Hon Andrew Powell MP
Member for Glass House

Ref: CTS 08705/12

4 JUL 2012

Minister for Environment and Heritage Protection

Ms Wendy Craik
Commissioner
Barriers to Effective Climate Change Adaptation
Productivity Commission
LB2 Collins Street East
MELBOURNE VIC 8003

Dear Ms Craik

The Queensland Government is pleased to provide a submission in response to the Productivity Commission's Draft Inquiry Report into Barriers to Effective Climate Change Adaptation.

The attached response provides comment on a number of matters in the draft report, including:

- considerations for government in relation to private risk
- the importance of clarifying the policy role for the Commonwealth in adaptation
- the pros and cons of a 'real options' approach for managing risk and
- the opportunity to improve resilience through disaster recovery.

Queensland has a wealth of experience to contribute to this inquiry – from the destructive extreme events of 2010/11 and subsequent work of the Floods Commission of Inquiry and Queensland Reconstruction Authority, to other adaptation issues identified during the ongoing update to Queensland's adaptation strategy.

The recent climatic extremes experienced in Queensland over the past decade brings home the need to better plan for a more variable climate, based on the best science available.

Queensland looks forward to the Commission's final report in September and will consider its final recommendations in consultation with the Commonwealth and other States and Territories through the COAG Select Council on Climate Change.

I hope this information will be of assistance to you.

Yours sincerely

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Minister for Environment and Heritage Protection

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Queensland Government response to the Productivity Commission draft inquiry into *Barriers to Effective Climate Change Adaptation*

Introduction

Queensland welcomes the Productivity Commission's draft report into Barriers to Effective Climate Change Adaptation, as a timely contribution to an agenda in which Queensland holds a strong interest. Queensland notes the approach taken by the Commission: that there is a strong basis for reforms which address climate variability and vulnerability to current extreme events, that adaptation actions will generally be local actions, and that local governments, communities, businesses should be enabled and supported to manage their own risks.

This is particularly pertinent for Queensland, which is recognised as having a higher natural hazard risk profile than other Australian states. Despite uncertainties regarding the timing and extent of some aspects of future climate change, Queensland will continue to face significant risks from these hazards in the decades to come.

A key focus for the Queensland Government continues to be rebuilding following the devastating state-wide floods and Cyclone Yasi in 2010-11 as well as the significant flooding experienced in the 2011-12 summer. Through a range of programs led by the Queensland Reconstruction Authority (QRA), Queensland has demonstrated a best-practice approach to reconstruction, embracing the recovery effort as a cost-effective opportunity to improve resilience. On 7 June 2012 the Queensland Government committed to implementing the 177 recommendations of the Queensland Floods Commission of Inquiry Final Report to further improve preparedness for future events.

Building on the work of the QRA and the Floods Commission of Inquiry, in 2011 the Queensland Government also undertook extensive community and stakeholder consultation on the broader climate adaptation issues for Queensland. This consultation looked at issues spanning seven key sectors: human settlements (including land use planning), infrastructure, ecosystems, water supply, primary industries, human health and emergency management. Throughout 2012, the Queensland Government is considering potential responses to public feedback as part of an updated adaptation strategy for Queensland.

Through this work, the Queensland Government has a wealth of recent experience dealing with a number of the adaptation issues raised in the Productivity Commission's report. This includes the sufficiency of building codes and land use planning arrangements for extreme events and the importance of post-disaster recovery as an opportunity for cost-effective adaptation. Despite differences in the risk profile and regulatory and planning systems across Australia, these experiences are relevant to other jurisdictions. In many respects, disaster events of recent years have demonstrated that much of the challenge of preparing for future climate risks rests in adequately preparing for and responding to risks posed by our climate today.

Queensland's submission below outlines our key interests in this inquiry. It highlights the importance of clear roles and responsibilities for addressing barriers and discusses approaches to adaptation decision-making, including the pros and cons of the 'real options' approach. Furthermore, it emphasises the opportunity to build resilience through post-disaster recovery and the potential role of funding arrangements, such as the Natural Disaster Relief and Recovery Arrangements (NDRRA) and Natural Disaster Resilience Program (NDRP), in delivering cost-effective adaptation as well as for managing residual climate risk.

The following response is structured in three parts. The first part provides an overview of Queensland's general comments on the Commission's draft report, the second part provides our response to specific recommendations and the third, our response to the information requests.

General Comments

- **Roles and responsibilities for addressing barriers to adaptation**

Effectively addressing adaptation barriers requires clarity on roles and responsibilities both between government and private individuals and between levels of government. Queensland agrees that, to the extent it is possible and cost-effective, barriers should be removed to incentivise the private management of risk.

The draft report argues that privately held risk can be managed efficiently, subject to the removal of adaptation barriers. While acknowledging that distortions can occur from unwarranted government intervention in relation to privately held risk (i.e. the proposal to underwrite household insurance premiums in known hazard areas), it is suggested that the draft report assumes too great an ability for government to effectively disown risk in perpetuity. While the draft report identifies moral hazard as a relevant issue for Commonwealth-State natural disaster arrangements, moral hazard applies equally – if not more – to the question of the role of government in relation to private risk.

Governments' emergency management responsibilities and legal liability places limits on how much risk can be effectively discharged to private individuals. There is a strong community expectation that governments plan and take decisions in the interests of, not only their economic welfare, but also their safety. As such, governments carry a large amount of risk from future climate impacts for private goods to the extent that they impact the welfare and productivity of the community.

Furthermore, governments carry a large amount of risk for public goods and assets. Chapter 11 of the draft report discusses environmental and health services, critical areas of government responsibility which are likely to be significantly affected by climate changes. As discussed in chapter 3, these services are often 'public goods', likely to be undersupplied by the market, and may represent a 'barrier' to effective adaptation. It is suggested that recommendations be drafted from chapter 11 to emphasise the important role of governments in this area.

In addition, clearly defined roles and responsibilities between Local, State, and Commonwealth governments are necessary for addressing identified barriers. The report fails to adequately explore the appropriate policy role for the Commonwealth in adaptation and under 'Reform Priorities' (page 245), actually recommends a narrower role than that it is currently playing through the COAG Select Council on Climate Change (SCCC).

Queensland believes that the Commonwealth has an important and meaningful policy coordination role to play in adaptation, at least in the near term. Adaptation is a relatively new and complex whole-of-government public policy issue, and comprehension and understanding is generally poor. Like local governments, state government agencies vary in their capacity to effectively deal with adaptation issues. The dissemination of 'lessons learnt' from treating or responding to natural hazard risks through all levels of government and across jurisdictional boundaries is therefore important. In this context, and based on well-defined and agreed roles and responsibilities, the Commonwealth's continued leadership on this issue is welcomed.

An example of this is the Coastal Adaptation Decision Pathways Program (CAPP), developed by the Commonwealth in response to a lack of understanding regarding the practical complexities of coastal adaptation. Under this program it funded state governments, local government and other stakeholder groups to undertake projects across the country to pilot different adaptation decision-making methodologies in their communities, and actively facilitate the sharing of lessons between projects. It is unlikely that such a diverse range of case studies would have been undertaken concurrently had it not been for the Commonwealth's encouragement. Outcomes from these case studies will form a key input as the Queensland Government revisits the Queensland Coastal Plan in 2012.

Queensland will provide further input to discussions around appropriate Commonwealth-State responsibilities via its participation in the SCCC, and in its proposed adaptation strategy.

- **Cost-effective investment in adaptation**

Chapter 4 discusses the preferred timing and extent of investment in adaptation. The commission recommends that a 'real options' approach be taken for prioritising adaptation investment, due to the large amount of uncertainty involved in the timing and extent of climate impacts. The real options approach is well suited to adaptation decision-making which involves a range of stakeholders, creates winners and losers, and often has a political dimension. This decision-making approach inherently biases adaptation decisions which defer immediate action.

Funded through the Commonwealth CAP program, the Townsville Coastal Hazard Adaptation Strategy (CHAS) pilot project, being delivered in partnership between the Queensland Government, Townsville City Council and LGAQ, provides an example of the real options approach working 'on the ground'. It determines risk management options for areas projected to be affected by sea level rise and storm surge. This takes place in a highly complex decision-making framework – where policy direction is provided by the state, land use planning and financial responsibility lies with local government and coastal hazard risks are substantially privately held.

The methodological approach combined a Multi-Criteria Analysis and Cost Benefit Analysis to balance the consideration of economically quantifiable costs and benefits with other qualitative criteria. Importantly, the particular Cost Benefits Analysis methodology used for the Townsville project attempts to identify not only the Net Present Value of future investment decisions, but determine optimum time frames. This enables communities to continue to make productive use of existing development in hazard areas and deal with nuisance issues, only enacting an alternative plan once a trigger-point has been reached.

While the real options approach in essence seeks not to 'over-commit' resources to adaptation pending greater certainty, acceptance of uncertainty should not obscure that future climate risks may be very significant and potentially worse than anticipated. It also runs the risk that some beneficial actions will not be taken until it is too late. New investment decisions are being made everyday that will create 'path dependencies' for decades or even centuries into the future. While the 'real options' approach can maximise the productive use of sunk investments, it is essential that new investment decisions, that will create new path dependencies, take account of future climate risks.

By emphasising the 'real options' approach, the report also understates the potential risk and scale of the adaptation task. Although scientific uncertainty means that it is impossible to accurately project the future costs of climate to the Queensland economy, based on the economic impact of Queensland's recent natural disasters, it is clear that any escalation of climate risk in the future could have severe economic consequences. The QRA is currently administering a reconstruction program in excess of $12 billion related to disaster events from 2009 to 2012.

The cost effectiveness of adaptation measures to address future risk is clearly an important consideration. A recent study into the effectiveness of flood mitigation measures in Charleville in South-western Queensland demonstrated that the economic benefits drawn from those measures were two times the actual cost of the works, for a single flood event. If Charleville were again to be subject to other flood events in the future, the benefits of the works (and therefore the cost-effectiveness of those measures) would be concordantly greater.

The draft report fails to identify that uncertainty is itself a barrier to climate change adaptation, and therefore understates the importance of research for reducing this uncertainty. Queensland suggests that addressing uncertainty through research and pilot projects should be a higher priority role for the Commonwealth than as suggested in the draft report (page 246). In the context of financial constraints facing governments at all levels, the potential efficiencies of a centralised approach to funding science development should be emphasised.

Some recommendations in the draft report cannot be effectively implemented without greater scientific certainty. For example recommendation 8.2 that a work plan be developed to incorporate

climate change into the National Construction Code is at odds with the ABCB report *Possible Building Code Australia (BCA) Adaptation Measures for Climate Change* which found that:

> *"the latest climate change science indicates a high emissions scenario is likely in the medium to long term (2050-2100). Should this prove to be the case, the BCA will need to adapt in response to the high emissions scenario. Whatever the case, additional research and more reliable data will be required on specific climate impacts, such as cyclonic events and intense rainfall, to ensure that standards can be adequately reviewed to take account of longer term trends.* ***This further work is required before BCA changes can be justified in accordance with the COAG Principles.***"

- **Emergency Management and Adaptation**

No matter what level of action is taken to prepare and build resilience, some events may be so extreme that damage to community and economic infrastructure is unavoidable. For this reason, the Queensland Floods Commission of Inquiry focussed on the question of acceptable levels of risk. It found that differentiated levels of risk should be used in planning to determine the tolerable level of risk based on the proposed or existing use.

It is impractical, and often undesirable, to build for the worst case scenario. For example, the Q100 is embedded in the planning system to ensure buildings are safe from a 1 in 100 year flood event. However we accept that a 1 in 200 or 1 in 1000 year flood will impact our settlements so that we can benefit from the use of the space in meantime. In the future, some level of risk will be accepted as tolerable, just as today we accept some level of climate risk.

Tolerability of natural hazard risk is an important consideration in adaptation; in some cases it is appropriate to take an approach that empowers a community to live with natural hazards rather than insulating against all risks. In this context, accessible and affordable insurance markets, ongoing investment in emergency services, and appropriate Commonwealth-State disaster relief arrangements are vital complements to other adaptation policies.

The draft report recommends that the Commonwealth review the National Disaster Relief Arrangements (NDRRA) in the context of moral hazard issues. Insofar as these issues relate to the reinsurance of state government assets, they were the subject of a comprehensive inquiry by the Senate Economic Committee in 2010. The inquiry established that Queensland had a higher natural hazard risk profile than other states[1].

In response to the recommendations from that inquiry, and subsequent amendments to NDRRA, the Queensland Government has taken out reinsurance over all non-road assets. The policy covers State assets worth $53.6 billion for an annual premium in the range of $25 to $30 million. Investigations made through this process have confirmed that the insurance market cannot offer comprehensive insurance for Queensland's roads. Road repairs following future natural hazards can therefore only be funded from the State budget and through NDRRA.

Although the draft report focuses on the question of moral hazard in Commonwealth-State disaster relief arrangements, NDRRA remains vital because not all risk can be cost-effectively avoided. With moral hazard issues related to NDRRA already examined, the recommended NDRRA review could instead focus on how existing arrangements can be improved to ensure that recovery expenditure maximises future benefits.

Part of enhancing future benefits is to maintain a high level of governance control over NDRRA funds to ensure funding presents value for money and disaster related funds can be stretched as far as possible. The QRA has instigated an assessment and accountability framework which is ensuring that NDRRA funds are appropriately allocated and expended. Under arrangements put in place by the QRA, councils and State agencies are only paid on the actual cost of restoration/repair works. This is a staged process whereby each claim for repair of a damaged asset is assessed for eligibility under NDRRA guidelines and the proposed repair

[1] Parliament of Australia, 2011. Views on Queensland's insurance arrangements, http://www.aph.gov.au/Senate/committee/economics_ctte/state_gov_insurance_2011/report/c04.htm

methodology/costing is subject to a value for money assessment. Actual work delivered is also assessed against the scope of works approved, with any variations the responsibility of council.

By utilising a thorough value for money approach with effective governance, the QRA has avoided costs to the reconstruction program (i.e. savings) of roughly 1 in 5 dollars from submitted applications. In the context of a $12.2 billion program, this delivers large savings that can be better directed to other priorities.

The draft report finds that there is a lack of evidence on the effectiveness of the current NDRRA betterment provisions. However, the lack of applications made under these provisions, is in itself evidence of their inadequacy. The lack of a clear methodology for assessing betterment proposals, combined with the limited time available to execute the application process when critical infrastructure needs to be rebuilt, has posed a significant impediment to the use of this provision since 2007.

The report 'Building it Back Better' (Part 1 and Part 2 attached), prepared by the Queensland Government using Commonwealth funding, describes a proposed framework and methodology for preparing and assessing betterment proposals. Investment will be required to develop cost benefit models tailored for use in Australia. In the short term, however, criteria should be developed as an interim tool for assessing betterment proposals.

The imbalance of investment between recovery expenditure and pre-disaster expenditure is well recognised through government enquiries and reviews (e.g. O'Sullivan 2009[2]). This is exemplified by the disparate amounts of funding made available through the NDRP and NDRRA funding arrangements. The report should consider the benefits from increasing investment in resilience through programs such as the NDRP, to help mitigate future risks and reduce the demand on post-disaster recovery funding.

Recent experience in Queensland particularly during the 2012 South West flooding event has shown how mitigation can result in significant reconstruction and recovery cost savings. The expenditure on the Charleville mitigation works, undertaken at a cost of $28 million, has saved in excess of $50 million in potential NDRRA and associated recovery costs for the 2012 event alone, which was the second-highest event on record.

The Queensland Government recently announced its intention to increase the level of funding for mitigation measures. Through its Royalties for the Regions commitment, the Queensland Government has allocated $40 million in funding for a Floodplain Security Scheme to enable much need mitigation works to occur. The Queensland Government is seeking an equal contribution from the Commonwealth Government, as well commitments from local governments, to create a $100 million fund.

[2] O'Sullivan, J, 2009, Report on a review of disaster management legislation and policy in Queensland. Department of Community Safety, QLD.

Response to recommendations

Draft Recommendation 4.1
Reforms to address barriers to effective risk management in the current climate should be implemented without delay, where they are likely to deliver net benefits. In relation to barriers to adaptation to uncertain future climate trends, the case is less clear.

- ***Where a reform has low up-front costs and potentially large benefits, albeit with long time periods between the costs being incurred and the benefits being received, there could be a case for preparatory action. The case is likely to be stronger if the reform will deliver benefits under a range of climate change scenarios.***
- ***Where measures have high up-front costs, the community is likely to benefit by deferring high-cost options until better information becomes available.***

Response

It is suggested that this recommendation be amended to include: "*where future climate trends are uncertain, scientific research should be prioritised and coordinated to reduce this uncertainty to a level allowing costs and benefits of actions to be understood*".

Without investment in research to reduce the uncertainty about future climate, our selection of adaptation actions will remain sub-optimal and measures that could be beneficial investments may fail to occur in time. For example, research that reduces the uncertainty around rainfall projections would allow more timely and cost effective investment in land-use planning for new communities, taking account of future flood risk and water supply.

Adopting the "real options" approach involves acknowledgement that, due to the level of uncertainty, it is not presently possible to identify all cost-effective actions, and so there is a risk that some measures that would have been beneficial investments may fail to occur in time. It is appropriate to recognise and respond to this risk. Adoption of the "real options" approach should be explicitly linked to actions to reduce uncertainty through nationally coordinated research.

Chapter 5: Building adaptive capacity

Draft Recommendation 5.1
Australian governments should implement policies that help the community deal with the current climate by improving the flexibility of the economy. This would also build adaptive capacity for dealing with future climate change. This includes reforms to:

- ***taxes that influence the way resources are used, such as land tax exemptions and conveyancing duty, which could inhibit the mobility of labour, capital, or both***
- ***government transfers that reduce incentives to adjust to changing circumstances, such as the reforms recommended in the Commission's 2009 inquiry into drought support***
- ***regulations that impose unnecessary costs or inhibit competition or flexibility and could impede climate change adaptation by reducing the ability of firms, households or other organisations to respond to changing circumstances, such as restrictions to water trading.***

Response
Diverse local economies are more resilient to changes in climate and extreme events. It is therefore suggested this recommendation is amended to include: "Australia governments should implement policies that help the community deal with the current climate by improving the flexibility of the economy *and supporting the diversity and resilience of local economies*".

Chapter 6: Information provision

Draft Recommendation 6.1
The Australian Government initiative to improve the coordination and dissemination of flood-risk information should be expanded over time to encompass other natural hazards. Guidelines to improve the quality and consistency of risk information should be regularly updated and take climate change into account where feasible.

Response
It is essential that work to prepare flood-risk information is coordinated between governments. Previously, flood risk mapping efforts by the Australian government relating to sea level rise duplicated work being undertaken by the Queensland government and this proved unhelpful. This was exacerbated by the different approaches taken to mapping flood risk such as the resolution of the digital elevation model used and different sea level rise scenarios.

It is suggested that the national guidelines should consider the 'fit for purpose' approach to flood risk management developed by the QRA. It provides for a multi-level assessment dependent on likely consequences and local government resource capacity. This approach is set out in the Guidelines: *Planning for Stronger More Resilient Floodplains* – available at: http://qldreconstruction.org.au/publications-guides/land-use-planning/planning-for-stronger-more-resilient-flood-plains).

While Queensland supports the establishment of a national point of contact for flood mapping and for other natural hazards, it is suggested that greater barriers for local governments in conducting flood studies and disseminating mapping lie in:

- The cost of studies and the availability of funding for local governments
- The liability issues for local government, identified in chapter 7 of the draft report.

Chapter 7: Local government

Draft Recommendation 7.1
There is uncertainty about the roles and responsibilities for adaptation by local governments, including in the areas of land-use planning, coastal management, and emergency management. As a first step to clarifying these roles and responsibilities, state and Northern Territory governments should publish a comprehensive list of laws which delegate regulatory roles to local governments.
This would assist state, territory and local governments to assess whether local governments have the capacity to effectively discharge their roles.

Response
A comprehensive whole-of-government list or register of laws as recommended in the report does not currently exist in Queensland, beyond the Queensland Administrative Arrangements Order (No. 3) 2012 which records all Acts administered by State Ministers and relevant administrative units. Some individual agencies may have such a list or register in respect of legislation which they administer.

The development of such a register would be a significant whole-of-government task which would require specific resourcing for establishment and on-going maintenance. An assessment of the establishment and on-going maintenance costs and identification of the host agency would be required before Queensland could progress this initiative.

The Land Use Planning and Building Codes Taskforce has undertaken a national review of land use planning and building codes. This review provides insight into existing roles and responsibilities in dealing with natural hazards across each State and Territory jurisdiction.

Draft Recommendation 7.2
Uncertainty about the legal liability of local governments is emerging as a barrier to effective climate change adaptation. State and Northern Territory governments should clarify the legal liability of local governments regarding climate change adaptation matters and the processes required to manage that liability.

Response
These issues have long been identified by local governments as a significant barrier to effective planning for climate change adaptation and reform has consistently been called for by bodies such as Local Government Association of Queensland (LGAQ) and Council of Mayors of South East Queensland.

The Queensland Government has committed to implementation of all recommendations of the Flood Inquiry which include the following:

> *Recommendation 4.1*
> *The Queensland Government should:*
> a. *narrow the definition of 'development commitment' in State Planning Policy 1/03: Mitigating the Adverse Impacts of Flood, Bushfire and Landslide to ensure more development applications are assessed for compatibility with flood, and*
> b. *investigate whether the compensation provisions of the Sustainable Planning Act 2009 act as a deterrent to the inclusion of flood controls in a planning scheme and consider whether they ought be amended.*

Investigation has commenced to determine whether the compensation provisions of the Sustainable Planning Act 2009 ought to be amended.

Submissions from local governments, LGAQ and research organisations to an Issues Paper on Climate Change Adaptation, released in 2011, strongly supported the need for action to provide protection to local governments for measures taken to adapt to climate change. The Queensland Government is presently giving consideration to a program of climate change adaptation initiatives. These may include action to:

- ensure that local governments' potential injurious affection liability doesn't impede effective adaptation through local land use planning instruments; and
- provide exemption from civil liability to local governments taking action to adapt to climate change, similar to that provided in s733 of the NSW Local Government Act 1993.

Chapter 8: Planning and building regulation

Draft Recommendation 8.2
As a priority, the Building Ministers' Forum should ensure that the National Construction Code and associated standards (including those developed by Standards Australia) take climate change impacts into account. As soon as practicable:

- ***the Building Ministers' Forum should provide a formal response to the Australian Building Codes Board's 2010 review of the Building Code of Australia under climate change***
- ***the Australian Building Codes Board should develop a formal work program that outlines its approach to incorporating climate change in the National Construction Code over time. This work program should reflect any formal government response to the 2010 review of the Building Code of Australia.***

The Australian Government should give consideration to the public funding requirements for the Australian Building Codes Board and Standards Australia to undertake this work.

Response
With regard to incorporating climate change adaptation into the Australian Building Code, a recent Australian Building Code Board investigation found that for low to medium climate change projections, current building codes should be sufficient to manage climate risks. While the latest

climate science indicates a high emissions scenario is likely, additional research and more reliable date will be required before BCA changes can be justified.

Policy decisions on localised building regulation require considerable regulatory scrutiny. These requirements are being considered in Queensland in the context of floods and coastal hazards:

- Following the Queensland Floods Commission of Inquiry's Final Report, Queensland is developing a draft QDC part for the construction of buildings in flood hazard areas for adoption later this year (2012).
- With respect to some mitigation measures, such as minimum floor levels to deal with possible sea level rise, it may be appropriate to consider these at a localised level but only if considered in combination with land use requirements.

Following the 2010-11 floods and Tropical Cyclone Yasi, the QRA worked with Energex, Ergon Energy and Powerlink to produce a guideline relating to flood and cyclone risk and electrical infrastructure. The guideline aims to improve the resilience of electrical infrastructure as it relates to electricity distribution, land use planning, emergency planning and management, building and design.

The Authority, in partnership with James Cook University, CSIRO the Cassowary Coast Council and others also worked to develop a two part Guideline – Planning for a stronger, more resilient North Queensland to support areas affected by Severe Tropical Cyclone Yasi.

It was identified that there are no existing design and/or building standards related to storm surge. In response a guideline for Rebuilding in Storm Tide Prone Areas: Tully Heads and Hull Heads was developed, and JCU has sought support from Australian Building Codes Board to develop an Australian standard for building in storm surge areas. The second component is a guideline for Wind Resistant Housing.

Chapter 10: Emergency management

Draft Recommendation 10.1
The Australian Government should commission an independent public review of the Natural Disaster Relief and Recovery Arrangements. This review should commence as soon as possible and desirably produce a preliminary report by the end of October 2012. The review should consider whether the arrangements lead to inadequate infrastructure investments or insurance decisions, or reduce the incentives of state and territory governments to appropriately manage their risks. It should also examine alternative arrangements or funding models.

Response
The Queensland Government considers that one of the principal mechanisms to direct funding towards pre-disaster mitigation is by rebuilding damaged public assets to a more resilient standard. With the issues of moral hazard in relation to the NDRRA already addressed through responses to the Senate Economic Committee 2010 inquiry, the recommended NDRRA review should instead focus on how existing arrangements can be improved to ensure that recovery expenditure maximises future benefits.

The starting point should be a recognition that the primary purpose of NDRRA is to enable communities to get back on their feet after a disaster and to repair essential public assets. The current arrangements allow rapid responses on the ground after a disaster as councils have confidence that they will be reimbursed for expenses. Any review needs to maintain the close nexus that currently exists between actual damage and funding assistance.

As noted earlier, the QRA's enhanced governance structure for NDRRA assistance has avoided significant costs to the NDRRA program. Consideration of an approach, as suggested in the report, of a lump sum funding grants not tied to actual rebuilding costs presents a financial risk to the State and Commonwealth. Such an approach can also slow-down action on the ground while funding is being secured and may impede equitable distribution of disaster funding.

It is also recognised that a key component of recovery should involve building back multi-dimensional resilience which addresses the needs to make communities, the economy and environment more prepared for future extreme weather events.

To some extent this is occurring through the restoration process. Increased resilience is being achieved through the deployment of new technologies (such as more resilient road treatments) and consideration of current engineering standards in restoration works.

Using Commonwealth funding, the report 'Building it Back Better" has been prepared by Queensland to describe a proposed framework and methodology for preparing and assessing betterment proposals. This report has been submitted to the Commonwealth Attorney General's Department for consideration by the National Emergency Management Committee.

As such, the Queensland Government welcomes the review of the NDRRA to the extent that it focuses on how existing arrangements, (including NDRP and Australian Government Disaster Recovery Payment) can be improved to ensure that recovery expenditure maximises future benefits.

Chapter 13: Reform priorities

Draft Recommendation 13.1
The Australian Government should focus on national policy responses in areas such as emergency management, research and information provision. Existing agencies will have a role in managing policy responses in these areas.
The Council of Australian Governments' Select Council on Climate Change, and any successor, should coordinate policy responses in areas where cooperation between levels of government is required.

Response
Clear roles and responsibilities between Local, State, and Commonwealth governments are necessary for addressing identified barriers. The draft report identifies that effective adaptation actions will largely be implemented locally, and correctly identifies the need to better define the role of local governments and address gaps in their capacity.

However, with regard to the role of the Commonwealth, Queensland does not agree with the report's recommendation of a narrower role ('Reform Priorities' page 245) than is currently proposed through the COAG Select Council on Climate Change (SCCC). If accepted, the limited role for the Commonwealth proposed in the draft report may lead to its withdrawal from future funding for climate change adaptation programs by state and local government and for climate research beneficial to Queensland. Further to this, the importance of a flexible economy is highlighted in the draft report as essential for enabling effective adaptation, indicating an important role for the Commonwealth to ensure the ongoing productivity of the national economy.

The Commonwealth has an important role to play in providing funding support given existing vertical fiscal imbalances and where there is a rationale for providing national consistency across jurisdictional boundaries, for example, in relation to climate projections. Queensland will provide further input to discussions around appropriate Commonwealth – State responsibilities via its participation in the Select Committee on Climate Change (SCCC), and in its proposed adaptation strategy.

3. Response to information requests

Information request 6.1: Hazard risk information

Response:
The Floods Commission of Inquiry (FCoI) identified the need for improved flood risk disclosure. Recommendation 2.19 of the FCoI Report states:

> "The Queensland Government should consider implementing a mechanism by which prospective purchasers of property are alerted to the issue of flood risk. To that end, the Queensland Government should consider consulting the Real Estate Institute of Queensland and the Law Society of Queensland as to the appropriateness of amending standard contract conditions so as to include a 'subject to flood search' condition, or other means of achieving the same objective."

Queensland is investigating possible amendments to the *Property Agents and Motor Dealers Act 2000* to assist in streamlining the residential sales process, and this will include consideration of flood risk disclosure issues.

The Queensland Government has committed to commence drafting of legislative amendments to reduce real estate red tape by scrapping sustainability declarations and streamlining home sale contracts and statements.

Following feedback from local governments, research institutions and peak bodies on an Issues Paper released in 2011, the Government is also giving consideration to a program of climate adaptation initiatives. These may include action to ensure property purchasers are aware of a broader range of climate-related risks at time of sale and for local government to be responsible for making information on natural hazards publicly available.

The final report of the National Disaster Insurance Review reinforces the need for improved provision of flood risk information. The Commonwealth Government's commitment to establish a flood risk information portal to develop national guidelines, covering the collection, comparability and reporting of flood risk information will assist in addressing this issue.

Queensland has no specific information on the costs and risks that local governments may incur providing natural hazard risk information on rates notices. It is suggested that the LGAQ and individual local governments could more appropriately provide this information.

In terms of usefulness, one of the potential disadvantages associated with individual local governments providing natural hazard risk information on rates notices is the risk of a lack of consistency or uniformity. In terms of consistency and uniformity of the information provided, a better alternative may be the annual valuation notices issued in Queensland by the Department of Natural Resources and Mines.

The Queensland Government is undertaking consultation with the Queensland Law Society and the Real Estate Institute of Queensland regarding flood data records and mechanisms which will alert prospective purchasers of property to flood risk issues.

Information request 7.1: Local governments' legal liability

Response:
It is suggested that the report appears to conflate the two issues of injurious affection compensation liability and civil liability– box 7.5 on p135 contrasts Queensland's injurious affection compensation provisions with the NSW exemption from civil liability. These are separate sources of potential liability and this should be clarified in the text.

The provisions of the Civil Liability Act 2003 (Queensland) in relation the legal liability of public authorities (including local governments) are similar to the provisions of the Civil Liability Act 2002 (NSW). It is not clear if the Commission is aware of the provisions in the Queensland legislation.

Section 733 of the Local Government Act 1993 (New South Wales) would appear to provide to local governments wide-ranging exemptions for liability for a range of actions, including for example the carrying out of flood mitigation works. The issues covered by the exemptions from liability are much more extensive than issues relating to injurious affection compensation liability.

Information request 8.1: planning and building regulation – development approvals

Response:
It is currently unclear whether the *Sustainable Planning Act 2009 (Queensland)* allows local governments to approve trigger-bound development. It appears that time-bound development approvals may be issued, using conditions that "place a time limit on how long a lawful use may remain in place" (s346), however this may not cover uncertain timeframes associated with future "triggers" for the cessation of lawful uses, such as sea-level rise or erosion beyond a certain point.

The *Sustainable Planning Act 2009* conditioning powers are broad and are only limited in this context by the requirement that conditions be "relevant and reasonable". Conditions will be far more defensible if they are anchored in a clear policy framework – for example, any "trigger point" for sea level rise should be clearly stated in policy and founded upon accepted climate science.

The concept of rolling easements has not yet been thoroughly considered in the Australian context and Queensland considers there is benefit in further investigating their use. Similarly, novel land acquisition powers provided to the Queensland Reconstruction Authority may warrant broader use in addressing climate change risks.

It is not clear whether the discounting of risk due to other short term benefits has been sufficiently examined. For example, for every year that a house on the beach is not subject to storm tide inundation, it is providing benefits without any costs being materialised. How many times a generation, or a decade, or a year is flooding acceptable before it is intolerable and the costs outweigh the benefits? This is likely to differ between private and public infrastructure and will depend on the ability of the infrastructure to withstand associated adverse effects. These matters will affect whether adaptation actions are acceptable to community.

Information request 8.2: planning and building regulation – existing settlements

Response:
The Queensland Government and Townsville City Council are collaborating on a trial Coastal Hazard Adaptation Strategy (CHAS) for Townsville, to determine risk management options for areas projected to be affected by sea level rise and storm surge, in a process combining best available science with community consultation. The project will develop recommendations for the council to consider in future planning scheme reviews. This process serves as a pilot and a model for other coastal local governments.

Information request 8.3: planning and building regulation – gaps and overlaps

Response:
The Building Regulations should be amended to reflect housing design standards in coastal hazard areas in order for councils to regulate design mitigation options. Unless standards are set through a streamlined regulatory framework, building designers may become unwilling to sign off on development due to the risk of liability for vulnerability to climate change risks.

In 2011 the National Emergency Management Committee initiated a review under the National Disaster Resilience Strategy of land use planning and building codes to enhance disaster resilience in the built environment. It involved analysis of gaps, duplication and barriers in existing codes, to provide a roadmap for improvements in disaster resilience. This project will form an important contribution to the Productivity Commission in relation to adaptation barriers.

Building it back better

Part 1. Betterment imperatives and impediments

Factors affecting the preparation and assessment of applications for funding under the *Natural Disaster Relief and Recovery Arrangements* betterment provision

May 2012

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Disclaimer

An Australian Government Initiative

Building it back better is a two-part report that describes a proposed framework and methodology for preparing and assessing applications for funding under the Natural Disaster Relief and Recovery Arrangements (NDRRA) betterment provision.

Part 1: Betterment imperatives and impediments (this document) describes factors affecting the preparation and assessment of applications for funding under the NDRRA betterment provision.

Part 2: Betterment framework and methodology describes a proposed approach for the preparation and assessment of applications for funding under the NDRRA betterment provision

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Executive Summary

Australia has a long history of experiencing and withstanding natural disasters – from bushfires to flooding and cyclones. In 2010-11 and again in 2012, the prevalence and scale of these natural disasters have highlighted the spiralling impact and recovery costs of these serious events. In recognition of these increasing costs and the long-term detrimental effects on individuals and communities, the Commonwealth, State and Territory Governments have adopted a concerted program of policy reform through the Council of Australian Governments (COAG) to reduce immediate and long-term costs to the community and all levels of government by increasing the resilience of communities to natural disasters. Enhancing resilience through reducing the impact and downtime caused by natural disasters is a core element of this strategy.

The Natural Disaster Relief and Recovery Arrangements (NDRRA) Determination describes shared funding arrangements between the Commonwealth, States and Territories to enable individuals, communities and businesses to recover from the impact of natural disasters. In 2007, an additional funding mechanism was added to the NDRRA Determination to encourage jurisdictions to rebuild or restore destroyed or damaged essential public assets to a higher standard of disaster resilience than their pre-disaster state. Although this mechanism – commonly referred to as the 'betterment provision' – has existed since 2007, at the time of writing only one betterment proposal across Australia has been successfully developed and implemented under this provision. It is understood that a second proposal is being prepared.

In order for the Commonwealth to fund a betterment proposal under the NDRRA, it is necessary for a State, Territory or Local Government to demonstrate that the project is cost-effective, and increases the asset's disaster resilience – thereby mitigating against future impacts[1]. Although these requirements are simply stated, the absence of significant funding allocated to betterment projects over the past five years points to significant impediments to the successful use of the NDRRA betterment provision and insufficient implementation of COAG goals to achieve greater community resilience to natural disasters. The following six intersecting factors have been identified here as impediments to making an application for betterment funding under NDRRA:

1. underdeveloped administrative and technical processes for project evaluation;
2. criticality of time;
3. ambiguous cost-sharing arrangements;
4. extent of available funding;
5. non-uniform guidelines; and
6. absence of context.

To address these impediments, this discussion paper states the case for the establishment of a cost-benefit framework and methodology to guide the timely preparation and assessment of cost-effective NDRRA betterment applications. This will enable governments at all levels to significantly increase the resilience of essential public assets – and thus the resilience of Australian communities – to natural disasters. Broader and timely implementation of the NDRRA betterment provision will help to markedly reduce the future burden of natural disasters.

1 NDRRA Determination cl.3.6.6 c) and cl.3.6.6 d)

1 Introduction

Achievement of greater community resilience is a shared responsibility between governments, communities, businesses and individuals (NSDR 2011, p.3). However, governments inevitably play the lead role in preparing for and managing the response to disasters when they occur, and of recovery and reconstruction efforts in their aftermath. Consistent with the recommendations of the *Natural Disasters in Australia: Reforming Mitigation, Relief and Recovery, 2002*, (discussed in section 2.2) and the general acceptance that restoring infrastructure to an even higher standard than contemporary standards can increase its resilience to the effects of future natural disasters and result in savings in future rebuilding costs (Rose et al. 2006), in 2007 the 'betterment provision' was included as part of NDRRA Category B.

The NDRRA Category B emergency assistance measure allows for the restoration or replacement to pre-disaster standard, of publicly owned infrastructure damaged as a direct result of a natural disaster. Under Category B essential public assets may be restored or replaced to their pre-disaster standard in accordance with contemporary engineering standards and building codes, while maintaining the same (i.e. pre-existing) asset class and resilience level. The betterment provision was introduced as a disaster resilience enhancement policy and included to allow a cost sharing arrangement with the Commonwealth to rebuild or repair damaged essential public assets to a better than pre-disaster standard. Through application of the betterment provision, States and Territories were encouraged to 'build back better' with an eye on future cost savings. Rebuild or repair costs are typically higher in the first instance when betterment is conducted, but lower after future disasters (of a like type and magnitude), as the strengthened infrastructure is better able to withstand these events and consequently requires fewer and/or less extensive repairs (Rose et al. 2006).

'Betterment' is defined here within the context of the NDRRA, i.e. restoration of a damaged essential public asset to a standard *better* than contemporary building standards in order to improve the asset's resilience to withstand the economic and social impacts of future natural disasters of a particular type, severity, and frequency of occurrence. In this report, the financial cost of betterment represents the portion of project expenditure that is *additional* to the cost of restoration to pre-disaster standard (referred to here as the 'base case'). That being said, betterment cannot be undertaken without the costs of the base case being met, thus betterment options for an asset can only be compared against the base case.

As illustrated by Figure 1 the betterment provision provides a link between recovery from the effects of natural disasters, and prevention and mitigation of future disasters. Aligning national natural disaster policy with the cyclical prevention, preparedness, response, and recovery (PPRR) framework gives further insight into the policy intent of betterment.

In the four phases of disaster management planning in Australia – the NDRP[2] focuses funding on the prevention and preparedness phases and the NDRRA program focuses funding on the response and recovery phases. The NDRRA betterment provision, whilst generally considered during the recovery phase, is arguably more appropriately aligned with the prevention stage.

Although the NDRRA provision has been available since 2007, to date there has only been one successful application for betterment funding under NDRRA. To date there has only been one successful application for betterment funding under NDRRA. The Tumut Shire Council's application to relocate the Adelong Swimming Pool was approved by the Commonwealth in August 2011. The Council received $0.778 million in NDRRA betterment provision funding, representing one-third of the total project cost, with the remaining two-thirds being divided between New South Wales Government and Tumut Shire Council (Australian Senate Debate 2011). At the time of writing a second proposal is under assessment, in relation to the North West Coastal Highway in the Gascoyne Region of Western Australia.

The Productivity Commission has also recently noted that current NDRRA betterment provision is rarely used and may discourage states and territories from improving the design, location or objectives of infrastructure .

This discussion paper identifies impediments to applying for funding under the provision and states the case for a cost-benefit framework and methodology designed to assist Australian States and Territories in making applications for betterment funding under NDRRA.

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2 NDRP is just one example of a source of funding for mitigation / resilience related initiatives. There is also the National Emergency Management Program (NEMP) which provides funding for resilience based projects with national applicability but is a very small pool of funding (approximately $4 million per annum nationwide).

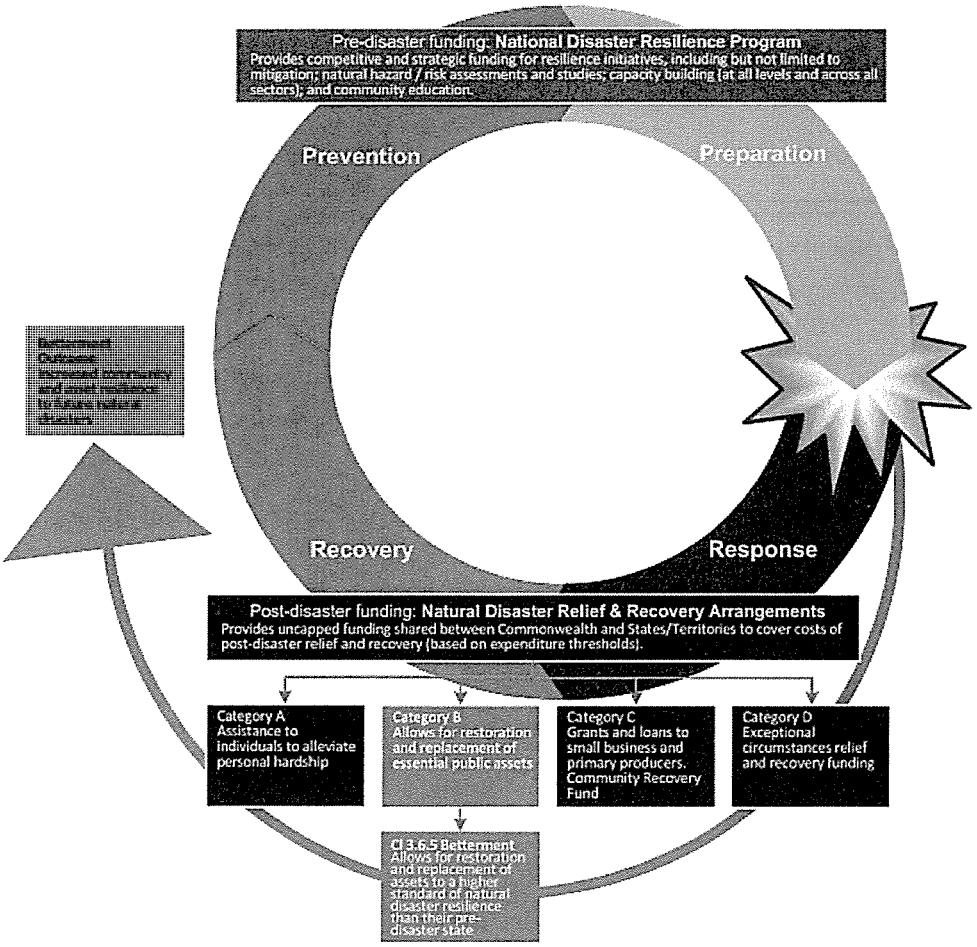

Figure 1: Betterment as the link between Prevention / Preparedness (NDRP) and Response / Recovery (NDRRA)

2 Background

2.1 Upward trends in disasters and disaster costs

In the last decade, Australia has experienced a series of large-scale, severe natural disasters including catastrophic bushfires, widespread and repeated flooding, cyclones and storms. The threat of natural disasters is also likely to be exacerbated by climate change as weather patterns become less predictable and more extreme (COAG 2009), combined with socio-economic developments such as increased density of settlements, population increase, and the increased numbers of settlements in coastal areas (Latham, McCourt and Larkin 2010).

The prodigious natural disasters of 2010-11 and 2012 across Australia, particularly in relation to flood and cyclone events, resulted in an unprecedented number of essential public assets destroyed and damaged. The frequency, severity and costs of natural disasters worldwide has markedly increased over the past 50 years and is expected to continue increasing in the future (Munich RE 2010a, Latham, McCourt & Larkin 2010). Figure 2 provides a visual depiction of this upward cost trend.

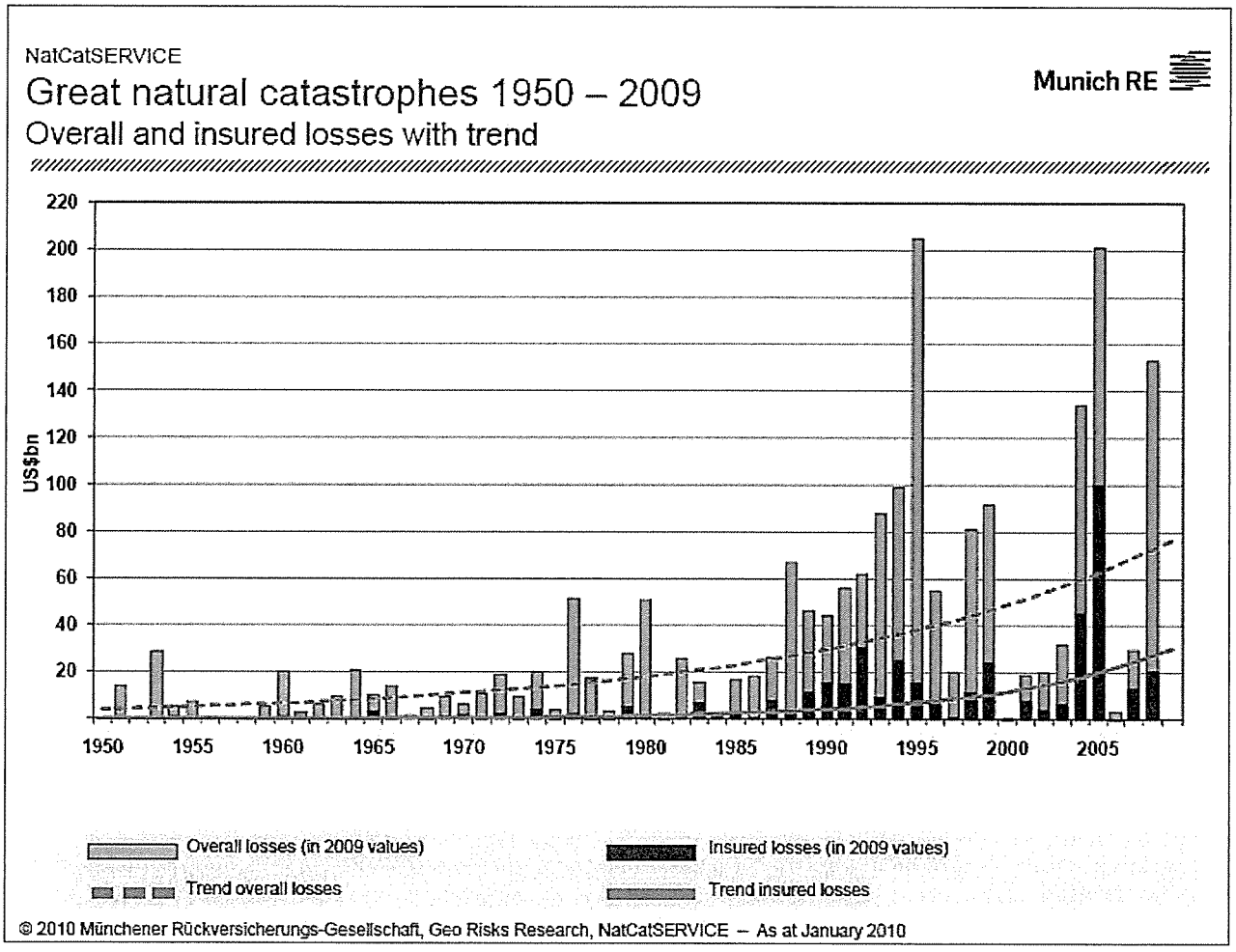

Figure 2: Great natural catastrophes 1950 – 2009: Overall and insured losses with trend (Munich RE 2010b)

This trend raises the question of how sustainable it is to continue investing money into restoring assets repeatedly damaged by natural disasters and whether there is a more cost-effective solution. Therefore, it is timely to reassess the merits of betterment, particularly in relation to application of the betterment provision under the Natural Disaster Relief and Recovery Arrangements (NDRRA). Already, in accordance with contemporary building standards, a restored asset will invariably attain a higher standard than that of the previous structure. In this report however, adherence to betterment principles means restoring an asset to a standard *even higher* than contemporary building standards, to make it more resilient to the types of natural disasters to which it is susceptible.

The Australia-wide natural disaster events of 2010-11 offer insights into the potential claims to restore and replace eligible public assets under the NDRRA betterment provision. The Australian Local Government Association (ALGA)

reports that more than 280 Local Government authorities across five States experienced significant damage, some on more than one occasion, to community infrastructure and assets (ALGA 2011b). ALGA has also noted the imbalance between recovery and mitigation / resilience funding, describing the current levels of funding for potential mitigation measures as 'clearly inadequate compared with the scale of damage and substantial returns for mitigation investments' (ALGA 2011b, p.15).

2.2 Natural disaster policy context

Concurrently, Australian Governments at all levels have collaborated to introduce policy reforms aimed at reducing the growing cost of natural disasters and the impacts that extreme weather events have on individuals, communities, assets, the economy and the environment.

In June 2001, the Council of Australian Governments (COAG) commissioned a review of Australia's approach to dealing with natural disasters. A high level officials group report, *Natural Disasters in Australia: Reforming Mitigation, Relief and Recovery, 2002* made a number of recommendations designed 'to reform the way Australia manages natural disasters and achieve safer, more sustainable communities and regions in economic, social and environmental terms...' (2002, p vi).

Of most relevance is Recommendation 6, which was given in-principle approval by COAG in December 2003:

> *Reduce the problem of public infrastructure repeatedly damaged by natural disasters through cost-effective mitigation measures to make infrastructure more resilient, where feasible, by pro-active measures under the Disaster Mitigation Australia Package, and post-disaster under the Commonwealth Natural Disaster Relief Arrangements* (2002, p vii).

The COAG review recommended a new Disaster Mitigation Australia Package (DMAP) acknowledging that one of the key strategies for reducing the social, environmental and economic impacts of natural disaster is to increase investment in hazard mitigation. This is supported by evidence that indicates the considerable economic costs of disasters may be alleviated through investment in projects that are designed to mitigate their impacts. In an Australian context, economic research shows that flood mitigation can provide up to a 3:1 return on investment through avoided response and recovery costs (Bureau of Transport Economics (BTRE) 2002). In the United States, disaster mitigation investment has been shown to provide a 4:1 return on investment (Rose et al. 2006).

Although integral to avoiding or reducing the physical impacts of natural disasters, Australian Governments recognised that mitigation alone does not increase the capacity of individuals, communities or institutions to withstand or recover from a disruptive event. This flagged a policy shift from mitigation to the concept of 'resilience', culminating in December 2009 with COAG agreeing to adopt a whole-of-nation resilience-based approach to disaster management, which recognises a national, coordinated and cooperative effort is needed to enhance Australia's capacity to prevent, prepare for, respond to, and recover from disasters.

2.2.1 National Strategy for Disaster Resilience

The National Strategy for Disaster Resilience (NSDR) was developed and adopted by COAG on 13 February 2011 as the leading strategy for providing high-level guidance to all tiers of government, business and community leaders, and the not-for-profit sector, for building disaster-resilient communities across Australia (COAG 2011a).

The NSDR acknowledges the increasing frequency and severity of natural hazard events and the escalating costs of disaster recovery in Australia, underscoring the importance of COAG's long-term commitment to the strategic policy intent. The NSDR also notes that a community with a high level of resilience is better able to withstand a crisis and better placed to recover from associated impacts (COAG 2011a, p.5).

The NSDR does not define disaster resilience *per se* and instead focuses on the common characteristics of disaster resilient communities, individuals and organisations, which include functioning well while under stress; successful adaptation; self-reliance; and social capacity. The NSDR also emphasises that critical infrastructure and essential services are fundamental to the ability of individuals, communities, businesses and governments to recover from an adverse event such as a natural disaster. It identifies reducing risks in the built environment as one of the key actions that can be taken to increase resilience and highlights the unique opportunities available post-disaster to achieve more resilient infrastructure and assets:

> *Following a disaster, recovery efforts may require significant infrastructure reconstruction. Building public and private infrastructure to a more resilient standard, if appropriate, taking into account cost-benefit and other considerations, will reduce the need for significant expenditure on recovery in the future* (p.12).

Although other policy instruments such as building codes, land-use planning, design standards and other regulatory mechanisms promote resilient infrastructure and assets, the NSDR focuses on priority areas to build disaster resilience

and has identified the need for recovery efforts to consider the rebuilding of infrastructure to a more disaster-resilient standard as one way of mitigating the impacts of future disasters as well as reducing costs in the longer term (2011).

2.2.2 The NDRRA and the NPA on Natural Disaster Resilience

In addition to the NSDR there are two key national policy instruments dealing with natural disasters – the NDRRA, and the National Partnership Agreement on Natural Disaster Resilience (NPA-NDR) (COAG 2011b), under which sits the Natural Disaster Resilience Program (NDRP).

NDRRA funding is practically uncapped once activated; curbed only by the jurisdiction's financial resources. The arrangements provide for the Commonwealth to reimburse States and Territories for a proportion of expenditure incurred as a result of a natural disaster (as defined under cl.2.1 of the Determination), including funds directed towards the restoration of essential public assets. The Determination sets out cost-sharing arrangements between the Commonwealth, State and Territory Governments to recover the costs of natural disasters, including damage to Local Government assets and is contingent on assessments by jurisdictions that the disaster has or will exceed relief and recovery costs of $240,000 plus CPI (Determination clauses.5.4 and 5.5).

Once State expenditure reaches the first of two predetermined thresholds[3], the Commonwealth contributes to the costs of a natural disaster on a 50:50 basis shared with the jurisdiction. Upon reaching the second threshold, the Commonwealth-State contribution is 75:25. NDRRA assistance from the Commonwealth is vital to the recovery of States and Territories following a natural disaster. In 2009-10 the Commonwealth reimbursed $118.284 million to States and Territories through NDRRA (AGD 2010a).

Unlike NDRRA, NDRP is a limited pool of funding under the NPA-NDR. The NPA-NDR stipulates the arrangements for NDRP funding – including quantum – which is provided by the Commonwealth Government and matched on an equal basis by the State or Territory Government. With the NPA-NDR due to expire 30 June 2013, the 2012-13 round of NDRP is the fourth and last under the current provisions. The program, like the NPA-NDR itself, is presently under review.

Significantly, funding for resilience measures under NDRP is a fraction of the disaster recovery expenditure through NDRRA, estimated at approximately one tenth per annum[4]. In Queensland, there was approximately $10 million available to fund resilience measures under each of the 2010-11 and 2011-12 Rounds of NDRP. The Queensland Reconstruction Authority has recently forecast that NDRRA expenditure alone for the restoration of essential State and Local Government Infrastructure following the flood and cyclone events of 2010-11, will cost $7.5 billion (Queensland Reconstruction Authority 2012, p.44).

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3 The threshold formula is based on defined percentages of the jurisdiction's total government sector revenue and grants in a specified financial year as provided by the Australian Bureau of Statistics (cl.5.7 of the Determination).

4 Based on 2006-07 estimates (Commonwealth Grants Commission 2011)

3 Betterment

3.1 The case for betterment

The betterment approach to reconstruction is predicated on the potential for long-term cost savings. It embraces the rationale that an upfront increase in asset / infrastructure investment will provide significant future savings in terms of rebuilding or replacement costs and consequent economic losses in the event of a damaging natural disaster in the future. Repairs and restoration of damaged infrastructure and public assets are the most significant component of the cost of natural disaster events. A study of 5,500 mitigation grants approved by the United States Federal Emergency Management Agency (FEMA) between 1993 and 2003 report an overall benefit-cost ratio of 4:1 (Rose et al. 2006).

The significance for making this distinction between the total project cost (i.e. betterment component plus base case component), and the betterment component itself is relevant in all estimates and calculations for development of the strategic business case, proposal prioritisation, and preparation of the detailed appraisal. It is also relevant to determining the NDRRA shared funding arrangements between the Commonwealth and States and Territories for the betterment proposal (refer 3.2.1.3).

For example, a busy rural highway that is flooded in most years and not passable for a week or more each time, creates significant community disruption. Commercial and private motor vehicles must make long diversions (potentially of several hundred kilometres) while the road is out of commission. The economic and social costs to business and the community of such disruptions are considerable. In this example, the base case would be restoration of the road to its pre-disaster standard each time it is flooded. Given its predisposition to flooding, history indicates that within 12 to 24 months the road will be both impassable and require subsequent repair as a result of flooding.[5]

Alternatively, betterment options may include raising the road, rerouting the road, or even building a bridge to make the road more resilient to this regular level of flooding. Arguably, this will minimise potential traffic disruptions due to road closures and their associated costs as a result of flooding (of this magnitude). The case for betterment thus takes into account the incremental costs and benefits of the betterment option/s versus the restoration option (base case). However, the feasibility of each betterment option will depend on a number of factors, not least of which being the cost-effectiveness and available funding. Whilst greater disaster resilience would be the goal typically, it will come at a price that may not a worthwhile jurisdictional investment for – it may even be cheaper (on a purely dollar basis), to simply accept that the road will invariably be cut at some point each year, and to continue restoring the road to the same pre-disaster standard.

Beyond financial considerations, the NSDR notes there is a strong link between development of community disaster resilience and implementation of risk reduction strategies, including the building of public assets to withstand the range of risks and hazards identified in a community's risk and hazard profile. Strengthening a public asset so that during or directly following a natural disaster it remains operational, or is non-operational for a shorter period, is a core element to enhancing a community's resilience, and an example of the broader social benefits that can be achieved through asset betterment.

The considerations relevant to making a decision whether to better an essential public asset or not, are further discussed in the betterment framework and methodology within this report (refer Chapter 4).

The expected increase in frequency and severity of natural disasters is one of the strongest arguments for betterment versus simply restoring the asset. Replacing an essential public asset on a like-with-like basis[6] after disaster events such as those experienced over summer 2010-11, invites the prospect of having to replace it yet again should a disaster of the same type and similar magnitude occur. Prudent financial considerations alone strongly support betterment investment, where cost-saving benefits clearly demonstrate value-for-money and the investment is financially practicable.

If mitigation is estimated to provide a return on investment between 3:1 and 4:1 for every dollar spent, there is a financial incentive to shift the balance from expenditure on post-disaster restoration to pre-disaster mitigation. For damaged essential public assets, this means investment in betterment – that is, rebuilding to mitigate against similar natural disasters in the future.

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5 Note that even if there is minimal damage to the road, the duration and cost of the road's outage is likely to extend beyond the period that it is impassable due to floodwaters, i.e. to avoid additional damage, the road may not be opened immediately to commercial traffic once floodwaters recede.

6 Albeit rebuilt to contemporary and therefore higher building standards.

3.2 Formal requirements of the NDRRA betterment provision

Clause 3.6.6 of the Determination specifies the conditions under which betterment of an asset will be considered an eligible NDRRA measure:

a) the asset is an essential public asset; and

b) the State informs the Secretary of the Commonwealth Attorney-General's Department of its decision to restore the asset to a more disaster-resilient standard, and of its reasons for doing so; and

c) the Secretary is satisfied with the cost-effectiveness of the proposal; and

d) the Secretary is satisfied that the increased disaster-resilience of the asset will mitigate the impact of future natural disasters.

Sub-clause a) specifies that the asset must be an essential public asset, defined under cl.3.6.1 as follows:

An essential public asset is an asset of an eligible undertaking that, in the judgment of the State concerned:

a) is an integral and necessary part of the State's infrastructure; and

b) would, if lost or damaged, severely disrupt the normal functioning of a community; and

c) would, if lost or damaged, be restored or replaced as a matter of urgency.

Sub-clause 3.6.6 b) is an important procedural requirement. It specifies that the State must inform the Secretary of a decision to restore the asset to a more disaster-resilient standard and the reasons for doing so. Priority setting in respect of essential public assets is thus to be determined by State and Territory Governments.

Finally, sub-clauses 3.6.6 c) and d) require the Secretary to be *satisfied* that the proposal meets certain criteria, although there are no clear guidelines regarding the requirements to be undertaken in order to achieve this.

3.2.1 Impediments to applying the NDRRA betterment provision

The betterment provision has been available since 2007. Although all tiers of government have considered opportunities for use of this provision, preparing a satisfactory business case to support a betterment proposal in a timely fashion has proved challenging.

Six intersecting factors have been identified as impediments to making an application for betterment funding under NDRRA:

1. underdeveloped administrative and technical processes for project evaluation
2. criticality of time;
3. ambiguous cost-sharing arrangements;
4. extent of available funding;
5. non-uniform guidelines; and
6. absence of context.

These impediments fall into two major categories; policy and process. Policy impediments include unresolved issues, such as how betterment funding is to be apportioned between Commonwealth, State and Local Governments, and how funding earmarked for betterment will be prioritised across assets.

Process impediments include technical issues that primarily revolve around the content, methodology and form required of submissions to suitably address the tests for project approval.

3.2.1.1 Underdeveloped administrative and technical processes for project evaluation

Although each jurisdiction has developed clear operational guidelines for the restoration and repair of public assets to current standards, agreed national guidelines to assess and compare the relative merits of betterment proposals are not available. Similarly, in many jurisdictions there is limited guidance to assist with the prioritisation of proposals and investments against State, Territory and Local Government needs. State and Local Government officials cite a lack of administrative tools and specific operational manuals to guide the development and submission of applications, as considerable impediments to applying for betterment funding under NDRRA.

The administrative process could also be assisted by inclusion of specified timeframes for submission, consideration, and approval of betterment proposals. Longer term, it would also be appropriate to review and evaluate successful betterment proposals in terms of their value-for-money, particularly where subsequent natural disasters have occurred.

There are varying levels of assistance regarding betterment, however none of the current State and Territory guidelines provide clear instructions regarding the mechanics of proposals suitable for betterment investment. Additionally,

although templates for submitting restoration and recovery projects under Category B are provided under the NDRRA guidelines, these templates do not address issues related to betterment or substantiating the cost-effectiveness of betterment proposals. Clarification is necessary as to how cost-effectiveness is to be demonstrated, as recognised by the Commonwealth Senate Standing Committee on Economics, which "recommends that the Commonwealth Treasury clarify what is meant by the term 'cost-effective' as it relates to the 2011 NDRRA Determination" (Senate Economics References Committee 2011, recommendation 4).

3.2.1.2 Criticality of time

An essential public asset designation signifies a pressing need for the asset's earliest repair following damage by a natural disaster, in order to restore normal community functioning as quickly as possible. The lack of clarity regarding administrative processes for betterment funding applications[7], also represents a significant disincentive, as negotiating these requirements on a case-by-case basis is both time and resource intensive.

3.2.1.3 Ambiguous cost-sharing arrangements

Under the Determination, reimbursement of NDRRA claims is made on the following cost-sharing basis:[8]

- 100% State funding for claims under the first threshold;
- 50:50 Commonwealth- State funding for claims between threshold 1 and threshold 2; and
- 75:25 Commonwealth- State funding for claims above threshold 2.

However, the Determination does not currently detail the cost-sharing arrangements for betterment, specifically, whether the same thresholds apply. In the absence of formal advice (and for the purposes of this report and case studies), the working interpretation of States and Territories derived from the cost-sharing principles outlined in *Natural Disasters in Australia: Reforming Mitigation, Relief and Recovery* (COAG 2002, p.48)[9] has been adopted.

That is, in relation to betterment of a State asset, irrespective of whether the State has reached the first or second threshold, betterment works are funded on a 50:50 share basis between the Commonwealth and the State. Importantly, this 50:50 funding split *for the betterment component* still applies, even where the State has reached the second threshold in relation to other NDRRA works (i.e. those *without* a betterment component), and those works are being funded on 75:25 cost basis.

This rationale is predicated on the assumption that the betterment component is the cost above and beyond the cost of restoration of the asset to pre-disaster standard and should therefore be treated independently in terms of application of the threshold limits, rather than as the whole cost (i.e. restoration plus betterment). It follows then that the 75:25 cost sharing arrangement for betterment works would only take effect when the combined individual betterment components themselves reached the second threshold.

The working interpretation also recommends that betterment of local assets be funded by equal one-third contributions by all three levels of government. However, as noted by ALGA in its 2011-12 Budget submission, 'Many councils may have insufficient own-source funding to meet the costs not covered by the NDRRA and will thus require additional support from other levels of government'[10].

While budgets will vary (and will be informed by the proposed betterment methodology), confirmation of cost-sharing arrangements should the proposal be approved by the Commonwealth Government requires clarification in order to determine, upfront, the total budget available for the proposed betterment project.

3.2.1.4 Extent of available funding

Whilst clarification of the shared funding arrangements for the betterment works will play a significant role, of greater influence on the decision by a State or Territory Government to apply for betterment funding is the extent of available funding to restore the asset above its pre-disaster state. Where there has been extensive damage as a result of a natural disaster, it is difficult to secure support for an investment greater than restoration costs alone in order to yield potential savings in future years, particularly when these savings or avoided costs, are estimated over the lifetime of the asset (say 30 years), and thus will not be realised within the current forward estimates period, i.e. be attributed as an initiative of the current government. This difficulty is only compounded in times of fiscal stringency and further exacerbated by the costs of recovery, which have escalated following the inordinate number of widespread natural disasters in recent times.

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7 Refer 3.2.2.5

8 Refer 2.2

9 Specifically, 1.a) of Recommendation 50

10 *Boosting Regional Capacity and Supporting Our Urban Communities, January 2011*, ALGA (2011a)

Additionally, whereas funding from the Commonwealth Government for the restoration of damaged essential public assets is guaranteed under the NDRRA, similar certainty does not exist for betterment projects. This is not unexpected as these projects constitute additional discretionary expenditure and governments at all levels are obliged to ensure this expenditure constitutes value-for-money.

There is also a range of transaction costs that impede the development and submission of betterment proposals. Money spent developing a proposal, if unsuccessful, is a sunk cost. Whilst concerning for State and Territory Governments, it is Local Governments, particularly Indigenous and low rate base communities already struggling, where this acts as a significant disincentive to the development and submission of betterment funding applications.

3.2.1.5 Non-uniform guidelines

In its submission to the NDIR, ALGA cites inconsistencies in guidelines and level of support across jurisdictions, as barriers to Local Governments making claims for assistance under NDRRA (ALGA 2011b). While each State and Territory has its own NDRRA guidelines that set out in operational detail how the jurisdiction interprets and handles applications for assistance under NDRRA, on the whole, the betterment provision is not well documented consistently across the country.

Table 1 summarises public guidelines outlining each jurisdiction's interpretation of the betterment provision, demonstrating a clear lack of uniformity across the States and Territories, contributing to its limited use thus far.[11]

Table 1: Betterment provisions within State and Territory guidelines

State/Territory	Betterment Provision
New South Wales Disaster Assistance Guidelines (Emergency Management New South Wales 2010)	Betterment appears to be restricted to a specific sub-set of essential public assets. Only mentioned with respect to Restoration of Public Roads (section B.2) and Repair of Crown Roads (Section B.3). Proposals for betterment works must be submitted for approval through the Roads and Traffic Authority (now known as Roads and Maritime Services) (pp.33-36).
Northern Territory NDRRA Administrative Guidelines (Northern Territory Government 2011)	Betterment broadly endorsed through the statement "where a constructed public asset is damaged as the result of an eligible natural disaster, betterment as a long-term mitigation strategy should be a considered option" (p.8) No further information is provided as to how this endorsement may be enacted.
Queensland Disaster Relief and Recovery Arrangement Guidelines (Emergency Management Queensland 2009)	Notes that 'betterment of an essential asset may be considered under exceptional circumstances'. Requires a Cabinet submission to be approved before the project is passed on to the Commonwealth for consideration (section 4.4.7). Subsequent clause that lists restoration or replacement of an asset to a higher immunity level or level of service as an ineligible expenditure, unless otherwise agreed (section 4.4.9d).
Tasmania Emergency Management Plan (Department of Police and Emergency Management 2009, p 103)	Financial Administration Guide makes reference to the NDRRA and provides a summary of expenditure categories that reflect the NDRRA arrangements. No reference is made to betterment as part of recovery activities (in section 5.6.8)

11 Note that at the time of writing, there were no guidelines readily available for the Australian Capital Territory.

State/Territory	Betterment Provision
Victoria Natural Disaster Financial Assistance for Local Councils (Department of Treasury and Finance 2012)	Sets out advice regarding the replacement of essential public asset infrastructure including betterment and enhancement. Betterment of state assets is on a 50:50 Commonwealth-State basis. Betterment of local council owned assets is to be cost-shared equally on a one-third basis between the Commonwealth Government, State Government, and the Local Government.
Western Australia NDRRA Overview (Fire and Emergency Services Authority 2010)	Notes that Category B projects include approved betterment projects. Proposals should be submitted to Fire and Emergency Services Authority (FESA) prior to provision to the Commonwealth. (Annex A) Submission criteria reflect those of the NDRRA Determination with no further information provided.

3.2.1.6 Absence of context

ALGA has questioned whether individual Local Governments are aware of the existence and finer details of NDRRA (ALGA 2011b). Beyond the large infrastructure and works agencies of State and Territory Governments, awareness of the NDRRA betterment provision may be somewhat limited. However, in consultation with the relevant planning and infrastructure organisations, the state-wide natural hazard risk assessment for each jurisdiction[12] provides the context for betterment proposals in relation to a jurisdiction's essential public assets.

A greater understanding of the nexus between NDRRA betterment criteria and COAG policy objectives, namely the NSDR and building the disaster-resilience of Australian communities, would benefit of levels of government.

3.3 Conclusion

The betterment provision is the link between recovery now and the mitigation of future disasters. With recovery costs of natural disasters in Australia escalating, an effective means of reducing the impact of these events and to build community resilience is to increase investment in improved disaster mitigation measures. Such investment has the potential to reduce the financial and social costs of disaster recovery, in addition to minimising asset downtime, and provides a strong incentive for governments at all levels to develop betterment proposals.

The concept of a nationally consistent framework for the development, assessment and prioritisation of betterment proposals, and comparison of their relative merits through an agreed methodology with a clear betterment objective, is outlined in the following section.

An agreed NDRRA betterment framework and methodology across all jurisdictions would enable State, Territory and Commonwealth Governments to compare the relative merits of individual proposals on a consistent, standardised basis, and identify the proposals that have the greatest potential benefits and long-term cost savings if the assets were to be bettered in accordance with those proposals. The framework and methodology assist in addressing some of the identified issues / impediments to making NDRRA betterment applications. However, they are not designed to be an authoritative answer but simply a first step in the development of a uniform approach, requiring refinement through ongoing consultation with jurisdictions.

[12] Required under cl.15c of the NPA-NDR to have been completed by December 2011.(COAG 2011b)

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Building it back better

Part 2. Betterment framework and methodology

A framework and methodology to prepare and assess applications for funding under the *Natural Disaster Relief and Recovery Arrangements* betterment provision

May 2012

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Disclaimer

An Australian Government Initiative

Building it back better is a two-part report that describes a proposed framework and methodology for preparing and assessing applications for funding under the Natural Disaster Relief and Recovery Arrangements (NDRRA) betterment provision.

Part 1: Betterment imperatives and impediments describes factors affecting the preparation and assessment of applications for funding under the NDRRA betterment provision.

Part 2: Betterment framework and methodology (this document) describes a proposed approach for the preparation and assessment of applications for funding under the NDRRA betterment provision.

For enquiries about this publication please contact the Department of Community Safety, GPO Box 1425, Brisbane, Queensland 4001.

Executive Summary

Australia has a long history of experiencing and withstanding natural disasters – from bushfires to flooding and cyclones. In 2010-11 and again in 2012, the prevalence and scale of these natural disasters have highlighted the spiralling impact and recovery costs of these serious events. In recognition of these increasing costs and the long-term detrimental effects on individuals and communities, the Commonwealth, State and Territory Governments have adopted a concerted program of policy reform through the Council of Australian Governments (COAG) to reduce immediate and long-term costs to the community and all levels of government by increasing the resilience of communities to natural disasters. Enhancing resilience through reducing the impact and downtime caused by natural disasters is a core element of this strategy.

The Natural Disaster Relief and Recovery Arrangements (NDRRA) Determination describes shared funding arrangements between the Commonwealth, States and Territories to enable individuals, communities and businesses to recover from the impact of natural disasters. In 2007, an additional funding mechanism was added to the NDRRA Determination to encourage jurisdictions to rebuild or restore destroyed or damaged essential public assets to a higher standard of disaster resilience than their pre-disaster state. Although this mechanism – commonly referred to as the 'betterment provision' – has existed since 2007, at the time of writing only one betterment proposal across Australia has been successfully developed and implemented under this provision. It is understood that a second proposal is being prepared.

In order for the Commonwealth to fund a betterment proposal under the NDRRA, it is necessary for a State, Territory or Local Government to demonstrate that the project is cost-effective, and increases the asset's disaster resilience – thereby mitigating against future impacts[1]. Although these requirements are simply stated, the absence of significant funding allocated to betterment projects over the past five years points to significant impediments to the successful use of the NDRRA betterment provision and insufficient implementation of COAG goals to achieve greater community resilience to natural disasters.

This report presents a framework and methodology to guide the preparation and assessment of NDRRA betterment applications for the purpose of building the resilience of Australian communities to natural disasters that will help to achieve greater long-term social and economic benefits for asset owners and affected communities. The recommended approach draws on business system principles endorsed and widely used by the Australian transport sector, cost benefit guidelines developed by the Commonwealth Government, and international best practice methods for evaluating natural disaster mitigation projects.

The framework and methodology are built on the following precepts that should also be used to guide adoption and implementation of procedures for the preparation and assessment of betterment applications:

- *rigorous,* adhering to nationally and internationally relevant methodologies;
- *responsive*, recognising community and government needs;
- *timely*, recognising that essential public assets need to be urgently restored;
- *consistent and adaptable*, enabling application across jurisdictions to meet regional needs;
- *operationally practical*, achieving reasonable expectations and minimising administrative costs; and
- *achievable*, matching available funding and relevant government commitments.

The framework reflects contemporary COAG-endorsed policies in addition to the 2011 NDRRA Determination by synthesising these requirements into a succinct objective for NDRRA betterment proposals. Collectively, these requirements provide an unambiguous link between the goals of mitigation planning and event-specific response and recovery activities. The application of these requirements will also be informed by local knowledge, risk assessments and mitigation plans

The framework also requires State and Territory Governments to implement a process for the prioritisation of betterment applications that acknowledges the specific needs of jurisdictions and local communities. These needs include timing of reconstruction, capacity to fund the proposed betterment works, current policy positions, and various government commitments. The framework recognises the importance of achieving value-for-money from betterment investments.

Given the array of essential public assets and likely constraints to available funding, it is pragmatic to direct betterment funding to restoration projects that deliver cost-effective and significant outcomes for communities and governments requirements. Jurisdiction priorities for betterment funding can be informed by state-wide risk profiles required under

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1 NDRRA Determination cl.3.6.6 c) and cl.3.6.6 d)

the *National Partnership Agreement on Natural Disaster Resilience* (NPA-NDR), where appropriate, and other State, Territory or Local Government risk assessments and hazard mitigation plans.

The methodology for evaluating betterment proposals consists of two phases based on consideration of the financial scale of the project. In Phase one of the methodology, a seven step strategic assessment identifies the merit of a proposal based on its alignment with identified mandatory and value-for-money requirements. This first phase involves cost-effective analysis (CEA) to compare the costs and benefits of alternative projects. This CEA does not require quantification of benefits in dollars. Phase one leads to the preparation of a strategic business case, which is then considered by States or Territories to determine its suitability for funding or revision.

More complex and resource-intensive betterment applications should undergo further evaluation through the twelve step detailed appraisal of Phase two to develop a full business case. This appraisal includes a comprehensive cost benefit analysis (CBA) including detailed betterment reconstruction costings and quantified dollar estimates of benefits including avoided future repair costs and avoided indirect costs to asset users. There is also provision to capture additional social, environmental and heritage costs and benefits of these high value projects.

The methodology is presented as a step-by-step process to guide the preparation of a strategic business case, and for high value, complex betterment proposals, development of the full business case including a CBA.

The framework and methodology address most of the identified impediments to preparing and assessing NDRRA betterment applications, and provide the next critical step in the development of a uniform national approach to wider and more efficient implementation of the betterment provision. Further refinement of this approach and consultation with each jurisdiction will be needed as the Commonwealth, States, Territories and Local Governments advance the implementation of betterment policies and procedures.

Broader and timely implementation of the NDRRA betterment provision will help to markedly reduce the future burden of natural disasters. Adoption of 'building it back better' principles and procedures described in this report will enable governments at all levels to significantly increase the resilience of essential public assets – and thus the resilience of Australian communities – to natural disasters.

1 A proposed betterment framework and methodology

1.1 Overview

The framework and methodology presented here are intended for use in preparing and assessing betterment proposals by means of a consistent set of criteria and assist in reducing the time required to assess the suitability of proposals for betterment investment following a natural disaster. This will enable State and Territory Governments and the Commonwealth to assess and then prioritise proposals. Jurisdictions will be able to compare the relative merits of each project to inform betterment funding decisions that provide the greatest benefits to communities.

The proposed framework and methodology could also be used *before* a disaster event occurs, as tools to proactively identify priority assets suitable for betterment funding applications, including ascertaining the level of investment at which value-for-money is achieved vis-à-vis betterment, should a particular natural disaster occur.

Consistent with the NDRRA Determination 2011 version 1, the framework and methodology applies to 'essential public assets' as defined in cl.3.6.1 of the Determination.[2] Out of scope for the purposes of this report is a consideration of privately owned infrastructure irrespective of whether it is considered critical to the delivery of essential community services. This includes infrastructure that was formerly in public ownership but has been corporatised such as telecommunications, electricity, water and transport services.

Also beyond the scope of this report is the role insurance might play in the application of NDRRA. A range of issues arising from the 2010-11 natural disasters was considered by the Natural Disaster Insurance Review (NDIR) panel which presented its final report including 47 recommendations to the Commonwealth Government on 30 September 2011. The majority of the recommendations require extensive consultation to be undertaken during 2012, and remain under consideration at the time of writing.

The NDRRA betterment framework developed within this report aligns with cost-benefit methodologies and guidelines that are widely endorsed and commonly used across a range of sectors within Australia. Whilst the case studies in this report focus on flooding, the framework can be applied by users working within a disaster management context to different hazard types and to different categories of essential public assets.

Whilst developing, assessing and prioritising betterment proposals is a complex process – especially where there are a number of betterment options for multiple assets that differ vastly from each other – it can be simplified through an overarching framework that is underpinned by a methodology.

To develop the report's betterment framework and methodology, it was necessary to contextualise the environment in which the desired outcome – to prepare, assess and prioritise betterment proposals by means of a consistent set of measures – would be achieved. Thus the starting point – or first tier – is the overarching natural disaster resilience context, encompassing national policy goals, which is informed on a practical level by 'situational awareness', that is, local understanding and perspective.

Sitting underneath this is the second tier – the proposed betterment framework itself – which steps out the purpose, precepts and objective. The purpose is clear – improved community resilience to natural disasters through bettered essential public assets. The precepts are the underlying principles on which the framework is founded, and have been garnered from best practices and other relevant standards. The objective has seven elements, of which four are mandatory betterment requirements and three are value-for-money requirements. Correlated with these requirements are criteria for assessing whether each element of the objective will be met.

Finally, the third tier is the proposed betterment methodology, which allows consistent evaluation of proposals to determine those that should be recommended for betterment funding. The methodology is based on a cost-benefit approach and is comprised of an initial strategic assessment of the proposal, a prioritisation process for meritorious proposals, a detailed appraisal if warranted, i.e. if the proposal exceeds a preset funding limit, and a re-prioritisation process. These three tiers combine to form the betterment framework and methodology (Figure 1).

In the longer term, application of the NDRRA betterment provision using a simplified and agreed process should assist in alleviating the rising costs associated with essential public assets being repeatedly damaged by natural disasters, and in this way contribute to more disaster-resilient communities.

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[2] An essential public asset is an asset of an eligible undertaking that, in the judgment of the State concerned:
a) is an integral and necessary part of the State's infrastructure; and
b) would, if lost or damaged, severely disrupt the normal functioning of a community; and
c) would, if lost or damaged, be restored or replaced as a matter of urgency.

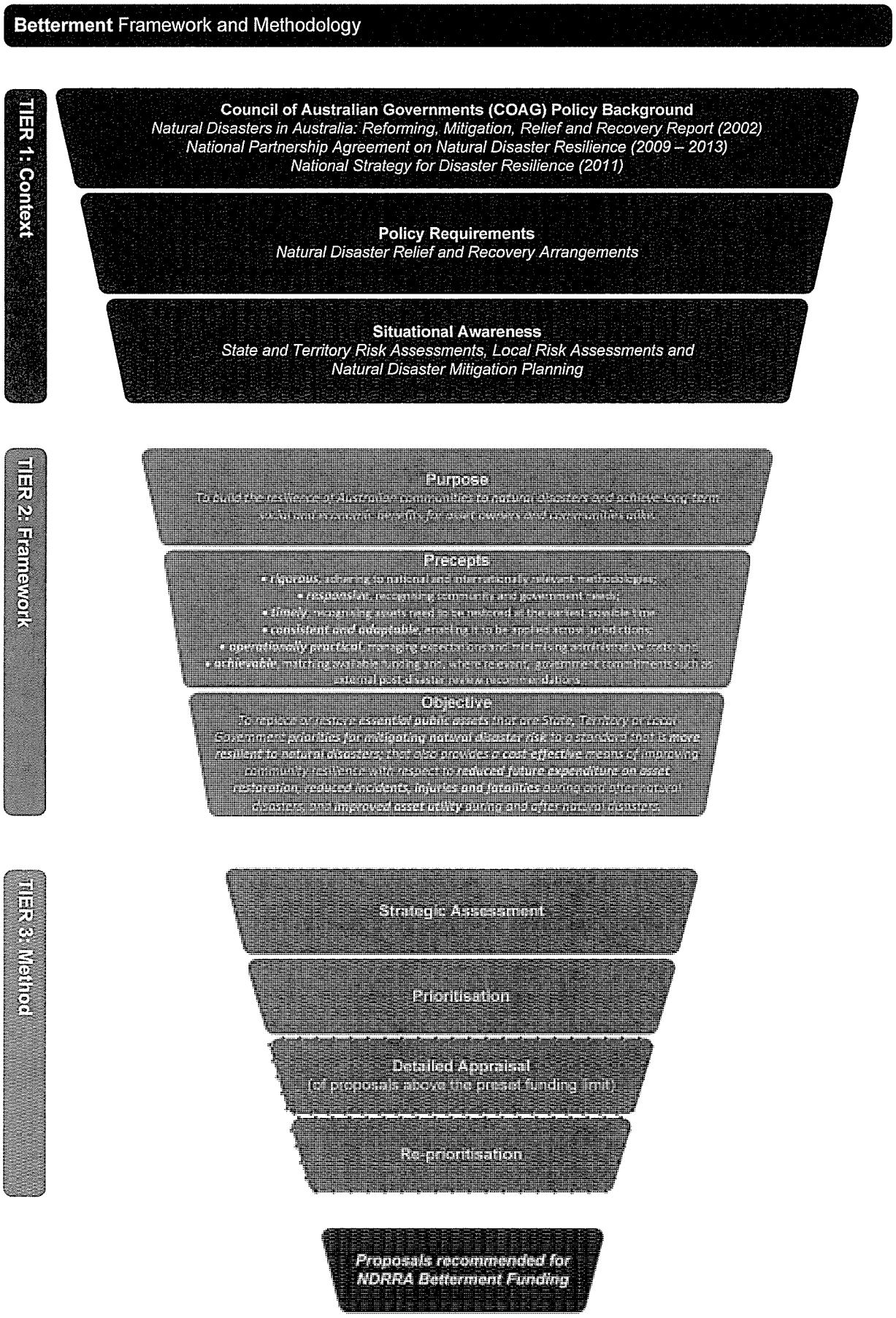


Figure 1: Betterment framework and methodology

1.2 Overarching natural disaster resilience context

1.2.1 COAG policy background

As discussed in Chapter 2, the national agenda vis-à-vis disaster resilience and mitigation is the overarching policy driver, with COAG policy setting the background, in particular through the following documents:

- *Natural Disasters in Australia: Reforming , Mitigation, Relief and Recovery Report* (2002);
- *National Partnership Agreement on Natural Disaster Resilience* (2009-2013); and
- *National Strategy for Disaster Resilience* (2011).

1.2.2 Policy requirements

The NDRRA determination provides the administrative basis for the development and assessment of betterment proposals across all levels of Government. As these arrangements are activated upon notification of an eligible natural disaster (NDRRA, cl.4.2), NDRRA-funded betterment works are activities aligned with the response and recovery phases of disaster management. Planning for betterment, however, is an activity applicable across all four phases as it involves prevention (mitigation) of future disasters following asset damage, preparation for timely restoration of disaster-damaged assets, and enhancing future response and recovery activities by increasing asset utility. Betterment is thus the link between pre-disaster mitigation and post-disaster recovery. Accordingly, betterment projects should be planned and implemented in cohesion with activities across *all four* phases of the disaster management spectrum.

1.2.3 Situational awareness

Policy context alone is insufficient to inform betterment options with 'on the ground' data required at the State or Territory level, and more locally in consultation with the communities serviced by the asset. Relevant information should be sourced from the state-wide natural hazard risk profiles required under the NPA-NDR, local risk assessments, and natural disaster mitigation plans to identify the natural hazard risks to which essential public assets are exposed and are vulnerable. This pre-disaster, pre-damage awareness of assets with a low level of resilience could be used to identify and develop betterment proposals against future natural disasters of the type and scale indicated by the risk profiles, but is used here to inform whether the asset in question is a high risk mitigation priority for the jurisdiction.

1.3 Betterment framework

1.3.1 Purpose

The framework is designed to guide the development and assessment of betterment proposals made under the NDRRA betterment provision for the purpose of building the resilience of Australian communities to natural disasters and achieving long-term social and economic benefits for asset owners and communities alike. It also provides a benchmark for the reporting and evaluating of betterment project outcomes.

1.3.2 Precepts

The precepts of the betterment framework are drawn from cls.3.6.5 and 3.6.6 of the NDRRA Determination 2011 v.1, Recommendation 6 of the COAG report *Natural Disasters in Australia: Reforming mitigation, relief and recovery arrangements (2002)* and the shift in national and international focus toward disaster risk reduction and community resilience. These underlying principles also reflect international best practice and standards accepted within the Australian transport sector and characterise the framework as:

- *rigorous,* adhering to nationally and internationally relevant methodologies;
- *responsive*, recognising community and government needs;
- *timely*, recognising that essential public assets need to be urgently restored;
- *consistent and adaptable*, enabling application across jurisdictions to meet regional needs;
- *operationally practical*, achieving reasonable expectations and minimising administrative costs; and
- *achievable*, matching available funding and relevant government commitments.

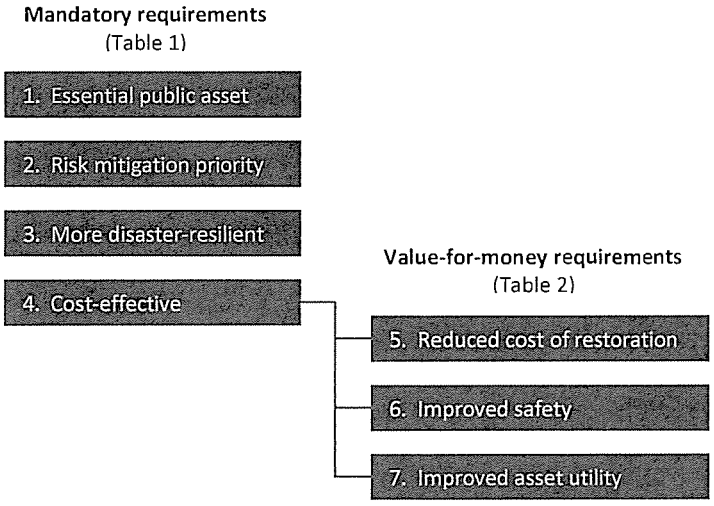
1.3.3 Objective

It is important the framework identifies a betterment objective that adopts contemporary policy requirements to reflect current national policies and agreements[3]. The objective for betterment under this framework is:

> *To replace or restore **essential public assets** that are State, Territory or Local Government **priorities for mitigating natural disaster risk** to a standard that is **more resilient to natural disasters**; that also provides a **cost-effective** means of improving community resilience with respect to **reduced future expenditure on asset restoration, reduced incidents, injuries and fatalities** during and after natural disasters, and **improved asset utility** during and after natural disasters.*

This objective has been interpreted as needing to satisfy four *mandatory betterment requirements* derived from the NDRRA (#1, #3, #4) and the NPA-NDR (#2), and three *value-for-money requirements* for cost-effective achievement of community resilience outcomes depicted in Figure 2. These requirements and associated criteria are reflected in Step 4 of the Strategic Assessment (see 2.1.4.4 page 9) and Step 4 of the Detailed Assessment (see 3.1.2.4 page 18).

Figure 2: Mandatory and value-for-money requirements to achieve betterment objective



1.4 Betterment proposal evaluation methodology

At the heart of the betterment framework is the methodology to evaluate betterment proposals. Consisting of two phases, the methodology's Phase one strategic assessment entails the preparation of a strategic business case. Phase two (for high-value complex proposals) is a detailed appraisal requiring the development of a full business case, including a CBA.

The methodology uses a cost-benefit approach based on the premise that the complexity of the assessment should be *proportional* to the value of the project. This approach, drawing on the National Guidelines for Transport Systems Management in Australia (ATC 2006) and the Commonwealth Handbook of Cost Benefit Analysis (DoFA 2006), recognises that with substantial costings comes the need to calculate the benefit cost ratio (BCR) using a more sophisticated methodology than what is proposed in Phase one[4]. That is, the more expensive the betterment proposal, the greater the rigour required to validate the application for betterment funding.

Correspondingly, the higher the proposed betterment expenditure, the more important factors such as the quantification of likely avoided losses over the asset's lifetime become in determining cost-effectiveness. Therefore, a funding limit for betterment project costs is set, so while all betterment proposals will necessitate the preparation of a strategic business case (Phase one), only those projects costed above this preset funding limit are required to undergo the detailed appraisal of Phase two to determine whether betterment funding has merit. For the purposes of the case studies in this report, the preset funding limit has been arbitrarily set at $5 million, although this figure would be a matter for individual jurisdictions and/or the Commonwealth to establish.

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3 NDRRA Determination 2011 version 1; COAG 2002; NSDR; NPA-NDR; NPA-NDRR

4 Refer Step 4; in particular, 2.1.4.4.

1.4.1 Strategic assessment

As outlined above, Phase one of the betterment methodology requires a strategic assessment to be undertaken for all betterment proposals. The strategic assessment[5] is designed to inform State, Territory and Local Governments of the degree to which a proposed betterment project can meet its objective through fulfilment of the betterment requirements. The output of this phase is a strategic business case.

The strategic business case is the prime statement of merit for the betterment proposal involving a subjective assessment of a project by the applicant, with any quantitative information on costs and qualitative impacts evaluated. In effect, it is a simple, uncomplicated and expedient cost-effectiveness analysis**Error! Bookmark not defined.**. While inputs may vary between States and Territories and within regions, the process of undertaking the strategic assessment would be the same across each jurisdiction. This report puts forward a seven-step strategic assessment process to be followed (refer Figure 3).

Significantly, betterment projects demonstrating eligibility through the strategic assessment phase and which are *below* the preset funding limit would qualify immediately for prioritisation by States and Territories (in relation to betterment funding recommendations).

Projects that demonstrate eligibility through the strategic assessment phase but are *above* the preset funding limit undergo a preliminary prioritisation process by States and Territories but then progress to Phase two – detailed appraisal – and a full business case must be developed.

Chapter 2 steps out the strategic assessment phase in greater depth.

1.4.2 Detailed appraisal

Phase two requires a detailed appraisal[6] of the betterment project proposal. However, the methodology recommends that only proposals *above* the preset funding limit need undertake this second phase, as it necessitates a full business case to be developed – including preparation of a CBA – in order to quantify and cost the expected benefits of each betterment option within the proposal. Detailed appraisals require a greater commitment of time and resources to establish a higher level of certainty that the proposed project is suitable for betterment investment.[7]

Inclusion of betterment options acknowledges that the degree to which an asset may be bettered will vary depending on the level of disaster-resilience sought. As such, there will be a point at which the level of betterment proposed no longer represents value-for-money. This will be calculated using the CBA. The CBA is based on more refined estimated costs of asset restoration and betterment than the data provided for Phase one and is a more exact methodology than the cost-effectiveness analysis undertaken in the strategic business case. It also follows that the greater the betterment investment proposed, the more robust the CBA which should be undertaken, to validate the proposal's application for betterment funding.

Only when proposals above the preset funding limit pass this more rigorous second phase, are they then able to be properly prioritised for betterment funding.

Chapter 3 sets out the workings of the detailed appraisal phase.

1.4.3 Prioritisation process

The priorities for betterment will vary according to the circumstances of the NDRRA activation and the affected region and influenced by issues specific to individual jurisdictions. Accordingly, each State and Territory will be responsible for implementation of its prioritisation and re-prioritisation processes. Clearly factors such as timing of reconstruction, capacity to fund the proposed betterment works, and current government policy positions are fundamental. However, additional factors may also need to be considered, such as commitments to implementing recommendations from post-disaster reviews, and long-term land use planning decisions, etc. These additional considerations may have a substantial impact on how two betterment proposals, which under the framework and methodology are equally meritorious, are prioritised.

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5 In this methodology, 'assessment' refers to *quantitative and qualitative analysis to produce information to aid decision-making* (ATC 2006, p.5).

6 The term 'detailed appraisal' here is given to mean "the process of determining the impacts and overall merit of a proposed initiative, including the presentation of relevant information for consideration by the decision-maker" (ATC 2006, p.19).

7 This approach is consistent with the ATC guidelines which require proposals to pass through a Strategic Merit Test filter and a Rapid Appraisal filter before determining which initiatives are then subject to the final Detailed Appraisal filter (ATC 2006, p.19). It is also consistent with the assessment methodology outline in Infrastructure Australia's *Reform and Investment Framework* which requires investment proposals to pass through a preliminary Profiling Pillar (aimed at checking for fit with national priorities, incorporating long-term planning processes for building a better infrastructure network and a preliminary comparison with alternative options) before proceeding to the Triple Bottom Line Economic Viability Pillar (Infrastructure Australia 2010).

1.4.4 Proposals recommended for betterment funding

Following prioritisation, each State and Territory will have its individual list of projects to be recommended to the Commonwealth for betterment funding under NDRRA. While internal processes will vary between jurisdictions vis-à-vis endorsement of betterment proposals to be submitted to the Commonwealth, final approval of NDRRA betterment proposals is the responsibility of the Commonwealth Attorney-General's Department.

Thus, while application of the framework and methodology will be able to provide a contestable basis in relation to proposals submitted by jurisdictions for betterment funding, whether or not a proposal is granted NDRRA funding above the base case, i.e. for betterment, is solely at the discretion of the Commonwealth.

1.5 Conclusion

The implementation of a nationally-agreed betterment framework and consistent proposal evaluation methodology establishes a solid foundation for delivery of betterment projects that aligns with COAG's strategic policy intent. When linked to a prioritisation process that is informed by risk assessments and mitigation priorities at the State / Territory and local levels, the unique aspects of geography, demography and economic priorities of each jurisdiction and local government area are also appropriately taken into account.

Although each State and Territory has their own guidelines / plans regarding implementation of the NDRRA Determination 2011, the framework and methodology outlined in this report would allow all State and Territory agencies and Local Governments, to adopt a nationally consistent approach for preparing and evaluating claims for betterment funding.

2 Phase one – strategic assessment

2.1 Preparing the strategic business case – overview

Phase one of the betterment methodology requires a strategic assessment to be undertaken for all betterment proposals and involves a subjective assessment of the merits of a project by the applicant, supported by quantitative information on costs and impacts. Seven keys step are identified for development of the strategic business case (refer Figure 3). Two worked examples of the strategic business case methodology are also provided in Appendix A.

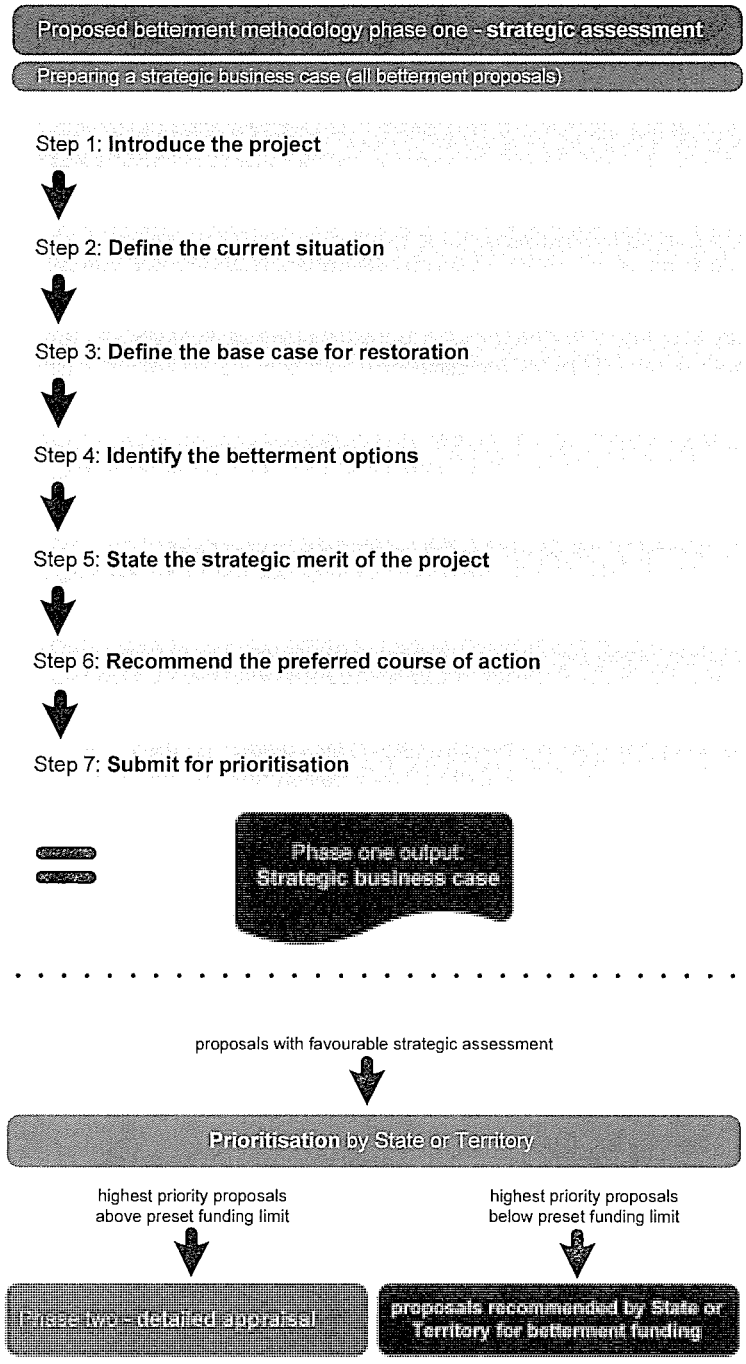

Figure 3: Key steps of Phase one: strategic assessment – strategic business case methodology

2.1.1 Step 1 – Introduce the project

2.1.1.1 State the title of the proposed project and the applicant

2.1.1.2 Describe the challenge addressed by the proposal

➢ *Describe project in terms of location, characteristics and estimated costs.*

The project needs to be clearly defined in the context of the region – whether the relevant region comprises the nation, the State or Territory, or more localised area. For example, a segment of transport infrastructure (road, port, airport, or rail network) may be essential for the movement of rural produce between the region of production to the region where it is either processed or sold. In another region, an item of social infrastructure (hospital, educational facility, community hall, or sporting facility) may be the essential public asset in question.

➢ *Identify main anticipated benefits and quantifiable costs of the project.*

The main benefits should be described and quantified where possible.

➢ *Describe the relevant risk profile.*

➢ *Define how the asset will be more disaster-resilient through proposed betterment options.*

Anticipated betterment outcomes of a project may occur under the following categories:

- Does the project reduce the probability (or recurrence) of a particular natural hazard impacting on the public asset? If so, by how much is this probability estimated to be reduced?
- Does the project reduce the duration of impacts (or loss of functionality) experienced in relation to use of the public asset? If so, by how much is this duration estimated to be reduced?
- Does the project reduce the severity of impacts (or loss of functionality) experienced in relation to use of the public asset? If so, by how much is this severity estimated to be reduced?

2.1.2 Step 2 – Define the current situation

➢ *Clearly describe the current situation and affected infrastructure, its pre-disaster and current conditions.*

➢ *Describe how the asset is impacted by flooding or other natural disaster events and summarise the frequency and severity of recent disaster events of relevance.*

The history of damage to the asset in previous natural disasters of the type under consideration needs to be established. For example, if the project is aimed at making the asset more resilient to a 1 in 10 year flood event, then details need to be provided of the damage to the asset that occurred in previous flood events of a 1 in 10 year severity. In addressing the history of damage from previous events, any prior claims for NDRRA assistance should also be documented.

2.1.3 Step 3 – Define the base case for restoration

➢ *Clearly describe the base case for restoration of the asset.*

The base case for assessment of proposed betterment options would be the reinstatement of the asset to its pre-disaster event condition, allowing for applicable contemporary building standards.

2.1.4 Step 4 – Identify the betterment options

2.1.4.1 Describe the betterment options

➢ *Identify and discuss the feasible betterment options and what each would achieve relative to the base case.*

Improving the asset above the base case may involve considering the feasibility of:

- rebuilding in its current location to a more disaster-resilient standard in the context of the natural hazard/s in question; or
- relocating it to a new location less likely to be impacted by the same type and intensity of hazard; or
- rebuilding to a more disaster-resilient standard and moving new location.

The partitioning of each option should be described in the strategic business case, for example:

- is this a single project or one of a series of options? Can the project be divided into stages? If one of a series, list the alternative options that were considered;
- can the project be divided into smaller projects? If yes, list the smaller projects and explain the reasons for treating them as a single project.

Where appropriate, options that were identified but subsequently rejected should be described, including the reasons for their rejection.

2.1.4.2 *Describe the indicative costs and impacts of each of the proposed betterment options*

- *Identify the indicative capital, operating and maintenance costs relative to the base case (restoration).*
- *Describe the consequences in terms of potential losses from natural disasters from not implementing the betterment option.*
- *Define the assumptions made on the reoccurrence of relevant disaster events and their scale and likely impact on these consequences.*
- *State the assumptions made about future developments that are likely to impact on potential losses from natural disasters under both the base case and betterment case.*

2.1.4.3 *Estimate the proposed timing and resource requirements for the base case and betterment options*

- *Collate the indicative capital, operating and maintenance costs for the base case, and each proposed feasible betterment option in a year by year tabular summary for the life of the proposed assets.*

2.1.4.4 *Assess the strategic merit of each betterment option*

- *State the merits of each project option against assessment criteria for mandatory and value-for-money requirements.*

2.1.4.4.1 *Mandatory betterment requirements*

Eligibility for betterment funding requires all four mandatory requirements set out in **Error! Reference source not found.** to be established in the betterment proposal. That is, a 'yes' answer is required for *every* element of *each* criteria. Any one 'no' response would mean that the proposal is ineligible to be considered for betterment funding.

Table 1: Mandatory betterment requirements and assessment criteria

Mandatory betterment requirements	Assessment criteria (qualitative and quantitative)	Assessment categories
1. The proposal is to replace or restore an *essential public asset*[8] **Essential public asset**	The asset: a) is an integral and necessary part of the State's infrastructure; and b) would, if lost or damaged, severely disrupt the normal functioning of a community; and c) would, if lost or damaged, be restored or replaced as a matter of urgency; and	 Yes / No Yes / No Yes / No
2. The proposal is a Local Government or State or Territory Government *priority for mitigating natural disaster risk*[9] **Risk mitigation priority**	The asset: a) has been subject to major repeated damage that is documented; and b) is a high State, Territory or Local Government priority for the mitigation of natural disaster risk; and	 Yes / No Yes / No
3. The proposal is to replace or restore the asset *to a standard that is more resilient to natural disasters* which will mitigate the impact of future natural disasters[10] **More disaster-resilient**	The proposal: a) will restore or replace the damaged asset to a more disaster-resilient standard than its pre-disaster standard; and b) will mitigate the impact of future natural disasters; and	 Yes / No Yes / No
4. The proposal is a *cost-effective* means of building community resilience i.e. provides value-for-money [11] **Cost-effective**[12]	The proposal provides a high ratio of benefits to reconstruction costs, compared to other betterment options.	Yes / No

8 NDRRA Determination 2011 v.1, cl.3.6.1 a), b), c)

9 NPA-NDR; COAG 2002:14

10 NDRRA Determination 2011 v.1, cl.3.6.5, cl.3.6.6 b), d)

11 Value-for-money is the core principle underpinning Commonwealth Government procurement. It requires a comparative analysis of all relevant costs and benefits of each proposal throughout the whole procurement cycle (whole-of-life costing). (DoFA 2008, Principle 4.1)

12 The cost-effectiveness of a proposal can be measured by calculating cost-effectiveness (CE) ratios. This involves identifying the benefits relevant to the program or activity. In CE analysis, benefits are expressed in physical units (e.g. lives saved, tons of hazardous waste reduced, number of children vaccinated, etc.) rather than monetary terms, whereas the associated costs are expressed in monetary terms. The simplest ratio is to calculate the average cost per unit of effectiveness. This is represented mathematically as CE = C/E where CE is the cost-effectiveness of the proposal, C is the cost (measured in dollars) and E represents the effectiveness (i.e. the benefit measured in physical units), (DoFA, 2006b).

Mandatory requirement #1 relates to the essential nature of the public asset.

Mandatory requirement #2 relates to the priority for bettering the asset specifically by reference to its history of repeated damage from natural disaster events (of the same type).

Mandatory requirement #3 relates to the standard of the asset that will be achieved by undertaking the proposal and its ability to mitigate the impact of future natural disasters. It is implicit that the 'future natural disasters' referred to are natural disasters of the *type* and *magnitude* to which the asset was bettered.

Mandatory requirement #4 relates to indicating which proposal provides the greatest value-for-money compared to other betterment options for the same asset. Demonstration of cost-effectiveness requires comparison of the *value-for-money requirements* of alternative betterment options against qualitative and quantitative criteria described below.

2.1.4.4.2 Value-for money betterment requirements

The value-for-money requirements evaluate how community resilience outcomes are enhanced by virtue of the asset being bettered, where community includes members of the public, business and government agencies affected by the loss of functioning of that asset. The assessment criteria for these betterment requirements are outlined in **Error! Reference source not found.**.

Table 2: Value-for-money betterment requirements and criteria to evaluate community resilience outcomes

Value-for-money requirements	Assessment criteria (qualitative and quantitative)	Assessment categories
5. The proposal will reduce future expenditure on asset restoration **Reduced cost of restoration**	The proposal will reduce future expenditure on asset restoration through the avoided cost of repairs to government from damage by future natural disasters through reduced expenditure on future asset restoration.	5 (very high) to 1 (neutral)
6. The proposal will reduce incidents, injuries or fatalities during and after natural disaster events[13] **Improved safety**	The proposal will reduce future incidents, injuries or fatalities (as a result of improved function of the asset during and after natural disasters), through: a) improved shelter from natural disasters; b) improved emergency access (to evacuation shelters / medical services / health facilities); c) decreased need to travel via alternative routes while the asset is not functional (i.e. damaged or under repair).	5 (very high) to 1 (neutral) for each criteria a), b), and c)
7. The proposal will improve essential functioning for community use during and after natural disaster events[14] **Improved asset utility**	The proposal will reduce future expenditure through the avoided indirect costs while the asset is not functional (i.e. damaged or under repair) to: a) community users of the asset; b) business users of the asset; c) government users of the asset.	5 (very high) to 1 (neutral) for each criteria a), b), and c)

Value-for-money requirement #5 looks at the avoided costs of repairing an asset (value and degree of savings) that would otherwise be damaged if not for having been bettered.

Value-for-money requirement #6 looks at reducing incidents, injuries or fatalities during or after future disaster events. Providing more disaster-resilient infrastructure may, in some circumstances, enhance opportunities for self-evacuation or emergency access to emergency or medical services. Correspondingly, an asset of higher disaster-resilience may enhance safety and wellbeing through improved access to health and medical services. It may also allow for reduced incidents, injuries or fatalities by reducing the need to travel via alternative routes while the asset is not functional.

Value-for-money requirement #7 considers enhanced utility to community, business and government users of the asset, during and after future natural disaster events by minimising the time of closure of the asset while it is repaired post-disaster.

To compare and rank these value-for-money (VfM) requirements, a rating system of 1 to 5, with 5 being the highest score down to a low of 1, is proposed in **Error! Reference source not found.**. While acknowledging more precise and

[13] NSDR 2011:5-6, 13

[14] COAG (2002, p.14); NSDR (COAG 2011a, p.12)

agreed definitions are needed, for the case examples in this report, a rating of 5 means the proposal would result in a very high reduction of future costs, whereas a rating of 1 indicates that the proposal demonstrates no discernible reduction of future estimated costs. Clearly, betterment proposals should be able to demonstrate considerably enhanced community resilience.

Table 3: Ratings for value-for-money betterment requirements

Rating	Qualitative description	Specific considerations[15]
5. **Very high** reduction of future costs	**Significant** reduction of future estimated expenditure or improved safety resulting in substantial, extensive long-term improvements for a very large area and very large numbers of people and/or businesses.	Reduction of future expenditure or improved safety for: – a very high number of asset users affected for more than 1 day a year on average; OR – a high number of asset users affected for more than 10 days a year on average.
4. **High** reduction of future costs	**Major** reduction of future estimated expenditure or improved safety resulting in substantial, extensive long-term improvements for a large area and large numbers of people and/or businesses.	Reduction of future expenditure or improved safety for: – a high number of asset users affected for about 1 day a year on average; OR – A moderate number of asset users affected for about 10 days a year on average.
3. **Moderate** reduction of future costs	**Moderate** reduction of future estimated expenditure or improved safety, possibly of short, medium or longer-term duration. Positive outcome will enhance improvements for a moderate area and moderate number of people and/or businesses.	Reduction of future expenditure or improved safety for: – a moderate number of asset users affected for 1 day a year on average; OR – a small number of asset users affected for 10 days a year on average
2. **Slight** reduction of future costs	**Minimal** reduction of future estimated expenditure or improved safety, possibly only lasting over the short-term. Effects confined to a limited area or limited number of people.	Reduction of future expenditure or improved safety for: – a moderate number of asset users affected for about 1 day a year; OR – a small number of asset users affected for 10 days a year on average
1. **Neutral**	**Nil** – no discernible reduction of future estimated expenditure or improved safety.	Reduction of future expenditure or improved safety for a very small number of asset users affected for less than 1 day a year on average

The sum of the ratings of the forecast community resilience outcomes of the value-for-money requirements (i.e. the total benefit score) is a proxy for the benefit that would be derived for that betterment project / option. Dividing the total benefit score by the estimated cost of the proposal provides a 'Cost-Effectiveness Ration' (CER) as a surrogate for a benefit / cost score[16], which is then used as the basis for ranking projects, with projects that produce the highest benefits compared to costs are listed at the top of the table (refer **Error! Reference source not found.**). However, as discussed at 1.4, this crude ranking system is only suitable for low budget i.e. proposals below the preset funding limit. Where two proposals have comparable a CER, the total cost of the project and additional qualitative information should be used to rank the project with the greater cost-effectiveness.

15 Note that what constitutes 'very high', 'high' etc ., in relation to the number of asset users requires further refinement and has been arbitrarily assigned here for the purposes of the worked case examples.

16 Phase two – the detailed appraisal – uses CBA to produce a Benefit Cost ratio (BCR).

Table 4: Ranking of proposals in relation to value-for-money betterment requirements (examples)

Proposal / option	The proposal / option will reduce expenditure on restoration VfM requirement #5	The proposal / option will improve safety VfM requirement #6	The proposal / option will improve asset utility VfM requirement #7	Cost-effectiveness (CE) ranking based on benefits / costs			
				Total benefit score	Cost ($m)	CE Ratio (CER)	CE Rank
Proposal A Option 2	3 (**moderate** reduction)	2 (**some** improvement)	5 (**very high** improvement)	10	2.5	4.0	**1**
Proposal A Option 1	1 (**neutral** – no discernible improvement)	1 (**neutral**)	2 (**slight** improvement)	4	1.0	4.0	**2**
Proposal C Option 1	5 (**significant** reduction)	3 (**moderate** improvement)	3 (**moderate** improvement)	11	4.0	2.75	**3**
Proposal B Option 1	4 (**major** reduction)	4 (**high** improvement)	3 (**moderate** improvement)	11	5.0	2.2	**4**

In summary, each project option will include:

- a qualitative description of how much the project option will contribute to the mandatory (refer **Error! Reference source not found.**) and value-for-money betterment requirements (refer **Error! Reference source not found.**);
- a quantitative description of how much the project option will contribute to the mandatory and value-for-money betterment requirements; and
- a rating of the project against each corresponding objective using rating categorises described in **Error! Reference source not found.**.

2.1.5 Step 5 – State the strategic merit of the project

➢ *Compare the betterment options with the relevant base case using the ratings in **Error! Reference source not found.** and others as relevant.*

This argument should address relevant *value-for-money* requirements and associated criteria.

2.1.6 Step 6 – Recommend the preferred course of action

This section concludes the strategic business case. The preferred option – whether it is the base case or a betterment option – should be clearly identified supported by a sound rationale that draws on the outputs of the strategic assessment.

➢ *Specify problems, issues, or needs.*

➢ *Outline government commitment to the project such as legislation, standards or existing agreements.*

2.1.7 Step 7 – Submit for prioritisation

➢ *Submit the strategic business case, informed by the outputs from steps 1-3 described above, to the relevant State or Territory authority for prioritisation.*

If the strategic assessment is favourable towards betterment (as the preferred option) and:

- the project cost is *below* the preset upper limit, it is immediately eligible for State or Territory prioritisation; or
- the project cost is *above* the preset upper limit, the proposal would undergo a preliminary State or Territory prioritisation, and then be submitted for a detailed appraisal i.e. a full business case, including CBA through Phase two.

If the base case is the preferred option, this step is not required and no further action is necessary.

2.2 Conclusion

This section presented a step-by-step guide for completion of Phase one – undertaking a strategic assessment of the betterment proposal and preparing the strategic business case. Betterment proposals / options above the preset upper limit will be required to go undergo the more rigorous Phase two – a detailed appraisal, to ensure they represent value-for-money. This involves development of a full business case include a CBA report based on more refined estimated costs of infrastructure restoration and betterment than the data provided for the strategic business case. The steps for Phase two are described in the following chapter.

3 Phase two – detailed appraisal

3.1 Developing the full business case – overview

Phase two of the betterment methodology involves preparation of a detailed appraisal in the form of a full business case to be undertaken for betterment proposals above the preset funding limit[17]. Typically, States and Territories will only prepare full business cases for proposals with higher levels of strategic merit (i.e. higher levels of cost effectiveness). The full business case re-articulates the merit of a betterment proposal described in the strategic assessment (Phase one).

The purpose of this second phase is to confirm the viability of the proposal and to re-evaluate the relative merit of betterment proposals above the funding limit by conducting a CBA including fully costed benefits and discounted costs. The CBA is a more exhaustive process than the semi-quantitative cost-effective analysis conducted during Phase one and prioritisation. The full business case provides an additional level of screening to avoid consideration of proposals with insufficient merit.

The CBA process ensures that the benefits (recognised by mandatory criteria) and costs of more expensive proposals are well documented, that all feasible options have been considered, and that the case for progressing the proposal for NDRRA betterment funding is robust.

The full business case requires the collation of all available information relevant to the proposal. All capital, operating and maintenance cost estimates need to be fully documented and benchmarked against recent experience with similar projects. This comparison may itself result in the reassessment of estimated benefits.

Twelve key steps are identified to develop the full business case (refer Figure 4). Where results at any stage of Phase two indicate that the betterment proposal is *not* favourable (e.g. after the CBA), the proposal should not proceed to later stages of the appraisal (e.g. risk assessment and consultation) to reduce time and resources on the appraisal process.

An overview of a worked example of the Phase two methodology is provided in Appendix B.

[17] As suggested in 1.4, a nominal value for the preset funding limit has been set at $5 million.

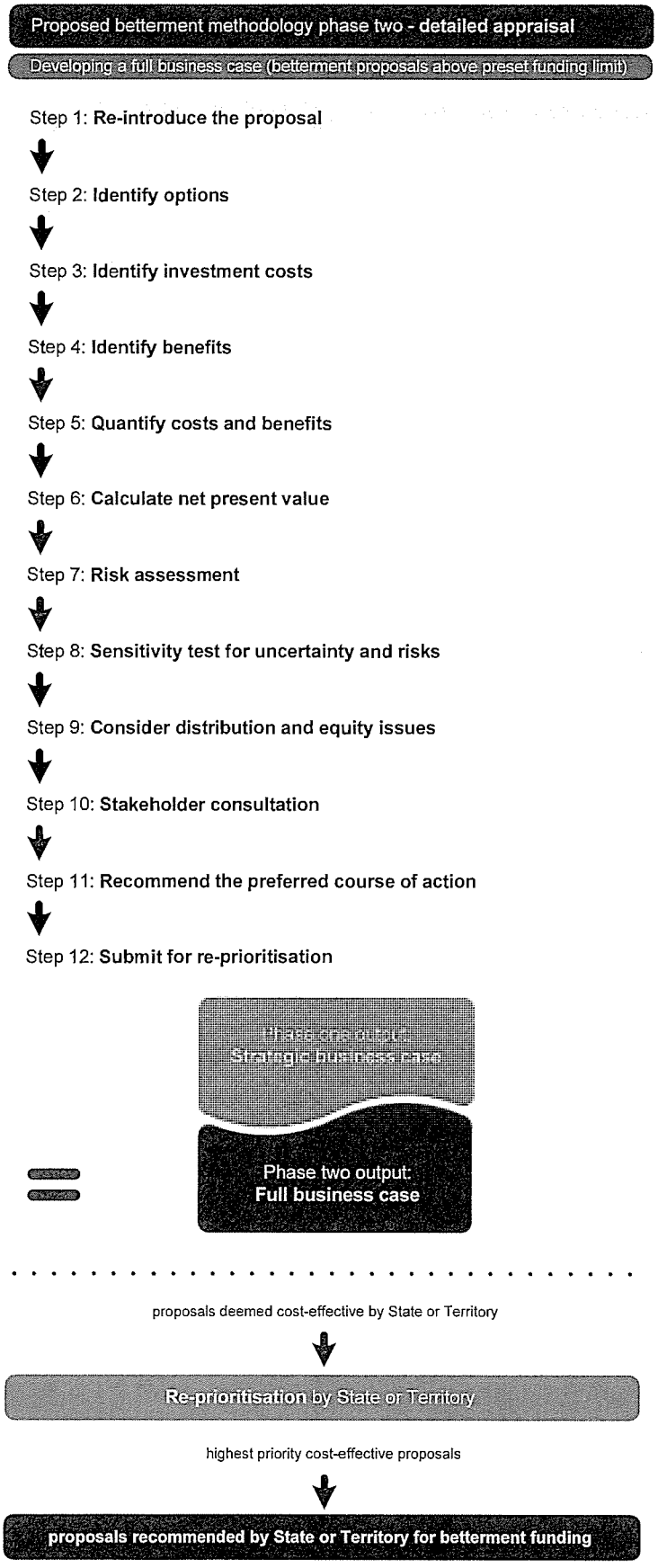

Figure 4: Key steps of Phase two: detailed appraisal – full business case methodology

3.1.1 Understanding cost benefit analysis in the context of betterment

CBA is the definitive evaluation tool for determining value-for-money and cost-effectiveness as stipulated in the proposed mandatory requirement #4 for all NDRRA betterment proposals (refer **Error! Reference source not found.**)[18]. CBA is also the preferred evaluation tool for use in the Australian Transport Council's (ATC) National Guidelines, in Infrastructure Australia's (IA) Decision Making Guidelines (ATC 2006, Infrastructure Australia 2010)[19], and the Department of Finance and Administration Handbook of Cost Benefit Analysis (DoFA 2006). Other approaches include financial evaluation and cost-effectiveness analysis.

The CBA allows a detailed comparison of the cost-effectiveness of competing betterment proposals that is more robust than the relative evaluation conducted during Phase one and proposal prioritisation. It adds rigour to a project evaluation because it explicitly links inputs with outcomes, clarifies underlying assumptions, and points to gaps in information. Specifically, the CBA will assist in:

- Deciding whether a betterment proposal (above the preset funding limit) should be progressed; and
- Identifying the most cost-effective proposal or betterment option.

The major contribution of CBA is to confirm that betterment of an asset is viable, i.e. an economic case for betterment exists, based on estimates of likely capital, operating and maintenance costs, and expected benefits. It also determines whether betterment is more cost-effective than regular and repeated restoration of the asset to its pre-disaster standard (base case) by evaluating whether the total expected benefits (avoided losses) are greater than reconstruction costs (immediate and ongoing expenditure), taking into account the time at which costs and benefits occur by discounting future costs and benefits to present values. It confirms whether a proposal represents value-for-money (and efficient use of public resources). CBA also facilitates comparison across different types of projects through use of a common metric (dollars).

The primary decision variable from a CBA is the estimated Net Present Value (NPV)[20]. A proposal is potentially worthwhile (or viable) where the total discounted value of benefits is greater than the total discounted costs (i.e. if the NPV is greater than zero). A second decision variable, the benefit-cost-ratio (BCR)[21], is also useful to assist in comparing project. A major limitation of the BCR is that it is biased towards small value projects (DoFA 2006a, p.59), but is not a significant concern for the approach taken in this report[22].

Equity and distributional issues are also difficult to express in quantitative terms and may not be fully encapsulated in the NPV or BCR, and should also be considered in other stages of the CBA and decision-making process where relevant.[23]

The CBA should include a statement of key assumptions and justification of key variable values such as discount rate, confidence levels in estimates of costs and benefits, along with a presentation of the outcomes of any sensitivity analyses[24] undertaken, acknowledging that assumptions will vary with asset and hazard type.

3.1.2 Developing the full business case

Resources should only be committed to preparing a full business case for projects over the funding limit when results of the cost effectiveness analysis in Phase one and the proposal prioritisation are favourable.

Outputs from Phase one and the proposal prioritisation should be incorporated into a single document. In developing the full business case, it is important to remember that, in general, the robustness of the business case should be commensurate with the dollar value of the proposal.

The full business case should re-state the strategic merit of the proposal described in the strategic business case (Phase one), and incorporate State or Territory feedback. The full business case should articulate the value-for-money of the proposal (expressed by the calculated NPV) and clearly identify the increased resilience that will be achieved through the betterment proposal.

The following methodology is intended to be used *in conjunction with* the Commonwealth Department of Finance and Administration guidelines *Handbook on Cost-Benefit Analysis* (DoFA 2006), which provides further technical guidance on issues such as the choice of discount rate, and Volumes 1 to 5 of the National Guidelines on Transport Systems

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18 NDRRA Determination 2011 v.1, cl.3.6.1 c) and cl.3.6.6 c)

19 The CBA methodology set out in this report is consistent with the appraisal guidelines set by ATC and IA.

20 The NPV is the discounted value of the expected benefits of a project, less the discounted value of the expected costs.

21 The BCR is the ratio of discounted benefits to discounted costs.

22 Because a CBA is being conducted for projects above $5 million.

23 This is consistent with the DoFA Handbook (2006a, p.85).

24 A sensitivity analysis is a technique used to determine how different values of an *independent* variable will impact a particular *dependent* variable under a given set of assumptions.

Management in Australia (ATC 2006) which provide critical references for quantification and valuation of the avoided costs of disruption of transport services.

The *Handbook on Cost-Benefit Analysis* (DoFA 2006) identifies nine key steps in undertaking a CBA which provides a protocol for undertaking a betterment CBA. The first step 'Determine Scope and Objectives' is addressed by the strategic business case in Phase one, through steps 1 and 2. The remaining eight steps outlined in the DoFA approach are incorporated in the following CBA methodology.

The step-by-step process for preparation of a full business case is described as follows.

3.1.2.1 Step 1: Re-introduce the proposal

The problem to be remedied by the proposal, its context and background, as described in Steps 1 and 2 from the Strategic Business Case (Phase one, refer Chapter 2) should be re-stated to also include a description of constraints such as funding availability, timing, land use planning considerations etc, and any other impediments.

This step should also re-state how the proposal addresses mandatory requirements (refer **Error! Reference source not found.**), including description of previous damage, how it relates to the State, Territory, or Local Government risk and hazard profile, and how it aligns with State, Territory or Local Government mitigation plans and priorities.

Specific quantitative information is also needed on the intensity (magnitude) and annual probability (frequency) of the hazard that impacts on the asset so that benefits (avoided costs) of betterment can be adjusted to take account of the probability of an event occurring, the duration of the event, and the intensity of the event. This data is used to calculate the expected average annual benefit of betterment. A template for recording information on flood impacts for different intensity and magnitude events is shown in Table 5.

Table 5: Template for recording information on estimated hazard impacts for the base case

Event magnitude and probability		Estimated asset damage costs ($) to return to pre-disaster standard	Estimated closure (days)	
ARI (years) (Average return interval)	AEP (%) (Annual exceedance probability)		During event	During repair
1	63			
2	39			
5	18			
10	9			
20	5			
50	2			
100	1			

3.1.2.2 Step 2: Identify options

The second step is to re-state steps 3 and 4 of the strategic business case from Phase one for the base case and at least two betterment options. Other options that were considered and rejected should also be described, including the reasons why they were ruled out. Results of the prioritisation process should also be stated including outcomes of the cost effectiveness analysis and any State, Territory or Local Government advice. The process should include estimation of asset closure for the identified betterment options. A template for recording information on estimated hazard impacts is shown in Table 6.

Table 6: Template for recording information on estimated hazard impacts for betterment options

Event magnitude and probability		Betterment Option 1			Betterment Option 2		
ARI (years) (Average return interval)	AEP (%) (Annual exceedance probability)	Estimated asset damage costs ($)	Estimated closure (days) During event	Estimated closure (days) During repair	Estimated asset damage costs ($)	Estimated closure (days) During event	Estimated closure (days) During repair
1	63						
2	39						
5	18						
10	9						
20	5						
50	2						
100	1						

3.1.2.3 Step 3: Identify investment costs

Step 3 requires the preparation of full costings for each proposed option, including the base case. Examples of costs include:

- capital expenditures;
- operating and maintenance costs for the entire expected economic life of the proposal;
- labour costs;
- costs of other inputs (materials, manufactured goods, transport and storage, etc);
- research, design and development costs;
- opportunity costs associated with using land and/or facilities already in the public domain; and
- harmful effects on other parties (for example, environmental costs such as air pollution and noise nuisance) (DoFA 2006a, p.8)

3.1.2.4 Step 4: Identify benefits

Step 4 requires systematic categorisation of benefits needed to satisfy cost effectiveness criteria for building greater community resilience (refer **Error! Reference source not found.**) being reduced cost of asset restoration (value-for-money requirement #5), improved safety (value-for-money requirement #6), and improved asset utility (value-for-money requirement #7).

These benefits are the avoided costs of future disruption to affected communities and the future avoided damage and restoration costs that would occur under various betterment options.

Reduced future expenditure on asset restoration – these are the costs avoided by building the asset to a more disaster-resilient standard than its pre-disaster state, and include.

- Avoided costs of asset rebuilding, restoration or maintenance.
- Avoided environmental and heritage costs – this would include cost of damage to the environment e.g. wetlands, parks, wildlife [25], and to historic and/or other culturally significant sites[26]. These costs may be subsumed within the above total avoided costs of asset rebuilding, restoration and maintenance, or articulated separately if the costs are substantial and/or warrant highlighting for decision-makers.[27]

Improved safety – these benefits relate to reducing incidents, injuries and fatalities, and include:

- Avoided costs of incidents, injuries and fatalities due to improved shelter during and after[28] natural disasters.
- Avoided costs of incidents, injuries and fatalities due to improved emergency access to evacuation shelters / medical services / health facilities during and after natural disasters.
- Avoided costs of incidents, injuries and fatalities that would result from decreased need to travel via alternative transport or diversionary routes.

Improved asset utility – these benefits relate to facilitating recovery and include:

- Avoided costs to community users of the asset not being functional.
- Avoided costs to business users of the asset not being functional.
- Avoided costs to government users of the asset not being functional[29], and would include, for example, the cost of emergency evacuations.

Types of benefits that cannot be costed should also be recorded and documented in the full business case, even though they cannot be included in the CBA.

3.1.2.5 Step 5: Quantify costs and benefits

There are four steps to the quantification of costs and benefits:

- estimate costs of each betterment option;
- estimate benefits (avoided costs) of betterment;
- calculate expected average annual benefit (avoided costs); and
- summarise quantified costs and benefits.

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25 Included in these costs would be the avoided vehicle emissions incurred, for example, due to traffic having to be diverted via longer routes.

26 These avoided environmental and heritage costs may be subsumed within the avoided costs of asset

27 For the purposes of this report and the worked example in Appendix B, the avoided environmental and heritage costs are assumed to be included within the total avoided costs of asset rebuilding, restoration or maintenance.

28 During the recovery phase.

29 Included in these costs would be the avoided public agency costs incurred by the agency that owns and/or manages the asset.

Estimating the costs of each betterment option entails the estimation of capital, operating, and maintenance costs and estimation of expected avoided damage and disruption costs (i.e. the benefits) for each betterment option and the base case.

Benefits include estimates of the avoided losses associated with the asset's unavailability post-event and when it is unable to be used in its normal manner during the natural disaster itself. Estimated non-market benefits (e.g. reduced travel time) may require reference to other studies based on revealed or stated preference research (DoFA 2006, p.3.2)[30].

A damage-probability curve based on historical records can be calculated to estimate the expected average annual avoided costs for a particular type of hazard and range of probabilities.

The net capital costs and recurrent costs associated with each betterment option and net annual average annual benefits compared to the base case are estimated for each year over the evaluation period to approximate the proposed asset's assumed lifetime. Table 7 below illustrates a format for summarising quantified costs and benefits.

Table 7: Example template – average annual costs and benefits

Life of project	**Years**	**Years**	**Years**
Life of project			
COSTS OF BETTERMENT	**Base Case**	**Option 1**	**Option 2**
Option	**Value ($)**	**Value ($)**	**Value ($)**
Construction costs to rebuild to current standard (base case) Construction costs to rebuild to better standard (betterment option X)			
Cost of betterment			
ANNUAL AVERAGE BENEFITS OF BETTERMENT			
Reduced future expenditure on asset restoration (VfM requirement #5)			
Benefit category	**Value ($)**	**Value ($)**	**Value ($)**
Avoided costs of asset rebuilding, restoration or maintenance Avoided environmental and heritage costs[31]			
Total reduced future expenditure on asset restoration p.a.			
Improved safety (VfM requirement #6)			
Benefit category	**Value ($)**	**Value ($)**	**Value ($)**
Avoided costs of incidents etc., during and after event due to improved shelter from natural disasters Avoided costs of incidents etc., during and after event due to improved emergency access (to evacuation shelters / medical services / health facilities) Avoided costs of incidents etc., during and after event due to reduced need for diversionary routes / alternative transport			
Total reduced number of incidents, injuries and fatalities p.a.			
Improved asset utility (VfM requirement #7)			
Benefit category	**Value ($)**	**Value ($)**	**Value ($)**
Avoided costs to community users of asset not being functional Avoided costs to business users of asset not being functional Avoided costs to government of asset not being functional			
Total improved community use benefits p.a.			
GRAND TOTAL	**Value ($)**	**Value ($)**	**Value ($)**
TOTAL COSTS			

3.1.2.6 Step 6: Calculate net present value

When undertaking a CBA, all relevant costs and benefits need to be converted to a common time-frame. This is done by adjusting the future expected streams of costs and benefits into a present dollar amount using an agreed discount rate[32].

30 This is particularly relevant for many public assets that economists recognise as pure public goods or intermediate goods.

31 This benefit may be subsumed within the avoided costs of asset rebuilding or restoration.

32 The discount rate should be agreed between the Commonwealth and States and Territories before commencing preparation of the full business case.

A discount rate of 6% has been adopted for case studies described in this report with sensitivity testing to include a 4% and 10% discount rate[33].

Since betterment is calculated as the cost difference between restoration to the pre-disaster condition (i.e. the base case) and a particular betterment project option, the incremental *benefits* of betterment compared to restoration should be calculated and compared to the incremental *costs* of betterment.

Where the incremental benefits of betterment (expressed in today's values) do not exceed the incremental costs, then there is no demonstrated economic case for proceeding with the betterment proposal.

The Net Present Value (NPV) of a betterment proposal is the discounted value of the expected additional benefits of a project, less the discounted value of the expected additional costs, relative to the base case. The NPV of a betterment proposal should be greater than zero for the proposal to be worth the investment.

As previously stated, the BCR of an acceptable betterment project should also have a BCR greater than one. While the BCR is biased towards small value projects, it can be used as an aid decision making where two proposals have the same or very similar NPVs to select the option with the higher BCR.

Table 8: Example template for presentation of NPV and BCR for betterment options

PV Benefit	
PV Cost	
NPV of betterment (e.g. at 6% discount rate)	
BCR (at 6%)	

3.1.2.7 Step 7: Risk assessment

Identify the major risks to the delivery and the ongoing success of the proposal and provide indicative timelines for resolution. Describe the major risks on the cost side (e.g. cost overrun) and benefit side (e.g. benefits not realised), detailing the likelihood and consequence of occurrence, and the risk mitigation measures to be adopted should the risk occur. Indicate major risks associated costs, benefits and timing to be assessed in sensitivity testing.

3.1.2.8 Step 8: Sensitivity test for uncertainty and risks

The calculation of economic performance (i.e. NPV and BCR) is based on estimates of expected values of investment cost and expected average annual benefits determined from the relevant damage-probability curve. However, because natural disaster events vary considerably in frequency and severity, the *actual* annual benefits may be quite different to the *expected average* annual benefits – even if the probable frequency of occurrence of any damaging natural event is known with a degree of certainty. Indeed, experience shows that investment costs are often *underestimated* in practice, which is only compounded in instances where the probable frequency of occurrence of an event is not known with any certainty[34]. The influence of climate change on the return frequency and severity of disaster events is also a factor that warrants consideration and any available information on the changed probability of natural hazards should be included where there is reason to believe that climate change will play a significant role.

A simple method of addressing risk and uncertainty in the context of betterment is to undertake sensitivity analyses to highlight which, if any, of the cost or benefit types are most influential on the calculation of economic performance. NPV calculations may be particularly sensitive to the choice of discount rate, estimates of betterment cost, and damage-probability assumptions.

To test the robustness of findings and associated recommendations, sensitivity analysis on these variables (and any other potentially sensitive variables) should be undertaken[35]. Alternatively, more advanced analysis of risk and uncertainty could be undertaken using Monte-Carlo modelling or mathematical statistics.

3.1.2.9 Step 9: Consider distribution and equity issues

Betterment proposals may have benefits (or avoided losses) that impact unequally between different socio-economic groups and/or regions. This may include benefits to particular community groups or industries not quantified in Step 5 (refer 3.1.2.5). Distributional and equity issues are important to consider because benefits are often constrained by income and socio-economic status, which are not equally distributed. In these circumstances, the proposal's NPV may not be an adequate indicator of its overall worth to all sectors of a community. Differential benefits of each betterment option should be highlighted for consideration by decision-makers.

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33 Further discussion around the theory and methods of discounting is provided in the DoFA *Handbook on Cost-Benefit Analysis* (2006).

34 Historical records may only cover several decades or be incomplete if they are available at all.

35 This is consistent with the DoFA Handbook, (2006, pp.74-77) and the ATC Guidelines (2006, pp.77-78).

3.1.2.10 Step 10: Stakeholder consultation

Describe the stakeholder consultation process. List the key stakeholders and indicate the degree of consultation that has taken place to date and the level of support received.

3.1.2.11 Step 11: Recommend the preferred course of action

This section concludes the full business case. The preferred option should be clearly identified supported by a sound rationale that draws on the outputs of the strategic business case, including a re-articulation of the strategic merit of the proposal to include any modifications resulting from the CBA.

3.1.2.12 Step 12: Submit for re-prioritisation

If the preferred course of action is to proceed with a betterment proposal, it should be submitted to the State or Territory for re-prioritisation to take account of additional information compiled during the detailed appraisal and for comparison with other proposals.

3.2 Conclusion

The methodology for detailed appraisal of NDRRA betterment proposals recognises existing procedures, tools, and guidelines, and builds on established knowledge and expertise by:

- Providing a set of sequential tasks needed to confirm the strategic merit and value-for-money of betterment proposals above a specified funding limit;
- Using estimates of past damages to assess future risk and associated avoided damages;
- Using CBA techniques that focus on quantifiable costs and benefits;
- Identifying preferred categories of benefits and costs;
- Confirming use of NPV as the primary decision variable;
- Incorporating pragmatic steps to consider risks and stakeholder feedback;
- Providing specific guidance to supplement contemporary CBA handbooks and financial policy.

Appendix A – Strategic assessment case studies

Two case studies – a public school damaged by flooding and a rural road also affected by flooding – have been developed to demonstrate how betterment options could be applied to the restoration of essential public assets. These case studies are based upon actual assets that have been impacted by natural disasters but do not refer to the specific localities and could be located anywhere in Australia.

Case study 1 – Strategic assessment of a proposal to undertake betterment of a public building

The first example is the restoration of classrooms in a State school that has repeatedly suffered significant damage and disruption due to flooding in recent decades. In this example, two classrooms were inundated in 2011, 2005, 1992 and 1974. Each time the school has been flooded, students have been transferred to temporary alternative facilities, involving additional travel for students and teachers and costs for the provision of the temporary facilities. Community groups using the school's facilities after hours have likewise been displaced.

Restoration of the damaged buildings includes clean up, removal of hazardous materials and addressing health risks, repairing damaged classrooms and replacing damaged equipment.

The owner of the building, the State Education Department considered a number of options for restoration of the damaged classrooms when preparing their NDRRA funding proposal within a few weeks of a recent flood. Based on updated information, the cost of cleanup, replacing damaged equipment and restoring the buildings to the standard of the classrooms before the most recent flood, amounted to $1.01 million.

Initial cost estimates to raise the low lying buildings were estimated at $2.96 million, with relocation of the classrooms to a higher location in the school grounds estimated to start from $3.48 million.

Strategic assessment #CS1 – Step 1: Introduce the project

Title	XYZ State School classroom restoration
Applicant	State Education Department
Challenge	The School is designated as essential State owned public infrastructure, which has not been available for extensive periods over the past decades due to flooding of classrooms. This has resulted in severe disruption to students and teachers and their related households (e.g. parents). Students have had to be relocated on an ongoing basis to temporary facilities, requiring additional travel for both teachers and students and in many cases parents transporting their children to school. The State has provided special bus transport services to enable students to attend the alternative facilities. Parents were required to provide additional care for students while temporary facilities were secured. Recent flooding of the classrooms has resulted in the need to clean up the debris from the site and to make the site safe (including removal of hazardous materials and addressing health risks), repair of buildings, replacement of damaged equipment and restoration of essential services (e.g. power, water, sewerage etc). One of the risks to be considered is the limited data available on flood levels in particular, what is currently considered to be the relevant ARI flood events may be underestimated.
Risk profile	A review of records of flooding events over the past few decades indicates that the school is subject to flooding on an Average Recurrence Interval (ARI) of 10 years (i.e. probability of event occurring in any one year is 10%).

Title	XYZ State School classroom restoration
Betterment proposal	Three betterment options are examined that would remove the continual need for recovery after each major flooding event. **Option 1** is to raise the level of the existing two low lying critical buildings (classrooms) 0.5m above the 50 year ARI.[36] **Option 2** proposes that affected classrooms in the low lying areas of the school precinct be raised 0.5 metres above the 100 year ARI flood level, which would involve relocation of the classrooms to higher ground on the school grounds. **Option 3** proposes raising the classrooms 0.5m above the 200 year ARI.
Main costs	The main costs of the proposal involve the following: • Cost of construction of the new facilities (including raising of the existing buildings as appropriate) and connection of services • Cost of demolition and/or clean up of previous facilities • Ongoing maintenance costs for all options (including base case) are the same as current costs and have therefore been excluded
Main benefits	The main benefits of the betterment in this case would be: • Avoided direct repair or restoration costs resulting from future flooding events • Avoided costs associated with students and teachers not having to transfer to alternative facilities[37] • Avoided community disruption to student education and the knock-on effects for families • Avoided displacement of community groups using facilities outside of school hours • Avoided safety costs associated with risk exposure to traffic incidents • Reduction in ongoing maintenance costs of the new facilities to current building standards • Having more disaster resilient school buildings could also provide additional temporary shelter for the local community when affected by future disaster events

Strategic assessment #CS1 – Step 2: Define the current situation

Current situation	The school is an essential public asset for the local community and there are no readily available alternatives for short-term disruptions. Damage due to flooding is currently recovered and restored after each flood event with resultant disruption for the school and community for prolonged periods, impacting on students' educations and resulting in considerable costs to the community. Significant disruption (and cost) is involved with each flooding event as alternative temporary facilities are sourced and students and teachers have to relocate on a daily basis to the alternative facility. The potential impacts from not undertaking the betterment proposal are expected to become greater as the community is growing and hence the potential number of students and community groups using the facilities will also increase.
Susceptibility to natural hazard events	• Major flooding events are occurring approximately every 10 years based on available records. • As a result of major flooding events the school is closed for an extended period of three to six months while clean up and restoration works are completed.
Prior NDRRA claims	• As a result of flood-related events, prior NDRRA claims have been made for restoration of the school in 2011 and 2005 totalling $1.25 million.

[36] Option 1 is included to demonstrate a betterment proposal that could be considered but subsequently rejected on the basis that although it would better the asset to a higher standard than its pre-disaster / base case state, it would not meet the minimum betterment standard as recommended by the risk analysis.

[37] Note that not all benefits – particularly indirect social benefits – are readily quantifiable, and they have not been costed for this case study.

Strategic assessment #CS1 – Step 3: Define the base case for restoration

Base case:	Restoration to pre-disaster standard (*status quo*)	
Costs	• Estimated **immediate cost $1.01 million** • Restoration costs to be repeatedly expended at estimated 10 year intervals • Restoration costs over 30 years estimated at **$3 million**	
Detailed costs		($)
	Preliminaries	344,900
	Trade works	662,900
	Total estimate	**1,007,800**
Benefits	• Lowest immediate expenditure required	
Timings	• Immediate three to six months restoration (building closed) • Estimated disaster repairs of three to six months recurrent at estimated 10 year intervals. • Major recurrent disruption to school life.	

Strategic assessment #CS1 – Step 4: Identify the betterment options

Betterment Option 1:	Raise the level of the existing two low lying critical buildings (classrooms) by 0.5m above the 50 year ARI. This would also involve raising the surrounding ground level as appropriate. This is expected to involve raising the buildings by 1.5 and 2.0 metres respectively *(rejected option)*	
Costs	• Estimated **immediate cost $2.96 million** • Betterment component[38] **$1.96 million** • Disruption for each building for the period of the construction, i.e. require the existing building to be vacated. In addition the quality of the existing infrastructure would have to be considered in terms of suitable structural strength to allow the raising process and the quality of the building (considering age and level of functionality) if the building is to be raised. In some cases the functionality provided by the existing building may not be in accordance with current standards and not justify the cost of raising the building, rather it may be more cost-effective to construct a new building. • Moderate repair costs estimated over 30 years – estimated < **$500,000**	
Detailed costs		($)
	Preliminaries	344,900
	Trade works	2,617,930
	Total estimate	**2,962,830**
Benefits	• Very minor impact to school life following 10 and 50 year ARI flood level events • Classrooms become potential recovery centres during 10 and 50 year ARI flood events	
Timings	• Immediate three to six months restoration (building closed) • Estimated disaster repairs of three to six months recurrent at estimated 50 year intervals. • Moderate recurrent disruption to school life.	

[38] The total project cost is required for comparison purposes and the betterment component is of greatest significance in relation to the cost sharing arrangements between the Commonwealth and States / Territories.

Betterment Option 2:	Build two new classrooms 0.5 metres above the 100 year ARI flood level on higher ground within the existing school precinct *(preferred / recommended option)*	
Costs	• Estimated **immediate cost $3.48 million** • Betterment component **$2.47 million** • Very minor clean up and repair costs following 10, 50 and 100 year ARI flood level events • Minor repair costs estimated over 30 years – estimated **< $250,000**	
Detailed costs		($)
	Preliminaries	344,900
	Trade works	3,135,560
	Total estimate	**3,480,460**
Benefits	• Very minor impact to school and community life following 10, 50 and 100 year ARI flood level events • Classrooms become potential recovery centres during 10, 50 and 100 ARI flood events	
Timings	• Immediate three to six months demolition and building (building closed) • Estimated disaster repairs of three to six months recurrent at estimated 100 year intervals. • Very minor recurrent disruption to school life.	

Betterment Option 3:	Build two new classrooms 0.5 metres above the 200 year ARI flood level on higher ground within the existing school precinct *(non-recommended option)*	
Costs	• Estimated **immediate cost $4.51 million** • Betterment component **$3.51 million** • Very minor clean up and repair costs following 10, 50, 100 and 200 year ARI flood level events • Very minor repair costs estimated over 30 years – estimated **< $75,000**	
Detailed costs		($)
	Preliminaries	344,900
	Trade works	4,168,820
	Total estimate	**4,513,720**
Benefits	• Very minor impact to school life following 10, 50, 100 and 200 year ARI flood level events • Classrooms became potential recovery centres during 10, 50, 100 and 200 ARI flood events • Added undercover Learning Area to be used for outdoor learning curriculum, outdoor covered area for break activities	
Timings	• Immediate three to six months demolition and building (building closed) • Estimated disaster repairs of three to six months recurrent at estimated 100 year intervals. • Very minor recurrent disruption to school life.	

There is potential to consider each of the buildings as individual projects to allow staging of the work, however there are economies of scale by considering all of the work as a single project.

Table A1: Assessment of mandatory betterment requirements (all betterment options)

Mandatory requirements	Relevant criteria	Assessment against requirement	Assessment
1. Replace or restore an essential public asset	a) integral and necessary part of State infrastructure	The school is an integral and necessary State infrastructure asset	Yes
	b) severely disrupts normal functioning of community	Significant reduction in number of events. Significant reduction in flood damage exposure from 10y ARI to 50y ARI (Option 1); 100y ARI (Option 2); or 200y ARI (Option 3).	Yes

Mandatory requirements	Relevant criteria	Assessment against requirement	Assessment
	c) restored as a matter of urgency	School is a critical public asset that impacts on community and is required to be restored urgently. Provides resilience by allowing quick recovery of school use.	Yes
2. Priority for mitigating natural disaster risk	a) been subject to major repeated damage	Significant flood damage events (10y ARI)	Yes
	b) high State or Territory or Local Government priority	School is a critical state public asset	Yes
3. Replace or restore the asset to standard that is more resilient to natural disasters	a) standard that is more resilient to natural disasters	Upgrade infrastructure to a more disaster-resilient standard (major flooding).	Yes
	b) impact of future natural disasters mitigated	Significant reduction in damage and associated recovery costs.	Yes
4. Cost-effective proposal (represents value-for-money)	Avoided cost of asset restoration to government	Disaster-resilient buildings above 100y ARI flood (1% AEP)	**Option 1:** No[39] **Options 2-3:** Yes

Table A2: Assessment of value-for-money betterment requirements (base case and all betterment options)

Value-for-money requirements	Relevant criteria	Assessment against requirement	Assessment
5. Reduces future expenditure on asset restoration	Avoided cost of repairs to government from damage by future natural disasters.	**Base case** – estimated restoration costs of $3 million over 30 years **Option 1** – $2.5 million estimated avoided costs **Option 2** – $2.75 million estimated avoided costs **Option 3** – $2.93 million estimated avoided costs	**Option 1:** 3 **Option 2:** 4 **Option 3:** 5
6. Reduces future incidents, injuries and fatalities during and after natural disaster events	a) improved shelter from natural disasters	**Option 1** – improved emergency shelter for community **Options 2-3** – additional emergency shelter for community	**Option 1:** 2 **Options 2-3:** 5
	b) improved emergency access (to evacuation shelters / medical services / health facilities)	n/a (for base case and all betterment options)	n/a[40]
	c) decreased need to travel via alternative routes	Allows community to recover quickly to normal functioning **Option 1** – moderate reduction in disruption **Options 2-3** – significant reduction in disruption. Recovery of school function reduced from 3-6 months to 1-2 weeks (reduced outage).	**Option 1:** 3 **Options 2-3:** 5

[39] Option 1 would be rejected at this initial stage as it does not address all the mandatory betterment requirements specifically, the minimum flood immunity standard to which the asset is recommended to be bettered and would therefore not be considered a cost-effective option.

[40] Criteria are only able to be disregarded where they have no application to the base case and all betterment options, otherwise a nil / neutral score of 1 would be recorded.

Value-for-money requirements	Relevant criteria	Assessment against requirement	Assessment
7. Improves community use during and after natural disaster events	a) avoided indirect costs to community users	Reduced impact of school being closed – disruption to students, teachers and families. Recovery of school function reduced from 3-6 months to 1-2 weeks (reduced outage).	**Option 1:** 3 **Options 2-3:** 5
	b) avoided indirect costs to business users	n/a (for base case and all betterment options)	n/a
	c) avoided indirect costs to government users	Additional emergency shelter for community. **Option 1** – moderate reduction in costs **Options 2-3** – significant reduction in costs.	**Option 1:** 3 **Options 2-3:** 5

Table A3: Ranking of proposals in relation to value-for-money betterment requirements

Proposal / option	Value-for-money requirements			Cost-effectiveness (CE) ranking based on benefits / costs			
	The proposal / option will reduce future expenditure on restoration VfM requirement #5	The proposal / option will improve safety VfM requirement #6	The proposal / option will improve asset utility VfM requirement #7	Total benefit score	Total Cost ($m)	CE Ratio (CER)	Rank
Base case					1.01		
2	4	10	10	24	2.47	9.72	1
1	3	5	6	14	1.96	7.14	**2**
3	5	10	10	25	3.51	7.12	**3**

Strategic assessment #CS1 – Step 5: State the strategic merit of the project

The strategic merit of the proposal for the betterment of the school classrooms to reduce the impact of major flooding is demonstrated by the analysis in the above tables, vis-à-vis the mandatory and value-for-money betterment requirements. Although the cheapest options in the short-term, neither the base case nor betterment Option 1 (50y ARI) are sufficiently cost-effective to be recommended, particularly as neither will address the recommended minimum flood immunity / disaster-resilience of 100 year ARI (1% AEP).

Strategic assessment #CS1 – Step 6: Recommend the preferred course of action

Of the betterment proposals, Option 2 is preferred as the most cost-effective option that meets the risk profile (1% AEP).

Option 3 is not favoured due to budget constraints (combined with having the cost-effectiveness ranking), and the risk profile does not suggest that a 200y ARI (0.5% AEP) is required.

Option 1 (as discussed above) provides insufficient disaster-resilience.

Overall, Option 2 meets the mandatory betterment requirements and has very high, to high strategic impact considering the economic and social impacts.

Strategic assessment #CS1 – Step 7: Submit for prioritisation

As the strategic assessment is favourable and the project cost of Option 2 is less than the upper limit of $5 million, a detailed appraisal – Phase two – is not required to be undertaken. This betterment proposal is now eligible for State or Territory prioritisation.

For the purposes of this report, this step is assumed to have been undertaken but is not included for this case study.

Case study 2 – Strategic assessment of a proposal to undertake betterment of a bridge on a rural highway

The second case study concerns the restoration of a low level bridge within a flood plain near the intersection of two important rural highways. These highways provide critical links between several major regional towns and are used to move cattle between production areas and markets located in capital cities and coastal centres. The bridge is estimated to carry about 400 vehicles each day on average, of which about one third are trucks carrying cattle, or agricultural products to markets or goods for use by people in the regional towns.

The bridge is subject to regular wet season flooding where inundation is usually restricted to three days each year, followed by a repair period of seven days equalling a total average annual closure of 10 days. However flooding in each of the last two wet seasons has caused the highway to be inundated for five days causing extensive damage requiring major emergency repairs of several million dollars per event, and the road to be closed for more than four weeks (28 days), a total closure period of at least 33 days in each year. Taking these recent events into account, the probability that the road would be closed for more than one month per year is 20% i.e. a one in five year flood event.

The major costs to the community occur during the period of road closure where local traffic is trapped by flood waters at the base of the bridge, and regional traffic needs to make use of an alternative route that adds 400 km and five hours to the journey.

Following recent inundation and damage, and facing a bill of $3.5 million to restore the road to its pre-disaster condition, and with the expectation that similar expenditures would be required in future, the road authority decided to investigate the case for betterment under NDRRA. The road authority was influenced by observations that the severity of recent floods appears to be increasing due to more intensive agricultural use upstream of the bridge. Two options for NDRRA betterment of the bridge were subsequently identified.

The first involves strengthening the bridge for $30 million to reduce damage to the bridge and approach roads so that they are trafficable as soon as the water subsides (three day average annual closure as opposed to 10 days in the current situation and base case). The second option involves raising the bridge and approach roads for a cost of $100 million so that the road would be closed only in the case of a 1 in 100 year event (zero days average annual closure).

Since the investment cost of both options exceed the proposed preset upper limit for NDRRA betterment projects, a full business case under Phase two, which includes an analysis of costs and benefits of each option, is required in addition to the strategic business case.

Strategic assessment #CS2 – Step 1: Introduce the project

Title	Betterment of bridge XYZ on a rural highway in rural Australia
Applicant	State Transport and Main Roads Department
Challenge	Vital connectivity between key centres and regions is significantly disrupted ever year due to flood and poor existing asset resilience. Restoration of the existing bridge and approach road sections to the previous disaster-resilient standard is estimated to cost $3.5 million. Average annual repairs are estimated to cost $1.4 million based on an analysis of the likely damage that would be caused by a range of flood return periods and their probabilities. The estimates are: 3y ARI: $1.4 million; 5y ARI: $1.8 million; 50y ARI: $2.5 million 100y ARI: $5.0 million.
Risk profile	The risk profile for this asset and location indicates that a 1% AEP is the minimum flood immunity that should be adopted.
Betterment proposal	Two approaches to betterment were identified: **Option 1** is to rebuild the bridge and approach roads at the same height to better withstand the impact of flooding and inundation so major damage can be avoided and the asset opened immediately following the water subsiding. **Option 2** is to rebuild the bridge and approach roads to a higher level so flood damage is avoided and inundation occurs infrequently (100y ARI).
Main costs	The main costs of the proposal involve the following: • Cost of construction of the restoration and betterment (including demolition and/or clean up of previous structure) • Ongoing maintenance costs for all options (including base case)

Title	Betterment of bridge XYZ on a rural highway in rural Australia
Main benefits	The main benefits of betterment in this case would be: • Reduced injuries, fatalities and improved resilience through reduced asset closure – a reduction of an minimum average of about 7 days every year compared to the base case; • Avoided future on-going costs of restoration of the bridge to its pre-disaster resilient standard; and • Enhanced recovery due to the avoided road user cost, effect on businesses, essential services, environmental damage and traffic incidents due prevention of local travel, interrupting traffic who did not have prior knowledge of the event, or a possible 400km diversion for other long distance traffic for each incremental day of road closure.

Strategic assessment #CS2 – Step 2: Define the current situation

Current situation	The project site is the interface of two important rural highways and connects towns A and B. It currently carries 400 vehicles (500 persons) per day of which 30% are trucks carrying cattle or supplies. About 100 of the vehicles (125 persons) per day are local trips made, generated by the local population of 300. Traffic is growing at 6% per annum. Improving the bridge and approach roads to either higher natural disaster resilient standard is not included in the current forward three year program. There is no possibility of staging or dividing any of the options into smaller projects as the bridge's connectivity function needed to be reinstated.
Susceptibility to natural hazard events	• The road is closed for about 10 days a year on average due to inundation (3 days) followed by repair work (7 days) (3y ARI). This average closure period increases with the severity of inundation to an estimated 19, 28 and 35 days for ARIs of 5, 50 and 100 years respectively. • Due to more intensive agricultural use upstream of the bridge, the severity of recent floods appears to be increasing. Flooding in the two last wet seasons caused the highway to be impassable for four weeks and six weeks (at least 33 days) – well above the 'average' closure of not more than 10 days per annum, between the estimates for ARIs of 5 and 50 years. • Taking these recent events into account, the probability that the road would be closed for more than one month per year is 20% i.e. a 5y ARI.
Prior NDRRA claims	• As a result of flood-related events, prior NDRRA claims have been made for restoration of the road in 2011, 2010, 2009, and 2005 totalling $15 million

Strategic assessment #CS2 – Step 3: Define the base case for restoration

Base case:	Restoration to pre-disaster-resilient standard (*status quo*)
Costs	• Estimated **immediate cost $3.5 million** • Average of $1.4 million dollars (conservative) in each subsequent year for flood repairs • Average maintenance costs of $6,000 per year • Restoration cost over 30 years estimated at (minimum) **$42.18 million**, in addition to significant ongoing expense to local and long distance road users forced to avoid the road for an estimated 10 days every year.
Detailed costs	• This step is assumed to have been undertaken but is not included for this case study.
Benefits	• Earliest re-establishment of usage • Minimal short-term disruption to the local travel (100 vehicles, 125 person per day) and the economy • Minimal short-term disruption to long distance traffic (400 vehicles, 30% of which carry cattle and supplies) that would otherwise avoid the area, using a 400km diversion at considerable inconvenience and cost.
Timings	• Estimated immediate 12 days restoration (road closed) • Estimated annual 3 days inundation (road closed). • Estimated annual 7 days flood repair and clean up, starting when the water subsides (road closed)

Strategic assessment #CS2 – Step 4: Identify the betterment options

Betterment Option 1:	Strengthening the bridge and approach roads to better withstand the effects of inundation so that they are immediately trafficable when the water subsides.
Costs	• Estimated **immediate cost $30 million** • Betterment component **$26.5 million** • Very minor average annual maintenance costs • Restoration costs **avoided** over 30 years estimated at (minimum) **$16.0 million**, in addition to ongoing expense to local and long distance road users forced to avoid the road for an estimated 3 days every year.
Detailed costs	• This step is assumed to have been undertaken but is not included for this case study.
Benefits	• Reduced injuries, fatalities and improved resilience through reduced asset closure – a reduction of an average of about 12 days every year compared to the base case; • Avoided annual social costs following a flood event is estimated to average $330,000 per annum based on expected damage for flood events for various return frequencies (refer Figure B1). • Avoided future on-going costs of restoration of the bridge to its pre-disaster resilient standard; and • Enhanced recovery due to the avoided road user cost, effect on businesses, essential services, environmental damage and accidents due prevention of local travel, interrupting traffic who did not have prior knowledge of the event, or a possible 400km diversion for other long distance traffic for each incremental day of road closure.
Timings	• Estimated immediate 20 days construction (12 days restoration + 7 days betterment component) (road closed) • Estimated 4-7 days flood repair and clean up annually, starting when the water subsides. Minimal disruption to traffic (road open during repair)

Betterment Option 2:	Raising the bridge and approach roads so that the road would be closed only in the case of a 1 in 100 year event
Costs	• Estimated **immediate cost $100 million** • Betterment component **$96.5 million** • Average maintenance costs approximately $10,000 per year; and • Repair and clean-up following a flood event is estimated to be insignificant. • Restoration costs **avoided** over 30 years estimated at **$20.8 million**, with no significant impact to local or long distance road users.
Detailed costs	• This step is assumed to have been undertaken but is not included for this case study.
Benefits	• Reduced incidents, injuries, fatalities and improved resilience since the asset would not be closed at all except in the case of a more than 1 in 100 year event – 0 average annual days of closure compared to the base case of 15 days); • Avoided future on-going costs of restoration of the bridge to its pre-disaster resilient standard; and • Enhanced recovery due to the avoided road user cost, effect on businesses, essential services, environmental damage and accidents due to a possible 400km diversion by 280 light vehicles and 120 trucks for each incremental day of road closure. • In the subsequent detailed cost benefit analysis (CBA) the annual benefits of building each betterment standard would be estimated by considering the probability of various flooding events and the potential avoided damage costs taking into account the duration of the asset closure and the attendant repair and maintenance works that would be needed.
Timings	• Estimated immediate 32 days restoration (12 days restoration + 20 days betterment component) (road closed) • Estimated 2 day annually, minor repairs and cleanup. Very minor disruption to traffic (road open)

Table A4: Assessment of mandatory betterment requirements (all betterment options)

Mandatory requirements	Relevant criteria	Assessment against requirement	Assessment
1. Replace or restore an essential public asset	a) integral and necessary part of State infrastructure	Strategic link in State Highway Network – links production areas to markets in towns A and B. Without repair or betterment, current damaged means road would be impassable all year around. Nearest diversion route for long distance traffic is 400km longer and is not an adequate alternative.	**Options 1-2:** Yes
	b) severely disrupts normal functioning of community	As a strategic link road is only alternative for long distance and local traffic generated by 300 local residents for normal business, social and educational purposes. Towns A, B and C would find their economic base severely eroded likely in proportion to traffic diversion (i.e. 75%). 100 vehicles (125 persons) are local trips that would be severely disrupted. Few alternatives exist. 300 vehicles (375 persons) are long distance trips that would avoid the region altogether incurring inconvenience, using more fuel and generating pollution.	**Options 1-2:** Yes
	c) restored as a matter of urgency	Since it is a strategic link policy position is link would be replaced.	**Options 1-2:** Yes
2. Priority for mitigating natural disaster risk	a) been subject to major repeated damage	Road has been damaged 8 times in past 20 years. Five recent events have required repairs totalling $28 million.	**Options 1-2:** Yes
	b) high State or Territory or Local Government priority	State policy directive based on grounds of strategic critical link.	**Options 1-2:** Yes
3. Replace or restore the asset to standard that is more resilient to natural disasters	a) standard that is more resilient to natural disasters	**Option 1** (strengthening) – ensures road is passable for 362 days per year, compared to 355 days for base case. **Option 2** (strengthening plus raising to withstand ARI=100) – road is passable virtually 365 days per year.	**Options 1-2:** Yes
	b) impact of future natural disasters mitigated	Significant reduction in damage.	**Options 1-2:** Yes
4. Cost-effective proposal (represents value-for-money)	Avoided cost of asset restoration to government	**Option 1** – Typical annual damage expected to be restricted to signage, clean-up and minor works compared to regular annual repair. Expected net avoided cost of $16.0 million (present value at 6% per annum). **Option 2** – Typical annual damage expected to be restricted to signage, clean-up and minor works compared to regular annual repair. Expected net avoided cost of $20.8 million (present value at 6% per annum).	**Options 1-2:** Yes

Table A5: Assessment of value-for-money betterment requirements (base case and all betterment options)

Value-for money requirements	Relevant criteria	Assessment against requirement	Assessment
5. Reduces future expenditure on asset restoration	Avoided cost of repairs to government from damage by future natural disasters.	**Base case** – estimated restoration costs of $42.18 million over 30 years **Option 1** – $40.5 million estimated avoided costs **Option 2** – $70.3 million estimated avoided costs	**Option 1:** 3 **Option 2:** 5
6. Reduces future incidents, injuries and fatalities during and after natural disaster events	a) improved shelter from natural disasters	n/a (for base case and all betterment options)	n/a
	b) improved emergency access (to evacuation shelters / medical services / health facilities)	**Option 1** – No improved access during event for 300 local residents. **Option 2** – Improved access to medical facilities during event for 100 local residents.	**Option 1:** 1 **Option 2:** 3
	c) decreased need to travel via alternative routes	**Option 1** – Road is passable 7 days per year on average more than the base case. Avoided diversion of up to 400km for 300 vehicles (375 persons) on average 7 days per year. **Option 2** – Road is passable 10 days per year on average more than base case and 3 days per year more than Option 1. Avoided diversion of up to 400km for 300 vehicles (375 persons) on average 10 days per year.	**Option 1:** 4 **Option 2:** 5
7. Improves community use during and after natural disaster events	a) avoided indirect costs to community users	**Option 1** – Road is passable for 7 days per year on average more than base case. 300 local residents have normal access 362 days per year. **Option 2** – Road is passable for 10 days per year on average more than base case. 300 local residents have normal access all year round.	**Option 1:** 4 **Option 2:** 5
	b) avoided indirect costs to business users	**Option 1** – Road is passable 7 days per year on average more than the base case. 200 estimated local and other business users residents can come and go normally 362 days per year on average, compared to 350. **Option 2** – Road is passable 10 days per year on average more than the base case. 200 estimated local and other business users residents can come and go normally all year round.	**Option 1:** 3 **Option 2:** 4
	c) avoided indirect costs to government	**Option 1** – Road is passable 7 days per year on average more than the base case. Reduces cost of aerial emergency events cost of $10,000 per year. **Option 2** – Road is passable 10 days per year on average more than the base case. Reduces cost of aerial emergency events cost of $12,000 per year.	**Option 1:** 2 **Option 2:** 2

Table A6: Ranking of proposals in relation to value-for-money betterment requirements

Proposal / option	Value-for-money requirements			Cost-effectiveness (CE) ranking based on benefits / costs			
	The proposal / option will reduce future expenditure on restoration VfM requirement #5	The proposal / option will improve safety VfM requirement #6	The proposal / option will improve asset utility VfM requirement #7	Total benefit score	Total Cost ($m)	CE Ratio (CER)	Rank
Base case					3.5		
1	3	5	9	17	26.5	0.64	1
2	5	8	11	24	96.5	0.25	2

Strategic assessment #CS2 – Step 5: Strategic merit

Both betterment options meet the mandatory strategic requirements and have high to very high strategic impact considering the economic and social impacts. However, according to the simple ranking system in Table A6, Options 1 and 2 are not cost-effective in comparison with the base case – despite the advice that they will avoid costs of $16.0 million and $20.8 million respectively. This demonstrates that such a simple ranking system to ascertain BCR has limited use with high value betterment proposals and a detailed CBA is required as per Phase two.

Strategic assessment #CS2 – Step 6: Recommend the preferred course of action

While the second betterment option is preferred based on strategic merit, it has significantly greater cost. A detailed appraisal would subsequently be carried out to determine the betterment option with the higher overall net community resilience benefit and to determine whether it represents value-for-money (refer Appendix B).

Strategic assessment #CS2 – Step 7: Submit for prioritisation

With a favourable strategic assessment, a preliminary prioritisation process would be undertaken, noting that as the project costs of the betterment options are over of $5 million, a detailed appraisal – Phase two – is required to be undertaken to determine if either betterment option represents value-for-money (refer Appendix B).

For the purposes of this report, the prioritisation process is assumed to have been undertaken but is not included for this case example.

Appendix B – Detailed appraisal case study

Case study 2: Detailed appraisal of a proposal to undertake betterment of a bridge on a rural highway

This detailed appraisal case study provides summary details of a cost-benefit analysis and step-by step demonstration of tasks needed to progress consideration of a hypothetical proposal to undertake betterment of a rural bridge. This case study is also described in the strategic business case study (Appendix A) that would also form part of a full business case.

This detailed appraisal case study illustrates, for proposals above the agreed funding limit:

- How betterment options for the same project can be evaluated using CBA
- Preferred methods to present costs and benefits relevant to the evaluation of a betterment proposal
- How to ensure a betterment proposal aligns with the current NDRRA determination via fulfilment of mandatory requirements and cost effectiveness criteria;
- Calculation of average annual benefits using a damage-probability distribution; and
- How to identify a preferred betterment option.

This case study does not aim to provide an authoritative analysis of each category of cost or benefit for all types of natural hazards and essential assets, acknowledging that assumptions made throughout the CBA will vary with the hazard and asset type. Given its hypothetical nature, details for several steps have not been included where other guidance or best practice is well established.

Detailed appraisal #CS2 – Step 1: Re-introduce the project

This step will re-state the problem to be remedied by the project, and state constraints, alignment with mandatory requirements and how the proposal mitigates the impact of future natural disasters in accordance with state, territory or local government risk profiles and hazard mitigation plans. These details are not included here as they have been summarised in the strategic assessment (Appendix A).

This step also requires inclusion of additional details of the intensity (magnitude) and annual probability (frequency) of the hazard (in this case flooding).

The site of this hypothetical project is described as being subject to regular flooding during the wet season. Regional staff have recorded observations that indicate the severity of recent floods is increasing due to more runoff from intensive agricultural use upstream of the bridge. Flooding in the last two wet seasons caused the highway to be inundated for about five days with extensive damage requiring a repair period of more than four weeks. Using available hydrology records, it is assessed that the asset could be closed due to inundation and repair due to flood events with ARIs of 3, 5, 50 and 100 years, as shown in Table B1. It is acknowledged that there is considerable uncertainty in relation to the effect of very rare, large flood events given the limited scope of available records.

Table B1: Current hazard impacts

Average Return Interval (ARI) (years)	Annual Exceedance Probability (AEP) (%)	Estimated asset damage costs to return to pre-disaster standard ($m)	Estimated closure (days)		
			Inundation	Repair	Total
3	28	1.4	3	7	10
5	18	1.8	5	14	19
50	2	2.5	10	18	28
100	1	5.0	12	23	35

The base case to restore the bridge to the pre-disaster standard is estimated at estimated $3.5 million. The road authority estimated the extent of damage and rectification costs that could be incurred due to floods with various return periods as: $1.4 million (3y ARI); $1.8 million (5y ARI); $2.5 million (50y ARI); and $5.0 million (100y ARI) (see also Figure B1).

Detailed appraisal #CS2 – Step 2: Identify options

In this hypothetical proposal, only two proposed betterment options have been identified. In a real proposal, it is preferred if a wide range of options to avoid or mitigate damage are described and considered. The two betterment options include in this analysis are:

- Option 1 – strengthening the bridge and approach roads to better withstand the effects of inundation and be trafficable when the water subsides, for a cost of $30 million i.e. $3.5 million for restoration (base case) + $26.5 million (betterment component).
- Option 2 – raising the bridge and approach roads so that this segment would be closed only for a flood event greater than a 1 in 100 year ARI, for a cost of $100 million i.e. $3.5 million for restoration (base case) + $96.5 million (betterment component).

Both options would limit road closure due to inundation and repairs and future NDRRA claims. Since Option 1 would not raise the bridge and approach roads, the period of inundation would be the same as for the base case. The main benefits for Option 1 are derived from strengthening the road and bridge pavement to minimise damage so that the road can be opened very soon after flood waters subside. Option 2 would raise the bridge and approaches so that only minimal closure would only be required for a flood event of 1 in 100 year ARI (Table B2).

Table B2: Estimate of days closed for Options 1 and 2

ARI (years) (Average return interval)	AEP (%) (Annual exceedance probability)	Option 1 – Days closed			Option 2 – Days closed		
		Inundation	Repair	Total	Inundation	Repair	Total
3	28	3	0	3	0	0	0
5	18	5	0	5	0	0	0
50	2	10	0.1	10.1	0	0	0
> 100	1	12	0.2	12.2	3	0	3

Detailed appraisal #CS2 – Step 3: Identify investment costs

Detailed reporting of costings has not been included in this hypothetical case project. Detailed cost estimates of capital expenditure, operating and maintenance costs, labour costs and all other relevant reconstruction costs would be required for an operational betterment full business case (refer 3.1.2.3).

Detailed appraisal #CS2 – Step 4: Identify benefits

The road is an important regional transport corridor for passenger and freight traffic for movement of agricultural and mining products and services. Accidents during the wet season are not uncommon and the road is also used by local communities, tourists and government service providers. During floods nearby towns are isolated but not completely reliant on this route for evacuation. The bridge has been damaged on several other occasions and will be impacted in future flooding, so avoidance of would reduce future damage and repair costs.

All of the nominated benefit categories identified in Table B3 are relevant with the exception of *avoided costs of incidents, injuries and fatalities through improved shelter during and after natural disasters* (refer **Error! Reference source not found.**).

Table B3: Benefit categories relevant to the proposal

Benefit category	Applicability to proposal
Value-for-money requirement #5 – Reduced future expenditure on asset restoration	
Avoided costs of asset rebuilding, restoration or maintenance	Yes
Avoided environmental and heritage costs	Yes
Value-for-money requirement #6 – Improved safety – these benefits relate to reducing incidents, injuries and fatalities	
Avoided costs of incidents, injuries and fatalities through improved shelter during and after natural disasters.	No

Benefit category	Applicability to proposal
Avoided costs of incidents, injuries and fatalities due to improved emergency access (to evacuation shelters / medical services / health facilities) during and after natural disasters.	Yes
Avoided costs of incidents, injuries and fatalities that would result from decreased need to travel via diversionary routes or alternative transport during and after natural disasters.	Yes
Value-for-money requirement #7 – Improved asset utility – these benefits relate to facilitating recovery	
Avoided costs to community users of the asset not being functional.	Yes
Avoided costs to business users of the asset not being functional.	Yes
Avoided costs to government users of the asset not being functional[41], and would include, for example, the cost of emergency evacuations.	Yes

Detailed appraisal #CS2 – Step 5: Quantify costs and benefits

This step includes the following tasks:

- estimating costs of each betterment option;
- estimating benefits (avoided costs) of betterment;
- calculating expected average annual benefit (avoided costs); and
- summarising quantified costs and benefits.

Estimations of detailed costings for each betterment option are not reported in this hypothetical example, but would be a major component of an operational proposal. Summary costs of each betterment option are provided in Table B4.

Theoretical damage-probability curves for each benefit category were used to estimate the average annual damage associated with a particular event type and disaster-resilient standard of the asset. For example, the total damage probability curve for Option 1 was estimated as shown in the Figure B1.

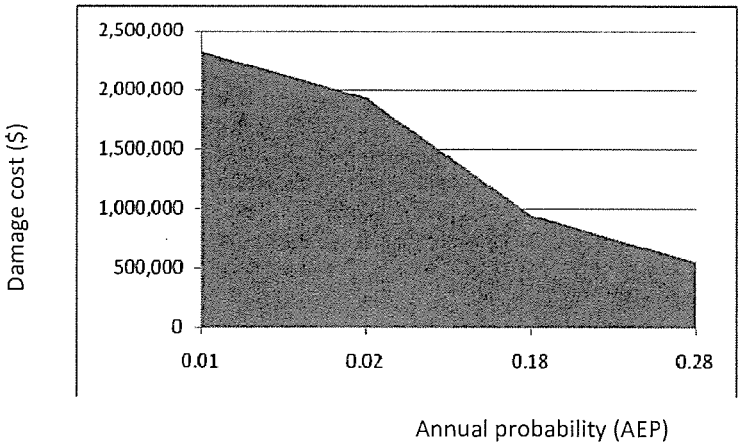

Figure B1: Flood damage probability curve for Option 1

The flood damage probability curve (Figure B1) shows that insignificant damage would be expected for flood events with a more frequent return period than three years (AEP 0.28).

The reduction in days of closure for each option was derived by comparing data in Table B1 with Table B2. Taking into account the flood probability (Figure B1), the average annual days of closure for the base case, Option 1 and Option 2, was estimated at 6 days, 2 days, and 0 days respectively.

The estimate of average annual damage for floods for Option 1 was calculated to approximate the area under the curve at $330,000 per annum. This estimate of damage cost was mainly based on the impacts due to prevention of travel, waiting and diverting for all classes of traffic.

[41] Included in these costs would be the avoided public agency costs incurred by the agency that owns and/or manages the asset.

Estimated avoided costs of disruption to the community due to damage of the asset, the cost of temporarily blocked access during flood event, and avoided costs during the period of repair were prepared from traffic models and cost data derived from standards published by the ATC (2006). These models are based on well researched willingness-to-pay studies that indicate the social and business impacts associated with time delays in travelling.

The average annual damage for each benefit type was also calculated for Options 1 and 2 and the base case. The difference in average annual costs by benefit type was calculated for each option relative to the base case. Estimated average annual benefits for each option relative to the base case are shown in Table B4.

Table B4: Example template – average annual costs and benefits

AVERAGE ANNUAL COSTS AND BENEFITS	Option 1	Option 2
Life of project	Years	Years
Life of project	30	30
COSTS OF BETTERMENT	($m)	($m)
Option	1	2
Construction costs to rebuild to current standard (base case)	3.5	3.5
Construction costs to rebuild to better standard (betterment option X)	30.0	100
Cost of betterment	26.5	96.5
ANNUAL AVERAGE BENEFITS OF BETTERMENT		
Reduced future expenditure on asset restoration (value-for-money requirement #5)	($)	($)
Benefit category		
Avoided costs of asset rebuilding, restoration or maintenance	330,000	427,900
Avoided environmental and heritage costs	15,600	22,900
Total reduced future expenditure on asset restoration p.a.	**$345,600**	**$450,800**
Improved safety (value-for-money requirement #6)	($)	($)
Benefit category		
Avoided cost of incidents etc., due to improved shelter during natural disasters.	0	0
Avoided costs of incidents etc., due to improved emergency access (to evacuation shelters / medical services / health facilities) during and after natural disasters.	0	0
Avoided costs of incidents etc., due to decreased need to travel via diversionary routes or alternative transport during and after natural disasters.	20,399	30,020
Total reduced number of incidents, injuries and fatalities p.a.	**$20,399**	**$30,020**
Improved asset utility (value-for-money requirement #7)	($)	($)
Benefit category		
Avoided costs to community users of asset not being functional	144,109	211,142
Avoided costs to business users of asset not being functional	949,020	724.181
Avoided costs to government of asset not being functional	10,000	12,000
Total improved community use benefits p.a.	**$628,129**	**$947,651**

Detailed appraisal #CS2 – Step 6: Calculate net present value

The first task in calculating NPV is to quantify the costs and benefits for the assumed life of the project, and discounting costs and benefits occurring later, relative to those occurring sooner. In this analysis, the base case and each betterment option were assumed to be able to be implemented within one year. Also, a zero residual value was assumed for the asset in the base case and the betterment option. A discount rate of 6% per annum was applied. Alternative discount rates of 4% and 10% were also used in sensitivity testing.

Discounted cash flow techniques were used to estimate the present values of each cost and benefit for both options over the 30 year evaluation period as shown in **Error! Reference source not found.**Table B5.

Table B5: Evaluation results for Options 1 and 2

	Option 1	Option 2
Life of project (years)	30	30
COSTS OF BETTERMENT		
Description	**($m)**	**($m)**
Construction costs to rebuild to current standard	3.50	3.50
Construction costs to rebuild to betterment standard	30.00	70.00

	Option 1	Option 2
Cost of betterment	26.50	96.50
AVERAGE ANNUAL BENEFITS OF BETTERMENT COMPARED TO BASE CASE		
Value-for-money (reduced future expenditure on asset restoration)		
Description	**($m)**	**($m)**
Avoided future costs of asset rebuilding, restoration or maintenance[42]	16.01	20.76
Total reduced future expenditure on asset restoration p.a.	**$16.01**	**$20.76**
Improved safety		
Description	**($m)**	**($m)**
Avoided cost of incidents etc., due to improved shelter during natural disasters.	0.00	0.00
Avoided costs of incidents etc., due to improved emergency access (to evacuation shelters / medical services / health facilities) during and after natural disasters.	0.00	0.00
Avoided costs of incidents etc., due to decreased need to travel via diversionary routes or alternative transport during and after natural disasters.	0.38	0.56
Total improved safety (reduced cost of incidents, injuries and fatalities) p.a.	**$0.38**	**$0.56**
Improved asset utility		
Description	**($m)**	**($m)**
Avoided costs to community users of asset not being functional	2.67	3.92
Avoided costs to business users of asset not being functional	9.16	13.42
Avoided costs to government of asset not being functional	0.19	0.22
Total improved asset utility (reduced costs to users) p.a.	**$12.02**	**$17.56**

Table B6 displays the CBA evaluation results for betterment Options 1 and 2.

Table B6: NPV and BCR for betterment Options 1 and 2

Evaluation summary (6% Discount Rate)	Option 1	Option 2
	Value	Value
Benefit cost ratio (BCR)	1.33	0.27
Net present value (NPV) $ million	3.25	-52.22

Option 1 is estimated to have a NPV of $3.25 million and a BCR of 1.3 compared to the base case for the central discount rate of 6% per annum.

Option 2 is estimated to have an NPV of -$52.22 million and a BCR of 0.27 compared to the base case for the central discount rate of 6% per annum.

This analysis indicates that Option 1 is viable as it has a positive NPV and a BCR greater than 1, while Option 2 is not viable as it has a negative NPV and a BCR of less than 1

Option 1 therefore provides greater value-for-money than Option 2.

Detailed appraisal #CS2 – Step 7: Risk assessment

The major risks to the delivery and the ongoing success of this proposal are increased costs, decreased benefits due to changes in market conditions, labour availability and flood probability estimates.

Detailed appraisal #CS2 – Step 8: Sensitivity test for uncertainty

The results reported above in Steps 5 and 6 are based on best estimates of costs and benefits and assumed discount rates. Changes in costs and benefits in practice may vary because of differences in the actual occurrence and severity of flooding and community and business behavioural responses.

Sensitivity of the evaluation to changes in costs and benefits were examined by testing changes in benefits (+20% to -20%) and costs (+30% to -5%) for each option. Alternative discount rates were also applied including a 4% discount rate – inferring less urgency for a payoff and increased scope for the project to achieve viability – and a 10% discount rate to

[42] Includes avoided environmental and heritage costs

test a demand for more urgent outcomes and increased project scope. The impact of a possible increase in flood frequency and severity was also assessed.

Testing of all scenarios indicates that the NPV for Option 1 could increase to $12m or decrease to $0m under a 10% discount rate. Under none of these scenarios does the NPV for Option 2 approach positive values.

Detailed appraisal #CS2 – Step 9: Consider distribution and equity issues

The estimation of benefits by type indicates that the benefit to the local community is likely to be minor compared to the benefits to long distance traffic (75% of all traffic). While the result may seem perverse, in this case the high relative difference is mainly due to the long diversionary path.[43] From a local community perspective, the impact on the region's economic base is likely to be considered quite significant. However, from the State or National perspective such matters have to be weighed up across all regions from where betterment proposals originate.

An operational appraisal would be expected to give further consideration to unequal distribution of benefits to different socio-economic groups and communities.

Detailed appraisal #CS2 – Step 10: Stakeholder consultation

This hypothetical case study not described the stakeholder consultation process. An operational appraisal would list the key stakeholders and indicate the degree of consultation that has taken place to date and the level of support received.

Detailed appraisal #CS2 – Step 11: Recommend the preferred course of action

This evaluation indicates that Option 1 is viable as it has a positive NPV of $3.25m and that it provides greater value for money than Option 2. Option 2 is not viable as it has a negative NPV.

This hypothetical case study does not include a detailed rationale to draw on the outputs of the strategic business case and which would include a re-articulation of the strategic merit of the proposal to include any modifications resulting from the CBA.

Detailed appraisal #CS2 – Step 12: Submit for re-prioritisation

The preferred course of action for betterment of the hypothetical proposal for betterment Option 1 to upgrade a road bridge should now be submitted to the State or Territory for re-prioritisation to take account of additional information compiled during the detailed appraisal and for comparison with other proposals.

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[43] Noting that in the analysis it was not assumed all traffic would simply divert but instead individuals and firms would, to some extent, find other lower cost mitigation options e.g. delay a trip or find other goods distribution options.

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