CoastAdapt

Climate change impacts on emergency management in the coastal zone

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Impact Sheet 3

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Contents

Introduction

Emergency management responses are likely to be needed for both slow and rapid onset disasters caused by climate change. Climate change impacts are likely to be felt in the Australian coastal zone in the form of increased frequency and intensity of some climatic events and natural disasters. While impacts will vary depending on local geography they will also differ depending on Australian and global policy as well as regulatory and private sector responses to the challenge of emissions reduction.

As over 80% of Australia's population lives within the coastal area, communities and emergency managers will need to prepare for disasters in ways that also address climate change adaptation and mitigation. This outline identifies and describes likely climate change impacts on emergency management in the Australian coastal zone in terms of the growing challenges and costs facing emergency responders and planners.

Extreme climate events and the likelihood of their occurrence are set out in Box 1.

- **Heatwaves:** high level of certainty of increased frequency and intensity.
- **Fire danger:** strong evidence that southern-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.

Box I: Future projections of extreme climate events and the associated confidence. Source: from Handmer et al. 2012 citing Garnaut 2011.

What are the key impacts of climate change for emergency management in coastal areas? Answers to this question, in relation to primary and secondary climate change impacts, illustrate the complexities of the system and of the task faced by emergency managers and planners.

Climate change impacts for emergency management

Changes to sea-level rise and air and sea temperatures are gradual, and climate change impacts are both direct and indirect and have slow and fast onset (Box 2). An example of this is given by the Indian Ocean Dipole (IOD), an oscillation of sea-surface temperatures in the Indian Ocean (see http://www.bom.gov.au/climate/enso/history/ln-2010-12/IOD-what.shtml accessed 7 April 2017). A positive IOD pattern has been shown to be associated with lower rainfall over parts of central and southern Australia. Over the last 50 years, an increased incidence of the positive phase of the Indian Ocean Dipole (IOD) has gradually occurred (CSIRO 2013). Some of its effects are fast onset: there were three consecutive IOD events in 2006–2008 which created the conditions for the catastrophic Black Saturday bushfires in Victoria in February 2009 (CSIRO 2013). Some of the IOD's effects are also slower onset such as decreased rainfall, increased drought and greater fire hazard.

Box 2: Major direct impacts of climate change in the coastal zone. Source: Adapted from Engineers Australia 2012.

In the coastal zone, major direct impacts of climate change include:

- inundation and displacement of wetlands, lowlands and their buffering
- eroded sandy coasts
- increased coastal flooding by storms
- salinity intrusion of estuaries and aquifers
- altered tidal ranges, prisms and circulation in estuarine systems
- changed sedimentation patterns
- decreased light penetration.

The complexity of emergency management includes the range of social, technical and infrastructure systems that are affected by disasters — including events induced by climate change — and that need to interact ahead of time to mitigate these impacts. Existing public policy tends to divide responsibility into discrete geographical and subject areas, which can lead to siloing, turf protection and rivalries that impede effective planning and response (Owen et al. 2013). Emergency managers have sought better quality information linking climate change and emergency management, so they can map the interdependencies that arise. A greater research and policy focus on land-use planning (strategic and statutory), coastal and non-urban construction requirements (e.g. building codes) and on climate change topics specific to emergency management is generating data and analysis needed to better address both the primary and secondary challenges arising from climate change. Engineers also use this information to increase the safety of communities (Place 2010).

Different jurisdictions in Australia have different disaster planning policy approaches that guide emergency responders and inform their training. For example, coastal areas of Victoria and NSW face the threat of coastal inundation from sea-level rise and associated storm surge. NSW has adopted a policy of 'defend', which focuses on engineering solutions, while Victoria has advocated a policy of 'retreat' (Thomas et al. 2011). Yet ongoing improvements in strategic planning and policy development continue to bring greater coherence to state and territory disaster management approaches. As an example, the Council of Australian Governments oversaw the development of the 2011 *National Disaster Resilience Strategy*, which aims to bring greater coordination and cooperation nationally.

Cross-sectoral approaches are critical to successful emergency management planning and responses to the coastal impacts of climate change. Such cooperative approaches are needed to ensure sharing of essential data, but also to build relationships and interoperability that become critical during disaster response. For example, due to significant training and disaster response preparation, the Australian Defence Force and Australian Federal Police, among others, operated well with the range of stakeholders (local government, community, private sector) during and after the Black Saturday bushfires in Victoria in 2009. They also worked well with international emergency services officers assisting from other countries including New Zealand, Indonesia, and Canada.

Despite the successful history of cooperation between emergency management agencies, the potential increase in concurrent events may limit the ability to draw on resources from interstate or the region. Equipment- and personnel-sharing arrangements between Australia and the United States, for example, may be jeopardised by the increasing overlap of fire seasons. Senior fire and emergency management personnel will need to manage complex challenges and increasing demands on limited resources.

Emergency management in the coastal zone and climate change – emerging practice and trends

To reduce the potential increased need — due to more frequent climate change-related events — for emergency response services, there has been a growing policy and research focus on mitigation and adaptation responses. These aim to reduce the impact in particular on the most vulnerable in the community. Disaster risk-reduction (DRR) and preparedness are key focuses of international research and policy, which emphasises the need to engage emergency management approaches to reduce vulnerability and build resilience well ahead of time, as well as during and after an event. In Australia, there is increasing recognition that climate change adaptation plays a critical role in disaster management, and DRR is now well recognised as a critical climate change adaptation tool. For example, the fire and emergency services sector has sought to use adaptive building and planning regulations to ensure buildings provide better protection from heat in the event of fire (Handmer et al. 2013).

In parts of Australia, an increased focus by emergency management on improved preparedness, warnings and emergency response has resulted in a trade-off for areas with a high risk of climatic hazards, such as flood and fire. The assumption in this approach is that improved preparedness, warnings and emergency response will be sufficient (NCCARF 2013). It also places an increased burden on emergency management services and may lull residents and businesses in such areas into a false sense of safety. The increased vulnerability that comes with greater exposure of people and economic assets to disaster impacts has not been attributed to climate change, although climate change has not been discounted (IPCC 2012).

Climate change affects the emergency management sector's capacity to support preparedness, response and recovery efforts. As extreme events increase, so will the demands on full-time and volunteer emergency service personnel and non-government organisations. This requires increased resourcing, including volunteer support, and more creative partnerships between the public and private sector to meet critical infrastructure needs (Handmer et al. 2013). In Australia, there are currently about 500,000 volunteers in the emergency management sector, with approximately 350,000 involved in response and recovery (Handmer et al. 2012). Recent research has found that many volunteers struggle to balance full-time paid work and family responsibilities with higher expectations of training and compliance and the emergency callouts (Handmer et al. 2012). Australian disaster responders (civilian and military) also play an increasing role in responding to humanitarian disasters and emergency response needed especially in the Asia-Pacific region, with significant costs borne by a shrinking public aid budget.

In Australia, critical components of emergency management responses to climate change in coastal areas will continue to be community education and engagement to raise risk awareness and promote protective action; identification of vulnerable locations, groups and individuals who may require assistance; and facilitation and support of emergency management research.

Summary

It is clear that emergency management cannot solely address the varied impacts — primary and secondary, slow and rapid onset — of climate change. Many of these coastal impacts will need the focused and sustained attention of engineering, environmental, horticultural, agricultural, marine and other sectors, which must work together to find holistic and long-term approaches to mitigating and adapting to climate change and its impacts. Clearly, climate change will significantly affect emergency management in the coastal zone of Australia over the next 100 years and beyond, with severity of impacts depending largely on the strength of the emissions regimen that will be globally agreed. Emergency responders will need to be well prepared and well resourced and have the skills needed to deal with the impacts of sea-level rise, temperature increases, rainfall changes and changes in extreme events.

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