

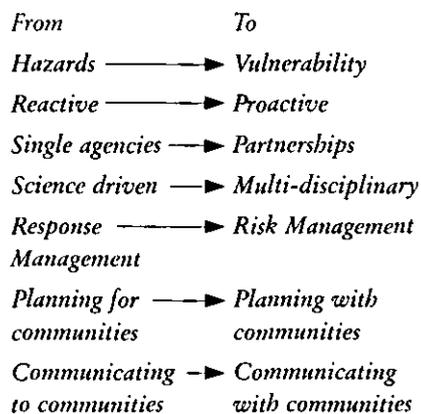
# Risk management in the emergency management context

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## Introduction

### Developments in emergency management

Change is the most significant constant. In response to pressures for change, the emergency management community is re-inventing itself to deliver services that will better meet the needs of communities. Some of the key shifts in service provision are summarised in *Figure 1* below. These shifts involve migration beyond 'responding to events' and embrace the broader set of issues associated with 'risk and its management'.



*Figure 1: Shifts in emergency management service provision*

This issue set involves

- vulnerability, not just hazard
- partnerships, not merely single agency 'silos of excellence'
- community participation in decision making, not just consideration of the community (as a target audience) for a position arrived at in isolation.

These shifts are fundamental in nature, involving paradigm shifts that will impact on the structure of organisations and the cultures of their members.

### What is 'hazard', what is 'risk'?

The distinction between hazard and risk is:

- Hazard is 'something' with the potential to produce harm.
- Risk is a concept used to give meaning to 'things, forces or circumstances' that pose a danger.

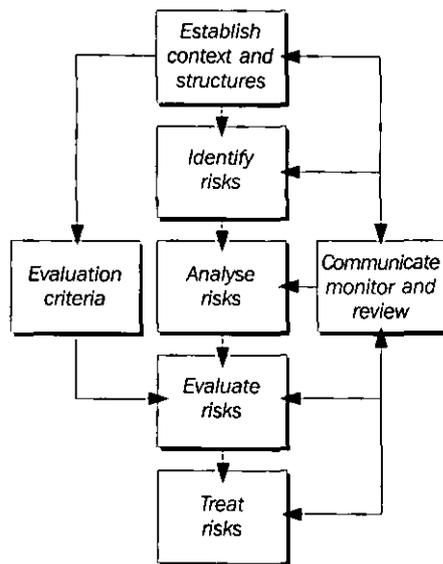
Descriptions of risk are typically stated in terms of likelihood of loss (from a hazard).

### Risk management: what it is, what it is not

Risk management is not merely a tool for analysis or assessment. Neither is it just business as usual. It is a framework for the systematic application of management policies, procedures and practices to the tasks of identifying, analysing, evaluating, treating and monitoring risk (AS/NZS 4360:1995).

### The risk management framework

The framework (represented in *Figure 2* below) is derived from the Australia/New Zealand Risk Management Standard (1995), and is being adopted by many stakeholders within the emergency management community.



*Figure 2: Risk management framework*

Advantages of adopting a risk management framework (as identified and agreed by the National Emergency Management Committee, 1996) include:

- it is a formalised, systematic analysis and decision-making process
- it is being widely used, thereby providing a common language and process across all organisations, facilitating both promotion and integration.

### Establishing the risk management context

Risk management applied to emergency management, is applied in the context of established policy and organisational relationships. The purpose context of emergency management organisations may be established by considering the following:

- *legislation* under which the organisation operates (for example, the organisation may have prescribed roles in relation to comprehensive emergency management i.e. prevention, preparedness, response and recovery)
- *arrangements* that the organisation has agreed to (for example, the organisation may be committed to partnerships with other organisations)
- *hazards* for which the organisation has some responsibility (for example, the organisation may be responsible for the risks associated with only one hazard agent, such as fire)
- *environments* within which the organisation operates (for example, organisations need to be responsive to political policy).

### Developing risk evaluation criteria

It is important that risk evaluation criteria are established early. Decisions concerning action to be taken may be made based on technical, financial, legal, social, humanitarian or other criteria.

Key risk evaluation processes include:

- consider significance e.g. how 'big/bad'
- consider acceptability e.g. societal tolerance
- consider economic issues e.g. costs/benefits
- agree a 'political' position e.g. accept, reduce, or transfer risks.

The criteria should be developed through broad, interactive risk communication processes involving all stakeholders. This reflects the move towards planning with communities rather than for them and of developing

interactive, enabling processes involving (a) the exchange of information and opinion about the nature of risk, and (b) the development and implementation of strategies to manage risk.

### Identify risks

This step seeks to identify a comprehensive list of events or conditions to be managed. Comprehensive identification using well-structured systematic processes (e.g. brainstorming techniques, Delphi or expert groups) is critical. The four key components of this process are:

#### 1. Study Environment

This involves a detailed investigation of the physical environment, lifelines, demography, economics and socio-political factors. This information will be used to identify sources of risk, to identify elements at risk and advise the determination of vulnerability. This information must be documented and may be summarised for use in further analysis. The risk management context will determine the social and physical environment to be studied

#### 2. Determine credible sources of risk

Sources of risk (hazards) are events or conditions which may, when considered in conjunction with elements at risk, facilitate the identification of risk. They may include:

- **Natural hazards.** These include events such as bushfire, severe storm, flood, cyclone, storm surge, earthquake, and extreme heat or cold.
- **Technological hazards.** Are those events caused by the failure of socio-technical systems. These include events such as dam or levee failure and systems failures related to industrial sites, infrastructure and transportation.
- **Civil/political hazards.** These include events such as terrorism, sabotage, civil unrest, hostage situations and enemy attack.
- **Management activities and controls.** These include deficiencies in areas such as relationships between organisations and/or communities such as compliance with agreements for outsourcing service provision, mutual aid arrangements, statutory requirements and codes of practice.
- **Economic circumstances.** These include the direct circumstances of the community, as well as factors contributing to those circumstances such as industry restructuring, trade relations, government policy and global influences.

- **Political circumstances.** This includes political stability, legislative changes and factors which may influence other sources of risk.

#### 3. Determine credible elements at risk

An element at risk is anything valued by the community which may, when considered in conjunction with sources of risk, facilitate the identification of risk.

They may include:

- people
- community
- the environment
- lifelines
- performance
- asset and resource base
- intangibles such as reputation, goodwill, quality of life.

#### 4. Identify risks

To identify a list of risks, collected data should be used to identify relationships between the determined credible sources of risk and the determined credible elements at risk. This allows the identification of those risks which will require further analysis. This process may be displayed in a matrix similar to that below in Figure 3, adapted from AS/NZS 4360 (Appendix C). Where no element at risk can be matched with a source of risk it is to receive no further consideration.

Elements at risk	Sources of risk (examples only)		
	Flood	Fire	Earthquake
Lifelines and infrastructure	Y/N	Y/N	Y/N
Industry and Commerce	Y/N	Y/N	Y/N
Citizens	Y/N	Y/N	Y/N
Environment	Y/N	Y/N	Y/N

Figure 3: Risk identification matrix (for area 'x')

The *LICE* mnemonic used to represent 'elements at risk' is a taxonomy used as a heuristic/learning aid only. Any taxonomy developed should aim to encourage flexibility across stakeholders and to address specific needs as they relate to areas of responsibility and context.

### Analyze risks

Risk analysis is a process incorporating considerations of hazard and vulnerability, within the context of existing control measures, to analyse risk. The objective of the risk analysis process is to provide information to assist in the evaluation of risks. The information produced will also assist the process of developing options for the treatment of

risk. This analysis uses judgments and assumptions which may be based on incomplete information. The best available information sources and techniques should be used when characterising hazard, consequences and vulnerability. Wherever possible the confidence placed on estimates of levels of risk should be included.

The two key components of this process are:

#### 1. Profile hazards

The process involves combining information about significant features of the sources of risk including likelihood, intensity, speed of onset, duration, areal extent and perceived dread.

#### 2. Profile vulnerability

The process involves combining information about estimated or calculated effects, history and experience in order to appreciate the characteristics of a community or system in terms of its coping capacity.

### Information sources, techniques and types of analysis for hazards and vulnerability.

The information sets from the previous processes in 'Identify risk' are carried forward to analysis and are enhanced by the following:

- Sources of information may include the following relevant:
  - records
  - experience
  - literature
  - expert judgements.
- Techniques may include:
  - structured interviews with experts in the area of interest
  - use of multidisciplinary groups of experts
  - use of HazOp (Hazard and Operability) studies
  - use of computer and other modeling
  - scenario analysis.

c. Types of analysis  
Risk analysis may be undertaken to various degrees of refinement depending upon the risk information and data available. Analysis may be qualitative or quantitative or a combination of these, depending on the circumstances.

- Qualitative Analysis.** Qualitative analysis uses word form or scales to describe the likelihood of each event arising and its consequences. These scales can be adapted or adjusted to suit the circumstances and different descriptions may be used for different risks.
- Quantitative Analysis.** Quantitative analysis uses numerical values (rather

than the descriptive scales used in qualitative analysis) for both likelihood and consequences.

3. *Sensitivity Analysis*. Since some of the estimates made in the analyses are imprecise, sensitivity analysis should be carried out to test the effect of changes in assumptions and data.

### An example: scenario analysis – the hazard press

Scenario analysis examines extreme events and explores the interface between the event(s) and the vulnerable community.

Key features of scenario analysis are:

- it uses 'maximum credible event' – (e.g. flood of record, or probable maximum flood)
- its outputs focus on:
  - 'Impact Mapability (sic)' (tables/figures/diagrams)
  - intensity/strength (i.e. how powerful)
  - speed/timeframe (speed of onset and duration)
  - extent/size (expressed as point, line or area it covers)
  - anything else that enables people to 'get a handle on' the hazard.
- The outcome or purpose is to advise 'manageability (sic) judgments' (what, if anything can be done about it?)

Fundamental to 'pressing the hazard' is ensuring a comprehensive 'backcloth' of information about vulnerability. Vulnerability is about:

- *proximity and exposure* (to hazard agents). This is relatively easily 'mapped' in geographic space.
- *access to resources* (things of 'use value'). This is not as easily 'mapped' in geographic space, as it occurs in social space.

Things of 'use value' raise issues of wealth, power and status. Issues of access to information, cultural knowledge, social networks, legal rights or economic and physical resources.

What factors make up a vulnerability profile? Recent progressive thinking focuses on vulnerability as a function of the resilience of people's livelihood (its strength and its ability to recover) i.e. income, assets and health, in conjunction with the degree of preparedness, which is determined by the measures and capabilities of social- and self-protection available.

Analysis, which examines the interaction of hazards, communities, agencies and the environment (physical,

social, political, economic) taps a wide range of information sources. To identify vulnerability indicators, the nine information sets (with associated example fields) outlined below provide useful considerations:

1. *Physical*. Infrastructure, built environment, natural environment, services, utilities, industry, communications, isolation, transportation, equipment, shelter, hazardous substances and processes.
2. *Emergency management*. Management strategies, plans, evacuation strategies, trained people, public safety ethos, appropriate resources.
3. *Demographic*. Numbers, density, distribution, structure, tourists, migrants, occupation, temporal distribution.
4. *Health*. Disabilities, mental health, patients, age, public health, sanitation, disease, service dependence.
5. *Economic*. Income, production, productivity, wealth levels, welfare recipients, government grants, level of insurance, land valuations, business register, occupation (in region).
6. *Communication*. Public education, warnings, warning systems, awareness, media, inter/intra-agency, public information, access to information, availability of information, ability to monitor, decision-making power.
7. *Psychological*. Coping strategies, experience, knowledge, stress, acceptance, bravado, isolation, realisation.
8. *Societal/cultural*. Cohesion, ethnicity, language, age, gender, family, education, functional literacy, friends, community leaders, parochial organisations, religion, rituals, beliefs, history.
9. *Organisational*. Networks, communication(s), resources, logistics, government services, non-government services, legal, political.

Fieldwork on these information sets already indicates they are of practical value to emergency managers. Determinations from the processes should be documented to reflect and record research undertaken. The output from this analysis will be used to inform the evaluation of risks.

### Risk evaluation

Risk evaluation involves comparing the risks found during the analysis process with previously established risk criteria, and deciding whether risks require treatment. The output of a risk evaluation is a prioritised list of risks for

further action. The resolution of issues related to evaluation criteria is not technical, it is political. It is about power and negotiation. If risk is recognised as a socially-constructed attribute, risk communication becomes pivotal, and focuses on the development of procedures for structuring dialogue in order to develop shared understandings about risk and its acceptability.

If risk communication, as something fundamental to the design and implementation of treatments, is about facilitating meaningful dialogue that addresses any concern (information, attitudes, opinions), it becomes essential to recognise that risk communication is a political process. Implications include the need to provide open, democratic processes that are underpinned by enabling provisions. Risk as a social construct in this context will also highlight the quality and performance of organisations within the emergency management community. Report cards will feature institutional values related to things such as bureaucratic access, caring, competence, trust and credibility. These social processes will be significant factors in the alignment of risk management towards vulnerability for, as noted by Wisner, any indicators of vulnerability must be chosen by reference to assumptions about underlying processes.

Risk evaluation criteria may be developed with reference to the areas of seriousness, manageability, acceptability, urgency and growth (the SMAUG model).

- *Seriousness* is about the effect of a risk in terms of any potential loss.
- *Manageability* is about determining the capability to influence the risk.
- *Acceptability* is about how the risk is perceived.
- *Urgency* is about the perceived need for action.
- *Growth* is about the potential of the risk to become more serious.

Judgements about seriousness, manageability, acceptability, urgency and growth may consider the following factors:

- *Loss*, which may be judged using the following factors: fatalities; serious injury; economic effects; financial cost; scope and scale (social, spatial and over time); asset, resource and environmental degradation; continuity of functions; confidence
- *Technical judgements*, which appropriately acknowledge uncertainty: international technical standards;

national standards; codes of practice; guidelines; professional judgment (individual); professional judgment (institutional).

- **Community capability** (to manage the risks), which should be judged using the following factors: resources; readiness; knowledge and skills; values and beliefs
- **Legal considerations** may include *inter alia*: international law, conventions and treaties, statutory provisions, common law precedents, recommendations of investigative offices such as the coroner, boards of inquiry (e.g. air safety) and Royal Commissions; land use; exposure to litigation
- **Social and political considerations**: government policy; community expectations; community values; community attitudes; community perceptions; special group interests.
- **Equity**: socially imposed (inequity); power (access to) individuals and community; information (access to) individuals and community; distribution of costs and benefits (scope and scale).

**Risk treatment**

Risk treatment involves identifying the range of options for treating risk, selecting intervention options, planning and implementing intervention strategies.

**Identifying options for risk treatment**

Figure 4 illustrates the emergency management risk treatment process.

Comprehensive emergency management (prevention, preparedness, response, recovery) provides a framework within which intervention options may be derived and treatments applied. Options, which are not necessarily mutually exclusive or appropriate in all circumstances, include the following.

**Prevention**

Intervention options under prevention programs may include measures such as landuse management, building codes, developing community awareness, tax and insurance incentives or disincentives

The effect of measures under prevention programs may be to avoid the risk, reduce the likelihood, reduce the consequences, reduce community vulnerability, or transfer the risk.

**Preparedness**

Intervention options under preparedness programs may include measures such as contingency planning for response and recovery, training and exercises,

developing community awareness, and developing warning systems

The effect of measures under preparedness programs may be to accept the risk, reduce the consequences, reduce community vulnerability, or transfer the risk

**Response**

Intervention options under response programs may include contingency measures to activate emergency coordination centres, coordinate resources, issue warnings, and provide immediate relief and medical assistance.

The effect of measures under response programs may be to reduce consequences, and reduce community vulnerability.

**Recovery**

Intervention options under recovery programs may include contingency measures to restore essential services, provide temporary housing, provide counselling, and provide financial support and assistance.

The effect of measures under recovery programs may be to reduce consequences and reduce community vulnerability.

**Evaluating risk treatment options**

In general the adverse impact of risks should be made as low as reasonably practicable. In developing criteria to judge what is 'as low as reasonably practicable' planners should consider factors such as feasibility, costs and

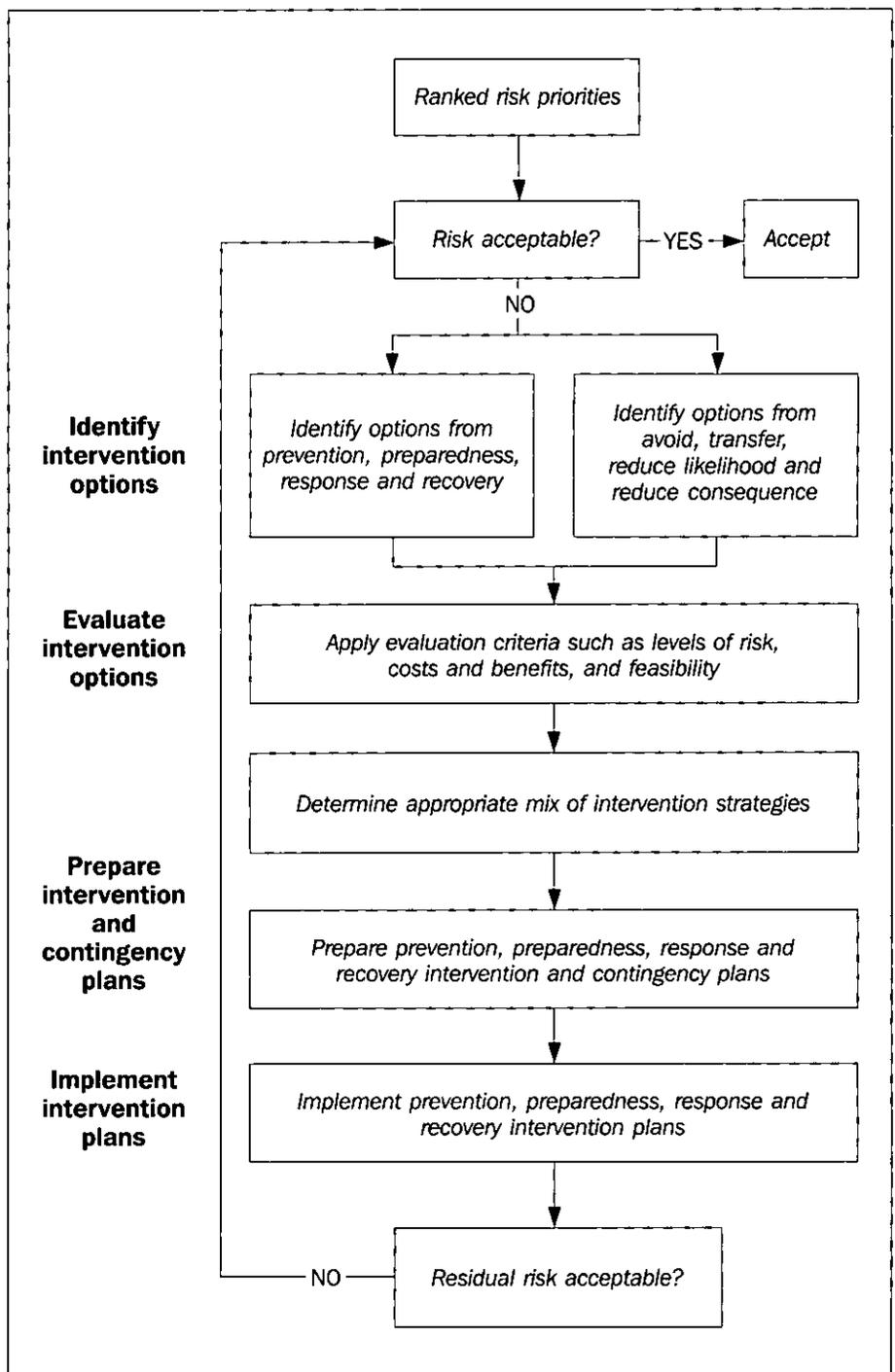


Figure 4: Risk treatment in the emergency management context

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benefits and levels of risk. In many cases, it is unlikely that any one risk treatment option will be a complete solution for a particular problem and a number of options may be considered and applied either individually or in combination.

Selection of the most appropriate option involves balancing the cost of implementing each option against the benefits derived from it. In general, the cost of managing risks needs to be commensurate with the benefits obtained. Where large reductions in risk may be obtained with relatively low expenditure, such options should be implemented. Further options for improvement may be uneconomic and judgment needs to be exercised as to whether they are justifiable.

Of particular significance in the emergency management context is the principle that decisions should take account of the need to consider carefully rare but severe risks, which may warrant risk reduction measures that are not justifiable on strictly economic grounds. If the level of risk is high, but considerable opportunities could result from taking the risk (e.g. building a dam) then acceptance of the risk needs to be based on an evaluation of the costs of risk treatment and rectifying potential consequences, versus the opportunities afforded by taking the risk.

Risk treatment options should consider how risk is perceived by stakeholders and the most appropriate ways to ensure that stakeholders agree to accept residual risks and/or costs of treatment options.

#### *Preparing treatment plans*

Plans should document how the chosen options will be implemented. The treatment plan should identify responsibilities, schedules, the expected outcome of treatments, budgeting, performance measures and the review process to be set in place.

The plan should also include a mechanism for evaluating the implementation of the plan against performance criteria.

#### *Implementing treatment plans*

Ideally, responsibility for treatment of risk should be borne by those best able to control the risk. Responsibilities should be agreed between the parties at the earliest possible time. The successful implementation of the risk treatment plan requires an effective management system which specifies the methods chosen, assigns responsibilities and individual accountabilities for actions,

and monitor them against specified criteria.

#### *Residual risk*

If after treatment there is a residual risk, a decision should be taken as to whether to retain this risk or re-enter the risk treatment process. After risks have been reduced or transferred, there may be residual risks that are retained. Risks can also be retained by default (i.e. when there is a failure to identify or appropriately transfer or otherwise treat risks).

Transfer of risk involves another party bearing or sharing some part of the risk. Mechanisms include physical transfer, the use of contracts, insurance arrangements and organisational structures such as partnership and joint ventures. Where risks are transferred in whole or in part, the organisation

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transferring the risk has acquired a new risk, in that the organisation to which the risk has been transferred, may not manage the risk effectively.

#### *Risk communication*

Risk communication is an integral part of risk management that must be considered at every stage of the risk management process. Risk communication between responsible authorities and the general public is particularly important in emergency management since effective management often depends on the public's understanding and acceptance of both the risks and the risk management options.

At an early stage of the risk management process arrangements should be made that detail when and how information will be communicated. Effective risk communication is a two-way pro-

cess that allows the public to request the information they require to allow them to make their own personal risk management decisions in an informed fashion.

Community information about hazards and emergencies is particularly difficult because the community often lacks experience since these tend to be infrequent events, and the uncertainty associated with the likelihood and consequence components of the risk. Risk communication in emergency management is therefore an interactive learning process.

Key issues include:

a. The structure of a risk decision process depends on the particular situation, but five objectives can be identified:

- getting the right participation.
- getting the participation right.
- getting the right science
- getting the science right
- developing an accurate, balanced, and informative synthesis.

b. Those responsible for a risk decision should begin by developing a provisional diagnosis of the decision situation so that they can better match the analytic-deliberative process to the needs of the decision, particularly in terms of level and intensity of effort and representation of parties. The eight steps in this process are:

1. diagnose the kind of risk and the state of knowledge
2. describe the legal mandate
3. describe the purpose of the risk decision
4. describe the affected parties and anticipate public reactions
5. estimate resource needs and timetable
6. plan for organisational needs
7. develop a preliminary process design
8. summarise and discuss the diagnosis within the responsible organisation.

#### *Monitoring and review*

It is necessary to monitor risks, the effectiveness of the risk treatment plan, strategies and the management system that is set up to control implementation.

Risks and the effectiveness of control measures need to be monitored to ensure changing circumstances do not alter risk priorities. Few risks remain static. Ongoing review is essential to ensure that the management plan remains relevant. Factors which may affect the likelihood and consequences of an outcome may change, as may the factors which affect the suitability or cost of the various treatment options.

## Discussion

Some of our current emergency management processes are historical legacies of narrow constructs. The scientific study of hazards has largely driven the way we view and manage risk. The 'turf' sensitivity of organisations with responsibility for public safety defined in relation to particular hazard agents (such as fire and flood) has reinforced the hazard focus.

Constructs such as 'PPRR' (prevention, preparedness, response and recovery) have facilitated the development of the simplistic notion that there is a linear and temporal relationship between elements viz. 'first P, then P, then R, and finally R', thereby becoming an encumbrance to effective management. Such misunderstanding has fostered attitudes of division and hierarchy, such as 'my hazard is more important than yours', or 'my Response is more important than your Prevention'.

The shift toward risk management has significant implications for emergency management service provision, especially in terms of implementation and organisational change. As reported by Smith et al, these include increased service provision diversity (including a shift to prevention), community empowerment and responsibility, and increased inter-agency cooperation.

Under the broad public policy umbrella of 'risk management for safer communities', we are moving into the domain of client-focused service provision. Several new skill sets will be required of the emergency management community, for example:

- risk communication processes (based on planning with, not for) to negotiate appropriate levels and types of emergency management service provision will require facilitation skills to conduct service reviews and agree service level definition with clients
- contract specifications associated with outsourcing emergency management service provision will need a thorough understanding of and sensitivity to implications in order to achieve appropriate outcomes and performance indicators.

Lessons from the recent review of New Zealand emergency management service provision outlined by Helm indicate 'risk management will play a central role in the work of any new national organisation . . . (as) a source of practical advice on risk management for local authorities and others . . . (and)

to advise Ministers on the best allocation of central government funding and resources across different risk categories'. Further, 'those responsible for public safety and for managing infrastructural assets . . . are obliged to assume full responsibility for managing the risks, i.e. to identify the hazards, to assess the risks, and to take whatever precautions are required. Support from central government is conditional upon proper risk management having been demonstrated'.

While New Zealand arrangements between levels of government do not parallel Australia's Commonwealth-State relations, some of the principles underpinning the New Zealand recommendations of value for consideration in the development of policy within the Australian emergency risk management framework include:

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### **Risk management, focused on vulnerability, provides a flexible and holistic framework to better advise emergency management.**

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- maximising integration and effectiveness by encouraging the formation of emergency management groups (EMGs) involving consortia and partnerships
- developing national 'overarching' service provisions to support emergency management capability that
  - commission research and provide feedback to emergency services
  - provide strategic policy advice on issues such as the hazardscape, potential and actual costs of emergencies, and how to determine levels of acceptable risk.

### **Conclusions**

Successful problem structuring is a crucial first step in developing successful solutions. The management priority is how best to reduce community exposure to major risks. Considerations related to hazards and strategies of prevention,

preparedness, response and recovery are necessary elements of disaster management, however they are not sufficient. A comprehensive taxonomy of emergency management strategies is necessary.

We have adopted, and are grappling with, the implications of the internationally promulgated construct that  $RfH \& V$  (where  $R$ =Risk,  $H$ = Hazard and  $V$ =Vulnerability). Indeed, the only reason for emergency managers to analyse hazards and assess vulnerability is to enhance their capability to manage risk.

Risk management, focused on vulnerability, provides a flexible and holistic framework to better advise emergency management. Analyses focused on vulnerability will by identifying processes that bring about risk and highlight management options that address underpinning social features, structures or processes.

In sum, in an era of increasing accountability, risk management provides a framework which, by focusing on managing community exposure to major risks, will facilitate the identification and implementation of intervention options which address the socially significant problems.

### **Definitions**

For the purpose of the draft guidelines for applying risk management in the emergency management context and this paper, the definitions below apply.

**Affected parties.** People, groups, or organisations that may experience benefit or harm as a result of a hazard, or of the process leading to risk characterisation, or of a decision about risk. They need not be aware of the possible harm to be considered affected.

**Community.** A social group that has a number of things in common generally defined by location, but which may include such things as shared experience, culture, heritage, language, ethnicity.

**Consequence.** The outcome of an impact or situation expressed qualitatively or quantitatively, being death or injury of people, or loss of or damage to property or the environment or disruption of the community.

**Cost.** Both direct and indirect, including disruption, financial costs, time, labour, and intangible losses.

**Disaster.** A condition or situation of significant destruction, disruption and/or distress to a community.

**Elements at risk.** Anything valued by the community that may be exposed to a hazard.

**Emergency.** A condition or situation requiring urgent action or assistance.

**Emergency management.** A range of measures to manage risks to communities and the environment. It involves the development and maintenance of arrangements to prevent the effect of, prepare for, respond to or recover from events causing significant community disruption or environmental damage.

**Environment.** Conditions or influences that surround or interact with a community. Concepts of environment include *built environment* (elements such as cities and systems or networks that provide for the movement of people, goods, services, and information), *physical environment* (elements from the natural environment such as topographical features, water bodies, vegetation communities, and ecosystems), and *social environment* (relates to the nature of the community and incorporates conditions and characteristics of elements such as politics, economics, and culture).

**Event.** A situation or hazardous occurrence that may require emergency management.

**Frequency.** A measure of the number of occurrences of a particular type of event in a given time. See also *Likelihood* and *Probability*.

**Hazard.** A situation or condition with potential for loss or harm to the community or environment.

**Interested parties.** People, groups, or organisations that decide to become informed about and involved in a risk characterisation or decision-making process. Interested parties may or may not also be affected parties.

**Lifelines.** Systems or networks that provide for the movement of people, goods, services, and information upon which the health, safety, comfort and economic activity of the community depend.

**Likelihood.** A qualitative description of probability.

**Loss.** Any negative consequence, financial or otherwise.

**Probability.** The chance of a specific outcome, measured by the ratio of particular outcomes to the total number of possible outcomes. Probability is expressed as a value between 0 and 1, with 0 indicating an im-

possible outcome and 1 indicating that an outcome is certain. These values are commonly expressed as a percentage i.e. 0.1 = 10%.

**Residual risk.** The remaining level of risk after risk treatments have been undertaken.

**Risk.** A concept used to give meaning to things, forces, or circumstances that pose danger to people or to what they value. Descriptions of risk are typically stated in terms of the likelihood of harm or loss from a hazard and usually include an identification of what is 'at risk' and may be harmed or lost (e.g. people, quality of life, property, ability to carry on an economic activity or the environment), the hazard that may occasion this loss, and a judgment about likelihood that harm will occur.

**Risk acceptance.** An informed decision not to take further intervention action for a specific risk.

**Risk analysis.** The systematic use of available information to characterise risk.

**Risk characterisation.** A synthesis and summary of information about risk that addresses the needs and interests of decision makers and of interested and affected parties. Risk characterisation is a prelude to decision making and depends on an iterative, analytic-deliberative process.

**Risk communication.** Interactive processes involving the exchange of information and opinion about risk among individuals, groups, and institutions.

**Risk evaluation.** The process used to determine risk management treatment priorities.

**Risk identification.** The systematic process of identifying risks involving an appreciation of the environment, credible sources of and credible elements at risk.

**Risk management.** The systematic application of management policies, procedures and practices to the tasks of identifying, analysing, evaluating, treating and monitoring risk.

**Risk treatment.** Selection and implementation of appropriate intervention strategies for dealing with risk.

**Sensitivity analysis.** Examines how the results of a calculation or model vary as individual assumptions are changed.

**Vulnerability.** The degree of susceptibility and resilience of the community and environment to hazards, the characteristics of a community or

system in terms of its capacity to anticipate, cope with, and recover from events.

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This paper was the keynote address to the Seminar for World Disaster Reduction Day, 'Risk Management for Safer Communities', held on the 7th October 1997.

The views expressed draw on work currently being undertaken by teams within the emergency management community to develop risk management guidelines in the emergency management context. While duly recognising the work of these teams, the opinions and views expressed are those of the author.

Please direct any comments you may have regarding proposed enhancements to the draft guidelines to the author John Salter, e-mail: jsalter@ema.gov.au.