Chapter 2

The case for change

2.1 In recent years the science of climate change has become increasingly well-understood due to the efforts of the world's scientists. As public interest and debate over the issue has grown, many of the important concepts and debates in climate science have effectively become accepted by the mainstream scientific community. It is interesting to note in this respect that Australia's 2007 election has been described as 'the first election in history in which climate change…was among the top three voting issues'.[1]

The greenhouse effect

2.2 Carbon dioxide (CO_2) is a gas that occurs naturally in the atmosphere. It and other greenhouse gases absorb and re-radiate heat from the Earth's surface, which maintains the Earth's surface temperature at a level necessary to support life.[2]

2.3 This '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 re-radiated towards the ground by the greenhouse gases in the Earth's atmosphere.

2.4 Human activities such as burning fossil fuels (coal, oil, natural gas), agriculture and land clearing release large quantities of greenhouse gases (particularly CO_2, nitrous oxide and methane) into the atmosphere, which trap more heat and further raise the Earth's surface temperature.

Global warming

2.5 Since modern measurements began in the late 1800s, global average surface temperature has increased by around 0.7ºC – 0.8ºC.

2.6 The *Garnaut Review*'s projections for temperatures if nothing is done, or if CO_2e is stabilised at 450 and 550 parts per million, are shown in Chart 2.1. Stabilisation at 450 ppm, which Garnaut concluded was in Australia's interests, requires significant reductions in emissions starting very soon.

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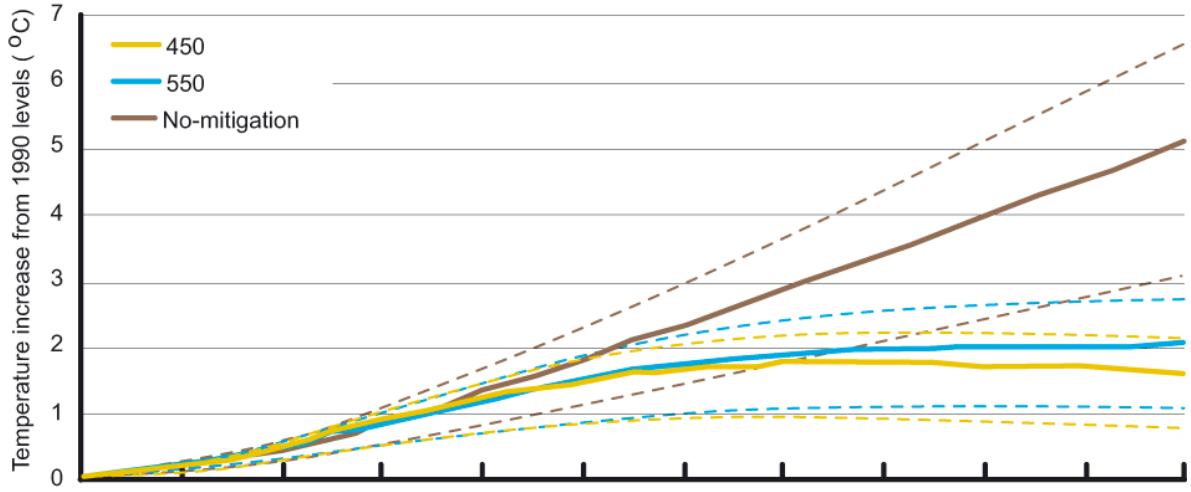
1 Thomas Friedman, *Hot, Flat and Crowded,* 2008, p 128.

2 The other greenhouse gases are water vapour, methane, nitrous oxide, halocarbons and tropospheric ozone. Greenhouse gases are often expressed as a carbon dioxide equivalent (CO_2e) due to the different warming potential of the various gases.

Chart 2.1: Global average temperature outcomes for three emissions cases 1990-2100



Note: Temperature increases from 1990 levels are from the MAGICC climate model (Wigley 2003). The solid lines show the temperature outcome for the best-estimate climate sensitivity of 3ºC. The dashed lines show the outcomes for climate sensitivities of 1.5ºC and 4.5ºC for the lower and upper temperatures respectively. The IPCC considers that climate sensitivities under 1.5ºC are considered unlikely (less than 33 per cent probability), and that 4.5ºC is at the upper end of the range considered likely (greater than 66 per cent probability).

Source: R Garnaut, *The Garnaut Climate Change Review: Final report, Cambridge University Press*, 2008, p. 92.

Scientific consensus on climate change

2.7 An overwhelming majority of the world's scientists, particularly climate scientists, have concluded that greenhouse gases are the main factor contributing to climate change since the 1950s.

2.8 The pre-eminent international body studying climate change is the Intergovernmental Panel on Climate Change (IPCC). The IPCC has concluded that warming of the climate system is unequivocal;[3] and, with a very high confidence (at least a 9 out of 10 chance of being correct) that the increase in global average temperature since the mid-20th century is due to anthropogenic greenhouse gas concentrations. In a 'business as usual' world the IPCC's best estimate is that average temperatures will rise four degrees by 2100.[4]

2.9 As an exercise in global scientific consensus the IPCC is unparalleled, and the IPCC 2007 report is 'probably the most scrutinised scientific document in the world'.[5] John Holdren, now President Obama's chief science adviser, said of its conclusions:

> They are based on an immense edifice of painstaking studies published in the world's leading peer-reviewed scientific journals. They have been vetted and documented in excruciating detail by the largest, longest, costliest,

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

4 Cited in *White Paper*, p 1-2. This may not sound a lot, however, 5 degrees is the difference between now and the last ice age.

5 *White Paper*, p 2-1.

> most international, most interdisciplinary, and most thorough formal review of a scientific topic ever conducted.[6]

2.10 The IPCC makes clear that there is a range of uncertainty around the projections. 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 just mean that remaining fossil fuel supplies would last longer.

Impacts on Australia

2.11 The IPCC has predicted with high confidence (an 8 out of 10 chance of being correct) 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.

2.12 Notably in the light of the recent bushfires in Victoria, the IPCC predicts with high confidence that risks to major infrastructure are likely (66% to 99% probability) to increase, and that by 2030 the criteria for extreme events that have been used for designing buildings and infrastructure are very likely (90% to 99% probability) to be exceeded more frequently. There will be greater risk of failure of floodplain protection, increased storm and fire damage and more heatwaves.

2.13 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.[7]

2.14 The Secretary of the Department of Climate Change warned:

> Australia can expect higher temperatures, reduced rainfall in the south and east of the country, rising sea levels and more frequent or intense extremes, including drought, heatwaves, storm surge, extreme rainfall and cyclones. Under a no-mitigation emissions scenario, average temperatures across Australia are expected to rise by around five degrees Celsius by 2100.[8]

2.15 The effects of climate change also carry significant national security implications:

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6 John Holdren, Professor of Environmental Policy, at Harvard University and former president of the American Association for the Advancement of Science, cited in Thomas Friedman, *Hot, Flat and Crowded*, 2008, p 125.

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

8 Dr Martin Parkinson, *Proof Committee Hansard*, 18 March 2009, p 4.

> …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.[9]

Committee comment

2.16 The Committee heard from a broad cross section of stakeholders and the vast majority agreed that policy needed to be adopted to address the challenges of climate change.

2.17 The Committee believes that any policy that aims to deal with this challenge should meet the following objectives:

1. Lower Australia's emissions and contribute to a global solution.
2. Avoid economic disadvantage or hardship whilst encouraging households to become more energy efficient.
3. Transition industry to a low carbon economy by providing assistance to avoid carbon leakage, and ensure energy security.
4. Fast track investment and research into renewable energy technologies.

2.18 The following chapters will examine the proposed CPRS legislation in regards to achieving the above objectives.

9 A Dupont & G Pearman, 'Heating up the planet: Climate change and security', *Lowy Paper*, no 12, Lowy Institute for International Policy, 2006, cited in *White Paper* p 1-2.