

# The application of risk management principles to municipal emergency management practice

## Introduction

Charleville and Augathella are located adjacent to the Warrego River in the Shire of Murweh in far Western Queensland and have a history of flooding. In 1990 a record flood of 8.54m was experienced at Charleville that resulted in major evacuations, disruption to essential services (including telecommunications) and significant economic and social consequences in both towns. Recovery bills totalled in excess of \$71.6m.

Two flood studies were undertaken following this flood (Scott and Furphy 1991; Kinhill, Cameron and McNamara 1993) and recommended a suite of structural and non-structural solutions to the flooding problem. However, and in large part due to a lack of community consensus on the most appropriate actions, recommendations had not been acted upon before another major flood in 1997, which reached a height of 7.39m occurred at Charleville, again with serious consequences.

Against this background the Queensland Department of Emergency Services commissioned a Flood Risk Study for Charleville and Augathella in mid-1997 aimed at establishing vulnerability to flooding and barriers to the implementation of past study recommendations. Two main deliverables were sought: a list of intervention strategies to address community vulnerabilities to flooding, and the development of a methodology for local disaster management planning based on AS/NZS 4360: 1995 – Risk Management.

During 1999 the Queensland Department of Emergency Services commissioned another study (Qld Risk Management Consultants Pty Ltd 2000) to further develop and refine the disaster risk management process established as part of the Murweh Shire study. The study was conducted in the Local Government areas of Cairns, Harvey Bay and Mackay. It addressed multi-hazards in large urban environments as distinct from the Murweh Shire study, which dealt with a single hazard (flooding) in a rural environment.

by Ken Durham, Disaster Policy and Research Unit, Department of Emergency Services, Queensland, Michael Cawood, Geo-Eng Australia Pty Ltd and Roger Jones, TEM Consultant.

The three cities were chosen because of their exposure to a range of hazard events and the diverse nature of their communities.

The refined process/product will be made available with appropriate training to all Local Governments in Queensland. The methodology is applicable to all Local Governments in all other States and Territories.

This paper discusses the study processes and presents a methodology for applying the risk management process specified in AS/NZS 4360 to emergency risk management that is applicable to and can be used by all Local Governments.

## Risk management approach outlined

### The Australian/New Zealand Risk Management Standard

The Standard, hereafter referred to as 'AS/NZS 4360', provides a generic framework for the identification, analysis, assessment, treatment and monitoring of risk. It is focused on the needs of single organisations, independent of any specific industry or economic sector. AS/NZS 4360 emphasises that the design and implementation of a risk management system within an organisation, while drawing on the elements of the risk management process specified, would be influenced by the varying needs of that organisation, its particular objectives, its products and services, and the processes and specific practices employed.

### Applying AS/NZS 4360 to Public Safety Risk Management

While AS/NZS 4360 is by design generic and specifically organisational in context,

it can be seen to have application in the multi-organisational context of public safety risk management.

This has been recognised in the area of disaster and emergency risk management by the Australian National Emergency Management Committee (NEMC) which in 1996 directed that guidelines be developed for the application of the risk management process specified in AS/NZS 4360 in a disaster and emergency management context.

Early drafts of the emergency risk management guidelines informed the studies (EMA 1997) and while the guidelines have now been agreed nationally, work continues on developing them into detailed planning materials. As the Longford (Victoria) gas crisis in September 1998 demonstrated, more work needs to be done in addressing such public safety risk concerns as security of supply in the area of essential services.

## The emergency risk management process

Emergency risk management processes must take account of the need to adapt the generic framework and process of AS/NZS 4360 to public safety concerns. This requires recognition that the 'strategic and organisational contexts' of public safety emergency risk management inevitably involve all three spheres of government and that the 'risk management context' of emergency risk management is fundamentally about the protection and preservation of life, property and the environment within a designated community.

Steps in the emergency risk management process are drawn down from equivalent steps in AS/NZS 4360 and show clear parallels with both generic terms and processes. A comparison of terminology is presented in *Table 1*.

Risk is defined in AS/NZS 4360 as 'the chance of something happening... measured in terms of consequence and likelihood', and thus the focus of risk management is largely upon events, in terms of what can happen, and how and

why it can happen. In the emergency risk management context, however, risk is more than an aggregation of the products of the consequence and likelihood of separate hazards: it is a complex interaction between hazard, community and environment. Identifying and profiling community vulnerability to hazard is thus an essential part of the emergency risk management process.

A diagram of the suggested emergency risk management process (incorporating an 'Establish Community Vulnerability Profile' step), as a revision of the process depicted in AS/NZS 4360, is shown in Figure 1. The diagram also shows the need for the profile to be employed in the 'Identify, Evaluate and Implement Interventions' step.

## Disaster risk management studies

### Context

The following factors are relevant in establishing the framework for public safety risk management planning at Local Government level in Queensland and were of specific relevance to the Murweh Shire Flood Risk Study (Geo Eng Australia Pty Ltd 1998) and the Local Government Disaster Management Project in Cairns, Mackay and Hervey Bay:

- State initiatives, including the policy shift at State level to a comprehensive, all hazards, whole of Government and integrated public safety approach to the management of all risks, and other external influences which impose Local Government obligations and responsibilities in relation to public safety
- existing local administrative and planning policies, arrangements and processes which bear on public safety.

### State initiatives and other external influences

The *Integrated Planning Act 1997* (IPA), is designed to facilitate the coordination and integration of planning at local, regional and State level and to ensure that balanced ecological, economic and social outcomes are achieved for future development proposals.

Disaster and emergency planning arrangements and processes clearly need to be cognisant of the public safety impacts of decisions under the IPA arrangements and, similarly, public safety issues need to be addressed in the development of local planning schemes, corporate policies and town plans. Actions taken in the name of the town plan, corporate plan or local planning scheme are likely to have an immediate or long-term impact on public safety risk mana-

Generic management	Risk management (AS/NZS 4360)	Emergency risk management
problem definition	establish content	establish emergency risk context
analysis	identify risk	determine evaluation criteria; characterise hazards, community and environment; establish community vulnerability profile
analyse risks	analyse risks	
decision making	evaluate risks	evaluate and rank risks
implementation	treat risks	identify, evaluate and implement interventions

Table 1: Comparison of terminology

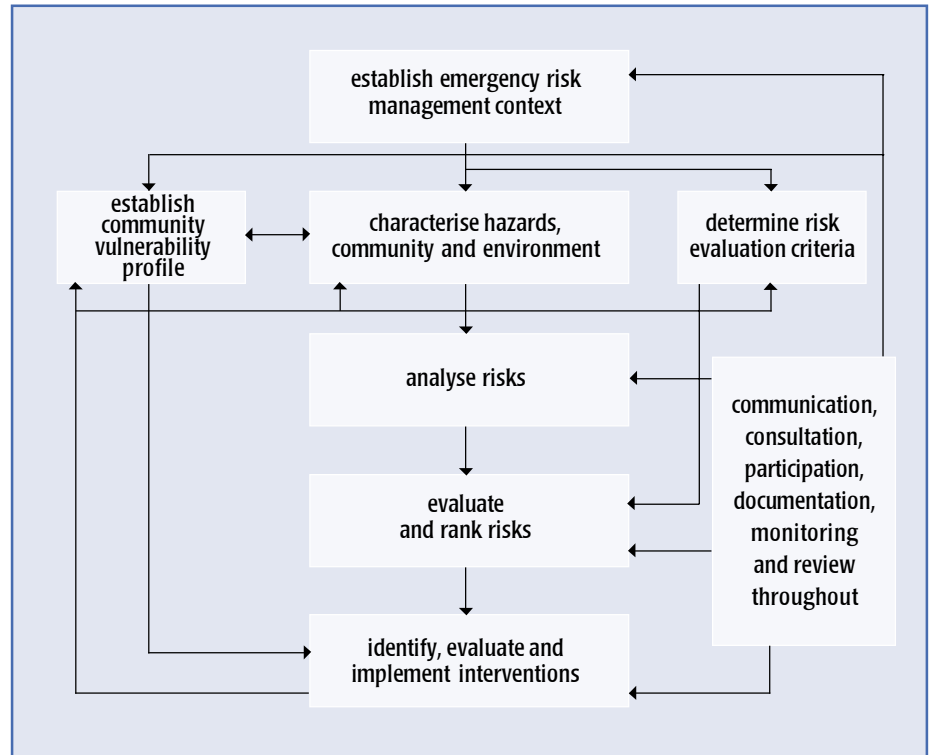


Figure 1: Main elements of the emergency risk management process

gement arrangements. For example, unless the implications for the community of a development approval are taken into account in a disaster management context, that approval is likely to perpetuate ongoing disaster management problems and escalate the cost of recovery.

The recent *Protocol between the Queensland Department of Emergency Services and the Local Government Association of Queensland Relating to Disaster Management and Local Government Volunteer SES Units* provides a framework for the creation of a commitment from Local Government to include disaster planning and support for their volunteer State Emergency Service (SES) Units as part of their normal business functions. It also reflects new directions in Queensland in treating disaster management as an integral part of 'whole of government'

public safety arrangements and is reflected in current state counter disaster planning philosophy. The new arrangements will provide a mechanism for local and State governments to jointly develop appropriate provisions in such areas as indemnities, common law responsibilities and duty of care.

It is of interest to note that New South Wales already provides exemption, in legislation, for Council and its staff from future action over duty of care for flooding decisions provided that the guidelines given in the New South Wales Floodplain Development Manual are followed.

Other potential or actual external influences on local planning frameworks include:

- specific State legislation and policy to implement effective urban and rural

floodplain management, including Best Practice Manuals such as the national manual 'Floodplain Management in Australia'

- the national Murray Darling Basin Agreement, and specifically the provisions of Clause 46 which relates to the protection of the rights and interests of downstream users/States
- Commonwealth Natural Disaster Relief Arrangements (NDRA) that are now formulated to promote effective mitigation activities at State level by linking the extent of NDRA funding for likely or re-occurring disaster events to the existence of disaster mitigation actions or plans (where such actions are feasible)
- Commonwealth and State Environmental Protection Acts that require that the impact of mitigation options on the environment be taken into account when considering the various risk treatment strategies.

Issues of floodplain management in Queensland are exacerbated by the lack of a policy and administrative framework and the inconsistent application of Local Government powers. As a result there has been a growth of flood-prone developments and the potential for future flood damage has continued to increase. The four Local Government areas in which this series of studies were conducted are no exception.

**Existing policies, arrangements and processes in the study areas**

Existing policies, arrangements and processes with direct bearing on public safety risk management generally, and disaster management in particular, are detailed in several documents, namely, the

*State Counter Disaster Organisation Act 1975*, the *State Disaster Plan Queensland* and in the Council's *Corporate Plan*, *Town Plan* and *Counter Disaster Plan*.

Public safety and disaster management are issues that must be addressed by Local Government under the present Queensland arrangements.

**Application of the risk management approach**

The process described in *Figure 1*, including the added step of establishing a community vulnerability profile, was applied in the studies.

**Establishing the emergency risk management context**

The policy and organisational contexts were established by the study briefs. This information was supplemented by meetings with the Project Management

Board (PMB), discussions with Brisbane and locally based agencies, study of background material, reports, relevant existing and pending legislation and other documentation. This step also involved a series of meetings with key stakeholders: the citizens of the Local Government areas being studied.

The various modes of stakeholder and community consultation used in the studies is outlined in *Table 2*.

**Risk evaluation criteria:** The key criterion developed for evaluating the risks was, in terms of significance and acceptability, whether the hazard event was likely to cause significant damage and disruption. If so, the risk was unacceptable. This was derived from the community itself indicating a general acceptance of an element of risk associated with events up to a certain threshold level but very low acceptance of risk above that level, although the degree of risk considered 'acceptable' by individuals and community sectors varied considerably.

*Characterising the hazard, the community and the environment.* This was materially assisted by the Councils, reference groups, community and agency discussions during visits to the study areas and was supplemented by research and Australian Bureau of Statistics (ABS) data.

A process of *recording and profiling community vulnerability* to the identified natural hazards was instituted, based upon an assessment of the interaction of the hazard, community and environment. Consideration of the variety of factors identified in the literature as relating to community vulnerability—the susceptibility and resilience of a community and its constituent elements to risk—was limited to those which offered some

opportunity for measurement. It was recognised that appropriate instruments for recording and profiling community vulnerability to risk, developed in the Murweh study, would require further development and validation. This was achieved in the studies undertaken in Cairns, Mackay and Hervey Bay.

The community vulnerability profile, developed for the Murweh study and tested in the study in Cairns, Mackay and Hervey Bay, is shown in *Table 3*

The *analysis and evaluation of risks* was undertaken progressively throughout the studies. The step of ranking risks, inclusive of all hazards, was generally undertaken during this process although in the case of Murweh Shire it was deleted as flooding was the sole hazard considered. The analysis included modelling of the interaction between the hazard, the community and the environment and the evaluation of risks was undertaken in the context of the risk evaluation criteria established earlier.

An *identification of potential intervention strategies* was undertaken in the final stages of the project, and a preliminary evaluation of those intervention strategies carried out against the community vulnerability profiles established earlier. The preliminary evaluation of potential intervention strategies was then tested with the PMB, the Council, reference groups, stakeholders and communities in the study areas.

Criteria for identifying and evaluating individual intervention measures evolved from discussions with the Council, community members, reference groups, and stakeholders and included:

- recognition that natural disasters will continue to occur and that they cannot be stopped

Murweh study	Cairns, Mackay, Hervey Bay study
Combined meeting of Brisbane based stakeholders.	Group and face to face meetings with Brisbane based stakeholders.
Small group meetings with local agency stakeholders including Council staff	Small group meetings with local agency stakeholders
Full Council	
Community reference groups	Community reference groups
1800 phone number	1800 phone number
Walk and chat	Walk and chat including door knocking
Local paper articles	Local paper articles
Drop in centre	
Radio talk back	Radio talk back and TV interviews
Public meetings	
	Shopping centre interviews and information booths.

*Table 2: Modes of Stakeholder and Community Consultation*

- general recognition that there is no one solution
- any measures need to be practical and affordable (issues of efficacy, benefit and cost)
- no one should be worse off (issues of equity).

All of the studies were based on an extensive program of *communication, consultation, participation and documentation*. Regular reports to and meetings with the PMB ensured effective *monitoring* of the studies.

## Study outcomes

### Risk reduction measures

The recommended risk reduction measures put forward to the Councils represented the out-workings of the comprehensive consultation process. While particular individuals and groups displayed considerable strength of feeling on the efficacy and desirability of particular 'solutions' to the identified problems, it was clear that they recognised there are a range of possible 'solutions' available. It was also recognised that no one 'solution' was likely to deal satisfactorily with the problem and be acceptable to all interest groups. None of the measures put forward are sufficient by themselves: there are significant dependencies between the measures which involve a mix of structural and non-structural solutions. It was also made clear to Councils that additional interventions worthy of further consideration may be identified as the Council and the community worked through the issues in the coming years.

Action is required to effectively reduce the risks in all of the study areas. The time frame for such action is dependent on factors such as:

- feasibility in terms of political and funding opportunities
- practicability
- future strategic planning directions adopted by Council
- community acceptance both from the point of view of residual risk, aesthetics and quality of life
- overall cost and willingness of the community to pay initial and on going costs.

The measures were not prioritised as this is seen to be a joint responsibility of Council and the community. In the case of Murweh Shire they were grouped under Must Do, Should Do and Could Do headings to indicate the broad priority, in terms of immediacy and urgency of action, attached to each grouping. For Cairns, Mackay and Hervey Bay the options were presented in the broad

Vulnerability assessment framework		←—————→				
Key factors (see attachment: key factors and vulnerability indicators)		Less Vulnerable		More Vulnerable		
		1	2	3	4	5
<b>A. Factors operating at individual/household level</b>						
<b>A1. Association with hazard prone area</b>						
a. Location of residence		1	2	3	4	5
b. Suitability of Residence						
c. Location of livelihood						
<b>A2. Coping capacity</b>						
a. Financial resilience/susceptibility						
b. Knowledge of appropriate protective behaviour						
c. Capability to undertake appropriate protective behaviour						
d. Health						
e. Social network						
<b>B. Factors operating at community/local government level (internal)</b>						
<b>B1. Public safety service provisions</b>						
a. Community planning processes		1	2	3	4	5
b. Mitigation measures						
c. Response/recovery capability						
<b>B2. Social infrastructure resilience</b>						
a. Lifelines						
b. Items of economic significance						
c. Items of environmental and/or cultural significance						
<b>C. Factors operating at community/local government level (external)</b>						
<b>C1. Public safety service provisions</b>						
a. External government planning processes		1	2	3	4	5
b. Mitigation policies						
c. Response/recovery support capability						

*Note: This tool identifies key factors which can be easily measured and provide necessary and sufficient information to inform judgments about vulnerability.*

Table 3: Community Vulnerability Profile (after Salter 1997)

categories of 'non-structural', that included a number of administrative issues, and 'structural'.

### Implementation of risk study recommendations

Murweh Shire Council has presented the findings of their study to the community. As a result of this consultation it was resolved that all non-structural recommendations would be implemented and that levees would be built at Charleville and Augathella as a long-term solution subject to the availability of funding from the three levels of Government.

Cairns, Mackay and Hervey Bay Councils are yet to consider the findings of the studies in their areas and determine an appropriate course of action.

### The template

One of the requirements of the study in Murweh Shire was the delivery of an all-hazards methodology for the application of AS/NZS 4360 to the development of disaster management plans that could be applied in other Local Government areas.

The methodology was developed and refined during the course of the study and presented as a template. The methodology was used in the studies at Cairns, Mackay and Hervey Bay where it was further refined.

### Important considerations

There are two important considerations in the application of the methodology developed.

Firstly, it is a suggested methodology: a form of procedure or process. As detailed processes for the application of AS/NZS 4360 to the management of community emergency risk are still evolving, the content of a number of the steps described in this paper may need to be refined as experience in the use of the methodology is gained.

Secondly, it needs to be recognised that there are three key participants involved in the application of this process, and effective input from all three is required if the process is to lead to the required outcome of a safer local community:

- State Governments, which must provide

planning formats and guidelines, liaison, advice, effective facilitation where needed and general oversight of the planning process

- local Governments, which must manage the process at local level and oversight the implementation of outcomes of the process
- the community itself, which must be given the opportunity to make effective input to the process through a planned and interactive consultation program.

## Future application of the risk management approach

### General comments

The risk studies described above were conducted against a background of community distrust of past Council actions and some Government inaction over possible solutions to risks generally. It will be appreciated that this coupled with the conduct of earlier studies in each of the Local Government areas, that had tended to polarise the community views on the practicability and efficacy of recommended non-structural and structural mitigation options and led to some difficulties in the conduct of the studies. A coherent process such as that suggested within the template needs to be followed from the outset in the conduct of any disaster risk management study.

### Issues of policy

It is evident that there is a range of Commonwealth and State policy matters that influence the development of mitigation strategies (e.g. requirement under NDRA that future financial relief arrangements be related to risk mitigation practices).

Flooding is the single major hazard facing Local Governments in Queensland however the institutional and legislative mechanisms used to underpin flood policy in Queensland are unclear. Local Governments in Queensland are moving to adopt and implement urban floodplain planning practices that embrace non-structural planning measures. This move does not stem from a formal requirement of the State Government but appears to be driven by a desire to implement good management practice and a concern at Local Government level over liability under duty of care (see in particular Smith D.I. 1997).

There is a clear need to develop and implement specific State policy to ensure effective urban and rural floodplain management. This would give clear direction on agency roles and responsibilities and allow completion of a

comprehensive State floodplain management policy and manual. There is also a clear need for the Queensland State Government to address issues of indemnity, particularly with respect to floodplain management, and to define the term 'public safety'.

It is considered that in general these policy issues, particularly in relation to NDRA funding, are applicable to a majority of Local Governments across Australia.

### Recent developments in Queensland

The State Government has provided an incentive to Local Governments with a \$3m rate revenue base or less to undertake disaster risk management studies. The submission of an acceptable interim disaster mitigation plan will result in the NDRA trigger point for that Council being lowered from \$77,000 to \$50,000. At the time of submitting the plan the Council gives an undertaking that it will complete a full disaster risk study by 31 March 2002.

A Queensland Flood Coordination Committee (QFCC) has been established to develop a State Floodplain Management Manual and a position paper on the need for a State policy on floodplain management.

The Department of Emergency Services in conjunction with the Local Government Association of Queensland Inc. has undertaken an extensive Awareness and Education Program for Local Governments on the application of the risk management process in a disaster context.

The methodology used in the risk studies described in this paper has also been documented for distribution to Local Governments in Queensland. Local Governments who follow the process will develop mitigation options and implementation plans that will assist in ensuring the continuity of NDRA funding. The implementation plans must include timelines that indicate when various elements of the mitigation options will be implemented.

The Department of Emergency Services has developed and distributed to all Local Governments in Queensland the following publications; *Disaster Risk Management*; and *Disaster Risk Management Guide: A How to Manual for Local Government*; that outline the risk management process in a disaster context.

The Commonwealth Government has introduced two funding programs to assist Local Governments to address mitigation issues: one provides funds for risk management studies the other for flood mitigation works.

## Conclusion

The risk studies addressed in this paper provided the first real opportunity to apply the National Emergency Risk Management Guidelines based on AS/NZS 4360. Both the Guidelines and the standard on which they are based have proved a major innovation in the management of community risk and have significant implications for future comprehensive and integrated emergency risk management.

The process provides outcomes, which must be reflected in the corporate, strategic, operational and counter disaster plans of Councils. The documentation of the outcomes together with the establishment of short, medium and long-term implementation timelines will meet Commonwealth Government guidelines for the continuing provision of NDRA funding.

There is a clear need to develop and implement specific State policy and guidelines to ensure effective floodplain management.

There is also a clear need to address issues of indemnity particularly with respect to floodplain management and to define the term 'public safety'.

These policy issues and the application of the risk management process to community risk management are applicable to all Local Governments in Australia.

The major outcome achieved by these studies was the development testing and documentation of a disaster risk management process based on AS/NZS 4360. The Department of Emergency Services will provide a copy of the documented process to every Queensland Local Government.

## References

- Emergency Management Australia, 1997, *Emergency Risk Management*, (Draft), November 1997.
- Geo-Eng Australia Pty Ltd. 1998, *Flood Risk Study for Murweh Shire: Final Report*, May 1998.
- Kinhill, Cameron & McNamara, 1993, *Charleville Flood Study*, November 1993.
- Queensland Risk Management Consultants Pty Ltd. 2000, *Local Government Disaster Mitigation Project, Cairns, Mackay and Hervey Bay*, February 2000.
- Scott & Furphy Pty Ltd. 1991, *Western Queensland Towns Flood Study* (2 Volumes), January 1991
- Smith D.I. 1997, *Urban Flooding in Queensland—A Review*, prepared for the Department of Natural Resources Queensland May 1997.

Standards Australia/Standards New Zealand. 1995, *AS/NZS 4360:1995 Risk Management*

New South Wales Floodplain Development Manual.

### About the Authors

#### Ken Durham

Ken Durham has 44 years experience as a local government engineer in New South Wales and Queensland and has spent the last 3 years working with the Department of Emergency Services managing the various local government disaster risk management projects referred to in this paper.

From 1972 to 1997 Ken was employed by Ipswich City Council Queensland in a number of positions including deputy city engineer and resources manager. Throughout his years with Ipswich City Council Ken was the manager of the Council's flood control centre and he was instrumental in the installation of the first A.L.E.R.T. system in Queensland on the council streams. He is the Local Government Association of Queensland representative on the Flood Warning Consultative Committee, and the Total Management Planning Floodplain Management Committee. He also represents the Department of Emergency Services on the Dam Safety Policy Advisory Committee and a State Committee developing a position paper on the need for a State Policy on floodplain management.

*Ken Durham*

*Disaster Policy and Research Unit*

*Department of Emergency Services GPO  
Box 1425 Brisbane Qld 4001*

*Email: kdurham@emergency.qld.gov.au*

#### Michael Cawood

Michael Cawood has more than 22 years professional experience in the areas of hydrology and flood management and has a masters of Engineering Science Degree. He has been involved in the investigation and strategic assessment of water resource engineering and floodplain management projects and has particular experience in operational and surface water hydrology and associated areas such as flood management.

Prior to joining Geo-Eng, Michael led the Bureau of Meteorology's Hydrological Services Program in Victoria for more than 8 years and had responsibility for planning, coordination, development and management of the flood forecast and warning program. This involved significant involvement in emergency management planning matters.

Since joining Geo-Eng in 1996, Michael has worked extensively on flood management consultancies and was part of the team that prepared the Emergency Management Australia sponsored national Best Practice Guidelines on Flood Preparedness and on Flood Warning.

*Michael Cawood*

*20 Business Park Drive*

*Notting Hill Vic 3168*

*Email: m.cawood@geo-eng.com.au*

#### Roger Jones

His last posting in a 21 year Australian Regular Army career was as Principal Staff Officer, Operations (Colonel) in the then newly-formed Natural Disasters Organisation in Canberra.

From 1976 to 1984, he was Deputy Director and Chief Instructor at the Australian Counter Disaster College (now Australian Emergency management institute) at Mount Macedon in Victoria.

In the aftermath of the 1983 Ash Wednesday fires in south-eastern Australia, he worked with the Victorian Government in reviewing that State's emergency management arrangements and was responsible for the introduction of the Emergency Management Act 1986. He returned to the Mount Macedon establishment as Director in 1987 and took early retirement in 1994 to pursue consultancy opportunities in emergency and disaster management.

He has worked extensively in that field for UN agencies, other governments and the Australian federal and State authorities as a consultant in emergency management policy, education and training. His work has been published widely, and he is a regular contributor to major national conference and workshops.

*Roger Jones*

*PO Box 142 Mount Macedon Vic 3441*

*Email: temcons@netcon.net.au*

## Announcement

### Resilience and vulnerability assessment

A report and associated guidelines on assessing personal and community resilience and vulnerability have recently been completed for Emergency Management Australia.

These documents have been prepared by Philip Buckle, Graham Marsh and Sydney Smale. Their research focuses on the social dimensions of vulnerability but endeavours to locate it within the broader contexts of social, economic and environmental change.

Their research involved extensive consultations with local people and agencies across Victoria, Australia, and derives some lessons and observations that may challenge some preconceptions of the emergency management community.

Comments and critical appraisal are welcome.

*The authors are following up this study with complementary research examining approaches to effective implementation of resilience and vulnerability assessment.*

Exposure drafts of the report and the guidelines are available at [www.ls.rmit.edu.au/landinfo/landinfo/Riskhome/Risk1.htm](http://www.ls.rmit.edu.au/landinfo/landinfo/Riskhome/Risk1.htm)

or

contact Philip Buckle:

email: [philipbuckle@bigpond.com](mailto:philipbuckle@bigpond.com)

phone: +61 3 9925 9663