# Emergency management and climate change adaptation

We depend on emergency management (including prevention) to deal with much of the risk from climatic events - cyclones and storms, bushfires, extreme heat and flooding.

These events cause great financial and emotional hardship for individuals and communities, and can result in significant loss of life.

Key Points

- Emergency management needs to invest in enhanced agility, capability and flexibility to effectively address the challenges that climate change will bring through more frequent and more intense extremes, through changes in the geographical extent of extremes and through concurrent events such as coastal flood and windstorm.
- Long-term and sustained funding is needed to achieve necessary change in the balance of emergency management from response to preparedness and prevention.
- Lessons learnt from events need to be incorporated in policy in a timely manner.
- Land-use planning and emergency management need to be better connected to incorporate risk management into planning.
- Community education is critical to improving resilience and social understanding of risk, and requires dedicated and adequate funding.
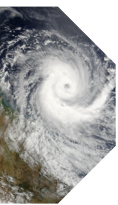
NCCARF's evidence-based Policy Guidance Briefs address key challenges to effectively adapting Australia to a variable and changing climate. They provide high-level policy advice designed for use by policy makers at Commonwealth and State level. This Guidance Brief deals with the management of climate-related disasters under climate change.

1 The climate context

Climate change has the potential to change the frequency (increase or decrease) and magnitude of extremes. However, confidence in projections of the future varies depending on the type of extreme, the region and season etc. (IPCC 2012). This adds to the uncertainty that emergency management already faces as a result of climate variability. Future projections of climate change and associated extremes, and the level of confidence in these projections, are summarised in Box 1.

There is some evidence of observed changes in extremes in the past five decades (Table 1). The IPCC (2012) SREX report noted that the observed changes in climate extremes reflect the combination of climate change, natural climate variability and changes in exposure and vulnerability as a result of non-climatic factors (e.g. development in at-risk areas such as floodplains and coastal zones).

Box 1 Future projections of extreme climate events and the associated confidence (from Handmer et al. 2012 citing Garnaut 2011).

- *Heat waves:* high level of certainty of increased frequency and intensity.
- *Fire danger:* strong evidence that south-eastern Australia will experience an increased frequency of high fire risk days, with uncertainty about magnitude of change.
- *Rising sea levels and storm surge events*: high level of certainty of some sea-level rise resulting from thermal expansion, but rate and extent of rise caused by ice melt uncertain.
- *Storm surge affected by intensity of storms:* less certainty over extent and frequency.
- *Rainfall events:* high level of agreement that some areas will become drier, and some areas will be likely to experience intensified rainfall events and therefore suffer an increased risk of flooding, but uncertainty over which areas will be affected and how.
- *Tropical cyclones:* considerable uncertainty remains over climate change impacts on the location, frequency and severity of tropical cyclones.
- *Strong winds from east coast lows:* East Coast Lows are intense low-pressure systems that occur off the eastern coast of Australia. While some types of east coast lows have increased in number since 1970, it is still uncertain how climate change is likely to alter their frequency and magnitude.
- *Hail:* significant uncertainty over the potential for hail events to increase in some regions.

Table 1: Observed changes in extremes since 1950 (Source: Table 3-2, IPCC 2012)

Region	Tmax WD: warm days CD: cold days	Tmin WN: warm days CN: cold days	Heat waves/ warm spells	Heavy rainfall	Dryness
N. Australia	High confidence: Likely increases in WD, likely decreases in CD. Weaker trends in NW	High confidence: Likely decreases in CN, likely increases in WN	Not known	Not known	Medium confidence: Decrease in dryness in NW since mid 20th century
S. Australia	High confidence: Very likely increases in WD, very likely decreases in CD	High confidence: Very likely decreases in CN	Medium confidence: Increase in warm spells across southern Australia	High confidence: Likely decrease in heavy rainfall in many areas, especially where mean rainfall has decreased	Medium confidence: Increase in dryness in SE and SW tip. Decrease in dryness in central Australia

¹ Prevention is defined here as "Regulatory and physical measures to ensure that emergencies are prevented, or their effects mitigated. Measures to eliminate or reduce the incidence or severity of emergencies" (EMA 1998).

2 Current effects, impacts and issues

Recent unprecedented climate-related extreme events have affected many parts of Australia, (e.g. the exceptionally hot summer of 2012-13; 2009 Black Saturday Bushfires in Victoria; summer flooding in 2010/11 and 2012/13; Cyclone Yasi in 2011). They have brought the nation's vulnerability to such disasters into sharp focus and placed a significant financial (see Table 2), emotional and social burden on governments and affected communities.

When extreme events occur, the scale of the damage and loss reflects the effectiveness of pre-existing disaster reduction strategies, the response and activities of the emergency services and the resilience and preparedness of the community and the economy. Some of the work in preventing extreme weather events from leading to disaster lies in regulation (e.g. extensive losses during 1974 cyclone Tracy reflected inadequate building standards, and led to their fundamental redesign; Mason and Haynes 2010).

In parts of Australia, it is increasingly common to trade-off risks from climatic hazards, such as floods and fire, against improved emergency management. The result of this approach is that areas at risk may be developed for residential purposes on the assumption that improved warnings and emergency response will adequately manage the increased risk (Handmer et al. 2012).

Table 2: Cost of recent disasters in Australia

Extreme	When	Where	Insurance claims (AUD)[1]	Government expenditure (AUD)
Floods	Dec 2010 to Jan 2011	Queensland (Brisbane, Toowoomba, Lockyer Valley, plus rural areas)	$2.39 billion	$5 billion (Queensland)[2]
Floods	Dec 2010 to Jan 2011	Victoria	$126 million	$676 million (Victoria)[3]
Cyclone Yasi	Feb 2011	Far north Queensland	$1.41 billion	included in total for Qld flooding
Severe storms	Feb 2011	Victoria	$488 million	unknown
Bushfires	Feb 2011	Perth and surrounds	$35 million	unknown
Totals			$3.18 billion	$12.33 billion

[1] Insurance Council of Australia as at 21 January 2013

[2] Queensland Government 2011

[3] Victorian state budget released in May 2011 (AU$115 million expected to be recovered from insurance)

There are many good examples of ongoing improvements in strategic planning for, and management of, extreme events. For example, most states have now implemented heatwave warning systems and response plans. At a national level, the Council of Australian Governments (COAG) agreed in 2009 to adopt a 'whole-of-nation' resilience-based approach to disaster management, published in 2011 as the National Disaster Resilience Strategy. This approach recognises the need for a national, coordinated and cooperative effort to enhance Australia's capacity to withstand and recover from emergencies and disasters. The policy is aimed at delivering sustained behavioural change and enduring partnerships in order to build disaster resilient communities.

3 Future effects, impacts and issues

Under a changed and changing climate the adaptation options available to communities to manage the risks from extreme events will need to be more than a simple multiplying of existing emergency management capabilities. The present-day distribution of financial and social risks from extreme events is unlikely to remain the same in the future. There is a growing need to build enhanced resilience to extremes across more of the population.

Governments already have powerful instruments to manage the risks that will be altered by climate change, including land-use planning legislation and building regulations. While risk modelling and assessment can inform where and when there is need to enhance these strategies, little will be achieved without the political and social will. Demands for development, urban expansion and enhanced production (e.g. from agriculture and mining) are often prioritised ahead of risk to the community and/or environment – with an expectation that infrequent extremes can be dealt with through emergency management. Planning and development activities will need to be mindful of changing risks from extremes and to avoid placing the government in the position of insurer of last resort.

Other well-understood adaptive mechanisms such as early warning systems and community education awareness and engagement programs can be brought into play in new locations or with additional capacity in existing locations. The implementation of such strategies would be 'win-win' or low-regret options in terms of having the immediate benefit of reducing present-day risks from severe weather events.

New technologies and new approaches will continue to enhance the current suite of risk reduction strategies. At the community level, for example, the roles of the Internet and mobile phone communications continue to grow in the management of disaster response especially, in Australia, to bushfire. In the financial sector, increasingly sophisticated products continue to be developed around disaster risk financing and insurance.

Many adaptation needs will be strongly place-based, requiring the combination of location-specific strategies and interventions with national- and state-level systems and institutional arrangements.

Adaptation: what this means for managing the sector

4.1 Preparedness

The emergency response: Emergency management agencies will need to be prepared not only to be busier, but to deal with more intense, possibly more complex events, occurring in locations not previously at risk. Agencies will require flexibility, agility (rapid change response) and capacity to manage multiple events. For example, in February 2009 the Victorian ambulance service was overloaded during an unprecedented severe heatwave, while at the same time having to plan for outbreaks of intense and extensive bushfires. This need for flexible, multiple-hazard capacity will demand greater cooperation between agencies, e.g. flood warning systems require cross-agency support including the Bureau of Meteorology, SES, local authority and police. It may also require the development of new business models for the sector.

Policy and governance: The emergency management sector is already seeing a change in the way business is done: moving from an emphasis on 'lights and sirens' to embedding the response stage within a more complex framework which includes a planning stage considering risk, community and policy development. This transition is prompted in part by major events in the last few years and recognition that emergency services may not be able to reach every individual during a disaster necessitating development of community and individual resilience.

Historically, there has been a disconnect between response and recovery, and between policymakers and practitioners. There is a growing awareness that policy must address the problems facing emergency management practitioners and that on-ground experience must inform policy development. Typically the community is ready and willing to adapt and is adapting faster than institutions.

Australia does not have a centralised emergency management system; rather it has networks of diverse stakeholders from different agencies. As a result there can be a lack of consistency in coordination and structure, and different levels of experience and knowledge. Strategies to retain corporate knowledge are generally not in place. A common across-agency framework for understanding risk is needed, encompassing policymakers and practitioners, and with a goal of improving the agility and flexibility of the sector. Such risk frameworks must be evidence rather than assumption based. For example, advice on how to manage heat waves should be based on evidence that a proposed action will in fact reduce the risk of heat-related illness.

Work is now underway to develop such risk frameworks. Generally these are all-hazards approaches with sub-plans for specific hazards (fire, heat, flood etc.).

Knowledge and communication: Education and awareness-raising efforts are fundamental parts of preparing for natural disasters, but do not necessarily change behaviour. The challenge is to make emergency management preparedness part of the 'collective wisdom' of society. This may be achieved through expansion of householder preparedness programs and making use of community-based programs where engagement is already established.

Community education should include overcoming the 'cry wolf' mentality and building understanding that hazard warnings are good risk management, which should always be acted on even though previously the hazard has not eventuated or was less severe than predicted. This should be complemented by work to improve warning reliability.

Community education is currently often funded through project grants rather than core funding. This does not create sustainability and continuity. Generally there is little or no evaluation of the impact of education and awareness-raising programs, mostly because funding is not available for such evaluation, so that the determinants of success are poorly understood.

Education needs to extend to practitioners, so that lessons learnt from previous events are incorporated into the planning and hazard mitigation space.

Planning: Risk management is increasingly looking at planning measures to reduce risk and prevent disastrous consequences of natural hazards. For example, hazard mapping (particularly flooding) draws on historical impacts and potential consequences of future hazards. This information can also usefully feed into community programs to raise risk awareness.

A critical constraining factor in risk reduction is land-use (e.g. the flood risk and preparation for farm land will be very different compared to an aged care facility). However, land-use planning is not traditionally within the scope of the emergency management sector and emergency management personnel are usually not involved in decision-making for land-use planning. (See Bird et al. 2013 for a comprehensive review of planning legislation and policy and the scope for emergency management planning).

There are several challenges to effectively incorporating risk management into land-use planning.

- Emergency management needs the appropriate channels to influence land-use planning.
- Information and risk assessment must be relevant, up-to-date and at an appropriate scale (e.g. planning is generally at the sub-division or block of land level, while hazard mapping and emergency management strategy is at a much larger scale).
- Legislation needs to support emergency management risk assessment in planning.

Building regulations can play a role in risk reduction and preparation for natural hazards. The introduction of building standards for cyclone-prone or bush fire-prone areas can reduce the impact of hazards on building stock and people (e.g. Mason and Haynes, 2010). Both design (e.g. ground level rooms designed to let flood water out) and choice of materials (e.g. fire-resistant house cladding) can contribute to the reduction of risk. Building codes, however, are developed around a premise of reducing cost and this may not always facilitate resilience in building stock. Likewise, design is dictated by budget constraints, material availability and design trends. This does not always lead to the best outcomes for risk reduction.
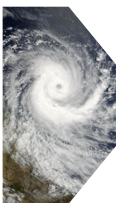
4.2 Recovery

Rebuilding after a disaster often involves clean-up and restoration of private and community assets, but climate change may force communities to consider a new normal incorporating increased risk of hazards. Where this is not acceptable, then relocation may become a necessary part of adaptation. Migration can be driven by a desire to find new opportunities, and leaving a community after a disaster is not a failure. A strong local economy will influence the choice to migrate, where the economic opportunities of staying are greater than leaving. A challenge will be how to work with those that don't have the resources to change or move. Repeated events in a location may reduce individual or household ability to cope with the impacts.

Cost: Decisions around actions to lessen the impacts of future events often revolve around an assessment of costs – in particular, will the investment in adaptation be less than the cost of the impacts? The understanding of costs, however, tends to be with tangible things (e.g. house repairs, infrastructure replacement costs). The challenge in discovering the real cost of an event is identifying and costing the intangibles that can have a bigger impact on society (e.g. business bankruptcies or decisions to relocate, planned development or infrastructure cancelled due to redeployment of funds). In their analysis, Australia's Productivity Commission (2012) suggested that the cost-benefit of adaptation points towards accommodating risk (e.g. raised floor levels, migration) rather than investing in protection (e.g. flood levees). As the risks associated with extremes increase in the future, it will be essential to articulate and understand the full consequences (i.e. tangible and intangible costs) so that funding and investment are targeted correctly.

5 Policy implications

The points below provide clarity about what is required to shift the balance more completely from a focus on reactive emergency management to a focus on preparedness.

Land-use planning and building
- Mainstream climate change adaptation and emergency risk management into land-use planning. To ensure commercial market interests do not create untenable risk, explicit legislation or the development of a governance body for land-use planning may be required.

  While COAG has acknowledged that disaster management should be incorporated into planning principles, no guidance is yet available on implementing this policy and is urgently needed.
- Incorporate design and materials standards for hazard reduction into building codes.

Actions within the emergency management sector: translating lessons and understanding consequences
- Bring experience of recovery and management of an incident forward into planning and preparedness.
- Tackle organisational barriers to within-organisation learning to ensure new knowledge and understanding reaches all levels. Risk management should be incorporated across government and sectors.
- Provide training opportunities, and ensure staff have updated knowledge and skills.

Public education
- Develop and promote effective and tailored (to the community and hazard) models of learning. Successful cyclone season campaigns have provided exposed residents with preparation knowledge, and this could be drawn on for other hazards. Public education campaigns should be all-hazards, and focus on addressing the wider impacts of disaster, encouraging people to prepare to survive the hazard and to prepare to recover from the hazard.
- Provide recurrent funding for education to ensure sustainable long-term change. Understanding what fire, flood or cyclones can do should become part of the shared wisdom of society. Public education must reach all levels from primary and secondary school through to land-use planners and engineers.
- Ensure community preparation information reaches transient people (e.g. tourists).
- Utilise social media as both an intelligence gathering opportunity and warning channel. It is important to know who can't see/hear a broadcast because of a disability, and to develop strategies to reach these individuals.

Resilience and vulnerability
In order to continue to develop resilience and reduce vulnerability, policy needs to:
- Engage a wide audience to develop a common understanding of what represents a 'resilient community'. Processes of understanding the factors that create resilience, and moving to implement policies to develop resilience, can then be undertaken.
- Provide support (educational, financial and expertise) to communities to build resilience and manage risks. For example, support aged care facilities to develop fit-for-purpose evacuation plans.
- Expand the resilience approach to emergency management of the National Disaster Resilience Strategy into a broader range of sectors beyond emergency management.
- Ensure programs to support the least resilient are available, sufficiently funded, and sustainable.

Policy context – risk appetite
- Determine the public risk appetite (i.e. what risks are people prepared to accept) to determine the extent of policy need in adapting to natural hazards. What can be lost? What can be afforded?
- Decision-making needs to take into account what is known, what the knowledge gaps are, and the uncertainties.
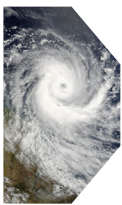
Approach

The policy guidance provided in this brief was developed at a workshop held in Melbourne. The workshop was attended by policy makers and managers from within Fire Commissioner Victoria, Tasfire, Red Cross, NSW SES (Steve Opper), Australasian Fire and Emergency Service Authorities Council, Ambulance Victoria, Australian Emergency Management Institute, Paul Barnes (QUT), David King (JCU), Michael Howes (GU), John Handmer (RMIT) and NCCARF staff.

NCCARF's research programs have delivered over 140 reports on climate change adaptation, many of which address the topics of the Policy Guidance Briefs.
For more information, see www.nccarf.edu.au/publications4

NCCARF is producing a portfolio of twelve Policy Guidance Briefs in 2012–13 on critical climate change adaptation topics. For a complete list of available Policy Guidance Briefs, please go to: www.nccarf.edu.au/publications/policy-guidance-briefs

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