Australian Government
Productivity Commission

Barriers to Effective Climate Change Adaptation

Productivity Commission Issues Paper

October 2011

The Issues Paper

The Commission has released this issues paper to assist individuals and organisations to prepare submissions to the inquiry. It contains and outlines:

- the scope of the inquiry
- the Commission's procedures
- matters about which the Commission is seeking comment and information, and
- how to make a submission.

Participants should not feel that they are restricted to comment only on matters raised in the issues paper. The Commission wishes to receive information and comment on issues which participants consider relevant to the inquiry's terms of reference.

Key inquiry dates

Receipt of terms of reference	20 September 2011
Due date for submissions	16 December 2011
Release of draft report	April/May 2012
Public hearings	June/July 2012
Final report to Government	September 2012

Submissions can be made:

By email: climate-adaptation@pc.gov.au By fax: (03) 9653 2199

By post: Barriers to Effective Climate Change Adaptation
Productivity Commission
LB2 Collins Street East
Melbourne Vic 8003

Contacts

Administrative matters:	Yvette Goss	Ph: (03) 9653 2253
Other matters:	Anthea Long	Ph: (03) 9653 2162
Freecall number for regional areas:	1800 020 083	

Website **www.pc.gov.au**

The Productivity Commission

The Productivity Commission is the Australian Government's independent research and advisory body on a range of economic, social and environmental issues affecting the welfare of Australians. Its role, expressed most simply, is to help governments make better policies, in the long term interest of the Australian community.

The Commission's independence is underpinned by an Act of Parliament. Its processes and outputs are open to public scrutiny and are driven by concern for the wellbeing of the community as a whole.

Further information on the Productivity Commission can be obtained from the Commission's website (www.pc.gov.au) or by contacting Media and Publications on (03) 9653 2244 or email: maps@pc.gov.au

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1 What is the inquiry about?

Australians have a long history of coping with a highly variable climate. However, a changing climate could introduce new pressures over time, and permanently change the weather patterns and events that we face. The impacts could be large, wide-ranging and complex, and vary by sector and region (box 1). At the same time, it remains uncertain what changes may occur, or exactly where or when they will occur. Notwithstanding this, some parts of the economy are already responding to potential climate change impacts. For example, coastal planning policies have been implemented in a number of areas to address the possibility of sea-level rise.

While some individuals and businesses may already be well placed to deal with these changes, barriers may exist that impede adaptation to climate change in the ways that best suit individual circumstances, or that would provide the largest benefits for the community. These barriers could include market failures, and behavioural and cultural factors. Barriers can also result from government regulations or the way that institutions perform their duties.

The Australian Government has asked the Commission to identify regulatory and policy barriers to effective adaptation, and to identify high priority reform options to address any identified barriers. The Commission is also required to report on:

- policy frameworks required to facilitate effective adaptation to climate change
- the costs and benefits of identified reform options
- priority reform options
- the role of market and non-market mechanisms in facilitating adaptation
- the appropriateness of government intervention.

While relevant to the broader climate change policy debate, mitigation policy (policies designed to reduce emissions) and climate change science will not be considered in this inquiry. (However, to some extent, the degree of adaptation required will depend on the success of global mitigation efforts.) The full terms of reference for the inquiry are provided in attachment A.

Box 1 **Potential impacts of climate change**

Australia's climate is projected to change significantly over the next century. Estimates suggest an increase in annual average temperature of between 1.8°C and 3.4°C on 1990 levels by 2070 (CSIRO 2007). While the magnitude and timing of climate change will depend on future emissions, the potential impacts are significant, wide ranging and uncertain.

- Sea-level rise coupled with storm surges could lead to increased erosion and flooding for coastal properties and infrastructure, and a loss of beaches.
- Increases in the intensity and/or frequency of extreme events such as heatwaves, drought, hailstorms and bushfires may place at risk public infrastructure, private property, human health and safety, and economic output.
- Higher temperatures and other factors could impact human health, for example, by increasing risks associated with the transmission of mosquito-borne, food-borne and water-borne infectious diseases.
- Reduced rainfall and higher evaporation rates could negatively affect water supply in many parts of Australia.
- A range of competing factors could have positive or negative effects on agriculture, which could vary significantly by commodity and region.
- Higher sea surface temperatures may lead to more frequent mass coral bleaching, causing loss of habitat and biodiversity in marine ecosystems with flow-on effects for coastal tourism. Higher temperatures, more variable rainfall and a range of related factors could also lead to significant loss of habitat and biodiversity in other ecosystems.

Effective adaptation may help to manage these impacts.

Sources: CAWCR (2011); CSIRO (2007); IPCC (2007).

The Commission's approach

In examining regulatory and policy barriers to adaptation, the Commission will take account of the welfare of the community as a whole, and is proposing to take the following approach to the inquiry.

- Clarify what is meant by 'effective' adaptation and consider how effectiveness can be assessed in the context of adaptation.
- Identify the various types of barriers to effective adaptation with an emphasis on market failures and policy-imposed barriers, such as regulatory impediments.
- Identify specific instances where government intervention may be warranted to address barriers to adaptation.

- Examine the range of policy tools that governments could use to address these barriers — for example, facilitating markets, regulatory responses, or government supply of goods and services.
- Weigh up the costs and benefits of reform options and identify those that are likely to provide the greatest benefits to the community as a whole.

In undertaking this assessment, the Commission will be mindful of the influence of the broader economy on climate change adaptation. Well-functioning and flexible markets can be important for reducing the costs of climate change. Thus, while not often specifically discussed in the context of adaptation, broad-based reform may be of high priority to facilitate adaptation.

How you can contribute to this inquiry

The Commission is seeking feedback from a wide and representative range of stakeholders. It has already commenced an informal consultation process and is inviting submissions from organisations and individuals with an interest in barriers to climate change adaptation. (Attachment B outlines how you can make a submission.) Some particular areas where the Commission would appreciate input are highlighted in the subsequent sections of this issues paper.

The Commission is seeking initial submissions by 16 December 2011. Wherever possible, submissions should be supported by evidence. This can include data on a whole sector or region (or specific groups within it), descriptive material on observable trends and practices, or even relevant anecdotal examples.

Drawing on the input it receives, and on its own analysis, the Commission will produce a draft report by May 2012. This will detail the Commission's preliminary conclusions, and will provide a further opportunity for participants to express their views before a final report is submitted to Government by September 2012. (An indicative timeline for the inquiry is outlined inside the cover of this issues paper.)

2 What does adaptation to climate change mean?

The Commission's terms of reference define climate change adaptation as 'action by households, firms, other organisations and governments to respond to the impacts of climate change that cannot be avoided through climate change mitigation efforts'. That is, adaptation includes actions to adjust to climate change, but does not include actions to adjust to government policies to mitigate climate change.

Adaptation can take many and varied forms and involve a variety of sectors. It can be as simple as an individual buying an air conditioner in response to warmer weather, or as complex as an insurance firm changing the way it forecasts the likelihood of extreme weather events.

Whereas the definition provided in the terms of reference focuses on adjustments by humans, some other definitions of climate change adaptation take a broader view (box 2).

Box 2 **Defining climate change adaptation**

Climate change adaptation is a relatively new term, no definition is universally agreed and the precise meaning can differ by context. For instance, the Intergovernmental Panel on Climate Change adopts a wider definition than the terms of reference, including adaptation by ecosystems as well as human societies and the exploitation of the potential benefits of climate change:

> Adaptation is the adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects, which moderates harm or exploits beneficial opportunities. (IPCC 2007, p. 7)

Others explicitly emphasise the use of strategies to respond to climate change impacts. For example, the United Nations Development Program has stated that:

> Adaptation is a process by which strategies to moderate, cope with and take advantage of the consequences of climate events are enhanced, developed and implemented. (UNDP 2004, p. 36)

As the definitions above illustrate, the key terms used to describe adaptation are not always the same. Whereas the terms of reference expresses adaptation as 'action', other definitions describe adaptation as an 'adjustment', 'process' or 'outcome'. Differences in definitions sometimes reflect the context in which the definitions are to be used — technical publications tend to adopt relatively broad definitions whereas policy documents are often more focused and specific.

Definitions also sometimes differentiate adaptation based on the timing of the adaptation decision (anticipatory or reactive), the economic sphere in which the adaptation takes place (private or public) and whether or not adaptation is facilitated by institutions (autonomous or planned).

However, such categorisations are often difficult to delineate. For example, if someone builds a more wind-resilient house after a cyclone this could be regarded as both anticipatory and reactive adaptation.

Sources: Fankhauser, Smith and Tol (1999); IPCC (2007); Levina and Tirpak (2006); UNDP (2004); Willows and Cornell (2003).

In most cases, adaptation is likely to involve reducing the harmful impacts of climate change, but in some cases it may also mean exploiting potential benefits. Even within a particular industry, climate change may have both costs and benefits. For instance, sugarcane producers in southern Queensland and northern New South Wales may suffer from reduced water availability as rainfall declines, but increased temperatures may also allow for longer growing seasons (CSIRO 2008).

Climate change adaptation is about the way people adjust to, and trade off, changes in costs and benefits brought about by climate change. These changes will affect where people live, how they do business, the occupations they choose, and the goods and services they buy. In this sense, adaptation is a form of structural adjustment — it is the aggregation of a countless number of adjustment decisions made by individuals and businesses that, for the most part, can be expected to occur autonomously.

However, climate change adaptation is more than just an ordinary structural adjustment. The impacts of climate change are expected to be uncertain, pervasive and diverse, with effects extending far beyond the economy. In most cases, impacts will be felt gradually over an extended period of time — for example, increases in temperature will occur over many decades. However, it is possible that gradual changes could result in certain thresholds being exceeded (such as a high temperature), which means that changes in weather extremes may be noticed much faster than changes in weather averages (Fankhauser, Smith and Tol 1999).

Adaptation does not necessarily imply 'climate proofing' that completely avoids all impacts. First, in many cases adaptation can only help to reduce the impacts of climate change, not ameliorate them completely. Second, there may be many circumstances where an individual, firm or other organisation may prefer to bear some, or all, of the impacts of climate change rather than fully offsetting the impacts in advance. That is, in some cases adaptation may involve action after an event in preference to action in anticipation of an event, or even just an attitudinal change in what is considered 'normal'.

Making adaptation effective

The terms of reference request the Commission to assess barriers to effective adaptation. However, the meaning of 'effective adaptation' is open to interpretation. In general terms, effective means producing the desired or intended result, but something more specific may be required for the purposes of this inquiry.

One possible interpretation of effective adaptation is that which maximises the net benefit to the community as a whole. On this basis, adaptation can be considered

effective if it is done at least cost, if resources are allocated to activities that generate the greatest net benefit to the community, and if the timing of adaptation is 'optimal'. That is, timing decisions should be based on the relative costs and benefits of taking action at different points in time. This means an investment should be delayed as long as the benefits of delay are greater than the associated costs (Fankhauser, Smith and Tol 1999). Whether, and when, to invest in a specific adaptation is therefore likely to depend on one's expectations about the future benefits and costs of that action. Delaying may be preferable if costs are likely to fall in future, but not if they are expected to rise sharply.

This raises the question of how to evaluate the effectiveness of adaptation, especially considering that the appropriate timing and extent of adaptation will likely differ for each individual, firm and government. In addition, the presumption that there are barriers to adaptation could be taken to imply that adaptation may not be occurring fast enough. Thus, it will be important to consider if and how adaptation outcomes should be monitored.

Dealing with uncertainty

Effective climate change adaptation is complicated by a number of cascading uncertainties that limit our ability to predict the timing and magnitude of future climate change impacts. These include uncertainty with regard to future greenhouse gas emissions (including mitigation efforts), the sensitivity of the global climate to greenhouse gas emissions, and how global climate change will translate to regional climate impacts.

Individuals, firms, governments and other organisations often manage uncertainty. For example, over the past three decades, farmers have faced major droughts and declining terms of trade, yet the value of agricultural output has continued to increase (PC 2009). Many farmers have learned to cope with climate variability and a variety of other changes via technological innovation, product diversification and more strategic management of business risks. This illustrates that uncertainty need not imply paralysis. However, the uncertainty associated with climate change is likely to be much greater than that associated with past climate variability, both for the agricultural sector and for the economy and community more broadly.

Climate change adaptation will inherently involve incomplete information about the expected outcomes. Consequently, adaptation that appears appropriate now may turn out to be ineffective once further information becomes available. This may suggest that adaptation is best pursued with an emphasis on flexibility and with a

preference for ‘no regrets’ options that have benefits regardless of future climate change.

This uncertainty also creates a challenge for monitoring and evaluating the effectiveness of adaptation measures. If future outcomes are uncertain, how can one determine if adaptation is occurring at the optimal rate? If private adaptation can be judged to be insufficient this may suggest a greater role for government facilitation, but making this judgment is no easy task. What might appear to be an insufficient degree of adaptation may be the rational and efficient response of individuals, firms and governments to an uncertain future environment and to the different incentives that they face.

How is effective adaptation best defined? How can it best be assessed? In other words, is the rate of adaptation ‘too much’ or ‘not enough’, ‘too soon’ or ‘too late’? What other considerations may be relevant for maximising the net benefits to the community from adaptation?

What kinds of adaptation to climate change (and variability) have proven most effective to date?

How can uncertainty be addressed in the context of adaptation to climate change?

3 Are there barriers to adaptation?

The terms of reference ask the Commission to assess the regulatory and policy barriers to effective climate change adaptation and, more generally, to identify any specific barriers that may inhibit effective adaptation. A barrier is something that could reduce the willingness or capacity of individuals, businesses or other organisations to adapt to the impacts of climate change. The existence of such barriers may mean that the community does not adapt to climate change as effectively as it might otherwise, or could embark on the wrong sort of adaptation.

The Commission proposes to classify barriers to climate change adaptation using the following broad categories.

- *Market failures* occur when markets do not allocate goods and services in a way that maximises the overall welfare of the community (box 3).
- *Regulatory barriers* result from government policies or regulations that increase costs, create delays or inhibit activities. These could include planning rules, inconsistent regulations across jurisdictions, or administrative burdens.

- *Behavioural and cultural barriers* result from constraints on the decision-making abilities of individuals, and may arise, for example, due to cognitive factors or cultural values (box 4).
- *Organisational barriers* are constraints on the decision-making abilities of organisations, including large firms and government agencies. These may arise, for example, because the managers and owners of a firm have different incentives or attitudes to risk, decision-making time horizons are short, or there is insufficient cooperation (PC 2005).

While barriers can arise because of existing policies or regulations, the absence of a regulation that might otherwise be appropriate could be just as much a barrier to effective adaptation.

Government intervention could address some of the barriers

The existence of barriers to adaptation may warrant government intervention when the benefits exceed the costs, from the perspective of the community as a whole. But caution is necessary, as in some cases intervention can have unintended adverse consequences. An essential part of evaluating any potential intervention is to first consider the nature and magnitude of the problem, and assess the costs and benefits of all available options. In principle, the option that produces the greatest net benefit for the community should be selected as the appropriate policy response — which, in some cases, could involve no action if intervening would have costs that exceed the benefits.

The clearest case for government intervention is to address a market failure, providing the benefits of intervention exceed the costs. Competitive markets can facilitate an efficient allocation of resources when there are private benefits and costs from adaptation to climate change, but this outcome may not arise in the presence of market failures. Thus, intervention to address a market failure could improve the welfare of the community.

Likewise, there can also be a case for adjusting or removing policies and regulations that do not appropriately address a market failure, or that have unintended adverse consequences by reducing the ability of individuals or organisations to adapt to climate change.

The case for government intervention to address other kinds of barriers is less compelling. Behavioural or organisational barriers could impede adaptation, but they are not market failures in the normal sense, and may not be amenable to simple solutions. Intervention also risks introducing distortions — such as mandates or

standards that might override people's preferences, or constrain their adaptation choices (PC 2005). But that is not to rule out all scope for intervention — behavioural considerations can be taken into account when designing schemes, such as by providing information in an accessible, easy-to-use form. In other cases, there can be scope for intervention when a market failure is exacerbating a behavioural or organisational barrier — for example, the market could be underproviding good information on the risks of climate change.

Box 3 **Market failures that may be relevant to adaptation**

- *Imperfect information* — markets may not supply the optimal quantity of some goods and services because buyers and sellers lack sufficient or good information. Market information might be imperfect because of its public-good characteristics (see below) or its restricted availability to some parties to a transaction (asymmetric information). This can lead individuals to make decisions that do not maximise welfare for the community as a whole.
  - *Adverse selection* — can arise from asymmetric information. For example, when taking out insurance against extreme weather events, households facing the greatest risks are more likely to buy insurance. This can raise insurance premiums and discourage households facing lower risks from buying insurance.
  - *Moral hazard* — can also arise from asymmetric information when the buyer possesses more information than the seller and uses that information to engage in behaviour that is detrimental to the seller after a contract is agreed. This can arise in insurance contracts, where the insurer cannot observe all actions that the insured takes, giving the insured less incentive to manage their risks.
- *Public goods* — markets may undersupply goods and services that can be used by one party without reducing their availability to others (non-rivalry), and for which those that do not pay cannot be excluded from their use (non-excludability). Examples could include flood protection works or the conservation of national parks.
- *Externalities* — markets may not supply the optimal quantity of some goods and services because actions by one party impose costs (*negative externalities*) or benefits (*positive externalities*) on other parties that are not reflected in the transaction or market price. For example, a negative externality could arise if a coastal resident constructs a sea wall to protect their property but this increases erosion on neighbouring properties. Alternatively, research on climate change impacts may have positive externalities because benefits accrue to third parties.
- *Market power* — can impede adaptation by reducing competition in markets. This could arise due to impediments preventing new firms from entering the market, or because owners of natural monopoly infrastructure (such as electricity and telecommunications networks) face little or no competition.

More broadly, other factors may also affect whether and how individuals and businesses adapt to climate change. For example, some adaptation measures might not be adopted in some cases because there are transaction costs or capital constraints. However, these could reflect the costs involved in undertaking some activities, rendering them uneconomic. This can affect the market outcomes (which could still be efficiently allocating resources) or lead to the absence of a market, rather than a market failure.

Box 4 **Behavioural and cultural barriers**

Faced with the consequences of climate change, it might be expected that individuals will take actions that maximise the benefits and minimise the costs to them privately. But there may be behavioural barriers that can cause people to deviate from this ideal response. Some of the barriers more relevant to climate change adaptation include:

- *Bounded rationality* — arises because 'individuals are limited in their ability to obtain and process complex information and to handle the uncertainties that invariably arise in a dynamic and evolving operating environment' (PC 2005, p. 55). As a result, they may settle for outcomes that are less than optimal but deemed reasonable given the conditions at the time. This can have important implications for policy. For example, bounded rationality suggests that providing information on the implications of climate change and the potential for adaptation might not always be sufficient to affect behaviour as decision makers might be unable to process it.
- *Inconsistent preferences over time* — arises when the discount rate used to assess a future reward or benefit declines the further into the future that the benefit will be received. For example, if offered the choice between $10 now and say $12 a year from now, an individual might prefer the $10 now. However, if the same individual was offered the choice between $10 in ten years and $12 in 11 years, they might prefer the $12 in 11 years. This illustrates how preferences can be inconsistent over time because one year from now seems much longer than one year in ten years' time. When people behave like this they may procrastinate and defer indefinitely making an adaptation decision that was in their own best interest.
- *Risk estimation* — is when an individual compares their perceived probability of exposure to a risk (such as climate change), and its potential consequences, to an evaluation of how damaging and urgent other problems are. For example, an individual might not take any action to adapt to an increased risk of flooding because they significantly underestimate the probability of flooding and the potential damages that would result.

Cultural barriers can also influence adaptation. These include religious and personal attitudes and beliefs, or social pressures that might constrain an individual's capacity or willingness to adapt to climate change. For example, some businesses may be unwilling to significantly change existing practices because of family traditions.

Sources: Grothmann and Patt (2005); Harrison (2010); PC (2005); Winkler (2009).

What is the most useful way to classify, define and identify barriers to adaptation? Are the categories set out above appropriate? Are there other types of barriers?

What market failures could inhibit adaptation in any specific sector or region?

Are there examples of policy or regulatory barriers that could inhibit adaptation? What are these? Could the objectives of these policies or regulations be met in alternative ways that have greater benefits and/or lower costs and distortions?

What other significant barriers (for example, behavioural or organisational) might inhibit adaptation? What effects might these have on decisions about whether and how to adapt to climate change?

4 What policy instruments could be used to address the barriers?

Most governments in Australia have introduced explicit climate change adaptation policies in one form or another. These include policy frameworks, guidance manuals, planning and zoning regulations, research programs, information provision, and tools for evaluating climate change threats and opportunities (box 5). For the most part, adaptation policies have focused on research into climate change impacts and dissemination of this information to the public, although in some cases regulations have been introduced that impose specific requirements on building or land-use planning.

There is a range of generic policy options that may be useful when considering government intervention to address barriers to adaptation. This includes:

- broad-based reform
- facilitating insurance markets
- regulatory responses
- provision of public goods
- direct assistance.

It will also be important to consider the degree of policy interaction across levels of government and the roles and responsibilities of each.

Box 5 What adaptation policies have Australian governments implemented?

In April 2007, the Council of Australian Governments agreed to a *National Climate Change Adaptation Framework*. The Framework outlines future collaboration between different levels of government and details strategies over the medium term (5–7 years) to build adaptive capacity and understanding, and reduce exposure to climate change in key sectors and regions.

Australian Government

The Australian Government's approach to adaptation is set out in the position paper *Adapting to Climate Change in Australia*. This paper states that the Government's main roles are to maintain a strong and flexible economy, lead national reforms to maintain consistent regulations and standards, manage Commonwealth assets and programs, and provide information and research required for effective adaptation. The position paper also lists priority areas for adaptation action — coastal management, water, infrastructure, natural ecosystems of national significance, disaster management and planning, and agriculture. Prior to the release of the position paper, a national assessment of the risks of climate change for Australia's coasts was released. This was followed by an update report in 2010 that summarised the outcomes from the national climate change forum and identified more consistent land-use planning and better information as two areas that could help facilitate adaptation.

State and Territory Governments

All State and Territory Governments have developed policy statements on adaptation. Most focus on providing information on the potential impacts of climate change and possible adaptation strategies. For example, a *Climate Change Action Plan* is being developed in New South Wales to outline potential policy responses to climate change impacts on buildings, sea level, bushfires, health, agriculture and the environment.

Other states have in place overarching legislative frameworks that support climate change adaptation. For example, the *Climate Change Act 2010* requires the Victorian Government to develop a *Climate Change Adaptation Plan* every four years. Most states also have in place strategies to consider the risk of rising sea levels. For example, the *NSW Sea Level Rise Policy Statement* specifies sea-level rise benchmarks that should be considered in planning decisions.

Local Governments

The extent of local government involvement in climate change adaptation varies. Many councils have focused on assessing the implications of climate change for their operations and planning decisions. For example, Byron Shire Council in New South Wales has adopted a policy of 'planned retreat' for development near eroding coastlines. In Victoria, an amendment was made to the Wellington Shire Council Planning Scheme to impose minimum floor levels for buildings based on the level of a 1 in 100 year flood.

Sources: COAG (2007); DCCEE (2010); NSW Government (2009).

Broad-based reform

Climate change is expected to have widespread effects on the economy and may result in structural changes in various sectors and regions. As these effects materialise, and as new information becomes available, the economic value of some activities and resources can be expected to change. For example, higher temperatures may mean that snow-based tourism may no longer be viable in some alpine regions of Australia, and as a result, tourism operators may choose to change locations or provide other forms of tourism. (Higher temperatures may also make some regions of Australia more popular tourism locations.) It could also mean that it is less desirable to own a home or business in an area at greater risk from bushfires or flooding.

These changes will result in individuals and businesses redirecting goods and services to areas where they are most highly valued. Well-functioning and flexible markets are the best way to minimise the costs of redirecting these resources. Governments can help facilitate this process through broad-based reform, and by removing barriers to the efficient operation of markets. This could include removing impediments to the flow of capital and labour resources, creating markets and strengthening price signals for natural resources, as well as reducing compliance costs and regulatory burdens on businesses and the community more broadly. Indeed, a number of reforms in these areas have already been identified through initiatives such as the Council of Australian Governments (COAG) and Australia's Future Tax System Review (the 'Henry Tax Review').

The benefits of many of these reforms will be apparent even in the absence of climate change — they are 'no regrets' reforms that benefit the community as a whole. However, climate change strengthens the case for reform, and some reforms will have more impact on the ability of the economy to adapt than others.

Improving the mobility of capital and labour

A range of existing regulations and taxes have the potential to impede the movement of capital and labour resources. These can affect adaptation to climate change if they distort the location or relocation decisions of businesses, households or workers.

For example, the Henry Tax Review identified stamp duty on the sale of property as a particularly inefficient tax that has the potential to deter homeowners and businesses from selling their properties (Treasury 2010). This could affect capital and labour mobility if it influences decisions to relocate and change jobs or business locations.

Regulations affecting labour markets can also influence the mobility of labour, for example, where regulations differ significantly between jurisdictions and this creates costs for businesses or workers operating across jurisdictions. This could include regulations governing occupational health and safety and occupational licensing. These areas have been identified by COAG as priorities for reform and timetables are in place to move to nationally consistent approaches (Safe Work Australia 2011; National Occupational Licensing Authority 2011).

Strengthening price signals and markets for natural resources

Climate change will have a variety of effects on natural resources, many of which have the potential to exacerbate existing environmental problems, such as biodiversity loss and river stress. Many of these problems arise because ownership of environmental resources cannot be well defined or enforced. This may be the case where individuals cannot be excluded from using a natural resource, such as clean air or biodiversity on public land.

There are a number of ways that government policy can help ensure environmental resources are managed so as to maximise social welfare. This can include enforcing property rights (ownership) over natural resources or creating new property rights, using environmental taxes and charges, or providing payments for conserving habitats. These are features of good environmental policy that have been applied by governments in various instances. Such approaches can also facilitate adaptation by providing stronger price signals about the increased scarcity of some resources and the higher economic benefit of others (OECD 2008).

For example, in the case of Australia's water resources, Australian governments have improved the flexibility and efficiency of water markets by strengthening property rights and removing barriers to trade. This has provided incentives for users to respond to changes in water availability and allocate water to where its use is most highly valued. Governments have also used market-based mechanisms to help protect ecosystems that are under threat. Examples include tradeable permits for saline water discharges, tenders for biodiversity conservation, and the buyback of water rights in the Murray–Darling Basin (Murtough, Aretino and Matysek 2002; PC 2010).

Other potential areas for reform

There are various other government policies and regulations that can also affect the efficiency of resource use and could potentially have impacts on the flexibility of the economy to adapt to climate change. For example, stamp duty on the sale of

property applies to the value of the whole property. Thus to some extent it taxes the capital used to improve the property (Treasury 2010). As a result, it may discourage property owners from improving and selling property. This could affect adaptation if it deters property owners from undertaking improvements that protect their property from the effects of climate change. Another example is state-based insurance taxes, which raise the cost of insurance and thus could discourage individuals or firms from taking out insurance or from purchasing an adequate level of insurance.

More broadly, regulations can affect the cost of activities that households and businesses undertake. These include licensing requirements, consumer protection schemes, business registrations, building codes, and planning and zoning requirements. (Some of these are discussed in more detail in the following sections.) And while regulations are necessary for a properly functioning society and economy, they can impose excessive costs if not properly designed or implemented. Thus, initiatives that harmonise regulations across jurisdictions, or reduce unnecessary compliance costs, will also help to increase the flexibility of the economy and reduce the costs of adaptation.

Which broad-based reforms also offer potential benefits for facilitating adaptation to climate change?

What taxes affect the mobility of capital and labour and may therefore affect adaptation?

Are there any other impediments to capital and labour mobility that are particularly relevant to adaptation? For example, if climate change results in some jobs or business activities no longer being viable, or less profitable, is there anything that discourages businesses or workers from changing locations, undertaking new economic activities, or changing occupations?

Are there any other taxes or regulations that may affect adaptation decisions?

What other reforms would improve the overall flexibility of the Australian economy and thus contribute to efficient adaptation?

Facilitating insurance markets

Insurance can be an efficient way to adapt to climate change by spreading risks to those most willing to bear them. It can also create financial incentives to reduce exposure to hazards, which will be most efficient when insurers can match premiums closely to the risks faced by individual customers. Similarly, when insurance is not available — because it is not commercially viable — households and businesses can choose to respond to this signal by facing the financial risks themselves or relocating.

The best way to facilitate insurance markets is to maintain or strengthen these signals. Government intervention to address market failures can have net benefits to the community. For example, governments might provide hazard-related mapping (say for flooding or bushfires) that could have spillover benefits for households, businesses, property buyers, developers and local councils by allowing them to better understand risks. This information could also help insurers properly price those risks.

In contrast, intervention that dilutes the signals provided by the market may ultimately lead to significant costs and distortions. An example could be direct government provision or subsidisation of insurance where it is not available on the private market, which could encourage further development of disaster-prone land. This could impede the structural adjustment that may be required in a changing climate, or lead to significant costs to taxpayers when a major disaster occurs. Further, in some cases, 'moral hazard' might be an issue that arises when there are expectations that governments will make compensation payments following a natural disaster. This could reduce incentives to purchase insurance or manage risks.

Are any existing regulatory arrangements (including state-based insurance taxes and disaster recovery policies) impeding the efficient operation of the Australian insurance market, or reducing incentives to take up insurance?

What kinds of government intervention, if any, would be most appropriate for addressing any market failures or regulatory barriers? What are the costs and benefits of these interventions?

How well are Australian insurance markets coping with climate change and any associated uncertainties? What new insurance products might be developed by the market in response to climate change (for example, insurance for land values or insurance linked to weather indexes)? Would regulatory changes be required to accommodate these, or to improve the operation of the insurance market in a changing climate?

Regulatory responses

Regulatory measures such as rules, codes or standards can be an efficient way to achieve some policy objectives. For example, the environmental impacts of some land uses are managed through the planning system, and a system of regulations requires that buildings, infrastructure and consumer products meet basic standards. Regulations can also be used to address barriers to effective climate change adaptation. Some governments have already modified regulations in response to potential impacts of climate change (box 5).

Regulations can also create barriers to effective adaptation. Some existing regulatory systems could affect the ability of individuals and businesses to adapt (box 6). For instance, some regulations may impose unnecessary costs on the community by limiting valuable activities or creating unnecessary administrative costs and delays. Alternatively, some regulations could limit the options that households have available to adjust to a changing climate (such as by mandating particular actions now, even though the future impacts of climate change are uncertain), or give rise to uncertainty about legal liability.

It may be beneficial to review or modify some regulations to address these barriers. (There is also scope to improve the efficiency of regulation more broadly through wider reforms.) In addition, there may be cases where new regulations may be required to address barriers. A key consideration in any of these instances will be to evaluate whether a regulation is the most efficient way to achieve the objective sought, and to assess alternative ways to meet these objectives — for example, voluntary or community-based schemes, market-based measures or taxation. If regulation is selected as the most appropriate policy tool, performance-based regulation (that specifies a precise outcome to be met) might be considered rather than prescriptive regulation (that mandates a particular technology). This can provide individuals and businesses flexibility to meet the objective at the lowest cost, or to respond to climate change impacts in the most appropriate way given their circumstances.

What regulations reduce the flexibility of individuals, businesses and other organisations to adapt to the potential impacts of climate change?

What reforms are needed to improve the efficiency of existing regulations? Are there alternative ways to achieve the desired objectives?

Are any new regulations justified to facilitate adaptation? What would be the costs and benefits to the wider community?

Box 6 Regulatory systems that might impede adaptation

A range of regulatory systems could affect the ability of individuals and businesses to adapt to climate change. These may include:

- *Planning and zoning* — planning and zoning schemes set limits on different types of land use, generally with consideration for local environmental conditions, and could influence how settlements and economic activities adapt to climate change. Some state and local governments have already implemented planning regulations that explicitly concern adaptation (box 5). More broadly, all states and territories have planning policies relating to bushfires, cyclones, flooding and/or coastal erosion. These impacts could become more frequent or severe due to climate change. In addition, development approval and environmental impact assessment processes can influence or constrain how individuals and business adapt to a changing climate.
- *Building codes* — the Building Code of Australia sets out minimum construction standards to deal with specific hazards, such as fire and flood, which may become more frequent and/or severe in a changing climate. In some geographic zones, stronger or additional standards are applied, such as structural requirements for buildings in cyclone and bushfire prone areas and energy efficiency standards that are tailored to specific 'climate zones'. There are differences across the states and territories in the ways the code has been adopted. More broadly, some provisions of the code may have implications for how people adapt to climate change, in terms of the cost of meeting the required standards or inconsistencies across jurisdictions.
- *Regulation of network infrastructure* — governments often regulate large infrastructure networks (such as electricity and water distribution). This is because some of this infrastructure has features of natural monopoly, where one business can more efficiently supply the market than two or more businesses. With only one business, there may be incentives to set prices higher than would occur in a more competitive market. Governments can achieve more efficient outcomes by regulating prices and investment, and setting conditions of access and/or technical standards. However, there may be cases where regulatory arrangements could inhibit adaptation if they discourage investments made in anticipation of climate change impacts — such as upgrading networks to perform better in higher temperatures, or purchasing (but not immediately using) land that allows for greater flexibility to adapt over time.

How have state and local governments responded to the potential impacts of climate change through their planning and zoning policies? Are there existing planning policies that could constrain the ability of individuals and businesses to adapt, or reduce their flexibility? What reforms may be needed to meet community objectives while facilitating effective adaptation — are there good examples?

What implications might climate change have for local councils' planning policies and development approval processes? Has concern about legal liability restricted

the ability of councils to achieve good economic, social or environmental outcomes?

How might building regulation affect the ability of individuals and businesses to adapt to climate change? Are there any inconsistencies across the States and Territories that could impede adaptation?

What would be the costs and benefits of changing the way that the building code is applied across different geographic or climatic zones, or to establish new zones (for example, to allow for greater variation across regions)?

How might regulation covering network infrastructure affect how infrastructure owners adapt to the impacts of climate change — for example, by discouraging investments in infrastructure upgrades or strategies that give them greater flexibility to adapt? What would be the costs and benefits of any changes to existing regulations?

Government provision of public goods

Governments traditionally supply a range of public goods — such as some infrastructure, government services and habitat conservation — that can address market failures and meet social and environmental objectives. These can be provided either directly by governments, or indirectly through contracts or tenders with private-sector providers. In some circumstances, they may also be provided directly by local communities.

Some public goods may have an important role to play in facilitating efficient adaptation to climate change. For example, emergency services can help households during a natural disaster. However, increases in extreme weather events or temperatures may increase demand for emergency services, and governments will have to make decisions about the appropriate mix of preparedness (such as building more robust infrastructure), emergency response, and post-disaster recovery (such as rebuilding roads or assisting households). Governments may also want to consider how these services are provided as there may be scope for community-based provision in addition to, or complementary to, public provision, such as rural fire brigade services. In any case, care will be required to ensure that private incentives for risk management are not diluted or crowded out by government.

Another example is research and information provision, which can be underprovided by the market. These can directly influence how households and businesses adjust to the impacts of climate change. An appropriate role for

governments may be to research the potential impacts of climate change and disseminate information about the risks and opportunities, in a form that can be readily used by the community (Garnaut 2008). This could improve the capacity of people to adapt (or reduce the costs of doing so). Indeed, information provision features prominently in many policies that governments in Australia have implemented to date.

Governments also own and manage a range of infrastructure assets that may be susceptible to climate change impacts. One way to respond to the uncertainty regarding these impacts may be to take steps to delay decisions about large, irreversible investments until more information is available on their costs and benefits (a 'real options' or 'adaptive management' approach) (PC 2011a). Another response could be through risk-sharing arrangements in public–private partnerships. A clear allocation of climate and other risks in government contracts could be used to place responsibility for managing these risks on the party that is best placed to do so (which in some cases could be private companies).

What government-provided goods and services might be significantly impacted by climate change? What decisions or trade-offs may have to be made — for example, about the balance between emergency response and preparedness, or the best way to protect natural environments when species may need to migrate?

What kinds of information are already provided by governments to help individuals or businesses to understand risks? Is there a case for more government provision of climate-related information, or to disseminate this differently?

To what extent do government infrastructure decisions draw on a 'real options' approach? Are there regulatory, institutional, governance or political barriers that may be discouraging such approaches?

Who bears climate-related risks in public–private partnerships and other government contracts? Is there scope to further clarify who bears the burden of such risks in a manner that would have net benefits for the community?

Direct assistance

Households, industries and regions are likely to be affected by climate change in diverse ways and some will be affected more than others. Adjustment may be required in response to gradual impacts of climate change (such as increases in average temperature or sea level), or more suddenly in response to low-probability extreme events (such as natural disasters). In circumstances where impacts could be uneven and significantly affect particular groups, there may be a role for

government to intervene to meet distributional and social objectives. This could be done by providing direct assistance to those most in need, while taking care to ensure that any assistance does not create new distortions in the economy or reduce incentives to manage risks.

When the impacts of climate change are gradual, households and businesses may be able to adjust over time. The 'social safety net' can be an appropriate (and the least distortionary) way to facilitate this adjustment while moderating adverse distributional impacts of policy decisions or climate-induced change (PC 2001). The safety net consists of the system of progressive taxes and transfer payments, as well as labour market programs such as job-search assistance. Importantly, it focuses on individuals and households, treats individuals in similar circumstances equally, and targets assistance to those in genuine need.

However, the safety net may not always be the most appropriate mechanism to address the adverse impacts of sudden events such as natural disasters. In these situations, there can be a case for providing short-term assistance to aid recovery from disasters. For example, relief payments and other forms of assistance (such as temporary accommodation) are often provided after significant natural disasters, including through the Natural Disaster Relief and Recovery Arrangements. In principle, such assistance can meet social objectives and help people to adjust.

In what areas or sectors might structural pressures as a result of climate change be greatest? Are there any existing regulatory and policy barriers that might impede adjustment?

What pressures might be placed on the existing social safety net as the impacts of climate change are felt by households?

Are current relief payments, such as those funded through the Natural Disaster Relief and Recovery Arrangements appropriate?

Which governments are responsible for addressing the barriers to adaptation?

The impacts of climate change may vary significantly across sectors and regions. Thus, adaptation responses will involve strong local dimensions — for example, Garnaut (2008) argued that unlike mitigation, adaptation requires a local or bottom-up response. The differing and complementary roles of the national, state and territory, and local governments in adaptation policy were also highlighted by COAG (2007). This is reflected in the numerous adaptation policies that have been implemented across all levels of government (box 5).

Local approaches to adaptation may be appropriate in many circumstances because local and state governments have the greatest understanding of the issues facing their jurisdictions. This is also consistent with the principle of 'subsidiarity' — where responsibility for a particular function should reside with the lowest level of government that is best able to deal with that issue (PC 2006). For example, local governments have responsibility for implementing planning rules made by state governments in a manner that best suits their local circumstances. In the context of climate change, the efficiency of these arrangements will depend on whether local governments have the resources and capability to deal with climate change issues and implement policies developed by state and territory governments.

In other circumstances, activities may be more appropriately undertaken by the Australian Government, especially when they are national in scale or where they cannot be effectively carried out at a lower level. Other reasons include significant interjurisdictional spillovers (such as transport systems), economies of scale (such as information provision or welfare support) or a high potential for capital or labour to move across jurisdictions (as arises with income or capital gains taxes) (PC 2006).

More practically, policy responsibility may fall to the level of government that has traditional responsibility for that area, or where it is clearly established by the division of roles and responsibilities of governments under the Commonwealth and State Constitutions. There can also be advantages from multiple policies and arrangements across jurisdictions — these can encourage innovation and diversity in policy approaches and allow different jurisdictions to learn from the experiences of others (PC 2004, 2006). However, they can also create policy duplication, coordination problems or inconsistencies across, and even within, jurisdictions, leading to excessive compliance costs, administrative burdens or uncertainty for households and businesses. Some of these problems could potentially be avoided through cooperative processes, such as COAG or other intergovernmental arrangements. But these should not restrict individual governments from pursuing reforms where it is established that there are net benefits from doing so.

The strength of existing governance arrangements may also be relevant for adaptation policy that spans jurisdictions, particularly in instances where the separation of funding and implementation responsibilities could give rise to cost shifting. 'Good governance' usually requires aligning authority, incentives and accountability. Those who make decisions should be accountable for the consequences of their decisions. Conversely, those who will have to bear the costs if decisions fail should have a say in making such decisions.

Are there significant overlaps or inconsistencies between the adaptation policies of different levels of government? If so, what are these and what problems might they cause for effective adaptation? Alternatively, where differences exist, are there good examples of cooperative arrangements that could be adopted more broadly?

Is there a need to alter policy responsibilities (or clarify responsibilities) across the different levels of government in order to facilitate adaptation?

Are local governments adequately resourced and equipped to respond to climate change and implement policies developed by state and territory governments?

What are the most appropriate governance arrangements for overseeing adaptation responses at the local level?

5 Setting priorities for reform

The terms of reference require the Commission to identify high-priority reform options to address any identified barriers to adaptation. Many reform measures that are justifiable in their own right may be high-priority options, as they will also facilitate adaptation. However, establishing priorities for measures that go beyond these 'no regrets' options will be more difficult.

The 'first best' approach would be to evaluate the benefits and costs of all the possible options and undertake those with the highest net benefits. In practice, evaluating and quantifying the effects of the many potential reform options would be costly and time consuming. Given the scope of the inquiry, the Commission anticipates that it will largely be restricted to undertaking a qualitative assessment of high-priority options.

Past experience with regulation reform can provide some guidance on how high priority options could be identified. The Commission's recent discussion draft on *Identifying and Evaluating Regulation Reforms* (PC 2011b) set out criteria that can be used to identify areas where the returns to reform are likely to be highest. It identified three primary determinants of the likely benefits of reforms.

- *Depth of reform* — does the reform address a problem that causes a large distortion in the allocation of resources? The larger the distortion, the greater the benefits of reform.
- *Breadth of reform* — does the problem affect a large share of the community? The more widespread the benefits, the more likely the return from the reform will be higher.

- *Cost of reform* — the costs of reform can include the costs to government of developing and implementing a reform, and the costs to business and the community of dealing with the changes. The higher the costs of a reform, the greater the payoff necessary to warrant the investment.

In the case of options to address barriers to climate change adaptation, these criteria would suggest that the highest priority should be attached to reforms that address significant distortions, and/or reforms that would deliver widespread benefits. Reforms that can be delivered at a relatively low cost to government, businesses and the community as a whole should be prioritised.

Are these criteria relevant for assessing reforms to reduce barriers to adaptation?

Are there other considerations or criteria the Commission should take into account to assess the likely costs and benefits of reform options?

What reform options might satisfy these criteria?

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Attachment A Terms of reference

REGULATORY AND POLICY BARRIERS TO EFFECTIVE CLIMATE CHANGE ADAPTATION

Productivity Commission Act 1998

I, Bill Shorten, Assistant Treasurer and Minister for Financial Services and Superannuation, pursuant to Parts 2 and 3 of the Productivity Commission Act 1998 hereby request that the Productivity Commission undertake an inquiry into regulatory and policy barriers to effective climate change adaptation. The Commission will report within 12 months of receipt of this reference and will hold hearings for the purpose of this inquiry.

Background

Climate change adaptation is action by households, firms, other organisations and governments to respond to the impacts of climate change that cannot be avoided through climate change mitigation efforts. An effective national adaptation response will require all levels of government, the private sector and intermediary markets to contribute to that response.

This inquiry will assist the Council of Australian Governments (COAG) to advance climate change adaptation reforms in Australia by examining the policy frameworks required to facilitate effective adaptation, and the costs and benefits of various adaptation options so as to identify the highest priority reforms. In undertaking this review the Commission will also assess the effectiveness and efficiency of market based approaches in facilitating adaptation.

Scope of the Inquiry

The Commission is requested to assess the regulatory and policy barriers to effective adaptation. In undertaking the review, the Commission should identify any specific barriers that may act to inhibit effective adaptation to unavoidable climate change.

The Commission should identify high priority reform options to address any identified barriers to effective adaptation. The Commission should also:

- examine the costs and benefits of the options to address those barriers where it is feasible to do so, including a 'no change' (maintaining the status quo) option

- assess the role of markets (including insurance markets) and non-market mechanisms in facilitating adaptation, and the appropriateness of government intervention.

In undertaking its inquiry, the Commission should take into account the relevant policies of all levels of government and the work on adaptation undertaken under the auspices of COAG.

The Commission should consult with relevant Australian Government, state and territory and local government agencies, and other key stakeholders.

The Commission is to provide both a draft and a final report, and the reports will be published. The Government will consider the Commission's recommendations, and its response will be announced as soon as possible after the receipt of the Commission's report.

Bill Shorten

Assistant Treasurer

[Received 20 September 2011]

Attachment B Have your say

This is a public inquiry, and the Commission invites any interested party to make a written submission. Submissions should be lodged with the Commission by **16 December 2011**.

Submissions may range from a short letter outlining your views on a particular topic to a more substantial document covering a range of issues relevant to the inquiry's terms of reference (attachment A).

Submissions are public documents

To facilitate the consultation process, each submission will be published on the Commission's website shortly after receipt. These will remain online indefinitely as public documents.

Under certain circumstances, the Commission can accept sensitive material on a confidential basis — for example, if it was of a personal or commercial nature, and publishing the material would be potentially damaging. You are encouraged to contact the Commission for further information and advice before submitting such material. Any material supplied in confidence should be provided under a separate cover and clearly marked.

Copyright in submissions sent to the Commission resides with the author(s), not with the Commission.

How to make a submission

Each submission should include a completed cover sheet, containing your contact details. (For privacy reasons, this cover sheet will not be published.) The cover sheet, along with complete details on how to lodge your submission, can be found on the inquiry website.

Website: http://www.pc.gov.au/projects/inquiry/climate-change-adaptation

For advice on how to make a submission, or for any administrative queries relating to this inquiry, please contact Yvette Goss on (03) 9653 2253.