

# EMERGENCY RISK MANAGEMENT

Applications guide

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**Part II**

**Approaches to Emergency Management**

**Volume I - Risk Management**

**Manual 1**

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# Foreword

This document is based on AS/NZS 4360-1999 *Risk management*. The following interests are represented on Joint Technical Committee OB/7 – Risk Management:

Australian Computer Society  
Australian Customs Service  
Australian Institute of Risk Management  
CSIRO  
Department of Administrative Services, Australia  
Department of Defence, Australia  
Environmental Risk Management Authority, New Zealand  
Institution of Engineers, Australia  
Institution of Professional Engineers, New Zealand  
Insurance Council of Australia  
Insurance Institute of New Zealand  
Ministry for Emergency Management, New Zealand  
Ministry of Agriculture and Forestry, New Zealand  
Ministry of Commerce, New Zealand  
NSW Department of Urban Affairs and Planning  
NSW Treasury Managed Fund  
National Insurance Brokers Association of Australia  
Securities Institute of Australia  
The Association of Risk and Insurance Managers of Australia  
Centrelink

Additional information contained in this document has been adapted from a number of references. Acknowledgments are due to:

- State/Territory documentation on emergency risk management; and,
- pilot emergency risk management projects.

The document was developed under the guidance of a steering committee comprising:

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- Mr Alan Cormack, South Australia Emergency Services Administration;
- Mr David Craven, Victoria State Emergency Service;
- Mr Bevis Dutton (chair), Tasmania State Emergency Service;
- Mr Mike Tarrant, Australian Emergency Management Institute; and,
- Ms Alice Zamecka, Queensland Emergency Service.



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# Introduction

## Aim, user group, scope & application

The **aim** of this document is to explain how emergency risk management can be applied. The expected **user group** for the document are those at community, local government, regional/district or State/Territory level who lead or facilitate the emergency risk management process. The **scope** includes major risks to community safety that require whole-of-community or multi-organisational attention - other risks should be addressed by individual organisations using standard procedures or AS/NZS 4360:1999 *Risk management*.

Emergency risk management can be **applied** at a number of levels and groupings, including:

- community, local government, regional/district, or State/Territory levels; and,
- groupings based on geography, shared-experience, sectors or functions.

Each of these levels or groupings is complex in that hazards and vulnerabilities, hence risks, will not be evenly spread throughout, but concentrated in certain areas.

Users of the guide may develop or implement policy concerning how this document is to be used at different levels. A policy may determine:

- policy and standards for application of emergency risk management;
- information inputs to the emergency risk management process;
- where and how the full emergency risk management process may be applied; and,
- resourcing for emergency risk management.

## Background

In 1995, Standards Australia and Standards New Zealand published AS/NZS 4360:1995 *Risk management*. This standard was developed “with the objectives of providing a generic framework for identification, analysis, assessment, treatment and monitoring of risk”<sup>1</sup>. The standard was intended for use by **organisations** to “enable organisations to minimise losses and maximise opportunities”<sup>2</sup>.

The applicability of this standard to **community emergency management** was immediately recognised, and use of the standard in this field began in many parts of Australia.

A workshop on emergency risk management was conducted at the Australian Emergency Management Institute in March 1996<sup>3</sup>. The aim of the workshop was “to identify, in the context of public administration, whether a systematic risk management approach (as represented by AS/NZS 4360) could enhance emergency management”<sup>4</sup>. It was decided that risk management should be promoted as the basis for emergency management over a 3-5 year period<sup>5</sup>.

The *Guidelines for Emergency Risk Management* were developed over the next two years, and were endorsed by the National Emergency Management Committee, Australia’s peak emergency management body, in October 1998. The *Guidelines* form the basis for this document.

## What is ‘emergency risk management’?

Emergency risk management is “a systematic process that produces a range of measures that contribute to the well being of communities and the environment”. It includes: context definition; risk identification; risk analysis; risk evaluation; risk treatment; monitoring and reviewing; and, communicating and consulting.

The philosophy and methods of emergency risk management are a blend of traditional emergency management and the risk management approaches outlined in AS/NZS 4360:1999 *Risk management*.

## Why 'emergency risk management'?

Emergency risk management:

- provides a series of tools and processes, and a general philosophy, that can be used by communities;
- focuses on the causes of risk, rather than on emergencies that may result from risk;
- provides an auditable and credible means of reducing risk; and,
- uses a language that is common to other risk management approaches.

## Method of compilation

The guiding principles for the compilation of this document were to conform as closely as possible to AS/NZS 4360:1999 *Risk management*, to keep analysis and documentation to a minimum, and to ensure that each step in the emergency risk management process is logically connected to succeeding steps. However, AS/NZS 4360:1999 is designed specifically for **organisations**, whereas emergency risk management is applied to **communities**. Thus this document has required some rational deviations from AS/NZS 4360. These deviations are based, to a large extent, on work performed in Queensland, South Australia, Tasmania and Victoria. A wide variety of sources have been used, all of which are noted in the references. The document has been exposed to wide-ranging consultation and discussion.

## Explanatory notes

This document is intended as a 'how-to' document with a minimum of background material. The *Guidelines for Emergency Risk Management* (as endorsed by the National Emergency Management Committee) appear in this document in Times New Roman font.

The parts in the emergency risk management process are described sequentially in this document, ie.: establish the context; identify risks; analyse risks; evaluate risks; treat risks; monitor and review; and, communicate and consult. Each part of the process is described using five headings:

- **purpose** of the step (what does it achieve?);
- **rationale** for the step (why do it?);
- **inputs** to the step (what do we need to do it?);
- suggested **methods** (how do we do it?); and,
- possible content and forms of the **outputs** (what do the outputs contain and look like?).

The following application notes can be found at the end of the document:

- documentation (Annex A);
- project management (Annex B);
- information management (Annex C);
- managing the emergency risk management committee (Annex D);
- marketing emergency risk management (Annex E);
- generic hazards (Annex F);
- example of a qualitative method of vulnerability analysis (Annex G);
- scenario analysis (Annex H); and,
- qualitative risk analysis (Annex I).

## Scope, application & definitions

### SCOPE

These generic guidelines, based on the Australian/New Zealand Standard AS/NZS 4360:1999 *Risk management*, outline the process for using that Standard in emergency risk management. These guidelines will be complemented by a detailed application guide and supporting material. Emergency risk management is a systematic process that produces a range of measures that contribute to the well being of communities and the environment.

### APPLICATION

These guidelines outline the processes that can be applied in any emergency management context to enhance community safety.

### DEFINITIONS

For the purpose of these guidelines, the definitions below apply.

#### **Community**

a group of people with a commonality of association and generally defined by location, shared experience, or function.

#### **Consequence**

the outcome of an event expressed qualitatively or quantitatively, being a loss, injury, disadvantage or gain. (In emergency risk management - the outcome of an event or situation expressed qualitatively or quantitatively. In the emergency risk management context, consequences are generally described as the effects on persons, society, the economy and the environment.)

#### **Emergency**

an event, actual or imminent, which endangers or threatens to endanger life, property or the environment, and which requires a significant and coordinated response.

#### **Emergency risk management**

a systematic process that produces a range of measures that contribute to the well being of communities and the environment.

#### **Environment**

conditions or influences comprising built, physical and social elements, which surround or interact with a community.

#### **Hazard**

a source of potential harm or a situation with a potential to cause loss. (In emergency risk management - a situation or condition with potential for loss or harm to the community or environment.)

#### **Lifeline**

a system or network that provides services on which the well being of the community depends.

#### **Likelihood**

used as a qualitative description of probability and frequency.

#### **Monitor**

to check, supervise, observe critically, or record the progress of an activity, action or system on a regular basis in order to identify change.

#### **Preparedness**

measures to ensure that communities and services are capable of coping with the effects of emergencies.

#### **Prevention**

measures to eliminate or reduce the incidence or severity of emergencies.

#### **Recovery**

measures which support emergency-affected individuals and communities in the reconstruction of the physical infrastructure and restoration of emotional, economic and physical well being.

**Residual risk**

the remaining level of risk after risk treatment measures have been taken.

**Response**

measures taken in anticipation of, during and immediately after, emergencies to ensure the effects are minimised.

**Risk**

the chance of something happening that will have an impact upon objectives. It is measured in terms of consequences and likelihood. (In emergency risk management - a concept used to describe the likelihood of harmful consequences arising from the interaction of hazards, communities and the environment.)

**Risk analysis**

a systematic use of available information to determine how often specified events may occur and the magnitude of their likely consequences. (In emergency risk management - the systematic use of available information to study risk.)

**Risk Evaluation**

the process used to determine risk management priorities by evaluating and comparing the level of risk against predetermined standards, target risk levels or other criteria.

**Risk treatment options**

measures that modify the characteristics of hazards, communities and environments to reduce risk, eg. prevention, preparedness, response and recovery.

**Stakeholders**

those who may affect, be affected by or perceive themselves to be affected by the emergency risk management process.

**Vulnerability**

the susceptibility and resilience of the community and environment to hazards.

**WORDS & IDEAS**

There is no national agreement on emergency management terms and definitions in Australia. This is because emergency management overlaps many other fields of endeavour, is influenced by European and American ideas and words, and is currently moving towards risk management.

The terminology used in this document is based on AS/NZS 4360:1999 *Risk management* and the *Australian Emergency Management Glossary*<sup>6</sup>. Nevertheless, the following discussion of how terms are used in this document may be useful for some readers.

'**Risk**' is considered, from the AS/NZS 4360:1999 and the hazardous industry point of view, to be a function of 'likelihood' and 'consequence'. In occupational health and safety usage, risk is considered a function of 'consequence', 'exposure' and 'probability'<sup>7</sup>. However, in emergency management, it is often considered a function 'hazard' and 'vulnerability'. 'Risk' is used here in the senses of 'likelihood' and 'consequence', and also 'hazard' and 'vulnerability'.

'**Hazard**' is synonymous with 'source of risk'.

'**Elements at risk**' are parts of the community and environment that are at risk.

'**Vulnerability**' comprises 'resilience' and 'susceptibility'. 'Resilience' is related to 'existing controls' and the capacity to reduce or sustain harm. 'Susceptibility' is related to 'exposure'.

'**Mitigation**' includes measures to reduce the severity of emergencies, primarily in prevention and preparedness.

The term '**hazard analysis**' has been superseded by 'risk identification', 'risk analysis' and 'risk evaluation'.

Some jurisdictions may prefer to interpret the term '**emergency**' as 'disaster'.

# Emergency risk management overview

## GENERAL

Emergency risk management, as described in these guidelines, parallels both risk management as outlined in AS/NZS 4360:1999 *Risk management* and normal management practice. All three are most effective when based on stakeholder consultation and participation, are multi-faceted, and may be performed by multi-disciplinary teams. The equivalent components of each are outlined in the following table.

Table 1

Alignment of management, risk management & emergency risk management

MANAGEMENT	RISK MANAGEMENT (AS/NZS 4360)	EMERGENCY RISK MANAGEMENT
<b>Problem definition</b>	Establish the context Establish strategic, organisational & risk management contexts Develop risk evaluation criteria Decide the structure	Establish the context Define problem Establish emergency risk management framework Develop risk evaluation criteria
<b>Research</b>	Identify risks What can happen? How can it happen?	Identify risks Identify & describe hazards, community & environment Scope vulnerability Describe risks
<b>Analysis</b>	Analyse risks Determine existing controls Determine likelihood & consequence Estimate level of risk	Analyse risks Determine likelihood & consequence
<b>Decision making</b>	Evaluate risks Compare against criteria Set risk priorities Decide on risk acceptability Treat risks Identify treatment options Evaluate treatment options Select treatment options	Evaluate risks Compare risks against criteria Set risk priorities Decide on risk acceptability Treat risks Identify options Evaluate options Select options
<b>Implementation</b> Implement plan	Prepare treatment plans	Plan & implement risk treatments
<b>Monitor &amp; review</b>	Monitor & review	Monitor & review
<b>Communicate &amp; consult</b>	Communicate & consult	Communicate & consult

## MAIN ELEMENTS

The main elements of the emergency risk management process are the following:

- a. **Establish the context** Identify issues and establish a management framework, ie. define the nature and scope of the problem to be solved, and identify a framework in which the emergency risk management process will be undertaken. Define the community expectation of acceptable risk for the problem.
- b. **Identify risks** Identify and describe the nature and scope of the hazards, community and environment that provide the setting for the established problem.
- c. **Analyse risks** Analyse the risk associated with the problem using a modelling process and determine the vulnerability of the community and/or environment to hazards.

- d. **Evaluate risks** Compare risks against risk evaluation criteria, prioritise the risks, and decide on risk acceptability.
- e. **Treat risks** Respond to the level of risk by deciding which factors in the problem (hazard, environment or community) can be changed to reduce the risk, test the changes in the model to obtain an estimate of the new level of risk, and determine which factors should be changed.

Underpinning the emergency risk management process is a requirement for:

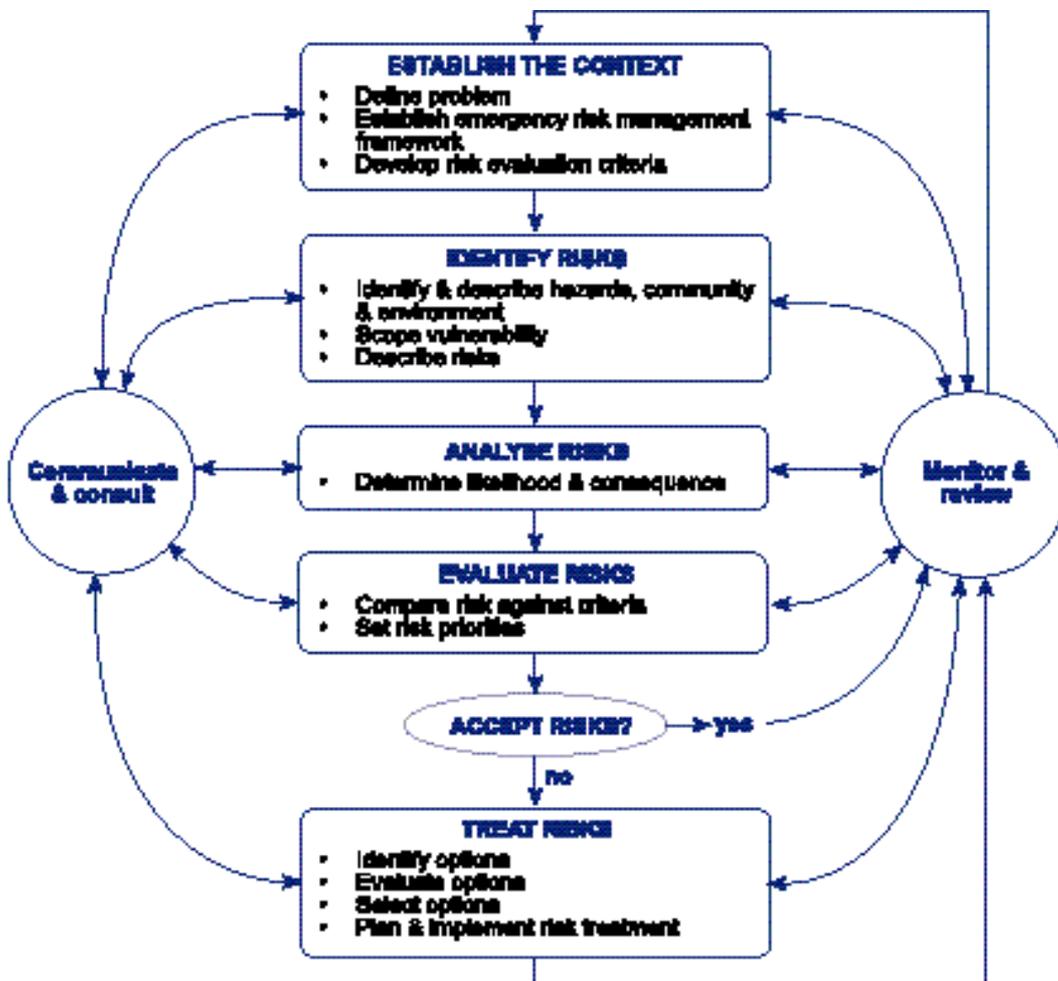
- a. **Communication and consultation** Where all stakeholders contribute to the decision-making process there is a much larger pool of information and expertise to enable valid solutions to be developed. Further, for any decision to be successfully implemented, it must engender ownership and commitment from all parties influenced by it.
- b. **Documentation** Appropriate documentation, to retain knowledge and to satisfy audit, should be integrated within the process at all stages and maintained.
- c. **Monitor and review** Factors which may affect the problem may change, as may the factors which affect the suitability of the various risk treatment options. Therefore systems that monitor and review risk and its management must be established and maintained. Where risk treatments leave a residual risk, a decision should be taken as to whether to retain this risk or re-enter the emergency risk management process.

The emergency risk management process is shown in diagrammatic form in Figure 1.

The emergency risk management process may be undertaken a number of times to ensure that interventions can accommodate change and uncertainty. The entire process should be re-entered at any point when the in-built review mechanisms indicate such a necessity.

Figure 1

The emergency risk management process



## Getting started

Like any project, such as building a house, or organising a conference, emergency risk management must be carefully planned and managed. This can ensure that the process produces worthwhile results. Five steps that will assist this are:

- initiating communication, consultation and participation from the very beginning;
- developing and using a project management plan;
- identifying or forming an emergency risk management committee;
- marketing emergency risk management; and,
- training potential participants.

These steps are described below.

**Initiate communication, consultation and participation** – Emergency risk management is not just a technical or political process – it is also, or even primarily, a social process. It is social in that meaningful participation from the community, and effective collaboration with a wide range of organisations, is required to manage major risks to the community. Communication and consultation are essential means for ensuring this participation and collaboration. The section entitled ‘Communicate and consult’ on page 29 describes this area further.

**Develop the project management plan** – The project management plan can ensure that the emergency risk management produces worthwhile outcomes as efficiently and effectively as possible. Project management itself, however, should not be allowed to overtake in time or perceived importance the conduct of emergency risk management - it is simply a management tool. The project management plan should include the following<sup>8</sup>:

- project definition (aim, objectives, scope and authority, stakeholders, relationship of project to other projects);
- project planning (tasks, responsibilities, timetable, resources); and,
- project implementation (communication, consultation, performance, monitoring and review).

Annex B describes how to develop a project management plan.

**Identify or form an emergency risk management committee** – There may be a group of people who are responsible for or have an interest in safety, crisis or emergency management in a given community. If such a group exists, then it may be ideal for the purposes of emergency risk management because it may already have:

- the appropriate authority;
- appropriate representation;
- an efficient reporting system; and,
- sufficient expertise.

If a committee does not exist, then it should be constituted using the above four criteria and with reference to the project definition. The emergency risk management committee should be requested to comment on and suggest alterations to the project management plan. Annex D contains a description of how to manage an emergency risk management committee.

**Market emergency risk management** – Emergency risk management offers many opportunities for communities to take charge of their own destiny by promoting community involvement. But many people will resist these opportunities because: they may perceive it to be too slow; they may believe they know the solutions; or, they may believe that major risks are the government’s responsibility. To counter these arguments, and to engage the participation of community members, it is worthwhile to introduce emergency risk management by pointing out that:

- to achieve workable solutions it is necessary to have a sound problem-solving process;
- this process must be systematic and consider all available information and opinions; and,
- the best solutions are often those chosen by community members because they reflect the realities and expectations of the community.

Annex E describes how to market emergency risk management.

**Train potential participants** – Participants in emergency risk management may be divided into three broad groups:

- facilitators;
- community and organisational representatives; and,
- community decision-makers.

Facilitators should have skills in leading and influencing groups and a thorough understanding of the emergency risk management process.

Other participants in the emergency risk management process should be provided with sufficient information to allow them to contribute fully.

## Establish the context

### GENERAL

Emergency risk management, as with all processes in society, occurs within the scope and limitations of established policies, practices and relationships. It is therefore essential to define the problem, establish the risk management framework, and develop risk evaluation criteria.

### DEFINE PROBLEM

A first step in establishing the emergency risk management framework is to identify and define the problem. This involves identification of the nature and scope of issues that should be addressed to improve community safety. Problem definition does not identify solutions - it defines the boundaries within which the framework can be established.

### ESTABLISH EMERGENCY RISK MANAGEMENT FRAMEWORK

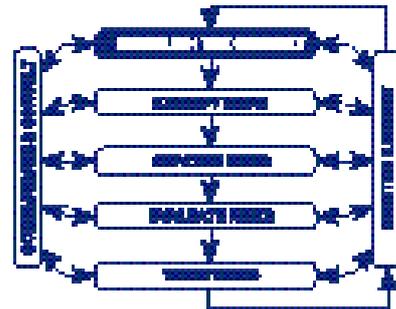
This step is focused on identifying how emergency risk management will be applied to solve the problem. Factors to be considered include any or all of the following:

- a. stakeholders;
- b. applicable legislation and policy;
- c. applicable management arrangements;
- d. political and economic circumstances; and
- e. social and cultural issues.

Central to the establishment of emergency risk management is the identification of stakeholders, eg. communities, organisations, property owners, personnel, customers, suppliers, government, contractors, community safety service providers, and the establishment of communication, consultation and participation frameworks for applying the emergency risk management process.

### DEVELOP RISK EVALUATION CRITERIA

In this step, the criteria against which risk is to be evaluated are developed. The criteria should be developed through broad, interactive processes involving all stakeholders. It is important that risk evaluation criteria are established early. Risk evaluation criteria may be based on technical, economic, legal, social, humanitarian or other criteria as determined by the stakeholders.



### Purpose

The purpose of establishing the context is to develop a shared understanding of the position of emergency risk management in a given community and policy framework.



### Rationale

This step is required:

- to define the scope of the emergency risk management process; and,
- to determine the community aspirations, expectations, interests, values and circumstances.



## Inputs

The inputs to this step may include:

- the project management plan;
- National, State and local policies;
- information on economic and social circumstances; and,
- community aspirations, expectations and perceptions.



## Method

The suggested methods for this step are:

1. establish policies;
2. establish the risk management and strategic context; and,
3. develop risk evaluation criteria.

These methods are explained below.

### 1. Establish policies

The policies for emergency risk management will come from many different areas. This is because emergency risk management does not just focus on hazards and emergencies, but also upon communities, the environment, and resources. It is necessary to:

- obtain National and State policy on emergency risk management; and,
- identify other policies and relevant legislation, eg.; emergency management, land use planning, environmental resource management, public and environmental health, Natural Disaster Relief Arrangements, emergency services, National Emergency Management Committee, and State/Territory emergency management committee.

### 2. Establish the risk management & strategic context

To establish the risk management and strategic context:

- use the items in the following table as triggers for discussion in establishing context;
- describe community objectives found in strategic plans for the community, local government, region/district or State/Territory; and,
- identify community expectations and community risk perceptions.

Table 2  
Some aspects of emergency risk management context <sup>9</sup>

attitudes	finance	politics	skills
capability	harm	protection mechanisms	stakeholders
change	knowledge	purposes	things to be protected
clients	objectives	resources	uncertainty
cultures	penalties	responsibility	vulnerability

**Strategic plans** - Strategic plans, policy statements, etc. may contain agreed or suggested community objectives. An emergency risk management project should conform to relevant and appropriate community objectives.

**Community expectations & perceptions** - It is necessary to determine what the community expects in terms of safety and risks. There may be a great diversity of opinion on risks arising from various hazards, given different perceptions of risk.

### 3. Develop risk evaluation criteria

Emergency risk management may reveal more risks than there are resources to deal with – risk evaluation criteria will assist in making judgements about which risks are the most serious. The following steps are recommended.

1. Inform the community and relevant organisations that risk evaluation criteria are being developed and invite their participation.
2. Consider what is unacceptable to the community in terms of:
  - loss of life and harm to people's health;
  - economic loss;
  - environmental harm;
  - lifeline damage;
  - social infrastructure damage, ie. schools, libraries, etc.; and,
  - loss of heritage.
3. Develop a series of draft statements for each of these categories, bearing in mind:
  - legal requirements;
  - cost and equity;
  - some risks are clearly unacceptable;
  - risk should be kept as low as reasonably practicable; and,
  - the form and language of the evaluation criteria must match that of the risk analysis statements.

### RISK PERCEPTION

Different people think about risk in different ways. 'Experts' in risk management may emphasise likelihood and consequences of risks and emergencies, and say they have an objective and correct view. Others may emphasise factors such as:

- whether they can control the risk;
- whether exposure to the risk is voluntary;
- if the risk is familiar;
- the potential for catastrophes;
- whether the consequences are greatly feared;
- future or unforeseen effects; and, who is at risk and who may benefit.

The draft risk evaluation criteria may be expressed in terms of future losses being below agreed levels, monetary amounts, etc.

4. Publish draft risk evaluation criteria and seek consensus.
5. Monitor and review the risk evaluation criteria throughout the emergency risk management process. The criteria may need to be revisited and modified when risks have been identified or during other steps



### Outputs

The expected outputs of this step are:

- a description of policy and context; and,
- a number of statements that can be used to evaluate risks.



### Documentation

Documentation of this step includes:

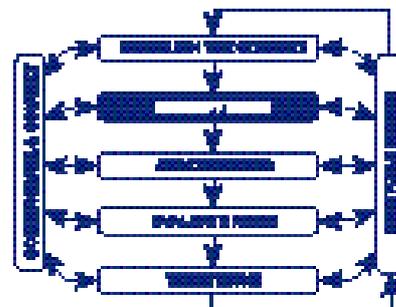
- a brief description of policy and context; and,
- a list of risk evaluation criteria that will guide future decisions on what risks should be dealt with.

## Identify risks

### GENERAL

Identifying risk requires a detailed investigation of the characteristics and interaction of the hazards, the community, and the environment which form the basis of the problem to be solved. The interaction requires a scoping of vulnerability and will suggest which risks exist.

The use of a well-structured systematic process is critical to the identification of risk. This step will also provide information about conditions or events that can be managed as part of the risk treatment options.



### IDENTIFY AND DESCRIBE HAZARDS

A hazard is a situation or condition with potential for loss or harm to the community or environment. Hazards may include:

- a. *Natural hazards* These include bushfire, storm, flood, cyclone, storm surge, earthquake, and extreme heat or cold.
- b. *Technological hazards* These include the failure of socio-technical systems related to agriculture, food processing and storage, industrial sites, infrastructure and transportation.
- c. *Biological hazards* These include the spread of disease, pests or contaminants among plants, animals or people.
- d. *Civil/political hazards* These include terrorism, sabotage, civil unrest, hostage situations and enemy attack.

Most hazardous situations are rarely simple, and the situation studied in emergency risk management may involve a combination of a number of the types of hazard above.

*Characteristics* The process of identifying and describing hazards examines information in fields including likelihood, spatial distribution, intensity, speed of onset, duration, and the concern that the hazard arouses in the community. Information about a range of possibilities within each of the fields should be considered, eg. in flood hazards, variability in fields such as river height, duration of flood event and rate of river rise and fall may be considered.

### IDENTIFY AND DESCRIBE COMMUNITY

A community may be identified by:

- a. *Geographically based groupings* Households, neighbourhoods, suburbs, towns, local government areas, cities, regions, states and the nation.
- b. *Shared-experience groupings* Interest groups, ethnic groups, professional groups, language groups, religious groups, age groupings, those exposed to a particular hazard.
- c. *Sector-based groupings* Agricultural, manufacturing, commercial, mining, education sectors. It may be necessary to consider groups within these sectors, eg. the food processing group within the manufacturing sector.
- d. *Functionally-based groupings* Service providers responsible for systems or networks which provide for the movement of people, goods, services and information on which health, safety, comfort and economic activity depends (lifelines).

Most communities are rarely simple, as individuals are generally members of more than one community and communities are not homogenous. The situation studied in emergency risk management may involve a combination of a number of different types of communities.

*Characteristics* The process of identifying and describing a community examines information in fields including: population size, spatial distribution, remoteness, prior experience or perception of hazards, degree of exposure to hazards, capacity to affect the environment or hazards, access to resources, and susceptibility or resilience to hazards. Information about a range of possibilities within each of the fields should be considered, eg. for geographically based communities, variability in fields such as degree of exposure and ability to cope may be considered.

### IDENTIFY AND DESCRIBE ENVIRONMENT

The environment is a set of conditions or influences that surround or interact with a community and the hazards. Elements of environment include:

- a. *Built environment* Elements such as buildings and infrastructure that provide for the movement of people, goods and services.
- b. *Physical environment* Elements from the natural environment such as topographical features, water bodies, vegetation communities, and ecosystems.
- c. *Social environment* Elements such as politics, economics, commerce, culture and community safety service provisions that relate to how the community functions.

The built, physical and social environments have complex interactions with the community and hazards. The situation studied in emergency risk management may involve a combination of a number of different aspects of the environment.

*Characteristics* The process of identifying and describing the environment examines information in fields including: the degree of mitigation effected on the hazard, the degree of protection afforded to the community, susceptibility or resilience to hazards. Information about a range of possibilities within each of the fields should be considered, eg. for an earthquake hazard and the built environment, a range of building types which provide differing degrees of protection may be considered; for a fire hazard and the social environment, variability in mitigation measures may be considered.

## SCOPE VULNERABILITY

Central to emergency risk management is a focus on determining vulnerability by establishing the capability of communities and the environment to anticipate, cope with, and recover from, emergencies. Vulnerability combines the concepts of resilience (the ability to sustain loss, including existing controls) and susceptibility (the degree of exposure). To profile the vulnerability of a community and the environment it may be necessary to identify appropriate vulnerability indicators. Vulnerability indicators should be capable of measurement and meet tests for necessity and sufficiency. Studies of vulnerability involve both quantitative and qualitative methods.



### Purpose

The purpose of identifying risks is to develop risk statements for later analysis and evaluation.\*



### Rationale

Risk is a result of the interaction between hazards and the community and environment. In order to develop risk statements it is necessary to describe this interaction.



### Inputs

The inputs to this step may include:

- policy direction;
- perception of risk and hazards;
- information on hazards and vulnerability of the community and the environment; and,
- guidance from the context description.



### Method

The suggested methods for this step are:

1. identify and describe hazards;
2. identify and describe the community and the environment;
3. scope vulnerability;
4. generate risk statements; and,
5. revisit risk evaluation criteria.

These methods are explained below. In identifying and describing hazards, the community and the environment, it is necessary to:

- gather information on hazards, the community and the environment;
- list hazards;
- list elements at risk;
- determine which hazards can affect which elements at risk and how; and,
- develop risk statements.

## 1. Identify and describe hazards

Hazard identification concerns discovering the hazards that may affect the community. Hazard identification is not straightforward - people may have quite different perceptions on what constitutes a significant hazard. It is therefore important to seek the views of many people from the community.

Techniques for identifying hazards include:

- researching the history of emergencies in the community, by consulting history, newspapers, records and older community members;
- inspecting the community for evidence of previous emergencies, existing hazards and existing vulnerability;
- examining literature or interviewing people from other similar communities;
- requesting information from State/Territory or National governments;
- using maps to overlay known community and environmental characteristics and determining potentially harmful events;
- using the planning group to 'brainstorm' on possible hazards; and,
- considering checklists (for example the list in Annex F).

There are five basic characteristics that can be used to describe most hazards:

- intensity (how big, fast, powerful);
- likelihood (the chance of a hazard causing an emergency);
- extent (the area that a hazard may affect);
- time-frame (warning time, duration, time of day/week/year); and,
- manageability (what can be done about it).

For each hazard these characteristics may mean quite different things. For example, in a cyclone, intensity relates to wind speed and air pressure, whereas in an earthquake intensity means the number and strength of earth tremors. Each hazard should be briefly described using these characteristics.

### **MAPPING**

Every picture tells a story. One of the best ways of presenting the results of hazard, community and environment descriptions is through maps. Maps are familiar to everybody, and the characteristics of hazards can be overlaid on other types of information, such as features of the environment, and relevant characteristics of a community. These maps are useful tools for development planning and for emergency preparedness and give an idea of the problems and opportunities posed by hazards and development can be achieved. They are also an excellent risk communication tool.

## 2. Identify and describe the community and the environment

Without knowledge about the community and environment, it is impossible to determine the elements at risk and to describe their vulnerability, and thus develop appropriate risk treatments. The characteristics shown in Table 3 can be used as prompts for discussion about vulnerability in the community and environment. Each column in this table is discussed below.

Table 3  
Some community & environment characteristics

Demography	Culture	Economy	Infrastructure	Environment
population & age distribution	traditions	trade	communication & transportation networks	land forms
mobility	ethnicity	agriculture & livestock	essential services	geology
skills	social values	investments	community assets	waterways
health status	politics	industries	government structures	climate
education level	religion	wealth	resource base	flora & fauna
	attitudes to hazards			
	risk awareness			

**Demography** - Demography is the study of human populations. There is often a large amount of data available on the population of any given community, but only some of this data is relevant to emergency risk management. The relevant data concerns the number of people in the area of study, their distribution across the area, the distribution of population characteristics, and any concentrations of vulnerable groups. Most people are vulnerable to risks in some way.

**Culture** - The attitudes of a community towards hazards and vulnerability will be strongly influenced by their attitudes towards nature, technology, the causation of accidents and emergencies, and the value of mitigating or contingent actions. Some communities, for example, accept loss due to risks, and may be unwilling to take preventative, preparatory or response actions.

**Economy** - The economy is a part of the community that requires protection. Consider the implications of a major disaster on investments and tourism. It is likely that an emergency that causes considerable structural and environmental damage would devastate the local tourism industry. Investment may also suffer, due to a perception on the part of potential or current investors that the risks in the area are too high. Industries and trade could also suffer due to a restriction in the access to both goods and markets caused by disruption to transport and communications. The wealth of a community may also determine its resilience.

**Infrastructure** - The infrastructure (both physical lifelines and organisational infrastructure) of a community is often highly vulnerable to hazards, particularly natural hazards. Risk identification should consider any possible damage to power generation and distribution systems, water supplies, communications systems, etc. These are often referred to as 'lifelines', and factors relevant to them include:

- the existence of risk management systems;
- the effects of loss of the service on the community;
- the possible extent of damage;
- alternative means of supplying the service;
- the amount of time repairs would take; and,
- the cost of repairs.

It is also important to have a basic description of the government structure, and service and community organisations, as these will provide the mechanism for emergency risk management programs and strategies.

**Environment** - The environment can be defined as the built, physical and social surroundings. If any of these elements of the environment are damaged, other elements might also be affected, due to the inter-connectedness of all parts of the environment. Paradoxically, the environment that nurtures us also causes some of the biggest threats - natural hazards. Indeed, describing the environment in risk identification will often identify some hazards that haven't yet been considered.

### 3. Scope vulnerability

In order to determine probable consequences arising from the interaction of hazards, communities and the environment, it is necessary to analyse the vulnerability of the community and the environment. This includes an analysis of the susceptibility and resilience of these elements.

Vulnerability is a function of resilience and susceptibility. Scoping of vulnerability involves looking for sections of the community and environment that are noticeably less resilient or more susceptible to hazards (sources of risk). There will always be variation in community and environment vulnerability within and across communities and environments. One approach is to determine where there are differences in vulnerability. Vulnerability is dependent upon the capacity of physical, social, economic and political structures to resist harmful events. Some vulnerability indicators include:

- proximity to hazards;
- income level;
- social-economic status; and,
- level of awareness.

See Annex G for an example of a qualitative method of vulnerability analysis.

### 4. Generate risk statements

A risk statement describes the possibility of a hazard (source of risk) affecting an element at risk. Risk statements can be generated in a number of ways. Whatever method is used to generate risk statements, it must:

- be systematic (to ensure a good coverage of hazards and elements at risk); and,
- result in carefully structured information (as very large numbers of risk statement may be generated).

One method is to establish a relationship between hazards and elements at risk using a matrix such as that shown in Table 4 below.

Table 4  
Example of a risk identification matrix <sup>10</sup>

Hazards (Sources of risk)	Elements at risk				
	people	environment	private property	lifelines	etc.
contaminated water supply	✓	✗	✗	✗	
minor flood	✗	✓	✓	✗	
severe flood	✓	✓	✓	✓	
poor industry safety controls	✓	✓	✗	✗	
etc.					

Where possible, each hazard identified should be broken into subsets (eg. 'fire' can be broken into 'bushfire', 'urban fire', etc.) and be listed in the left-hand column of the matrix. The following list of elements of risk could be similarly broken down into component parts (eg. 'people' can be broken down to 'the aged', 'special needs groups' and other perceived vulnerable groups):

- people
- economy;
- lifelines;
- environment; and,
- private property.

Each box in the matrix represents a possible set of risks, ie. a hazard that may affect an element at risk. If a given hazard (source of risk) may affect a given element at risk, the box should be ticked. Where there are no likely affects, the box should be crossed.

Risk statements can then be generated from each box that has a tick.

## 5. Revisit risk evaluation criteria

At this point it may be necessary to revisit the risk evaluation criteria to see if some identified risks do not have evaluation criteria.



### Outputs

The expected outputs of this step are:

- descriptions of hazards, the community and the environment;
- identified risks; and,
- risk statements describing both hazards and elements at risk.



### Documentation

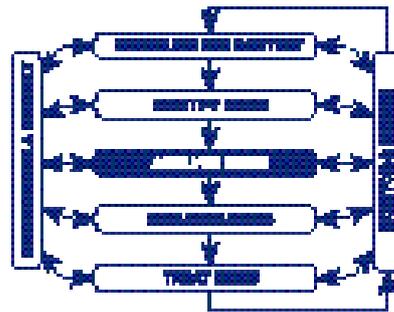
Documentation of this step includes:

- concise, descriptions of hazards, the community and the environment;
- a list of identified risks; and,
- a list of risk statements describing both hazards and elements at risk to be entered into the first column of the risk register (see Annex A).

## Analyse risks

### GENERAL

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 risk treatment options. This analysis uses judgments and assumptions, which may involve uncertainty and be based on incomplete information. The best available information sources and techniques should be used. Wherever possible the confidence placed on estimates of levels of risk should be included.



### DETERMINE LIKELIHOOD AND CONSEQUENCE

The predicted likelihood and expected consequences of risk should be estimated, either qualitatively or quantitatively, based on the description of hazards, and the degree of vulnerability of the community and environment. Causes of risks should also be described to enable the evaluation of the likely merit of risk treatment options. In the context of emergency risk management modelling is a representation of processes associated with the situation being studied. Emergency risk modelling can be used to estimate risk for a given scenario and facilitates the progression from a known situation to a prediction, based on expected behaviour. Modelling can be:

- a. physical - a scaled replica is used for prediction;
- b. virtual - a computer simulation is used for prediction;
- c. mathematical - a mathematical relationship between causes and effects is used; and/or
- d. intuitive - intuitive understanding of the behaviour, based on experience or an understanding of the processes, is used.

Processes such as modelling should be used in risk analysis to accommodate uncertainty and to investigate the impact of various selected assumptions. Outputs will provide valuable information for the determination of effective treatments.



### Purpose

The purpose of analysing risks is to provide information for the evaluation and treatment of risks.



### Rationale

Not all risks are equally serious. This step assigns a risk level to each risk.



### Inputs

The inputs to this step may include:

- a description of hazards and vulnerability of the community and the environment; and,
- risk statements.



### Method

The suggested method for this step determining likelihood and consequence. This method is explained below. The depth of analysis required in this step depends on:

- the time and money available;
- the seriousness of a risk; and
- the complexity of a risk.

### Determine likelihood and consequence

All risks should be analysed and described in the same terms – if risks are described in different terms, it will be very hard to prioritise them later.

**Likelihood** should be determined qualitatively (without using numbers or probabilities). This is because very few risks will have quantifiable likelihood (probability). Any quantitative measures (eg. 1/100 per year or 1%) should be converted to qualitative measures (eg. possible) using Table 9 or another method agreed by the emergency risk management committee.

Likelihood does not only concern the likelihood of an emergency in the present, but includes the likelihood in 10, 50 or 100 years' time. Land use planning strategies, in particular, need a long predictive timeframe, with many land use decisions causing vulnerabilities that may last for 100 or more years.

The emergency risk management committee should consider a variety of likelihoods for each risk. For example, with flood risks a range of probable events should be considered, such 10%, 1% and 0.1% flood events.

The information on vulnerability that was generated in identifying risks should be considered in determining consequences.

Tables 8 and 9 in Annex I can be used to determine the consequence level and likelihood level of given risks. Using Table 10, the level of risk can be determined, be it 'extreme', 'high', 'moderate' or 'low'.

The results should be entered into the risk register.

### SCENARIO ANALYSIS

What is the cause? What is the likely effect?

Risk is rarely simple, and is the result of a variety of situations and conditions, and causes and effects. Scenario analysis can be used to determine cause-effect relationships for complex and extreme risks. Risk scenarios can describe risk in a manner that will help with the generation and selection of risk treatment options.

Scenario analysis is described in Annex G.



### Outputs

The expected outputs of this step are risk statements with assigned consequences, reflecting vulnerability, assigned likelihood, and risk levels.



### Documentation

Documentation of this step includes the addition of assigned consequences, assigned likelihood, and risk levels to the risk register.

## Evaluate risks

### COMPARE RISK AGAINST CRITERIA

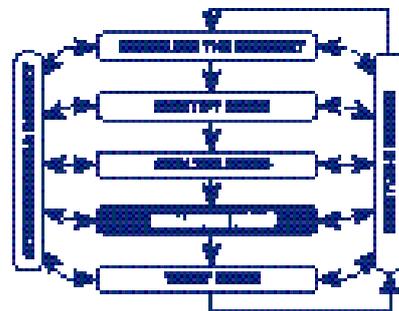
Risk evaluation requires the comparison of levels of risks estimated during the analysis process with previously established risk evaluation criteria.

### SET RISK PRIORITIES

One of the outputs of a risk evaluation is a prioritised list of risks for further action. The prioritisation tools must be logical, documented and based on likelihood and consequence.

### DECIDE ON RISK ACCEPTABILITY

A decision is required as to which risks are acceptable, using a consultative process to determine and use acceptability criteria. Risks that are not accepted should be monitored and periodically reviewed to ensure they remain acceptable.





## Purpose

The purpose of evaluating risks is to make judgements about the relative seriousness of risks.



## Rationale

Given limited resources, it is necessary to determine which risks will be treated.



## Inputs

The inputs to this step include risk statements with assigned consequences, reflecting vulnerability, assigned likelihood, and risk levels.



## Method

The suggested methods for this step are:

1. compare the risk evaluation criteria with risk statements which have been allocated levels of risk;
2. prioritise risks using the risk levels; and,
3. determine which risks are acceptable.

These methods are explained below.

### 1. Compare the risk evaluation criteria with the levels of risk

The risks should be compared to the risk evaluation criteria developed in establishing the context.

### 2. Prioritise risks using the risk levels

The risk levels, ie. 'extreme', 'high', 'moderate' and 'low' will have been assigned in the previous step. These can be used to prioritise the risks. It may also be necessary to prioritise within the risk levels, ie. determining which of the 'high' risks is the most serious.

### 3. Determine which risks are acceptable

The following table can be used to determine which risks are acceptable.

Table 5  
Level of risk & possible courses of action

Level of risk	Possible courses of action
extreme risk	<ul style="list-style-type: none"> <li>• immediate action required</li> <li>• executive attention required</li> <li>• further research recommended on scenario analysis or vulnerability analysis</li> </ul>
high risk	<ul style="list-style-type: none"> <li>• action required</li> <li>• senior management attention required</li> <li>• further research may be required on scenario analysis or vulnerability analysis</li> </ul>
moderate risk	<ul style="list-style-type: none"> <li>• some action may be required</li> <li>• management responsibility must be specified</li> </ul>
low risk	<ul style="list-style-type: none"> <li>• action may not be required</li> <li>• managed by routine procedures</li> </ul>

Those risks that are considered acceptable should be documented, but not subjected to further analysis or risk treatment. These decisions should be communicated to the community. They should, however, be monitored and reviewed as conditions alter over time. Risks should be kept as low as reasonably possible. Those risks that may be reduced easily or quickly with little cost, even if they are low or moderate, should be reduced.



## Outputs

The expected outputs of this step are risk statements with assigned consequences, reflecting vulnerability, assigned likelihood, risk levels and risk priorities.



## Documentation

Documentation of this step includes addition of risk priorities to the risk register.

# Treat risks

## GENERAL

The objective of these processes is to reduce the risks by modifying the characteristics of hazards, the community and the environment. Risk reduction may affect vulnerability, likelihood or consequence.

## IDENTIFY TREATMENT OPTIONS

In identifying options, factors such as legal, social, political and economic considerations need to be taken into account.

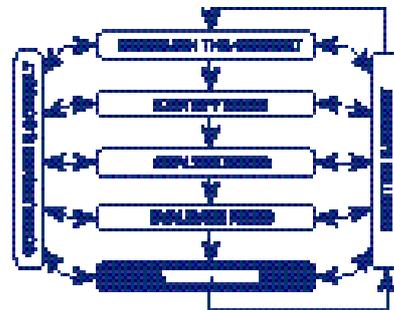
Immediate actions and longer-term strategies should be considered.

**Evaluate options** requires an assessment of each option to determine its potential effects. The adverse impact of risks should be made as low as reasonably practicable. The impact of each option on risks should be considered together with legal, social, political, economic and other implications. Care should be taken to ensure that risks to others are not inadvertently increased.

**Select options** involves the selection of the preferred risk treatment options based on the evaluation of the identified options. Selection should be based on rational and agreed criteria.

**Plan and implement risk treatment** involves the preparation of plans and strategies that document how the selected risk treatments will be implemented. Implementation of the risk treatment requires an effective management system which specifies the methods chosen, assigns responsibilities and individual accountabilities for actions, and monitors them against agreed criteria.

If after risk treatment there is a residual risk, a decision shall be taken as to whether to retain this risk or repeat the risk treatment process.



## Purpose

The purpose of treating risks is to reduce the likelihood of harm to the community and environment through selecting and implementing risk treatment options.



## Rationale

There are a large number of possible risk treatment options. To implement all of them is not cost-effective or even possible. It is necessary to choose and implement the most appropriate mix of risk treatment options.



## Inputs

The inputs to this step may include:

- the description of context;
- the description of hazards and vulnerability of the community and environment;
- and,

- risk statements with assigned consequences, assigned likelihood, risk levels and risk priorities.



## Method

The suggested methods for this step are:

1. generate risk treatment options;
2. consider the assessment criteria for risk treatment options;
3. assess and select most appropriate mix of risk treatment options; and
4. prepare and implement risk treatment schedule and plan.

These methods are explained below.

### 1. Generate risk treatment options

There are a number of ways of **thinking about** risk treatment options. These include:

- prevention, preparedness, response and recovery (PPRR);
- hierarchy of control; and,
- standard risk management treatment options.

**Prevention, preparedness, response and recovery (PPRR)** are described in the definitions. PPRR are overlapping aspects of emergency management, not phases. Much of the potential success of emergency risk management can be achieved through prevention and preparedness.

The '**hierarchy of control**', a variety of control measures, describes ways of managing occupational health and safety risk. These measures can be used to trigger innovative risk treatment options for enhancing community safety. They consist of<sup>1</sup>:

- elimination – eliminating the hazard, ie. removing the cause of harm;
- substitution – substituting the hazard for another process or substance that causes less harm;
- engineering controls – using structural measures to reduce the exposure of the elements of risk to hazards;
- administrative (procedural) controls – instituting a series of administrative procedures to reduce exposure to a hazard;
- personal protective equipment – using equipment to protect people from harm;
- emergency procedures – developing procedures for use during an emergency.

**Standard risk management treatment options** are<sup>12</sup>:

- avoid the risk – decide not to proceed with the activity likely to generate risk;
- reduce likelihood of occurrence – by modifying the hazard;
- reduce consequence of occurrence – by modifying susceptibility and/or increasing resilience;
- transfer the risk – cause another party to bear or share the risk; and,
- retain the risk – accept the risk and plan to manage its consequence.

Other ways of thinking about risk treatment options are to be encouraged. The risk management committee should be flexible in thinking about risk treatment options, and consult broadly with the community to discover innovative and useful options. These options should then be listed for evaluation.

### 2. Consider the assessment criteria for risk treatment options

A number of assessment criteria for risk treatment options are suggested in Table 6 below. In considering the assessment criteria it may be necessary to refer to State/Territory policy and it will be necessary to consider community expectations. Then decisions should be made as to which criteria are to be used, and they should be modified to suit the context of the given emergency risk management project.

**Table 6**  
Some criteria for assessing risk treatment options <sup>13</sup>

Criteria	Questions
Equity	Do those responsible for creating the risk pay for its reduction? Where there is no man-made cause, is the cost fairly distributed?
Timing	Will the beneficial effects of this option be quickly realised?
Leverage	Will the application of this option lead to further risk-reducing actions by others?
Cost	Is this option the most cost-effective or could the same results be achieved more cheaply by other means?
Administrative efficiency	Can this option be easily administered or will its application be neglected because of difficulty of administration or lack of expertise?
Continuity of effects	Will the effects of the application of this option be continuous or merely short term?
Compatibility	How compatible is this option with others that may be adopted?
Jurisdictional authority	Does this level of Government have the legislated authority to apply this option? If not, can higher levels be encouraged to do so?
Effects on the economy	What will be the economic impacts of this option?
Effects on the environment	What will be the environmental impacts of this option?
Risk creation	Will this option itself introduce <i>new</i> risks?
Risk reduction potential	What proportion of the losses due to this risk will this option prevent?
Political acceptability	Is this option likely to be endorsed by the relevant governments?
Public and pressure group reaction	Are there likely to be adverse reactions to implementation of this option?
Individual freedom	Does this option deny basic rights?

### 3. Assess & select most appropriate mix of risk treatment options

Using the assessment criteria chosen by the risk management committee, and the risk evaluation criteria, each risk treatment option should be assessed. Those options that are rated as the most appropriate in the light of these criteria should be selected. A possible way of rating risk treatment options is to assign each option to one of three categories<sup>14</sup>:

- must do;
- should do; and,
- could do.

Recommendations on risk treatments should be made to the appropriate authority for implementation. The local political processes will probably be involved in major cost/impact decisions.

## 4. Prepare and implement risk treatment schedule and plan

“Plans should document how the chosen options shall 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 (see Annex A for a template risk treatment schedule and plan). The plan should also include a mechanism for assessing the implementation of the options against performance criteria, individual responsibilities and other objectives, and to monitor critical implementation milestones. ... 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 monitors them against specified criteria. If after treatment there is a residual risk, a decision shall be taken as to whether to retain this risk or repeat the risk treatment process.”<sup>15</sup>



### Outputs

The expected outputs of this step are plans for treating risks.



### Documentation

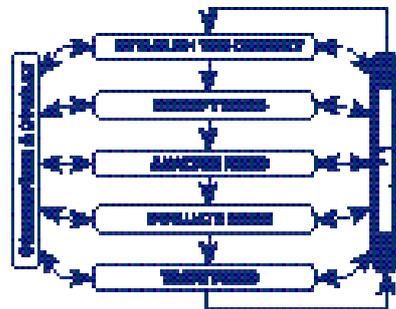
Documentation of this step includes:

- a risk treatment schedule and plan; and,
- risk action plans

## Monitor & review

Few risks remain static. It is necessary to monitor risk, the effectiveness of risk treatment plans and strategies, and the management system that is set up to control implementation. Risks and the effectiveness of the risk treatments need to be monitored to ensure changing circumstances do not alter risk priorities.

Ongoing review is essential to ensure that the management system remains relevant. Factors that may affect the likelihood and consequences of an outcome may change, as may the factors that affect the suitability or cost of the various risk treatment options. It is therefore necessary to repeat regularly the risk management cycle. Review is an integral part of the risk management system.



### Purpose

The purpose of monitoring and reviewing the emergency risk management process is to ensure the process remains relevant and on track.



### Rationale

Context and risks may change over time, so it is necessary to review the emergency risk management process based on monitoring:

- changes to context, hazards, the community and the environment;
- the emergency risk management project; and,
- events arising from risks.



### Inputs

The inputs to this step include:

- the project management plan;

- the description of context, hazards, the community and the environment;
- progress of the emergency risk management project; and,
- reports and event debriefs.



## Method

The suggested methods for this step are:

1. project management methods;
2. emergency risk management project review; and,
3. evaluating reports and events.

These methods are explained below.

### 1. Project management methods

The means of monitoring and evaluating during the implementation phase of a project include:

- measuring the progress toward project objectives;
- analysis to determine the cause of deviations in the project; and,
- determining corrective actions.

### 2. Emergency risk management project review

The emergency risk management project itself should be subject to review, at least in respect to changes in context and risks, eg:

- **context** - political change, organisational responsibility, legislative requirements, economic circumstances, community objectives and expectations, and perceptions of risk; and,
- **risk** - hazards, community, environment, and changes due to the effectiveness or otherwise of risk treatment strategies.

The emergency risk management process should also be repeated in total on a regular basis, eg. once every two or three years.

#### ENVIRONMENTAL SCANNING

What's happening? Environmental scanning is the observation of changes in circumstances or context. This can be achieved by:

- monitoring the news and other media;
- establishing and maintaining a network of peers and sharing information; and,
- periodically reviewing assumptions and information about context.

### 3. Evaluating reports & events

Any emergency events in the community, or in comparable communities, should be evaluated to determine whether the results of the emergency risk management process were adequate.

**Vulnerability** – Are the earlier judgements on vulnerability supported by new information?

**Consequence** – Were the consequences of the event as predicted by the risk analysis?

**Likelihood** – Were the estimates of likelihood accurate?

**Treatment options** – Were the treatment options instrumental in reducing either vulnerability or consequences? Are other treatment options now obvious in the light of the event?

The results of this evaluation may lead to alterations in risk analysis, evaluation, or treatment plans.



## Outputs

The expected outputs of this step include recommendations for improving the emergency risk management process.



## Documentation

Documentation of this step includes:

- recommendations for improvements to the emergency risk management process;
- regular reports on the application of the process; and
- recommended changes to the process itself.

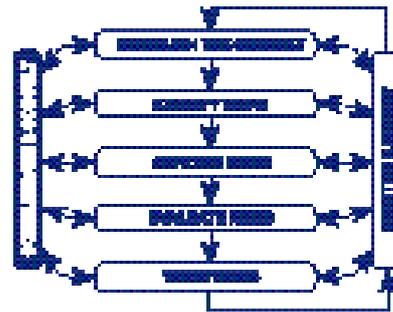
## Communicate & consult

Communication and consultation are an important consideration at each step of the emergency risk management process. It is important to develop a communication plan for stakeholders at the earliest stage of the process. This plan should address issues relating to both the risk itself and the process to manage it.

Communication and consultation involve a two-way dialogue between stakeholders with efforts focused on consultation rather than a one-way flow of information from the decision-maker to other stakeholders.

Effective communication is important to ensure that those responsible for implementing risk management and those with a vested interest understand the basis on which certain decisions are made and why particular actions are required.

Perceptions of risk can vary due to difference in assumptions and conceptions and the needs, issues and concerns of stakeholders as they relate to the risk or the issues under discussion. Stakeholders are likely to make judgments of the acceptability of a risk based on their perception of risk. Since stakeholders can have a significant impact on the decisions made, it is important that their perceptions of risk, as well as their perceptions of benefits, be identified and documented and the underlying reasons for them understood and addressed.



“The process of communication should consider the following aspects:

- identification of major issues and focus groups;
- the ways in which information will be communicated to the community;
- the strategies that may be used to determine the concerns of the community regarding hazards within the community;
- the type of information that will be distributed;
- information materials should be presented in a simple, non-technical, clear and unambiguous form;
- it may be necessary to prepare messages in different ways for different groups of people;
- uncertainty of information, modelling techniques and risk assessment should be clearly communicated;
- it should also be acknowledged that freedom of information (FOI) enables citizen’s rights for access to information;
- communication should enable and encourage individuals and groups to search for more information (powerful communication systems such as the Internet could increase public desire for more information); and,
- the role of the media in risk communication should be carefully examined and efforts made to ensure that messages are clear and unambiguous.”<sup>16</sup>

A process for forging government-community partnerships is the CONSULTT process.<sup>1</sup> “The CONSULTT process involves:

**C**LARIFYING the existing situation: by interviewing key players, distributing a simple survey, reviewing Australian and overseas literature, and using this information to prepare a discussion paper for circulation

**O**PENING up the issues to all comers: by circulating the discussion paper, attending community meetings (going where the clients are), holding workshops for special interests and presenting all ideas to a public forum

**N**EGOTIATING agreement: on directions with the community stakeholders, before any commitments are made (credibility vanishes if people believe they are only a rubber stamp)

**S**YNTHESISING contributions: into a common strategy to achieve the negotiated agreement

**U**NDERTAKING a test of the strategy in practice, either as a feasibility study, or a trial run of the real thing, before the process is cast in stone and citizens can no longer readily influence the process

**L**EARNING from the practical application and reporting back to the community and those whose task it will be to implement the strategy

**T**RENCHING the management solution in community and council structures and then

**T**AKING IT AROUND AGAIN repeating the whole process at stated intervals, so that the system remains responsive and flexible.”

## Annex A Documentation

“Each stage of the [emergency] risk management process should be documented. Documentation should include assumptions, methods, data sources and results.

The reasons for documentation are as follows:

- to demonstrate the process is conducted properly;
- to provide evidence of a systematic approach to risk identification and analysis;
- to provide a record of risks and to develop the organisation’s knowledge database;
- to provide the relevant decision makers with a risk management plan for approval; and subsequent implementation;
- to provide an accountability mechanism and tool;
- to facilitate continuing monitoring and reviewing;
- to provide an audit trail; and
- to share and communicate information.”<sup>18</sup>

A simple **document control system** is recommended in which:

- all documents are identified by name, version and date;
- all documents are periodically reviewed as part of monitoring and reviewing;
- all obsolete material is labelled, dated, catalogued and archived; and,
- off-site back up is considered.

The **content of a risk management report** could be as follows.

1. Executive summary
2. Summary of project management plan
3. Context
  - 3.1 Relevant policies
  - 3.2 Context
  - 3.3 Risk evaluation criteria
4. Risks
  - 4.1 Hazards description
  - 4.2 Community description
  - 4.3 Environment description
  - 4.4 Identified risks
5. Risk analysis and evaluation
  - 5.1 Summary of analysis
  - 5.2 Summary of evaluation
6. Risk treatment
  - 6.1 Risk treatment options
  - 6.2 Assessment criteria for risk treatment options
  - 6.3 Summary of risk treatment planning

Appendix 1 – Project management plan

Appendix 2 – Communication plan

Appendix 3 – Monitoring and review

Appendix 4 – Hazard, community and environment maps

Appendix 5 – Risk register

Appendix 6 – Risk treatment schedule and plan

Appendix 7 – Risk action plans

Examples<sup>19</sup> follow of a:

- risk register;
- risk treatment schedule and plan; and,
- risk action plan.

**Table x**

**Example of a risk register**

Date of risk review: \_\_\_\_\_ Compiled by: \_\_\_\_\_ Date: \_\_\_\_\_

Risks	Consequence	Likelihood	Risk level	Risk priority

**Example of a risk treatment schedule and plan**

Date of risk review: \_\_\_\_\_ Compiled by: \_\_\_\_\_ Date: \_\_\_\_\_

Risks in priority order      Risk level      Risk treatments      Responsibility for implementation      Timetable      Monitoring

## Annex B Project Management

Using simple project management tools and ideas, the professionalism and quality of emergency risk management can be greatly enhanced. Project management methods are recommended to ensure that the emergency risk management project is:

- appropriate (it sets out to do something worthwhile);
- effective (it achieves the required results); and,
- efficient (it is completed within time and resource constraints).

Any project has a purpose, a series of **inputs** and **methods** that produce **outputs** that result in **outcomes**.

Figure 2

Parts of a project



- The **purpose** is a statement of what the project expects to achieve, ie. the expected outcomes.
- The **inputs** include: people's time and energy; people's perceptions of hazard, vulnerability and risk; money and resources; and, commitment and perseverance.
- The **methods**, in this instance, are the methods of emergency risk management.
- The **outputs** include: information on hazards and vulnerability; organisations that are aware of their responsibilities in emergency risk management; commitment to an emergency risk treatment strategies; and, implemented risk management strategies.
- The **outcomes** of appropriate and effective emergency risk management are improved protection of life, property and the environment, enhanced community safety and the ability to sustain development.

There are three possible parts to a project management plan<sup>20</sup>:

- project definition;
- project planning; and,
- and, project implementation.

**Project definition** concerns the aim and objectives of a project, as well as its scope and authority. The project definition provides a brief outline of the intentions of the project to others, and provides a description of the project if funding is being sought. A project manager should be appointed to manage the project.

**Project planning** is the process of sequencing tasks to achieve the project objectives and to ensure timely project completion and efficient use of resources. It involves:

- determining tasks;
- assigning responsibilities;
- developing a timetable; and,
- determining resource allocation and timing.

**Project implementation** consists of project performance, monitoring and review, and taking corrective action.

The development of concise **project management plan** is recommended. The content of a project management plan could be as follows:

1. Project definition
  - 1.1 Background
  - 1.2 Purpose of project
  - 1.3 Objectives
  - 1.4 Scope
  - 1.5 Authority
  - 1.6 Emergency risk management committee
  - 1.7 Project manager
2. Project plan
  - 2.1 Method
  - 2.2 Tasks and responsibilities
  - 2.3 Timetable
  - 2.4 Resources and responsibilities
3. Project implementation
  - 3.1 Communication and consultation plan
  - 3.2 Monitoring and review
  - 3.3 Marketing plan
  - 3.4 Training plan
  - 3.5 Documentation
  - 3.6 Information management

## Annex C Information Management

The emergency risk management process can generate a great deal of information. This information may be inputs to the process, decisions taken, or outputs. As with documentation, and the emergency risk management process itself, this information should be carefully managed. If there is too much or disorganised information, the process can be easily swamped.

A method for managing information could involve the following steps:

1. determine what types of information may be required;
2. identify and document sources of information;
3. sample possible sources of information, assess their value and select the preferred;
4. collect information from selected sources;
5. collect information on decisions and outputs of the emergency risk management process; and,
6. categorise and store information in an easily accessible form.

Each of these steps is explained below.

**1. Determine what types of information may be required** - The types of information required for emergency risk management may concern:

- community aspirations, expectations, interests and circumstances;
- legislation and policy; and,
- hazards, the community and the environment.

**2. Identify and document sources, forms and content of information** - Information forms may include: verbal; paper; electronic; video; and, audio. Information content may include: data; anecdote; history; opinion; theory; event reports; and, plans for the future. Sources, form and content of information should be documented.

**3. Sample possible sources of information, assess their value and select the preferred** - Not all available information can, or should, be collected. Each information sources should be sampled and assessed in terms of: relevance; completeness; succinctness; credibility; accuracy; and,

currency. Failure of sources of information in one or more of the above criteria should be documented, and these sources should be noted for possible future reference. Preferred sources should then be accessed.

**4. Collect information from selected sources** - Information collection should be planned to ensure that all sources of information are fully utilised, all forms are accessed, and all relevant content is retained.

**5. Collect information on decisions and outputs** - Each output and decision, even those that are draft or preliminary, should be collected.

**6. Categorise and store information in an easily accessible form** - Whilst information is being collected, it is necessary to:

- develop and use a simple method for categorising information;
- create and maintain an information register;
- store information in a safe area; and,
- backup crucial information off-site.

At any point in the management of information, even years after it is first collected and used, the information may be called upon. Thus it should remain easily accessible. At all times commercial and personal confidentiality should be maintained.

## Annex D Managing the emergency risk management committee

Emergency risk management requires the formation and management of a committee or consultative group. A committee is essential to emergency risk management for the following reasons.

- Committee members who represent the community can facilitate communication with a broad cross-section of stakeholders.
- Rapid access is required to diverse information. It is possible to gather this information through correspondence, interviews, and telephone calls, but this method will take time. Assembling the people who can provide information will make information gathering more efficient.
- No single person is expert in everything and so the input of subject experts is required. If local subject experts are ignored they may become the greatest critics of your emergency risk management project.
- If emergency risk management is to be taken seriously, then the commitment of all the relevant players is required. An effective means of gaining this commitment is through encouraging people to participate in emergency risk management, and working together to produce the end result.

Some aspects of managing the emergency risk management committee are:

- determine who should be on committee;
- training of committee members;
- use standard group processes, eg. Delphi technique, encourage open discussion by allowing all to speak, and not allowing stronger individuals to dominate, develop a knowledge of group processes, and determine what forms of decision-making processes will be used;
- manage meetings professionally (consider timing, venue, frequency, calling meetings, degree of notice, selecting a chair, agenda, taking minutes, sending out minutes, reporting, and length of meetings); and,
- the need to have tangible results from each meeting in order to demonstrate the value of emergency risk management.

The committee is like a jury in that it:

- is using a large amount of incomplete information;
- must reconcile conflicting technical information;
- must work for the good of the community in an environment of high uncertainty; and,
- must reconcile conflicting ethics and standards within the committee.

## Annex E Marketing emergency risk management

Marketing is about selling a product, and the standard 'four P's' of marketing:

- product;
- price;
- place; and,
- promotion;

can be applied to emergency risk management.

The **product** (emergency risk management and its potential outcomes) can be adapted to suit different client groups, and simplified considerably. Extensive trialing and consultation with many individuals and organisations across Australia has ensured the quality of the product. The basis for emergency risk management, AS/NZS 4360:1999 *Risk management*, is becoming internationally recognised as an essential tool for business and government.

The **price** of the product has two aspects. The high cost to the community if major risks are not identified and addressed, and the low cost of applying emergency risk management. There is also the high cost of resources being inappropriately applied in risk reduction, such as the construction of levees for flood retention, when land use planning and emergency preparedness may be more cost-effective.

The **place** refers to the distribution of a product in a way which best suits the clients' needs. Emergency risk management should be targeted at the most appropriate range of levels within a community. For example, the application of emergency risk management at State, regional/district, and local government levels may not be the only or preferred placements. Other options, such as catchment areas, townships, decentralised rural areas, or communities of interest, could be considered.

**Promotion** concerns the ways that a product can be exposed to the community. A mix of promotional activities is recommended, and this mix should suit the target audiences and could include:

- presentations at public forums, eg. councils, clubs, community service organisations, schools, etc.;
- advertising through the print or electronic media, posters, or leaflet drops; and,
- public displays.

One or more credible community figures could be enlisted to help sell emergency risk management. Parts of the promotion should emphasise:

- previous community experience in emergencies;
- what individuals and the community can gain from emergency risk management, as well as the consequences of not addressing risk;
- case studies of how it has worked in other communities;
- the comparatively low cost of applying emergency risk management; and,
- the opportunity for communities to take control of their own destiny.

Reactions to marketing strategies should be monitored to enable improvements to the strategies.

## Annex F List of generic hazards

The following list of generic hazards may be useful in identifying hazards in a given community.

Table 7  
List of generic hazards <sup>21</sup>

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• aeronautical and space debris	• heatwave
• blizzard/snow storm	• industrial accident
• bomb threat	• infrastructure failure (power, water, communication, gas)
• bridge collapse	• landslide/rock fall/mudflow
• building collapse	• mine accident
• carcinogens/mutagens/ pathogens	• nuclear hazards
• civil disturbance/riot	• ozone depletion
• cyclone	• plague (animal, human, insect, plant)
• dam failure	• pollution (chemical, oil, hazardous waste)
• desertification	• resource shortage/depletion
• drought	• salination
• drugs	• sea level rise
• earthquake	• severe storm (electrical, extreme wind, torrential rain, hail storm)
• economic recession/ depression	• storm surge
• electromagnetic radiation	• subsidence
• epidemic (human, animal, plant)	• terrorism
• erosion (soil, coastal)	• tornado
• famine	• transport accident (air, rail, road, sea)
• fire (residential, industrial, bush, grass)	• tsunamis
• flood	• volcano
• fog	• warfare (nuclear, conventional, chemical, biological)
• frost/extreme cold	
• hazardous materials	

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## Annex G Example of a qualitative method of vulnerability analysis<sup>22</sup>

Vulnerability factors	Indicators	
	Less vulnerable	More vulnerable
<b>Factors operating at household level</b>		
Location of residence	Residence outside hazard-prone area	Residence inside hazard-prone area
Physical suitability of residence	Residence provides protection from hazard	Residence does not provide protection from hazard
Age	Aged over 5 or under 65	Aged under 5 or over 65
Disability/health	Healthy people	Disabled people
Income level	Households with an income over \$25,000	Households with an income under \$25,000
Membership of social network	Member of strong social network	Member of weak social network
Access to emergency services	Good access	Poor access
Capability to undertake appropriate protective behaviour	Adequate knowledge and skills in appropriate protective behaviour	Inadequate knowledge and skills in appropriate protective behaviour
Ability to improvise	Individuals help themselves using whatever is available	Individuals are forced to wait for assistance
<b>Factors operating at community level</b>		
Average age of population	Younger community	Older community
Special needs/health	Health community	Frail, infirm, dependent on medical support/systems
Ethnicity	Groups with sufficient knowledge of English, medium or higher income, socially cohesive, members of supporting groups	Groups with no or insufficient English, low income, socially not cohesive, non-members of supporting groups
Employment	Little unemployment	Substantial unemployment
Critical facilities (medical and emergency services)	Robust, resilient	Frail, not resilient
Engineering lifelines (transport, power, water, sewerage, telecommunications)	Robust, protected, contingent	Frail, exposed, not contingent
Local economic production and employment opportunities	Robust, protected, contingent	Frail, exposed, not contingent
Response and recovery capability	Test and adequate	Untested or inadequate
Social structure	Strong and robust	Fragile
Community planning process including mitigation measures	Community participates in planning process, effective mitigation strategies	Community not involved in planning process, no or ineffective mitigation strategies
External government financial support and policies	In place and effective	Not in place or not effective
Items of environmental and cultural significance	Robust, protected, contingent	Frail, exposed, not contingent
Government planning processes including mitigation policies and programs	In place and effective	Not in place or not effective

## Annex H Scenario analysis

A risk scenario can be constructed by combining a fault tree and an event tree. A fault tree combines a number of possible conditions and cause-effect relationships that contribute to an event. An event tree considers the various effects that an event may cause. In occupational health and safety this is called the 'sequence of events'<sup>23</sup>. It has also been called 'cascading crises' and is similar to a 'domino effect' or 'knock-on effect'.

Each condition, cause and effect is a potential point for intervention using a risk treatment strategy. Thus developing risk scenarios can assist in generating either proactive or reactive strategies.

Consider a housing development along the crest of a ridge with bush growing on both sides of the ridge. The obvious risk, in the Australian context, could be a risk of death or property damage due to bushfire. The components of this risk scenario are:

- bush downhill from people and property;
- possibly limited access routes;
- inappropriate development in relation to the bushfire risk;
- possible lack of preparedness of householders;
- possible remoteness from emergency services;
- risks associated with unplanned or spontaneous evacuation;
- possibility that emergency services may be overwhelmed;
- risks to responding emergency services;
- etc.

Each component of this risk can be, or could have been, addressed.

Another example that illustrates how a disaster can arise from a failure to develop risk scenarios, address the individual components of the risk, and develop and implement risk treatment options is the Piper Alpha oil and gas platform fire. In the case of the Piper Alpha fire, failures in risk treatment occurred with:

- design that did not consider all risks (poor risk analysis);
- ignoring the negative results of a risk audit;
- failure of the 'permit to work' system;
- lack of briefing of incoming duty manager by outgoing duty manager;
- lack of training in fire and evacuation procedures;
- poor emergency process shut-down procedures; and,
- poor inter-platform communication protocols.

If any or all of these risk treatment options had been properly implemented, the disaster would either not have occurred or would have been of a much reduced scale.

## Annex I Qualitative risk analysis

Table 8

### Qualitative measures of consequence <sup>24</sup>

Descriptor	Description
insignificant	No injuries or fatalities. Small number or nil people are displaced and only for short duration. Little or no personal support required (support not monetary or material). Inconsequential or no damage. Little or no disruption to community. No measurable impact on environment. Little or no financial loss.
minor	Small number of injuries but no fatalities. First aid treatment required. Some displacement of people (less than 24 hours). Some personal support required. Some damage. Some disruption (less than 24 hours). Small impact on environment with no lasting effects. Some financial loss.
moderate	Medical treatment required but no fatalities. Some hospitalisation. Localised displacement of people who return within 24 hours. Personal support satisfied through local arrangements. Localised damage that is rectified by routine arrangements. Normal community functioning with some inconvenience. Some impact on environment with no long-term effect or small impact on environment with long-term-effect. Significant financial loss
major	Extensive injuries, significant hospitalisation, large number displaced (more than 24 hours duration). Fatalities. External resources required for personal support. Significant damage that requires external resources. Community only partially functioning, some services unavailable. Some impact on environment with long-term effects. Significant financial loss - some financial assistance required.
catastrophic	Large number of severe injuries. Extended and large numbers requiring hospitalisation. General and widespread displacement for extend duration. Significant fatalities. Extensive personal support. Extensive damage. Community unable to function without significant support. Significant impact on environment and/or permanent damage.

Table 9

### Qualitative measures of likelihood <sup>25</sup>

Descriptor	Description
almost certain	is expected to occur in most circumstances; and/or high level of recorded incidents and/or strong anecdotal evidence; and/or a strong likelihood the event will recur; and/or great opportunity, reason, or means to occur; may occur once every year or more
likely	will probably occur in most circumstances; and/or regular recorded incidents and strong anecdotal evidence; and/or considerable opportunity, reason or means to occur; may occur once every five years
possible	might occur at some time; and/or few, infrequent, random recorded incidents or little anecdotal evidence; and/or very few incidents in associated or comparable organisations, facilities or communities; and/or some opportunity, reason or means to occur; may occur once every twenty years;
unlikely	is not expected to occur; and/or no recorded incidents or anecdotal evidence; and/or no recent incidents in associated organisations, facilities or communities; and/or little opportunity, reason or means to occur; may occur once every one hundred years
rare	may occur only in exceptional circumstances; may occur once every five hundred or more years

Table 10  
Qualitative risk analysis matrix - level of risk

Likelihood	Consequences				
	Insignificant	Minor	Moderate	Major	Catastrophic
almost certain	high	high	extreme	extreme	extreme
likely	moderate	high	high	extreme	extreme
possible	low	moderate	high	extreme	extreme
unlikely	low	low	moderate	high	extreme
rare	low	low	moderate	high	high

## Annex J References

- <sup>1</sup> Standards Australia (1999) AS/NZS 4360:1999 *Risk management*
- <sup>2</sup> *ibid.*
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- <sup>4</sup> *ibid.*
- <sup>5</sup> *ibid.*
- <sup>8</sup> Kepner-Tregoe, Inc. (1987) *Project Management*
- <sup>9</sup> Koob, P.C. (1996) *The context of emergency management*, The Australian Journal of Emergency Management, Winter 1996, 11:2 pp.1-4, Mt Macedon, Victoria
- \* A 'risk statement' describes how a hazard (source of risk) may affect an element at risk.
- <sup>10</sup> Standards Australia (1999) AS/NZS 4360:1999 *Risk management*
- <sup>11</sup> Standards Australia (1997) AS/NZS 4804:1997 *Occupational health and safety management systems—General guidelines on principles, systems and supporting techniques*, Homebush, Australia
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- <sup>14</sup> Cawood, M.W. & Jones, R.T. (1998) *Flood risk study for Murweh Shire – Final Report* Geo-Eng Australia Pty Ltd
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- <sup>25</sup> Victoria State Emergency Service (1998) *Community Emergency Risk Management: Facilitator's Resource Kit*, Melbourne