

CHAPTER 1: CONTEXT FOR REDUCING EMISSIONS

Key points

This report uses economic models to analyse the macroeconomic, sectoral and household impacts of Australia reducing its greenhouse gas emissions under different targets and trajectories.

This report is a collaborative effort between leading climate change economists and the Australian Treasury.

This report examines the cost of reducing greenhouse gas emissions on the Australian economy. This report does not examine the economic benefits of reducing emissions, such as lower risks of dangerous climate change.

This report should be evaluated in the broader context of all the costs and benefits of climate change mitigation.

Much of the world's economic activity results in greenhouse gas emissions. The primary sources of emissions from human activity are combustion of fossil fuels, deforestation and agriculture (IPCC, 2007). As the world economy expands, global emissions continue to rise. While the world economy's emission intensity fell in the past three decades (World Resources Institute, 2008), global emissions from human activities increased 70 per cent between 1970 and 2004 (IPCC, 2007).

With the global community producing more greenhouse gases each year, the stock of emissions in the atmosphere is growing. Since the industrial revolution, when fossil fuel combustion began driving economic growth, global atmospheric concentrations of greenhouse gases have increased markedly. Current concentrations of carbon dioxide and methane — two of the most significant anthropogenic greenhouse gases — far exceed the range estimated over the past 650,000 years (IPCC, 2007).

Changes in atmospheric concentrations of greenhouse gases change the global climate system's energy balance. The Intergovernmental Panel on Climate Change (IPCC) concludes that warming of the climate system is unequivocal and is evident in increases in global average air and ocean temperatures, widespread melting of snow and ice, and rising global average sea level (IPCC, 2007).¹

While the extent to which human activity is responsible for the observed warming is uncertain, emissions from human activities have very likely caused most of the global warming since the 1950s, and continued emissions at or above current rates would cause further warming and induce many changes in the global climate system over coming decades and centuries (IPCC, 2007). Climate science projects that warming is likely to drive changes in wind patterns,

1 The issue of whether there is a warming trend in global temperature data was examined in the Garnaut Climate Change Review (Garnaut, 2008, Box 4.1, p 79).

rainfall, snow and ice cover, extreme weather events (for example, heat waves and intense storms), and increasing acidification of the ocean (IPCC, 2007).

For Australia, climate change could severely affect agriculture, infrastructure, biodiversity and ecosystems (Garnaut, 2008). Australia's hot and dry climate, geographical proximity to developing countries, and economic structure make Australia particularly vulnerable to climate change and give it a stronger reason to effect a global agreement to mitigate climate change than other developed countries (Pearman, 2008; Garnaut, 2008).

1.1 AUSTRALIAN POLICY CONTEXT

The Australian Government has identified responding to the challenge of climate change as one of its highest priorities. The Government's climate change policy is built on three pillars:

- reducing Australia's greenhouse gas emissions;
- adapting to climate change that cannot be avoided; and
- helping to shape a global solution.

The Government has adopted a long-term greenhouse gas emission reduction target of 60 per cent below 2000 levels by 2050, and is considering the scale and timing of the emission reductions Australia should pursue towards this goal.

As a party to the Kyoto Protocol, Australia is obliged to limit its national greenhouse gas emissions to no more than 108 per cent of 1990 levels during the Kyoto commitment period (2008-2012). Post-2012 targets for developed countries are being negotiated internationally, with negotiations scheduled to conclude in Copenhagen in 2009 (Box 1.1).

The Government will introduce a Carbon Pollution Reduction Scheme (CPRS) as the primary mechanism to achieve its emission reduction goals in a responsible and flexible manner and at the lowest possible cost to the economy (DCC, 2008). As part of the design features of the scheme, the Government will announce a national emissions target range for 2020 by the end of 2008.

The emission caps for this scheme will be set in 2010, in light of the national emissions trajectory and targets and final decisions regarding scheme design. The Government will take a range of factors into account in setting the trajectory and targets, including the work of the Garnaut Climate Change Review, modelling in this report, consultation with stakeholders and the international negotiations now underway.

Box 1.1: The international response to climate change

The global community has recognised the risks associated with climate change and the need for a coordinated global response. The United Nations Framework Convention on Climate Change established in 1992 has almost global membership, with 192 parties. The Convention aims to stabilise greenhouse gas concentrations at a level that would prevent dangerous human-driven interference with the climate system.

No global agreement exists on what constitutes a 'safe' concentration level. With higher levels come increasing risk of greater temperature change and greater impacts on the climate system. A concentration of 450 parts per million CO₂-equivalent (ppm CO₂-e) generally is associated with a 50 per cent chance of limiting the increase in global average temperature to 2°C above pre-industrial levels, while 550 ppm CO₂-e is associated with a 50 per cent chance of limiting the temperature increase to 3°C (IPCC, 2007).

The Convention recognises that all countries should act, and an important principle is that developed countries should take the lead given their historical contribution to greenhouse gas emissions and the economic development they have enjoyed as a result. The Kyoto Protocol to the Convention commits developed country parties (known as Annex B parties) to binding national emission targets for the period 2008-2012, with the aim of reducing their collective emissions by at least 5 per cent from 1990 levels.

The Bali Conference in 2007 set in place two negotiation tracks, collectively known as the Bali Roadmap, on an arrangement to follow on from the first Kyoto period in 2013.

The Convention track seeks to involve major developing countries and non-Kyoto developed countries such as the United States in efforts to reduce emissions. Critically, it aims to develop a long-term global goal for emission reductions. This will highlight the scale of the mitigation task and the need for action by all major emitters. The Protocol track will determine post-2012 emission reduction targets for Annex B parties.

1.2 PURPOSE OF THIS REPORT

This report uses economic models to analyse the macroeconomic, sectoral and household impacts of Australia reducing its greenhouse gas emissions under different targets and trajectories. Because responding to climate change is a global challenge, this report evaluates the impacts on Australia in the context of global action to reduce emissions.

This report also describes possible economic, environmental and technological pathways that Australia and the world could take to reach their objectives.² Given the long timeframes involved in climate change mitigation policy, this analysis extends to 2050 and, in some scenarios, to 2100.

² The scenarios are illustrative and their primary focus is to explore the economic effects of different emission constraints to inform decisions by government, business and households. The estimates of emissions in this report, including the reference scenario, do not represent the official policy or negotiating position of the Australian Government and are not an official Government or Treasury forecast.

Achieving greenhouse gas emissions reduction targets will lead to significant changes in the structure of the Australian economy. Continued strong economic growth is likely. These changes will arise domestically, primarily through transforming the way energy is produced, distributed and consumed, as well as from international factors, such as through trade, as Australia's trading partners respond to their own emission constraints.

Decarbonising the Australian economy will lead to adjustment costs for some individuals, industries and regions. It will create benefits for some individuals, industries and regions, and lead to new industries and employment opportunities. It will affect almost every Australian in some way.

In mid-2007, the Australian Treasury established a climate change modelling unit to analyse the possible macroeconomic, sectoral and distributional impacts of greenhouse gas emission reduction targets and trajectories on the Australian economy.

Treasury's modelling program is extensive and includes model development, engagement with domestic and international experts, and consultation with stakeholders across industry, community organisations and government agencies. The result, an integrated modelling analysis of the global, national, industry, household, technological and environmental dimensions of greenhouse gas mitigation, is the most comprehensive exercise of its kind in Australia to date.

This report presents the results of this modelling program.

This report uses a reference scenario and four main policy scenarios. Two policy scenarios — Garnaut -10 and Garnaut -25 — were modelled for the Garnaut Climate Change Review, and two other scenarios — CPRS -5 and CPRS -15 — were based on the Government's *Carbon Pollution Green Paper Scheme Green Paper* (DCC, 2008). To complement the four main policy scenarios, several sensitivity scenarios explore key uncertainties.

The Treasury's analysis cannot be considered in isolation when exploring policy choices for Australia, as it focuses only on the costs of mitigation — that is, the costs of reducing greenhouse gas emissions. This report does not consider the costs of climate change impacts. The benefits from global action to reduce greenhouse gas emissions are not included in the Treasury's analysis, but are explored by the Garnaut Climate Change Review. Benefits include the reduced risks of climate change impacts and lower costs of adapting to the climate change that does occur. The Garnaut Climate Change Review used three scenarios (the reference scenario, Garnaut -10 and Garnaut -25) as inputs to its independent analysis of the costs of action versus inaction on climate change (Garnaut, 2008).

1.2.1 Structure of this report

The less technical summary of this report outlines the main modelling results and messages. It is available as a separate publication.

Chapter 1 describes the purpose of this report and the context for Australia's action on climate change mitigation policy.

Chapter 2 sets out the report's analytical framework, describing the models and how to interpret the results.

Chapter 3 describes how the Australian and global economy could evolve if new policies to reduce emissions are not introduced. The reference scenario provides the benchmark to judge emission reduction policies.

Chapter 4 describes the domestic and international policy frameworks of the policy scenarios.

Chapter 5 describes the international results and analysis from the policy scenarios.

Chapter 6 describes the modelling results and analysis for Australia in terms of the macroeconomic, sectoral and household impacts of greenhouse gas emissions targets and trajectories.

Chapter 7 discusses key findings and areas for future work.

Reports on the analysis and modelling commissioned from external consultants are on the Treasury website.

1.3 REFERENCES

Department of Climate Change (DCC), 2008. *Carbon Pollution Reduction Scheme Green Paper*, Australian Government, Canberra.

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Pearman, G., 2008. *Climate Change, Risk in Australia under Alternative Emissions Futures*, Department of the Treasury, Canberra.

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