

Executive summary

Natural disasters including bushfires, floods, storms and cyclones have destructive and devastating consequences for Australia

The impacts of these disasters to businesses, properties and people have been substantial and are expected to grow as their intensity and frequency increase. In 2015, the total economic cost of natural disasters in Australia exceeded \$9 billion and is expected to rise to an average of \$33 billion per year by 2050 (Deloitte Access Economics, 2016).

Protecting lives and property is an enduring issue for Australians yet the opportunity remains to develop a national, long-term preventative approach to managing natural disasters. The Australian Business Roundtable for Disaster Resilience & Safer Communities was formed to work constructively with governments by contributing expertise, research and resources to fulfil this opportunity.

A major share of natural disaster costs arises from damage to critical infrastructure. This report estimates that \$17 billion (in present value terms) will need to be spent on the direct replacement of essential infrastructure between 2015 and 2050 due to natural disaster damage. Most of this cost will be borne by governments, and ultimately taxpayers, as owners of these assets. The cost of replacing damaged assets is comparable to the entire cost of establishing other large infrastructure projects. For example, the Inland Rail Project and Sydney Rapid Transit Project are estimated to cost \$10 billion each.

Beyond the direct costs of rebuilding, there are also substantial indirect costs associated with losing infrastructure services. The loss of such services affects businesses, communities and the broader economy via delays, interruption, financial losses, loss of customers and broader social impacts such as stress and anxiety. As such, the total cost of infrastructure damage is substantially higher than the direct replacement costs.

Resilient infrastructure plays a critical role in supporting communities to withstand, respond to and recover from natural disasters. More than \$60 billion worth of essential infrastructure was completed in 2014–15 (ABS, 2015a; 2015b). This could increase to \$142 billion per year by 2049–50, based on gross domestic product (GDP) growth forecasts. In present value terms, total spending on new critical infrastructure is projected to be \$1.1 trillion over this period. Despite the significant investment, this report shows that governments and business do not consistently consider the resilience of infrastructure when making investment decisions nor are there requirements to do so.

Both the Productivity Commission and Infrastructure Australia have highlighted the need to prioritise investments that can limit the extent of disaster damage.

- The Productivity Commission's *Natural Disaster Funding Arrangements* inquiry report (2015) revealed that 'Governments overinvest in post-disaster reconstruction and underinvest in mitigation that would limit the impact of natural disasters in the first place. As such, natural disaster costs have become a growing, unfunded liability for governments'
- Infrastructure Australia's *Australian Infrastructure Audit* report (2015) called for an increased focus on resilience and improving the maintenance of existing infrastructure, noting that 'The number and intensity of extreme weather events is increasingly likely to threaten certain infrastructure assets'.

In response to the Productivity Commission's *Public Infrastructure* inquiry report (2014), the Commonwealth (2014) has committed to improving project selection processes, including favouring projects that deliver long-term priorities. To achieve this, Infrastructure Australia has been given a role to develop and implement a best practice framework to evaluate projects. This includes 'determining a robust and consistent methodology for cost benefit analyses for all economic and social infrastructure'.

Planning for resilience has the potential to significantly reduce disaster costs. Most importantly, when considering a new project, there is a need to ensure risks associated with natural disasters are appropriately analysed and all options for resilience are considered during the decision-making process. The current reform agenda provides an invaluable opportunity to embed resilience in the planning process for significant infrastructure.

This report reviews the decision-making process for investing in new 'hard' infrastructure, including the various Commonwealth and state guidelines for comparing project options through cost-benefit analysis. It discusses the need to embed resilience into this process and offers practical steps to do so.

The focus is on hard infrastructure that provides essential services, including: roads, bridges, railways, ports, airports, school and hospitals as well as telecommunications, energy, water and sewage infrastructure.



Earth moving equipment was brought in to clear debris from the railway bridge after floodwaters receded in Grantham, west of Brisbane in Queensland. (Jon Hargest/Newspix)

Investment decision-making and resilience

Infrastructure planning requirements typically make little reference to resilience. Where references exist, there is a lack of supporting guidelines on how this should be achieved. There is an implicit assumption that land use planning, building codes and standards provide adequate requirements. Yet, for at least some assets, it is likely to be cost-effective to build to a higher level of resilience than these prerequisites mandate.

The decision-making process for building new infrastructure is often complex, requiring trade-offs between objectives within budget constraints. Cost-benefit analysis (CBA) is a key factor in the decision-making process and is used to prioritise options with the greatest net benefits.

Yet a review of the CBA guidelines applicable to infrastructure project appraisal reveals that, with the exception of Queensland's guideline to measure the benefits of flood-proofing transport infrastructure, there are no explicit guidelines for measuring the benefits of resilient infrastructure.

The economic case for change

Determining which (if any) resilience measures are appropriate before a natural disaster event and indeed before infrastructure is built is challenging. It requires a detailed ex-ante assessment of the likelihood of a hazard affecting a proposed asset and an analysis of the resilience options that could be implemented to mitigate disaster impacts.

Three ex-post case studies provided in this report demonstrate that infrastructure investment decisions would change if resilience was evaluated before initial investment approvals.

- **Loss of electricity services** caused by the 2007 Victoria bushfires cost the national economy \$234 million. While it is expensive to build underground transmission lines (\$11 million per kilometre), evidence indicates that there would be net benefits from this additional resilience measure in some high-risk areas, specifically where the likelihood of a similar event is greater than 5% per year (a one-in-20-year event).
- **Flooding of a state highway bridge** in regional New South Wales (NSW) has caused six major traffic disruptions since its construction in 1987. The cost of future events is estimated at \$75 million, totalling about \$92 million (in present value terms) over the projected life of the asset. This compares to an estimated replacement cost of \$7.4 million. The example highlights that the cost of minor disruptions to a local area can add up significantly over time.
- **Loss of telecommunications services** as a result of the Brisbane floods in 2011 cost users about \$1 million per day and Optus around \$1 million overall. The future cost of similar events is expected to be around \$9 million. In contrast, Optus has invested between \$3 and \$5 million to improve infrastructure resilience since 2011. The benefits exceed the costs of the measures implemented if the risk of a similar event occurring exceeds 4% (a one-in-25-year event).

In all three cases, greater investment in resilience would have more than paid off in terms of avoiding disaster costs.



A single loss-of-supply incident cost around **\$234 million**



Total bridge closure costs are estimated at **\$91.8 million**



Lost mobile services cost **\$1 million** a day during the Brisbane floods

Planning for resilient infrastructure

A number of limitations affect the capacity (and incentives) for government and industry decision-makers to invest in resilience for new and replacement infrastructure. These include complex cross-jurisdictional approval processes, intensive data requirements, limited technical capacity, a lack of specific guidelines for CBAs to include resilience benefits and inadequate references to resilience in appraisal processes.

To support the shift towards a system in which options for resilience are considered at the planning and decision-making stages in major infrastructure projects, this report offers:

- **Practical guidance** for practitioners to integrate resilience into the CBA process for proposed infrastructure
- **Five principles** for decision-makers (at all levels of government and business) to facilitate comprehensive integration of disaster resilience into infrastructure planning, appraisal and approval processes.

Decision-makers at all levels can embed resilience into infrastructure investment by integrating this practical guidance into their CBA frameworks and adopting these five principles in their planning and appraisal frameworks. The principles are summarised as below.

Figure i: Five principles for resilience in infrastructure planning



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Recommendations

This report offers three key recommendations:

1 Improve infrastructure planning processes: Integrate resilience in government and industry decision-making by adopting the principles for resilience in infrastructure planning.

A consistent approach by all stakeholders will ensure resilience becomes a mainstream component of strategic planning and investment in infrastructure, improving the effectiveness of these investments in providing essential services to Australian businesses and communities.

2 Improve incentives: Prioritise policy changes and funding arrangements that ensure disaster resilience has been considered and incorporated where appropriate into infrastructure planning.

All levels of government should update project appraisal frameworks to include criteria to demonstrate that resilience has been considered. These criteria will improve the robustness of infrastructure selection and generate greater long-term benefits for the Australian community. Industry will be motivated to consider resilience too, despite the higher costs often associated with doing so. Where appropriate, governments should also consider funding mechanisms that recognise resilience benefits to the broader community.

3 Improve capacity: Government and industry should work to strengthen the technical capacity of practitioners to identify, analyse and evaluate the costs and benefits of resilience options.

Technical capacity must be significantly improved to embed resilience in the infrastructure decision-making process. Sophisticated and data-intensive analysis is required to model natural disaster risks in local areas, and quantify the benefits of resilient infrastructure using CBA. This suggests a need for long-term investment in resilience education at the tertiary level and revisions to existing tools and guidelines for practitioners.

Importantly, the capacity to evaluate disaster risk and resilience relies heavily on the availability of and access to relevant data and research. The Roundtable supports recent policy initiatives to improve data access.

Conclusion

These recommendations will help to embed resilience in the decision-making process for new infrastructure. In turn, this will improve the cost-effectiveness of infrastructure spending and, more importantly, mitigate the devastating and costly impacts of disasters on businesses and communities.