Advances in risk assessment for Australian emergency management

Trevor Jones introduces the first of our two special all hazards risk assessment editions of the Australian Journal of Emergency Management.

Abstract

This paper is an introduction to the two AJEM Special Issues on risk assessment. The role of risk assessment in emergency management in Australia is firmly established. Considerable progress has been made in utilising risk modelling tools and supporting data to develop new information on risk for some hazards. Several key achievements relating to the governance and science of natural disaster risk assessment are highlighted here and, while significant further work is required to reach an understanding of all hazards risks nationally, the way forward is clear.

Introduction

In the early part of this century, risk management became a fundamental principle of Emergency Management in Australia, partially influenced by the publication of the Australian/New Zealand Standard AS/NZS 4360 in 1995. This standard was revised in 1999 and 2004 (AS/NZS 4360: 2004), and a similar international standard is being prepared (ISO, 2007).

The risk management approach was promoted nationally through the Emergency Risk Management Applications Guide in 2000 and its revised version in 2004 (EMA, 2004). However, the most influential steps that led emergency managers across Australia to adopt risk management were the publication of two reports for the Council of Australian Governments (COAG). The first report to COAG on the management of natural disasters in Australia advocated 'a fundamental shift in focus towards cost-effective, evidence-based disaster mitigation' (High Level Group, 2002, p.3). A second national inquiry, this time on bushfires, advocated risk management and stated a vision for 2020 that 'Decisions about bushfire mitigation and management are made within a risk-management framework …' (COAG, 2005, p.1).

According to the AS/NZS Standard, risk assessment is an intrinsic function of the risk management process and subsequently risk assessment has also become a core part of emergency management (AS/NZS 4360:2004, Fig. 2.1). We are unable to reproduce this figure for copyright reasons. Together, risk assessment and risk management are vital tools across Planning, Preparation, Response and Recovery (PPRR). However, the unique benefit of risk assessment to emergency management, unavailable from other means, is the ability to identify and describe future events that can be mitigated or prevented by long term, strategic risk reduction measures. These events can include extreme-impact events that may not have been experienced previously.

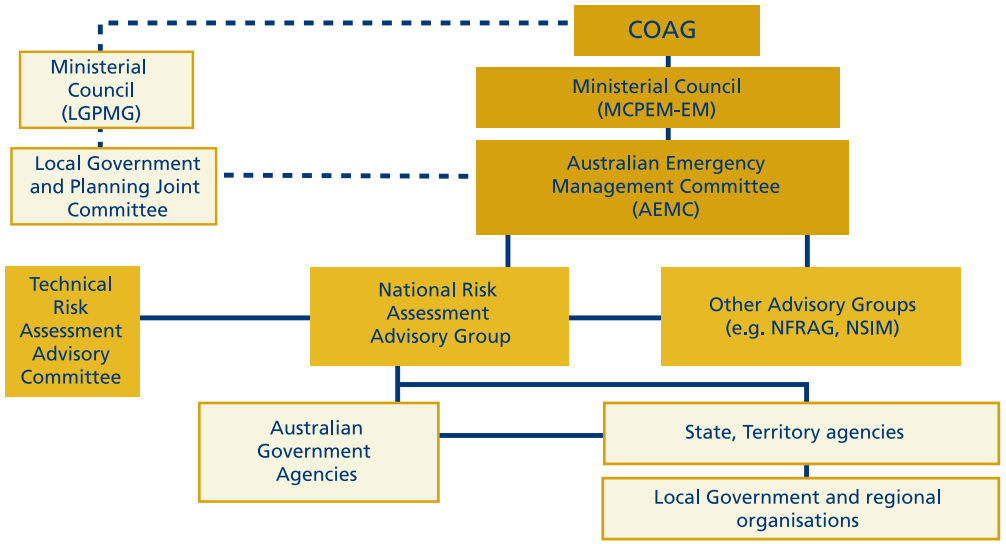
Many of the major recommendations of the report to COAG on natural disasters were acted upon swiftly. In the May 2003 federal budget, the Disaster Mitigation Australia Package (DMAP) was announced, managed at the Australian Government level by the (then) Department of Transport and Regional Services (DOTARS). DMAP included the highly successful Natural Disasters Mitigation Programme (NDMP), now managed by Emergency Management Australia (EMA).

The report to COAG on natural disasters set out its first Reform Commitment, 'A five-year national programme of systematic and rigorous disaster risk assessments'. This reform was required because there was a 'lack of independent and comprehensive systematic natural disaster risk assessments, and natural disaster data and analysis.' DOTARS engaged Geoscience Australia (GA) as a technical advisor on risk assessment and data collection in DMAP.

The National Risk Assessment framework

The development of the National Risk Assessment Framework (NRAAG, 2007) is a milestone in establishing national arrangements to improve our knowledge of natural hazard risks in Australia. The framework was developed collaboratively by the Australian, State and Territory governments, the Australian Local Government Association, academics and representatives from the insurance industry and peak national professional organisations. It was endorsed by the Australian Emergency Management Committee (AEMC) in September 2006.

Figure 1: Main governance roles in National Risk Assessment Framework. Key advisory groups are shaded.



LGPMC	Local Government and Planning Ministers' Council
MCPEM-EM	Ministerial Council for Police and Emergency Management - Emergency Management
NSIM	National Spatial and Information Management Working Group
NFRAG	National Flood Risk Advisory Group

The main goal for the National Risk Assessment Framework is 'To support the development of an evidence base for effective risk management decisions, thereby delivering the outcomes sought in Reform Commitment 1 of the report to COAG 'Natural Disasters in Australia".

Three key areas are identified to achieve the goals of this framework. These are:

- agreement on roles in the framework, with an emphasis on governance, and structures for reporting and review;
- consistent and systematic production of baseline information on risk and improvement of risk assessment methods and tools; and
- management of information including enabling access to information on risk.

An outline of the main governmental roles and communication lines for the National Risk Assessment Framework is shown in Figure 1. Two committees have been formed to implement the framework. These are the Technical Risk Assessment Advisory Committee (TRAAC) and the National Risk Assessment Advisory Group (NRAAG), also shown in Figure 1.

Progress

Major progress has been made on risk assessment projects in the past four years through national grant schemes including NDMP, EMA's Local Grants Scheme and other initiatives. The Bushfire Cooperative Research Centre has also directed its research increasingly towards risk management and risk assessment (www.bushfirecrc.com/). Although considerable efforts are still required, several key national achievements have been made and these are outlined below.

The major report 'Natural Hazards in Australia' (Middelmann, 2007) provides an overview of the rapid onset natural hazards which impact on Australian communities, including tropical cyclone, flood, severe storm, bushfire, landslide, earthquake and tsunami events. Emphasis is placed on identifying risk analysis requirements for these hazards.

A draft set of National Risk Assessment Priorities has been prepared by NRAAG and TRAAC in consultation with the national framework stakeholders. Expanding on these priorities is not in the scope of this paper and the priorities are in draft form. However, in brief, the priorities cover:

- floods;
- tropical cyclones;
- other severe storms;
- earthquakes;
- tsunami;
- improved knowledge and models for community exposure and vulnerability; and
- national elevation and bathymetric data especially in coastal areas.

National Emergency Risk Assessment Guidelines are being developed by NRAAG and TRAAC and trialled in pilot projects as this Issue goes to publication. The guidelines will:

- be based on AS/NZS 4360, and be designed for emergency risk assessments at state, regional (sub state) and local application;
- provide usable results both with and without detailed information inputs, so that priorities can be determined; and
- facilitate outputs that are comparable and consistent, so that they are able to be aggregated up to a national level, in principle.

Significant progress on the development of modelling tools and supporting data has also been achieved. Many of the major advances in developing and applying risk assessment tools in Australia are featured in the two Special Issues.

The AJEM special issues on risk assessment

The two AJEM Special Issues (this Issue and a further Special Issue in February 2009) give some outstanding examples of progress in Australia on risk assessment in emergency management. The Special Issues inform the reader of key areas of activity in Australian risk assessment, illustrating these activities with a series of state of the art papers. The geographic scale of the papers ranges from local to national and papers on earthquakes, tsunami, cyclones, severe storms, floods, fires and landslides are included. The papers cover many topics such as the development of computational risk assessment techniques, the need for supporting data, the role of risk assessment in risk management, progress made and future directions.

This Special Issue has the theme 'Assessing Risk' and its papers address current progress and future directions of risk assessment for the draft set of priority natural hazards in the National Risk Assessment Framework. The papers collectively give a national overview of current all hazards risk assessment including the methods, data requirements, and issues from a government and insurance industry point of view.

The February Special Issue has the theme 'Assessing Risk and Risk Management'. The Issue contains some outstanding examples of risk management projects that employ risk assessment practices to enhance decision making. The projects are at a range of scales including local government, community, state/territory and regional. They cover several major topics including government and insurance treatment of coastal flooding and managing the fire-community interface. A paper on landslide risk management for Australia is included, and we are also fortunate to include a paper on planning guidelines for landslide in New Zealand.

The reader is encouraged to investigate and enjoy the many advances reported by practitioners in the two Special Issues. Naturally, not all the progress that has been made can be included in a score of papers and the reader can find further information from Middelmann (2007) and from federal, state/territory and local organisations and their web sites.

The way ahead

The way ahead is very positive and clear in principle at least. Risk assessment tools can be constructed and the required critical datasets can be identified and assembled, as has been demonstrated in tsunami impact assessment, both nationally and in several states (see the paper by Hall and others in this Issue). Cooperative governance arrangements are also established through the National Risk Assessment Framework and the AEMC.

In addition, energetic efforts are being made in climate change programs to determine the future impacts on communities from meteorological, climatic and demographic risks. There is a significant and urgent demand for this information from government and industry. Fortunately, the information on risk required, and techniques employed to obtain it, are quite similar to those in emergency management, with the main exception that future changes to the hazards also need to be considered. Careful linking of risk assessment programs in emergency management with those in climate change will lead to accelerated gains in understanding natural hazard risks. One initiative making that link is the National Adaptation Research Plan for Disaster Management and Emergency Services (www.climatechange.gov.au/).

Although significant progress has been made, several challenges to achieving an understanding of all hazard risks remain. First and foremost, significant funds are required to maintain or increase current risk assessment programs and these programs compete against other government priorities for funding. Delays in progress need to be avoided to hold the interest of government stakeholders.

Developing quantitative risk modelling tools and data can be relatively costly (although not compared to the gains made through mitigation) and can take several years. The trade-off between delivering rapid information on risk (which may have high levels of uncertainty and have been derived using simplistic methods) versus delivering more comprehensive information in a longer time frame, and at a greater cost, requires closer attention. A pertinent question is: how good does the information on risk need to be now?

Figure 2: An example output from the National Probabilistic Tsunami Hazard Assessment that was conducted by Geoscience Australia supported by Emergency Management Australia. This map shows the expected maximum tsunami wave amplitude for a specific return period. Outputs such as these can be used by emergency managers to understand the relative offshore tsunami hazard to the Australian coastline and to prioritise communities for further detailed inundation studies. Note that outputs such as these cannot be used to infer onshore inundation.

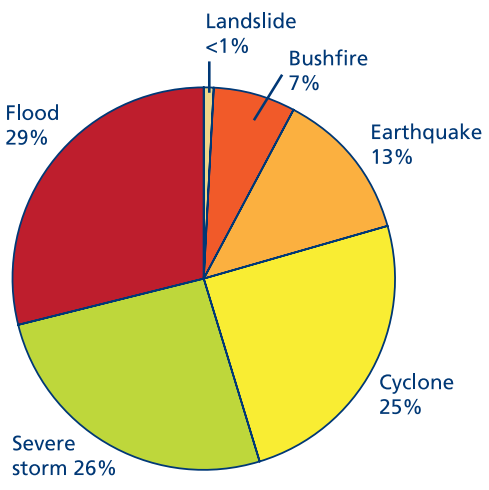
The National Emergency Risk Assessment Guidelines, currently being prepared, set out an initial, largely qualitative risk assessment process. This can be followed by a second phase of more quantitative studies should the risks appear significant, confidence in the results be low or more information be required for risk treatment decisions.

Tsunami is an excellent example of a natural hazard for which a remarkable new set of hazard and impact information, in addition to modelling tools, has been developed through a national, collaborative approach (see the paper by Hall and others in this Issue). A series of national tsunami hazard maps has also been prepared by GA with support from EMA (Burbidge and others, unpublished). Figure 2 shows an example of these maps.

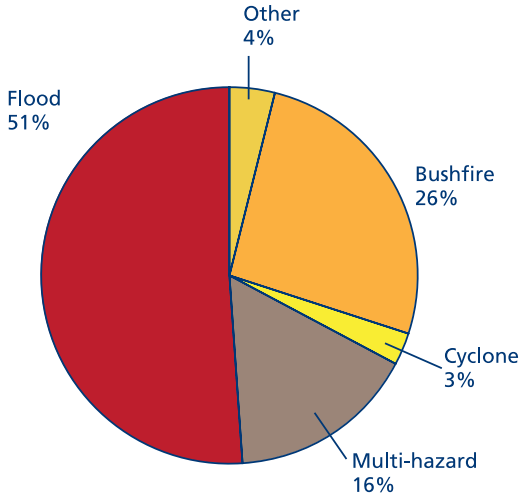
However, the valuable new information on tsunami came about for arguably the wrong reasons because it was developed *after* a major event had occurred – the disastrous 2004 Southeast Asian Boxing Day tsunami. The tsunami hazard and impact assessments mentioned above have improved our knowledge of tsunami risk in Australia and have reduced the previously high levels of uncertainty about that knowledge. In future however, for other hazards, we will benefit by improving our understanding of risks that have been identified as priorities *in advance* of extreme events occurring, the next time perhaps closer to home.

The costs of disasters in Australia were estimated by the Bureau of Transport Economics (BTE, 2001) and the annualised costs by hazard are shown in Fig. 3 (a). The total expenditure by hazard by all levels of government on NDMP projects in the years 2003-04 to 2006-07 is

Figure 3: (a) annualised cost of disasters in Australia by hazard for the period 1967-1999 (after Table 3.1, BTE, 2001, p.35); (b) NDMP total government expenditure on disasters by hazard, 2003-04 to 2006-07 (Pittard and others, personal communication, 2007).



(a) Costs of Disasters by type



(b) Govt expenditure on mitigation by type

shown in Fig. 3 (b) (Mark Pittard, Monica Osuchowski and Trevor Dhu, personal communication, 2007).

Notwithstanding the limitations described by BTE of estimating annualised costs, e.g., the limited time window for which the data were available, the proportional costs for each hazard do not compare closely with the NDMP expenditure on each hazard.

We might not expect that government expenditure on mitigation would fully correspond to the proportional costs of disasters described by BTE because other factors are involved in decision making on mitigation. These include the ease of achieving mitigation gains, the need to apply funding to expensive but effective structural mitigation measures, and non-government expenditure on mitigation for some hazards, e.g., through insurance policies. Decisions on NMDP project proposals are carefully considered at all levels of government and additional input is taken from technical experts as required. However, future expenditure on disaster mitigation projects could match more closely with the risks from individual hazards if those risks were better known.

We have the opportunity now to develop a deeper understanding of the important all hazard risks and to base mitigation actions on the priorities that are identified. This approach would reverse the post-event logic that nonetheless led to excellent results in tsunami impact assessment. By becoming pre-emptive in assessing and managing important risks we reduce the impacts of potential major events before they occur.

Conclusions

An improved approach to information management for risk assessment will lead to gains by all levels of government as well as the insurance industry. A centralised (or interoperative) data repository that collects information on risk and makes it available for others to use would ensure that full value is made of the developed information, and enable decisions on priorities for risk assessment and management to be made iteratively.

The model of developing risk assessment tools and databases at a national level and making them available for projects at all levels, from community upwards, has proven successful for tsunami. All Australian communities will benefit from a continuation of this approach for an extended range of hazards including tropical cyclones (wind and storm surge), floods, bushfires, and severe storms. Comprehensive, quantitative information on risk is durable and long term policy decisions can be based on it.

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