

## 8 Adapting efficiently

**T**HE BEST of mitigation will leave Australians dealing with a lot of climate change.

They will have no choice but to adapt.

But to what will they be adapting? While the climate outcomes from the Cancun Agreements cannot be defined even in broad brush because they say nothing much about what happens after 2020, Chapter 4 suggests that they could lead to atmospheric concentrations of greenhouse gases of 550 or 650 parts per million—most likely leading to temperature increases of 3°C or 4°C. It is still possible that the Cancun pledges could evolve into a set of commitments that achieves the Cancun temperature objective of below 2°C. And it is not impossible that future Australians could face an increase in global temperature of 6°C or more.

The range of uncertainties is wide and extends into territory in which it is unrealistic to think that a national policy response can be coherent or even relevant. Beyond a certain point government would be overwhelmed by the impacts of climate change.

We are already feeling some impacts of climate change when the increase so far is less than 1°C since pre-industrial times. How will Australians in future manage 2°C, which for the moment seems a lower bound on a wide range of possibilities?

Even an increase of 2°C above pre-industrial levels would have significant implications for the distribution of rainfall in Australia, the frequency and intensity of flood and drought, the intensity of cyclones and the intensity and frequency of conditions for catastrophic bushfires.

The difference between 2°C and 3°C was examined in detail in the 2008 Review. It is large. And every degree upwards after that is worse. There is no point at which we can say that so much damage has been done that there is not much point in stopping more.

Let us say that the International Energy Agency is right and that in the absence of a decisive change in policies we are headed towards the atmospheric concentrations of greenhouse gases that would give us a temperature rise of around 4°C.

A global average temperature rise of 4°C from pre-industrial levels (3.5°C above 1990 levels) is well outside the relatively stable temperatures of the last 10,000 years, which have provided the environmental context for

the development of human civilisation. We would be in unknown territory for humanity.

A temperature increase of 4°C above pre-industrial levels would give an 85 per cent probability of initiating large-scale melting of the Greenland icesheet, put 48 per cent of species at risk of extinction, and place 90 per cent of coral reefs above critical limits for bleaching. It would trigger the lower threshold for initiating accelerated disintegration of the west Antarctic icesheet and changes to the variability of the El Niño – Southern Oscillation, and the upper threshold for terrestrial sinks such as the Amazon rainforest becoming sources of carbon rather than sinks.

There are two main building blocks for a productive response to the adaptation challenge. The first is to make sure we have a strong, flexible economy, with smoothly functioning markets. The second is to make sure we have sound information about possible impacts of climate change on various regions and activities and that information is disseminated in easily useable forms.

These are the most valuable things that we could bequeath those who come after us as they do their best in a world of climate change. Adaptation policy is first of all about doing these things well.

### **A resilient and flexible economy**

It is an obvious point, but true, that the high probability of dangerous climate change strengthens the reasons for Australia making sure that it has a strong and flexible economy based on a well-educated and adaptive people.

Climate change strengthens the importance of Australia quickly getting back onto a path of strong productivity growth, built on efficient markets and effective economic policy-making institutions that are able to define and implement policy in the national interest.

There will be shocks and hard times, some coming from the direct effects of climate change on us, and others from the effects on other countries that are important to us. Australians in future will do better if they are working with a productive economy, which is in a strong fiscal position in preparation for a shock, and has the structural flexibility that comes from well-regulated markets.

These strengths are the less likely to be tested beyond their limits the more effective global action has been in constraining climate change.

So current mitigation policy is an important foundation for future adaptation policy. And, similarly, adaptation options should be designed with an awareness of their impact on mitigation policies.

The challenge of future climate change makes it even more important to minimise the costs of mitigation. Doing our fair share in global mitigation will have a cost—and in the early years a net cost before the benefits of avoided climate change are brought to account. It is important that this cost is the lowest that it can be. A similar argument applies to adaptation.

Here the advantages of carbon pricing over regulatory or direct action are twofold. First, the immediate and direct sacrifice of some productivity growth for mitigation will be much smaller if a carbon price encourages millions of Australians to find, and sometimes to invent, ways of reducing emissions at lowest cost, rather than having a few political leaders and their advisers and close associates identifying clever ideas for direct action. Second, and of fundamental importance, the many interventions involved in making large reductions in emissions through direct action would encourage the return to the old-style Australian political economy. When we need to remove the great Australian complacency of the early 21st century, a regulatory approach to mitigation would entrench and extend it.

### **Adapting through markets**

As with reductions in emissions, adaptation to climate change will be more effective and secured at lower cost the more individual Australians and enterprises as well as governments at all levels are involved in working through the choices, anticipating problems before they arrive and taking into account all of the risks in their investment decisions.

Soundly functioning markets assist households, communities and businesses to respond effectively to the impacts of climate change. Markets provide the most immediate and well-established avenue for addressing many of the uncertainties posed by climate change.

Australia's prime asset in responding to the adaptation and mitigation challenges that lie ahead is the prosperous, open and flexible market-oriented economy that has emerged from reform over the last quarter century. Government can facilitate adaptation by continuing to promote broad and flexible markets, and seeking to correct remaining barriers to their efficient operation.

Some domestic and international markets for particular goods and services will be especially important to Australia's adaptation response. These

markets may require increased policy attention to remove barriers that limit the ability of markets to harness efficient adaptation. Included in this category are markets for insurance and finance, water and food.

### **Insurance and financial markets**

Households and businesses are able to manage many risks effectively through the insurance and financial markets. As the frequency and intensity of severe weather events increase with climate change, demand will rise for related insurance and financial services.

The recent innovation and deepening in insurance markets shows their considerable potential to promote adaptation to climate change. By its nature, however, conventional insurance is of limited value when an adverse event is likely to have similar impacts over wide areas of the world. Nor is conventional property insurance of much help when the uncertainty mainly involves the timing rather than the extent of an impact.

An example is sea-level rise if it were to become clear that the melting of the Greenland icesheet had become irreversible. It would then be inevitable that large numbers of coastal properties would be inundated, but uncertainty would remain about the timing of the loss. There might then be scope for developing new property insurance products that share characteristics with traditional life insurance. Life insurance covers the risk of timing of death, although the fact of eventual death is itself certain. The development of innovative products that matured on loss of property and that would provide the means of buying housing elsewhere if the insured event occurred may be seen as having value and could be developed by the commercial insurance sector. The commercial viability of such instruments would depend on insurance companies being able to develop a balanced portfolio of insurance and financial risks in a world of climate change.

The expansion and dissemination of knowledge from applied climate change science can assist the development of new insurance products for these circumstances. To the extent that state and local government decisions about land-use planning and zoning are based on sound knowledge from the climate science, there will be improvements in the operation of relevant insurance markets.

As the Henry tax review has noted, insurance products are subject to a range of insurance transaction taxes and direct contributions to the funding of fire services, which leads to inefficient outcomes. The interaction of these taxes and levies increases the cost of premiums, which may reduce insurance

uptake. The revenue benefits of such taxes need to be evaluated against their inefficiencies and economic costs, particularly given the role of insurance in encouraging firms and households to adapt to climate impacts.

## **Water markets**

The challenges for rural and urban water supply result from the interaction of climate change with increased demand from growth in population and economic activity. The limited scope of markets has complicated the task of allocating water to its most valuable uses. Chapter 10 notes that there will at times be local reasons for constraining landowners' decisions on the uses to which their land and water assets can be put. But these limits should only be applied when there is good reason to do so, and land-use planning should generally be directed by affected communities.

The same rules should be applied to water use. There are advantages in water being covered by property rights and regulated for sustainability, and for the owners of those rights to be able to apply the water to uses of their choice unless there are good local land-use planning reasons to constrain private decisions.

Australia's rural water market is the result of many years of reform, but some barriers to efficient operation remain. While extraction of in-stream flows has been regulated and subsequently subject to a price, access to groundwater and surface flow has often been left as a common property resource, with predictable consequences.

The 2008 Review noted that the establishment of a well-functioning water market that delivers the best possible outcomes in the context of climate change will require the active involvement of government. Government is required to establish the most effective administrative and regulatory arrangements for the functioning of the market. Once the water market has matured, the role of government moves to one of adequate monitoring and enforcement.

But barriers to efficient water management in a changing climate persist. For example, in water markets, regional restrictions on trading remain a significant barrier. Severe water shortages in urban centres have led to the development of a number of desalination plants in Australia over the past few years, at high cost. The Productivity Commission has questioned the cost-effectiveness of some of this expenditure. Would wider market exchange of water, with desalination plants competing with bids from a range of sources including long-distance storage, have produced a good result at lower cost?

In the nature of market exchange, we would only find out by trying it, but the general experience is that market processes often generate results that are surprisingly good.

### **Food markets**

In the absence of effective and ambitious global action, deep participation in international trade in food as an importer as well as an exporter is going to be important for Australian food security. This is going to require the easing of inhibitions about the import of food. This will be stressful for many rural Australians in particular, but the alternatives will be worse. The importance of free trade in food to food security in a world in which there has not been effective and strong mitigation is discussed in Chapter 10.

### **An informed Australian people**

Sound information is the second foundation for effective adaptation to climate change. Informed people and enterprises and governments at all levels will see problems in advance and develop low-cost responses to them. On the other hand, people and firms and governments responding to crisis will make decisions without the benefit of long reflection and consideration of alternatives to what the crisis seems to demand.

Here I should draw attention to another of the costs of so-called ‘scepticism’ about climate change science beyond its interference with the development of sound mitigation policies. If a proportion of Australians are persuaded that the mainstream science is wrong or unreliable then they are denied information that is essential to the exercise of sound judgments about many decisions that affect the quality and cost of adaptation.

As the average rainfall declines sharply with each passing decade in the south-west of Australia, a farmer who shares the scientific knowledge that is the common heritage of humanity will make different decisions about land use than one who thinks that a series of dry autumns is a passing phase. The regulators of power distribution in a state that has just been devastated by a bushfire during what would once have been described as once-in-a-century conditions will make different decisions if they know from science that these conditions will now arrive with awful frequency.

Improvement of applied climate science and dissemination of the outcomes will not assist adaptation decisions by those who have closed their minds to uncomfortable reality. As is the case with denial of science in many areas—Professor Peter Doherty asks us to consider denial on immunisation

and transmission of AIDS as parallels to climate science denial—the isolation of some people from reality can damage the adaptive response for others in the community.

In any case, we need more and better information on the likely impacts of climate change on various parts of Australia, and we need that information to be readily available for those who require it for decisions on many things. There are several aspects of the applied climate science that work out differently here than in the northern hemisphere. As the leading country of science in our hemisphere, we will have to do a lot of the science ourselves.

We have made progress on building our national strengths in climate change science since the 2008 Review noted that our capacities in this area, while of high quality, were inadequate to the national task. I observed in 2008 that while pluralism in science was desirable in itself, the importance of scale for some of the large modelling tasks in particular meant that integration of the national effort was important.

The joint CSIRO – Bureau of Meteorology Centre for Australian Weather and Climate Research has strengthened Australia's capacities as it was intended to do. The National Climate Change Science Framework, the National Climate Change Adaptation Research Facility and the CSIRO Climate Adaptation Flagship are making substantial contributions. This work is of great importance for effective adaptation to a changing climate.

The dissemination of the results from applied science to the people who are interested and who would make use of them is an important task. Also important is analysis of the barriers impeding the best use of this information to adapt. The Climate Commission, an independent body set up in early 2011 to provide reliable and authoritative information on climate change, and to inform the debate on this issue of national significance, is young in its responsibilities. It would be of great value if it evolved as a trusted channel of communication from the scientific community to the general public. It would also be of great value if it evolved into a source of information for government. While there is a substantial body of research on climate change mitigation to aid policy makers, there has been relatively little research on adaptation. This limits the ability to identify 'no-regret' measures that would be justified under all possible future climate change scenarios. And it affects our ability to identify measures that reduce our vulnerability to climate change while meeting other policy objectives.

At the moment it is difficult for government to answer questions about how well we are adapting. And although climate change risk is gradually

being reflected in government approaches in non-climate policy areas, we are not able to say whether we are adapting enough and in the right ways. Consequently, it is difficult for governments to evaluate where best to direct its efforts to reduce barriers hindering efficient adaptation. Also, it is difficult to assess whether the cumulative result of decisions is a better adapted Australia.

### **Adaptation policy and the regulatory role of government in infrastructure**

Some of the necessary regulatory roles of government intersect with adaptation to climate change. The government as owner of some types of infrastructure, as regulator of others and with responsibility for land-use planning will necessarily be at the centre of many adaptation decisions.

The Australian Government's assessment in 2009 of climate change risks to Australia's coast provided for the first time a nationwide indication of the extent of risk, with up to \$63 billion of existing residential buildings alone at risk from inundation by 2100. Further work is needed to identify risks to essential services and infrastructure, and to the commercial sector. However, there is clearly a large legacy risk in the coastal zone. Eventually, the impacts on the coast could lead to abandonment of houses, resettlement of towns or the construction of major protection works for threatened cities and public facilities such as airports.

The recommendations from the National Climate Change Forum held in February 2010, followed by the report to the Australian Government by the Coasts and Climate Change Council in December 2010, highlight the need for national action to help coastal communities (including those outside capital or major cities) prepare for the impacts of climate change, as there are significant economic and social implications of adaptation.

The report notes that, without coordinated action, there is an increased chance of inefficient and wrongly focused adaptation—of actions that, while delivering short-term benefits, may exacerbate vulnerability to climate change over the longer term. The forum concluded that national action was needed to enhance consistency in policy and regulatory settings across jurisdictions, and identified a number of key issues—sea-level rise planning benchmarks, risk guidance for planning and development, legacy issues and legal liability, building codes and standards, and integrated regional planning approaches. A major barrier to adaptation identified by the forum was moral hazard—the expectation that government will support those whose property is damaged by an extreme event—which presents a disincentive to prepare for future risk.

The government in 2009 identified initial national adaptation priorities—coastal management, water, infrastructure, natural systems of national significance, disaster resilience and agriculture. The Council of Australian Governments' agreement in February 2011 on the National Strategy for Disaster Resilience demonstrates an increased focus on emergency planning and the implications of climate change for disaster preparedness and highlights the change in emphasis from reactive responses to proactive risk-reduction measures.

The Commonwealth, state and local governments are responding with increasing awareness and forethought to the climate change adaptation challenge, despite the raucous public disputation over whether climate change is a problem that warrants attention at all. It is good to know that Australians have not lost our characteristic ability to respond pragmatically to real problems when we see them, undisturbed by disputation over dogma. But we are in the early stages of thinking through all of the implications for government of effective adaptation to climate change.

### **Biodiversity and ecosystems**

Climate change is a significant and additional pressure on ecosystems and biodiversity in Australia. It will affect ecosystems and biodiversity by shifting, reducing and eliminating natural habitats. In Australia, many species of flora and fauna are at risk from rapid climate change because of their restricted geographic and climatic range. Where ecosystems and species have low tolerance for change, altered climatic conditions can trigger irreversible outcomes such as species extinction.

Just as greenhouse gas emissions without a carbon price represent a market failure, the decline in Australia's biodiversity can be attributed at least in part to a failure to correct through public policy the market's failure to value the natural estate. This failure, combined with the vulnerability of Australian ecosystems to climate change, provides a strong argument for the establishment of market mechanisms to ensure the resilience of Australia's ecosystems. For example, the Henry tax review pointed to the important role government can have in protecting biodiversity and ecosystems through specified payments, for example, in management agreements with landholders.

There is increasing private philanthropic interest in maintaining biodiversity, but government is likely to remain the major source of funds to conserve biodiversity. Separate but complementary incentives for carbon

sequestration and other ecosystem services will allow the respective benefits to be sold in separate markets, with landowners selling into both and making decisions that maximise total incomes and benefits to themselves.

## Conclusion

The 2008 Review discussed a number of challenges for Australia in a changing climate in the areas of water scarcity, risks to infrastructure, resilience of ecosystems and biodiversity, and disaster resilience. Developments since 2008 continue to highlight the importance of these issues, including the need for further reform to reduce barriers to adaptation. The type and extent of adaptation will be affected by the characteristics of the climate risk, the decision makers and the institutional framework within which adaptation decisions are made.

We need to think in a more coherent and integrated way about how we allocate inevitably large sums to adaptation. The inclination will be to respond to each crisis separately. And yet the increased challenges of extreme events of flood and fire and drought, of disruption of infrastructure in heatwaves, of erosion of coastal properties, of changes in fish stocks and disappointment about sustained river flows for irrigation, are different aspects of a single phenomenon.

An integrated adaptation response with clear priorities will be of particular importance where there are long-lived decisions to be made on land-use planning and major infrastructure development.

Australia's future economic productivity will be influenced by the ability of the government to provide climate change information and develop tools that can be used at the appropriate scales for decision making by private agents, and to develop coherent approaches to land-use planning and to management and climate-relevant building codes and other standards in high climate risk areas.

Australians in future will have to manage the world as they find it. We may be leaving them with a difficult task. We should seek to avoid leaving them with an impossible one.

We will improve their chances by encouraging an effective global mitigation effort and doing our fair share; reducing emissions in the lowest-cost way through carbon pricing; replacing the great Australian complacency of the 21st century with a new era of productivity-oriented reform; working to establish and extend effective markets generally and in insurance, water and food in particular; strengthening applied climate change science and making

its results widely available; being cognisant of the value of our own inheritance of biodiversity and reflecting that value in our decisions on managing climate change; and embodying knowledge of climate change in private and public infrastructure decisions.

---

## **PART III**

# AUSTRALIAN TRANSFORMATIONS

---

