Submission by Ian Carruthers on draft PC report 'Barriers to Effective Climate Change Adaptation'

The Productivity Commission makes a valuable contribution in its draft report to helping frame a sound national approach to the young but critical public policy agenda on adapting to climate change.

I broadly support the recommendations provided. However, there are several areas where improvement or deeper development should occur in finalising the Inquiry report.

My input is framed from a perspective of a career interest in environmental risk management and climate change policy.

Key points

The following key points are made in this submission:
(1) a stepwise approach over time to implementing a national action agenda on adaptation to climate change impacts is sound and necessary.
(2) the real options approach advocated by the PC in deciding the sequence of actions has merit

- but attention is needed to clarify and nuance its application.

(3) the PC is correct in proposing that some improvements in managing current day climate risks would have immediate benefit and would aid in positioning Australia to cope with the impacts of changing and increasing climate risks

- but the limits to this proposition need articulating; and.
- I recommend the PC consider adding to current climate management measures: (a) strengthening Bureau of Meteorology climate observation records; and (b) a reform review of institutional arrangements and priorities for action on spatial mapping.

(4) emphasis on gradual climate change is largely a red herring for the purposes of this Inquiry - the dominant issue is around the implications of changing patterns of future extreme climate events; and non-linear damage functions as safety thresholds are exceeded.
(5) the PC is correct that specific climate change adaptation reform activities should concentrate mostly on capacity building - planning frameworks, local scale projections, and knowledge of adaptation response options - that will form the foundation for future (and likely costly) physical adaptation actions. This point should be brought out more strongly in the recommendations.

- but there is no evidence to support the PC proposition that these climate change capacity building measures have a lower priority than remedying residual weaknesses in managing current day climate risks.

Improving Management of Current Climate

The PC proposes that top priority should be given to remedying deficiencies in how current climate risks are managed (eg. Fig 1). Addressing the capacity to manage current climate risks has merit, but the limitations to that proposition need to be made clear - a point picked up later in this submission.

The PC report would benefit from some reflection on why it is that there are still some fundamental weaknesses in how current climate events are managed, notwithstanding many decades of policy focus and expenditure investment on tackling this national threat; and what lessons can we draw to avoid repeating those failings as we commence to address future climate risks.

In the draft report, there is a sanguine view that 'Australia has a long history of coping with climate variability' (for example, at p2). Perhaps, given the extent and cost of climate risks through bushfires, heat deaths, floods and drought (to name some) experienced in the past few years, this would better be expressed in terms of there being good evidence of substantial improvement in coping ability made over time; but with important weaknesses in some key climate management areas still apparent. And to address those weaknesses would give Australia a better starting point for coping with the greater risks that will become apparent due to climate change.

I propose two specific additional measures that should be advanced in improving Australia's resilience to manage current climate conditions.

Bureau of Meteorology - It is notable that the draft PC report does not address the role of the Bureau of Meteorology and the economic and social dividend resulting from investment in its operations when it comes to managing risks of current climate patterns. (The forecasting reliability and longer outlook capability today is much superior to that of a decade or two ago - with substantial national benefits resulting in areas like cyclone and flood warnings.) However, Australia suffers due to a sub-optimal investment in the Bureau's climate observations network.

That observation network provides the long term data series upon which is calculated the probability of extreme climate events occurrence at locations around Australia - the fundamental starting point for establishing risk criteria for protecting human life and damage to assets. The weaknesses in current observations relate to spatial distribution, longevity of records, and types of data gathered. Looking ahead, observational data gathering systems will need to cope with a major statistical perturbation due to climate change. There will be a need for enhanced observational records relevant to those changing climate conditions and what that implies for statistical occurrence of future extreme climate events.

The Bureau of Meteorology could presumably advise the PC on priorities for climate services as it sees them with a view to covering this item in a Recommendation.

Climate Hazard Mapping - The PC draft report gives attention to recent Inquiries identifying deficiencies in flood map availability and the actions taken in response. Weaknesses in availability of flood risk information is long-standing and has been noted repeatedly. Similar (or even greater) deficiencies apply to other climate hazard risk information like bushfires. The PC draft recommendation 6.1 on improving coordination and dissemination is sound, but it should be taken further.

There has been a technological revolution in the past decade that could deliver capability to acquire spatial information at much lower cost - to generate hazard maps and information. But Australia has not put in place the institutional framework to capitalise on those potential benefits. In the absence of dealing with the institutional framework issue, Australia is destined to continue being handicapped in providing hazard information and to be shackled by efforts that are not least cost.

In the case of weather maps and climate observations, Australia reaps a large dividend because from Federation a national approach to meteorology was put in place through the Bureau of Meteorology. The role of the Bureau was expanded in recent years to drive a national effort on water data - to address long known deficiencies in that area. As the PC notes, GeoScience Australia very recently has been assigned the task to develop a portal for flood risk information; but aside from these types of select investments GeoScience Australia has very limited resource capability or mandate.

Given the technological revolution in this area, combined with a society and business community that is much more aware of what some of the potentials could be, it is timely for the PC to propose that a strategic and comprehensive reform review be undertaken on the institutional needs and the priorities for action to harness the benefits of spatial mapping for managing climate and other risks.

Coping with Future Climate Risks

The draft PC report correctly distinguishes adaptation to climate change in terms of two elements: building capability; and implementing adaptation measures; and frames this around a 'real options' approach.

To underpin the application of the real options approach, the PC report would be strengthened by a more structured treatment of the climate risk challenge that confronts Australia - beginning with a summary of the starting point of practice now.

- **Climate risk management today and beyond**

At a simple level, management of climate risk today for societal and economic benefit involves:

> (a) selection of place and of activity suited to the generally occurring state of the climate, based upon observation and experience; with modification of activities as experience grows, technology changes, and as economics change and;
>
> (b) assessment of risks of extreme climate events which in statistical terms are expected to occur infrequently, with application of preventative and recovery measures to deal with those.

With human interference to the climate system having begun and bound to grow over time due to global emissions of greenhouse gases, the way Australia manages the circumstances of both (a) and (b) above will change.

The PC draft report addresses 'gradual changes' in the climate (ch 2.1), which seems to relate to changes in the averages of temperature, precipitation and sea level (and the like) - and so averages can be expected to change 'gradually' (key points - p.33). This emphasis on gradual climate change seems to miss the point about what is most important about climate change adaptation, and where the priority focus of the PC Inquiry should be concentrated.

Adaptation to changes in the average general state of the climate does have some importance into the future; for example, what will it mean to have a general drying of aggregate precipitation in southern and eastern Australia in terms of maintaining stocks of water for cities. These are changes that will play out over timeframes sufficient to adopt structural change strategies. They seem amenable to being addressed within a framework of 'real options' for structural change.

It is the changed patterns of occasional extreme events - their intensity and frequency - that really matter when it comes to planning climate change adaptation for human systems. Marked exceedence of safety thresholds drives high damages, and increased frequency of highly damaging events leads to reduced recovery capability.

And in the case of biological systems there are defined thresholds (tipping points) - often little separated from current conditions at which abrupt changes occur. (These are known and distinct from the 'surprises' mentioned in the PC report.) Examples include human mortality with protracted heat wave incidence, basic structures of marine ecosystems as oceans acidify, and sea surface temperature thresholds for coral bleaching.

Extreme Climate Events

Australia experiences already variability in climate conditions exceeding that of most other countries - the 'droughts and flooding rains' image provided at p. 34.

The PC draft report discusses aspects of the way Australia currently plans to deal with, mitigates against, spreads risk from, and recovers from extreme climate events. However, what is not dealt with is consideration of how the system defines extreme events and sets a risk acceptance norm.

In the case of current climate conditions, climate risk management is generally based on an accumulating observational record and modelling - from which can be established probabilities of events. Societal and economic processes then explicitly (or in some cases implicitly) define what is an acceptable level of risk for a particular type of activity.

Land use plans and zoning, infrastructure design standards and building design variously adopt as thresholds 1:25 year, 1:100, or far more infrequent benchmarks to define suitability of locations, assets design and emergency planning for various purposes. It is implied that by operating within those safety benchmarks, damage from weather events to human safety and economic loss is kept within acceptable bounds.

And it is understood that, when climate events exceed these safety benchmarks (for wind, flood, fire, hailstorm etc risk), significant damage will likely result. The damage bill is further escalated to the extent that systemic planning and design is deficient in corresponding with the accepted safety thresholds. It is notable that the PC report does not contain information on the costs to the economy and society from current extreme climate events, relative to other reform agendas.

Once climate events exceed applied safety thresholds, the damage cost typically is non-linear with the increased magnitude of the event. For example, a 25% increase in wind speeds from 40-50 knots to 50-60 knots generates a 650% increase in insurance claims cost (IAG climate change paper, Tony Coleman). Similarly, there is good data that in North Queensland houses built to pre-1980 construction standards are greatly more prone to cyclone damage than those built to current standards.

The PC does observe (p 43) that small changes in averages can translate to large changes in the probability of extreme values. However, the profound implications of this are not developed in the draft report. One example can be found in the DCCEE coastal vulnerability assessment (report referenced by PC) which states that for a sea-level rise of (only - *my emphasis)* 0.5 metres, the current sea storm tide event occurring currently once in a hundred years could occur several times a year.

The combination of: a non-linear probability of extreme events occurring as climate change progresses; along with a non-linear damage cost for communities and businesses once present climate safety factors are exceeded - is something that needs to explicitly underpin the PC's interpretation of how to apply the 'real options' approach to climate change adaptation.

Applying the 'Real Options' Approach to Extreme Events under future climate conditions

The draft PC report would benefit from providing a clearer treatment of the real options approach and ensuring that across the several parts of the report where it is explained or applied that is done consistently. As it stands, this reader finds the draft somewhat confusing, and lacking indication of qualifications or specific application of some propositions made.

- **Priority of reform measures**

The PC proposes a focus on reform actions that deal with current day frequency and intensity of climate events, delivering immediate benefits. It is true that achieving sound governance and institutions in managing present climate risk would likely carry over to benefit how future climate change impacts are managed. But the limits to the proposition also need to articulated - even sound governance for today will need substantial adaptation to cope with the climate challenges of the future.

The PC also proposes correctly that 'no-regrets' measures should be advanced. It is not clear precisely which of the proposed measures fit this category. However, I assume that it is the set of measures listed in the last column of Figure 1 (page 11). It is notable that all of those measures are listed as being of lower priority than measures for addressing deficiencies in managing current climate risks - the cost/benefit evidence basis for assigning them to be lower priorities seems absent. (And curiously, reforming the Construction Code to take account of climate change is selected as the only measure of high priority -why does it stand above other climate change specific measures?)

By consigning climate change specific measures paraphrased in Figure 1 to a lower priority, may well play out as deferring their implementation indefinitely.

In the absence of cost-benefit assessment of the range of measures summarised in Table 1 (and of deferring their implementation), it would seem that all should be presented as important - without attempting to rank them.

Treating Uncertainty

The PC notes that uncertainty surrounds understanding of a range of subject areas on which national decisions must be made. There seems to be a tone though that uncertainty is an especially difficult matter when it comes to how to address climate change impacts.

The IPCC (2007) states that it is *very likely* (meaning greater than 90% probable) that hot extremes, heat waves and heavy precipitation will continue to become more frequent; and makes similar statements about other forms of climate extremes.

The clear message is that climate change impacts will produce greater risks for national wellbeing - that is a message of substantial certainty. The use of terminology which suggests a questionable risk (eg the sub-heading 'Possible future climate risks' in Figure 1) should be avoided. (Indeed, it could be argued that at this broad scale level, there is a greater certainty of the long-term trend direction than is the case of other uncertain public policy issues like health pandemics or terrorism.)

Where the climate uncertainty lies relates particularly to locational features of frequency, intensity and rate of change, which the PC correctly identifies as having key implications for specific adaptation investments.

The scale of risk to national well-being is not established. Perhaps the best piece of work indicating this is the DCCEE coastal vulnerability assessment (referred to in PC report) concluding that up to $226 billion of present assets on the coast would be at risk from a 1.1 metre sea level rise. A broad-brush view across all types of extreme climate events (eg Garnaut report referenced by PC) would suggest that the stakes for national wellbeing are potentially exceedingly high. Fortunately, though there is time to prepare to act to limit these potential costs.

This suggests that there is a high priority to be placed upon those climate change measures which address building capability and which in proportion to the future threat are relatively inexpensive. The specific measures in this area laid out in the draft PC report - addressing science tools, information, building knowledge of adaptation options, and future oriented planning frameworks are basically sound.

Whilst there is time to prepare for substantive interventions, it will take a significant period of time to put in place the under-girding capacity building - so those measures should be a priority to progress now - a point that should be given more emphasis in the PC recommendations.

On the question of how to deal with those adaptation measures that involve high up-front costs, the PC report would benefit from a deeper consideration and more nuanced treatment of the issue. The case example at p73 for a coastal house development is comparatively simple and small scale. Other situations should also be considered such as development decisions with long-life lock in effects (eg major infrastructure investment and land use zoning changes) and having limited flexibility to adapt in future when better climate impact information does become available.

Governance

In light of the scale of significance of the climate change adaptation issue, its systemic implications for decision-makers at all levels, and the complexity of learning how best to progress action, there would be merit in the PC providing a view on how to review periodically whether national action is on track. Reference is made in the draft report to the 2010 Commonwealth adaptation position paper which stated an intention to produce periodic 'Climate Futures' reports.

The PC holds the view (Recommendation 13.1) that advancement of the climate change adaptation agenda on a coordinated and integrated basis can sufficiently be done by the COAG Select Ministerial Council. It is notable that the work of COAG to date has been led from DCCEE, and that a substantial body of the initiatives to date in climate change adaptation have substantial involvement of DCCEE. Given the immaturity of this major area of public policy, the complexity, the systemic and interlinking features, and the benefits of creating a sound footing, the case opposite to p. 249 could be put. It could be argued that DCCEE should during these formative stages have a significant role within the Commonwealth and nationally in catalysing and reviewing action on climate change adaptation.