disaster education programs are on the increase, and a greater number of younger researchers are entering the field both in universities and in government departments.

A small flaw in post disaster studies is their snapshot of a moment in time. A much deeper understanding of the impact and behaviour of a community is enhanced through longitudinal studies, or at the very least, return visits at a time significantly after the event. This opportunity will also develop as more researchers and more research interest become focussed on understanding disasters. This is particularly likely as the former emphasis on response has shifted to longer term recovery, and most importantly, to mitigation, education and preparedness. These policy directions have undoubtedly been influenced partially by the experiences of post disaster studies and the desire to contribute knowledge and understanding to long term mitigation and prevention. Thus the developing policy emphases and the experiences of post disaster surveys reinforce one another in moving towards the bigger picture – the long term and mitigation. While a snapshot in time, post disaster studies are a record of history and provide us the opportunity to learn from that history so that we may avoid repeating past mistakes.

It is reassuring to find that one's own work complements that of a wide range of similar studies and fits into a category of research methodology common to many of the others. This paper began by reviewing our own post disaster studies in order to illustrate the diversity of events and situations and research problems. In summarising these studies and drawing common conclusions and issues, the point is that the synthesis of often crude and rapid fieldwork provides us with a bigger picture of disaster experiences that helps us in understanding vulnerability and resilience, and in devising effective mitigation strategies. It is a common criticism of geographers that they carry out fieldwork and subsequently try to work out what it all means. Rapid response surveys, many also carried out by geographers, frequently do the same thing. Unclear aims and vague research questions are clearly a problem of many post disaster studies, but the immediacy and uncertainty of the situation frequently leaves little choice but rapid fieldwork. Consequently it is crucially important that the research methodology is legitimate and replicable. In the studies that have been examined in this paper this is almost entirely the case. Standard social science methods were used within a framework of the diversity of disciplines, the towards overall research aims, and the constraints of speed and sensitivity towards victims and managers.

The full list of references which accompanying this article appear on the EMA website at www.ema.gov.au/ajem/

David King may be contacted at Email: David.King@jcu.edu.au

The Politics of Emergency Response and Recovery: Preliminary Observations on Taiwan's 921 Earthquake

Prater and Wu from the Hazard Reduction & Recovery Center, Texas A&M University reinforce the importance of planning and organisational structure in disaster response and recovery.

By Carla Prater and Jie-Ying Wu, Hazard Reduction & Recovery Center, Texas A&M University, College Station, TX, U.S.A.

On September 21, 1999 the 921 or *Chi Chi* earthquake struck the centre of Taiwan. The earthquake's magnitude was ML 7.3, and MW 7.7 and the epicentre depth was 8 km. The earthquake hit at 1:47 am, and left about 2,471 dead and 11,305 seriously injured. Over 10,000 buildings collapsed and direct losses were estimated at US\$14 billion. This paper describes some of our preliminary findings on a National Science Foundation project conceived in order to study the organisational and institutional response to 921, concentrating on linkages between organisations and different levels of government. The study area covered the two most affected counties, two smaller towns and Taipei. Data were gathered from interviews, government documents, and media reports. Our research questions centred on the agenda status of earthquake preparedness, the role of the military in disaster response and recovery, the role of the private sector in disaster response and recovery, and the effects of local government capacity on disaster response and recovery. The authors gratefully acknowledge support from the American National Science Foundation (CMS 0085056) and assume sole responsibility for all statements and conclusions.

Introduction

The 921 earthquake was the strongest to hit Taiwan for a century, with a magnitude of 7.6 on the Richter scale

and an epicentre at ChiChi Township, Nantou County. It jolted people awake at 1:47 am on the morning of September 21, 1999. Approximately 2,471 people, out of a population of 22,048,356, were killed by the resulting building collapses. An additional 8,739 were injured; of these, 723 were seriously injured. It is estimated that 51,925 housing units were destroyed, and 54,376 units were partially destroyed. The estimate of total economic losses due to the earthquake is about \$14 billion¹, or 3.3% of Taiwan's GDP.

An event of this scale in a small country undergoing rapid social, economic and political changes can have noticeable effects. This paper is based on a study in which data was gathered primarily on emergency response and secondarily on disaster recovery.

Project staff used elite interview methods to gather data on emergency response efforts at the local, county, and central government levels. Interview data were supplemented with documents produced by different responding agencies, media reports, and other reports. Our efforts were centred on the two counties most affected by the earthquake: Nantou and TaiChung. We also studied two townships, one in each county: Puli and TungSi. Some interviews were conducted at the central government level in Taipei. This paper describes some of our preliminary findings, focusing on the relationship between the disaster response effort and the Taiwanese government system. The next section reviews the theoretical questions involved and describes the propositions to be examined. A presentation of the data and an analysis of how it addresses these propositions follows.

Theoretical issues

There is a large and growing body of literature on the importance of agendas in policy change (Schattschneider 1960, Bachrach and Baratz 1962, Kingdon 1995, Cobb and Elder 1972, Baumgartner and Jones 1993). Scholars

¹ All monetary amounts are given in US dollars, at the rate of 32NT\$ to 1.

have used this literature to help us understand why it is so difficult for decision-makers to concentrate more of society's resources on disaster prevention. It is common for societies to live through a repeated disaster cycle of inadequate mitigation and preparedness leading to high levels of disaster impact and an unsatisfactory emergency response (May and Williams 1986, Birkland 1997, Prater and Lindell 2000, Olson 2000). The 921 earthquake provides a valuable opportunity to examine the generalizability of these ideas by applying them to events outside the United States. From this literature, we derived the expectation that disaster preparedness had low agenda status in Taiwan before the earthquake. This would have had the effect of limiting the resources and influence of the agencies charged with disaster response, thus negatively influencing emergency response at all levels of government.

The other issues addressed in this paper are drawn from the literature on governmental centralization and decentralization. There is a vast literature on the subject, but there is as yet no widely accepted definition of what type of government can be called centralised and what can be called decentralised (Hutchcroft 2001). By most measures of governmental centralization, Taiwan is a relatively centralised system. For example, numerous scholars have used financial indicators of centralization (Pickvance and Preteceille 1991, Smith 1985, Nickson 1995, Manor 1999). In Taiwan, there is a national level law governing the allocation of government revenues and expenditures that gives revenue from the most productive taxes directly to the central government. Some of this revenue is then disbursed to the lower levels of government, but this share is less than half overall, and in some cases local governments only receive 10%. Municipal, county and township governments are allowed to collect taxes on some activities, and 'special' taxes can be enacted by local level governments. Local governments have to share some of this revenue with the central government however, and are often reluctant to enact politically unpopular 'special' taxes. Local government budgets are thus dependent on subsidies from the central level to meet basic payrolls.

Another indicator of centralization is the location of the planning process (Sivanna and Azziz 1996). Taiwan has national legislation covering urban and regional planning. All townships are required to develop urban land use plans and emergency management plans, which are to be checked by the higher levels of government for compliance with national legislation. In some cases, townships do not have the resources to develop their own land use plans, and so must hire consultants to do them, or get help from the central government to develop them.

The location of basic governmental functions and the amount of discretion local government agencies have in managing these functions is another indicator of



Courtesy: Agence France Presse

Agenda status of emergency management was low before the earthquake.

centralization (Page and Goldsmith 1987, Manor 1999). Here, too, Taiwan is quite centralised. For example, there are national standards dictating the number of firefighters, fire trucks, and emergency medical units cities must have per unit of population. All law enforcement is centralised, with policy and staffing decisions made at the national level by the National Police Administration.

There has been little research on the relationship between the levels of governmental centralization and emergency response systems. Two early works explicitly addressed this issue. Anderson (1969) reported that centralised systems tend to produce higher levels of military involvement in emergency response. In centralised systems, local governments are often quite weak. The military is often the best-organised and best-equipped institution in a country, and is called upon to use its resources and personnel in the national crisis provoked by a large-scale disaster. Thus we expected to see an active military presence in Taiwan's response to the 921 earthquake.

McLuckie (1975) found that decentralised systems are associated with an increased role for the private sector in emergency response, reflecting a wider distribution of resources throughout society and greater openness in decisions about resource allocation. He found that specialised resources were often called in from outside the impact area in both types of systems, but such resources were more likely to be under local civilian control in decentralised systems. In addition, he found regions with greater resources were more likely to act in an autonomous fashion than poorer regions in the same country. McLuckie's work led us to expect that the private sector would not be an important actor in the 921 response, and that TaiChung county, the more prosperous county in our study, would be more likely to act quickly and independently of the central government than the poorer county government of Nantou.

Based on this literature review, we have the following propositions to examine:

- Disaster preparedness and emergency management had low agenda status in Taiwan before the earthquake. This low status is expected to limit the resources and influence of the agencies charged with disaster response, negatively affecting emergency response at all levels of government.
- An active military presence in Taiwan's response to the 921 earthquake is expected.
- The private sector is not expected to have an important role in the response to the 921 earthquake.
- TaiChung county is expected to act more quickly and independently of the central government than Nantou county.

Findings

1. *The agenda status of emergency management was low before the earthquake, which had a negative effect on emergency response operations.*

As is often the case, emergency management did not get much attention before the earthquake. Taiwan had adequate building codes, but enforcement was not always strict. During periods of building boom such as the early 1990s there was a tendency by contractors to ignore some construction regulations, and by government agencies to overlook this practice because it allowed the supply of housing and office space to be increased rapidly. The rapid increase in office and residential space led to lower prices, which was a politically popular accomplishment.

Land use planning was another potential mitigation policy that looked better on paper than in practice. There were rules about where construction was allowed, but enforcement was not uniform. Townships varied widely in their levels of capacity, and local officials did not always understand the risks their jurisdictions faced. There was an over-reliance on mitigation coupled with a lack of understanding of disaster vulnerability. One of our informants in Puli, a city badly damaged by the quake, said "Nothing ever happens here. We did not expect such a tragedy." This in spite of Puli's mountain location, near an earthquake fault and in a landslide zone.

Many emergency management functions in Taiwan were given to the National Fire Administration (NFA) under the Ministry of the Interior (MOI) and to local fire departments. However, other functions were allocated on the basis of hazard, with the Ministry of Economic Affairs (MOE) having responsibility for floods and pipeline explosions, the Ministry of Transportation and Communication (MTC) having responsibility for transportation accidents, and the MOI for fires, earthquakes, and typhoons. In theory, the institution in charge of each type of hazard is to cover all four phases of emergency management (mitigation, preparedness, response, and recovery). In practice however, there has been some specialisation, with the NFA under the MOI concentrating on preparedness and response including search and rescue (SAR) for floods, and the Water Resource Development Administration of the MOE doing flood warnings. The Central Weather Bureau of the MTC provides warnings for typhoons, as well as running the island's network of seismographs. The Planning and Building Administration of the MOI does work on earthquake mitigation, and sheltering is the responsibility of the Ministry of Education.

The basic structure of emergency management in Taiwan revolves around the Central Hazards Mitigation Council (CHMC), and the NFA plays an important role in this



Courtesy: Agence France Presse

None of the governments or institutions planned for situations where buildings were damaged.

Council. The CHMC is aided by an Implementation Committee and a Technical Advisory Committee. There are no paid personnel in any of these units, and there is no budget for these units. All administrative work is to be done by the NFA. The missions of the Council are to make hazard mitigation policy, develop and promote a hazard mitigation plan, make and promote an emergency management plan, and approve the establishment of the Central Disaster Emergency Operations Center in case of emergency.

During an emergency, a group is assembled at the national level in the Central Disaster Emergency Operations Center located in the NFA headquarters in Taipei. This group is composed of both the CHMC and the CHMC Implementing Committee. These people are executives from many different ministries and governmental jurisdictions. The Implementing Committee is under the coordination of the head of whatever ministry is in charge of that particular category of events (flood, fire, earthquake, typhoon, etc.). One problem is that many of these members of the CHMC Implementing Committee are themselves Ministers, or rank nearly as high, and are unwilling to 'take orders' from an equal.

Another problem with this organisational structure is that none of the participants in the CHMC are full-time paid professionals in emergency management. Their duties as members of the CHMC or the CHMC's Implementing Committee can therefore conflict with their duties in their fulltime positions. No funds are

budgeted to run the CHMC or the CHMC's Implementing Committee because there are no personnel assigned to these units. The NFA has the responsibility of managing the paper work involved in running the CHMC and its Implementing Committee. Its budget during the fiscal year '98-99 was about \$30,531,400, or 0.8% of the national budget.

Officials at the central and local levels stated repeatedly that many agencies did not take their disaster-related responsibilities seriously, and were unprepared to respond when needed. This lack of preparedness was evident at all levels. The NFA and its associated local fire departments were the only government agencies that had consistently and systematically worked on disaster preparedness. When the disaster occurred, the fire departments found themselves dealing with the SAR functions for which they were trained, and also issues of supply, sheltering, and organisation for which they were ill-equipped. It took some days for the other agencies involved to learn what was needed and begin to fit into their disaster roles. Most city level agencies had no familiarity with the disaster plans the local fire departments had prepared, even though they had responsibilities under the provisions of the plans.

Legislation passed by the Legislative Yuan in 1995 mandated the development and staffing of an EOC by each county government, but few have done this yet. Many fire departments already have EOCs, and run the emergency call system (119 in Taiwan) already, so local

governments often use their EOCs and rely on their expertise during emergency situations. For example, the fire department in Taichung County has a detailed emergency response plan that is revised twice a year to reflect changes in personnel. Before the earthquake, no other county departments had requested a copy, but afterwards all departments needed one to find out what their responsibilities were. Disaster drills are held annually, but many departments had never participated in one and had little idea of what was involved in emergency response. After the earthquake they relied on advice from the fire department in order to quickly develop their own disaster operation procedures.

The day-to-day operations of most departments have little to do with emergencies and many had ignored their emergency responsibilities, believing that "it's the Fire Department's job." Many agency personnel are only assigned to emergency operations part time, so emergency management functions suffer from a lack of dedicated personnel. The local government executives are theoretically in charge during emergencies, but many know little about emergency management. The lack of an all-hazards approach has limited the understanding of the many common elements of disaster response for any type of event and the bureaucracy's willingness to invest in developing disaster response capacity.

One reason the fire departments in Taiwan do not have a very high status administratively is that until 1998 the National Fire Administration was a division of the National Police Administration. Other departments occupy more central locations in the governmental structure and have better access to the executive and to resources. The fire department in TaiChung County is trying to become directly responsible to the mayor, which will further raise its status.

The consensus among our informants was that the earthquake had changed people's attitudes and habits. There had been some small incidents like typhoons during the interval between the earthquake and our interviews, and the level of response from all local government departments had remained higher than it was before the quake.

Emergency planning for disasters due to natural hazards in general occupied a low position on the public agenda, and earthquakes in particular were not addressed. In both counties that we studied, any emergency planning and drills that had been done were focused on smaller, more common events like typhoons and multi-casualty traffic accidents. No agency we spoke to had done any planning for earthquakes. None of the volunteer SAR teams had any earthquake rescue training. The hospitals' plans were focussed on incidents with 30 or fewer casualties. None of the governments or institutions had done any planning for situations in which their buildings were damaged. Thus, the 921

earthquake caught everyone unprepared. There were problems in the response due to this lack of preparation, although improvised solutions were quickly implemented with some success due to the high capacity of the central government and the prompt arrival of foreign aid.

2. The military is expected to play an important role in emergency response operations.

Taiwan's government has a close relationship with the military because of historical circumstances since the KMT moved to the island in 1949. In addition, all males (with a few exceptions for family reasons) must spend two years in military service. Therefore, it would not be surprising to see the military playing an important part in disaster response.

The military is included in the central government's emergency management planning, but this planning is not nearly so thorough and detailed as, for example, the U.S. Federal Response Plan coordinated by FEMA. The Minister of Defense is a member of the CHMC, together with many other ministers, chairmen, mayors, and other high level officials. Emergency duties of each ministry and agency were not spelled out in any detail before the earthquake.

On the day of the earthquake, President Lee issued instructions for emergency response and disaster relief. The only instruction to deal with the military established a policy allowing men whose families were disaster victims to substitute three months of national service for their regular two year period of military service. That same day, Premier Siew established a set of policies for disaster assistance and relief. The first of these put the MOI in charge of "immediate and on-site relief assistance." The MOI was to be assisted by the Ministry of Defense (MOD) and the Public Construction Commission. More detailed instructions to the MOD were issued five days later (personal interview, Jan 2001). These instructions gave official approval to activities that had, in some instances, already taken place. The armed forces were directed to assist with disaster relief and reconstruction "until all such tasks were completed," and to put their equipment at the disposal of the civil authorities (Information Division, 1999).

In fact, the military had already deployed many men and a great deal of equipment to help out with emergency response. At 2:30 am on the 21 September, the Commander of Hang-Sun base in metropolitan Taipei issued orders for all the military services to begin disaster rescue operations. By 4 am, military units were moving to the impact area. The armed forces set up four Field Command Centres in Nantou County, TaiChung County, Taipei County and the City of Taipei (Urban and Housing Development Department, 2000).



Courtesy: Agence France Presse

The Community Recuperation Centres helped minority communities with their recovery needs, and helped local churches to develop capacity for community service.

According to our interviews, military personnel and supplies arrived in some places as quickly as three hours after the earthquake. In other locations, the military response was a little slower. Few base commanders seemed to wait for orders from the central authorities before acting. The central government order gave official standing to what was already happening in the disaster impact area.

Despite the speed with which the base commanders offered their men and equipment, the soldiers did not always play an active part. This might have been because of a lack of training, but there were reports of soldiers waiting for instructions before digging into piles of rubble to look for victims.

Taiwan's armed forces are located in many small bases scattered throughout the island. This increases their availability for purposes of the State, such as crowd control, suppression of anti-government demonstrations, and disaster relief. They are better supplied than the local civilian governments, and better organised than most civil authorities. These factors contributed to the notable presence of the armed forces in response to the 921 earthquake. By 28 September, they had completed 90,000 supply and evacuation trips, over a thousand flights, and provided thousands of tents, blankets, vehicles, food and water rations, as well as much needed

heavy equipment for debris removal (Information Division, 1999).

3. The private sector is not expected to play an important role in emergency response and recovery.

In contrast to many recently democratised countries, Taiwan has a lively and outspoken civil society. In addition, the economy is relatively healthy, with a large and expanding base of privately owned and managed companies, ranging from small shops to fairly large players in the high-tech industry. The private sector contributed in many ways to disaster response, and is maintaining a high level of activity during the recovery phase.

One group that played a prominent role in the response phase was the International Association of Search and Rescue of the Republic of China. This group began in 1981 with 15 members, and now has about 10,000 members. They are organised into local teams of 50–90 people each. There are eight paid staff in the central office, and at most one each in the division offices. Members pay annual dues of about US\$60 per year. They also receive subsidies from local businesses and religious groups. This group was very active during the disaster response period. They were one of the few groups that had some experience with rescues from

collapsed buildings because the previous year they had the chance to learn SAR techniques from a North American USAR team during the response to a building collapse in Taipei County.

Other examples of private sector activity include religious organisations like the Tz' Chi Foundation, a Buddhist group founded by a Taiwanese nun in 1966 (Liu 2001 and personal interview Jan. 2001). Tz' Chi has an active disaster relief program under its Mission of Charity, and has participated actively in international disaster relief efforts since 1991. Since it is a decentralised organisation and many members have disaster experience, members were able to organise themselves quickly into teams in their neighbourhoods after the earthquake hit. By 3 am, they had set up four stations near the collapsed hotel building in Taipei, providing direct aid for victims, emotional and psychological support for victims and rescuers, support for rescue teams, and an information office. They immediately set up a vegetarian kitchen in cooperation with other religious groups that were serving non-vegetarian food.

By the second day, officials from the Taipei branch office had arrived in Nantou County with tools and a generator, as well as other supplies. Local members had begun relief efforts as a group immediately after the quake, digging their uniforms out first in order to identify themselves as Tz' Chi members. On the 3rd day after the quake, Tz' Chi founder Master Cheng Yen visited the area and decided that the most immediate need was for emergency housing. Tz' Chi's resources were immediately focused on acquiring large numbers of tents, and then small, quickly built temporary housing units. They also gave immediate cash gifts of \$625 to the families of the deceased and \$156 to the injured, over and above the cash benefits from the government.

The next need Tz' Chi addressed was rebuilding the schools. Over 20% of the school and university buildings in Taiwan were damaged. In the non-urban areas of TaiChung and Nantou counties alone, 140 schools were damaged (Soong, Yao and Lin, 2000). The MOE appealed for help from non-governmental organisations (NGOs) with the task of rebuilding the schools. Private organisations were allowed to choose which schools they would rebuild, and the government took on the rest. Many school principals came to Tz' Chi to request help in building new schools because the private sector had a reputation for faster action than government recovery programs. Tz' Chi has created Project Hope to oversee the school construction and has undertaken the reconstruction of 53 schools.

Architects were asked to develop a unique design for each of the schools, using local materials and taking the physical site and local culture into account during the design process. These schools are being built of steel-reinforced concrete, and the use of air conditioning is

avoided to minimise energy consumption. The architects were asked to use natural ventilation and design features to keep the schools comfortable.

Other religious groups also participated in the relief effort. The Presbyterian Church in Taiwan adopted a social services approach. They have developed a network of Community Recuperation Centres (CRCs) in the hope of making "the best use of donations from church members as well as the general public" and extending support for reconstruction up to four years (Huang and Chen 2001). The CRCs had two missions: to help minority communities with their recovery needs and to help local churches develop their capacity for community service. The CRCs offered the same type of counseling and emotional support services as Tz' Chi, plus day care for children and senior citizen home care, help with navigating the bureaucratic maze for acquiring government assistance to rebuild, and economic development projects. These centres have filled a critical role in Nantou County, where there were only six professional social workers to serve a population of 544,762, approximately one for every 90 thousand people. TaiChung County was somewhat better off with 32 social workers for a population of 1,479,105 (approximately one per 50,000 persons).

The CRCs acted as coordinating centres, helping victims gain access to needed governmental services and services provided by NGOs. Many of the workers were hired locally, and had little or no professional training. Some problems arose in the implementation of the CRC plan because it had not taken sufficient account of the role local churches and pastors play in governing church activities. The program's structure has been revamped to include more input from the local pastors and congregations, which is hoped to increase the system's effectiveness.

Local businesses were very active in responding to the disaster as well. Although the potential contributions of businesses were overlooked in emergency planning before the earthquake, many donated food, water, heavy equipment, tools, and other materials to the relief effort without waiting to be asked. EVA Air heard that refrigerated containers were needed to serve as temporary morgues and donated several containers to Taichung County (Personal interview, Jan. 2001). The government did not provide emergency acquisition procedures until the Emergency Decree published by the President four days after the earthquake. In spite of this, every local government we interviewed reported excellent cooperation from local businesses, and few instances of price gouging.

Important evidence of the strength of civil society in Taiwan is the level of donations to the special fund for earthquake relief. This fund, which was set up by the government on September 23rd to accept donations from overseas and from inside Taiwan received more

than \$431,500,000 from Taiwan and overseas (921 Foundation, 2000). There were many other private accounts collecting money for earthquake relief as well, and total donations have been estimated at \$903 million (Chen 2001). Political appointees of the Executive Yuan were required by the Prime Minister to donate one month of their salaries to this fund, but we found no other evidence of coercion. The amount raised for this fund showed that Taiwan is not a poor country, relatively speaking, and that the people felt a great deal of solidarity with the earthquake's victims.

The vibrancy of Taiwan's civil society stems at least in part from historical factors. While certainly authoritarian, the Republic of China under Chiang Kai Shek and his son Chiang Ching Kuo was more open than many authoritarian societies. The government, for geopolitical reasons, found it necessary to present a façade of democracy, and over time this generated the expectation of democracy among the masses. In the end, the authoritarian regime had to allow for political expression of dissent, which further emboldened the opposition and empowered the citizenry (Rigger 1999).

In addition to the political reasons for a strong civil society, there are institutional factors involved as well. Many government agencies rely to a large extent on volunteers to fill out their ranks and perform needed services. This is especially notable among two first-responder agencies: police and fire. The volunteer fire fighters and police serve regular shifts and in many cases are as well trained as the professionals. Other agencies also rely on volunteer assistance, as is the case with the understaffed Ministry of Social Work office in Nantou County and its collaboration with the Presbyterian Church in Taiwan. Thus, Taiwan's inhabitants are accustomed to collaborating closely with their government on service delivery, although they are very politicised and do not hesitate to criticise government policy.

For these reasons, the third proposition does not hold true for Taiwan. The private sector has contributed significantly to the response and recovery efforts. In addition, many of the private sector resources involved remained under the control of local governments, NPOs, and the owners of businesses. A special committee called the 921 Earthquake Post Disaster Recovery Commission was set up by the Executive Yuan on 27 September. The Commission was reorganised in June of 2000 by the new administration

as a full-time organisation based in Tsong Shin Village in Nantou County (seat of the former Provincial Government). While this Commission disbursed government funds, another group, the 921 Earthquake Recovery Foundation was set up to manage the donation fund. Business and academic leaders were appointed to this foundation by the central government. The new administration changed some personnel and has tried to make the awards process more transparent so that people would have confidence that their donations were being spent wisely. There are thus multiple sources of aid for victims, and those who are not assisted by one group can go to another.

4. *TaiChung County is expected to respond independently of the central government and more quickly than Nantou County.*

Central government planning and control of finances has not served to even out disparities in the capacities of the different local governments in Taiwan. The many differences between the two counties in this study include differences in economic base, topography, settlement patterns, local government capacity and characteristics of the earthquake itself.

First, the two counties have very different economic bases (see Table 1). Nantou's economy is based on tea, fruit, and tourism. There is little industry, and what little there is tends to be based on the local agricultural products, such as the breweries that make wine from locally grown plums. Before the earthquake, there was a thriving tourist industry centred on the picturesque Sun Moon Lake, a favourite honeymoon spot. Other cities and villages were popular destinations for Taiwanese seeking a bit of outdoor activity. One interesting result of this is the large number of volunteer SAR teams active in the county, specialising in mountain rescue. Some villages like *Chi Chi* have drawn increasing numbers of tourists because of local landmarks and historic buildings, especially temples, that were damaged in the earthquake.

TaiChung county has a more diversified economy, relying on farming to some extent, but with more manufacturing than Nantou and an active seaport. There is an extensive small business sector that is dominated by manufacturers of mechanical equipment.

Topography has a strong influence on the settlement patterns of both counties. 83% of Nantou's land is

Table 1: TaiChung and Nantou county economies

County	Agriculture	Industry	Service	Annual Household Income
Nantou County	23.6%	30.7%	45.8%	\$26,837
Taichung County	7.0%	48.9%	44.1%	\$27,350
National Average	8.3%	37.2%	54.5%	\$27,783

Table 2: Numbers of County Employees

County	Population	# of County Employees	Employees per 1,000
San Bernadino, CA	1,418,380	14,218	10.02
Santa Clara, CA	1,497,577	17,626	11.77
Bexar, TX	1,185,394	6,607	5.57
Dallas, TX	1,852,810	11,087	5.98
Taichung, Taiwan	1,481,407	4,280	2.89
Kern, CA	543,477	8,103	14.91
San Joaquin, CA	480,628	7,067	14.70
El Paso, TX	591,610	3,466	5.86
Travis, TX	576,407	2,948	5.11
Nantou, Taiwan	544,038	2,426	7.87

mountainous, and only 17% is arable and suitable for occupation (Personal interview, Jan. 2001). Villages are scattered along the rivers that flow through narrow, lush valleys crowded with small farm plots. The population is low (544,762), as is the population density compared to the rest of the country, and Nantou is the only county in Taiwan that does not border the sea. Like rural areas in many countries, Nantou county is losing its young adult population as the young people leave to find education and work in the cities.

TaiChung County extends a long finger into the island's central mountain chain, and the land slopes quickly into the broad coastal plain of the island's western coast where the bulk of Taiwan's population lives. The population density is very high, and townships and villages are frequently not separated by any noticeable open space. Farms are small and intensely cultivated, with up to three crops a year from each field. Even in the small towns, any open space not devoted to city parks is cultivated, and buildings of several stories line the narrow streets, with commercial uses on the ground floor and residences above. Only a small part of the county is as picturesque as Nantou, but sections of two national parks fall within the county's eastern border. This section of the county supports a small tourist industry.

The level of staffing in Taiwan's county governments depends on two factors: the target figures set by the central government and the reality of local budgets. Staffing levels of police, fire, health and environmental protection departments are determined by centralised bureaucracies, although consultation with local magistrates is increasingly important because of the emphasis on democratisation. Elementary and secondary school teachers are county employees. About 70% of all tax revenue goes to the central government and the remaining 30% returns to the local governments (counties, townships, villages) through a complex formula of tax collection and disbursement. Local

governments formerly received large subsidies from the provincial government, but these were eliminated when the provincial level of government was dissolved in June 1999. The subsidy from the central government does not make up the shortfall, so counties frequently have to rely on bank loans to meet payroll, and most have cut staff and other expenses. Some counties have not been able to meet their loan obligations, and are not yet out of fiscal trouble.

The two county governments differed substantially in their capacity to handle a disaster. Nantou was understaffed and underfunded to a much greater degree than TaiChung. It is difficult to make direct comparisons to the United States, because the local government system in Taiwan is very different from that of the U.S. For instance, many functions such as education, police and fire that in the U.S. are controlled by the cities or other administrative units are controlled by the county or central government in Taiwan. Table 2 compares the level of county employment in a high services state with a large population (California), and a low services state with a large population (Texas), to the two Taiwanese counties we studied. The California counties have much larger staffs, and even in Texas, the more populous counties have larger staffs than their counterparts in Taiwan. Given the fact that county governments are given greater responsibilities in Taiwan than in the US, it is readily apparent that the county governments are understaffed.

Indeed, neither county government we studied was prepared to handle a disaster as big as the 921 earthquake. There was evidence of emergency response planning, but only in the fire departments, which were supposed to coordinate with other departments. Other departments ignored their disaster management responsibilities until after the 921 event. As one informant said: "Before the earthquake, nobody read the plan. After the earthquake, all the departments wanted a copy." Many departments had not participated in the

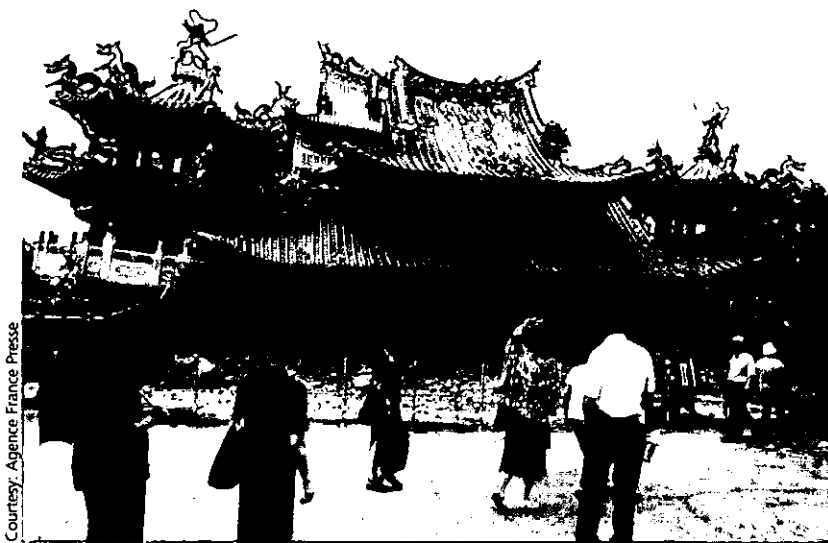
annual drills, so they had no familiarity with disaster operations or their role in disaster response. In no case was there any recovery planning, or planning for damage assessment of any kind. Disaster response planning had concentrated on typhoons, which are fairly frequent (on average 2.5 per year). These give plenty of time for warning the population, although evacuation is generally not attempted. No one had planned to respond to a large earthquake in spite of the numerous known fault lines (52) and frequent earthquakes (over 80 significant quakes during the past century). It was felt that the issue was adequately addressed by mitigation practices such as land use planning and building codes. None of the many volunteer and professional SAR groups had trained for earthquake rescues, concentrating instead on training for mountain, landslide, or water rescues.

In some ways, the experiences of Nantou and TaiChung counties during and after the 921 earthquake were very different. For one thing, the epicentre of the quake was in Nantou, the poorer of the two counties. In fact, aid to TaiChung County was slow in arriving because the extent of damage there was not understood at first. As in many disasters, clear information on damages did not come in to the central government's EOC quickly enough to provide data for efficient resource allocation. The flow of information to the central government EOC was hampered by systemic problems (lack of prior coordination among responding agencies) and by physical damage to communications systems, roads, and bridges.

The network of seismic sensors quickly pinpointed the earthquake's epicentre near ChiChi Township in Nantou County, so aid was immediately routed there. Unfortunately, it took two to three days for the central government to realise the extent of damage and casualties in TaiChung County. This led to problems with resource allocation, and townships that were hit hard in TaiChung County felt that they were neglected. In fact, aid reached both areas at about the same time, and both areas had some isolated villages that were hard to reach until the roads were re-opened. For the first few days, what aid came in was ferried in on helicopters that were also used to transport the injured out to hospitals outside the damage zone.

All respondents described the classic problems with disaster response (Dynes 1974): poor assessment of needs, misallocation of personnel or resources, convergence of outside resources, and poor communications due to earthquake damage. In addition, they suffered from confused lines of authority due to poor planning at the central level that was transferred down to the local governments, and an almost total lack of urban search and rescue training and equipment.

Differences in local government capacity began to show up as recovery tasks were initiated. Some of



Courtesy: Agence France Presse

Before the earthquake there was a thriving tourist industry in Nantou.

these problems are related not only to differences in government capacity, but also to differences in the counties' economic bases. There are several reasons Nantou is having more difficulty recovering than TaiChung. First, TaiChung had less damage proportionately. In Nantou County, almost 40% of the housing stock was destroyed or damaged, while in TaiChung County, only about 10% was destroyed or damaged.

Second, TaiChung is a wealthier county with a more diversified economy. The damage to Nantou's tourist attractions was serious, and well publicised. For some time, visitors stayed away not only because of the damage they saw on television broadcasts, but also because they feared aftershocks. Third, Nantou's county government building was destroyed. The county government was struggling to serve higher than normal demands while in temporary quarters that were not designed for government functions. Their offices were still located in a stadium two years after the disaster.

Fourth, Nantou's county magistrate was not as effective, and has been under investigation for corruption. He was in custody while we were in the county for interviews. We heard two perspectives on this. The local government people defended him, saying he had only tried to help move things along faster by doing away with some of the red tape. Central government personnel said that he was in trouble because he had only allocated 13% of the aid sent to him for distribution by the end of the first year after the disaster. In contrast, the TaiChung County government organised its Recovery Committee before the Executive Yuan established the 921 Earthquake Post-Disaster Recovery Commission in the former seat of the provincial government, Tsong Shin Village in TaiChung County on October 29th. The TaiChung County Recovery Committee has had a fairly good working relationship



Courtesy: Agence France Presse

Both of the countries studied had serious difficulties with emergency response because the magnitude of the event was larger than anyone had envisaged.

with the townships, because the County magistrate is considered to be a good manager who can delegate responsibility as needed.

Fifth, some of the most intractable recovery problems affect Nantou much more than they do TaiChung. For instance, ground displacement, up to 11 meters horizontally and 10 meters vertically (Loh and Lee 2000) has resulted in one of the most serious recovery issues in the agricultural areas, especially in Nantou County. Much of the agricultural land has shifted to a significant degree and must be resurveyed. There were not enough people qualified to do this large amount of surveying quickly so outside help was needed. To compound the difficulties, land ownership is not clear in many cases. There are two reasons for this. The first involves the aboriginal people who have occupied Taiwan for hundreds of years. With the arrival of the Han and Hakka Chinese, the aboriginals were pushed up into the mountainous interior but have never been granted clear title to lands that they have occupied for generations. The second problem results from inheritance issues. Some land has been informally subdivided among heirs without clear title to any parcel ever being established. Now both these groups of people have problems establishing their ownership of land. This has affected their ability to receive government benefits for damages or loans to rebuild their houses and replace crops damaged by earthquake-triggered landslides (Urban and Housing Development Department 2000, personal interview Jan. 2001).

Summary and conclusions

We began this paper with four propositions for examination:

- Disaster preparedness had low agenda status in Taiwan before the earthquake. This low status was expected to limit the resources and influence of the agencies charged with disaster response, negatively

affecting emergency response at all levels of government.

- An active military presence in Taiwan's response to the 921 earthquake was expected.
- The private sector was not expected to have an important role in the response to the 921 earthquake.
- TaiChung county was expected to act more quickly and independently of the central government than the Nantou county government.

The first and second propositions were supported by the evidence in this case. Low agenda status had negative effects on disaster response at all levels of government. From the national level to the smallest township we studied, everyone we interviewed stated that no agency other than the fire departments had done any serious planning for disaster response, let alone the other phases of emergency management. Emergency management functions ended up in the domain of a minor administration, the NFA, that had only recently gained independence from the National Police Administration. Disaster response suffered because of the NFA's low bureaucratic status. This finding suggests that disaster research, much of which has been conducted on North American communities, may also apply to other countries.

As was expected in a highly centralised system, the military played a large part in disaster response. This was not seen as a negative by most of our informants, who appreciated the high level of skill the military brought to key issues of transport and housing in the immediate aftermath of the earthquake. Military base commanders did not wait for orders from the central command to intervene, but responded immediately, based on their relationships to the communities where they were located.

The third proposition was not supported in the case of Taiwan's 921 earthquake. The private sector in Taiwan did have a key role in disaster response that continued into the recovery period. The private sector includes businesses and non-profit organisations such as churches or volunteer SAR teams. These organisations were prominent in both the disaster response and recovery phases after the 921 earthquake. This result may be related to the social mobilisation and tremendous growth of civil society that occurred all over the world in the 1980s and 1990s. Taiwanese society was affected by this wave of social mobilisation, especially after the legalisation of opposition parties in 1989. The relationship between centralization of government and a weak private sector may have weakened since McLuckie's seminal research was completed in the 1970s.

The fourth proposition was partially supported. Both of the counties we studied had serious difficulties with emergency response because the magnitude of the event was larger than anyone had envisioned. Moreover, as

noted in connection with the first proposition, disaster preparedness was chronically low throughout Taiwan. This minimised the initial differences between the counties. However, differences in local government capacity and in the scope of damage have affected the long-term recovery processes.

In summary, this research has reinforced what we know about the importance of planning and organisational structure in disaster response and recovery. Without adequate structures in place and intensive planning for all hazards, disaster response is bound to be confused and appear chaotic to the affected populations. This perceived inadequacy may have had some bearing on the results of the March 2000 elections, in which the KMT lost the presidency. Recent scholarship has addressed the issue of disasters and regime change (Olson 2000). This case illustrates political effects short of regime change that can follow a disaster.

Although some of our informants stated that they did not believe the problems with earthquake response caused the KMT's defeat, the party understood the danger. This is illustrated by changes in the amount of the benefits for victims' families, which was increased by the president from \$ 6,250 to \$ 31,250 for the dead and from \$ 3,125 to \$ 6,250 for those seriously injured. Another instance of policy change in response to political pressure was in the relaxation of the rules for declaring a residence 'totally collapsed' as opposed to 'partially collapsed.' Many benefits hung on this distinction: a reduction of military service, access to temporary government employment, extra points for anyone taking the college entrance examination, access to the health care system without the normal copayments, low interest loans for rebuilding or buying a new house, and a reduced income tax rate (interviews Jan. 2001). It is not surprising that the process of damage assessment became highly politicised and vulnerable to the influence of *guanxi* (relationships).

Whether the government's response to the 921 earthquake cost the KMT the presidency is uncertain, although the evidence is suggestive. This project has clarified the ways in which existing political and governmental institutions can affect disaster response and recovery. Future research will compare disaster response in Taiwan to cases in Japan (1995) and Mexico (1985).

References

921 Foundation. 2000. <http://www.921fund.org.tw>

Anderson, William A. 1969. "Social structure and the role of the military in natural disaster." *Sociology and Social Research*. 53, 242–252.

Bachrach, Peter, and Morton Baratz. 1962. "The Two Faces of Power." *American Political Science Review* 56:947–52.

Baumgartner, Frank R. and Bryan D. Jones. 1993. *Agendas and Instability in American Politics*. Chicago: University of Chicago Press.

Birkland, Thomas A. 1997. *After Disaster: Agenda Setting, Public Policy, and Focusing Events*. Washington, D.C.: Georgetown University Press.

Chen, Liang-Chun. 2001. "A Discussion on the Characteristics, Impacts and Emergency Responses of Chi-Chi Earthquake."

Cobb, Roger W., and Charles D. Elder. 1972. *Participation in American Politics: The Dynamics of Agenda-Building*. Boston: Allyn and Bacon.

Dynes, Russell R. 1974. *Organisational Behavior in Disasters*. Columbus, OH: Disaster Research Center.

Huang, Chiao-Hsing, and Liang-Chun Chen. 2001. "The Making of a Post-Earthquake Community Care Network—Experience of the Presbyterian Church in Taiwan." pp. 35–1–35–10, *Proceedings: APEC Workshop on Dissemination of Disaster Mitigation Technologies for Humanistic Concerns*. Taipei, Taiwan: June 18–21.

Hutchcroft, Paul D. 2001. "Centralization and Decentralization in Administration and Politics: Assessing Territorial Dimensions of Authority and Power." *Governance: An International Journal of Policy and Administration* 14:23–53.

Information Division, Taipei Economic and Cultural Office in New York. 1999. "Important Relief Measures by the Executive Yuan for the September 21 Earthquake." <http://www.taipei.org/whatsnew/quake928.htm>.

Kingdon, John W. 1995. *Agendas, Alternatives and Public Policies*. 2nd ed. New York: Harper Collins

Liu, King-Pong. 2001. "Lessons from Tz' Chi's Earthquake Relief Programs." pp. 33–1–33–13, *Proceedings: APEC Workshop on Dissemination of Disaster Mitigation Technologies for Humanistic Concerns*. Taipei, Taiwan: June 18–21.

Loh, Chin-Hsung, and George C. Lee. 2000. "Geology and Tectonics of Taiwan." pp. 5–12, *The Chi-Chi, Taiwan Earthquake of September 21, 1999: Reconnaissance Report*. MCEER Technical Report MCEER-00-0003

Manor, James. 1999. *The Political Economy of Democratic Decentralization*. Washington, D.C.: World Bank.

May, Peter J., and Walter Williams. 1986. *Disaster Policy Implementation: Managing Programs under Shared Governance*. New York: Plenum Press.

McLuckie, Benjamin F. 1975. "Centralization and natural disaster response: A preliminary hypothesis and interpretations." *Mass Emergencies*, 1, 1–9.

Nickson, R. Andrew. 1995. *Local Government in Latin America*. Boulder CO: Lynne Rienner Publishers.

Olson, Richard S. 2000. "Toward a Politics of Disaster: Losses, Values, Agendas and Blame." *International Journal of Mass Emergencies and Disaster* 18:265–287.

Olson, Richard S. and Vincent T. Gawronski. 2000. "The 1985 Mexico Earthquake Disaster: A 'Critical Juncture'?" Presented at the 25th Annual Hazards Research and Applications Workshop. Boulder, CO: July 9–12.

Page, Edward C. and Michael J. Goldsmith. 1987. "Centre and locality: Functions, access and discretion." pp. 1–11 in Edward Page and Michael J. Goldsmith (Eds.) *Central and Local Government Relations*. London UK: Sage Publications Ltd.

Pickvance, Chris and Edmond Preteceille. 1991. "Conclusion: Towards a comparative analysis of state restructuring and local power." pp. 197–209 in Chris Pickvance and Edmond Preteceille (Eds.) *State Restructuring and Local Power*. London UK: Biddles Ltd.

Urban and Housing Development Department, Council for Economic Planning and Development. 2000. "Response and Recovery to the 921 Earthquake." Internal report.

Prater, Carla S., and Michael K. Lindell. 2000. "Politics of Hazard Mitigation." *Natural Hazards Review* 1:73–82.

Rigger, Shelley. 1999. *Politics in Taiwan: Voting for Democracy*. New York: Routledge.

Schattschneider, E. E. 1960. *The Semisovereign People: A Realist's View of Democracy in America*. New York: Holt, Rinehart and Winston.

Sivanna, N and Abdul Aziz. 1996. "An overview and conclusions." pp. 278–288 in *Decentralized Governance in Asian Countries*. Thousand Oaks CA: Sage Publications.

Smith, B. C. 1985. *Decentralization: The Territorial Dimension of the State*. London UK: George Allen and Unwin Ltd.

Soong, Tsu T., George C. Yao, and Chi-Chang Lin. 2000. "Critical Facilities." pp. 29–41, *The Chi-Chi, Taiwan Earthquake of September 21, 1999: Reconnaissance Report*. MCEER Technical Report MCEER-00-0003.

Carla Prater and Jie-Ying Wu may be contacted at
Email: carla@archone.tamu.edu

EMA Update

PLANNING & OPERATIONS

Bali bombing

EMA was called into action soon after the Australian response to the Bali incident commenced. The initial task assigned by the Department of Foreign Affairs and Trade (DFAT) was to coordinate the reception in Darwin of victims evacuated by the Australian Defence Force and to coordinate their on-movement to hospitals in the south.

EMA completed its task within three days of the incident. Following an offer by the Australian Government to treat critically injured Indonesian citizens in Australia, EMA was then tasked to liaise with the DFAT doctor in Bali to coordinate the movement of Indonesian victims to Australian hospitals. Only five patients were transported to Australia.

A further task followed with EMA being asked to assist DFAT with the repatriation of bodies to Australia. EMA also provided community recovery advice to a number of Commonwealth agencies and facilitated effective linkages between Commonwealth and State agencies involved in the Australian response.

EMA was greatly assisted in the performance of these tasks by emergency management personnel in States and Territories.

*For further information contact: Rod McKinnon
Phone: 02 6266 5328, email: rod.mckinnon@ema.gov.au*

Papua New Guinea volcano eruption assessment

The eruption of Mount Pago in the West New Britain Province of PNG during August threatened to impact heavily on the health and welfare of local communities.

At the request of the PNG Government, the Australian Agency for International Development (AusAID) conducted an assessment of the situation to provide advice to the PNG National Disaster Committee and the Provincial Disaster Committee on the possible provision of assistance by the Australian Government

Under a Record of Understanding between EMA and AusAID for the delivery of emergency management services, EMA participated in the assessment mission. At short notice, EMA despatched Steve Banks, to make a number of recommendations to AusAID on the priority for the provision of assistance to the affected communities at the scene.

*For further information contact: Steve Banks
Phone: 02 6266 5505, email: steven.banks@ema.gov.au*

Urban search and rescue

The first meeting of the newly formed National Urban Search and Rescue Working Group (NUSARWG) was held in Sydney in October. Replacing the former National Urban Search and Rescue Steering Committee, NUSARWG aims to promote the strategic development of urban search and rescue capabilities nationally.

EMA chairs and supports the working group comprising of representatives from each State and Territory, the Police Commissioners Conference, the Convention of Ambulance Authorities, the Australian Council of State Emergency Services, the Australasian Fire Authorities Council and the Australian Disaster Medicine Group. The Ministry of Civil Defence and Emergency Management and the Fire Service represents New Zealand.

*For further information contact: Trevor Haines
Ph: 02 6266 5169, email: trevor.haines@ema.gov.au*

Fiji exercises

EMA participated in two emergency-management-related exercises in Fiji during October.

The first, *Exercise SUVEQ 2002*, a Fiji Ministry for Regional Development initiative, was designed to test the National Disaster Plan. A magnitude 6.5 earthquake, in the ocean off Suva, causing a tsunami that subsequently impacted on the Suva City region was the base scenario of the exercise.

The second was a combined Australian Defence Force (ADF) and Republic of Fiji Military Forces (RFMF) Humanitarian Assistance (HA) and Disaster Relief (DR) exercise called *Exercise Longreach 2002*. The purpose of the exercise was to practise the ADF and the RFMF in the conduct of a HA/DR operation following a request for assistance from the Fiji Government.

Steve Banks, EMA's Manager Regional Technical Assistance, participated in both exercises in an advisory capacity. At the request of the Fiji Ministry for Regional Development, EMA also sponsored the participation of Urban Search and Rescue Team Leader, Mr Trevor Owen, from the Melbourne Fire and Emergency Services Board in Exercise SUVEQ 2000.

*For further information contact: Steve Banks
Phone: 02 6266 5505, email: steven.banks@ema.gov.au*

PLANNING & OPERATIONS *continued*

APEC earthquake seminar

In September, David Morton from EMA participated in a seminar in Chinese Taipei conducted under the auspices of the APEC Earthquake Response Cooperation Program for Energy Supply Systems. He presented a paper outlining Australia's emergency response arrangements and giving details of a proposed EMA sponsored project to establish a national emergency risk management methodology and benchmark for utilities.

The meeting developed guidelines for improving the earthquake performance of energy supply systems and for preparation and implementation of effective emergency response and restoration plans. Progress was also made in establishing effective post-earthquake cooperation mechanisms between member economies.

*For further information contact: Dave Morton
Phone: 02 6266 5325, email: david.morton@ema.gov.au*

Aviation accident preparedness workshop

In October, EMA co-sponsored a Pacific Island Region Aviation Accident Preparedness Workshop in Nadi, Fiji. Other sponsors were the Disaster Management Unit from the South Pacific Applied Geoscience Commission, the Association of South Pacific Airlines, Qantas and Air New Zealand.

The aim of the workshop was to enhance the capability of the Pacific Island Region to manage aviation accidents. Thirty five representatives from airlines, airport operators, National Disaster Management Offices, police and other government departments from 10 Pacific countries participated in the workshop which was deemed a success by all participants.

*For further information contact: Joanne Laurence
Phone: 02 6266 5618, email: joanne.laurence@ema.gov.au*

KNOWLEDGE MANAGEMENT & BUSINESS GROUP

Australian science festival

EMA participated in the Australian Science Festival in Canberra in late August. Through informative video material, colourful displays, publications and interaction with the community, EMA was able to raise the awareness of emergency management and reaffirm our commitment to assisting the community.

*For further information contact: Grahame Parker
Ph: 02 6266 5218, email: grahame.parker@ema.gov.au*

EMATRACK – Australian disaster database

With increased public awareness of emergency management issues and the associated costs to the community, greater demand is being placed on EMA for information relating to Australian disasters. Through the ongoing development of the EMATrack database, over one hundred years of disaster information is being made available through the EMA web site.

*For further information contact: Grahame Parker
Ph: 02 6266 5218, email: grahame.parker@ema.gov.au*

Australian Disaster Information Network

The AusDIN concept continued to develop during the past three months. AusDIN continues to represent the best model for Commonwealth and State/Territory emergency management sector organisations, and partnering agencies, to effectively share information relating to emergency management. The development of an Internet portal is a practical means of facilitating cooperation via the dissemination of emergency management information.

*For further information contact: Rob Lee
Ph: 03 5421 5245, email: rob.lee@ema.gov.au*

Knowledge networks

The transition of the EMA Websites to the Rapidweb environment has progressed considerably. EMA has

trained the web team in authoring for Rapidweb, the range of templates is complete and the web team is transferring content to the new sites. The site should go live in December.

The Text-only section of the current website is complete and there are several new areas including sections for Volunteers and the Australian Journal of Emergency Management (AJEM).

Discussions are progressing between Education & Training and their consultant regarding the development of a Strategic Plan for implementing flexible delivery options within EMA's suite of training products.

*For further information contact: John Laurie
Ph: 03 5421 5280, email: john.laurie@ema.gov.au*

Emergency Management Australia Institute simulation centre

Equipment installation and systems testing of the new equipment is now complete. The Centre has now hosted several internal and external activities—receiving enthusiastic response from users.

*For further information contact: John Haydock
Ph: 03 5421 5297, email: john.haydock@ema.gov.au*

Community awareness activities

In partnership with Geoscience Australia, EMA is currently engaged in reviewing and revising a hazard awareness publication titled Landslide Awareness that will be available for distribution by all State and Territory emergency management agencies.

Initiation of the South West Pacific Community Awareness Program in conjunction with SOPAC began with a pilot program in Tuvalu. This program complements the existing Comprehensive Hazard and Risk Management (CHARM) initiative, cooperatively developed with SW Pacific nations, by developing measures that ensure communities will have knowledge

KNOWLEDGE MANAGEMENT & BUSINESS GROUP *continued*

and understanding to identify hazards and to cope with their effects. One of the objectives of CHARM is to increase public awareness and a corresponding community awareness campaign by assisting local Tuvaluan authorities to develop appropriate initiatives and increase local capacity to undertake these programs.

*For further information contact: Christine Jenkinson
Ph: 03 5421 5241, email: christine.jenkinson@ema.gov.au*

Library service improvements implemented

EMA library staff, in conjunction with the Attorney General's Library service, have evaluated and selected a

new library management system. It is expected that this system will improve library service capabilities, simplify and improve client searching and allow for new formats to be classified such as photographs and electronic documents.

Recent improvements to the entrance also include a new lounge area; current journals section; whiteboard; TV/video unit; lecturers' desk and computer, and phone access.

*For further information contact: Linda Hansen
Ph: 03 5421 5224, email: linda.hansen@ema.gov.au*

DEVELOPMENT GROUP

Australian Safer Communities awards

The Attorney-General the Hon Daryl Williams AM QC MP presented the National Safer Communities Awards to the winning entrants at a ceremony held at Parliament House on 9 October 2002. Over 100 people in attended the event that generated considerable media attention.

The awards recognised excellence and innovation in emergency management. Nationally, sixty-seven entries were received with the State and Territory winners progressing through to the national finals. The award winning entries were representative of the breadth of emergency management and covered such things as flood awareness, kitchen fire safety, bushfire behaviour modelling, arson prevention, recovery management at the local government level, cliff safety, volunteer training, research and the prevention of exotic animal diseases.

In his speech, the Attorney-General encouraged other emergency management authorities, government and private corporations to adopt the ideas generated by the awards.

*For further information contact: David Winterburn
Phone 02 6266 5009, email: david.winterburn@ema.gov.au*

Management of cyclone risk

The cyclone season in WA, NT and Queensland lasts nearly six months (November to April) with communities in the cyclone area vulnerable to attack by high winds, heavy rain and/or storm surge. Given the growing population, the increasing value of assets and the development of industry in northern Australia, the management of cyclone risk in Australia is very important. However, arrangements to manage cyclone/storm surge risk vary across the three States/Territories and there is little coordination between the risk management agencies. Following a proposal from WA, EMA has initiated a project on the management of cyclone risk. The aim of the project is to improve coordination between the cyclone risk management agencies and to produce *Guidelines for the Management of Cyclone Risk in Australia*. To progress the project a workshop will be held in Darwin on 12-13 November and consider current cyclone risk management practice and how best to approach the development of guidelines.

*For further information contact: Peter Arnold
Phone 02 6266 5496, email: peter.arnold@ema.gov.au*

Emergency Management Volunteers in Action photographic competition

The Emergency Management Volunteers in Action photographic competition concluded on 27 August culminating in an awards ceremony at the National Press Club. The competition attracted 46 entries from media and freelance photographers in the Professional Stream, and another 76 entries from volunteer organisations and individual volunteers in the Volunteer Stream. The Attorney-General presented awards to the following photographers:

Professional stream

- Winner: 'Devastation', Angela Trapani, Shepparton News, Victoria (see front cover of this edition of AJEM).
- Highly Commended: 'Rescued Possum', Jo-Anna Robinson, Adelaide Advertiser, South Australia

Volunteer stream

- Winner: 'Biting the Bullet', Brenton Ragless, Country Fire Services, South Australia
- Highly Commended: 'Frontline', Didier Moutia, St John Ambulance Australia, New South Wales; and
- 'Rescue', Glenn Alderton, State Emergency Service, Queensland

*For further information contact: Trevor Jenner
Phone 02 6266 5317, email: trevor.jenner@ema.gov.au*

Emergency Management Volunteers

The newly formed Australian Emergency Management Volunteers Forum met for the third time recently to continue to address the issues and recommendations arising from the Volunteers Summit. The Forum now has a distinctive logo and is currently establishing a web site, planned for public access on 1 December 2002.

*For further information contact: David Winterburn
Phone 02 6266 5009, email: david.winterburn@ema.gov.au*

This is EMA

EMA has produced and distributed the companion document to the EMA 2002-2005 Corporate Plan, *This is EMA*. The publication presents corporate information about EMA, relationships within the Department, the operational environment, and trends in the emergency management sector.

*For further information contact Rob Cameron.
Phone: 6266 5408, email: robert.cameron@ema.gov.au*

EDUCATION & TRAINING GROUP

Education and Training Group

The Education and Training team have been revising, updating and enhancing the delivery and assessment system and learning and assessment strategies to comply with the new national industry competency standards from the Public Safety Training Package and the Australian Quality Training Framework Standards for Registered Training Organisations (ANTA 2001).

In 2003 the Institute will still deliver the nationally agreed content of our current programs. However, the learning and assessment strategies will now be based on five national industry competency standards from the Advanced Diploma in Public Safety (Emergency Management) together with a number of accredited courses for which national competency standards are not yet available. This approach is consistent with feedback from the Training Needs Assessment and the Evaluation for Impact Study conducted by the University of Melbourne in late 2001.

The Institute is also developing a Recognition of Prior Learning (RPL) strategy including a bridging program to enable those who attended EMA courses from 2000 (when the Public Safety Training Package was introduced) to be assessed against the competency standards from the PS Training Package and receive recognition. There will be no charge to participants for this program.

Further information can be obtained by contacting Judy Parker on judy.parker@ema.gov.au.

Detailed information regarding reviews of the programs offered at the Institute can be found at the EMA website: www.ema.gov.au or by contacting the relevant course coordinator below.

Emergency Risk Management Program

Further information can be obtained by contacting the Course Coordinator, Mark Scillio, mark.scillio@ema.gov.au

Exercise Management (ExMan)

Further information can be obtained by contacting the Course Coordinator, Colin Fiford, colin.fiford@ema.gov.au

Emergency Coordination Centre Management

Further information can be obtained by contacting the Course Coordinator, Barry Dean, barry.dean@ema.gov.au

Course in Evacuation Management

Further information on this course can be obtained by contacting the Course Coordinator, Michael Dickinson, michael.dickinson@ema.gov.au

Competency Standards Review

Further information can be obtained by contacting Margery Webster, margery.webster@ema.gov.au

Graduate Certificate in Emergency Management

Further information can be obtained by contacting Dianne Cooper, dianne.cooper@ema.gov.au

Recovery Management

Changes in the Recovery Management Course may be obtained by contacting the Course Coordinator, Bruce Gray, bruce.gray@ema.gov.au

The timetable for EMA activities covering the first half of 2003 can also be found at the EMA website www.ema.gov.au

School Education

The Disaster Education in Schools section of the EMA web site is designed specifically as a teacher resource and student research capability on issues relating to natural and man-made disasters in Australia. A collaborative project between three states and territories, the project includes the involvement of a team of teachers from both primary and secondary levels and a range of subject areas, reviewing the site and making recommendations for its improvement according to a set of criteria.

The results of their findings will be available this year and development work on the web site will begin next year. The new School Education officer, Neil Barker, who will take up his position at Mt Macedon in early February 2003 will manage the project. Neil will be the fourth teacher who has worked with EMA as part of the Teacher Release to Industry Program (TRIP), which is a joint venture between the Victorian Employers' Chamber of Commerce and Industry (VECCI) and the Victorian Department of Education & Training (DE&T).

The current School Education Officer, Greg Moore, can be contacted at Mt Macedon until 6 December 2002. Contact details will remain the same for next year. For matters relating to schools, teachers and students, telephone 03 5421 5242, or email schooled@ema.gov.au.

Scanlon wins Charles E Fritz Award

Joe Scanlon, Director of Emergency Communications Research Unit at Carleton University in Canada is the 2002 winner of the Charles E Fritz Award for career achievements in the Social Science Disaster Area.

Joseph Scanlon has a Bachelor of Journalism degree and a graduate Diploma in Public Administration from Carleton and a Master of Arts (Politics) from Queen's University. After a career in Journalism – he was both Washington and Parliamentary correspondent for the Toronto Daily Star – and a brief career in politics – he was executive assistant to the late Hon. Judy LaMarsh, he joined the faculty of Carleton's School of Journalism. He served the School as its Director from 1966 to 1973.

Since becoming Director of ECRU, Professor Scanlon has been a regular lecturer at the Canadian Emergency Preparedness College and lectured for 20 years at the Canadian Police College and for ten years made regular visits to give seminars for the British Emergency Planning College in Easingwold, Yorkshire. Recently he has also lectured in Australia, Austria, England, Holland, Hungary, Ireland, Spain, United States as well as Canada.

Between 1994 and 1998, Professor Scanlon was President, Research Committee on Disasters, International Sociological Association. He is now both past president and general editor of a series of books the Research Committee is producing with Routledge, London.

The Charles E Fritz Award is named after an early pioneer in social science disaster studies and is given for significant and numerous contributions to the disaster area, including research, publications, policy development as well as providing input into the professional development of the field. It is given in recognition of major and notable career achievements of a lifetime.

Emergency Management Australia congratulates Joe on receiving this recognition.

CONFERENCE DIARY

INTERNATIONAL

Date: January 6–9, 2003

Location: Charleston, South Carolina, North America

Title: Coastal GeoTools – 2003

Detail: Possible focus areas include hazard mitigation, land use and community development, remote sensing, watershed planning and other hazards-related topics. Abstracts are due July 19, 2002

Enquiries: Mark Jansen, NOAA Coastal Services Center, 2234 South Hobson Ave, Charleston, SC 29405-2413; (843) 740-1200; email: Geo.Tools@noaa.gov

Sponsor: National Oceanic and Atmospheric Administration (NOAA), Coastal Services Center (CSC).

Date: January 8–10, 2003

Location: Catholic University in Washington

Title: Terrorism: Threats, Tactics, Training and Technology,

Detail: Transit Terrorism, terrorist attack profiles, terrorism early warning and intelligence fusion, terrorist training, terrorist tactics, terrorist targeting, emerging technologies, threat of cyberterrorism, and newest aviation security threat information.

Enquiries: www.terrorism.com

Date: January 24–28, 2003

Location: St. Petersburg, Florida, North America

Title: Weapons of Mass Destruction Conference 2003: Preparedness Through Partnership

Enquiries: Gregory Watts: (727) 398-9482; email: Gregory.Watts2@med.va.gov; <http://www.va.gov/wmd/>.

Sponsor: University of South Florida College of Medicine, Veterans Health Administration, Emergency Management Strategic Healthcare Group, Florida Department of Health – Emergency Operations, Brooke Army Medical Center, Pinellas County Emergency Management and Federal Emergency Management Agency.

Date: January 27, 2003

Location: London, United Kingdom

Title: Emergency Lighting – Design and Practice

Enquiries: Fire Courses Secretary, Mid Career College, PO Box 20, Cambridge CB1 5DG UK courses@mid-career-college.ac.uk; tel: (01223) 880016; fax: (01223) 881604.

Date: February 6–9, 2003

Location: Orlando, Florida, North America

Title: 2003 International Disaster Management Conference: "Disaster 2003"

Detail: The organizers have issued a call for presentations.

Enquiries: John Todaro, Director of Education, Florida Emergency Medicine Foundation, Florida College of Emergency Physicians, 3717 South Conway Rd, Orlando, Florida. 32812-7607; (407) 281-7396, dxt.17; fax: (407) 281-4407; email: jtodaro@femf.org.

Host: Florida Emergency Medicine Foundation.

Date: 5–8 February, 2003

Location: Portland, Oregon, North America

Title: The Earthquake Engineering Research Institute (EERI) Annual Meeting

Enquiries: EERI, 499 14th Street, Suite 320, Oakland, CA 94612-1934; Tel: (510) 451-0905; Fax: (510) 451 5411. Email: 33ri@eeri.org. Website: <http://www.eeri.org/>

Date: 11 February, 2003

Location: OFC, Ontario, North America

Title: 2003 Fire Coordinators' Conference

Date: 12–16 February, 2003

Location: Baltimore, Maryland

Title: 7th World Congress on Stress, Trauma and Coping: Crisis Intervention in a Changing World

Detail: Call for presentations and papers is available at the website: <http://www.icsf.org/cfp.pdf>

Enquiries: Shelley Cohen; (410) 750-9600; email: scohen@icsf.org

Host: International Critical Incident Stress Foundation (ICISF). One and two-day pre-congress workshops will be offered February 12–13, 2002.

Date: 13–15 February, 2003

Location: Christchurch, New Zealand, Australasia

Title: Pacific Conference on Earthquake Engineering

Detail: Abstracts due by April 2002

Enquiries: Conference Secretariat, Conference Office, Centre for Continuing Education, Canterbury, Private Bag 4800, Christchurch, New Zealand; Tel: 64-3-364-2534; Fax 64-3-364-2057. Email: pcee@cont.canterbury.ac.nz

Host: New Zealand Society for Earthquake Engineering.

Date: 22–26 February, 2003
Location: Washington DC, North America
Title: National Emergency Management Association (NEMA) 2003 Mid-year Conference
Enquiries: Registration materials will be available in December 2002. Contact: NEMA; (859) 244-8162; email: nema_admin@csg.org
Date: 23–26 February, 2003
Location: Providence, Rhode Island, North America
Title: International Disaster Recovery Association (IDRA) Annual Meeting
Details: The theme for the 13th annual conference is 'readiness, resilience, recovery and reassessment of all topics focus on telecom contingency planning.
Enquiries: IDRA (508) 845-6000; email: 2003@idra.com
Date: 24–28 February, 2003
Location: Las Vegas, Nevada, North America
Title: International Erosion Control Association 34th Annual Conference and Expo
Enquiries: International Erosion Control Association, PO Box 774904, 1355 S. Lincoln Ave., Steamboat Springs, CO 80477-4904.
Date: 3–6 March, 2003
Location: Rotterdam, The Netherlands, Europe
Title: International Conference on Advances in Flood Forecasting in Europe
Enquiries: Bob van Kappel; email: bob.vankappel@wldelft.nl
Host: WL/Delft Hydraulics and the Joint Research Center of the European Commission.
Date: 4–8 March, 2003
Location: New Orleans, Louisiana, North America
Title: Association of American Geographers (AAG) Annual Meeting
Details: Includes a session on hazards-related issues. Deadline for submissions is September 25, 2002.
Enquiries: Jayajit Chakraborty, Department of Geography, University of South Florida, 4202 East Fowler Avenue, SOC 107, Tampa, FL 33620; email: jchakrab@chuma1.cas.usf.edu
Date: 8–12 March, 2003
Location: Reno, Nevada, North America
Title: 2003 National Disaster Medical System (NDMS) Conference
Enquiries: Contact NDMS. Tel: 0011/0018 1800-USA-NDMS, and press the 'star' key. Email: ndms@usa.net.
Host: National Disaster Medical System
Date: 10–15 March, 2003
Location: Puerto Rico, South America
Title: Dissertations Initiative for the Advancement of Climate Change Research (DISCCRS) Symposium
Sponsors: American Geophysical Union, American Meteorological Society, American Society of Limnology and Oceanography, Ecological Society of America and Whitman College
Enquiries: To register with DISCCRS, or for complete symposia information including eligibility, deadlines and how to apply contact C Susan Weiler; (509) 627-5948; email: weiler@whitman.edu; or web site: http://aslo.org/disccrs/disccrsposter.pdf .

Date: 12–21 March, 2003
Location: Madison, Wisconsin, North America
Title: Disaster Management Workshops
Enquiries: Don Schramm, email: schramm@epd.engr.wisc.edu; or Jennifer Oster, Department of Engineering Professional Development, University of Wisconsin-Madison, 432 Lake Street, Madison, WI 53706; 1-800-462-0876 or (608) 262-4468; fax: (608) 263-3160; email: oster@epd.engr.wisc.edu.
Sponsor: University of Wisconsin – Madison, Department of Engineering Professional Development

Date: 16–23 March, 2003
Location: Kyoto, Shiga & Osaka, Japan
Title: Third World Water Forum
Enquiries: Secretariat of the 3rd World Water Forum, 5th Floor 2-2-4 Kojimachi Chiyoda-ku, Tokyo 102-0083, Japan; tel: +81-3-5212-1645; fax: +81-3-5212 1649;
Sponsor: World Water Council.

WESTERN AUSTRALIA

Date: 27–28 March, 2003
Location: Perth, Western Australia
Title: Demystifying Emergency Management: warts and all
Enquiries: Scott-Andrew Smith, email ssmith@fesa.wa.gov.au

CALL FOR PAPERS – AUSTRALIA

Date: 10–12 September, 2003
Location: Canberra, Australia National Convention Centre,
Title: Australian Disasters Conference Safer Sustainable Communities – 2003
Description: The 2003 Australian Disasters Conference Committee invites the Australian emergency management community and other prospective participants to submit abstracts for the presentation of papers.
Enquiries: To register your interest and to ensure you receive further information and regular updates via our mailing list email the Conference Coordinators enquiry@einsteinandedison.com.au or phone Liz or Katie on (02) 6232 4240.

BOOK REVIEW

With Spirit and Courage: the extraordinary life of Paul Featherstone

By Paul Featherstone with Ian Heads. Publisher: Pan Macmillan Australia Recommended Retail: \$30.00



With spirit and courage: the extraordinary life of Paul Featherstone is the autobiography of rescue paramedic, Paul Featherstone, who recently received worldwide attention as the rescuer of Stuart Diver, the sole survivor of Australia's Thredbo landslide.

Featherstone takes the reader inside some of the most dramatic moments in Australian life in the last 30 years including the Thredbo landslide, the Granville train disaster and the Nyngan floods.

In this inspirational and thoroughly captivating book, Featherstone tells of the spirit and teamwork that he believes makes Australians special. 'Feathers', as he is known in paramedic circles, describes the national sense of team spirit he encountered when the volunteer team extricated Stuart Diver from the crush of concrete and rock at Thredbo.

Recounts of exhilarating access operations in the book reveal the natural and human elements that may work against a rescue attempt. Featherstone talks of how his aircraft was inverted due to the unpredictable turn of a water tornado direction during a sea rescue of lost fishermen. He also tells of a surfer who placed a rescue mission in jeopardy because he wanted to have his surfboard winched up with him when stranded in rough seas.

He also describes the many dangers of rescue missions including descending from a helicopter winch into a violent sea storm during an ink black night, encountering a black snake while plucking a victim from the Nyngan floodwaters and crawling under a potentially unstable train to access an injured victim.

As well as his historical recollections of some of Australia's major disasters, Featherstone follows the institution of the Australian Paramedic Unit from its inception in 1976 to its

current world-class status and his formation of the Specialty Casualty Access Team (SCAT) in the eighties.

The feats of courage and endurance described in the book illustrate why Featherstone advocates SCAT members need to be multi-skilled. SCAT access operations often need medical and physical capabilities for feats that are not only extraordinary but also often heroic. He says that training and the ongoing tests of physical and mental endurance are crucial to SCAT operational effectiveness especially given the unpredictability of access circumstances such as pounding seas, cliff ledges or caves.

Featherstone also talks of the human qualities necessary for a rescue paramedic. He believes paramedics need confidence to place their lives in their colleagues' hands because in their profession, the likelihood is that they inevitably will.

With so many additional factors working against the volunteer like violent weather, poor visibility, tight spaces and unstable surfaces a common theme emerging from this book is the importance of teamwork.

Reviewed by Giovanna di Natale, Reference Librarian, Emergency Management Australia.

AUSTRALIAN DISASTERS CONFERENCE

Safer Sustainable Communities – 2003

The 2003 Australian Disasters Conference hosted by Emergency Management Australia (EMA) has been rescheduled. The Conference will now be held in Canberra from 10–12 September 2003.

EMA recognises that the success of the Conference will rely heavily on the quality of speakers and the material presented. The Conference Committee invites the Australian emergency management community and other prospective participants to submit abstracts for presentation at the conference. Conference planners expect the length of each presentation will be 30 minutes including time for questions/discussion. The Conference Committee seeks abstracts for papers addressing one or more of the Conference themes and streams listed below. Papers will be selected based on innovation, relevance to the conference theme/streams and author's expertise, and clarity of reasoning criteria.

The theme for the Conference is 'Community Safety is Everyone's Business'. In this context, the Conference streams are:

- Working with Communities
- Understanding Risk and Uncertainty
- Consequence Management (Response and Recovery)
- Sustainability
- Critical Infrastructure Protection/The Role of Business
- Information and Communication

For a copy of the Initial Announcement and Call for Abstracts brochure, contact Susan Stevens, phone: 02 6266 5005, email: susan.stevens@ema.gov.au; or the Conference Secretariat, Einstein & Edison, phone: 02 6232 4240, email: enquiry@einsteinandedison.com.au

