Chapter 2

Science and emissions targets

2.1 There are essentially three stages in setting appropriate targets for Australia's greenhouse gas emissions targets, drawing on different disciplines. The first stage is examination of the relevant science to learn the relationship between alternative levels of greenhouse gas concentrations in the atmosphere and the associated probability of temperature increases and their likely consequences. The second stage is to use these data to form a view about the desirable limits to place on global greenhouse emissions. This process will be informed by economics but is largely a matter of ethical or moral considerations concerning what is a 'just' distribution of costs between current and future generations. The third stage is to translate global emissions targets into conditional and unconditional targets for Australian emissions. This introduces considerations of national and international politics and strategic bargaining.

Climate science

2.2 When concerns emerged in the scientific community that increased emissions of greenhouse gases might be leading to global warming which if unchecked could lead to dangerous climate change, the Intergovernmental Panel on Climate Change (IPCC) was established to assemble and assess the best peer-reviewed science on the topic from a range of relevant disciplines. Its reports have been endorsed by the world's leading academies of science. Most scientists submitting to the committee and appearing before it broadly endorsed the findings of its 2007 report that warming of the climate system is unequivocal;[1] and gave evidence, with a very high confidence that the increase in global average temperature since the mid-20th century is due to anthropogenic greenhouse gas concentrations.[2] A brief account of the science follows.

The greenhouse effect

2.3 There are a number of 'greenhouse gases'. The most important is carbon dioxide (CO_2). The others listed under the Kyoto Protocol are methane, nitrous oxide, sulphur hexafluoride, hydroflurocarbons and perflurocarbons. To express levels of the various gases as a single number, they are often converted to carbon dioxide equivalents (CO_2e), where the conversion factors reflect the warming potential of the various gases.

2.4 The 'greenhouse effect' involves the sun's light energy travelling through the Earth's atmosphere to reach the planet's surface, where some of it is converted to heat energy. Most of that energy is re-radiated towards space—however, some is

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1 IPCC 2007, *Climate Change 2007: The Physical Science Basis*, p. 5.

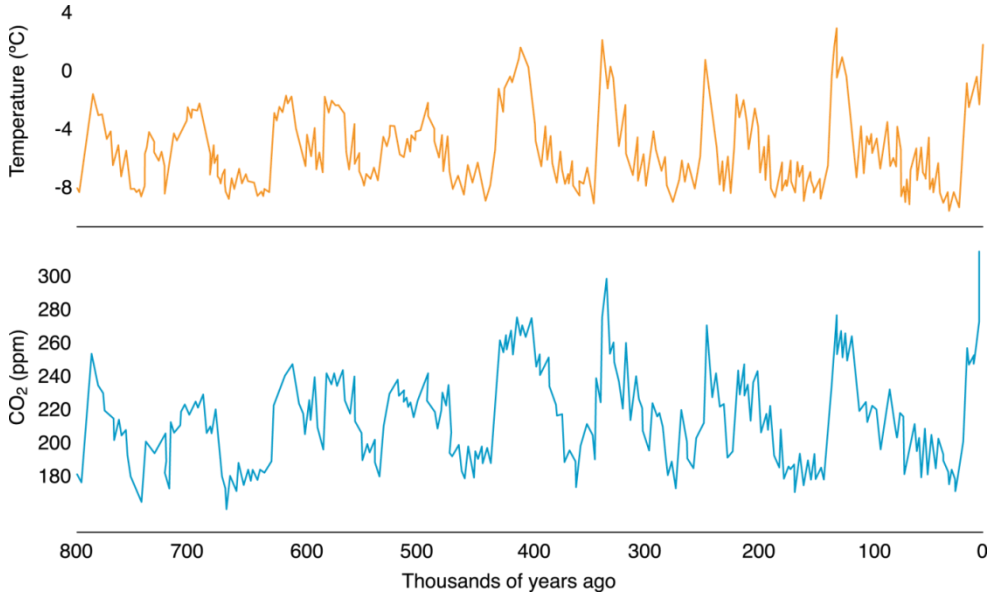
2 IPCC 2007, *Climate Change 2007: The Physical Science Basis*, p. 10. A more recent metastudy by Rosenzweig et al in the leading journal *Nature*, 15 May 2008, provides a range of further evidence of anthropogenic climate change.

re-re-radiated back towards the ground by the greenhouse gases in the Earth's atmosphere. Like a greenhouse, this keeps temperatures higher than they would otherwise be. The effect has operated for millions of years.

2.5 Human activities such as burning fossil fuels (coal, oil, natural gas), agriculture and land clearing release large quantities of greenhouse gases into the atmosphere, which trap more heat and further raise the Earth's surface temperature.

2.6 The relationship between atmospheric concentrations of CO_2 and temperature over time is shown in Chart 2.1. There are two important points to note from the chart. Firstly, there is a clear long-run correlation between CO_2 and temperature. This reflects a two-way mutually reinforcing causation; an exogenous factor, such as variations in the Earth's orbit around the Sun, that changes temperature will lead to a change in CO_2, and a change in CO_2 will lead to changes in temperature.

Chart 2.1: Atmospheric concentration of CO_2 and temperature (deviation from recent)



Source: CSIRO, 'Climate change: the latest science', 2009.

2.7 Professor Robert Carter of James Cook University claimed that temperature rises always preceded rises in CO_2 concentrations.[3] However, Professor Will Steffen, Executive Director of the Climate Change Institute at the Australian National University, explained that the record also includes times when greenhouse gas concentration increases preceded temperature rises.[4]

2.8 The second point to note from Chart 2.1 is that, over the 800,000 years shown, the atmospheric concentration of CO_2 varied in a range from around 180 to 280 parts per million (ppm) until the industrial revolution. It has now risen to 380 ppm.

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3 Professor Robert Carter, *Proof Committee Hansard*, 15 April 2009, pp 68 and 70.

4 Professor Will Steffen, *Proof Committee Hansard*, 15 April 2009, p. 83.

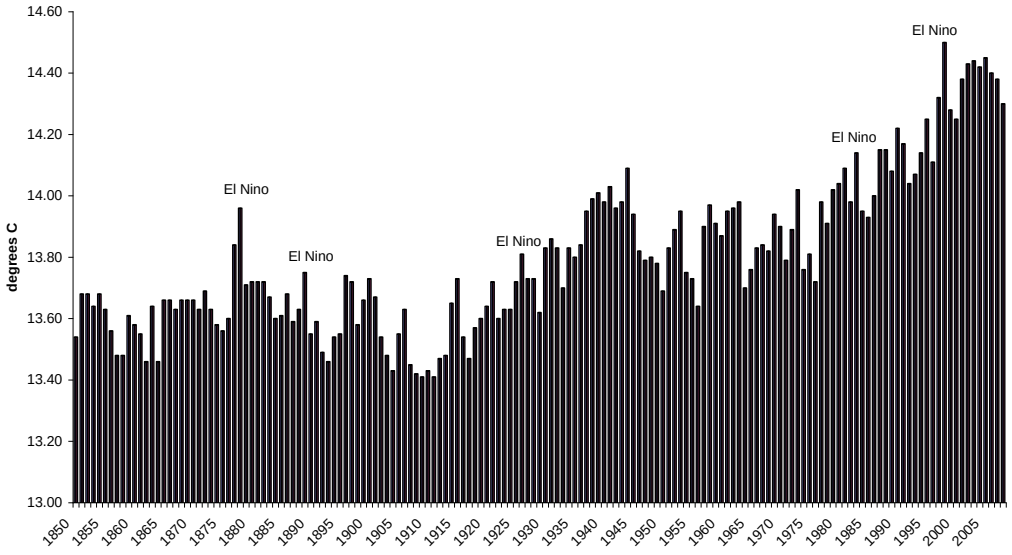
Global warming

2.9 Since modern measurements began in the late 1800s, global average surface temperature has increased by around 0.7ºC–0.8ºC. Tree rings and other records tell us that average Northern Hemisphere temperatures are likely to have been the highest in at least the past 1300 years. The 13 hottest years since the mid-19th century have all occurred in the past 14 years.

2.10 Global average annual temperatures from 1850 to the present are shown in Chart 2.2. While there is a clear uptrend trend in the temperature data there is volatility from year to year, reflecting factors such as volcanic eruptions and the El Nino effect.

Chart 2.2

Global temperature 1850-2008



Source: calculated from data from Bureau of Meteorology.

2.11 Some scientists place great emphasis on the average global temperature in 2008 being lower than in 1998. Professor Bob Carter of James Cook University interpreted this as indicating 'there is no warming at all, there is cooling'.[5] However the climate scientists pointed out that 1998 was an outlying El Nino year (Chart 2.2) and that 2008 was still hotter than any year prior to 1990.[6] Professor Steffen, added that the less volatile ocean temperatures show a clear warming trend.[7]

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5 Professor Bob Carter, *Proof Committee Hansard*, 15 April 2009, p. 59.

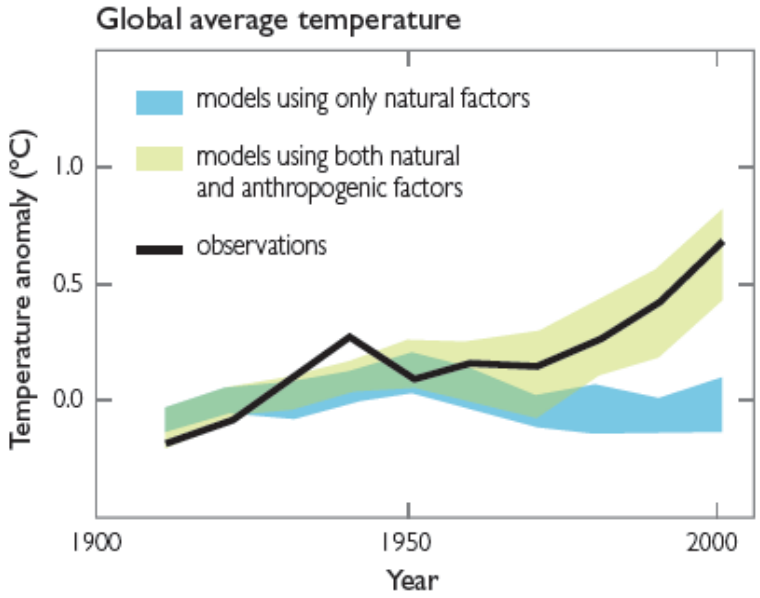
6 Professor David Karoly, Wentworth Group of Concerned Scientists, *Proof Committee Hansard*, 15 April 2009, p. 82.

7 Professor Will Steffen, *Proof Committee Hansard*, 15 April 2009, p. 82.

2.12 Media reports claim that an expansion of the ice area in part of Antarctica provides evidence of global cooling. Dr Ian Allison, of the Australian Antarctic Division in the Department of the Environment, Water, Heritage and the Arts, explained that wind changes were spreading a decreasing volume of ice over a wider area. He also drew attention to the localised impact of the hole in the ozone layer, which until the reduction in use of CFCs allows its repair, is likely to result in temperatures in some parts of Antarctica being warmer than would otherwise be the case.[8]

2.13 It was put to the committee by Associate Professor Stewart Franks of the University of Newcastle that any warming in the 20th century was due to natural factors.[9] However, as Chart 2.3 illustrates, climate models relying on natural factors could not explain the warming in the 20th century but models that incorporated increased greenhouse gas emissions from human activities could do so.[10]

Chart 2.3: Modelling temperature increases



Source: CSIRO, *The science of climate change*.

2.14 In a 'business as usual' world the IPCC's median estimate is that average temperatures will rise four degrees by 2100.[11] Four degrees may not sound a lot.

8 Dr Ian Allison and Dr Tony Press, *Proof Committee Hansard*, 23 April 2009, pp 11–13.

9 Professor Stewart Franks, *Proof Committee Hansard*, 15 April 2009, p. 59 and Mr Ian McClintock, *Submission 7*, p. 2.

10 Professor David Karoly, Wentworth Group of Concerned Scientists, *Proof Committee Hansard*, 15 April 2009, p. 90. The CSIRO comment 'there is less than 5% likelihood that the observed warming is due to natural causes alone'; *The science of climate change*.

11 Cited in *Carbon Pollution Reduction Scheme: Australia's Low Pollution Future*, December 2008, (hereafter *White Paper*), pp 1-2.

However, as Chart 2.1 shows, five degrees is the difference between now and the last ice age.

Implications for Australia

2.15 The IPCC has predicted with high confidence that without mitigation, by 2100 a temperature rise of over four degrees in Australia would lead to water security problems, and risks to coastal development and population growth from sea-level rise and increases in the severity and frequency of storms. It predicts with very high confidence that Australia would suffer a significant loss of biodiversity in such ecologically rich places as the Great Barrier Reef and the Queensland Wet Tropics, as well as the Kakadu wetlands, south-west Australia, the sub-Antarctic islands and alpine areas. The IPCC predicts with high confidence a decline in production from agriculture and forestry by 2030 over much of southern and eastern Australia due to increased drought and fire.[12]

2.16 The effects of climate change also carry national security implications:

> …the cumulative impact of rising temperatures, sea levels and more mega droughts on agriculture, fresh water and energy could threaten the security of states in Australia's neighbourhood by reducing their carrying capacity below a minimum threshold, thereby undermining the legitimacy and response capabilities of their governments and jeopardising the security of their citizens. Where climate change coincides with other transnational challenges to security, such as terrorism or pandemic diseases, or adds to pre-existing ethnic and social tensions, then the impact will be magnified.[13]

More recent scientific observations

2.17 More recent evidence suggests that the 2007 IPCC report may prove optimistic:

> …the recent climate change congress in Copenhagen where we had about 2,500 researchers from around the world [indicated]…We have good evidence that shows that the climate system is tracking at the upper level of the IPCC projections…In keeping with that, temperature and sea levels are also tracking at or near those upper levels of projections.[14]

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12 IPCC 2007, *Impacts, adaptation and vulnerability*, p. 509.

13 Dr Alan Dupont & Dr Graeme Pearman, 'Heating up the planet: Climate change and security', *Lowy Paper*, no. 12, Lowy Institute for International Policy, 2006, cited in *White Paper* pp 1-2.

14 Professor Will Steffen, *Proof Committee Hansard*, 15 April 2009, p. 76. Similar views were put by Dr Graeme Pearman, *Proof Committee Hansard*, 15 April 2009, p. 75 and Professor Tim Flannery, *Standing Committee on Economics Proof Committee Hansard*, 27 March 2009, p. 100.

Support for the views of climate scientists

2.18 The bulk of the evidence presented to the committee indicated that the overwhelming majority of scientists actively researching in the area broadly support the conclusions of the IPCC.[15] As one witness pointed out:

> All of the major national academies of science—from Australia, the US, the UK, Canada, Germany, India, Russia, China, Italy, Japan and so on—have declared that climate change is a major global threat.[16]

2.19 The committee heard that medical experts regard climate change as a major health issue:

> Last week one of the world's top medical journals, the *Lancet*, published a report after a year of cooperation with University College London, declaring that climate change was the greatest threat to global public health of the 21st century.[17]

2.20 The bulk of the thousands of submissions which the committee received from the public accept that climate change is happening and urge action.

2.21 Many of the large companies appearing before the committee (either directly or via industry organisations) employ many scientists, and would be in a position to express views about the science of climate change. It was notable that none questioned the science. Examples of statements made are:

> The Australian minerals sector is committed to being part of a comprehensive global response to prevent dangerous climate change.[18]

> We accept the general conclusion of the UK government's Stern report that the costs of not acting exceed the costs of acting to address climate change.[19]

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15 See for example Professor David Karoly, Wentworth Group of Concerned Scientists, *Proof Committee Hansard*, 15 April 2009, pp 81–82; Dr Tony Press, Chief Executive Officer, Antarctic Climate and Ecosystems Cooperative Research Centre, *Proof Committee Hansard*, 23 April 2009, p. 10 and Dr James Risbey, a CSIRO scientist and researcher at the centre for Australian Weather and Climate Research, speaking in a private capacity, *Proof Committee Hansard*, 23 April 2009, p. 64.

16 Dr Brett Parris, World Vision Australia, *Proof Committee Hansard*, 20 May 2009, p. 110. The joint statement by the academies, led by the Royal Society, can be found in *Science*, 18 May 2001, p. 1261.

17 Dr Brett Parris, World Vision Australia, *Proof Committee Hansard*, 20 May 2009, p. 110. The article, which can be found in *The Lancet*, 16 May 2009, p. 1693, says that 'effects of climate change on health will affect most populations in the next decades and put the lives and wellbeing of billions of people at increased risk'. Further evidence on medical implications is given by Doctors for the Environment, *Submission 401*.

18 Mr Peter Coates, Chairman of Xstrata and Chairman of the Minerals Council of Australia Standing Committee on Climate Change, *Proof Committee Hansard*, 22 April 2009, p. 22.

19 Mrs Heather Ridout, Chief Executive, Australian Industry Group, *Proof Committee Hansard*, 22 April 2009, p. 32.

> I have not heard of anyone within our business or most other businesses who is against an emissions trading scheme. The end point is agreed by business.[20]
>
> Rio Tinto supports effective, coordinated action by governments to reduce greenhouse gas emissions…[21]

2.22 Support was also provided by farmers' organisations:

> The Western Australian Farmers Association recognises the reality of climate change…95 per cent of the climate scientists tell us that humans are causing it and that we have to do something about it.[22]

Greenhouse gas concentrations and future temperatures

2.23 The *Garnaut Review* concluded that stabilisation of greenhouse gas concentrations at 450 ppm was in Australia's interests. As concentrations are now around this level, stabilisation will require significant falls in emissions starting very soon and then reversing some overshooting.

2.24 Most of the scientists assembled by the committee supported the consensus of global science that 450 ppm was the highest acceptable stabilisation level.

> Just about everyone on the panel has been saying that achieving a 450 stabilisation by 2050 will give us a 50 per cent probability of keeping within two degrees…[23]
>
> Dangerous climate change is generally thought to start when the global average temperature has risen by about two degrees above what it was in pre-industrial times. In addition, it is generally thought that stabilisation of greenhouse gases in the atmosphere at a 450 parts per million CO_2 equivalent will give rise to a global temperature rise of about two degrees centigrade above that of pre-industrial times.[24]

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20 Mr Anthony Concannon, Chairman, Energy Supply Association of Australia, *Proof Committee Hansard*, 28 April 2009, p. 42.

21 Mr Steve Hodgson, President and Chief Executive Officer, Bauxite and Alumina, Rio Tinto Alcan, *Proof Committee Hansard*, 28 April 2009, p. 126. Similar sentiments were expressed by Mr Miles Prosser, Executive Director, Australian Aluminium Council, *Proof Committee Hansard*, 1 May 2009, p. 51.

22 Mr Mike Norton, President, and Mr Dale Park, Climate Change Spokesperson, Western Australian Farmers Federation, *Proof Committee Hansard*, 20 April 2009, pp 95 and 99. A similar view was put by Mr Nick Flittner, Tasmanian Farmers and Graziers Association, *Proof Committee Hansard*, 23 April 2009, p. 19.

23 Mr Peter Cosier, Director, Wentworth Group of Concerned Scientists, *Proof Committee Hansard*, 15 April 2009, p. 89.

24 Dr John Hunter, Antarctic Climate and Ecosystems Cooperative Research Centre, *Proof Committee Hansard*, 23 April 2009, p. 3.

2.25 Aiming at 550 ppm CO_2e would lead to much greater risks:

> …if you stabilise at a 550 parts per million carbon dioxide equivalent, there is about a 50 per cent chance of Greenland going into this phase of what could be irreversible melting…If that does shrink significantly, the potential sea-level rise will be about seven metres.[25]

2.26 There are also scientists who regard the risks of settling for stabilising at 450 ppm as greater than this. Dr Risbey, a CSIRO (Commonwealth Scientific and Industrial Research Organisation) scientist and researcher at the centre for Australian Weather and Climate Research, warned:

> At 450 parts per million there is a 50 to 90 per cent chance of exceeding the dangerous threshold of two degrees Celsius…where if we look back to previous times in earth's history, we see the ice sheets in Greenland and West Antarctic would break down or start to break down. The worry is that we get to a point where that breakdown is irreversible…The last time the temperature was two degrees Celsius warmer than at present,…was about 130,000 years ago. That was in the peak of the last major interglacial period. At that time sea level was about five metres higher than present levels…[450 ppm] also gives us about a 10 to 25 per cent probability of exceeding three degrees,…The last time temperature was three degrees warmer than the present temperature was about three million years ago, in the Pliocene where sea level was about 25 metres higher than at present.[26]

2.27 Experts also expressed concern that increasing CO_2 was leading to ocean acidification, which would disrupt the marine food chain by preventing some organisms forming shells.[27]

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25 Dr John Hunter, Antarctic Climate and Ecosystems Cooperative Research Centre, *Proof Committee Hansard*, 23 April 2009, p. 4.

26 Dr James Risbey, speaking in a private capacity, 23 April 2009, pp 58–59.

27 Dr Martin Riddle, Australian Antarctic Division, *Proof Committee Hansard*, 23 April 2009, pp 7 and 9. Similar views were put by Dr Risbey, *Proof Committee Hansard*, 23 April 2009, p. 59 and Dr Matear, *Proof Committee Hansard*, 23 April 2009, pp 61–62. Some scientists did not dispute this, but downplayed its significance: 'we are not talking about the end of the planet'; Professor Franks, *Proof Committee Hansard*, 15 April 2009, p. 71.

Ethical and moral dimensions

2.28 The scientific evidence that taking no action is likely to lead to a rise in temperatures with serious adverse consequences for future generations is not alone a case for action if there are some short-term costs to action. The *Stern Review* was faced with this issue and captured the essence of the argument:

> …if you care little about future generations you will care little about climate change, As we have agued that is not a position which has much foundation in ethics…[28]

2.29 The key question is how policymakers should value the welfare of future generations. If political leaders are meant to follow 'the will of the people', or act 'in the public interest', does this include future generations who have no vote? A related question is the extent to which policymakers in wealthy countries should be concerned with the welfare of those in poor countries.

2.30 Professor Glenn Albrecht, an environmental philosopher from Murdoch University, argued:

> …it is ethically repugnant to force on innocent and non-consenting communities, particularly obviously our children and all future children, a deliberate decision to increase greenhouse gas emissions or a calculated failure to reduce them to safe levels. We must do the right thing to avoid imposing a massive and potentially irreversible risk on them. The idea of irreversibility is something that our ethical systems have not had to deal with in the past…. The science is more than sufficient to deliver an ethical response based on risk minimisation. The issue of irreversible change to the global climate is not one that humans can dismiss with scepticism or inaction and Australia's obligation as a relatively rich, very wealthy, industrialised and well educated country is to take the lead on greenhouse gas reductions and to set standards that will deliver a safe and predictable world to future generations.[29]

2.31 An eloquent and moving exposition was provided by Reverend Tim Costello, Chief Executive Officer of World Vision Australia:

> …climate change is no longer [just] an environmental issue; it is now a humanitarian and a development issue. It is starting to cost lives, and it will cost many, many more lives… The burden of climate change is going to fall on the poorest in our own society through higher costs and impact globally on the poorest nations, which is why World Vision is involved in this issue. It literally threatens to undo 50 years of development work.

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28 *The Economics of Climate Change: the Stern Review*, Cambridge University Press, 2007, p. 54. In its more technical analysis, the Stern team applied a discount of 0.1 per cent a year to the welfare of future generations, solely on the grounds that some global catastrophe (such as collision with an asteroid) may mean they do not exist.

29 Professor Albrecht, *Proof Committee Hansard*, 20 April 2009, pp 70–71.

> We work with Abdul Mannan, who is 55. He is an elder of the Dalalkandi on the island of Bhola in Bangladesh. That island has a population of 2,200. He speaks for many in his community when he says: 'The place where I was born lies five kilometres out in the sea. I have already moved my home and family four times; this is my fifth house. Soon I will have to move again.' I have personally seen and listened to these stories…Bangladesh is one of the poorest and most low-lying coastal areas on earth. Bhola, its biggest island, is eroding at a phenomenal rate. From a size of 6,400 square kilometres in the 1960s, it is now half its original size. At this rate the entire island of Bhola will be lost in the next 40 years. So what will become of Bhola's two million islanders? Many will be refugees.
>
> …as a child-focused development agency, we are very concerned about the intergenerational equity of children here and overseas…We in Australia are enjoying the fruits of our forebears' thought and work, we have gratitude for their mobilisation, their sacrifice that saved us from fascism, and we look forward to our children's future. But I do not think they will regard our conduct as fair, looking back, if as a generation they see us as a selfish generation that left them with problems with no viable solution.[30]

2.32 Reverend Costello's point about the impact on the younger and future generations was echoed by younger witnesses who appeared before the committee:

> The terrible irony of climate change is that those who will be most affected are the ones that have contributed the least. Also, those who will be the most affected by climate change have the least ability, at the present time, to contribute to the decision making and have been consistently left out of the decision-making processes…Climate change is not a political issue. It is a human issue. It is about Anna's grandparents farm in Gunnedah. It is about the tourism operators up on the Great Barrier Reef and in Kakadu. It is about the victims of natural disasters all over Australia. It is about our neighbours in the Pacific that are threatened with their whole homes, livelihoods and cultures disappearing under the ocean, and about our Torres Strait that may well go the same way. It is about all we value in Australia and what we imagine as the cultural icons. It is about our beaches and the heritage that we want to leave to our children.[31]

30 Reverend Tim Costello, *Proof Committee Hansard*, 22 April 2009, pp. 79–80.

31 Ms Amanda McKenzie, Australian Youth Climate Coalition, *Proof Committee Hansard*, 30 April 2009, pp 34–35.

The economics of global climate change

2.33 The *Stern Review* compared the short-term costs of taking action to reduce global greenhouse gas emissions with the long-term costs of allowing climate change to take its course.

2.34 Its conclusion was that there was a clear case for action:

> Using the results from formal economic models, the review estimates that if we don't act, the overall costs and risks of climate change will be equivalent to losing at least 5% of global GDP each year, now and forever. If a wider range of risks and impacts is taken into account, the estimates of damage could rise to 20% of GDP or more.
>
> In contrast, the costs of action – reducing greenhouse gas emissions to avoid the worst impacts of climate change – can be limited to around 1% of global GDP each year. [32]

2.35 The *Garnaut Review* looked at similar issues from an Australian perspective. It concluded:

> Mitigation on the basis of 550 [ppm atmospheric concentration of CO_2e] objectives was judged to generate benefits that exceeded the costs. Mitigation on the basis of 450 was thought to generate larger net benefits than 550.[33]

Committee view on risk management

2.36 The balance of the evidence discussed above suggests that climate change is occurring, is driven by anthropogenic factors and is a grave threat to accustomed ways of life and natural systems. If this view is right, the calculations above make a virtually unarguable case for taking global action.

2.37 The IPCC makes clear that there is a range of uncertainty around the projections. But this is not an excuse for inaction.[34] Prudent risk management would balance the risk of doing nothing when the climate scientists are right—which would involve very severe and irreversible damage to human welfare—against the outcome if action is taken unnecessarily, which would modestly lower economic growth in the short term but mean that remaining fossil fuel supplies would last longer.

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32 *The Economics of Climate Change: the Stern Review*, Cambridge University Press, 2007, p. xv.

33 The *Garnaut Climate Change Review: Final Report*, Cambridge University Press, 2008, (hereafter *Garnaut Review*), p. xxv. Further information on the modelling results in the *Garnaut Review* is given below, starting in paragraph 2.120.

34 This point is made in a recent literature survey by the OECD, which noted the uncertainties but argued action was justified 'even if the marginal cost of greenhouse gas emissions mitigation exceeds the marginal damage of one additional ton of carbon…because two features of the impacts of climate change tilt the balance in favour of action: their irreversibility, and the risk they are extreme'; S Jamet and J Corfee-Morlot, 'Assessing the impact of climate change: a literature review', *OECD Economics working papers*, no. 691, April 2009.

2.38 Even acknowledging the possibility that the majority view on the science could be totally wrong still leaves a powerful case for a 'no regrets' policy. Taking action amounts to 'giving the planet the benefit of the doubt'. It is a sensible insurance policy.

Australia's fair and equitable share of global emissions targets

2.39 Prime Minister Kevin Rudd in an address to the international climate conference in Bali in 2007, said:

> Climate change is the defining challenge of our generation…one of the greatest moral, economic and environmental challenges of our age.

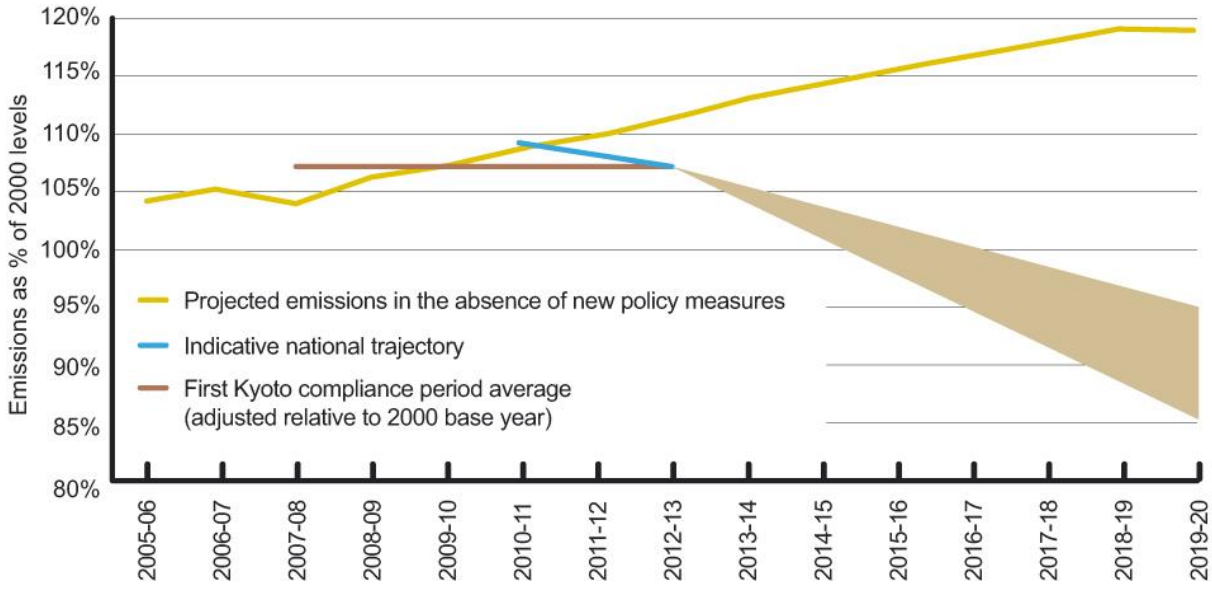
2.40 The Government says that Australia's emissions targets are set with regard to:

> the principle that the stabilisation of atmospheric concentrations of greenhouse gases at around 450 parts per million of carbon dioxide equivalence or lower is in Australia's national interest.[35]

The Government's unconditional offer

2.41 The *White Paper* envisaged an unconditional offer of a reduction of 5 per cent in carbon emissions from 2000 to 2020. A path consistent with this would see Australian emissions reducing from 109 per cent of 2000 levels in 2010–11 to 108 per cent in 2011–12, and 107 per cent in 2012–13 (Chart 2.4).

Chart 2.4: CPRS targets



Source: *White Paper*, p 4-23.

35 *Carbon Pollution Reduction Scheme Bill 2009,* (hereafter *CPRS Bill*), section 14(5)(c)(i).

The Government's original conditional offer

2.42 The Government had stated it would go to 15 per cent if there were a global agreement 'where all major economies commit to substantially restrain emissions and all developed countries take on comparable reductions to that of Australia'.[36]

The Government's revised conditional offer

2.43 The Government announced on 4 May that it was raising the conditional offer it was taking to Copenhagen to a 25 per cent reduction. It explained:

> The Government's new commitment of 25 per cent below 2000 levels by 2020 follows extensive consultation with environment advocates on the best way to maximise Australia's contribution to an ambitious global outcome. It also reflects that international developments since December 2008 have improved prospects for such an agreement.[37]

2.44 The proposed Australian offer is subject to strict conditions. The main condition is that there must be an international agreement capable of stabilising greenhouse gases at 450 ppm or lower by mid-century. The detailed conditions are quite specific:

> 1. comprehensive coverage of gases, sources and sectors, with inclusion of forests (e.g. Reducing Emissions from Deforestation and forest Degradation - REDD) and the land sector (including soil carbon initiatives (e.g. bio char) if scientifically demonstrated) in the agreement;
>
> 2. a clear global trajectory, where the sum of all economies' commitments is consistent with 450 ppm CO_2-e or lower, and with a nominated early deadline year for peak global emissions no later than 2020;
>
> 3. advanced economy reductions, in aggregate, of at least 25 per cent below 1990 levels by 2020;
>
> 4. major developing economy commitments to slow growth and then reduce their absolute level of emissions over time, with a collective reduction of at least 20 per cent below business-as-usual by 2020 and a nominated peak year for individual major developing economies;
>
> 5. global action which mobilises greater financial resources, including from major developing economies, and results in fully functional global carbon markets.[38]

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36 *CPRS Bill Commentary*, p. 14.

37 Department of Climate Change, fact sheet, *Strengthening Australia's 2020 carbon pollution target*, p. 1. The *Garnaut Review* had also advocated a 5 per cent unconditional cut but recommended an offer of a 25 per cent cut in the context of an international agreement that added up to sufficient cuts to reach a CO_2 concentration of 450 ppm.

38 Department of Climate Change Fact Sheet, *Strengthening Australia's 2020 Carbon Pollution Target*, p. 1.

2.45 The Department of Climate Change was asked to clarify what was meant by 'fully functioning carbon markets' and replied:

> Operationally, it has really meant that Australia would have access to a broad range of international trading mechanisms. We are not talking about how every country has to be participating in a particular market; it is just that there is a deep and liquid market available. That may not require enormous enhancements, other than the CDM market expanding access to, for example, European markets et cetera.[39]

2.46 Views differed among witnesses as to whether the conditions were realistic:

> There has been comment around the conditions that have been set on the 25 per cent target from the government, but in our view they are a realistic expression of the kind of agreement which would get us to that 450 ppm.[40]
>
> I think that the 25 per cent target is still very low and the contingencies associated with it are problematic…[41]
>
> …some of those criteria are not helpful, and that the government should consider revising them.[42]
>
> …the conditions are too stringent.[43]

2.47 Australia's offer is compared to that of other economies in Table 2.1. Comparing different countries' plans is complicated as they refer to different base years. For example, the US 2009 Budget proposes a 14 per cent reduction in emissions by 2020 but, as this is from 2005 levels, it represents only about a return to 1990 levels. Table 1 attempts to express the various plans on a common 1990 base. It uses United Nations population projections to express the targets in per capita terms; in some cases (including Australia) these projections differ from those of national governments. Another reason the table should only be regarded as indicative rather than definitive is that different sources give differing estimates of historical emissions.

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39 Mr Blair Comley, Department of Climate Change, *Proof Committee Hansard*, 20 May 2009, p. 4.

40 Mr John Connor, Climate Institute, *Proof Committee Hansard*, 20 May 2009, p. 27.

41 Dr Richard Denniss, Australia Institute, *Proof Committee Hansard*, 20 May 2009, p. 42.

42 Professor Stephen Howes, *Proof Committee Hansard*, 20 May 2009, p. 58.

43 Dr Brett Parris, World Vision Australia, *Proof Committee Hansard*, 20 May 2009, p. 111.

Table 2.1: Comparison of emission reduction targets for 2020

Targets and proposals	% change from 1990	% change from 1990 per capita	per capita emissions (tonnes of CO_2e)
Australia	-3 to -24	-30 to -45	15 to 12
European Union	-20 to -30	-25 to -34	8 to 7
United Kingdom	-34	-42	7
US (2009 budget proposal)	-1	-27	11
US (Waxman bill[44])	-4	-29	11
Canada (Government target)	+24	-8	12
Canada (House bill C-311[45])	-25	-44	7
Germany	-40	-41	9
Netherlands	-30	-39	8
Norway	-30	-43	4
Switzerland	-20 to -30	-32 to -40	4

Sources: Secretariat calculations based on *White Paper*, p 3-3; *Garnaut Report*, p 177; Department of Climate Change Fact Sheet – Emissions, target and global goal; 'Economic cost as an indicator for comparable effort'; 'A new era of responsibility: renewing America's promise' (US 2009 Budget), p 21; *UK Budget 2009: Building a low-carbon economy- implementing the Climate Change Act 2008*. Per capita percentage changes are calculated from the previous column based on population projections in United Nations, *World Population Prospects* and then the numbers in the final column calculated by applying these per capita percentage changes to 1990 per capita emissions (including land use change and forestry) from the United Nations Framework Convention on Climate Change; http://esa.un.org/unpp.

Arguments for 25 per cent or higher emissions reductions

2.48 As discussed above, the scientific evidence suggests that the global concentration of greenhouse gases needs to be kept to 450 ppm to avoid the dire consequences following from increases in average temperatures of over two degrees. The majority of submitters argued that Australia should therefore make an offer consistent with its fair share of a global effort to the world stabilising concentrations at 450 ppm. As Professor Garnaut says:

> …to make an unrealistically low offer in the international negotiations is to negate the prime purpose of our own mitigation, which is to facilitate the emergence of an effective agreement.[46]

44 The Waxman-Markey bill has been approved (by 33–25) by the House of Representatives Energy and Commerce Committee, and is now under consideration by other committees.

45 The bill has passed a second reading vote and is now before a parliamentary committee.

46 *Garnaut Review*, p. 278.

2.49 Australia currently has per capita emissions well above the global average and many submissions regard it as neither fair nor realistic to expect the world to accept this remaining the case forever.

2.50 The *Garnaut Review* assumes the world agrees to eliminate these differences in per capita emissions (or emissions entitlements) gradually over the period to 2050 (in a process know as 'contract and converge'). Under this arrangement, Professor Garnaut's calculation is that Australia's contribution would be about a 25 per cent reduction in emissions from 1990 levels.[47] This calculation was not challenged by any witness or submission.

2.51 This conditional target is still Professor Garnaut's preferred position:

> …the ETS…would be substantially better than nothing if the upper limit to emissions reductions were raised to 25 per cent of 2000 levels by 2020 on condition that other countries had made commitments that added up to an agreement to hold and to reduce greenhouse gas concentrations in the atmosphere to 450 parts per million.[48]

2.52 Whether there would be global agreement to this timetable for convergence has been questioned:

> I think the fairest way to do it would be along a contraction and convergence scenario where you converge at around 2030. I think 2050 is the sort of thing that the developing world is not going to accept.[49]
>
> So contraction and convergence models as proposed internationally for well over a decade and most recently by Professor Garnaut's review are going to be a key part of the debate. One of the issues, of course, is: when does convergence happen? When is a fair time at which we all arrive at some global per capita level of emissions? If you look at it as an entitlement issue with trading between larger emitters and lower emitters in the early stages, there is nothing to stop that happening in a very early phase. You do not need to wait until 2050 to do that, and we may see increasing global pressure for that to occur.[50]

2.53 Professor Garnaut's approach was endorsed by other witnesses:

> Everybody has to be in the boat, as Garnaut has said. But you cannot get people into the boat in our judgement unless…you have as your objective an equitable per capita policy that over time delivers some kind of social

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47 A similar calculation in a report by Ecofys gives a 22–28 per cent reduction as Australia's contribution; Dr Paul Twomey, *Standing Committee on Economics Proof Committee Hansard*, 27 March 2009, p. 116. This is also about a 25 per cent reduction from 2000 levels, as in Australia there was little net increase in emissions over 1990–2000.

48 Professor Ross Garnaut, *Proof Committee Hansard*, 16 April 2009, p. 46.

49 Mr Andrew Macintosh, *Proof Committee Hansard*, 15 April 2009, p. 84.

50 Dr Iain MacGill, Joint Director (Engineering), Centre for Energy and Environmental Markets, University of New South Wales, *Proof Committee Hansard*, 1 May 2009, p. 63.

> equity in terms of per capita emissions. If not, you are in effect saying to people in India and elsewhere, 'Your job is to ride your bike and cook on cow dung for another 50 years while we enjoy getting around in the big cars.' We just think that is unsustainable.[51]

2.54 The logic of limiting the Australian offer to a maximum reduction of 15 per cent, as proposed in the *White Paper*, had been questioned by a number of witnesses, many of whom argued for the 25 per cent target the Government subsequently adopted:

> …we think it is absolutely critical that Australia puts on the table at least a 25 per cent target in the upper end of its range as part of a global effort so it signals that it is actually willing to play its fair share in an effective global agreement.[52]

> …it is terrific that the 25 per cent target is on the table—it means that Australia need not now go into negotiations as something of a wrecker…[53]

> The main problem with the CPRS is that the targets bear no relationship to the problem that is trying to be solved…the selection of targets in the CPRS is entirely disconnected from the scientific problem of reducing greenhouse gas emissions.[54]

> If you look at the ways some of the other countries such as China and India are positioning themselves, if we are taking a half-arsed approach in Australia it is going to make a global agreement that much harder.[55]

> …the stronger target of 25 per cent does move Australia into an international climate position that is reasonable to negotiate a successful outcome for an agreement for 450 ppm or less at the critical negotiations in Copenhagen later this year.[56]

> I think the biggest single problem with the CPRS as announced is that that conditional agreement—the amount we say we will do if everybody else joins in—is much below what we need to stabilise the climate. The Garnaut estimate of a 25 per cent reduction by 2020, I think, was at the very low end of the reduction that is needed.[57]

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51 Mr Michael O'Sullivan, Australian Council of Superannuation Investors, *Proof Committee Hansard*, 30 April 2009, p. 167.

52 Mr Erwin Jackson, Climate Institute, *Proof Committee Hansard*, 1 May 2009, p. 77.

53 Dr Brett Parris, World Vision Australia, *Proof Committee Hansard*, 20 May 2009, p. 111.

54 Dr Richard Denniss, Australia Institute, *Proof Committee Hansard*, 15 April 2009, p. 18.

55 Dr Phill Pullinger, Environment Tasmania, *Proof Committee Hansard*, 23 April 2009, p. 95.

56 Mr Owen Pascoe, Australian Conservation Foundation, *Proof Committee Hansard*, 20 May 2009, p. 26.

57 Professor John Quiggin, *Proof Committee Hansard*, 28 April 2009, p. 17.

2.55 The view of some eminent scientists is that more ambitious targets are required, in some cases because they interpret the latest scientific results as indicating that 450 ppm poses unacceptable risks:

> The best estimate for the level of global emission reductions is between 50 and 85 per cent global emission reductions based on the IPCC assessments by 2050 and an equal per capita approach globally would suggest 90 per cent to 97 per cent emissions reductions for Australia by 2050...if you want to achieve a 450 parts per million CO_2 stabilisation target. At 450 parts per million we still have a 50 per cent risk of exceeding two degrees of warming…In 2020 emission reductions for developed countries should be between 25 per cent and 40 per cent.[58]

> If you aim for a target of 450 parts per million, as we said in our submission that would require at least a 25 per cent 2020 target for Australia.[59]

> …there seems to be a disjunct in what has been put forward in the Government's *White Paper*. The Government emphasised in its *White Paper* that it would like to pursue a 450 parts per million CO_2-e outcome and it has put forward an emissions target range that seems to be inconsistent with achieving that ppm outcome. If the Government wants to achieve a 450 part million CO_2 outcome, the bare minimum to which Australia can commit is at least 30 per cent.[60]

2.56 These considerations led some environmentalists to regard even the 25 per cent offer as inadequate:

> If such a strong agreement were met then we think that Australia's contribution should be significantly higher than 25 per cent, probably in the order of 50 per cent reductions by 2020 if the global deal resulted in the conditions that have been stipulated by the government being met for a 25 per cent reduction.[61]

> …we really need domestic reduction targets of closer to 40 to 50 per cent by 2020 if we are going to make the contribution that is needed to meet that level of ambition that the climate science is saying we need.[62]

> The vision of young people is that they will be able to live in a climate that is somewhat similar to the one their parents and their grandparents lived in. The current targets…will not ensure this...Even at the upper range of the government's target, at 25 per cent, there is a 50 per cent chance of the

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58 Professor David Karoly, Wentworth Group of Concerned Scientists, *Proof Committee Hansard*, 15 April 2009, p. 77.

59 Mr Peter Cosier, Director, Wentworth Group of Concerned Scientists, *Proof Committee Hansard*, p. 86.

60 Mr Andrew Macintosh, Associate Director, ANU Centre for Climate Law and Policy, *Proof Committee Hansard*, 15 April 2009, p. 74.

61 Mr John Hepburn, Greenpeace Australia, *Proof Committee Hansard*, 20 May 2009, p. 20.

62 Mr Lawson, Friends of the Earth Australia, *Proof Committee Hansard*, 20 May 2009, p. 23.

> temperature increase going above two degrees and having significantly adverse consequences for Australia.[63]

2.57 A study by McKinseys consultants concludes that a 30 per cent target would be easily affordable for Australia:

> A significant reduction in Australian GHG emissions is achievable—30 percent below 1990 levels by 2020 and 60 percent by 2030 without major technological breakthroughs or lifestyle changes. These reductions can be achieved using existing approaches and by deploying mature or rapidly developing technologies to improve the carbon efficiency of our economy. They require significant changes to the way we operate in key sectors, for example, changes in our power mix, but can be achieved without major impact on consumption patterns or quality of life. Reducing emissions is affordable—with an average annual gross cost of approximately A$290 per household to reduce emissions in 2020 to 30 percent below 1990 levels. This compares to an expected increase in annual household income of over A$20,000 in the same time period.[64]

2.58 Reverend Costello and Dr Pearman questioned the Government's (previous) conditional target on ethical grounds:

> It is not fair because the targets do not represent Australia taking its fair share of the burden, let alone taking leadership on the issue.[65]
>
> We are a relatively wealthy country and we cannot sit back and expect all countries to take an equal share in this. All of that together says to me that we should have a 30 per cent reduction by 2020.[66]

2.59 As noted above, while Australia 'only' emits 1½ per cent of global emissions, it is one of the world's highest *per capita* emitters. Furthermore, these calculations only include emissions in Australia. If Australia were regarded as 'responsible' for the emissions when our exports are used, on the grounds that we are benefiting from these emissions, Australia would be regarded as an even higher emitter. World Vision Australia provided an example of these calculations to bolster the case for Australia adopting a stricter target:

> With respect to our coal exports alone, we exported 252 million tonnes of coal last year, and from that you get approximately 740 million tonnes of CO_2. If that was a country by itself, its emissions would rank higher than Canada's and slightly below Germany's. If you add that to our domestic

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63 Ms Amanda McKenzie, Australian Youth Climate Coalition, *Proof Committee Hansard*, 20 May 2009, p. 24.

64 McKinseys, *An Australian Cost Curve for Greenhouse Gas Reduction*, February 2008, *Submission 764a*, p. 6.

65 Reverend Tim Costello, Chief Executive, World Vision Australia, *Proof Committee Hansard*, 22 April 2009, p. 79.

66 Dr Graeme Pearman, *Proof Committee Hansard*, 15 April 2009, p. 85.

> emissions, we would rank slightly below India in terms of our contribution to the problem.[67]

Arguments that 5 per cent reduction is already tough

2.60 On the other hand, there were some witnesses who regarded even the unconditional 5 per cent reduction as a tough target:

> We do not believe that negative five is a small ask. It is a big ask for Australian industry. It will require us to reduce emissions by around 20 per cent on what they otherwise would have been by 2020. So it is not an insignificant ask and it will have consequences.[68]

> …the minus five per cent target, which represents a 25 per cent reduction in emissions relative to expected trends and a 34 per cent reduction relative to per capita emissions, is some three to four times stronger than those proposed by other, wealthier countries such as the USA and countries of the EU, as measured by an impact on gross national product. AIGN advocates that Australians shoulder a fair share of the global burden—no more and no less.[69]

2.61 There were industry witnesses who feared for the future if this target is pursued – or at least pursued under the CPRS as currently formulated (see Chapter 4):

> …there will be less production, less exports and less regional employment from both of our [meat and dairy] industries,…[70]

> I am absolutely sure that we will see [cement] plants progressively shutting down prematurely in Australia.[71]

> The most immediate and significant impact of increasing the costs and risks of developing LNG [liquefied natural gas] in Australia is that it will threaten the industry's competitiveness…[72]

> Under the current scheme half of Rio Tinto's open-cut coal mines would be likely to close by around 2020.[73]

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67 Dr Brett Parris, World Vision Australia, *Proof Committee Hansard*, 22 April 2009, p. 82.

68 Mrs Heather Ridout, Chief Executive, Australian Industry Group, *Proof Committee Hansard*, 22 April 2009, p. 33.

69 Mr Michael Hitchens, Australian Industry Greenhouse Network, *Proof Committee Hansard*, 15 April 2009, p. 21.

70 Mr Chris Phillips, Dairy Australia, *Proof Committee Hansard*, 30 April 2009, p. 195.

71 Mr Chris Leon, Chair, Cement Industry Federation, *Proof Committee Hansard*, 30 April 2009, p. 48.

72 Woodside Energy, *Submission 375*, p. 3.

73 Mr Steve Hodgson, President and Chief Executive Officer, Bauxite and Alumina, Rio Tinto Alcan, *Proof Committee Hansard*, 28 April 2009, p. 127.

2.62 Some industry witnesses pointed out that they had already made significant investments to reduce emissions and that further reductions in emissions intensity were limited by the laws of physics:

> In integrated steel works such as Whyalla or Port Kembla, direct emissions from the use of carbon as a chemical reductant comprise about 80 per cent of emissions…Both companies' Australian blast furnaces are efficient by world standards in their reducing agent consumption. Energy costs such as coal have always been a focus of the industry and significant work has been ongoing to reduce these costs over a long period of time. There is very little ability to further reduce these direct emissions without a breakthrough in technology.[74]

> …since 1990, per tonne of product, we have seen a reduction of 25 per cent of CO_2…The reason for that reduction is primarily through large technological change.[75]

> If you look at the aluminium industry overall over the last 50 years we have reduced direct CO_2 emissions by 50 per cent without a carbon price...[but] in terms of process gains, efficiency gains and business gains we have reached a plateau.[76]

> ALOA's members have been active in reducing greenhouse gas emissions from their operations over the last two decades. In fact, the waste sector is the only sector under the CPRS that has actually recorded reductions in greenhouse gases in this period. Since 1990, the sector has reduced its overall emissions by 12.6 per cent.[77]

> …60 per cent of lime's emissions are in fact through the use of the raw material limestone and do not come from an energy basis…as such, there is no real opportunity for the lime industry to address that 60 per cent emissions base.[78]

2.63 The Department of Climate Change's special envoy agreed with the following characterisation of the argument for the targets in the *White Paper*:

> …we have got to make up for the fact that at the Kyoto agreement we were allowed an increase. Some people argue that, therefore, we have not done our fair share and we need a stronger target. But, in fact, that makes our

74 Mr Paul O'Malley, Chief Executive Officer, BlueScope Steel, *Proof Committee Hansard*, 22 April 2009, p. 13.

75 Ms Robyn Bain, Chief Executive Officer, Cement Industry Federation, *Proof Committee Hansard*, 30 April 2009, p. 47.

76 Dr Liu Xiaoling, President, Primary Metals Pacific, Rio Tinto Alcan, *Proof Committee Hansard*, 28 April 2009, pp 130 and 134.

77 Mr James Spedding, Secretary, Australian Landfill Owners Association, *Proof Committee Hansard*, 22 April 2009, p. 44.

78 Mrs Ros DeGaris, Chief Executive Officer, National Lime Association of Australia, *Proof Committee Hansard*, 21 April 2009, p. 19.

> trajectory harder to turn around and that is part of the justification for our target.[79]

Australia's influence in international negotiations

2.64 Some have questioned whether Australia's actions will make a difference to international agreements:

> With only one per cent of world GDP, we are neither prominent among world nations nor particularly influential within world councils. And while Australia has many well-qualified scientists, few of these are considered to be world authorities on climate change. Accordingly, it is pure hubris for Australia to attempt to take the lead in abatement activity.[80]

2.65 Professor Garnaut, a former ambassador to China, commented:

> That position is ignorant of the realities of Australian diplomacy. I know from my work on the review that views developed in Australia are very much respected in some of the developing countries that are going to be very important for the outcome. I have had lengthy discussions at ministerial level in Indonesia that confirm that. The Indonesian government sees Australia as a partner in its efforts to do something about climate change…In China we have access with ideas and we can play a very important role in helping to define a global regime that helps solve the problem and secures our interests in the process. I know from close interaction with those three countries, for a start, that what we say, so long as it is consistent with what we do, can have a significant influence on the outcome.[81]

2.66 Mr Don Henry, Executive Director of the Australian Conservation Foundation, believes that Australia can be influential:

> Australia can be influential in encouraging key nations, such as China and the US—and, in our region, Indonesia and India—to strive for a strong global outcome at Copenhagen...[82]

2.67 He gave as an example of past influence:

> Australia played a very strong and very positive role in getting a global agreement for the reduction of ozone depleting substances. [83]

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79 Mr Howard Bamsey, Deputy Secretary and Special Envoy, Department of Climate Change, *Proof Committee Hansard*, 1 May 2009, p. 88.

80 Dr Alan Moran, Institute of Public Affairs, cited in Senate Standing Committee on Economics, *Exposure draft of the legislation to implement the Carbon Pollution Reduction Scheme*, April 2009, p. 128.

81 Professor Ross Garnaut, *Proof Committee Hansard*, 16 April 2009, p. 49.

82 Mr Don Henry, *Proof Committee Hansard*, 22 April 2009, p. 60.

83 Mr Don Henry, *Proof Committee Hansard*, 22 April 2009, p. 62.

2.68 Other witnesses argued that Australia should at least try to exert influence, and setting a good example was an important means of doing so:

> It is hard to see a scenario where Australia helps to achieve a strong global deal by offering to do very little in Australia.[84]

> …while we are not a superpower, we are an influential player in climate change negotiations. Since the EU negotiates as one block, there is only the EU, the US, Japan, Canada and Australia—they are the five significant developed countries in this.[85]

Australia's ethical obligations

2.69 There is also an ethical dimension, articulated by environmental philosopher Professor Albrecht, and supported by other witnesses:

> …Australia's obligation as a relatively rich, very wealthy, industrialised and well educated country is to take the lead on greenhouse gas reductions and to set standards that will deliver a safe and predictable world to future generations...we in Australia are privileged by virtue of the wealth that we have generated through our natural resources…That is precisely the kind of society that has to provide leadership to the rest of the world on all of these major globally significant issues…[86]

> …there is a strong economic and ethical argument for richer countries such as Australia, the USA and the European Union to take the lead on reduction commitments.[87]

2.70 Reverend Costello views it as not just a matter of international justice but inter-generational justice:

> Our generation, which has been the highest spending, worst saving generation in human history…has had the benefit of not pricing the carbon. For our generation to actually be locked in the counsel of despair, I have to say, as an Australian, is a failure of leadership.[88]

Australia's targets in the absence of (adequate) global agreement

2.71 In the event of no agreement being reached at Copenhagen, as noted above, the Government has said that Australia's target would be a 5 per cent reduction from 2000 emissions by 2020.

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84 Ms Trish Harrup, Greenpeace Australia, *Proof Committee Hansard*, 21 April 2009, p. 70.

85 Professor Stephen Howes, *Proof Committee Hansard*, 20 May 2009, p. 43.

86 Professor Glenn Albrecht, *Proof Committee Hansard*, 20 April 2009, p. 71.

87 Mr Amar Breckenridge, Frontier Economics, *Proof Committee Hansard*, 16 April 2009, p. 18.

88 Reverend Tim Costello, *Proof Committee Hansard*, 22 April 2009, p. 85.

2.72 One view is that the Australian unconditional target should be the same as the conditional offer.

> If doing something is the right thing to do, it remains the right thing to do whether or not others are doing it too.[89]

2.73 Professor John Quiggin of the University of Queensland said:

> … if the rest of the world does not do anything, we are in grave straits. The question is really a political one. We have to make an offer that is sufficient to be in earnest and good faith but sufficiently short of what we are going to do in an agreement. We are indicating the weight we place on an international agreement. That is to some extent a tactical question.[90]

Direct environmental impact of Australia acting

2.74 As Australia is only directly responsible for around 1½ per cent of global greenhouse emissions, if its actions have absolutely no influence on the rest of the world, the impact will be correspondingly moderate.

2.75 It is sometimes claimed that Australian actions in these circumstances would have *no* impact. A number of witnesses believe this is an exaggeration:

> Australia's emissions are at least 1.4 to 1.5 per cent of the global emissions as well, which may sound insignificant, but when you are dealing with a non-linear system, every bit matters. It is simply not the case that a relatively small amount of emissions necessarily has no effect on the climate. That can push us over the limit and over thresholds.[91]

> … a 20 per cent cut in Australian emissions by 2020 will cut projected global emissions by 0.2 per cent.[92]

> To a certain extent, the response of the climate system will be proportional to the emissions and over small ranges. If the emissions turn out to be 1½ per cent smaller than they would be otherwise because Australia reduced its emissions, say, to zero, that would have a significant effect on the climate. I do not like people saying that there will not be any effect. There will be an effect.[93]

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89 James Garvey, Secretary of the Royal Institute of Philosophy, *The Ethics of Climate Change*, 2008, p. 108.

90 Professor John Quiggin, *Proof Committee Hansard*, 28 April 2009, pp 19–20.

91 Dr Brett Parris, World Vision Australia, *Proof Committee Hansard*, 22 April 2009, p. 86.

92 Minerals Council of Australia, *Submission 425*, p. 15.

93 Dr John Hunter, Antarctic Climate and Ecosystems Cooperative Research Centre, *Proof Committee Hansard*, 23 April 2009, p. 8.

2.76 One witness noted that if every country with smaller emissions than Australia also took the attitude that it was not worth acting, this would represent about a third of global emissions that continue to grow.[94]

2.77 Another argument is that a failure at Copenhagen does not end the process. Environmentalists argued that it remains important for Australia to set an example.

> I think that Australia should lead because as an energy intensive nation we have a good opportunity to show that a country can become smarter and more efficient and retain its prosperity by using new energy sources.[95]

Is Australia acting alone?

2.78 There have been claims that in the absence of a comprehensive global agreement at Copenhagen that Australia will be acting alone. However, most witnesses acknowledged this was not the case:

> We recognise that Australia is not alone in proposing to take action to address climate change…[96]

> We are not acting alone. The developed world is moving on this issue. The United States is now taking steps to introduce emission trading schemes. Japan and New Zealand are doing so and Europe already has one.[97]

> …my view is that other countries over time will come on board, establishing various different ways of pricing carbon within their own economies…The trend that we have seen is that there are carbon prices out there in the world. In various places there are voluntary trading schemes, the European scheme of course, and a couple of regional schemes in the US that are proposed to start shortly.[98]

Early adoption

2.79 A number of witnesses pointed to advantages in Australia acting before all other (advanced) economies have agreed to act:

> One obvious big benefit would be to avoid having new investments that later turn out to be inappropriate in a low carbon world.[99]

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94 Ms Amanda McKenzie, Australian Youth Climate Coalition, *Proof Committee Hansard*, 30 April 2009, p. 45.

95 Ms Fiona Wain, CEO, Environment Business Australia, *Proof Committee Hansard*, 15 April 2009, p. 45.

96 Mrs Heather Ridout, Chief Executive, Australian Industry Group, *Proof Committee Hansard*, 22 April 2009, p. 32.

97 Mr Andrew Macintosh, Associate Director, ANU Centre for Climate Law and Policy, *Proof Committee Hansard*, 15 April 2009, p. 91.

98 Mr David Pearce, Executive Director, Centre for International Economics, *Proof Committee Hansard*, 16 April 2009, p. 7.

99 Dr John Pezzey, *Proof Committee Hansard*, 16 April 2009, p. 60.

> From a strategic point of view in terms of industry, it is actually about adopting the practices, growing the skill base and understanding this process that will be global in my view within less than a decade, and I think probably less than five years.[100]
>
> If the Australian government and Australian industry embrace this as an opportunity to play our part, then Australians will benefit from the jobs and the technology that we will develop. If our national policy settings focus on resisting change, we will allow other nations to get a head start on us that we may never recover from.[101]

2.80 It is argued that there is a need to encourage industry restructuring regardless of whether most countries in the world move quickly or slowly:

> I think the aluminium industry is a case in point. The question is how we develop industry restructuring to assist them to actually take advantage of Australia's huge resources of renewable energy. One way we may fail to do that is if we offer them free trading permits to allow them to continue to emit. [102]

2.81 On this view, if Australia waits it risks a poor outcome:

> …those countries that locked themselves in to a high-carbon future would be economic losers in the future—because the world will change.[103]

Risks of carbon tariffs if Australia does not act

2.82 Another disadvantage of inaction raised was the risk of facing carbon tariffs:

> The EU in the context of cement is already talking about imposing border taxes on non-compliant countries, countries which do not sign up to the general terms available to people. So I think a developed country which just says, 'Look, we can't do this and we won't do it,' is also taking a very substantial risk with its trade.[104]

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100 Dr Ray Wills, Chief Executive, Western Australia Sustainable Energy Association, *Proof Committee Hansard*, 20 April 2009, p. 45.

101 Mr Dave Oliver, Australian Manufacturing Workers Union, *Proof Committee Hansard*, 22 April 2009, p. 4.

102 Dr Ray Wills, Chief Executive, Western Australia Sustainable Energy Association, *Proof Committee Hansard*, 20 April 2009, p. 46.

103 Mr Todd Stern, President Obama's climate change envoy, cited by Ms Harrup, Greenpeace Australia, *Proof Committee Hansard*, 21 April 2009, p. 62.

104 Professor John Quiggin, *Proof Committee Hansard*, 28 April 2009, p. 29.

Economic modelling

2.83 Deciding an appropriate emissions target for Australia requires an assessment of the economic costs involved, which can be informed by economic modelling.

Treasury modelling

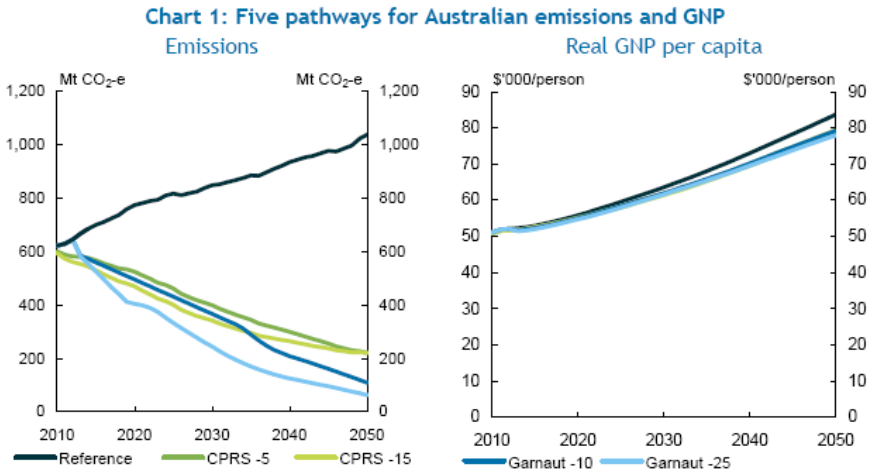
2.84 Treasury's modelling was released in October 2008, and was described by the Treasurer and Minister for Climate Change as 'one of the largest and most complex economic modelling projects ever undertaken in Australia'.[105] The work drew on a range of models with differing characteristics.[106] The key conclusions reached are:

> …early global action is less expensive than later action; that a market-based approach allows robust economic growth into the future even as emissions fall; and that many of Australia's industries will maintain or improve their competitiveness under an international agreement…[107]

2.85 The impacts on real income of differing emissions scenarios are illustrated in Chart 2.5. The key quantitative conclusion is that:

> From 2010 to 2050, Australia's real GNP per capita grows at an average annual rate of 1.1 per cent in the policy scenarios, compared to 1.2 per cent in the reference scenario.[108]

Chart 2.5: Treasury modelling



Source: Treasury (2008, p xii).

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105 Treasury, *Australia's Low Pollution Future: The Economics of Climate Change Mitigation*, October 2008, p. iii. This report is hereafter referred to as Treasury (2008).

106 The three main computable general equilibrium models used were the Global Trade and Environment Model (GTEM) developed by ABARE, the G-cubed model developed by Professor Warwick McKibbin of the Australian National University and the Monash Multi-Regional Forecasting (MMRF) model. They were supplemented by industry-specific models. The impacts on households were modelled using Treasury's Price Revenue Incidence Simulation Model (PRISMOD). Treasury (2008, pp 12–14).

107 Treasury (2008, p. ix).

108 Treasury (2008, p. xi).

Criticisms and commentary on the Treasury modelling

Modelling based on outdated specification of CPRS

2.86 There has been criticism that the Treasury modelling does not refer to the latest specification of the CPRS. The modelling refers to the ETS envisaged in the *Green Paper* and so does not incorporate the changes made in the *White Paper*. There have since been further changes to the CPRS announced by the Government on 4 May.

2.87 Ms Meghan Quinn, who led the Treasury's modelling team, explained:

> The main differences between the analysis that was undertaken in the modelling and the *White Paper* announcements were around the emission-intensive trade-exposed sectors. It is the case that the arrangements in the white paper were altered such that more transition assistance was provided to emission intensive trade exposed compared with the *Green Paper* proposals.[109]
>
> In general, the aggregate economic costs as a result of the changes between the *Green Paper* and the *White Paper* would not be expected to be very large at all, but there would be different distributional implications for both households and for sectors.[110]

2.88 On the specific issue of carbon leakage, the modifications to the scheme have been in the direction of reducing the imposts on large emitters, so revised modelling would presumably show smaller leakage effects.

No modelling of alternative schemes

2.89 The Treasury modelling compares the consequences of a few variants of the CPRS with 'business as usual'. It does not model some of the alternative schemes (discussed further in Chapter 3) such as a standard carbon tax, Carmody's consumption-based approach or the 'baseline-and-credit'/'intensity' approach, or indeed a purer version of cap-and-trade:

> …the claim in the *White Paper* that the CPRS will achieve abatement at lowest possible cost…is nowhere tested or demonstrated…It is fundamentally important that the abatement measures we adopt are in fact least cost, because that will mean we can afford to do more. I would like to see some explicit modelling to test that claim—that is, to test whether it really is the least possible cost of abatement.[111]

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109 Ms Meghan Quinn, Manager, Climate Change Modelling Division, Department of the Treasury, *Proof Committee Hansard*, 30 April 2009, p. 29.

110 Ms Meghan Quinn, Manager, Climate Change Modelling Division, Department of the Treasury, *Proof Committee Hansard*, 30 April 2009, p. 29.

111 Mr David Pearce, Centre for International Economics, *Proof Committee Hansard*, 15 April 2009, p. 22.

> I would love Treasury to model a consumption based approach.[112]
>
> … the standard benchmark that economists would use to assess low cost abatement would be to simulate an emissions trading scheme with full auctioning where that auction revenue is used to lower other distorting taxes…That simulation has not been done…[113]

2.90 To some extent the models used by Treasury may not be well-suited to this task. They are able to track through the system the consequences of a price being established for carbon, but are probably indifferent to the means by which the price is set. Some modelling at the level of individual companies may be needed to tease out the differences between baseline-and-credit and cap-and-trade systems.

No modelling of 'Australia going alone'

2.91 There has been criticism that Treasury has not modelled a 'worst case scenario' where Australia acts well in advance of competitors:

> What we do not see at the moment is an analysis, if you like, of the risks to Australia of different countries not imposing their own carbon price.[114]
>
> The Treasury did not even model what would happen if Australia acted on its own.[115]
>
> Given the nature of the collective action problem and the historical record of slow, partial and fragmented action, it is difficult to conceive why Treasury did not model and publicly release at least one policy scenario where comprehensive and coordinated global action fails to develop in the next decade.[116]

2.92 Treasury has responded that such a scenario would be very unlikely, especially given that many countries are already implementing an ETS.[117] Furthermore, Treasury has defended the assumption by arguing that:

> To assume otherwise — that is, to presume that the world's major emitters will not act at any time to decisively reduce greenhouse gas emissions — is to presume that the world will gradually succumb to potentially catastrophic damage to the global environment…The prehistoric peoples of Easter Island took this path, and paid the price (*Collapse*, Jared Diamond, 2005). We would do well not to follow their lead. Another logical possibility is

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112 Mr Geoff Carmody, *Proof Committee Hansard*, 15 April 2009, p. 31.

113 Mr David Pearce, Centre for International Economics, *Proof Committee Hansard*, 16 April 2009, p. 6.

114 Mr David Pearce, Centre for International Economics, *Proof Committee Hansard*, 16 April 2009, p. 7.

115 Mr Trevor St Baker, ERM Power, *Proof Committee Hansard*, 28 April 2009, p. 77.

116 Dr Brian Fisher, 'A peer review of the Treasury modelling of the economic impacts of reducing emissions', Concept Economics, 30 January 2009, p. 20.

117 The question of whether Australia risks 'acting alone' is discussed commencing paragraph 2.78.

> that majority scientific opinion is simply misguided and will turn out to be a fad. However, to invoke such a possibility as a basis for deciding on public policy seems to me extraordinarily foolhardy. [118]

2.93 Indeed, Treasury argues that their modelling already covers very pessimistic scenarios:

> …it was judged that having China take on no targets until 2015, despite currently doing quite a lot in the greenhouse gas space to reduce emissions, we are being more pessimistic than current government policies out to 2015. Then from 2015, China's emissions allocation continues to grow until 2030, which was judged to be realistic. Similarly, India does not do anything at all in the greenhouse gas space until 2020 and then its emissions allocation continues to grow until 2040. Other developing low income countries do not do anything until 2025.[119]

2.94 This progressive adoption of carbon pricing was viewed as too optimistic a programme by some witnesses:

> It is going to be an extremely long time before we have a comprehensive international scheme. Firstly, the negotiations are incredibly difficult and it is extremely unlikely that countries will sign up on the sort of timetable that is assumed, for example, in the Treasury modelling assumptions.[120]

Revised modelling to incorporate the global economic crisis

2.95 Treasury has also been criticised for not redoing the modelling to use a baseline incorporating the impact of the global financial crisis. Ms Quinn explained that they had not been asked by the Government to do such modelling:

> We have not been asked to examine in detail the implications of the GFC [Global Financial Crisis] through the suite of economic models that we used for the report.[121]

2.96 Moreover, Treasury felt that revising the modelling in the light of the crisis would not substantially change the results:

> …the long-term economic consequences for Australia of placing a price on emissions is largely unaffected by cyclical variations in output.[122]

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118 Dr David Gruen, 'The economic costs of reducing greenhouse gas emissions: understanding the Treasury modelling', Treasury *Economic Roundup*, no. 4, 2008, p. 27.

119 Ms Meghan Quinn, Manager, Climate Change Modelling Division, Department of the Treasury, *Select Committee on Fuel and Energy Hansard*, 19 November 2008, p. 63.

120 Dr Brian Fisher, *Proof Committee Hansard*, 30 April 2009, p. 212.

121 Ms Meghan Quinn, Manager, Climate Change Modelling Division, Department of the Treasury, *Proof Committee Hansard*, 30 April 2009, p. 26.

122 Ms Meghan Quinn, Manager, Climate Change Modelling Division, Department of the Treasury, *Proof Committee Hansard*, 30 April 2009, p. 26.

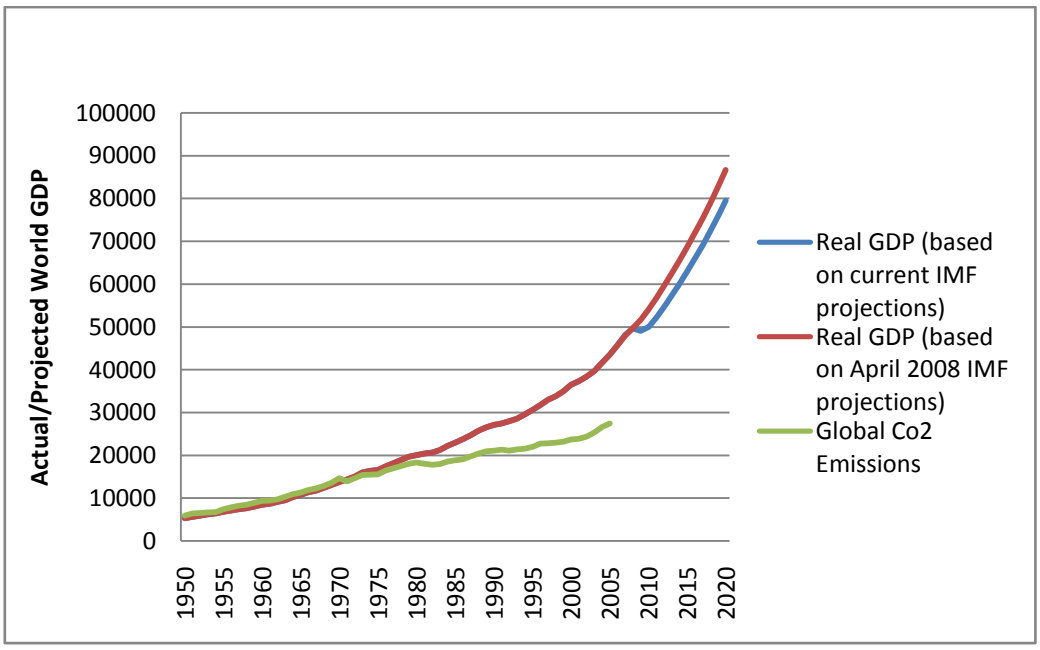
> …we do not believe that short-term cyclical influences on the Australian or global economy necessarily have a significant implication for the medium- and long-term impacts of emissions pricing on the Australian economy. That still stands true.[123]

2.97 Professor Garnaut provided some support to this view:

> …the global financial crisis and recession does not materially affect the costs of mitigation…[124]

2.98 The deterioration in economic prospects is illustrated by Chart 2.6. This shows the growth of global real GDP since 1950 (the upper line) and two forecasts—the current International Monetary Fund projections and that made a year ago.[125] (The lower line in the chart shows the path of global CO_2 emissions; the lines diverge when the mid-1970s oil crisis led to increased interest in energy efficiency.)

Chart 2.6: World real GDP and CO_2 emissions



Sources: Chart generated by Secretariat based on data from IMF, *World Economic Outlook*; A Maddison, *The World Economy: Historical Statistics*, OECD, 2003; World Resources Institute, CAIT database.

123 Ms Meghan Quinn, Manager, Climate Change Modelling Division, Department of the Treasury, *Proof Committee Hansard*, 20 May 2009, p. 8.

124 Professor Ross Garnaut, *Proof Committee Hansard*, 16 April 2009, p. 45.

125 The IMF's April 2008 *World Economic Outlook* has projections to 2013 and the April 2009 issue out to 2014. In both cases the forecasts have settled down to around 4.8 per cent growth in the final projection years and this growth rate is assumed to continue to 2020 in the chart. The CO_2 emissions exclude those due to land use change and forestry. The units used in the chart are billions of 1990 (international Geary-Khamis) dollars for GDP and millions of tonnes for CO_2 emissions.

Full employment assumption

2.99 The Treasury modelling has been criticised for applying a full employment closure rule in the long run. This implies that the lack of impact on unemployment of introducing an ETS is an *assumption* rather than a *result* of the modelling.

2.100 Mr David Pearce of the Centre for International Economics, who has reviewed the Treasury modelling, was not critical of this for the long-term analysis:

> I think it is an appropriate closure in the long run, and these particular models are good at long-run analysis…[126]

2.101 Ms Quinn, who led the Treasury modelling team, explained that they used three models, one of which has the labour market adjusting rapidly and two of which have a more gradual adjustment. Models assuming a rapid adjustment in employment reflect a slowing in output in lower real wage growth rather than a rise in unemployment.[127]

Lack of modelling the transition

2.102 The Treasury modelling focuses on the long-run consequences; on the position of the economy once it has settled down into a new, lower-emission, equilibrium. It has less to say about the impact during the adjustment phase:

> The economic modelling solves each year of the scenario, so there are results for 2010, 2011, 2012 and 2013…Chapter 2 of the report outlines some of the limitations of the economic models that we have available to us. They do not necessarily capture all the transition elements and in some cases they are too fast in terms of their adjustment. They are typically, in our judgement, better for looking at after the first few years…What is important to look at for these economic models for these types of questions are averages and time frames.[128]

2.103 Mrs Heather Ridout of the Australian Industry Group emphasised to the committee that more attention should be paid to the difficulties of transition:

> … some people think that we will get in the Tardis booth in 2010 and get out in 2020 and everything will be hunky-dory… The Treasury's modelling acknowledged that they could not fully capture those transition costs…I go back to what I said after the Treasury modelling came out: it is not easy to capture the transition costs and we are not in a Dr Who Tardis box.[129]

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126 Mr David Pearce, Centre for International Economics, *Proof Committee Hansard*, 16 April 2009, p. 15.

127 Ms Meghan Quinn, Manager, Climate Change Modelling Division, Department of the Treasury, *Proof Committee Hansard*, 30 April 2009, p. 13.

128 Ms Meghan Quinn, Manager, Climate Change Modelling Division, Department of the Treasury, *Proof Committee Hansard*, 20 May 2009, p. 18.

129 Mrs Heather Ridout, Chief Executive, Australian Industry Group, *Proof Committee Hansard*, 22 April 2009, pp 33 and 43.

2.104 This aspect of the modelling was criticised by Dr Brian Fisher, director of Concept Economics:

> …you can see that there are no transaction costs and there are no transition costs represented in that modelling…It simply is not realistic.[130]

2.105 Dr Fisher is therefore critical of the modest costs of introducing a carbon price in the Treasury modelling:

> …that is what every piece of modelling will say to you if you do it in this particular way, that does not pick up the costs of taking people in regional Australia, getting them better jobs, putting them someplace else, retraining them and dealing with the fact that our energy intensive emissions associated with the aluminium industry, the alumina refining industry and so on effectively are no longer competitive in the world. [131]

2.106 Mr Pearce commented:

> The transitional analysis is not easy to do. The frameworks that we use generally take a long-term perspective, but it can be addressed. It is important to do so and to walk in with our eyes open about what the transitional consequences are. The fact that there are transitional costs is not a reason not to proceed with the policy, because mitigation has costs but those costs will hopefully be offset by benefits in the future.[132]

Lack of regional or more disaggregated modelling

2.107 The Treasury modellers presented results disaggregated by state and by industry. There was a call that Treasury should have done modelling at a finer degree of disaggregation:

> We had hoped the Treasury modelling exercise might have addressed the impact of higher energy prices on a sectoral, firm or regional level.[133]

> We were hoping for some more detail in that information regarding the impact on particular industry segments across each of the states and so on.[134]

> I believe there needs to be more extensive modelling so that we can assess the effects of an ETS scheme...I think drilling down into the detail is a component that I see missing so far…[135]

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130 Dr Brian Fisher, *Proof Committee Hansard*, 30 April 2009, p. 217.

131 Dr Brian Fisher, *Proof Committee Hansard*, 30 April 2009, p. 218.

132 Mr David Pearce, Centre for International Economics, *Proof Committee Hansard*, 16 April 2009, p. 15.

133 Mr Greg Evans, Australian Chamber of Commerce and Industry, *Proof Committee Hansard*, 30 April 2009, p. 116.

134 Mr Andrew Canion, Chamber of Commerce and Industry of Western Australia, *Proof Committee Hansard*, 20 April 2009, p. 7.

2.108 Frontier Economics prepared a report for the NSW Government, which contained results at a regional level. Unfortunately the NSW Government has not publicly released this report, although it has been discussed in the media.

2.109 Ms Quinn doubted whether modelling at a regional level would be sufficiently robust to aid in analysis of the CPRS:

> …we did not use the regional component of the MMRF [Monash Multi Regional Forecasting] model in the Treasury modelling because we did not think it was robust enough. The results coming out of it were nonsensical… Unfortunately the data sets available make it very difficult to do robust analysis at a quantitative level for regional economies.[136]

2.110 Questions were also asked about reconciling Treasury's modelling results with claims of imminent job losses by individual companies. Ms Quinn responded:

> Our economic modelling does suggest resources will move between sectors. You have had people say that they will be adversely affected and you have had people say that they will benefit from this scheme. What happens is that there is a shift between industries and that means a movement of capital and labour between industries in response to relative price.[137]

Lack of peer review and transparency

2.111 Treasury have been criticised for not making more detailed results public and having their modelling subject to the kind of 'peer review' that would apply to an academic paper published in a leading journal.

2.112 Mr Pearce cast a critical eye over Treasury's work. He said:

> I agree that those models themselves are sound. However, I believe in any modelling analysis it is very important to do a lot of sensitivity analysis to understand the importance of particular parameter choices within those models. That is one of the things that has not been done yet.[138]

2.113 A useful check on Treasury's use of the models was that Frontier Economics, as part of their regional analysis, replicated some of the Treasury modelling:

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135 Mr Tate, Lord Mayor of Newcastle, but appearing in a personal capacity, *Proof Committee Hansard*, 28 April 2009, pp 89 and 96.

136 Ms Meghan Quinn, Treasury, *Proof Committee Hansard*, 20 May 2009, pp 14–15.

137 Ms Meghan Quinn, Manager, Climate Change Modelling Division, Department of the Treasury, *Proof Committee Hansard*, 30 April 2009, p. 13.

138 Mr David Pearce, Centre for International Economics, *Proof Committee Hansard*, 16 April 2009, p. 10.

> The modelling results that we produced on one scenario—the one that has been reported most widely—is in fact the same modelling result, as far as we can tell, as that produced by the Treasury.[139]

2.114 The Senate Select Committee on Fuel and Energy commissioned a review from Concept Economics of the Treasury modelling. The author, Dr Brian Fisher, questioned some assumptions in the modelling which he thought 'likely to result in the Treasury modelling seriously underestimating the economy-wide and sectoral challenges associated with particular emissions reductions targets'.[140]

2.115 The Select Committee on Fuel and Energy sought unrestricted access to all the model codes and databases used in the Treasury modelling but it was not provided. The Government referred to the extensive documentation that had been made publicly available and claimed contractual arrangements with external consultants limited the additional information that could be provided.[141]

Inadequate modelling of consequences for the rural sector

2.116 Agricultural emissions are not included in the CPRS, at least in the initial years of its operations. However, this does not mean that the rural sector is unaffected. Farmers will face higher prices for electricity. They may also face lower prices for the animals and products they sell to food manufacturers as the manufacturers try to 'pass back' some of the additional cost they face in having to buy permits.

2.117 The committee heard claims that these impacts have not been properly addressed by the Treasury and Australian Bureau of Agricultural and Resource Economics (ABARE) modelling:

> As to most of the general equilibrium models that operate at the moment…they do not have the linkage back in terms of cost.[142]

> **CHAIR**—But none of the modelling that I have read through seems to take into account the impact on farm of the CPRS on the processing sector of agriculture… **Mr Keogh**—No, and the difficulty is that you cannot do that modelling until you know with some degree of certainty what proportion of the processing sector exceeds the 25 kilotonne threshold and therefore is required to pay a price for their emissions.[143]

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139 Mr Danny Price, Frontier Economics, *Proof Select Committee on Fuel and Energy Hansard*, 2 April 2009, p. 14.

140 Senate Select Committee on Fuel and Energy, *The CPRS: Economic cost without environmental benefit*, May 2009, p. 89.

141 Senate Select Committee on Fuel and Energy, *The CPRS: Economic cost without environmental benefit*, May 2009, pp 90–100.

142 Mr Chris Phillips, Dairy Australia, *Proof Committee Hansard*, 30 April 2009, p. 198.

143 Mr Michael Keogh, Executive Director, Australian Farm Institute, *Proof Committee Hansard*, 21 April 2009, p. 110.

2.118 Ms Quinn believed these effects were adequately reflected in the modelling:

> My understanding is that this analysis is quite comprehensive and…looks at the implications of, and has much more detail on, disaggregating the meat processing and dairy processing from the input side, so that you can get a feel for what is going to happen through the process chain in agriculture.[144]
>
> Can I clarify that the computational general equilibrium models used do link together agriculture and processing industries back and forward, just as occurs in the economy.[145]

2.119 There were more general requests for more detailed modelling of the effects on the farm sector:

> The government has done no sectoral modelling around agriculture, other than the broad general equilibrium model.[146]

Recommendation 1

2.120 The committee notes that the Treasury modelling was conducted in economic circumstances that were markedly different to those in which the legislation is proposed to now be introduced. Since the modelling was conducted the global financial crisis has led to a marked deterioration in the short-term economic outlook.

Whilst the CPRS package has been revised on two occasions, the modelling continues to fail to take into account the impact of these changed economic circumstances. The committee considers the modelling undertaken by Treasury to be inadequate and recommends that the Government direct Treasury to undertake further modelling. The further modelling should:

- **consider in detail the short-term adjustment costs;**
- **respond to criticisms made of Treasury's initial modelling including:**
  - **taking into account the deterioration of the Australian economy**
  - **the likely effect of the CPRS upon jobs and upon the environment**
  - **the absence of any modelling of the impact of the CPRS on regional Australia; and**
- **model other types of schemes that have been proposed as alternatives to CPRS, including:**
  - **a conventional baseline-and-credit scheme**

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144 Ms Meghan Quinn, Manager, Climate Change Modelling Division, Department of the Treasury, *Proof Committee Hansard*, 30 April 2009, p. 31.

145 Ms Meghan Quinn, Manager, Climate Change Modelling Division, Department of the Treasury, *Proof Committee Hansard*, 1 May 2009, p. 107.

146 Mr Bryan Clark, Grain Growers Association, *Proof Committee Hansard*, 30 April 2009, p. 67.

- **an intensity model**
- **a carbon tax**
- **a consumption-based carbon tax, and**
- **the McKibbin hybrid approach.**

The Garnaut Review modelling

2.121 The *Garnaut Review* modelling was broader than the Treasury modelling, as it also considered some of the costs of *not* addressing climate change. In particular it covered impacts on primary production, human health, infrastructure, tropical cyclones and international trade.[147] By 2100 real GNP, GDP, consumption and wages are 6-10 per cent lower than they otherwise would be as a result of climate change and the impact is continuing to grow.[148] Adding in the increased risk of absolutely catastrophic outcomes, and the non-market impacts, would raise these estimates considerably. Garnaut notes that other modelling has shown that costs in the 22nd century will be dramatically higher—perhaps approaching 70 per cent of global GDP by 2300.[149]

2.122 Concerning the costs of restricting emissions, the Garnaut modelling closely agrees with the results of the Treasury modelling, about a 0.1 per cent a year reduction in economic growth.

2.123 The net costs of mitigation become negative by 2060 (i.e. GDP growth is stronger with mitigation than under business-as-usual). Agriculture is the big winner (as crops are more sensitive to temperature than manufacturing) but by the latter half of the century mining also is doing better.

2.124 The modelling also throws some light on the difference between aiming to stabilise at 450 and 550 ppm. The more ambitious target costs an extra 0.7–0.9 per cent of GDP (in net present value terms). Given the environmental benefits and the insurance value of reducing the risk of catastrophic impacts, Garnaut:

> …judges that it is worth paying less than an additional 1 per cent of GNP as a premium in order to achieve a 450 result. [150]

2.125 Garnaut's conclusion is that:

> The costs of well-designed mitigation, substantial as they are, would not end economic growth in Australia, its developing country neighbours, or the global economy. Unmitigated climate change probably would.[151]

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147 *Garnaut Review*, p. 253.

148 *Garnaut Review*, p. 253.

149 *Garnaut Review*, pp 262–263.

150 *Garnaut Review*, p. 272.

2.126 He also comments that modelling of large changes to the structure of the economy is likely to overstate the costs of these changes:

> Experience shows that once consumers and producers have accepted the inevitability of change, and face predictable incentive structures, they will alter their behaviour to account for the new conditions more efficiently and effectively than previously predicted. This experience suggests that economic models are more likely to underestimate the benefits or overestimate the costs of changes in economic conditions, so long as the change is to stable institutional arrangements and predictable incentives. This bias may be further exacerbated by lack of data about the full costs of climate change impacts and a corresponding downward bias in the estimated benefits of avoided climate change.[152]

Australian Bureau of Agricultural and Resource Economics (ABARE) modelling

2.127 ABARE referred to their recent modelling:

> …we had a look at what the Government's settings are in the CPRS and the policy in the *White Paper* for the emissions-intensive trade-exposed assistance. Our examination of that showed that it did maintain the competitiveness of the trade exposed agricultural industries...you have very small impacts on the production costs of the agricultural sector…they vary between 0.1 per cent and a little bit under 0.5 per cent.[153]

2.128 As noted above, the cost impact on the agricultural sector is only part of the story. The impact on their prices from the effect of a carbon price on the food manufacturing sector is also relevant, so a whole-economy perspective is needed. Once these linkages are considered in their general equilibrium modelling, ABARE's modelling shows:

> In 2020 the carbon price under the CPRS minus five scenario is estimated to be $35 a tonne and also the shielding is in place for the emissions intensive and trade exposed sectors. What you see are small increases in production for beef and sheep meat and dairy cattle, a large increase for grains and small decreases for other animals and other crops.[154]

2.129 Some of the modelling results are dependant on the proportion of food manufacturing plants and abattoirs that are over the threshold to be captured by the scheme, currently 25,000 tonnes.[155] This may vary once the scheme is introduced: the

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151 *Garnaut Review*, p. 268.

152 *Garnaut Review*, p. 306.

153 Mr Phillip Glyde, Executive Director, ABARE, *Proof Committee Hansard*, 16 April 2009, pp 112–113.

154 Mr Phillip Glyde, Executive Director, ABARE, *Proof Committee Hansard*, 16 April 2009, pp 113–114. This modelling assumes no change in the climate.

155 Mr Michael Keogh, Executive Director, Australian Farm Institute, *Proof Committee Hansard*, 21 April 2009, p. 111.

committee heard of a company that was thinking of scaling back its large abattoir and recommissioning a number of smaller ones to stay under the threshold.

2.130 There were also criticisms that the ABARE modelling as it dealt with forestry paid insufficient attention to physical constraints on the available land:

> Finally, looking at some of the economic modelling by Treasury and ABARE that addresses just one of these aspects, and that is the Kyoto compliant afforestation… the total forestation area potential, according to their modelling, is about 5.8 million hectares, or about 20 megatonnes per annum on average. CPRS 15 rises to 26 megatonnes or 80 megatonnes per annum, which as I mentioned yesterday, in spatial area represents something like 20 per cent of the Murray-Darling Basin. If you go to Garnaut 25 and adopt a deeper short-term target and a long-term target, the total afforestation area rises dramatically to 40 million hectares…[which] spatially would be 30 to 35 per cent of the Murray- Darling Basin, but that would be spread across the Australian continent…[156]

> It is very implausible modelling. The ABARE models are not well constrained physically. Their assumptions about whether the land is going to be suitable for growing trees…I do not think that it is biophysically realistic.[157]

2.131 There is a further discussion of modelling of the rural sector by ABARE and others in Chapter 6.

Concept Economics modelling of the minerals sector

2.132 Some modelling by Concept Economics commissioned by the Minerals Council of Australia argued that employment in the minerals (including smelting) industry would be 23,500 lower in 2020 if the CPRS was introduced than if it was not introduced.[158]

Other modelling

2.133 Among other organisations to conduct relevant modelling are the CSIRO, Allen Consulting Group and Frontier Economics. They gave comparable results at a national level to the Treasury modelling, although the Frontier Economics study warned that some regions could incur larger than average costs.[159]

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156 Mr Peter Cosier, Wentworth Group of Concerned Scientists, *Proof Committee Hansard*, 16 April 2009, p. 72.

157 Dr Chris Mitchell, Executive Director, Corporate Development, CO2 Group, *Proof Committee Hansard*, 16 April 2009, p. 76.

158 Concept Economics, *The Employment Effects in the Australian Minerals Industry from the Proposed Carbon Pollution Reduction Scheme in Australia*, May 2009.

159 The results from these exercises are given in Chapter 4 of the Senate Standing Committee on Economics April 2009 report, *Exposure draft of the legislation to implement the Carbon Pollution Reduction Scheme*.