Government of South Australia submission:

Productivity Commission draft Report *Barriers to Effective Climate Change Adaptation*

4 June 2012

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Introduction

In response to the Productivity Commission's Draft Report *Barriers to Effective Climate Change Adaptation* (the draft report) the Government of South Australia wishes to make the following contribution. The response reflects on South Australia's experience in climate change adaptation to date, identifying lessons which are relevant to the Productivity Commission's analysis on this issue.

The SA Government response begins with a short summary of the adaptation policy reform underway in the State. This is followed by general comments on the treatment of climate uncertainty in the draft report.

The next sections of the document provide direct responses to the recommendations in the draft report, and to the requests for more information.

Finally the response concludes with general comments on the draft report.

South Australia's Climate Change Response

'Prospering in a changing climate – South Australia's Climate Change Adaptation Framework' is currently being finalised. The Framework outlines a regional approach to climate change adaptation across the state. The Framework was developed to provide guidance for how climate change adaptation activity should occur in South Australia. It articulates roles and responsibilities for adaptation, creates mechanisms for coordination and sharing, outlines community engagement processes and the regional implementation model and provides for the science and research agenda.

The Framework provides guidance for regional communities to undertake adaptation planning. The Framework endorses undertaking integrated vulnerability assessments on a regional scale as the primary measure for understanding the communities' vulnerability to climate change.

The integrated nature of SA's assessments means that they take into account the range of industry, natural resource, community and other factors making communities vulnerable, as well as the factors of resilience that communities can tap into to manage risk and prosper in a changing climate.

There are many other ways in which South Australia is already responding to the challenges of climate change. For example the State Natural Resources Management Plan 2012 recognises climate change as an important priority for managing the State's natural resources. The State Government has developed *Water for Good - A plan to ensure our water future to 2050*, a plan for sustainable water supply and use in South Australia for at least the next 40 years.

The 30-Year Plan for Greater Adelaide, and wider Planning Strategy, provides important policy measures to build an effective long term approach to dealing with the impacts of climate change particularly in urban form, including energy efficient building design, less vulnerability of critical infrastructure and continued protection of coastal development from seawater inundation. The *Living Coast Strategy* is a plan to protect the South Australian coast for the future.

The Coast Protection Board will continue to play a key role in implementing many of its actions, including identifying development, infrastructure and ecosystems at risk, and developing and implementing strategies to inform adaptation planning.

No Species Loss: a biodiversity strategy for South Australia 2006–2016 identifies and recommends a suite of actions designed to underpin South Australia's natural assets in the face of climate change.

The 2008 State of the Environment Report made a number of recommendations about adapting to climate change and in its response the Government announced a "planned and strategic approach to climate change adaptation, which involves all levels of government, the private sector and the community, and that cuts across all sectors". The Government also committed to conducting research on the health impacts of climate change, including through its effects on air quality, and to programs for generating community awareness and behaviour change.

As around 90 per cent of primary industry's contribution to Gross State Product currently comes from regional South Australia, the implication of climate change adaptation is also a significant regional development issue.

Climate change is predicted to impact agricultural, forestry, aquaculture and marine sectors through higher temperatures (land and water), longer and deeper droughts, and more intense and unseasonal weather events such as tropical cyclones, hail storms and extreme cold/hot periods. In addition, there will be the market and policy implications of climate change, such as the introduction of the carbon pricing mechanism.

Current predictions indicate that Australian agriculture is likely to differ from many other developed countries in that it faces net costs from climate change (Garnaut, 2008). By all accounts adaptation appears to be an unavoidable requirement and offers the potential to reduce some of the estimated costs associated with climate change.

Managing risk and adapting to changing economic and physical environments is a normal part of business for farmers. Farmers will adapt production decisions in response to, amongst other things, product prices and input costs, new technologies, availability of skilled labour and climate variability. Australian producers have a long history of innovation and change that has contributed to growth in agricultural productivity averaging approximately two per cent a year over more than five decades (ABARE, 2010). Despite productivity growth having slowed more recently, there remain

high expectations that agricultural industries will be well placed to systematically respond to the future threat of climate change (PIMC, 2009).

Productivity Commission treatment of uncertainty & definition of current climate

The draft Productivity Commission report discusses the uncertain nature of climate change projected impacts and their timings. The Government of South Australia submits however, that these discussions tend to overstate the amount of uncertainty associated with climate change impacts.

It is acknowledged that there is still a great deal of remaining uncertainty surrounding the precise nature and timing of climate change impacts, which may be the basis for the Commission treatment of the issue. Challenges for effective adaptation to climate change in South Australia include a lack of access to information on future projections of climate change, understanding the impacts of changes to climate on agricultural production and assessing the effectiveness of different adaptation options. When decision makers do have access to the climate change projections they are confronted with uncertainty, especially for rainfall.

This leads to a second challenge of effective decision making under uncertainty. The South Australian Research and Development Institute (SARDI) Climate Applications is working to communicate (but not develop climate change projections), to use modelling and experiments to better understand the impacts and assess adaptation options. There are many sections of SARDI that are contributing to future adaptation options through R&D.

Projections, remain useful tools for indicating potential impacts. Approaches for decision making in the face of uncertainty are key for maximising the usefulness of projections and other uncertain information. SARDI Climate Applications is working on approaches to decision making under uncertainty. The role here is one of assisting with an assessment of the risks and leaving decision makers with the responsibility of managing the risks.

The Government of South Australia agrees with the Commission's observation that adaptation can be thought of as a part of the on-going process of risk management – identifying, evaluating and responding to changes in risk.

Uncertainty on the timing and extent of climate change has implications for diagnosis and policy prescriptions regarding adaptation. It is acknowledged that there is potential for climate change impacts and adaptive capacity to be affected by increased knowledge over time as events unfold and more options are deepened through both research and experience. In such cases the principles of decision making under uncertainty (or real options) appear appropriate.

It is unclear if Australia has explicitly taken such an approach to climate change adaptation to date, although the wide breadth of initial adaptation inquiry may be consistent with such an approach. This type of policy approach would certainly involve considered monitoring of scoping adaptation research, deepening of meritorious research, taking into account high cost or close to irreversible costs to society and the identification, deepening and exercising of 'real' options as they become apparent (Dixit and Pyndyck, 1993) (Dobes, 2008).

Similarly, the draft report supports risk management in planning for the 'current climate'. However the Government of South Australia submits that this is not a useful term, insofar as it implies that the current climate is static. In fact, there are a good number of examples which demonstrate that current climate change is well underway and is having an impact. There is a significant and increasing amount of evidence that the 'current climate' is in-fact a 'changing climate', and this directly affects how current climate must be treated when making short, medium and long term decisions.

There are many examples of climate change already occurring, and referencing these will add value to the analysis, conveying that despite uncertainty, in many cases, there is enough knowledge about projected trends, and current impacts to warrant planning around a shifting climate consistent with climate projections. The following examples are presented as evidence for this viewpoint. Copies of the references can be made available on request.

Temperature:

Recent work by Gergis etal. has considered 20th century warming in the Australiasian region. Since 1910, Australia has experienced an annual mean land surface temperature increase of 0.9°C. The paper, published ahead of print by the Journal of Climate, finds that the unusual post 1950 warming observed in Australasia cannot be explained by natural variability alone, suggesting a strong influence of anthropogenic forcing in the region (Gergis etal. 2012).

Sea Level Rise:

In regards to sea level rise there is a high level of certainty. Global sea levels are currently rising at around 3.2 mm a year, nearly twice the average rate (1.7 mm per year) experienced during the 20th century as a whole and at a rate near the upper end of the Intergovernmental Panel on Climate Change projections. Rising sea levels have already significantly increased the frequency of high coastal sea-level events in Australia and overseas. There is evidence that the observed changes to the climate system are consistent with changes expected due to increasing greenhouse gases. It is rising at an increasing rate will continue way beyond normal planning timeframes. Given that level of certainty it is reasonable to take action now, even if that is perceived to be high cost, so that future costs do not fall suddenly to owners and government, and that the opportunity for adaptation action is not lost (CSIRO, 2011).

Wine grape ripening:

Three recently published papers have demonstrated maturity advancement in wine grape ripening, due in part to temperature increases and in part to other factors, including drought. Petrie and Sadras (2008) found maturity advancement of 0.5 to 3 days per year for 1993-2006, while Webb et al. (2011) found an average of 1.7 days per year for 1993-2009 but lower for earlier periods. Webb etal. (2012) finds that this increase is partly due to temperature, but also due to drought and how the vines are managed.

Changes in plants:

Irrefutable evidence is emerging from the scientific literature of universal shifts in phenology as a consequence of climate change. The intimate relationship which exists between seasonal flowering and climatic conditions, coupled with ease of observation, makes the monitoring of flowering events a reliable and cost effective method for the early detection of change in biological systems and an important tool in global change research. (Mac Gillivray etal, 2010).

Analysis of plant specimens have revealed changes consistent with a response to contemporary climate change. The report concluded that leaf width is linked to maximum temperature regionally and leaf area to minimum temperature locally. (Guerin etal, 2012 - submitted)

Reduction in Autumn Rainfall:

Australia is subject to extreme rainfall variability compared with many regions of the world, including other arid regions such as the Sahara or Gobi deserts. It is difficult to characterise long-term changes in Australian rainfall amidst this background of large, natural, year-to-year and decade-to-decade variability. However, Cool season (April to November) rainfall in the south-west of Western Australia and in south-eastern Australia over the last 15 to 30 years has shown changes that are large compared with natural variability. (CSIRO, 2011).

Comments on the draft recommendations

The following table provides specific comments in relation to the draft recommendations.

Draft Recommendation	SA Government Comment
Assessing reforms and setting priorities **Draft Recommendation 4.1** Reforms to address barriers to effective risk management in the current climate should be implemented without delay, where they are likely to deliver net benefits. In relation to barriers to adaptation to uncertain future climate trends, the case is less clear. Where a reform has low up-front costs and potentially large benefits, albeit with long time periods between the costs being incurred and the benefits being received, there could be a case for preparatory action. The case is likely to be stronger if the reform will deliver benefits under a range of climate change scenarios. Where measures have high up-front costs, the community is likely to benefit by deferring high-cost options until better information becomes available.	Recommendation 4.1 is supported, subject to discussions above. Uncertainty should not be overstated and definitions of current climate should recognise that climate change is already occurring.
Building adaptive capacity **Draft Recommendation 5.1** Australian governments should implement policies that help the community deal with the current climate by improving the flexibility of the economy. This would also build adaptive capacity for dealing with future climate change. This includes reforms to: taxes that influence the way resources are used, such as land tax exemptions and conveyancing duty, which could inhibit the mobility of labour, capital, or both government transfers that reduce incentives to adjust to changing circumstances, such as the reforms recommended in the Commission's 2009 inquiry into drought support regulations that impose unnecessary costs or inhibit competition or flexibility and could impede climate change adaptation by reducing the ability of firms, households or other organisations to respond to changing circumstances, such as restrictions to water trading.	The South Australian Government stated in its recent submission to the GST Distribution review that it is prepared to explore tax reform options which are beneficial to the community. It was noted, however, that there are a range of factors that are important to facilitate pursuit of a more efficient tax system - these include revenue neutrality, community preferences, equity considerations and transitional impacts particularly in relation to those who may be made worse off as a result of reforms. In relation to abolishing conveyance duty and replacing it with residential land tax, community acceptance may point to the relative acceptability of incurring an irregular, albeit large, tax liability when purchasing a property given that this occurs at a time of liquidity, as compared with a regular annual tax impost imposed on the site value of the family home. In relation to insurance duty, a significant replacement revenue stream would need to be found. The best way for State tax reform to be achieved is through multilateral negotiation between the Commonwealth and the States, culminating in an Intergovernmental Agreement which addresses budgetary and transitional impacts associated with large scale reform, including compensating those who suffer adverse impacts.

Draft Recommendation	SA Government Comment
Information provision **Draft Recommendation 6.1** The Australian Government initiative to improve the coordination and dissemination of flood-risk information should be expanded over time to encompass other natural hazards. Guidelines to improve the quality and consistency of risk information should be regularly updated and take climate change into account where feasible.	In regards to sea flooding it is not just a matter of coordination, it is a matter of understanding the nature and scale of the risks by providing access to high resolution data.
Local government **Draft Recommendation 7.1** There is uncertainty about the roles and responsibilities for adaptation by local governments, including in the areas of land-use planning, coastal management, and emergency management. As a first step to clarifying these roles and responsibilities, state and Northern Territory governments should publish a comprehensive list of laws which delegate regulatory roles to local governments. This would assist state, territory and local governments to assess whether local governments have the capacity to effectively discharge their roles.	In SA the development control system, including council responsibilities, is well defined by the *Development Act 1993*. That sets up a sound structure of planning strategy, development plans (including sea level rise provisions) and development assessment.
Planning and building regulation **Draft Recommendation 8.1** As a priority, land-use planning systems should be revised to ensure that they are sufficiently flexible to enable a risk management approach to incorporating climate change risks into planning decisions. In doing this, consideration should be given to: • transparent and rigorous community consultation processes that enable an understanding of the community's acceptable levels of risk for different types of land use • the timeframe of risks and the expected life time of proposed land use • the costs and benefits of different types of land use.	It is reasonable to factor in the appetite for risk in determining adaptation strategies. And it is reasonable to expect that such variations explain the relatively minor differences between states in sea level rise benchmarks outlined in Table 8.1. That speaks against the consistent benchmarks sought in the discussion on page 151 under the heading 'Consistency in planning regulation across different jurisdictions'. However, communities have only limited ability to determine their own 'acceptable level of risk'. Given a choice, most communities will choose the least cost option now and defer most of the cost to future generations. Regarding the long timeframes for sea level rise and development approvals: Whatever the lifespan of the structure being approved, an approval (unless time limited) does imply some rights for development to continue in that place beyond that lifespan (including 'existing use rights' as acknowledged in part 8.3). At the least, the owners of land expect that they can continue to occupy that place. In addition, Schedule 4 (Complying Development) of the Development Regulations

Draft Recommendation	SA Government Comment
	determine that the following development, except in a few zones, receives automatic planning consent: *'(a) the construction of a new building in the same, or substantially the same, position as a building which was demolished within the previous 3 years where the new building has the same, or substantially the same, layout and external appearance as the previous building.'*
Emergency management **Draft Recommendation 10.1** The Australian Government should commission an independent public review of the Natural Disaster Relief and Recovery Arrangements (NDRRA). This review should commence as soon as possible and desirably produce a preliminary report by the end of October 2012. The review should consider whether the arrangements lead to inadequate infrastructure investments or insurance decisions, or reduce the incentives of state and territory governments to appropriately manage their risks. It should also examine alternative arrangements or funding models.	The Commonwealth are currently undertaking a review of NDRRA. The review is, inter alia, looking at the "betterment" provisions in relation to infrastructure. An independent public review would appear to duplicate the existing review.
The role of insurance **Draft Recommendation 12.1** State and territory taxes and levies on general insurance constitute a barrier to effective adaptation to climate change. State and territory governments should phase out these taxes and replace them with less distortionary taxes.	See comments on recommendation 5.1
Draft Recommendation 12.3 Governments should not subsidise premiums for household or business property insurance, whether directly or by underwriting risks. This would impose a barrier to effective adaptation to climate change.	Supported

Information Requests

The below information is submitted in response to information request 8.1: *To what extent do current state and territory land-use planning frameworks facilitate or impede the use of different land-use planning tools, such as time limited development approvals or 'triggers'? What changes are required to state and territory planning frameworks to address any impediments?*

Time limited development approvals

The SA Development Act (Section 42) includes:

(3)A relevant authority may, for example, approve a development subject to a condition—

*(d)**where the applicant is seeking approval for a temporary development**—that provides that, at a future time specified in the condition—*

(i) the previous use of the land will revive, or a use of the land will cease; and

(ii) any person who has the benefit of the development will restore the land to the state in which it existed immediately before the development.

However this provision appears to apply only if the applicant proposing that the development is temporary, rather than allowing for the planning authority to determine that it is temporary.

Indemnities

In SA indemnities have been included in Land Management Agreements (LMA) attached to freehold shack land. E.g. from the Chinaman's Wells LMA:

CLAUSE 5

The Owner acknowledges that, by virtue of the nature and situation of the Land, the Land is or may be subject to many risks which the Owner acknowledges may occur on or in respect of the Land at any time, such risks include, but are not limited to the following….

INDEMNITY

The Owner shall indemnify and keep indemnified the Minister, the Council, the Coast Protection Board, the Development Assessment Commission, the Land Management Corporation (established pursuant to the Public Corporations Act 1993) and the Crown in the right of the State of South Australia against all past, present and future claims made by the Owner or by any persons who are not parties to this Deed and against all demands, actions, proceedings, judgments, orders, damages, costs, losses and expenses which the Council, the Minister, the Coast Protection Board, the Development Assessment Commissions and/or the Crown in the right of the State of South Australia may suffer of incur rising out of the use, occupation or ownership of the land (including, without limitation, the risks referred to in clause 5 of the Deed) however caused (whether directly or indirectly or by negligence or otherwise).

However, indemnities are of limited usefulness as they do not actually make the hazard go away or equip the owner to protect against the hazards.

Retreat and Relocation

Transferable development rights (TDR) are a possible instrument to address retreat of existing development. They are a planning tool that compensates owners of land for which rights have been restricted by regulation, with compensation achieved by allocating those owners a right of development that may be transferred from the restricted (donor) site to another (receiving) site. The TDR may also be sold to another owner. These are enabled in the SA Development Act by Section 23(3)(b).

Other examples include the retreat strategy embedded in the Yorke Peninsula Development Plan for Black Point:

http://sa.gov.au/upload/franchise/Housing,%20property%20and%20land/PLG/Online%20DPs/Country/Yorke_Peninsula_Council_Development_Plan.pdf

However those provisions do not specifically identify a trigger for retreat.

The Lockyer Valley Regional Council's Grantham Relocation Policy is another potential model:
http://www.lockyervalley.qld.gov.au/images/PDF/grantham_relocation_policy_master_final_with%20map.pdf

Commentary on issues covered by the draft Report

Understanding and responding to the impacts of climate change

On page 49 the draft report discusses incremental (adjusting the existing system) and transformational (changing land use or location) adaptation. Importantly the report goes on to make the point that…The Commission recognises the need for economic and regulatory flexibility to accommodate both incremental and transformational actions to adapt to climate change. However, the Commission has not identified any cases where transformational actions require fundamental changes to regulation or policy frameworks.

Fundamental changes to regulation or policy frameworks that might be considered barriers to the effective adaptation in SA agriculture have not been identified. The changes to drought and water policy that would be required to adapt to climate change are largely the same as those that are most efficient in managing a variable climate.

Within an agricultural context, the challenges for effective adaptation to climate change in South Australia are a lack of access to information on future projections of climate change, understanding the impacts of changes to climate on agricultural production and assessing the effectiveness of different adaptation options. When decision makers do have access to the climate change projections they are confronted with the high level of uncertainty, especially for rainfall. This leads to a second challenge of effective decision making under uncertainty. SARDI Climate Applications is working to communicate (but not develop climate change projections), to use modelling and experiments to better understand the impacts and assess adaptation options. There are many sections of SARDI that are contributing to future adaptation options through R&D. SARDI Climate Applications is also working on approaches to decision making under uncertainty. The role here is one of assisting with an assessment of the risks and leaving decision makers with the responsibility of managing the risks.

Intergenerational Equity

Intergenerational equity is one of the key concerns over climate change and as noted by the Commission (page 71) may present a barrier to adaptation. There are numerous and varied opinions surrounding this issue including the management of confusion between equity and efficiency objectives through either adjusting of social discount rates or specification of intergenerational benefits and costs. The approach suggested by the Commission to use a range of discount rates in its analysis to show the effects of the discount rate on the decision and highlight some of the key characteristics of the project being assessed is supported.

Assessing Reform Options

The occurrence of adverse climate impacts in regions and for industries, even if large, does not automatically suggest that Government should provide support. To qualify, it is useful to consider:

- The nature of the problem, industry or regional equity concerns and opportunities for an in principle case for providing assistance;
- How those facing climate change are placed to adapt to the change;
- Whether existing measures can address the issue in question; and if not
- Whether intervention would result in a better outcome.

Governments recognise that market forces alone are unlikely to deliver the full response necessary to deal with the risks from climate change. Policy settings may assist in increasing climate change preparedness and facilitate business decisions by the agricultural, forestry and fishing sectors including moving in and out of business activities and relocation where possible (PIMC, 2009).

Experience suggests that efforts to suppress long-term signals for change, or actions aimed at distorting those signals, is not in the best interest of the regions or people affected by them. Government efforts would be better directed towards facilitating the process of autonomous adjustment. As noted by Hilmer (1993):

"To maintain Australia's wealth and prosperity, the reality of change needs to be accepted and overall benefits of the free flow of resources to more productive uses must be positively and continuously pursued."

Broadly speaking, the rationale for government intervention in relation to change processes can be categorised as relating to addressing equity concerns, expediting the change, or to improving the efficiency of the change process (COAG, 2008).

Governments have attempted to address change pressures in agricultural industries through a range of different adjustment assistance programs and approaches with mixed successes. An example from the Lower Murray Reclaimed Irrigation Area is provided in Box 1.

The key lesson from this case study was the importance of explicitly addressing both program timing and process in designing and implementing the adjustment program. The sequencing of elements of an adjustment program in the context of broader market or environmental information being revealed to those considering adjustment is critical to program effectiveness. This is particularly true for climate change where information is uncertain and the lock-in of infrastructure may introduce long-term inefficiencies or costs to communities. The Government of South Australia therefore supports the Commission's draft recommendation 4.1.

BOX 1: Lower Murray Reclaimed Irrigation Area restructuring program

The Lower Murray Reclaimed Irrigation Area (LMRIA) restructuring program was a joint South Australian/Commonwealth program introduced in tandem with the imposition of new environmental requirements on irrigators. The program was aimed at accelerating industry restructuring in the LMRIA, improving the viability of farm businesses and minimising the costs of infrastructure required to reduce pollution inflows into the Murray system. The program comprised:

- financial assistance for farm business planning to assist landholders in making decisions regarding the future of their farming in the LMRIA;
- financial incentives for existing irrigators to transfer or purchase land to promote farm consolidation in the LMRIA, thereby reducing rehabilitation costs and improving farm viability;
- exit assistance for farmers who chose to sell their property or retire their land from irrigation;
- Rehabilitation Financial Assistance was available to assist irrigators who decided to continue irrigating to construct necessary environmental supply and run-off prevention works, contingent upon an irrigator contribution.

The reforms resulted in significant reductions in pollutant loads, and an estimated 50GL of water was returned to the Murray River. While the number of dairy farms in the LMRIA significantly declined, overall state dairy production was maintained through increased productivity and/or the relocation of farms to more productive areas. The social and regional impacts have therefore been significant.

The recent drought has caused wide spread soil cracking in the area and damaged some of the rehabilitated infrastructure including the levee banks. Maintaining a sound sustainable regional economy is not yet assured.

On the whole, regions have demonstrated considerable capacity and resilience to adapt to external pressures and the importance of regional economies having operating environments that do not impede the types of changes required to minimise impacts of climate change has been recognised. In providing regional assistance the purpose is not to interfere with direction of change but rather minimise the transitional costs inevitably borne by communities when the change is occurring.

For example, all industries along the River Murray corridor were significantly affected by drought (in combination with market pressures). Water trade and carryover were important mechanisms for managing the reduced water availability. In 2008-09 when allocations were 18 per cent, net allocation trade into South Australia for irrigation purposes totalled 120GL and 94GL carryover.

As identified in draft recommendation 5.1, the correct mix of consistent policies is crucial to ensuring the best operating environment for producers managing climate change risk and other business challenges. For the agriculture sector there has been a recent decision to develop proposals for a future drought policy package that moves away from crisis management

to greater emphasis on risk management and preparedness by farmers. The integration and synergy between policies, particularly drought, water and mitigation reforms, will also play a significant role in encouraging climate change preparedness (PIMC, 2009) and therefore needs to be appropriately coordinated.

The use of vulnerability assessment methodologies in an agricultural context has historically had some challenges. Past assessments of the vulnerability of agriculture to climate change, for example ABARE (2008), are limited by their ability to differentiate the impact of climate change on producers within regions based on their individual farm characteristics, farmer preferences, financial and environmental circumstances. It is also important that vulnerability assessments are comprehensive. Partial analyses that focus on impacts, without incorporating adaptive capacity can be misleading and unhelpful. On the other hand, decisions on the depth of analysis in a vulnerability assessment should recognise the marginal costs and benefits of further analysis. In many instances, a qualitative assessment may be enough to direct further adaptation inquiry or activity.

As a result of these significant limitations, the Primary Industries Ministerial Council's High Level Officials Group on Mitigation and Adaptation (PIMC, 2009) recommended that general vulnerability studies should only be used as a guide for identifying possible regions at higher climate risk. Within this context it is SA's policy to undertake first pass integrated vulnerability assessments across a whole region as a first stage of climate change adaptation planning.

The integrated nature of SA's assessments means that they take into account the range of industry, natural resource, community and other factors making communities vulnerable, as well as the factors of resilience that communities can tap into to manage risk and prosper in a changing climate. This address the concerns outlined above.

Building adaptive capacity

The discussion on drought (page 88) seems to be consistent with previous Productivity Commission (PC) reports. The PC report on drought followed many reports and reviews associated with the removal of drought from the natural disaster and the responsibility for managing the risk shifting from government to farmers. The role of government becomes one of providing information, assisting structural adjustment and providing welfare support. The WA trial (and previous recommendations) are that farm business are supported by information and training rather than a transfer of funds.

If adaptation is taken as a "continuous stream of activities, actions, decisions and attitudes" (P 52 of PC report citing Adger et al. 2005) then drought policy that encourages farmers and farming practices in regions that are unsuitable or changing in suitability will distort the ideal farming practices. An obvious case is the low rainfall farming regions.

This is referred to on page 49 "For example, the agriculture sector may be able to incrementally adjust to the impacts of climate change by changing crop management processes and planting times. However, more significant

climate change could have significant effects on crop productivity in some regions. This may mean farmers need to take transformational actions, such as relocating the farm, or using the land for other purposes such as other crops, grazing or plantation forestry (CSIRO 2008)."

However the low confidence in climate science on future rainfall over coming decades and the difficulty in separating a climate change signal from decade to decade and year to year variability make planning for farmers and governments difficult. Furthermore there are likely to be technology improvements in farming techniques and other factors such as commodity prices and changes to input costs over the time period.

SARDI Climate Applications is part of an NCCARF project led by economists from the University of Sydney to examine the application of Real Options to farmer decision in a transect from medium rainfall to low rainfall. This work is integrated with the terrestrial production component of Transect for Environmental Decision Making (TREND) which is funded by the Premier's Science Research Fund. In partnership with CSIRO Adaptation Flagship and TREND we have studied Goyder's Line in the current and changing climate.

Water policy

The question of water policy has again been much discussed (page 90). It seems that the cost of the drought for the MDB in both financial and social terms would have been worse in the absence of water trading. The overall consensus is that a water market did reduce the impact of the recent drought across the whole MDB and especially for South Australia.

Information provision

There is a useful discussion (page 95) on the role of government to provide information as part of a well functioning economy. As mentioned earlier if adaptation is taken as a "continuous stream of activities, actions, decisions and attitudes" (P 52 of PC report citing Adger et al. 2005), then information is necessary for this to occur.

The role of government as outlined in Figure 1, page 11 (reproduced below) has information provision as a responsibility of the Commonwealth government and this is restricted to providing downscaled climate predictions.

Figure 1 **Reform priorities by level of government**

	High priority	Lower priority
Risks	*Current climate risks*	*Possible future climate risks*
Characteristics	High degree of certainty	Significant uncertainty
Effective adaptation	Take action today to improve risk management and build adaptive capacity	Take preparatory actions that are low cost and reversible
Australian Government	• Review natural disaster recovery arrangements • Improve hazard mapping • Ensure the National Construction Code takes climate change into account • Reform transfers that impede adaptation (such as drought support)	• Provide downscaled climate projections
State and territory governments	• Clarify the roles, responsibilities and legal liability of local governments • Better align building and planning regulation • Phase out inefficient taxes (such as taxes on insurance and property transfers)	• Make changes to land-use planning regulations to respond to uncertain future climate change impacts
Local governments	• Improve communication of hazard information to residents	• Consider new planning instruments
National coordination (possibly through COAG)	• Clarify roles and responsibilities in emergency management • Pursue ongoing economic reforms to enhance flexibility and adaptive capacity	• Establish guidelines for managing climate change risks to existing settlements

The first issue is that while the basic climate science is best provided by the Commonwealth government, state governments have a role in generating and transferring information as do local governments and Universities running projects with government funds.

The second issue is the focus on downscaling. On pages 102 and 103 some caution is expressed on the value of downscaling fine resolution climate information for decision making, however this should be captured in the early summarising sections of the document. There are questions within the climate science community about downscaling and for the climate applications community we need to be aware that downscaling is unlikely to resolve many of the key uncertainties for South Australian climate.

On one hand in the report there seems to be a somewhat naïve perspective that what is required is more information from climate science and end users (farmers, agribusiness, policy makers and planners) will easily pick up this information and use it. The report also addresses in some detail the challenges of decision making under uncertainty. The SA experience working with the agricultural sector to apply climate information has required a participative approach. This is more than consulting end-users or conducting market research to identify how to best package and communicate information. The question of developing actionable knowledge from climate science is an active area of research. It is useful to distinguish between the

research and development process and the ongoing delivery and individual tailoring of information.

On page 114 the report makes valid points about the limit to the role of governments in providing on-going detailed information. "However, it is also important to recognise that there are fundamental limits to the scope of information on adaptation options that governments can and should provide. The most appropriate approach to adaptation could vary significantly from one individual or business to the next reflecting differences in circumstances and personal preferences. Governments are unlikely to be able to provide highly customised information, and should not attempt to. Precisely because such information is specific, the benefits are likely to accrue privately and should be purchased privately."

The approach South Australia is trying to take in SARDI Climate Applications is that we need to work closely with end-users on adaptation, but to then feed the research findings and information to other groups – private consultants or Rural Solutions who can offer specific information. Nevertheless this requires funding for the initial work through RDCs and the Commonwealth Government.

Policy reform is a critical complement to the institutional arrangements that facilitate the uptake of practices and technologies at farm level that have been proven through research and development and which builds resilience and increases productivity. As noted by Pannell (2006) technologies and practices should provide sufficient advantage relative to existing practices, particularly in financial terms, be easy to test and learn about before adoption, and be consistent with farmers' goals.

Adaptation is by definition local, however many of the issues and approaches can benefit from learning across sectors and regions. Although not perfect, an important role was played by NCCARF in funding research, including cross cutting issues and providing conferences and funded networks to facilitate the sharing. The recent Commonwealth budget (May 2012) did not provide for more funding in this area and this may be a barrier to better adaptation and make coordinated provision of information to end-users less efficient.

Planning and building regulation

Page 138 discusses that planning and building regulation in Australia is often based on historical information and static climates. However, in SA, Coast Protection Board policy and Development Plan policy, from the early 90's, has addressed mostly the 100 year ARI (ie '1-in-100 year') event and sea level rise.

Regarding table 8.1, outlining the 2050 and 2100 benchmarks (page 142), it is worth noting that most development is required to address the 30cm sea level rise only (provided that there are reasonably practical means of addressing the further 70 cm rise to 2100).

In addition, the last dot point on page 142, indicating the SA policy is to impose minimum floor heights for buildings is an over-simplification. Coast Protection Board policy and the Development Plan provisions (neither of which are mandatory provisions) also recommend (mostly) site levels and erosion buffers.

Box 8.4 on page 145 outlines a range of planning scheme instruments. South Australia submits the following comments in relation to the instruments discussed:

- Overlays: In SA overlays are commonly applied where hazards might provide constraints in an area laying over a number of zones (eg bushfire protection areas). They can be a useful tool for addressing a hazard which was not properly considered when an area was opened to development but zoning is generally a much better tool.
- Zones: In SA this has been our preferred approach by way of the various coastal zones (the SA Planning Policy Library currently includes Coastal Conservation, Coastal Open Space and Coastal Settlement Zones).
- Indemnity statements: Indemnities are of limited usefulness as they do not actually make the hazard go away or equip the owner to protect against the hazards.
- Transferable development rights are an additional possible instrument to address retreat of existing development. They are a planning tool that compensates owners of land for which rights have been restricted by regulation, with compensation achieved by allocating those owners a right of development that may be transferred from the restricted (donor) site to another (receiving) site. The TDR may also be sold to another owner. These are enabled in the SA Development Act by Section 23(3)(b).

Box 8.9 on page 150 discussed provisions of the Port Adelaide Enfield Council development plan. This provision is actually contained in all of SA's coastal Development Plans. It originated from the Minister's Amendment in 1994 and reflected Coast Protection Board policy.

The draft report discusses incentives for adaptation for property owners (Page 161 -163). It is worth noting that the incentive for an owner to undertake adaptation action now which allows for the better addressing of a hazard which is increasing with time is somewhat diminished. For example, in regards to sea level rise, establishing higher site and floor levels now fall to the cost of the current owner, but that avoids costs which are more likely to arise for future owners (and the government).

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