

**PART TWO  
SPECIFICATION**

**NATIONAL EMERGENCY RISK ASSESSMENT GUIDELINES FOR RAPID ONSET NATURAL  
HAZARDS**

**TENDER NO.:** [NERA/CB/07]

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**1. INTRODUCTION**

Over the past three decades, state and local governments within Australia, supported by Australian Government funding under the now-titled Natural Disaster Relief and Recovery Arrangements (NDRRA), have spent millions of dollars responding to, and assisting recovery from natural disasters. Over the same period, only a comparatively small amount of Australian Government directed funding has been dedicated to implementing strategies to prevent/mitigate and/or prepare for such emergencies. Studies at both national and state level have now confirmed that the implementation of prevention/mitigation strategies will assist in reducing the cost of such emergencies and their impact on the community.

In most states and territories the emergency risk management (ERM) process based on community perceptions of risk has been used at municipal and local levels to produce risk management studies. Studies of this type are good starting points but many fail to have the technical input and data necessary to adequately articulate the appropriateness of identified risk treatment strategies. Additional problems with this approach arise from a lack of organisational capacity and/or will to invest in the treatment/mitigation of *community perceptions* of risks (especially in a fiscally constrained environment). In addition, risks at state/territory and regional levels may have been overlooked or not considered.

The development of National Emergency Risk Assessment Guidelines is an element of the National Risk Assessment Advisory Group's (NRAAG) progression of Reform Commitment One (RC1) from the Council of Australian Governments' (COAG) report on natural disaster mitigation, relief and recovery in Australia:

*RC1 - 'develop and implement a five- year national program of systematic and rigorous disaster risk assessments'.*

Behind this recommendation lies an intent to be able to compare risks as they exist in different places, so as to inform the allocation of resources to risk reduction in ways reflective of risk differentials.

The development of nationally agreed guidelines is a key step in the Implementation Plan for the National Risk Assessment Framework that has been developed to meet the outcomes sought by RC1.

## 2. SCOPE

This Request for Tender seeks proposals to develop nationally accepted and agreed natural hazard risk assessment guidelines for use at the local, regional and state/territory and national levels. The guidelines will need to be based on AS/NZS 4360:2004 *Risk Management* and it is envisaged that the guidelines will eventually be published as a companion guide to the Standard.

The Guidelines will provide a risk assessment model that is consistent with AS/NZS 4360 that:

- Can be used both for quantitative and qualitative risk assessment;
- Can be used by consultants, agencies, multi-agency groups - ie with varying levels of technical ability and available time;
- Can provide useable results both with and without detailed information inputs;
- Can provide outputs that are comparable, and in principle able to be aggregated up to national level;
- enable focus on risks in small (eg municipal) or large (regional and/or state and/or nation) areas;
- Is useable for both risk 'from' and risk 'to' (eg risk **from** bushfire, risk **to** infrastructure from all/specific hazards);
- Provides outputs that, in addition to rating risk, suggest means to reduce risk.

The guidelines will be structured so as to:

- indicate the sequence of steps in the relevant area of the risk assessment process;
- provide assistance for users to customise the risk assessment methodology to reflect national state/territory, regional or local contexts;
- provide a methodology with detailed guidance on standards for the reporting and recording of data and outcomes including but not limited to format, scale and units for reporting, spatial and temporal dimensions;
- enable users to produce outcomes-based information on risk that is consistent with that of other users at all scales of application and deliver it to others as required;
- suggest methodology for inclusion of secondary or more detailed analysis for high priority focus.

Extensive research and stakeholder consultation will be required in order to develop effective, robust guidelines. The project will include an evaluation from states/territories following the completion of draft guidelines to ensure that the final product is comprehensive, functional and suits their needs.

## 3. BACKGROUND

Risk is a measure that describes the probability that an event will occur and will have particular consequences. Risk may be applied to a variety of complex situations and with regards to emergency management, risk can be defined as the probability that a natural disaster or hazardous event will occur with the potential to adversely affect the community or environment. Consequently, there are several implications regarding risk such as the existence of a hazard, the hazard becoming an event and that the event will become dangerous and transform into a disaster.

Risk characterises the probabilities of a variety of situations and therefore it is essential to put risk into context for each circumstance that arises, both qualitatively and quantitatively. Tables 1 and 2 provide examples of qualitative and quantitative definitions of risk used in various contexts.

Risk is multi-dimensional and the practitioner needs to consider a number of probabilities related to hazard and impact, the vulnerability and exposure of elements at risk (e.g. community, infrastructure). Risk decreases with management and mitigation systems however, residual risk is still a factor once management and mitigation systems are implemented. Residual risk is defined as the risk remaining after implementation of risk treatments.

**Table 1** – Selected qualitative definitions of risk

Source	Definition of Risk
American Society of Healthcare Engineering (ASHE)	Potential Impact that any given hazard may have on the organisation
Department for International Development (DFID)	Factor that could adversely affect the outcome of an activity or intervention
Emergency Management Australia (EMA)	A concept used to describe the likelihood of harmful consequences arising from the interaction of hazards, communities, and the environment
Federal Emergency Management Agency (FEMA)	The probability that an event will occur and the consequences of its occurrence
National Research Council (NRC)	Concept used to give meaning to things, forces, or circumstances that pose danger to people or to what they value
Society for Risk Analysis	The potential for realisation of unwanted, adverse consequences to human life, health, property, or the environment
United Nations Department of Humanitarian Affairs (UN-DHA)	Expected losses (of lives, persons injured, property damaged and economic activity disrupted) due to a particular hazard for a given area and reference period
United Nations/International Strategy for Disaster Reduction (UN/ISDR)	Probability of harmful consequences or expected losses resulting from interactions between natural or human induced hazards and vulnerable/capable populations

**Table 2** – Selected quantitative definitions of risk (Sourced from Arnold 2005 *Prehospital and Disaster Medicine*)

Source	Definition of Risk	Terms
UN-DHA UN/ISDR	$R = (H)(V)$	H = Hazard V = Vulnerability
World Health Organisation	$R = (x)(y)$	x = Probability of an event occurring y = Probability of various possible consequences
Zilinskas	$R = (H)(E)$	H = Hazard or harm an agent will cause E = Exposure or what population will be exposed to the agent, at what concentration, and for how long
Misra	$R = (C)(T)(Cm)(S)$	C = Chance T = Toxicity Cm – Concentration S = Time
Shook	$R = (H)(V)(P)$	H = Threatening event that could cause loss of life or damage to property or the environment V = Susceptibility of vulnerable elements, such as human populations P = Level or degree of planning for and control of hazardous events and vulnerable elements
Arnold Noson	$R = (H)(V)(M)$	H = Hazard or phenomena that cause harm to human populations V = Vulnerability or susceptibility of human populations to hazards M = Manageability or ability of humans to reduce hazards or vulnerability
TFQCDM	$P_D = f(H_N + H_M)(R_H)(V_N + a_1 + a_2 + b_1 + b_2)$	$P_D$ = Probability that event will inflict damage on the society and/or the environment at risk $H_N$ = Hazard dictated by nature $H_M$ = Hazard dictated by man $R_H$ = Probability (risk) that hazard will be converted into an event $V_N$ = Resultant vulnerability as dictated by nature $a_1$ = Vulnerability augmentation $a_2$ = Vulnerability mitigation $b_1$ = Counter-productive disaster response $b_2$ = Productive disaster response

Generally, total estimated risks are calculated by multiplying the quantitative scores of individual hazard probabilities and the potential level of impact. Risk estimates can be used to determine risk priorities (i.e. high risk estimates equal high priority for risk management).

There are many difficulties surrounding the accurate prediction of probabilities in risk assessment. Literature identifies a number of strategies at the conceptual, logistical and operational levels to assist in improving the accuracy of predictions:

- Clear definition of risk and associated terms;
- Clear definition/detail of potential situations to avoid multiple interpretations;
- Identifying the system at risk (e.g. demographic, economic, environmental or a combination)
- Characterisation of hazards and events (e.g. type, magnitude, location, duration etc.);
- Assessing the manageability of the event by the system;
- Identifying, gathering and coordinating all required resources (e.g. funding, materials, expertise) prior to conducting risk assessments;
- Selecting risk assessment methodology with consideration to “best practice” ;
- Participation from a broad spectrum of experts with a range of knowledge and skills
- Avoiding bias and conflicts of interest;
- Considering the influence of local environments when applying evidence from overseas and interstate;
- Detailing the entire chain of events that a situation will stem from, thus highlighting all points of vulnerability;
- Anticipating that errors may occur and incorporating buffers to reduce the consequences of errors.

Although common definitional approaches to risk may provide common understandings of risk, for risk management purposes consideration needs to be given to defining 'risk acceptability' - or 'acceptable level of risk'. Historically this has not been subject to rigorous tests, possibly because this is often qualitative and difficult to measure. However, much of the recent literature recognises this as a critical variable particularly as a direct contributor to disaster mitigation decision making. The ANCOLD guidelines provides an example of acceptable levels of risk using their societal risk index.

## **Risk Management**

Risk management provides managers with a basis for implementing mitigation strategies and reduction measures to reduce risk. Effective risk management is underpinned by the evidence base from risk assessment. Risk assessment matrices are a common method of estimating the probability and severity of potential risks/hazards and provide results that non-specialists can easily understand.

The Emergency Risk Management Applications Guide (EMA Manual 5) has guided much of the work being carried out at the municipal or local level but is perhaps less practical in the assessment of risk at the state/territory and regional level. Additional concerns have been raised with the appropriateness of community ERM as a tool for setting of priorities in local government. In many instances, risks identified are not owned by the council but by private or state agencies or by other community groups. In addition, there appears to be a lack of consistency between states/territories in the application of the ERM process. The development of standardised guidelines seeks to address this inconsistency.

This project seeks to develop a more rigorous methodological approach that allows for more detailed analysis of those risks considered high priority and which in turn allow for better focus of treatment strategies.

## 4. STATEMENT OF REQUIREMENTS

The principle purpose of this project is to develop a comparable nationally accepted standard of emergency risk assessment methodology.

### 4.1 Project Outline and Milestones:

#### Literature Review

Conduct a literature review of documents pertinent to risk assessments for 'all hazards' with a focus on sudden onset natural hazards, for all scales (local regional, state/territory, national) including national/state/territory processes to inform the development of draft guidelines.

The hazards of interest for the risk assessment guidelines are bushfire, earthquake, flood, storm, cyclone, storm surge, landslide, tsunami and tornado.

#### Facilitate stakeholder consultation

Consider consultation undertaken to date through the efforts of national forums hosted by Geoscience Australia, the Technical Risk Assessment Advisory Group and the National Risk Assessment Advisory Group. Build on the existing body of work and consultation to date by conducting stakeholder meetings in order to:

- Inform and gather further comment;
- Encourage buy-in from state officials, administration and community partners of the ERM guideline development program;
- Critically examine ERM tools currently in use for "all hazards" or one or more of the individual hazards listed above; and
- Gather suggestions for desirable/important attributes for emergency risk assessment processes and practices.

#### Analysis

The literature review and consultation identify "best practice" or "good practice" guidelines already in use. Also, conduct gap analysis to:

- Identify inconsistencies in risk assessment methodologies and analysis between municipal, regional and states/territory levels, and between the hazards of interest, so that a comparable nationally accepted standard of emergency risk assessment methodology can be developed; and
- Identify knowledge gaps in research.

#### Develop Draft Guidelines

Develop preliminary Draft Guidelines based on the outcomes of the literature review and stakeholder input. The Draft Guidelines will provide a comparable nationally accepted standard of emergency risk assessment methodology and be able to address:

- Risk assessment at all scales (local, regional, state/territory, national);
- Risk assessment applicable to the natural hazards of interest in general;
- Risk assessment for each of the individual natural hazards of interest; and
- Five types of risks (financial, socio-economic, casualty, political and environmental – see the National Risk Assessment Framework Section 1).

### Pilot Study

A pilot study will be conducted in one or more state/territory using the agreed Draft Guidelines.

An evaluation report of the pilot study against the Draft Guidelines will be produced.

### Refine Guidelines

Refine the Draft Guidelines on the basis of the lessons learnt from the pilot study and further consultation with stakeholders.

### Milestones

The proposed milestones are as follows:

- Literature review completed and report submitted;
- Stakeholder consultation completed and an outcome report submitted;
- Draft guidelines developed;
- Pilot studies and evaluation of draft guidelines completed;
- Refined final version of guidelines delivered.

## **4.2 Specified Requirements and Information:**

**Literature Review:** With regard to the literature review, the library services of Emergency Management Australia should be consulted to ensure the completeness and comprehensiveness of the literature review. Also, the Consultant should seek documents from all stakeholders.

**Stakeholder Consultation:** Significant progress has already been made in national consultation on the development of nationally agreed risk assessment guidelines. Geoscience Australia and the Department of Transport and Regional Services have led a number of workshops, and deliberation has been progressed through the Technical Risk Assessment Advisory Group and the National Risk Assessment Advisory Group. Additional consultation will build on these efforts and include as a minimum: correspondence with relevant agencies within all jurisdictions, consultation with relevant professional and industry bodies such as the Australian Geomechanics Society, further stakeholder meetings, consultation workshops to showcase and critique draft guidelines, written correspondence seeking feedback on drafts and final correspondence details outcomes of the project. Close liaison with Standards Australia is also expected to ensure that the final product aligns with relevant publication requirements.

**Guidelines Development:** The guidelines will be published in hard copy and will be provided electronically in a format to be agreed by the parties. The guidelines should include, but not be limited to:

- An introduction that provides: the purpose of the guide, scope of the guidelines, details on the structure, reasons and benefits of conducting robust risk assessments, a context within which risk assessments are conducted and an introduction the key principles underpinning AS/NZS 4360 ;
- A description of a methodology for considering risks for each natural hazard of interest (Section 4.1) across the various hazards including: the evaluation framework, workshop/study process overview, process for identifying risks, analysing risks, evaluating and reviewing risks;
- A description of an agreed method for describing and reporting the consequences of events for different hazards across a range of levels of likelihood for the five types of risks considered (Section 4.1);
- A description of an agreed process for ensuring that existing controls are considered and residual risk is consistently displayed in standardised risk matrices or curves;
- Details on the sequence of steps in the relevant part of the emergency risk management (ERM) process;

- A description on how the model is to be interpreted, applied or customised for state, regional and local application;
- Provision of guidance on the development of actual contextual material for states/territories to enable experts within government departments and agencies to develop risk curves/matrices within respective jurisdictional contexts;
- Provision of risk evaluation criteria for risk assessment at local, regional and state/territory levels including guidance on acceptable levels of risk;
- Provision of likelihood and consequence descriptors calibrated to levels: local regional, state, national;
- Description of processes for integrating detailed risk analyses, including mechanisms for addressing and estimating uncertainties and dealing with risk errors, guidance on integration of risk assessment into other activities including preparedness and planning;
- Sections or annexures that describe the principles that underpin current “*best practice*” based on lessons learned from recent disasters and reference to studies with regard to hazard specific risk assessments;
- Checklists of recommendations and other hints;
- Annexure containing worked example of fictitious state level multi-hazard risk assessment;
- References and glossary; and
- Provision for amendments and updates in the future.

It is envisaged that national agreement on the guidelines including the risk evaluation criteria and likelihood and consequence descriptors will be achieved through the Ministerial Council for Police and Emergency Management (Emergency Management) via the Australian Emergency Management Committee.

**Pilot Study:** The pilot study, or studies, will include, but not be limited to:

- Facilitating and observing a pilot implementation of the agreed process/guidelines for an emergency risk management study for one selected regional area and/or one jurisdiction.
- Producing a report which evaluates the pilot study against the draft guidelines.

**Security and confidentiality:** All project material will be kept confidential until reported to the National Steering Committee. The State will retain the Intellectual Property for all project material from the consultancy.

**Contract Management:** The consultant will report directly to the Contact Officer as identified on the front page. A national Steering Committee will support the Contact Officer.

**Project Plan:** The consultant must provide a description of the proposed methodology at the commencement of the project in the form of a project business plan. This must include potential solutions that meet the project objective and recommending the most suitable strategy, costing of outputs, timing and milestones.

**Update:** Due to the complex and comprehensive nature of the project, and the short timeframe for its completion, significant interaction and communication between the Consultant and the Contract Officer and Steering Committee is expected. As a minimum, the consultant must provide progress reports at quarterly intervals or as required by the Department.

**Reports:** The consultant must prepare and submit a succinct written outcome report at the completion of the project. Reports are also required at completion of each milestone.

**Time:** The project will be completed on or by 30 June 2008.

## **5. DOCUMENTS**

The following documents form part of the specification:

- National Risk Assessment Framework (attached);
- Emergency Management Australia (EMA) Application Guide (available from [www.ema.gov.au](http://www.ema.gov.au));
- Australian Standard AS/NZS 4360.

## **6. IMPLEMENTATION TIMETABLE**

The project is to be completed on or by 30 June 2008.

## **7. INFORMATION TO BE PROVIDED BY THE TENDERER**

The Tenderer is to provide:

- Completed Tender Form (including Pricing Schedule);
- Curriculum Vitae of the principals who will conduct the work;
- References;
- Referee contact details;
- The limit of the Tenderer's occupational liability under any Scheme in force under the *Professional Standards Act 2005*;
- Details of previous contract work undertaken;
- Examples of previous planning work undertaken.

## **8. ATTACHMENTS**

- a. National Risk Assessment Framework