

Statutory frameworks, institutions and policy processes for climate adaptation

Final Report

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STATUTORY FRAMEWORKS, INSTITUTIONS AND POLICY PROCESSES FOR CLIMATE ADAPTATION

**Do Australia's existing statutory frameworks,
associated institutions and policy processes
support or impede national adaptation planning and
practice?**

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ACRONYMS AND ABBREVIATIONS USED IN THIS SYNTHESIS REPORT

ACT	Australian Capital Territory
ANOA	Australian National Audit Office
ARC	Australian Research Council
ARI	Average Recurrence Interval
ASX	Australian Stock Exchange
BAU	business as usual
CCCLM	Council of Capital City Lord Mayors
CCRSPI	Climate Change Research Strategy for Primary Industries
Cmth	Commonwealth of Australia
COAG	Council of Australian Governments
CoM	City of Melbourne
CRAC	Climate Risk Adaptation Commission (proposed, not real)
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DAFF	Department of Agriculture fisheries and Forestry (Commonwealth)
DCCEE	Department of Climate Change and Energy Efficiency (Commonwealth)
ESD	ecological sustainable development
FAT	Financial activities tax
GDP	Gross Domestic Product
GHG	Green House Gas
HSBC	Hong Kong Shanghai Banking Corporation
IGCC	Investor Group on Climate Change
IPCC	Intergovernmental Panel on Climate Change
LEPs	Local environmental plans
MCPEM	Ministerial Council for Police and Emergency Management
NCCARF	National Climate Change Adaptation Research Facility
NCP	National Competition Policy
NGOs	Non-government organisation

NHMRC	National Health and Medical Research Council
NHT	Natural Heritage Trust
NPA	National Partnership Agreement
NRM	Natural resource management
NSDR	National Strategy for Disaster Resilience
NSESD	National Strategy for Ecologically Sustainable Development
NWI	National Water Initiative
PC	Productivity Commission
PIA	Planning Institute of Australia
QCC	Queensland Coding Committee
QFCI	Queensland Floods Commission of Enquiry
QLD	Queensland
RAC	Resource Assessment Commission
RCB	Regional Coastal Boards
R&D	Research and Development
RIRDCs	Rural Industry Research and Development Corporations
SBI	Sustainable Business Institute
SCoPI	Standing Council of Primary Industries
SEWPAC	Department of Sustainability, Water, Population and Community (Commonwealth)
SEPPs	State environmental planning policies
SMEC	Snowy Mountains Engineering Corporation
SPA	Sustainable Planning Act 2009 (Qld)
UK	United Kingdom
UNEPFI	United National Environment Programme Finance Initiative
UNFCCC	United Nations Framework Convention on Climate Change
VCCARF	Victorian Climate Change Adaptation Research Facility

1. EXECUTIVE SUMMARY

1.1. Objectives and rationale

Funded under the National Climate Change Adaptation Research Facility, this study addresses two objectives:

1. To assess the extent to which existing statutory frameworks, associated institutions and policy processes support or impede national adaptation planning and practice, and
2. To make a significant contribution to the development and implementation of a strategic national policy framework.

The rationale for conducting this study was two-fold. First, that significant climate change is unavoidable and that it is in Australia's national interest to adapt to those changes. Climate impacts are many and varied, direct and indirect, hard to predict and quantify generally but particularly at the local scale, and impacts will inevitably affect all sectors and jurisdictions. For this reason, it is a complex policy problem. The IPCC, for example, identifies ten key areas of impact for Australia including increasing frequency and intensity of extreme events such as droughts, bushfires and floods, higher peak temperatures for longer periods of time, and sea level rise. Despite the lack of hard economic data with respect to costs and benefits that might underpin formal business cases to determine precise levels of investment needed for adaptation, the case to adapt is compelling considering the projected effects to Australia's economy, infrastructure, communities, environment and human life.

Second, Australia's capacity to adapt to climate change will rely on robust, efficient, transparent, fair and flexible institutions which build a resilient and enabling environment in which the necessary behavioural change can occur. While humans and our institutions have a remarkable capacity to adapt to all manner of change, this can occur at great cost to society as a whole or certain segments of it without the guiding hand of judicious policy intervention.

This report synthesises our key findings against the two project objectives. In doing so, it focuses on (i) where institutional arrangements currently support or impede climate adaptation policy, and (ii) where revisions or new institutions may be required, and the potential for a strategic national policy framework to achieve those reforms.

1.2. Approach

The project behind this report undertook a nation-wide analysis of 'core' statutory and institutional arrangements. At its commencement, the project team developed a 'policy and institutional arrangement matrix' to select seven case studies that, combined, capture the full range of statutory and institutional arrangements in Australia. Analysis of the individual case studies produced insights to the policy mechanism, sector, threat or jurisdiction particular to each. All case studies have

been written as self-standing works and draw out their own conclusions and recommendations. Many involved close collaboration with stakeholder groups so as to empirically associate theory with practice.

In addressing the two project objectives, it was necessary to evaluate the results across all case studies. This evaluation drew upon the multidisciplinary expertise of the team which included policy, legal, sociological, political, economic, environmental and scientific fields. Concepts and emerging conclusions were tested with an independent advisory committee as well as at a workshop of senior policy officials from across a broad range of government portfolios.

1.3. Findings

Much is already being done in the adaptation arena in Australia. There is clear evidence of:

- An awareness of climate risk amongst all levels of government, and particularly of the relevance of climate impacts to existing laws, institutions and policy processes;
- Climate risk having been, or likely to be soon, incorporated into key, relevant statutory arrangements such as planning and strategic decision-making, regulatory frameworks, technical standards, performance-based standards and some policy processes, at all levels of government, and
- Bottom-up initiatives by local governments and authorities to utilise those arrangements so as to increase adaptive capacity in communities and regions.

Australia's regulatory and institutional landscape is designed to be dynamic and flexible, and all jurisdictions in Australia have made recent reforms to, *inter alia*, planning and strategic decision-making, regulatory frameworks, technical standards, performance-based standards and some policy processes. This is an important finding because it implies that *in the main* existing statutory arrangements do have the capacity to support climate adaptation planning. However, despite this progress the report identifies some qualifying factors, for example:

- Some States/Territories are lagging behind in the review and reform of existing arrangements, with the result that statutory arrangements can be more or less 'robust' depending on the jurisdiction;
- There is evidence of perverse incentives or conflicting policy goals in higher order policies and associated legislative arrangements i.e. drought policy, disaster relief policy, the primacy of human life over other social objectives in planning regimes;
- Almost all of the statutory and institutional arrangements we assessed apply to new developments, projects and infrastructure, so that existing dwellings and infrastructure are not captured by the revised legislation, except in certain circumstances (in-fill developments, or post disaster reconstruction); and
- All Australian governments are making investments in climate change adaptation with few being able to clearly articulate the business case for such investment. While this reflects the precautionary principle in action, it also suggests that governments have little basis (and possibly little policy capacity) for determining what level of investment is an appropriate level and, *inter-alia*, what indicators are appropriate to underpin monitoring and evaluation activities throughout investment cycles.

Unfortunately, while the evidence suggests that existing arrangements are adequate in terms of legal prescription, the study indicates that those arrangements do not support climate adaptation *in practice*.

With respect to the enablers of and impediments to adaptation that lies at the heart of the project's title, around a dozen enablers and a dozen impediments emerge from the studies. By distilling these and aggregating their essence, this report identifies three significant concerns for national adaptation planning *in practice*:

1. Lack of clear and consistent implementation frameworks to guide adaptation planning;
2. Lack of financial and human capacity at the state and local level to adequately implement adaptive strategies; and
3. Detailed information, data and response strategies are patchy, not fit-for-purpose and lack accreditation processes.

1.4. Recommendations

The report identifies a number of recommendations with each providing alternative responses depending on the extent to which governments can negotiate a collective response and the extent to which they seek to build longer-term resilience and adaptive capacity across Australian institutions and communities. These recommendations follow in Tables (i) and 6.

Three key recommendations stand out in addressing the three concerns (impediments). Detailed justifications for these three recommendations are outlined in the conclusions of the report.

Impediment 1: Lack of clear and consistent implementation frameworks and guidelines
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Recommendation: There would be substantial benefits from a coordinated, national approach to improving adaptation policy. National in scale, such an approach could be undertaken by the Commonwealth or through COAG, with a view to identifying and articulating an overarching framework for climate adaptation priorities and strategies, based on the principle of resilience.

Given the accelerating rate of climate change, and of the observed fragmentation between policy domains, of particular importance in the development of a national strategy for adaptation policy is that it should embody nested connections between policy frameworks, so that as new information on climate hazards comes to light, there is a single point of reference for all other policy and administrative domains.

Significantly, such an approach would further benefit from the establishment of a new, dedicated institution to oversee implementation of the framework and support State/Territory and local government adaptation strategies.

Impediment 2: Lack of financial and human capacity at the state and local level to adequately implement adaptive strategies
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Recommendation: There are underutilised means of garnering more resources with minimal government investment. These include: providing knowledge that is ‘fit for purpose’ (see Impediment 3) to reduce redundancy in effort at the local government level; creating incentives for private sector investment in adaptation, again to reduce the financial burden on all three tiers of government; establishment of clear overarching frameworks and guidelines (see Impediment 1) to establish priorities for where available resources should and should *not* be spent; and investing in ‘no regrets’ adaptation.

Overcoming impediments 1 and 3 will make a significant contribution to overcoming impediment 2. However, new approaches for collaboration between local councils and regional organisations should be explored and encouraged so as to develop critical mass in adaptation activities, share scarce financial resources, and exploit synergies in experience. New coordinating, collaborative arrangements between local councils – extending existing, successful models – would also reduce the administrative burden on State and Commonwealth agencies in their dealings with them.

Impediment 3: Detailed information, data and response strategies is patchy, not fit-for-purpose and lacks accreditation processes
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Recommendation: There is a need to generate information that is ‘fit for purpose’, at the appropriate scale so as to support policy and investment decision-making, and that is deemed to be of sufficient quality as to be reliable (even allowing for uncertainties). The inference here is that if information is generated, accessible and accurate, the likelihood of public and private incentives aligning with ‘adaptive’ strategies will be enhanced. We note that significant work is being undertaken at Commonwealth and State levels to improve the information base.

Commonwealth and State initiatives to generate climate-relevant information should be continued, and that a central repository or ‘clearing house’ portal of climate relevant information could be beneficial. Such a repository would include all federally-funded information; it would respect the principle of ‘open access’; and it would include both raw data provision and data ‘translation’ functions so that key stakeholders such as local governments can understand the relevance of the data for their particular jurisdiction. One vitally important use of information linking this recommendation with the first is its role in underpinning national and state business cases for adaptation investment. To this end, fit-for-purpose information should take into account indicators of and methods for measuring investment success.

Table (i) Detailed recommendations and a road map for reform

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
<p>Impediment Lack of investment to avoid the economic, social and environmental costs associated with projected scenarios of climate change impact</p> <p>Response Principle Sound investment case</p>	<p>Recommendation 1: 1a: There is a role for <u>all</u> governments to play in stimulating both public and private investment in climate change adaptation. In the first instance, governments should acknowledge this role based on the argument that investment in precautionary adaptation actions will deliver no-regret benefits as well as long-term public investment savings by minimising impact reparations</p> <p>1b: Public investment should be conditional upon assurance that robust National and State / Territory-wide approaches to adaptation are in place and embrace objective criteria and decision support to determine where different forms of adaptation are required (i.e. incremental versus transformative) so as to avoid maladaptation</p> <p>1c: Governments should consider the implementation of a number of the instruments for increasing private sector investment</p>	<p>Recommendation 1: Define and clarify the demarcation of roles and responsibilities of governments in investing in climate adaptation. Existing and future investments in climate adaptation should be consistent with these</p>	<p>Australian Government State and Territory Governments</p>	<p>4-6 degree temperature increase scenarios of climate impact demand investment, and ex-ante investments significantly reduce levels of post-investment required impact</p> <p>Investments need to be framed in terms of their wider socio-economic benefits and not marginalised to environmental considerations</p> <p>In considering the role for government, the role for the private sector is fundamental and needs to be promoted in the public discourse</p>	<p>Within 1 year</p>

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
<p><u>Impediment</u> Policy outcome conflicts and inefficient resource allocation due to lack of coordination across multilevel (vertical) governance regimes</p> <p><u>Response Principle</u> Partnership approach</p>	<p>Recommendation 2: 2a: The Australian Government should facilitate the coordination of nation-wide climate risk adaptation efforts from risk assessment through to response implementation and review This mechanism should take the form of a National Partnership Agreement facilitated through the Council of Australian Governments' Select Council on Climate Change and be based on the overriding principles of multilevel governance and ecological sustainable development (ESD)</p>	<p>Recommendation II: The Australian Government would develop bilateral agreements with State / Territory governments to facilitate climate risk adaptation efforts to a high standard be based on the overriding principles of multilevel governance and ecological sustainable development (ESD)</p>	<p>Australian Government State and Territory Governments</p>	<p>Coordination will not occur efficiently or effectively in the absence of devolved ownership of the issues and shared interest in their resolution The reference to ESD here ensures that Australia meets its international legal obligations to advance ESD principles and places the remit within Commonwealth jurisdiction</p>	<p>1-3 years</p>
<p><u>Impediment</u> Inappropriate scaling of adaptation activities and or the insufficient critical mass of resources (human, knowledge, financial etc) to plan and implement adaptation activities</p> <p><u>Response Principle</u> Critical mass at appropriate scale</p>	<p>Recommendation 3: 3a: Cooperating clusters of Councils should be the primary modus operandi for the development and implementation of regional adaptation strategies across Australia. These clusters need to be identified nationally and would preferably match (to the extent possible) catchment boundaries to facilitate connection to catchment management scale processes and governance structure and to broaden risk based approaches to adaptation to take into account ecosystem approaches</p>	<p>Recommendation III: Identify existing and emerging clusters of actors collaborating in the adaptation arena at regional scales and support their interactions in defining collaborative adaptation strategies and activities</p>	<p>Australian Government State and Territory Governments Local governments Catchment management authorities (where appropriate)</p>	<p>Clusters of Councils are already emerging as a natural network with which to appropriately scale responses and achieve critical mass in adaptive capacity and implementation resources. Such emergence is only going so far, with existing clusters needing access to information, skills and funds beyond their own collaborative capacity</p>	<p>2-5 years</p>

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
<p><u>Impediment</u> Lack of institutional continuity, certainty and legal gravitas in the implementation of national scale initiatives</p> <p><u>Response Principle</u> Institutional stability</p>	<p>Recommendation 4: 4a: In support of a National Partnership Agreement (Recommendation 2), a new Climate Risk Adaptation Commission (CRAC), or similar organising structure, residing under the Attorney General's department should be established. This body would:</p> <ul style="list-style-type: none"> • Support institutions with clearly defined roles and responsibilities for climate risk adaptation and facilitate clarification of demarcations where roles and responsibilities are uncertain (per Recommendation 1 – Modest) • Facilitate the development and assessment of regional (urban, coastal, rural) adaptation strategies covering clusters of local government boundaries across Australia (per Recommendation 3) • Facilitate the negotiation of formal implementation action agreements between Australian Government, States and Local governments involved in the clusters • Facilitate benchmarking of planning and EIA legislation 	<p>Recommendation IV: The roles envisaged for the CRAC be delegated to policy and program functions of DCCEE</p>	Australian Government	The Attorney General's department is suggested here because of its assured ongoing existence, its links with national and state legal procedures overlapping the climate change arena and its link to national disaster policies and programs	2-5 years

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
	<p>across state</p> <ul style="list-style-type: none"> Facilitate benchmarking and adaptive learning across regions in adaptation planning and implementation Report to COAG on the progress being made, and its adequacy, in climate change adaptation 				
<p>Impediment Policy outcome conflicts and inefficient resource allocation due to lack of coordination within (horizontal) levels of governance regimes</p> <p>Response Principle Houses in order</p>	<p>Recommendation 5: 5a: Intra-governmental arrangements at both National and State levels should be in place to ensure mechanisms aim to identify and eliminate conflicting policy outcomes particularly in respect to policies, planning and development regulations and infrastructure works that compromise or impede the implementation of regional, cross regional and sectoral adaptation strategies 5b: The CRAC (Recommendation 4) review Australian Government laws and programs progressively over a number of years to identify and recommend to Cabinet reforms needed to enhance adaptation</p>	<p>Recommendation V: Synthesise the findings from existing reviews (5b) and facilitate the exchange of lessons through distributing information and stimulating debate</p>	<p>Australian Government State and Territory Governments Local governments Catchment management authorities (where appropriate)</p>	<p>Intra-governmental frameworks can be even more important than multilevel ones, particularly given the prominence of state planning and development actions in the climate adaptation arena. Reviews need to acknowledge that a one-size-fits-all approach is not appropriate given the differentiation of approaches and their linkages to other processes across state jurisdictions. That said, facilitating the exchange of lessons and experience across state boundaries is important</p>	1-3 years

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
<p><u>Impediment</u> Planning approaches based on narrow framing are insufficient to translate in adaptation strategies that are feasible in their implementation</p> <p><u>Response Principle</u> Appropriate framing</p>	<p>Recommendation 6: 6a: Risk management is an important framing for climate change adaptation but insufficient to take into account spatial, social, managerial and temporal complexity critical to translating planning into action. The CRAC should assess how broader systems-based approaches to adaptation planning can be mainstreamed to influence the efficacy of implementation processes and practices 6b: If Recommendation 3 is accepted, then this assessment needs to take into account how misalignments between catchment and regional cluster boundaries can be taken into account in regional adaptation strategies 6c: The results of 6a and 6c should be taken into account in the assessment of regional adaptation plans and in allocating investment (per Recommendation 4a)</p>	<p>Recommendation VI: Support 6a and 6b as preliminary scoping studies</p>	<p>Australian Government State and Territory Governments Local governments Catchment management authorities (where appropriate)</p>	<p>NCCARF and VCCARF research has shown that while a risk management approach to planning is worthwhile, on its own it supports a project-based mode of operationalization insufficient to achieve optimal uptake / adaptation. The resilience literature suggests that its legacy may be limited in terms of building adaptive capacity and self-reliance</p>	<p>1-3 years</p>

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
<p><u>Impediment</u> Lack of timely access to relevant, scale appropriate and, preferably, interpreted data and information to support decisions</p> <p><u>Response Principle</u> Equitable access to information</p>	<p>Recommendation 7:</p> <p>7a: A central repository of climate change info which informs different stakeholders groups should be established either under the DCCEE or if Recommendation Three is agreed to, then under the new Climate Risk Adaptation Commission</p> <p>7b: For the repository to maximise its value, it will need to be maintained and preferably supplemented with interpretation assistance (knowledge brokering) to assist information seekers to adapt the information to their specific context</p> <p>7c It should be mandatory for federally funded data to be provided to the repository</p> <p>7d: Data contributions should be invited from State / Territory, industry and community organisations</p> <p>7e: Legal indemnity should be provided for organisations making adaptation data available in good faith</p>	<p>Recommendation VII:</p> <p>As per Recommendation 7a</p>	<p>Australian Government State and Territory Governments Local governments Catchment management authorities (where appropriate)</p>	<p>Good information is the fundamental driver of decision-making, but it needs to be easily accessible and preferably interpreted in the decision-making context/framing</p>	<p>1-2 years</p>

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
<p><u>Impediment</u> Policy amnesia is reinforced by insufficient resources and time allocated to ensuring lessons will be implemented following disasters or policy failure</p> <p><u>Response Principle</u> Tied funding obligation (the obligation to improve)</p>	<p>Recommendation 8: 8a: Ensure that key infrastructure is not rebuilt in risk-prone areas and that 'betterment' begins at the beginning of post disaster reconstruction by tighter oversight of where disaster relief funds are spent 8b: A portion of relief funds are restricted to betterment activities post disaster 8c: Australian Government funding is made available to state and local authorities for prior planning and approval of projects for disaster prone infrastructure to facilitate betterment post-disaster</p>	<p>Recommendation VIII: This recommendation should be non-negotiable</p>	Australian Government	This recommendation should not be read as a punitive device, rather one which ensures continuous learning	Immediate
<p><u>Impediment</u> Research investment is ad-hoc and rewards those with capacity to prepare good applications rather than meet highest priority issues</p> <p><u>Response Principle</u> Maximisation of returns on R&D investment</p>	<p>Recommendation 9: 9a: Funding programs that support adaptation research should modify the way in which they operate so as to focus on negotiating investment partnerships in research activities rather than negotiating project-by-project terms and conditions 9b: A greater proportion of commissioned research should be supported following scoping studies that define problems and opportunities for adaptation innovation</p>	<p>Recommendation IX: Investment in 9b</p>	Australian Government State and Territory Governments	Facilitation of collaboration is as important as the provision of funds in that it helps broaden the investment pool and identifies appropriate contributions in line with the various principles outlined across the recommendations	1-2 years

2. INTRODUCTION

Despite the development and implementation of climate mitigation policies in individual countries, including by the Australian Government through the *Clean Energy Futures Plan*, efforts by the international community to find a meaningful, global agreement on how best to reduce greenhouse gas emissions and mitigate climate change have progressed very slowly. The consequences of this remain to be seen in terms of scale and magnitude, but it now seems incontrovertible that significant climate change is unavoidable and Australia will need to adapt to those changes. The IPCC identifies ten key areas of impact for Australia, including increasing frequency and intensity of extreme events such as droughts, bushfires and floods, higher peak temperatures for longer periods of time, and sea level rise (IPCC 2007). With ninety per cent of Australia's population living in coastal settlements and \$263 billion of capital assets vulnerable to inundation under even the most conservative estimates of sea-level rise, adaptation will be an important and difficult task in Australia (DCCEE 2009).

Yet many of the threats posed by climate change are not new to the Australian landscape: drought, floods, cyclones and prolonged periods of extreme temperatures are a feature of Australia's climatic system and weather patterns. In response, successive Australian governments at both the state/territory and federal level have designed and implemented a range of institutions to cope with those often-devastating events, including planning and development regimes, building codes, the provision of emergency services, mandatory insurance schemes and/or payments for exceptional circumstances, to name a few. Thus, the effectiveness of adaptation is a function of *existing* and potentially *new* institutions of governance, policy processes, legal settings, organisational arrangements and administrative procedures.

However, there has been very little detailed investigation into what institutions are important, how these may limit or enable adaptation, or what specific institutional, governance and policy process reforms might be needed. To address this deficit, this project undertook a nation-wide analysis of key Australian statutory arrangements, institutions and policy processes, to ascertain the extent to which they currently support or inhibit adaptation responses. Where our current legal and policy framework inhibits effective and timely adaptation, opportunities for appropriate reforms were sought; so the project also explored if and/or where Australia's climate adaptation policy might benefit from new institutions and processes, including the efficacy of a national climate adaptation strategy.

An important rationale underlying this project was the recognition that there is a difference between the *existence* of laws or policies to support adaptation planning and practice; the *implementation* of those laws or policies and; finally, the *potential* of those laws and policies to support climate adaptation, following review and reform. We draw attention to this distinction because a raft of statutory and institutional

arrangements has been adopted which could in principle support adaptation, but their use and efficacy hitherto has been limited in some areas, and ad hoc in others.

In short, the law is only as effective as the context in which it operates and thus in this project, assessment was also made of broader policy and planning issues which inhibit effective implementation. For instance, we considered issues such as (i) information and knowledge gaps, including missing stakeholder contributions, (ii) overlap, ambiguity, or contradictions in legislative requirements or processes, (iii) inappropriate scale or scope of implementation and regulatory arrangements, (iv) incentive gaps and conflicts for private and public sector actors that risk impeding adaptation, including shortfalls in accountability and transparency arrangements, or perverse public revenue or funding linkages, and (v) conflicting strategic policy goals frameworks, which create unintended outcomes.

Another significant gap in our knowledge and understanding is how the task of climate adaptation should be allocated between different levels of government, particularly in a federation (Farber 2009; Harrington 2010; Glicksman 2011). As with other policy issues in a federation, two key questions arise: when is it *appropriate* for the federal government to act and what *form* might that action take? State and local governments are in some ways the natural “first responders” to climate change: they own or license critical infrastructure, provide health services, and control land use (Farber 2009). Yet the federal government may logically be involved to set or promote appropriate and uniform standards for adaptation efforts, disseminate information in relation to risk assessments and mitigation options, or to finance adaptation. Many factors need to be considered: constitutional constraints may limit where and how federal governments can act (Glicksman 2011), the ideologies of dominant political parties can tend towards more or less centralisation, and thus the power of the national government relative to states can and does evolve over time (Harrington 2010), and pragmatic considerations in relation to capacities, skills and financial resourcing will inevitably merit attention (Tiernan 2011; Howlett 2009; Coggan 2012). The allocation of responsibilities between federal and state governments is not static, and determining ‘who does what and how’ demands careful reflection, particularly at important junctures in policy decision-making. Therefore a key premise of this project was that before the need to adapt becomes truly acute, the Australian policy community has to think about the appropriate role and responsibility of the federal government in its efforts to adapt to climate change.

Taking these two ‘gaps’ in knowledge as the rationale for our project, the objectives were to:

1. Assess the extent to which current policies and institutional arrangements promote or impede climate adaptation, in practice, and
2. Make a significant contribution to the development and implementation of a strategic national policy framework.

This synthesis report summarises the insights gleaned from the seven focused assessments that were undertaken. The paper is structured as follows. In the next section we briefly recount our project design and methodology. In Section 4 we explore the institutional and policy landscape within which climate adaptation exists - and which informed our analysis and subsequent conclusions. In Section 5 we provide a summary of the seven case studies undertaken (separate case study reports supplement this synthesis report). In Section 6 we present our findings against our 'resilience' framework. In Section 7 we present our conclusions with respect to the efficacy of existing policy mechanisms, which is followed in Section 8 by our assessment of the 'enablers' and 'impediments' to climate adaptation in each of the governmental mechanisms. Finally, in Sections 9 and 10, we present our recommendations for how existing statutory and institutional arrangements should be reformed or better utilised (Obj. 1), and where new statutory and institutional arrangements may be necessary (Obj. 2).

3. PROJECT DESIGN AND METHODS

Extensive detail on the project's design and methods is provided in 'Appendix 1: The Selection of Case Studies': the following summarises that detail. To achieve its aims, the project was divided into four sequential parts, described below.

Part 1: Identification of relevant statutory arrangements and associated institutions

It was neither possible nor necessary to assess all Federal, State and Territory statutory and institutional arrangements of relevance to climate change in order to better understand how those arrangements support or impede climate adaptation. Instead, the project team opted to assess a sample of 'core' governance arrangements that could be drawn on to advance adaptation planning and practice in Australia.

Both the climate change adaptation and the policy literature are rich with forms of categorisation of concepts relevant to each. Only on a few occasions do these come together to explore how various categories of policy instruments, for example, relate to various categories of desired climate adaptation response. Here, examples of policy instruments might include both existing as well as new and modified governance modes and mechanisms, such as: formal policy processes, statutory and legislative settings, formal and informal organisational arrangements and administrative procedures, markets and market-based instruments, information management, and legitimacy and influence over the roles of civil society and industry stakeholders (Garnaut 2008; Pittock 2011; Agrawala et al 2007; Butzengeiger-Geyer et al 2011; Dovers and Hezri 2010; Dovers 2009). Examples of adaptation responses might include adaptation of standards, institutions, investments and domestic, agricultural and industrial practices (Hallegatte et al 2011); incremental, transitional or transformational adaptation (Nelson et al 2011); and generic versus specific adaptation, spontaneous versus planned adaptation and positive versus negative adaptation (Preston and Stafford-Smith 2009). Combining such categories into a matrix that quickly reveals the relationship between policy stimulus and intended areas of response can provide the basis for the selection of case studies to explore areas that reveal insights of interest to a project such as this.

Drawing from this literature, the project team devised a Policy and Institutional Arrangement Matrix (Table 1) comprising, on the y axis, seven policy mechanisms, and on the x axis, five attributes of these mechanisms. The policy mechanisms are largely the instruments of government that can be employed to stimulate increased adaptation to climate change across the community i.e. statutory arrangements and associated institutions. The 'attributes' on the x-axis essentially act as descriptors of each policy mechanism (i.e. factors that differentiate one form of mechanism from another).

In summary, our list of policy and institutional mechanisms in the matrix (y axis) include the following:

- a) **Intergovernmental functions:** These are formal agreements between governments to work towards specified objectives. The Council of Australian Governments, comprising the heads of the Federal and all State and Territory Governments, represents the pinnacle of such frameworks. At the issue level, agreements and frameworks include the Murray Darling Basin Agreement, National Water Initiative, and the National Competition Policy among others. Often, but always, these agreements and frameworks are underpinned by legislation and supporting institutions.
- b) **Intra-governmental functions:** These are initiatives within a tier of government, either Federal or State, which imposes a common platform of accountability, such as reporting on sustainability or social inclusion, or promotes or requires cross agency cooperation in dealing with a particular issue. The joint administration of the Natural Heritage Trust and Caring for our Country initiatives between SEWPAC and DAFF is an example of this. At a more operational level inter-departmental committees, networks or task forces are commonplace.
- c) **Regulation by prescription:** These are mandatory (legal) requirements that must be met under specific laws/legislation. They are the primary instrument of government agencies to achieve agency objectives.
- d) **Planning processes:** These are strategic and administrative procedures and modus operandi by which agencies prescribe and authorize desired action in anticipation that such action will provide public benefit or avoid public disbenefits.
- e) **Funding functions:** These are incentive programs or investment initiatives that provide subsidies or co-investment as a means of stimulating the uptake of particular actions.
- f) **Information and analysis functions:** These are publicly funded initiatives aimed at enhancing the understanding of phenomena (basic research) and how to deal with these (applied research) and at enhancing stakeholder understanding of the consequences of phenomena and the means of responding (education and awareness).
- g) **Market arrangements:** These are instruments of government that influence the way in which industry actors behave in various markets. Examples include water trading, carbon pricing and trade policy.

While there are relationships between these different domains, and so their demarcation is not black and white, the order of the domains essentially represents a spectrum of stimuli from those that are more centrally controlled to those that are more devolved. It should be noted that beyond these mechanisms are the mechanisms of industry, such as self-regulation, and civil society, and community-based education initiatives. These are very important mechanisms as they demonstrate some level of commitment to shared responsibility (Newell 2008).

Using the Policy and Institutional Arrangement Matrix, the research team selected seven case studies. In doing so, we aimed to balance scientific, socio-political and pragmatic concerns. For example, our goal was to ensure that as a whole, the case studies cross a spectrum of desired adaptation responses aimed at different climate change phenomenon (scientific concern) and across a spectrum of targeted

respondents as differentiated by their jurisdictional realm or financial capacity to respond (socio-political concern). Importantly, the case studies needed to be researchable (available information, willing participants etc) and be able to be undertaken within the available budget and timeframe (a pragmatic concern).

Reflecting this, we chose case studies to deal with Mechanism 1 (Intergovernmental function), Mechanism 4 (Planning processes), Mechanism 6 (Information and analysis function), and Mechanism 7 (Market arrangements). Moreover, given that many mechanisms can be seen to act concurrently or collectively to enhance or impede adaptation at the local level, the research team included three attribute-based case studies at the regional level (Attribute A), the threat level (Attribute B) and the sectoral level (Attribute C). Figure 1 summarises the relationship between the proposed case studies.

Figure 1: Relationship of case studies

Attribute	A.	B.	C.	D.	E.
Mechanism	Juris-dictional scope	Sector	Threat	Nature	Basis of power
1. Inter-governmental function	Case study 5 (City of Melbourne)	Case study 1 (NWC/NCC)	Case study 6 (Primary Industries)	Case study 1 (NWC/NCC)	
2. Intra-governmental function					
3. Regulation by prescription					
4. Planning processes		Case study 2 (Planning regs)		Case study 2 (Planning regs)	
5. Funding function					
6. Information and analysis function		Case study 3 (Energy, water)		Case study 3 (Energy, water)	
7. Supporting market arrangements		Case study 4 (Finance)		Case study 4 (Finance)	

Part 2: Development of criteria to assess the appropriateness and capacity of chosen statutory and institutional arrangements

To be effective, any policy regime dealing with adaptation needs to be measured by the extent to which adaptive capacity is built; by the extent to which adaptation occurs as the ultimate evidence of success and as a fundamental intermediate step. In dealing with the intermediate step, the research team applied a framework assessing the extent to which the following four characteristics of effective adaptive capacity (and resilience, after Cork et al 2011) are evident in each of the case studies:

- **Clarity of purpose:** Requires clear definition and understanding of problems at a system level so that we can address root causes and not just symptoms.
- **Diversity:** Requires a diversity of ideas, skills and resources, a diversity of views, innovation, flexibility in problem solving, and wide inclusion of stakeholders in a purposeful and structured fashion.
- **Connectivity:** Requires institutional (including community) networks that are not susceptible to collapse due to one part failing; effective use of resources; community ability to organise itself; appropriate leadership; spare capacity; and some duplication of functions and overlapping of institutions.
- **Integration and feedback:** Requires a holistic consideration of issues and realistic consideration of scale, accounting for the full range of interactions between humans and ecosystems. It also requires resources to monitor and to promote debate and learning.

Part 3: Critical analysis of the key statutory and institutional arrangements and policy processes

To understand the extent to which these characteristics were evident in our case studies, the project team sought specific data in respect to the following (drawn from Dovers 2009, Pittock 2009; Lin & Barton 2001):

- What is the nature and reach of the approach? Is it generic (systemic) or specific? What is its source of power and funding?
- Is there explicit inclusion or scope for inclusion of climate adaptation in the approach, and what are the relevant policy and decision-making responsibilities?
- Does the approach focus across stages of an adaptation management or resilience enhancing process (e.g. vulnerability assessment, adaptation planning, advocacy and awareness raising, emergency planning, early warning, monitoring etc)? How is it communicated?
- Is there evidence that the approach has resulted in some level of adaptation to the consequences of climate change either as sudden shocks (e.g. flooding, cyclones, drought, erosion etc.) or as slower-onset changes (e.g. new risks to health, food security, livelihoods, basic infrastructure and services etc)? Have the benefits been immediate? Have they been local and specific, or multiple and diffuse?
- What were the supporting, impeding or conflicting factors affecting success and have there been perverse or unexpected outcomes? Is there sufficiency of resources, including human, informational and financial resources to implement the existing arrangements? What are the information and knowledge gaps, including missing stakeholder contributions?
- What is the potential or otherwise for the approach to be incorporated into a national adaptation framework or to help shape such a framework?

Data were derived from telephone and face to face interviews with those responsible for relevant policy development, implementation and review based on the above criteria, as well as from the literature including previous reviews the case study stakeholders have been involved in. The results from each case study are written-up in the form of a discussion paper, all attached in Appendix B to this Report. The case studies explored include:

- **Case Study 1:** *The potential of national and inter-governmental frameworks to address climate adaptation: existing strengths, potential future reforms]*
- **Case Study 2:** *Planning processes and strategic decision-making in Australia: are they sufficiently robust to deal with climate change?*
- **Case Study 3:** *Information and analysis in the relationships between energy and water: promoting adaptation and avoiding maladaptation*
- **Case Study 4:** *Market mechanisms and industry policy: The role of the financial market in climate adaptation*

- **Case Study 5:** *Interactions between policy mechanisms in a particular jurisdictional setting: the case of the City of Melbourne's Climate Change Adaptation Strategy*
- **Case Study 6:** *Climate adaptation in the primary industries sector: strengths and weaknesses of national frameworks*
- **Case study 7:** *Implementing the findings from the QLD and Vic Flood Reviews: 'unpacking' shared responsibility and the role of the Commonwealth*

Part 4: Identification of possible legislative reform and other policy recommendations

For the most part, the project unfolded sequentially through each case study so that the identification of possible legislative reform and/or policy recommendations was on-going. However, the final part of the project – which this Synthesis Paper reflects – aimed to synthesise the insights gleaned from the assessments undertaken in Part 3, with a view to identifying:

- i. where and how existing statutory and institutional arrangements should be reformed or better utilised
- ii. where new statutory or institutional institutions may be necessary
- iii. the core features of these and
- iv. the most appropriate agency to carry out those reforms.

Methodology

The methodology in this project encompassed three types of information outlined below with the relevant cluster of the project highlighted in parenthesis:

- Review and synthesis of existing literature concerning appropriate and optimal statutory arrangements and policy processes for climate adaptation planning and practice, including review of current knowledge and understanding from relevant sectors (i.e. water policy, extreme events etc.), as well as recent work on climate adaptation and adaptive governance in particular (Part 1 and Part 2)
- Review of existing legislation, key agency strategic plans and policy goals, relevant reports, submissions and enquiries (state and federal) etc. as well as any proposed reforms to legislation and/or policy processes (Part 1 and Part 3)
- Interviews with leading experts on climate change adaptation, federal and state government organisations and key stakeholders in policy processes which fed into both the development of the assessment criteria (Part 2) and provided much-needed intelligence in the assessments (Part 3 and Part 4) from key end-users. A list of those consulted or more formally interviewed is provided in Table 1.

Table 1: Consultation and interviews conducted during the course of the project

Project component	Number consulted/ interviewed	Affiliation
Preparatory stage and ongoing guidance	5	<ul style="list-style-type: none"> • Department of Climate Change and Energy Efficiency; • Land and Environment Court of New South Wales ; • Commission for Environmental Sustainability, State of Victoria; • Department of the Environment, Climate Change, Energy and Water (ACT); • Business Council of Australia.
Case study 1: Intergovernmental agreements		n/a - undertaken as desktop research
Case study 2: Strategy and Planning		n/a - undertaken as desktop research
Case study 3: Information and analysis		n/a - undertaken as desktop research
Case study 4: Finance sector	28	<ul style="list-style-type: none"> • Investor Group on Climate Change Australia/New Zealand (IGCC); • The Carbon Bonds Initiative; • Climate Risk Pty Ltd; • London School of Economics; • Grantham Research Institute; • the Climate Group; • the Institutional Investors Group on Climate Change Europe (IIGCC); • Westpac; • ANZ; • HSBC; • Deutsche Bank; • Credit Suisse; • Citi Bank; • Morgan Stanley.
Case study 5: City of Melbourne	6	<ul style="list-style-type: none"> • City of Melbourne; • University of Melbourne; • Royal Melbourne Institute of Technology

Project component	Number consulted/ interviewed	Affiliation
Case study 6: Primary Industries	24	<ul style="list-style-type: none"> • University of Melbourne; • Department of Agriculture Fisheries & Forestry (Cmth); • Horticulture Australia Ltd; • Australian Farm Institute; • Australian Wool Innovations; • Department of Agriculture Fisheries & Forestry Qld; • Sugar R&D Corporation; • Meat & Livestock Australia; • Grape & Wine R&D Corporation; • SA R&D Institute; • Dept of Agriculture and Food WA; • Department of Primary Industries, Parks, Water & Env. Tas; • Dairy Australia Ltd; • Fisheries R&D Corporation; • Australia Dairy Ltd; • NSW Department of Primary Industries; • Department of Primary Industries Vic; • CSIRO; • Rural Industries R&D Corporation; • Grains R&D Corporation; • Australian Pork Ltd; • Dept of Resources NT
Case Study 7: Flooding	19	<ul style="list-style-type: none"> • Victoria State Emergency Service; • Department of Primary Industry, Victoria; • Office of the Emergency Services Commissioner, Victoria; • Department of Sustainability and Environment, Victoria; • Local Government Association of Queensland; • Queensland Reconstruction Authority; • Queensland Department of Environment and Resource Management; • Insurance industry; • Griffith University.
Synthesis workshop	14	<ul style="list-style-type: none"> • Department of Climate Change and Energy Efficiency (DCCEE) • Attorney General's Department – Disaster Relief, Emergency Management branch • Department of Industry, Innovation, Science, Research, Tourism and – Industry and Innovation Division • Department of Treasury and Finance – Industry,

Project component	Number consulted/ interviewed	Affiliation
		Environment and Defence branch; <ul style="list-style-type: none"> • Department of Sustainability, Environment, Water, Population and Communities (SEWPaC) - Environmental Assessment Branch; • Department of Infrastructure and Transport (DIT) - Major Cities Unit; • Department of Prime Minister and Cabinet (DPM&C) - Climate Change and Energy Section, Industry, Infrastructure and Environment Division • CSIRO – Climate Change Adaptation Flagship • Australian Bureau of Agricultural and Resource Economics (ABARES) • Business Council of Australia

The full methodology for the project is described in Appendix A. The research findings from this project will be published in their entirety in a forthcoming book; synopses of the seven case studies are contained in Appendix B. Further details on the forthcoming publication are available from the principle investigator.

4. INSTITUTIONAL AND POLICY LANDSCAPE

The rationale for adaptation is clear: even with maximum emissions mitigation, climate change will still occur, and while the size and magnitude of those impacts is difficult to predict or quantify, the impacts will still need to be adapted to so as to avoid devastating impacts to Australia's economy, infrastructure, communities, the environment and human life (DCCEE 2009). It is, therefore, in Australia's national interest to provide leadership on two fronts: first, in global climate mitigation efforts so as to lessen the extent of climate adaptation needed in Australia and the region; and second, to enhance the ability of households, businesses and communities to adapt to climate change in the coming years.

Climate impacts are many and varied, direct and indirect, hard to predict and quantify generally but particularly at the local scale, and impacts will inevitably effect all sectors and jurisdictions. For this reason, it is a complex policy problem and effective adaptation will necessarily involve actions across multiple sectors and regions, and at multiple social scales, including (i) individual, household and firm behaviour, (ii) formal laws, incentives and governance arrangements, and (iii) evolving norms, attitudes and understanding. This project focuses on level (ii) where adaptive responses will generally require formal processes of review and legislative change. However, the challenge in identifying where those reforms might be needed - or indeed whether they might best be undertaken in the context of a national climate adaptation framework - demands an understanding of the institutional and policy landscape in which those policies and laws are created.

In Australia, the institutional landscape is characterised by the shift in recent decades towards a 'shared responsibility' model, involving ever-increasing numbers of state and non-state actors with varying degrees of responsibility and capacity (Giddens 2009; McLennan and Handmer 2011). For example, the emergency management sector has moved towards greater devolution of responsibilities across many more actors, a move which has been criticised recently as a result of recent events (e.g. Black Saturday bushfires, major floods, prescribed burning escape etcetera). The state cannot – as previously imagined – be either the sole preparer or responder, or the insurer of last resort, and fierce debates are emerging as theory and practice struggle to define the necessary balance of public, private and community roles and responsibilities (Eburn and Dovers 2011; Handmer and Dovers 2013). While a clear rationale for such devolution can be identified (and noting that this shift was replicated in numerous developed economies in the same period), experience so far has been mixed and recent work has pointed to the need for strong meta-governance settings to support such devolution of powers (Oliver and Hussey 2012). The question for Australian governments, especially the Federal government, is inevitably: when is it sensible for the federal government to act and build adaptive capacity, in the context of variable contributions by different State governments, and which of the policy mechanisms at their disposal will have the greatest impact?

Another important institutional shift has taken place across Australia in more recent times with profound implications for climate change policy. The installation of conservative coalition governments in most states has seen a corresponding shift in policy and investment priorities. In some cases this shift has been dramatic in both its speed and breadth; for example in Queensland we have witnessed an almost overnight backlash against public investment in climate change related activities, including the closure of the Office of Climate Change, amendments to the Sustainable Planning Act and to the Local Government Act, and a review of regional plans. From an adaptation perspective, the focus has shifted towards, or stepped back, to management of climate variability. This shift in emphasis from managing climate change to managing climate variability is now manifesting in most state governments. The ramifications for national climate change adaptation policy are profound because consistent and successful implementation of climate change adaptation activities across jurisdictions will require inter-governmental cooperation. Such cooperation will depend on some level of agreement on climate change (adaptation or mitigation) as a policy priority.

As is often the case in policy analysis, sometimes it is in analysing policy failures that insight strikes. With respect to climate adaptation, the existence of obviously 'maladaptive' policy responses affords us the opportunity to understand where things went wrong, and thus where reforms or revisions might be necessary. Barnett and O'Neil (2010: 211) define maladaptation as "action taken ostensibly to avoid or reduce vulnerability to climate change that impacts adversely on, or increases the vulnerability of, other systems, sectors or social groups", and they go on to identify five types of maladaptation:

1. Increasing emissions of greenhouse gas emissions
2. Disproportionately burdening the most vulnerable
3. High opportunity costs
4. Reduce the incentive to adapt
5. Path dependency

While Barnett and O'Neil describe the different *forms* of maladaptation, the concept also neatly captures three critical problems in institutional arrangements that mar attempts to increase resilience to climate change or, in the worst instances, create maladaptive outcomes:

- first, the failure to identify unintended and unwanted consequences of decisions in one sector on outcomes in another (absence of knowledge);
- second, the failure to incorporate that information (if known) into decision-making frameworks (absence of process or agency); and
- third, the failure to pursue alternative, more 'adaptive' strategies even when information on unwanted consequences is known and considered (absence of political will or incentive).

It is instructive to explore some of the challenges which contribute to these problems, and in the following section we explore three that proved particularly salient in our

seven assessments and which were consequently addressed either directly or indirectly in our recommendations: policy and decision-making under uncertainty; multi-level governance arrangements; and the significance of 'framing' in the development of climate adaptation policy.

4.1. *Policy and decision-making under uncertainty*

Information on climate change impacts is abundant, particularly in relation to well known threats in Australia such as bushfires and floods. All levels of government, as well as research and training institutions, industry bodies and NGOs are involved in the production and analysis of information related to climate impacts and adaptation. This includes information on the impacts of climate change, guidance material in the form of best practice manuals, tools, information networks, courses and workshops. (Although we note issues of coordination and access in this regard, and refer to the current NCCARF Leading Adaptation Practices project.) Governments also have a role in developing guidance to improve the quality and consistency of information. Production of information is often collaborative with a number of different organisations involved and funding opportunities from many different sources (see Case Study 3). Many recent initiatives led by different organisations are outlined in "Australia's fifth national communication on climate change" (Australian Government 2010).

While information abounds, *local* information on climate impacts is often lacking, is not publically available or is not used (Wenger et al. 2012). Downscaling climate models and projections has significant limitations at present. Alternatively, studies are issue or sector specific, and fail to make the links within and between sectors which is so crucial to avoid maladaptive outcomes (Hussey and Pittock 2012). For example, Foerster (2012) makes the point that it is important to acknowledge that there are trade-offs associated with decision making in managing climate risk. Using Victoria's decision after the devastating 2009 bushfires to provide for a strong prioritisation of human safety over other concerns in planning provisions, Foerster (2012) warns that such a decision may lead to unwanted environmental externalities: "Of particular concern is the potential for development to continue in fire-prone areas but on the condition that vegetation is cleared to mitigate fire risks. The management of fire risks through vegetation removal can lead to increased carbon emissions, biodiversity loss, and other forms of land and water degradation" (p. 333). Purely on a public safety and asset protection basis, the efficacy of both focused and broad-scale fuel reduction in such cases is contested (Gibbons et al 2012).

Climate adaptation research focuses on assessing the possible impacts of climate change; identifying vulnerable sectors or communities in society; and proposing strategies to increase our resilience to those impacts. However, three issues in this domain pose particular problems for providing accurate, policy-relevant information for decision-making. The first of these issues is the high level of uncertainty around the magnitude and location of climate impacts. Much has been written on the

uncertainties surrounding climate science, and the IPCC has dedicated much thought to how uncertainties can be accurately and consistently accounted for in the provision of climate information (IPCC 2010). More recently, Hallegatte et al. (2012) consider the challenge of “deep” uncertainty in investment decision-making, which they define as “a situation in which analysts do not know or cannot agree on (1) models that relate to key forces that shape the future, (2) probability distributions of key variables and parameters in these models, and/or (3) the value of alternative outcomes” (p.2). The authors argue that climate change is a clear example of “very deep uncertainty”, because historical weather and climate data can no longer be trusted to provide an accurate picture of the future. There are three major sources of uncertainty:

- **Future emissions of greenhouse gas emissions** (‘policy uncertainty’), which are linked to demographic and socio-economic evolutions, to available technologies, to values and preferences (e.g. development models) and to policies. This uncertainty is linked to scientific uncertainty (what futures are possible?), but also to a policy uncertainty, which is a positive uncertainty that represents our ability to choose our future
- **Scientific uncertainty** (‘epistemic uncertainty’), which is created by our imperfect knowledge of the functioning of the climate system and of affected systems. It is for instance the uncertainty on the response of the global mean temperature to a given quantity of GHGs (including “climate sensitivity” i.e. the increase in global mean temperature for a doubling of CO₂ concentration in the atmosphere), but also uncertainty in the regional effects of global warming, and the uncertainty on the reaction of affected systems, such as lakes, glaciers and ecosystems
- **Natural variability** (‘aleatory uncertainty’), i.e. the fact that global climate variables have their own dynamics, linked to the chaotic behaviour of the climate system. Climate models provide information of statistical nature (averages, variance, likelihood to exceed thresholds etc.), but they do not provide forecasts, i.e. deterministic prediction of the future. In other terms, they can estimate the average number of rainy days in the summers of 2060s, but do not say anything about the ‘any given day’ or even any specific summer (Hallegatte et al. 2012: 6-7)

The extent to which one or other of these uncertainties is significant depends on the scale of assessment. At a global level, and over the short term, natural variability and scientific uncertainty in the models play the largest role while future GHG emissions are relatively minor. However, at a regional scale, natural variability plays a more important role, and climate model uncertainty is still large, and policy uncertainty pertaining to GHG emissions is moderately important. As Hallegatte et al. (2012: 8) explain “It shows that when looking at one country or one region, it is much more difficult to predict future climates, regardless of future progress in our understanding

of climate change: natural variability means that the climate signal is more difficult to extract". At the local scale, "downscaling techniques" are used to predict future climate, though this technique is based on historical data which can sometimes be difficult to obtain, and even where long time series are available the technique assumes that the statistical relationship between the climate data and local climate phenomena will remain valid in a future climate (Hallegatte et al. 2012: 8). These three uncertainties combined make it all the more difficult for decision-makers to assess investments for long term climate resilience.

The second issue that is problematic in climate adaptation policy-making relates to a scale misfit between what can be provided by climate models and what is needed by decision-makers (this is more or less of a problem depending on how climate adaptation is 'framed', see Section 3.2). As described in the discussion above, climate models are susceptible to policy, epistemic and aleatory uncertainties which increase in magnitude the closer one gets to the 'grass clippings'. The models are simply not capable of providing forecasts at the local level: there is a resolution of ~50km for physical downscaling and ~10km for statistical downscaling. In other words, the finer-scale the modelling is, the greater the uncertainty. The consequence of this limitation is an absence of knowledge at the scale at which decisions are made: most notably, the local scale. This is developed further in Case Studies 3, 5 and 7.

A third challenge for policy-makers concerns the myriad actors and 'end-users' involved in adaptation strategies. Adaptation is a nation-wide process, and decisions need to be made within all levels of government, in businesses (small, medium and large), by individuals, communities, associations, within and between whole sectors, and involving scientific and other types of experts. The multitude of actors involved makes climate adaptation as a policy problem infinitely more complex. In the first instance, and as explored in Section 3.2, all of those actors will hold several different interpretations of the meaning and purpose of 'climate adaptation', such that arriving at a shared understanding of the 'problems' and 'solutions' is very difficult (Fünfgeld and McEvoy 2011: 17). The large number of actors that have a 'stake' in climate adaptation also makes identifying, funding and disseminating information relevant to those individuals actors extremely difficult - a difficulty endured mostly by those responsible for providing climate-relevant information and analysis (governments and research agencies/institutions). The provision of information raises interesting questions. For example, to what extent is information generated within the private sector protected as a matter of competitive advantage? When climate resilient research is undertaken through tax-payer research funding should it be open-access (and thus not buried in academic publications with expensive subscription fees)? If so, how can and should that information be shared? As a matter of principle, it would seem appropriate that any research funded by the Australian tax-payer that contributes to the resilience of Australians and the Australian economy should be accessible to all, yet there are many grey areas (see Case Study 3).

There is also uncertainty over the efficacy of possible policy interventions, for example of a disaster warning system, of an education campaign on heat management in households, or of a policy assessment procedure triggered by insertion of climate adaptation consideration in statutory objects (Dovers and Hezri 2010).

Combined, the three challenges of uncertainty, scale and 'audience' render policy-making for climate adaptation a somewhat nebulous task and readily prone to politicisation. Ultimately any form of uncertainty adds to the likelihood that decisions, decision-making processes and the data informing these two will be contested. Contestation in the climate change arena has been subject to considerable analysis over the past two decades, much of it related to identifying and understanding the implications of the dominant discourses that influence how problems are perceived (if perceived as problems at all) and hence how they should be resolved (and specifically through what actions) (see Dryzek 1997 and Heazle 2010 for example). Suffice to say here that contestation is essentially a political process in terms of what different stakeholders define as important, how politicians choose, set and promote particular agendas and how they then act with bureaucrats to allocate resources to implement agenda-laden policy in an environment where stakeholders' competing interests may not be resolved but become latent (i.e. subjected to domination by political elites and acquiescence in that domination) (Lukes 2005).

Uncertainty and contestation are not only problematic for defining policy objectively, they also impede clarity around questions like "How much adaptation is enough?" and "What are the indicators of success?" These are questions that keep bureaucrats awake at night as if consensus on these can be reached through traditional positivist analysis; yet these questions are normative and context specific. The dimensions of success are therefore diverse (i.e. in terms of economic, ecological, social and institutional outcomes) and can be conflicting (Moser and Boykoff 2013). Resolution to these questions is, once again, ultimately a political process.

Notwithstanding the contested nature of climate change policy, as the next section reveals, climate adaptation as a policy problem can be more - or less - complicated, depending on how it is framed.

4.2. The significance of ‘framing’ in adaptation policy

In addition to, or perhaps as a result of, the uncertainties inherent in climate -relevant information, policy-making for climate adaptation is very much influenced by the way in which ‘climate adaptation’ is *framed* as a policy problem. In abstract terms, frames can be characterised as ‘organising principles that enable a particular interpretation of a phenomenon’ (de Boer et al., 2010: 502). They are decisive in knowledge production as part of research, policy development and policy implementation because they are of agenda-setting character. Frames allow certain questions to be asked while others get silenced (O'Brien et al., 2007).

In their formative paper ‘Framing Climate Change Adaptation in Policy and Practice’, Fünfgeld and McEvoy (2011), identify three levels at which framing takes place: firstly, at a meta-level, in public discourses which reflect cultural values and belief systems; secondly, at a conceptual level, which is largely manifest in theories on adaptation processes and outcomes, most commonly in the scientific domain but which subsequently inform policy development and adaptation practice; and lastly, framing occurs at an operational level of adaptation practice, where any given framing is articulated in policy documents, consultancy reports, strategies or guidelines. At this latter level, the framing might appear in the written word as a question of ‘risk management’, or ‘disaster resilience’ or ‘climate vulnerability’, all of which influence the types of responses that will be considered. It stands to reason that the three levels of ‘framing’ are not mutually exclusive, and, moreover, frames that guide climate change adaptation can be explicit, i.e. openly discussed as part of a policy or program design, or they can be subconsciously represented without ever being reflected on or discussed (Fünfgeld and McEvoy 2011: 19). Due to the nature of framing as a social process discussed above, such implicit framing is common and manifests itself by:

- How adaptation is referred to (e.g. as ‘problem’, ‘challenge’, ‘opportunity’, or ‘process for increasing capacity’),
- Who is expected and permitted to make qualifying statements about adaptation (e.g. politicians, government staff, scientists, local residents),
- What questions are considered relevant and important (e.g. ‘what are the key climate change impacts?’; ‘how certain is climate change?’; ‘who and what is going to be affected by climate change?’; or ‘who or what assets do we want to protect?’), and
- The range of answers considered appropriate (e.g. depending on underpinning values, professional traditions, and political risk involved).

(modified from de Boer et al., 2010 and cited in Fünfgeld and McEvoy 2011: 18)

In other words, the way in which adaptation is framed is critically important to what information is considered relevant and necessary, the likely adaptation responses will be, who will be involved in making decisions around adaptation, and, crucially, who is responsible for financing adaptation processes or outcomes.

In Australia, the Productivity Commission's draft report 'Barriers to Effective Climate Change Adaptation' (2012) framed climate adaptation very much as a problem of risk, much like any other risk:

Responding to change and managing risks are a normal part of daily life. Adaptation to climate change can be thought of as a part of this ongoing process of risk management — identifying, evaluating and responding to changes in risks faced to minimise damage from harmful events and maximise gains from new opportunities. Generally speaking, households, businesses and other organisations are capable of managing the climate variability and the risks they face. This is because people have an incentive to assess the costs and benefits of taking action to mitigate the impacts of climate change on themselves (PC 2012: 5).

Once framed as such, the policy response is to rely on providing information and market signals to alert actors of the risks, on the assumption that private actors i.e. the householder, the business owner, the investor etc. will react accordingly. Using this framing, and perhaps not surprisingly, the PC came to the conclusion that “most adaptation would occur without the need for government intervention” (PC 2012: 7).

However, as Fünfgeld and McEvoy contend (2011: 29), relying solely on private actors for achieving effective adaptation is difficult for a number of reasons, as outlined in Table 2, below.

Table 2. Barriers to market-based adaptation

Barrier	Example
Uncertainty about climate change impacts affects the assessment of expected climate-related damages and the benefits of adaptation	Cost-benefit assessment results are inconclusive regarding financial and non-financial costs and benefits
Individual resource constraints in understanding the nature of impacts on a system require collective action	High cost of developing climate change projections
Effective adaptation through market-based processes may be limited for non-traded public assets and goods	Supporting adaptation of biodiversity and jointly consumed ecosystem services
Resource constraints regarding implementing adaptation actions, as much adaptation will draw on resources not held by the adapting actors themselves	Local adaptation action plans not being implemented due to resource constraints
Adaptation benefits may spill over to beneficiaries other than the actor making the change, which is as a systemic disincentive for private adaptation investment	Reducing agricultural water use from a pooled water resource increases water availability for other actors
Individual adaptation action may dislocate climate-related impacts onto other stakeholders unable to take action themselves and put them at increased risk	Protecting a coastal property from erosion by hard infrastructure may dislocate coastal erosion impact to neighbouring properties
Some climate change impacts require collective adaptive action in order to be effective but high costs and uncertainty prevent timely private action	A whole-of-catchment approach to reducing water runoff can have a significant effect on flood prevention whereas the effect of action by individual property owners may be limited
Climate change impacts are distributed unequally across space and social groups, leading to inequalities that markets and private action are unlikely to address sufficiently without regulatory intervention	Low income groups may suffer disproportionately from an increase in food prices following extreme events (e.g. storms, hail, flooding)
Focus on one small part of a system can lead to maladaptation in other parts or systems	Increased use of pesticides to combat an increase in vector-borne diseases may lead to adverse environmental effects
Institutional barriers need to be removed before individual action can take place	Unclear governance arrangements over responsibilities for climate change adaptation prevent private action

Source: Fünfgeld and McEvoy (2011: 29).

Yet, once framed as essentially a problem of ‘risk management’, detailed exploration of where the market barriers in Table 2 might exist, and thus what role each level of government might play to overcome them, is necessarily shut down.

Interestingly, in the course of this project, it was clear that there are multiple framings of climate adaptation currently evident amongst Australia’s policy community and within official policy documents (see Case Studies 4, 5, 6, and 7). This may be expected, as adaptation as a policy problem and broader societal issue has only been recently prominent (relative to mitigation, Dovers and Hezri 2010), despite components of the issue (drought, flood, etc) being of longer standing concern. The most commonly used framings of adaptation are:

1. A hazards approach.
2. Risk management approach.
3. Vulnerability approach.
4. Resilience approach.

The consequences of these multiple framings are explored in Section 6 and in individual case studies. As is explained in Section 5, our project deemed the ‘resilience approach’ to be the only ‘frame’ that could hope to achieve robust, long term climate adaptation policies which respect the principles of ecological sustainable development. In taking this position, we are aware that this could be seen as a concession to a constructivist epistemology, whereas the dominant theory in practice in climate change reflects the epistemology of realism, which holds that there is no one frame or realm where universals exist and so action needs to be pragmatic, meaning it should be defined and pursued in context (Devitt 1984). We believe, however, that the realist approach taken in climate change reflects a greater emphasis on being seen to be taking multiple courses of action than on taking the most appropriate courses of action.

While a resilience frame is suited to the purpose here, we do not discount the usefulness of other framings for different purposes, where appropriate. A resilience approach has been argued to be complementary rather than oppositional to more deterministic, focused approaches (Fischer et al 2009): with resilience framing being most powerful for strategic and long term purposes, and approaches such as risk or optimisation suited to more focused and particular decision contexts within the broader strategic frame. As with the resilience approach adopted here, justification and specification of the framing is necessary given, for example, the multiple definitions of resilience that might be used (Botterill, in press) or many available risk assessment and management frameworks available.

4.3. Multi-level governance

From the recent body of work on climate adaptation in the national and international literature, there is common consensus that a key part of adaptation policy will focus on creating an enabling environment for adaptation; creating that enabling environment is ultimately a responsibility of government and includes the need to:

- Set a legal, regulatory and economic framework for adaptive activities that enhances resilience at the necessary scales without reducing resilience at other scales i.e. balance resilience across a number of spatial scales;
- Drive adaptation at a number of scales (local, regional, national) and sectors (business, households, communities);
- Manage distributional impacts across different regions, socio-economic and demographic groups;
- Remove price distortions created by regulatory or market failures that act as a barrier to adaptation;
- Remove institutional barriers that prevent autonomous adaptation;
- Provide public goods such as information or the maintenance of ecosystem services that are necessary inputs to autonomous adaptation;
- Provide human capital, skills formation, and structural adjustment and community assistance that can underpin adaptive capacity at both individual and community level.

Interestingly, a particular criticism levelled at the Australian Government by the IPCC was that fragmentation across the three levels of government is a major constraint to more robust adaptation in Australia (IPCC 2007). A consequence of this fragmentation and the lack of central guidance is that “regional and local responses have been limited, variable and inconsistent” (IPCC 2007: Section 11.5). The IPCC’s criticism cuts to the heart of two factors which pose significant challenges for effective and coordinated governance for climate adaptation. First, trends in governance over the past 30 years have been characterised by a shifting focus away from state-centred programs, with a devolution and diversification of governance featuring non-state actors and non-government based modes of governance (Schout and Jordan 2005). This shifting emphasis has primarily been dominated by a focus on economic reform and markets on the one hand, and ‘empowerment’ of communities/civil-society on the other. This has given rise to issues of authority, responsibility, accountability, coordination and integration (Benham et al. forthcoming).

In Australia, the federal system engenders significant governance and coordination challenges. While there has been increasing societal expectations of a more national framework and policy approach in many policy areas (for example, education policy, environmental policy, and natural resource management) through increasing Federal Government involvement, the primary responsibility for the majority of governance programs which relate to climate change resides with the state, territory and local governments, and in many cases newer regional entities. In many respects, the

reality of federation is at odds with contemporary societal and political expectations and national economic and environmental imperatives. This gives rise to substantive issues of state power, federal coordination and consistency and multi-jurisdictional governance (Bell and Hindmoor 2009).

Additionally and significantly, state authority is highly fragmented in many of the policy domains that are affected by climate change (for example, critical infrastructure supply such as urban water governance, emergency management, planning and development laws around the built environment etc). While the Federal Government seeks to coordinate the macro-policy settings for economic efficiency and structural reform in many of these sectors, implementation responsibility resides with state and territory governments. Further fragmentation of state authority is evident within most jurisdictions as various responsibilities are delegated to local government, public utilities and to 'independent' state/territory government economic regulatory agencies. Such fragmentation weakens Australia's resilience to climate threats, but also demands greater attention be paid to the potential role of the federal government in climate adaptation policy. Positively, multiple approaches in different jurisdictions allows experimentation and relevance to different contexts, however for this to yield benefits in terms of comparison and lessons arising, varied 'experiments' must be coordinated and monitored.

As mentioned above, the role of federal governments in climate adaptation policy is often unclear, ill-defined or contested. Some authorities argue that adaptation is essentially a local-scale endeavour and the role of the Federal Government is small (Garnaut, 2008; Productivity Commission, 2012), while others assert that promoting adaptation is a responsibility of all scales of governance (Dovers & Hezri, 2010). In examining adaptation in large-scale river management in six countries, Pittock (2009) identified the roles of national governments in promoting adaptation are to act within their jurisdictions and facilitate action at sub-national scales by communicating relevant knowledge and ensuring that there are appropriate legal mandates and funding mechanisms. In responding to catastrophic national disasters, Eburn (2011) argues that the Commonwealth has significant interests in responding to disasters of national consequences and thus the role, powers and responsibilities of the Commonwealth be enshrined in legislation to that effect. The existence of numerous national strategies or policies that are climate-relevant suggests that while the degree of responsibility for the Commonwealth may be contested and vary between sectors, the fact that the Commonwealth has a role to play is not. Indeed, the Commonwealth's role in funding relief and recovery efforts after the 2010-11 Queensland floods is a stark reminder of just how pivotal the Commonwealth is in dealing with natural hazards; it is also a reminder of the duty the Commonwealth bears on behalf of the tax-payer to ensure relief and recovery bills are kept to a minimum.

As a federated constitutional state, the areas in which Australia's federal government is *legally* entitled to govern is laid down in the Australian Constitution Act 1900 (UK)

and is restricted to the 'external affairs' power and matters relating to taxation, health, postal and telegraphic communications, defence and counter-terrorism, insurance, trading corporations, and the payment of social security benefits (Australian Constitution s 51(xxix)). However, in practice, there are numerous issues and policy domains of relevance to climate change which the Commonwealth has an interest in, or responsibility for, even in the absence of statutory powers. In recent years, the language of 'shared responsibility' has emerged to characterise co-operative federalist responses in key policy domains, which are often initiated and co-ordinated through the Council of Australian Governments (COAG). The Australian Government's 2010 position paper, 'Adapting to Climate Change in Australia', is supportive of this view, though it goes further to advocate a leading and strategic role for the federal government in future adaptation policy: "The Australian Government has a responsibility to lead national reform to ensure Australia is well placed to deal with these [climate] risks. Similarly, while many adaptation decisions will be based on local conditions, it will be important where necessary to maintain national consistency in important areas of standards" (Commonwealth of Australia 2010: 9). In contrast, the draft PC report on barriers to effective climate adaptation saw only a very limited role for the federal government, for reasons outlined in the previous section. In our assessment, there are a number of ways in which the federal government can and should take a leadership role, though the extent to which that role can be successful is conditional (see Section 7 this paper, and Case Study 1) and both the opportunities presented by, and challenges inherent in, multi-level governance require close scrutiny before long-term policy commitments are made.

5. SUMMARY OF CASE STUDIES

5.1. *Case Study 1: The potential of national and inter-governmental frameworks to address climate adaptation*

This study explored the role and potential of national framework policies that could be applied to initiating, enabling and coordinating adaptation options. To do so, we analysed the strengths and weaknesses of existing or recent national frameworks as a policy tool, essentially to identify key policy design features, institutional factors and resourcing issues that lead to more or less degrees of impact. The national frameworks examined include the National Strategy for Disaster Resilience (NSDR), the National Water Initiative (NWI), the National Strategy for Ecologically Sustainable Development (NSED), the Resource Assessment Commission (RAC) and the National Competition Policy (NCP).

The five national policies examined underline the difficult, though not insurmountable, challenge of developing and implementing effective national policy frameworks in Australia.

The NCP and water markets component of the NWI illustrate that, to succeed, a national policy needs bipartisan support, from Federal and State governments or agencies and a coalition of stakeholders advocating for their implementation. Notably, these two policies sit squarely within the ambit of the dominant neo-classical economic paradigm. They also focus on national issues generally perceived as requiring immediate action and delivering tangible benefits, namely; enhancing the competitiveness of the national economy and addressing water scarcity and combating devastating salinity, rather than issues regarded as having incremental and long term benefits, such as disaster resilience (NSDR) and ecologically sustainable development (NSED).

The NCP and NWI share other commonalities. These policies focussed on a limited number of core principles and systemic legislative reform and have been implemented incrementally over many years. The allocation by the Federal Government of substantial funds for state governments, contingent on policy implementation, was a critical incentive for NCP and NWI policy implementation. Importantly, the two policies reported to COAG, perhaps making them less vulnerable to the preferences of a single federal minister or government in power at the time. They also had champions in the Federal Government - backed by central agencies - for implementation in the form of the National Competition Council and the National Water Commission in the Federal Government. The focus of the NCC and NWI on legislative reform and on independent regulatory agencies has provided subsequent opportunities for public legal challenges that add accountability, transparency and incentives for governments to follow through on their policies.

By contrast, the NSED has a broader and more diffuse agenda and does not focus on a small number of core principles, or share the incremental implementation and

associated legislative reform of the NWI and NCP. Similarly, the slower progress of the NSESD can be linked to the lack of substantial federal funding, linked to policy implementation, to state governments and the cessation of cross-compliance funding. The NSDR and NSESD lack champions in the Federal Government or dedicated central agencies and have made little progress. This broad federal support is crucial, the RAC as a unit within a government department was beholden to the views of a single political leader - the Prime Minister - and fell with a change of leadership. The role of RAC with its adhoc investigation briefs and deficit of systemic roles made it easily marginalised.

These observations suggest that it will be hard to develop and very difficult to systemically implement an effective national climate change adaptation policy. To succeed, a policy will need to be focussed on a limited number of core principles. Bipartisan support will be required, and while this is conceivable, it will be hard to engender when climate change policies are politically and publicly contested. Consistent support from key stakeholders will be required; however few may be motivated by the incremental and long term impacts of climate change to be such diligent advocates. Positioning an adaptation policy in terms of socio-economic benefits is crucial to engender more support rather than seeing such policy marginalised in the environment portfolio.

5.2. Case Study 2: Planning processes and strategic decision-making in Australia: are they sufficiently robust to deal with climate change?

The role of planning regimes – and the strategic decision making that is embedded in them – is central to any climate adaptation framework. Our objective in this paper was to assess the potential of existing urban planning regimes to *require* or *enable* human decision-making to respond to the challenges of a changing climate. Following this definition, we divided the analysis into the potential of existing planning regimes to integrate consideration of climate impacts into decision-making in urban settings, according to ‘statutory requirements’ and ‘enabling factors’. We assessed the state planning regimes in Victoria, Queensland and New South Wales.

In our assessment, Australia’s existing planning law does support national adaptation planning inasmuch as there is clear evidence of climate risk having been, or likely to be soon, incorporated into key, relevant statutory planning arrangements, strategic decision-making, regulatory frameworks, technical standards, performance-based standards and some policy processes. For example: the peak standard for flood management, the Australian Rainfall and Runoff Guidelines, are currently being extensively revised to take account of natural and anthropogenic climate change; the building codes of Australia are currently under review to take account of future climate change; Environmental Impact Assessment is evolving in some jurisdictions to take account of climate change; major infrastructure projects like airports are incorporating climate risk into their design; and some states are using existing

frameworks to develop state-wide climate vulnerability assessments and response strategies. Ambitions for nationally-consistent planning schemes to overcome inconsistencies between the states have also been expressed in recent years, and while little progress has been made on that front hitherto, the decision by the Council of Australian Governments (COAG) to develop and implement national urban policy is indicative of how Australia's institutional arrangements can be used, where there is sufficient appetite.

However, the paper also analysed the 'enabling' factors in implementing planning provisions, such as the institutional settings and organisational structures for planning regimes, which are the 'soft' side of planning, but ultimately determine how vigorously and rigorously a government can/will act in scrutinising its own policies and proposals. For example, adopting a strategic planning approach is in and of itself insufficient to ensure that planning regimes achieve intended outcomes for climate change adaptation because ultimately it is the institutional settings that dictate who has the independence, authority and necessary skills to undertake an independent assessment for decision-making. Analysis of the legal and management aspects of the three state planning processes supports this. It suggests that existing statutory and institutional arrangements should be sufficient to support adaptation in process, but while the law is not inadequate, the institutional settings that underpin it are.

Overall, the case study observes that much progress can be made by mainstreaming climate adaptation into existing planning and strategic decision-making frameworks - as has been done with many other issues, especially after the 1990s and the introduction of ecological sustainable development. However, such mainstreaming only works if the necessary information is available for the risk assessment and if decisions are made and upheld by the appropriate agency, which in turn is appropriately skilled, resourced and motivated.

5.3. Case Study 3: Information and analysis in the relationships between energy and water: promoting adaptation and avoiding maladaptation.

This case study looked at the potential and scope for the Commonwealth Government to use its role in the provision of information on climate adaptation to greater effect. More specifically, the case study examined the role of governments' information and analysis functions to see how they deal with combinations of regulatory/policy measures. The example dealt with the regulatory arrangements which require energy suppliers and developers to account for water withdrawal and consumption in development proposals, and the knowledge and awareness measures needed to enhance the adaptive capacity of the energy sector to likely changes in water availability.

The case study took it as read that funding and generating information and analysis to support climate adaptation is not itself an end-goal but rather a means towards achieving increased resilience and adaptive capacity in society. However, the peculiarities of climate adaptation as a policy issue – the need to evaluate location-specific impacts and responses, uncertainty in projections and ambiguity in who ‘owns’ the problem – means that information and analysis generated can risk missing its intended audience. As a result, policies and decisions are made which often produce unwanted and maladaptive outcomes.

From this analysis, several barriers that exist to reduce the usefulness of that information were found:

- Policy, epistemic and aleatory uncertainties in the climate science and modelling exist which make it more difficult for decision-makers to assess investments for long term climate resilience;
- There is an absence of accurate fine-scale modelling for local contexts, resulting in significant knowledge gaps about what the impacts will be at a local level and therefore how best to respond;
- Numerous end-users of climate adaptation information and analysis, across all sectors of society and levels of government, make it difficult to prioritise research needs when the end-users are limitless but the funds are finite.

Nevertheless, there has been considerable effort taken in identifying and filling research gaps, through the various research and information mechanisms established by Commonwealth funds. For example, through NCCARF, CSIRO, the Bureau of Meteorology, Geoscience Australia, RIRDCs, and the competitive grants schemes of the ARC and NHMRC. Co-funding arrangements between Commonwealth funds and universities, industry-funded entities such as RIRDC and the private sector have shown the capacity for tax-payer dollars to be leveraged to greater effect. Factors which would support this policy function therefore include:

- A long-standing, sizeable and talented research capacity to provide the supporting science behind decision making, including adaptive management
- Institutional arrangements that enable Commonwealth initiatives to lever funds with industry-funded, university-funded, or state/local government-funds to establish climate adaptation projects
- Strong ties that exist between science and extension, building on the NRM sphere (see Case Study 6), including through the process of participatory research, to enhance adoption of adaptation strategies
- A targeted, national framework to identify research needs, informed by and directed at, the establishment of a greater number of ‘clusters’ of local councils modelled on existing and successful regional organisations of councils working in the adaptation space

5.4. Case Study 4: Market mechanisms and industry policy: The role of the financial market in climate adaptation.

The finance sector historically has not been considered in the context of climate change, yet it has become apparent in recent years that finance sector actors are not only impacted by climate change, they also have a central role to play in responding to climate change. Comprising the insurance (including reinsurance), asset management (including institutional investment) and banking industries, the finance sector needs to take on this role because reducing emissions and adjusting to climate change involve investment and risk. The purpose of this case study was to identify existing Australian policy that motivates private sector finance to protect assets from the risks of climate change; identify extant institutional or regulatory barriers that inhibit private sector finance for and investment in adaptation strategies and projects; and make regulatory recommendations for how the Australian federal government could stimulate a greater flow of private sector finance/investment for climate change adaptation.

The case study discusses four particular findings. First, protecting long-term assets in Australia, both fiscal and physical, from the risks of climate change will require significant capital outside of normal government channels and business as usual. Private finance sector actors are economic gatekeepers with access to money and licence to allocate it and direct capital flows. These actors make decisions based on 'the business case', which comprises a cost/benefit analysis of projected returns and potential risks inherent in a potential investment or project. Accordingly, existing and new government policy for adaptation in Australia must be measured against this benchmark: 'how does it facilitate the business case for private investment and financing?'

Second, current market policy mechanisms, being a carbon price, the renewable energy target, and the forthcoming Clean Energy Finance Corporation, should provide confidence for investors in low-carbon assets in order to protect long-term monetary assets, such as superannuation. However, there are no equivalent market policy mechanisms that encourage finance for adaptation in physical assets/infrastructure. Grants under the National Partnership Agreement on Natural Disaster Resilience, extant building/infrastructure guidelines and company reporting requirements are all insufficient to incentivise private adaptation investment in physical assets, especially existing ones.

Third, there are several salient institutional and policy barriers that inhibit private sector investment in adaptation strategies and projects. Institutional barriers include: information asymmetry and perceptions of risk that skew business case evaluations; and the private finance sector's lack of (a) awareness of climate change impacts, and (b) experience in identifying and making climate-related investments. Current policy barriers include: continuing fossil fuel subsidies that create incentive distortions, and a lack of policy incentives to replace or refurbish existing assets to

increase climate resilience beyond energy efficiency savings. This is particularly relevant for owners of multiple assets such as utilities or property investors with large portfolios.

Finally, a federal regulatory mix could be considered to encourage, leverage and procure financial resources for adaptation at the necessary scale. There are policy options that would complement the existing low-carbon policy framework and which comprises three elements: (1) a central national information repository; (2) non-coercive adaptation policy that encourages climate finance for adaptation, recommendations include co-financing arrangements and the use of market policy mechanisms such as tax credits, grants, feed-in-tariffs, and Climate Bond; and (3) coercive adaptation regulation that mandates how financial actors must facilitate adaptation, taxation and prescriptive mechanisms.

5.5. Case Study 5: Interactions between policy mechanisms in a particular jurisdictional setting: the case of the City of Melbourne's Climate Change Adaptation Strategy.

The objective in this case study was to shed light on how different policy mechanisms (laws, processes, funding etc.) interact with each other within a single jurisdictional setting to either enable or limit considerations of climate adaptation. The focus was on the Climate Change Adaptation Strategy of the City of Melbourne given the strategy's relatively high profile and comprehensive approach to adaptation. The case study provided the opportunity to assess how climate adaptation is handled at the level commonly advocated as the scale most relevant to and effective in adapting to climate change namely, the local level.

A number of findings from the case study are of cause for concern, not because they are new and insightful, but because failure to act on them in the past represents an institutional failure. In particular, the need for greater coordination between all three levels of government is required so that the implementation of local adaptation strategies is not undermined by conflicting visions for development at the Council and State Government levels. This should be of concern to the Australian Government where it invests in risk assessments and local adaptation planning that processes that are not given due consideration in adaptation responses.

A highlight of the case study was the tension caused by funding for adaptation largely being *project based*, and therefore encumbered with quantitative outcome-based accountability measures inconsistent with the nature of resilience. As such, proposals for many activities are couched in terms of short-term demonstrable outputs that largely leave no legacy in terms of long-term adaptive capacity or self-sufficiency (including transitions to self-funding). One contributing factor to this form of maladaptation has inadvertently been the narrow risk assessment framing through which adaptation options are identified and pursued.

Alternative ways of framing adaptation include the hazards, vulnerability and resilience approaches. Different approaches to framing assessments and adaptation planning can result in significantly different adaptation plans, and therefore significantly different responses. This is because each framing has biases towards different institutions, information, disciplines, professions and types of people, all with different methods and processes. With each of these come diverse perspectives of what the problem is and what the solutions might then be.

Most local governments are not as well-resourced as the City of Melbourne, but even here the Council struggles to gain access to the timely scientific, social and economic evidence to underpin policy decisions. While the impacts of climate change will differ from local government to local government, consistency of information and messages is important to gain confidence. There is a role not only for local and state institutions to be involved here, but there is a role for national research institutions to ensure data and analytical assumptions are benchmarked.

5.6. Case Study 6: Climate adaptation in the primary industries sector: strengths and weaknesses of national frameworks.

This paper focused on national frameworks associated with the primary industries sector to assess the extent to which they have been successful in encouraging climate adaptation responses. In this way the case study adds to the national frameworks explored under Case Study 1. Primary Industries was selected as an industry sector case study because it has been arguably the most active in climate adaptation, albeit it mostly focused on climate variability, over many decades.

Many of the primary industry sector's institutions have a legislative base while also having close ties industry stakeholders. The industry's Research and Development Corporations, for example, receive funding from both industry and government, and these bodies have enabled government to implement a range climate change initiatives in return for government matching of industry levies. Indeed, the strong statements from government about what it expects to see for its matching contributions acts as a very effective and efficient means of reaching agricultural stakeholders across the country. Importantly, it also acts to lever private (industry) investment in climate change activities, including adaptation.

Primary industries have a strong history of investment in adaptation, particularly in respect to adaptively managing the vagaries of seasonal variability. However an assumption made by many of the industries is that the path of incremental change that they continue to actively pursue will be enough to address climate change. For some industries and for some regions this assumption may hold true while for others it may not. If investing in primary industries adaptation efforts, policy programs need to be cognizant of whether an investment in incremental adaptations will have any value, or whether supporting longer-term transformative efforts would be better. That

said, transformative adjustments are difficult for many traditional farm businesses where risk aversion is a dominant culture and where capital investment is difficult. While many primary industries have claimed that they have built their success on their capacity to adapt, in reality surveys have shown that only around one third of farmers and graziers are now actively participating in the process of innovation. This has implications for how R&D investors devise engagement strategies for farmers that are time bound or reluctant to adjust their farming practices.

A number of conflicts are discussed in the case study. These tend to be based on an inherent tension between i) productivity growth and its consequences for industry profitability, export growth and industry contribution to national GDP, and ii) the need for sustainable production systems that minimise externalities and where possible, even restore degraded environments. Unfortunately, many government funding programs tend to deal with these issues as though they were separate. While many land management programs incorporate the rhetoric of integration, the separate administrative and information support mechanisms send an inconsistent message to farmers.

Factors which foster climate change adaptation within the primary industries include: the capacity of industry-funded institutions involved in the innovation process to provide a credible conduit for coordinating significant public good programs such as climate change policy initiatives; a long-standing, sizeable and talented research capacity to provide the supporting science behind decision making, including adaptive management; the strong ties between science and extension, including through the process of participatory research, to enhance adoption of adaptation strategies; and institutional arrangements that enable government investment to lever (mostly private) investment.

Impediments include: the mixed messages inadvertently sent by different policy interventions aiming to achieve conflicting outcomes; poorly designed programs aiming to achieve multiple outcomes that might be in conflict unless well integrated (often requiring additional management expertise not available to policy organisations); and uncoordinated policies and programs administered by different portfolios where the merits of programs may be judged on the attributions stakeholders give to the administering body rather than on the merits of the policies and programs themselves.

5.7. Case study 7: Implementing the findings from the QLD and Vic Flood Reviews: ‘unpacking’ shared responsibility and the role of the Commonwealth.

This case study analyses the findings of four major flood reviews conducted in 2010-2011 to identify the key roles and responsibilities of the state and federal governments in achieving the recommendations put forward in those reviews.

The study finds that while climate change adaptation is a stated rationale for resilience, it is not referred in key funding mechanisms such as the National Partnership Agreement for Natural Disaster Resilience, or in most annual state implementation plans. However, these funding mechanisms and others have enabled the development of risk assessments and adaptation plans, as well as community awareness raising and development or revision of key flood management tools. At this stage, it is difficult to determine whether the resilience approach has resulted in adaptation to flooding.

To adapt to climate change, Australia needs to ensure it maximises the benefits of large and small floods, while minimising the adverse consequences of large floods that result from poor management. Floods are vital for Australia’s water security and this will only become more important during the prolonged droughts anticipated as a result of climate change. Analysis in this case study suggests that aspects of flood management which address these objectives most in need of attention are:

- assessment of the adequacy of current planning instruments to accommodate climate change;
- consistent policy, legislation and planning processes to ensure that future flood risks are assessed and addressed;
- sufficient resources for local government (both technical and financial) for on the ground flood prevention and mitigation;
- significant increase in funds available to flood prevention/mitigation to reduce long term damages, in particular for:
 - basic nationwide flood mapping
 - sophisticated flood mapping in urbanised and developing areas that includes worst case scenarios, projected population and development and flood consequences
 - improved development planning to mitigate risk to the extent possible
 - relocation of those most at risk and reassignment of land to flood compatible uses
 - recognition and support for ecosystem approaches
- flood recovery strategies that merge with prevention to increase future resilience;
- administrative structures that enable a catchment based approach to flood management;
- integration of ecosystem approaches into training for flood managers, coupled with community education programs

Major impediments to achieving these objectives include conflicting development policy objectives, many of which value short term development gains over long term disaster prevention; the non-mandatory nature of many current provisions relating to flooding; insufficient investment in prevention (as opposed to relief and recovery); disincentives such as badly targeted flood relief and lack of financial consequences for those making risky development decisions; planning that is based on administrative boundaries rather than natural geographic ones; planning tools that are inadequate to address future risks; and inadequate resourcing, particularly for on the ground implementation. Potential financial consequences are a major barrier that inhibits local government from using flood information and applying appropriate land use and development controls, particularly if this means land has to be 'downzoned'.

In order to achieve improved flood management, reforms will be needed at all three levels of government. At the Federal level, funding needs to be targeted at preventative measures that will reduce future damage bills, such as the better integration of disaster recovery programs with mitigation of future risks. The current focus on risk assessment that addresses consequences is sound. However, the amount of money available to mitigate flood risk needs to be vastly increased. Stronger options to encourage improved land use and development planning, such as reduced federal investment in regions with inadequate controls could be explored if current cooperative approaches prove insufficient.

State / territory planning processes could be improved to enable facilitate adaptation. Rather than relying on modelling to provide greater certainty about flood risk, improved decision making systems need to be implemented that enable low cost, flexible approaches to flood risks. Local governments also need to be better supported by state governments in terms of technical capacity and financial resources for generation of flood information and risk assessment. Appropriate legal protection or financial capacity to pay compensation when it is necessary to downzone could encourage the actual application of flood information.

6. DISCUSSION: POLICY MECHANISMS FOR RESILIENCE

6.1. *Background*

Resilience thinking has been advocated as the appropriate framework for facilitating adaptation to climate change. It is a framework that has grown from the field of ecology to be embraced by a broad range of institutions seeking to address perceptions of growing risks and threats and an increase in the severity and frequency of surprise events (Kennedy et al 2011). A particularly appealing feature of resilience that lends itself to climate change adaptation is its acceptance that systems are always in a state of change and as a consequence need to be managed for flexibility, not stability (Nelson et al. 2007).

“Resilience of what, to what?” is an important question to ask if taking this approach to framing adaptation policies. Context is vital to turning resilience theory into adaptive practice. In this regard resilience can fluctuate over time, and usually emerges from the bottom up (Cork et al 2010).

Resilience and adaptive capacity can also apply to policy. The resilience of policy is challenged by many factors, including its focus on economic efficiency. Concepts associated with resilience have been used by this project to analyse the efficacy of the broad range of policy and institutional mechanisms available to Government to facilitate adaptation. These concepts included:

- **Clarity of purpose:** Resilience requires clear definition and understanding of problems at a system level so that we can address root causes not just symptoms
- **Diversity:** Resilience requires a diversity of ideas, skills and resources, a diversity of views, innovation, flexibility in problem solving, and wide inclusion of stakeholders in a purposeful and structured fashion
- **Connectivity:** Resilience requires institutional (including community) networks that are not susceptible to collapse due to one part failing; effective use of resources; community ability to organise itself; appropriate leadership; spare capacity; and some duplication of functions and overlapping of institutions
- **Integration and feedback:** Resilience requires that there is holistic consideration of issues and realistic consideration of scale, accounting for the full range of interactions between humans and ecosystems. It also requires resources to monitor, debate and learn (Cork et al 2010)

The concepts of diversity, connectivity and integration and feedback are well known to resilience theorists. Clarity of purpose is an important inclusion in our analytical framework because it helps take resilience theory into the pragmatic world of management, implementation and accountability while not losing sight of the assertion that resilience is a process and not simply an outcome. Resilience cannot be considered in isolation from either adaptability or transformability. The former is the collective capacity of the human actors in the system to manage resilience, while the latter refers to the capacity to create a fundamentally new system when

ecological, economic, or social conditions make the existing system untenable (Table 3).

Table 3: Attributes of systems indicating resilience, adaptability or transformability (Cork et al 2010; adapted from Walker and Salt 2006, and Resilience Alliance 2009)

General resilience	Adaptability	Transformability
Diversity (e.g. of skills, ideas, functions) Modularity (failure in one part of the system does not cause failure of the whole system) Awareness of cross-scale processes Tight feedback (early detection of emerging change, effective transfer of information and rapid and appropriate responses) Overlapping institutions and reserves of human and other resources	Social capital (leadership, trust) Human capital (skills, education, health) Adaptive governance Financial resources Natural capital Social and ecological memory and ongoing learning	Experimentation Support for change Trust Human, built and natural capital Cross-scale awareness

Adaptation best takes place through the networks closest to where adaptation is required, hence the discourse of community engagement and local action is prominent within the discourse of climate change adaptation. The challenge for policy is that resilience within communities or local organisations is not a fixed quantity in that it can grow or decline over time. Moreover, studies of community development generally conclude that one size cannot fit all when it comes to supporting resilience and adaptive capacity. Many studies however recognise that economies of scale can enhance resilience and adaptive capacity, and such economies can be achieved through coordinated regional efforts. Yet herein lays a dilemma, as many regional efforts are organised from the top-down, whereas the self-organisation feature of resilience generally emerges from the bottom up. Maguire and Cartwright (2008) suggest that there are actions that can be considered as a way to enhance community resilience without exerting too much control over ecological or social systems (Table 4). The analysis of our study enables us to supplement Maguire and Cartwright's conclusions in regards to community resilience (see the first two columns) with a third column providing a specific climate change adaptation dimension.

Table 4: Fostering the features that support resilience**Source: Adapted from Maguire and Cartwright (2008)**

Features of resilient communities	Corresponding fostering activity	Implications for climate change adaptation
Economic diversity	Investment in new industry assessment and growth Support and training for business development	Opportunities for stimulating businesses that facilitate adaptation New industries should be carbon budget beneficial
Community ability to effectively organise itself	Implementation of effective local government and catchment management governance systems Support provided to civil society organisations pivotal to resilience	Impediments to adaptation need to be identified at local as well as national levels Different mechanisms should be complementary and not induce conflict at the local level
Leaders (individuals or groups) in the community who can mobilise awareness and resources to manage the process	Support for leadership and succession programs Support for whole-of-community network forums and exchanges	Fostering activities should incorporate building the capacity to implement resilience concepts and processes and move towards a state of self-reliance
Ability of the community to learn from change	Encourage implementation of processes to plan, implement, monitor, evaluate, reflect and adapt Support underpinning knowledge (analysis) of what happened, how and why when a shock occurs	Provision of data at all stages of adaptation is critical to planning, implementation, monitoring, reflecting and adapting. Collective interpretation rather than scientific righteousness is needed in the process
Community seeks creative solutions to change	Ensure regional investment is open to a diversity of solutions	Promote multiple means to common ends in adaptation to maximize potential for uptake
Community reacts quickly or appropriately (time-wise) to change	Planning and risk management strategies are supported ahead of shocks Easy and equitable access to services	Impediments to good planning are removed, such as conflicting visions and processes between levels of government where they intersect at the local level
Strong communication channels within the community	Effective, diverse and trusting communication mechanisms are put in place	Build and reward communication network mechanisms that have local credibility

Using the resilience framework, the following sections synthesise what we have learnt about current policy and institutional mechanisms in terms of clarity of purpose, diversity, connectivity and integration and feedback. In using this framework, however, we acknowledge and take into account that a resilience approach is not exclusive of also using more deterministic approaches (risk, optimisation, etc), which serve different purposes (Fischer et al 2009).

6.2. *Clarity of purpose*

Climate change is not an environmental issue; it threatens the economic, social and environmental systems that societies have constructed over millennia as much as it threatens the ecological systems that the interaction of the physical, chemical and biological fundamentals of nature has constructed. Yet climate change has by and large been assigned to the institutional, political, administrative and communicative structures that position the issue as an environmental challenge with social and economic consequences. It could equally be seen as a social issue with economic and environmental consequences or even as an economic (productivist) issue with environmental and social consequences. Different institutions, organisations, groups and individuals within civil and political society take a differing stand on each perspective, most commonly favouring one over the others. In itself this is a challenge in that no matter how clearly the purpose of a policy or institutional mechanism is stated from one perspective, it will be contested as unclear from the other perspectives.

This contention was implied in many of the submissions to the Productivity Commission's review on climate change adaptation. The CCCLM submission, for example argued that "effective adaptation should address environmental, social and economic impacts, and not focus narrowly on economic and community impacts." This example further demonstrates the challenge of conveying clear triple-bottom-line messages when, despite the concept being well understood, behaviour reverts to one or another narrow perspective such as focussing only on the economic benefits of adaptation at the cost of building longer-term community resilience. In other words, while a broad based sustainability purpose behind a climate change adaptation strategy may be intended, it becomes difficult to pursue in practice, particularly where there are personal, community and business costs associated with difficult to measure benefits over difficult to measure timeframes. For this reason, adaptation needs to be seen as a process rather than as an outcome, but selling the benefits of a process is potentially even more difficult to couch in terms that are clear and immediately meaningful.

The case study on intergovernmental agreements suggests that narrower foci can be more effective. The National Competition Policy (NCP) and the water markets component of the National Water Initiative (NWI) had a relatively narrow, or at least more clearly comprehended, focus on enhancing markets and thus can be seen as having had more specific and achievable reform agendas, more technical in nature and less likely to stir widespread opposition. These policies also targeted sectors - sequentially in the case of the NCP - where there was a high degree of ownership by governments as opposed to invoking the need for reform across society and challenging many private interests at once. The three tranches of the NCP were implemented over ten years while the initial agreement for the NWI was eight years, illustrating the robust nature of these policies and in great contrast with the National

Strategy for Ecological Sustainable Development whose central processes were discontinued after just four years.

Clarifying the governance of adaptation remains a pivotal challenge for all levels of government (Adger et al., 2005). The Australian Government recognises that adaptation is best undertaken at the level most locally relevant to impacts, but the three tier form of governance ensures that frameworks to enable local adaptation becomes as much a political issue as a structural one. Specific roles for different actors in the adaptation space, in terms of administrative sectors as well as in terms of level of governance therefore remain generalised and as a result subject to contention (Juhola and Westerhoff 2011). Ultimately a lack of clarity and leadership in a multilevel governance regime could potentially lead to sub-optimal outcomes or even maladaptation, in that a lack of coordination may ultimately prove counterproductive to wider adaptation efforts in the future.

Three processes can be surmised from the literature that should improve coordination between multilevel governance regimes: 1) the participation of actors at one level in the processes of another as a means of gaining the ownership that comes from the formation of rules that will need to be implemented; 2) the creation of institutions or processes at one level specifically to influence processes or institutions at other levels; and 3) the sharing of knowledge produced in order to influence processes at other levels (Pahl-Wostl 2009). The processes of the DCCEE go some way down this track, but are not always reciprocated at the State level.

Clarity of purpose is about more than simply understanding a challenge; it must deal with fully understanding the required response (or adaptation). For example, the primary industries case study suggests that Australia's farmers and graziers have well understood the concept of adaptation since northern hemisphere farming systems were introduced onto an unforgiving continent. This understanding is reflected in a long tradition of investment in technologies and practices such as drought tolerant plant species, minimum tillage and enterprise diversity (e.g. mixed farming). However, many of the adaptations in the primary industries sector are incremental, and while for the most part this may be enough, in many cases more transformative adaptations may be required. Of more concern, adaptation to drought can be maladaptation to climate change. This is because adaptation to drought may assume that the aim is to increase the resilience of the existing farm business until conditions 'return to normal.' However, under conditions of climate change adaptation may require transformation to a new type of agricultural business. An example is the former drought relief subsidies program versus the water licence buy-back program targeting small block irrigators along the lower Murray. The primary industries case study suggests that policy and institutional mechanisms that seek to facilitate adaptation need to not only be clear about their process for driving adaptation but also to be clear about the nature of adaptation that will be sufficient to build longer-term resilience.

Elsewhere, the floods case study suggests that information about climate change impacts, on flooding at least, is not lacking and much work has been done at all levels of government to identify the impacts and assess risks. Indeed, these are used liberally to justify proposed adaptation activities and numerous intergovernmental initiatives, including national strategies, arrangements, agreements, frameworks, action plans and roadmaps that provide an agreed national approach to flood problems, including exacerbated risk from climate change. The approach taken explicitly couches disaster management in terms of 'resilience', yet it is sometimes hard to distinguish the specific aspect of the problem that some measures are intended to address. Some, such as the National Partnership Agreement for Natural Disaster Resilience, while 'sold' as the federal government's contribution to disaster mitigation, actually address symptoms as well, while contradictory definitions of 'mitigation' obscure the Agreement's true purpose. However, some recognised methods of flood prevention are understood and are included in initiatives aiming to adapt to climate change. The prevention focus is on improved development controls, but inconsistent legislation and processes for addressing flood risk at the state level reflect conflicting development policies. This makes it difficult for different institutions to have a good understanding about what is expected of them in terms of flood prevention and management. This lack of clarity about policy priority in different situations results in a lack of shared responsibility and institutions that work at cross purposes.

6.3. *Diversity*

This study has demonstrated that governments currently employ a wide range of policy and institutional mechanisms in the climate change adaptation space. Of the seven categories of policy and institutional mechanisms, we found evidence of government activity within and across all. In some cases these mechanisms are complementary, for example in the primary industries sector where intergovernmental agreements influence a range of other mechanisms such as the information and analysis functions, funding programs and market engagement. In other cases greater complementarity is required, such as where separate state and local government projections of development initiatives within a region or district may be at odds with adaptation plans that may have been prepared for the area. This would require greater cooperation between levels of government and a greater level of recognition, possibly through formal intergovernmental agreements, of adaptation plans.

Diversity from a resilience perspective is not simply about the existence of diverse mechanisms; it is also about the diversity of support for each mechanism. In this regard, the case study on intergovernmental agreements found that in and of themselves such agreements have neither broad support or non-support – the critical factor for their acceptance comes down to other factors, and in particular their focus and acceptance among non-government stakeholders. In the case of the former, focus can be viewed in different ways. For example, the National Water

Initiative (NWI) is limited to one, albeit, large sector (water), while the National Competition Policy (NCP) has been applied to most sectors of the economy but is clearly focused on economic competition. In the case of the latter, strong advocacy by business interests and the Federal Government for the NCP were translated into a robust policy structure and implementation plan (Curran & Hollander, 2002). The NWI had less enthusiastic support from some state governments concerned at criticism and some constraints on their policies but none the less had a sufficiently diverse supportive group of industry, financial agency and community supporters to survive (Rosalky, 2011). The Resource Assessment Commission's sequential series of inquiries on different topics may have touched on a diverse range of stakeholders for short periods but in a less enduring manner.

The flood case study is also relevant here. Flood management is all inclusive and evidence indicates wide stakeholder engagement across different levels of government and portfolios, research institutions, industries and communities, even to the individual level. 'Shared responsibility', promoted by intergovernmental arrangements fosters this involvement. At the federal level, the strengths of different agencies are combined to implement the National Flood Risk Information Program, which works with state governments and local governments to make information about flood available to all. In turn, guidelines produced by the federal government aim to improve quality, consistency and comparability of flood information commissioned across the country by other entities. The aim is for everyone to have access to the flood risk information they need to make development, mitigation or purchase decisions.

Diversification has become an import adaptation strategy for many farmers. The timeframes of climate change are not such that whole enterprises need to change overnight, however climate variability can and does necessitate interim and ongoing adaptive behaviour. There is evidence that many farmers are turning to mixed farming to deal with the uncertainties of a variable climate, in some cases with a view to making a permanent switch in enterprise when a longer-term shift in climate demands it. Likewise, many irrigators have changed crops and stock in relation to water availability, and have become traders in water as an addition, or even an alternative, to production of other commodities. Off-farm income has been an adaptation strategy for many years.

The primary industries also provide an example of where policy options have broadened in recent years. Water markets have been a welcome addition to the range of options for adapting to climate variability and have been much more effective than most people expected (Cork et al 2010). Indeed the hope is that this new option will raise the business acumen of farm businesses, which in turn will put them in good stead for dealing with climate change. Not all is rosy, however, as several concerns have been raised about the role of water trading, including the role and influence of governments as buyers and sellers of water and the perception of those at the bottom of the systems that water markets still fail to take their needs into

account adequately. And while the Water Act 2007 (Cwlth) encourages the use of a wide range of economic and other instruments to increase the diversity of responses to climate variability, few of these have been developed or applied. This is a major opportunity for the future.

The City of Melbourne (CoM) case study raised the spectre of problem framing as having longer-term implications for adaptation. The risk management focus of the CoM's adaptation strategy is well understood and acknowledged with the CoM. Risk management is a familiar approach in many sectors and professions and thereby easily adopted for new purposes such as adaptation. The strategy was made possible with partial funding from the Australian Government, and so it bears the hallmarks of the risk-based approach advocated through the various toolkits and guidelines either prepared for or by the Australian Greenhouse Office and its successor, the Department of Climate Change and Energy Efficiency. The most tangible component of the risk management approach is risk assessment, a fundamental first step in defining required adaption responses and their feasibility. Some of this guiding material also promotes the adoption of adaptive management by local governments as a means of treating risks. Being less tangible in that it is a process rather than an action, the process for implementing adaptive management is not described. As a result, the risk-based approach not only dominates most local government adaptation strategies where they exist, but together with the lack of a complementary adaptive management approach it constrains adaptation thinking and responses to those that are more target driven and measurable. The issue of framing is important as it potentially gives rise to different supporters for or barriers to successful climate change adaptation vis-à-vis alternative frames such as a hazards approach, vulnerability approach and resilience approach (Fünfgeld and Kennedy 2012). By looking beyond the risk-based approach, more effective strategies may be developed that take into account whole system vulnerabilities that have qualitative as well as quantitative manifestations (Kennedy et al 2010).

Diversification has obvious drawbacks; one being the potential dilution of funds across too many adaptation approaches may result in a lack of critical mass to achieve any or all approaches; another being the need for greater coordination to ensure that different approaches are not in conflict or leading to maladaptation. A risk assessment framework can help identify which approaches may be best to pursue, but the framework needs to be supplemented, at least during any planning phase, by having regard for the resilience, hazards and vulnerability approaches.

6.4. Connectivity

Resilience requires institutional (including community) networks that are not susceptible to collapse due to one part failing. It also requires effective use of resources, community ability to organise itself, appropriate leadership, spare capacity, and some duplication of functions and overlapping of institutions. The extensive literature on alternative governance models for dealing with major

environmental challenges across society suggest that these requirements for resilience demand movement towards governance that is more polycentric (multi-levelled). Such models advocate matching authority and resources across society to the types of decisions that need to be made and to the spatial and temporal scales of those decisions.

Even though the Natural Heritage Trust (NHT) was not one of the case studies we looked at, or even a part of the intergovernmental case study, it nonetheless demonstrated how polycentric mechanisms can potentially operate to match the broad strategic goals of government at one level to the more tactical drivers of action (including adaptation) of at lower levels. We acknowledge criticism that the rhetoric of polycentralism associated with the NHT and similar natural resource management programs has not been matched by lower-level policy and implementation and that governments may not have gone far enough in sharing authority and resources to achieve environments and societies that are likely to be resilient to future challenges and shocks and able to make the most of opportunities. Nonetheless, there are lessons to be learnt from such programs that are based on locally developed system-wide strategies (such as catchment management plans) backed by rigorous science and strong on-ground networks and implementation capacities, and legitimised by and resourced through accreditation under intergovernmental arrangements.

From within our case studies, the concept of connectivity does not simply apply to vertical (hierarchical) relationships but also to horizontal ones. Where initiatives reflect strong relationships both vertically and horizontally, success is more likely. A good example can be drawn from the intergovernmental case study. The NCP and water markets component of the NWI are relatively narrowly focussed on enhancing markets, drawing as they do from neo-classical economics for inspiration. Thus they enjoyed broad support from many in government, academia and business. The National Competition Council and the National Water Commission were established as independent agencies within the Federal Government and involved state governments to champion national reform. They were also supported by the Federal Government's central agencies. Both the NCP and the NWI benefitted from funding of billions of dollars for implementation, particularly by state governments. While RAC was also narrowly focussed, it was restricted to a process and widely perceived by other Federal Government agencies, state governments and industries as a competitor and blocker rather than an enabler: an umpire with few friends. While driven by a desire to achieve public goods, it did not have the ability to engender engagement or engender the same commitment from many political leaders and business stakeholders as the other two policies.

At the opposite end of the scale, the flood case study showed that 'bottom up' networks such as local government alliances and natural resource management bodies appear very strong and effective. They involve large numbers of stakeholders and have a diverse funding base; the loss of one will not make a large difference.

While their objectives continue to remain relevant and they continue to deliver results, they are unlikely to fail.

Not all networks are as successful. The vast majority of recommendations in recent flood reviews pointed to a need for better governance, coordination, integration, accountability, oversight, and communication among other things. Moreover, administrative systems, operating as networks across portfolios, do not always function effectively. The intra-governmental section of the flood case study shows network failure resulted in non-compliant planning schemes that did not incorporate flood controls. This is likely to be a consequence of conflicting portfolio agendas and a lack of policy leadership. Similar conflicts occur between local and state governments in respect to planning and development. The City of Melbourne case study suggests that these conflicts make it difficult to implement adaptation strategies consistently across council boundaries.

In other areas, many stakeholders demand reform, including reform that enables them to become more connected and self-reliant, reform fatigue can also be an issue. This is discussed in the primary industries case study. For example, concern has been expressed by farming communities that many of the beneficial linkages between people in regional Australia have been weakened by the move from the Natural Heritage Trust to Caring for Our Country and this has reduced the pool of leadership potential in regions. This problem may be repeated as some of the Caring for Our Country Programs metamorphose into Clean Energy Act (2011) initiatives, particularly if there is a corresponding shift in focus from issues about which farmers have clear perspectives (adaptation driven by sustainable agriculture) to ones where they do not (adaptation driven by climate change). At the catchment level, constantly changing lines of reporting between catchment management bodies and their coordinating government departments, brought on by cabinet and other political and bureaucratic reshuffles, often acts to erode the trust and social capital that underpins healthy working relationships (Cork et al 2010).

The City of Melbourne case study describes several networks and alliances in which the CoM participates, regionally, nationally and international, both formally and informally. These enable the CoM to share its experiences and learn from others confronted by similar issues. The networks and alliances also allow the members to form the critical mass needed to have their voice heard. This critical mass, however, has benefits flowing both ways, as it enables others to more efficiently interact with more actors multilaterally than if they had to do so bilaterally. Such networks therefore may reduce the transaction cost of the coordination between tiers of government. Another important benefit to be derived through networks is the potential to benchmark adaptation strategies, processes, outcomes and impacts. The CoM has entered into the international C40 Cities network, a group of 40 city councils from around the globe, for this very reason.

The theory of resilience suggests that duplication and overlap can be useful, however, the flood case study calls for some caution in this regard. The strategies,

plans and arrangements in place for emergency management are profuse and somewhat confusing to negotiate. It seems likely that some, such as the National Framework for Disaster Resilience might be redundant now that the more detailed National Strategy for Disaster Resilience is in place. The complexity may have led to some strategies being overlooked or given only cursory attention. Implementation of the MCPPEM Climate Change Adaptation Plan, for example, appears to be less than thorough.

6.5. *Integration and feedback*

The work of Fünfgeld, Kennedy and others about assessment framing of the climate change adaptation challenge makes a strong case for integration. Integration considers the relationship between system components that, if missing even in part, can lead to system failure. In practical terms, not taking a comprehensive view of what a problem is can result in stakeholder condemnation of the problem definition and planning process. The Basin Plan is a case in point, flowing from legislative foundations that focus on water as a natural asset and thereby creating a discussion where economic and social considerations were either not sufficiently accounted for or at least perceived this way.

Moreover, integration is not simply a problem definition exercise, although this is a logical and appropriate place to start. Implementation of policies, programs, strategies and actions requires integration in many forms; management and administrative coordination, scientific and social science support to inform then review progressive decisions and actions, provision of synthesised information and knowledge, and negotiated resolution of conflicts resulting from incompatible policy and institutional interventions. Integration therefore is a key tool in the public policy function of efficient resource allocation.

Intergovernmental agreements provide the highest level of integration in public policy, and if well-structured can facilitate integration and feedback at all levels of a multilevel governance system and within and across many different policy and institutional mechanisms. The primary industries case study for example shows how climate adaptation initiatives within that sector relate to cascading forms of coordination stemming from COAG and flowing right down to project-level integration on the ground. Similarly, the National Competition Council and the National Water Commission continue to oversee coordinated implementation and evaluation of their relevant policies, reporting to COAG.

Lack of integration and coordination currently results in policy inconsistencies between and across levels of government. For example, legislation and development planning systems currently have an inconsistent approach to flood risk. Opposing policy objectives, such as affordable housing and short term financial concerns conflict with concerns about flood safety and long term damage costs. This reflects a lack of policy leadership about approaches to flood risk by state governments. The situation is not assisted by current arrangements for payment of damage costs, which are largely paid for by the federal government, thus externalising the

consequences of this lack of leadership. If policy conflicts are not resolved, flood costs will continue to grow under climate change scenarios, compromising Australia's economy and the wealth and safety of its citizens. The money that could have been spent on mitigating climate change and developing adaptive strategies will be wasted on avoidable damage costs.

The federal government has been making increasing efforts to address prevention through coordination and leadership of initiatives such as the Enhancing Disaster Resilience in the Built Environment Roadmap. However, some of the government's stated objectives, such as the integration of climate change impacts into the Building Code of Australia, have so far failed (Australian Government 2010: 119); (Productivity Commission 2012: 155). The federal government's current focus on resilience, which covers all aspects of flood management, obscures a desirable emphasis on prevention.

Similarly in the primary industries sector, exceptional circumstance payments made to farmers irrespective of their farming practices, including putting in place adaptations designed to reduce exposure to climate variability, undermines the incentive to adopt risk management strategies. These payments also undermine the goals of other policies such as natural resource management programs that seek adaptive management practices to maintain the ecological as well as financial health of farms.

Governments and institutions of civil society generally acknowledge the desirability of polycentric governance models, but express concern about how these might be supported and nurtured. This acknowledgement comes during a cycle of public administration that is more amenable to centralised forms of governance that are as much concerned about managing political risk as they are about managing administrative and public investment risk (Price 2012). In the arena of climate change adaptation, where problems are best owned and responded to locally, the reality is that disempowering civil society or limiting their capacity and flexibility to act in good faith is in itself a political and ultimately public investment risk.

Across the case studies, knowledge management and communication have been discussed not simply from the perspective of filling knowledge vacuums but also in terms of avoiding confused and conflicting messages. Many disagreements come from poor understanding of climatology and the intent and details of policies. Much of this can be addressed through better two-way communication and engagement. However, communication with many communities, particularly those under stress, is challenging and often best done through the networks of civil society and industry rather than government. In many cases, it has been the lack of engagement, poor communication or clarity of policy intent and lack of empowerment and capacity to act through provision of decision-support information that has driven many bodies to form networks and alliances. While this may appear to be the market at work, negative motivations to form alliances and networks are less likely to result in the kind of actions needed than positive motivations.

7. DISCUSSION: THE EFFICACY OF EXISTING POLICY MECHANISMS

7.1. *Intergovernmental function*

Intergovernmental functions:

These are formal agreements between governments to work towards specified objectives. The Council of Australian Governments, comprising the heads of the Federal and all State and Territory Governments, represents the pinnacle of such frameworks. At the issue level, agreements and frameworks include the Murray Darling Basin Agreement, National Water Initiative, and the National Competition Policy among others. Usually these agreements and frameworks are underpinned by legislation and supporting institutions.

Before the need to adapt to climate change becomes truly acute, Australia must consider the appropriate role and responsibility of governments in their efforts to build the capacity to adapt across multilevel scales, from local to national. Identifying roles and responsibilities for governments is particularly complex because the threats posed by climate change are many, varied, inter-connected and almost inevitably uncertain in place, time and scale (IPCC 2001; 2007; 2012). The challenge is further complicated by the shift in recent decades towards a 'shared responsibility' model in dealing with natural hazards, involving ever-increasing numbers of state and non-state actors with varying degrees of responsibility and capacity (Giddens 2009; McLennan and Handmer 2011). Moreover, just as climate change impacts are location-specific, so too must adaptation responses be tailored to local parameters: there is no single one-size-fits-all tool which will be functionally applicable across all sectors (Hussey et al. 2012).

Much of what has been learnt about the intergovernmental function has been discussed in the introduction of this report as well as in the summary of Case Study 1 and hence need not be repeated here. The key points made were:

- The role of government in promoting climate change adaptation is contested;
- There is currently fragmentation of policy effort across the three levels of government which has led to inconsistent local approaches to common problems;
- There is a role for the Australian government in fostering national consistency in the area of standards;
- 'Shared responsibility' is a key principle underpinning government perspectives on adaptation;
- The dual focus on economic reform / markets approaches and community empowerment in recent decades is not necessarily implemented harmoniously;
- State authority is highly fragmented in many of the policy domains that are

- affected by climate change; and
- Delegations to local government can exacerbate fragmentation.

The observations from Case Study One suggest that it will be hard to develop and very difficult to systemically implement an effective national climate change adaptation policy. To succeed, a policy will need to be focussed on a limited number of core principles. Bipartisan support will be required, and while this is conceivable, it will be hard to engender when climate change policies are politically contested. Consistent support from key stakeholders will be required; however few may be motivated by the incremental and long term impacts of climate change to be such diligent advocates. Positioning an adaptation policy in terms of socio-economic benefits is crucial to engender more support rather than seeing such policy marginalised in the environment portfolio.

The regional/local governance case study (Case Study Five) shows that irrespective of relationships defined by the Constitution, the reality is that the City of Melbourne Council (CoM - the focus of the study), the State Government of Victoria and the Australian Government are all active climate change adaptation actors within the city limits of the CoM and hence there is some if not considerable need for coordination. It was the lack of coordination and lack of support by the State and Australian governments that provided the initial impetus for the CoM 'to stand up and paint a strategic vision for the city, including the setting of challenging stretch targets' (CoM, 2003). Yet since then, the Australian government has shown how it can work with all levels of government in the local climate adaptation space without recourse to negotiating and executing national agreements. The CoM Council, for example, advanced its risk assessments, planning, strategy development and early implementation with the help of both the Australian and Victorian Governments through program level funding. For example, the Australian Government's Local Adaptation Pathways Program (DCCEE 2012) provided the CoM with the supplementary funds and access to the knowledge and skills required to prepare its Climate Change Adaptation Strategy (CoM 2009).

While this shows some progressive steps towards improving multilevel coordination, the CoM case study identifies a salient lesson for how this coordination is framed. A highlight of the case study was the tension caused by higher-level government support for adaptation largely being project based, and therefore couched in terms of short-term demonstrable outputs that leave little legacy in terms of long-term adaptive capacity or self-sufficiency (including transitions to self-funding). One contributing factor to this form of maladaptation has inadvertently been the narrow risk assessment framing through which adaptation options are identified and pursued. This framing is embedded in the various tools and guidelines advocated by higher-level governments. Alternative ways of framing adaptation include the hazards, vulnerability and resilience approaches. Different approaches to framing assessments and adaptation planning can result in significantly different adaptation plans, and therefore significantly different responses. This is because each framing

has biases towards different institutions, disciplines, professions and types of people, all with different methods and processes. With each of these come diverse perspectives of what the problem is and what the solutions might then be. Framing therefore is an important issue for consideration in designing national policies that at higher levels seek to influence the actions and responses at lower levels.

The primary industries case study (Case Study Six) shows that there are means of dealing with climate change adaptation policies and programs at the sectoral level within the COAG framework without COAG taking on an all-encompassing cross sectoral approach to adaptation. For primary industries, cascading levels of governance under COAG include a Ministerial coordinating mechanism (the Standing Council of Primary Industries - SCoPI), a supporting senior government officials committee overseeing several national strategies including a National Primary Industries Research, Development and Extension Framework, and several coordinating committees to oversee the various strategies under that framework. One of these strategies is the Climate Change Research Strategy for Primary Industries (CCRSPI) which includes an adaptation component and coordinates the research and extension activities of the Federal Department of Agriculture, Fisheries and Forestry, the agricultural ministries of all States and the Northern Territory, 15 rural R&D Corporations established under various statutes, and the CSIRO.

However, while ultimately established under the COAG framework, CCRSPI is at least three degrees of governance removed from the highest level of ministerial coordination. Perhaps because of this, membership is voluntary and its strategy functions more as a form of guidance to members, providing opportunities for collaboration across jurisdictions and primary industry sectors. While the CCRSPI Steering Committee is required to report on its activities, there is no formal compulsion for members to participate in CCRSPI initiatives or, if they do, to report to the committee on their climate change investments and activities. What CCRSPI serves to demonstrate is that the effectiveness of inter-governmental agreements in influencing climate change adaptation may be limited to the extent to which this function intersects with other functions. Of these, the funding function emerges the most significant in the case of primary industries..

7.2. *Intra-governmental function*

Intra-governmental functions:

These are initiatives within a tier of government, either Federal or State, which imposes a common platform of accountability, such as reporting on sustainability or social inclusion, or promotes or requires cross agency cooperation in dealing with a particular issue. The joint administration of the Natural Heritage Trust and Caring for our Country initiatives between SEWPAC and DAFF is an example of this.

All States have in recent years established either specific agencies or inter-agency committees dedicated towards addressing state-wide climate change issues. For most part, these have focussed on investigating the likely projected impacts of climate change, reducing greenhouse gas emissions and / or promoting carbon sequestration initiatives. Such activities reflect the dominance of mitigation over adaptation in the national and international discourses on climate change. Despite this bias towards mitigation in intra-governmental mechanisms, all states invest in adaptation initiatives and most have frameworks applying across different government departments. The position held on adaptation, and the levels of investment in adaptation activities, vary from state to state and to some extent reflects the political position states take on climate change more generally. The waning priority given to climate change in some states following recent changes in government is widely acknowledged by stakeholders, and this is playing out differently across those states. In Victoria, for example, agencies such as the Department of Primary Industries, while continuing adaptation investments, are being more overt about these being directed towards shorter-term management of climate variability; while in Queensland, investments in all forms of climate change response are being curtailed in favour of reducing state debt and investing in sustainable industry growth.

The intra-governmental function is dealt with particularly in the primary industries, flooding and regional/local government case studies, but is also dealt with implicitly in case studies focusing on planning, where for example state government regulations influence the processes of a number of state and local government practices. Indeed, like the Intergovernmental function, the implementation of the intra-governmental function is often manifested through its intersection with other mechanisms including the regulation by prescription function, the funding function and the information and analysis function. Because of this, and because the same sets of stakeholders and policy implementers overlap, the need for coordination and consistent messages becomes as important across the horizontal level of government as it does across multiple levels of governments.

Where there is a perceived lack of formal coordination at the intra-governmental level, many agencies particularly at the local government level tend to fill the void through establishing formal networks and alliances. Both the City of Melbourne and the flooding case studies deal with these alliances in detail and finds that not only are they an effective means of establishing a mutual support system for exploring adaptation issues in common, for sharing information and experience, for leveraging funding and for jointly advocating policy positions, but they can also provide benchmarking systems to measure and compare progress and achievements. These voluntary processes, while very beneficial, do not mean that the institutional market will take care of itself in the most efficient manner. The lack of intra-governmental coordination was reported on by the Victorian Government's 2030 Audit Expert Group (2008), responsible for evaluating the Melbourne 2030 – Planning for Sustainable Growth strategy, and made the observation that the lack of coordination contributed to a fragmented approach to climate change action in Melbourne city. This is not something the city council's voluntary networks can help with, particularly where state and local governments may have different aspirations for development within a council's boundary.

In other parts of Australia, leading examples of cross-local government action in climate adaptation are being pursued via formal alliances/regional organisations of councils. In some cases these are climate change-specific (SE Melbourne), whereas others have incorporated adaptation work into a longer history of collaboration (Sydney coastal councils, Hunter region).

An important justification for formal intra-governmental frameworks is that they can provide a means of supporting agencies to be objective in their climate change adaptation investments. In the primary industries, for example, climate change research investment audit data (Price 2012) suggest that much of the climate change adaptation investment at the State level is, in many respects, a continuation of a long history of climate variability adaptation research. Such rebadging of traditional investment can, at worst, represent a business as usual approach aimed more at maintaining harmony between agencies and their stakeholder base than most appropriately dealing with climate change. While in the primary industries incremental change may be appropriate, it can also lead to maladaptation by reinforcing particular land uses where a transformation in land use may be more appropriate. Providing objective criteria and decision support to determine where different forms of adaptation are required can be a function of intra-governmental and intergovernmental frameworks.

As the flooding case study demonstrates, intra-governmental mechanisms have been shown to work. The National Strategy for Disaster Resilience (NSDR), for example, operates at the intergovernmental and intra-governmental level and has through the National Flood Risk Information Project made good use of different agency strengths in underpinning risk management responses. The case study more broadly suggests that collaborations between agencies are important in ensuring a

whole of government approach and are often very efficient in terms of making use of skills and resources from other agencies, pooling financial resources, and providing a focus for common concerns that might otherwise be overlooked due to competing priorities. However, to be effective, they require policy leadership to ensure all agencies involved are working together, rather than working to separate and possibly conflicting agendas.

Ultimately intra-governmental frameworks can create the space for governments to consider and debate interrelated policy conflicts. Examples of such conflicts, discussed in the flooding case study include:

- affordable housing objectives versus safety through reduced exposure to floods;
- short term economic gains from development versus long term cost of exposure to flooding;
- population pressure that pushes development into unsuitable areas;
- high cost of developing flood free land beyond existing townships;
- environmental objectives (e.g. to reduce the urban footprint via infill) which reduces the availability and affordability of flood-free land within urban areas.

7.3. Regulation by prescription

Regulation by prescription:

These are mandatory (legal) requirements that must be met under specific laws/legislation. They are the primary instrument of government agencies to achieve agency objectives.

This mechanism and the next, which deals with planning processes, are closely allied because many of the regulatory steps that governments can and do take to influence climate change adaptation either directly or indirectly relate to land-use and development planning. That said, there are regulatory instruments beyond the planning arena relevant to the climate change adaption discussion or which, if created and prescribed, could influence adaptation investment and other action. The case studies on flooding, regional/local government and the finance and primary industry sectors form the basis for the discussion here.

Coercive regulations expressly in relation to climate change adaptation in Australia are rare, the NSW sea level benchmark being an example of the exception. In general, State legislation relating to land-use planning does not contain any requirement to take climate change into account. Some states have legislation specific to climate change or coastal management that can include a non-coercive requirement for decision makers, including planners, to consider climate change, particularly increased flood risk due to sea level rise. For example, the Queensland government administers development planning through the Sustainable Planning Act 2009 (Qld) (SPA). The Act allows for the development of the Queensland Planning

Provisions, which set out a standard structure for planning schemes and drafting instructions. These Provisions include standard zones and overlays and assessment criteria. In terms of flooding, the Provisions include a standard overlay for flood hazard in the 'development constraints' category. However, the use of the overlay in planning schemes is optional, even where flood mapping information is available (QFCI 2012: 106-108). Also problematic in many regulations are the extensive exemption provisions that can compromise consistent management of risks such as floods (see Case Study 7).

The non-coercive versus coercive nature of regulations warrants discussion as it brings to surface some of the barriers at play in greater use of the regulatory mechanism. To this end, the regional/local government case study is relevant. For example, Australian state and territory Local Government Acts provide Councils with the capacity to make and enforce by-laws so that they may perform their functions provided such actions are not expressly precluded by other legislation (National Office of Local Government, 2004). Such powers are rarely incorporated into adaptation strategies, such as the City of Melbourne's Climate Change Adaptation Strategy, which tend to take a broader project or activity based approach to advancing broad community action such as climate change adaptation. This case prevails despite legislative reforms to expand the general competence powers of local governments which open new avenues for giving such strategies more teeth. These reforms include added capacity for Councils to engage in stronger forms of governance, advocacy, service delivery, planning and community development, and regulation (SMEC 2008).

Of particular relevance to climate change adaptation are the opportunities afforded by general competence reforms to strengthen approaches to development planning and building codes consistent with meeting adaptation goals and targets. The reluctance of local governments to fully capture these opportunities has led to accusations of Councils bending to pro-development group pressure and for pursuing climate change policies largely on political and economic grounds (Jones 2011; Engel 2009). However, some of this reluctance can be attributed to uncertainty and perceived uncertainty over the public liability of councils with regards to land planning under common law. Local councils are reluctant to take action on climate change adaptation due to concerns where:

- Councils do or do not release information relating to climate change impacts
- Councils approve or refuse to approve applications for development that may be susceptible to climate change risks
- Councils make chances to climate change planning instruments to incorporate climate change considerations which affect existing developments
- Councils install or do not install protective structures" (Productivity Commission, 2012 p 134)

The Productivity Commission Report 2012 considers this “uncertainty about the legal liability of local governments is emerging as a barrier to effective climate change adaptation”(Productivity Commission Report, 2012 p 136), despite the protection offered under various state civil liability acts such as The Wrongs Act, 1958, s83 in Victoria (England 2008). The Productivity Commission goes on to say that planning regulations that accommodate climate change adaptation need to facilitate a risk management approach, and incorporate community risk tolerance, rigorous consultation processes and full cost benefit analysis of land use. A key component of the risk management approach is for development approvals to be time-limited or trigger-bound to enable land to be used in the short term until new adaptation approaches are needed (Productivity Commission 2012: 139-143).

One area where coercive regulations can be effective in facilitating appropriate adaptation responses is in the establishment and enforcement of building codes. While it is preferable to avoid siting development in areas of flood risk, this is not always possible to achieve (QFCI 2012: 223, 245). Improved materials and design can be used to improve flood resilience and can significantly reduce damages and enable rapid clean up and recovery. This is a useful adaptation measure for climate change, as it can mitigate more frequent small flooding as well as extreme flood events. Prescriptive building requirements are generally easier to apply to new development, but they can also be applied to rebuilds, as in the case of North Wagga Wagga (Wagga Wagga City Council 2010).

The concept of coercive regulations is also discussed in the primary industries case study. In the farming sector, extending regulations such as those relating to environmental protection has been contentious, and in any case would be difficult to implement where the negative consequences of certain practices are diffuse and cannot be attributed to a point-source. A common fear expressed by many farmers is the notion that they one day may need a real licence to farm and not just a social licence to farm (Williams and Martin 2011). The imperative for collective action across farms has been a constant dilemma for catchment management, particularly where issues require voluntary and often widespread cooperation between many farm enterprises. Here, while regulations may struggle to compel collective action, they may at least compel individual compliance to not act in ways detrimental to the environment, for example by restricting clearance of native vegetation.

In the finance market case study, opportunities for both non-coercive and coercive are discussed. Specifically in the case of adaptation, non-coercive regulation can stimulate appropriate sector responses by supporting a business case for the replacement and refurbishment of existing and future physical assets/infrastructure to increase resilience. Coercive approaches, however, can be taken by prescribing particular behaviours; although certain taxation-based system can also act to provide a strong incentive for change. Here, new taxes on the finance sector for example can be imposed as a way to raise money for public climate finance. In the case of the latter, legislation could prescribe how investors and financiers must alter their

practices to facilitate adaptation. For example, legislation could stipulate that financiers must lend at preferential rates for infrastructure adaptation projects and household adaptation measures, or that institutional investors are prohibited from financially supporting listed carbon-intensive projects or industries.

The conclusions of the coercive versus non-coercive approaches in the finance market case study can be thought about more broadly. In summary, the advantage of coercive regulation is that it minimises the challenge of providing cost/benefit analyses for voluntary action. However, the disadvantage is that, on its own, it is ill-equipped to deal with an emerging and dynamic area like climate finance, and may constrain the scope for unexpected, innovative adaptation by firms or sectors. Climate finance regulation for adaptation needs flexibility and credibility given the complexity and newness of this area. As such, it needs to be responsive to new information gained through learning by doing, and will require input from experts in the field (including private finance actors) in order to have traction with them. Moreover, coercive regulation forces private finance actors to become government-directed instruments of adaptation. It is not surprising that, in market economies, they prefer to not be coerced.

7.4. Planning processes

Planning processes:

These are strategic and administrative procedures and modus operandi by which agencies prescribe and authorize desired action in anticipation that such action will provide public benefit or avoid public disbenefits.

Improved land use planning and building controls are a key climate change adaptation mechanism identified in the federal government's position paper on climate change adaptation (DCCEE 2010). Planning processes are generally complex with responsibilities shared by both State and local governments. Generally planning policies, strategies, legislation and plans for regional development are prepared by State governments. Contained within these provisions are various planning tools and instruments such as zones and overlays, assessment criteria. In flood management for example, local government is responsible for acquiring flood information, using this information as a basis for risk assessment and incorporating it into compliant planning schemes. Local government is primarily responsible for planning decisions, within State statutory settings, but State governments may also influence or approve developments of certain classes.

To understand the potential of planning regimes for enhancing climate change adaptation, it is necessary to consider this in context of the legal arrangements for environmental governance. These include those relating to climate change recognition and adaptation that perform a number of different functions: stating substantive values, strategies and outcomes; prescribing processes and procedures to enable and in some cases to require the formation of plans and instruments to

realize these values, strategies and outcomes; creating sets of associations rights and duties designed to implement these plans and instruments; ensuring that these associated rights and duties can respectively be protected and enforced by the executive agencies of government and ultimately the judicial agencies of government. Some of these functions are information; some are descriptive; and increasingly many are prescriptive. It is the relationship between them that has become important in the context of ensuring compliance and enabling enforcement.

As introduced in discussion on the previous mechanism (regulation by prescription), there is a clear distinction to be drawn between the existence of legal arrangements designed to enable or require climate change adaptation; the capacity of these legal arrangements to do so in practice; the differentiated capacity of these legal arrangements to be enforced; and ultimately the extent to which the implementation of these legal arrangements actually achieved the outcomes for which they have been designed. The significance of these points is that a raft of statutory and institutional arrangements are in place which could in principle support adaptation, but their use and efficacy hitherto has been limited in some areas, and adhoc in others. In short, the law is only as effective as the context in which it operates and thus assessment must be made in the context of broader policy and planning issues which inhibit effective implementation, such as (i) information and knowledge gaps, including missing stakeholder contributions, (ii) overlap, ambiguity, or contradictions in legislative requirements or processes, (iii) inappropriate scale or scope of implementation and regulatory arrangements, (iv) incentive gaps and conflicts for private and public sector actors that risk impeding adaptation, including shortfalls in accountability and transparency arrangements, or perverse public revenue or funding linkages, (v) conflicting strategic policy goals frameworks, which create unintended outcomes, and (vi) the availability or lack thereof of human, financial and other (i.e. technical) resources (Hussey et al. 2012).

Environmental planning law frameworks incorporate a range of different pieces of legislation that regulate land use planning decisions for development, and this legislation can and will vary depending on the geography of the land. For example, QLD, VIC and NSW all have legislation relating specifically to coastal management. The term 'planning frameworks' needs to be defined broadly as including everything from "the strategic planning phase through to post-consent mechanisms" and "building and construction" (Ghanem and Ruddock 2011: 17). In New South Wales, for example, the planning framework embraces a broad raft of strategic planning tools including the New South Wales State Plan, Metropolitan and regional strategies, Local environmental plans (LEPs), Standard Instrument (Standard LEP), State environmental planning policies (SEPPs), and Coastal policies and strategies.

In recent years, a number of the states have amended their planning law framework to take into account climate risks. For example, in Victoria, the Victorian Coastal Strategy 2008 was developed, and associated laws amended, to incorporate climate change (see de Wit and Webb 2010). To enable these state reforms, new

institutional arrangements have been established, for example, in Victoria, the Victorian Coastal Council has been established as the peak body for the strategic planning and management of the Victorian coast, as well as the Regional Coastal Boards (RCB) – Western, Central and Gippsland.

A weakness in current planning processes is the lack of consistency applied in supporting development initiatives, particularly in respect to achieving both State and local government aspirations. In many instances relevant state Ministers can proceed with a development if it is deemed to be a “critical infrastructure project” i.e. if it is deemed to be essential to the State for economic, social or environmental reasons”. The Kurnell Desalination Plant is one such development, so too new electricity infrastructure over 250MW. The City of Melbourne case study suggests that where State governments take the lead on a development process within a local government's boundary, it is not compelled to act in accordance with local government strategies, including climate change adaptation strategies, and so different developments within close proximity could be inconsistent with achieving local aspirations for adaptation.

The flood case study draws attention to other planning problems. The study reports on barriers to incorporating up-dated information into planning schemes in both Victoria and Queensland, including a ten-year interval before some planning instruments become due for revision, the complexity of approval processes, cost, compensation liabilities and competing pressures. These can all prevent timely incorporation of flood data, including climate change information, into planning schemes. The Productivity Commission adaptation review also found that climate change risks are not consistently managed in land-use planning schemes, with local governments hampered by a lack of guidance from state governments and financial and expertise constraints (Productivity Commission 2012: 151).

Data accuracy, assumptions and collection techniques aside, combinations of future changes such as development and climate change are expected to alter catchment hydrological conditions; what was once a 1:100 year event may become a more frequent occurrence. A study by Melbourne Water on the impacts of climate change on flooding found that rainfall intensity over five urban catchments in Melbourne was likely to increase and that the interval between large scale events would decrease. Using existing tools and models, they found a 30% increase in rainfall intensities was likely by 2030. While results varied from catchment to catchment typical results from this analysis indicated the 2070 1 in 5 year design ARI event was equivalent to the present 1 in 10 year ARI event and the 2070 1 in 100 year ARI event was equivalent to the 1 in 300 year ARI event (Pedruco and Watkinson 2010). Similarly, studies suggest the urban heat island effect caused by intensification of development can exacerbate climate change impacts over specific areas (Coutts et al 2010).

New approaches to planning are advocated that focus on ecological systems. To manage flooding, for examples, some researchers suggest that work needs to be

done primarily in the upper catchment to impede water flow. Thus, rather than clearing and straightening water channels, vegetation actually needs to be encouraged to grow inside them and for water to spill over onto the floodplain. This is an approach that strongly contrasts with current practices and community views (Wenger, Hussey et al. forthcoming); (Parliament of Victoria 2012: 114-118). Upper catchments would be encouraged to flood and hold water temporarily in wetlands or detention basins and then gradually release it back into the system. Such an approach demands a totally different governance framework for planning that is more attune to catchment management principles, taking into account different actions needed by different stakeholders along the physical geography of a catchment from upper, to middle then to lower catchment. A business case that applies ecosystem approaches to sediment reduction in the Moreton Bay area was recently prepared by the Queensland Conservation Council in collaboration with university researchers as part of the Healthy Waterways Partnership. It found that 70% of the sediment is coming from 30% of the region, suggesting that it is possible to target activities to specific localities. This example also suggests that in the Australian context, ecosystem approaches would be cost effective in terms of water quality and supply, as well as having side benefits for fisheries and wildlife. The value of avoided flood damage costs was not included in this study (QCC 2012).

Ecosystem approaches to climate change mitigation and adaptation are probably the least understood in Australia. A reason for lack of understanding about this approach could be the segregation between traditional impact (e.g. flood management) and natural resource management disciplines. However, ecosystem approaches are widely used overseas as a strategy to adapt to climate change related flooding. They can mitigate the impacts of flooding for existing as well as future development, and thus have a wider reach than development planning.

7.5. Funding function

Funding functions:

These are incentive programs or investment initiatives that provide subsidies or co-investment as a means of stimulating the uptake of particular actions.

As previously discussed, there is an inevitable inter-relationship between the different policy and institutional mechanisms of government, but perhaps none stronger than the link between the funding function and the information and analysis function. This may be particularly the case with climate change adaptation, where the identification of options for responses and the development of appropriate technologies associated with these are dominated by the paradigm of research methodologies, research management and research funding. This paradigm is reinforced by the risk assessment framing approach to adaptation planning advocated by government; an approach that demands the technical interpretation of projected impacts and their implications for adaptation. While the funding function of

government certainly goes beyond support for research, nearly all of the case studies found that most funding initiatives associated with the case study area were either directed towards research or towards projects involving advice from research professionals.

The importance of the link between the funding and information and analysis functions of government cannot be overstated because it affords the Commonwealth considerable influence in what research is undertaken, under what conditions and ultimately, by virtue of the dominant risk assessment framing approach, what adaptations occur. That said, the authors encourage caution be taken with this approach because it may reinforce an opportunistic project-based mind-set in dealing with adaptation at the cost of building longer-term personal, community, business, organisational and sectoral resilience in the face of climate change. This is not to suggest that the funding function should be downplayed in favour of other mechanisms, but rather that a different approach to funding management may be needed. One alternative approach, for example, is to not administer the funding of research (or other types of projects) but rather to administer the facilitation of adaptation collaborations. In other terms, to invest in adaptation *collaborations* rather than adaptation *projects*. Such an approach could go so far as to actively discourage opportunistic behaviour of research institutions that has been known to impede greater private sector engagement in collaborative ventures (Tripsas et al 1993).

There is currently a plethora of funding programs that in one way or another support climate change initiatives, including adaptation. Indeed, their number is too imposing to list here: many are described in the case studies, and most comprehensively in the information and analysis, primary industries and flooding case studies. These are variously administered at all three levels of government, and occasionally by agencies outside of government under formal agreements. Primarily, their mode of investment is project-based.

At the Australian Government level, the Clean Energy package has added a raft of funding packages, including the \$1.7 billion Land Sector Package, which in turn supports the Carbon Farming Futures Program, Carbon Farming Initiative non-Kyoto Carbon Fund, Biodiversity Fund, Indigenous Carbon Farming Fund, Regional Natural Resource Management Planning for Climate Change Fund and the Carbon Farming Skills Program administered by DCEE. The Biodiversity Fund is notable as it is a repackaging of a range of previous native vegetation programs tweaked to make carbon sequestration a more prominent criterion for project selection.

Repackaging of funding programs can be an issue when it potentially leads to maladaptation, such as support for incremental change along a wrong trajectory where transformation is warranted. Here, the primary industries case study is significant. The agricultural sector is unquestionably the sector with the longest history of climate related adaptation in Australia. This has primarily been due to the innovation required to cope with Australia's extreme climate variability. Much of the

agricultural research investment for the past few decades has involved a statutory-based model combining industry levy payments with matching government funds to create largely commodity based investment pools (Rural Industry Research Funds). These funds in turn are managed largely by commodity specific R&D funding institutions (some run as statutory corporations, others as industry companies). The commodity focus of these institutions can be a strength from the perspective of stakeholder ownership, but also a potential weakness in that it potentially ties the investment mind-set to one of incrementalism built around improving the sustainability of particular commodities. While incremental improvements may be appropriate in some cases under projections of climate change impact, they may be inappropriate in other cases. An audit of R&D investments by these bodies as well as by national and state research agencies suggests that in the adaptation space, around 15% of research funding is directed towards transformative research (Price 2012). This may be appropriate, however, there was little evidence to show how investment decisions across incremental versus transformative were rigorously determined and justified. Indeed, it appears that many of the incremental adaptation investments were continuation of long-term research themes rebadged to suggest they were related to climate change.

Across its full portfolio of activities the CoM runs several different grant, sponsorship and investment financing programs. None of these relate directly to the implementation of its adaptation strategy, although some do have this potential. For example, the Council's Sustainable Melbourne Fund "provides loans of up to \$500,000 for up to six (6) years for individual projects that minimise impact on the environment and deliver improved economic outcomes for the people of Melbourne (and since 2002) has invested \$8.14 million in energy generation, water savings and energy efficiency" (CoM 2012a). The Council also runs an Environmental Upgrade Fund to support building upgrades and retrofits that, among other things, can include energy efficiency improvements, renewable energy systems and water conservation improvements. This Fund is based on an innovative financing arrangement that sees the CoM enter into partnerships with financial institutions and voluntary agreements with building owners to finance environmental upgrades for non-residential buildings. With the tenant's consent, part of the cost of any upgrade can be passed onto them. The finance rate is lower than commercially available to property owners and by treating the repayments as levies to the CoM then passed on to the financial institution, the mechanism also reduces the risk to the institution (CoM 2012b). Such funding opportunities are further explored under the Market arrangements section below.

The CoM case study also provides a pertinent example of the limitations project-framed investments suffer. This Council was one of a small number to received first round funding under the Australian Government's Local Adaptation Pathways Program to assist develop its Climate Change Adaptation Strategy. Discussion with some key informants within the CoM suggested that this form of funding, while

strategically useful for supporting specific tactics and actions, did not provide for long-term adaptation investment, including the kind that supports community and business resilience in addition to short-term risk management strategy development.

In the flood case study, discussion on the National Partnership Agreement on Natural Disaster Resilience suggests there may be a potential model here for broader adaptation funding. The amount allocated by the federal government to this agreement is approximately \$100 million over four years (2009-10 to 2012-13), divided between all the States and Territories (COAG 2009). Under the terms of the agreement, recipients are required to match Commonwealth funding and state/territory annual implementation plans indicate that matching funds are also commonly required from local government or other agency beneficiaries, thus providing leverage opportunities (eg, see NSW Implementation Plan 2010/11). The Partnership Agreement is described as addressing climate change adaptation on websites and in annual reports, however the Partnership Agreement itself makes no mention of climate change. Wording relating to climate change is included in some of the Agreement's State/Territory annual implementation plans. Generally this is in the form of acknowledgement of climate change rather than specific strategies to address it. A study of the eight implementation plans for 2011-12 found that six made no reference to climate change, one included climate change in its preamble and the remaining one included climate change in its performance measures.

Such a model is not unlike those that have been used for natural resource management, including the existence of multilevel agreements between tiers of government to pursue particular outcomes. Notwithstanding some of the weaknesses of this model pointed out by the Australian National Audit Office (ANOA 1997) and others (Roberts and Pannell 2010; Morrison et al 2010), including a diminished role for local government in the current Caring for Our Country program and that program's fixation with opaque project-based funding decisions, some principles remain useful and transferable. In the context of climate change adaptation, it is not hard to see a process whereby multilevel agreements can be formed around collaborative actions to support the implementation of regional adaptation strategies. This would not simply be about funding, but also and possibly more importantly about aligning policies, building codes, development planning processes and other activities to be consistent with the outcomes sought by the strategies.

7.6. Information and analysis function

Information and analysis functions:

These are publicly funded initiatives aimed at enhancing the understanding of phenomena (basic research) and how to deal with these (applied research) and at enhancing stakeholder understanding of the consequences of phenomena and the means of responding (education and awareness).

As stated in the introduction to this synthesis report, information on climate change impacts is abundant, with all levels of government, as well as research and training institutions, industry bodies and NGOs involved in the production and analysis of information related to climate impacts and adaptation. This includes information on the impacts of climate change, guidance material in the form of best practice manuals, tools, information networks, courses and workshops. Many specific examples of such material are provided and discussed in the various case studies. What becomes clear in these is that governments also have a role in developing guidance to improve the quality and consistency of information. (We refer to the forthcoming report from the NCCARF Leading Adaptation Pathways project.)

While information abounds, *local* information on climate impacts is often lacking, is not publically available or is not used (Wenger et al. 2012). Of greater concern perhaps is that those in positions needing to access this information often do not have the time to do so and may proceed with activities based on poorly conceived foundations. Alternatively, these positions may rely on external support (i.e. researchers, consultants etc.) to undertake analysis of options based on available information but as a result may not have built any organisational capacity to become self-reliant in information seeking and interpretation. In other words, decision-makers may be no better off at knowing how to make decisions under uncertainty.

Climate adaptation issues pose particular problems for providing accurate, policy-relevant information for decision-making, with the issue of uncertainty being most prominent. Three major sources of uncertainty are discussed in Case study 3 and previously in this synthesis report: Future emissions of greenhouse gas emissions ('policy uncertainty'); Scientific uncertainty ('epistemic uncertainty'); Natural variability ('aleatory uncertainty') (Hallegatte et al. 2012: 8). These three uncertainties combined make it all the more difficult for decision-makers to assess investments for long term climate resilience. As such, the information and analysis function of government in the arena of climate change adaptation becomes one not only of information and analysis *provider*, but potentially also information and analysis *interpreter*. That is, in environments of decision-making uncertainty, there is a need for information providers and decision-makers to work closely together to interpret options, steps, feedback and further options in the context of adaptive management.

The importance of information and uncertainty in adaptation policy is heightened by the fourth domain of uncertainty: that associated with the likely efficacy of policy interventions.

The City of Melbourne case study provides a good example of how decision-makers can work alongside information providers to not only gain access to information but to gain a richer understanding of the content of the information. Here, a close relationship has evolved between CoM staff and adaptation researchers associated with the Victorian Climate Change Adaptation Research Facility Institute. In effect, the NCCARF initiative was intended to support these kinds of collaborations, where research and decision-making imperatives are closely aligned. It is apparent that the volume of adaptation research resulting from the NCCARF initiative places Australia in a leading position, however the application and impact of this knowledge is a matter yet to be determined. Such processes not only provide researchers with insights into real world decision making dilemmas, but ensure a legacy of stronger capacity within organisations to identify and assess adaptation options. In many ways, this is nothing more than a form of action research within a policy context. Such relationships should be encouraged across Australia between local councils / other critical adaptation organisations and their (preferably) locally situated research institutions.

Another issue that is problematic in climate adaptation information relates to a spatial scale misalignment between what can be provided by climate models and what is needed by decision-makers. This is discussed in the flooding, water/energy and finance market case studies in particular. For example, in the case of floods, it was observed that municipal boundaries do not coincide with catchment boundaries, resulting in flood studies that are done on an individual town or locality scale (QFCI 2012: 55). Yet flood management is most effective on a catchment scale, which raises the issue of whether systems for mapping are fit for purpose. Better management outcomes could be achieved if local flood studies were designed to 'nest' within an overall catchment study.

The consequence of the scale issue is essentially an absence of knowledge at the scale at which decisions are made: most notably, the local scale. For example, the need to downscale climate change flood information to catchment level has been identified as a key issue by the Productivity Commission's report on barriers to effective climate change adaptation (Productivity Commission 2012). Even at local scales, however, the problem is exacerbated by the myriad end-user decision makers that need information, any information, no matter how coarse. The large number of end-users makes identifying, funding and disseminating information extremely difficult. Other questions surface about proprietary rights and competitive advantage when information is generated with co-funding from the private sector. (We note the data resolution and access issues that are currently being addressed by the Commonwealth-funded Australian Urban Research Infrastructure Network in the urban space.) These complex issues reinforce the need for new approaches to

information generation and sharing in the context of adaptation, and reinforces the need for transforming the government's funding role (in research or information provision) into something more akin to collaboration broker, where partnerships in knowledge generation, information provision and on-ground implementation are intimately connected and the enabling resources negotiated among collaborators.

NCCARF's emphasis on the involvement of local councils, state governments, emergency management organisations and other end users in the planning and operationalisation of research goes some way to filling this role, but falls short in that it sets an albeit imprecise demarcation line between research/planning and implementation/monitoring/learning. With the first phase of NCCARF drawing to an end, and discussions still in process over any second phase and the relative roles of the Commonwealth, State and Territory, and local governments, as well as key business partners, research institutes and the private sector more broadly, there is an emerging basis for a more sophisticated approach to building adaptive capacity that can potentially deal with the uncertainties of climate change discussed previously. This would require, however, NCCARF managers to evolve from program and project managers to negotiators of collaborations. It would also require more flexible forms of investment extending beyond the traditional research contract paradigm.

Nationally, the CSIRO is a critically important organisation in the climate adaptation arena. With its research endeavours crossing so many sectors of society and disciplinary fields of expertise, the organisation should be well placed to identify adaptation synergies, antagonisms and trade-offs that may not be intuitively obvious to some other research organisations or decision-makers with much narrower remits. Identification and understanding of these synergies, antagonisms and trade-offs are of acute relevance in framing national and state-wide adaptation policies. They could also be of tremendous use to local governments in adaptation strategy formulation, and while some of these or their combination may be unique to specific regions or councils, there is a need for the more common or generic ones to be documented and shared. The Productivity Commission saw the importance of this kind of integrating role in the context of the food/water/energy relationship when reviewing the rural R&D Corporation model (Productivity Commission 2010). The challenge for CSIRO in contributing to national climate adaptation capacity is ensuring that its privileged and important helicopter view of synergies, antagonisms and trade-offs is not undermined by diluting its human capacity across too many and more narrowly defined research activities. Quite rightly CSIRO recognises the value of continued interaction and engagement with stakeholders and other research (CSIRO 2012: 297), and an important contribution it can make in these interactions is to ensure that the challenges of dealing with complexity are not overlooked in favour of seeking simple and potentially maladaptive solutions.

Other specific climate adaptation research is undertaken by the Bureau of Meteorology and Geoscience Australia. Clearly both departments are integral to the

development of Australian climate models, and recent initiatives have seen the two agencies committed to developing national, natural hazard risk assessments through open-access databases. Such repositories of information are important means of providing quicker access to relevant information without costly and time consuming searches, particularly if they included the outputs of highly dispersed research agencies. It is safe to assume that some of the research funded through the ARC and the NHMRC is relevant to climate adaptation, but it is not easily accessible and discernible from the two organisations' websites. More such repositories, possibly within a common framework, would be of value not just to those undertaking research, but also to those in planning, monitoring, emergency management and education institutions to name a few. (Again, the discussions of information portals by the NCCARF Leading Adaptation Practices project applies.)

In an age of litigation, the perception of liability can be a significant barrier to the provision of risk information and its incorporation into planning schemes by local government. Councils can be exposed to compensation claims if land is 'down-zoned', subjecting it to flood controls and reducing land value. Councils are also liable for losses if they provide flood advice, act or fail to act in respect to flood-prone land (QFCI 2012: 128). This issue is also identified by Gibbs and Hill, who note that some states such as Queensland have greater legal provision for compensation than others for councils wishing to apply development controls (Gibbs and Hill 2011). Some sources suggest a potential liability for the quality and accuracy of flood information (Trowbridge, Minto et al. 2011: 70). In one case reported by the QFCI, a council decided not to provide any information on historic or current flooding unless an application was made under freedom of information legislation (QFCI 2012: 130).

A recent paper finds that the liability risk of providing flood risk information is vastly overstated and there are "no cases where anyone has successfully sued a council for releasing up to date, accurate hazard information". Rather, councils face liability for not supplying information about known risks (Eburn and Handmer 2012).

7.7. *Supporting market arrangements*

Market arrangements:

These are instruments of government that influence the way in which industry actors behave in various markets. Examples include water trading and trade policy.

International discussion about climate finance for adaptation is dominated by a focus on the provision of financial aid by developed countries to developing countries to build their resilience against climate variability. However, it has become clear that adaptation investment must also become a priority for developed nations as severe weather events increase in severity and rapidity within their borders. Despite this reality, procuring or leveraging the necessary finance for such measures has not taken centre-stage in adaptation policy discussions. To date there has been no published estimate of the overall costs of adaptation in developed nations (Agrawala and Fankhauser 2007). Nonetheless, an indication of the required costs for adaptation in Australia can be ascertained from sector-specific calculations. For example, funding estimates for the adaptation components of the Water for the Future program – being only one policy initiative - exceed AU\$11 billion over 10 years (ABS 2012). Conversely, at least AU\$63 billion of capital assets in coastal settlements are vulnerable to inundation from sea-level rise (DCCEE 2009). Accordingly, protecting assets – both fiscal and physical - from the risks of climate change is going to require significant capital outside of normal government channels and business as usual (BAU).

The importance of capital markets and private sector finance actors to this discussion becomes clear here. In 2011 the global bond and equity markets were valued at US\$95 trillion and US\$55 trillion respectively (Maslakovic 2011), which dwarfed Australia's GDP (purchasing power parity) of less than US\$1 trillion (CIA World Factbook 2012). Private sector finance actors are economic gatekeepers with access to money and the innate ability to move it around. For example, the Investor Group on Climate Change (IGCC) represents Australian institutional investors with approximately AU\$900 billion of funds under management (IGCC 2012a). This includes industry superannuation funds, property investment trusts, retail and wholesale fund managers, and the research units of global investment banks (IGCC 2011). These entities also invest in several markets/assets for which adaptation investment will be required, namely: property (residential and commercial), transport infrastructure (roads, bridges, airports), social infrastructure (hospitals, prisons), utilities and network infrastructure, and agriculture (IGCC 2011). As such, institutional investors themselves have a clear interest in being involved in this discussion and any potential solutions.

Clearly, we need to be thinking about how best to incentivize and leverage private sector finance to facilitate the necessary capital for adaptation initiatives. Specifically: (a) existing and future monetary assets, such as superannuation investments, need

to be protected for the long term; and (b) private sector finance/investment must be channelled into new and existing physical assets and infrastructure to increase climate resilience.

Unlocking the substantial potential for private investment will require overcoming certain institutional and regulatory barriers to investment. The first institutional barrier is simply awareness. Attention to climate change is not widespread amongst private finance sector actors in Australia or elsewhere. In 2008, a report of the United Nations Framework Convention on Climate Change (UNFCCC) noted that adaptation to climate change was not a significant consideration for private sector actors even though they are responsible for the bulk of investments in climate-sensitive sectors (UNFCCC 2008, p.34). More recently in 2012, Mercer found that climate-related policy risk alone could contribute 10% of risk to an investment portfolio yet “nowhere near 10% of the average risk manager’s budget or attention” is being dedicated to climate risk management for institutional investments (Mercer 2012, p.15).

Second, information asymmetry and perceptions of risk can create investment reticence. In the context of adaptation, robust cost-benefit analyses are hampered by information gaps regarding the precise local impacts of climate change and resulting costs, how impacts and costs might apply to specific assets, and a lack of definitional clarity around the term ‘adaptation’. Moreover, risk perceptions for climate-related investments are often high due to future uncertainties such as global and domestic climate policy frameworks and technology preferences (Brahmbhatt 2011).

Third, the long timeframes required for major infrastructure present challenges for business case evaluations of adaptation investment in physical assets. For example, the planning timeframe for refurbishing major infrastructure is 10 to 30 years, and major upgrades or replacements have an expected lifetime of 50 to 100 years (PIA 2004). As such, long-term risk/benefit analyses are required to project decades into the future. A concern for investors is that risks might arise after the completion of the project but during the life of the asset, which are very difficult to account for upfront. Importantly, community benefits or ‘social returns’ of such investments, such as airports and utilities, are outside the timeframe and scope of private sector investment decisions (DCCEE 2011).

Finally, Mercer recently found that extant institutional barriers include a widespread deficit of ‘how to’ climate-related financing experience (Mercer 2012). Specifically, fund managers may not know where to allocate climate-related investments. This means that even robust climate-related investment opportunities will be overlooked if they do not fit neatly into an established asset-class classification or silo.

On this point, market-based innovations can assist fund managers to identify and allocate climate-themed investments. For example, the HSBC Climate Investment Indices re-classify industrial sectors into four climate-related themes: low carbon energy production, energy efficiency, climate finance, and water/waste/pollution control. In so doing, the Indices evaluate and funnel investment into “companies that

are focused on addressing, combating or developing solutions to offset and overcome the effects of climate change” (HSBC 2010, p.6). An investment analyst explained how sector performance correlates to government policy: analysts watch very carefully for regional and national policy initiatives or changes in order to ascertain investment targets. The targets are then fed into the Indices, which in turn inform the investment allocations made by fund managers.

In addition to institutional barriers, policy barriers also exist that inhibit private finance for adaptation. Such barriers to financing adaptation in physical assets or infrastructure are brought into stark relief when contrasted with the ‘investment-grade’ low-carbon policy framework. There are no equivalent market policy mechanisms that encourage finance for adaptation in physical assets or infrastructure. NPA grants, existing building guidelines and company reporting requirements are all insufficient to incentivise private investment, especially for existing assets and large portfolios. Moreover, disparate sources of information and conflicting planning regulations at different government levels impede private adaptation endeavours.

With respect to what needs to be done to address information barriers, the finance market case study this paper recommends the creation of a central repository of climate-related information to assist investment decision-making. Its purpose: to minimise gaps in available information particularly about the extent of likely local impacts; and to remove or at least coordinate disparate multi-jurisdictional sources of information. A central information resource will redress the institutional barriers of information asymmetry and skewed risk perceptions that create investment reticence, and the policy barrier of conflicting requirements between levels of government.

The repository must provide general access to standardised historical and predicted weather information in order to ensure a common reference framework for the private and the public sector at all levels (UNEPFI and SBI 2011). Moreover, financial actors require ‘applied’ research and information, tailored to specific sectors or geographies; they are not interested in pure climate information. They require specific information such as sectoral analyses, regional scenarios, databases of adaptation and clean tech projects, and extreme weather events (historical and predicted) (UNEPFI and SBI 2011); Economics of Climate Adaptation Working Group 2009).

Leading insurers and other financial service providers have developed statistics and competencies in these areas, including extreme weather and loss databases and catastrophe models. UNEPFI found that finance actors desire collaboration with research institutes and other partners to help develop information services and formats. Thus, a further benefit of a national repository is to provide opportunity for co-operation between private and public actors with different experience and knowledge.

Finance actors, particularly lenders and investors, also require climate-related company data upon which to base their decisions. Current ASX rules are insufficient to motivate voluntary corporate disclosure of the effects of climate risks. Disclosure of 'material business risks' occurs only at a board's discretion and it is unlikely that directors currently consider climate-related risks in this light. Accordingly, a Corporations Act 2001 (Cth) amendment could be considered to obligate companies operating in Australia to report on their adaptation risks and strategies explicitly. At the very least a new ASX guidance on the climate change disclosures that public companies ought to provide in financial filings must be established, similar to that of the US SEC.

In either case, what would companies be required to disclose? An indicative list is this: climate risk management strategies; investment strategies; market segment vulnerabilities; climate impacts on pricing and capital; capturing climate opportunities; coastal and non-coastal analyses; stakeholder and local community engagement (Grossman 2012; Anderson 2006; IGCC et al. 2012). The finance market case study is very detailed in its recommendations, divided into non-coercive and coercive options for government. Non-coercive options can stimulate 1) climate change mitigation by supporting a business case for renewable energy and clean-tech, which surpasses a competing business case for fossil fuels, and brings low-carbon options to scale; and 2) climate change adaptation by supporting a business case for the replacement and refurbishment of existing and future physical assets/infrastructure to increase resilience. The recommendations cover blended finance options involving public-private co-financing of adaptation responses, use of tax credits, use of grants and use of climate bonds.

In contrast to the steering nature of non-coercive policy, coercive climate finance legislation would mandate how private finance actors must facilitate climate change adaptation. Two examples of coercing private finance actors to facilitate adaptation investment are discussed at length in the case study. These include taxation and legislative mechanisms. In the case of taxation, a financial activities tax (FAT) could be levied on defined 'private finance institutions' to tithe a specific percentage of their annual profits, which is then funnelled into specified initiatives. Indeed, a 2010 Australia Institute poll found that 81% of Australians wanted government consideration of a bank industry 'super profits' tax (The Australia Institute, 2010), which would require banks to tithe annual profits that reach a certain threshold. Finance from this type of tax is usually funnelled into a national sovereign fund; in the case of a 'climate finance tax' however, funds could be directed into prescribed climate change adaptation initiatives.

In the case of legislation, prescriptions could stipulate that financiers must lend at preferential rates for infrastructure adaptation projects and household adaptation measures, or that institutional investors are prohibited from financially supporting listed carbon-intense projects or industries. Importantly, development/planning requirements (such as Environmental Impact Assessments) need to obligate developers and owners to consider climate impacts on existing physical assets.

7.8. Features of extant frameworks, policies and programs which enable or impede adaptation

Presented here are the project findings drawn from the case studies and preceding discussion which move towards the final conclusions and recommendations in the subsequent chapter. The findings are grouped in Tables 5 and 6 according to themes which emerged under the project objective to explore factors which either enable or impede adaptation. To provide context and showcase how various mechanisms feature in several iterations across the case studies, the relevant case studies are also indicated.

Table 5: Features of extant frameworks, policies and programs which enable adaptation

Enabling feature	Examples	Case study reference
Integrated policy development & implementation	More successful National Programs (i.e. NWI, NCCARF, CCRSPI) seek to generate knowledge in close association with strategy development and policy implementation	CS1, CS3, CS6
Knowledge capacity	A long-standing, sizeable and talented research capacity which provides the supporting science and information informing decision making, including adaptive management	CS2, CS3, CS4, CS5, CS7
Non directive support	National initiatives which support rather than direct local and state efforts	CS1
Clarity of purpose	A clear definition and understanding of problems at a system level and actions to address root causes and not just symptoms fosters resilience	All case studies
Diversity	A diversity of ideas, skills and resources, a diversity of views, innovation, flexibility in problem solving, fosters resilience	All case studies
Connectivity	Resilience follows from institutional (including community) networks that are not susceptible to collapse due to one part failing; effective use of resources; community ability to organise itself; appropriate leadership; spare capacity; and some duplication of functions and overlapping of institutions	All case studies
Integration and feedback	Resilience requires an holistic consideration of issues and realistic consideration of scale, which accounts for the full range of interactions between humans and ecosystems. It also requires feedback and resources to monitor, debate and learn	All case studies
Positioning	Positioning climate in terms of socio-economic benefits rather than marginalised as an exclusively environmental issue	CS1, CS4, CS6
Championed (internal and external)	National policies that have succeeded have had independent agencies in the Federal Government as champions combined with strong stakeholder and government central agency support	CS1, CS5, CS6, CS7
Conformity	Successful national initiatives such as the NWI and NCP have benchmarked relevant legislation in each jurisdiction and proposed reforms so they conform with policy principles	CS1
Investment flexibility	Negotiation of investment partnerships can be more fruitful than negotiating project terms and conditions. diverse means of supporting action is required. Competitive funding does not necessarily lead to the greatest benefits	All case studies

Table 6: Features of extant frameworks, policies and programs which impede adaptation

Impeding feature	Examples	Case study reference
Lack of framework policies and principles	The lack of an effective, overarching policy process with accepted, guiding principles may be one reason why there are so many conflicting policies or processes (i.e. planning)	CS1, CS2, CS7
Incorrect framing	Risk management is the dominant framing of adaptation strategy planning, but it is only one aspect of building resilience and encourages a task based rather than ongoing strategic or systemic mindset when implementing adaptation strategies	CS2, CS3, CS5,
Uncertainty and information asymmetry	Policy, epistemic and aleatory uncertainties in the climate science and modelling exist which make it more difficult for decision-makers to assess risks, investments and actions for long term climate resilience. Decision and support information is asymmetric; not at the right scale, at the right timeframe or in the right decision-making language	All case studies
Management incapacity	While uncertainties due to a lack of policy clarity, knowledge guidance or foreseeable system response may not necessarily impede <i>action</i> , management incapacity to deal with uncertainty can impede adaptation or result in maladaptation	CS3
Poor awareness	Climate-related policy risk alone could contribute 10% of risk to an investment portfolio yet only a fraction, if any, of the average risk management budget or attention is directed to climate risk management for institutional investments	All case studies, but particularly CS4
Timeframe incongruity	For asset investors, risks might arise after the completion of a project but during the life of the asset, which are very difficult to account for upfront. Community benefits, social good or 'social returns' of such investments, such as airports and utilities, are outside the timeframe and scope of private sector investment decisions	CS4, CS5
Context incongruity	Fund managers may not know where to allocate climate-related investments. This means that even robust climate-related investment opportunities will be overlooked if they do not fit neatly into an established asset-class classification	CS4, CS5
Policy distortions	Fossil fuel subsidies create policy distortions by rewarding investment in high emission activities. In other words, they perpetuate a competing business case for continued investment in fossil fuels and carbon-intensive projects in Australia	CS5, CS7
Inappropriate support scaling	Financial incentives need to exist beyond just energy efficiency savings. Current policy focuses on energy efficiency measures, asset-by-asset evaluations and future assets. There is insufficient policy assistance or incentive for adaptation investments in existing physical assets, especially for owners of multiple assets such as utilities (which have many thousands of assets) or property investors with large portfolios	CS3, CS4, CS5, CS7
Normative momentum	Industries such as the primary industries have a long history in climate variability adaptation which can shape their perspective on responding to all climate related challenges. It favours incrementalism which while sometimes appropriate, may in other instances lead to maladaptation	CS6

Impeding feature	Examples	Case study reference
Reform fatigue	Reform fatigue can reinforce normative momentum (resistance to reform) as many communities are simply tired of many consecutive reforms, over-consultation and in some cases, lack of engagement and a platform for participation in decision making	CS6
Lack of acknowledgment	Some sectors and communities are trying adapt in ways which when aggregated can be effective. The competitive reward system (grants, prizes etc) does not acknowledge this	CS6, CS7
Inadequate review	The length of time before key instruments are due for revision is often too long and the processes for regular update and inclusion of information are too complex	CS2, CS7
Resources	Good intentions can be undone by providing insufficient investment – engaging groups on a hand-to-mouth basis does not work or at best slowly and at additional cost	All case studies

NB: Conflicting policies do not necessarily impede action (adaptation) but they may lead to unintended consequences or known but adverse consequences as the result of trade-offs.

8. CONCLUSIONS

The rationale for conducting this study was two-fold: first, that significant climate change is unavoidable and that it is in Australia's national interest to adapt to those changes; and second, that Australia's capacity to adapt to climate change will rely on robust, efficient, transparent, fair and flexible institutions which enable and encourage the necessary behavioural change.

To that end, this project has pursued two objectives:

1. To assess the extent to which existing statutory frameworks, associated institutions and policy processes support or impede national adaptation planning and practice, and
2. To make a significant contribution to the development and implementation of a strategic national policy framework.

To achieve these objectives, we undertook a nation-wide analysis of 'core' statutory and institutional arrangements. To recall from Section 2, we used a 'policy and institutional arrangement matrix' to select seven case studies that, combined, capture the full range of statutory and institutional arrangements in Australia. Each of the seven case studies analysed produced insights particular to the policy mechanism, sector, threat or jurisdiction in focus and some of those insights and recommendations could offer significant benefits to Australia's quest to adapt to climate change; the details of which are in the individual discussion papers. However, it is only in evaluating the results from the case studies *as a whole* that we can usefully and adequately address the two project objectives. We turn to our overarching conclusions now.

In our assessment, Australia's existing statutory frameworks, associated institutions and policy processes do support national adaptation planning inasmuch as there is clear evidence of:

1. An awareness of climate risk amongst all levels of government, and particularly of the relevance of climate impacts to existing laws, institutions and policy processes;
2. Climate risk having been, or likely to be soon, incorporated into key, relevant statutory arrangements such as planning and strategic decision-making, regulatory frameworks, technical standards, performance-based standards and some policy processes, at all levels of government, and
3. Bottom-up initiatives by local governments and authorities to utilise those arrangements so as to increase adaptive capacity in communities and regions.

Australia's regulatory and institutional landscape is designed to be dynamic and flexible. In our assessment, that flexibility was evident, although admittedly the machinations of statutory reform is not a *quick* process. Nevertheless, our research,

combined with others', has shown that all jurisdictions in Australia have made recent reforms to, inter alia, planning and strategic decision-making, regulatory frameworks, technical standards, performance-based standards and some policy processes. For example: the peak standard for flood management, the Australian Rainfall and Runoff Guidelines, are currently being extensively revised to take account of natural and anthropogenic climate change; the building codes of Australia are currently under review to take account of future climate change; Environmental Impact Assessment is evolving in some jurisdictions to take account of climate change; major infrastructure projects like airports are incorporating climate risk into their design; and some states are using existing frameworks to develop state-wide climate vulnerability assessments and response strategies.

This is an important finding because it implies that *in the main* existing statutory arrangements do have the capacity to support climate adaptation planning. It further suggests that there would be little value in having a comprehensive, national review of legislative frameworks (as has been suggested elsewhere), as, in many cases, this evaluation and review is proceeding albeit in a variable manner.

However, while being pleasantly surprised by recent progress already being made in reforming Australia's existing statutory and institutional arrangements, we did identify some qualifying factors, for example:

- Some States/Territories are lagging behind in the review and reform of existing arrangements, with the result that statutory arrangements can be more or less 'robust' depending on the jurisdiction;
- There is evidence of perverse incentives or conflicting policy goals in higher order policies and associated legislative arrangements i.e. drought policy, disaster relief policy, the primacy of human life over other social objectives in planning regimes;
- Almost all of the statutory and institutional arrangements we assessed apply to new developments, projects and infrastructure, so that existing dwellings and infrastructure are not captured by the revised legislation, except in certain circumstances (in-fill developments, or post disaster reconstruction); and
- All Australian governments are making investments in climate change adaptation with few being able to clearly articulate the business case for such investment. While this reflects the precautionary principle in action, it also suggests that governments have little basis (and possibly little policy capacity) for determining what level of investment is an appropriate level and, *inter-alia*, what indicators are appropriate to underpin monitoring and evaluation activities throughout investment cycles.

Nevertheless and even allowing for these qualifying factors, in terms of *legal prescription*, current arrangements are sufficiently flexible and dynamic to support climate adaptation planning over time.

Unfortunately, while the evidence suggests that existing arrangements are adequate in terms of legal prescription, our assessment indicates that those arrangements do not support climate adaptation *in practice*.

As we stressed in the preface to this synthesis report, our interest in this project extended beyond the 'letter of the law' to include analysis of the context in which the law operates. To that end, our analysis in each case study was cognisant of broader policy and planning issues which can inhibit effective implementation, such as (i) information and knowledge gaps, including missing stakeholder contributions, (ii) overlap, ambiguity, or contradictions in legislative requirements or processes, (iii) inappropriate scale or scope of implementation and regulatory arrangements, (iv) incentive gaps and conflicts for private and public sector actors that risk impeding adaptation, including shortfalls in accountability and transparency arrangements, or perverse public revenue or funding linkages, (v) conflicting strategic policy goals frameworks, which create unintended outcomes, and (vi) the availability or lack thereof of human, financial and other (i.e. technical) resources.

Based on our analysis against these broader, contextual issues, we have identified three significant impediments to national adaptation planning *in practice*:

1. Lack of clear and consistent implementation frameworks to guide adaptation planning;
2. Lack of financial and human capacity at the state and local level to adequately implement adaptive strategies, and
3. Detailed information, data and response strategies are patchy, not fit-for-purpose and lack accreditation processes.

These findings suggest that attention must now turn to addressing these three impediments. We explore each in turn below in the context of Objective 2 and our recommendations.

9. RECOMMENDATIONS

Our second objective in this project was to make a significant contribution to the development and implementation of a strategic national policy framework, informed by the analysis and findings from Objective 1. To that end, we have based our recommendations for a strategic national policy framework on overcoming the three significant impediments identified above. Specific recommendations are contained in Table 7, and brief explanation of our rationale for those recommendations and the underlying principles driving them, are explained below.

Impediment 1: Lack of clear and consistent implementation frameworks and guidelines

All of the case studies exposed significant fragmentation in the institutional landscape: vertically between the three levels of government, and horizontally across different policy domains. The consequence of this lack of coordination and 'disconnect' is the existence of competing or conflicting agendas, priorities and overarching policy goals; conflicting messages which undermine or confuse efforts by individuals or communities to adapt; and an 'administrative maelstrom' which hinders attempts to achieve more resilient strategies, such as support for ecosystem approaches to land management. Our observation from this impediment is that there would be substantial benefits from a coordinated, national approach to improving adaptation policy. National in scale, such an approach could be undertaken by the Commonwealth or through COAG, with a view to identifying and articulating an overarching framework for climate adaptation strategies, based on the principle of resilience. Given the accelerating rate of climate change, and of the observed fragmentation between policy domains, of particular importance in the development of a national strategy for adaptation policy is that it should embody nested connections between policy frameworks, so that as new information on climate hazards come to light, there is a single point of reference for all other policy and administrative domains. Significantly, such an approach would further benefit from the establishment of a new, dedicated institution to oversee implementation of the framework and support State/Territory and local government adaptation strategies.

Impediment 2: Lack of financial and human capacity at the state and local level to adequately implement adaptive strategies

Like other policy issues such as natural resource management and social services, the implementation of climate adaption policy relies on adequate resourcing in local governments and organisations. From the flooding case study through to the planning and finance case studies, a lack of resources was identified as a very significant impediment to the implementation of climate adaptation strategies. The lack of resources relates to budgetary constraints that prevent local governments

from obtaining expert opinion on climate vulnerability and adaptive strategies. Similarly, implementation capacity can be impeded by a lack of human resources to oversee adaptation strategies, or the inability to retain those people beyond the life of short-term projects.

Our observation from this impediment is that additional resources need to be directed to local governments to support adaptation implementation, but also that *new* approaches for collaboration between local councils and regional organisations be explored and encouraged so as to develop critical mass in adaptation activities, share scarce financial resources, and exploit synergies in experience. New coordinating, collaborative arrangements between local councils – extending existing, successful models – would also reduce the administrative burden for State and Commonwealth agencies in their dealings with them.

Impediment 3: Detailed information, data and response strategies is patchy, not fit-for-purpose and lacks accreditation processes
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Aside from the lack of coordination between policy frameworks, and the lack of financial and human resources, our research identified a number of critical failings in the provision *and use* of information that hinders attempts to implement climate adaptation policy in practice:

- first, the failure to identify unintended and unwanted consequences of decisions in one sector on outcomes in another (absence of knowledge);
- second, the failure to incorporate that information (if known) into decision-making frameworks (absence or failure of process or agency); and
- third, the failure to pursue alternative, more ‘adaptive’ strategies even when information on unwanted consequences is known and considered (absence of public or private incentives).

The implication of these ‘failures’ is that we need to generate information that is ‘fit for purpose’, at the appropriate scale as to support policy and investment decision-making, and deemed to be of sufficient quality as to be reliable (even allowing for uncertainties). The inference here is that if information is generated, accessible and accurate, the likelihood of public and private incentives aligning with ‘adaptive’ strategies will be enhanced. We note that significant work is being undertaken at Commonwealth and State levels to improve the information base.

Our observation from this impediment is that Commonwealth and State initiatives to generate climate-relevant information should be continued, and that a central repository or ‘clearing house’ portal of climate relevant information could be beneficial. Such a repository would include all federally-funded information; it would respect the principle of ‘open access’; and it would include both the ‘raw’ data and a ‘translation’ function so that key stakeholders such as local governments can understand the relevance of the data for their particular jurisdiction.

10. DETAILED RECOMMENDATIONS AND A ROAD MAP FOR REFORM

Addressing the three primary impediments identified above, we have developed a set of recommendations which seek to provide policy responses that range from 'high' to 'modest' in their extent and strength in achieving adaptive capacity. Furthermore, we have identified the most appropriate actor or agency to drive that policy response, and we have included indicative timing of when that policy response could be pursued, allowing for the political realities of the day. Those recommendations are contained in Table 7, below.

Table 7: Detailed recommendations and a road map for reform

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
<p>Impediment Lack of investment to avoid the economic, social and environmental costs associated with projected scenarios of climate change impact</p> <p>Response Principle Sound investment case</p>	<p>Recommendation 1: 1a: There is a role for <u>all</u> governments to play in stimulating both public and private investment in climate change adaptation. In the first instance, governments should acknowledge this role based on the argument that investment in precautionary adaptation actions will deliver no-regret benefits as well as long-term public investment savings by minimising impact reparations</p> <p>1b: Public investment should be conditional upon assurance that robust National and State / Territory-wide approaches to adaptation are in place and embrace objective criteria and decision support to determine where different forms of adaptation are required (i.e. incremental versus transformative) so as to avoid maladaptation</p> <p>1c: Governments should consider the implementation of a number of the instruments for increasing private sector investment</p>	<p>Recommendation 1: Define and clarify the demarcation of roles and responsibilities of governments in investing in climate adaptation. Existing and future investments in climate adaptation should be consistent with these</p>	<p>Australian Government State and Territory Governments</p>	<p>4-6 degree temperature increase scenarios of climate impact demand investment, and ex-ante investments significantly reduce levels of investment required post-impact</p> <p>Investments need to be framed in terms of their wider socio-economic benefits and not marginalised to environmental considerations</p> <p>In considering the role for government, the role for the private sector is fundamental and needs to be promoted in the public discourse</p>	<p>Within 1 year</p>

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
<p><u>Impediment</u> Policy outcome conflicts and inefficient resource allocation due to lack of coordination across multilevel (vertical) governance regimes</p> <p><u>Response Principle</u> Partnership approach</p>	<p>Recommendation 2: 2a: The Australian Government should facilitate the coordination of nation-wide climate risk adaptation efforts from risk assessment through to response implementation and review This mechanism should take the form of a National Partnership Agreement facilitated through the Council of Australian Governments' Select Council on Climate Change and be based on the overriding principles of multilevel governance and ecological sustainable development (ESD)</p>	<p>Recommendation II: The Australian Government would develop bilateral agreements with State / Territory governments to facilitate climate risk adaptation efforts to a high standard be based on the overriding principles of multilevel governance and ecological sustainable development (ESD)</p>	<p>Australian Government State and Territory Governments</p>	<p>Coordination will not occur efficiently or effectively in the absence of devolved ownership of the issues and shared interest in their resolution The reference to ESD here ensures that Australia meets its international legal obligations to advance ESD principles & places the remit within Comm. jurisdiction</p>	<p>1-3 years</p>
<p><u>Impediment</u> Inappropriate scaling of adaptation activities and or the insufficient critical mass of resources (human, knowledge, financial etc) to plan and implement adaptation activities</p> <p><u>Response Principle</u> Critical mass at appropriate scale</p>	<p>Recommendation 3: 3a: Cooperating clusters of Councils should be the primary modus operandi for the development and implementation of regional adaptation strategies across Australia. These clusters need to be identified nationally and would preferably match (to the extent possible) catchment boundaries to facilitate connection to catchment management scale processes and governance structure and to broaden risk based approaches to adaptation to take into account ecosystem approaches</p>	<p>Recommendation III: Identify existing and emerging clusters of actors collaborating in the adaptation arena at regional scales and support their interactions in defining collaborative adaptation strategies and activities</p>	<p>Australian Government State and Territory Governments Local governments Catchment management authorities (where appropriate)</p>	<p>Clusters of Councils are already emerging as a natural network with which to appropriately scale responses & achieve critical mass in adaptive capacity and implementation resources. Such emergence is only going so far, with existing clusters needing access to information, skills and funds beyond their collaborative capacity</p>	<p>2-5 years</p>

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
<p><u>Impediment</u> Lack of institutional continuity, certainty and legal gravitas in the implementation of national scale initiatives</p> <p><u>Response Principle</u> Institutional stability</p>	<p>Recommendation 4: 4a: In support of a National Partnership Agreement (Recommendation 2), a new Climate Risk Adaptation Commission (CRAC), or similar organising structure, residing under the Attorney General's department should be established. This body would:</p> <ul style="list-style-type: none"> • Support institutions with clearly defined roles and responsibilities for climate risk adaptation and facilitate clarification of demarcations where roles and responsibilities are uncertain (per Recommendation 1 – Modest) • Facilitate the development and assessment of regional (urban, coastal, rural) adaptation strategies covering clusters of local government boundaries across Australia (per Recommendation 3) • Facilitate the negotiation of formal implementation action agreements between Australian Government, States and Local governments involved in the clusters • Facilitate benchmarking of planning and EIA legislation 	<p>Recommendation IV: The roles envisaged for the CRAC be delegated to policy and program functions of DCCEE</p>	<p>Australian Government</p>	<p>The Attorney General's department is suggested here because of its assured ongoing existence, its links with national and state legal procedures overlapping the climate change arena and its link to national disaster policies and programs</p>	<p>2-5 years</p>

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
	<p>across state</p> <ul style="list-style-type: none"> Facilitate benchmarking and adaptive learning across regions in adaptation planning and implementation Report to COAG on the progress being made, and its adequacy, in climate change adaptation 				
<p>Impediment Policy outcome conflicts and inefficient resource allocation due to lack of coordination within (horizontal) levels of governance regimes</p> <p>Response Principle Houses in order</p>	<p>Recommendation 5: 5a: Intra-governmental arrangements at both National and State levels should be in place to ensure mechanisms aim to identify and eliminate conflicting policy outcomes particularly in respect to policies, planning and development regulations and infrastructure works that compromise or impede the implementation of regional, cross regional and sectoral adaptation strategies 5b: The CRAC (Recommendation 4) review Australian Government laws and programs progressively over a number of years to identify and recommend to Cabinet reforms needed to enhance adaptation</p>	<p>Recommendation V: Synthesise the findings from existing reviews (5b) and facilitate the exchange of lessons through distributing information and stimulating debate</p>	<p>Australian Government State and Territory Governments Local governments Catchment management authorities (where appropriate)</p>	<p>Intra-governmental frameworks can be even more important than multilevel ones, particularly given the prominence of state planning and development actions in the climate adaptation arena Reviews need to acknowledge that a one-size-fits-all approach is not appropriate given the differentiation of approaches and their linkages to other processes across state jurisdictions That said, facilitating the exchange of lessons and experience across state boundaries is important</p>	<p>1-3 years</p>

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
<p><u>Impediment</u> Planning approaches based on narrow framing are insufficient to translate in adaptation strategies that are feasible in their implementation</p> <p><u>Response Principle</u> Appropriate framing</p>	<p>Recommendation 6: 6a: Risk management is an important framing for climate change adaptation but insufficient to take into account spatial, social, managerial and temporal complexity critical to translating planning into action. The CRAC should assess how broader systems-based approaches to adaptation planning can be mainstreamed to influence the efficacy of implementation processes and practices 6b: If Recommendation 3 is accepted, then this assessment needs to take into account how misalignments between catchment and regional cluster boundaries can be taken into account in regional adaptation strategies 6c: The results of 6a and 6c should be taken into account in the assessment of regional adaptation plans and in allocating investment (per Recommendation 4a)</p>	<p>Recommendation VI: Support 6a and 6b as preliminary scoping studies</p>	<p>Australian Government State and Territory Governments Local governments Catchment management authorities (where appropriate)</p>	<p>NCCARF and VCCARF research has shown that while a risk management approach to planning is worthwhile, on its own it supports a project-based mode of operationalization insufficient to achieve optimal uptake / adaptation. The resilience literature suggests that its legacy may be limited in terms of building adaptive capacity and self-reliance</p>	<p>1-3 years</p>

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
<p><u>Impediment</u> Lack of timely access to relevant, scale appropriate and, preferably, interpreted data and information to support decisions</p> <p><u>Response Principle</u> Equitable access to information</p>	<p>Recommendation 7:</p> <p>7a: A central repository of climate change info which informs different stakeholders groups should be established either under the DCCEE or if Recommendation Three is agreed to, then under the new Climate Risk Adaptation Commission</p> <p>7b: For the repository to maximise its value, it will need to be maintained and preferably supplemented with interpretation assistance (knowledge brokering) to assist information seekers to adapt the information to their specific context</p> <p>7c: It should be mandatory for federally funded data to be provided to the repository</p> <p>7d: Data contributions should be invited from State / Territory, industry and community organisations</p> <p>7e: Legal indemnity should be provided for organisations making adaptation data available in good faith</p>	<p>Recommendation VII:</p> <p>As per Recommendation 7a</p>	<p>Australian Government State and Territory Governments Local governments Catchment management authorities (where appropriate)</p>	<p>Good information is the fundamental driver of decision-making, but it needs to be easily accessible and preferably interpreted in the decision-making context/framing</p>	<p>1-2 years</p>

Impediment / Response Principle	Recommendation		Lead actors	Commentary	Implementation Timing
	Desirable (High adaptive capacity)	Immediately feasible (Modest adaptive capacity)			
<p><u>Impediment</u> Policy amnesia is reinforced by insufficient resources and time allocated to ensuring lessons will be implemented following disasters or policy failure</p> <p><u>Response Principle</u> Tied funding obligation (the obligation to improve)</p>	<p>Recommendation 8: 8a: Ensure that key infrastructure is not rebuilt in risk-prone areas and that 'betterment' begins at the beginning of post disaster reconstruction by tighter oversight of where disaster relief funds are spent 8b: A portion of relief funds are restricted to betterment activities post disaster 8c: Australian Government funding is made available to state and local authorities for prior planning and approval of projects for disaster prone infrastructure to facilitate betterment post-disaster</p>	<p>Recommendation VIII: This recommendation should be non-negotiable</p>	Australian Government	This recommendation should not be read as a punitive device, rather one which ensures continuous learning	Immediate
<p><u>Impediment</u> Research investment is ad-hoc and rewards those with capacity to prepare good applications rather than meet highest priority issues</p> <p><u>Response Principle</u> Maximisation of returns on R&D investment</p>	<p>Recommendation 9: 9a: Funding programs that support adaptation research should modify the way in which they operate so as to focus on negotiating investment partnerships in research activities rather than negotiating project-by-project terms and conditions 9b: A greater proportion of commissioned research should be supported following scoping studies that define problems and opportunities for adaptation innovation</p>	<p>Recommendation IX: Investment in 9b</p>	Australian Government State and Territory Governments	Facilitation of collaboration is as important as the provision of funds in that it helps broaden the investment pool and identifies appropriate contributions in line with the various principles outlined across the recommendations	1-2 years

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APPENDIX A: METHODOLOGY AND SELECTION OF CASE STUDIES

AN ASSESSMENT OF AUSTRALIA'S EXISTING STATUTORY FRAMEWORKS, ASSOCIATED INSTITUTIONS AND POLICY PROCESSES: DO THEY SUPPORT OR IMPEDE NATIONAL ADAPTATION PLANNING AND PRACTICE

METHODS PAPER: THE SELECTION OF CASE STUDIES

April 2012

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EXECUTIVE SUMMARY

Purpose

- This paper is the first of several prepared under an NCCARF project that explore the potential for a national framework to address climate change adaptation
 - this paper focuses in particular on the method by which the seven case studies, of institutional and policy responses intended to stimulate climate change adaptation, have been selected for rigorous scrutiny and analysis in this project.

Rationale (the problem framing)

- Developments in science, global emissions profiles and shifts in the structure of global climate change agreements have all strengthened the national interest case for a stronger Australian mitigation effort. However, the best of mitigation will leave Australians facing significant impacts which are the result of climate change. They will have no choice but to adapt (Garnault 2011).
- Understanding the best approaches to adaptation from local level decisions through to national level policies is constrained by several factors:
 - much of the research on adaptation has focused on intentions to act rather than on adaptation actions;
 - many actions are motivated by drivers other than climate change, including responses to extreme events;
 - focus is more on proactive than reactive responses; and
 - reported adaptations are biased towards developed countries, with limited reporting on adaptations that take into account various demographic traits such as gender and age.
- Improved understanding of constraints should help guide priorities for policy responses under any forthcoming national framework for climate change adaptation. However, there has been very little detailed investigation into what institutions are important in this space, how these may limit or enable adaptation, or what specific institutional, governance and policy process reforms might be needed.
- This project addresses this deficit by undertaking a comprehensive analysis of Australia's existing and most relevant statutory arrangements and their associated institutions to ascertain the extent to which they currently support or impede our adaptation planning and practice.
- This project is timed to coincide with intensifying Australian Government attention to climate change adaptation, including the potential invigoration of a national adaptation strategy.

Background

- This project is entitled “An assessment of Australia’s existing statutory frameworks, associated institutions and policy processes: do they support or impede national adaptation planning and practice.” The project is:
 - being conducted by a team led by the Australian National University;
 - funded under the National Climate Change Adaptation Research Fund; and
 - scheduled to run from October 2011 to December 2012.
- The project has close links to the Australian Government’s Department of Climate Change and Energy Efficiency (DCCEE), not only through the NCCARF mechanism, but through DCCEE representation on a Project Advisory Committee. This relationship is intended to:
 - ground the project within a realistic policy environment; and
 - provide the project with a ‘home’ for its findings and recommendations.
- The methodology in this project comprises three main components:
 - review and synthesis of the existing literature concerning appropriate and optimal statutory arrangements and policy processes for climate adaptation planning and practice;
 - case study analysis, following interviews with leading experts on climate change adaptation, federal and state government organisations and key stakeholders in policy processes; and
 - synthesis of insights gained from across the case studies to develop assessment criteria for a future national climate change adaptation framework.
- This paper sets out in detail the selection of seven case studies, the justification for their selection, and the areas of enquiry that will be applied across the case studies in order to underpin the final analysis.

Case study selection and proposed areas of enquiry

- A policy matrix has been developed as a means of framing all possible policy and institutional functions and mechanisms and to select six case studies. The main functions and mechanisms include:
 - Intergovernmental function
 - Intra-governmental function
 - Regulation by prescription
 - Planning processes
 - Funding function
 - Information and analysis function
 - Market arrangements.

- The seven case studies selected for analysis include:
 - Case Study 1: National and inter-governmental frameworks
 - *Aim:* to explore the role and potential of national framework policies, not or not directly specific to climate adaptation, both Commonwealth-driven and intergovernmental (typically via COAG), in initiating, enabling and coordinating adaptation options.
 - Case Study 2: Planning processes and strategic decision-making
 - *Aim:* to assess the potential of existing urban planning regimes to enable or require human decision-making to respond to the challenges of a changing climate, specifically the use of strategic environmental assessment and other procedural mechanisms.
 - Case Study 3: Information and analysis in the relationships between energy and water
 - *Aim:* To explore the feasibility of combining regulatory measures, for example, regulatory arrangements which require energy suppliers and developers to account for water withdrawal and consumption in development proposals, and knowledge and awareness measures to highlight the oft-misunderstood links between the energy and water sectors and enhance the adaptive capacity of the energy sector to likely changes in water availability.
 - Case Study 4: Market mechanisms and industry policy: The financial market
 - *Aim:* To explore the role of private finance in supporting climate adaptation efforts.
 - Case Study 5: Interactions between policy mechanisms in a particular jurisdictional setting – The City of Melbourne Council
 - *Aim:* To shed light on how different policy mechanisms interact with each other within a single jurisdictional setting.
 - Case Study 6: Interactions between policy mechanisms in a particular sectoral setting- Primary Industries
 - *Aim:* To explore the efficacy and transferability of the adaptation approaches taken within the primary industries sector either as a stand-alone sectoral policy approach or as part of a broader national policy framework.
 - Case Study 7: Interactions between policy mechanisms in a particular threat setting –Floods
 - *Aim:* To identify the key roles and responsibilities of the state and federal governments in achieving the recommendations from the four major flood reviews of 2010-2011.
- Case studies 1-4 deal with specific functions and mechanisms in the matrix, while case studies 5-7 address examples where different mechanisms and functions interact
 - the areas of enquiry intended for analysis are outlined in the paper. These provide a unifying basis for data collection in order to support comparative analyses.

INTRODUCTION

Climate change is a reality and no longer the phenomenon exclusively residing in the domain of scientists. From disturbed citizens and streetwise activists, to concerned business operators and resource managers, through to informed bureaucrats and politicians, the threat of climate change has become the certainty of climate change. So rapidly has the issue metamorphosed from the need to understand, to the need to mitigate and finally to the need to adapt, that responses to climate change can look makeshift and improvised; with shared responsibility in a vague space between science, policy, education, industry and civil society. Irrespective of any visible or invisible hand of direction, responses to climate change will take place; concerned change agents will act and adaptation will occur. But will it be enough, and what cost will it occur? From a societal level, taking a concerted, shared and synergistic approach to adaptation throws out a particular policy challenge: the need to understand how laws and legal institutions support or impede adaptation planning and practice and what the roles and responsibilities might be within a federal system to enhance and achieve appropriate levels of adaptation.

This paper marks the beginning of the output from a project that explores the potential for a national framework to address climate change adaptation. As the first paper, it focuses on methodology, and in particular the method by which case studies of institutional and policy responses intended to stimulate climate change adaptation have been selected for rigorous scrutiny and analysis. The overall project will help provide a better understanding of the drivers and barriers to successful adaptation. By exploring federal statutory arrangements and policy settings the project will provide much needed knowledge and understanding on the role of the federal government in climate adaptation planning and practice and it will make a significant contribution to the development of a strategic, national adaptation policy framework in Australia.

The imperative for adaptation

The Garnaut Review update of 2011 could not have put it more plainly: “Developments in science, global emissions profiles and shifts in the structure of global climate change agreements have all strengthened the national interest case for a stronger Australian mitigation effort. . . [but] . . . The best of mitigation will leave Australians dealing with a lot of climate change. They will have no choice but to adapt” (Garnaut 2011). At the global scale, 2010 climate data showed the average global temperature increase since the late 19th century had already reached 0.7°C (Metz et al 2007), while the European Climate Foundation (2011) suggests current pledges to mitigation are unlikely to keep global temperature increase below 2°C. Moreover, Butzengeiger-Geyer et al (2011) argue incidents such as the nuclear accident at Fukushima have put into doubt consideration of a range of emissions mitigation technologies.

Debates about adaptation versus mitigation have become redundant. This is evidenced by the decisions, actions and climate change investment strategies of governments across the globe. As Dovers (2009) and Dovers and Hezri (2010) put it, the issue before policy analysts is really about how much adaptation might be needed. A related but

equally compelling issue then becomes what institutional arrangements are appropriate to achieve the desired level of adaptation.

Notwithstanding the attention being placed on adaptation, understanding the best approaches to adaptation from local level decisions through to national level policies is constrained by several factors, as summarized by Berang-Ford et al (2011): much of the research on adaptation has focused on intentions to act rather than on adaptation actions; many actions are motivated by drivers other than climate change, including responses to extreme events; focus is more on reactive than proactive responses; and reported adaptations are biased towards developed countries, with limited reporting on adaptations that take into account various demographic traits such as gender and age. Understanding such constraints should help guide priorities for policy responses under any forthcoming national framework for climate change adaptation.

Pressure for a coordinated national approach/framework for adaptation

Dovers and Hezri (2010) argue that Australia has already taken a national approach to some matters of weather, climate and climate risk, something which can be observed in government responses relevant to Dovers' (2009) three-part typology of policy problems relating to climate weather risk disasters. The three levels of the typology include Level 1) dealing with existing variability faced in lived memory, but to which societies have not adapted to as well as they could, and have the capacity to deal with better; Level 2) dealing with a significantly exacerbated degree of climate variability and impacts – more droughts, floods, cyclones, heatwaves, vector-borne diseases, etc – not outside historical experience, but very challenging; and Level 3) dealing with climate change and variability beyond human experience and institutional memory and capacity, threatening the productive bases of economies, potentially including the inundation of major urban areas, serious health impacts, integrity of ecosystems, and resilience of institutions. It can be argued that the response to the first of these takes the form of a national framework through the National Drought Policy administered through the Australian Department of Agriculture, Fisheries and Forestry (DAFF), although it has been argued that the unstated intention of this policy has been to keep farmers on the land until conditions return to 'normal' rather than to encourage them to adapt to a non-stationary environment (Pittock and Connell 2010)

Dovers and Hezri (2010) also argue that "there is a prima facie case that a competent policy system can easily comprehend and cope with Level 1, by reinforcing or extending current capacities and measures in public health, emergency management, coastal planning and protection . . . [and that] . . . such a strategy could extend some way into Level 2." It is in Level 3 that the Australian Government has previously dabbled with a national framework for dealing with climate change adaptation, namely the National Climate Change Adaptation Framework developed in 2007 by the Council of Australian Governments (COAG 2007), and the subsequent policy position outlined in the Australian Government's *Adapting to Climate Change* (Department of Climate Change 2010). Through referring the issue of adaptation to the Productivity Commission, the Australian Government has signalled its intention to rigorously assess the options, qualities and impediments to the implementation / development of a national adaptation strategy.

Our project and its objectives

Societal adaptation occurs at multiple social scales, including (i) individual behaviour, (ii) formal laws, incentives and governance arrangements, and (iii) evolving norms, attitudes and understanding. This project focuses on level (ii) where adaptive responses will generally require formal processes of review and legislative change within the framework of a national strategy. However, there has been very little detailed investigation into what institutions are important, how these may limit or enable adaptation, or what specific institutional, governance and policy process reforms might be needed (Dovers and Hezri 2010; Hatfield-Dodds *in press*). This project addresses that deficit by undertaking a comprehensive analysis of Australia's existing and most relevant statutory arrangements and their associated institutions to ascertain the extent to which they currently support or impede our adaptation planning and practice.

In some respects the objective of this project is reminiscent of the objectives of the 1992 National Competition Policy Review Committee (NCP) which involved a legislative review of some 1,800 statutes to identify where existing legislation unnecessarily hindered competition between the States and Territories: such reviews are powerful and systemic but rare in sustainability and climate change (Dovers 2006). The principal reform that emerged from the NCP process was a public benefit test to justify the maintenance of any policy which *prima facie* restricts competition. A similar review is now needed to assess the extent to which Australia's state and federal statutory settings and policy processes are prepared for the challenges of climate adaptation. Where the NCP was using 'competitive neutrality' as a litmus test, the test here is 'adaptive capacity'.

Building on nascent work on Australia's 'adaptive capacity' at local-regional scales (eg. Cork et. al. 2011; Smith et. al. 2010; Li and Dovers 2009), this project is the first attempt to undertake this type of assessment, and it is particularly innovative because it encompasses relevant statutory arrangements across multiple jurisdictions and the broader policy processes that support them. It is for this reason that the project demands disciplinary depth across environmental law, public policy and political science.

A second gap in our knowledge and understanding concerns the appropriate role and responsibility of the federal government in Australia's climate adaptation policy. Just as climate change impacts are location-specific, so too must adaptation responses be tailored to local parameters: there is no single one-size-fits-all tool which will be functionally applicable across all sectors. However, we know from extensive experience with other economy-wide issues in federal systems that a strategic, nationally-consistent policy framework which embodies common values and objectives and which avoids distortion is crucial to success (for example, in water reform, see: Hussey and Dovers 2007; Pittock 2009). Nevertheless, the challenge in identifying what a national climate adaptation framework might look like is further complicated by the shift in recent decades towards a 'shared responsibility' model, involving ever-increasing numbers of state and non-state actors with varying degrees of responsibility and capacity (Giddens 2009; McLennan and Handmer 2011). For example, the emergency management sector has moved towards greater devolution of responsibilities across many more

actors, a move which has been criticised recently as a result of recent events (eg. Black Saturday bushfires, major floods, prescribed burning escape et cetera). The state cannot – as previously imagined – be either the sole preparer or responder, or the insurer of last resort, and fierce debates are emerging as theory and practice struggle to define the necessary balance of public, private and community roles and responsibilities (Eburn and Dovers 2011). The question for Australian governments, especially the Federal government, is inevitably: when is it sensible for the federal government to act and build adaptive capacity in the context of potentially reduced State government attention to this issue, and which of the policy mechanisms at their disposal will have the greatest impact?

METHOD

A number of important points need to be clarified before a methodology for undertaking this project can be finalized. The legal arrangements for environmental governance including those relating to climate change recognition and adaptation perform a number of different functions: stating substantive values, strategies and outcomes; prescribing processes and procedures to enable and in some cases to require the formation of plans and instruments to realize these values, strategies and outcomes; creating sets of associations rights and duties designed to implement these plans and instruments; ensuring that these associated rights and duties can respectively be protected and enforced by the executive agencies of government and ultimately the judicial agencies of government.

Some of these functions are information; some are descriptive; and increasingly many are prescriptive. It is the relationship between them that has become important in the context of ensuring compliance and enabling enforcement. If this is extrapolated to climate change recognition and adaptation, there is a clear distinction to be drawn between the existence of legal arrangements designed to enable or require climate change adaptation; the capacity of these legal arrangements to do so in practice; the differentiated capacity of these legal arrangements to be enforced; and ultimately the extent to which the implementation of these legal arrangements actually achieved the outcomes for which they have been designed. We make these points because a raft of statutory and institutional arrangements has been adopted which could in principle support adaptation, but their use and efficacy hitherto has been limited in some areas, and ad hoc in others. An example to illustrate the point: the current Environmental Protection and Biodiversity Conservation (EPBC) Act (1999) makes provision for the extensive use of strategic environmental assessment (SEA), but that provision is under-utilised for a variety of reasons, and, even where it is invoked, the successful implementation of SEA depends to a large extent on the quality of existing assessment processes and human and information resources in the relevant sector (Marsden 2005).

In short, the law is only as effective as the context in which it operates and thus assessment must be made in the context of broader policy and planning issues which inhibit effective implementation, such as (i) information and knowledge gaps, including missing stakeholder contributions, (ii) overlap, ambiguity, or contradictions in legislative requirements or processes, (iii) inappropriate scale or scope of implementation and

regulatory arrangements, (iv) incentive gaps and conflicts for private and public sector actors that risk impeding adaptation, including shortfalls in accountability and transparency arrangements, or perverse public revenue or funding linkages, (v) conflicting strategic policy goals frameworks, which create unintended outcomes, and (vi) the availability or lack thereof of human, financial and other (i.e. technical) resources.

The distinction between the existence of laws and legal institutions, and the broader policy and planning issues which may inhibit their effective implementation, demands a more comprehensive methodology than simply analysing existing laws and legal institutions. Many of the critical issues identified above may only be identified by gathering information, input and feedback from key stakeholders. Furthermore, the development of criteria by which to assess the appropriateness and capacity of those statutory arrangements and policy and planning processes must necessarily draw on existing, relevant literature as well as first-hand account from key stakeholders.

Taking all of this into account, the methodology in this project encompasses three components to achieve its objectives:

1. Review and synthesize the existing literature concerning appropriate and optimal statutory arrangements and policy processes for climate adaptation planning and practice, which will necessarily include review of current knowledge and understanding from relevant sectors (i.e. water policy, extreme events etc.), as well as the recent work on climate adaptation and adaptive governance. This review has helped underpin the methodology for the selection of case studies (see below), however the review will continue throughout the life of the project as new lines of enquiry arise during the analytical stage.
2. Undertake in-depth analysis of particular existing legislation, key agency strategic plans and policy goals, relevant reports, submissions and enquiries (state and federal), taking into account any proposed reforms to legislation and/or policy processes, by conducting interviews with leading experts on climate change adaptation, federal and state government organisations and key stakeholders in policy processes, as the foundation for the project's case studies.
3. Synthesize information, knowledge and insights gained from across the case studies to develop assessment criteria for a future national climate adaptation framework.

Rationale for and efficacy of using a case study approach

This project is based on the use and analysis of case studies representing a subset of the policy and institutional approaches adopted around Australia as a means of stimulating climate change adaptation. It is neither possible nor necessary to assess all Federal, State and Territory legislation that are relevant in order to better understand how those arrangements support or impede climate adaptation. Rather, there are a number of 'core' statutory arrangements that are obvious inclusions in the assessment and then there are 'peripheral' arrangements which need to be identified and a short-list made. Common sense demands that only those 'peripheral' arrangements which have

widespread applicability between jurisdictions and/or which offer common insights should be assessed.

While the case-study approach has been accepted by our investors, it is nonetheless valuable to be clear on the rationale for using case studies. In doing so, we can come to understand both the strengths and limitations of such an approach, and how such an approach can underpin recommendations for future policies and frameworks to stimulate appropriate levels of adaptation.

It is estimated that the majority of all peer reviewed articles published in political science journals embrace the use of case studies [Flyvbjerg 2011]. Indeed, case study research has provided insights into the empirical world that otherwise would not be as well understood. For the disciplines of sociology, anthropology, economics, political science, management, geography, psychology, medical science and many others, case studies are a fundamental element of revealing the nature of relationships, phenomena and cause and effect. Case studies are particularly powerful where the issues being examined are highly complex.

One way of understanding the nature and strength of case studies is by dealing with the misperceptions about them; misperceptions often perpetuated by advocates of traditional reductionist science. Flyvbjerg (2011; 2006) describes these misperceptions as:

1. General, theoretical knowledge is more valuable than concrete, practical knowledge.
2. One cannot generalize on the basis of an individual case and, therefore, the case study cannot contribute to scientific development.
3. The case study is most useful for generating hypotheses, whereas other methods are more suitable for hypotheses testing and theory building.
4. The case study contains a bias toward verification, i.e., a tendency to confirm the researcher's preconceived notions.
5. It is often difficult to summarize and develop general propositions and theories on the basis of specific case studies.

Each of these misperceptions has been comprehensively dismissed in the extensive literature on expert knowledge, which the authors shall not go into in detail here suffice to say that there are many legitimate forms of knowledge beyond scientific knowledge upon which well-reasoned decisions can be based (see, for example, Collins 2001). In the context of facilitating adaptation, which is often a process involving trial and error in practice, these other forms of knowledge cannot be dismissed; indeed, they will be applied by practitioners either in ways complementary to scientific knowledge or irrespective of it.

Common to most of the misperceptions is the notion of subjective interpretation. Meaning from case studies reflects interpretation from observation (Gieryn 1999), and this interpretation is derived from the interpreters' personal experience (Spradley 1990). To counter-balance subjective interpretation, it is important to verify conclusions against theory and other findings in the literature.

Flyvbjerg (2011) argues that the best case studies are not necessarily those that provide the most data, but rather those that reveal an interesting, unusual or particularly insightful set of circumstances. Moreover, he suggests that case study selection that is based on representativeness will seldom be able to produce these kinds of insights, and so selection is better based on information-oriented sampling, as opposed to random sampling. This, of course, exposes the selection process to criticism on the grounds of subjectivity and bias. To counter this to the extent possible, as well as to ensure that the project remains relevant to the policy development process, an independent steering committee will be involved in advising on case study selection. This committee comprises:

- The Hon. Justice Brian J. Preston (Chief Judge, Land and Environment Court of New South Wales)
- Professor Katy Auty (Commissioner for Environmental Sustainability, State of Victoria)
- Mr David Papps (Chief Executive, Department of the Environment, Climate Change, Energy and Water (ACT))
- Ms Claire Thomas (Formerly; Director, Competition, Regulation and Economic Strategy, Economic and Financial Policy Division, Victorian Department of Treasury and Finance, Director of Policy, Business Council of Australia)
- Dr. Subho Banerjee (Director, Department of Climate Change and Energy Efficiency)

Basis for case study selection: The policy and institutional arrangement matrix

Both the climate change adaptation and the policy literature are rich with forms of categorisation of concepts relevant to each. Only on a few occasions do these come together to explore how various categories of policy instruments, for example, relate to various categories of desired climate adaptation response. Here, examples of policy instruments might include both existing as well as new and modified governance modes and mechanisms, such as: formal policy processes, statutory and legislative settings, formal and informal organisational arrangements and administrative procedures, markets and market-based instruments, information management, and legitimacy and influence over the roles of civil society and industry stakeholders (Garnaut 2008; Pittock 2011; Agrawala et al 2007; Butzengeiger-Geyer et al 2011; Dovers and Hezri 2010; Dovers 2009). Examples of adaptation responses might include adaptation of standards, institutions, investments and domestic, agricultural and industrial practices (Hallegatte et al 2011); incremental, transitional or transformational adaptation (Nelson et al); and generic versus specific adaptation, spontaneous versus planned adaptation and positive versus negative adaptation (Preston and Stafford-Smith 2009). Combining such categories into a matrix that quickly reveals the relationship between policy stimulus and intended areas of response can provide the basis for the selection of case studies to explore areas that reveal insights of interest to a project such as this.

Drawing from this literature, the project team has devised a Policy and Institutional Arrangement Matrix (Appendix 1) comprising, on the y axis, seven policy mechanisms, and on the x axis, five attributes of these mechanisms. The policy mechanisms are

largely the instruments of government that can be employed to stimulate increased adaptation to climate change across the community. The 'attributes' on the x-axis essentially act as descriptors of each policy mechanism (i.e. factors that differentiate one form of mechanism from another).

In summary, our list of policy and institutional arrangement mechanisms in the matrix (y axis) include the following:

1. Intergovernmental functions: These are formal agreements between governments to work towards specified objectives. The Council of Australian Governments, comprising the heads of the Federal and all State and Territory Governments, represents the pinnacle of such frameworks. At the issue level, agreements and frameworks include the Murray Darling Basin Agreement, National Water Initiative, and the National Competition Policy among others. Usually these agreements and frameworks are underpinned by legislation and supporting institutions.

2. Intra-governmental functions: These are initiatives within a tier of government, either Federal or State, which imposes a common platform of accountability, such as reporting on sustainability or social inclusion, or promotes or requires cross agency cooperation in dealing with a particular issue. The joint administration of the Natural Heritage Trust and Caring for our Country initiatives between SEWPAC and DAFF is an example of this.

3. Regulation by prescription: These are mandatory (legal) requirements that must be met under specific laws/legislation. They are the primary instrument of government agencies to achieve agency objectives.

4. Planning processes: These are strategic and administrative procedures and modus operandi by which agencies prescribe and authorize desired action in anticipation that such actions will provide public benefit or avoid public disbenefits.

5. Funding functions: These are incentive programs or investment initiatives that provide subsidies or co-investment as a means of stimulating the uptake of particular actions.

6. Information and analysis functions: These are publicly funded initiatives aimed at enhancing the understanding of phenomena (basic research) and how to deal with these (applied research) and at enhancing stakeholder understanding of the consequences of phenomena and the means of responding (education and awareness).

7. Market arrangements: These are instruments of government that influence the way in which industry actors behave in various markets. Examples include water trading and trade policy.

While there are relationships between these different domains, and so their demarcation is not black and white, the order of the domains essentially represents a spectrum of stimuli moving from those that are more centrally controlled to those that are more

devolved. It should be noted that beyond these mechanisms are the mechanisms of industry, such as self-regulation, and civil society, and community-based education initiatives. These are very important mechanisms as they demonstrate some level of commitment to shared responsibility (Newell 2008).

On the x axis of our policy and institutional arrangements matrix, the list of attributes includes the following:

A. Jurisdictional scope: This attribute specifies the geographic (national, State, basin, region, shire) and geo-political (Federal, State or Local Government) coverage over which the mechanism operates.

B. Threat: This attribute specifies whether the mechanism is aimed at a particular ecological (flood, fire, sea level rise etc) or human induced (population pressure) threat or whether it is more comprehensive.

C. Sector: This attribute specifies the policy and administrative portfolio domain of each mechanism. The portfolios include, for example, environment, health, planning and infrastructure, trade and so forth.

D. Legal basis: This attribute indicates the source from which each mechanism derives its existence and authority, such as executive power, judicial power, legislation, contractive power, competence, or obligation.

E. Nature: Formulation of strategy, of policy, of plans, of programmes, of standards, of rules, of processes, of incentives, of databases, of advice, of recommendations or research.

Case Study Selection

The research team has selected seven studies based on the information provided in the Policy and Institutional Arrangement Matrix. In doing so, we aim to balance scientific, socio-political and pragmatic concerns. For example, our selection ensures that as a whole, the case studies cross a spectrum of desired adaptation responses aimed at different climate change phenomenon (scientific concern) and across a spectrum of targeted respondents as differentiated by their jurisdictional realm or financial capacity to respond (socio-political concern). Importantly, the case studies were required to be researchable (available information, willing participants etc) and feasible within the available budget and timeframe (pragmatic concern).

With several domains in mind, the team selected four case studies from the policy mechanisms and three from attributes crossing all policy mechanisms. The four policy mechanism cases studies enable the project to gain a deep understanding of how different mechanisms stimulate adaptation responses differently. By choosing three 'attribute' case studies, the project can also reveal if and how different policy instruments complement one another in eliciting adaptation. All the case studies, and not just the attribute case studies, aim to incorporate some level of integrative analysis; that is, even in the specific 'mechanism' case studies the relevant researchers seek to

reveal relationships and dependencies between the mechanism in question and other mechanisms.

Also, bearing in mind that the results of this project will be used as one input into the revitalisation of a national climate change adaptation framework, the project team recommends that the seven case studies be those likely to contribute the most to such a prospect. For this reason, the research team sees considerable merit in pursuing four mechanism-based case studies dealing with the scale of a national framework, with the fundamental role of planning in ensuring the right adaptation occurs in the right place, with the inter-relationship between knowledge and awareness, and with market arrangements that complement government efforts . Reflecting this, we recommend case studies to deal with Mechanism 1 (Intergovernmental function), Mechanism 4 (Planning processes), Mechanism 7 (Information and analysis function), and Mechanism 7 (Market arrangements). Moreover, and as indicated above, given that many mechanisms can be seen to act concurrently or collectively to enhance or impede adaptation at the local level, the research team included three attribute-based case studies; at the regional level (Attribute A), the sector level (Attribute B) and the threat level (Attribute C). In supporting these recommendations, Table A.1 summarises the relationship between the proposed case studies.

Table A.1: Relationship of case studies

Attribute	A.	B.	C.	D.	E.
Mechanism	Juris-dictional scope	Sector	Threat	Nature	Basis of power
1. Inter-governmental function	Case study 5 (City of Melbourne)	Case study 1 (NWC/NCC)	Case study 7 (Floods)	Case study 1 (NWC/NCC)	
2. Intra-governmental function					
3. Regulation by prescription					
4. Planning processes		Case study 2 (Planning regs)		Case study 2 (Planning regs)	
5. Funding function					
6. Information and analysis function		Case study 3 (Energy, water)		Case study 3 (Energy, water)	
7. Supporting market arrangements		Case study 4 (Finance)		Case study 4 (Finance)	
		Case study 6 (Primary Industries)			

DESCRIPTION OF EACH CASE STUDY

Case Study 1: National and inter-governmental frameworks

Aim:

- to explore the role and potential of national framework policies, not or not directly specific to climate adaptation, both Commonwealth-driven and intergovernmental (typically via COAG), in initiating, enabling and coordinating adaptation options.

This case study should focus on an analysis of the National Water Initiative (NWI), the National Competition Policy (NCP), the Resource Assessment Commission (RAC) and the National Strategy for Disaster Resilience (NSDR) and the National Strategy for Ecologically Sustainable Development (NSED). These included many of the partners that would be involved in a national adaptation framework. Moreover, it has been recently evaluated, including through a public submission process, and so there is a wealth of contemporary material available to support the analysis of a case study. Finally, all the CIs and the SRA have extensive knowledge and expertise in the implementation (and strengths and weaknesses) of these policies.

Case Study 2: Planning processes and strategic decision-making

Aim:

- to assess the potential of existing urban planning regimes to enable or require human decision-making to respond to the challenges of a changing climate, specifically the use of strategic environmental assessment and other procedural mechanisms.

This case study should focus on the efficacy of planning processes at the State/local government level, including evaluation of the processes for strategic decision-making, and the adequacy of funding regimes to effectively implement climate change adaptation policies and programs. . Part 1 of the paper dissects the statutory requirements in NSW relating to processes and procedures, such as the use of strategic planning. This involves analysis of not only the statutory object but also analysis of the triggers/thresholds, capacities and targets of strategic planning and whether these are adequate.

Part 2 analyses the 'enabling' factors in strategic planning, such as the institutional settings and organisational structures for planning regimes, which are the 'soft' side of planning, but ultimately determine how vigorously and rigorously a government can/will act in scrutinising its own policies and proposals, because the institutional settings dictate who has the independence, authority and necessary skills to undertake an independent assessment for decision-making.

Case Study 3: Information and analysis in the relationships between energy and water

Aim:

- To explore the feasibility of combining regulatory measures (for example, regulatory arrangements which require energy suppliers and developers to account for water withdrawal and consumption in development proposals), and knowledge and awareness measures to highlight the oft-misunderstood links between the energy and water sectors and enhance the adaptive capacity of the energy sector to likely changes in water availability.

The energy sector is an important 'user' of water, accounting for 7% of national use, (1794 GL) (SEWPAC 2006), in the extraction, generation, supply and distribution of energy for many and varied uses (including electricity generation). This case study explores the relationship between climate, energy and water policy, specifically the need for the energy sector to adapt to increased variability in water availability and the possibility for maladaptation. The project assesses both conflicting and synergistic water use impacts of measures in the carbon abatement curve and then recommends appropriate cross-sectoral statutory and other institutional governance measures that aid both climate change mitigation and adaptation.

Case Study 4: Market mechanisms and industry policy: The financial market

Aim:

- To explore the role of private finance in supporting climate adaptation efforts.

The private sector is already an important source of climate finance. The major focus of the private sector to date has been on supporting mitigation activities but there is evidence that there is an emerging market for raising new finance from the private sector for adaptation. Recent signals from large institutional investors suggest that further capital could be raised specifically for adaptation activities, provided the right investment products are available. There are various ways in which private finance can support adaptation. Debt, in particular, can be used as an enabling instrument for both publicly and privately initiated adaptation, including direct project lending and credit lines to local finance institutions; the use of superannuation funds for investment projects is another. The focus of this paper will be on identifying (i) institutional or regulatory barriers to the use of private finance for climate adaptation projects and (ii) incentives the Australian government could introduce to encourage greater flow of private sector finance to climate adaptation strategies or projects.

Case Study 5: Interactions between policy mechanisms in a particular jurisdictional setting (Region)

Aim:

- To shed light on how different policy mechanisms interact with each other within a single jurisdictional setting.

Unlike the first three case studies which explore particular, individual mechanisms and institutional arrangements, this case study will focus on the cumulative impact of the range of adaptation policy and institutional measures in an urban location and will focus specifically on an 'attribute' (i.e. spatial/jurisdiction). The particular jurisdiction was identified upon completion of the first three case studies. We have used the Climate Change Adaptation Strategy of the City of Melbourne as chosen, given the strategy's relatively high profile and comprehensive approach to adaptation. The case study also deals with the issue of how climate change adaptation policies and/or actions are largely framed within a risk management lens, potentially limiting the way they can deal with longer-term issues of capacity building and resilience.

Case Study 6: Interactions between policy mechanisms in a particular sectoral setting (Sector)

Aim:

- To explore the efficacy and transferability of the adaptation approaches taken within the primary industries sector either as a stand-alone sectoral policy approach or as part of a broader national policy framework.

This case study complements the first case study in that it will identify key policy design features, institutional factors, resourcing issues, etc that are relevant at an institutional level that from (i) design perspective is potentially at least one level of control and management beyond a centralised a national policy approach, but still linked to one, and (ii) an implementation perspective potentially links national goals and targets to on-ground adaptation responses through alignment to industry intermediaries and collective and individual decision-makers.

Case Study 7: Shared responsibility and the role of the Commonwealth (Threat)

Aim:

- To explore flooding from the perspective of government function to determine the current policies and institutional arrangements in place to address flooding and the types of reforms that would be required to reduce Australia's vulnerability to flooding in the future.

This case study analyses the findings of four major flood reviews conducted in 2010-2011 to identify the key roles and responsibilities of the state and federal governments in achieving the recommendations put forward in those reviews. The emphasis of this paper is on identifying the drivers and barriers to more proactive prevention approaches to flood management.

APPROACH TO THE ANALYSIS OF THE CASE STUDIES

To be effective, any policy regime dealing with adaptation needs to be measured by the extent to which adaptive capacity is built; by the extent to which adaptation occurs as the ultimate evidence of success and as a fundamental intermediate step. In dealing with the intermediate step, the research team will apply a framework assessing the extent to which the following four characteristics of effective adaptive capacity (and resilience, after Cork et al 2011) are evident:

1. Clarity of purpose
2. Diversity
3. Connectivity
4. Integration and feedback

These characteristics of adaptation are defined as follows:

Clarity of purpose: Requires clear definition and understanding of problems at a system level so that we can address root causes and not just symptoms.

Diversity: Requires a diversity of ideas, skills and resources, a diversity of views, innovation, flexibility in problem solving, and wide inclusion of stakeholders in a purposeful and structured fashion.

Connectivity: Requires institutional (including community) networks that are not susceptible to collapse due to one part failing; effective use of resources; community ability to organise itself; appropriate leadership; spare capacity; and some duplication of functions and overlapping of institutions.

Integration and feedback: Requires a holistic consideration of issues and realistic consideration of scale, accounting for the full range of interactions between humans and ecosystems. It also requires resources to monitor and to promote debate and learning.

To understand the extent to which these characteristics are evident, the project team have considered specific data in respect to the following (drawn from Dovers 2009, Pittock 2009; Lin & Barton 2001):

1. What is the nature and reach of the approach? Is it generic (systemic) or specific? What is its source of power and funding?
2. Is there explicit inclusion or scope for inclusion of climate adaptation in the approach, and what are the relevant policy and decision-making responsibilities?
3. Does the approach focus across stages of an adaptation management or resilience enhancing process (e.g. vulnerability assessment, adaptation planning, advocacy and awareness raising, emergency planning, early warning, monitoring etc)? How is it communicated?
4. Is there evidence that the approach has resulted in some level of adaptation to the consequences of climate change either as sudden shocks (e.g. flooding, cyclones, drought, erosion etc.) or as slower-onset changes (e.g. new risks to health, food security, livelihoods, basic infrastructure and services etc)? Have the

benefits been immediate? Have they been local and specific, or multiple and diffuse?

5. What have been the supporting, impeding or conflicting factors affecting success and have there been perverse or unexpected outcomes? Is there sufficiency of resources, including human, informational and financial resources to implement the existing arrangements? What are the information and knowledge gaps, including missing stakeholder contributions?
6. What is the potential or otherwise for the approach to be incorporated into a national adaptation framework or to help shape such a framework?

Data will be derived from telephone and face to face interviews with those responsible for relevant policy development, implementation and review based on the above criteria, as well as from the literature including previous reviews the case study stakeholders have been involved in.

CONCLUSION

Any climate change adaptation policy response is challenged by many factors, among the more significant being the capacity of those who are required to adapt to do so within an environment of complexity (difficult, unclear or conflicting messages about the adaptation options and even about the need for adaptation) and uncertainty (uncertain climate forecasts and timeframes, uncertain markets and uncertain risks and rewards).

It is for this reason that the case studies outlined in this paper, grounded in reality and revealing the strengths and weaknesses of past and present practice, are imperative for a comprehensive and robust methodology. By utilizing a mix of case studies that analyse specific policy and institutional mechanisms and the intersections between them, the project aims in its synthesis to provide a rigorous platform upon which to build future adaptation policy frameworks.

This project is based on the premise that bringing clarity to the policy environment, possibly through the form of a national climate adaptation strategy, will best position Australia to alleviate existing barriers to adaptation and respond effectively to future challenges of adaptation made more difficult by their inherent complexity and uncertainty.

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Appendix A (Methods paper): Policy and Institutional Arrangement Matrix

Showing major policy and institutional arrangements of importance for governance of climate change adaptation (work in progress, not exhaustive)

Attribute Mechanism		A. Jurisdictional scope	B. Threat	C. Sector	D. Nature of function	E. Basis of power
1. Intergovernmental functions						
Council of Australian Governments		National	Water, Disaster Response, Climate Change, Energy	Whole-of-Government	Strategy, policy, plans, programmes, processes, incentives, databases and legislation	Statutory Authority
National Water Initiative		National	Over-allocated, overused water systems, changes in future availability, disconnected approach to surface and groundwater	Government – water, environment	Strategy, policy, plans, programmes, processes, incentives, databases, recommendation and legislation	Intergovernmental Agreement
Murray-Darling Basin Authority		National, State, Regional	Water scarcity and quality, increased climate variability – more droughts and flooding	Government – water, environment	Plans, programmes and recommendations	Legislation - <i>Water Act 2007 (Cwlth)</i>
Lake Eyre Basin Ministerial Agreement		State, Regional	Decreased rainfall, increased variability	Government – water, environment	Programmes, advice and recommendations	Intergovernmental Agreement
Australian Building Codes Board		National, State	Bushfire areas, cyclone zone	Government - infrastructure	Standards, rules and databases	COAG writing body
National Competition Policy		National	Access to infrastructure, Water	Whole-of-Government	Standards and rules	Intergovernmental Agreement
National Strategy for Ecologically Sustainable Development		National	Biological diversity, ecological processes and lifer support systems	Government - environment	Plans and processes	Policy
State local government statutes and funding		State and Local	Comprehensive	Government - local	Policy, plans, processes and legislation	State statute
2. Intra-governmental functions						
Commonwealth Department of Climate Change and Energy Efficiency		Federal, State, Local	Sea level rise, increased variability, decreased rainfall, storm surges, severe weather events	Government - environment	Strategy, policy, plans, programmes, processes, incentives, databases and legislation	Department
State Departments relevant to climate change		State	Comprehensive	Government – environment, water	Strategy, policy, plans, programmes, processes, incentives, databases and legislation	Department

Attribute		A. Jurisdictional scope	B. Threat	C. Sector	D. Nature of function	E. Basis of power
Mechanism						
State conservation coordination councils		State	Habitat loss, Biodiversity, Variability	Government – environment, water, agriculture	Standards, rules, advice and recommendations	State coordination
State Climate Change Adaptation frameworks		State	Comprehensive	Whole-of-Government	Policy, plans and recommendations	State coordination
State Risk Management frameworks		State	Comprehensive	Whole-of-Government	Strategy, policy, plans, standards, rules, advice and recommendations	State coordination
State Emergency Management frameworks		State	Comprehensive	Whole-of-Government	Strategy, policy, plans, standards, rules, advice and recommendations	State coordination
State Catchment Management arrangements		State, Local, regional	Variability, Water availability and quality	Government – environment, water	Plans, standards, rules, advice and recommendations	Legislation - Sydney Water Catchment Management Act 1998
State regional development initiatives		National, State	Variability, Infrastructure	Government – regional development, planning	Strategy, policy, plans and programmes	Administrative orders
3. Regulation by prescription						
Planning and building regulations		State, local	Comprehensive	Government – planning, infrastructure	Standards and rules	State regulations
Land use regulations		State, local	Comprehensive	Government – planning, agriculture	Standards and rules	State regulations
Water ordinances		State, local	Flooding, water quality, water availability	Government - water	Standards and rules	State regulations
Large-Scale Renewable Energy Target (LRET) and Small-scale Renewable Energy Scheme (SRES)		National	Climate change	Government - environment	Programmes	Commonwealth regulation
Environmental impact assessments		National, State, Local	Comprehensive	Government – planning, mining, agriculture, infrastructure	Processes and standards	State regulations
National Greenhouse and Energy Reporting Act		National	International reporting obligations, Emissions increase, Energy intensity	Government	Rules and databases	<i>National Greenhouse and Energy Reporting Act 2007</i>
State greenhouse reduction regulations		State	Climate change, storm surges, variability, temperature rise, Infrastructure	Government - environment	Rules	State regulations
Economic regulation of State utilities		State	Climate change, Infrastructure, energy pricing	Government – energy, water	Advice and recommendations	State regulations

Attribute		A. Jurisdictional scope	B. Threat	C. Sector	D. Nature of function	E. Basis of power
Mechanism						
4. Planning processes						
State Local Government arrangements	Government	State, local	Comprehensive	Government	Plans and rules	State regulations
State Environmental Protection arrangements	Protection	State	Climate change	Government – biodiversity, pollution	Advice and programmes	State regulations
Specific regional initiatives (i.e. South East Queensland initiative)		State	Comprehensive	Government – planning, development	Strategy and policy	State regulations
Coastal Zone planning frameworks		State	Sea level rise, infrastructure, land use change, erosion	Government – planning, development	Policy	State regulations
5. Funding functions						
Low Carbon Communities Program		National, Local government, community organisations	Energy efficiency, Low income energy efficiency, Energy price increase	Government	Programme, incentives, advice	Departmental Program DCCEE
Remote Indigenous Energy Program		National?, Regional	Energy efficiency, autonomy	Government	Programmes and incentives	Departmental Program DCCEE
Solar Hot Water Rebate (Closed as of June 2012)		National, State	Emissions	Government	Incentives	Policy
Home Insulation Program (Closed February 2010)		National, State	Emissions	Government	Incentives	Policy
Clean Technology Program		National	Emissions, carbon constrained economy	Government	Incentives	Departmental Program DCCEE
Tax Breaks for Green Buildings Program		National	Emissions, energy efficiency and security	Government	Programmes and Incentives	Policy
6. Information and analysis functions						
National Climate Change Adaptation Research Facility		National, local government, community organisations	Comprehensive	Government – research	Research and recommendations	Government - research
Climate Commission		National	Climate change - carbon pricing	Government – research	Advice and recommendations	Regulation
Bureau of Meteorology		National	Climate change - variability	Government agency: monitoring, data management & research	Databases and research	Regulation

Attribute		A. Jurisdictional scope	B. Threat	C. Sector	D. Nature of function	E. Basis of power
Mechanism						
The Climate Change Research Strategy for Primary Industries		National	Climate change – adaptation	Government, tertiary - research	Strategy, advice, recommendations and research	Intergovernmental agreement
Primary Industries Adaptation Research Network		National	Climate change – adaptation	Government – research	Strategy, recommendations and research	Regulation
CSIRO Climate Adaptation Flagship		National	Climate change – adaptation	Government – research	Advice, recommendations and research	Research Institute
The Climate Institute		National	Climate change – carbon pollution	Independent research, NGO	Recommendations and research	Research Institute – Not for profit incorporation
Low Carbon Living CRC		National	Climate change – carbon pollution	Tertiary – research, NGO	Recommendations and research	Research Institute
7. Market-arrangements						
Insurance markets		National	Extreme events	Financial	Standards, rules and databases	Regulated market
Water Markets		National, State	Climate change variability	Government, private sector	Standards, rules and databases	Regulated market
Energy markets		National, State	Climate change variability, infrastructure	Government, private sector	Standards, rules and databases	Regulated market
Food markets		National, State, Local	Comprehensive	Government, Co-operatives	Standards, rules and databases	Regulated market
Offset programmes		National	Climate change - emissions	Government	Standards, rules and recommendations	Regulated market

APPENDIX B: EXTENDED SUMMARIES OF CASE STUDIES 1-7

Appendix B presents extended summaries of the seven case studies, highlighting (i) the rationale for and objectives of the case study (ii) the methodology employed (iii) key conclusions and (iv) references used. These summaries contain all the information necessary to demonstrate the breadth of work carried out, and to substantiate the key findings of the project. Full details of the research and conclusions from each of the seven case studies will be published in a forthcoming book, authored by this project's research team. Details about this book can be obtained from the Principal Investigator, Dr Karen Hussey

The case studies summarised on the following pages are:

	Title of case study	Authors and affiliations
1	The role and potential of national framework policies to initiate, enable and/or coordinate climate adaptation	Dr Jamie Pittock, ANU Dr Karen Hussey, ANU Jules Livingstone, ANU
2	Australia's planning regimes: do they support or impede national adaptation planning and practice?	Dr Karen Hussey, ANU Prof. Douglas Fisher, QUT Prof. Steve Dovers, ANU
3	Information and analysis for climate adaptation: uncertainty, conflict, coordination and the role of the Commonwealth	Dr Karen Hussey, ANU Dr Phillip Wallis, Monash University Dr Jamie Pittock, ANU
4	Market mechanisms and industry policy: the financial market	Dr M Bowman, UNSW
5	Regional/Local Cross-Mechanism Relationships: The Case of the City of Melbourne Council	Dr Richard Price, ANU Jules Livingstone, ANU Dr Hartmut Fünfgeld, RMIT University
6	Do Australia's existing statutory frameworks, associated institutions and policy processes support or impede national adaptation planning and practice: the case of primary industries	Dr Richard Price, ANU Jules Livingstone, ANU
7	Climate change adaptation and floods	Caroline Wenger, ANU

CASE STUDY 1

The role and potential of national framework policies to initiate, enable and/or coordinate climate adaptation

Jamie Pittock (The Australian National University)

Karen Hussey (The Australian University)

Jules Livingstone (The Australian National University)

Introduction

The premise of this paper is that before the need to adapt becomes truly acute, Australia must think about the appropriate role and responsibility of the federal government in its efforts to adapt to climate change. Yet, identifying the appropriate role for federal governments in climate adaptation is particularly complex because the threats posed by climate change are many, varied, inter-connected and almost inevitably uncertain in place, time and scale (IPCC 2001; 2007; 2012). The challenge is further complicated by the shift in recent decades towards a 'shared responsibility' model in dealing with natural hazards, involving ever-increasing numbers of state and non-state actors with varying degrees of responsibility and capacity (Giddens 2009; McLennan and Handmer 2011). Moreover, just as climate change impacts are location-specific, so too must adaptation responses be tailored to local parameters: there is no single one-size-fits-all tool which will be functionally applicable across all sectors (Hussey et al. 2012). Yet we know from extensive experience with other economy-wide issues in federal systems that a strategic, nationally-consistent policy framework which embodies common values and objectives and which avoids distortion is crucial to success (for example, in water reform, see: Hussey and Dovers 2007; Pittock 2009).

Our objectives in this paper were two-fold. First, we explored the role and potential of relevant, current, national framework policies in initiating, enabling and coordinating adaptation options. The underlying assumption to this objective is that much of the adaptation we must do in the future has been the focus of federal attention in the past, for example, managing water scarcity. The key question here is: are our existing institutions sufficient? We consider policies driven by the federal government as well as intergovernmental agreements between the federal and state governments (typically under the auspices of the Council of Australian Governments (COAG)). The second objective is to analyse the strengths and weaknesses of national frameworks as a policy tool, essentially to identify key policy design features, institutional factors and resourcing issues that lead to more or less degrees of impact. The objective is not to design a national adaptation policy *per se*, but to understand how engagement by the federal government might best be pursued. The key question here is: what makes a good national strategy? This may then inform the

design of future sectoral policies, and/or of an adaptation-specific national policy should one be considered necessary.

Analysis of the two objectives combined shed much needed light on (i) the appropriateness and efficacy of existing national institutions in our attempts to adapt to climate change and (ii) where reforms might be necessary.

Climate-relevant national frameworks and their capacity to initiate, enable and/or coordinate adaptation options

We selected national policies over the last two decades for analysis that seek to direct Commonwealth, state and other actors' priorities, actions and investments, in other words, they have 'systemic' intent to influence behaviours across a wide set of actors and activities. These selected policies are those that are already reasonably well-documented and analysed. Candidate policies considered for inclusion were the Intergovernmental Agreement on the Environment; National Competition Policy; the National Strategy for Disaster Resilience; the National Strategy on Ecologically Sustainable Development; the National Water Initiative and the Resource Assessment Commission. Other policies for which there is less detail available include the (new) National Wildlife Corridors Plan, the National Reserve System and disaster resilient cities. We chose to focus on policies based on their systematic intent, available documentation, and divergent timing, form and outcomes.

In the first analysis three policies were selected that may already contribute to climate change adaptation nationally. These policies are the: National Strategy for Disaster Resilience (NSDR), the National Strategy on Ecologically Sustainable Development (NSESD) and the National Water Initiative (NWI). Specific data was sought on the following adaptive characteristics of these policies (drawn from Dovers 2009, Lin & Barton 2001):

- Evidence that the approach resulted in some level of adaptation to the consequences of climate change either as sudden shocks (e.g. flooding, typhoons, drought, erosion) or as slower-onset changes (e.g. new risks to health, food security, livelihoods, basic infrastructure and services);
- Explicit inclusion of climate adaptation, or scope for inclusion, via statutory objectives or regulatory guidelines;
- Existence of overlap, ambiguity, or contradictions in legislative requirements or processes;
- Focus across stages of an adaptation or resilience enhancing process (e.g. vulnerability assessment, adaptation planning, advocacy and awareness raising, emergency planning, early warning, monitoring);
- Generic (systemic) reach, rather than ad hoc or project specific, and related issues concerning appropriate scale or scope of implementation and regulatory arrangements;
- Applicability to relevant policy and decision-making responsibilities;

- Sufficiency of resources, including human, informational and financial resources to implement existing arrangements;
- Information and knowledge gaps, including missing stakeholder contributions;
- Existence of incentive gaps and conflicts for private and public sector actors that risk impeding adaptation, including shortfalls in accountability and transparency arrangements, or perverse public revenue or funding linkages;
- Existence of conflicting strategic policy goals frameworks, which create unintended outcomes;
- Potential or otherwise to be incorporated into a national adaptation framework.

Discussion: Adaptive characteristics of policies

A comparison of adaptive characteristics across these three national framework policies drawing on the assessment is shown in Table B.1.

Table B.1 Comparison of adaptive characteristics across selected national framework policies

Characteristic	National Policy		
	NSED	NSDR	NWI
• Level of adaptive outcomes	LOW	LOW	HIGH
• Explicit inclusion of climate change adaptation	MEDIUM	MEDIUM	MEDIUM
• Weaknesses in legislative requirements or processes	LOW	LOW	HIGH
• Focus across stages of an adaptation process	MEDIUM	HIGH	HIGH
• Degree of systemic reach	MEDIUM	MEDIUM	HIGH
• Applicability to decision-making responsibilities	MEDIUM	LOW	HIGH
• Sufficiency of resources	LOW	LOW	HIGH
• Information and knowledge gaps	MEDIUM	MEDIUM	MEDIUM
• Incentive gaps and conflicts	LOW	LOW	MEDIUM
• Conflicting strategic policy goals	LOW	LOW	MEDIUM
• Potential to be incorporated into an adaptation framework	MEDIUM	HIGH	HIGH

The NWI has shown promise in leading to adaptive outcomes in requiring reform of state institutions in line with better national practices in order for these governments to access Federal Government funding and to benefit from water markets. One result is that during drought conditions water users can now adapt by buying or selling water to meet their objectives (Kiem and Austin 2012; R.Q. Grafton & Jiang, 2010). The aspirational NSDR and NSESD should contribute to adaptation but there is no evidence that this is the case given lack of requirements for state government implementation and little Federal Government funding as an incentive for action.

The NWI does explicitly require consideration of climate change adaptation in water planning, even if this has been poorly implemented at times (Pittock, et al., 2010). The ESD process is so out of date that its consideration of adaptation requires revision whereas as the NSESD is so vague as to be meaningless in directing adaptation measures.

Regrettably there are many contradictory policies that detract from the erstwhile commitments to adaptation in these policies. Wenger et al (this volume), in relation to flood management, outlines numerous policy barriers and contradictory measures that hinder the effectiveness of the NSDR, beginning with mapping of flood zones through to planning to prevent development in harm's way, through to recovery strategies that are not designed to relocate impacted structures and activities. Recent critiques of adaptation developments highlight the risks that poorly considered "sustainable developments" may be overly narrow or 'maladaptive' (Barnett & O'Neill, 2010; Pittock, Finlayson, & Howitt, 2012). While the need to prevent impacts and plan for their impact is often recognised, disproportionately few resources are usually devoted to these stages of the adaptation process (Wenger et al, this volume).

Although all three policies were intended to have systematic reach and engage relevant decision-makers, in practice only programs associated with the NWI have had the resources to engender the reach desired for effective implementation, and even then the environmental components have been less well applied than the market-based measures.

The three policies in theory should each allow participation by stakeholders, but it is really only the National Water Commission structure and the emphasis that it has placed on generating knowledge, linked to national water accounting that was derived from the NWI, which has enabled substantial progress in the water sector. By contrast, great information and incentive gaps and conflicts remain for effective sustainable development and disaster resilience, as indicated in the flood control sector (Wenger et al, this volume). There are also incentive gaps and conflicts in the water sector, for instance, with the failure of state governments to regulate inflow interception activities and bring them within the water markets (NWC, 2011). This illustrates the need for clear requirements, accountability and financial incentives if national policies are to be effectively implemented at state and more local scales.

The lack of an effective, overarching ESD policy process may be one reason why there are so many conflicting policies, for instance, climate change mitigation policies that may exacerbate water scarcity in parts of Australia (Pittock, Hussey, & McGlennon, (in review)).

Theoretically NSESD should form an overarching policy framework that may embrace climate change adaptation (S. R. Dovers & Hezri, 2010). Major institutional reform will be required at the core of the Federal Government for this to be effective (Ross & Dovers, 2008). Given the out-dated state and limited support for the Strategy this appears unlikely in the foreseeable future. The NSDR should be part of a national adaptation framework but as outlined in this assessment it is in no fit state to contribute given its aspirational approach, parallel policies and limited funding. The NWI is a logical part of a national adaptation framework and can contribute now but could do much more with further inducements for state implementation in areas like inflow interception management, water markets and environmental flows (NWC, 2011).

Discussion: factors for success and lessons for resilience in national framework policies

In the second part of our analysis, three policies that had systemic influence were identified to discern the elements that contributed to their success and which may in turn inform national climate change policy development. The Resource Assessment Commission (RAC) was a successful, albeit short-lived effort to mainstream assessment of contentious developments at the heart of the Federal Government. The National Competition Policy (NCP) was a far-reaching economic meta-policy that emerged in the early 1990's and dramatically changed natural resource industries (Curran & Hollander, 2002). The NWI is also considered in this analysis. In assessing the elements that contributed to the success of these policies, we applied a framework developed by Cork et al. (2011), identifying four characteristics of effective adaptive capacity and resilience are evident: Clarity of purpose; Diversity; Connectivity; Integration and feedback (for further details see Appendix A). Table B.2 summarises the analysis and assessment against the four characteristics,

Table B.2 Comparison of the three strategies against characteristics of effective adaptive capacity and resilience (Cork et al. 2011).

Policy	Clarity of purpose	Diversity	Connectivity	Integration and feedback
Resource Assessment Commission (Stewart & McColl, 1994)	High. Issue specific open inquiry process used to assess ecological, economic and social issues with proposed developments.	High. Process engaged a diversity of views from different stakeholders.	Low. The establishment of the RAC as an agency with the Prime Minister's portfolio left it vulnerable to a change of political leadership,	High. The open inquiry process enabled the RAC to draw on best available knowledge and adopt new approaches from public submissions.
National Competition Policy (Curran & Hollander, 2002; NCC, n.d.).	High. A tight focus on economic competition.	High. Process engaged a diversity of views. Public challenges are enabled. Arguably economic competition fosters diversity.	High. The policy involved removal of monopolies which may lead to duplication of service providers.	Medium. Regulatory institutions established under the policy enable public challenges and are self-reinforcing. The policy does not consider non-competition issues.
National Water Initiative (Commonwealth of Australia, et al., 2004).	Medium. While the economic elements of the NWI's many principles have largely been implemented the sustainability oriented ones have been poorly enacted (NWC, 2011).	Medium. Some elements of the policy have enabled a diversity of approaches, such as water trading. Other elements lack diversity under the purview of governments, eg. focus on environmental flows over complementary measures (Pittock & Finlayson, 2011).	Medium. The market-based elements show attributes of resilience, for instance during the past decade of drought (R. Quentin Grafton, 2011). The environmental elements remain at risk from physical and governance failures (Pittock, et al., 2012).	Low. On paper the NWI integrates issues of scale and of socio-economic and environmental issues well. The Commission provides a feedback mechanism to COAG but despite sage advice COAG has not engendered change by the state governments in recent years (NWC, 2011).

Conclusions

This assessment examined both existing strategies that may already support climate change adaptation as well as less directly related national policies that hold lessons for a national adaptation policy. The five national policies examined underline the difficulty in developing and implementing effective policy frameworks in Australia.

The NCP and water markets component of the NWI illustrates that, to succeed, a national policy needs bipartisan support and a coalition of stakeholders advocating for their implementation. Notably, these two policies can be seen as lying within the ambit of the dominant neo-classical economics paradigm. They also focus on perceived urgent national issues, namely making the economy more competitive and addressing water scarcity, rather than issues regarded as having incremental and long term benefits, such as disaster resilience and ecologically sustainable development.

The NCP and NWI have other commonalities. These policies focus on a limited number of core principles and systemic legislative reform and have been implemented incrementally over many years, as opposed to the much broader and more diffuse NSESD agenda. The allocation by the Federal Government of substantial funds for state governments, contingent on policy implementation, was a critical incentive for NCP and NWI policy implementation, again, in contrast to the NSESD. The cessation of such funding cross-compliance has subsequently seen slower progress with these policies. Importantly, the two policies reported to COAG, perhaps making them less vulnerable to the whims of a single federal minister. They also had champions in the Federal Government - backed by central agencies - for implementation in the form of the National Competition Council and the National Water Commission in the Federal Government. This is in contrast to the NSDR and NSESD that have not and have made little progress. RAC as a unit within a government department was beholden to the views of a single political leader - the Prime Minister - and fell with a change of leadership. The role of RAC with its ad hoc investigation briefs made it easily marginalised, as opposed to the more systemic roles for the other policies examined here. The focus of the NCC and NWI on legislative reform and on independent regulatory agencies has provided subsequent opportunities for public legal challenges that add accountability, transparency and incentives for governments to follow through on their policies as compared to much of the NSDR and NSESD agenda.

These observations suggest that it will be hard to develop and very difficult to systemically implement an effective national climate change adaptation policy. To succeed, a policy will need to be focussed on a limited number of core principles. Bipartisan support will be required, and while this is conceivable, it will be hard to engender when climate change policies are politically contested. Consistent support from key stakeholders will be required; however few may be motivated by the incremental and long term impacts of climate change to be such diligent advocates.

Positioning an adaptation policy in terms of socio-economic benefits is needed to engender more support rather than seeing such policy marginalised in the environment portfolio.

The national policies that have succeeded have had champions in the form of independent agencies in the Federal Government. A robust government agency to champion a climate change adaptation strategy is required, which is an unlikely proposition given that at least one major political party has proposed abolition of the Department of Climate Change at the next federal election. Successful policies have also had substantial funding available for state governments contingent on adequate policy reform (whereas the NSDR and NSESD have not). The NCP and water markets component of the NWI focussed on benchmarking relevant legislation in each jurisdiction and proposing reforms to bring them into conformity with policy principles, which could be a focus of national adaptation policy. The Federal Government would need to manage the divergent demands of an adaptation policy for both engendering reform in the state jurisdictions as well as undertaking adaptation measures within its own institutions.

Ideally there is a strong case for the Federal Government to lead a national climate change adaptation policy based on discrete principles, to act within its jurisdictions as well as facilitate action at sub-national scales by communicating relevant knowledge (see Case Study 3, this project) and ensuring that there are appropriate legal mandates and funding mechanisms (see Case Studies 2, 4, 5, 6, 7, this project). Yet, we conclude that the prospects of such a strategy being more than another aspirational statement are limited unless a formidable list of conditions are met, including stakeholder support, funding and rigorous implementation structures.

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CASE STUDY 2

Australia's planning regimes: do they support or impede national adaptation planning and practice?

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Introduction

The focus of this paper was on the potential of planning regimes to support climate adaptation policy, planning and practice in urban systems. Following our definition of climate adaptation, we elected to divide the analysis according to *statutory requirements* and *enabling factors*. However, it is important to state at the outset that the importance of planning regimes to climate adaptation has been recognised in recent years and there is considerable, excellent work published in the literature, by individual scholars, law firms, local governments and Government-commissioned reviews¹. Our modest ambition in this paper was to synthesise that work, so as to contribute to the broader project question of whether Australia's current statutory and institutional arrangements support or impede climate adaptation. A synthesis is particularly timely owing to the large volume of work on planning regimes emerging and the inherent value in assessing broader trends, commonalities and peculiarities for future decisions with respect to a national, strategic climate adaptation policy.

Evidence of climate adaptation in existing statutory requirements

The flexibility and scope of Australia's planning regimes offer many opportunities for consideration of climate impacts. However, it is worth restating that many of the impacts from future climate change are hazards that Australia has a long history of dealing with, most notably bushfires, floods and cyclones. The most obvious exception is the impact of sea-level rise, though even in that instance, the indirect effects of sea level rise are familiar to local and state planning authorities, for example storm surges, floods and coastal erosion.

The fact that many of the impacts of climate change are not new means that Australia's planning regimes already have prescriptive regulations in relation to those threats. In addition to planning and development regimes, there are relevant building codes, technical standards and reference guidelines designed to mitigate the impact of natural hazards. Thus, the effectiveness of adaptation is a function of *existing* and potentially *new* institutions of governance, policy processes, legal settings, organisational arrangements and administrative procedures. At the very least,

¹ For a full list of references refer to Section 6. Climate Change and Energy Efficiency; COAG Reform Council (2012), State of Australian Cities Report 2012: Gurren et al 2011; Foerster A. 2012;

existing arrangements should be implemented adequately so as to address existing threats; ideally, existing arrangements should be revised and reformed to account for future, projected impacts (even where uncertainty exists, the precautionary principle can and should be invoked). With respect to planning regimes, and building on the analysis above, evidence of these eventualities differs according to whether the focus is statutory or strategic planning:

For statutory arrangements, evidence of climate change consideration includes: revisions to planning provisions to account for new climate risks (such as sea-level rise or more intense heat-island effects); development of climate vulnerability assessment and climate adaptation plans; conditions on development approvals; explicit recognition of climate change in assessment procedures; agreements between planning authorities and developers or owners in relation to climate risk mitigation plans and/or support for upgraded infrastructure.

For strategic arrangements, evidence of climate change consideration includes: inclusion of climate change in strategic planning or development of a comprehensive climate adaptation strategy per se; guidelines on long term planning consideration and strategic responses to climate change for use by planning authorities; inclusion of explicit 'triggers' in legislation for consideration of climate change in all levels of strategic planning.

In recent years, a number of states and territories have amended strategic and statutory planning to support climate adaptation planning. In this section, we provide an overview of those developments. The range of impacts which could be considered is lengthy, so we restrict the analysis to three major impacts: sea-level rise, bushfire risk, and floods. Similarly, the volume of activity and reform undertaken by Australia's local governments and state/territory governments is relatively impressive, and rather than list all revisions by all authorities, we highlighted those reforms that are most substantive.

Discussion: Enabling factors for climate adaptation planning in practice

While allowing for a variety of limitations in the planning regimes identified and documented in this case study, there was strong evidence to suggest that Australia's planning arrangements are evolving to take account of climate impacts and a number of laws have been amended to that effect, and some institutions have been established to give effect to those revisions.

However, as alluded to in our Introduction, we are ever mindful that in a review of existing planning regimes and their capacity to support or impede adaptation planning and practice, there is a need to assess not only the planning laws, or even the plans themselves, but also the institutional context in which those laws are

implemented (or not). In that way, we are interested in 'enabling factors', such as the institutional settings and organisational structures for planning regimes, which are the 'soft' side of planning, but which ultimately determine how vigorously and rigorously a government can/will act in scrutinising its own policies and proposals, because the institutional settings dictate who has the necessary independence, authority, human and financial capacity and skills to undertake an independent assessment for decision-making. An example to illustrate the point: the current Environmental Protection and Biodiversity Conservation (EPBC) Act (1999) makes provision for the extensive use of strategic environmental assessment (SEA), but that provision is under-utilised for a variety of reasons, and, even where it is invoked, the successful implementation of SEA depends to a large extent on the quality of existing assessment processes and human and information resources in the relevant sector (Marsden 2005).

A wealth of evidence is now emerging on where there is an absence of these so-called enabling factors and in this section we distil that work to identify the primary impediments for climate adaptation planning *in practice*. We categorise these impediments according to: limitations in planning regimes per se; limitations in human and financial capacity; and limitations relating to the provision, accuracy and quality of climate relevant information for planning decisions.

Limitations in planning regimes

Early signs suggest that significant progress has been made to account for climate change in Australia's existing planning regimes and that those regimes are, in the main, flexible and dynamic in the way that they were originally designed to be. However, even from the nascent progress summarised above, there are a number of factors which could limit the opportunities for national adaptation planning through existing statutory arrangements.

The first and most obvious limitation is that planning regimes in Australia regulate *prospective or future* use and development of land. Moreover, 'existing use rights' protect the use of existing buildings and works connected with the existing use. As de Sousa and Thwaites point out, this means that the use of back zoning to curtail development in areas that are vulnerable to the effects of climate change will have no effect on use or development for which there are existing use rights (de Sousa and Thwaites 2011: 67). In other words, statutory planning regimes are almost impotent to protect the existing built environment from climate change. This is a serious impediment given that many of Australia's existing built environments are already vulnerable to heatwaves, bushfires, storms, floods and sea level rise (DIT 2012: 135). However, State and Territory legislation contains a 'trigger' which could address this impediment: when existing building stock undergoes major alterations or additions those alterations must conform to the standards set out in the Building Codes of Australia (BCA). Additional triggers also exist for when a building is subdivided or where the classification of the building is changed (de Sousa and

Thwaites 2011: 61). The importance of these triggers cannot be overstated, for two reasons: first, because it presents an opportunity for current planning regimes to influence existing building stock; and second, because it provides an opportunity for national adaptive capacity to be developed through the use of national reference tools, namely the BCA but also associated guidelines such as through Standards Australia.

The second issue relates to the trade-offs identified in the Victorian bushfire example above, whereby reforms to Victoria's planning laws following the tragic bushfires of 2009 illustrate direct consideration of climate impacts and thus the need to adapt, the subsequent importance given to human life could see unintended and unwanted trade-offs. While Foerster (2012) mentions biodiversity conservation as the most obvious trade-off, it is also possible to imagine indirect consequences, for example in relation to the availability of affordable housing or increased energy use². It may be pertinent to review the strategic direction provided in overarching framing instruments on these issues to ensure that decision makers are required to consider and mitigate environmental impacts when making strategic and statutory decisions on the management of bushfire risks (Foerster 2012: 333).

The third issue relates to 'two speed' adaptation. Some jurisdictions have moved quicker than others to account for the possible impacts of climate change. As with any policy issue, the problems associated with there being 'leaders' and 'laggards' in policy reform and implementation relate to the inequity of some jurisdictions being better prepared while others are disadvantaged, which is particularly worrying in relation to climate change (Adger and Barnett 2012). A fragmentation between jurisdictions can also add unwanted transaction costs for developers and investors, who necessarily must address proposals differently according to different planning regimes. However, the counter-argument to any criticism of a 'two speed' process is the opportunity for laggard states to learn from the 'best practice' example of the more progressive jurisdictions. This is a well known advantage of federal systems, and was highlighted as a particular strength in the recent COAG review of strategic planning in cities, which recommended that "COAG note the best practice highlights of consistency against the agreed criteria" (COAG Reform Council 2012: 15). Moreover, as was the case with the second phase of the Local Adaptation Pathways Program, a consortium approach to climate adaptation amongst councils proved particularly useful as experiences and resources were shared.

The fourth impediment in relation to the design and reach of planning regimes relates to the non-mandatory nature of many of the statutory provisions (even after recent reforms, see QLD), and the related issue of enforcement. The exception here seems to be Victoria's recent reforms in relation to bushfire risk, but certainly in the case of floods and sea-level rise, the absence of mandatory provisions or punitive

² For example, clearing away native bushland to reduce the risk of bushfire, also reduces the natural 'cooling' effecting of trees in urban settings, which can in turn see the need for more air-conditioners and hence more energy consumption, and finally an increase in GHG emissions.

measures in the absence of robust mitigation plans, tends to undermine climate adaptation planning in practice. Nevertheless, if one considers that climate adaptation is a very recent policy issue, it stands to reason that the current trend towards more frequent review and revision of planning regimes and associated standards, may yet see more stringent provisions introduced. Recent moves by the insurance industry in QLD could prove to be the catalyst for such reforms (Wenger et al. 2012; and Case Study 7).

Limitations in human and financial capacity

The overwhelming conclusion from all the case studies in this project, and from other relevant studies (see for example COAG Reform Council 2012; PMSEIC 2011; Gurran et al 2011; PC 2012; Maddocks 2010, 2011) is that a major impediment to better climate adaptation planning in practice is the lack of human and financial capacity within local (and to some extent state/territory) authorities³. This manifests in different ways, as Gurran and her co-authors (2011) discovered in their assessment of local adaptation planning in coastal communities. In that study - and reinforced in our case studies - local governments expressed particular concern about the lack of capacity and experience in planning for and minimising bushfire risk in their areas. In other studies, a lack of capacity and experience in planning for and minimising flood risk was a concern (Wenger et al. 2012), while the Productivity Commission (2012) also identified lack of expertise and available time as a key impediment to climate adaptation planning in local governments. In Case Study 5 of this project, we found an absence of time amongst local and state government employees as a key barrier to achieving better integrated decision making in climate adaptation planning.

The quality of professional expertise and standards in undertaking climate vulnerability and risk assessments is also a potential problem in some jurisdictions. A number of participants in the Gurran et al. (2011) study pointed to concerns about the lack of effective monitoring of the quality of private sector risk analyses being undertaken, particularly work being commissioned by developers to support a planning application. In part, these concerns are associated with the lack of clear industry standards and technical criteria governing data sources and analytical methods used in this rapidly evolving area of practice (see next limitation).

The full financial implications for adapting to climate change impacts remain unclear, but all local governments are already experiencing increased budgetary pressure associated with managing climate risk. According to Gurran's study (2011: 44), the major areas of expenditure include increased costs associated with obtaining legal opinions and, in some cases, defending planning decisions; meeting insurance premiums; and, coastal protection works. Other expense areas relate to staff education and time, as well as consultant studies and expert advice.

³ Note this is not a new issue: lack of capacity in local and catchment authorities has also been a significant problem with respect to natural resource management (see Benham et al. forthcoming).

Limitations relating to the provision, accuracy and quality of climate relevant information for planning decisions.

In the COAG Review of Strategic Planning in Cities, a major impediment identified was the lack of sound information and evidence. They identified three areas for further work in this field, articulated in Recommendation 3 of their report:

- “A need to improve information on cities—Work should be done to understand what information is readily available and what could be available through greater access to administrative data and ‘smart’ systems.
- Supporting sound policy evaluation and review—Based on better information, work could be done to improve evidence-based policy analysis and review regarding the nationally-significant policy issues in cities.
- Measuring progress—There is a case for greater knowledge sharing and collaboration on these systems across governments to improve the credibility of Australian capital city strategic planning systems and provide a sound framework for evidence-based policy interventions.”

Similarly, in almost all of the work reviewed for this synthesis on planning regimes, an absence of fine-scale modelling and information on climate risk was identified as a key impediment to producing vulnerability assessments by local governments. To some extent this is a problem of science rather than a lack of resources or effort, and recent efforts by the Bureau of Meteorology, Geosciences Australia, and CSIRO to address this deficit is promising. Nevertheless, for all local planning authorities to be able to access and effectively utilise that information, they will need to have adequate financial resources and expertise. A shift towards more collaborative work between councils would lessen the demands on people’s time and resources.

Conclusion

In our assessment, Australia’s planning regimes do support national adaptation planning inasmuch as there is clear evidence of:

- An awareness of climate risk amongst all levels of government, and particularly of the relevance of climate impacts to existing statutory and strategic planning;
- Climate risk having been, or likely to be soon, incorporated into key, relevant statutory arrangements such as planning and strategic decision-making, regulatory frameworks, technical standards, performance-based standards and some policy processes, at all levels of government, and
- Bottom-up initiatives by local governments and authorities to utilise those arrangements so as to increase adaptive capacity in communities and regions.

Australia's regulatory and institutional landscape is designed to be dynamic and flexible. In our assessment, that flexibility was evident, although admittedly the machinations of statutory reform is not a *quick* process. Nevertheless, our research, combined with others', has shown that all jurisdictions in Australia have made recent reforms to their planning and strategic decision-making, particularly after the devastating bushfires in Victoria in 2009, and the floods in Queensland and Victoria in 2010-2011. However, we did identify some qualifying factors, for example:

- Some States/Territories are lagging behind in the review and reform of existing arrangements, with the result that statutory arrangements can be more or less 'robust' depending on the jurisdiction;
- There is evidence of perverse incentives or conflicting policy goals in higher order policies and associated legislative arrangements i.e. drought policy, disaster relief policy, the primacy of human life over other social objectives in planning regimes; and
- Almost all of the planning arrangements we assessed apply to new developments, projects and infrastructure, so that existing dwellings and infrastructure are not captured by the revised legislation, except in certain circumstances (in-fill developments, or post disaster reconstruction).

Nevertheless and even allowing for these qualifying factors, in terms of legal prescription, current arrangements are sufficiently flexible and dynamic to support climate adaptation planning over time.

Unfortunately, while the evidence suggests that existing planning regimes are adequate in terms of legal prescription, our assessment indicates that those arrangements do not support climate adaptation in practice. Based on our analysis against these broader, contextual issues, we identified three significant impediments to national adaptation planning in practice:

- Lack of clear and consistent implementation frameworks to guide adaptation planning
- Lack of financial and human capacity at the state and local level to adequately implement adaptive strategies, and
- Detailed information, data and response strategies are patchy, not fit-for-purpose and lack accreditation processes.

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CASE STUDY 3

Information and analysis for climate adaptation: uncertainty, conflict, coordination and the role of the Commonwealth

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Introduction

A key challenge in climate adaptation lies in generating the information needed by decision-makers in government and in vulnerable sectors and communities to manage the risks of climate change impacts. This is made all the more difficult in light of the inherent uncertainty around climate impacts, and the complexity of addressing multiple impacts across multiple scales (Hallegatte et al. 2012). In Australia, the establishment of the *National Climate Change Adaptation Research Facility* (NCCARF) in 2008 was the first step in the long road to generating that knowledge, and considerable, valuable research has been produced in Australia and internationally in recent years. The focus of that research has been on, variously: scientific assessments of the likely impacts of climate change (floods, heatwaves, sea-level rise etc.); identifying the sectors and communities most vulnerable to those impacts; and understanding the social, economic and institutional dimensions of adapting to climate change. The broader project, within which this paper sits, lies in the latter category, addressing as it does the ‘enablers’ and ‘barriers’ to climate adaptation in Australia’s statutory and institutional arrangements.

In the context of that broader project, we identified seven policy mechanisms through which Australian governments may be able to increase adaptive capacity within society, including: inter-governmental agreements; intra-governmental agreements; regulation by prescription; planning and strategic decision-making; market based mechanisms; the provision of funds; and generating and disseminating information and analysis on climate adaptation (Hussey et al. 2012). The focus of this paper is on the final mechanism, the provision of information and analysis to be used in decision-making as a means of increasing adaptive capacity and/or avoiding ‘maladaptive’ outcomes. In particular, we are interested in the focus, sources and targets of that information and analysis. Interestingly, while the primary ‘users’ of information in relation to climate adaptation are state and local governments, it is often the federal government that funds climate adaptation research (Farber 2009). For example, in Australia, the Commonwealth Government’s total investment in research and development in 2012-13 was just under \$9 billion (DIISRTE 2012:

100)⁴; a figure which suggests that the significance of the ‘information and analysis’ function as a means to achieve national objectives cannot be overstated. Our objectives in this paper are threefold.

First, we explore the range of different mechanisms by which knowledge on climate adaptation is currently generated and disseminated to the sectors and communities that need it. Our key question here is: how is climate-relevant information and analysis currently being generated, by whom and for whom? We focus our analysis particularly on the provision of funds by the Commonwealth Government to organisations such as NCCARF, the National Competition Grants Program of the ARC, funding through the National Health and Medical Research Council, GeoScience Australia, the Bureau of Meteorology, CSIRO and particular programs through Commonwealth and State/Territory departments. We also explore the role of end-users and stakeholders (such as local councils, insurers, primary producers etc.) in generating climate-relevant information for their own purposes, noting that several of the other case studies (4, 5, 6 and 7) in the project have gone into considerably more detail on this point and thus we confine ourselves in this paper to the implications for Commonwealth funding.

Funding and generating information and analysis to support climate adaptation is not itself an end-goal; *impact*, as demonstrated by increased resilience and adaptive capacity in society, is clearly the intended outcome. Indeed, with significant investment in climate adaptation research and analysis, one would hope to *at the very least* identify and avoid maladaptive outcomes. However, the peculiarities of climate adaptation as a policy problem – the need to evaluate location-specific impacts and responses, uncertainty in projections, and ambiguity in who ‘owns’ the problem – means the information and analysis generated risks missing its intended audience. Thus, not surprisingly, and despite the existence of excellent research in this domain, policies and decisions are made which often produce unwanted and maladaptive outcomes (Barnett and O’Neill 2011). In light of this, the second objective of the paper is to identify impediments to climate adaptation *within* the knowledge-generation sphere. In particular, we’re interested in the development of ‘blind spots’ in climate-relevant knowledge which might lead to suboptimal or ‘maladaptive’ outcomes. Our key question here is: are existing platforms for knowledge generation and analysis sufficient to increase adaptive capacity amongst societies and communities? To provide sufficient depth to the analysis, we have chosen the ‘climate-energy-water’ nexus as the lens through which we explore this question. Specifically, we explore climate mitigation policies aimed at reducing GHG

⁴ State and territory expenditure on R&D in the 2008-09 period was \$1.2 billion and since the Global Finance Crisis fiscal constraints have impacted on how states and territories focus their funding. For example, the State and Territory proportion of Australia’s expenditure on agricultural and veterinary sciences research has decreased from over 60 per cent in 1992-93 to around 30 per cent in 2008-09. See DIISRTE 2012: 30.

emissions which could consequently result in maladaptive outcomes for the water sector. We have chosen the 'climate-energy-water' nexus as our case study owing to (i) the complex, inter-sectoral knock-on effects and/or trade-offs that are only now coming to light (ii) the variable outcomes in the nexus depending on the geographical context and (iii) the positive 'feedback loop' that exists between climate mitigation and climate adaptation. In this way, the 'nexus' is emblematic of the potential to either overlook synergistic opportunities in policy-making, or, alternatively, to unwittingly encourage maladaptive outcomes, in the absence of complete knowledge (Hussey and Pittock 2012; Pittock 2011).

Building on the analysis above and so as to achieve the aims of the broader research project, the final objective of the paper was to make preliminary conclusions and recommendations on future directions for the provision of information and analysis to increase adaptive capacity in Australia. This final objective draws out particularly interesting insights in relation to the feasibility of the Commonwealth Government using *one or more* of the seven major 'policy mechanisms' to address both knowledge gaps and barriers to adaptation.

Discussion: Funding and the role of the Commonwealth in climate adaptation

In this paper we identified a number of important and inter-related issues. The first is that the Commonwealth Government - through its research investment programs - funds over \$9 billion of research annually. There is, therefore, a direct link between two of the policy mechanisms at the Commonwealth's disposal: the 'information and analysis' function; and the 'funding' function. The importance of this link cannot be overstated because it affords the Commonwealth considerable influence in what research is undertaken, and under what conditions.

We also saw that an abundance of information on climate adaptation already exists; some of it historical owing to Australia's experience with climate variability, some of it very recent through NCCARF and targeted programs in CSIRO and Geoscience Australia. Indeed, in some respects we could say there an abundance of adaptation-relevant research, the very problem though is that *local* information on climate impacts is often lacking, is not publically available or is not used (Wenger et al. 2012). This deficit in local information on climate impacts is to some extent a consequence of the limitations of climate science discussed in Section 2. And aside from all of that, we know that all the information and analysis done on climate change and climate adaptation is subject to high levels of uncertainty.

Luckily, this is not the first time that Australia has had to deal with an issue that demands local uptake, involves multiple users, contested science, and a degree of 'fuzziness' between the multi-levels of government. Since the 1980s, Australia has been grappling with these issues in the context of natural resource management,

and it is instructive for this paper to review some of the steps taken in that policy domain.

Since 2002, the Australian Natural Heritage Trust Phase 2 (NHT2) has required community groups seeking funds for natural resource management projects to have developed nationally accredited regional strategies and investment plans. In one study by Farely and Conacher (2007), progress of one such regional (and sub-regional) group was examined, in particular the perceptions of the community group members and other stakeholders of the overall process. Through interviews, participant observation and document analysis in 2004–05, the process of developing a regional strategy and an investment plan by the Northern Agricultural Catchments Council in Western Australia, and the involvement of regional stakeholders in the process, were examined. While the concept of regional-scale management was perceived favourably by community interviewees, their concerns related to increasing bureaucracy, the need for further local involvement, more on-ground action instead of further planning, the relevance of the regional Council to local communities, and the motives of Council members. Communication with regional stakeholders was extensive in preparing the regional strategy, but fell short during the development of the investment plan. The success of the regional planning process rested on whether members of the regional community actively implement regional priorities, and whether long-term funding and support from the State and Australian governments are provided (Farely and Conacher 2007).

The parallels between NRM planning and climate adaptation planning are clear: both demand local knowledge, multiple policy strategies to achieve desired outcomes, long term implementation, monitoring and evaluation to assess outcomes and success (or failure), and both rely on local organisations to be sufficiently resourced to achieve outcomes over the long term. Together with the energy-water case study described above, it is clear that much adaptation and NRM is indeed linked - and the key institution around which those issues pivot is at the local or regional level.

However, State and Territory governments have never been the sole sources of funding for local or catchment management authorities to undertake NRM activities. The Commonwealth has had a pivotal role, in two ways: funding, and the provision of information. If the lessons of NRM in Australia can tell us anything, it is that capacity building at the local level is vital, and the only sustainable source of funding over the long term will be from the Commonwealth. Foerster (2012) cites the role of the Country Fire Authority as pivotal in bushfire prevention and management in Victoria, which further attests to the importance of local organisations in climate adaptation planning and practice. The second link to the Commonwealth lies in the provision of information from Commonwealth-funded research and Commonwealth funded agencies, such as BOM, CSIRO and GA. There are, therefore, several links between Commonwealth funding and local, on the ground adaptation. Indeed, Hallegatte very deliberately links the two relationships by suggesting that climate adaptation would be more efficient through the creation of local expertise, financed as research and development

institutions (Hallegatte 2012: 9). In our assessment, based on this case studies and others in the project, there is very strong potential for the Commonwealth's funding to be used most efficiently through the development of 'clusters of councils' which can exploit critical mass to fully benefit from scarce financial and human resources, both obtaining information and in utilising that information for climate adaptation planning and practice.

Conclusions

The focus of this paper was on the potential and scope for the Commonwealth Government to use its role in the provision of information on climate adaptation to greater effect. From this analysis, we found several barriers that exist to reduce the usefulness of that information:

- Policy, epistemic and aleatory uncertainties in the climate science and modelling exist which make it more difficult for decision-makers to assess investments for long term climate resilience.
- There is an absence of accurate fine-scale modelling for local contexts, resulting in significant knowledge gaps about what the impacts will be at a local level and therefore how best to respond.
- The numerous end-users of climate adaptation information and analysis, across all sectors of society and levels of government, make it difficult to prioritise research needs when the end-users are limitless but the funds are finite.

Nevertheless, there have been tremendous steps taken in identifying and filling research gaps, through the various research and information mechanisms established by Commonwealth funds. For example, through NCCARF, CSIRO, the Bureau of Meteorology, Geoscience Australia, RIRDCs, and the competitive grants schemes of the ARC and NHMRC. Co-funding arrangements between Commonwealth funds and universities, industry-funded entities such as RIRDC and the private sector have shown the capacity for tax-payer dollars to be leveraged to greater effect. 'Supporters' of this policy function therefore include:

- A long-standing, sizeable and talented research capacity to provide the supporting science behind decision making, including adaptive management
- Institutional arrangements that enable Commonwealth initiatives to lever funds with industry-funded, university-funded, or state/local government-funds to establish climate adaptation projects
- Strong ties that exist between science and extension, building on the NRM sphere (see Case Study 6), including through the process of participatory research, to enhance adoption of adaptation strategies.

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CASE STUDY 4

Market mechanisms and industry policy: the financial market

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Objectives

The broad purpose of this case study is to explore the role of private finance in supporting climate adaptation efforts. Specifically, the objectives of this paper are threefold:

- identify existing Australian policy that motivates private sector finance to protect assets from the risks of climate change;
- identify extant institutional or regulatory barriers that inhibit private sector finance for and investment in adaptation strategies and projects; and
- make regulatory recommendations for how the Australian government could stimulate a greater flow of private sector finance/investment for climate change adaptation.

In addressing these areas, this study aims to facilitate understanding of how different policy mechanisms interrelate and stimulate climate finance for adaptation.

Methodology

A combination of documentary sources and interview data was used for this case study. Documentary sources included: relevant government policy documents and industry reports; PowerPoint presentations from industry and non-government organizations (NGOs); submissions to government by industry and NGOs; bank equity investment strategy documents; bank policy documents; media articles; and NGO reports.

Interviews were conducted with experts in Australia and, for the purposes of comparison and broader discussion, the United Kingdom (UK). A total of nine interviews were conducted by phone or in person in September 2012. Australian interviews were undertaken with staff from the Investor Group on Climate Change Australia/New Zealand (IGCC), the Carbon Bonds Initiative, and Climate Risk Pty Ltd. The UK interviews included staff at the London School of Economics and the Grantham Research Institute, the Climate Group, and the Institutional Investors Group on Climate Change Europe (IIGCC). The aim of interviews was threefold: to gauge investors and financiers' current awareness about adaptation; to understand what motivates and impedes their action; and to discuss how private finance for adaptation might best be mobilised.

Findings and recommendations in this paper were also informed by interview data from an earlier project on mitigation finance, which comprised 19 interviews with managers that head up the teams/units responsible for carbon and climate-related bank practices. These interviews were conducted in Australia at Westpac and ANZ in September 2011, and in the UK/Europe and the United States (USA) at HSBC, Deutsche Bank, Credit Suisse, Citi and Morgan Stanley during May-June 2010.

Finally, several Australian finance experts provided comments on drafts of this paper to ensure that the recommendations had merit and traction from a practical perspective. Those experts were from the IGCC, Climate Bonds Initiative, Climate Risk Pty Ltd, Mercer LLC and Australian Super.

Structure of Paper

The paper was structured as follows. Part 2 reveals the crucial relationship between private finance and climate change adaptation. It starts by outlining the different types of private sector finance institutions and their function in a market economy before describing the business case logic of such actors and the increasing relevance of climate risk to their decisions. Specifically, it pinpoints the importance of procuring and leveraging private finance for adaptation efforts in Australia.

Part 3 identifies and assesses existing Australian policy in two sections. The first section addresses existing and forthcoming policy initiatives that encourage financial investment in low-carbon options in order to protect long-term monetary assets, such as superannuation. The second section addresses extant policy that encourages adaptation investment into physical assets and infrastructure.

Part 4 reviews salient institutional and policy barriers that inhibit private sector finance for and investment in adaptation strategies and projects. In particular, it pinpoints a lack of current incentives for private adaptation investment in physical assets and infrastructure.

Finally, Part 5 makes recommendations for a national adaptation policy framework that comprises: (a) a central climate-related information repository; (b) non-coercive steering regulation to encourage private finance; and (c) coercive regulation that directs how private finance actors must assist adaptation.

Summation

Climate finance for adaptation in developed nations is a new area. This paper has (a) provided a working definition of climate finance for adaptation and (b) identified extant policy incentives and institutional and policy barriers to it in Australia. The findings show that current statutory arrangements and market-based policy mechanisms are insufficient to stimulate private climate finance for adaptation at scale in Australia.

Consequently, a consistent national policy approach is required. It needs to comprise a regulatory mix to encourage, leverage and procure financial resources for adaptation at the necessary scale. Specifically, this paper recommends the implementation of a central information repository as well as new adaptation policy (both coercive and non-coercive) to complement Australia's existing low-carbon policy framework.

Summary of Findings

Several salient institutional and policy barriers exist that inhibit private sector climate finance for adaptation in Australia.

Institutional barriers include the private finance sector's lack of awareness of climate change impacts and experience in identifying and making climate-related investments. There is also the difficulty of preparing a robust business case to cover the expected lifetime of physical infrastructure due to information gaps on precise local impacts of climate change and the non-inclusion of social returns. In turn, this perpetuates investment reticence due to information asymmetry and skewed perceptions of risk.

Policy barriers to financing adaptation in physical assets or infrastructure in Australia are brought into stark relief when contrasted with the investment-grade low-carbon policy framework. There are no equivalent market policy mechanisms that encourage finance for adaptation in physical assets or infrastructure. NPA grants, existing building guidelines and company reporting requirements are all insufficient to incentivise private adaptation investment/financing, especially for existing assets and large portfolios. Moreover, disparate sources of information and conflicting planning regulations at different government levels impede private adaptation endeavours.

Summary of Recommendations

A national policy framework for adaptation will stimulate private finance to increase the resilience of existing and future infrastructure/physical assets. Specifically, policy mechanisms need to: leverage private finance at both wholesale and retail levels; overcome the institutional barriers of a lack of awareness and 'how to' experience; and cover information gaps and multi-jurisdictional inconsistencies.

The following recommendations have drawn on international policy analogs as well as suggestions from Australian experts. This policy design enables public finance to be phased out over time as private sector actors gain the tools and experience to manage risks autonomously. In short, the federal government needs to:

- Create a central repository of climate-related information with general access in order to: (a) ensure a common reference framework for the private and public sectors at all levels; and (b) facilitate adaptation investment decision-making.

- Monitor and support new tools for making a robust cost-benefit analysis in the adaptation space, such as the CBI/Climate Risk initiative.
- Provide anchor financing, concessional finance, subordinated or mezzanine debt and/or grants to encourage public-private co-financing, particularly in major infrastructure assets with high social returns. Also, encourage creative use of insurance products for projects with high upfront costs or uncertain returns. The CEFC's mandate could be extended to include these aspects or to cover 'adaptation projects' generally.
- Amend asset development and planning processes, such as Environmental Impact Assessments, to obligate developers and owners to consider climate impacts on existing assets.
- Require companies operating in Australia to report on their climate risks and adaptation measures via an amendment to the *Corporations Act 2001 (Cth)* or, at the very least, a new ASX guidance on climate change disclosures that public companies should provide in financial filings.
- Implement ITCs and/or Grants that encourage private sector investment in existing and/or future physical assets and infrastructure, potentially titled the 'Federal Adaptation Tax Incentives program'.
- Issue Climate Bonds.
- Implement policy mechanisms that support the issuance of Climate Bonds by other entities (corporations, municipal councils), such as tax credits, FITs and legal frameworks that drive income streams for issuers and encourage banks as underwriters.
- Implement new legislation that mandates how private finance actors must facilitate climate change adaptation by way of taxation and/or prescription. A tax would take one of two forms: an FTT levied on the value of financial transactions or a FAT levied on the profits of financial institutions. Financial activity prescriptions would stipulate how financiers must support adaptation, for example, by lending at preferential rates to commercial and household adaptation projects.

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CASE STUDY 5

Regional/Local Cross-Mechanism Relationships: The Case of the City of Melbourne Council

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Introduction

This case study is one of a suite of seven which, when aggregated and analysed, address the question: *Do Australia's existing statutory frameworks, associated institutions and policy processes support or impede national adaptation planning and practice?* The focus of this paper is the urban local government response to the cumulative impact of a range of adaptation policy and institutional measures, other papers focused on this in the context of primary industries and floods.

The rationale for an urban case study is simple; Australia is an urban nation, with 70 per cent of the population concentrated in metropolitan centres situated along or very close to the coast (Steele, 2010). This coastal proximity makes cities vulnerable to many of the impacts of climate change, specifically changes in temperature, sea level rise and extreme weather events. To date, Australian capital cities have responded to the challenges raised by climate change adaptation through position statements, action plans, strategies and risk analyses. These responses have largely been at the local government level, through city councils, and it is their interaction with national, state and regional government initiatives, programmes, policy mechanisms and institutions that this paper explores.

Such interactions are of practical as well as theoretical interest as they can tell us much about those things that support or impede successful adaptation planning and practice at the local decision-making level. As has been widely argued, the local nature of most adaptation responses requires a certain level of coordination at different jurisdictional scales in order remove potential constraints imposed by national or regional processes (Juhola and Westerhoff 2011; Adger et al., 2005). Without such coordination the end result may be maladaptation and increased vulnerability (Burton 1997). Yet across the globe, including in Australia, harmonious relationships between various levels of government in the governance of adaptation remains a significant challenge (Juhola and Westerhoff 2011; Juhola 2010; Keskitalo, 2010).

The two objectives of this paper are:

- (i) to assess the extent to which current policies and institutional arrangements promote or impede climate adaptation in practice (the 'practice objective'); and
- (ii) to make a significant contribution to the development and implementation of a strategic national policy framework (the 'framework objective').

Methodology

This paper uses the City of Melbourne as the focal point for an inter-jurisdictional examination of the cumulative impact of the range of adaptation policy and institutional measures. The City of Melbourne presents an ideal case to explore these issues due to its size, planned expansion, location and comprehensive strategy to address and integrate the challenges of climate change adaptation as articulated in its 2009 City of Melbourne Climate Change Adaptation Strategy. The area of the city covered by this plan has a present resident population of 80,000, swelling to 760,000 during the working day and covers an area of 36.5 km². Within this con-urbanised space exists a diversity of land typologies and demographics; wetlands, port zones, light industrial areas, a marine environment, the central business district and high density residential areas. Each of these has different stakeholders, vulnerability to climate change impacts and potential adaptation responses. Similarly, each interacts with wider jurisdictional and governance issues in relation to climate change adaptation.

The City of Melbourne (CoM) was selected as a cross-mechanism case studies because of the rich diversity of national policies, frameworks and institutions with which the Council directly deals, is influenced by or needs to acknowledge when undertaking its own initiatives. Table B.3, for example, shows how this diversity corresponds to each of the mechanisms in the matrix. Moreover, the CoM's Climate Change Adaptation Strategy is one of the most comprehensive of its type in Australia.

Table B.3: Examples of the relationship between the Case Study Matrix and City of Melbourne local jurisdiction policy and institutional mechanisms

Mechanism	Examples in the City of Melbourne
1. Inter-governmental function	<ul style="list-style-type: none">• Local government is recognised in the Constitution Act, 1975,• The Local Government Act, 1989, provides a framework for the operation of councils• The City of Melbourne Act, 2001, contains provisions relating to the differences between the City of Melbourne and other local councils.
2. Intra-governmental function	<ul style="list-style-type: none">• The CoM is a member of a number of council networks and alliances:• South East Councils Climate Change Alliance (SECCA)• The Victorian State Government Greenhouse and Climate

Mechanism	Examples in the City of Melbourne
	Change Alliances (GCCA) <ul style="list-style-type: none"> • The Central Victorian Greenhouse Alliance (CVGA) • The Northern Alliance for Greenhouse Action • The Council of Capital City Lord Mayors (CCCLM) • The C40 Cities Climate Leadership Group
3. Regulation by prescription	<ul style="list-style-type: none"> • Local government may make and enforce by-laws within their competence powers which are not expressly excluded by other State or Federal legislation
4. Planning processes	<ul style="list-style-type: none"> • Council Municipal Strategic Statements (MSS) and Local Planning Policies (LPP) must both further the objectives of Victorian State planning in the State Planning Policy Framework
5. Funding function	Two Council funds potentially provide resources for Climate Change: <ul style="list-style-type: none"> • The Sustainable Melbourne fund • Environmental Upgrade Fund The Australian Government provides funds under the: <ul style="list-style-type: none"> • Local Adaptation Pathways Program • Local Government Infrastructure Program
6. Information and analysis function	<ul style="list-style-type: none"> • The CoM website, factsheets and flyers contain information on climate change responses and mitigation • The City Switch Program provides information on energy efficiency (albeit weighted towards mitigation) • Various alliances with other council groups such as the NAGA and the GCCA share information on climate change adaptation responses
7. Supporting market arrangements	<ul style="list-style-type: none"> • Businesses are key stakeholders and voters in the CoM electorate. • Most funding for climate change initiatives has focussed on mitigation, see (5) above

Following initial discussions with CoM staff, the originally proposed data collection process was fundamentally altered. In addition to detailed background reading and literature review analysis, the case study had intended to interview up to 20 key informants from within the Council. However, because staff of the CoM have been involved with numerous academic studies on a wide range of subjects over recent years, the first author was granted permission to undertake the case study on the condition that it utilized interview and focus group data collected from another recent climate adaptation study dealing with policy framing (Fünfgeld and McEvoy 2011). In order to abide by the ethics approval processes of the two research institutions concerned, the principal investigator of the framing study was invited to participate and contribute as an author to this study. All authors have taken care to avoid abusing the confidentiality of data collected previously. In essence, therefore, this case study is largely a desk-top analysis of readily available information, supported

by interaction with key CoM informants who provided periodical briefings as well as feedback on drafts of the case study report.

The analysis in this paper follows the format set out in Hussey et al 2012. It addresses how each of the policy and institutional mechanisms of the matrix plays out in the implementation of the CoM's adaptation strategy and the degree to which, the strategy addresses the characteristics of effective adaptive capacity and resilience (after Cork et al 2011) namely: clarity of purpose, diversity, connectivity and integration and feedback (see Hussey et al 2012 for a more detailed description).

Discussion on the resilience framework and the City of Melbourne's adaptation strategy

Clarity of purpose and issues

The CCCLM submission to the Productivity Commission's adaptation review acknowledges that "adaptation is not a simple concept . . . [but that] . . . effective adaptation should address environmental, social and economic impacts, and not focus narrowly on economic and community impacts" (CCCLM 2011 p1-2). Despite this clear triple bottom line message, the member Councils of the CCCLM, including the CoM, revert to economic benefits when conveying climate change messages to potential investors and adopters (or adaptors). In other words, while a broad based sustainability purpose behind a climate change adaptation strategy may be intended, it becomes difficult to pursue in practice, particularly where there are personal, community and business costs associated with difficult to measure benefits over timeframes which are unknown. For this reason, adaptation needs to be seen as a process rather than as an outcome, but selling the benefits of a process is potentially even more difficult.

Where does clarity of purpose come from? The CoM's endeavours to implement the *Climate Change Adaptation Strategy* are limited by its reliance on collaborations, partnerships, coordination and leadership. Yet the very impetus for the Council's involvement in climate change action is due to the lacuna it recognised in these things at the turn of the millennium. A dozen or so years later, the CoM and its fellow CCCLM members still seek the roles and responsibilities for each level of government for climate change adaptation policies to be clarified and agreed by all levels of government (CCCLM 2011 p1 and p9).

Clarifying the governance of adaptation remains a pivotal challenge for all levels of government (Adger et al., 2005). The Australian Government recognises that adaptation is best undertaken at the level most locally relevant to impacts, but the three tier form of governance in Australia, ensures that frameworks to enable local adaptation become as much a political issue as a structural one. Specific roles for different actors in the adaptation space, in terms of administrative sectors and level

of governance, therefore remain generalised and as a result, subject to contention (Juhola and Westerhoff 2011). Ultimately, Juhola and Westerhoff argue, a lack of clarity and leadership in a multilevel governance regime could potentially lead to maladaptation, in that a lack of coordination may ultimately prove counterproductive to wider adaptation efforts in the future.

In the literature, three processes can be surmised that should improve coordination between multilevel governance regimes: 1) the participation of actors at one level in the processes of another as a means of gaining the ownership that comes from the formation of rules that will need to be implemented; 2) the creation of institutions or processes at one level specifically to influence processes or institutions at other levels; and 3) the sharing of knowledge produced in order to influence processes at other levels (Pahl-Wostl 2009). The processes of the DCCEE go some way towards this objective, but are not always reciprocated at the State level to local governments.

The call for greater coordination in multi-level governance systems is a simple one, but is not a silver policy bullet. Such coordination can demand the time, skills and resources of some actors, particularly at the lower levels, that are not readily at hand (Betsill and Bulkeley 2006). Even though such engagement is critical to the success of a national or state-wide strategy, it can consume not only the resources of essential partners better spent on actual implementation but also consume goodwill. In this sense, a poor approach to coordination can be self-defeating for the reasons above, while higher levels in multilevel systems also risk foregoing the opportunity to experiment and learn from multiple efforts at the lower levels (Jones 2011; Charbit and Michalum 2009), in the spirit adaptive policy (Dovers 1999).

Diversity

The risk management focus of the CoM's adaptation strategy is well understood and acknowledged within the CoM. The strategy was made possible with partial funding from the Australian Government, and so it bears the hallmarks of the risk-based approach advocated through the various toolkits, guidelines and other support material either prepared for or by the Australian Greenhouse Office and, to some extent, its successor, the Department of Climate Change and Energy Efficiency. The most tangible component of the approach is risk assessment, a fundamental first step in defining adaption responses and their feasibility. Some of this guidance material also promotes the adoption of adaptive management by local governments as a means to manage risks. Being a process rather than an action and consequently less tangible, the means to implement adaptive management are not described. As a result, the risk-based approach not only dominates most local government adaptation strategies where they exist, but together with the lack of a complementary adaptive management approach, it constrains adaptation thinking and responses to those that are more target driven and measurable.

Fünfgeld and McElroy (2011) suggest that this risk-based approach is only one of at least four frames through which adaptation responses can be identified, defined and acted upon. Other frames include a hazards approach, closely linked to disaster risk management; a vulnerability approach, which considers vulnerability in the broader context of interactions between climate and society; and a resilience approach, emphasising the ability of groups or communities to cope with the external stresses and disturbances as a result of social, political or environmental change. By looking beyond the risk-based approach, more effective strategies may be developed that take into account whole system vulnerabilities that have qualitative as well as quantitative manifestations (Kennedy et al 2010).

Adopting broader-based strategies requires not only the additional resources required to implement complementary responses, but also the support of other tiers of governance that have responsibility for intersecting components of whole systems.

Connectivity

This paper has described a number of networks and alliances in which the CoM participates either formally or informally. These enable the CoM to share its experiences and learn from others confronted by similar issues. They also allow the members to form a critical mass that can put forward common concerns or advocate common positions more forcefully. But they can also act to make it easier for others to interact more efficiently with a larger number of actors multilaterally than if they had to do so bilaterally. These networks therefore, may reduce the transaction cost of the coordination between tiers of government strenuously advocated in the literature and also by stakeholders. In the case of the C40 Cities, a group of 40 Councils from around the globe of which the CoM is a member, a network can also act to benchmark adaptation progress and achievement (C40 Cities 2012).

The value of networks is not lost on the CoM. Not only does it actively participate in them, it has established an Inner City Climate Adaptation Network comprising 34 member organisations. The network, launched on 30 August 2012, seeks to facilitate information sharing on specific adaptation issues.

While climate change adaptation demands a certain level of local specificity in terms of responses, in reality many responses may share foundations in the impact they are attempting to address or in the knowledge, skills or experience that are needed to underpin the response. Networks can play an important role here in allowing members to access these and other resources (Tompkins and Adger, 2004).

Moreover, from a systems thinking perspective, complex systems connected ecologically, atmospherically, hydrologically, economically and/or socially, networks and alliances can help avoid severing critical links. A resilience approach to adaptation would suggest that it may not be the formal institutions of multi-scale, multilevel governance systems that are most critical, but rather the informal networks that contribute to building resilience (Folke 2006).

Integration and feedback

Being the Council, with the most comprehensive, studied and cited strategy, engaged in the implementation of a climate change adaptation strategy, the CoM has few precedents to draw on to suggest how it should coordinate, implement, monitor and evaluate the strategy's multi-faceted activities and responsibilities. Coordination of the strategy draws on limited but highly dedicated staff resources. This further highlights the value of networks, previously discussed, in providing encouragement as well as feedback. The C40 Cities initiative is also an important element of gaining feedback on the CoM's performance benchmarked against other member Cities.

Conclusions

A number of findings from the case study are of cause for concern, because failure to act on them in the past represents an institutional failure. In particular, the need for greater coordination between all three levels of government is required so that the implementation of local adaptation strategies is not undermined by conflicting visions for development at the Council and State Government levels. This should be of concern to the Australian Government where it invests in risk assessments and local adaptation planning that processes that are not given due consideration in adaptation responses.

A highlight of the case study was the tension caused by funding for adaptation largely being project based, and therefore encumbered with quantitative outcome-based accountability measures inconsistent with the nature of resilience. As such, proposals for many activities are couched in terms of short-term demonstrable outputs that largely leave no legacy in terms of long-term adaptive capacity or self-sufficiency (including transitions to self-funding). One contributing factor to this form of maladaptation has inadvertently been the narrow risk assessment framing through which adaptation options are identified and pursued.

Alternative ways of framing adaptation include the hazards, vulnerability and resilience approaches. Different approaches to framing assessments and adaptation planning can result in significantly different adaptation plans, and therefore significantly different responses. This is because each framing has biases towards different institutions, disciplines, professions and types of people, all with different methods and processes. With each of these come diverse perspectives of what the problem is and what the solutions might then be.

City of Melbourne council received funding under the Commonwealth LAPP enabling the development of the comprehensive CoM CCA Strategy. In keeping with the risk management framework of the LAPP, the adaptation designated 'high value' by CoM focused on risk, rather than accounting for vulnerability or a hazards approach and, on examination, appear to be directed towards low cost and high feasibility adaptation options rather than those enhancing resilience for the impacts

hypothesised for the City of Melbourne due to its location (sea level rise, water supply stress and incidence of dangerously high urban temperatures).

It also emerges that despite an overlap with jurisdiction and responsibility with the state government, it is federal policy initiatives and funding that provide the impetus of climate change adaptation strategies and measures. The CoM does fund climate change initiatives in its own right but so far they are directed towards mitigation and energy saving and efficiency. Their reliance on grants for adaptation initiatives then, fosters strategically useful tasks and projects but does not provide for long term adaptation investment which supports community and business resilience beyond short term risk management.

Local governments target and choose federal discretionary funding, framing their initiatives in terms that satisfy discretionary funding award requirements, as a consequence of state governments shifting responsibility to the local level without providing supporting funding. Local governments may also need to align their development strategies with state governments where there is overlap across jurisdictional boundaries which can prove problematic if state governments then decide to excise a district from local government control. In short there can be a lack of co-ordination and integration between the three levels of government, hitherto and issue with sustainability and now manifest with climate change adaptation.

This lack of co-ordination has resulted in councils forming their own networks and associations to around issues where direction and guidance from other levels of government is lacking. This also allows for a sharing of resources and efficiencies not possible when dealing with state and federal governments and agencies as an individual council rather than an interest group or cluster of interested parties. The lack of intra-governmental co-ordination contributes to the fragmented approach to climate change adaptation across the city of Melbourne.

Another outcome in the absence of co-ordination is conflict, in the domain of planning, where local planning regimes may fall foul of state planning aspirations, for land use and development or the objectives of federal policies seeking to enhance climate change adaptation. There is an increasing tendency at local level to devolve regulation from planning and leave decision making to the free market. Here, the discretionary system discourages regulation following the market approach wherein benefits to the city beyond economic growth are rendered incidental. This approach forfeits the opportunity that regulation provides for flexibility and the wider benefits of some prescriptive outcomes, such as inspiring development aligned with social and environmental as well as economic goals. Adaptation is not forgotten in this market approach but is catered for by increasing timeframes for durability and which, by inference alone, *may* increase resilience.

Insufficient clarity, leadership and co-ordination in a multilevel governance regime can potentially lead to maladaptation, where a lack of co-ordination may ultimately

prove counterproductive to wider adaptation efforts in the future. In addition to the difficulties at lower levels of government, higher levels of government also risk foregoing the opportunity to learn in the spirit of adaptive policy.

Most local governments are not as well-resourced as the City of Melbourne, but even this Council struggles to gain access to the timely scientific, social and economic evidence to underpin policy decisions. While the impacts of climate change will differ from local government to local government, consistency of information and messages is important to gain confidence. There is a role not only for local and state institutions to be involved here, but there is a role for national research institutions to ensure data and analytical assumptions are benchmarked.

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CASE STUDY 6

Do Australia's existing statutory frameworks, associated institutions and policy processes support or impede national adaptation planning and practice: the case of primary industries

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Introduction

A legacy of the past highly regulated nature of Australia's primary industries sector is that it is institutionally rich in terms of the government, quasi-government and non-government institutions dedicated to industry policy, marketing, research, development and extension. Many of these functions have been dealing with the issue of adaptation in one form or another for close to two hundred years (Price 2012, 1994). Indeed, individuals involved in modern, largely western forms of agriculture have been struggling with adaptation from the first day these non-indigenous forms of food and fibre production were introduced to the one of the driest (Davidson 1969), most nutrient deficient (Wild 1958) and climatically variable (Cleugh et al 2011) continents on the planet. In essence then, adaptation is not a new concept in Australian agriculture.

Considering that the Australian primary industry sector has long been highly sensitive to the impact and implications of climate variability, and that this variability is likely to increase under scenarios of climate change (Nicholls and Alexander 2007), it is hardly surprising that the sector's constituent members have been active participants in national climate change forums and strategies for more than two decades. This may be fortuitous given agriculture contributed to 16.8% of Australia's greenhouse gas emissions in 2005 (Garnault 2008), rising to 23 % when taking into account the energy and transport used by the agricultural sector (Hatfield-Dodds et al., 2007). The lower figure alone makes it the second largest greenhouse gas emitting sector behind stationary energy (AGO 2007). Perhaps because of this, national frameworks for addressing climate change issues in the sector are relatively mature compared to those in other sectors and so provide a good basis for assessing whether such frameworks support or impede national adaptation planning and practice. This paper undertakes such an assessment within the context of a broader, overarching project designed to provide a better understanding of the drivers and barriers to successful adaptation. By exploring federal statutory arrangements and policy settings, the project is intended to generate much needed knowledge and understanding on the role of the federal government in climate adaptation planning and practice. In doing so, it may potentially make a significant contribution to the development of a strategic, national adaptation policy framework in Australia (Hussey et al 2012).

Methods

The two overarching project objectives of this case study are:

- to assess the extent to which current policies and institutional arrangements promote or impede climate adaptation in practice (the 'practice objective'); and
- to make a significant contribution to the development and implementation of a strategic national policy framework (the 'framework objective').

The primary industries sector was selected as the second of the cross-mechanism case studies because of the rich diversity of national policies, frameworks and institutions associated with the sector for nearly two centuries (Price 2012). Table B.4, for example, shows how this diversity corresponds to each of the mechanisms identified in the methods for the project paper as a whole (see Appendix A).

Table B.4: Examples of the relationship between the Case Study Matrix and primary industry policy and institutional mechanisms

Mechanism	Examples in Primary Industries
1. Inter-governmental function	<ul style="list-style-type: none">• COAG Standing Council of Primary Industries and its cascading subsidiary committees, including the Climate Change Research Strategy for Primary Industries
2. Intra-governmental function	<ul style="list-style-type: none">• Regional NRM delivery through catchment management agencies aligned to state portfolios, local governments and regional development authorities
3. Regulation by prescription	<ul style="list-style-type: none">• State land-use regulations, including pollution emission laws• Environmental Protection and Biodiversity Conservation Act (including its relationship to the Clean Energy Future Biodiversity Fund)
4. Planning processes	<ul style="list-style-type: none">• State and local council land-use zoning
5. Funding function	<ul style="list-style-type: none">• Carbon Farming Initiative (Action on the Ground Program)• Rural Research and Development Corporations
6. Information and analysis function	<ul style="list-style-type: none">• Carbon Farming Initiative (Filling the Research Gap, Carbon Farming Skills Program and Extension and Outreach Program)#• FarmReady Program (including Reimbursement Grants and Industry Grants initiatives)
7. Supporting market arrangements	<ul style="list-style-type: none">• Statutory arrangements for primary industry R&D investment, including enabling legislation for levy collection• Water trading

The paper explores each of these mechanisms in detail, and evaluates the outcomes of that analysis against the resilience framework developed for the project as a whole (see Hussey 2012).

Discussion

The practice objective

Perhaps more than any other industry sector, primary industries have been the most active in their interaction with climate change discourse and initiatives. This is despite a relatively high level of climate change scepticism among its participants. One reason for this seems to be the proliferation of industry specific institutions that elsewhere have been described as boundary organisations. That is, these institutions have a close tie to government through their legislative base, funding mechanisms or both, but also have a close tie to primary industry stakeholders through levy collection, investment mechanisms, governance arrangements and strong industry credibility. These organisations have enabled government to deliver various climate change initiatives in return for continued support and government matching of industry levies. Combined with strong statements from government about what it expects to see for its matching contributions, this acts as a very effective and efficient means of reaching agricultural business more broadly as well as in leveraging private (industry) investment in climate change activities.

With respect to adaptation initiatives in particular, primary industries have a strong history of investment in this kind of research and practice change, particularly in respect to adaptively managing the vagaries of climate variability. On the face of it, the leap to adjusting to climate change should not be too difficult; however the assumption made by most of the industries is that the many years of incremental change that these industries have actively pursued will automatically be sufficient to address climate change. For some industries and for some regions this assumption may hold true while for others it may not. Adjustments beyond the incremental are difficult for many traditional farm families and businesses, where risk aversion is a dominant culture. And while many industries have claimed that they have built their success on their capacity to adapt, in reality, recent surveys have shown that only around one third of farmers and graziers are now actively participating in the process of innovation (Instinct and Reason 2009).

This paper has shown that primary industries are subject to almost every conceivable form of government function and process of market intervention conceivable. For this reason, it is hardly surprising that industry participants continue to rely on peak representative bodies to act on their behalf not only in policy debates but also in interpreting the implications of government policy. Most of these peak bodies also have close links to the industry institutions that participate in the implementation of various government programs. Many of these bodies also acted for some time to counterbalance powerful monopolies such as some of the international plant breeding and chemical companies (Manwell and Barker 1988). However, while these bodies may have facilitated the capacity of government to implement certain policies to an otherwise non-receptive stakeholder base, they may also have contributed to conflicts between the different policy mechanisms and functions this paper has outlined (e.g drought relief funding).

Many of the conflicts are based on an inherent tension between i) productivity growth and its consequences for industry profitability, export growth and industry contribution to national GDP, and ii) the need for sustainable production systems that minimise externalities and where possible even restore degraded environments. In part, the effort to achieve the latter has underpinned the substantial contribution being made by government and industry to reduce the carbon emissions, including greenhouse gasses such as methane, from agriculture, as well as to increase the carbon storage capacity of agricultural land. Yet tension such as this mobilises support bias towards one or the other outcome (productivity versus conservation) despite rhetorical acknowledgment of the need for balance. This need for balance often manifests in separate programs aimed at each outcome, frequently without either administrative or on-ground coordination of each. The example of drought safety-net programs not requiring evidence of sound risk management (including financial management and groundcover management strategies) is one where the messages are inconsistent with those dealing with climate change adaptation. In short there are many programs which are inconsistent.

The science capacity dealing with agriculture and natural resources, while dwindling, is at the forefront of research bringing climate and other future scenarios together with on-ground decision making and practice. Indeed, much of what we know about adaptive management comes from the collective fields of science and social science working on rural and regional-scale issues and opportunities. These disciplines are not always well integrated, but this is often a problem of program management rather than information or science management. Moreover, many of the advancements in integrating the long-term science of climate change with the shorter term science of climatology and weather have been advanced by primary industry investment (as well as by the airline industry).

In essence, the supporters and impediments to adaptation in the rural industries appear to be:

Supporting factors

- The capacity of industry-funded institutions involved in the innovation process to provide a credible conduit for coordinating significant public good programs such as climate change policy initiatives;
- Institutional arrangements that enable government investment to lever private (mostly levy) investment;
- The strong ties between science and extension, including through the process of participatory research, to enhance adoption of adaptation strategies;
- A long-standing, sizeable and talented research capacity to provide the supporting science behind decision making, including adaptive management.

Limiting factors

- The mixed messages inadvertently sent by different policy interventions aiming to achieve conflicting outcomes;
- Poorly designed programs aiming to achieve multiple outcomes that might be in conflict unless well integrated (often requiring additional management expertise not available to policy organisations);
- Uncoordinated policies and programs administered by different portfolios where the nature of programs may be judged on the attributions stakeholders give to the administering body rather than on the merits of the policies and programs themselves.

The framework objective

There is perhaps no more comprehensive an approach to climate change adaptation in Australia than across the primary industries sector. COAG's National Primary Industries Research, Development and Extension Framework, encompassing a Climate Change Research Strategy for Primary Industries that involves the Australian Government, all State governments and most agricultural industry sectors, is the tip of an extensive network of activity demonstrating that the various policy and institutional functions at the disposal of government seldom operate in isolation from one another. This is not a weakness that could otherwise reflect a diminished focus on the few areas where government and industry can come to agreement. Rather, it reflects a capacity for each mechanism to build on the strengths of each other. For example, the Funding Function is most effective when it works with the Information and Analysis Function and the Market support mechanisms; that is ensuring new knowledge is linked to effective, participatory learning models that are coordinated through market oriented bodies with high stakeholder credibility.

These interrelated mechanisms have proven to be successful in building industry commitment to climate change activities, despite a groundswell of scepticism at the individual stakeholder level. This has been made possible because ultimately what has been supported has not been far removed from past stakeholder investment experience (e.g. in adaptation to climate variability). It has also been made possible by long-standing institutional arrangements that enable climate change investments to be transparent through formal co-investment processes. Moreover, these transparent arrangements involve well-resourced industry owned organisations as relatively equal partners.

The bias in the overall primary industries framework is overtly towards research rather than specific practice change. However, unlike many industries, the primary industries can get away with this owing to the close connection between issue prioritisation, research investment, market contextualisation and practice change processes. This is critically important where the most significant common denominator, the individual farmer, is also the key adaptation decision-making entity. If investment takes place acknowledging and even stimulating these linkages, then

an investment in climate change research can ultimately be an investment in climate change adaptation.

In reality, even at the highest order of intergovernmental frameworks, those participating in the primary industries are subject to many different and overlapping frameworks. For example, farmers are major stakeholders affected by the Murray-Darling Basin Plan, yet despite the potential rural adjustment and unplanned adaptation processes the Plan will trigger, beyond investment in irrigation technologies there is little connection between the Plan and the climate change adaptation frameworks of primary industries. This is in part due to distinctions between government water and landuse institutions where the connections between the two are weak.

Frameworks

In essence, the lessons for adaptation strategies beyond the primary industries include:

- Intergovernmental functions and frameworks benefit from close, formal and ongoing engagement with industry and other stakeholder groups, particularly where a strategy relies on co-investment;
- Frameworks that involve research investment need make tangible linkages between prioritisation, co-investment and practice change. This is not a linear nor academic process and requires considerable facilitation resources;
- Frameworks need to build on problem definitions that identify whether solutions need be incremental or transformative, with investment and activity and policy direction clearly aimed the decision-making steps required to achieve these very different outcomes.

As a final conclusion, if the primary industries case study tells us anything, it is that climate change adaptation is a process and not a neatly contained, measurable, time bound, tangible activity. The primary industries have been adapting to climate related challenges in Australia with and without government intervention for two centuries in Australia; a long, gradual journey in the search for sustainability (including its economic forms) and resilience. As other case studies have shown (e.g. Price et al 2012) adaptation does not result from project-wrapped investments. Such investments create the impression of busyness but rarely lead to the outcome of long-term resilience. This suggests a greater reliance on strategic frameworks, coordination, information, regulatory and market-based mechanisms over traditional funding mechanisms as a means of enhancing primary industry adaptation to climate change.

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CASE STUDY 7

Climate change adaptation and floods

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Introduction

2010-2011 saw some of the biggest flood events in Australia's history, with approximately 80% of Queensland declared a disaster zone and extensive flooding in other eastern states, notably Victoria. Flooding is the most expensive natural hazard in Australia and the federal government allocated 5.6 billion in recovery funding to Queensland alone, primarily to restore public infrastructure (BITRE 2008; Gillard 2011). Climate change scenarios predict an increase in intensity and frequency of flooding, potentially exposing Australia to even greater damages in the future, and making this a key area for improving adaptive capacity.

The large scale of events, the number of lives lost and the scale of the damage incurred prompted numerous inquiries and review processes by different governments and organizations. A project funded by NCCARF under its synthesis and integrative program analyzed these reviews⁵ to determine if they offered any lessons for climate change adaptation (referred to in this paper as the SIRP Report) (Wenger, Hussey et al. *forthcoming*). The project identified inadequacies in institutional and regulatory arrangements, development planning and funding mechanisms and overwhelmingly pointed to the need for improvements in non-structural measures, particularly in the preventative and preparation phases of emergency management. It also found that adaptive approaches that are proving successful and cost effective overseas are largely unknown in Australia, and would have difficulty being implemented under current arrangements.

Accordingly, this paper will explore flooding from the perspective of government function to determine:

- current policies and institutional arrangements in place to address flooding
- the types of reforms that would be required to reduce Australia's vulnerability to flooding in the future.

⁵ Australian reviews studied for the SIRP report include: the Queensland Floods Commission of Inquiry (referred to in this report as the QFCI); the Victorian Review of the 2010-11 Flood Warnings and Response (referred to in this report as the Comrie Review); the Brisbane Flood January 2011: Independent Review of Brisbane City Council's Response; and the Environment and Natural Resources Committee Inquiry into Flood Mitigation Infrastructure in Victoria (referred to in this report as the ENRC Inquiry). Other reviews were referenced but not studied in depth.

Methodology

Prevention, Preparation, Response and Recovery, otherwise known as PPRR, is the standard emergency management framework used in Australia (EMA 2004; COAG 2011). Its advantage, as well as being widely understood by flood managers, is that it divides disaster management into temporal phases. Past research indicates that intervention in the more proactive prevention stage, is more effective and cost efficient than interventions at later stages (BTRE 2002). These findings were supported by the SIRP Report.

Floods are not only disasters. Australia's carryover water storage system depends on them. Managed well, flooding can replenish groundwater, restore ecosystems and boost economies. How Australia manages floods will be vital for its adaptation to other climate change impacts such as drought.

Adaptation to climate change in the context of flooding can encompass many different strategies, including protect, accommodate and retreat options. In terms of protection, structural measures such as constructing flood walls, dams and levees are options often called upon, though in the long run, this approach can be maladaptive, having adverse environmental impacts, transferring problems elsewhere or leading to a false sense of security that increases vulnerability when defences are overcome. Another approach is to ensure land use and/or building design that is compatible with flooding. For this to be effective under climate change conditions, it is important that future risks are assessed and incorporated into planning processes. Where accommodating floods is not feasible, relocation can be used to remove people from hazardous areas, and this can be combined with land use changes so that affected areas can continue to be used. Other adaptation strategies can include improved planning and response mechanisms for large scale emergencies that enable joined up capacity across different agencies, coupled with improved community awareness and self-sufficiency. Many of these can be hard to sustain during extended periods between large flood events. Moreover, some note that non-structural methods of prevention, such as land use planning and building standards, are more effective than attempting to modify human response behaviour through public education, warning systems and emergency response (Comrie 2011: 191). The emphasis of this paper is therefore on identifying the drivers and barriers to more proactive prevention approaches to flood management.

The analytical framework used is that developed for the larger project (see Hussey 2012), such that the institutional arrangements are analysed according to the seven key governing mechanisms: inter-governmental function, intra-governmental function; market mechanism; information and analysis function; regulation; planning and strategic decision-making; and funding. Those institutional arrangements are

then evaluated against the 'resilience' framework: clarity of purpose; diversity; connectivity; and integration and feedback.

Discussion on the extent to which adaptation characteristics are evident

Clarity of purpose

Information about climate change impacts on flooding is not lacking and much work has been done at all levels of government to identify these impacts and assess risks. These are used liberally to justify proposed adaptation activities.

Numerous intergovernmental initiatives, including national strategies, arrangements, agreements, frameworks, action plans and roadmaps provide an agreed national approach to flood problems, including exacerbated risk from climate change. The approach in terms of disaster management is 'resilience', which encompasses both root causes and symptoms. As resilience is such a broad term, it is sometimes hard to distinguish the specific aspect of the problem that some measures are intended to address. Some, such as the National Partnership Agreement for Natural Disaster Resilience, while 'sold' as the federal government's contribution to disaster mitigation, actually address symptoms as well. Contradictory definitions of the word 'mitigation' obscure the Agreement's true purpose. However, some recognized methods of flood prevention are understood and are included in initiatives aiming to adapt to climate change. The prevention focus is on improved development controls. Measures such as relocation appear to be less systematically supported, while ecosystem approaches to flood management (that can help mitigate existing as well as future development) are not yet widely understood.

Inconsistent legislation and processes for addressing flood risk at the state level reflect conflicting development policies. This makes it difficult for different institutions to have a good understanding about what is expected of them in terms of flood prevention and management. This lack of clarity about policy priority in different situations results in a lack of shared responsibility and institutions that work at cross purposes.

Diversity

Flood management is all inclusive. Evidence from all mechanisms indicates wide stakeholder engagement across different levels of government and portfolios, research institutions, industries and communities, even to the individual level. 'Shared responsibility', promoted by intergovernmental arrangements fosters this involvement.

At the federal level, the strengths of different agencies are combined to implement the National Flood Risk Information Program, which works with state governments and local governments to make information about flood available to all. In turn, guidelines produced by the federal government aim to improve quality, consistency and comparability of flood information commissioned across the country by other

entities. The aim is for everyone to have access to the flood risk information they need to make development, mitigation or purchase decisions.

Examples from local government include climate change alliances. These not only build synergies across other municipalities within a region but also enable better access to federal government grant schemes. Many of them have wide stakeholder involvement including with industry and research institutions to fund adaptation projects tailored to the local level. Federal government has actively supported such partnerships through grants schemes such as LAPP.

Issues arise at the local level due to resourcing constraints. Many do not have the means, either financial or technical, to undertake flood studies or assess flood information. The Productivity Commission suggests that this could lead to shortcuts in decision making processes that are otherwise costly in time and effort (Productivity Commission 2012: 109-110). For adaptation to actually be implemented there needs to be a wide skills base and financial resources on the ground, coupled with strong policy leadership and guidance from state government.

Connectivity

Networks related to flooding are of varying robustness. The 'bottom up' networks studied in this paper, such as local government alliances and natural resource management bodies appear very strong and effective. They involve large numbers of stakeholders and have a diverse funding base; the loss of one will not make a large difference. While their objectives continue to remain relevant and they continue to deliver results, they are unlikely to fail.

Not all networks are as successful. The vast majority of recommendations in recent flood reviews pointed to a need for better governance, coordination, integration, accountability, oversight, communication, and other socio-institutional issues. Administrative systems, operating as networks across portfolios, do not always function effectively. As demonstrated in the section on intra-governmental function, network failure resulted in non-compliant planning schemes that did not incorporate flood controls. This is likely to be a consequence of conflicting portfolio agendas and a lack of policy leadership.

While duplication and overlap seem to have occurred in some areas, this is not always useful. The strategies, plans and arrangements in place for emergency management are profuse and somewhat confusing to negotiate. It seems likely that some, such as the National Framework for Disaster Resilience might be redundant now that the more detailed NSDR is in place. The complexity may have led to some strategies being overlooked or given only cursory attention. Implementation of the MCPPEM Climate Change Adaptation Plan, for example, appears to be less than thorough.

Information and analysis is of great importance as a prerequisite to implementation of climate change adaptation. The production of this information is from diverse

sources, with multiple sources of funding that address the needs of different stakeholders. In this instance, overlap is positive, in that a broad range of strategies can be explored and all sections of society can be reached. However, there are problems associated with the vast number of tools, approaches and methodologies available to managers, in that it causes confusion about which to use (Productivity Commission 2012: 129).

Integration and feedback

Floods are not only disasters. Australia's carryover water storage system depends on them. Managed well, flooding can replenish groundwater, restore ecosystems and boost economies. How Australia manages floods will be vital for its adaptation to other climate change impacts such as drought.

Currently Australia does not capitalise on its flood opportunities. Highly regulated water management in Australia eliminates smaller high-frequency floods, which might otherwise replenish watertables and restore natural assets. Not only does this reduce Australia's preparedness to deal with large magnitude events but it can also increase the negative impacts of large scale events, for example, resulting in blackwater events⁶ and degraded, unconnected wetlands that are less able to mitigate flooding.

Another issue hampering the management of floods is that humans and ecosystems function with different geographic and temporal boundaries. Flood management needs to consider whole catchments and cumulative impacts when assessing development and flood mitigation alternatives. Unless planning and management can be carried out on a catchment scale by organisations with sufficient technical expertise and a long term perspective, the interaction between floods and humans will continue to be harmful.

Legislation and development planning systems currently have an inconsistent approach to flood risk. Opposing policy objectives, such as affordable housing and short term financial concerns conflict with concerns about flood safety and long term damage costs. This reflects a lack of policy leadership about approaches to flood risk by state governments. The situation is not assisted by current arrangements for payment of damage costs, which are largely paid for by the federal government, thus externalising the consequences of this lack of leadership. If policy conflicts are not resolved, flood costs will continue to grow under climate change scenarios, compromising Australia's economy and the wealth of its citizens. The money that could have been spent on mitigating climate change and developing adaptive strategies will be wasted on avoidable damage costs.

⁶ Blackwater events occur during floods as a result of rapid breakdown of organic matter. This depletes dissolved oxygen levels in the water (also causing water discoloration) and commonly results in fish kills. Blackwater events are worsened by higher temperatures that accelerate the decay of matter. Blackwater events are believed to have worsened due to water regulation which eliminates small floods thus allowing longer accumulation of large amounts of organic matter. This is expected to be exacerbated by prolonged droughts associated with climate change.

As discussed in this paper, policy conflict is not confined to state governments. Recent development projects located in flood prone areas have also been funded through the federal government's economic stimulus package. Leadership is required at all levels to resolve policy conflicts and to develop consistent legislation and planning processes accordingly.

The federal government has been making increasing efforts to address prevention through coordination and leadership of initiatives such as the *Enhancing Disaster Resilience in the Built Environment Roadmap*. However, some of the government's stated objectives, such as the integration of climate change impacts into the Building Code of Australia, have so far failed (Australian Government 2010: 119); (Productivity Commission 2012: 155). The federal government's current focus on resilience, which covers all aspects of flood management, obscures a desirable emphasis on prevention. Moreover, prevention needs to be better integrated into the federal government's disaster recovery efforts. Simply rebuilding is 'reinvesting in disaster'⁷.

Activity on all levels contributes to information about flooding and key aspects, such as weather patterns and projected climate change impacts continue to be monitored and reported by organisations such as the Bureau of Meteorology and CSIRO. This information is used as a basis for research, debate and action. Ecosystem researchers and state government natural resource management agencies are investigating the potential for ecosystem approaches to flood management (Queensland Government 2012; State Government Victoria 2012). However, there is a current divide between floodplain managers with a natural resource management background and flood managers with an engineering background. Professional training needs to be better integrated so that there is consideration of all options on a case by case basis. Methods of cost benefit analysis have been developed overseas to compare the merits of flood mitigation options and these could be applicable for use in Australia.

Flood reviews are a major feedback mechanism and these were studied comprehensively in the SIRP report. The report found that none of the reviews studied by the project included climate change in their terms of reference and only ad hoc mention was made of climate change in the body of the reports. Consideration of the adequacy of arrangements in place to address flooding was retrospective rather than considering future conditions (Wenger, Hussey et al. *forthcoming*). This narrow analysis of events will be of limited value in helping Australia to adapt to future threats. Review of the performance of the QRA as a model for flood recovery would be beneficial as initial indications are that it has focused efforts and achieved several successful outcomes, including basic flood mapping for all Queensland floodplains.

⁷ Charles L. Hardt, Tulsa Public Works Director, 1993. In NWF, 1998: p.144.

Conclusion

Analysis in this paper suggests that aspects of flood management most in need of attention are:

- assessment of the adequacy of current planning instruments to accommodate climate change
- consistent policy, legislation and planning processes to ensure that future flood risks are assessed and addressed
- sufficient resources for local government (both technical and financial) for on the ground flood prevention and mitigation
- significant increase in funds available to flood prevention/mitigation to reduce long term damages, in particular for:
 - basic nationwide flood mapping
 - sophisticated flood mapping in urbanised and developing areas that includes worst case scenarios, projected population and development and flood consequences
 - improved development planning
 - relocation of those most at risk and reassignment of land to flood compatible uses
 - recognition and support for ecosystem approaches
- flood recovery strategies that merge with prevention to increase future resilience
- administrative structures that enable a catchment based approach to flood management
- integration of ecosystem approaches into training for flood managers, coupled with community education programs.

Major impediments to achieving these objectives include conflicting development policy objectives, many of which value short term development gains over long term disaster prevention; the non-mandatory nature of many current provisions relating to flooding; insufficient investment in prevention (as opposed to relief and recovery); disincentives such as badly targeted flood relief and lack of financial consequences for those making risky development decisions; planning that is based on administrative boundaries rather than natural geographic ones; planning tools that are inadequate to address future risks; and inadequate resourcing, particularly for on the ground implementation. Potential financial consequences are a major barrier that inhibits local government from using flood information and applying appropriate land use and development controls, particularly if this means land has to be 'downzoned'.

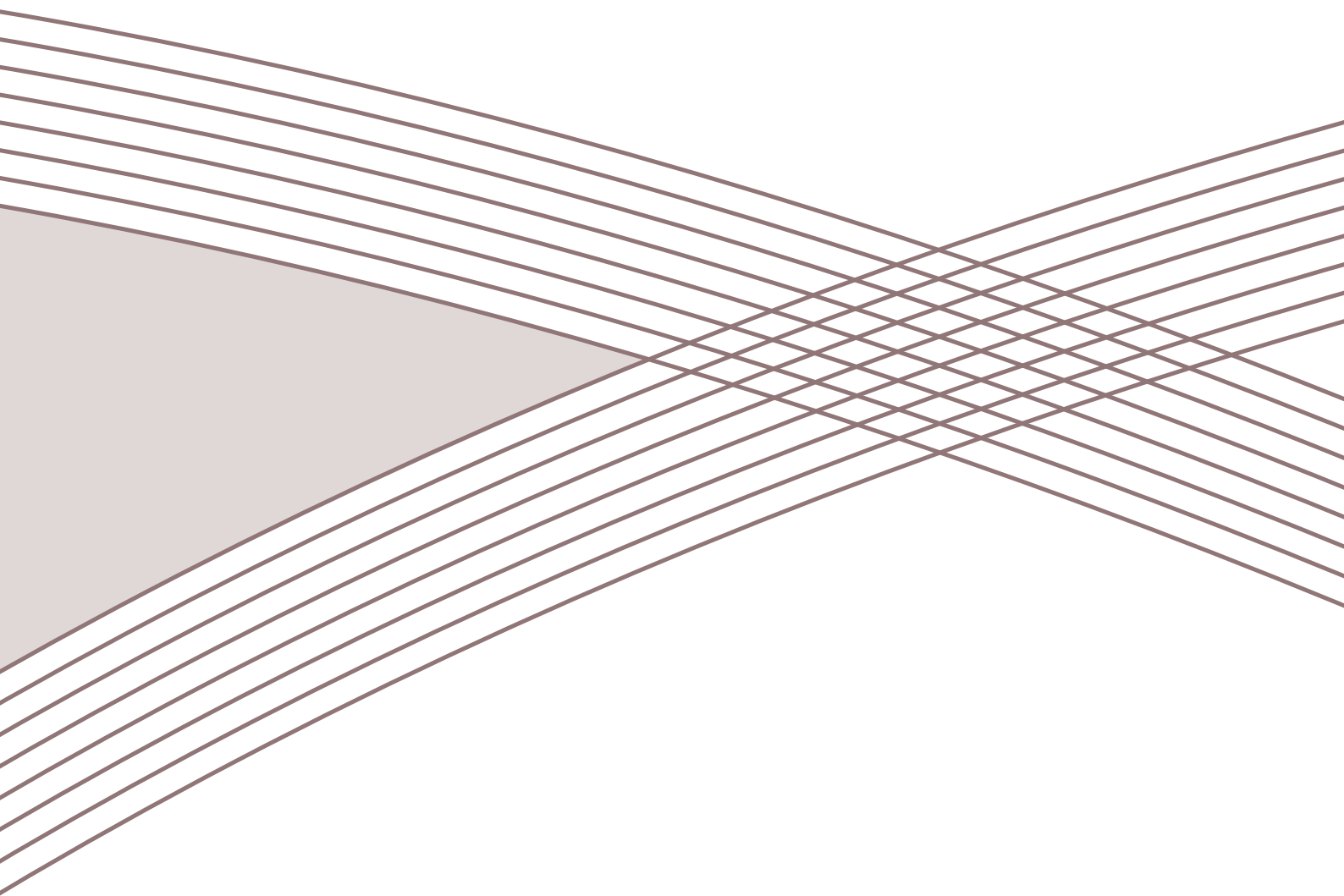
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