Appendix B: Resilience international experience

International institutions

The number of people affected by natural disasters around the world has increased markedly over recent years. Over a two year period more than 450 million people were impacted by 700 natural disasters around the world. The cost of disasters has risen from an average of $20 billion each year during the 1990s to more than $100 billion each year by 2010–11. This dramatic increase is the result of the interaction between the rising number and increasing severity of events, with the concentration of people and infrastructure in high risk areas. Over the past few years of global economic instability, natural disasters have lowered economic growth and worsened fiscal balances (IMF, 2012).

In 2012 natural disasters cost US$160 billion. The majority of this was attributable to the United States. Losses in 2012 were significantly lower than in 2011 when natural disasters caused around US$400 billion worth of damage. The cost of damage caused by natural disasters in 2012 was around the 10 year average of US$165 billion.

Of greater significance is the number of people who lost their lives due to natural disasters. In 2012 alone, around 9,500 people died as a result of natural disasters (Munich Re, 2013).

There are a range of international frameworks that have been established which aim to reduce the impacts of natural disasters on communities, economies and the environment. These programs are primarily based around information sharing and disseminating guidance to national government and other interested stakeholders. In some circumstances financing is provided, particularly for developing countries facing high risk scenarios.

Established in 1999 the United Nations International Strategy for Disaster Reduction (UNISDR) has the primary goal of ensuring disaster risk reduction. The UNISDR coordinates disaster risk reduction and ensures that activities are aligned across the UN network. The UNISDR facilitates collaboration and information sharing amongst governments, international organisations and other stakeholders. The UNISDR organises a Global Platform for Disaster Risk Reduction every two years, this is a forum for exchanging information and builds awareness of disaster risk reduction (UNISDR, 2013).

Other programs include:

- PreventionWeb, a website for distributing information on disaster risk reduction
- Biennial Global Assessment Reports a global analysis of disaster risk (Productivity Commission, 2013).

The UNISDR program is premised on the strategic goals of the Hyogo Framework for Action (HFA) (2005-2015). The Hyogo framework, adopted in 2005, aims to substantially reduce losses from natural disasters by 2015. The framework outlines priorities to reduce losses from natural disasters and offers guidance and practical actions to achieving disaster risk reduction. PreventionWeb regularly publishes Hyogo Framework National Progress Reports. Australia's national report is prepared with the assistance of the Attorney General's department and outlines how Australia has committed to meeting the outcome of the framework.

The financial costs of natural disasters can exacerbate pre-existing social and economic conditions. Ensuring that economies are financially resilient is a key attribute to achieving national resilience to natural disasters. In recognising this in 2012 the OECD released a disaster risk assessment and financing framework. The methodological framework for disaster risk assessment and risk financing, is intended to help national finance ministries develop disaster risk management strategies, which focuses on disaster risk reduction and risk financing, rather than specific risk reduction policies (G20 & OECD, 2012). Key to this is the influence that strong financial management has in developing sound disaster risk management strategies. Australia has the potential to be a leader in these efforts.

Future activities could include:

- Developing a further understanding of budgeting for disasters, e.g. identifying, pricing and budgeting of contingent liabilities
- Considering mechanisms to enable sustained prevention and pre-disaster resilience investments (e.g. pre-disaster resilience funds), complementing the focus of the framework on the financial management of disaster losses
- Examining the potential impacts of disasters on financial infrastructure and systems, focusing on their sustainability and business continuity
- Building guidance and case studies for developing countries operating in extremely resource-scarce environments where people may be highly vulnerable to disasters and lack access to resources to mitigate impacts (OECD, 2012).

The International Monetary Fund (IMF) has emphasised the importance of a cooperative approach to building resilience to natural disasters. By providing financial support, policy support and risk management options the IMF helps national governments lay the foundation for economic recovery following disaster. The IMF achieves this by improving the coordination of multilateral institutions, bilateral donors, the authorities and civil society organisations which are intended to strengthen policy frameworks and improve resilience. There is however, considerable work to be done to improve donor coordination and international consultation which would focus on promoting donor assistance pre-disaster, that is funding for disaster risk reduction, which the IMF believes is likely to have a higher return than emergency assistance ex post (IMF, 2012). This action will strengthen disaster risk mitigation and build community resilience prior to disaster.

In recognising that adapting to climate change is one of the most fundamental challenges facing European territorial development, the European Commission has announced a package to advance action on adaptation to climate change in the European Union (EU). The strategy sets out a framework and mechanisms for taking the EU's preparedness for current and future climate impacts to a new level. The strategy is based around:

- **Promoting action by member states:** The EU Commission will encourage all member countries to adopt comprehensive adaptation strategies and will provide funding to assist members build their capacity to adapt
- **'Climate-proofing' action at EU level:** this will include promoting adaptation in vulnerable sectors as well as encouraging the use of insurance against natural and man-made disasters
- **Better informed decision-making:** the Commission will address information gaps and will continue to promote climate adaptation platform (Climate-ADAPT) as the 'one-stop shop' for adaptation information in Europe.

The Netherlands

Water management

More than 60% of the country and around two thirds of the population of the Netherlands is under sea level or at risk of flooding. The Dutch are keenly aware of the consequences of floods and the urgency to act to reduce the effects. Policies and programs, implemented at the national and local level, are focused on anticipating and minimising the effects of flooding.

Over the centuries the Dutch developed an elaborate system of levees designed to 'hold back' the water. Serious flooding in 1916 and again in 1953 highlighted that this policy was no longer appropriate. The decades long policy response to the 1953 flood was to implement a program of Delta Works. The program administered by the *Deltacommissie* focused on risk based approaches to flood protection which considered the probability and consequences of flooding (Deltacommissie, 2008). Specifically, the program guarded estuaries from storm surges, raised and strengthened levees, and included a program of floodplain management. The program cost around $13 billion over four decades.

Another series of serious flooding in 1993 and again in 1995 initiated a shift in policy away from flood control and towards making communities more resilient to floodwaters. The new policy emphasised a holistic approach to water management which identifies adaptation measures which consider water management issues more broadly including drought, flooding and water quality.

More recently The Deltacommissie focus is on building long-term resilience, through visionary, proactive and enabling policies (Wegner et at, 2012). Since 2007 the commitment to resilience has been most notable in the 'Room for Rivers' program. The 'Room for Rivers' program aims to ease flooding by giving waterways space to move and overflow, with pre-disaster resilience activities taking place at the municipality and national level. Each year the Dutch government spends around $1.3 billion on water control including the 'Room for Rivers' program, with local water boards, who have the rights to levy taxes from locals within the area, spending hundreds of millions more to maintain levees and canals (Statistics Netherlands, 2012).

There are many examples of a fragmented approach to water management in the Netherlands. The work of water management authorities is often limited to one part of the water system. While the Deltacommissie recognised the need for integrated and multi-functional land use projects, in practice there have been examples of a siloed approach to funding, the result of funding being directed only towards projects within a sector, instead of a whole of system approach. There are further conflicts within the system that are the result of issues between municipalities which are responsible for development planning and Water Boards some of which are incentivised to leave areas at risk of flooding undeveloped.

A fragmented approach to water management has the potential to cause irrevocable damage to those who are at risk. A coordinated response, which involves people at the local and national level, is necessary to ensure that communities are protected effectively.

Overall, the Dutch offer some practical examples for Australia of managing risks from floods including:

- The '*retain–store–drain*' and 'Room for the River' models could be implemented in Australia, these approaches would ensure that more land was allowed to flood by removing or setting back floodplain levees and would reduce the severity of flooding in affected areas
- There are advantages in the approach to land use where space is scarce, this strategy would provide an optimal outcome to stakeholders and encourage cost sharing of projects across jurisdictions.

The Dutch process of reviewing and preparing for natural disasters could also be implemented in Australia. Australia's review process has tended to be retrospective with a focus on past issues but this is not always effective in preparing for future disasters. The Dutch take a long term view, with a focus on future risks, when undertaking disaster reviews, Australia could benefit from having a similar approach to future reviews.

Insurance arrangements

Despite the improvements in flood protection over the last 60 years, flood risk in the Netherlands was generally considered uninsurable: most insurance companies in the Netherlands do not cover flood damage (Botzan W.J.W & van den Bergh J.C.J.M, 2006) and most of the country's homeowners do not have access to flood insurance. The Deltacommissie outlines the relationship between insurance and community resilience:

Lessons from the USA and the UK teach us that leaving responsibility to individuals does not always mean that they accept it … Flood protection often remains confined to local 'postage stamps' based on local cost-benefit considerations and so do not always form a consistent whole … Damage control and disaster management (and insurance) are better organised in countries with poorer levels of protection (and more frequent flooding). (Deltacommissie 2008).

The lack of private insurance has necessitated the Dutch government to provide compensation as an insurer of last resort. The Dutch government has recently attempted to stimulate the private insurance market by shifting risks to the private sector. However, private insurance coverage for floods remains limited.

In 2012, Neerlandse began offering flood insurance by assessing individual property owners, using a unique underwriting and risk assessment tool. The underwriting tool, which is available online for property owners to access, combines flood data from engineers with mapping technology to produce a risk assessment (Lloyds, 2013). Using this assessment a premium is determined for an individual property. This however, does not take into account resilience activities that individual property owners undertake. This does, however, demonstrate that insurance premiums which assess individual properties are possible.

The United States of America

Institutional arrangements

Like Australia, the United States of America faces threats from multiple natural disasters. In 2011 alone, President Obama issued 99 'major disaster declarations'[14]. Like Australia, the costs in the United States have been rising as a result of the increasing frequency and severity of events and the demographic shifts that are taking place. Significantly, some of the most expensive natural disasters in history have taken place in the United States within the last 10 years.

The Federal Emergency Management Authority (FEMA) is an agency within the Department of Homeland Security and is responsible for coordinating responses to natural disasters which overwhelm local authorities. This situation is similar to that found in Australia. In the United States preparedness and response to natural disasters are seen as part of responding to emergencies and disasters more broadly, both man-made and natural. Similar to the Attorney General's department in Australia the Department of Homeland Security is focused on national security as a primary concern. The policy outlined in section 5 suggests shifting the responsibility of responding to natural disasters to the Department of Prime Minister and Cabinet.

FEMA's Federal Insurance and Mitigation Administration (FIMA) is responsible for implementing a variety of programs which focus on:

- Analysing risk
- Reducing risk
- Insuring for flood risk.

FEMA also administers the Hazard Mitigation Assistance (HMA) grant programs which provide funding for activities that reduce disaster losses and protect life and property from future disaster damages. This program includes: Hazard Mitigation Grant Program; Pre-Disaster Mitigation; Flood Mitigation Assistance; Repetitive Flood Claims; and Severe Repetitive Loss.

Each state has a division of homeland security and emergency services and a Natural Hazard Mitigation Plans. The plans receive formal approval through FEMA, which allows states access to FEMA funding. For example, the New York State Office of Emergency Management (NYS OEM) is responsible for coordinating the activities of all the State's agencies to protect communities, and the environment from natural disasters and emergencies.

This includes offering assistance to local governments, voluntary organizations, and private industry with loss prevention, planning, technical support, and disaster recovery assistance.

Recently FEMA established the FEMA Think Tank. The Think Tank is intended to help FEMA understand best practice and to generate new ideas from the perspectives of the communities directly affected by natural disasters. The FEMA Think Tank brings together state and local governments and members of the public, including the private sector, the disability community, and the volunteer community.

The FEMA Think Tank has two main components:

- Online Forum which allows individuals to submit ideas, comment on others, and participate in conversations meant to generate solutions, about amongst other things mitigating against disaster.
- Monthly Conference Call Discussions: The Deputy Administrator Serino conducts monthly conference calls to discuss solutions and ideas that are generated by this online forum.

As recently as 6 February over 80 participants, including Secretary of Homeland Security, Janet Napolitano, participated in a Whole Community Discussion.

Funding

Over 2011 the Hazard Mitigation Assistance program provided $252 million for flood mitigation projects. In total over 2011, FEMA spent $2.9 billion on all activities which strengthened the United States ability to prevent, protect, respond to, recover from, and mitigate terrorist attacks, major disasters, and other emergencies (funding was for all natural and man-made disasters). Around $50 million of this was allocated to the National Pre-disaster Mitigation Fund. In contrast in 2011 alone, natural disasters caused around $14 billion worth of damage in the United States, far greater than the amount spent on resilience measures.

14 Disaster relief is a local responsibility, however the Australian Government will become involved when disasters are so severe that state and local governments are unable to respond and recover without federal assistance. Federal involvement takes place after the President declares a 'major disaster' following a formal request by a state government. (Wenger, 2012).

While it is not possible to say that resilience measures would have significantly reduced the costs of natural disasters, it is not unreasonable to expect that greater expenditure on mitigation activities prior to a disaster taking place, rather than expenditure after the fact is warranted.

There is some concern that voters value funding spent on recovery after an event, such as payments to individuals, rather than funding for mitigation activities prior to an event, such as funding for large scale community-wide projects, the benefits of which are not immediately recognised[15]. Specifically, Healy and Malhorta (2009) find that voters do not appear to value prevention measures at all. Direct payments may be contributing towards the imbalance between mitigation expenditure and recovery expenditure (Wegner, 2012).

Similar direct payments have been made in Australia following disasters. The Australian Government Disaster Recovery Payment was offered to all people affected by floods with payments totally $800 million. The value of having such a significant amount of funding spent after an event, rather than before, should be carefully considered. Specifically, Chapter 4 of this report recommends a higher quantum of funding be allocated to pre-disaster mitigation activities in order to reduce the cost of natural disasters to communities.

The current arrangements for emergency management in the United States demonstrate that governments are able to work with locals and businesses in communities to develop co-ordinated and appropriate responses to emergency management. However, what is also clear is that adequate funding for resilience measures, emergency response and recovery funding, is necessary to ensure the long term protection of communities.

The United Kingdom

Policy

Serious flooding, the Fuel Crisis in 2001 and the Foot-and-Mouth Disease outbreak in 2001 highlighted deficiencies in the United Kingdom's capacity to respond to disasters. As a result the Civil Contingencies Secretariat (CCS) was established in 2001. The CCS aims to improve the UK's preparedness for and response to disasters, both man-made and natural. Unlike Australia and the United States, in the UK the CCS sits within the Cabinet Office[16], and works with government departments and other key stakeholders.

The CCS has five objectives:

- Spotting trouble, assessing its nature and providing warning
- Being ready to respond
- Building greater resilience for the future
- Providing leadership and guidance to the resilience community
- Effective management.

Only two of these focus on activities prior to an event. Building greater resilience for the future covers activities which include delivery of resilience at the local and national level, as well as working with international organisations to build resilience capabilities. The CCS also aims to provide leadership and guidance to the resilience community; the Civil Contingencies Act is a key output of this objective. The Civil Contingencies Act is separated into two parts, local arrangements for civil protection and emergency powers. The former outlines the roles and responsibilities at a local level for emergency preparedness. The CCS is also currently working on developing a 'National Resilience Strategy'.

15 Other research has found that communities do value payments for mitigation activities. In a study of eight FEMA mitigation grants the National Institute of Building Sciences found that Interviewees in all communities thought the FEMA grants were important to reducing the communities risk to natural disasters and assisted in preventing future damage. Importantly, most of the people participating in the study felt that the grants provided additional benefits to their community than what could be readily measured.

16 The Cabinet Office supports the Prime Minister and Deputy Prime Minister.

Recent achievements in the area of disaster resilience of the CCS include:

- Establishing a national risk assessment process which, for the first time, takes a systematic and all-inclusive approach to risk analysis. The National Risk Register is designed to raise awareness of the risks faced by individuals and organisations, and importantly, encourages them to think about their own preparedness for disaster. This involves identifying risks over a five year period which assesses likelihood and impact and which forms the basis for decisions about disaster preparedness. After the risks are identified, the register then determines capability planning and funding arrangements
- Supporting the establishment of three new Resilience Emergency Divisions, these are managed by the Department of Communities and Local Government, and focus on facilitating communication between national and local government.

Severe flooding in the summer of 2007 pushed the issue of flood risk to the forefront of the policy debate in the United Kingdom. The Pitt Review undertaken in 2008 recommended immediate action from the UK government. Recommendations included restricting building in areas of high flood risk, and making flood risk assessments a mandatory part of Home Information Packs[17].

Currently the government does not have a complete understanding of expenditure on disaster preparedness in the UK. In the National progress report on the implementation of the Hyogo Framework for Action (2011–2013) released in March 2013, the ratio of budget allocation to risk reduction versus disaster relief was unknown. This is largely the result of the funding which is directed towards departments who are responsible for different risk, rather than one centralised agency.

Flooding and insurance

Almost three million homes in the United Kingdom face threat from floods. Flood risk insurance is currently provided under 'the Statement of Principles on the provision of flood insurance' as per the agreement between the Association of British Insurers and HM Government. The statement binds insurers to offer flood insurance to homes and small businesses where the risk of flooding is lower than a 1.3% AEP event (≈1 in 75 year) and where the property is already insured. For properties at a greater risk, insurance is available on the condition that flood defences are planned to be built to reduce the risk below that limit within five years.

Flood defence expenditure has been cut by 25% since 2010, while 294 schemes that should have received funding since then have yet to be started. As the Statement of Principles expired on July 1st 2013, the insurance industry wants to see more commitment from the government on spending on flood defences before it commits itself any further. The Department of Environment, Food and Rural Affairs has also intimated that if no settlement is reached between the insurance industry and the government, they would be willing to legislate in order to force insurers to provide flood insurance for those in high risk areas, at a fixed price.

17 Home Information Packs were a mandatory requirement, which were to be supplied by homeowners selling their homes. This has since been discontinued.

International cost benefit analysis

There is a paucity of available studies which examine the relative benefits of natural disaster resilience measures at an aggregate level. Primarily, the available evidence assesses the costs and benefits of individual resilience projects. Hence, this paper fills an important information gap, both in Australia and internationally, on the potential outcome of mitigation activities at an aggregate, or national, level.

Aggregate analysis

Rose et al., (2007), 'Benefit-Cost Analysis of Federal Emergency Management Agency (FEMA) Hazard Mitigation Grants' and Multi-hazard Mitigation Council 2005, 'Natural Hazard Mitigation Saves: An Independent Study to Assess the Future Savings from Mitigation Activities'.

- The report assessed the potential savings from FEMA hazard mitigation activities for earthquake, flood and wind hazards
- The overall results of the assessment indicate a benefit-cost ratio (BCR) of 4:1, that is, each dollar spent on hazard mitigation by FEMA provides around $4 of future benefits for the country
- There was variation across natural peril, with a ratio of 1.5:1 for earthquake mitigation, and 5.1:1 for flood mitigation
- A majority (95%) of the contribution to the net benefit ratio for floods was through an avoidance of losses to structures and contents, as a result of purchases (and demolitions) of homes in flood plains.

UNDP Maldives and Government of Maldives, 'Cost Benefit Study of Disaster Risk Mitigation Measures in Three Islands in the Maldives', 2009.

- CBA of three islands based on implementing risk management measures which would develop these into 'safer' islands
- Comparison between two scenarios: Hazards and their impacts on communities 'without' any Disaster Risk Reduction (DRR) measures, and the reduction in hazard impact 'with' DRR measures
- Findings are island specific, that is, they do not examine costs and benefits between islands, or on neighbouring islands
- Sensitivity analysis for each island was undertaken based on minimum hazard occurrence and maximum hazard occurrence
- Results varied from a Benefit-Cost Ratio (BCR) of 0.39 to 1.40 for Thinadhoo Island, a BCR of 0.28 to 1.0 for Viligili Island, and a BCR of 0.50 to 1.95 for Vilufushi Island.

UK Environment Agency 2009, 'Investing for the future'.

- Five investment scenarios were tested to assess how different levels of investment change the amount of flood and coastal mitigation measures
- Costs and benefits between 2011 and 2110 are assessed to analyse the long term results of investments
- Modelling includes the costs and benefits to manage coastal, tidal and river flooding and managing coastal erosion
- The Benefit Cost Ratio from different investment scenarios ranges from four to 11
- The net benefit to society, based on 100 year costs and benefits ranges from around £140 billion to more than £180 billion.

Individual project analysis

Mechler, R 'Cost-benefit Analysis of Natural Disaster Risk Management in Developing Countries', 2005.

This paper reviewed evidence of preventative disaster management measures that reduce or avoid impacts of natural disasters in developing countries.

Table B.1: Summary of evidence on net benefits of risk management projects

Project	Actual or potential benefits	Result
Hypothetical evaluation of benefits of retrofitting of a port in Dominica and school in Jamaica	Avoided reconstruction costs in one hurricane event	Benefit-cost ratio (BCR): 2.2–3.5
Appraisal of Argentinean Flood Protection Project. Construction of flood defence facilities and strengthening of national and provincial institutions for disaster management	Reduction in direct flood damages to homes, avoided expenses of evacuation and relocation	Internal rate of return (IRR): 20.4%
Research-oriented appraisal of integrated water management and flood protection scheme for Semarang, Indonesia	Reduction in direct and indirect economic impacts	BCR: 2.5
Ex-post evaluation of Rio Flood and Reconstruction and Prevention Project in Brazil. Construction of drainage infrastructure to break the cycle of periodic flooding	Annual benefits in terms of avoidance of residential property damages.	Internal rate of return (IRR): > 50%

Source: Mechler (2005)

Lessons for Australia

Experience with the full range of natural disasters makes Australia well placed to become a leader in developing safe and resilient communities. Currently disaster management encompasses the full range of emergencies, both natural and man-made. Australia can take a fresh approach by elevating the development of resilient and safer communities to the centre of government, as a separate issue to disaster management more broadly.

International experience demonstrates the importance of establishing an inclusive national framework for disaster management. Local on the ground activities should be supported through data sharing and information gathering facilitated at the national level by an organisation. This organisation should also coordinate activities across and between stakeholders to ensure alignment of a best practice approach all jurisdictions and stakeholders.

It is also clear that more funding for mitigation activities prior to disaster is needed, as part of this, Government needs to have a clear understanding of how much is spent on mitigation activities relative to relief expenditure.

Cost benefit analyses undertaken in similar developed countries demonstrate a clear positive outcome from investment in pre-disaster resilience measures, which are related to the analysis in Chapter 4. In particular, analysis of flood mitigation measures indicates significant benefits of investing in flood mitigation infrastructure. In the United Kingdom for each $1 invested in flood mitigation measures the benefits ranged from between $4 and $11, this was equivalent to savings of between £140 and £180. While in the United States the benefit cost ratio was around 5:1. These results are broadly similar to those obtained through the analysis undertaken for raising the Warragamba Dam wall (Chapter 4.2) which would reduce average flood costs by around 73%.