Why is climate change important for the emergency management sector?

Why is climate change important for the emergency management sector?

Impacts of climate change on extreme events

Heatwaves

Heatwaves have caused more deaths in Australia since 1890 than bushfires, cyclones, earthquakes, floods and severe storms combined [32]. Queensland is experiencing warmer weather over time, with an increase in exposure to higher temperatures and heatwaves causing heat stress, illness and deaths [33, 34]. Extreme heat increases the risk of heat-related illness across the population, and can also exacerbate pre-existing conditions such as cardiac and respiratory conditions. Children, the elderly and manual workers exposed to extreme heat (e.g. working outdoors or indoors without adequate cooling during heatwaves) are most at risk [32, 35]. More than 100 excess deaths in Brisbane were attributed to the summer of 2004 heatwave [33]. One study assessed the impact of heatwaves on mortality and emergency hospital admissions from non-external causes in Brisbane between 1996 and 2005 and found a statistically significant increase in mortality among the elderly and people with cardiovascular, renal or diabetic disease [34].

In 2014, the World Health Organization estimated an additional 250,000 potential deaths annually around the world between 2030 and 2050 due to the impacts of climate change [36]. Scientists have shown that just a half degree increase in average summer temperature, as has occurred over the past century, strongly influences the probability of occurrence of a dramatic heatwave, such as that in 2003 in Europe which killed more than 40,000 people [37, 38]. A recent study estimated that under a high-emission scenario, temperature-related excess mortality in Brisbane will increase by 92.5 per cent towards the end of the century relative to baseline numbers from 2000–2009[39].

However, heatwaves only become disasters if the community is unable to respond to the meteorological conditions [40]. Aging populations, socioeconomic vulnerability and poor urban planning can all contribute towards reducing a community's capacity to adapt to heatwaves [41, 42]. The emergency management sector in Queensland plays a key role under these circumstances, with increased peak demand for its services to manage or respond to heat exposure events, including demand for early warning and risk communication with communities. A study that investigated the effects of heatwaves on ambulance attendances in Brisbane found a 50.6 per cent increase in ambulance attendance for a 9.5°C increase above a reference temperature of 29°C [43].

Extreme conditions during heatwaves can also impact on critical infrastructure. Heatwave events can trigger power outages due to increased peak demand. This in turn can cause service failure among multiple critical infrastructure systems. Prolonged periods of increased temperatures coinciding with high demand for water may also damage water infrastructure, leading to the risk of contamination through bacterial growth[44]. Transport infrastructure such as rail lines can buckle under excessive and prolonged heat causing short-term disruption to major services, which can lead to traffic congestion in roads and reduce the ability of emergency services to respond to assistance requests of all types [44]. The number of days of high fire risk across south-east Australia is increasing, which has the potential to increase the number and intensity of bushfire events [45]. Complexities for the sector exist where extreme heat events coincide with fire events (as they often do at present), and this may increase in future [35].

Coastal inundation and erosion

Sea-level rise and associated changes in extreme waves can accelerate the erosion of coastal margins, threatening surrounding land, property and infrastructure. Rising seas may also lead to an increase in coastal flooding, either by providing a higher median sea level and increasing the height of storm surges, or by acting as a higher seaward barrier, restricting the escape of floodwaters caused by excessive run-off [46]. Australia relies heavily on the coastal zone for livelihood, with approximately 85 per cent of the population living within 50 km of the coast, and 710,000 addresses below 6 m elevation [47]. A number of critical infrastructure facilities such as airports, parts of major highways and sewage treatment plants are also located close to the coast, and some of them in Queensland are in low-lying, hazard-prone areas. A national first-pass risk assessment of sea-level rise conducted by the Federal Government in 2011 estimated the replacement cost of Queensland buildings and infrastructure as a result of a 1.1m sea-level rise at between $35 and $55 billion [48].

With a higher median sea level in the future, coastal waves during storms and cyclones will reach extreme heights more frequently, inundating low-lying coastal settlements [49]. The foundations of infrastructure close to erodible shores will be at risk as a result of erosion of soft shores and coastal margins [50, 51]. These coastal hazards can affect exposed infrastructure leading to power outages, contamination by sewage, destruction of road networks and temporary suspension of rail, maritime and air services. Although coastal management does not reside with the emergency management sector, the occurrence of extreme coastal events can lead to increased demand on sector services, such as search and rescue operations, restoration of affected infrastructure, utilities and houses, removal of dangerous obstacles, and provision of support and accommodation for affected communities [15].

Figure 10: The combined estimated replacement value (A$ billion) for residential, commercial and transport infrastructure for a 1.1 metre sea-level rise [48].

Inland flooding (including excessive rainfall and severe weather events)

The risk of flood events is influenced, not only by the intensity of precipitation in the river basin, but also by the flow regime that is strongly affected by land use in the catchment [40]. Projected increases in the intensity of heavy rainfall would contribute to increases in precipitation-generated local flooding (e.g. flash flooding and urban flooding) [52]. Such events may interrupt essential services such as electricity, water, sewage treatment and health care, and also have direct impacts on housing, business and industry. Flooded roads disconnect and isolate communities, hospitals etc., resulting in demands on the emergency management sector to support and maintain the functioning of those affected. The economic costs of flooding are significant. For example, the health and social costs associated with the 2011 Queensland floods amounted to $7.4 billion, and the costs due to damage to infrastructure and commerce amounted to $6.7 billion [53]. Economic losses from floods have greatly increased over the years, and these increases are likely to continue, principally driven by the expanding exposure and value of assets at risk [54].

Bushfires

Fire threats to tropical and subtropical Queensland have been increasing over the years. Weekly bushfire frequencies in Australia increased by 40 per cent between 2008 and 2013, with tropical and subtropical Queensland the most severely affected regions [55]. Projected changes in the forest fire danger index indicate this trend is likely to continue [9]. A number of climatic factors that influence bushfires are likely to change as a result of climate change (e.g. higher temperatures, changes in drought frequency, drier soils, changing vegetation structures, strong winds, increased storm activity), and where these factors increase in frequency and intensity, this is expected to lead to more high fire risk days and higher bushfire potential in parts of the state[9, 56].

Bushfire is mostly observed in natural bushland areas across Queensland, with some interaction with the peri-urban and urban landscape. Nearby infrastructure such as power and communication nodes, roads and rail networks, and air services are likely to observe short- to medium-term disruption periods, with potentially damaging impacts during future fire events. Demand for emergency management sector resources will increase as communities situated in at-risk areas come under threat more frequently. Additionally, short-term disruption to road and rail networks may also impact access, resupply and response efforts within the affected communities. Disruption and loss to local and regional economies and industry may occur, and the impacts will depend on the severity of the event [44].

With extension of the fire danger season in future, firefighting agencies will face increasing demand for services, increased cost and fire suppression difficulty, prolonged and complex recovery, and employee and volunteer fatigue [15, 57].

Tropical cyclones

In comparison to heatwave and sea-level rise, tropical cyclones (TCs) are the product of more complex atmospheric interactions, and therefore their future projection is much more uncertain [40]. However, scientists suggest that increases in atmospheric carbon dioxide concentrations will provide more energy to fuel TCs, which may lead to higher intensity wind speeds. As a result, some future projections based on theory and modelling tend to indicate that fewer but more intense TCs can be expected [58–61]. Other papers suggest that both storm frequency and intensity may decline due to climate change [62, 63], or the possibility of cyclone activities moving further southward [64], so the situation with respect to future projections of TC occurrence remains highly uncertain.

The impact of TCs in Queensland depends on their intensity, location of landfall and correlation to astronomical high tides. They have the potential to disrupt power and communication networks and cause the closure of transport facilities in affected areas. As a result, remote communities can be isolated, making it difficult for the emergency management sector to operate and provide the necessary relief to the community.

The presence of highly vulnerable people in the impact area can further increase the complexity of emergency operations.

Some critical infrastructure, such as hospitals, medical and care facilities, are located in hazard-prone areas, and are highly vulnerable to the effects of a TC (e.g. high winds, flooding and storm surge) that may lead to structural damage to buildings [44]. Disruption of these critical services can be compounded by the addition of secondary hazards such as riverine and flash flooding, and by increasing high tide levels due to sea-level rise.

The influence of climate change on sector policy

In 2016, the World Economic Forum listed 'failure of climate change mitigation and adaptation' as its highest risk in terms of impact, and third highest in terms of likelihood [65]. While mitigation focuses on reduction of greenhouse gas emissions to reduce future atmospheric concentrations, adaptation focuses on addressing the impacts and risks that may arise in future as a result of climate change. The following summary outlines a number of agreements, frameworks and policies that influence sector priorities and activities.

Climate mitigation policies

At an international level, the Paris Agreement [66], which entered into force in late 2016, provides the basis for international mitigation efforts, with an aim of keeping the average global temperature rise this century below 2ºC above pre-industrial levels, and limiting the increase to 1.5ºC. The 2017 review of climate change policies [67] conducted by the Australian Government provides an exhaustive list of national-scale mitigation policies. At a state level, the Queensland Climate Transition Strategy [68] outlines how Queensland intends to transition to a zero net emissions future that supports jobs, industries, communities and the environment. The sector will need to consider what the arising transitional risks will be, and how it may contribute to these transition targets moving forward (see 'Link between mitigation and adaptation').

Climate adaptation policies

At an international level, the Sendai Framework for Disaster Risk Reduction 2015–2030 [69], to which Australia is a signatory, is the new global blueprint to reduce risk and build resilience to disasters. Its expected outcome to 2030 is to realise 'substantial reduction of disaster risk and losses in lives, livelihoods and health and in the economic, physical, social, cultural and environmental assets of persons, businesses, communities and countries'.

Australia has also committed to the United Nations 2030 Agenda for Sustainable Development, and the 17 Sustainable Development Goals (SDGs) [70]. The SDGs represent an important guiding framework, with several of particular relevance to the emergency management sector. For example, SDG 13 (Climate Action) includes targets for strengthening resilience and adaptive capacity to climate-related hazards and natural disasters (in all countries), integrates climate change measures into national policies, strategies and planning, and improves education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning.

At a national level, the National Strategy for Disaster Resilience (NSDR), 2011 [71] provides a basis for increasing natural disaster resilience, including climate change across the nation. The purpose of the Strategy is to provide high-level guidance on resilience strategies to federal, state, territory and local governments, business and community leaders, and the not-for-profit sector. The NSDR acknowledges climate change as a major threat to Australia's national security and resilience.

There are a number of state-specific strategies and frameworks in place

in Queensland that respond to climate change and extreme events. To assist with the state level implementation of the NSDR, the Queensland Strategy for Disaster Resilience (QSDR) was released in 2017, and 'provides a framework to align disaster resilience activities with Queensland Government priorities, including the Q-CAS [72]. Through the QSDR, the Queensland Government commits to 'understanding the risks associated with a warming climate with improved coastal management' and 'identifying adaptation opportunities following disasters and in anticipation of climate change' [72]. More recently, the Queensland Reconstruction Authority released Resilient Queensland: 2018–2021 to coordinate the state-wide delivery of the QSDR. It is an engagement and implementation plan to ensure outcomes are delivered against the objectives of the QSDR, including a changing climate [73].

The Q-CAS [74] provides the basis for climate adaptation for the state, and outlines how the state will prepare for current and future impacts of a changing climate to reduce risk and increase resilience. As part of this approach, the EM-SAP will reflect and build on existing policy, as it outlines policy direction and priority action areas for adaptation within the sector.

The 2017 Queensland State Natural Hazard Risk Assessment [44] and the Queensland Emergency Risk Management Framework (QERMF) [44] support the communication of risk information across the QDMA and adopts a multi-hazard approach (Figure 11). The QERMF was endorsed in August 2017 by the Queensland Disaster Management Committee as Queensland's approach to the management of natural disaster risks at all levels of the QDMA, and complements existing and widely recognised risk management standards. Moving forward, QFES will be examining how climate change scenarios can be incorporated into the QERMF.

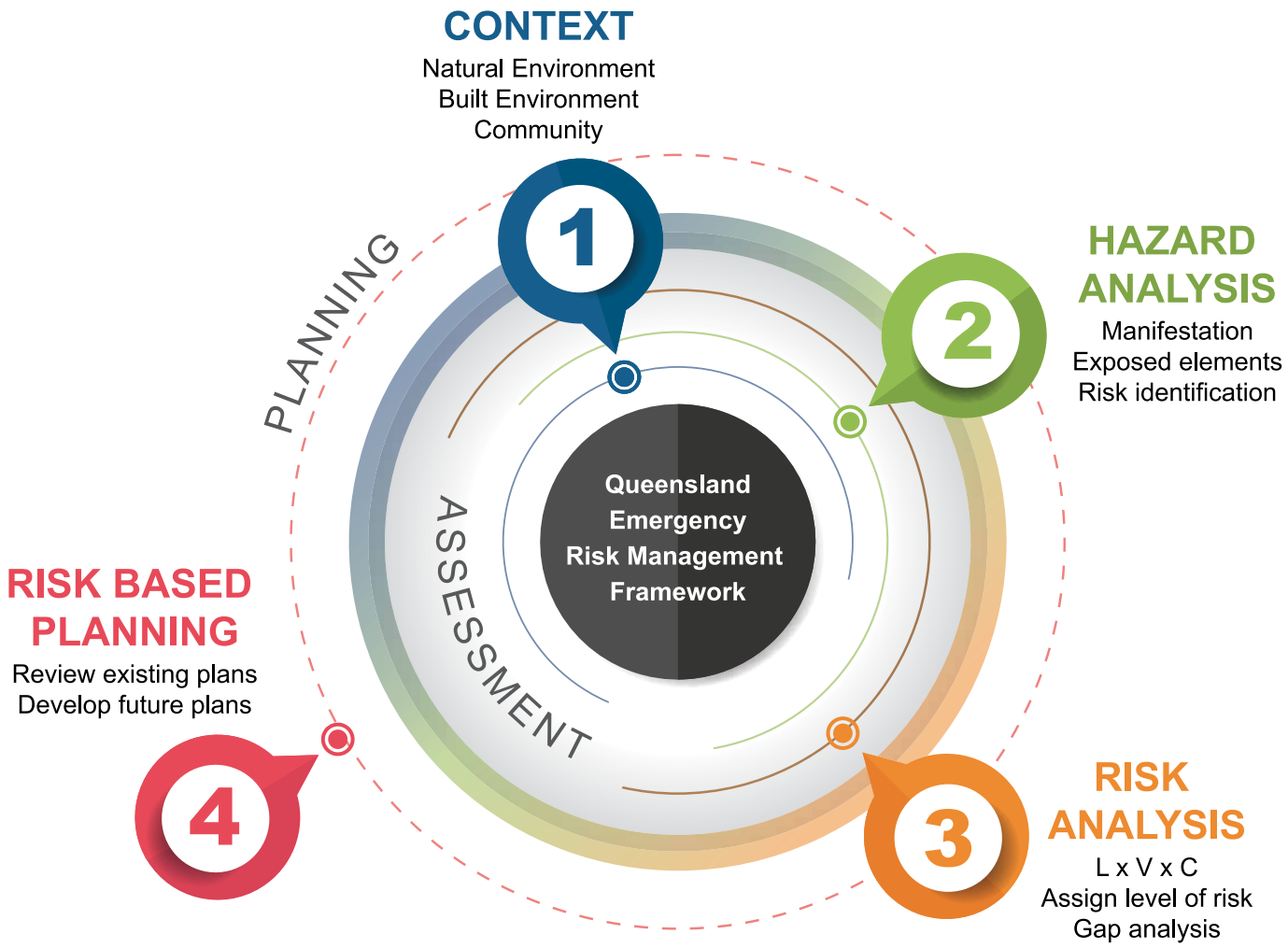

Figure 11: Queensland Emergency Risk Management Framework [75].

Other relevant activity guiding climate adaptation for the sector

A position paper recently approved by the Australasian Fire and Emergency Service Authorities Council (AFAC) identifies the potential climate change impacts and risks to the sector, in particular the physical, transitional and legal risks [76]. The paper provides high-level recommendations for the sector that will continue to influence the national direction in this space.

The Centre for Policy Development and the Future Business Council commissioned and published a legal opinion by Noel Hutley QC in 2016 [77]. This opinion reflects the extent to which Australian corporate law requires board directors to take climate change into account when making decisions about organisational strategy, performance and risk disclosure. It suggested that directors who fail to properly consider the impact of foreseeable climate change risks on their business could be held personally liable in a court for breaching their duty of due care. This decision has been endorsed by the Australian Prudential Regulation Authority and the Australian Institute of Company Directors, and is now resonating across all sectors, in particular, banking and finance, and emergency management.

Link between climate change mitigation and adaptation

To build resilience to climate change impacts and prepare for a low-carbon world, the sector needs to consider its own contribution to climate change, and begin to address its contribution to Australia's emissions (see Principle 8). There is scope and opportunity for the sector to improve resilience of its own organisations by transitioning to low-carbon and environmentally friendly technology. For example, by investing in solutions such as renewable energy and battery storage, the reliance on centralised power and communications infrastructure can be reduced, which will contribute to enhanced sector resilience during disasters (see Case study 1). Additionally, the sector may also reduce transition risk posed by the evolution of goods and services within other sectors (e.g. automotive industry, utilities) by taking a proactive approach in its asset and organisational management.