

As climate-related hazards grow in intensity and frequency and urban density increases there is increasing pressure to strengthen our infrastructure to reduce the risk to the community and to lower longer-term recovery costs.

Decisions around infrastructure construction and the built environment would benefit from more consideration of the risks of natural hazards.

A better understanding of the built environment and how it interacts with other factors will enable action to increase disaster resilience and can also provide tangible benefits for the community, such as reduced insurance premiums. There are a range of activities that can help to reduce vulnerability to aid community and individual resilience before, during and after disasters and emergencies. These activities include setting of a risk profile and building standards, infill and retro-fitting existing development, and critical infrastructure.

While it is widely recognised that disaster resilience of communities and landscapes can be improved through better linkages between the community, the emergency management sector and people that work in the built environment, this potential is not yet fully realised.

Contemporary ideas around disaster resilience are generally holistic, and the built environment is now understood to be a core component that will interact with other enabling and inhibiting factors such as mitigation measures, social capital and socio-economic status of the community. These interactions can become barriers that inhibit the ability to determine and articulate the cost of the transfer of risk for the protection of life and property.

Throughout 2015-2017, emergency service agencies around Australia participated in workshops hosted by the Bushfire and Natural Hazards CRC to consider the major issues in natural hazards emergency management.

This publication on the built environment summarises the outcomes of one of these workshops and poses questions as a guide for a national research agenda in natural hazard emergency management.

Future challenges such as the changing frequency and intensity of natural disasters, increasing population density and urbanisation of the landscape will put the urban built environment under significant stress.

Population growth in the urban environment will result in either urban sprawl or an increase in urban densification, each with significant challenges for the emergency management sector and the built environment. Increased urban density equals greater pressure on public services and infrastructure that can be further intensified by an increasingly diverse population that may not always understand the inherent risks in the environment. Planned investment of resources will ensure that infrastructure is able to withstand pressure from multiple sources. However, this does not always occur leaving infrastructure and community vulnerable to different emergency events.

It is the intersection of challenges in the urban environment, where the communities risk exposure to a number of natural hazards such as floods, heatwave, and coastal inundation is significantly increased, that is complex and difficult. For example, a multi-storey residential complex will require significant community engagement, legislation, regulation, and operating procedures, such as evacuation, from government (at all levels) and the emergency services to establish just the minimal level of resilience in a residential community.

- **What does urban densification look like in Australia, now and in ten years' time?**
- **What is the impact of increased density in an urban environment on government and emergency services?**
- **What can government and the emergency management sector do to improve the resilience of communities in urban centres as population density increases?**

Building resilient buildings and infrastructure with all hazard protection would be a major contribution to helping the emergency services mitigate risk in the community.

A large proportion of the current building stock in Australia is brittle and susceptible to a number of different hazards, including fire, heatwave, and earthquake. Given the current trends for urban densification and greater exposure to risk as the frequency and intensity of events are expected to change, it is important that our building stock provides the community with appropriate protection from natural hazards.

Critical infrastructure such as water, power, oil, gas and communication, are integral to the working of our community. Critical infrastructure is under pressure not only from urban densification and sprawl but also many are also ageing and in need of upgrading and repair. Resilience in critical infrastructure is about maintaining connection in a natural disaster and the community having ongoing access to services, as any disruption is both socially and economically costly to the community.

There are a number of solutions to providing resilient buildings and infrastructure, for instance regulation and legislation, protection including the provision of hardened physical barriers and equipment and procedures such as sprinklers and smoke detectors and evacuation or shelter in place procedures. However, these solutions have a significant economic and social up-front cost to the community and/or Government.

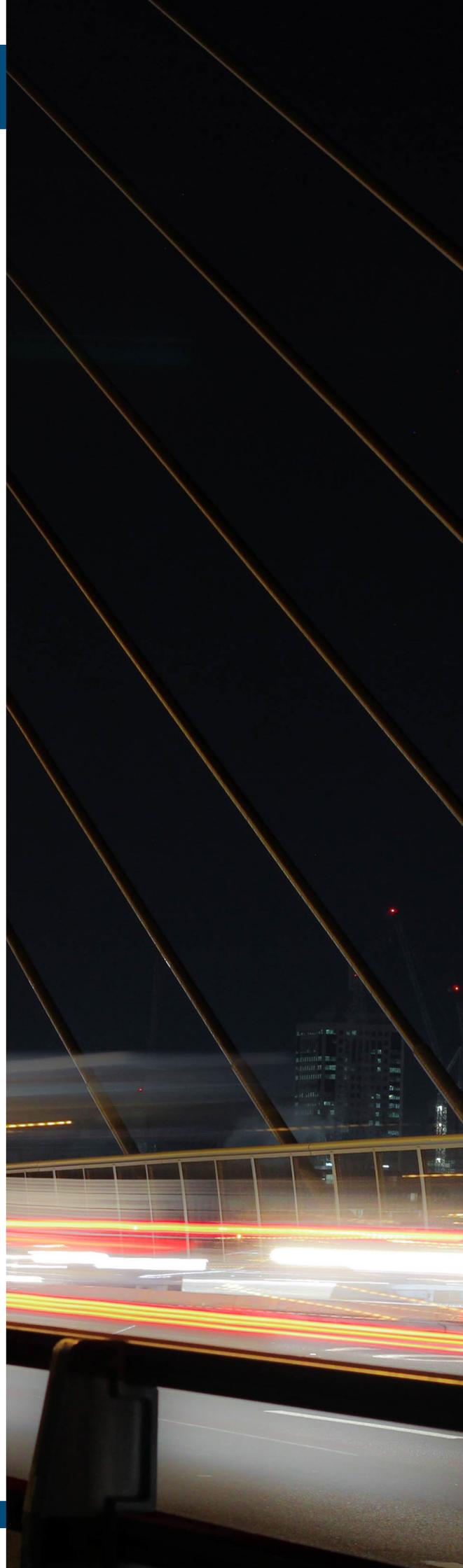
- **How vulnerable are our building stocks and critical infrastructure to natural disasters? Are there examples of resilient building and infrastructure, what can we learn from these cases?**
- **How can we harden and secure our critical infrastructure to be resilient to natural disasters?**
- **Does the Australian regulatory environment supports resilience building in Australia? How can we better leverage off standards and building codes?**

SHARING KNOWLEDGE BETWEEN COMMUNITY, INDUSTRY AND AGENCIES

Our government and emergency services are under increasing pressure to develop adaptive emergency management policy and procedures that can respond to current and future challenges to the built environment. Collaboration makes sense when there are increasing demands of government and emergency, coupled with austere fiscal arrangements. Collaboration provides opportunities for the emergency services to share resources and ideas and eliminate unintentional replication of services with the benefit of providing more perspectives to enable innovation and greater efficiency.

Collaboration requires a broad alignment of priorities in the built environment. This means community, emergency services, and all levels of government including regulation, legislation and planning, working together. Practically there are considerable hurdles that need to be overcome in order for this to work seamlessly. The sector could leverage the social and economic costs of a particular challenge, for example, climate change, to encourage all parties to work together to build resilience. However, this would require the development of a comprehensive risk model and evidence to support the economic and social benefits of risk mitigation. There are illustrations of working collaboratively from other countries such as Canada, Holland and New Zealand that have achieved this that provide some working examples.

- **What are the social and economic benefits of risk mitigation to natural hazards for the built environment?**
- **How can community, emergency agencies and government work together to plan strategically to build resilience?**
- **How can we build shared responsibility?**
 - o **Do we take the concept of community resilience which works well in a rural community to high density urban?**
 - o **Do we use emergency events to encourage community government and emergency agencies to understand shared responsibility?**
 - o **How do we deal with uncertainty and how do we build uncertainty of catastrophic events into our collaboration models?**





National research priorities for natural hazards emergency management

What are the most significant natural hazard emergency management issues Australia faces over the next 10 years?

This was the question posed to emergency service agencies around Australia in a series of workshops hosted by the Bushfire and Natural Hazards CRC from 2015-2017.

This publication is an outcome of one of these workshops and part of a broader national research agenda in natural hazards emergency management being developed by the CRC.

The workshops provided an exploration of major issues that would benefit from the support of research at a national level. There was no attempt to solve any of the issues or problems raised nor was there any discussion on the details of specific research projects. The participants discussed the issues they believed were relevant to the specific topic under discussion, the relative importance of the issues and the reasons underpinning their relative importance.

This series of publications summarises the outcomes of the workshops conducted so far – more will take place in 2017. They provide a guide for future research activities by identifying national priorities across major themes. The workshop outcomes have also influenced the evolving research agenda of the CRC.

This publication on the built environment has been developed with the assistance of the Australasian Fire and Emergency Service Authorities Council Built Environment Technical Group. This Group hosted the workshop in Melbourne and by video conference to all other Australian states on 20 April 2016.



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◆◆◆ CONTACT US

Bushfire and Natural Hazards CRC
Email: office@bnhcrc.com.au

